RAIB
Rail Accident Investigation Branch

Rail Accident Report

Serious injury to a cyclist at Scate Moor bridleway crossing
8 January 2006

Department for Transport

Report 06/2006
June 2006

This investigation was carried out in accordance with:

- the Railway Safety Directive 2004/49/EC;
- the Railways and Transport Safety Act 2003; and
- the Railways (Accident Investigation and Reporting) Regulations 2005.

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Serious injury to a cyclist at Scate Moor bridleway crossing, 8 January 2006

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Introduction

1 The sole purpose of a Rail Accident Investigation Branch (RAIB) investigation is to prevent future accidents and incidents and improve railway safety.

2 The RAIB does not establish blame, liability or carry out prosecutions.

3 This report contains the findings of the RAIB investigation into the serious injury to a cyclist at Scate Moor bridleway crossing, 8 January 2006.

4 Certain technical terms (shown in *italics* where they first appear in the body of this report) are explained in the Glossary at Appendix A.

Summary

5 At approximately 17:35 hrs on Sunday 8 January 2006 a cyclist suffered a severed leg as a result of the passage of a train over Scate Moor bridleway crossing (16 km west of York, on the railway between York and Harrogate).

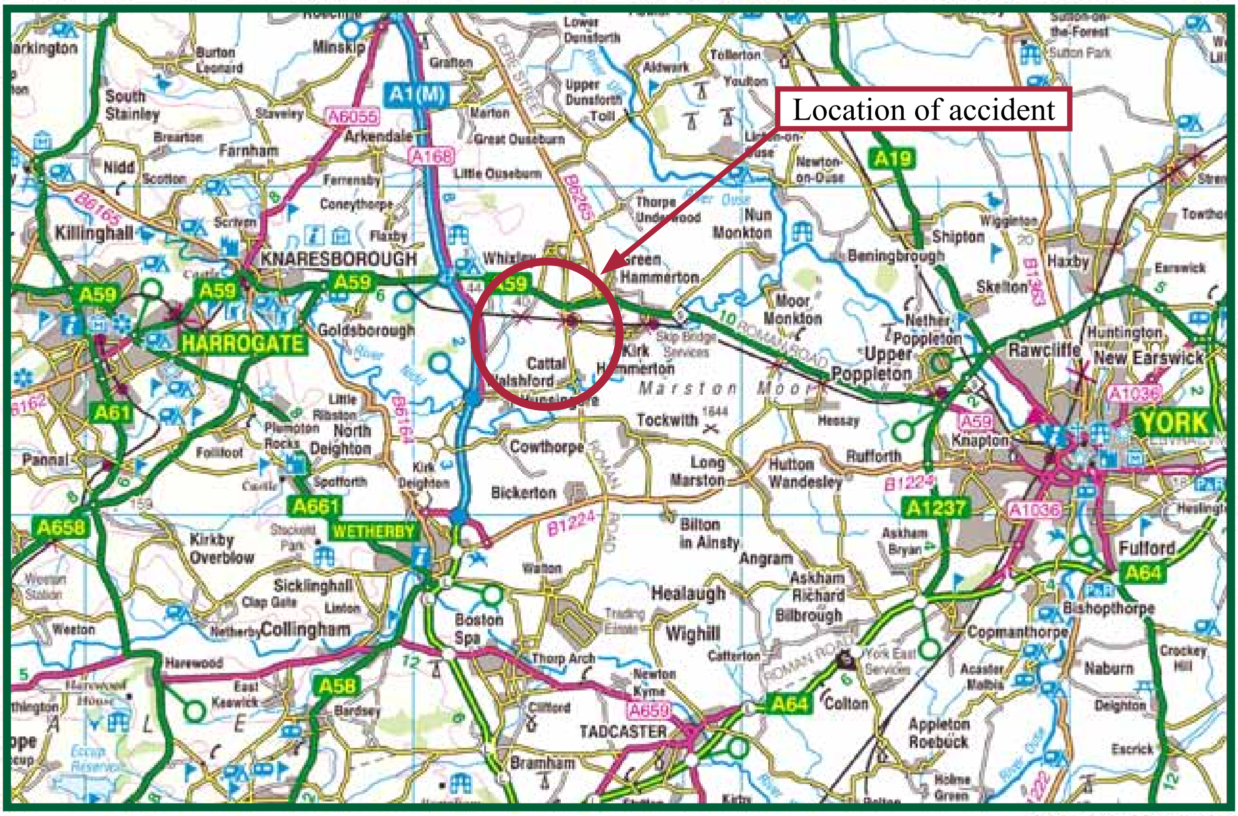

Figure 1: Extract from OS map of Cattal and surrounding area

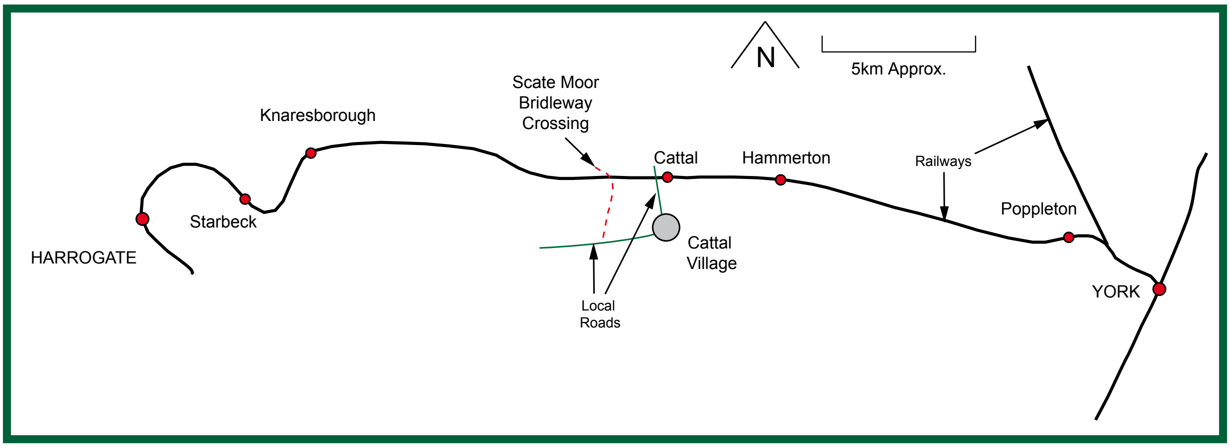

Figure 2: Railway map showing location of Scate Moor crossing

6 The cyclist is the only person who at the time was aware of the accident. He has been unable to recall the period between pushing his bicycle up the slope to the railway and when the train was passing.

