



MINISTRY OF TRANSPORT

RAILWAY ACCIDENT

Report on the collision that occurred on 31st December 1968 at Norwood Junction

IN THE
SOUTHERN REGION
BRITISH RAILWAYS

(20471.1)

LONDON: HER MAJESTY'S STATIONERY OFFICE

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1970

SIR,

I have the honour to report for the information of the Minister of Transport, in accordance with the Order dated 1st January 1969, the result of my Inquiry into the collision between two passenger trains that occurred at about 17.15 on Tuesday 31st December 1968 on the Up Local line at Norwood Junction in the Southern Region of British Railways.

The 16.57 electric multiple-unit passenger train from Coulsdon North to London Bridge, having passed at Danger the Norwood Junction Up Local Inner Home signal, collided with the rear of the 16.45 electric multiple-unit passenger train from London Bridge to London Bridge via Streatham and Selhurst which was standing in the Up Local platform at Norwood Junction station. There was no derailment, but severe damage was caused to the rear motor coach of the 16.45 train and lesser damage to the leading motor coach of the 16.57 train. Altogether 56 passengers received minor injuries, of whom 16 were taken to hospital but not detained. The drivers of both trains were slightly injured and the guard of the 16.57 sustained a broken rib and suffered from shock.

The emergency services were promptly summoned by the station staff at Norwood Junction. The Police arrived at the scene at 17.20, Ambulances at 17.25 and the Fire Brigade a minute later.

After the accident, Up suburban trains were run over the Up Through line at Norwood Junction which was not obstructed. Normal working was resumed from 07.08 the following morning.

On the day of the collision, which was fine and clear, sunset was at 16.59. It was still twilight when the collision took place.

DESCRIPTION

The Site and Signalling

1. Norwood Junction station lies $8\frac{1}{2}$ miles from London Bridge on the main line to Brighton via East Croydon. Between Norwood Junction and East Croydon, in a complex of connections controlled from Gloucester Road Junction signalbox, this line is joined by the main line from Victoria, both lines having connections to the West Croydon line. In addition, a double track link known as the Norwood Fork Spur connects Selhurst on the Victoria-East Croydon line with the London Bridge line, this spur forming part of the route of the London Bridge to London Bridge via Streatham, Selhurst and Norwood Junction (SSN) services.

2. The attached diagram shows the three routes by which trains can approach Norwood Junction on the Up Local line, from East Croydon, from West Croydon and from Selhurst. These routes converge about 1,000 yards south of Norwood Junction within the control area of Gloucester Road Junction, in a series of non-conflicting junctions in which the Down Lines are carried over the Up lines on a flyover. The gradient from the junction towards the station is rising at 1 in 620, steepening to 1 in 185 into the platform.

3. All the signalling in the area is on the Track Circuit Block System with 4-aspect colour light signals and magazine type train describers. The signalboxes at Gloucester Road Junction (CY) and Norwood Junction (JC) are all-electric with miniature lever frames, each signal being controlled by a separate lever, the aspect being repeated by multiple aspect indicator lamps immediately behind the lever in the frame. In places where a signal reads to more than one route and is provided with a route indicator, each route is controlled by a separate lever, the numbers of which, in respect of signals mentioned in this report, are shown on the diagram. The signals are restored to Danger by occupation of the track circuit in advance and can only be cleared again when the track is clear to the overlap of the signal ahead. So that the signalman knows when he can clear a signal, an additional indicator known as an "F" light is provided which is illuminated when the signal is free to be pulled off. The lever must be worked for each train movement; the signals do not work automatically when the lever is left reversed in the frame.

