PROTECTED LEVEL CROSSING RISK ASSESSMENT

Anglia Route

Level Crossing Narrative Risk Assessment

Meldreth Road AHB

Planned 9th May 2022

1. LEVEL CROSSING OVERVIEW AND ENVIRONMENT

1.1 LEVEL CROSSING OVERVIEW

This is a risk assessment for Meldreth Road AHB level crossing.

Crossing Details	
Name	Meldreth Road AHB
Type	AHB
Crossing status	Public Highway
Overall crossing status	Open
Route name	Anglia
Engineers Line Reference	SBR – 49m 37ch
OS grid reference	TL388477
Number of lines crossed	2
Line speed (mph)	90
Electrification	No DC provided but OHLE present.
Signal box	Cambridge PSB

Risk Assessment Details	
Name of assessor	Andrew Waling
Post	Level Crossing Manager.
Date completed	09-05-2022
Next due date	08-08-2023
Email address	andrew.waling@networkrail.co.uk
Phone number	07860500842

ALCRM Risk Score	
Risk per traverse risk	**D**
Collective risk	**2**
FWI	**0.017870966**

1.2 INFORMATION SOURCES

Reason for Risk Assessment

Network Rail has a responsibility and legal duty under the Health and Safety at Work Act 1974 for the health, safety and welfare of its employees and for protecting others against risk.

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.

Network Rail is committed to reducing the risk on the railway and has identified that one of its greatest public risks is at level crossings. This is where the railway has a direct interface with other elements e.g., vehicles and/or pedestrians. Network Rail is working to reduce this risk to as low as is reasonably practicable.

The table below shows the stakeholder consultation that was undertaken as part of the risk assessment.

Consulted	Attended site
LOMS, MOMS and signaller.	No
Crossing users and some local residents.	No
Police (BTP/Home Office Force)	No
Local Resident	No

Stakeholder consultation and attendance notes:

None of the above attended the site meeting for this Narrative Risk Assessment but al have been contacted either via telephone or email and their thoughts/recommendations have been noted within this document.

The reference sources used during the risk assessment included:

- CCIL
- Census Counter
- Geo-RINM
- SMIS
- Other Data Sources: Google maps, Bing maps, hazard directory and sectional appendix.
- South Cambs District Council
- Network Rail Town Planning

1.3 ENVIRONMENT

Approach Photos	
	
Upside crossing approach.	**Downside crossing approach.**

The road approach speed is estimated to be 30 to 40mph.

It is a Public Highway level crossing.

At Meldreth Road AHB level crossing the orientation of the road/path from the north is 65°; the orientation of the railway from the north to the up line in the up direction is 210°.

Sun glare

LCG13 assessing sun glare at public road level crossings has been completed and records risk as Tolerable with detailed sun glare risk assessment not needed

