North West & Central (NW&C) Region

North West Route

Moorgate Halt Level Crossing

Impact Risk Assessment Report

Report Reference:	IAR/MVL3/13.26

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Contents

Reference Documents

Ref.	Name	Date	Version
1	Level Crossings: A Guide for Managers, Designers and Operators	December 2011	2234207

2	Principles for Managing Level Crossing Safety	15 June 2021	1
3	Moorgate Halt LC Narrative Risk Assessment (NRA)	16 August 2022	-

1. Background

1.1. This report has been commissioned to allow for assessment of the likely impact that the Transpennine Route Upgrade scheme and their railway improvements will have on user safety. This report will also help determine what action is to be taken to ensure the change in safety risk suitability it addressed.

1.2. Transpennine Route Upgrade project is a large scheme of works happening across multiple lines of track. For Moorgate Halt specifically, these improvements include a more frequent train service, an increased linespeed and electrification of the line,

1.3. Network Rail also has a legal responsibility under the Management of Health and Safety at Work Regulations 1999. Section 3 focuses on the requirement for suitable and sufficient assessments of risk to health and safety of employees and others in connection with their undertaking.

2. Level Crossing Details

Name of crossing	Moorgate Halt
Type	Footpath with Wicket Gates (FPW)
ALCRM Risk Rating	**C4**
Fatality Weighted Index (FWI)	**0.00369509**
Engineers Line Reference (ELR)	MVL3
Mileage	13m 26ch (572yds)
Region / Route	NW&C Region / North West Route
OS Grid Reference	SD998066
What3words	verb.siesta.foresight
Number of lines crossed	2
Line Speed (mph)	65mph
Electrification	N/A
Signal Box	Manchester East Signalling Centre

2.1. As part of a level crossing risk assessment, data is entered into the industry accepted risk modelling support tool (All Level Crossing Risk Model – ALCRM) which enables Network Rail to compare risk at all level crossings throughout the network. Results for this level crossing are referenced above; further calculation details are provided later in this document.

2.2. The Crossing is classed as an unprotected 'passive' crossing. This means there is no active warning of train approach; users are not protected from train movements and trains traverse the Crossing irrespective of whether

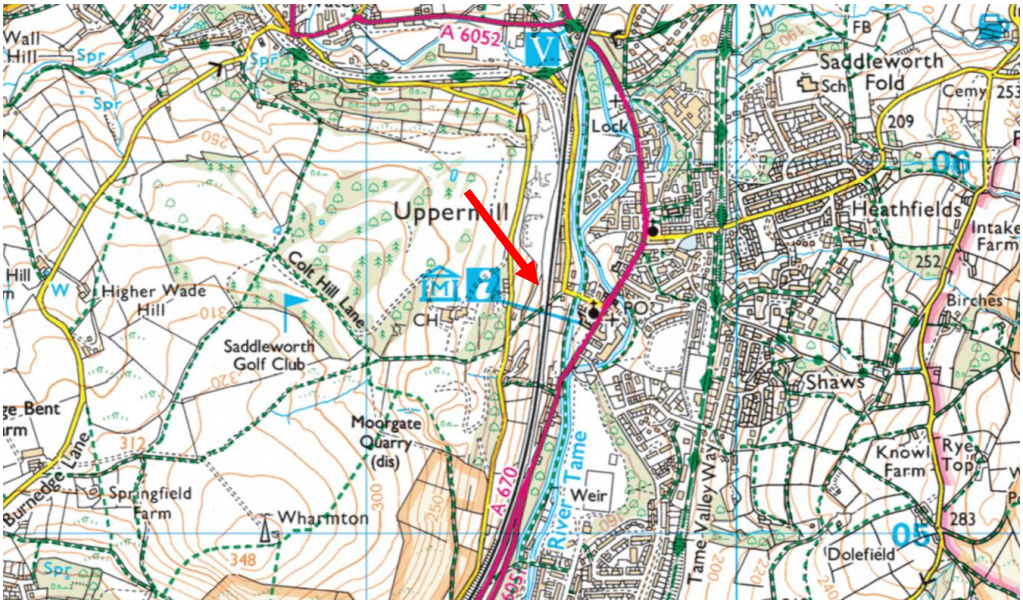
it is clear. Apart from the provision of whistle boards, which do not provide any significant level of mitigation outside of the NTQP (and none during the NTQP), users are required to decide by themselves, whether to cross by looking in both directions for the absence of trains.

3. Aerial Photos of the Crossing

Figure 1 – Satellite view of the level crossing

Figure 2 – Drone view of the level crossing from Route View

3.1. Ordnance Survey Map of the Town and crossing



4. The Local Environment

4.1. Moorgate Halt is a public footpath level crossing that is located in the village of Uppermill which has an approximate population of 7,500 based on a 2001 census. Uppermill is part of the parish of Saddleworth which has an approximate overall population of 30,700 (based on 2011 census). The surrounding area is a mixture of rural land and urban land.