4. For a train on the Up Local line from East Croydon to Norwood Junction the signal sequence and spacing is as follows. Approaching Gloucester Road Junction all Up local trains pass Signal CY 91 with a junction indicator at position 1. For trains via Norwood Junction this signal will only clear to a single yellow, because Signal CY 88, 393 yards ahead, is approach controlled by occupation of a short berth track circuit. The next signal, 457 yards ahead on the Up East Croydon Local Spur is CY 29, protecting the converging junction with the lines from West Croydon and Selhurst. This signal is located on the approach side of the flyover at a point where the line is flanked by the embankments carrying the Down Local lines; it is mounted on a post at the left side of the line with the red aspect about 3 feet above driver's eye level.

5. The next signal, JC 107, 581 yards ahead, is the Norwood Junction Up Local Outer Home. It is mounted at the left of the line on a bracket post which also carries Signal JC 92, the Up Through Outer Home. The Inner Home Signals, JC 105 for the Up Local line and JC 91 for the Up Through line are mounted side by side on a signal bridge spanning 5 tracks. Each signal is mounted above and slightly to the

left of the line to which it applies. The distance between the Outer and Inner Home signals is 479 yards and the approach view of the latter is 327 yards.

6. The distance between Signal JC 105 and the point of collision in the Up Local platform was 318 yards. The Up Local platform line at Norwood Junction is somewhat unusual in that it has a platform face on each side. Each platform is provided with an awning over most of its length and these combined with the effect of a slight reverse curve in the track just short of the platform, make it impossible to see whether the platform line is occupied by a train until after passing Signal JC 105. When there is a train standing in the platform, it is not possible to read through from JC 105 to the Up Local Starting Signal, JC 96, which is located at the London Bridge end of the platform on the left side of the line.

The Trains

7. Both of the trains involved in the collision were formed of two 4-coach suburban electric multiple-units, each comprising two driving motor coaches with brake compartments adjoining the driving cabs, with two trailer coaches marshalled between. Each unit was close-coupled with single centre buffers and link couplings between the individual coaches, the length of each unit being 257 ft 5 inches. There were a number of differences, however, between the type of construction and equipment of the units of which the two trains were formed.

8. The 16.45 London Bridge to London Bridge (SSN) was made up of 4-SUB units No. 4280, built in 1949, leading and No. 4103, built in 1945, trailing. The former was of all-steel construction, but the bodies of the latter were of composite construction with steel sides and timber roofs. The underframes of both sets were of the former Southern Railway standard design of riveted steel sections and the motor coaches were fitted at the outer ends with screw couplings and heavy spring side buffers. The total tare weight of the train was 278 tons 11 cwt. It was fitted with the Westinghouse Brake throughout and was carrying a normal oil tail lamp.

9. The 16.57 Coulsdon North to London Bridge was formed of 4-EPB units, No. 5115 leading and No. 5046 trailing. The coach bodies of both units were of all steel construction built in 1953/54 and mounted on standard Southern Railway underframes recovered from earlier types of suburban stock built at various dates between 1928 and 1935. During the reconstruction, the underframes of the motor coaches were strengthened at the outer ends and fitted with Pullman-type centre buffers and buckeye couplings. The total tare weight of the train was 272 tons 18 cwt. It was fitted with air brakes with electro-pneumatic actuation and the Westinghouse automatic brake for emergency use.

The Damage

10. As at the point of collision there was a platform face on either side of the line, no derailment occurred and no other lines were obstructed. The bulk of the damage was confined to the two motor coaches between which the actual impact occurred, but of the two, by far the more serious damage was sustained by the rear coach of Unit No. 4103, the cab and brake compartment of which were completely crushed back as far as the first passenger compartment. The headstock was severed and the solebars splayed out and distorted throughout their length. In contrast, the cab front of the leading coach of Unit No. 5115, though stove in to a depth of about 15 inches, remained attached to headstock, side and roof panels. The cab front windows remained unbroken, as did the sliding window alongside the driver's seat, although the body was wracked and twisted and the roof over the brake compartment buckled.

11. Lesser damage was caused to the adjacent trailer coaches and minor damage throughout both trains. A number of platform coping slabs were damaged as was the platform awning on each side of the Up local line. Only minor damage was done to the track at the point of collision.