7 No failings that could have contributed to the accident have been found relating to the railway infrastructure (including the crossing), the train, its operation or the signalling.

8 The immediate cause of the accident was that the cyclist was on the crossing at the time the train passed over the crossing.

9 It is not possible with certainty to state the root cause of the accident. After considering the evidence two possibilities remain. Either:

- The cyclist reached the crossing at some time between the passage of the previous train and the train that he was injured by. He then lost consciousness, and recovered as the second train was passing. However, there is no medical evidence to support this possibility; or
- The cyclist reached the crossing slope but did not stop, look and listen. He then stepped into the path of the train, saw the train at the last moment and either stepped backwards, falling in the process or slipped and fell backwards.

10 Contributing factors may include:

- The cyclist's slightly impaired eyesight; or
- Lack of light. It was dark, there was no significant ambient light and the weather was inclement; however, visibility was reasonable and the train headlight was functioning correctly; or
- The cyclist was wearing cycling shoes and had just cycled across a field and pushed his bicycle up a partially muddy slope. He probably had mud on his soles that could have increased the possibility of him slipping.

11 No recommendations are made in respect of this accident.

The Investigation

Background

12 At approximately 17:35 hrs on Sunday 8 January 2006, a cyclist suffered a severed leg as a result of the passage of a train over Scate Moor bridleway crossing. The train was 2C13, the 17:17 hrs York to Leeds via Harrogate.