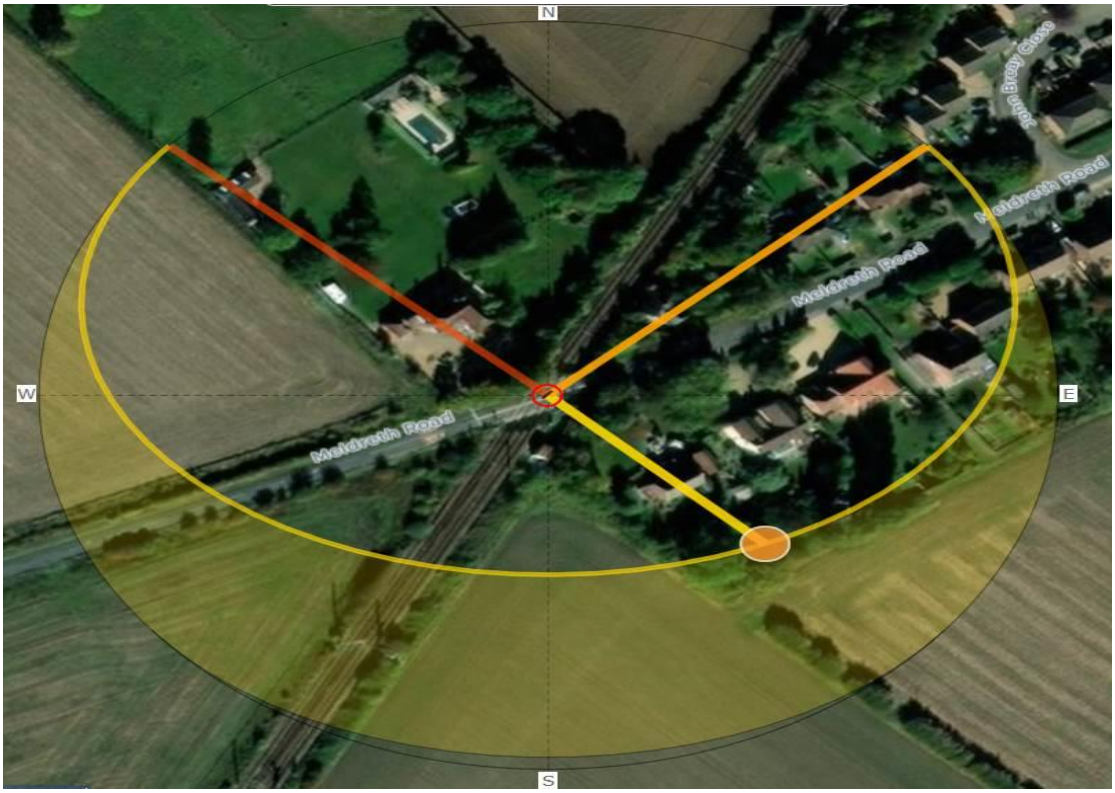
Impact of low sun on the crossing

Below is the output from the Sun Calc application, which shows the lines of sunrise and sunset angles at two times of year (longest day June 21st & shortest day December 21st) when low sun would align with the rail approaches and might impact on the sighting.

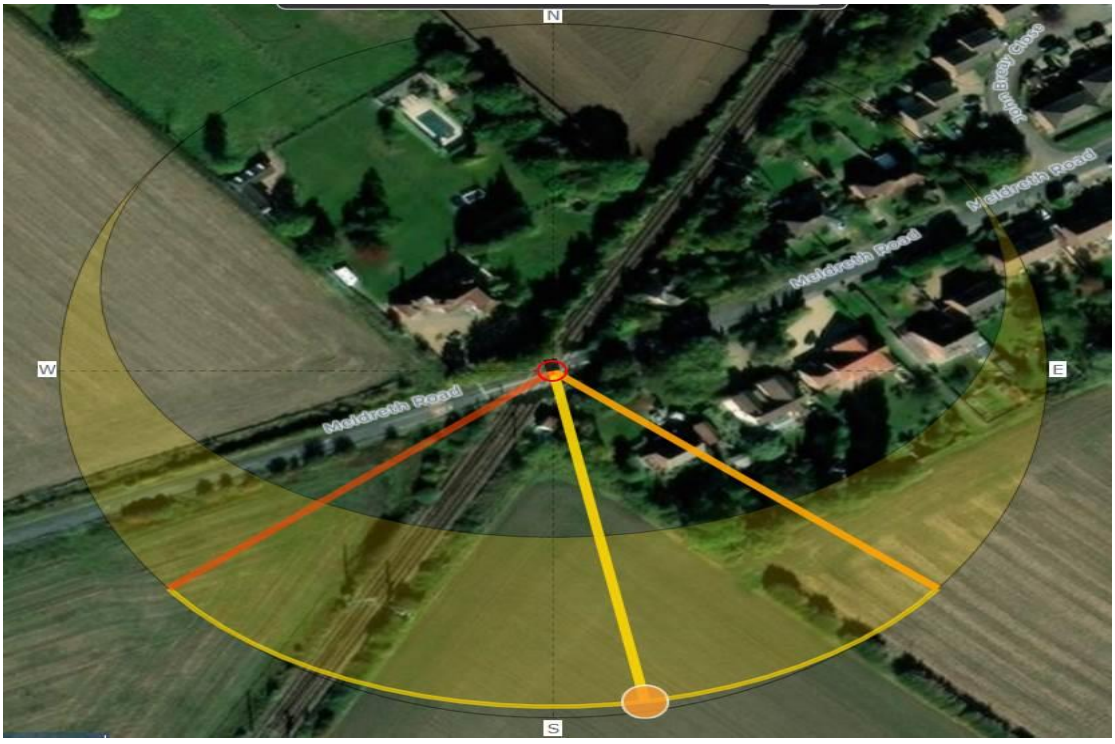
The thin orange curve is the current sun trajectory, and the yellow area around is the variation of sun trajectories during the year. The closer a point is to the centre, the higher is the sun above the horizon.