EVIDENCE

12. On duty as Up side signalman in Norwood Junction Signalbox was *Signalman L. R. Hollands* who had 6 years experience in this signalbox. He took up duties at 14.00 and he found all the signalling apparatus in good working order with the exception of an intermittent fault on the route indicators on Signals JC 61/62/63 controlling movement out of the siding on the Up side in the Down direction. This fault had no affect on the signalling of Up trains. At 17.08 he had received a description for the 16.57 Coulsdon North to London Bridge on the Up Local line, but 3 or 4 minutes later the signalman at Gloucester Road Junction called him on the direct line telephone and told him that he would be getting the 16.45 London Bridge to London Bridge (SSN) in front of the train from Coulsdon North. This was the result of an error in train sequencing during a changeover of signalmen.

13. Signalman Hollands explained that, although the 16.57 from Coulsdon North should have connected with the 16.45 from London Bridge at Norwood Junction, he decided to let it follow it in the Up Local platform since the 16.41 Tattenham Corner to London Bridge was already signalled on the Up Through line. He then intended to cross the Coulsdon North train to the Up Through line at the crossover north of the station to follow the Tattenham Corner train to New Cross Gate. He had not at any time changed his mind about the procedure he intended to follow.

14. The London Bridge train ran into the station under clear signals and he recalled restoring levers 107 and 105 in sequence behind it. He then repulled lever 107 to bring the Coulsdon train up to Signal JC 105. At this time Signals JC 92 and 91 had both gone back to red after the passage of the Tattenham Corner train and just as he was putting back the levers in the frame he looked over his shoulder and realised that the Coulsdon North train had passed Signal JC 105 at Danger, with no "F" light displayed because the platform line was still occupied by the 16.45 London Bridge to London Bridge (SSN).

15. Being aware that a collision was imminent, Hollands tried to display a hand Danger signal but before he had time to do so the train had passed the signalbox. Looking towards the station, Hollands could just see the rear end of the London Bridge train in the Up Local platform. He expected to hear the brakes of the Coulsdon North train go on, but the next thing he heard was the noise of the collision. He at once sent the Obstruction Danger signal to Gloucester Road Junction and then spoke direct to Selhurst Electrical Control to have traction current taken off the Up Local line. He then reported the accident to Redhill Control. Immediately after the collision he asked the Down side signalman to check the positions of the levers in the frame and the indications displayed.

16. *Station Supervisor R. A. Corps*, who had recently been appointed to the grade but had not yet taken up his new duties, was acting as Relief Signalman on the Down side at Norwood Junction. He was standing with his back to Up traffic when he heard Signalman Hollands say "He has run by" and saw him reach for a red flag to make a hand Danger signal; however, the train passed before he could exhibit it. He did not hear any brake application as the train passed. He immediately called up the Signal Technician from below while Signalman Hollands was taking the necessary emergency action. He then confirmed the position of the levers in the frame, noting that 107 was reversed with a red aspect, 105 normal with a red aspect, 96 and 90 reversed with green aspects. He also confirmed that although members of the Signal Engineer's staff had been working in the signalbox during the day in connection with the extension of the Norwood Junction control area, no work of any kind had been carried out in the vicinity of levers 105 and 107, or on the wiring connected with them.

17. *Station Supervisor Corps*, who had over 24 years experience as a signalman at Norwood Junction, knew of no incident during that time when a signalman's evidence as to the aspect of a signal had been disputed by a driver.

18. Responsible for the maintenance of the signalling equipment at Norwood Junction was *Technician C. Frost*. On the day of the collision other members of the Signal Engineer's staff had been working in the relay room in connection with the extension of the Norwood Junction control area, but by the time Frost returned to the signalbox at 16.50, after spending the afternoon in the Crystal Palace area, they had gone. He did not enter the relay room, and was drinking his tea when the Signalman called down to him that there had been a run-by and a collision. Frost went upstairs at once and checked the positions of the levers in the frame and the indications displayed, which were as described by the Signalman. He then went out and checked the aspects of Signals JC 105 and 107; both were showing red.