13 Scate Moor crossing is located on the railway between York and Harrogate, 16 km to the west of York (Figures 2 & 7). This railway has a regular passenger service. At the crossing there is generally one train per hour in each direction during normal operating hours. The passenger trains are operated by Northern Rail as part of its York to Leeds via Harrogate service.

14 Scate Moor crossing is a bridleway crossing and is for use by pedestrians, horse-riders and cyclists (Figures 3, 4, 5 & 6).

15 At the crossing, there is one railway line which is used by trains travelling in either direction. The railway is on a low embankment about 2 m above the level of the fields on either side of the line.

16 The railway is straight in both directions for more than 2 km. At the crossing, vegetation did not restrict the ability of users to see approaching trains. In reasonable conditions, trains approaching from the Cattal direction (the direction that train 2C13 approached), were visible for approximately one minute in daylight (see also Paragraph 19).

17 The risk assessment for the crossing as carried out by Network Rail (or its predecessor Railtrack) identified the time for a pedestrian to cross the crossing from *decision point* to decision point (7.5 m) to be less than five seconds and for an equestrian user to be less than seven seconds. These times were far less than the length of time the train is visible as it approached. Figures 10, 11, 12 & 13 show the train approaching at 12 seconds and less from the crossing.

18 The safe system for the use of this crossing by pedestrians, equestrian users and cyclists did not rely on audible warning from the train. Train drivers were not required to sound the train's horn on the approach to the crossing because the sighting distance for crossing users was good.

19 The safety system for use of this crossing also relies on users being able to see approaching trains and taking appropriate care. Trains are fitted with headlights that provide good visibility of the train from the crossing. On a night with good visibility, trains approaching from Cattal are visible for more than 40 seconds. Trains are also audible for about 20 seconds.

20 Signs are positioned on the approach to the crossings informing users to 'Stop, Look and Listen. Beware of Trains' (Figure 4).

21 The crossing is accessed through a gate and then has a reasonably steep southern approach, this being the approach used by the cyclist, with a gradient of about 24 per cent. The surface of the approach consists of grass from field level with *railway ballast* for the last 2-3 m prior to the crossing.