The yellow line shows the direction of sunrise; the dark orange line the direction of sunset and the mid orange line the direction at a selected time of day (shown by the orange circle above the satellite image).

Longest Day June 21st.



Shortest Day December 21st.



There are no planned or apparent developments near the crossing which may lead to a change or increase in use or risk.

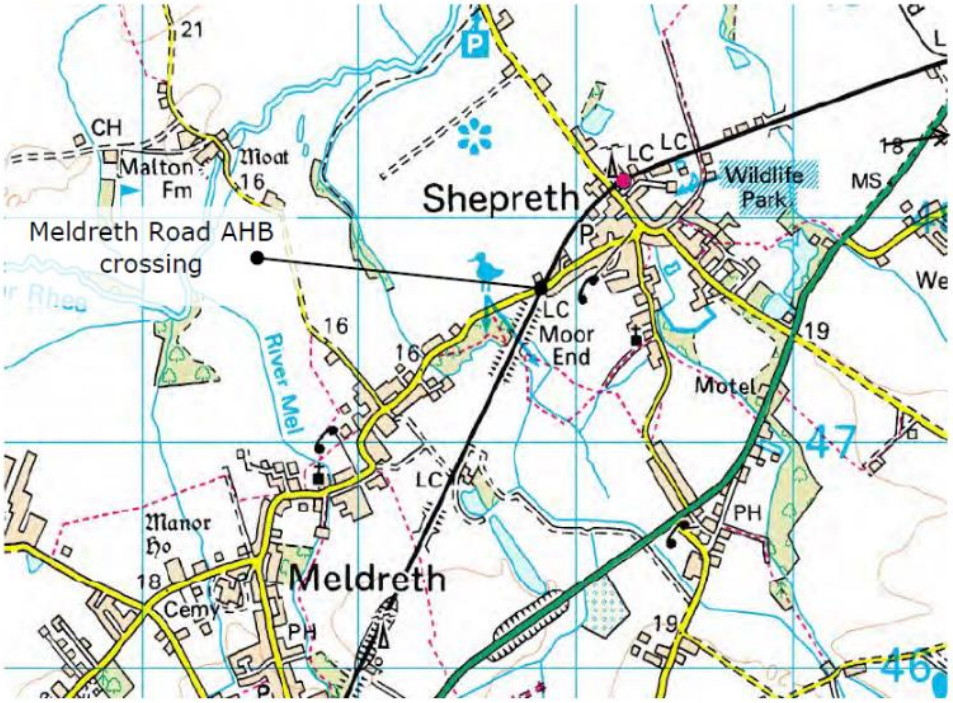
Site Visit General Observations:

There are no planned or apparent developments near the crossing which may lead to a change or increase in use or risk, this has been checked with South Cambs District Council and Network Rail Town Planning.

The crossing is located on Meldreth Road southwest of the village of Shepreth providing access to the village of Meldreth. The line-speed over the line is 90 mph in the Up direction and 65mph in the Down Direction. The train frequency is 217 trains per day, the line is also electrified, and this is deemed as live at all times.

There are local residential homes and various gateways near the crossing on both sides of the crossing and no yellow lines on floor near level crossing so cars could park on the road near the level crossing.
Risk of grounding signage is on both sides of the crossing but not necessarily required as crossing is relatively flat.
Foliage can be an issue on the approach if not regularly cut back and also, fog and sun glare can affect users at certain times of the year.
In the satellite view of the crossing below there are a few features that could cause issues which need to be considered within this risk assessment.

- The skew of the crossing relative to the road increasing the chance of vehicles weaving around the barriers.
- Long pedestrian walkways due to the skew of the crossing.
- Residents near to the crossing giving rise to the chance of blocking back.
- The absence of pavements either side of the crossing and narrow footways.
- Significant use of cyclists and motorcycles.

