Deadline 7 submissions of National Highways Limited

Application by Liverpool Bay CCS Limited for an Order granting Development Consent for the Hynet Carbon Dioxide Pipeline Project

Planning Inspectorate Reference Number: EN070007

1 Introduction

1.1 This document sets out the latest submissions of National Highways Limited (National Highways) provided at deadline 7 of the examination. It is split into two sections; (i) an update following CAH2; and (ii) response to ExQ3.

1.2 The Authorised Development will have an impact on the Strategic Road Network (SRN) and as such it is critical to the operation of the SRN, the safety of the travelling public and to ensure the proper and efficient use of public resources that the Authorised Development proceeds in consultation and agreement with National Highways and with appropriate protections in place.

1.3 National Highways does not object to the principle of the development subject to the inclusion of adequate protections to manage any potential interface between the Authorised Development and the highway and the resolution of the issues relating to compulsory acquisition.

2 Compulsory Acquisition Hearing 2 – Post-hearing written submissions

2.1 This section provides a detailed update to the Examining Authority in relation to Compulsory Acquisition Hearing 2 which was held on 10th August. Unfortunately National Highways was unable to attend the Hearing in person, but it is the intention that this section of the submission will cover all of the points that National Highways would have raised at that hearing.

2.2 The SRN is a critical piece of national infrastructure which National Highways needs to be able to effectively manage without being encumbered by unnecessary third party interests. All applications for rights over the SRN must not disrupt National Highways' ability to operate, maintain and amend the network with suitable restrictions as well as protections for the highway authority. Without such restrictions and protections unacceptable risks would be created to the public's ability to utilise public highways and legacy issues can be created which can have safety implications and ultimately could cost the public purse significant sums of money to rectify.

2.3 National Highways objects to the Applicant's case for compulsory acquisition where it impacts on National Highways' land and interests.

Rights over non-highway land

2.4 In relation to non-highway land that is required for its undertaking, National Highways, within its Deadline 5 submission, made clear that it considered it of the utmost importance to ensure that rights over land could co-exist such that any new rights that the Applicant is seeking to acquire do not result in the extinguishment of National Highways' existing rights. The Applicant, as part of their response to National Highways Deadline 5 submission, have inserted wording into the Protective Provisions (their paragraph 13) in an attempt to enable this. This is welcomed by National Highways, however it is noted that this does not cover all of the plots where National Highways requires assurances. The following 2 plots are missing and should be added:

Plot and acquisition sought	**National Highways Interest**	**Applicant Comments (taken from *'Applicants comments on submissions made at Deadline 5 - Appendix A' [REP6-035])***	**National Highways Comments**
5-12 Permanent acquisition of subsurface of 739 square metres of agricultural land and hedgerows lying to the north of Hallsgreen Lane, Thornton-le-Moors	Rights granted by a Conveyance dated 22 January 1993. This interest relates to drainage. National Highways have a pipe in this plot which drains into a watercourse called Thornton Uplands.	It is understood that the National Highways use of these plots is for highway drainage and the Applicant has already committed not to interfere with that drainage as set out in the draft SoCG [REP5-009] at line 3.4.1. The Applicant is not, and has repeatedly confirmed it is not, proposing to interfere with these rights or National Highway's apparatus in this location. A commitment has been included within the Outline Construction Environmental Management Plan (OCEMP) [REP2- 021] and Register of Environmental Actions and Commitments (REAC)	Given the position as stated by the Applicant it should not be controversial to add this plot to the list included within the Protective Provisions to give certainty that National Highways' rights will not be extinguished. Noting the Applicant's comments, this appears to have been omitted in error. This ongoing interest is necessary to ensure the safe drainage of the SRN plus access is needed for maintenance purposes.

		[REP2-017] to satisfy National Highways that their ability to drain their highway will not be impacted by the Applicant's works. Covered in Protective Provisions.	
6-03 Permanent acquisition of land of 540 square metres of river (River Gowy) lying to the west of Ince Lane, Wimbolds Trafford	None identified in the Book of Reference or SoCG National Highways have drainage infrastructure in this plot of land.	The Applicant has no record of National Highways holding a current interest in this plot which is owned by the Environment Agency, and National Highways have not advised of such an interest.	National Highways have apparatus in this plot, namely a filter drain which prevents water from adjacent land flooding the SRN. These drains are likely to be in the order of 1.5m to 2m deep and will need to be retained to ensure the SRN is kept safe. The drains will need to be maintained during the works and, in addition, National Highways will need to maintain or potentially replace these in the future. Therefore, ongoing access rights are required. Any action that prevents National Highways from adequately draining the SRN has clear safety implications and would cause serious detriment to National Highways' undertaking. To ensure this does not happen this plot should be added to the Applicant's paragraph 13

			list included within the Protective Provisions.

2.5 If the National Highways rights and interests in respect of these plots were to be extinguished it could cause serious detriment to National Highways undertaking as it may no longer be possible for National Highways to carry out its statutory duties and maintenance responsibilities. This could create significant public safety issues and /or additional expense for the public purse. Any acquisition of a right is only likely to cause detriment to National Highways undertaking if it cannot co-exist with the interest that National Highways holds. If that was the case National Highways' interest would be extinguished under the current draft DCO. This could make it impossible for National Highways to carry out its statutory functions. National Highways' Protective Provisions are written in a way to ensure this does not happen. Whilst the Applicant has now accepted some of National Highways concerns and included wording in its paragraph 13 of the Protective Provisions confirming that National Highways' interests will not be extinguished this does not go far enough to prevent serious detriment from occurring.

2.6 In order for the new paragraph 13 in the Protective Provisions to be acceptable to National Highways, it will need to be amended to reflect National Highways interests in the two above-mentioned plots.

Operational highway land

2.7 In terms of operational highway land of the SRN, the relevant plots are 5-06 (the M56 motorway) and 7-05 (the M53 motorway). If the Applicant was to acquire National Highways operational land or extinguish any of its operational interests, this would cause serious detriment to National Highways' undertaking.

2.8 The Applicant is proposing permanent acquisition of the subsoil beneath the carriageway of both motorways which would cause detriment due to loss of ownership of the estate and therefore effect the ability to comply with regulatory responsibilities. It also becomes an issue with regard to suitable depth of ownership for maintenance purposes and potential for National Highways to trespass into third party land when carrying out vital and critical works necessary to support its undertaking.

2.9 Ownership of the subsoil beneath the highway (as well as the airspace above) also enables the highway authority to grant easements and to properly authorise street works. Should a third party own that land they could potentially benefit from a

ransom position should other parties need to place apparatus over or under the highway – whilst the highway authority would still have powers under the New Roads and Street Works Act 1991 (NRSWA) to authorise such works, it would no longer have the proprietary interest to permit what would otherwise be a trespass in the absence of a statutory right. That third party would need to authorise such works. This would not be in the public interest.

2.10 There are numerous locations across the SRN where apparatus has been placed beneath the highway and National Highways as a responsible public body with statutory obligations to facilitate sustainable development routinely accommodates such requests in its role as street authority and landowner. National Highways is concerned that should subsoil ownership pass to a third party then National Highways would no longer be able to accommodate those requests without third party approval. Unlike when it is National Highways that own the land, there is no statutory obligation for that third party to acquiesce to such requests. The risk is such that should this become common practice, there may become a time when land beneath all highways no longer lies in public ownership and this may have implications for future development with those third parties holding strong ransom positions.

2.11 As it happens a third party promoter has very recently approached National Highways to negotiate easements to place apparatus beneath the SRN in relatively close proximity to the authorised development. Whilst this is not the same location that the Applicant is seeking to acquire, it does provide a real and live example of the need for National Highways to maintain ownership of the subsoil beneath its network and the problems that could be caused if a precedent is set should this DCO authorise such compulsory acquisition.

2.12 In any event, it is unnecessary for the Applicant to compulsory acquire the freehold to these parcels of land when National Highways are willing to grant them the proprietary interest to do so.

2.13 For completeness National Highways acknowledges that there are some historical anomalies where it does not own the subsoil freehold beneath the SRN. Plot 7-05 is an example of this. Plot 7-05 is owned by Cheshire West and Chester Council (CWCC). Given the close working relationships that National Highways has with local authorities, such as CWCC, and the fact that they too are a public body with statutory responsibilities and obligations to act in the public interest, the same concerns do not apply should ownership pass into third party private ownership. Nevertheless, now that National Highways is aware of this anomaly it will look to regularise the position.

2.14 It should be noted that there are 7 plots owned by National Highways that form part of the local highway network where ownership of the subsoil did not automatically transfer following de-trunking. The principles of National Highways objections to compulsory acquisition of operational highway land apply equally to those plots.

2.15 In summary, the compulsory acquisition powers that the Applicant seeks in respect of National Highways land and interests are not necessary and National Highways submit that the necessary tests for authorising such have not been met. Compulsory acquisition should be an option of last resort. National Highways have shown that they are willing to grant the Applicant the necessary rights to place apparatus beneath the SRN in its role as both street authority and landowner. CWCC have confirmed to National Highways that they would provide the necessary consents for the works beneath the M53 subject to the Applicant applying for the necessary licences. Similarly National Highways would be willing to provide the necessary consents for works beneath CWCC highways subject to the Applicant applying for the necessary licences. As such it would be wholly inappropriate to grant powers of compulsory acquisition over operational highway land that would result in serious detriment and have numerous knock on implications for the future operation of the highway network.

3 ExA Q3.6.2 *Please provide a full and considered response to the 'Applicants comments on submissions made at Deadline 5 - Appendix A' [REP6-035].*

3.1 Status of works in the sub-soil under the highway and street works.

3.1.1 National Highways notes that the Applicant does not accept the legal advice it has previously submitted (REP5-051). It is relevant to note that that advice was prepared by Ms Ruth Stockley who is widely regarded as one of the UK's leading authorities on highways and has been an Editor of the Highway Law and Practice Encyclopaedia for over 25 years. As such National Highways consider the advice given by Ms Stockley to be reliable and accurate and would urge the Examining Authority to take the same view. This advice has informed a change in approach for National Highways and, notwithstanding the position it may have taken historically, it now intends to deal with such matters in the correct legal manner. National Highways acknowledges that this differs from its position in the past but it now needs to ensure that those historic errors are not carried forward in respect of future projects.

3.1.2 Following the same format of the Applicant's submission, further information on this point is provided below at paragraph 3.3 under the heading *Status of works in the subsoil under the highway and New Roads And Street Works Act 1991 (NRSWA).*

3.2 Protective provisions summary

3.2.1 National Highways position has been clear throughout the examination that it requires its standard set of protective provisions to appear on the order. To date the Applicant has not been prepared to do so. Whilst negotiations have been held on the subject, the parties remain some distance apart from reaching agreement. Most recently a meeting was held on 25 August 2023 where National Highways agreed to make a number of changes to its standard set of protective provisions to acknowledge that not all of its usual requirements would be relevant to tunnelling works beneath the carriageway. Unfortunately, the Applicant fundamentally disagreed with National Highways overall position and so it was not possible for the parties to reach agreement.

3.2.2 National Highways' position is a simple one. No third party should be permitted to carry out works in, on, over or under the SRN without the approval and authorisation of National Highways as the strategic highway company with full responsibility for such. Outside of the Planning Act 2008 regime (for example when applications come forward under the Town & Country Planning Act 1990) there is never any dispute on this point. Applicants accept that to carry out any such works to facilitate their development they are required to enter in an agreement with the highway authority pursuant to section 278 of the Highways Act 1980. The position that National Highways takes on Development Consent Order applications mirrors its position for such traditional developments.

3.2.3 National Highways' standard set of protective provisions originated from the company's section 278 agreement. It includes all of the provisions that a developer is required to adhere to when it wants to carry out works to the SRN to facilitate any development. It is needed to secure, inter alia:

- Bonds, cash deposits and commuted sums to ensure that National Highways is not exposed financially as a consequence of the Applicant's works;
- Road space booking procedures to ensure that network occupancy requirements are managed effectively for the safety of the public and contractors;
- Detailed design information to appropriately consider and approve the specification of works in accordance with technical standards;
- Appropriate maintenance obligations and defects liability periods;

- Collateral warranties from contractors and designers in respect of works undertaken on behalf of the Applicant;
- Restrictions on the commencement of works and the use of powers until detailed design specifications are agreed and safety implications have been satisfactorily addressed;
- Handover of maintenance responsibilities;
- Payment of all reasonable fees incurred by National Highways in respect of the Authorised Development;
- Indemnities for any loss incurred by National Highways in respect of the Authorised Development;
- Dispute resolution provisions.

3.2.4 All of these provisions are necessary to ensure the continued safe operation of the SRN, the safety of contractors working in the vicinity of the SRN and to protect National Highways, and therefore the public purse, from any financial risk.

3.2.5 The Applicant has a misguided belief that National Highways' requirements in this regard are disproportionate to the works expected to take place to facilitate the Authorised Development. National Highways strongly disagrees with this, and it shows a lack of understanding of how highway authorities operate to ensure the safe operation of their undertaking. Specified works which are carried out above or below the carriageway should be covered by the protective provisions. This includes tunnelling beneath the carriageway. Practically, such interfaces with the SRN could result in major loss to National Highways and must be signed off in the usual way as provided for in the protective provisions.

3.2.6 Any works on, in, over, under or adjacent to the SRN have the potential to be a source of danger to both the travelling public using the SRN as well as those who are carrying out such works. Safety is critical and is National Highways number one imperative. National Highways cannot permit anyone to carry out works that may affect its undertaking without safety being adequately addressed. The Applicant is of the view that National Highways' requirements are disproportionate and would place an unnecessary burden on them and potentially delay their development. This is not correct and it is certainly not National Highways' intention given the statutory obligations National Highways has, pursuant to its Licence, to support developments such as this one. That said, National Highways also has statutory obligations to protect its undertaking and ensure safety is paramount. It should be wholly unacceptable for anyone to consider compromising safety to enable a

developer to potentially achieve a quicker programme of delivery, even if the development is a nationally significant infrastructure project.

3.2.7 In an effort to reach some common ground with the Applicant National Highways has revisited its protective provisions to see which of those provisions may be unnecessary for works that solely involve tunnelling beneath the carriageway. The majority of provisions remain relevant to such works but National Highways has agreed that some will not be relevant in those circumstances and has now agreed for them not to apply in respect of those works. However, given the wide powers being sort by the Applicant which could result in 'unknown' highway works being brought forward under the DCO, it has been necessary to retain all National Highways standard provisions to ensure that appropriate protection is in place if the Applicant chooses to exercise those powers. An updated version of the protective provisions is now included at Appendix 1 to this submission. This remains a complete set as previously submitted to the examination but now includes some additional provisions which 'carve out' some of the requirements and obligations from applying to tunnelling works.

3.2.8 It is clear that the Applicant does not fully appreciate National Highways significant safety concerns associated with its proposed works. This is evidenced by their belief that installing large pipes beneath a high speed motorway are not street works and do not require appropriate highway authority oversight or protection.

3.2.9 Included at Appendix 2 is a Rail Accident Report that provides an example of the dangers that can arise if tunnelling works are not carried out appropriately. Whilst this incident related to an accident on the railway, the principles apply equally to the SRN. In this example pipes were installed underground using trenchless technology. Network Rail's asset protection standards and guidance were not fully complied with and as a result important factors were not addressed during the planning and approvals stages. Large voids developed under the railway as a result of excessive ground loss during the construction of the tunnel and these voids left the railway track unsupported that ultimately resulted in the derailment of a freight train. The report concluded that underlying factors that resulted in the incident were insufficient assessment of the risks posed by the tunnel and non-compliance with Network Rail's asset protection standards and guidance.

3.2.10 This example demonstrates the difficulties that National Highways faces over the Applicant's approach and its disregard for National Highways concerns. It is of particular concern that even at this late stage of the examination, the Applicant still does not appear to appreciate the dangers that its project could cause if National Highways' standards and procedures are bypassed. National Highways urges the ExA to include its preferred version of protective provisions in the order so that the risks posed by tunnelling beneath the SRN are sufficiently understood and so that National Highways can have oversight to

ensure appropriate standards and guidance are complied with to minimise the risks of these works causing similar dangers to the SRN as those detailed at Appendix 2.

3.3 Status of works in the subsoil under the highway and New Roads And Street Works Act 1991 (NRSWA)

3.3.1 National Highways is not suggesting that the depth of a highway is *"effectively whatever they wish"* as alleged by the Applicant. The point National Highways makes is that the depth of highway is not consistent and is not determined by a certain distance beneath the carriageway. It is instead based on many factors but ultimately is whatever depth is necessary to serve the relevant function, whether that be to support the carriageway or to provide drainage apparatus, for example. Without going on site and carrying out specific surveys it is not therefore possible for National Highways to say that in a certain location the depth of the highway is X metres.

3.3.2 National Highways will not reiterate previous submissions in detail here but it stands behind those submissions and the legal advice of Ruth Stockley. Works to tunnel beneath a highway clearly are street works and NRSWA is clearly relevant to the works proposed by the Applicant. The Applicant themselves *"accepts, and has always accepted, that National Highways has a legitimate interest in the trenchless works to be undertaken under the SRN, including in having a right of approval of the details and methodology of those works[1]."* It must therefore follow that the Applicant accepts such works are street works. If that were *not* the case, and if the Applicant's case to compulsorily acquire the subsoil beneath the SRN was successful, then National Highways would have no legal *right of approval of the details and methodology of those works*.

3.3.3 If the Applicant's view was correct in that the tunnelling works beneath the highway are not street works then it would mean that highway authorities across the country may, depending on the ownership situation of the subsoil, have no ability to govern works taking place beneath their network. This would result in obvious public safety issues. NRSWA is written as it is to ensure that cannot happen. The legislation cannot be any clearer on the point:

> The definition of "street works" is then of particular note. It includes any works executed in any highway pursuant to a statutory right or street works licence involving placing apparatus in the highway and any incidental works. Significantly, the reference to works

[1] Paragraph 2.2 to Applicants comments on submissions made at Deadline 5 - Appendix A' [REP6-035]

"*executed in a street*" must be interpreted in accordance with the definitions provision for the purposes of Part III, namely s.105(1), which provides as follows:

> "*"in," in a context referring to works, apparatus or other property in a street or other place includes a reference to works, apparatus or other property* ***under****, over, across, along or upon it*" (Emphasis added).

That is consistent with the definition of "street works" including "*tunnelling or boring under the street*". Hence, it matters not whether the works in question are physically in, over, on or under the highway; they are still "street works" governed by Part III of NRSWA.[2]

3.3.4 Contrary to the assertion of the Applicant National Highways understands that other street authorities affected by the authorised development agree that the proposed works beneath the highway are street works within the meaning of NRSWA.

3.3.5 National Highways acknowledges that it may not have made the same submissions as it now makes in respect of earlier applications for development consent but recent changes within the organisation has resulted in closer scrutiny being provided to such proposals and combined with legal advice received this has informed a change in approach for National Highways. Therefore, notwithstanding the position it may have taken historically, National Highways now intends to deal with such matters in the correct legal manner. National Highways must now ensure that those historic errors are not carried forward in respect of future projects.

3.3.6 National Highways notes the Applicant's concern that should it be held that tunnelling beneath a highway is street works (which it clearly is) this would have ramifications for the entire DCO and require extensive modifications to both the drafting and numerous plans. With respect to the Applicant, that is not National Highways problem but the law is clear that these works should be categorised as street works and therefore, should the Applicant carry out such works, without the DCO providing the necessary street works authority, then an offence will be committed. As such, the DCO is currently flawed in this respect. A simple solution to this would be for the Applicant to agree to enter into a street works licence with the street authority prior to carrying out such works. This could be included in the protective provisions as a very simple drafting update.

3.3.7 Unless these works are listed as street works in the DCO then the Applicant will not benefit from section 48(3) as it contends because the DCO would not provide them with the *statutory right.* The Applicant therefore has a choice, it can either include

[2] Paragraph 6 of Ruth Stockley opinion dated 4 July 2023 and provided as part of National Highways Deadline 5 submission.

the works as street works within the DCO; or it can agree to follow NRSWA in respect of these works as a separate consent outside the DCO. National Highways acknowledge this would be unusual and it would ordinarily be expected for such a consent to be included in the DCO but there is nothing to say it cannot be done this way if that is what the Applicant decides. What is clear is that one of these options must be taken to ensure that an offence is not committed.

3.3.8 National Highways notes that the Applicant seeks to draw parallels with National Highways own DCOs when it promotes its own schemes. What the Applicant fails to note is that National Highways is both a public body and, critically, a highway authority. It is not a comparable position to a private developer such as the Applicant.

3.4 Compulsory Acquisition

3.4.1 National Highways relies on the submissions made in section 2 above but supplements the same with the following points.

3.4.2 National Highways notes the Applicants comments in its table at paragraph 3.3 with regards the plots in which National Highways has an interest. For ease National Highways has grouped the plots by type and comments as follows:

Classification	Plots	Comments
National Highways freehold ownership beneath the SRN.	5-06	For the reasons stated National Highways objects to the compulsory acquisition of land beneath the SRN. Should compulsory powers be granted this would cause serious detriment to National Highways undertaking. Further, it is disputed that the Applicant has sufficiently made out a case for compulsory acquisition that would satisfy the relevant tests.
National Highways freehold ownership beneath the local road network.	2-09, 2-10, 5-09, 9-07, 9-09, 9-10, 9-12	For the reasons stated National Highways objects to the compulsory acquisition of land beneath the highway, including that of the local highway authority. Should compulsory

		powers be granted this would cause serious detriment to the local highway authority's undertaking. Further, it is disputed that the Applicant has sufficiently made out a case for compulsory acquisition that would satisfy the relevant tests.
National Highways freehold ownership of non highway land.	6-07	As noted by the Applicant this plot forms part of National Highways drainage system. The Applicant states that their compulsory acquisition proposals are compatible with National Highways interest resulting in no permanent impact on the use arising from acquisition of a sub-soil interest. With this in mind it should not be controversial to include this plot within the Applicant's paragraph 13 in the protective provisions showing their commitment not to extinguish National Highways interests. Without this commitment there would remain a risk that National Highways interests could be extinguished which would cause serious detriment to National Highways undertaking.
National Highways interests in third party land.	2-03, 2-05, 4-20, 5-01, 5-02, 5-05, 5-10, 5-12, 5-14, 5-15, 5-20, 5-22, 5-23, 6-02, 6-03, 6-04, 6-05, 6-06, 9-04,	These interests include, inter alia, rights of drainage, rights of access, and maintenance rights, all of which are necessary for National Highways to be able to carry out its undertaking. Should those rights be extinguished

		then this would cause serious detriment to National Highways undertaking by introducing public safety risks. It is noted that the Applicant has now included the majority of these plots in their paragraph 13 of the protective provisions confirming that they do not intend to extinguish these interests. This is welcomed although as referred to in section 2 above plots 5-12 and 6-03 are not included. Given the similarity with the other plots listed National Highways does not consider it would be controversial to add these two plots to the list at paragraph 13 to ensure that serious detriment does not arise.
National Highways interest as highway authority over third party land.	7-05	This relates to the M53 motorway for which National Highways is the highway authority and CWCC is the freehold owner of the subsoil. For the reasons stated National Highways objects to the compulsory acquisition of land beneath the SRN. Should compulsory powers be granted this would cause serious detriment to National Highways undertaking. Further, it is disputed that the Applicant has sufficiently made out a case for compulsory acquisition that would satisfy the relevant tests.

3.4.3 National Highways wishes to correct an earlier submission which suggested that compulsory acquisition of the SRN subsurface was unnecessary due to the Applicant's ability to rely upon NRSWA. This submission was based upon an incorrect understanding that the Applicant had a statutory right to lay apparatus beneath the highway (in the same way as a statutory undertaker) and so only required the street works authority to authorise such works (which it was assumed would be granted by the DCO). The Applicant is not a statutory undertaker and so does not benefit from a statutory right to lay apparatus beneath the highway without the landowner's consent. National Highways apologises for any confusion this may have caused. It is also now noted that as currently drafted the DCO would not provide the street works authority to authorise such works.

3.4.4 Nevertheless, National Highways remains of the view that compulsory powers are not necessary in respect of the highway subsurface. As street authority National Highways is willing to grant the appropriate consent for street works. It is also willing to grant the appropriate landowner consent for plot 5-06 (the crossing of the M56 motorway) subject to the Applicant applying for the necessary licences. In respect of plot 7-05 (the crossing of the M53 motorway) as street authority National Highways is willing to grant the appropriate consent for street works and it is understood that as landowner CWCC would be willing to grant the associated landowner consent subject to the Applicant applying for the necessary licences. This would mean that compulsory acquisition powers in respect of these plots would be unnecessary and so it could not be said that the Applicant has made out its case to satisfy the necessary tests for compulsory acquisition being an option of last resort. The same would apply to other plots where the Applicant is seeking to compulsorily acquire the subsurface of highway. National Highways is willing to grant landowner consent in respect of plots 2-09, 2-10, 5-09, 9-07, 9-09, 9-10, 9-12 however it would be for CWCC to grant the associated consent for street works as street authority.

3.4.5 At paragraph 3.15, the Applicant seeks to highlight inconsistencies with the approach being taken by National Highways here and its actions when promoting DCOs itself. This would appear to be based on a misunderstanding given that as highway authority National Highways would want to obtain compulsory acquisition powers to ensure it owned the highway subsurface for the reasons stated in this submission. In addition National Highways is a highway authority, statutory undertaker and public body, therefore it has duties to consider and adhere to that private companies such as the Applicant do not. It follows that land owned by National Highways forming part of the SRN should not be compulsorily acquired by a private company that does not have such stringent duties to adhere to.

3.4.6 To grant the Applicant compulsory acquisition powers over land owned by National Highways would, in National Highways opinion, set a dangerous precedent, would not be in the public interest and would cause a serious detriment to its statutory undertaking. For the reasons stated National Highways therefore submits that such powers should not be granted.