22 Between the rails is a substantial wooden deck, at rail level, with a non-slip surface. It is 3 m wide.

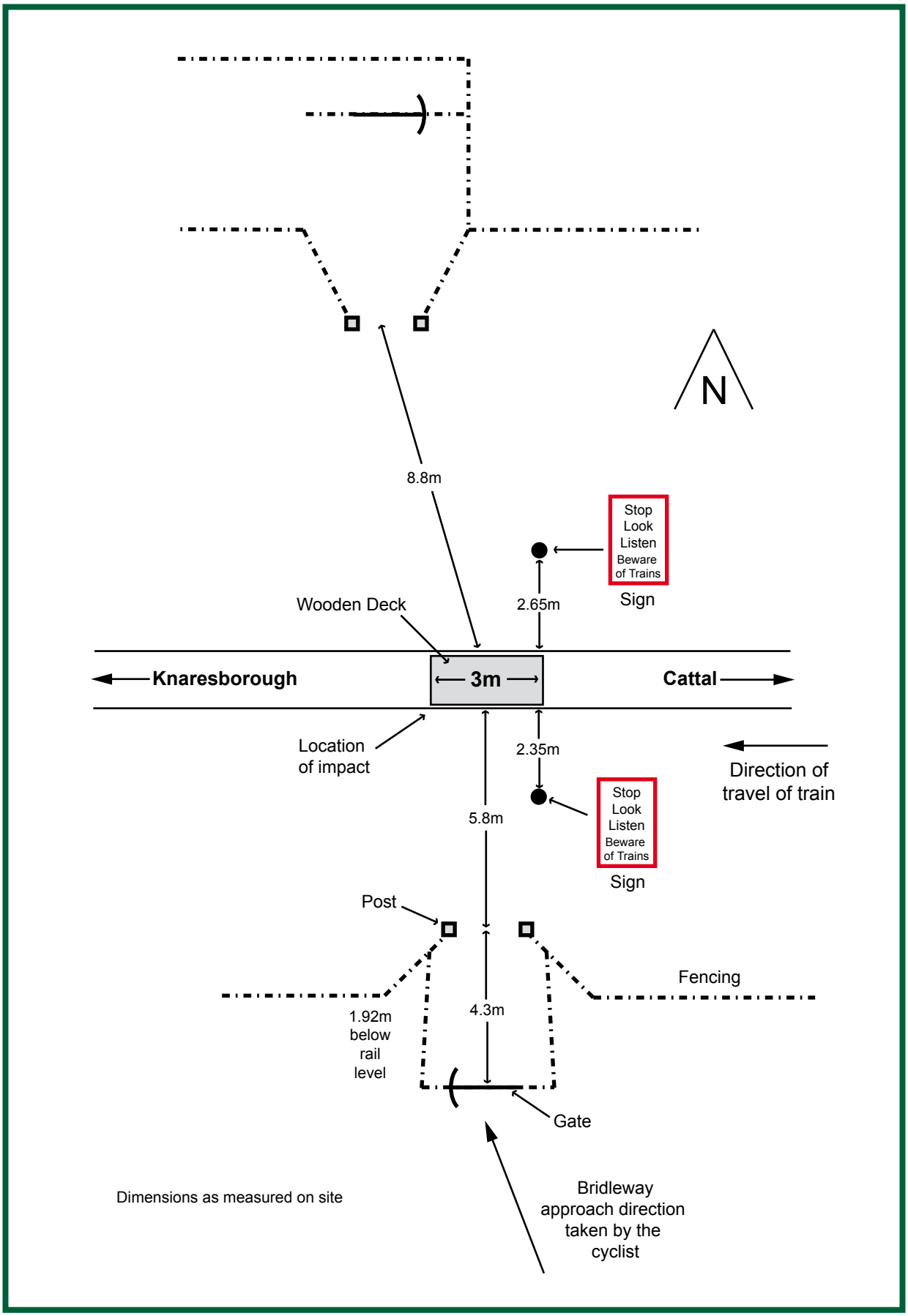

Figure 3: Detail of Scate Moor bridleway crossing

Figure 4: The southern bridleway approach to the crossing

Figure 5: Looking towards Cattal – train 2C13 approached the crossing from Cattal

Figure 6: The driver's view approximately 70 m prior to the crossing approaching from Cattal

Events preceding the accident

23 Train 2C08 left Leeds bound for York via Harrogate at about 15:54 hrs. It passed over the crossing at 16.49 hrs. This was the last train to pass the crossing before train 2C13.

24 Train 2C13 left York bound for Leeds via Harrogate at about 17:17 hrs. It was a class 144 *Diesel Multiple Unit* (DMU) number 144014, formed of three carriages. According to the train data recorder, it left Cattal station, which is 1.1 km from the crossing, at 17:33 hrs 25 seconds. The driver accelerated normally away from Cattal station attaining a speed of between 45 mph (72 km/h) and 50 mph (80 km/h) at the crossing and continued to accelerate. Line speed on this part of the line is 65 mph (105 km/h).

25 The cyclist was a man aged 41 years who was used to cycling. He was using a high specification mountain bicycle with road lights and was well prepared, having with him appropriate equipment including maps, clothing, tools, water, food and a mobile phone. He was used to riding on bridleways at night. He was wearing cycling shoes.

26 The cyclist drove his car to Cattal with his bicycle stowed on the car. He unstowed the bicycle and set off with the intention of riding about six miles. His planned route involved the use of Scate Moor crossing, a crossing that he had not used previously. The route taken was initially on a road, then a track, then a public bridleway crossing a field on the approach to the crossing. It was 4.3 km to the crossing from where he left his car.