4.2. The crossing receives a high volume of usage and is used as an access into the centre of Uppermill for many. This usage includes a higher than usual number of vulnerable users.

4.3. With regard to vulnerable users, there is a sighting deficiency on the down side train approach. As a result, a temporary speed restriction has been imposed on the crossing in order to achieve the suitable sighting for a vulnerable user.

5. Site Factors

5.1. Crossing Environment

5.1.1. This crossing is located between Greenfield station and Marsden station. At this location the crossing spans two lines with a maximum line speed of 65 mph. Due to a sighting issue on the down side, a temporary speed restriction has been placed at 55mph. The railway is orientated from north to south.

5.1.2. Normal passenger services run between the hours of 06:00 and 22:00 with approximately 117 services per day. Freight services also traverse this line with approximately 10 services running through the full 24 hours. The number and frequency of services can fluctuate depending on operational requirements, engineering works or during times of disruption.

5.1.3. Train service improvements here include an increased train service to 192 passenger services per day and 15 freight services. The linespeed is also increased to 80mph with electrified overhead line equipment.

5.1.4. On approach to the Crossing from the east (i.e. from the town) the first track met is the 'Up' line with the direction of train travel thereon, on approach from the right. The 'Up' side approach is via a public footpath which leads from Moorgate Street. This approach is on a steep incline towards the crossing.

5.1.5. On approach to the Crossing from the west the first track met is the 'Down' line, with trains also approaching from the right. The 'down' side approach is via a steep decline down Dark Lane. At this location, , the path is unmade and may be difficult to navigate for some users.

5.1.6. The Crossing traverses the dual track railway at 90 degrees (perpendicular). The surface is of rubber construction known as a Holdfast unit; the surface has built in anti-slip properties. The Crossing surface is in a good state of repair, with all required signage in position. The decision point is identified by the CC03 'Stop, Look, Listen' signs.

5.1.7. There is no lighting at the Crossing so visibility of the approaches, deck and signage is ambient with surrounding conditions during night/dusk. This crossing is known to have users traversing during the hours of darkness, the most recent census captured 6 users traversing between the hours of midnight and 6am.

5.1.8. Both approaches to the Crossing within the railway boundary are corralled with wooden handrail which guides all pedestrians up to the decision point. This helps to keep crossing users to the correct crossing point and dissuade from trespass.

5.2. Sighting Distance of Approaching Trains

5.2.1. The general principle of compliance at passive level crossings, where the user must make their own decision when to cross, is that the Crossing time must be less than the sighting time of the fastest train. The sighting time, measured in seconds, is the time from which the full front of the train is first visible to the user from the Decision Point to its arrival at the Crossing.

5.2.2. Based on the 65mph line speed, users of the Crossing require a minimum of 330m of sighting in order to cross in safety.

5.2.3. This was calculated against a traverse of 9m, being the distance between the decision points, at a walking speed of 1.189m/s for an unencumbered, able-bodied pedestrian. The traverse time was then increased by 50% owing to the high number of vulnerable users, resulting in a traverse time of 11.35 seconds.

5.2.4. The available sighting on the down side looking towards the train approach is significantly less than the required due to track curvature. As a result, a temporary speed restriction has been imposed at 55mph.

Up side looking up

Down side looking up

Up side looking down

Down side looking down

5.2.5. When stood on the down side looking towards train approach f the sighting is deficient by 44 metres giving a user 1.51 seconds less than the required warning time to cross.

5.2.6. This level crossing is also a location at which there is the possibility for a second train to pass over the Crossing within 20 seconds of an earlier, first train. This creates a high risk from the 2nd train being hidden from view as the 1st train passes, and for several seconds after passing, the sound of the 1st train also masks the sound of the 2nd train approaching from the opposite direction.

5.2.7. The Transpennine Route Upgrade are increasing their linespeed as part of the railway improvement works and the full benefit of the project will not be achieved if a temporary speed restriction remains on the crossing

5.2.8. Based on the improved 80mph line speed, users of the Crossing require a minimum of 406m of sighting in order to cross in safety.

5.2.9. The available sighting on the down side looking towards the train approach will be significantly less than the required. When stood on the down side looking towards train approach the sighting is deficient by 120 metres giving a user 3.35 seconds less than the required warning time to cross.

