STATE COMMISSION ON RAILWAY ACCIDENT INVESTIGATION
Ministry of the Interior and Administration.

REPORT No. PKBWK 04/2022

from the investigation of a railway accident that occurred on 29 July 2021 at 06:15 on the track Szczecin Gumieńce – Tantow, on track no. 1, at the railway crossing category C at 7.585 km of the railway line no. 409 Szczecin Gumieńce – State Border (Tantow)
PKP PLK S.A. infrastructure manager area Zakład Linii Kolejowych [Railway Facility] in Szczecin

Warsaw, 11 May 2022

https://www.gov.pl/web/mswia/panstwowa-komisja-badania-wypadkow-kolejowych

This Report was drafted pursuant to the provisions of *Commission Implementing Regulation (EU) 2020/572 of 24 April 2020 concerning the reporting structure to be followed for rail accident and incident investigation reports (Official Journal of the European Union No. 132 of 27 April 2020)*

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I. ABSTRACT

Type of event: Accident.

Description: An incident at a railway crossing involving the entry of a road vehicle, i.e., the entry of a heavy goods vehicle with a semi-trailer for transporting loose materials directly in front of an oncoming passenger train RMM 80681/5801 travelling on the route Szczecin Główny – Berlin Gesundbrunnen, composed of three three-member diesel multiple units of the VT646 type (DB Regio AG operator).

Event date: 29.07.2021 at 06:15.

Event location: Railway line no. 409 Szczecin Gumieńce – State border (Tantow), line Szczecin Gumieńce – Tantow, track no. 1, cat. C
at km 7.585, crossing ID 409 007 585, geographical position 53º20'33 "N 14º26'20 "E.

Consequences of the event: In result of heavy goods vehicle entering directly in front of an oncoming train, the train collided with the semi-trailer loaded with gravel and derailed the first multiple unit type VT646-030. The two other VT646 type multiple units of train RMM 80681/5801 did not derail. The semi-trailer of the road vehicle was destroyed. There were no fatalities in the accident. Nine persons were injured (the train driver, the driver of the road vehicle and seven passengers on the train). The passengers were released home after being treated at the scene. The train driver and the driver of the road vehicle were taken to hospital where they were released home after a medical examination.

Causal factor: Entry of a road vehicle at a railway crossing cat. C directly in front of oncoming passenger train RMM 80681/5801.

Contributing factor:

1) Failure to behave with special caution by the driver of a road vehicle when approaching a railway crossing, as provided for in Article 28 sections 1 and 2 of the Act of 20 June 1997 Traffic Code (consolidated text Journal of Laws of 2021, item 450, as amended).
2) The lack of reaction of the driver of the road vehicle to the light signals provided on the traffic signal system no. S1 and S3 in front of the railway crossing, as stipulated in § 98 (5) of the Regulation of the Ministers of Infrastructure and Internal Affairs and Administration of 31 July 2002 on road signs and signals (consolidated text Journal of Laws of 2019, item 2310, as amended).
3) Road merger to the gravel pit and the district road immediately in front of the railroad crossing (13 metres away from the outermost rail of the track).
4) Difference in level of road to gravel pit and district road making it difficult for heavy goods vehicles to merge into traffic.
5) Poor visibility of the district road for vehicles merging into traffic from the road to the gravel pit (trees, bushes in the road lane of the district road).
6) Sun glare (in the morning with a clear sky) on the user of the road to the gravel pit when accessing the district road and joining traffic.

Systemic factors: None found.

Recommendations and their addressees:

1) The mayor of the Kołbaskowo municipality shall implement measures to eliminate the current connection between the district road no. 3492Z and the access to the gravel pit by constructing a road in accordance with construction project No. P-872/2017 "Construction of a municipal road

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to service and production investment areas within the area of Barnisław," approved by the Starost of Police.

2) Until the current connection of the district road no. 3492Z with the access to the gravel pit is removed, the administrator of the district road shall develop and introduce a new traffic organisation in the area of the access to the railway crossing guaranteeing the improvement of traffic safety.
3) The infrastructure manager PKP PLK S.A. will undertake actions aimed at increasing the category of this crossing in order to improve safety in the area of the railway crossing at 7.585 km.
4) Infrastructure managers shall take measures to put in place mechanisms to implement conclusions and recommendations from diagnostic checks at railway crossings.

Photograph 1 – Consequences of the Incident (SCRAI own material)

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Photograph 2 – Consequences of the Incident (SCRAI own material)

Photograph 3 – Consequences of the Incident (SCRAI own material)

II. THE PROCEDURE AND ITS CONTEXT

1. Decision to initiate the Procedure

The Chairman of the State Commission on Railway Accident Investigation (hereinafter referred to as "SCRAI") Tadeusz Ryś issued the decision ref. no. SCRAI.4631.7.2021 of 04 August 2021 on undertaking proceedings to clarify the causes and circumstances of an accident at a railway–road crossing hereinafter referred to as "railway crossing," category C at 7.585 km. Considering this fact and the provisions of Article 28e section 2 of the Railway Transport Act of 28 March 2003 (consolidated text Journal of Laws of 2020, item 1043, as amended) hereinafter referred to as the "Railway Transport Act," the event was reported on time to the European Union Agency for Railways and registered in the database under reference number PL-10106 on 11 August 2021.

2. Statement of reasons for the decision to initiate the procedure

Based on the analysis of the circumstances and considering the nature of the incident, the Chairman of the SCRAI has decided to initiate proceedings by the Commission's Investigation Team pursuant to Article 28e section 2 of the Railway Transport Act.

3. The scope and limitations of the procedure including their justification, and an explanation of any delays considered a risk or otherwise affecting the conduct of the proceedings or the conclusions of the proceedings

The investigation to determine the causes of the incident was conducted under Article 28h section 1 of the Railway Transport Act, which, in accordance with the provisions of Article 28f section 3 does not determine fault or liability.
Considering the nature of the incident, an analysis has been carried out of the following, among others:

- documentation of the journey, infrastructure manager's and railway undertaking's internal regulations relevant to the incident under investigation,
- the safety management system (SMS) of the infrastructure manager,
- the maintenance system documentation (MSU) for the railway vehicle type VT646.

There were no constraints during the course of the proceedings that would adversely affect the procedure.

4. Aggregated description of the technical capacity of the functions in the team of persons conducting the procedure

The Chairman of the Commission appointed an Investigation Team consisting of three members selected from among the standing members of the Commission with appropriate qualifications and competences for the procedure.

5. Description of the communication and consultation process conducted with persons or entities involved in the incident, during the investigation and in relation to the information provided

Pursuant to Article 28h section 2 item 5 of the Railway Transport Act, the Chairman of the SCRAI obliged specific members of the railway commission to cooperate with the Investigation Team (letter no. PKBWK 4631.7.1.2021 dated 04.08.2021).

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In accordance with the contents of the letter no. PKBWK 4631.7.2.2021 dated 25.08.2021, documented handover of the documentation collected by the railway commission was carried out in PKP PLK S.A. Zakład Linii Kolejowych [Railway Facility] in Szczecin on 02.09.2021.
The Chairman of SCRAI issued a letter no. PKBWK.4631.7.4.2021 of 24 September 2021 to the President of the Board, Director General of POLREGIO Sp. z o.o. in Warsaw to gain access to the agreement concluded between "Przewozy Regionalne" sp. z o.o. and DB Regio AG on mutual international passenger rail transport (cross-border agreement)" and to provide data concerning, among others, the work of the train crew as well as the vehicle itself. POLREGIO sp. z o.o. railway undertaking provided relevant materials for the needs of the Investigation Team.

6. Description of the level of cooperation proposed by the units involved in the procedure

During the investigation of the circumstances and causes of the incident, the cooperation with the representatives of the entities involved in the incident did not raise any objections of the Investigation Team.

7. A description of the methods and techniques used in the investigation and the methods of analysis applied to establish the facts and make the findings referred to in the report

Throughout the process to clarify the causes and circumstances of the incident, the investigation team took into account the provisions of national and international legislation, the internal rules of the infrastructure manager and technical documentation. In addition, the Team applied its own knowledge and experience.
Use was made of documentation produced by the Investigation Team and documentation collected by the railway commission.
As part of the investigation of the incident, the Investigation Team carried out the following activities, among others:

- visual examination of the scene and the consequences of the accident on the day of the accident, including examination of the railroad crossing, the access roads and the railway line,
- drawing up photographic and film documentation on the day of the accident and at later dates,
- local inspections at the accident site carried out in conditions similar to the conditions existing on the day of the accident,
- conducting an experiment to check visibility conditions (including signs and signals) from a road vehicle when approaching a crossing, in environmental conditions similar to those on the day of the accident,
- analysis of documentation provided by the railway undertaking, the rail manager, the road manager and the owner of the road vehicle,
- data analysis of the recorder of the driving parameters of the railway vehicle (multiple unit VT646).