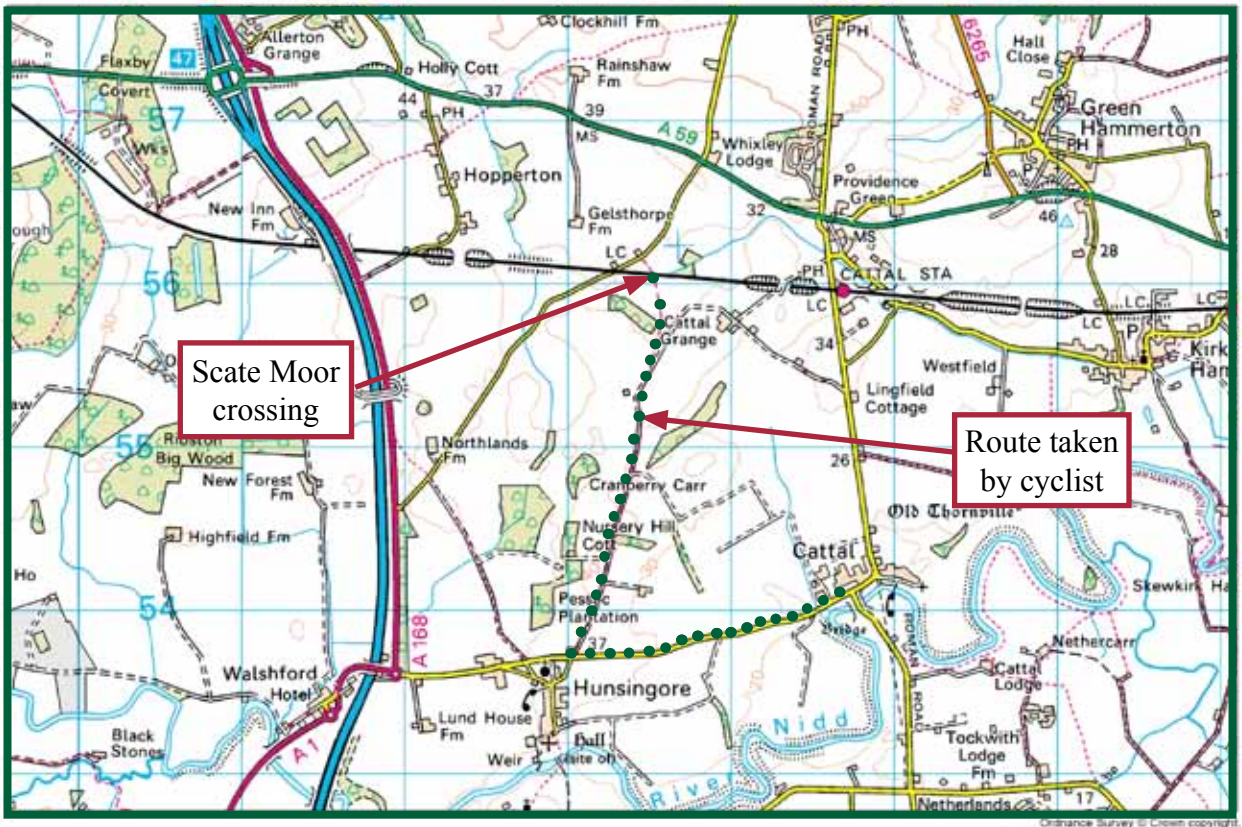

Figure 7: Map showing the cyclist's route

27 Sunset was at 16:03 hrs. The cyclist is unsure of the exact time that he started riding but thinks it was dark, therefore the time was probably 16:45 hrs or later.

28 He was wearing dark clothing.

29 It is estimated that it would take about 20 minutes for the cyclist to reach the crossing from Cattal.

30 From personnel who attended the site shortly after the accident, it is understood that on the day the weather had been inclement but around the time of the accident it was not raining and visibility was reasonable. Lights were clearly visible from some distance (Paragraph 38) and the train headlights would have been clearly visible from the crossing. It was dark and, apart from Whixley Level Crossing (250 m to the west), there were no other significant sources of light in the vicinity of the crossing.