	Minimum sighting distance required (m)	Available sighting distance (m)	Comments	Warning time provided by sighting distance (seconds)
Up side looking at trains travelling in the up direction	330	488	Measured to track curve.	16.79
Up side looking at trains travelling in the down direction	279	429	Measured to track curve.	14.76
Down side looking at trains travelling in the up direction	330	482	Measured to track curve.	16.59
Down side looking at trains travelling in the down direction	279	286	Measured to track curve.	11.63

6. ALCRM Scoring

6.1. The Qualitative risk assessment is based on data collected at the Crossing and entered into ALCRM. This is a computer-based application used by Network Rail to assist in the risk management of level crossings. The risk result consists of a 'letter' and 'number' classification of safety risk, giving the 'letter' (A-M for individual risk) or 'number' (1-13 for collective risk) band. These rankings represent the range of risk across all types of crossings where A and 1 are the highest and M and 13 are the lowest.

6.2. The Crossing is currently ranked as a C4, with an FWI of 0.00369509. This puts the crossing 42nd out of 457 crossings in terms of highest risk and 6th out of 93 in crossings of a similar type.

6.3. The Collective Risk is Measured in FWI/year and assigned a score from 1-13 (1 being the highest). It is specified for each user type, on-board staff and passengers for non-derailment events and on-board derailment.

6.4. The Risk Per Traverse is measured in FWI/traverse and assigned a score from A-M (A being the highest).

6.5. Following the Transpennine Route Upgrade improvements, the Crossing is ranked as a B3 with an FWI of 0.006663373. This equates to an 80% increase in risk.

7. Current Issues and Risks Recorded On Site:

7.1. Identify Hazards

Hazard	Potential impact	Mitigations
Trains	Fatality or serious injury	• Level crossing signage. • Rubber crossing surface with anti-slip properties. • Vegetation checked during inspections
Underfoot conditions	Fatality or serious injury	• Appropriate crossing decking for crossing type and location. • Regular crossing inspections and maintenance regime in place. • Vegetation checked during inspections
Difficulty on hearing or seeing approaching trains due to inclement weather	Fatality or serious injury	• Level crossing signage. • Vegetation checked during inspections. • Rubber crossing surface with anti-slip properties.
Darkness	Fatality or serious injury	• Review of night time usage completed midnight to 06:00 hours – 6 users during NTQP. • LED solar deck lights provided.
Vegetation growth between visits reducing the ability to see trains approaching crossing	Fatality or serious injury	• Vegetation checked during inspections. • Regular inspection and maintenance regime in place.
Vulnerable users	Fatality or serious injury	• Standard crossing layout, compliant with ORR (Office of Rail and Road) guidance. • Instructional signage at crossing. • Increased traverse time [by 50%] • Temporary speed restriction enforced.
Unfamiliar users	Fatality or serious injury	• Standard crossing layout, compliant with ORR (Office of Rail and Road) guidance. • Instructional signage at crossing • Rubber crossing surface with anti-slip properties. • Vegetation checked during inspections.
Increased usage due to future developments	Fatality or serious injury	• Review and update this risk assessment appropriately – no nearby known developments at the time of assessment.

7.1.1. There are known issues with fog at certain times of the year that might impair visibility of trains approaching the Crossing. Foliage and vegetation had to be regularly cut back during inspections or works orders were issued when larger areas require cutting back.

7.1.2. The NRA previously did not identify sun glare as a risk, although it is a known issue which may further impair visibility of approaching trains for a short period at certain times of the day, particularly in the months of July and August.

7.2. Census Details

7.2.1. Network Rail uses a minimum of nine days when carrying out a census of use at level crossings. The most recent NRA used a census over 11 days (25/03/2022 – 04/04/2022) whereby a total of 434 pedestrian movements across the Crossing was recorded. High level data from the census counted:

- Adult pedestrians: 418;
- Accompanied children: 8;
- Unaccompanied children: 8;
- Dogs on a lead: 82;
- Dogs not on a lead: 2;
- Cyclists: 13.

7.2.2. The crossing is known to have usage from vulnerable users due to its close proximity to the centre of Uppermill village. These results therefore necessitated and supported the increase of traverse time for pedestrian by 50%. This has also been supported by the report of misuse at the crossing, shown below.

7.2.3. During the census collection exercise, 6 pedestrians were also observed crossing during the night time quiet period (between midnight and 06:00 hours). With no ambient lighting on the Crossing, users crossing during the hours of darkness would require a personal light source.