19. *Driver R. W. Luckhurst*, stationed at Coulsdon North, was driving the 16.45 London Bridge to London Bridge (SSN). He received a single yellow aspect at signal CY 80 on leaving Selhurst and was somewhat surprised to find the next signal, CY 23, at green, because his train normally followed closely on a train from the East Croydon direction and he expected to follow it towards Norwood Junction under restrictive aspects. After that, the remaining signals through Norwood Junction were also at green. The train was kept standing in the Local platform at Norwood Junction for about 1½ minutes waiting a connection and, at the moment when the collision occurred, Driver Luckhurst had released the brakes ready to start and was awaiting the "Right Away" signal. The force of the impact threw him off his seat and pushed his train forward nearly a coach length.

20. In charge of the 16.45 London Bridge to London Bridge (SSN) was *Guard A. Watt*, travelling at the rear of the leading unit. He had taken over the train at London Bridge where a satisfactory brake test was made before leaving. His train was carrying an oil tail lamp which was showing a good light. The train ran normally as far as Norwood Junction, where they arrived at 17.15, but just as they were ready to leave, a member of the station staff called out that there was a connecting train just coming in on the Up Through platform. Watt therefore waited to pick up passengers wishing to change trains. Most had joined his train and he was almost ready to give the "Right Away" when, without warning, there was a sudden impact as the collision occurred. He ran back and found the driver of the Coulsdon North train, shaken but uninjured, getting out of his cab. He then went back and met the guard of the other train to arrange protection before assisting the injured passengers. Guard Watt estimated that his train had been standing in the station for about 1½ minutes when the collision occurred.

21. The driver of the 16.57 Coulsdon North to London Bridge was *Leading Driver C. H. Kingsnorth*, of Coulsdon North, where he had been stationed for 17 years. It was his first trip of the day, after signing on duty at 16.15. He had taken over the train, formed of two 4-EPB units, in the sidings, where a satisfactory brake test was carried out and he had a normal journey until after leaving East Croydon, when he found Signal CY 29 on the East Croydon Local Spur at Danger; he brought his train to a stand with his driving cab only a few feet from the signal. His train stood at the signal for 4 or 5 minutes, during which period he kept glancing at the red aspect. He was not aware of a train coming off the Norwood Fork Spur ahead of

him, although he agreed that he could have seen it had he been looking out for it, nor did he notice a train passing on the Up through line. He was just about to telephone the signaller when the signal cleared, first to one yellow and then within a few seconds, before he had started the train, to double yellow.

22. Driver Kingsnorth recalled the next signal ahead, JC 107 as being at one yellow and the following signal JC 105, coming into view under Tennison Road Bridge as also at one yellow. He could not recall the aspect of the Up Through Inner Home signal JC 91 on the same gantry as JC 105. He estimated that his speed on passing JC 105 was about 30 m.p.h. with his train coasting preparatory to making a normal station stop. It was not until his train was actually entering the platform line that he suddenly became aware of the other train about 2 coach lengths ahead; he described it as "just a black blob in front of me". He was not aware of the tail lamp or the yellow end of the rear motor coach which was in the dark shadow between the two platform awnings.

23. Driver Kingsnorth made an emergency brake application, but this had hardly started to take effect when the collision occurred, at a speed which he estimated as between 15 and 20 m.p.h. He thought that, had the train ahead been of the same type as his own, with an illuminated red screen and not an oil tail lamp, he would have been aware of it at a distance; as it was, he did not see the tail lamp at all.

24. As far as Signal JC 105 was concerned, Driver Kingsnorth had it firmly in his mind that it was showing one yellow as he passed it. His colour vision had been tested since the accident and found to be normal and he had never previously misread a signal in such a manner. He confirmed that during his long experience in the area he had never heard of anything that might have made drivers doubtful about the signalling controlled from East Croydon, Gloucester Road Junction or Norwood Junction signalboxes.