31 The cyclist was unable to confirm any timings prior to the accident, particularly when he set out in his car, when he left Cattal or when he arrived at the crossing.

The accident

32 The cyclist remembers reaching the gate at the foot of the embankment on the approach to the crossing. He remembers passing through the gate and closing it then pushing his bicycle up the partially muddy slope to the crossing, the slope commencing 8.2 m before the crossing. The next event he described was lying on his back, with a train going past and being in pain.

33 His left leg was severed by the passage of the train over the crossing.

34 The driver of train 2C13 noticed nothing untoward as he passed the crossing or in the vicinity of the crossing.

35 The cyclist realised that he was in a life threatening situation. He then took a number of actions that contributed greatly to his survival, calling upon his knowledge of diving training. The events noted here may not be in exact sequence.

36 His actions in the aftermath of the accident demonstrated that he was lucid. He moved himself a short distance from the rails out of further danger and then managed to take a strap out of his back-pack, threaded it and tightened it round his damaged left leg, applying a tourniquet.

37 He used his mobile telephone to contact the emergency services (the call commenced at 17:34 hrs and lasted 55 minutes). He requested help and directed the emergency services to his location, again showing his conscious and controlled actions.

38 After a period of time he noticed the lights of an emergency vehicle passing by on the A59 road. He then took a map out of his bag, took the light off of his bicycle and managed to identify the map reference for his location. This he passed on to the emergency services which helped to pin-point his location.

39 The emergency services arrived and took him to an ambulance at nearby Whixley crossing then by ambulance to hospital. His left leg was later amputated at mid thigh position.

Analysis

40 The RAIB investigation included examining the crossing, obtaining reports from the driver, the staff that inspected the train, and reviewing information from the train data recorder.

41 The distance from Cattal to the crossing by the cyclist's chosen route is 4.3 km, leading to the estimate that it would have taken the cyclist 20 minutes to reach the crossing (paragraph 29).

42 The cyclist thought it was dark when he left Cattal. It is therefore likely that the earliest he left Cattal was about 16:45 hrs arriving at the crossing at about 17:05 hrs. The previous train (2C08) passed the crossing at about 16:49 hrs. The latest he could have been in the vicinity of the crossing is immediately prior to the passage of train 2C13 which would be about 17:34 hrs.

43 Apart from the serious injury of a severed left leg, the cyclist had only minor bruising to the inner side of his right arm close to his elbow. His bicycle suffered no damage; it was adjacent to the cyclist, and clear of the railway line.

44 The train driver noticed no collision. This is unusual in that normally when colliding with, for instance animals, the train driver would hear any such collision as a loud bang.

45 The post accident inspection of train 2C13 carried out by Northern Rail found that there were a number of small pieces of human tissue on the *underframe* in the vicinity of the leading left wheel. This is consistent with the signs of blood and tissue at the crossing and confirms that the injury happened on the southern of the two running rails, ie the side that the cyclist approached from. No evidence of human tissue or blood was found on the previous train 2C08.

46 The shape of the train is such that for the cyclist to suffer only the injuries sustained he is most likely to have only come into contact with the train in the close vicinity of the wheel and *life guard*. Figure 8 shows that if he had been standing, he would have had to be at least 600 mm from the rail to avoid being hit by the train. Figure 9 shows that to suffer no injuries other than those noted, his leg would have had to be almost horizontal, consistent with lying on the ground.