7.2.4. Network Rail's internal safety management information systems have been interrogated and the incident history is provided below:

Event Date	**Description**
02/09/1994	ALLEGED NEAR MISS WITH A MALE
24/12/1995	ELDERLY MAN ON MOORGATE CROSSING
24/12/1995	2Z64 near miss with person on xing
17/01/2000	Female struck and killed by 6M07 at Moor Gate Footpath LC

09/02/2000	youths placed objects on the line
30/08/2002	Youths placed debris on the line
13/04/2005	Children placing ballast on the line
04/01/2006	Youths trespassing on the line
06/03/2008	Driver of 1K11 reported children placing ballast on the rail at Moorgate Foot crossing at Greenfield
22/03/2006	Person placing objects on the line
27/06/2008	Driver of 1P23 reported school children playing chicken at Stalybridge
05/06/2009	2M83 reported near miss with kids on foot crossing at Uppermill
29/05/2010	Near Miss - 1P47 reported a near miss with a group of youths who were sitting on the crossing.
31/05/2011	1P46 reported a near miss with an elderley woman and her dog at Moor Gate crossing.
21/08/2013	Fatality/Suicide - TPE 1P59 17:02 Newcastle - Manchester Airport struck a young male at Moorgate Halt Foot Crossing. BTP ref 551 RIDDOR
19/06/2014	Trespass - 2 girls aged approx 8-10 ran across the line at Moorgate Crossing in front of TPE 1E78 1812 Liverpool Lime Street-Newcastle. BTP Ref 582
03/11/2016	PA Fatality: TPE 1P29 0946 Middlesbrough - Manchester reported striking a person at Moorgate Halt FC.
03/12/2017	LC Near Miss: TPE 1K17 13:40 Hull-Manchester Piccadilly had a near miss with 4 youths at Moorgate Halt FPW level crossing

31/01/2018	LC Misuse - the driver of 1P40 (1406 Manchester Airport - York) reported an elderly male on Moorgate Halt Foot Crossing
16/03/2018	LC Near miss: TPE 1E64 0812 Liverpool Lime Street to Newcastle Central reported a near miss with a male and two dogs at Moorgate foot crossing
14/07/2018	Trespass - MESCC report, the driver of 1K72 (1153 Leeds to Manchester Piccadilly) reported observing four youths (three females and one male) approximately 13 years of age trespassing in the vicinity of Moorgate foot crossing, just Diggle side of Greenfield station.
22/11/2018	LC Misuse: 1K78 (14:53 Leeds to Manchester Piccadilly) reported 2 youths wearing uniforms jumping in front of trains at Moorgate LC.
25/04/2019	LC Misuse: 2M81 1617 Manchester Piccadilly to Huddersfield reported four school children playing chicken at Moorgate FP crossing
29/05/2019	LC Near Miss / LC Misuse - 9M12 (14:03 Newcastle Central - Liverpool Lime Street) reported a near miss with a pedestrian at Moorgate Halt Level Crossing.
21/10/2019	LC Near Miss / LC Misuse - 9M12 (1403 Newcastle Central - Liverpool Lime Street) reported a near miss with two young females at Moorgate Halt LC.
28/10/2019	LC Misuse - 1P73 (1147 Manchester Airport to Middlesbrough) reported two girls loitering at Moorgate Halt foot crossing.
11/12/2019	LC Near Miss / LC Misuse - 1P75 (12:47 Manchester Airport - Middlesbrough) reported having to apply the emergency brake due to an elderly female crossing at Moorgate Halt LC.
17/03/2020	LC Near miss: 2M74 1353 Huddersfield to Manchester Piccadilly reported a near miss with four youths at Moorgate Halt Level Crossing

08/07/2020	Object / LC Misuse / Trespass - 1K26 (16:08 Hull - Manchester Piccadilly) reported youths placing ballast on the line at Moorgate Level Crossing.
09/07/2020	LC Misuse / Trespass - 1K27 (16:30 Manchester Piccadilly - Hull) reported two males taking photographs on the line at Moorgate Halt LC.
09/08/2020	LC Near Miss / LC Misuse - 1K22 (14:06 Hull - Manchester Piccadilly) reported a near miss with an elderly couple at Moorgate Halt LC.
05/10/2020	LC Near Miss / LC Misuse - 1K23 (14:35 Manchester Piccadilly - Hull) reported making an emergency brake application due to a person stepping out onto Moorgate Halt LC.
14/06/2021	LC Misuse - 1K34 (20:08 Hull - Manchester Piccadilly) reported a person running across the crossing as the train approached Moorgate LC.
26/08/2021	LC Near Miss / LC Misuse - 1P85 (1738 Manchester Airport - York) reported a near miss with four youths at Moorgate Halt LC.
13/04/2022	Near miss/LC Misuse: 1P78 (15:07 Redcar Central - Manchester Airport) made an emergency brake approaching Moorgate Halt LC due to two male youths
11/08/2022	LC Near Miss / LC Misuse: 1P17 (07:54 Liverpool Lime Street - Newcastle) reported having to apply the emergency brake due to a pedestrian strolling across Moorgate Halt LC

8. Options Evaluated

8.1. Detailed below are the options that have been considered to reduce the risk at the crossing and whether this is sufficient to open the crossing for public use, balanced against gross disproportionality of the costs against the benefit achieved (see section 13).