3.5 Serious Detriment

3.5.1 National Highways has set out its position in respect of serious detriment already in this submission so does not repeat that further but instead relies on those earlier submissions.

3.5.2 Notwithstanding the suggestion made by the Applicant, National Highways has made a reasoned, objective assessment of the impact compulsory acquisition powers and determined that serious detriment would arise for the reasons set out in this submission.

3.5.3 The Applicant has referenced various DCO decisions where serious detriment has been deemed not to exist despite submissions having been made by statutory undertakers. The ExA will appreciate that each case is different and must be decided on its own merits and that the examples given by the Applicant do not set any precedents nor are they comparable to this matter. It is also worth noting that the Applicant for each of these DCOs (Lake Lothing, Great Yarmouth Third River Crossing and Hinkley Point C) was either a public authority or a statutory undertaker and so would have had statutory obligations to act in the public interest. This would be a significant factor when making a decision and clearly differentiates those cases from this one where the Applicant is a private company under no such statutory obligations.

3.6 Impact of compulsory acquisition on the undertaking

3.6.1 National Highways does not repeat submissions already made and believes it has made out its case for serious detriment. The only additional point National Highways make in reply to the Applicants submissions in this regard is that National Highways are not saying that the installation of the pipeline in itself will cause serious detriment so long as it is done correctly – as stated already in this submission, such works are done routinely beneath the highway throughout the country. The serious detriment arises from the loss of ownership of the highway subsurface. The reasons for which have already been stated but to reemphasise one point already discussed at length in this submission; if the Applicant's view is correct that tunnelling beneath the surface of the SRN does not amount to street works then should ownership of the subsurface be acquired from National Highways it would prevent National Highways having any control over works taking place beneath its highway. This quite clearly could cause serious detriment to its undertaking as there would be far greater risk of works being

carried out inappropriately resulting in stability issues for the highway above and the clear public safety issues that would present.

3.7 Protective Provisions

3.7.1 National Highways refers to section 3.2 above.

3.7.2 As has been highlighted in National Highways' previous submissions, the DCO includes powers for the Applicant to carry out additional works outside of the listed numbered works included in Schedule 1. This is standard practice in DCO drafting to ensure that the powers are available should an Applicant need to do something differently once on site which may be relatively minor in nature and would not justify an amendment to the DCO itself. In the context of highway works this would not enable the Applicant to create a new section of SRN or grade separated junction but could be used to create a new access or widen existing highway, for example.

3.7.3 It is for these reasons that National Highways insists that its full set of protective provisions is included in the order. The Applicant repeatedly states that they do not intend to carry out any such works but to date have refused to amend the drafting to remove this concern from National Highways. For the various instances where this applies it should be relatively simple to amend the drafting to exclude its application to the SRN. Unless this is done then National Highways is clearly justified in requiring this protection. The Applicant cannot have it both ways, if it wants the power it needs to allow National Highways the protection should it be necessary. It cannot have such wide powers and not expect to have to provide the same level of protection as all other developers.

3.7.4 The Applicant's drafting quite clearly permits such works and its reference to such works being *"within the scope of the work assessed within the environmental statement"* is misleading. The environmental statement does not need to precisely set out all works that may be undertaken, so long as they are in some way connected with the main works. A clear example is if the Applicant decided it needed to construct a temporary access off the highway. That would clearly fall within scope. This would pose safety implications and would need to be designed and built to appropriate standards. It would also require traffic management and the temporary closure of some lane(s) of the highway to construct; and should such an arrangement be permanent then it would also require signage. National Highways is not suggesting that it is the Applicant's intention to do this but the DCO does give them the power to do so which is why National Highways must be afforded the necessary protection to ensure appropriate safeguards are in place should they be required.

3.7.5 At paragraph 5.8 the Applicant shows a fundamental disregard to National Highways concerns and a clear misunderstanding of how a highway authority operates. Its belief that a bond would not be required is of particular concern as is its view that there are no works to the operational SRN itself that could be found to be defective. The nature of the works proposed pose a significant risk of defects to the SRN if not carried out correctly. Bonds are required to ensure that if works are started but not finished (for example if the Applicant becomes insolvent), or are not carried out correctly, this does not result in financial liability to National Highways and a safety risk to the public. National Highways does not have a budget to complete or correct works started by a third party developer. Any work carried out either to the SRN, or which may affect it, must be supported by a bond to ensure that if the works were ceased as a result of default by or the insolvency of the promoter, National Highways had appropriate access to funds to secure the restoration of the SRN that had been subject to works. National Highways cannot be left in a position where voids are left beneath the SRN due to incomplete works. Whilst the Applicant might say this risk is minimal, this development should be at nil risk to National Highways who are a public body funded by the taxpayer.

3.7.6 National Highways accepts that there are certain provisions included that would not be relevant to tunnelling works. It has therefore agreed to carve out such provisions from applying to those works. National Highways considers this to be a reasonable compromise. For the reasons stated it requires its full set of protection given the wide powers sort by the Applicant, that may result in the need to carry out works to the highway that are unknown at this time, but it can agree to a lesser level of protection for the tunnelling works acknowledging that not all of its usual requirements would be relevant to those works.

3.7.7 National Highways had hoped that its updated position would move the parties closer to reaching agreement but unfortunately this has not been the case. At a meeting on 25 August National Highways was informed that (i) the Applicant would not agree to National Highways request for protection against the wide powers being sort; and (ii) the provisions that National Highways had agreed would not need to apply to the tunnelling works were not as extensive as the Applicant required. As the Applicant was unwilling to engage further on this point the parties remain some distance apart despite the ExA's request for common ground to be found. National Highways therefore submits its preferred set of protective provisions for the ExA's attention and respectfully request that for the reasons stated these are recommended for inclusion in the DCO should it be made.

3.7.8 The protective provisions included at Appendix 3 show National Highways preferred drafting together with commentary in reply to the points made by the Applicant. This uses the version provided by the Applicant at Deadline 6 as a baseline and

where appropriate, changes made by them have been accepted. A clean version of these protective provisions is included at Appendix 1.

National Highways Limited

5th September 2023

APPENDIX 1

National Highways Protective Provisions (clean version)

National Highways draft Protective Provisions

FOR THE PROTECTION OF NATIONAL HIGHWAYS LIMITED

Application etc.,

1. — (1) The provisions of this Part of this Schedule apply for the protection of National Highways and have effect unless otherwise agreed in writing between the undertaker and National Highways.

(2) Except where expressly amended by the Order the operation of the powers and duties of National Highways or the Secretary of State under the 1980 Act, the 1984 Act, the 1991 Act, the Transport Act 2000, or Town and Country Planning (General Permitted Development) (England) Order 2015 which shall continue to apply in respect of the exercise of all National Highways' statutory functions.

Interpretation

2.—(1) Where the terms defined in article 2 *(interpretation)* of this Order are inconsistent with subparagraph (2) the latter prevail.

(2) In this Part of this Schedule—

"as built information" means one electronic copy of the following information—

(a) as constructed drawings in both PDF and AutoCAD DWG formats showing the location and depth of the pipeline as installed and any ancillary or protective measures installed within the strategic road network;

(b) list of suppliers and materials used, as well as any relevant test results and CCTV surveys (if required to comply with DMRB standards);

(c) product data sheets and technical specifications for all materials used;

(d) as constructed information for any utilities discovered or moved during the specified works;

(e) method statements for the specified works carried out;

(f) in relation to road lighting, signs, and traffic signals any information required by Series 1300 and 1400 of the Specification for Highway Works or any replacement or modification of it;

(g) organisation and methods manuals for all products used;

(h) as constructed programme;

(i) test results and records as required by the detailed design information and during construction phase of the project;

(j) a stage 3 road safety audit subject to any exceptions to the road safety audit standard as agreed by the undertaker and National Highways;

(k) in so far as it is relevant to the specified works, the health and safety file; and

(l) such other information as is reasonably required by National Highways to be used to update all relevant databases and to ensure compliance with National Highway's *Asset Data Management Manual* as is in operation at the relevant time.

"as built information for the tunnelling works" means one electronic copy of the following information—

(a) as constructed drawings in both PDF and AutoCAD DWG formats showing the location and depth of the pipeline as installed and any ancillary or protective measures installed within the strategic road network;

(b) as constructed information for any utilities discovered or moved during the tunnelling works;

(c) method statements for the specified works carried out;

(d) test results and records as required by the detailed design information and during the construction phase of the project;

(e) in so far as it is relevant to the tunnelling works, the health and safety file; and

(f) such other information as is reasonably required by National Highways to be used to update all relevant databases and to ensure compliance with National Highway's *Asset Data Management Manual* as is in operation at the relevant time.

"the bond sum" means the sum equal to 200% of the cost of the carrying out the specified works (to include all costs plus any commuted sum) or such other sum agreed between the undertaker and National Highways;

"the cash surety" means the sum agreed between the undertaker and National Highways;

"commuted sum" means such sum calculated as provided for in paragraph 9 of this Part of this Schedule to be used to fund the future cost of maintaining the specified works;

"condition survey" means a survey of the condition of National Highways structures and assets within the Order limits that may be affected by the specified works;

"contractor" means any contractor or subcontractor appointed by the undertaker to carry out the specified works;

"defects period" means the period from the date of the provisional certificate to the date of the final certificate which shall be no less than 12 months from the date of the provisional certificate;

"detailed design information" means such of the following drawings specifications and calculations as are relevant to the specified works—

(a) site clearance details;

(b) boundary, environmental and mitigation fencing;

(c) road restraints systems and supporting road restraint risk appraisal process assessment;

(d) drainage and ducting as required by DMRB CD 535 Drainage asset data and risk management and DMRB CS551 Drainage surveys – standards for Highways

(e) earthworks including supporting geotechnical assessments required by DMRB CD622 Managing geotechnical risk and any required strengthened earthworks appraisal form certification;

(f) pavement, pavement foundations, kerbs, footways and paved areas;

(g) traffic signs and road markings;

(h) traffic signal equipment and associated signal phasing and timing detail;

(i) road lighting (including columns and brackets);

(j) regime of California Bearing Ratio testing;

(k) electrical work for road lighting, traffic signs and signals;

(l) motorway communications as required by DMRB;

(g) highway structures and any required structural approval in principle;

(h) landscaping;

(i) proposed departures from DMRB standards;

(j) walking, cycling and horse riding assessment and review report;

(k) stage 1 and stage 2 road safety audits and exceptions agreed;

(l) utilities diversions; and

(m) topographical survey;

(n) maintenance and repair strategy in accordance with DMRB GD304 Designing health and safety into maintenance or any replacement or modification of it;

(o) health and safety information including any asbestos survey required by GG105 or any successor document; and

(p) other such information that may be reasonably required by National Highways to be used to inform the detailed design of the specified works;

"detailed design information for the tunnelling works" means such of the following drawings specifications and calculations as are relevant to the tunnelling works—

(a) site clearance details;

(b) boundary, environmental and mitigation fencing;

(c) earthworks including supporting geotechnical assessments required by DMRB CD622 Managing geotechnical risk and any required strengthened earthworks appraisal form certification;

(d) proposed departures from DMRB standards;

(e) utilities diversions; and

(f) other such information that may be reasonably required by National Highways to be used to inform the detailed design of the tunnelling works;

"DMRB" means the Design Manual for Roads and Bridges or any replacement or modification of it;

"final certificate" means the certificate relating to those aspects of the specified works that have resulted in any alteration to the strategic road network to be issued by National Highways pursuant to paragraph 9;

"the health and safety file" means the file or other permanent record containing the relevant health and safety information for the specified works required by the Construction Design and Management Regulations 2015 (or such updated or revised regulations as may come into force from time to time);

"nominated persons" means the undertaker's representatives or the contractor's representatives on site during the carrying out of the specified works as notified to National Highways from time to time;

"programme of works" means a document setting out the sequence and timetabling of the specified works;

"provisional certificate" means the certificate of provisional completion relating to those aspects of the specified works that have resulted in any alteration to the strategic road network to be issued by National Highways in accordance with paragraph 7 when it considers the specified works are substantially complete and may be opened for traffic;

"road safety audit" means an audit carried out in accordance with the road safety audit standard;

"road safety audit standard" means DMRB Standard HD GG119 or any replacement or modification of it;

"road space booking" means road space bookings in accordance with National Highways' Asset Management Operational Requirements (AMOR) including Network Occupancy Management System (NOMS) used to manage road space bookings and network occupancy;

"Specification for Highways Works" means the specification for highways works forming part of the manual of contract documents for highway works published by National Highways and setting out the requirements and approvals procedures for work, goods or materials used in the construction, improvement or maintenance of the strategic road network;

"specified works" means so much of the authorised development, including any maintenance of that work, as is on, in, under or over the strategic road network for which National Highways is the highway authority, including Work No.12 in so far as that crosses the M56 motorway, Work No.16 in so far as that crosses the M53 motorway, and Work No. 22 in so far as that crosses the A41 highway.

"strategic road network" means any part of the road network including trunk roads, special roads or streets for which National Highways is the highway authority including drainage infrastructure, street furniture, verges and vegetation and all other land, apparatus and rights located in, on, over or under the highway;

"tunnelling works" means any specified works which involve tunnelling, boring or otherwise installing the pipeline under the strategic road network without trenching from the surface;

"utilities" means any pipes wires cables or equipment belonging to any person or body having power or consent to undertake street works under the New Roads and Street Works Act 1991; and

"winter maintenance" means maintenance of the road surface to deal with snow and ice.

(3) References to any standards, manuals, contracts, Regulations and Directives including to specific standards forming part of the DMRB are, for the purposes of this Part of this Schedule, to be construed as a reference to the same as amended, substituted or replaced, and with such modifications as are required in those circumstances.

General

3.The undertaker acknowledges that parts of the works authorised by this Order affect or may affect parts of the strategic road network in respect of which National Highways may have appointed or may appoint a highway operations and maintenance contractor.

4.Notwithstanding the limits of deviation permitted pursuant to article 6 (limits of deviation) of this Order, no works in carrying out, maintaining or diverting the authorised development may be carried out under the strategic road network at a distance less than 4 metres below the lowest point of the carriageway surface.

5.References to any standards, manuals, contracts, regulations and directives including to specific standards forming part of the DMRB are, for the purposes of this Part of this Schedule, to be construed as a reference to the same as amended, substituted or replaced, and with such modifications as are required in those circumstances.

Prior approvals and security

6.—(1) Any tunnelling works must be designed by the undertaker in accordance with DMRB CD622 unless otherwise agreed in writing by National Highways.

(2) Subject to sub paragraph (3) the specified works must not commence until—

(a) a stage 1 and stage 2 road safety audit has been carried out and all recommendations raised by them or any exceptions are approved by National Highways;

(b) the programme for those works has been approved by National Highways;

(c) the detailed design of the specified works comprising of the following details, insofar as considered relevant by National Highways, has been submitted to and approved by National Highways—

(i) the detailed design information, or in respect of tunnelling works the tunnelling detailed design information, incorporating all recommendations and any exceptions approved by National Highways under sub-paragraph (a) ;

(ii) details of the proposed road space bookings;

(iii) the identity and suitability of the contractor and nominated persons;

(iv) a process for stakeholder liaison, with key stakeholders to be identified and agreed between National Highways and the undertaker;

(v) information demonstrating that the walking, cycling and horse riding assessment and review process undertaken by the undertaker in relation to the specified works has been adhered to in accordance with DMRB GG142 – Designing for walking, cycling and horse riding; and

(d) a scheme of traffic management has been submitted by the undertaker and approved by National Highways such scheme to be capable of amendment by agreement between the undertaker and National Highways from time to time;

(e) stakeholder liaison has taken place in accordance with the process for such liaison agreed between the undertaker and National Highways under sub-paragraph (c)(v) above;

(f) National Highways has approved the audit brief and CVs for all road safety audits and exceptions to items raised in accordance with the road safety audit standard;

(g) the undertaker has agreed the estimate of the commuted sum with National Highways;

(h) the scope of all maintenance operations (routine inspections, incident management, reactive and third party damage) to be carried out by the undertaker during the construction of the specified works (which must include winter maintenance) has been agreed in writing by National Highways;

(i) the undertaker has procured to National Highways collateral warranties in a form approved by National Highways from the contractor and designer of the specified works in favour of National Highways to include covenants requiring the contractor and designer to exercise all reasonable skill care and diligence in designing and constructing the specified works, including in the selection of materials, goods, equipment and plant; and

(j) a condition survey and regime of monitoring of any National Highways assets or structures that National Highways reasonably considers will be affected by the specified works, has been agreed in writing by National Highways.

(3) Sub paragraphs 2(a), 2(b)(iv), 2(b)(v), 2(d), 2(e), 2(f), 2(g) and 2(h) do not apply in respect of any tunnelling works.

(4) The undertaker must not exercise—

(a) article 5 *(power to maintain the authorised development)*;

(b) article 10 *(street works);*

(c) article 11 *(power to alter layout etc. of streets)*

(d) article 13 *(temporary restriction of public rights of way);*

(e) article 14 (*stopping up of public rights of way);*

(f) article 15 *(temporary restriction of use of streets)*

(g) article 16 *(access to works)*

(h) article 19 *(traffic regulation)*;

(i) article 20 *(discharge of water)*;

(j) article 22 *(authority to survey and investigate the land);*

(k) article 23 *(protective works to buildings)*;

(l) article 25 *(compulsory acquisition of land);*

(m) article 27 *(compulsory acquisition of rights and restrictive covenants);*

(n) article 28 *(statutory authority to override easements and other rights)*

(o) article 30 *(private rights)*

(p) article 32 *(acquisition of subsoil or airspace only)*

(q) article 34 *(rights under or over streets)*

(r) article 35 *(temporary use of land for carrying out the authorised development)*;

(s) article 36 (*temporary use of land for maintaining the authorised development)*;

(t) article 37 (statutory undertakers); or

(u) article 40 (*felling or lopping trees*) of this Order,

over any part of the strategic road network without the consent of National Highways including from ThirdPartySchemesNWA10@nationalhighways.co.uk and Area10Roadspace@nationalhighways.co.uk, and National Highways may in connection with any such exercise require the undertaker to provide details of any proposed road space bookings and/or submit a scheme of traffic management for National Highways' approval.

(5) National Highways must prior to the commencement of the specified works or the exercise of any power referenced in sub-paragraph (4),a inform the undertaker of the identity of the person who will act as a point of contact on behalf of National Highways for consideration of the information required under sub-paragraph (2), (3) or (4).

(6) Any approval of National Highways required under this paragraph-

(a) must not be unreasonably withheld;

(b) must be given in writing;

(c) shall be deemed to have been refused if neither given nor refused within 2 months of the receipt of the information for approval or, where further particulars are requested by National Highways (acting reasonably) within 2 months of receipt of the information to which the request for further particulars relates; and

(d) may be subject to any reasonable conditions as National Highways considers necessary.

(7) Any change to the identity of the contractor and/or designer of the specified works will be notified to National Highways immediately and details of their suitability to deliver the specified works will be provided on request along with collateral warranties in a form agreed by National Highways.

(8) Any change to the detailed design of the specified works must be approved by National Highways in accordance with paragraph 6(2) or 6(3) of this Part.

Construction of the specified works

7.—(1) The undertaker must give National Highways 28 days' notice in writing of the date on which the specified works will start.

(2) The undertaker must comply with National Highways' road space booking procedures prior to and during the carrying out the specified works and no specified works for which a road space booking is required shall commence without a road space booking having first been secured from National Highways.

(3) The specified works must be carried out by the undertaker to the reasonable satisfaction of National Highways in accordance with—

(a) the relevant detailed design information and programme of works approved pursuant to paragraph 6(2) or 6(3) above or as subsequently varied by agreement between the undertaker and National Highways;

(b) in so far as it may be applicable the DMRB, the Manual of Contract Documents for Highway Works, including the Specification for Highway Works, together with all other relevant standards as reasonably required by National Highways to include, inter alia; all relevant interim advice notes, the Traffic Signs Manual and the Traffic Signs Regulations and General Directions 2016 save to the extent that exceptions from those standards apply which have been approved by National Highways; and

(c) all aspects of the Construction (Design and Management) Regulations 2015 or any statutory amendment or variation of the same.

(4) The undertaker must permit and must require the contractor to permit at all reasonable times persons authorised by National Highways (whose identity must have been previously notified to the undertaker by National Highways) to gain access to the specified works for the purposes of inspection and supervision of the specified works.

(5) If any part of the specified works is constructed-

(a) other than in accordance with the requirements of this Part of this Schedule; or

(b) in a way that causes damage to the highway, highway structure or asset or any other land of National Highways,

National Highways may by notice in writing require the undertaker, at the undertaker's own expense, to comply promptly with the requirements of this Part of this Schedule or remedy any damage notified to the undertaker under this Part of this Schedule, to the satisfaction of National Highways, acting reasonably.

(6) If during the carrying out of the authorised development the undertaker or its appointed contractors or agents causes damage to the strategic road network then National Highways may by notice in writing require the undertaker, at its own expense, to remedy the damage.

(7) If within 28 days on which a notice under sub-paragraph (5) or sub-paragraph (6) is served on the undertaker (or in the event of there being, in the opinion of National Highways, a danger to road users,

within such lesser period as National Highways may stipulate), the undertaker has failed to take the steps required by that notice, National Highways may carry out the steps required of the undertaker and may recover any expenditure reasonably incurred by National Highways in so doing, such sum to be payable within 30 days of demand.

(8) Nothing in this Part of this Schedule prevents National Highways from carrying out any work or taking any such action as it reasonably believes to be necessary as a result of or in connection with the carrying out or maintenance of the authorised development without prior notice to the undertaker in the event of an emergency or to prevent the occurrence of danger to the public and National Highways may recover any expenditure it reasonably incurs in so doing.

(9) In constructing the specified works, the undertaker must at its own expense divert or protect all utilities and where relevant all agreed alterations and reinstatement of highway over existing utilities must be constructed to the satisfaction of National Highways.

(10) During the construction of the specified works, with the exception of any tunnelling works, the undertaker must carry out all maintenance (including winter maintenance) in accordance with the scope of maintenance operations agreed by National Highways pursuant to paragraph 6(2)(h) and the undertaker must carry out such maintenance at its own cost.

(11) The undertaker must notify National Highways if it fails to complete the specified works in accordance with the agreed programme pursuant to paragraph 6(2)(b) of this Part, or suspends the carrying out of any specified work beyond 14 days, and National Highways reserves the right to withdraw any road space booking granted to the undertaker to ensure compliance with its network occupancy requirements.

Payments

8.—(1) The undertaker must pay to National Highways a sum equal to the whole of any reasonable costs and expenses which National Highways incurs (including costs and expenses for using internal or external staff and costs relating to any work which becomes abortive) in relation to the specified works and in relation to any approvals sought under this Order, or otherwise incurred under this Part, including—

(a) the checking and approval of the information required under paragraph 6(2);

(b) the supervision of the specified works;

(c) the checking and approval of the information required to determine approvals under this Order;

(d) all costs in relation to the transfer of any land required for the specified works; and

(e) all legal and administrative costs and disbursements incurred by National Highways in connection with the Order and sub-paragraphs (a)-(d); and

(f) any value added tax which is payable by National Highways in respect of such costs and expenses and for which it cannot obtain reinstatement from HM Revenue and Customs,

together comprising "the NH costs".

(2) The undertaker must pay to National Highways upon demand and prior to such costs being incurred the total costs that National Highways believe will be properly and necessarily incurred by National Highways in undertaking any statutory procedure or preparing and bringing into force any traffic regulation order or orders necessary to carry out or for effectively implementing the authorised development.

(3) National Highways must provide the undertaker with a schedule showing its estimate of the NH costs prior to the commencement of the specified works and the undertaker must pay to National Highways the estimate of the NH costs prior to commencing the specified works and in any event prior to National Highways incurring any cost.

(4) If at any time after the payment referred to in sub-paragraph (3) has become payable, National Highways reasonably believes that the NH costs will exceed the estimated NH costs it may give notice to the undertaker of the amount that it believes the NH costs will exceed the estimate of the NH costs (the excess) and the undertaker must pay to National Highways within 28 days of the date of the notice a sum equal to the excess.

(5) National Highways must give the undertaker a final account of the NH costs referred to in sub-paragraph (1) above within 91 days of the issue of the provisional certificate issued pursuant to paragraph 10(4).

(6) Within 28 days of the issue of the final account:

(a) if the final account shows a further sum as due to National Highways the undertaker must pay to National Highways the sum shown due to it;

(b) if the account shows that the payment or payments previously made by the undertaker have exceeded the costs incurred by National Highways, National Highways must refund the difference to the undertaker.

(7) If any payment due under any of the provisions of this Part of this Schedule is not made on or before the date on which it falls due the party from whom it was due must at the same time as making the payment pay to the other party interest at 3% above the Bank of England base lending rate from time to time being in force for the period starting on the date upon which the payment fell due and ending with the date of payment of the sum on which interest is payable together with that interest.

Provisional Certificate

9.—(1) Following the completion of any specified works or prior to reopening any part of the strategic road network following any closure or partial closure, whichever shall be sooner, the undertaker shall notify National Highways who will carry out a site inspection to satisfy itself that the strategic road network is, in its opinion, safe for traffic and the undertaker must comply with any requirements of National Highways.

(2) As soon as the undertaker considers that the provisional certificate may be properly issued it must apply to National Highways for the provisional certificate.

(3) Following an application for a provisional certificate, National Highways must as soon as reasonably practicable:

(a) inspect the specified works; and

(b) provide the undertaker with a written list of works that are required for the provisional certificate to be issued or confirmation that no further works are required for this purpose.