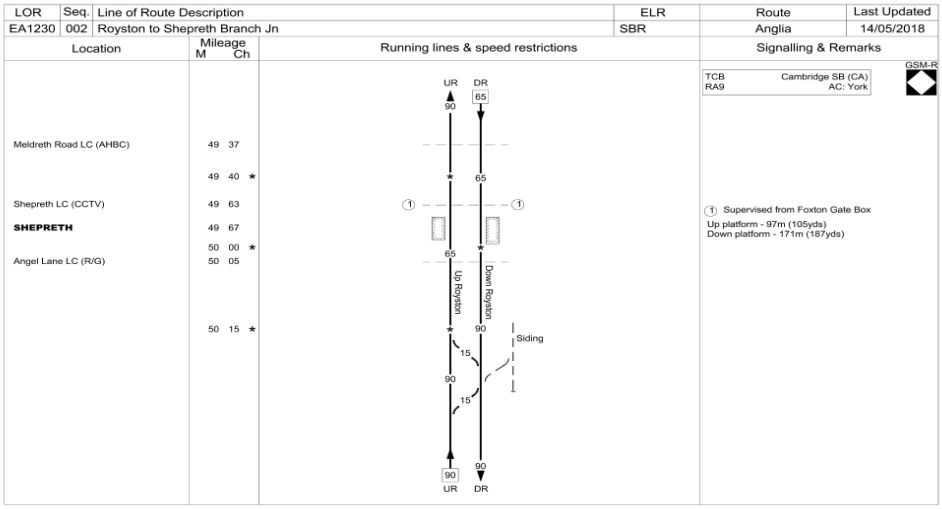


2.1 RAIL

The train service over Meldreth Road AHB level crossing consists of Passenger and Empty Coaching Stock and Freight trains. There are 217 trains per day. The highest permissible line speed of trains is 90 mph. Trains are timetabled to run for 20 hours per day.

Assessor's notes:

As stated above trains are timetabled to run for 20 hours per day, but lines are open 24 hours a day and may receive additional freight, passenger or engineering trains which often vary in length, these are non-time tabled trains which do run from time to time and are mainly for engineering, rail head treatment and track recording purposes.



2.2 USER CENSUS DATA

A 24 hour census was carried out on 11-05-2013 by Count on us. The census applies to 100% of the year.

The census taken on the day is as follows:

Cars / car-based vans / quad bikes	1,352
Large vans / small lorries / large 4x4s	147
Buses / coaches	9
HGVs	37
Tractors / large farm vehicles	0
Pedal / motor cyclists	62

Pedestrians	25
Horse riders	0
Animal herders	0

Assessor's general census notes:

Full 24hr census used, this was done for a project by Count on us in 2013 between 11/05/13 to 19/05/13

Available information indicates that the crossing has a high proportion of vulnerable users.

Vulnerable user observations:

Vulnerable usage not previously noted at this crossing, but recently more vulnerable users have been identified using this crossing, this could be because of the current coronavirus epidemic.

Available information indicates that the crossing does not have a high number of irregular users.

Irregular user observations:

No known irregular users but approximately 300 metres over the crossing on the downside is Shepreth 'L' nature reserve, so it could be possible for irregular users.

2.3 USER CENSUS RESULTS

ALCRM calculates the usage of the crossing to be 1,545 road vehicles and 87 pedestrians and cyclists per day.

Notes on daily, annual, seasonal usage:

Meldreth Road AHB sees a regular daily usage by both vehicles and pedestrians, this pattern is continuous throughout the year.

• the usage of the crossing is moderate for road vehicles (29% of crossings have higher levels of use)

• the use by pedestrian and cyclists is moderate (36% of crossings have higher levels of use)

• the train frequency is high compared to other AHB crossings (only 10% of crossings have a higher level of use).

3. RISK OF USE

3.1 CROSSING APPROACHES

The road approach speed for vehicles on the upside of the crossing is 30 to 40mph and the approach speed on the downside of the crossing is 30 to 40mph.

Both of the approach roads to Meldreth Road AHB level crossing are assessed as being long and straight. There are prominent features on the approach to the level crossing that could distract drivers.