Option	**Original ALCRM score**	**New ALCRM score**	**New ALCRM FWI**	**Safety benefit %**	**Cost**	**Remarks**
Closure by Diversion of Public Right of Way	C4	M13	0.000	100%	**£25,000**	**This is the only option to achieve ALARP**

Closure by Pedestrian Overbridge	C4	M13	0.000	100%	£1,200,000	This option is not suitable due to signal sighting.
Closure by Pedestrian Underpass	C4	M13	0.000	100%	£2,500,000	This option is not suitable due to gradients.
Installation of VAMOS (Overlay MSL)	C4	D5	0.000867134	76%	£500,000	This option is not technically feasible due to signal positioning.
Installation of integrated Miniature Stop Lights (MSL)	C4	D5	0.000867134	76%	£1,200,000	Not suitable under Signalling principles.
Maintain current crossing "as is"	C4	B3	0.006663373	-80%	£0	This would leave the crossing unsafe for the public.

8.2. The Optioneering concludes that the only practical option that removes the increased safety risk to users is the closure of the crossing by diverting the public right of way. All other options either not sufficiently reducing risk or the expense is not justifiable, being grossly disproportional to the benefit achieved.

9. Option Consideration

9.1. Technical Considerations

9.1.1. Technical considerations include new signalling and electrification at the crossing which will involve new signalling positions. This will affect any options that have an option integrated to the signalling system.

9.2. Options Considered

9.2.1. The following options have been further considered as risk solutions at the Crossing if it is to be reopened:

i. Closure by Pedestrian Overbridge;

ii. Closure by Pedestrian Underpass;

iii. Installation of VAMOS (Overlay MSL);

iv. Installation of integrated Miniature Stop Lights (MSL);

v. Maintain current crossing "as is";

vi. Closure by Diversion of Public Right of Way.

9.2.2. All but one of these scenarios have been discounted for the following reason**:**

<u>i. Closure by Pedestrian Overbridge – Discounted</u>

9.2.3. This option was the first choice of the Transpennine Route Upgrade and provides a 100% risk reduction as the crossing would be removed completely.

9.2.4. Due to new signal positions following the completion of this phase of the Transpennine Route Upgrade project, a pedestrian footbridge would not be suitable at this location. The erection of a footbridge here would block signal sighting for oncoming train drivers and would affect the running of the operational railway. These signals cannot be moved since the distance between these and other signals must give train drivers sufficient notice to start braking before a red signal.

9.2.5. The possible location of a proposed footbridge is also very limited. The geographical complexities of the area at the crossing and nearby, mean that it will still affect signal sighting even if moved slightly.

9.2.6. The erection of an overbridge would also have an impact on a lineside neighbour. Overhead line equipment is being constructed here in order to electrify the line. The overbridge would need to be large enough to clear the overhead equipment. Due to this and the need to maintain sufficient sighting distances of the operational railway the location of any new footbridge would result in users being able to see into the properties of our lineside neighbours and thus reduce privacy.

ii. Closure by Pedestrian Underpass - Discounted;

9.2.7. This option would remove the risk at the crossing by constructing an underpass and give users the ability to reach either side of the railway without having to traverse the level crossing.

9.2.8. There are steep gradients on both sides of the crossing which impact the construction of this option. Due to the steep gradients on approach to the level crossing, the underpass would have to be constructed deeper into the ground which would mean additional earth works and would also create incredibly long and steep gradients on either side of the railway. Additionally, this option may introduce new risks such as anti-social behaviour or flooding (the latter is considered high-risk in this location due rural area and the steep gradients on either side of the railway.

iii. Installation of VAMOS (oMSL) – Discounted;

9.2.9. The VAMOS system provides a visual indication of a train approach via a red or green light; if the system displays a red indication, a train is approaching meaning it is not safe to cross, whereas if the system displays a green indication there are no trains in section meaning it is safe for a user to cross.

9.2.10. The system is similar to MSL, however it does not link into the signalling system. Instead, treadles are overlaid onto the track allowing a train to ‘strike in’ at a designated point. Once a train strikes in the system will display a red indication which shows a user it is not safe to cross. After the train has passed over the level crossing, it will ‘strike

out' changing the indication to green, showing a user it is safe to cross. As the option is not integrated to the signalling system, it comes with many more technical constraints.

9.2.11. This option provides a 76% risk reduction and would mitigate the sighting issue for vulnerable users by providing an active warning.

9.2.12. However, a VAMOS system is not technically feasible at this location. Due to the new signal position, the signal would be located within the 'strike in' point. This means that there is a possibility that a train could be held at a danger signal whilst the system is showing a red aspect. If this were to happen, the VAMOS system would fail and go into 'dark mode'. This would cut all aspects from the system and a colour aspect would not be shown.