(4) Subject to sub paragraph (7) when—

(a) a stage 3 road safety audit for the specified works has been carried out and all recommendations raised including remedial works have (subject to any exceptions agreed) been approved by National Highways;

(b) the specified works incorporating the approved remedial works under sub-paragraph (4)(a) have been completed to the satisfaction of National Highways;

(c) any further works notified to the undertaker pursuant to sub-paragraph 9(3)(b) have been completed to the satisfaction of National Highways;

(d) the as built information, or where relevant the as built information for tunnelling works, has been provided to National Highways; and

(e) the undertaker has paid the commuted sum to National Highways,

National Highways must issue the provisional certificate.

(5) On the issue of the provisional certificate the bond sum shall be reduced to 20% of the total bond sum save insofar as any claim or claims have been made against the bond before that date in which case National Highways will retain a sufficient sum to ensure it does not have to meet any costs for or arising from the specified works.

(6) The undertaker must submit a stage 4 road safety audits as required by and in line with the timescales stipulated in the road safety audit standard. The undertaker must comply with the findings of the stage 4 road safety audit and must pay all costs of and incidental to such and provide updated as-built information to National Highways.

(7) Sub paragraphs (4)(a), 4(b), 4(e) and (6) do not apply in respect of any tunnelling works.

Opening

10. (1) Where it has been necessary to close, in whole or in part, the strategic road network the undertaker must notify National Highways not less than 56 days in advance of the intended date of opening to the public of the strategic road network and the undertaker must notify National Highways of the actual date the strategic road network will be opened to the public within 14 days of that date.

(2) The undertaker must notify National Highways as soon as possible, and in any event within 5 days, of completion of any tunnelling works.

Final condition survey

11.—(1) The undertaker must, as soon as reasonably practicable after making its application for a provisional certificate pursuant to paragraph 9(2), arrange for any highways structures and assets that were the subject of the condition survey under paragraph 6(2)(c) to be re-surveyed and must submit the re-survey to National Highways for its approval. The re-survey will include a renewed geotechnical assessment required by DMRB CD622 if the specified works include any works beneath the strategic road network.

(2) If the re-surveys carried out pursuant to paragraph 11 (1) indicates that any damage has been caused to a structure or asset, the undertaker must submit a scheme for remedial works in writing to National Highways for its approval in writing and the undertaker must carry out the remedial works at its own cost and in accordance with the scheme submitted.

(3) If the undertaker fails to carry out the remedial work in accordance with the approved scheme, National Highways may carry out the steps required of the undertaker and may recover any expenditure it reasonably incurs in so doing.

(4) National Highways may, at its discretion, at the same time as giving its approval to the re-surveys pursuant to paragraph 12(1) give notice in writing that National Highways will remedy any damage identified in the re-surveys and National Highways may recover any expenditure it reasonably incurs in so doing from the undertaker.

(5) The undertaker must make available to National Highways upon request copies of any survey or inspection reports produced pursuant to any inspection or survey of any specified work following its completion that the undertaker may from time to time carry out.

Defects Period

12. —(1) The undertaker must at its own expense remedy any defects in the strategic road network as are reasonably required by National Highways to be remedied during the defects period. All identified defects must be remedied in accordance with the following timescales—

(a) in respect of matters of urgency, within 24 hours of receiving notification for the same (urgency to be determined at the absolute discretion of National Highways);

(b) in respect of matters which National Highways considers to be serious defects or faults, within 14 days of receiving notification of the same; and

(c) in respect of all other defects notified to the undertaker, within 4 weeks of receiving notification of the same.

(2) Following the expiry of the defects period National Highways has responsibility for routine maintenance of the strategic road network save for any soft landscaping works which must be established and which must thereafter be maintained for a period of 3 years by and at the expense of the undertaker.

Final Certificate

13. —(1) The undertaker must apply to National Highways for the final certificate no sooner than 12 months from the date of the provisional certificate.

(2) Following receipt of the application for the final certificate, National Highways must as soon as reasonably practicable:

(a) inspect the strategic road network; and

(b) provide the undertaker with a written list of any further works required to remedy or make good any defect or damage in the strategic road network or confirmation that no such works are required for this purpose.

(3) The undertaker must carry out such works notified to it pursuant to sub-paragraph 13(2).

(4) When National Highways is satisfied that:

(a) any defects or damage arising from defects during the defects period and any defects notified to the undertaker pursuant to sub-paragraph 13(2) and any remedial works required as a result of, where necessary, a stage 4 road safety audit have been made good to the satisfaction of National Highways; and

(b) the NH costs have been paid to National Highways in full;

National Highways must issue the final certificate after which the bond shall be released in full.

(5) The undertaker must pay to National Highways within 28 days of demand the costs reasonably incurred by National Highways in identifying the defects and supervising and inspecting the undertaker's work to remedy the defects that it is required to remedy pursuant to these provisions.

Security

14.—(1) The specified works must not commence until—

(a) the undertaker procures that the specified works are secured by a bond from a bondsman first approved by National Highways in the agreed form between the undertaker and National Highways to indemnify National Highways against all losses, damages, costs or expenses arising from any breach of any one or more of the obligations of the undertaker in respect of the exercise of the powers under this Order and the specified works under the provisions of this Part of this Schedule provided that the maximum liability of the bond must not exceed the bond sum; and

(b) the undertaker has provided the cash surety which may be utilised by National Highways in the event of the undertaker failing to meet its obligations to make payments under paragraph 8 or to carry out works the need for which arises from a breach of one or more of the obligations of the undertaker under the provisions of this Part of this Schedule.

Commuted sums

15. —(1) Subject to sub paragraph (3) National Highways must provide to the undertaker an estimate of the commuted sum, calculated in accordance with FS Guidance S278 Commuted Lump Sum Calculation Method dated 18 January 2010 or any successor guidance, prior to the commencement of the specified works.

(2) The undertaker must pay to National Highways the commuted sum prior to the issue of the provisional certificate.

(3) Paragraph 15 does not apply to any tunnelling works.

Insurance

16. Prior to the commencement of the specified works the undertaker must effect and maintain in place until the issue of the final certificate, public liability insurance with an insurer in the minimum sum of £10,000,000.00 (ten million pounds) in respect of any one claim against any legal liability for damage loss or injury to any property or any person as a direct result of the execution of specified works or use of the strategic road network by the undertaker.

Indemnity

17. The undertaker fully indemnifies National Highways from and against all reasonable costs, claims, expenses, damages, losses and liabilities suffered by National Highways arising from the construction, maintenance or use of the specified works or exercise of or failure to exercise any power under this Order within 30 days of demand save for any loss arising out of or in consequence of any negligent act or default of National Highways.

Maintenance of the specified works

18.—(1) The undertaker must, prior to the commencement of any works of external maintenance to the specified works, give National Highways 28 days' notice in writing of the date on which those works will start unless otherwise agreed by National Highways, acting reasonably. Works of inspection or maintenance undertaken from within the pipeline will not be subject to this paragraph.

(2) If, for the purposes of maintaining the specified works, the undertaker needs to occupy any road space, the undertaker must comply with National Highways' road space booking requirements and no maintenance of the specified works for which a road space booking is required shall commence without a road space booking having first been secured.

(3) The undertaker must comply with any reasonable requirements that National Highways may notify to the undertaker, such requirements to be notified to the undertaker not less than 14 days' in advance of the planned commencement date of the maintenance works.

(4) The provisions of paragraph 10 shall apply to the opening of any part of the strategic road network following occupation of any road space under this paragraph.

Land

19.—(1) Following the issue of the final certificate pursuant to paragraph 13(4) National Highways may serve notice on the undertaker that it wishes to take a freehold transfer of land within the extent of strategic road network boundary which is not in the ownership of National Highways but has been acquired by the undertaker for the purposes of carrying out the specified works.

(2) If the undertaker receives notice under sub-paragraph (1) then the undertaker must effect a freehold transfer of the land which is the subject of the notice and complete such transfer as soon as reasonably practicable at no cost to National Highways.

(3) Where not covered under paragraph 20 the undertaker must not under the powers of this Order:

(a) acquire or use land forming part of;

(b) acquire new or existing rights over; or

(c) seek to impose or extinguish any restrictive covenants over;

any of the strategic road network, or extinguish any existing rights of National Highways in respect of any third party property, except with the consent of National Highways by written request to legalservicesinbox@nationalhighways.co,uk.

(4) Where any land or interest is proposed to be acquired for the benefit of National Highways, the undertaker must, unless otherwise agreed by National Highways, exercise article 25 *(compulsory acquisition of land)* and article 27 *(compulsory acquisition of rights and restrictive covenants)* as applied by articles 31 *(application of the 1981 Act)* and article 33 *(modification of Part 1 of the 1965 Act)* of this Order to directly vest in National Highways any such land or interest.

Land

20.—(1) The undertaker must not, in reliance on or in exercise of any power under this Order, interfere with, remove, damage or prevent or impair the functioning of, and must on reasonable request (or in case of emergency, on demand) allow access by National Highways to, the highway drainage assets located in plots 2-14, 4-20, 5-01, 5-02, 5-03, 5-04, 5-10, 5-14, 5-15, 5-20, 5-22, 5-23, 6-02, 6-04, 6-05, 6-06,

(2) The undertaker must not, in reliance on or in exercise of any power under this Order, interfere with, remove or prevent access by National Highways in pursuance of any right held over plots 2-03, 2-14 and 5-05.

(3) The undertake must not, in reliance on or in exercise of any power under this Order, acquire, extinguish or remove any right National Highways holds for the purposes of its undertaking in any of the plots listed in sub-paragraph (1) and (2) and plot 9-04.

Expert Determination

21.—(1) Article 49 *(arbitration)* of the Order does not apply to this Part of this Schedule.

(2) Any difference under this Part of this Schedule may be referred to and settled by a single independent and suitable person who holds appropriate professional qualifications and is a member of a professional body relevant to the matter in dispute acting as an expert, such person to be agreed by the differing parties or, in the absence of agreement, identified by the President of the Institution of Civil Engineers.

(3) On notification by either party of a dispute, the parties must jointly instruct an expert within 14 days of notification of the dispute.

(4) All parties involved in settling any difference must use all reasonable but commercially prudent endeavours to do so within 21 days from the date that an expert is appointed.

(5) The expert must—

(a) invite the parties to make submission to the expert in writing and copied to the other party to be received by the expert within 7 days of the expert's appointment;

(b) permit a party to comment on the submissions made by the other party within 7 days of receipt of the submission;

(c) issue a decision within 7 days of receipt of the submissions under sub-paragraph (b); and

(d) give reasons for the decision.

(6) Any determination by the expert is final and binding, except in the case of manifest error in which case the difference that has been subject to expert determination may be referred to and settled by arbitration under article 49 *(arbitration)*.

(7) The fees of the expert are payable by the parties in such proportions as the expert may determine or, in the absence of such determination, equally.

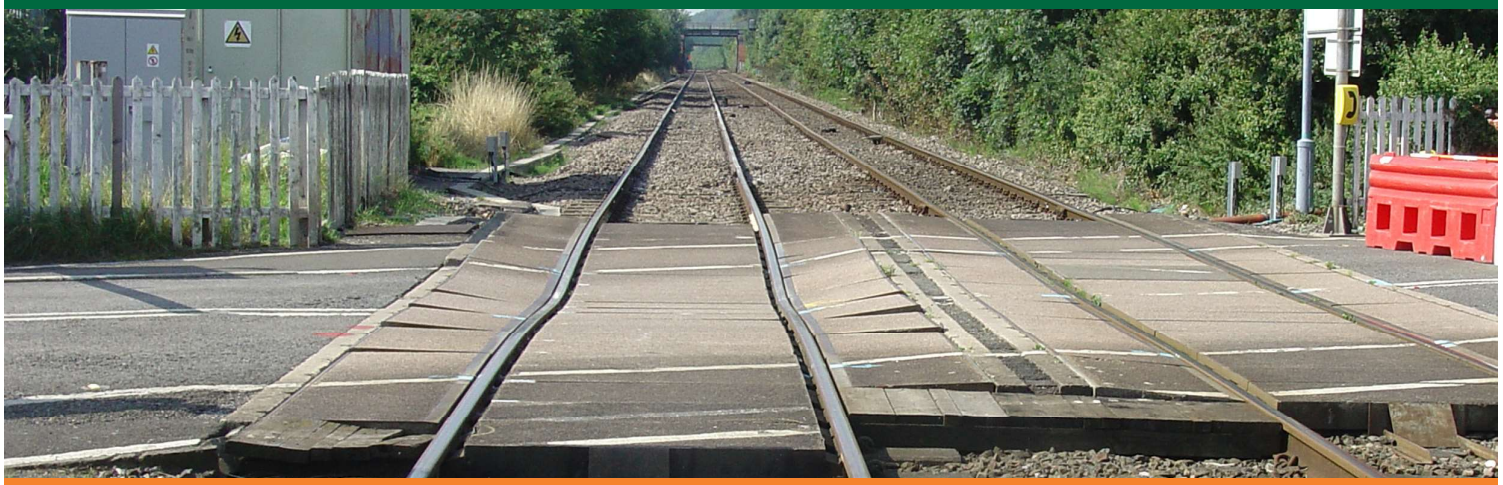
APPENDIX 2

Rail Accident Report

RAIB

Rail Accident Investigation Branch

Rail Accident Report



Derailment of a freight train at Stoke Lane Level Crossing, near Nottingham
27 August 2013

Report 02/2015
April 2015

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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This report is published by the Rail Accident Investigation Branch, Department for Transport.

Derailment of a freight train at Stoke Lane Level Crossing, near Nottingham, 27 August 2013

Contents

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Summary

On 27 August 2013, at around 04:27 hrs, a freight train comprising a Class 66 locomotive and 30 fully loaded tank wagons carrying diesel fuel, derailed by two axles as it traversed Stoke Lane level crossing on the Newark to Nottingham line. The train was travelling at a speed of 53 mph (85 km/h) when the trailing wheelsets of the 26th and 28th wagons derailed. Consequential damage to the rear of the train resulted in an air leak and the automatic application of the brakes. The train came to a stop after around 1.3 km, at Carlton station. The wagons remained upright and in line, and did not foul the adjacent running line. There was no leakage of diesel fuel from any of the tank wagons. The track was damaged by the derailed wheelsets for a distance of around 800 metres. The driver was not injured. The railway remained closed for repairs until 15:30 hrs on 8 September 2013.

The immediate cause of the derailment was a severe dip in the track which developed rapidly under the leading portion of the train. After the derailment, severe dips of about 100 mm were found in both rails of the affected line, where the rails had deformed over a large void in the ground which had left the track unsupported over a length of around 3 metres. The void under the railway and other voids found later under the adjacent road surface were caused by excessive ground loss during the recent construction of a microtunnel along the road centre line. The RAIB investigation has interpreted the available evidence in order to identify the most likely cause of the voids. Although some alternative explanations cannot be completely discounted, the RAIB considers that the most likely explanation for the ground loss is that it was as a result of overmining of the ground during the construction work.

The RAIB's investigation identified safety lessons, both for those in the construction industry who build undertrack crossings and also for the railway regarding managing asset protection processes for such constructions. In line with the RAIB's remit, the improvement of railway asset protection processes to prevent recurrence has been the focus of its investigation. This is reflected in the balance of the recommendations made, which relate to the following areas:

- disseminating key learning points arising from this accident to the UK tunnelling industry, via the Health and Safety Executive and relevant industry bodies;
- improving Network Rail's asset protection standard for construction of under track crossings so that there is one unified standard applicable to both outside parties and Network Rail;
- improving the technical knowledge of Network Rail's asset protection engineers about under track crossings and increasing the time and technical assistance available to them to adequately assess risks and review documentation submitted by outside parties; and
- reviewing the suitability of the action limits in Network Rail's standard for monitoring track movement over or adjacent to civil engineering works, including under track crossings.

Introduction

Preface

1 The purpose of a Rail Accident Investigation Branch (RAIB) investigation is to improve railway safety by preventing future railway accidents or by mitigating their consequences. It is not the purpose of such an investigation to establish blame or liability.

2 Accordingly, it is inappropriate that RAIB reports should be used to assign fault or blame, or determine liability, since neither the investigation nor the reporting process has been undertaken for that purpose.

3 The RAIB's investigation (including its scope, methods, conclusions and recommendations) is independent of all other investigations, including those carried out by the safety authority, police or railway industry.

4 In line with the purpose of RAIB investigations, the focus of this investigation was to derive safety learning for the railway industry. The RAIB has only considered the construction of the Stoke Lane microtunnel as far as necessary to identify lessons for the protection of railway assets in the future. This is reflected in the recommendations made in this report. Compliance of the construction project with the relevant legal requirements is a matter for the HSE and was outside the scope of the RAIB investigation.

Key definitions

5 All dimensions in this report are given in metric units, except speed and locations which are given in imperial units, in accordance with normal railway practice. Where appropriate the equivalent metric value is also given.

6 The report contains abbreviations and technical terms (shown in *italics* the first time they appear in the report). These are explained in appendices A and B.

The accident

Summary of the accident

7 At around 04:27 hrs on 27 August 2013, freight train 6M35, the 02:05 hrs service from Humber oil refinery to Kingsbury oil sidings, comprising a Class 66 locomotive and 30 loaded tank wagons carrying diesel fuel, was travelling along the Newark to Nottingham line at 53 mph (85 km/h). As it traversed Stoke Lane level crossing (figure 1) the driver felt a jolt, and shortly afterwards, noted that the train had started to slow down even though it was still under power at the time. The train's brakes had applied automatically after damage to its braking system had caused an air leak and the train came to a stop around 1.3 km later at Carlton station.

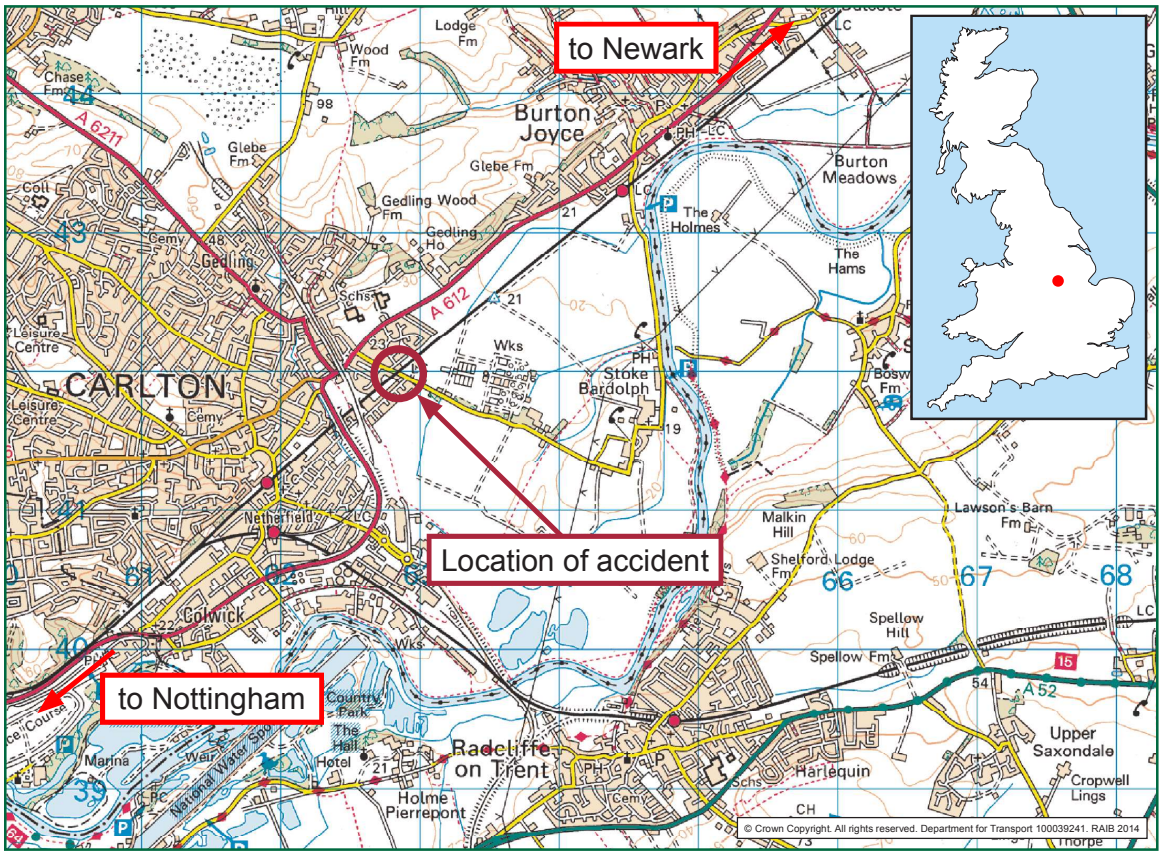

Figure 1: Extract from Ordnance Survey map showing location of accident

8 After informing the signaller of the automatic brake application, the driver went to investigate. He found the trailing axles of the 26th and 28th wagons had derailed toward the *six foot* (figure 2). The wagons had remained upright and in line and had not fouled the adjacent running line. There was no leakage of diesel fuel from any of the tank wagons, but the buffers on some had been damaged. The track was damaged by the derailed wheelsets for a distance of around 800 metres. The driver was not injured.

Figure 2: Train 6M35 (a) and its derailed wheelsets on 26th wagon (b) and 28th wagon (c)

9 Examination of the site revealed severe dips of about 100 mm in both rails of the up line at Stoke Lane level crossing (figure 3). The rails had deformed over a void in the ground. Because of this void the track was not supported over a length of around 3 metres (figure 4). The railway remained closed for repairs until 15:30 hrs on 8 September 2013.

Location and surrounding environment

10 The point of derailment was near the centre of Stoke Lane level crossing which is located at 3 miles 54 chains from Nottingham station and on the up and down Lincoln lines. The railway *engineer's line reference* for this section of track is 'NOB1'. The maximum line speed is 60 mph (96 km/h).

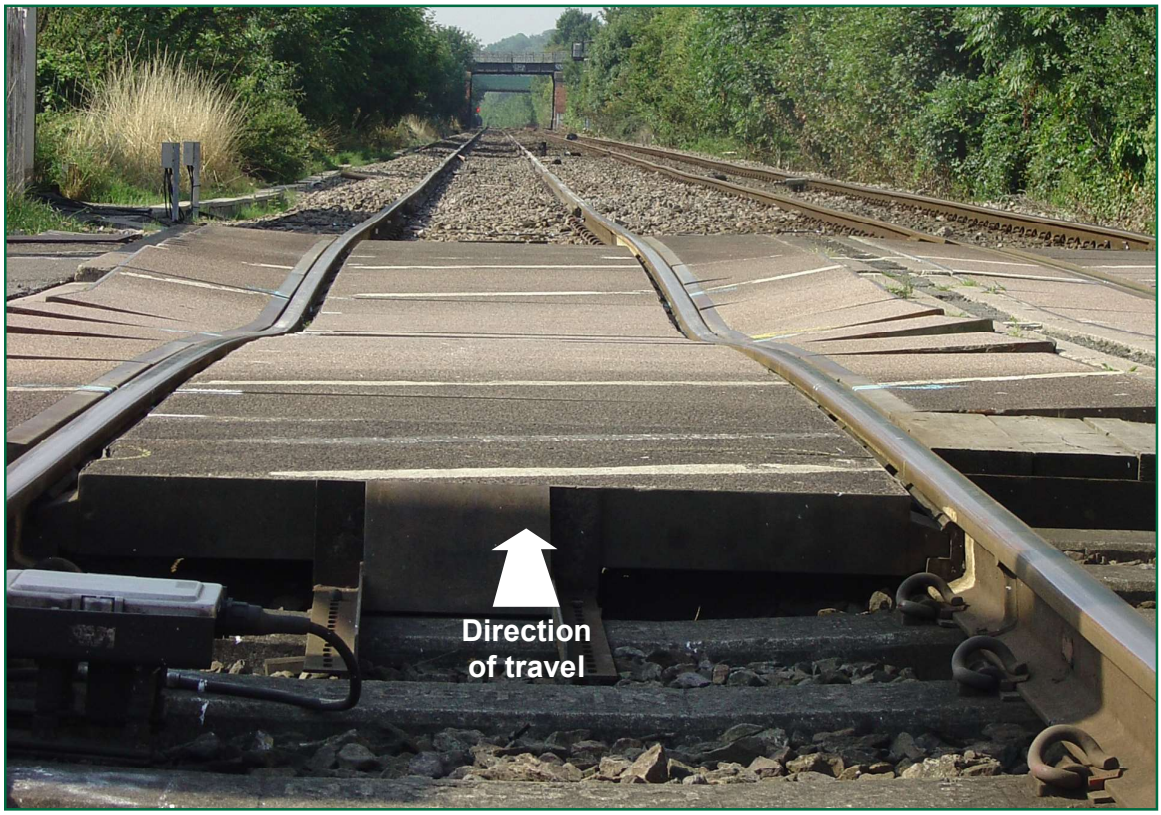

Figure 3: The dip in the rails at the point of derailment

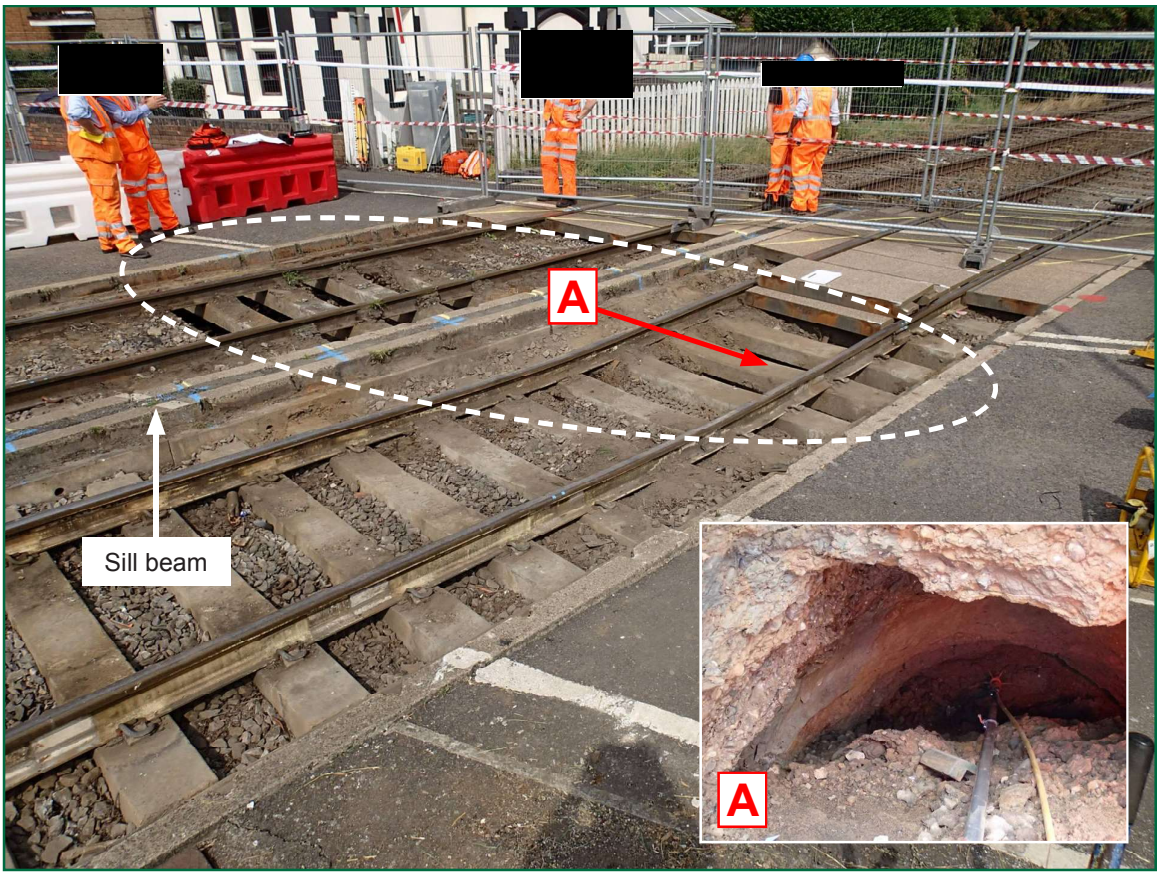

Figure 4: Extent of voiding below the track at the crossing

11 At this location there is an *under track crossing* (UTX) which had been built under the road and railway, seven weeks prior to the derailment (figure 5). The UTX was built to carry six 132 kV electrical cables along Stoke Lane as part of a larger project to build and connect a new substation on the east side of Nottingham at Stoke Bardolph. The UTX comprises a *microtunnel* around 53 metres long with an internal diameter of 1 metre and an external diameter of 1.2 metres. The crown of the tunnel lies at a depth of around 5.7 metres below ground level.

