



**IN ASSOCIATION WITH THE KENT & EAST SUSSEX RAILWAY
ROBERTSBRIDGE (RVR) JUNCTION STATION, STATION ROAD,
ROBERTSBRIDGE, EAST SUSSEX. TN32 5DG**

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**TRANSPORT AND WORKS ACT
The Transport and Works (Inquiries Procedure) Rules 2004**

**THE PROPOSED ROTHER VALLEY RAILWAY
(BODIAM TO ROBERTSBRIDGE JUNCTION) ORDER**

PROOF OF EVIDENCE

of

DAVID KEAY

Introduction

1. My name is David Keay and I am a Director of the Rother Valley Railway.
2. I have a Bachelor's Degree in Electrical & Electronic Engineering, I am a Chartered Engineer, a European Engineer, a Fellow of the Institute of Mechanical Engineers and a Fellow of the Institute of Engineering & Technology and have over 45 years' experience in designing, delivering and regulating railways around the world.
3. I have worked as a designer of turnkey projects, a research and development Engineer, and a promoter of light rail systems, developing Acts and Orders.
4. I spent 20 years with Her Majesty's Railway Inspectorate, latterly ORR, as Deputy Chief Inspector of Railways during in which time I was responsible for the oversight of level crossing safety.
5. I now run my own railway engineering and safety consultancy company. I act as Independent Competent Person for the UK Tramway industry and also have a number of voluntary posts as a Director of the Rother Valley Railway, Engineering Director of the Ffestiniog and Welsh Highland Railway, Engineering Director of Seaton Tramway and Trustee of Vintage Trains.

Involvement in the RVR Project

6. In 2017 upon retiring from ORR I was asked if I would help with the implementation of the missing link of Rother Valley Railway ("the Missing Link"). I took on the role of RVR Director and have been closely involved for 4 years. My main roles have been:
 - The design and development of the level crossings;
 - General direction and advice on engineering and safety;
 - Engagement with ORR, the safety regulator.

Evidence summary

7. My evidence addresses The Statement of Matters number 3(a) the impact of the three new level crossings on safety, traffic flows and congestion particularly in relation to the A21 and future plans for this road and 3(b) in relation to the proposed bridleway level crossing. The evidence presented addresses all those objections that place level crossing safety as one of the reasons for the objection to the re-instatement of the railway between Bodiam and Robertsbridge and in particular the following Statements of Case:
 - OBJ/0068 P Smith

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- OBJ/0091 Cllr S Hart
- OBJ/0133 K Bell
- OBJ/0782 Highways England
- OBJ/1002 Mr & Mrs A Hoad of Parsonage Farm & the Executors and Trustees of the Noel de Quincy Estate
- OBJ/1034 The British Horse Society

Design philosophy for the reinstatement of the railway

8. The RVR Directors have responsibility for overseeing the safety of the design, and will in due course be responsible for the re-instatement, of the railway. The approach has been to adopt the highest possible standards that are, in my professional opinion, equal the best current practice in the railway industry. We ensure that all risks are controlled to level as low as reasonably practicable ("ALARP"). To assist the Directors in ensuring safety by design we have employed world class consultants. We have spared no expense to provide for a safe railway and a safe environment for those people who use or interface with the railway.
9. In compliance with the Management of Health & Safety at Work Regulations 1999, RVR follows the hierarchy of safety control:
 - 1: Design or re-organise to eliminate hazards.
 - 2: Isolate the hazard from people.
 - 3: Use engineering controls.
 - 4: Use administrative controls, procedures and rules derived from risk assessment
 - 5: Use Personal Protective Equipment (PPE)
10. The hierarchy of controls was applied to the design of the 'Missing Link' from its inception. However, throughout the project it was evident that crossing the three roads (Northbridge Street, A21, Junction Road) and the Bridleway at Salehurst would be challenging. Tunnelling would be extremely difficult due to the proximity of the River Rother and the water table of the flood plain. Bridges would require long approaches to provide gradients compatible with steel wheels on steel rails. The difficulties of bridge and tunnel options are considered in the evidence of others.
11. In light of the apparent difficulties of crossing the highways via bridges or tunnels, proposals for at grade level crossings were developed. The detailed design for each of the crossings was developed using the design offices of Arup, a world class firm of specialists who the RVR directors, as professional Engineers, consider to be one of the most competent advisors for railway infrastructure design.

12. The general design of the crossings was fixed at an early stage, prior to the Planning Application and remained unaltered for the ORR appraisal stage (see below). Bridges and tunnels were also designed by Arup for all three crossings, and these designs were used to provide evidence for the ORR appraisal. The designs are contained within the Arup Options Report [RVR 76].