Site visit observations:

From the west: - The speed limit on the approach to the crossing is the national speed limit (60mph) but there is a speed reduction to 30mph just before the crossing. The 85th percentile road approach speed is 45 mph indicating a moderate to high road approach speed. The measurement point is generally sited at the distant signage where the posted speed limit is still 60mph. The actual speed over the crossing may be lower.
For vehicles traversing the crossing there is a right hand turn into a residence, which could be a source of blocking back although no blocking back was noted during the nine-day traffic census.
The road approach is orientated southwest to northeast at the crossing but there is background shielding to the crossing in the form of vegetation, which will limit the effects of low sun. Indeed, vegetation is beginning to impair the view of the near side RTL (Downside).
From the east: - Although the road is slightly curved on this approach, it is possible to see the crossing at the distant signage. Vegetation is beginning to impinge on the offside RTL. The road has a speed limit of 30mph and the 85th percentile road approach is 33.1 mph indicating a moderate road approach speed.
There are also no turnings or intersections near to the crossing that are likely to give rise to blocking back.
The road approach is orientated north-east to south-west at the crossing but there is background shielding to the crossing in the form of vegetation, which will limit the effects of low sun.

The road surface, including gradient if present, is unlikely to impact on the ability of a vehicle to stop behind the stop line.

There are known issues with ice, mud, loose material or flood water. In addition, there are known issues with foliage or fog.

Assessor's notes:

Foliage can be an issue if not regularly cut back. Fog, ice, mud can be issues at certain times of the year and sun glare. During the winter months Meldreth Road AHB is on a regular gritting route.

Upside across crossing.

Downside across crossing.

At the estimated road speed, the visibility of level crossing signage and equipment on the upside is easily sufficient - a vehicle would have surplus time to react if the crossing is activated

At the estimated road speed, the visibility of level crossing signage and equipment on the downside is easily sufficient - a vehicle would have surplus time to react if the crossing is activated

3.2 AT THE CROSSING – GROUNDING RISK

The visual evaluation of the vertical profile of the road indicates that it does not create a risk of vehicles grounding on the crossing.

Assessor's notes:

Risk of grounding sign is on both sides of the crossing but not required as crossing is relatively flat and has passed the SIN109 inspection.

3.3 AT THE CROSSING – BLOCKING BACK

The road layout at or close to the crossing does not result in identified incidents of traffic queuing over the crossing. Blocking back risk is known to occur Never known to occur.

No incidents of blocking back are recorded.

There are identified issues with the road layout, parked cars or other features that could stop traffic. In addition, the road is a known diversionary route.

Assessor's notes:

Blocking back has never known to occur at this crossing but there are right turns into local residential homes near the crossing on both sides that could cause blocking back. There are also no yellow lines on floor near level crossing so cars could park on the road near the level crossing which can also cause blocking back.

3.4 AT THE CROSSING – ANOTHER TRAIN COMING RISK

Trains are known to occasionally pass each other at this crossing.

Assessor's another train coming notes:

As stated above, trains are occasionally known to pass each other, if the train frequencies increase then the chance of a second train coming will increase. Due to the timetable at this crossing another train passing at the same time is a very high likely hood. This section of line has a standard timetable pattern from Shepreth Branch JN to Royston. These services mostly two forms of formations which consist of four and eight car units. As for the freight side there's a small number on this section of line measuring 400mtrs long but doesn't take into account any extra which are planned outside the trust system on a daily basis.

3.5 INCIDENT HISTORY

A level crossing safety event has been known to occur at Meldreth Road AHB level crossing in the last twelve months.

Assessor's incident history notes:

Nov 5, 2021, SMIS4314599 Meldreth Road AHB At 09:47 hours the driver of 2C21 09:27 Cambridge. London King's Cross, reported a near miss at Meldreth Road AHB level crossing, between Meldreth and Shepreth with a member of the public. The person ran onto the crossing, the driver sounded the horn and the person stepped back clear. The driver did not apply the emergency brake stating that there was no time due to the proximity, the driver was fit to continue.

Red light violations / barrier weaving

The chance of a vehicle user deliberately misusing the crossing is estimated as About average.

Measures have been taken to mitigate deliberate misuse.

Assessor's incorrect use notes:

LED Wig Wags have been fitted to all of the RTL's.

3.6 THE CROSSING – STRIKE IN TIMES

Strike in times

	Designed strike in time	Does the observed strike in time conform to the designed strike in time?	Is the observed barrier down time excessive?
Up line	52s	Yes	No
Down line	52s	Yes	No

Assessor's notes and observations on strike in times:

Strike in times comply with standards and do not seem excessive – if there is a speed restriction within the crossing then the strike in times will be greater.