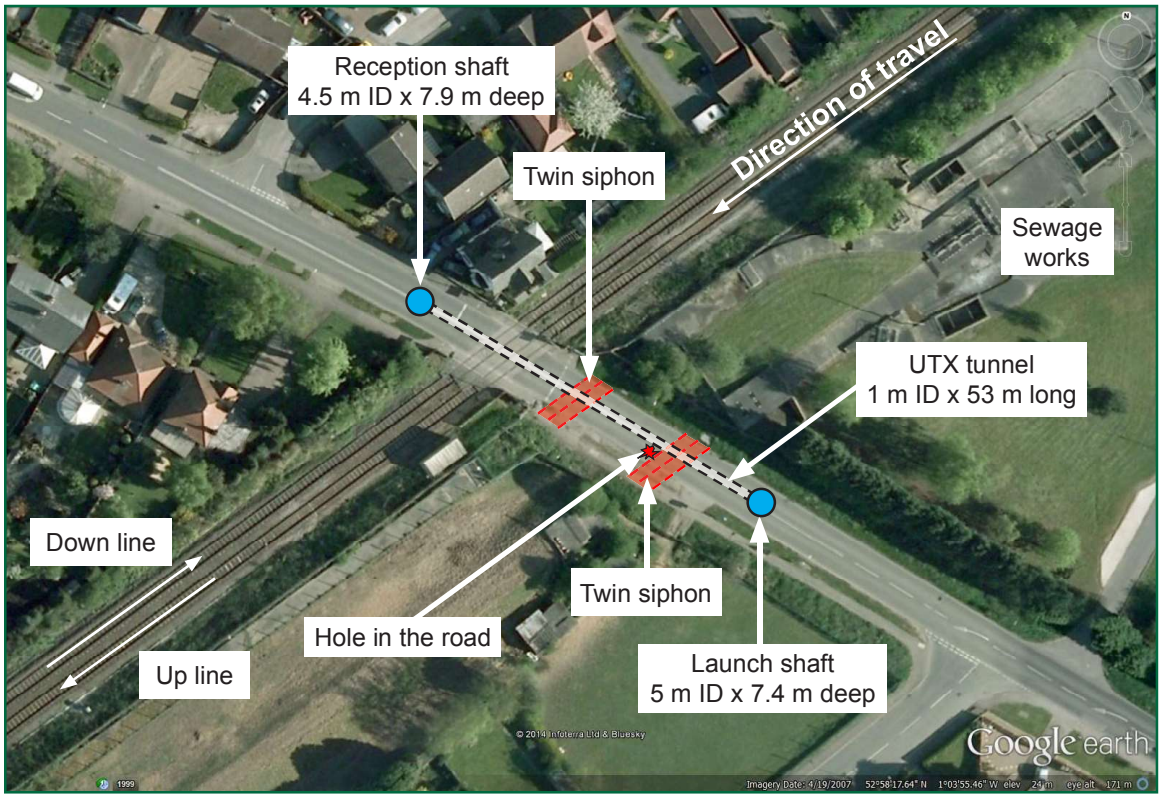

Figure 5: Google image of the level crossing, with microtunnel and construction shafts marked

12 The microtunnel was bored by a *slurry shield tunnel boring machine* (TBM) (appendix D) and lined with 2.5 metre long concrete pipes (called *jacking pipes)*, locked together end to end. In order to bore the microtunnel, two vertical shafts had to be built first. The launch shaft was built at the south eastern end of the tunnel and used to insert the TBM into position and then drive it and the jacking pipes forwards, along the path of the tunnel. At the north western end, the reception shaft was used to retrieve the TBM. These shafts (figure 6) are also the entry and exit points for the 132 kV electrical cables. A cross section along the centre line of the road showing the position of the microtunnel and shafts in relation to the railway is shown in figure 7.

Figure 6: Launch shaft (a) and reception shaft (b) during the works (image courtesy of Morgan Sindall)

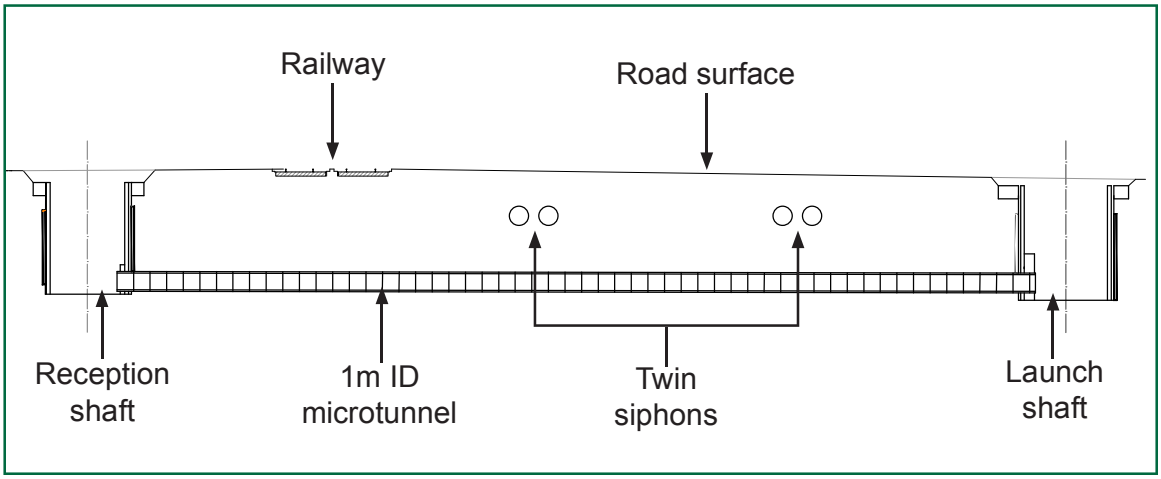

Figure 7: Schematic cross-section through microtunnel and construction shafts

13 Between the launch shaft and railway, two twin *sewer siphons* (figures 5 and 7) run across the road and parallel to the railway and carry sewerage from Nottingham into the Stoke Bardolph sewage works (figure 5). The twin siphons nearest the railway comprise two 1.2 metre diameter cast iron pipes located around 3 metres below ground level and date back to circa 1880. The twin siphons nearest the launch shaft are believed to be cast iron pipes of about 1.3 metres diameter each and encased in concrete. The two twin siphons have a combined flow capacity of around 6 m^3/sec and their location was a factor in deciding the depth of the microtunnel.

14 Ground investigations carried out after the accident, show that the ground at the site of the UTX varies in composition and density with depth. Generally, it comprises:

- An upper layer of asphalt supported by compacted made up ground, comprising sandy clay with mudstone fragments, down to around 0.8 - 1.2 metres, representing the road formation.
- Clayey sand with some gravel down to between 1.4 and 2.8 metres depth (typically around 2 metres), thought to be part of the alluvial deposits from the River Trent, which lies 2 km to the east. The water table lies at a depth of around 2.5 - 3 metres.
- Sand and gravel with density generally increasing with depth and often with a marked increase in density at about 5.5 metres depth.
- Mudstone, siltstone and sandstone below 6.8 - 7.9 metres depth.

Organisations involved

15 Network Rail owns, operates and maintains the track that runs over Stoke Lane level crossing. To comply with the law[1], the UTX project required the prior approval of the relevant Network Rail Asset Protection team. Initially the project was handled by the asset protection team of the London North Eastern (LNE) Route which, at the time the project started in January 2012, also covered the East Midlands area, including Stoke Lane level crossing. During the course of the project (around October 2012) the East Midlands (EM) became a separate Route of Network Rail and the project was managed by the East Midlands Route. In May 2014 a joint LNE and EM route was formed. Hereafter, the report will refer to the LNE&EM asset protection team. The team was responsible for checking, as far as was reasonably practicable, that the UTX project did not endanger railway operations and that it met Network Rail's specific requirements for UTXs. However, it was not the team's role to check and approve the design of the UTX as being fit for its intended purpose nor to carry out detailed checks of all aspects of its construction. The LNE&EM asset protection team had an agreement in place with Western Power Distribution (East Midlands) Plc to undertake the required review and approval of the UTX and to supervise the safety of staff from other organisations working near the railway.

16 DB Schenker was the operator of freight train 6M35. It owned the locomotive and employed the driver. The wagons were owned and maintained by others.

17 Western Power Distribution was building an electricity supply substation at Stoke Bardolph to reinforce the electricity supply to Nottingham.

[1] The Health and Safety at Work Act, 1974, section 3, paragraph 3 and the New Roads and Street works Act 1991 (chapter 22) Part 3 – Street works in England and Wales, section 93, 'Works affecting level crossings or tramways', paragraph 3 apply. These place a duty on anyone wanting to build near, over or under a railway to inform the infrastructure owner and comply with any reasonable requests they might make to ensure safety.

18 Morgan Sindall Utilities was the principal contractor to Western Power Distribution for the Stoke Bardolph cabling works. It was responsible for the design, procurement, installation and commissioning of the cables and associated structures at relevant substations. This included the sub-project to install the UTX along the route of Stoke Lane as specified by Western Power Distribution. During the tunnelling work, Morgan Sindall Utilities was responsible for general health and safety management of the site and spoil removal. Morgan Sindall Professional Services (a consultancy arm of Morgan Sindall), examined and approved the UTX design and construction in accordance with its own internal procedures. After the accident, Morgan Sindall Underground Professional Services carried out extensive ground investigations to assess the ground conditions and extent of voiding. It then carried out remedial grouting to stabilise the ground at the site of the UTX.

19 Bridgeway Consulting Ltd was contracted by Morgan Sindall Utilities and was responsible for the geometrical design of the UTX and shafts, and for specifying where they should be located in relation to the railway and existing services. In addition, Bridgeway Consulting was responsible for liaison with Network Rail and for making the necessary technical submissions and ground investigations to obtain approval from Network Rail for the works. Bridgeway Consulting was also responsible for monitoring the road and railway to check for any settlement during and after the tunnelling.

20 F&B Trenchless Solutions was contracted by Morgan Sindall Utilities to construct the UTX. It was responsible for selection of the tunnelling method and the construction of the tunnel and associated launch and reception shafts. It also provided and operated all the equipment necessary for construction, except for spoil removal from site.

21 Severn Trent Water owns and maintains the sewer system that crosses Stoke Lane and other water utilities that run along the road. It also owns and operates the Stoke Bardolph sewage treatment works adjacent to the level crossing.

22 All the above organisations freely co-operated with the investigation.

The Train

23 Freight train 6M35 was made up of a class 66 locomotive and 30 TEA type tank wagons. Each wagon (figure 2) had a maximum gross laden weight of 102 tonnes and was carrying around 75 tonnes of diesel fuel. The total weight of the train was 3160 tonnes, which was within the maximum allowable load of 3212 tonnes for Class 66 locomotive hauled trains operating over NOB1. None of the wagons on train 6M35 exceeded their design gross laden weight. Due to the liquid nature of the contents, it is likely that the wheel load distribution of the wagons was reasonably uniform.

External circumstances

24 It was dark and foggy at the time of the derailment. The fog was starting to lift by the time the driver inspected the wagons after the derailment. The weather conditions at the time did not play a part in the derailment.

The investigation

Sources of evidence

25 The following sources of evidence were used:

a) on-site inspections;

b) on-train data recorder (OTDR) from train 6M35;

c) signal box voice recordings;

d) train running data from Network Rail's *Control Centre of the Future*;

e) forward facing CCTV from two passenger trains which ran over NOB1 the previous evening;

f) wagon inspections;

g) interviews with relevant staff from the organisations involved;

h) technical specifications for the work scopes between the involved parties and relevant contractual documents;

i) Network Rail national and local procedures relevant to asset protection, UTXs and monitoring;

j) documentation submitted by Bridgeway Consulting relating to the geometrical design of the UTX and associated shafts and documentation submitted by F&B Trenchless Solutions relating to the construction of the microtunnel and shafts;

k) industry guidance on best practice in tunnelling (paragraphs 59 and 63);

l) data and reports on the post-accident ground investigations, maps of the voiding and a report on the cause of the voiding, provided by Morgan Sindall Underground Professional Services; and

m) expert review, commissioned by the RAIB, of various relevant technical submissions, pre and post-accident ground investigation reports and tunnel boring machine records.

Investigation timescales

26 Following consultation on its draft investigation report in September 2014, the RAIB decided to delay publication of its report until it had undertaken some work to further validate its conclusions regarding the most likely cause of the voids found at Stoke Lane (paragraph 51). This work was undertaken between October 2014 and February 2015 and involved reviewing submissions made during the consultation process, and undertaking further analyses of the tunnel boring machine records. Having assessed that these further investigations were unlikely to result in substantive changes to the recommendations arising from the investigation, the RAIB informed consultees on 28 November 2014 about the anticipated delay to publication, and encouraged recipients of its draft recommendations to start implementation.

Key facts and analysis

Sequence of events

Background

27 The contract for the Stoke Bardolph substation project and associated cabling works, which included the Stoke Lane UTX, was awarded by Western Power Distribution to Morgan Sindall Utilities on 7 December 2011. At that time the details of the tunnelling method, the number of cables and the route had not been finalised.

28 Discussions between Western Power Distribution, Morgan Sindall Utilities and Network Rail commenced in January 2012 and an agreement (called a Basic Asset Protection Agreement) was signed between Network Rail and Western Power Distribution on 1 March 2012. Under this agreement, Western Power Distribution undertook, amongst other obligations, to design and carry out the works in accordance with Network Rail's requirements. Network Rail agreed to provide its railway asset protection services to Western Power Distribution, on a commercial basis, to review and approve the UTX design and method statements against Network Rail's requirements. The scope of services also included the provision of staff to supervise the safety of Bridgeway Consulting personnel undertaking monitoring work around the railway.

29 On 8 March 2012, Network Rail issued a set of engineering conditions to Western Power Distribution and which specified the Network Rail company standards, *Railway Group Standards* and other standards that should be met. The letter also included other technical and programme management requirements. These requirements are described later at paragraph 70.

30 Between March 2012 and January 2013, work on the design of the UTX was progressed by Morgan Sindall Utilities and Bridgeway Consulting. Network Rail gave its initial approval in principle to the UTX design on 30 January 2013 and its final approval, upon receipt of further details, on 16 April 2013.

31 On 16 April 2013, Severn Trent Water arranged for trial excavations to be dug in Stoke Lane at two locations to verify the position of the two twin siphons (figure 5). The trenches were dug to a sufficient depth to locate the top and sides of each twin siphon. Following this, Severn Trent Water confirmed to Morgan Sindall Utilities on 12 June 2013 that it was satisfied that a depth of 5.5 metres below ground level to the crown of the tunnel gave sufficient clearance to its siphons. The way was now clear for the UTX construction to begin.

Events preceding the accident

32 F&B Trenchless Solutions began construction work on 11 June 2013, starting with the launch shaft and followed by the reception shaft on 18 June. Both shafts were completed by 27 June. This area of Stoke Lane had already been closed to road traffic by Nottinghamshire County Council since 18 February 2013, in anticipation of the works commencing earlier.

33 The TBM was launched from the launch shaft at 16:23 hrs on 6 July and the tunnelling was continuous until 15:25 hrs on 8 July, except for a 7.5 hour stoppage due to a pump failure, which started at around 15:00 hrs on 7 July, and periodic pauses to insert new sections of pipe. F&B Trenchless Solutions completed their work at Stoke Lane and left site on 11 July. Normal train services continued to operate over the crossing during the construction works, in line with usual Network Rail practice.

34 Bridgeway Consulting started full time monitoring for settlement of the road and railway when the tunnelling started. A set of base readings had been taken on 25 June. Road measurements were made at 13 equidistant points along the road centre line between the launch shaft and the south eastern railway boundary and three further points between the north western railway boundary and the reception shaft. Rail measurements were made at 22 targets located on each rail of the up and down lines at 3 metre intervals. Three measurement points on each rail were located over the level crossing. Bridgeway Consulting took measurements every 3 hours up to and including 11 July and sent these to Network Rail. By the end of tunnelling on 8 July the measurements indicated a maximum track settlement of 9.5 mm and a maximum road settlement of 7 mm (discussed further at paragraph 68). In accordance with Network Rail's instructions, the monitoring frequency was reduced in stages from two shifts per day starting on 12 July to two shifts per week starting 2 August.

35 On 19 July at 23:00 hrs, Network Rail started a planned blockade of Nottingham station to enable a major programme of re-signalling work to be carried out. This continued until 26 August. During the blockade, rail traffic over the level crossing was significantly reduced, amounting to a few engineer's trains per day until 10 August, when passenger services resumed. Freight traffic resumed on 26 August.

36 By 31 July, the maximum rail and road settlements had increased to 22.7 mm and 11 mm respectively. The rail settlement was by then was over four times Network Rail's maximum allowable predicted ground movement of 5 mm, but less than the trigger value of 25 mm at which immediate action was specified as being necessary. These limits are discussed later at paragraphs 94 and 95. Network Rail, Morgan Sindall Utilities and Bridgeway Consulting met on 1 August to discuss the increasing rail settlement and how to rectify it. At that meeting Network Rail stated that the track would need to be packed with ballast up to its normal level. In the following days its asset protection team requested an engineering *possession* as soon as possible to enable the remedial work to be carried out. Network Rail also agreed at this meeting to reduce the monitoring frequency to twice per week from 2 August (paragraph 34), in line with its practice of progressively reducing the monitoring frequency and because the settlement had levelled off. The reduction in traffic during the Nottingham blockade had been overlooked. Network Rail arranged for the remedial work to be done during a possession on 9 September. An earlier possession had been available between 24 and 26 August but Network Rail's re-signalling project team wanted to run test trains over the level crossing during that possession as part of the commissioning work. The testing work was deemed to take priority. This decision was not challenged by the asset protection team because it did not fully appreciate the severity of the problem at Stoke Lane level crossing (paragraph 70).

37 On 8 August, Bridgeway Consulting staff found a hole in the road located at one end of the trial excavation (paragraph 29) over the twin siphon closest to the launch shaft (figure 8). The position of the hole in relation to the siphons is shown in figure 5. On closer examination, the Bridgeway Consulting staff found the hole had loose material inside it which appeared to come from the reinstated road sub-base material and that there was a void below the surface which sloped downwards and toward the centre line of the road. Bridgeway Consulting called a site meeting the same day with representatives from Morgan Sindall Utilities and Nottinghamshire County Council, to examine the hole and determine the likely cause of the defect. The opinion of the two contractors' representatives at the meeting was that the hole had originated at the trial excavation due to inadequate reinstatement of the excavation and that both the hole and the void were not linked to the tunnelling activity. Nottinghamshire County Council's representative was uncertain as to the cause of the hole and subsequently sought further views from the involved parties. However no party accepted responsibility and the matter was unresolved when the derailment occurred. Severn Trent Water and F&B Tunnelling Solutions were informed of the hole. Network Rail was not informed and remained unaware of the hole until after the derailment.

Figure 8: Hole in the road found on 8 August 2013 (photograph taken on day of accident)

38 When passenger services resumed over the level crossing on 10 August, there was no increase in the maximum rail settlements, which were now being measured twice a week on Tuesdays and Thursdays. This monitoring regime continued until the derailment. Between 1 and 27 August the maximum settlement of the track varied from day to day but remained between 13 and 23 mm. However, the road settlement increased during this period to between 14 and 19 mm. The centre line of the road continued to show the greatest amount of settlement. During this period, Network Rail undertook routine track patrols on 13 and 20 August but no problems were reported over the level crossing.

39 Freight traffic over the level crossing resumed on 26 August, with seven trains on the up line, weighing between 2019 and 3162 tonnes, and four trains on the down line, weighing between 757 and 2359 tonnes. All these trains were within the permitted maximum weights for the track over Stoke Lane. One of the trains that went over the level crossing on the up line was driven by the driver who drove train 6M35 on 27 August. There were also several passenger trains over the crossing during the day. There were no reports from any train drivers of rough riding over the crossing. Examination of forward facing CCTV from two passenger trains which went over the crossing during the evening of 26 August, confirmed there were no obvious faults with the vertical alignment of the track over the level crossing on both the up and down lines.

40 On 27 August, four freight trains passed over the crossing on the up line prior to the derailment. The first was at 00:50 hrs and weighed 2856 tonnes. Subsequent trains were at 01:40 hrs (743 tonnes), 02:30 hrs (2100 tonnes) and 03:55 hrs (2068 tonnes). There were no reports from the drivers of those trains of any problems with the track at the level crossing.

Events during the accident

41 Freight train 6M35 departed Humber Oil refinery on time and had an uneventful journey until it reached Stoke Lane level crossing. It was the fifth train to go over the crossing that morning and it traversed the crossing at 04:26:37 hrs while travelling at 53 mph (85 km/h), which is within the maximum line speed of 60 mph (96 km/h).

42 The driver reported that he felt a jolt as his locomotive went over the crossing but did not think it was anything exceptional. According to the locomotive's on-train data recorder (OTDR), at 04:27:03 there was a drop in the train's brake pipe pressure, which caused the brakes to apply. The driver noticed this and his first thought was that he had inadvertently nudged the brake lever and applied the train's brake, and so he tried to release the brake. However, this action was not successful and the train started to slow down rapidly as its brakes came on automatically. The driver shut off power. Unbeknown to the driver at the time, the 29th wagon had sustained damage to an air tank and its brake equipment had been struck by debris, almost certainly from detached buffers (paragraph 43). This caused a rapid loss of air pressure from the brake pipe and resulted in the automatic application of the train brakes, starting with the rearmost wagons and progressing forward. The train came to a stop near Carlton station about one minute later at 04:28 hrs.

Events following the accident

43 The driver contacted the signaller and explained that he had had an unintended brake application and was going to investigate. The signaller blocked the adjacent down line to protect the driver as he examined his train. The driver found that the trailing wheelsets on the 26th and 28th wagons had derailed and that the trailing wagons had sustained various degrees of buffer damage. The buffers at the leading ends of the 24th and 26th wagons had completely detached. He then contacted the signaller a second time and declared a rail dangerous goods emergency (as required by the railway *Rule Book*) because of the nature of his load. He reported that none of the wagons were leaking and the train was not fouling the adjacent line.

44 The signaller alerted the emergency services (because of the nature of the freight) and Network Rail on-call staff. The fire brigade did not attend because there was neither a fire nor fuel leakage. Network Rail and DB Schenker arranged for the leading 22 wagons to be hauled away from the site at around 13:00 hrs and the remaining 8 wagons at 17:30 hrs.

45 The severe distortion in the rails of the up line (figure 3) was found at around 06:00 hrs. Later that day, the *level crossing panels* were removed and this revealed the large voids below both railway lines around the centre of the road (figure 4). In the following days, a significant amount of ground investigation and repair work was carried out by Network Rail and Morgan Sindall Underground Professional Services, in consultation with the RAIB, to document the voids and repair the track before the line was reopened to traffic on 8 September 2013.

46 In parallel with the remedial work to the track, Morgan Sindall Underground Professional Services undertook further detailed ground investigations of the road on both sides of the crossing, in consultation with the RAIB. The purpose of this work was to determine the extent and cause of the voiding and to design a scheme for remedial *permeation grouting* of the whole site to stabilise the ground. Network Rail arranged for all four rails to be monitored during the ground investigations between 15 September 2013 and 3 January 2014, during which time further ground settlement occurred; around 17 mm and 12 mm on the up and down lines respectively.