Figure 8: A class 144 DMU showing measured dimensions (mm) from the rail

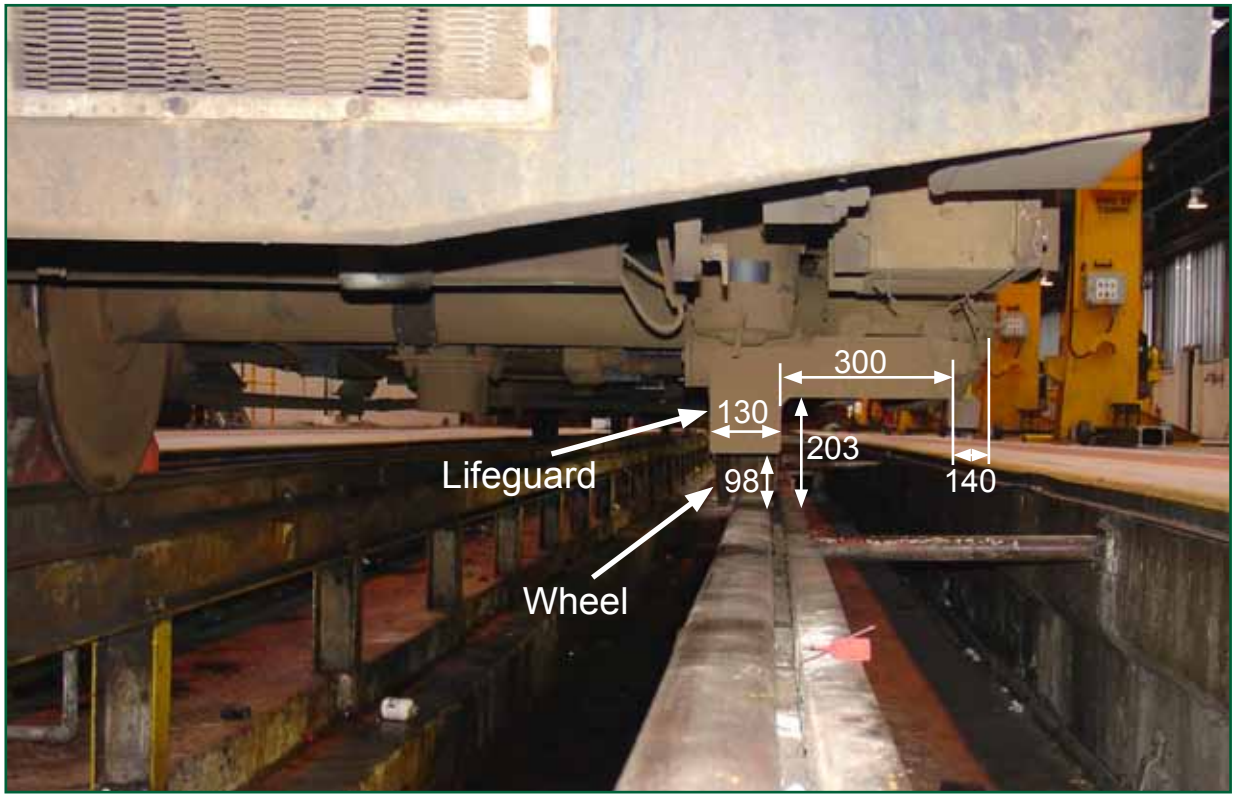

Figure 9: A class 144 DMU showing measured dimensions (mm) in the vicinity of the wheel and axlebox

47 If he had been standing when he was struck by the train, which would have been travelling at 45 mph (72 km/h) to 50 mph (80 km/h), then it is most likely that he would have either been killed or have sustained a number of further injuries. Also it is most likely that the driver would have noticed the impact.

48 His bicycle was undamaged. This fact is inconsistent with his last recollection prior to the accident, being that he was pushing the bicycle up the slope to the crossing. If he had been pushing the bicycle at the time of the impact, it is almost certain that the bicycle would have sustained some damage.

49 The cyclist was wearing cycling shoes and had just cycled across a field and pushed his bicycle up a partially muddy slope. He probably had mud on his soles that could have increased the possibility of him slipping.

50 The above leads to the conclusion that he is most likely to have been lying on the ground with his left leg over the southern rail prior to the train reaching the crossing, and that he had let go of his bicycle prior to impact.

51 The cyclist is slightly short-sighted and normally wears either contact lenses or spectacles. On the day he was not wearing glasses or contact lenses.

52 The cyclist suffers from the build up of ear wax which may have reduced his hearing ability. However, as the crossing relies on visual warning of the approach of trains (see paragraphs 16 - 19), this is not considered to be a causal factor.