Engagement with the Office of Rail and Road (ORR)

13. Prior to engaging with ORR at the pre planning stage the costs and the risks of all of the options to cross the three public roads and the Bridleway over which the Missing Link would pass were evaluated by Mott MacDonald [RVR 33 and RVR 34]. From the very start of the consideration of at grade level crossings in 2011 RVR sought guidance from ORR, sharing the designs and operating principles for the three road crossings on the level. ORR visited the sites of the crossings in January 2012 and issued a letter giving a general no objection to the reinstatement of all of the level crossings [RVR/W8/2-1] and requesting more detailed proposals in due course. Whilst I was employed by the ORR at that time, I had no involvement in the decision making process.
14. The general approach adopted by ORR, as the safety regulator for railways and level crossings, is to restrict new crossings save in exceptional circumstances. ORR works within the legal framework set out by the Health & Safety at Work etc. Act 1974 to ensure compliance by operators, who must demonstrate that they have reduced the risks borne by the railway and highway users at level crossings to a level as low as is reasonably practicable. The ORR Representation, document reference REP/017 sets out the ORR policy and the principles of reasonable practicability enshrined within the 1974 Act. Within that framework there is support for the elimination of level crossings where possible but also a clear recognition that, in many instances, removing level crossings is not reasonably practicable and would have a disproportionate effect on users and also on the railway. It is often far too costly to make other provisions. ORR does not oversee a policy where every level crossing must be removed, neither does it prohibit new level crossings providing both the test of exceptional circumstances and tolerable risk can be met. Across the rail network generally, the closure of level crossings is one approach of risk management, subject to cost-benefit analysis. However, it is not the only approach to ensuring that level crossing risk is as low as reasonably possible.
15. It is most important to recognise that the 'Missing Link' will operate at a speed of 10mph over all of the crossings and not at the very much higher speeds of

the main line railway where there are over 1000 crossings that have a line speed in excess of 80mph. The driver of a train approaching the RVR level crossings is able to stop the train in advance of any obstruction in the same manner as any highway driver obeying the Highway Code. A train travelling at 10mph can stop in a distance of 20m (the length of a carriage) even with low adhesion between the wheels and rails. By way of comparison trains approaching the Network Rail main line level crossing in Robertsbridge require over a quarter of a mile to stop.

16. As a Touristic Railway the RVR will not be unique in having level crossings, there are many UK Touristic and Heritage Railways having highway crossings on the level that have been approved by ORR/HMRI. A number of railways cross 'A' Roads on the level, including: Dean Forest Railway A48, Kent & East Sussex Railway A28, Mid Norfolk Railway A1075 and the Welsh Highland Railway A497.
17. In advance of providing evidence for the TWA Public Inquiry RVR directors met with ORR at the ORR London office on 23rd July 2018. At that meeting ORR requested documented evidence from RVR to demonstrate that all of the level crossings met the test of exceptional circumstances and specifically demonstrating that the cost of credible alternatives (bridges and tunnels) were grossly disproportionate when weighed against the safety benefits and the physical practicability of construction. See ORR record of meeting **RVR/W8/2-2**.
18. The detailed submission required a significant amount of information to be produced. Following ORR internal considerations throughout the process further information was requested at a meeting at the ORR London office on 13th February 2019. This evidence augmented the initial submission which included comprehensive narrative risk assessments to the same standard as produced by Network Rail for the high-speed main line railway. These assessments considered the risks associated with level crossing operation and the potential for errors and violations by highway users and railway staff and defined suitable and sufficient mitigations that could be provided to ensure a sustainable tolerable risk level. ORR use the principles of tolerability set out by the Health & Safety Executive publication 'Reducing risks and protecting people' that considers high hazard industries and societal risk [**RVR/W8/2-3**]. The detailed costings produced by Arup for the construction of level crossings and the alternative bridges and tunnels within an Options Report [RVR 76] were also used by ORR to compare with their own calculations on gross disproportion between level crossings and other alternatives.

19. The ORR Expert Panel for level crossings has opined that the road level crossings of Northbridge Street, the A21 and Junction Road do meet the exceptional circumstances test and that alternatives are not reasonably practicable. This decision was further ratified by the Chief Inspector and his management board for the preparation of the ORR Statement of Case to the Inquiry REP/017.