Presented below is a selection of the legislation, regulations and internal instructions used in the course of the procedure:

European Union regulations:

1) Directive (EU) 2016/798 of the European Parliament and of the Council of 11 May 2016 On railway safety (OJ L 253, 11.10.2002, p. 102).
2) Regulation (EU) 2016/679 of the European Parliament and of the Council of 27 April 2016 on the protection of natural persons with regard to the processing of personal data and on the free movement of such data, and repealing Directive 95/46/EC (General Data Protection Regulation (OJ EU L119 of 04.05.2016. p.1. as amended)) and the related Act of 10 May 2018 on Personal Data Processing (Journal of Laws, item 1000).

3) Commission Regulation (EU) No 1158/2010 of 9 December 2010 on a common safety method for assessing conformity with the requirements for obtaining railway safety certificates.
4) Commission Regulation (EU) No 1169/2010 of 10 December 2010 on a common safety method for assessing conformity with the requirements for obtaining a railway safety authorisation.
5) Commission Implementing Regulation (EU) 2020/572 of 24 April 2020 concerning the reporting structure to be followed for rail accident and incident investigation reports (Official Journal of the European Union No. 132 of 27 April 2020)

National legislation:

1) Railway Transport Act of 28 March 2003 (i.e., Journal of Laws of 2020 item 1043 as amended and i.e., Journal of Laws of 2021, item 1984 as amended).
2) Regulation of the Minister of Infrastructure and Development of 20 October 2015 on technical conditions to be met by junctions of rail lines and railway sidings with roads and their location (Journal of Laws of 2015 item 1744 as amended).
3) Regulation of the Minister of Infrastructure of 11 January 2021 on workers employed in positions related to the operation and safety of railway traffic and to the operation of certain types of railway vehicles (Journal of Laws of 2021, item 101).
4) Regulation of the Minister of Infrastructure of 18 July 2005 on general conditions for railway traffic and signalling (i.e., Journal of Laws of 2015, item 360, as amended).
5) Act of 7 July 1994 Construction Law (i.e., Journal of Laws of 2020, item 1333, as amended).
6) The Act of 20 June 1997 Traffic Code (i.e., of 2021, item 450, as amended).
7) The Regulation of the Ministers of Infrastructure and Internal Affairs and Administration on Road Signs and Signals (i.e., Journal of Laws of 2019 item 2310, as amended).
8) The Act of 21 March 1985 on Public Roads (i.e., Journal of Laws of 2021, item 1376, as amended).
9) Regulation of the Minister of Transport and Maritime Economy of 2 March 1999 on the technical conditions to be met by public roads and their location (i.e., Journal of Laws of 2016, item 124, as amended).

International agreements between Poland and Germany related to railway transport:

1) Agreement between "Przewozy Regionalne" sp. z o.o. and DB Regio AG on mutual international passenger rail transport (cross-border agreement) of 20 November 2012.
2) Agreement between the Federal Republic of Germany and the Republic of Poland on cooperation in the field of rail transport across the Polish-German state border concluded on 23 March 2016.
3) General Border Agreement between DB Netz AG Regionalbereich Ost Produktionsdurchführung Neustrelitz and PKP Polskie Linie Kolejowe S.A (PKP PLK S.A.).
4) Local Border Agreement between DB Netz AG Regionalbereich Ost Produktionsdurchführung Neustrelitz and PKP Polskie Linie Kolejowe S.A. (PKP PLK S.A.), Zakład Linii Kolejowych [Railway Facility] in Szczecin for the section operated in border traffic Szczecin Główny – Tantow.

Internal instructions of PKP PLK S.A. infrastructure manager

1) Ir-8 Instructions for handling severe accidents, accidents and incidents in rail transport.
2) Id-1 (D-1) Technical conditions for the maintenance of the railway superstructure.
3) Ik-2 Railway safety inspection manual.
4) Id-7 (D-10) Railway line supervision instruction.
5) Ir-1 Driver's rule book.

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6) Ie - 4 (WTB-E10) Technical guidelines for the construction of railway signalling equipment.

8. Description of the difficulties and specific challenges encountered during the procedure

The members of the Investigation Team did not encounter difficulties or problems that could affect the procedure, its timeliness or conclusions.

9. All interactions with the judicial authorities

There was no need to cooperate with the judicial authorities.

10. Other information relevant to the procedure

No other relevant information.

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III. DESCRIPTION OF THE EVENT

1. Event and background information

1.1. Description of the event type

Incident at the road crossing.
During the journey of passenger train RMM 80681/5801 of railway undertaking DB Regio AG (consisting of three three-sectional diesel multiple units, type VT646) on the route Szczecin Główny – Berlin Gesundbrunnen, on the railway crossing cat. C at 7.585 kilometre of railway line no. 409 Szczecin Gumieńce – State border (Tantow), a road vehicle loaded with gravel drove directly in front of the train. The road vehicle entered the crossing from the right-hand side looking in the train travel direction. The train came into contact with the left side of the semi-trailer of the road vehicle. The first three-sectional diesel multiple units derailed as a consequence of the impact. The road vehicle was thrown to the left side of the track in such a manner that the cab rotated 90 degrees to the direction of travel of the vehicle, while the chassis of the semi-trailer found itself under the first section of the VT646 multiple units. The remaining part of the train, i.e., two VT646 three-sectional diesel multiple units have not derailed.

1.2. Date, exact time and place of event

The event occurred on 29.07.2021 at 06:15, at the cat. C railway crossing, route Szczecin Gumieńce – State border (Tantow), track no. 1, km 7.585, on railway line no. 409 Szczecin Gumieńce – State border (Tantow).

1.3. Description of the site of the incident, including meteorological and geographical conditions at the time of the incident and any works carried out at or near the site

Photograph 4 – General overview of the scene (source: Google Earth)

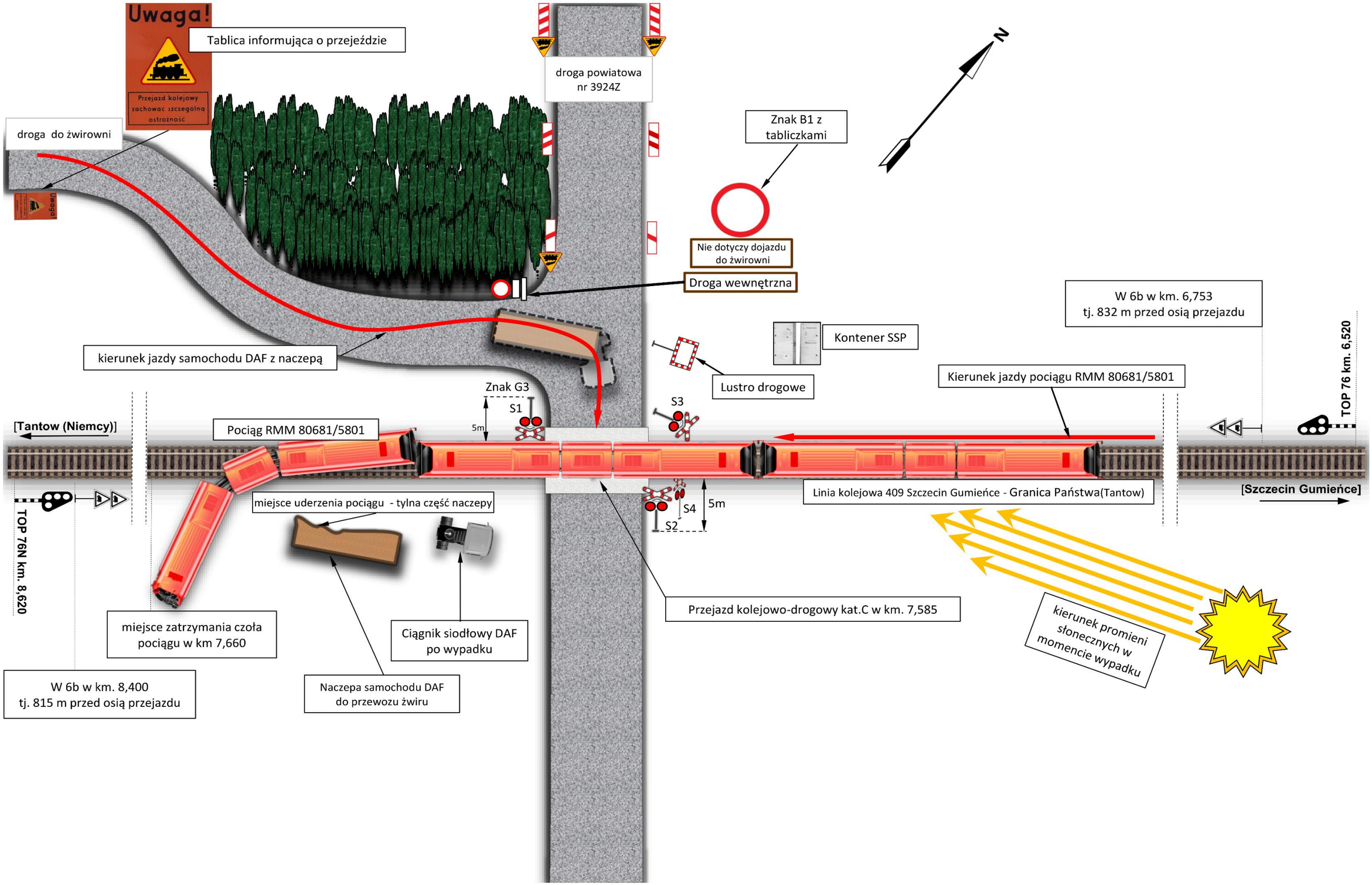
The category C crossing where the accident occurred is located on the district road no. 3924Z Smolęcin – Kołbaskowo, made of a bituminous surface with a dirt shoulder. The geographical coordinates of the crossing are 53º20'33"N 14º26'20" E. The speed limit for road vehicles on the road in the area of the crossing is set at 90 km/h. The district road crosses the railway track at an angle of 70º. The railway line crosses the road in an undeveloped area. The district access road to the crossing merges with access to gravel pit. The axis of the road joining the district road is situated 13 m away from the outermost rail of the track. The road to the gravel pit is only used as access to the gravel pit. The gravel pit access road contains no signage for traffic users regarding approaching the public district road nor information about approaching the crossing. 150 metres in front of the road, prior to the merging area with the district road, there is a board displaying the information "*Attention! Level crossing, take extra care*." Traffic signal no. S3, a self-acting crossing system, faces the exit from the district road (towards the road to the gravel pit) and it is built into the road strip of the district road. The level of the road to the gravel pit is lowered by approximately 1.6 metres in relation to the level of the district road. The levelling of the road to the gravel pit and the district road takes place in the area of the junction of these roads over a length of 30 metres, forming driveway (towards the district road). Within the area of the access road, looking to the left from the road to the gravel pit towards the district road, the visibility of vehicles travelling on the district road is restricted due to the wooded and vegetated area in the road lane of the district road. A road mirror has been installed in order to improve the visibility for vehicles merging into traffic from the road to the gravel pit. In the morning in sunny weather, drivers of road vehicles travelling on the gravel pit road towards the district road are blinded by sunrays. The sun is at the height of traffic signal number S3, which makes it difficult to identify the signals it transmits (photograph 9). When joining traffic from the road to the gravel pit onto the district road the road mirror is also at the level of the sun, making it very difficult to use as intended (photograph 10).