25. I asked Driver Kingsnorth about his health and private affairs but he could suggest nothing that might have distracted his attention from his task and he could see no reason why he should have misread a signal. He was well rested, having booked off duty the previous evening at 20.30. His intake of alcohol had been limited to one bottle of stout at lunchtime.

26. In charge of the 16.57 Coulsdon North to London Bridge was *Guard W. H. Simms* stationed at Selhurst. He had started duty at 13.09 and had met Driver Kingsnorth at about 16.30 in the staff room at Coulsdon North before they went together to the sidings to prepare the stock to form the 16.57. He had known Driver Kingsnorth well for some 15 years and confirmed that he seemed fit and his normal self that afternoon.

27. Guard Simms confirmed that they had carried out a brake test before leaving the sidings and after leaving East Croydon he had observed the signal aspects, as far as JC 107 which was at one yellow as described by Driver Kingsnorth, but he had not observed the aspect of JC 105 since he had gone to the door of his van in readiness for the station stop at Norwood Junction.

28. When the collision occurred Simms was thrown across his van, fracturing a rib. He got out and went at once to the rear of his train, checked that no other running lines were obstructed and then went straight to the signalbox and reported the collision. He then went back to the station to assist the passengers. He did not speak to Driver Kingsnorth immediately, but thought that he seemed very shaken, though apparently unhurt.

29. Travelling as a passenger on the 16.57 Coulsdon North to London Bridge was *Mr. A. Chappell*, a quantity surveyor employed in the Chief Civil Engineer's Department of the Southern Region at East Croydon. He used this particular service 3 or 4 times each week. On the day of the collision he was travelling in the second bay of the second coach of the train, facing the direction of travel. Although the train left East Croydon on time, he saw CY 29 at red as the train approached. He was expecting this, as it was a normal occurrence for the train to be held there for the 17.04 West Croydon to London Bridge to go first. On this occasion, however, he was surprised to see a train from Selhurst precede them towards Norwood Junction. The train restarted as soon as the signal had cleared and at about that time he saw the 17.13 from East Croydon pass by on the Up Through line. It had drawn clear ahead by the time they had emerged from the flyover.

30. As the train approached Norwood Junction, Mr. Chappell expected it to be stopped at the Home signal to give the train ahead time to make its station stop, but when they ran on towards the station without stopping, he passed a remark to a colleague "Goodness, that train cleared quickly". He thought at the time that it must have been an empty train, as he felt there could not have been time for a train to make a station stop and get clear. Mr. Chappell thought that the train entered the platform line at about 15-20 m.p.h. and he noticed the Tattenham Corner train already at a stand at platform 3. He was aware of a brake application but it was followed almost immediately by the impact of the collision.

31. Also travelling from East Croydon on the 16.57 Coulsdon North to London Bridge was *Mr. D. G. Brown*, Assistant, New Works, to the Chief Signal and Telecommunications Engineer. He thought the stop at CY 29 lasted about 5 minutes and thereafter the train ran at about normal speed towards Norwood Junction. He did not notice a brake application prior to the collision.

32. After the accident Mr. Brown went to the signalbox where he met Technician Frost. He then checked the position of all the relevant levers, which had been left untouched by the signaller, and noted the state of occupation of the various track circuits.

33. Mr. Brown remained at the site of the accident and subsequently assisted the Divisional Signal Engineer to carry out a full series of tests on the signalling installation. They first disconnected all functions in the cable in which the control circuit to Signal JC 105 was included and measured the resistance between each of the wires concerned with the operation of the signal and the associated junction indicator and the other cores in the cable. The very satisfactory reading of 100 megohms was recorded in each case. The cable was then left isolated between the test case adjacent to the signal and the signal head itself and was tested similarly. The resistance was also satisfactory. The internal wiring in the signalbox relevant to the circuitry of all the signals concerned was tested and found correct and the aspect sequence between Signals Nos. 96, 105 and 107 was found in order.