Type of crossing and operation

20. There are three types of level crossing proposed along the route of the Missing Link:

- Three Highway crossings having automatic full barriers;
- A Bridleway Crossing with gates operated by the user;
- A number of farming accommodation gated crossings operated by the user to gain access to fields.

Highway crossings

21. I believe that the type of protection used at each highway crossing represents the best of current practice both in the UK and worldwide. The proposal is for full barriers across all of the carriageway that will not operate unless the crossing surface has been proven clear by radar obstacle detection. In addition, there is pre scan of the highway approaching the crossing to detect vehicles that are travelling at speed unable to stop before a lowered barrier. This is the standard that Network Rail is now employing to upgrade and improve safety on its high-speed railway and is considered to be the safest option. There are just over 100 full barrier crossings with obstacle detection now operating.

22. A Transport and Works Act Order would provide in-principle approval for the proposed highway level crossings. ORR's Statement of Case states that it wishes to work with RVR post Inquiry to agree the most suitable and safe crossing controls. Approval for the protective equipment is granted by ORR on behalf of the Secretary of State using the powers under the Level Crossings Act 1983 to issue a Level Crossing Order. In producing the Level Crossing Order ORR must take into account the convenience for highway users and must consult with the local Highway Authorities in respect of highway safety and convenience. Post award of powers and in advance of the Level Crossing Order process RVR is committed to continue to work with the relevant Highway Authorities, Highways England and East Sussex County Council, on the further detail design of the crossings and the necessary Traffic Regulation Orders.

23. I believe that RVR has currently specified the highest level of safety with available technology. When the crossings are actually installed there may well be other proven technology on the market and RVR will adopt whatever provides the most reliable, user friendly and safe solution at that time as stipulated by the ORR in consultation with Highway Authorities.
24. To further improve safety, the road crossings are to be monitored by a competent signaller via high definition closed circuit television cameras who has the ability to place the protecting railway signals at danger should there be matters of concern around the crossings, such as very slow moving traffic or groups of walkers or children in the vicinity. If stopped on an approach to the crossings the train driver will be able to telephone the signaller for advice and information.
25. The closing sequence, initiated by a train and not a level crossing attendant/signaller, will be the standard timings as used on the UK main line crossings: 3 seconds flashing amber warning lights followed by 12 to 15 seconds of flashing red lights (Wig Wags) before the barriers begin dropping, unless prevented by the radar equipment. On completion of that sequence a proceed signal light is displayed to the driver of the approaching train. It is an offence under the Road Traffic Act 1988 to pass a flashing Wig Wag that will be displayed to road users and to assist with compliance Red Light Cameras will be fitted at the crossings. Such cameras have yielded benefits for other touristic railways and tramways at level crossings such as the Seaton Tramway crossing of the A3052, where evidence has been used for prosecution purposes.
26. The barriers will rise automatically once the train has cleared the crossing and an indication will be given to the train driver that the barriers have lifted and allowed highway users to proceed. The barrier equipment will not allow the barriers to fall on loss of electrical power as is currently the case with some types of crossings on the main line railway, that leads to road closure for some considerable time. The crossing will be illuminated to a suitable lux level (minimum of 4 Lux Uniformity but generally to the same standard as the highway) that ensures reliable vision by CCTV in hours of darkness or poor visibility.
27. The crossings will be fitted with data recorders that record all the sequences of operation to evidential standards also allowing remote access for monitoring and fault reporting by a competent person who has been trained and qualified by the manufacturer of the level crossing equipment. The management of the

safety of the crossings will be controlled by the Safety Management System of the Kent & East Sussex Railway as described in the evidence of Shaun Dewey [RVR/W9/1].