The district road No. 3924Z from Smolęcin is marked on both sides with warning signs A-10 and indicator posts on the right-side G-1a, G-1b, G-1c and on the left side G-1d, G-1e, G-1f. There is a G-3 sign and an automatic crossing system traffic signal 5 metres before the crossing.

Traffic signal number S3 from the road to the gravel pit was visible from a distance of approximately 70 metres. Recognition of the signals transmitted by this signalling post was limited due to the intense sunlight.

Visibility of the train front from the triangle road from 5 m is maintained. In the triangle area, visibility from a distance of 5 metres, there are no bushes and trees and no other obstacles limiting the field of vision. On the day of the incident, i.e., 29 July 2021, no work was being carried out on the rail and road infrastructure in the area of the crossing.

Drawing 1 – Sketch of the accident (developed by SCRAI)



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1.4. Deaths, injuries and damage to property

a) passengers, employees or contractors, level crossing users, trespassers, other persons on the platform, other persons not on the platform

There were no fatalities in the accident. Nine persons were injured (the train driver, the driver of the road vehicle and seven passengers on the train). The passengers were released home after being treated at the scene. The train driver and the driver of the road vehicle were taken to hospital where they were released home after a medical examination.

b) cargo, luggage and other property

The accident caused damage to the road vehicle and partial loss of the cargo it was carrying (gravel) as it has spilled. There was no damage to the luggage of the train passengers.

c) rolling stock, infrastructure and environment

Extent of damage to derailed three-unit diesel multiple unit VT646-030.

The collision caused the derailing of the first multiple units with all six wheelsets.

The bogies of multiple unit VT646 030 were severely damaged. The carriage frames and the superstructures were deformed as a result of the forces applied on them. The collision with the heavy goods vehicle caused a very serious deformation of the driver's cab.

The mechanical and electrical components connecting the individual parts of the rail bus were torn off. A large number of panes (windows/doors) were damaged.

In result of the collision, elements of the plating were torn out and the rear wall of the driver's cab was deformed and displaced. The body of the multiple units was deformed.

Damage of the VT646-030 vehicle caused its inability to run on tracks.

The remaining two multiple units VT646-014 and VT646-029, which were not damaged, descended with their own propulsion to Szczecin Gumieńce station.

Photograph 5 – View of the railway vehicle after the accident

Extent of infrastructural damage.

As a result of the incident, the ejected road vehicle destroyed one lighting pole and luminaire located in the vicinity of the crossing. The first multiple units of the train derailed and continued to move while derailed thus causing damage to the track and the installed equipment, i.e., 50 pieces of prestressed concrete sleepers, 30 metres of rails, an induction loop type FSSB 60/80 self-propelled crossing system with fittings.

1.5. Description of other effects, including the impact of the event on the regular activities of the entities involved

As a result of the incident, track no. 1 of Szczecin Gumieńce – State border (Tantow) was closed for train traffic (traffic stopped) from 06:34 on 29 July 2021 until 30 July 2021 at 12:00. The incident caused the delay of four passenger trains (18 minutes) and one goods train (2406 minutes).
A replacement bus service has been introduced until rail traffic is restored.

1.6. Identification of persons, their functions and entities involved, including possible links with contractors or other relevant parties

The following persons were directly involved in the incident:

- train driver on train RMM 80681/5801 – employee of railway undertaking DB Regio AG.
- the driver of the road vehicle – an employee of CT Szczecin sp. z o.o.

1.7. Description and identifiers of trains and their composition including associated rolling stock and registration numbers

Train no. RMM 80681/5801 was made up of three VT646-type three-car diesel multiple units.
First multiple units in a multiple unit

A three-unit diesel multiple units of series VT646, series 030, operated by DB Regio AG was driving as the first multiple units of passenger train RMM 80681/5801.
Certificate No. DB/0646/2018/04 of Technical Fitness of the Railway Vehicle – rail bus type GTW 2/6, year of construction 2001, serial number 520-030 manufactured by Bombardier / DWA, issued on the basis of the certificate of approval for the type of railway vehicle No. T/2013/0030, railway vehicle identifier 9580 0646 030-6 D DB.
Certificate of Technical Fitness of the Railway Vehicle valid until 05.09.2024 or for a mileage of 3,834,153 km calculated based on the odometer value of 2,394,153 km (i.e., up to 1,440,000 km).
Certificate No. DB/0646/2018/05 of Technical Fitness of the Railway Vehicle – rail bus type GTW 2/6, year of construction 2001, serial number 519-030 manufactured by Bombardier / DWA, issued on the basis of the certificate of approval for the type of railway vehicle No. T/2013/0030, railway vehicle identifier 9580 0646 030-3 D DB.
Certificate of Technical Fitness of the Railway Vehicle valid until 05.09.2024 or for a mileage of 3,834,153 km calculated based on the odometer value of 2,394,153 km (i.e., up to 1,440,000 km).
Certificate No. DB/0646/2018/06 of Technical Fitness of the Railway Vehicle – rail bus type GTW 2/6, year of construction 2001, serial number 397-030 manufactured by Bombardier / DWA, issued on the basis of the certificate of approval for the type of railway vehicle No. T/2013/0030, railway vehicle identifier 9580 0646 530-2 D DB.
Certificate of Technical Fitness of the Railway Vehicle valid until 05.09.2024 or for a mileage of 3,834,153 km calculated based on the odometer value of 2,394,153 km (i.e., up to 1,440,000 km).

Second multiple units in a train

three-unit diesel multiple units of VT646 series, no. 014, operated by DB Regio AG was driving as the second multiple units of passenger train RMM 80681/5801.
Certificate No. DB/0646/2017/30 of Technical Fitness of the Railway Vehicle – rail bus type GTW 2/6, year of construction 1999, serial number L-381-14 manufactured by Bombardier / DWA, issued on the basis of the certificate of approval for the type of railway vehicle No. T/2013/0030, railway vehicle identifier 9580 0646 014-0 D DB.
Certificate of Technical Fitness of the railway vehicle valid until 18.05.2023 or for a mileage of 1,440,000 km calculated based on the odometer value of 2,751,063 km.
Certificate No. DB/0646/2018/04 of Technical Fitness of the Railway Vehicle – rail bus type GTW 2/6, year of construction 1999, serial number 519-014 manufactured by Bombardier / DWA, issued on the basis of the certificate of approval for the type of railway vehicle No. T/2013/0030, railway vehicle identifier 9580 0946 014-7 D DB.
Certificate of Technical Fitness of the railway vehicle valid until 18.05.2023 or for a mileage of 1,440,000 km calculated based on the odometer value of 2,751,063 km.
Certificate No. DB/0646/2017/32 of Technical Fitness of the Railway Vehicle – rail bus type GTW 2/6, year of construction 1999, serial number 520-014 manufactured by Bombardier / DWA, issued on the basis of the certificate of approval for the type of railway vehicle No. T/2013/0030, railway vehicle identifier 9580 0946 514-6 D DB.
Certificate of Technical Fitness of the railway vehicle valid until 18.05.2023 or for a mileage of 1,440,000 km calculated based on the odometer value of 2,751,063 km.