34. The actual aspects displayed by Signals No. JC 105 and 107 were compared with the indications displayed on the power frame and the back lock on lever 105 was tested to prove that it could not be restored if the signal remained at yellow after the passage of a train. After the removal of the damaged trains the track circuit in the platform line, which controlled Signal JC 105 to red, was found to be functioning correctly within the accepted standards.

35. Mr. Brown confirmed that, if a danger side fault had occurred on this track circuit, resulting in a train standing in the platform failing to shunt it effectively, Signal JC 105 would have been showing a green aspect if the starting signal was at green or double yellow. It could not have displayed a yellow aspect unless the starting signal had been at red.

36. Subsequent to the collision, an examination of the brake controls on 4-EPB unit No. 5115 which formed the front portion of the 16.57 Coulsdon North to London Bridge was made by *Senior Technician C. Grinling* in the Chief Mechanical and Electrical Engineer's Department. From the undamaged cab the brakes worked satisfactorily both on electro-pneumatic operation and on Westinghouse automatic operation. From the damaged cab the automatic brake was functioning properly but the electro-pneumatic brake could not be made to work until some wires, severed in the collision, had been repaired. Mr. Grinling was satisfied that the brakes throughout the train were properly coupled and in full working order.

37. Tests of the performance and braking characteristics of units similar to those forming the 16.57 Coulsdon North showed that, if the train had accelerated under power as soon as it was clear of the permanent speed restriction of 20 m.p.h. over the junctions, it could have reached a speed of 50 m.p.h. before braking to stop at the normal 8-car mark at Norwood Junction. If, on the other hand, the train had coasted past Signal JC 105 at a speed of 30 m.p.h., it could have approached within 100 yards of the stationary train in the platform ahead and still stopped short of it.

CONCLUSIONS

38. The tests carried out on the signalling at Norwood Junction subsequent to the collision showed that the installation was in proper order and I am satisfied that the Up Local Inner Home Signal, JC 105, was at Danger as the 16.57 Coulsdon North to London Bridge train approached it and that it remained at Danger as the train passed it. The responsibility for this collision rests therefore with Driver Kingsnorth.

39. The signal concerned was well sited, in the standard position above and slightly to the left of the line to which it applied and the only other signal nearby, the Up Through Inner Home mounted on the same signal gantry, was also at Danger at the relevant time, having just been passed by the 16.41 train from Tattenham Corner to London Bridge. There was no possibility, therefore, of Driver Kingsnorth having taken the wrong signal in error.

40. For some reason which was not made apparent in his account of the accident, Driver Kingsnorth was not paying full attention to what he was doing and, as a result, he either failed to see, or at least to comprehend the message given by the red aspect of Signal JC 105. That he was not fully aware of all that was going on around him is borne out by his failure to notice the passage of the train ahead of him, coming from Selhurst, while he waited at Signal CY 29. It was clear even to Mr. Chappel, travelling as a passenger, that the other train was close ahead and would almost certainly delay their approach to Norwood Junction. If Driver Kingsnorth had been paying full attention to his job, this would have been obvious to him also. Even after passing the Signal at Danger, had he been keeping a proper lookout ahead there are good grounds for suggesting that the collision would have been averted. Although it was getting dark and the train ahead was in the shadow between the two platform awnings, he should have seen it in time to make an emergency brake application that, at the speed at which he was travelling, should have brought his train to a stand short of a collision. As it was, the brake application he made at the last moment was too late to have any effect.

REMARKS

41. Neither the line on which this collision occurred nor the train involved was equipped with the British Railways Automatic Warning System (AWS). This system provides a signalling aid to a driver by

which, as he approaches a signal at a restrictive aspect, he is warned by the sounding of a horn in his cab. He can cancel the warning by pressing a button and if he does not do so the brakes are applied automatically; however, the warning system does not differentiate between a signal at Danger and one at yellow or double yellow. If the signal is at green, a bell rings and does not need acknowledgment.