9.2.13. This would leave pedestrians with a dilemma of whether to cross or not. A user may cross whilst the crossing is in dark mode and a train on approach. This increases the risk of a collision between a user and a train greatly.

iii. Miniature Stop Lights – Discounted;

9.2.14. Red and Green Miniature Stop Lights provide a visual indication of a train approach via a red or green light; if the system displays a red light, a train is approaching meaning it is not safe to cross, whereas if the system displays a green light there are no trains in section meaning it is safe for a user to cross.

9.2.15. The introduction of MSLs assumes that all users of the crossing pay attention to the warning given by the lights and that they are not ignored. Research from the RSSB states that: *"When in a group of people, individuals are prone to following the 'herd mentality', paying less attention to their surroundings and following the decision-making of the group as a whole. This may be particularly problematic at footpath and bridleway crossings on routes used often by ramblers. Young people in groups also exhibit more risky behaviour. A young person's attitude to risk tends to be one of a 'risk adopter'. Although most young people will not engage in extremely dangerous behaviour, peer group dynamics can encourage them to behave more dangerously than they would when on their own"*.

9.2.16. In addition to the above, integrated MSLs are not suitable at this location under signalling and safety principles.

vi. Maintain current crossing "as is" – Discounted;

9.2.17. This option would be to simply leave the crossing in its current state following the improvements provided by the Transpennine Route Upgrade project.

9.2.18. The improvements made by the project would mean the crossing would be at a higher risk than ever, an increase of 80% from the current

crossing risk. This would leave the crossing at a B3 with an FWI of 0.006663373.

9.2.19. An electrified line would mean overhead line stanchions would be erected in order to construct the electrified wire. The erection of these stanchions would impact a user's sighting an would decrease the view, increasing the risk to a pedestrian traversing the crossing.

9.2.20. A higher line-speed would mean the user has a less amount of time to cross and be in a position of safety, at present there is a speed restriction on the down side and this would need to be removed in order to experience the benefits of the project.

9.2.21. Also, due to a new signal location, there is potential for a train to be stopped at a danger signal whilst also straddling the crossing and blocking a user's path. A public right of way is not allowed to be blocked at any point and therefore this option would not be suitable.

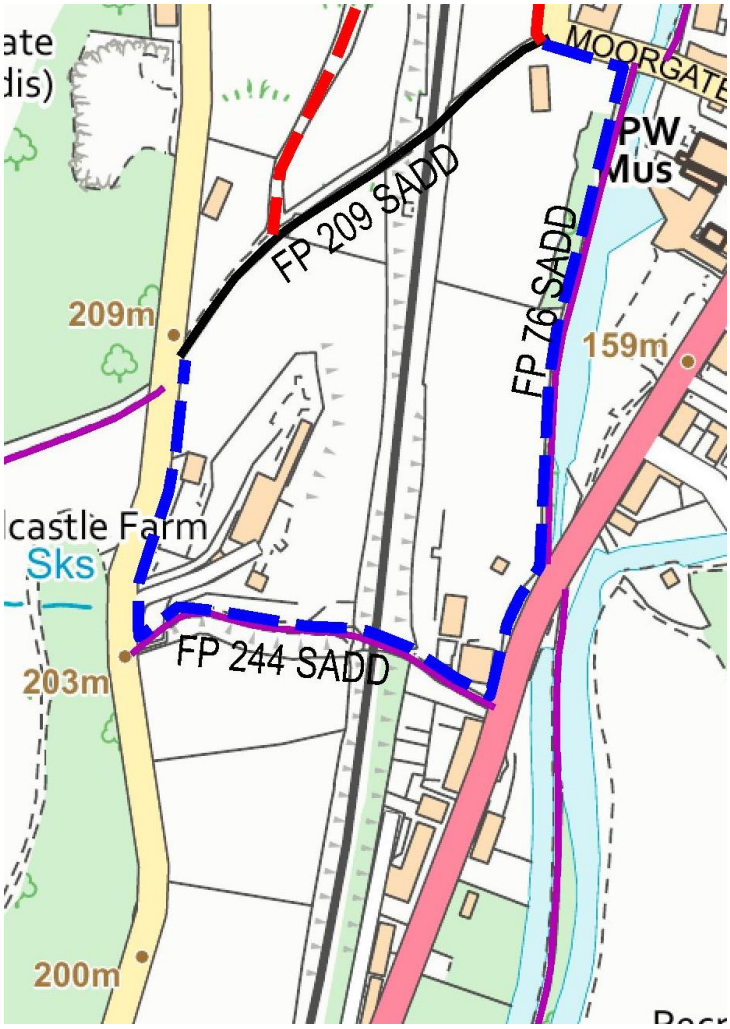
9.3. Taking into account the risks and costs associated with the above options the only remaining viable option is:

viii. Closure by Diversion of Public Right of Way:

9.3.1. This option would completely remove the risk by eliminating the crossing altogether and allow users to reach either side of the railway without coming into contact with the running railway.