28. Although it preceded my involvement in the project, I am aware that the Highways Agency did not object to the provision of a level crossing across the A21 and directed its specific detailed requirements for incorporation within the Planning Approval as Planning Conditions. Planning Approval was granted by the Local Authority in 2017 [RVR 07] and RVR accepted planning conditions applicable to the A21, which amongst other conditions places restrictions on the Level Crossing Operating Times (Condition 21). The condition states that movement of trains across the A21 shall only be permitted outside morning and evening peak times (7.00am to 9.00am and 5pm to 7pm respectively) from Monday to Friday and on Bank Holidays. The frequency of trains on the Missing Link will also be extremely low with a maximum of 10 trains per day. By way of comparison, the main line level crossing at Robertsbridge has six passenger trains per hour in peak periods and four per hour off peak, together with additional goods trains and light engines.
29. RVR has worked closely with Highways Agency's successor body, Highways England (HE), who objected to the railway crossing the A21. Significant detailed design of the A21 crossing has been presented to HE in advance of the Public Inquiry to demonstrate that the level crossing can be operated safely. The process that has been followed with HE for considering issues relating to the A21 level crossing is set out in more detail in Mr Hamshaw's evidence [RVR/W3/1] and the engineering aspects of the crossing options is set out in the evidence of Mr Porlock [RVR/W4/1]. My understanding is that Highways England has no in principle objection to the crossing of the A21, subject to compliance with its Departures process. As a Director of RVR I am committed to working with HE on the detail of construction and reducing the impact of road closure for installation and the efficient operation of the crossing when trains are operating.
30. The crossing surface will be a pre-fabricated reinforced concrete panel with encapsulated rails. This type of construction is now being used by Network Rail since it not only speeds up installation but also maintains a sustainable rail to road interface that requires minimal maintenance. The design of the crossing panel and the profile of the carriageway have been agreed with HE, and have been submitted to the Inquiry as "More detailed technical plans of the A21 Level Crossing – March 2021. ORR will take into consideration the views of HE in respect of protective measures such as additional advance signage and

sight lines. RVR will implement all reasonable measures requested by the Highway Authorities.

31. The principle of having level crossings over Northbridge Street and Junction Road has been accepted by the local Highway Authority, East Sussex County Council ("ESCC"), which supports the reinstatement of the Missing Link. RVR has worked with the ESCC's Highway Officers to develop traffic calming measures such as highway traffic speed reduction in the vicinity of Junction Road level crossing that will be implemented in advance of construction. There were no objections to the public consultation for traffic calming [RVR/W8/2-6]. RVR will continue to work with ESCC, adopting features as requested by the highway engineers.
32. The crossings of Northbridge Street and Junction Road follow the same design principles as set out above for the A21 and both will be automatic full barrier crossings with obstacle detection. There is no interlocking between the three automatic crossings and there is sufficient length of railway line to accept and hold the longest trains of six coaches permitted on the Kent & East Sussex Railway without affecting the operation of each crossing. The existing platforms and passing loops can only hold a locomotive and six coaches. All of the crossings will have CCTV monitoring to allow a competent crossing attendant to place protecting signals at danger should, for example, traffic was blocking any of the crossings. It should be noted however that all of the road crossings will have yellow box markings in accordance with the Traffic Signs Regulations & General Directions 2016 giving powers of enforcement under the Road Traffic Act 1988. Sussex Police were consulted by RVR and site visits were undertaken prior to submission of the planning application and subsequently prior to the TWAO application and had no comments. RVR anticipates that the CCTV cameras provided at each highway level crossing will be to an evidential standard agreed with Sussex Police.

Bridleway crossing at Salehurst

33. It is not reasonably practicable to build a bridge for the Bridleway due to the need for extremely long approach ramps, requiring considerable extra land outside the Order limits and the visual impact of such a structure upon the Area of Outstanding Natural Beauty, [RVR/W8/2-7]. Neither is it reasonably practicable to build an underpass since the safe height required by the British Horse Society set out in their guidance document 'Advice on width, area and height in England and Wales' [RVR/W8/2-4] is a minimum of 3.4m, with approach ramps, all of which would be below the water table.

34. RVR believes that there are fundamental practicability issues as set out above and I explain below that an at grade crossing can be designed and operated to control the risks to level as low as reasonably practicable as required by the Health & Safety at Work Act. In a letter to RVR dated 19 May 2020 [RVR 69] ORR has clarified the regulatory position in respect of the bridleway crossing, stating: 'if the Secretary of State is minded to make the Order with a provision for an at-grade bridleway crossing then when the railway makes such an appropriate application ORR will of course progress a Level Crossing Order to ensure that the protective measures and operational controls can be agreed between the railway company and the Highway Authority.
35. The railway alignment is essentially straight and this provides excellent inter-visibility for crossing users and train crews. There are many thousand such crossings around the UK including a Bridleway Crossing on the Kent & East Sussex Railway that has operated safely for over 40 years. The crossings will be gated, and each gate will be fitted with yellow lollipop signs that cannot be seen by the train crew when the gates are fully closed but display a clear disc when the gates are open. There will be a speed limit imposed across the crossing that will be agreed with ORR. In the event of open gates, unlike the national mainline railway, the train will whistle and proceed at caution being able to stop in the distance of a few metres should there be a potential obstruction. This system of control has been used for over 20 years on the Ffestiniog and Welsh Highland Railways with no incidents. In addition, the Bridleway Crossing will be fitted with audible warnings as currently being installed by Network Rail to Bridleway Crossings in Kent. Without a safe solution ORR will not permit operation of the railway over the Bridleway until a reasonably practicable, tolerably safe solution is implemented. RVR will work with ORR and the British Horse Society to ensure that suitable, user focused, and reliable protective measures are installed.