Third multiple units in the train composition

The three-unit VT646 series diesel multiple units no. 029 operated by DB Regio AG was running as the third multiple units of passenger train RMM 80681/5801.
Certificate No. DB/0946/2016/27 of Technical Fitness of the Railway Vehicle – rail bus type GTW 2/6, year of construction 1999, serial number 519-029 manufactured by Bombardier / DWA, issued on the basis of the certificate of approval for the type of railway vehicle No. T/2013/0030, railway vehicle identifier 9580 0646 029-5 D DB.
Certificate of Technical Fitness of the railway vehicle valid until 27.04.2024 or for a mileage of 1,440,000 km calculated based on the odometer value of 2,579,385 km.
Certificate No. DB/0646/2019/01 of Technical Fitness of the Railway Vehicle – rail bus type GTW 2/6, year of construction 1999, serial number DB 396 - 29 manufactured by Bombardier / DWA, issued on the basis of the certificate of approval for the type of railway vehicle No. T/2013/0030, railway vehicle identifier 9580 0646 029-8 D DB.
Certificate of Technical Fitness of the railway vehicle valid until 27.04.2024 or for a mileage of 1,440,000 km calculated based on the odometer value of 2,579,385 km.
Certificate No. DB/0946/2016/28 of Technical Fitness of the Railway Vehicle – rail bus type GTW 2/6, year of construction 1999, serial number 520-029 manufactured by Bombardier / DWA, issued on the basis of the certificate of approval for the type of railway vehicle No. T/2013/0030, railway vehicle identifier 9580 0646 529-4 D DB.
Certificate of Technical Fitness of the railway vehicle valid until 27.04.2024 or for a mileage of 1,440,000 km calculated based on the odometer value of 2,579,385 km.
The mileage at the time of the incident was 2,656,266 km. The vehicle inspection was performed on 18.06.2021.

Train data RMM 80681/5801 – from brake test sheet:

- train length ..... 117 m
- total weight of the train ..... 213 tonnes
- brake weight percentage..... 138%
- actual brake mass..... 294 tonnes.

1.8. Description of the relevant parts of the infrastructure and signalling – track type, switch, interlocking, signal, train protection systems

Track

Rails type.....	–	S49 - year class 2010
Sleepers.....	–	prestressed concrete type PS83
Attachment type.....	–	type K within the level crossing further type SB
Railroad ballast type.....	–	25 cm thick gravel
The maximum permissible train speed on the route.	–	120 km/h
Track slope in the crossing area in the direction of travel of the train	–	4.2 ‰ over a length of 430 m.

Level crossing:

- c category crossing, i.e., crossing of the railway line No. 409 Szczecin Gumieńce – State border (Tantow) with the district road No. 3924Z Smolęcin – Kołbaskowo,
- an individual trave; identification number (yellow sticker): 409,007,585,
- axis of the pass – 7.585 km,
- the angle of intersection of the road with the railway track – 70°,
- the surface of the crossing is made of prefabricated reinforced concrete CBP type crossing slabs - 3 sets,
- access road surface - bituminous,
- the level of the access road:
  - right side (direction of road vehicle entrance at the crossing) - 3.7% over a length of 7.5 m,
  - left side 4.8% over a length of 7 m,
- traffic product at the crossing – 17034; last measurements were taken on 17 and 18 May 2016,
- total length of passage - 9.5 m,
- width of the road crown at the crossing – 9.0 m,
- roadway width at the crossing – 9.0 m,
- roadway width in the access road left side – 5.1 m,
- width of roadway on access road right side – 5.6 m,
- maximum speed of road vehicles through the crossing – 90 km/h,
- illuminated crossing – two lighting poles.

There is a connection to the gravel pit road 13m from the outermost rail of the track on the district road accessing the crossing.

Automatic Level Crossing System (ALCS):

- automatic level crossing system equipment – BUES 2000 S&B,
- traffic signal type – SYG/RYB/SBP/1, 4 units,
- type of track sensors – FSSB 60/80,
- electronic sound generator – 2 units,
- type of crossing warning track – Top 98, 2 units,
- type of remote-control device – UZK 2000, installed at Szczecin Gumieńce station,

– equipment built for speeds of 120 km/h.

Crossing markings on the day of the incident:

1) Markings from the road to the gravel pit in the direction of the district road and the crossing
The road to the gravel pit to the junction with the district road lacks the A-10 warning sign and the G-1a, G-1b, and G-1c indicator posts. At a distance of 150 metres before the connection with the district road, there is a board with the information "*Attention! Railway crossing, take extra care*." In front of the crossing, on its left side, there is a traffic light No. S3 facing the road to the gravel pit. The signals transmitted by this beacon are visible from the road to the gravel pit from a distance of 70 metres.
2) Track side set indicators W6b
   – in the direction of increasing kilometres of the railway line located at 6.753 km, i.e., 832 metres from the axis of the crossing,
   – in the direction of the decreasing kilometrage of the railway line located at 8.400 km, i.e., 815 metres from the axis of the crossing.

1.9. All other information relevant to the description of the event and background information

Road infrastructure:

Directly in front of the crossing there is an exit from the district road, which is a connection of the district road with the road to the gravel pit and marked with a B1 sign with plates (photograph no. 6). The surface of the road to the gravel pit is bituminous at a length of approximately 200 m (counting from the junction with the district road). At a distance of 150 metres before the connection with the district road, there is a board with the information "*Attention! Railway crossing, take extra care*." (photograph no. 7) The road to the gravel pit does not have an approved permanent traffic organisation.

Photograph 6 – Sign placed at the entrance to the gravel pit road

Photograph 7 – Information board placed by the road to the gravel pit

2. A factual description of the events

2.1. The chain of discrete events leading up to the event, including: actions taken by the persons involved; operation of rolling stock and technical installations; operation of the operating system

On 29 July 2021 at 06:04, passenger train RMM 80681/5801 on the route Szczecin Główny – Berlin Gesundbrunnen departed from Szczecin Główny station. The last scheduled stop for this train was at Szczecin Gumieńce station. At 06:12, the train left the station and was approaching the crossing at 7.585 kilometre. The driver of the train, after passing a TOP level crossing warning disc transmitting signal TSO2 ("*the signalling equipment at the level crossing is operational and further movement across this level crossing is permitted at the highest authorised speed"*), gave the signal "Attention" next to indicator W6b and continued at a speed of approximately 70 km/h (with a maximum speed limit of 120 km/h). When approaching the crossing, the driver noticed that a road vehicle was coming from the right and had not stopped in front of the crossing. Consequently, the driver gave the "Attention" signal again and implemented an emergency braking of the train. The road vehicle failed to leave the crossing and the train hit the left side of the road vehicle's semi-trailer. At the time of the incident, the train was travelling at a speed of 62 km/h. The incident resulted in the road vehicle being thrown to the left side to spill the cargo. A semi-trailer chassis was jammed under the train causing the first multiple units to derail. After the impact, the train continued to move derailed at a distance of approximately 75 metres and came to a stop on the embankment (photographs 2, 3, 5).

At 06:08, a truck loaded with gravel left a gravel pit located in Germany. The driver of the vehicle, after driving about 3 km along the road to the gravel pit, reached the district road no. 3924Z. The driver of the road vehicle, having reached the district road, stopped and ensuring there were no obstructions, entered the district road. While entering the district road, the driver explained, the sun was shining into his eyes, making him unable to identify whether the lights on the traffic signal were on, as well as whether a train was coming. After driving his front wheels onto the tracks, the driver of the road vehicle heard the train driver give the audible signal and saw the train approaching from the left, then accelerated in an attempt to leave the crossing. The rear of the road vehicle remained on the track and an oncoming train struck the rear of a semi-trailer loaded with gravel.