42. In my view it is by no means certain that this collision would have been averted if the driver had had the assistance of AWS. Since leaving East Croydon, each signal had been at a restrictive aspect as he approached it and the warning would have been the same each time, whether the signal was at yellow or red. In such circumstances there is a real danger of the continuous succession of warnings ceasing to have any impact on the driver, who may cancel each time almost subconsciously.

43. A full discussion of the development of AWS in the Southern Region was included by Colonel J. R. H. Robertson in his Report on the collision between Paddock Wood and Marden on 4th January 1969, which also describes a development of the AWS system to incorporate selective cancellation of the warning with a different button according to the aspect of the signal concerned. In this modified system, which is now undergoing user trials and is known as SR AWS, the driver must pay attention to the aspect displayed by the signal and cancel the warning by the use of the appropriate button, thus reducing the risk of his making an automatic or sub-conscious cancellation and providing a reliable aid to prevent his passing a signal at Danger as occurred at Norwood Junction.

I have the honour to be,

Sir,

Your obedient Servant,

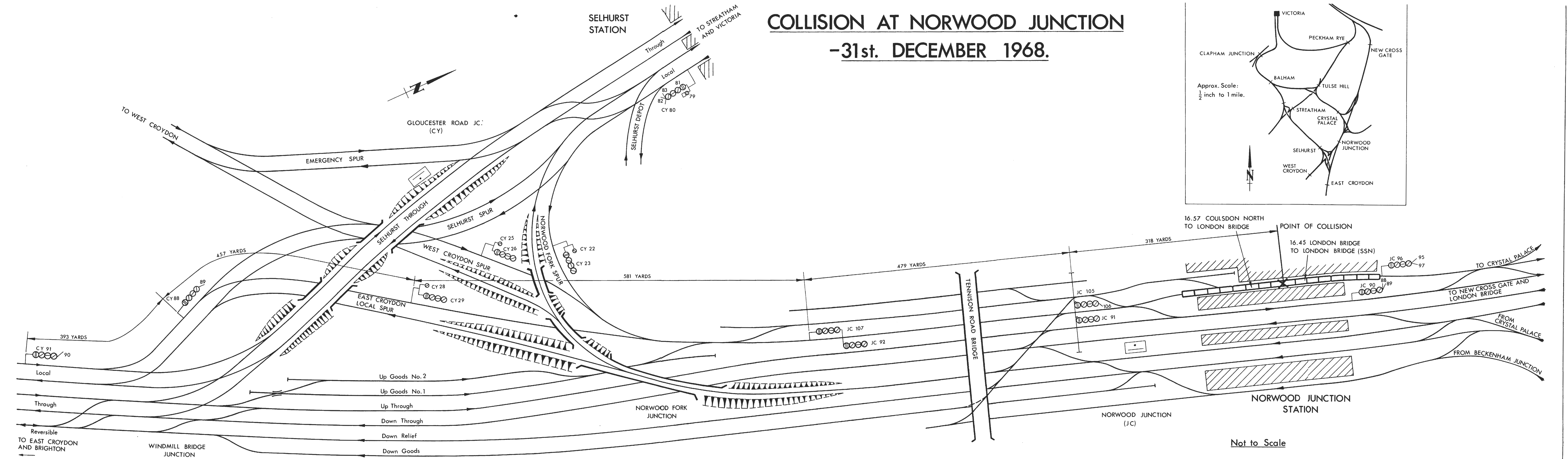
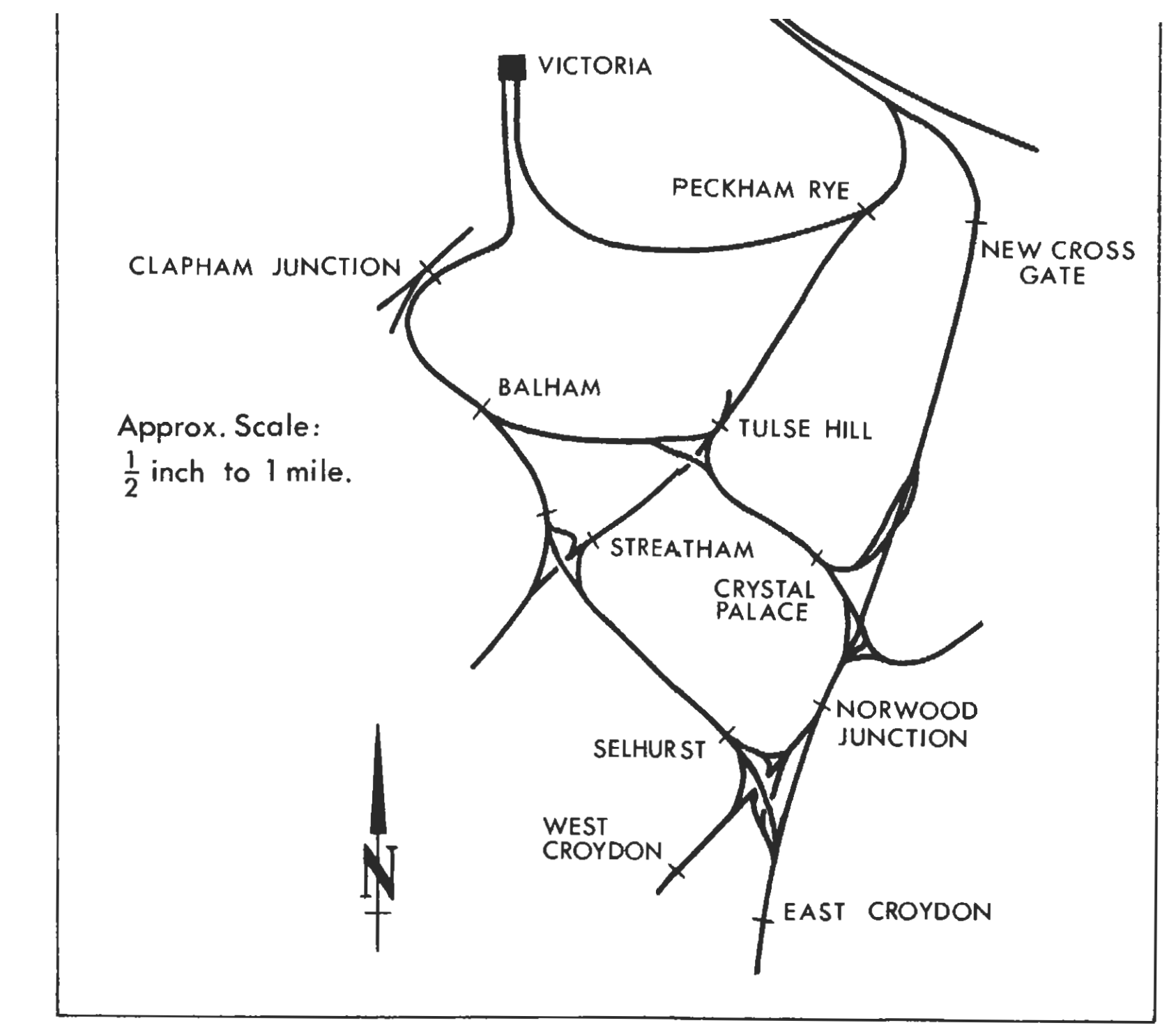
I. K. A. McNAUGHTON

Lieutenant Colonel

The Secretary,
Ministry of Transport.

COLLISION AT NORWOOD JUNCTION

-31st. DECEMBER 1968.



Not to Scale