47 After the ground investigations, an extensive programme of remedial grouting was carried out by Morgan Sindall Underground Professional Services to fill the voids and stabilise the ground, which was completed during February 2014. The road, which had been closed since 18 February 2013, was reopened on 14 March 2014.

Identification of the immediate cause[2]

48 **The immediate cause of the derailment was a severe dip in the track which had developed rapidly under the leading portion of train 6M35 and caused the 26th and 28th wagons to derail.**

49 After the derailment the maximum track dip was measured at 98 mm on the *cess* rail and 97 mm on the six foot rail. The actual amount of track dip that the last eight wagons of train 6M35 experienced would have been greater, due to additional deformation caused by elastic bending of rails under the weight of the wagons.

[2] The condition, event or behaviour that directly resulted in the occurrence.

Identification of causal factors[3]

50 The derailment occurred due to a combination of two causal factors:

a) Large voids had developed under the track as a result of excessive ground loss during the construction of a microtunnel under the road and level crossing. These voids left the track unsupported at the level crossing (paragraph 49).

b) Normal train services had been allowed to resume following the tunnelling work, despite evidence of abnormal ground movement (paragraph 65).

Each of these factors is discussed below.

Voids under the track

51 **Large voids had developed under the track as a result of excessive ground loss during the construction of a microtunnel under the road and level crossing. These voids left the track unsupported at the level crossing.**

52 Examination of the track after removing the level crossing panels revealed large voids under both the up and down lines around the centre line of the road. These voids resulted in virtually all the support for the track being lost over a length of around 3 metres. The only remaining support was the concrete centre sill beam between the up and down lines (figure 4). The jolt felt by the driver as he drove over the crossing indicates that the track had already been deformed by the time 6M35 arrived, probably by the previous freight trains that morning. The track dip at that time was not so severe that the driver of train 6M35 was unduly alarmed and the locomotive and leading 22 wagons crossed without derailment. However, the type of damage to the buffers of the last eight wagons indicated that *buffer locking* had occurred as a result of severe vertical movements between these vehicles by the time they reached the crossing, and that the track had given way under the leading portion of train 6M35.

53 Ground investigations carried out following the derailment revealed that the voids under the railway were not isolated but were part of a series of voids which ran between the launch and reception shafts of the UTX, generally along the centre line of the road as shown in figure 9. Most of the voids were just below the road surface, but there were also voids found under the railway and the twin siphons and around the shafts. The volume of each void was estimated by Morgan Sindall Underground Professional Services from the amount of grout that had to be pumped into them during the remedial work. The combined total volume of the voids was estimated at around 63 m^3 comprising:

a) Voids near the surface (shown in red): 46 m^3

b) Deep voids below the railway and twin siphons (shown in green): 8 m^3

c) Voids around the launch and reception shafts (shown in orange): 9 m^3

[3] Any condition, event or behaviour that was necessary for the occurrence. Avoiding or eliminating any one of these factors would have prevented it happening.

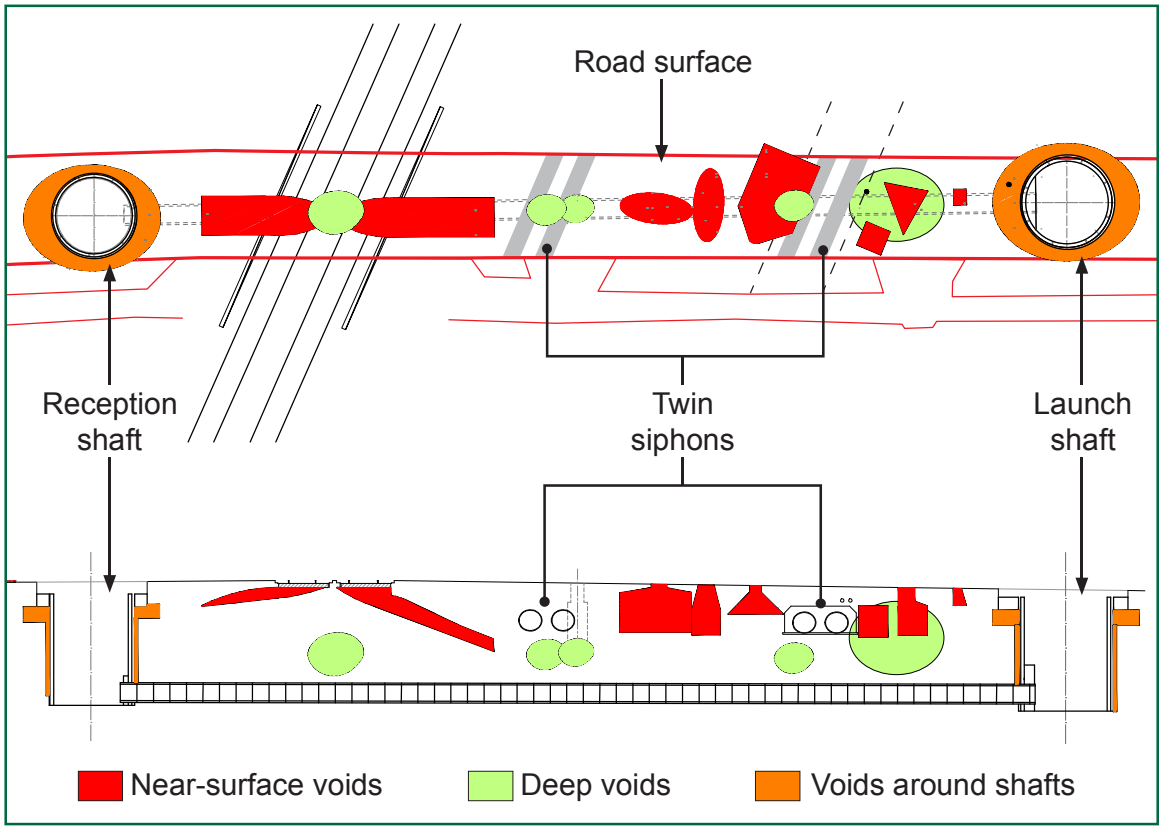

Figure 9: Map of voiding found during ground investigations undertaken by Morgan Sindall

54 The UTX at Stoke Lane was bored using a slurry shield tunnel boring machine (TBM), described in appendix D. The minimum amount of material that must have been removed by the 1.25 metre diameter TBM cutter head (figure 10) to bore out a 53 metre long tunnel, is around 65 m^3. The combined volume of the near surface and deep voids (shown in red and green in figure 9) was around 54 m^3, which indicates there had been additional ground loss[4] of around 80%. The RAIB was advised by its consultant that a typical upper bound value of ground loss for a tunnel of this type and size would be around 5%.

55 Several possible causes for such a large amount of ground loss were considered by the RAIB:

a) pre-existing voids caused by disused coal or gravel mining activity;

b) historic pre-existing voids caused by dissolution of rocks;

c) loss of ground due to the tunnelling operation damaging a water pipe or sewer and subsequent washing away of material;

d) overmining at the excavation face during the tunnelling operation;

e) loss of ground into unfilled annular spaces created behind the cutter head during tunnelling and during the construction of the launch and reception associated shafts;

f) loss of ground due to *dewatering* during the tunnelling operations and the associated possible loss of fines.

[4] The additional amount of ground that was removed during the tunnelling, expressed as a percentage of the minimum volume that must be removed.

Figure 10: TBM cutter head

56 Considering first causes (a) and (b) of paragraph 55; investigations showed no evidence of any coal mining activity in the area at a depth that could have affected the UTX tunnel. There is evidence of mine workings in the area in a seam of coal at a depth of 350 metres but the extent of the working was restricted to protect the sewers that run along the railway into Stoke Bardolph sewage treatment works. The nearest recorded mine shaft is located around 2.5 km to the north west of the level crossing. Although there are sand and gravel workings in the Trent valley, there are no records of any such activity in the area around the level crossing. There are also no recorded soluble rocks in the area which might have had associated dissolution cavities. Had there been any pre-existing voids, it is very likely that some would have risen to the surface and manifested themselves as subsidence of the road and railway a long time ago. It is very unlikely that any pre-existing voids created by natural or man-made means could be so aligned to the UTX as the voids found along Stoke Lane. Therefore, the RAIB has concluded that pre-existing voids are unlikely to have caused the voiding observed at Stoke Lane.

57 The RAIB considered the possibility of ground loss arising from damage to a water pipe or sewer during the tunnelling work (paragraph 55c). Although there are a number of services that lie below ground at the site, there are no confirmed records of any current or disused services existing at the depth of the UTX. Severn Trent Water carried out CCTV inspections of its services in the vicinity of the UTX after the accident and reported that it had not detected any leaks or damage. Had there been a breach of a sewer or water pipe, any resulting erosion of the surrounding ground would be expected to form a void local to the breach and not a series of voids along the length of the tunnel and on both sides of the railway. Hence, the RAIB has found no evidence to support the possibility that ground was lost into a damaged underground service and this mechanism of void formation is considered unlikely.

Overmining (mechanism (d))

58 The positioning of the voids above the path of the microtunnel (figure 9) is the strongest indication that the voids had been caused by overmining of the ground during the tunnelling activity. Most of the voids along the road and across the railway between the launch and reception shafts had migrated from the depth of the tunnel to a level just below ground level. Normally such voids would be expected to break through the surface soon after the tunnelling had been completed but the road and its foundations effectively bridged the voids, except for one hole which appeared in the road on 8 August (paragraph 37). The deep voids found below the railway and each of the twin siphons do not appear to have risen higher because they were bridged by those structures.

59 Overmining, to the extent seen at Stoke Lane, is rare (paragraph 101). Typically the upper bound value of ground loss expected for this type and size of tunnel is around 5% of the tunnel volume (paragraph 54). The only way to accurately check that the amount of ground being excavated is in line with expectation, is to measure the volume of material extracted. Best practice for using closed face tunnelling machines is published by the British Tunnelling Society in association with the Institution of Civil Engineers[5]. The guidance states that it is essential to have a management system to compare the volume of spoil excavated against the theoretical value for each section of pipe installed. For slurry shield tunnelling machines it recommends the use of a flow meter and a density meter in both the slurry feed line and return lines. From this data any overmining can be identified during the tunnelling process and appropriate action taken by the operators.

60 F&B Trenchless Solutions did not have density meters in the slurry feed and return lines. The TBM it used was fitted with flow meters only and so the operators would not have been able to accurately measure the amount of material excavated. F&B Trenchless Solutions reports that it visually monitored the quantity of spoil removed by applying its usual rule of thumb that it expected to fill a 9 tonne capacity dumper truck with spoil for each 2.5 metre length of tunnel excavated. Morgan Sindall Utilities was responsible for disposing the spoils and it took the excavated material in the 9 tonne dumper truck to a holding area about 2 miles away. Here the spoil became mixed up with spoil from other sources. Neither F&B Trenchless Solutions nor Morgan Sindall Utilities kept any records of the volume of spoil removed from the tunnel excavation, and therefore it has not been possible to verify how much ground was extracted.

[5] Closed-face tunnelling machines and ground stability – a guideline for best practice, published by Thomas Telford, London, 2005, ISBN 0727733869.

61 The TBM used for the UTX and the cutter head were appropriate for the ground conditions at Stoke Lane. Examination of the data recorded by the TBM control unit during tunnelling (called the machine protocols) indicates that it was driven to an accurate line and level. Key operating parameters did not indicate anything obviously amiss. However, detailed analysis of the volume flow rates (measured by flow meters) in the feed and return lines of the TBM, and the likely range of fluid densities in these lines (assessed by the RAIB's consultant), suggests that, most likely, there had been overmining to the extent reported at paragraph 52.

62 A key factor that increased the risk of overmining was that F&B Trenchless Solutions did not add *bentonite* to the slurry used in the TBM. The fluid it used comprised only water. Bentonite is added to water (at a concentration of around 5%) in slurry shield TBMs for certain types of ground, such as wet sands and gravel below the water table, because it offers support to the excavation face and minimises the risk of overmining.

63 The use of a bentonite slurry with polymer additives for spoil conditioning is recommended by the British Tunnelling Society and the Institution of Civil Engineers[5] to establish a film (called a 'filter cake') on the tunnel face to stabilise it and prevent slurry loss into the ground. British Standard 6164:2011[6], section 7.4.2.2 also explains that a pressurised heavy slurry with bentonite not only supports the sand and gravel but also negates the effects of the ground water by equalising the ground water pressure. The use of bentonite is not mandated in British Standard BS6164:2011 but is recommended to minimise the risk of overmining in *unstable ground* conditions. The RAIB has concluded that, although it is not possible to be certain about the cause of the voiding, the most likely explanation is overmining. The RAIB has taken into consideration all available evidence, expert advice and possible alternative explanations put forward by an involved party who disputes the RAIB's conclusion.

Loss of ground into unfilled annular spaces (mechanism (e))

64 In addition to the likelihood of ground loss at the tunnel face due to overmining, two other possible causes of ground loss, associated with unfilled annular spaces, were identified:

a) During the tunnelling process, a void space is normally created between the concrete pipes which form the tunnel and the cut ground, because the cutter head has a slightly larger diameter than the trailing part of the TBM and concrete pipes. This void space should be filled with bentonite or a polymer to avoid the ground collapsing onto the pipes as the tunnelling progresses and also to lubricate the outside of the pipes so that they slide more easily relative to the ground. F&B Tunnelling Solutions reported that it pumped 6 m^3 of bentonite into the void space. If this had been the case, this should have filled the void space around the pipes if there had only been the minimum over-cut (of about 25 mm around the pipes). However, the forces required to drive the TBM forward indicate a high level of friction between the pipes and ground, which indicates that bentonite was either not used or was not effective in preventing the ground closing onto the pipes. If the void space had not been filled effectively, as appears likely was the case, the ground would have collapsed around the pipes and contributed to the overall ground loss.

[6] BS 6164:2011; Code of practice for health and safety in tunnelling in the construction industry; page 34.

b) The launch and reception shafts were constructed from concrete rings which were jacked down into the ground while the ground within the rings was excavated. The process leaves an annular void between the concrete rings and the ground. It was estimated by Morgan Sindall Underground Professional Services that the volume of this annulus was around 9 m^3 for the launch shaft and 8 m^3 for the reception shaft. This annular space should have been filled with a grout to prevent the ground moving in. F&B Tunnelling Solutions build records indicate each shaft was pumped with 3 m^3 of bentonite which would not have been sufficient to prevent some ground loss into the void spaces around the shafts.

Dewatering (mechanism (f))

65 The launch and reception shafts were built with a concrete base around 300 mm thick with a sump in the bottom to allow ground water to enter the shaft. This was to ensure the whole shaft was not forced up by ground water pressure. Because the shafts were not sealed from the surrounding ground water, it was necessary to pump the shafts out (or dewater) at various times during the tunnelling work. F&B Trenchless Solutions used a standard 4 inch (100 mm) 'Hydrainer' pump which was discharged into a nearby manhole in the road. Interview evidence provided to the RAIB indicates the period of dewatering was between 5 and 7 days, including 24 hrs per day dewatering during the tunnelling activity. During this period a significant amount of water was pumped out of the ground and would have been replaced naturally by the water table.

66 This dewatering activity, which should have been the subject of a separate approval by Network Rail according to its procedures (discussed later at paragraph 79), could have caused fine grained particles to be washed out of the ground and thereby contributed to the loss of ground. There are no estimates of how much ground was actually lost as a result of the dewatering at Stoke Lane. F&B Trenchless Solutions reported that although it did not use a silt separation plant while dewatering the launch shaft, it did use such a plant for the reception shaft and that did not pick up a significant quantity of fines. Severn Trent Water also reported it did not find unusual quantities of fines at its pumping station next to the sewage treatment works, into which water pumped from the shafts would have been routed. Therefore, the available evidence indicates that the amount of ground potentially lost through dewatering was likely to have been small and mainly from the area adjacent to the shafts. Dewatering could also have caused a small amount of general settlement of the area around the shafts (because soil grains move closer together when there is a reduction in the water pressure holding them apart) but this would not be expected to have contributed significantly to the voiding.

The resumption of normal train services

67 Normal train services had been allowed to resume following the tunnelling work, despite evidence of abnormal ground behaviour.

68 As detailed at paragraphs 34 to 38, monitoring of the railway showed a trend of increasing track settlement from 9.5 mm on 8 July when the tunnelling operations finished, to around 23 mm on 31 July. A graph of settlement against time from the start of tunnelling (6 July) for the six foot rail of the up line at the road centre line (which generally showed the greatest amount of settlement) is shown in figure 11. After 31 July, this measurement position and some others around it indicated some fluctuation[7] between 23 mm and 12 mm. The last measurements taken before the derailment were on Thursday 22 August when the settlement recorded for position LX5 was 14 mm and those at other rail measurement positions at the centre of the level crossing were similar. The next set of readings were due on the day of the derailment. By 29 July, the monitoring had been reduced in frequency to three times per week (paragraph 34). The Nottingham station blockade, which had started on 19 July and continued until 26 August, had resulted in reduced rail traffic over Stoke Lane level crossing. Despite the reduced rail traffic flows there had been a further increase in settlement up to 31 July.

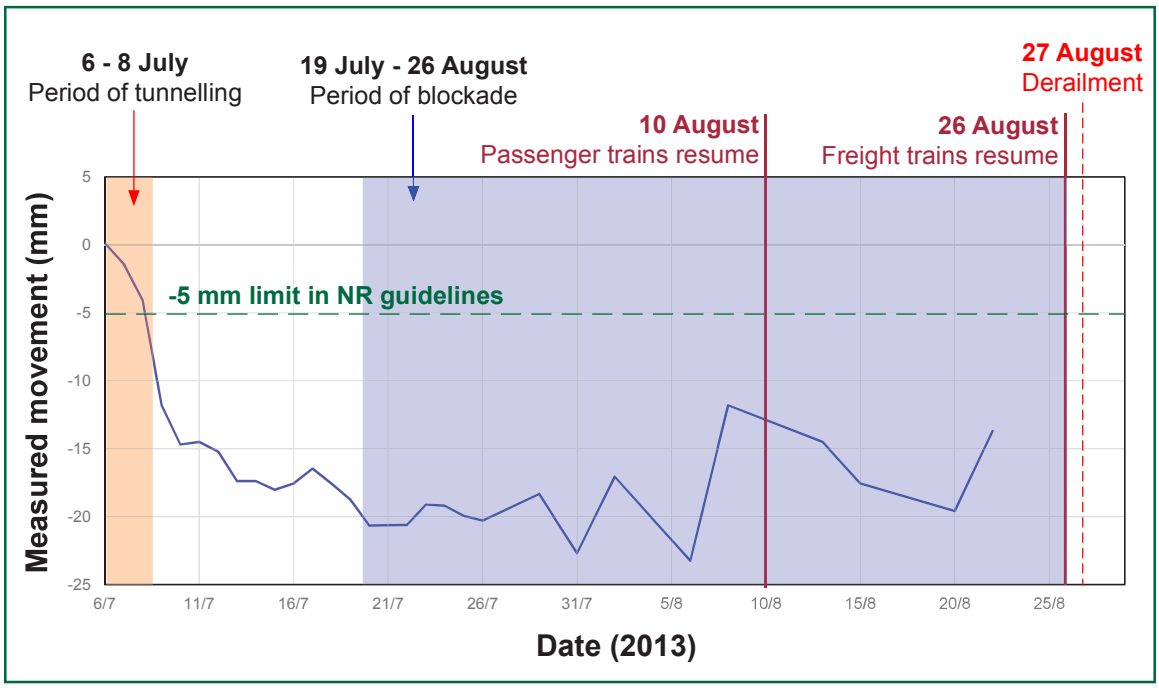

Figure 11: Movement of rail during and following tunnelling (on six foot rail of up line at road centre line)

[7] The precise reasons for the fluctuation are not known, but the RAIB considers it is unlikely that the ground level itself fluctuated by the amount indicated in the measurements. Other factors which could have contributed are the passage of a trains around these dates, natural expansion/contraction of the rails due to temperature changes and measurement errors (estimated by the surveyors to be around +/- 3mm).

69 Bridgeway Consulting and Network Rail assessed the measured settlements in accordance with Network Rail standard NR/BS/LI/045, 'Monitoring track over or adjacent to civil engineering works: procedure and intervention levels', August 2008. According to the criteria in that standard, the 23 mm of vertical movement recorded on 31 July and subsequently again on 8 August did not require immediate action. Nevertheless, Network Rail's construction manager had become increasingly concerned about the settlement during late July. There had been discussion between the asset protection team and the track maintenance team during 9 to16 July during which the track team reportedly indicated that it was not too concerned with the amount of settlement because the values were still below the track maintenance limits specified in Network Rail standard NR/L2/TRK/001 and the settlement was still being monitored. The use of track maintenance limits to assess settlement from construction activity is discussed later at paragraph 90.

70 Network Rail's construction manager called the meeting on 1 August with Morgan Sindall Utilities and Bridgeway Consulting (paragraph 36), to discuss action to remedy the situation. The agreed plan was that the track at the level crossing would be packed to its normal level as soon as possible to avoid the need to apply temporary speed restrictions. This led to arrangements for remedial work to pack the track during a possession on 9 September. Earlier possessions had been available but the nature of the problem at Stoke Lane was not fully appreciated by the asset protection team. Had it been, and the opportunity taken to inspect the track under the crossing before the derailment, it is possible that the voiding under the track might have been found.

71 There were two other factors which affected the decisions made by the involved parties about the severity of the settlement problem:

a) The hole that was discovered in the road on 8 August (paragraph 37) was not reported to Network Rail by either Morgan Sindall Utilities or Bridgeway Consulting, despite the joint meeting on 1 August to discuss Network Rail's concerns about the settlement. Interview evidence indicates that the reason it was not communicated to Network Rail was because it was considered by the parties at the site meeting of 8 August, that the hole had been caused by poor reinstatement of the trial excavation carried out prior to the tunnelling work and because it was quite far from the crossing. Examination of the hole after the derailment revealed that the trajectory of the void was steeply downward towards the centre of the road and the tunnel and not into the remainder of the trial excavation. Had more rigorous consideration been given to the cause of the void, a possible link to the tunnelling operation should have been apparent. This was a missed opportunity to provide potentially valuable information to Network Rail about what was happening at Stoke Lane almost three weeks before the derailment. Had Network Rail been informed about the hole in the road, and the trajectory of the void below, it may have led to lifting the level crossing panels sooner than the planned 9 September possession.

b) The settlement affecting both the up and down lines was not severe enough to be noted by the track patrollers on 13 and 20 July. Even if any voiding had been present directly under the track around 20 July, it would have been concealed by the level crossing panels and the only way track patrollers would have found a problem would have been if the settlement had been severe enough to have significantly deformed the panels. The lack of any rough riding reports by other drivers and the evidence from the forward facing CCTV of two passenger trains during the evening of 26 August indicate no visible distortion of the panels nor any noticeable jolt as the trains ran over the crossing.

Identification of underlying factors[8]

Relevant Network Rail standards

72 As a preface to the following sections of this report, the key Network Rail standards applicable to the construction of the Stoke Lane UTX are summarised below.

73 Standard NR/L2/CIV/003, 'Engineering assurance of building and civil engineering works', is Network Rail's high level document which sets out the process that should be followed for all construction work undertaken by Network Rail on outside party property and work undertaken by outside parties on Network Rail property. It requires the completion of three forms:

a) F001, 'Approval in principle', which signifies that Network Rail is satisfied that the design solution identified is the preferred option for achieving the objectives of the project and is acceptable to Network Rail.

b) F002, 'Statement of design intent', which defines the basis of the design for the works and is submitted by the contractor's responsible engineer acting for the outside party making the submission. This is reviewed by a Network Rail asset protection engineer.

c) F003, 'Certificate of design and check', is the detailed design submission and should include drawings, schedules, performance criteria, materials, workmanship specifications, testing and inspection plans, risk registers and other documents which form the design. It should be signed off by a responsible engineer to confirm that the design has been carried out in accordance with form F002 and checked in accordance with the agreed method of checking, whether in house or by an independent company.

74 Standard NR/SP/CIV/044, 'Design and construction of undertrack crossings', August 2004, is the mandatory standard for both Network Rail and outside parties who wish to build a UTX. Those responsible for the design and construction of UTXs, and also those involved in the management of its design and construction, are required by Network Rail to comply with this standard. It includes certain requirements for design, risk assessment, details of precautions that should be taken and what should be submitted to Network Rail.

[8] Any factors associated with the overall management systems, organisational arrangements or the regulatory structure.

75 There was also a guidance document which was used within the LNE route of Network Rail entitled 'Guidelines for design and construction of undertrack crossings under Network Rail infrastructure'. Its purpose was to assist Network Rail construction managers in providing advice to outside parties on how to comply with its requirements for UTXs. It was not issued to other parties involved in the design and construction of the Stoke Lane UTX. It expanded on the requirements specified in standard NR/SP/CIV/044 and included the following extracts relevant to the Stoke Lane UTX project:

a) 'Positioning of UTXs beneath level crossings is strongly discouraged due to the problems of installing an effective monitoring system and disruption to road and rail traffic should corrective action (packing of track) be needed.'

b) 'If using 'O'Reilly and New'[9] formulae for settlement calculations, any reduction factors applied during determination of 'Volume of losses' shall be justified within the F002 and F003 submissions.'

c) 'It is expected that drilling works will include the use of bentonite (or similar) drilling fluid under pressure head to maintain stability of the drill bore. Any proposal to omit this is subject to Network Rail approval. This shall be identified within the F001.'

d) 'Network Rail's Engineering Conditions states that dewatering is not permitted within the vicinity of the Railway. In extreme cases this may be relaxed where good engineering reasoning has been used to demonstrate there is no practicable alternative. Forms F002 & F003 will be required for any dewatering proposal.'

e) 'The predicted settlement, pipe strength and temporary ground support calculations (if required) shall be subject to a Cat 3 Independent Check. Pipe ovalisation shall be considered. Cat 3 Independent design check is carried out by an independent consultancy organisation that is a separate legal entity to the designer.'

f) 'The maximum allowable calculated settlement/heave is 5 mm. Certain exceptional circumstances will allow for slightly higher values ie line speed, track category, etc.'

g) 'All UTX installations require Network Rail full time supervision for works within the *zone of influence* of the railway infrastructure.'