9.3.2. The diversionary length is very short at 440m and uses existing public footpath routes FP244 SADD and FP 76 SADD.

9.3.3. With the increased linespeed, electrified line and more trains, along with the new signalling installation and the current type/volume of use at the crossing, this is the only option that is suitable and safest for the local public.



10. Gross Disproportionality Test

10.1. Applying the Gross Disproportionality Test

10.1.1. The risk of death or injury to an existing highway user of the Crossing is an unacceptable risk. Thus, the Cost Benefit Analysis (CBA) and Gross Disproportionality Test is applied to calculate a value of works that would be justifiable for NR to fund, to mitigate the risk.

10.1.2. To support the understanding of whether the risk at the Crossing is managed SFAIRP, the CBA is undertaken to provide a Benefit Cost Ratio (BCR); the principle being, if the cost of implementing a control measure is grossly disproportionate to the reduction in the risk that might be achieved, then it is reasonable for NR not to implement that control measure.

10.1.3. Additionally, a Gross Disproportion Factor (GDF) is applied to the BCR using one of the following factors:

- Medium = BCR x 1.5
- High = BCR x 2.5
- Exceptional = BCR x 6

10.1.4. The criteria for defining the correct multiplier is determined by considering the level crossing against the following criteria using a question bank [Ref. Appendix B]:

- Culpability – weighting deliberate misuse against genuine mistakes.
- Vulnerability – to reflect a greater responsibility towards those less able to protect themselves.
- Societal aversion – addressing the absence of public appetite for credible mass casualty train accidents.
- Uncertainty – for the degrees of confidence in our knowledge of the pattern of apply, which encompasses elements such as who/how/with/what consequences.

10.1.5. **The highest level indicated across all questions determines the appropriate GDF level to use and Moorgate Halt has been deemed as a high rated crossing, so a 2.5 factor is applied** (See Appendix A)**.**

10.1.6. The resultant GDF score informs and supports decision making based on the following criteria:

a. Benefit to cost ratio is ≥ 1: positive safety and business benefit established (GREEN).

b. Benefit to cost ratio is between 0.99 and 0.5: reasonable safety and business benefit established where costs are not grossly disproportionate against the safety benefit (AMBER).

c. Benefit to cost ratio is between 0.49 and 0.0: weak safety and business benefit established (RED).

10.1.7. The guidance provided to the level crossing / project teams is.

- GREEN: There would be a legal requirement to deliver the applicable intervention.
- AMBER: A record of the business decision / justification on the applicable intervention (or not where the decision is to not deliver any risk mitigation activity) is required.
- RED: No action would be proposed.

10.1.8. Section 12.3 of this Report considered all possible options for this crossing. Of those that remain viable, the key information is detailed below in Table 3.

10.2. Table 3 – GDF Assessment:

	Updated ALCRM Score	FWI Rating	Option Cost	Benefit Cost Ratio (BCR)	Equivalent Financial Benefit	BCR including Gross Disproportion Factor (GDF)
Closure by Diversion of Public Right of Way	M13	0	**£25,000**	**7.21**	**£180,330**	**18.025**
Closure by Pedestrian Over Bridge	M13	0	**£1,200,000**	**0.15**	**£180,330**	**0.375**
Closure by Pedestrian Underpass	M13	0	**£2,500,000**	**0.07**	**£174,066**	**0.175**
Installation of VAMOS (Overlay MSL)	D5	0.00867134	**£500,000**	**0.26**	**£131,363**	**0.65**
Installation of Integrated Miniature Stop Lights (MSL)	D5	0.00867134	**£1,200,000**	**0.11**	**£131,363**	**0.275**
Maintain Current Crossing "as is"	C4	0.0369509	**£0**	**0.00**	**£0**	**0.00**

10.2.1. Table 3 indicates that closure by a diversion of public right of way offers the strongest safety justification.

10.3. Application of GDF on Remaining Option

- Against each of the high cost options, closure by a diversion of public right of way is the most feasible, on safety and achieving risk reduction to ALARP, and on cost.
- The diversionary route will add approximately 440 metres to the distance required for a user to reach the other side of the railway.
- Table 3 summarises the information which is exclusively quantitative in nature, i.e. the data comes direct from the ALCRM and CBA tools managed and held by Network Rail.
- The qualitative element of this assessment clearly shows that closure by Extinguishment offers a positive Gross Disproportionate Factor which confirms the requirement to deliver the applicable intervention at this level crossing.