Accommodation crossings

36. Between Northbridge Street and Junction Road the railway alignment passes through agricultural land where a number of crossings will be required for the landowners to maintain access to farming land. RVR recognise the need for the provision of accommodation crossings to reduce severance and mitigate the effects of the railway on the efficient and sustainable use of the land. Article 3 of the draft Order (RVR 01) applies the provisions of section 68 of the Railway Clauses Consolidation Act 1845 within the draft Order. These provisions ensure that RVR must reach agreement with land owners to construct suitable and sufficient accommodation access and RVR agrees that such access is necessary. The evidence of Mr Hodges [RVR/ W10/1] explains the impacts of the railway on the two affected farms and the mitigation afforded by

accommodation crossings. Further background information on farming either side of the operational railway can be seen in the letter of support from Mr T Lewis [SUP/121] who farms land either side of the Kent & East Sussex Railway connected by accommodation crossings. There are 27 existing user worked crossings for land owners along the Kent & East Sussex Railway that have been operated safely for over 40 years.

37. The design of the accommodation crossings will implement best practice to ensure the safety of users and will as far as possible minimise the number crossings, whilst retaining efficient access. It is usual good practice for gates will be locked when not in use and for the key holders to be given instructions for the safe use of each crossing. This will be managed through the Safety Management System of the Kent & East Sussex Railway. Each gate will be fitted with yellow lollipop signs as explained in paragraph 37 and a speed limit will be agreed with ORR that ensures the ability of train to stop in advance of any obstruction of the crossing. RVR will work with the landowners to provide crossings that control the risks to a level as low as reasonably practicable including implementing guidance set out in the Heritage Railway Association/ORR guidance document for Footpaths and User Worked Crossings ref HGR-A0458,[**RVR/W8/2-5**].
38. ORR have clarified in their letter of 19 May 2020 [RVR 69] that 'If the railway can demonstrate that it is not reasonably practicable to either eliminate the need for a crossing, or construct a grade separated alternative to an accommodation crossing, and demonstrate that the use of an at-grade accommodation crossing is ALARP, and that the residual risks are tolerable, then at this point it is not clear on what grounds we could take action to prohibit the construction or use of such crossings under our HSWA powers.'

Summary Conclusions

The Office of Rail and Road (ORR), the national safety regulator for level crossings has not objected to the principle of at grade crossings and has confirmed that they will work with RVR to ensure the safest possible solution.

The risks at all of the crossings will be controlled to level as low as reasonably practicable. There will be the highest standards of protection at the crossings using the latest proven and reliable technology.

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ORR will not permit operation of any crossing unless they are satisfied that the risks are controlled and tolerable, in addition they will ensure that the Highway Authorities are content that the convenience of highway users has been fully addressed.

The level crossings will all be operated at very low railway speeds with trains being driven on line of sight and able to stop in advance of an obstruction. Trains will be able to stop within a carriage length.

The frequency of trains will be extremely low with a maximum of 10 trains per day.

The highway crossings will be fitted with monitoring CCTV and Red Light enforcement cameras.

The level of detail design for the crossings far exceeds that normally produced for a Transport and Works Act Order submission. The designs provide for a high level of confidence that the principle of level crossings decided by an Order can be readily developed to provide safe operation.

Appendices (RVR/W8/2)

1. ORR letter 20 January 2012
2. ORR letter 7 August 2018 - Record of meeting 23 July 2018
3. Health & Safety Executive publication - Reducing risks and protecting people
4. British Horse Society - Advice on width, area and height in England and Wales
5. Heritage Railway Association/ORR guidance document for Footpaths and User Worked Crossings ref HGR-A0458
6. Letter from East Sussex County Council -B2244 Junction Road - 27 June 2018
7. Letter from Rother District Council - 13 August 2020

Abbreviations

ALARP – As Low As is Reasonably Practicable

CCTV - Closed Circuit Television

ESCC – East Sussex County Council, the Highway Authority for Northbridge Street, Salehurst Bridleway and Junction Road

HE – Highways England, the Highway Authority for A21

HSWA – Health and Safety at Work etc. Act 1974

ORR – Office of Rail and Road, the railway and level crossing safety Regulator

RVR – Rother Valley Railway Ltd, the Promoters of the re-instatement of the Missing Link