2.2. The sequence of events from the occurrence of the incident until the end of the emergency services' operations, including: measures taken to protect and secure the scene of the incident; the efforts of the rescue and emergency services

After the accident, the driver, despite his injuries, switched off all equipment on the train, notified the emergency services and went to the compartment to provide possible assistance to the injured passengers of the train. A few minutes after the incident, the Fire Brigade, medical emergency team and police arrived at the scene. In the course of securing the scene and carrying out the rescue operation, medical assistance was provided to 7 travellers, while the driver and driver were taken to hospital for examination. They were released home after being examined. Police operational activities were carried out until 09:05 and at that time the train wreck and road vehicle were allowed to be removed from the accident scene. The second and third multiple units were withdrawn to Szczecin Gumieńce station using their own propulsion. The derailed first multiple units were moved to an area adjacent to the track outside the gauge at 12:30pm, then repairs were made to the railway infrastructure. Train traffic was restored after repairs on 30.07.2021 at 12:00.

IV. ANALYSIS OF THE INCIDENT

1. Roles and responsibilities

1.1. Railway undertakings or infrastructure managers

PKP PLK S.A. infrastructure manager Zakład Linii Kolejowych [Railway Facility] in Szczecin

The infrastructure manager is responsible, inter alia, for the proper maintenance of the railway line including level crossings. The duties of the infrastructure manager are set out, inter alia, in Article 62 of the Act of 07 July 1994 – Construction Law. This provision requires managers to carry out annual and five-year inspections of buildings (including crossings). The infrastructure manager's internal instruction Id-1 imposes an obligation to carry out a diagnostic survey of the building at least once a year.
PKP PLK S.A. Zakład Linii Kolejowych [Railway Facility] in Szczecin presented the members of the Investigation Team with a protocol from a diagnostic test of a railway-road crossing at 7.585 km of railway line no. 409 Szczecin Gumieńce – State Border (Tantow) no. IZDKN7.5003.409.4.2021.CB of 23 July 2021. The examining diagnostician included the following recommendations in the above-mentioned protocol:

1) recommendation to the district road manager:
   - clean the surface on the access roads, right and left side,
   - complete horizontal P-4 markings on the left and right sides,
   - improve fixing of G-1f sign left side,
   - check the position and fixing of the U-18 mirror.

   In a letter ref. no. IZ18DK.505.125.4.2021 MK of 18.10.2021, Zakład Linii Kolejowych [Railway Facility] in Szczecin applied to the road manager to remove the irregularities indicated above.
2) recommendation to the gravel pit road manager:
   - remove the connection of the road from the gravel pit to the district road in its present location.

   In a letter ref. no. IZ18DK.505.125.5.2021MK of 18.10.2021, Zakład Linii Kolejowych [Railway Facility] in Szczecin applied to the Mayor of Kołbaskowo municipality to issue an opinion regarding the exit located directly behind the 7.585 km cat. C, railway line no. 409.
   In a letter ref. no. GK.7221.69.2021 dated 26.10.2021, the Mayor of Kołbaskowo municipality informed that he has the design documentation for the construction of a new municipal road. The project involves removing the current exit (road connection) and constructing a junction with the district road, 67 metres from the railway line. Until the development of this road is completed, the current connection to the district road will remain unchanged.
3) recommendation to the railway line manager Zakład Linii Kolejowych [Railway Facility] in Szczecin:
   - in the event that no other safer solution for incorporating the road from the gravel pit into the district road is found by 15.10.2021, the introduction of a train speed limit in both directions to 60 km/h.

Based on the response received from the District Starosty in Police regarding the actions taken in the area of the crossing at 7.585 km by the road manager, the Chief Engineer of Zakład Linii Kolejowych [Railroad Facility] in Szczecin decided to abandon the introduction of the train speed limit to 60 km/h on 15 September 2021.
The Investigation Team believes that it was not reasonable to waive the introduction of the train speed limit, as the information provided by the road managers only informs about the planned construction of the road and its connection with the district road in a new location (along with the removal of the current road connection with the gravel pit in the area of the crossing) without specifying the implementation date. The planning of the above activities does not constitute the implementation of the diagnostic recommendation, i.e., citation. "*The manager of the road to the gravel pit and the owner of the gravel pit will remove the incorporation of the road from the gravel pit into the district road in its current location*...").

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In light of the above, the Chairman of the SCRAI issued a recommendation on 24.01.2022 to impose a speed limit of 60 km/h for trains travelling in both directions and to program the W6b indicators accordingly to the speed limit.
The infrastructure manager PKP PLK S.A. has introduced a train speed limit of 60 km/h in both directions in the area of the level crossing at kilometre 7.585 of railway line no. 409 from 27 January 2022 at 12:07.

Railway Undertaking DB Regio AG

The carrier operates services on the railway line from Berlin to Szczecin on the basis of the agreement between DB Netz and DB Regio AG concluded on 16 February 2020 and the agreement between the Federal Republic of Germany and the Republic of Poland on cooperation in the field of railway transport across the Polish-German state border concluded on 23 March 2016.
In connection with the execution of the passenger transport agreement, DB Regio AG also uses the cross-border contract for mutual international rail passenger transport concluded with the rail carrier Przewozy Regionalne sp. z o.o. On the basis of a cross-border agreement, the carrier DB Regio AG acts as the provider of rolling stock (RFO providing rolling stock) and personnel (RFO providing personnel), while the carrier Przewozy Regionalne sp. z o.o. acts as an entity that has concluded a contract with the infrastructure manager for the operation of the planned transport routes (RFO performing transport).
On the basis of these agreements, DB Regio AG is obliged to appoint railway vehicles which have a certificate of admission to operation of a railway vehicle type issued by the President of the Office of Rail Transport in Poland and a certificate of technical fitness of the railway vehicle. The Investigation Team found that the railway vehicle involved in the incident met the authorisation conditions and had the required documents.
DB Regio AG also provides the personnel for the services. The designated train crew operating the train had all the authorisations and qualifications required by law. The train operated in accordance with the schedule. The carrier's obligations with regard to safe driving are defined by the provisions of the General Border Agreement (GBA), the Local Border Agreement (LBA). Analysing the collected material, the Investigation Team did not find any irregularities in the behaviour of the train crew during the train driving as well as after the incident.

1.2. Entities in charge of maintenance, maintenance workshops or any other providers of maintenance services

As the RFO providing the rolling stock, the rail operator DB Regio AG is responsible for its operability, technical condition and compliance with the vehicle maintenance process. The vehicle had a Railway Vehicle Type Certificate and a current Certificate of Technical Fitness. The carrier provided documentation of the last technical inspections of the railway vehicles carried out. The investigation team found no irregularities in the maintenance and operation of the rolling stock. The technical condition of the railway vehicle had no influence on the incident.

1.3. Rolling stock manufacturers or other suppliers of railway products

The Investigation Team did not identify factors influencing the occurrence of the incident by rolling stock manufacturers and rail product suppliers on the basis of the study material collected.

1.4. The national safety authorities or the European Union Agency for Railways

The President of the Office of Rail Transport (ORT) supervises railway traffic safety. The Investigation Team, based on the research material collected, did not identify factors influencing the ORT in the incident.

1.5. Notified bodies, designated bodies or risk assessment bodies

The Investigation Team, based on the study material collected, did not identify factors influencing the notified bodies and risk assessment bodies in the occurrence of the incident.

1.6. Certification bodies of entities in charge of maintenance listed in item 1.2

The certification body for the railway undertaking DB Regio AG as the entity responsible for maintenance within the framework of the Safety Management System (SMS) is the Eisenbahn – Bundesamt (EBA). The Investigation Team did not identify factors influencing the railway undertaking's certification body on the occurrence of the incident on the basis of the study material collected.

1.7. Any other person or entity involved in the incident, as may be documented in one of the relevant safety management systems, or as referred to in the register or relevant legal framework

Pursuant to §81 of the Regulation of the Minister of Infrastructure and Development of 20 October 2015 *on technical conditions to be met by junctions of rail lines and railway sidings with roads and their location* (i.e., Journal of Laws of 2015, item 1744, as amended), the duties of proper marking and maintenance of the access road to the crossing belong to the administrator of the district road no. 3924Z.
Crossing markings were correct. Faults relating to the maintenance of the access road to the crossing were communicated by the infrastructure manager with letter no. IZ18DK.505.125.4.2021 MK dated 18.10.2021 to the district road manager in Police. The district road manager has not provided feedback on the implementation of the recommendations indicated in the letter mentioned above.