[9] O'Reilly M.P, New B.M, 'Settlements above tunnels in the United Kingdom, their magnitude and prediction'. Proc. of Tunnelling '82 Symposium, London. pp.173-181.

Compliance with Network Rail's asset protection standards

76 Network Rail's asset protection standards and guidance were not fully complied with, which introduced risks to the Stoke Lane UTX project.

77 Standard NR/SP/CIV/044 is mandatory, and both Bridgeway Consulting and F&B Trenchless Solutions were aware of the document and its requirements. However they did not comply with some of the requirements of that standard (paragraph 78) and Network Rail did not adequately check compliance. Network Rail's LNE route guidance document for UTXs contains important additional requirements (paragraph 79), but these appear to have been overlooked by Network Rail and not communicated to Bridgeway Consulting or F&B Trenchless Solutions. As a result important factors, which are detailed below, were not addressed during the planning and approvals stages.

78 The investigation identified the following issues with respect to the application of Network Rail standard NR/SP/CIV/044:

a) Use of the standard: Network Rail's engineer responsible for reviewing the design submission, who had previous experience of reviewing UTX submissions, considered that the standard was for outside parties to follow and sign that they were compliant, in line with custom and practice. He did not consider there was any need for Network Rail to perform checks that the standard had been followed and there is no explicit instruction in the standard for Network Rail to carry out a clause by clause check.

b) Competence of designers and construction managers: the standard requires that the skill, expertise, training and experience of those employed on a design shall be appropriate to the nature and complexity of the UTX being designed, and in line with the competency requirements of the Construction, Design and Management regulations, 1994[10]. The Stoke Lane UTX design required a good understanding of *microtunnelling* and the associated risks and mitigations at level crossings. Bridgeway Consulting submitted curriculum vitae (CVs) of its competent responsible engineer and competent responsible manager to Network Rail, as part of its technical submissions for approval of the UTX. Neither CV demonstrated relevant experience with UTXs but they were accepted by Network Rail without challenge. Network Rail did not check the CVs of key F&B Trenchless Solutions staff involved in the construction of the UTX.

c) Use of appropriate standards: the standard requires that UTXs are designed 'in accordance with Railway Group Standards, Network Rail Company Standards, European and British Standards, relevant industry standards and industry good practice'. Network Rail did not pass on to Bridgeway Consulting and F&B Trenchless Solutions some important requirements, because they were contained in the internal guidance document. Network Rail did not check against its own requirements in the guidance that key precautions against ground loss were in place.

[10] The Construction, Design and Management (CDM) regulations, 1994 was the predecessor to the current CDM regulations, which were introduced in 2007. Standard NR/SP/CIV/044 pre-dates CDM 2007. These regulations set out the legal duties on organisations involved in construction projects to ensure that the project is safe to build and use and maintain. (see http://www.hse.gov.uk/construction/cdm.htm). Compliance of the Stoke Lane UTX project with CDM 2007 is a matter for the Health and Safety Executive (HSE) and its investigation, and is outside the scope of the RAIB's investigation.

d) Monitoring of excavated material: the standard requires that the quantity of material excavated during construction of a UTX shall be monitored by the outside parties to ensure that the volume is compatible with the progress of the work. There is no requirement for Network Rail to undertake its own checks. As explained at paragraph 60, neither F&B Trenchless Solutions nor Morgan Sindall Utilities kept any records of the amount of material that was excavated. Network Rail did not check that either party was keeping records.

79 The following deviations with respect to the application of the LNE&EM guidance document for UTXs were evident:

a) Position of UTXs: the guidance strongly discourages positioning UTXs beneath level crossings, due to the problems of installing an effective monitoring system and potential for disruptive remedial works to road and rail traffic. Given that Network Rail were faced with such a UTX, it did not then take adequate heed of the difficulties of setting up an appropriate monitoring system for a level crossing, by for example, specifying the inclusion of sub-surface measurements of ground settlement.

b) Use of bentonite: the guidance states an expectation that bentonite will be used to maintain stability of the tunnel bore and that the volume of bentonite used will be monitored against the anticipated amount required. Any deviation from using bentonite should have prior approval from Network Rail. F&B Trenchless Solutions' method statement was clear that only water would be used without bentonite. Network Rail did not challenge this because it did not consider this specific aspect of the method statement. Its focus was on checking whether the predicted settlement was acceptable.

c) Dewatering: the guidance states that dewatering is not permitted within the vicinity of the railway but that in extreme cases this may be relaxed where good engineering reasoning has been used to demonstrate there is no practicable alternative. A separate set of forms, F002 and F003, should be used for any proposal to carry out dewatering. The guidance does not define 'vicinity of the railway' but the issue of dewatering was not considered until there was concern about the measured settlements. At that point Network Rail requested that dewatering be stopped. No engineering assessment was done as to the possible effects of the dewatering and no controls were put in place during the tunnelling work. It is possible that had forms F002 and F003 been submitted for the dewatering, Network Rail would have put some controls in place.

d) Design checking: the guidance clarifies the requirements specified in standard NR/SP/CIV/044, that calculations submitted as part of the approvals process for a UTX, including predictions of ground settlement, should be checked by an independent organisation (called a 'cat 3' check). For the Stoke Lane UTX project, Network Rail's design reviewer decided that it was sufficient for Bridgeway Consulting to check its own calculations, which represents a lower level ('cat 2' or 'cat 1') check. In the event, there was an issue with the calculation of ground settlement which is discussed later at paragraph 95.

80 Network Rail's LNE&EM asset protection team had not been subjected to any audit to check compliance with Network Rail's procedures and guidance related to the approval of UTXs. The RAIB has found no evidence of a process for such auditing.

Assessment of the risk posed by the Stoke Lane UTX

81 **There was insufficient assessment of the risks posed by the UTX at Stoke Lane.**

82 F&B Trenchless Solutions submitted four risk assessments to Morgan Sindall Utilities, the first three of which were passed to Network Rail as part of the approvals process for the works. These assessments covered:

a) General site risks which could cause injury to people working on site and passers-by, dated 10 October 2012. It included risks such as working at height, manual handling, transport, operating equipment, fire and environmental pollution.

b) Risks associated with construction of the launch and reception shafts, dated 10 October 2012. This covered hazards of the excavation, groundwater, flooding, methane, working at height, lifting, and grouting.

c) Risks which could cause injury to F&B Trenchless Solutions staff during the microtunnelling, dated 10 October 2012. This covered risks such as working at height, lifting operations, construction of the shaft walls, *pipe jacking*, operating machinery, use of lasers, transport, and excavation around buried services causing collapse. It included consideration of the collapse of unsupported ground around the shafts, to be mitigated by monitoring and management of the ground water.

d) Risks associated with the effect of the microtunnelling on the railway, dated 4 June 2013. This is the most relevant to the voiding found at Stoke Lane. It included consideration of the following risks:

- '*cant* or displacement of the rail': precautions listed are monitoring the amount of soil mined against pipes installed, and monitoring of settlement.
- 'unexpected ground conditions': precautions listed include monitoring of excavated material and TBM controls at all times, and modifying operation of the TBM as necessary.

83 Network Rail had given its approval to the UTX project and associated method statements by 16 April 2013, by which time it had received risk assessments (a) – (c) above. It had not received the final risk assessment done by F&B Trenchless Solutions (listed (d) above) which was the only one that considered the risk of ground loss affecting the railway. Therefore Network Rail's approval was given without an adequate assessment of the risk to the railway. Had Network Rail reviewed the final risk assessment of 4 June 2013, and applied its guidance procedures correctly, it would have realised that key mitigations in its standard NR/SP/CIV/044 and the LNE&EM UTX guidance document had not been adequately addressed.

84 There were two other factors which probably affected Network Rail's consideration of the Stoke Lane UTX submissions and its consideration of risk to its infrastructure:

a) There was some confusion about roles and responsibilities between Network Rail's design reviewer and construction manager, regarding who was responsible for checking the risk assessments submitted by F&B Trenchless Solutions. The design reviewer thought this was the responsibility of the construction manager and vice versa.

b) At the time of the Stoke Lane UTX project there was a shortfall in staff resources in the asset protection team for various reasons. The workload of the construction manager and his assistant was high due to several dozen other projects they were handling at the time. Witness evidence indicates that this did not allow them sufficient time to focus on the Stoke Lane UTX and its particular risks.

85 No party involved in the Stoke Lane UTX, other than F&B Trenchless solutions, carried out any risk assessments of their own for the tunnelling works. Although not a mandated requirement of the CDM regulations 2007, Bridgeway Consulting did not undertake a designer's risk assessment for the works or the routing of the UTX (as required by Network Rail standard NR/SP/CIV/044), because it was not specifically requested to do so. Morgan Sindall Professional Services approved the F&B Trenchless Solutions tunnel construction method statement on 8 July 2013, by which time the tunnelling had been completed.

86 The Network Rail and Morgan Sindall Utilities construction managers had not received any formal training on UTXs and had limited knowledge of the particular issues regarding UTXs at level crossings. Neither organisation sought to procure the expertise required, nor use the facilities of other departments within their own organisations. Consequently the risk assessments and other documentation put forward by F&B Trenchless Solutions were not properly scrutinised and the lack of important controls against overmining (eg such as the use of bentonite in the slurry, grouting of void spaces, and monitoring of spoil removal) were not addressed.

Adequacy of Network Rail's procedures for UTXs

87 **Network Rail's procedures for UTXs and the way they were used, did not provide adequate guidance for those involved in the design, scrutiny and construction of the UTX.**

88 Standard NR/SP/CIV/044 does not provide Network Rail or those required to comply with it, a clear and straightforward list of requirements. It does not include important additional requirements contained in the UTX guidance document. The guidance is not listed as a mandatory document and therefore outside parties did not have the full set of Network Rail requirements to work to in this case. However, the requirements in the guidance document are generally consistent with good microtunnelling industry practice and should have been familiar to experienced parties.

89 Neither standard NR/SP/CIV/044 nor the UTX guidance document provide a logical risk based approach to dealing with applications for UTXs. For instance the UTX guidance document states that UTXs under level crossings should be strongly discouraged, but it does not explain what procedure to follow or what additional precautions to take if a UTX has to be located under a level crossing.

Criteria for monitoring settlement at UTXs

90 **The criteria used for monitoring settlement were not appropriate for a UTX under a level crossing and did not adequately alert the asset protection team as to the severity of the developing problem.**

91 This factor adversely influenced the decisions made by Network Rail about the severity of the settlements, the urgency of the situation and the associated risk to the railway. The monitoring regime was a key safeguard for the safety of the railway.

92 Network Rail had specified that the monitoring of settlement during and after the tunnelling should comply with its standard NR/BS/LI/045, 'Monitoring track over or adjacent to civil engineering works: procedure and intervention levels', August 2008. This standard sets criteria for horizontal and vertical movement of the track, track cant and track twist over a 3 metre base.

93 The assessment of the measured settlements by Network Rail and Bridgeway Consulting's surveyors was generally in accordance with its standard NR/BS/LI/045. However, it did not help Network Rail to correctly assess the severity of the voiding at Stoke Lane for the reasons discussed below.

94 Bridgeway Consulting's surveyors calculated the changes in each parameter monitored and compared them with the limits specified in standard NR/BS/LI/045 by means of colour codes, and then emailed the results to Network Rail's construction manager as soon as they were compiled. Vertical rail movement was the main issue in this accident, the limits and actions for which were:

- 0 – 15 mm: no action;
- 15 – 25 mm: note but no action necessary; and
- 25 mm or greater: report fault.

These criteria are consistent with Network Rail maintenance standard, NR/L2/TRK/001, 'Inspection and maintenance of permanent way. The purposes of that standard are:

- to prescribe the inspections, limits and actions required to prevent track caused derailments; and
- to describe the inspections, limits and actions required to optimise track performance, cost and asset life.

By using the criteria in standard NR/BS/LI/045 there was an inherent assumption that the track, even if it was settling, always had solid ground below it. This cannot always be assumed. Standard NR/BS/LI/045 did not take cognisance of four important factors which were present at Stoke Lane. These are described in the following paragraphs.

95 Firstly, standard NR/BS/LI/045 did not require the size of the settlement to be compared to the predicted settlement. The maximum vertical settlement was 23 times the settlement predicted by Bridgeway Consulting, which was 1 mm. Bridgeway Consulting's prediction had been based on an unrealistically optimistic assumption that the amount of ground lost during the tunnelling would be 0.6% of the volume of the tunnel. A more realistic value of ground loss in the conditions at Stoke Lane would have been around 2.5%[11] which would have given a predicted settlement of around 4 mm. Even compared to this value, the actual settlement was still nearly 5 times more. The high ratios between predictions and measured settlements was a strong indication that something had gone wrong during the tunnelling operations.

96 Secondly, it did not require any consideration that the roadway and railway might have been bridging voiding beneath them and thereby masking the severity of the problem. The possibility of this occurring is recognised in Network Rail's LNE& EM guidance document for UTXs (paragraph 79a) but this warning had not been incorporated into standard NR/BS/LI/045. The track monitoring at Stoke Lane used the rails as the targets and would have been compromised from the outset because the settlements seen by the rails lying on the surface were unlikely to reflect the settlement affecting the ground below the foundations of the road and railway[12].

97 Thirdly, the standard did not require any assessment of the rate of settlement of the track in relation to the type and frequency of trains running over it. Had this been considered, it would have become apparent that the settlement continued to increase between 20 and 31 July although there was no rail traffic over the level crossing in that period except for two freight trains on 29 July. This should have increased the concern about the safety of the line over Stoke Lane when normal services resumed, even if the cause of the settlement was not clear.

98 Finally, it did not provide any advice on when and how to reduce the frequency of monitoring. At Stoke Lane the frequency of track monitoring was being reduced progressively while the settlement was increasing with the volume of rail traffic decreasing. It would have been logical to increase the frequency of monitoring in preparation for and following the resumption of normal rail services on 26 August. This could have shown further settlement as trains started running over the crossing and led to the closure of the line before the derailment.

Factors affecting the severity of consequences

99 The consequences of the derailment could have been worse if the wagons had rolled over and the tanks had ruptured or if a passenger train had derailed at the crossing.

[11] This value applies if the void space between the cutter head diameter and concrete pipes is filled with an appropriate grout. The cutter head diameter is necessarily slightly greater (by about 50 mm) than the outer diameter of the tunnel pipes. If the space is not filled with grout, the ground loss would be closer to around 8.5%, excluding any ground loss due to overmining at the tunnel face.

[12] To capture subsurface ground movements in such conditions, the targets would need to be attached to rods drilled deep into the ground.

Observations[13]

100 Although not linked to the cause of the derailment, the RAIB has noted a number of issues related to the submissions that were made to Network Rail. In particular, it was observed that submissions from Bridgeway Consulting were not updated as the design evolved during the project, both in relation to the type of tunnelling to be used and the geometry of the UTX and its associated shafts:

a) The submission made to Network Rail by Bridgeway Consulting on 18 December 2012 stated that the tunnel would be built by *auger boring* even though it was known by then that F&B Trenchless Solutions intended to use a slurry shield TBM. Although this was a typographical error, it was never corrected and meant the documentation approved by Network Rail was not consistent with tunnelling method that was used at Stoke Lane.

b) The UTX design approved by Network Rail was different in geometry to what was actually built in respect of tunnel length and depth, diameters of the launch and reception shafts and their position with respect to the railway. Changes to the design were not notified formally to Network Rail nor was re-approval sought. Document control of the design drawings was not up to normal engineering standards, resulting in different drawings with the same revision number and no list of amendments or dates.

c) The reception shaft was built closer to the railway than shown in the design drawings sent to Network Rail for approval. The decision to move the shaft closer to the railway was taken on site by Morgan Sindall Utilities and F&B Trenchless Solutions just before construction of the shaft was started, in order to ease the blockage of a driveway to a nearby house. However, the movement encroached slightly into the '*zone of influence'* of the railway and should have been formally notified to Network Rail. However, Network Rail was verbally informed of the move.

Previous occurrences of a similar character

101 Network Rail reports that 83 UTXs were constructed on its infrastructure nationally during December 2012 to December 2013. There have not been any previous derailments caused by subsidence following UTX installations.

102 There have been previous occasions where the track has had to be packed to its normal level following settlement resulting from the installation of UTXs:

a) In May 2003 at Prestonpans (near Edinburgh), a temporary speed restriction was applied until four sleepers were packed to correct the vertical alignment of the track.

b) In 2009 near Staythorpe power station, Nottinghamshire, continuous track settlement was noted and corrected by regular packing, during the installation of 17 ducts to the power station, each of 450 mm diameter, by auger boring. The total of the incremental settlements was estimated at 256 mm. The settlement was attributed to overmining.

[13] An element discovered as part of the investigation that did not have a direct or indirect effect on the outcome of the accident but does deserve scrutiny.

Summary of conclusions

Immediate cause

103 The immediate cause of the derailment was a severe dip in the track which had developed rapidly under the leading portion of train 6M35 and caused the 26th and 28th wagons to derail (**paragraph 48**).

Causal factors

104 The causal factors were:

a) Large voids had developed under the track as a result of excessive ground loss during the construction of a microtunnel under the road and level crossing. These voids left the track unsupported at the level crossing (**paragraph 51, Recommendation 1**).

b) Normal train services had been allowed to resume following the tunnelling work, despite evidence of abnormal ground behaviour (**paragraph 67, Recommendation 4**).

Underlying factors

105 The underlying factors were:

a) Network Rail's asset protection standards and guidance were not fully complied with, which introduced risks to the Stoke Lane UTX project, (**paragraph 76, Recommendation 2**).

b) There was insufficient assessment of the risks posed by the UTX at Stoke Lane level crossing (**paragraph 81, Recommendation 3**).

c) Network Rail's procedures for UTXs and the way they were used did not provide adequate guidance for those involved in the design, scrutiny and construction of the UTX (**paragraph 87, Recommendation 2**).

d) The criteria used for monitoring settlement were not appropriate for a UTX under a level crossing and did not adequately alert the asset protection team to the severity of the developing problem (**paragraph 90, Recommendation 4**).

Additional observations

106 Although not linked to the cause of the derailment, the RAIB observed that changes to the design of the UTX as it evolved were not formally notified to Network Rail and were not captured in the design drawings (**paragraph 100, Recommendation 2**).

Actions reported as already taken or in progress relevant to this report

107 On 3 March 2014, Network Rail LNE&EM route issued a document, 'Guidance for the installation of undertrack crossings using horizontal directional drilling (HDD) and other micro tunnelling/thrust boring techniques'. This is an enhanced version of the LNE&EM guidance document for UTXs that existed prior to the derailment. It stresses certain key points such as the need to avoid UTXs under level crossings as far as possible, ensuring adequate communication between all parties, demonstrating competency of the designer and tunnelling contractor, the need for a designer's risk assessment and analysis of possible failure modes.

108 Network Rail reports that it is in the process of delivering training for its LNE&EM route asset protection teams to bring them up to date with the latest microtunnelling techniques in relation to UTXs.

Learning points[14]

109 The RAIB has identified the following learning points for the construction industry:

a) A detailed risk assessment should be carried out which includes careful consideration of the prevailing ground conditions and the consequences of excessive ground loss or heave, and appropriate control measures should be implemented during the works.

b) UTXs should not be routed under level crossings unless absolutely necessary, due to the difficulties of reliably monitoring both the road and railway for settlement and the potential risk from settlement.

c) Bentonite or other appropriate additives should be used in the slurry where ground conditions require it, or best practice suggests it should be used.

d) The volume of spoil excavated from a tunnel or microtunnel under construction should be carefully monitored, to a level of accuracy that is achievable for the method of tunnelling being used, and compared to the expected volumes. Records of the spoil volumes extracted should be retained.

e) The method and frequency of measurement for monitoring ground settlement during and after tunnel construction should take cognisance of any nearby civil engineering structures such as level crossings, bridges, stations (which may mask the severity of any subsequent voiding or settlement) and any temporary changes to traffic conditions. For the specific case of UTXs at level crossings, consideration should be given to monitoring subsurface movements because surface measurements alone can be unreliable and give optimistic results.

f) Where there is an unexpected event such as the appearance of a surface hole in the vicinity of a tunnel, this should be investigated immediately and thoroughly, to identify the cause and any associated risks.

[14] 'Learning points' are intended to disseminate safety learning that is not covered by a recommendation. They are included in a report when the RAIB wishes to reinforce the importance of compliance with existing safety arrangements (where the RAIB has not identified management issues that justify a recommendation) and the consequences of failing to do so. They also record good practice and actions already taken by industry bodies that may have a wider application.

Recommendations

110 The following recommendations are made[15]:

1 *The intent of this recommendation is that the HSE, as the investigatory and regulatory authority for the construction of UTXs, disseminates the key learning points from this accident to the UK tunnelling industry. It is intended that the tunnelling companies then review their methods of working and make any necessary changes to prevent similar future accidents or incidents.*

The Health and Safety Executive (HSE) should:

a) disseminate the key lessons from this accident (paragraph 109 refers), to UK organisations representing tunnelling companies (eg The Pipejacking Association, British Tunnelling Society, UK Society for Trenchless Tunnelling), and request them to further disseminate the learning points to their members, so that individual companies can review and improve their working practices as necessary.

b) assess the need to carry out monitoring checks at UTX construction sites, as part of its audit programmes, to verify that the procedures being followed on site are in line with industry good practice and lessons learned from this investigation (paragraph 104a).

continued

[15] Those identified in the recommendations, have a general and ongoing obligation to comply with health and safety legislation and need to take these recommendations into account in ensuring the safety of their employees and others.

Additionally, for the purposes of regulation 12(1) of the Railways (Accident Investigation and Reporting) Regulations 2005, Recommendation 1 is addressed to the Health and Safety Executive, and Recommendations 2, 3 and 4 are addressed to the Office of Rail Regulation, to enable each to carry out their duties under regulation 12(2) to:

(a) ensure that recommendations are duly considered and where appropriate acted upon; and

(b) report back to RAIB details of any implementation measures, or the reasons why no implementation measures are being taken.

Copies of both the regulations and the accompanying guidance notes (paragraphs 200 to 203) can be found on RAIB's website www.gov.uk/raib.

2 *The intent of this recommendation is that there is one consistently applied Network Rail standard for UTXs, applicable to both outside parties and Network Rail, so that in future there is clarity about Network Rail's complete requirements and expectations and the checks its engineers should undertake.*

Network Rail should review how its current processes related to the construction and approval of UTX works are being applied, and consider the most effective way of merging its national standard and local route guidance documents into a unified set of requirements for UTXs. These requirements should:

a) include improvements to cover lessons learned from this accident as detailed at paragraph 109, and be included in a process of periodic review to check that they remain up to date;

b) list the main sources of risk to its infrastructure from the construction of UTXs (eg ground settlement, heave or voiding) and how it expects those risks to be mitigated;

c) provide clarity on roles and responsibilities within Network Rail, and its expectations of outside parties, particularly with respect to assessing and managing risk and communication for matters affecting safety of the railway; and

d) seek to use a risk based approach which leads users to additional control measures for higher risk UTXs, such as those at level crossings.

Once developed, the requirements should be the subject of appropriate briefing and training to relevant Network Rail staff and made available to outside parties installing UTXs. Compliance with the requirements should also be subject to a system of periodic internal audit (paragraphs 105a, 105c and 106).

3 *The intent of this recommendation is that Network Rail's asset protection engineers have sufficient knowledge about UTXs, and the time to properly assess and manage the associated risks to its infrastructure*.

Network Rail should:

a) review the working knowledge of its asset protection engineers with respect to UTXs and where necessary provide appropriate training, which should include information on types of UTX, methods of construction, best practice, failure modes, seeking specialist assistance; and

b) review the resourcing in its asset protection teams to check that engineers have sufficient time allocated to carry out their duties and access to specialist technical assistance when required, and where necessary, make any appropriate changes (paragraph 105b).

continued

4 *The intent of this recommendation is that Network Rail has a procedure for monitoring settlement in the vicinity of UTXs and other civil engineering works adjacent to its infrastructure, which can be relied upon to accurately measure ground movements that could adversely affect the safety of the line.*

Network Rail should:

a) review the suitability and action limits of its standard for the monitoring of track movement over or adjacent to civil engineering works, including UTXs. This should take into account calculated predictions of settlement, rates of movement and the potential for the movements to be masked by existing structures, and not rely upon inappropriate track maintenance standards; and

b) make any necessary changes to its procedures and brief these out to relevant staff (paragraph 105d).

Appendices

Appendix A - Glossary of abbreviations and acronyms

LNE&EM Route	London North Eastern and East Midlands Route
OTDR	On-train data recorder
TBM	Tunnel boring machine
UTX	Under track crossing

Appendix B - Glossary of terms

All definitions marked with an asterisk, thus (*), have been taken from Ellis's British Railway Engineering Encyclopaedia © Iain Ellis. [redacted].