Figure 10: A class 144 DMU approaching the crossing in daylight – approximately 250 m and 12 seconds from the crossing

Figure 11: A class 144 DMU approaching the crossing in daylight – approximately 80 m and 4 seconds from the crossing

Figure 12: A class 144 DMU approaching the crossing in daylight – approximately 30 m and 1.5 seconds from the crossing

Figure 13: A class 144 DMU approaching the crossing at night - approximately 80 m and 4 seconds from the crossing

53 On his final approach to the crossing, he did not hear or see the train approach. He was however aware that he was on the final approach to a railway crossing.

54 On departure from Cattal Station, the driver drove the train normally, accelerating towards the line speed of 65 mph (105 km/h). As he passed the crossing, he was travelling between 45 mph (72 km/h) and 50 mph (80 km/h), the time being shortly after 17:34 hrs. The driver did not sound his horn as there is no requirement to do so, nor did he have reason to.

Findings

55 A post accident examination of the train was undertaken at Neville Hill depot in Leeds. No defects were found with the horn, headlights, marker lights or speedometer.

56 Examination of the train data recorder demonstrated that the driver was driving in a normal and appropriate manner. No issues were identified with the operation of the train that may have been contributory to the accident.

57 The crossing was found to be in good order. No issues were identified that may have been contributory to the accident.

58 The signalling system for the passage of the train over the crossing is *electric token block* with signals of the *semaphore* type. A stop signal at Cattal station was placed in the *off position* to allow the train to travel from Cattal over the crossing and on towards Knaresborough.

59 The signalling system did not contribute to the accident.

Conclusions

60 The immediate cause of the accident was that the cyclist was on the crossing at the time that train 2C13 passed over the crossing.

61 The only witness is the cyclist. He is unable to recall what happened in the critical period from when he was pushing his bicycle up the approach to the crossing until when he was lying on his back with the train passing. It is not possible with certainty to state the root cause of the accident. After considering the evidence at least two possibilities remain. Either:

- The cyclist reached the crossing at some time between the passage of the previous train and the train that he was injured by. He then lost consciousness, and recovered as the second train was passing. However, there is no medical evidence to support this possibility; or
- The cyclist reached the crossing slope but did not stop, look and listen. He then stepped into the path of the train, saw the train at the last moment and either stepped backwards, falling in the process or slipped and fell backwards.

62 Contributing factors may include:

- The cyclist's slightly impaired eyesight; or
- Lack of light. It was dark, there was no significant ambient light and the weather was inclement; however, visibility was reasonable and the train headlight was functioning correctly; or
- The cyclist was wearing cycling shoes and had just cycled across a field and pushed his bicycle up a partially muddy slope. He probably had mud on his soles that could have increased the possibility of him slipping.

63 No failings that could have contributed to the accident have been found in the railway infrastructure, including the crossing, the train, its operation or the signalling.

Recommendations

64 No recommendations are made in respect of this accident.

Appendices

Glossary of terms — Appendix A

Decision point	The location from where the user will be able to observe the approach of trains and decide whether or not to cross the line. The 'Stop Look and Listen Beware of Trains' sign is placed close to the decision point.
Diesel Multiple Unit (DMU)	A train comprising a number of passenger carriages semi-permanently coupled together with a driving cab at each end. The train has diesel engines that provide traction and auxiliary power.
Electric Token Block	A signalling system which allows only one train to be in the same section of single line at the same time.
Life guard	A part of a train, positioned close to a leading wheel that is designed to prevent objects on the track from coming onto contact with the wheels.
Off position	In relation to a stop signal where the signal is in such a position that it indicates to the driver it is safe to pass the signal.
Railway ballast	Graded stone sub-base used for drainage and support of the track.
Semaphore	Signalling usually worked mechanically by wire from a signal box, but can be electrically operated. The signals have mechanical arms and display coloured lights at night.
Underframe	The lower part of a train (below the floor of a passenger vehicle), which includes the wheels and other equipment.

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