2. Rolling stock and technical installations

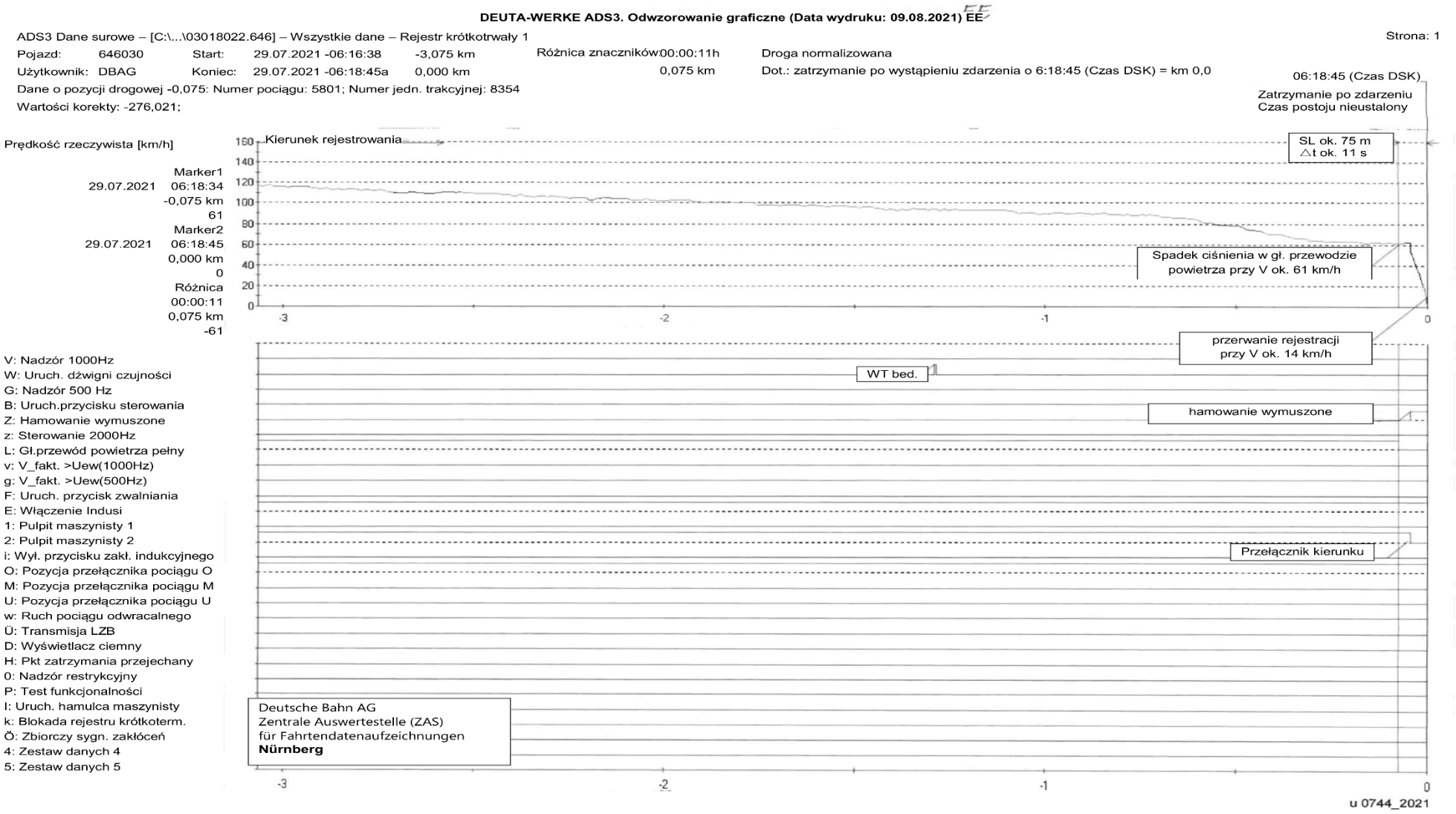
Powered railway vehicle
The three-unit VT646 series diesel multiple units is equipped with the DEUTA WERKE ADS3 electronic system for recording driving parameters.
The Investigation Team analysed selected driving parameters recorded on the system immediately before the incident. The running parameters of the train over the 3 km distance and during the 50 seconds before the incident until the moment of stopping after the incident are shown in the diagram below with description.
The following diagram shows the driving parameters of train RMM 80681/5801:

1) pressure in the main line,
2) speed,
3) enforced braking,
4) activation of emergency braking,
5) cab identification – control from cab B.

Description of running characteristics of train no. RMM 80681/5801 of Szczecin Główny – Berlin Gesundbrunnen on the section Szczecin Gumieńce – to the place of the accident:
- 06:12:19 – start of the train,
- 06:12 to 06:17 – increase in speed to 94 km/h,
- 06:17:39 – activation of the "caution" button and reduction of speed from 94 km/h to 61 km/h,
- 06:18:34 – the emergency brake was applied at the speed of 61 km/h and the speed dropped rapidly,
- 06:18:45 – recording interrupted from the time of the incident after 11 seconds and a distance of approximately 75 m.

It was not possible for the investigation team to analyse the course of the incident on the basis of the monitoring due to the fact that DB Regio AG vehicles do not have forecourt recorders.

Figure 2 – Diagram of the driving parameters of the multiple unit VT646 as a function of time (developed by SCRAI)



Automatic Level Crossing System

The BUES 2000 S&B type automatic level crossing system for category C was installed at the crossing in 2009. The system is equipped with TOP warning discs, which inform the drivers of trains approaching the crossing about the functionality of the equipment. The last recorded fault in the crossing system before the accident occurred on 17.07.2021. After it was removed on that day, the equipment continued to operate properly until the day of the accident. Maintenance process carried out correctly, on time according to approved schedules. The Investigation Team has no objections to the operation and maintenance of the automatic crossing system.

3. Human factors

3.1. Human and individual characteristics

The investigation did not reveal the influence of the individual characteristics of the driver and the driver of the road vehicle on the incident. The test carried out on the drivers of the road vehicle and the train driver did not reveal the presence of alcohol in their blood as well as other psychoactive compounds. The driver of the road vehicle was making his first run on the day of the incident. According to his explanations, the course of the road vehicle was planned and prepared the day before (the road vehicle was loaded with gravel). Once he started work, he completed the required steps to prepare the vehicle for the road without haste and in accordance with the work plan.

The Investigation Team did not identify the influence of health status, fatigue, stress of the participants in the incident.

3.2. Factors related to the job position

Diesel multiple unit VT646-030 has the relevant approval to operate on PKP PLKS.A. railway network. Working time for the train crew and the driver of the road vehicle was in accordance with the applicable standards. The driver of the road vehicle had 13 hours of rest before starting work. The driver of train number RMM 80681/5801 had 12 hours of rest before starting work. The road vehicle was in good working order and had an up-to-date technical inspection allowing it to be operated safely. The Investigation Team raises no objections to the factors associated with the workstation of the driver of the traction vehicle as well as the driver of the road vehicle.

3.3. Organisational factors and tasks

The material collected by the Investigation Team shows that the employer provided the statutorily required rest time to the train crew involved in the incident. These workers had all the authorisations and certificate required by regulations and instructions in relation to the activities performed on the job. The employer has equipped them with the necessary instructions and regulations to ensure safe work performance. The Investigation Team raises no objections to factors related to organisational tasks.

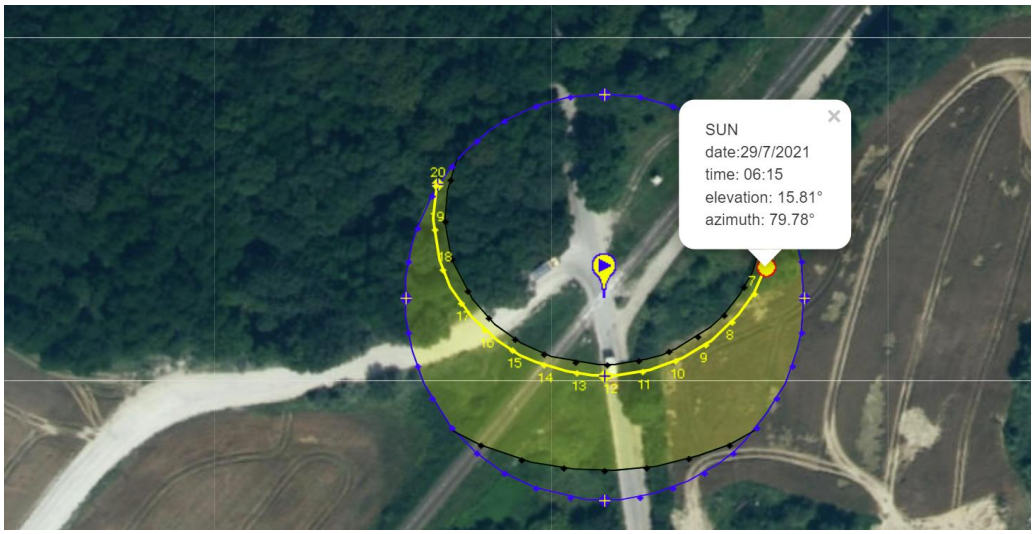
3.4. Environmental factors

The incident took place in the morning with good air clarity, the sun was not obscured by clouds. The investigation team concluded that weather conditions and topographical and technical conditions in the area of the road-railway crossing had a significant influence on the occurrence of the incident. Contributing factors include:

1. Road merger to the gravel pit and the district road immediately in front of the railroad crossing (13 metres away from the outermost rail of the track).
2. Level difference between the road towards the gravel pit and the district road. The levelling of these roads occurs on a short section of road (over a length of 30 metres in the area of the road junction), causing a steep climb (towards the district road). The steep ascent in the area of the crossing with simultaneous execution of the turning manoeuvre and joining the traffic, poses a great difficulty for road vehicles (especially for trucks with semi-trailers), resulting in a high probability of collision with road vehicles travelling on the district road as well as trains.
3. Poor visibility of the district road for vehicles merging into traffic from the road to the gravel pit (trees, bushes in the road lane of the district road, an additional traffic mirror was used).