Auger boring	A method of cutting small diameter tunnels (typically up to around 1 metre diameter). A rotating auger within a circular casing is used to transport the cut spoil from the cutter head at end of the auger to a pit at the other end, from which the spoils are removed. The casing around the auger provides support to the ground while the tunnel is cut and then forms the tunnel itself.
Bentonite	Bentonite is a processed form of a naturally occurring clay (called montmorillonite). It is used in the slurries of slurry shield TBMs (see appendix D) for tunnelling in certain types of ground where it helps to stabilise the excavation face (to minimise the risk of overmining) and assist in the transport of spoil away from the face to the surface. It is also used to lubricate the movement of the tunnel pipes during pipe jacking and to provide support for the ground around annular spaces resulting from the tunnel boring process.
Buffer locking	A phenomenon in some rail accidents involving rolling stock fitted with end buffers. Severe vertical movements can cause the buffers of one vehicle to ride over and lock against the back of the buffers of the adjacent vehicle.
Cant (of track)	The amount by which one rail of a track is raised above the other rail, measured over the rail centres.
Cess	The part of the track bed outside the ballast shoulder that is deliberately maintained lower than the sleeper bottom to aid drainage, provide a path and sometimes (but not always) a position of safety.*
Control Centre of the Future	A computerised system used by Network Rail and train operating companies as a source of real time train running and performance information.
Dewatering	The process of pumping out water from the ground at a construction site in order to artificially lower the ground water level, (where needed) or to keep an unsealed sunken structure dry while people are working in them.
Engineer's line reference	A unique reference, used by railway engineers, given to each route on the national network.
Jacking pipes	Concrete pipes used in a method of microtunnelling. See 'pipe jacking'.
Level crossing panel	A constructional unit, which together with other units, forms a level crossing surface suitable for carrying road traffic over the railway.

Microtunnel	A tunnel which is too small for an on-board operator during tunnelling; typically up to around 1.5 metres diameter.
Microtunnelling	A method of tunnelling in which an unmanned tunnel boring machine is remotely controlled from a control cubicle on the surface.
On-train data recorder	Equipment fitted on-board the train which records the train's speed and the status of various controls and systems relating to its operation.
Permeation grouting	A means of stabilising ground and filling up voids using a low viscosity grouting fluid to permeate into the inter-granular pores of the soil and any voids. As the grout hardens, it improves the strength and stability of the soil.
Pipe jacking	A method of installing underground pipes using a tunnel boring machine (TBM) which is driven forwards by hydraulic jacks installed in a launch shaft. The jacks drive the TBM forwards via a series of concrete pipe sections (called jacking pipes) which are dropped into position at the launch shaft as the TBM advances.
Possession	A period of time during which one or more tracks are blocked to trains to permit work to be safely carried out on or near the line.*
Railway Group Standard	A document mandating the technical or operating standards required of a particular system, process or procedure to ensure that it interfaces correctly with other systems, process and procedures.*
Rule Book	Railway group Standard GE/RT8000, which sets out most of the rules to be observed by railway staff for the safe operation of the main line network.
Sewer siphon	A pipe or pipes used to carry waste water under a road or other obstruction. Such siphons are designed to run full, with the flow being driven by a difference in hydrostatic pressure.
Six foot	The term for the space between two adjacent tracks, irrespective of the distance involved.
Under track crossing	A service, such as a cable, pipe or pipeline, which passes below the sleepers of the track.
Unstable ground	In the context of this report, ground in which a vertical excavation face is liable to collapse if there is not adequate support.
Zone of influence	A region directly below the track and extending laterally up to 3 metres from the cess rails horizontally and thereafter at a downward angle of 45 degrees.

Appendix C - Key standards current at the time

Network Rail standard NR/L2/CIV/003, Issue 4, 2 June 2012.	Engineering assurance of building and civil engineering works
Network Rail standard NR/SP/CIV/044, Issue 2, August 2004.	Design and construction of undertrack crossings
Network Rail standard NR/BS/LI/045, Issue 3, 26 August 2008.	Monitoring track over or adjacent to civil engineering works: procedure and intervention levels
Network Rail standard NR/L2/TRK/001/mod11, Issue 6, 1 December 2012.	Track geometry - Inspections and minimum actions

Appendix D - Slurry shield tunnel boring machine (TBM)

Slurry shield tunnel boring machines (TBMs) are a type of tunnelling machine suited to unstable ground where there is a high ground water pressure[16]. A schematic of the type of machine used at Stoke Lane is shown in the figure D1.

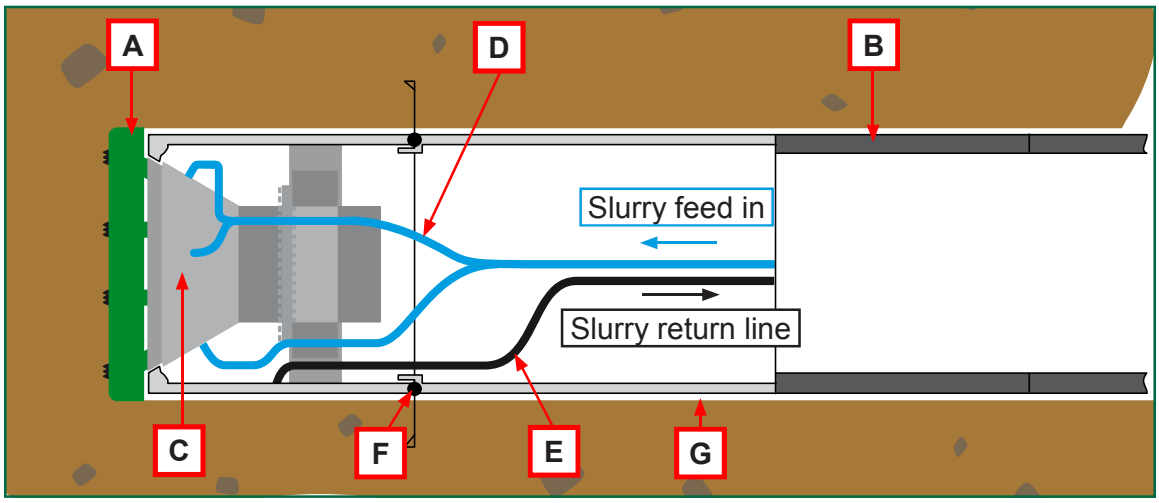

Figure D1: Schematic of a slurry shield TBM

The machine is remotely operated from a control cubicle at the surface. It works by cutting the ground with a rotating cutter head (A), which has rollers, scrapers and teeth, and which is pushed from behind by a series of concrete pipe sections (B). The pipes are pushed along the microtunnel by hydraulic jacks installed in the launch shaft. The process has to be paused periodically to insert a new pipe; at Stoke Lane this was every 2.5 metres. The cut ground falls into the excavation chamber (C) of the TBM. A crushing device (called a 'cone crusher') in the excavation chamber breaks up any large lumps as the cutter head rotates.

If the machine is being used in unstable ground such as wet sands and gravel below the water table, the excavated face must be supported while the TBM is operating, to prevent uncontrolled collapse of the ground into the excavation chamber, potentially leading to overmining. According to industry best practice this is achieved by feeding in a pressurised slurry (D), comprising water mixed with bentonite (or a polymer), into the excavation chamber. The pressure in the excavation chamber (called the face pressure) forces the slurry into the tunnel face in front of the cutter head, where it permeates into the ground, leaving a thin layer of bentonite (called a filter cake) on the surface of the ground. This layer of bentonite impregnated ground supports the areas of the tunnel face which are exposed as the cutter head (figure 10) rotates, while the slurry pressure counterbalances the ground water pressure. For excavation in some types of soil, such as clays, bentonite may not be required. In such cases the slurry may simply comprise water and a proportion of suspended clay material from the excavation face.

Material excavated from the ground falls into the excavation chamber where it is mixed with the incoming slurry and pumped into the slurry return line (E) to a separation plant at the surface (figure D2).

[16] [redacted] ld.

The plant separates the cut ground from the slurry, which is then recycled back to the TBM. The TBM has an articulation joint (F) which allows it to be steered by means of hydraulic jacks within the TBM (not shown) to maintain horizontal and vertical alignment as the TBM is driven forwards, using lasers and targets.

The cutter head diameter is slightly larger than the diameter of the main body of the TBM and the pipes and this results in an annular void space around the pipes (G) which, in accordance with industry best practice, should be filled with bentonite to prevent the ground closing in on the pipes.

Figure D2: Slurry separation plant (image courtesy of Morgan Sindall)

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APPENDIX 3

National Highways Protective Provisions (with commentary)

National Highways draft Protective Provisions

INCLUDING NATIONAL HIGHWAYS' COMMENTARY RESPONDING TO *APPLICANT'S COMMENTS ON SUBMISSIONS MADE AT DEADLINE 5 - APPENDIX A' [REP6-035]*

FOR THE PROTECTION OF NATIONAL HIGHWAYS LIMITED

Application etc.,

1.—(1) The provisions of this Part of this Schedule apply for the protection of National Highways and have effect unless otherwise agreed in writing between the undertaker and National Highways.

(2) Except where expressly amended by the Order the operation of the powers and duties of National Highways or the Secretary of State under the 1980 Act, the 1984 Act, the 1991 Act, the Transport Act 2000, or Town and Country Planning (General Permitted Development) (England) Order 2015 which shall continue to apply in respect of the exercise of all National Highways' statutory functions.

Interpretation

2.—(1) Where the terms defined in article 2 *(interpretation)* of this Order are inconsistent with subparagraph (2) the latter prevail.

(1) In this Part of this Schedule—

"as built information" means one electronic copy of the following information—

(a) as constructed drawings in both PDF and AutoCAD DWG formats showing the location and depth of the pipeline as installed and any ancillary or protective measures installed within the strategic road network;

(b) list of suppliers and materials used, as well as any relevant test results and CCTV surveys (if required to comply with DMRB standards);

(c) product data sheets and technical specifications for all materials used;

(d) as constructed information for any utilities discovered or moved during the specified works;

(e) method statements for the specified works carried out;

(f) in relation to road lighting, signs, and traffic signals any information required by Series 1300 and 1400 of the Specification for Highway Works or any replacement or modification of it;

(g) organisation and methods manuals for all products used;

(h) as constructed programme;

(i) test results and records as required by the detailed design information and during construction phase of the project;

(j) a stage 3 road safety audit subject to any exceptions to the road safety audit standard as agreed by the undertaker and National Highways;

(k) in so far as it is relevant to the specified works, the health and safety file; and

(l) such other information as is reasonably required by National Highways to be used to update all relevant databases and to ensure compliance with National Highway's *Asset Data Management Manual* as is in operation at the relevant time.

"as built information for the tunnelling works" means one electronic copy of the following information—

(a) as constructed drawings in both PDF and AutoCAD DWG formats showing the location and depth of the pipeline as installed and any ancillary or protective measures installed within the strategic road network;

(b) as constructed information for any utilities discovered or moved during the tunnelling works;

Commented [PB1]: NH has reinserted this provision. The Applicant's reason for rejecting the NRSWA reference as being incompatible with article 12 is incorrect. The text clearly states *"Except where expressly amended by the Order…"*

This standard provision has never proved controversial to any Applicant before now. It has 2 purposes; (i) it recognises that statutory powers and duties of National Highways or the Secretary of State may have been subject to amendment in the Order and that the protective provisions apply subject to those amendments; and
(ii) it ensures that all statutory powers not expressly referenced in the Order and which apply to National Highways, continue to apply. This is required to prevent any argument or ambiguity that National Highways' powers in statute which are not expressly referenced in the Order do not apply to the Order Land because they have been disapplied.

Commented [PB2]: NH has reinserted the full list of *"as built information"* to ensure that full protection is provided to NH and the SRN should the Applicant choose to rely on the wide powers available in the DCO to carry out additional highway works beyond the tunnelling.

NH has included a reduced list of *"as built information"* below for those works that do not involve direct works to the carriageway. The expanded list will therefore not be required should the Applicant's works impacting on the SRN be nothing other than tunnelling beneath carriageway.

Commented [PB3]: This reduced list of *"as built information for tunnelling works"* has been added to acknowledge that not all of NH's usual requirements in this regard would be relevant to the tunnelling works and NH would not require all of that detail for such works. Nevertheless, tunnelling still results in works beneath the SRN and therefore NH, as custodian of the asset, must have details to accurately record, and be aware of, what has taken place.

(c) method statements for the tunnelling works carried out;

(d) test results and records as required by the detailed design information and during the construction phase of the project;

(e) in so far as it is relevant to the tunnelling works, the health and safety file; and

(f) such other information as is reasonably required by National Highways to be used to update all relevant databases and to ensure compliance with National Highway's *Asset Data Management Manual* as is in operation at the relevant time.

"the bond sum" means the sum equal to 200% of the cost of the carrying out the specified works (to include all costs plus any commuted sum) or such other sum agreed between the undertaker and National Highways;

"the cash surety" means the sum agreed between the undertaker and National Highways;

"commuted sum" means such sum calculated as provided for in paragraph 9 of this Part of this Schedule to be used to fund the future cost of maintaining the specified works;

"condition survey" means a survey of the condition of National Highways structures and assets within the Order limits that may be affected by the specified works;

"contractor" means any contractor or subcontractor appointed by the undertaker to carry out the specified works;

"defects period" means the period from the date of the provisional certificate to the date of the final certificate which shall be no less than 12 months from the date of the provisional certificate;

"detailed design information" means such of the following drawings specifications and calculations as are relevant to the specified works—

(a) site clearance details;

(b) boundary, environmental and mitigation fencing;

(c) road restraints systems and supporting road restraint risk appraisal process assessment;

(d) drainage and ducting as required by DMRB CD 535 Drainage asset data and risk management and DMRB CS551 Drainage surveys – standards for Highways

(e) earthworks including supporting geotechnical assessments required by DMRB CD622 Managing geotechnical risk and any required strengthened earthworks appraisal form certification;

(f) pavement, pavement foundations, kerbs, footways and paved areas;

(g) traffic signs and road markings;

(h) traffic signal equipment and associated signal phasing and timing detail;

(i) road lighting (including columns and brackets);

(j) regime of California Bearing Ratio testing;

(k) electrical work for road lighting, traffic signs and signals;

(l) motorway communications as required by DMRB;

~~(m)~~(g) highway structures and any required structural approval in principle;

~~(n)~~(h) landscaping;

~~(o)~~(i) proposed departures from DMRB standards;

~~(p)~~(j) walking, cycling and horse riding assessment and review report;

~~(q)~~(k) stage 1 and stage 2 road safety audits and exceptions agreed;

~~(r)~~(l) utilities diversions; and

~~(s)~~(m) topographical survey;

~~(t)~~(n) maintenance and repair strategy in accordance with DMRB GD304 Designing health and safety into maintenance or any replacement or modification of it;

~~(u)~~(o) health and safety information including any asbestos survey required by GG105 or any successor document; and

Commented [PB4]: *"the bond sum", "the cash surety" and "commuted sum"* have all been reinserted to ensure that full protection is provided to NH and the SRN should the Applicant choose to rely on the wide powers available in the DCO to carry out additional highway works beyond the tunnelling.

NH accepts *that "commuted sum"* would not be relevant for the tunnelling works and a requirement for such has therefore been carved out of these PPs for those works.

For the reasons stated in NH's D7 *submission "the bond sum" and "the cash surety"* are required for the tunnelling works due to the risks such works pose to the SRN.

Commented [PB5]: NH has reinserted *"defects period"*. This is relevant to all works, including the tunnelling. Works beneath the SRN could result in settlement issues which may not become apparent immediately and therefore a defects period is needed.

Commented [PB6]: NH has reinserted *"detailed design information"* to ensure that full protection is provided to NH and the SRN should the Applicant choose to rely on the wide powers available in the DCO to carry out additional highway works beyond the tunnelling.

NH has included a reduced list of *"detailed design information for tunnelling works"* for those works that do not involve direct works to the carriageway. The expanded list will therefore not be required should the Applicant's works impacting on the SRN be nothing other than tunnelling beneath the carriageway.

~~(v)~~(p) other such information that may be reasonably required by National Highways to be used to inform the detailed design of the specified works;

"detailed design information for the tunnelling works" means such of the following drawings specifications and calculations as are relevant to the tunnelling works—

(a) site clearance details;

(b) boundary, environmental and mitigation fencing;

(c) earthworks including supporting geotechnical assessments required by DMRB CD622 Managing geotechnical risk and any required strengthened earthworks appraisal form certification;

(d) proposed departures from DMRB standards;

(q) utilities diversions; and

(r) other such information that may be reasonably required by National Highways to be used to inform the detailed design of the tunnelling works;

"DMRB" means the Design Manual for Roads and Bridges or any replacement or modification of it;

"final certificate" means the certificate relating to those aspects of the specified works that have resulted in any alteration to the strategic road network to be issued by National Highways pursuant to paragraph 9;

"the health and safety file" means the file or other permanent record containing the relevant health and safety information for the specified works required by the Construction Design and Management Regulations 2015 (or such updated or revised regulations as may come into force from time to time);

"nominated persons" means the undertaker's representatives or the contractor's representatives on site during the carrying out of the specified works as notified to National Highways from time to time;

"programme of works" means a document setting out the sequence and timetabling of the specified works;

"provisional certificate" means the certificate of provisional completion relating to those aspects of the specified works that have resulted in any alteration to the strategic road network to be issued by National Highways in accordance with paragraph 7 when it considers the specified works are substantially complete and may be opened for traffic;

"road safety audit" means an audit carried out in accordance with the road safety audit standard;

"road safety audit standard" means DMRB Standard HD GG119 or any replacement or modification of it;

"road space booking" means road space bookings in accordance with National Highways' Asset Management Operational Requirements (AMOR) including Network Occupancy Management System (NOMS) used to manage road space bookings and network occupancy;

"Specification for Highways Works" means the specification for highways works forming part of the manual of contract documents for highway works published by National Highways and setting out the requirements and approvals procedures for work, goods or materials used in the construction, improvement or maintenance of the strategic road network;

"specified works" means so much of the authorised development, including any maintenance of that work, as is on, in, under or over the strategic road network for which National Highways is the highway authority, ~~and specifically~~ including Work No.12 in so far as that crosses the M56 motorway, Work No.16 in so far as that crosses the M53 motorway, and Work No. 22 in so far as that crosses the A41 highway.

"strategic road network" means any part of the road network including trunk roads, special roads or streets for which National Highways is the highway authority including drainage infrastructure, street furniture, verges and vegetation and all other land, apparatus and rights located in, on, over or under the highway;

Commented [PB7]: This reduced list of *"detailed design information for tunnelling works"* has been added to acknowledge that not all of NH's usual requirements in this regard would be relevant to the tunnelling works and NH would not require all of that detail for such works. Nevertheless, tunnelling still results in works that impact the SRN and therefore NH, as custodian of the asset, must have the ability to see and approve the relevant details .

Commented [PB8]: NH have reinserted *"final certificate"* to ensure that full protection is provided to NH and the SRN should the Applicant choose to rely on the wide powers available in the DCO to carry out additional highway works beyond the tunnelling.

In addition the certification process is required in respect of the tunnelling works and the Applicant's comments that *"These definitions are irrelevant"* shows a fundamental misunderstanding of how highway authorities operate. As previously stated tunnelling works can create significant safety risks for the SRN and without an appropriate certification process NH is not able to ensure the safety of its network is adequately protected and the public purse is not financially exposed.

Commented [PB9]: NH has reinserted *"provisional certificate"* for the same reasons that it has reinserted *"final certificate"*.

Commented [PB10]: NH has reinserted the RSA definitions to ensure that full protection is provided to NH and the SRN should the Applicant choose to rely on the wide powers available in the DCO to carry out additional highway works beyond the tunnelling.

NH accepts that RSAs would not be relevant for the tunnelling works and a requirement for such has therefore been carved out of these PPs for those works.

Commented [PB11]: NH has reinserted *"road space booking"* to ensure that full protection is provided to NH and the SRN should the Applicant choose to rely on the wide powers available in the DCO to carry out additional highway works beyond the tunnelling.

This process is also required for tunnelling works as it includes the notification requirements for anyone working beneath the SRN.

Commented [PB12]: NH has reinserted *"specification for Highways Works"* to ensure that full protection is provided to NH and the SRN should the Applicant choose to rely on the wide powers available in the DCO to carry out additional highway works beyond the tunnelling.

In addition, as this goes hand in hand with DMRB standards it is also relevant to the tunnelling works.

Commented [PB13]: NH has accepted the amends made by the Applicant to *"specified works"* but has deleted the words *"and specifically"* because the PPs must protect NH in the event that the Applicant chooses to rely on the wide powers available in the DCO to carry out additional highway works beyond the tunnelling, not just the tunnelling works.

"tunnelling works" means any specified works which involve tunnelling, boring or otherwise installing the pipeline under the strategic road network without trenching from the surface;

"utilities" means any pipes wires cables or equipment belonging to any person or body having power or consent to undertake street works under the New Roads and Street Works Act 1991; and

"winter maintenance" means maintenance of the road surface to deal with snow and ice.

(2) References to any standards, manuals, contracts, Regulations and Directives including to specific standards forming part of the DMRB are, for the purposes of this Part of this Schedule, to be construed as a reference to the same as amended, substituted or replaced, and with such modifications as are required in those circumstances.

General

3.The undertaker acknowledges that parts of the works authorised by this Order affect or may affect parts of the strategic road network in respect of which National Highways may have appointed or may appoint a highway operations and maintenance contractor.

4.Notwithstanding the limits of deviation permitted pursuant to article 6 (limits of deviation) of this Order, no works in carrying out, maintaining or diverting the authorised development may be carried out under the strategic road network at a distance less than 4 metres below the lowest point of the carriageway surface.

5.References to any standards, manuals, contracts, regulations and directives including to specific standards forming part of the DMRB are, for the purposes of this Part of this Schedule, to be construed as a reference to the same as amended, substituted or replaced, and with such modifications as are required in those circumstances.

Prior approvals and security

6.—(1) Any ~~specified~~ tunnelling works ~~which involve tunnelling, boring or otherwise installing the pipeline under the strategic road network without trenching from the surface,~~ must be designed by the undertaker in accordance with DMRB CD622 unless otherwise agreed in writing by National Highways.

(2) Subject to sub paragraph (3) ~~T~~the specified works must not commence until—

(a) a stage 1 and stage 2 road safety audit has been carried out and all recommendations raised by them or any exceptions are approved by National Highways;

(b) the programme for those works has been approved by National Highways;

(c) the detailed design of the specified works comprising of the following details, insofar as considered relevant by National Highways, has been submitted to and approved by National Highways—

(i) the detailed design information, or in respect of tunnelling works the tunnelling detailed design information, incorporating all recommendations and any exceptions approved by National Highways under sub-paragraph (a) ;

(ii) details of the proposed road space bookings;

(iii) the identity and suitability of the contractor and nominated persons;

(iv) a process for stakeholder liaison, with key stakeholders to be identified and agreed between National Highways and the undertaker;

(v) information demonstrating that the walking, cycling and horse riding assessment and review process undertaken by the undertaker in relation to the specified works has been adhered to in accordance with DMRB GG142 – Designing for walking, cycling and horse riding; and

(d) a scheme of traffic management has been submitted by the undertaker and approved by National Highways such scheme to be capable of amendment by agreement between the undertaker and National Highways from time to time;

Commented [PB14]: NH has inserted a definition of *"tunnelling works"* to address the Applicant's concern that not all of NH's requirements would be relevant to such works. This updated version of the PPs now carves out those provisions which NH agree would not be relevant in respect of such works.

Commented [PB15]: NH has reinserted *"winter maintenance"* to ensure that full protection is provided to NH and the SRN should the Applicant choose to rely on the wide powers available in the DCO to carry out additional highway works beyond the tunnelling.

NH accepts *that "winter maintenance"* would not be relevant for the tunnelling works and a requirement for such has therefore been carved out of these PPs for those works.

Commented [PB16]: NH has accepted the amends made by the Applicant to this paragraph with the exception of their change to *'strategic road carriageway'* which should revert to *'strategic road network'* which is the correct and widely understood term.

Commented [PB17]: NH has made amends to this paragraph due to the addition of the *"tunnelling works"* definition and the agreement to carve out certain provisions for those works.

(e) stakeholder liaison has taken place in accordance with the process for such liaison agreed between the undertaker and National Highways under sub-paragraph (c)(v) above;

(f) National Highways has approved the audit brief and CVs for all road safety audits and exceptions to items raised in accordance with the road safety audit standard;

(g) the undertaker has agreed the estimate of the commuted sum with National Highways;

(h) the scope of all maintenance operations (routine inspections, incident management, reactive and third party damage) to be carried out by the undertaker during the construction of the specified works (which must include winter maintenance) has been agreed in writing by National Highways;

(i) the undertaker has procured to National Highways collateral warranties in a form approved by National Highways from the contractor and designer of the specified works in favour of National Highways to include covenants requiring the contractor and designer to exercise all reasonable skill care and diligence in designing and constructing the specified works, including in the selection of materials, goods, equipment and plant; and

(j) a condition survey and regime of monitoring of any National Highways assets or structures that National Highways reasonably considers will be affected by the specified works, has been agreed in writing by National Highways.

(3) Sub paragraphs 2(a), 2(b)(iv), 2(b)(v), 2(d), 2(e), 2(f), 2(g) and 2(h) do not apply in respect of any tunnelling works.

(4) The undertaker must not exercise—

(a) article 5 *(power to maintain the authorised development)*;

(b) article 10 *(street works)*;

(c) article 11 *(power to alter layout etc. of streets)*

(d) article 13 *(temporary restriction of public rights of way)*;

(e) article 14 (*stopping up of public rights of way)*;

(f) article 15 *(temporary restriction of use of streets)*

(g) article 16 *(access to works)*

(h) article 19 *(traffic regulation)*;

(i) article 20 *(discharge of water)*;

(j) article 22 *(authority to survey and investigate the land)*;

(k) article 23 *(protective works to buildings)*;

(l) article 25 *(compulsory acquisition of land)*;

(m) article 27 *(compulsory acquisition of rights and restrictive covenants)*;

(n) article 28 *(statutory authority to override easements and other rights)*

(o) article 30 *(private rights)*

(p) article 32 *(acquisition of subsoil or airspace only)*

(q) article 34 *(rights under or over streets)*

(r) article 35 *(temporary use of land for carrying out the authorised development)*;

(s) article 36 (*temporary use of land for maintaining the authorised development)*;

(t) article 37 (statutory undertakers); or

(u) article 40 (*felling or lopping trees*) of this Order,

over any part of the strategic road network without the consent of National Highways including from ThirdPartySchemesNWA10@nationalhighways.co.uk and Area10Roadspace@nationalhighways.co.uk, and National Highways may in connection with any such exercise require the undertaker to provide details of any proposed road space bookings and/or submit a scheme of traffic management for National Highways' approval.