11. Conclusion and Recommendation

11.1. Both the qualitative and quantitative issues identified at this site can be proven as high risk, requiring to be mitigated to ALARP.

11.2. This report considers the qualitative data that calculated the qualitative assessment rating by ALCRM, supporting the information detailed within the existing NRA with what was found during the site survey. In conclusion;

- **The increased risk following the Transpennine Route Upgrade improvements at the crossing is unacceptable and the crossing should be closed.**

11.3. Closure provides the greatest risk reduction as it removes all risks associated. The short diversionary route gives the ability for users to reach either side of the railway without coming into contact with it.

11.4. **Recommendation:** To close the crossing via diverting the public right of way.

Appendix A – Level Crossing GDF Level Determination Pro-forma

Moorgate Halt Level Crossing assessment highlighted in yellow

Culpability - weighing deliberate misuse against genuine mistakes				
What is the level crossing incident history since the last risk assessment?	Deliberate misuse events only	0 - 5 accidental misuse events	5 - 25 accidental misuse events	>25 accidental misuse events
GDF Level	**medium**	**medium**	**high**	**exceptional**
Vulnerability - carrying a greater responsibility for those less able to protect themselves				
Who uses the level crossing	No vulnerable users identified	Vulnerable User CAT 1 (cyclists, dog walkers)	Vulnerable User CAT 2 (children, elderly, encumbered, disabled, parents with young children)	
GDF Level	**Medium**	**Medium**	**high**	
Societal Aversion - addressing the absence of public appetite for credible mass casualty events				
What is the most credible worst-case scenario for a train accident consequence in a single event	Event with the potential of a single specified injury to 5 specified injuries (between 0.1 and 0.5 FWI).	Event with the potential of between 5 specified injuries and 2 fatalities (between 0.5 and 2 FWI).	Event with the potential of between 2 and 10 fatalities (between 2 and 10 FWI).	Event with the potential of between 2 and 10 fatalities (between 2 and 10 FWI).
GDF Level	**Medium**	**Medium**	**High**	**Exceptional**
Uncertainty – how confident are we that we know the pattern of use? This encompasses elements such as who/how/with what consequences				
Does the level crossing currently have a passive or active warning?	Active		**Passive**	
GDF Level	**Medium**		**High**	
Does the local environment create uncertainty in the currently understood user demographic?	**No**		**Yes**	
GDF Level	**Medium**		**High**	
Uncertainty – for private level crossings				
Who uses the crossing?	Authorised user or regular, controlled users only		Irregular users (delivery drivers etc.)	
GDF Level	**Low**		**Medium**	
Can we be certain what sort of vehicles use the crossing?	Confirmed by census	Described and confirmed by Authorised User		Unknown due to irregular users
GDF Level	**Low**	**Medium**		**high**
Uncertainty – for public road level crossings				
How effective is the current mitigation at the crossing? (barrier type)	Full Barrier	Half Barrier	Open crossing (if line speed is greater than 25mph)	
GDF Level	**Low**	**medium**	**High**	

Appendix B – Glossary

ALARP	As Low As Reasonably Practicable
ALCRM2	All Level Crossing Risk Model
BCR	Benefit Cost Ratio
CBA	Cost Benefit Analysis
ELR	Engineers Line Reference
FP	Footpath
FPW	Footpath with Wicket Gate
FWI	Fatalities and Weighted Injuries
GDF	Gross Disproportion Factor
LCM	Level Crossing Manager
MSL	Miniature Stop Lights
NR	Network Rail
ORR	Office of Rail and Road
SFAIRP	So Far As Is Reasonably Practicable
Vulnerable users	Vulnerable level crossing users can be defined as people who, when compared with typical users: are likely to take an extended time to traverse due to disability or distraction; and/or might be at greater risk of harm due to their perception of risk. **Types of vulnerable users:** Vulnerable users can include but are not limited to: People with physical and/or mental disabilities or other impairments; incl. those using mobility scooters. Young children; unaccompanied or in groups. Elderly people. Dog walkers. Cyclists, e.g., where known not to dismount and considered 'at risk'. People carrying heavy bags or large objects, with pushchairs etc. Non-English language speakers, e.g., migrant workers
WB	Whistle Boards
WG	Wicket Gate
Decision Point	Applies to user-worked crossings, footpath crossings and bridleway crossings. It is a point where guidance on crossing safely is visible and at which a decision to cross or wait can be made in safety. For footpath crossings this should be not less than 2m from the nearest running rails or 3m where the line speeds are higher than 160 km/h. For bridleway crossings and user-worked crossings this should not be less than 3m from the nearest running rail.
Encumbered	Crossing with bags, pushchairs, cycles or dogs (consider if dogs are on or off a lead (including the use of extendable versions), and if owners are in charge of more than one dog; it becomes increasingly harder to control multiple animals)