4. Sun glare (in the morning with a clear sky) on the user of the road to the gravel pit when accessing the district road and joining traffic (photograph no. 8).

Photograph 8– View from the road to the gravel pit during access to the district road and passage from the road vehicle
(source SCRAI)



Photograph 9 – Sun position at the time of the accident (source: https://www.sunearthtools.com)

The positioning of the lenses of the traffic signal number S3 causes the phenomenon of blinding the users of the road to the gravel pit in the morning in sunny weather, making it very difficult to identify the signals transmitted by this sign.

On 05.08.2021 (7 days after the incident) an experiment was conducted to determine the field of vision of the truck driver when approaching the district road and crossing. The experiment involved representatives of the infrastructure manager, the road carried whose vehicle was involved in the incident and members of the Investigation Team. The experiment was conducted under conditions similar to those in which the event occurred. A road vehicle of the same type as the vehicle involved in the incident (a heavy goods vehicle with a semi-trailer loaded with gravel) was used for the experiment. The weather conditions were similar to those on the day of the accident (sunny, temperature $+15^0$C, no rain or fog). The automatic crossing system equipment was activated by train mo. RMM 80681/5801 (in accordance with the timetable at the same time as on the day of the accident). The road vehicle journey was carried out in a manner similar to the technique and driving of the vehicle involved in the accident. A video recorder was installed in the road vehicle at the driver's eye level. During the experiment, it was found that the driver of a road vehicle is blinded by sunlight coming directly from above the traffic signal box no. S3 when approaching the district road. When joining the traffic and entering the district road, the driver of the road vehicle is forced to take the left side of the road to the gravel pit and make a sharp right turn (90-degree angle) also occupying the left lane of the district road while driving over a steep climb. During this manoeuvre, the sun blinds the driver at all times and at some point, during the journey, the signals transmitted by signal box S3 are not visible. The road mirror intended to improve visibility onto the district road when joining traffic from the road to the gravel pit is not performing its function job as it is also located the height of the sunlight (photographs 10 and 11).

Photograph 10 – A frame from the driving recorder during the experiment (source SCRAI)

Photograph 11 – Another frame from the driving recorder during the experiment (source SCRAI)

3.5. Any other factors relevant to the procedure

The Traffic Code, which is the basic regulation for the users of public roads, i.e., the provisions of the Act of 20 June 1997 – Traffic Code (i.e., Journal of Laws of 2021, item 450, as amended).
Specific provisions concerning level crossings and relating to drivers of road vehicles are contained in Article 28 of this Act and state that:
"1. The driver of a vehicle, when approaching or passing through a railroad crossing is obliged to exercise particular caution. Before driving over the track, he must ensure that no rail vehicles are approaching and take the necessary precautions, especially if air clarity is reduced by fog or other reasons.
2. The driver shall be required to drive the vehicle at such a speed as to stop it in a safe place when a rail vehicle is approaching or when a safety device or signal prohibits entry on the crossing."
Additionally, the Regulation of the Ministers of Infrastructure and Internal Affairs and Administration of 31 July 2002 on road signs and signals (Journal of Laws 2019, item 2310, as amended) states the following in § 98 item 5:
"*A flashing red signal or two alternately flashing red signals means that it is prohibited to drive behind a traffic signal or other device giving these signals*"
and the § 78 item 5 states that:
"*1. Sign G-3 St. Andrew's Cross before a level crossing – designates a place to stop in connection with the movement of a train or other railway vehicle at a level crossing without barriers or without half barriers,*"
The failure of the driver of the DAF truck to comply with the above-mentioned regulations when approaching and entering the crossing directly in front of the oncoming train was considered by the Investigation Team as a causal factor for the incident. The speed of the road vehicle immediately before entering the crossing was slow due to the terrain elevation immediately before entering the district road. The heavy goods vehicle was technically sound. The technical condition of the heavy goods vehicle made it possible to stop the vehicle in front of the crossing at a safe distance, i.e., in front of a traffic signal giving a signal prohibiting entry behind the signal.

4. Feedback and control mechanisms, including risk and safety management and monitoring processes

Conditions of the relevant regulatory framework:

4.1. The processes, methods, content and results of risk assessment and monitoring activities carried out by any of the parties involved: railway undertakings, infrastructure managers, entities in charge of maintenance, maintenance workshops, other maintenance providers, manufacturers and other entities and the independent assessment reports referred to in Article 6 of Implementing Regulation (EU) no. 402/2013

Within the framework of the proceedings in question, the Commission's Investigation Team conducted an analysis of the "Hazard Register," which is one of the most important elements of the Safety Management System of the infrastructure manager, PKP Polskie Linie Kolejowe S.A.

Chapter 5 covers risks associated with level crossings and pedestrian crossings as part of the railway infrastructure. These are risks caused by various irregularities in the formal and legal requirements, diagnostics, operation of equipment and maintenance of the crossing or crossing. The chapter also includes hazards caused by users of level or level crossings and other causes.

The following risks are associated with the event under investigation:

item 5.3.7 of the register: failure to implement recommendations following diagnostic tests,

item 5.7 of the register; deficiencies in the maintenance of level crossings,

item 5.9 of the register: "failure of users of level crossings and pedestrian crossings to comply with the provisions of the traffic code,"

sub-item 5.9.4: "failure to comply with information arising from vertical road signs,"

item 8.6.12 of the register: failure to take action to introduce speed limits in the vicinity of level crossings.

The investigation team concludes that the driver of the road vehicle, while approaching the crossing, did not follow the signals presented by the traffic signals and the G-3 sign and entered the crossing directly in front of the oncoming train RMM 80681/5801.

4.2. The safety management system of the railway undertakings and infrastructure managers involved, taking into account the essential elements set out in Article 9(3) of Directive (EU) 2016/798 and all EU implementing acts

Infrastructure Manager PKP Polskie Linie Kolejowe S.A.

Safety Management System (SMS) in the company PKP Polskie Linie Kolejowe S.A., was introduced by the Resolution no. 30/2011 of 24 January 2011 on adopting an order introducing Safety Management System in PKP Polskie Linie Kolejowe S.A. A summary of selected SMS elements binding in PKP PLK S.A. is presented in the table below.

Table 1 – List of selected SMS elements used by PKP PLK S.A. related to the event.

No.	Symbol/ Procedure no.	Name of document / procedure
Main process		
1.	SMS-PG-01	Provision of railway infrastructure and managing railway traffic
Auxiliary processes procedures		
2.	SMS-PW-01	Maintaining the railway line in a technically and organisationally sound manner
3.	SMS/ MMS-PW-03	Handling railway incidents
4.	SMS-PW-04	Remedying the consequences of railway accidents
5.		Hazard register

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6.		PKP Polskie Linie Kolejowe S.A. Railway Traffic Safety Improvement Programme 2021

The Investigation Team found that the infrastructure manager's personnel became acquainted with the SMS safety system. Employees are trained periodically and have access to up-to-date versions of the various procedures. As a result of the analysis of the SMS documentation in force at the infrastructure manager PKP PLK S.A., the Investigation Team does not raise any objections to the manner in which the safety management system operates, the hazard register is kept and the safety improvement programme for 2021 is implemented.

Railway Undertaking DB Regio AG

In accordance with the declaration included in Article 6 item 5 of the cross-border contract concluded between Przewozy Regionalne sp. z o.o. and DB Regio AG, the parties confirmed that they have a Safety Management System (SMS) and that they are aware of and manage all risks associated with railway operations. In addition, the contracting parties undertook to carry out regular audits of internal processes and regulations relating to safety and maintenance of rolling stock in accordance with the relevant national legislation.

The Investigation Team raises no objections to the manner in which the carrier's Safety Management System operates.

4.3. The management system of the entity/entities in charge of maintenance and maintenance workshops, taking into account the functions laid down in Article 14(3) of and Annex III to Directive (EU) 2016/798 and any subsequent implementing acts

Not applicable.

4.4. Results of supervision by national safety authorities in accordance with Article 17 of Directive (EU) 2016/798

Within the framework of supervision, the President of the Office of Rail Transport at the infrastructure manager conducted two inspections in 2020 and one inspection in the first half of 2021, the scope of which included railway and road crossings. The inspections were carried out on the following railway lines:

- Line no. 18 Kutno - Piła Główna – 3 crossings cat. D,
- Line no. 203 Tczew - Kostrzyn – 4 crossings cat. D,
- Line no. 403 Piła Głowna - Ulikowo – 5 crossings cat. D and 1 crossing of cat. C,
- Line no. 405 Piła Główna - Ustka – 5 crossings cat. D and 1 crossing of cat. C.