Commented [PB18]: This carves out 8 requirements for the tunnelling works which reflects the Applicant's reduced list from its D6 submission with the exception of (i) collateral warranties. It is NH standard practice to require collateral warranties from any contractor working on or under the SRN.

Commented [PB19]: NH has reinserted the full list of DCO articles which it is impacted by. Because NH has been unable to reach agreement with the Applicant on its PPs it must include the full list here to ensure its objections to such articles are addressed. All of these articles give the Applicant power to impact the SRN and it would not be appropriate for that to happen without NH oversight.

Included to prevent the applicant from exercising powers over the SRN or land in which NH has an interest without consent. This is to ensure open dialogue between the parties so that NH has control over the operations which may impact its network. This is critical from a safety perspective and to maintain the integrity of the asset. As a public body, National Highways is under a duty to act reasonably and this is expressly provided in sub-paragraph 6 below

(5) National Highways must prior to the commencement of the specified works or the exercise of any power referenced in sub-paragraph (24)National Highways must, prior to the commencement of the specified works,a inform the undertaker of the identity of the person who will act as a point of contact on behalf of National Highways for consideration of the information required under sub-paragraph (1) or (2), (3) or (4).

(6) Any approval of National Highways required under this paragraph-

(a) must not be unreasonably withheld;

(b) must be given in writing;

(c) shall be deemed to have been refused if neither given nor refused within 2 months of the receipt of the information for approval or, where further particulars are requested by National Highways (acting reasonably) within 2 months of receipt of the information to which the request for further particulars relates; and

(d) may be subject to any reasonable conditions as National Highways considers necessary.

(7) Any change to the identity of the contractor and/or designer of the specified works will be notified to National Highways immediately and details of their suitability to deliver the specified works will be provided on request along with collateral warranties in a form agreed by National Highways.

(8) Any change to the detailed design of the specified works must be approved by National Highways in accordance with paragraph 7(16(2) or 6(3) of this Part.

Construction of the specified works

7.—(1) The undertaker must give National Highways 28 days' notice in writing of the date on which the specified works will start.

(2) The undertaker must comply with National Highways' road space booking procedures prior to and during the carrying out the specified works and no specified works for which a road space booking is required shall commence without a road space booking having first been secured from National Highways.

(3) The specified works must be carried out by the undertaker to the reasonable satisfaction of National Highways in accordance with—

(a) the relevant detailed design information and programme of works approved pursuant to paragraph 6(2) or 6(3) above or as subsequently varied by agreement between the undertaker and National Highways;

(b) in so far as it may be applicable the DMRB, the Manual of Contract Documents for Highway Works, including the Specification for Highway Works, together with all other relevant standards as reasonably required by National Highways to include, inter alia; all relevant interim advice notes, the Traffic Signs Manual and the Traffic Signs Regulations and General Directions 2016 save to the extent that exceptions from those standards apply which have been approved by National Highways; and

(c) all aspects of the Construction (Design and Management) Regulations 2015 or any statutory amendment or variation of the same.

(4) The undertaker must permit and must require the contractor to permit at all reasonable times persons authorised by National Highways (whose identity must have been previously notified to the undertaker by National Highways) to gain access to the specified works for the purposes of inspection and supervision of the specified works.

(5) If any part of the specified works is constructed-

(d) other than in accordance with the requirements of this Part of this Schedule; or

(e) in a way that causes damage to the highway, highway structure or asset or any other land of National Highways,

National Highways may by notice in writing require the undertaker, at the undertaker's own expense, to comply promptly with the requirements of this Part of this Schedule or remedy any damage notified to the undertaker under this Part of this Schedule, to the satisfaction of National Highways, acting reasonably.

Commented [PB20]: Amendment linked to reinsertion of sub paragraph (4) above.

Commented [PB21]: Amendment required due to insertion of sub paragraphs (3) and (4).

Commented [PB22]: NH has reinserted its deemed refusal requirement which the Applicant had changed to deemed consent. For reasons already stated in its submissions to the examination NH cannot agree to deemed consent given the safety implications of works being carried out that may have bypassed its approval processes. This is a fundamental issue of public safety that should not be compromised to enable a private developer to achieve a quicker build programme. NH has statutory obligations to behave reasonably and support sustainable development and so it should not be forced to work under the pressure of deemed consent. The potential implications from a safety perspective of something going wrong far outweigh the Applicant's case for such a provision.

Commented [PB23]: NH has reinserted the collateral warranty requirement for the reasons stated earlier.

Commented [PB24]: This provision needs to be reinserted for all work types. For the tunnelling works the notification process under the road space booking procedure is required but there will be no need for a road space booking itself (assuming no traffic management is needed).

NH needs to know when works are taking place beneath its network and the notification requirements form part of NH's road space booking procedures.

Commented [PB25]: NH has reinserted these requirements but has amended the wording to make clear that only those that are applicable are necessary accepting that not all of these will be relevant to the tunnelling works.

(6) If during the carrying out of the authorised development the undertaker or its appointed contractors or agents causes damage to the strategic road network then National Highways may by notice in writing require the undertaker, at its own expense, to remedy the damage.

(7) If within 28 days on which a notice under sub-paragraph (5) or sub-paragraph (6) is served on the undertaker (or in the event of there being, in the opinion of National Highways, a danger to road users, within such lesser period as National Highways may stipulate), the undertaker has failed to take the steps required by that notice, National Highways may carry out the steps required of the undertaker and may recover any expenditure reasonably incurred by National Highways in so doing, such sum to be payable within 30 days of demand.

Commented [PB26]: The Applicant had deleted the requirement to pay such sum within 30 days of demand. NH has reinserted this requirement, a public body should not be out of funds for any longer than is strictly necessary.

(8) Nothing in this Part of this Schedule prevents National Highways from carrying out any work or taking any such action as it reasonably believes to be necessary as a result of or in connection with the carrying out or maintenance of the authorised development without prior notice to the undertaker in the event of an emergency or to prevent the occurrence of danger to the public and National Highways may recover any expenditure it reasonably incurs in so doing.

(9) In constructing the specified works, the undertaker must at its own expense divert or protect all utilities and where relevant all agreed alterations and reinstatement of highway over existing utilities must be constructed to the satisfaction of National Highways.

(10) During the construction of the specified works, with the exception of any tunnelling works, the undertaker must carry out all maintenance (including winter maintenance) in accordance with the scope of maintenance operations agreed by National Highways pursuant to paragraph ~~7~~6(~~1~~2)(h) and the undertaker must carry out such maintenance at its own cost.

Commented [PB27]: NH has reinserted this paragraph to ensure that full protection is provided to NH and the SRN should the Applicant choose to rely on the wide powers available in the DCO to carry out additional highway works beyond the tunnelling.

Text has been added so that this requirement would not apply to the tunnelling works.

(11) The undertaker must notify National Highways if it fails to complete the specified works in accordance with the agreed programme pursuant to paragraph 6(2)(b) of this Part, or suspends the carrying out of any specified work beyond 14 days, and National Highways reserves the right to withdraw any road space booking granted to the undertaker to ensure compliance with its network occupancy requirements.

Payments

Commented [PB28]: The Applicant has made substantial amends to this section which are not accepted. NH has therefore reinserted the original drafting (other than 'reasonable' insertions which have been retained). Specified works that impact on the SRN cannot commence until NH has approved the relevant technical information. This is a cost to NH which it will not have been anticipating and for which there is no internal budget. The works are a third party project interfacing with the SRN. It is the responsibility of the promoter to pay the reasonable costs of landowners and/or statutorily protected persons who are affected by the works. It is not for the public purse to absorb this cost. Given there are no budgets in place NH requires payment upfront. This section sets out NHs standard terms which are routinely accepted by developers all across the network.

8.—(1) The undertaker must pay to National Highways a sum equal to the whole of any reasonable costs and expenses which National Highways incurs (including costs and expenses for using internal or external staff and costs relating to any work which becomes abortive) in relation to the specified works and in relation to any approvals sought under this Order, or otherwise incurred under this Part, including—

(a) the checking and approval of the information required under paragraph 6(2);

(b) the supervision of the specified works;

(c) the checking and approval of the information required to determine approvals under this Order;

(d) all costs in relation to the transfer of any land required for the specified works; and

(e) all legal and administrative costs and disbursements incurred by National Highways in connection with the Order and sub-paragraphs (a)-(d); and

(f) any value added tax which is payable by National Highways in respect of such costs and expenses and for which it cannot obtain reinstatement from HM Revenue and Customs,

together comprising "the NH costs".

(2) The undertaker must pay to National Highways upon demand and prior to such costs being incurred the total costs that National Highways believe will be properly and necessarily incurred by National Highways in undertaking any statutory procedure or preparing and bringing into force any traffic regulation order or orders necessary to carry out or for effectively implementing the authorised development.

(3) National Highways must provide the undertaker with a schedule showing its estimate of the NH costs prior to the commencement of the specified works and the undertaker must pay to National Highways the estimate of the NH costs prior to commencing the specified works and in any event prior to National Highways incurring any cost.

(4) If at any time after the payment referred to in sub-paragraph (3) has become payable, National Highways reasonably believes that the NH costs will exceed the estimated NH costs it may give notice to the undertaker of the amount that it believes the NH costs will exceed the estimate of the NH costs (the excess) and the undertaker must pay to National Highways within 28 days of the date of the notice a sum equal to the excess.

(5) National Highways must give the undertaker a final account of the NH costs referred to in sub-paragraph (1) above within 91 days of the issue of the provisional certificate issued pursuant to paragraph 10(4).

(6) Within 28 days of the issue of the final account:

(a) if the final account shows a further sum as due to National Highways the undertaker must pay to National Highways the sum shown due to it;

(b) if the account shows that the payment or payments previously made by the undertaker have exceeded the costs incurred by National Highways, National Highways must refund the difference to the undertaker.

~~(8)~~(7) If any payment due under any of the provisions of this Part of this Schedule is not made on or before the date on which it falls due the party from whom it was due must at the same time as making the payment pay to the other party interest at 3% above the Bank of England base lending rate from time to time being in force for the period starting on the date upon which the payment fell due and ending with the date of payment of the sum on which interest is payable together with that interest.

Provisional Certificate

9.—(1) Following the completion of any specified works or prior to reopening any part of the strategic road network following any closure or partial closure, whichever shall be sooner, ~~of any of the strategic road network for the purposes of carrying out the specified works,~~the undertaker shall notify National Highways who will carry out a site inspection to satisfy itself that the strategic road network is, in its opinion, safe for traffic and the undertaker must comply with any requirements of National Highways ~~prior to reopening the strategic road network~~.

(2) As soon as the undertaker considers that the provisional certificate may be properly issued it must apply to National Highways for the provisional certificate.

(3) Following an application for a provisional certificate, National Highways must as soon as reasonably practicable:

(a) inspect the specified works; and

(b) provide the undertaker with a written list of works that are required for the provisional certificate to be issued or confirmation that no further works are required for this purpose.

(4) Subject to sub paragraph (7) ~~W~~when—

(a) a stage 3 road safety audit for the specified works has been carried out and all recommendations raised including remedial works have (subject to any exceptions agreed) been approved by National Highways;

(b) the specified works incorporating the approved remedial works under sub-paragraph (4)(a) ~~and any further works notified to the undertaker pursuant to sub-paragraph 10(3)(b)~~ have been completed to the satisfaction of National Highways;

(c) any further works notified to the undertaker pursuant to sub-paragraph 9(3)(b) have been completed to the satisfaction of National Highways;

(d) the as built information, or where relevant the as built information for tunnelling works, has been provided to National Highways; and

(e) the undertaker has paid the commuted sum to National Highways,

National Highways must issue the provisional certificate.

(5) On the issue of the provisional certificate the bond sum shall be reduced to 20% of the total bond sum save insofar as any claim or claims have been made against the bond before that date in which case National Highways will retain a sufficient sum to ensure it does not have to meet any costs for or arising from the specified works.

Commented [PB29]: NH strongly disputes the Applicant's assertion that the following paragraphs are irrelevant. They are necessary for all works, including the tunnelling works. Once tunnelling has taken place beneath the SRN, to ensure the safety of the travelling public NH would need to inspect the network to ensure network stability etc. This section has been reinserted by NH but tweaked as necessary to account for slight differences with tunnelling works, including the carve out of some provisions.

(6) The undertaker must submit a stage 4 road safety audits as required by and in line with the timescales stipulated in the road safety audit standard. The undertaker must comply with the findings of the stage 4 road safety audit and must pay all costs of and incidental to such and provide updated as-built information to National Highways.

(7) Sub paragraphs (4)(a), 4(b), 4(e) and (6) do not apply in respect of any tunnelling works.

Opening

10. (1) Where it has been necessary to close, in whole or in part, the strategic road network ~~T~~the undertaker must notify National Highways not less than 56 days in advance of the intended date of opening to the public of the strategic road network and the undertaker must notify National Highways of the actual date the strategic road network will be opened to the public within 14 days of that date.

(2) The undertaker must notify National Highways as soon as possible, and in any event within 5 days, of completion of any tunnelling works.

Commented [PB30]: This provision has been reinserted by NH to ensure that full protection is provided to NH and the SRN should the Applicant choose to rely on the wide powers available in the DCO to carry out additional highway works beyond the tunnelling. It has been updated to reflect differences for tunnelling works.

Final condition survey

11.—(1) The undertaker must, as soon as reasonably practicable after making its application for a provisional certificate pursuant to paragraph ~~10~~9(2), arrange for any highways structures and assets that were the subject of the condition survey under paragraph 6(2)(c) to be re-surveyed and must submit the re-survey to National Highways for its approval. The re-survey will include a renewed geotechnical assessment required by DMRB CD622 if the specified works include any works beneath the strategic road network.

(2) If the re-surveys carried out pursuant to paragraph ~~12~~11~~9~~ (1) indicates that any damage has been caused to a structure or asset, the undertaker must submit a scheme for remedial works in writing to National Highways for its approval in writing and the undertaker must carry out the remedial works at its own cost and in accordance with the scheme submitted.

(3) If the undertaker fails to carry out the remedial work in accordance with the approved scheme, National Highways may carry out the steps required of the undertaker and may recover any expenditure it reasonably incurs in so doing.

(4) National Highways may, at its discretion, at the same time as giving its approval to the re-surveys pursuant to paragraph 12(1) give notice in writing that National Highways will remedy any damage identified in the re-surveys and National Highways may recover any expenditure it reasonably incurs in so doing from the undertaker.

(5) The undertaker must make available to National Highways upon request copies of any survey or inspection reports produced pursuant to any inspection or survey of any specified work following its completion that the undertaker may from time to time carry out.

Commented [PB31]: NH has reinserted these provisions for the reasons previously stated.

Defects Period

12. —(1) The undertaker must at its own expense remedy any defects in the strategic road network as are reasonably required by National Highways to be remedied during the defects period. All identified defects must be remedied in accordance with the following timescales—

(a) in respect of matters of urgency, within 24 hours of receiving notification for the same (urgency to be determined at the absolute discretion of National Highways);

(b) in respect of matters which National Highways considers to be serious defects or faults, within 14 days of receiving notification of the same; and

(c) in respect of all other defects notified to the undertaker, within 4 weeks of receiving notification of the same.

(2) Following the expiry of the defects period National Highways has responsibility for routine maintenance of the strategic road network save for any soft landscaping works which must be

Commented [PB32]: NH has reinserted these provisions for the reasons previously stated. A defects period is relevant to all works including tunnelling beneath the carriageway which may result in settlement issues.

established and which must thereafter be maintained for a period of 3 years by and at the expense of the undertaker.

Final Certificate

13. —(1) The undertaker must apply to National Highways for the final certificate no sooner than 12 months from the date of the provisional certificate.

(2) Following receipt of the application for the final certificate, National Highways must as soon as reasonably practicable:

(a) inspect the strategic road network; and

(b) provide the undertaker with a written list of any further works required to remedy or make good any defect or damage in the strategic road network or confirmation that no such works are required for this purpose.

(3) The undertaker must carry out such works notified to it pursuant to sub-paragraph ~~14~~13(2).

(4) When National Highways is satisfied that:

(a) any defects or damage arising from defects during the defects period and any defects notified to the undertaker pursuant to sub-paragraph ~~14~~13(2) and any remedial works required as a result of, where necessary, ~~the~~ a stage 4 road safety audit have been made good to the satisfaction of National Highways; and

(b) the NH costs have been paid to National Highways in full;

National Highways must issue the final certificate after which the bond shall be released in full.

(5) The undertaker must pay to National Highways within 28 days of demand the costs reasonably incurred by National Highways in identifying the defects and supervising and inspecting the undertaker's work to remedy the defects that it is required to remedy pursuant to these provisions.

Commented [PB33]: This paragraph has also been reinstated for reasons previously stated. It is necessary to bring to an end the certification process to ensure a proper close out of works.

Security

14.—(1) The specified works must not commence until—

(a) the undertaker procures that the specified works are secured by a bond from a bondsman first approved by National Highways in the agreed form between the undertaker and National Highways to indemnify National Highways against all losses, damages, costs or expenses arising from any breach of any one or more of the obligations of the undertaker in respect of the exercise of the powers under this Order and the specified works under the provisions of this Part of this Schedule provided that the maximum liability of the bond must not exceed the bond sum; and

(b) the undertaker has provided the cash surety which may be utilised by National Highways in the event of the undertaker failing to meet its obligations to make payments under paragraph ~~9~~ 8 or to carry out works the need for which arises from a breach of one or more of the obligations of the undertaker under the provisions of this Part of this Schedule.

Commented [PB34]: NH has reinserted this paragraph for the reasons set out in its D7 submission. Any work carried out to the SRN (or which may impact the SRN) must be supported by a bond to ensure that if the works were ceased as a result of default by or the insolvency of the promoter, National Highways had appropriate access to funds to secure the restoration and or stability of the SRN that had been subject to works. To permit the Applicant to carry out those works without a bond would expose a taxpayer funded public body to financial risk.

Commuted sums

15. —(1) Subject to sub paragraph (3) National Highways must provide to the undertaker an estimate of the commuted sum, calculated in accordance with FS Guidance S278 Commuted Lump Sum Calculation Method dated 18 January 2010 or any successor guidance, prior to the commencement of the specified works.

(2) The undertaker must pay to National Highways the commuted sum prior to the issue of the provisional certificate.

(3) Paragraph 15 does not apply to any tunnelling works.

Commented [PB35]: NH has reinserted this paragraph to ensure that full protection is provided to NH and the SRN should the Applicant choose to rely on the wide powers available in the DCO to carry out additional highway works beyond the tunnelling.

A commuted sum is only payable should third party works result in the provision of new assets that require ongoing maintenance. NH accepts that this provision would not be relevant for the tunnelling works and sub paragraph (3) has been inserted accordingly.

Insurance

16. Prior to the commencement of the specified works the undertaker must effect and maintain in place until the ~~completion of all of the specified works~~issue of the final certificate, public liability insurance with an insurer in the minimum sum of £10,000,000.00 (ten million pounds) in respect of any one claim against any legal liability for damage loss or injury to any property or any person as a direct result of the execution of specified works or use of the strategic road network by the undertaker.

Indemnity

17. ~~(1)~~ The undertaker fully indemnifies National Highways from and against all reasonable costs, claims, expenses, damages, losses and liabilities suffered by National Highways ~~directly~~ arising from the construction, maintenance or use of the specified works or exercise of or failure to exercise any power under this Order within 30 days of demand save for any loss arising out of or in consequence of any negligent act or default of National Highways.

Maintenance of the specified works

18.—(1) The undertaker must, prior to the commencement of any works of external maintenance to the specified works, give National Highways 28 days' notice in writing of the date on which those works will start unless otherwise agreed by National Highways, acting reasonably. Works of inspection or maintenance undertaken from within the pipeline will not be subject to this paragraph.

(2) If, for the purposes of maintaining the specified works, the undertaker needs to occupy any road space, the undertaker must comply with National Highways' road space booking requirements and no maintenance of the specified works for which a road space booking is required shall commence without a road space booking having first been secured.

(3) The undertaker must comply with any reasonable requirements that National Highways may notify to the undertaker, such requirements to be notified to the undertaker not less than 14 days' in advance of the planned commencement date of the maintenance works.

(4) The provisions of paragraph 10 shall apply to the opening of any part of the strategic road network following occupation of any road space under this paragraph.

Land

19.—(1) Following the issue of the final certificate pursuant to paragraph ~~14~~13(4) National Highways may serve notice on the undertaker that it wishes to take a freehold transfer of land within the extent of strategic road network boundary which is not in the ownership of National Highways but has been acquired by the undertaker for the purposes of carrying out the specified works.

(2) If the undertaker receives notice under sub-paragraph (1) then the undertaker must effect a freehold transfer of the land which is the subject of the notice and complete such transfer as soon as reasonably practicable at no cost to National Highways.

(3) Where not covered under paragraph 20 ~~T~~the undertaker must not under the powers of this Order:

(a) acquire or use land forming part of;

(b) acquire new or existing rights over; or

(c) seek to impose or extinguish any restrictive covenants over;

any of the strategic road network, or extinguish any existing rights of National Highways in respect of any third party property, except with the consent of National Highways by written request to ~~generalcounsel'steam~~legalservicesinbox@nationalhighways.co,uk.

(4) Where any land or interest is proposed to be acquired for the benefit of National Highways, the undertaker must, unless otherwise agreed by National Highways, exercise article 25 *(compulsory acquisition of land)* and article 27 *(compulsory acquisition of rights and restrictive covenants)* as applied by articles 31 *(application of the 1981 Act)* and article 33 *(modification of Part 1 of the 1965 Act)* of this Order to directly vest in National Highways any such land or interest.

Commented [PB36]: NH does not accept the Applicant's amends to this paragraph. It is NH's standard requirement for insurance to remain in place until the final certificate has been issued when all works are fully closed out.

Commented [PB37]: NH does not accept this additional wording added by the Applicant. To ensure adequate protection to the public purse the indemnity should not be qualified in such a manner and the Applicant should be responsible for all liabilities etc suffered by NH as a result of its works. Given the nature of the proposed works there is the possibility of damage being caused indirectly to NH which would not have occurred had the works not taken place.

Commented [PB38]: Sub paragraph (4) had been deleted by the Applicant but is reinserted by NH given the reinsertion of paragraph 10 above.

Commented [PB39]: NH has reinserted these provisions which had been deleted by the Applicant as they are necessary to protect NHs interests and statutory undertaking.

Should the Applicant be granted compulsory powers in respect of land beneath the SRN to carry out its works sub-paragraphs (1) and (2) would enable NH to take ownership back once works had completed and therefore remove some of the concerns it has in this respect. This should be uncontroversial given the Applicant has already stated it does not want the freehold ownership, but requires the powers to ensure it can carry out its works.

Sub paragraph (3) records a commitment for the Applicant not to exercise CA powers without NH consent. Noting the commitments made at paragraph 20 this sub paragraph has been amended accordingly -see further comments below.

Land

20.—(1) The undertaker must not, in reliance on or in exercise of any power under this Order, interfere with, remove, damage or prevent or impair the functioning of, and must on reasonable request (or in case of emergency, on demand) allow access by National Highways to, the highway drainage assets located in plots 2-14, 4-20, 5-01, 5-02, 5-03, 5-04, 5-10, 5-14, 5-15, 5-20, 5-22, 5-23, 6-02, 6-04, 6-05, 6-06.

(2) The undertaker must not, in reliance on or in exercise of any power under this Order, interfere with, remove or prevent access by National Highways in pursuance of any right held over plots 2-03, 2-14 and 5-05.

(3) The undertake must not, in reliance on or in exercise of any power under this Order, acquire, extinguish or remove any right National Highways holds for the purposes of its undertaking in any of the plots listed in sub-paragraph (1) and (2) and plot 9-04.

Commented [PB40]: The addition of this provision by the Applicant is welcomed by NH and would enable it to remove its objection to a significant number of plots. However, it is not as wide as the NH standard paragraph above (19) and does not cover all of NH interests which is a concern.

Expert Determination

~~20.~~21.—(1) Article 49 *(arbitration)* of the Order does not apply to this Part of this Schedule.

(2) Any difference under this Part of this Schedule may be referred to and settled by a single independent and suitable person who holds appropriate professional qualifications and is a member of a professional body relevant to the matter in dispute acting as an expert, such person to be agreed by the differing parties or, in the absence of agreement, identified by the President of the Institution of Civil Engineers.

(3) On notification by either party of a dispute, the parties must jointly instruct an expert within 14 days of notification of the dispute.

(4) All parties involved in settling any difference must use all reasonable but commercially prudent endeavours to do so within 21 days from the date that an expert is appointed.

(5) The expert must—

(a) invite the parties to make submission to the expert in writing and copied to the other party to be received by the expert within 7 days of the expert's appointment;

(b) permit a party to comment on the submissions made by the other party within 7 days of receipt of the submission;

(c) issue a decision within 7 days of receipt of the submissions under sub-paragraph (b); and

(d) give reasons for the decision.

(6) Any determination by the expert is final and binding, except in the case of manifest error in which case the difference that has been subject to expert determination may be referred to and settled by arbitration under article 49 *(arbitration)*.

(7) The fees of the expert are payable by the parties in such proportions as the expert may determine or, in the absence of such determination, equally.