The controls did not cover the level crossing at km 7.585 of railway line No. 409 Szczecin Gumieńce – State border (Tantow).

4.5. Authorisations, certificates and assessment reports issued by the Agency, national safety authorities or other conformity assessment bodies

Infrastructure manager: PKP Polskie Linie Kolejowe S.A. owns

Security authorisation:

- EU number PL2120210000,
- date of issue 26.02.2021 with validity from 01.03.2021,
- expiry date 01.03.2026,
- type of infrastructure; normal rail (99.2%), broad gauge (0.8%).

The volume of infrastructure managed as reported in the 2019 Annual Report:

- total line length 18,680 km,
- total length of track 35,951 km,
- 38,663 turnouts,

– 14,013 level crossings, including 12,156 on lines in service

Rail carrier: DB Regio AG has

Single Safety Certificate:

– EU number .....EU 10202000089,
– date of issue 21.12.2020,
– expiry date 20.12.2025,
– type of service .....passenger services, excluding high-speed services,
– lines operated: German Federal Republic.

4.6. Other systemic factors

The Investigation Team did not identify any other systemic factors influencing the incident.

5. Previous incidents of a similar nature

The investigation team analysed accidents occurring at this crossing between 2010 and 2020 as part of their investigation. There were three accidents involving road vehicles and a train during this period.
A brief description of the events and their consequences.

1) On 13.02.2010 at 08:14 at km 7.585 of the C category crossing of the line 409 Szczecin Gumieńce State Border (Tantow), a road vehicle (Hyundai Accent) having driven from the gravel pit road onto the district road bypassed a tractor and stopped next to it (in the opposite lane). The road vehicle stopped in a manner that its front remained on the edge of the track. A train from Angermunde to Szczecin Główny consisting of two motive power units of D-DB type (DB RegioAG Nordost) hit a road vehicle in the gauge causing it to turn. None of the people involved were injured as a result of the incident.
2) On 04.06.2018 at 16:30 at the category C crossing at km 7.585 of line 409 Szczecin Gumieńce State Border (Tantow) directly in front of an oncoming passenger train AMMr 80668/5804 relation Berlin Lichtenberg – Szczecin Główny, a road vehicle (passenger car Volkswagen Passat) entered the crossing. When he realised that a train was approaching the level crossing the driver of the road vehicle accelerated. Despite this, he did not manage to leave the crossing, and the train ran into the rear of the vehicle. The train composition consisted of three three-member diesel multiple units of type VT646 (DB Regio AG Nordost). None of the people involved were injured as a result of the incident.
3) On 05.12.2018 at 11:35 at the category C crossing at km 7.585 of line 409 Szczecin Gumieńce State Border (Tantow) directly in front of an oncoming passenger train AMM 5808/80664 relation Berlin Angermunde – Szczecin Główny, a road vehicle (passenger car Skoda Karoq) entered the crossing. The train consisted of three three-member diesel multiple units of type VT646 (DB Regio AG). Upon impact the road vehicle caught fire and as a result of the incident the driver of the road vehicle died on the spot. The train crew and passengers were not injured. The road vehicle was completely destroyed.

An analysis of the Final Determination Protocol of Event no. 1 shows that the location of the road junction in the area of the crossing and its formation contributed to this behaviour of the driver of the road vehicle which resulted in the accident. On the day of the incident, it was slippery, snowing in the area where the road to the gravel pit joins the district road. The driver of the vehicle exiting the road to the gravel pit thought he was going to merge into traffic by crossing the driveway and stop next to another vehicle standing in front of the level crossing (on the left lane). The driver drove up the driveway and stopped the road vehicle in the rail loading gauge which resulted in an accident.
The explanation given by the driver of the road vehicle in relation to incident 2 shows that one of the factors that led to the incident was the blinding sun. The driver reported that he was blinded by the sun when he came out of the shade of the trees and the sun appeared just before the level crossing making it difficult to identify the signals communicated by the traffic signals.
These two cases show that the environmental conditions are factors that increase the risk of incidents at this crossing. The recommendations of the railway commission in the Final Determination Protocols referred mainly to the intensification of supervision of compliance with traffic regulations in the area of the crossing.

Due to the fact that accidents had occurred at this crossing in previous years, which proves that it is a particularly dangerous crossing, in order to improve safety the Investigation Team recommends to increase the category rating of the crossing in accordance with § 8 section 2 of the Regulation of the Minister of Infrastructure and Development of 20 October 2015 *on technical conditions to be met by junctions of rail lines and railway sidings with roads and their location* (Journal of Laws 2015, item 1744, as amended).
In order to draw the particular attention of the users of the district road to the approach of the dangerous place, the Investigation Team recommends to place the sign A-30 "Other danger" with the T-14d plate on both sides in front of the crossing.

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V. CONCLUSIONS

1. Summary of analysis and conclusions on the causes of the incident

The investigation into the causes of the accident showed that the rolling stock involved in the accident as well as elements of the railway infrastructure, including the automatic crossing system built at the crossing, were technically sound and did not contribute to the occurrence of the accident. Factors related to the job position as well as the organisational tasks performed by those involved in the incident did not contribute to the occurrence of the incident.

Environmental conditions were significant contributing factors to the incident. These factors include:

1. Road merger to the gravel pit and the district road immediately in front of the railroad crossing (13 metres away from the outermost rail of the track).
2. Level difference between the road towards the gravel pit and the district road. The levelling of these roads occurs on a short section of road (road connection area), causing a steep climb. The steep climb in the area of the crossing with simultaneous execution of the turning manoeuvre and joining of traffic is a major inconvenience for road vehicles (trucks). This results in a high probability of collisions with road vehicles travelling on the district road as well as trains.
3. Poor visibility of the district road for vehicles merging into traffic from the road to the gravel pit (trees, bushes in the road lane of the district road).
4. Sun glare (in the morning with a clear sky) on the user of the road to the gravel pit when accessing the district road and joining traffic.

The failure of the driver of the road vehicle to take extra care when approaching and crossing the crossing was also a factor in the incident. The driver of the road vehicle failed to follow the signals given by the traffic lights (two alternately flashing red lights). The speed of the vehicle as well as its technical condition made it possible to stop the vehicle in front of the crossing in a safe place, i.e., in front of the traffic signal prohibiting entering behind it, despite the difficult topographical conditions in the area of the crossing. The behaviour of the driver of the road vehicle in entering the crossing directly in front of the oncoming train was considered by the investigation team as a causal factor for the incident.

2. Measures taken since the incident

The chairman of the SCRAI on 25.01.2022 issued a recommendation to introduce a permanent speed limit in front of a railway-road crossing for trains moving in both directions to 60 km/h on the entire section L, referred to in part B of appendix no. 3 of the *Regulation of the Minister of Infrastructure and Development of 20 October 2015 on technical conditions to be met by junctions of rail lines and railway sidings with roads and their location* (Journal of Laws of 2015 item 1744 as amended) and to set indicators W6b in accordance with the speed.

3. Additional remarks

No additional remarks.

VI. SAFETY RECOMMENDATIONS

1) The mayor of the Kołbaskowo municipality shall implement measures to eliminate the current connection between the district road no. 3492Z and the access to the gravel pit by constructing a road in accordance with construction project No. P-872/2017 “Construction of a municipal road to service and production investment areas within the area of Barnisław,” approved by the Starost of Police.
2) Until the current connection of the district road no. 3492Z with the access to the gravel pit is removed, the administrator of the district road shall develop and introduce a new traffic organisation in the area of the access to the railway crossing guaranteeing the improvement of traffic safety.
3) The infrastructure manager PKP PLK S.A. will undertake actions aimed at increasing the category of this crossing in order to improve safety in the area of the railway crossing at 7.585 km.
4) Infrastructure managers shall take measures to put in place mechanisms to implement conclusions and recommendations from diagnostic checks at railway crossings.

STATE COMMISSION ON RAILWAY ACCIDENT INVESTIGATION
CHAIRMAN

……
Tadeusz Ryś

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List of entities appearing in the contents of Report **No. PKBWK/04/2022**

No.	Symbol (abbreviation)	Explanations
1	*2*	*3*
1.	EUAR	European Union Agency for Railways
2.	SCRAI	State Commission on Railway Accident Investigation
3.	ORT	Office of Rail Transportation
4.	Managing Authority	PKP PLK S.A. Zakład Linii Kolejowych
5.	POLREGIO Sp. z o.o. (currently POLREGIO S.A.)	Polish Railway Undertaking
6.	DB Regio AG	German Railway Undertaking

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