4. ALCRM CALCULATED RISK

Meldreth Road AHB level crossing ALCRM results.

Key risk drivers: ALCRM calculates that the following key risk drivers influence the risk at this crossing:

- Distracted / forced by dog (loss of control), Does not observe lights/barriers
- Slips, trips, falls or snagged on crossing, Unaware of crossing
- Railway cause: slow moving / short warning, Train unexpected
- Blocking back, Late braking, Incorrect use (eg. non-adherence with level crossing road traffic light signals)
- Stuck or grounded on crossing, Fails to observe level crossing, Parked on level crossing
- Road traffic accident, Second train coming, Stranded / failed on crossing
- Sunlight obscures crossing/lights or view up / down track, Turns onto the railway
- Poor crossing visibility
- Railway cause: failure to detect approaching train, lights / barriers or obstacle detection equipment fails to operate, signaller or other workforce, train driver

The calculated safety risk for this crossing is:	Risk per Traverse (Letter)	Collective Risk (Number)
	D	2
	Risk per Traverse (FWI)	Collective Risk (FWI)
Cars / car-based vans / quad bikes	0.000000019	0.009560228
Large vans / small lorries / large 4x4s		0.001039463
Buses / Coaches	0.000000004	0.000013289
HGVs		0.000054631
Tractors / large farm vehicles		0
Pedal / motor cyclists	0.000000176	0.003981931
Pedestrians		0.001605617
Horse Riders		0
Animal Herders		0
Vehicles user in pedestrian mode		0
Train Passengers	0.000000001	0.000064415
Train Staff	0.000000003	0.000211033
Derailment Risk		0.00134036
Weighted Average (Users)	0.000000027	
Total Risk		0.017870966
	Average Consequence	0.653003045
	Collision Frequency	0.027367355

5. OPTION ASSESSMENT AND CONCLUSIONS

5.1 OPTIONS EVALUATED

The options evaluated to mitigate the risks at Meldreth Road AHB crossing include:

Option	Term	Risk per Traverse	Collective Risk	FWI	FWI Difference	Cost	Benefit Cost Ratio	BCR with GDF	Status	Comments
Safety campaign	Short Term	D	2	.01770566	-.000165306	£500	N/A		Accept/ongoing.	This would be carried out by the Level Crossing Manager on his regular inspections to the site and will be supported by the BTP.
Close via diversion and overbridge.	Long Term	M	13	0	-.017870966	£50,000,000	0.02	0.05	RECOMMENDED Reject.	The diversion route could link up to the existing A10 road
Install ANPR cameras	Traffic Change Option	D	2	.016217906	-.00165306	£136,000	0.12	0.3	Reject.	Preferred option if MCBOD/CCTV does not proceed – passes CBA and whilst poor behaviour is not prevalent here would be an effective behaviour modifier
Standing Red man	Traffic Change Option	D	2	.017540354	-.000330612	£25,000	0.62	1.55	Reject.	Dog Walkers and other crossing users would get a warning at head height
Close via over bridge	Long Term	M	13	0	-.017870966	£10,000,000	0.12	0.3	Reject.	A bridge would need to cater for use by pedestrians with push chairs etc. and possibly for horses and accommodate maximum height overheads, which would mean that the cost is relatively high.
Upgrade to MCB-OD/CCTV	Long Term	H	4	.001084697	-.016786269	£3,500,000	0.17	0.425	Accept.	Natural Upgrade to MCB-OD could be considered here – would need to consider crossing redesign

NOTES

Network Rail always evaluates the need for short and long-term risk control solutions. An example of level crossing risk management might be a short-term risk control of a temporary speed restriction, with the long-term solution being closure of the level crossing and its replacement with a bridge.

5.2 CONCLUSIONS

Assessor's notes:

Meldreth Road is an AHB crossing with two half-width barriers and four RTL on the Cambridge to London Kings Cross Line. It is monitored from Cambridge signal box and is located on Meldreth Road southwest of the village of Shepreth in the county of Cambridgeshire, providing access to the village of Meldreth. The crossing is on the direct main road between the villages of Meldreth and Shepreth, there is an alternative route along the busy and congested A10 and would involve a detour of up to 8km so whilst this is possible it may be unpalatable in terms of crossing usage.

Trains are time tabled to run for 20 hours a day and mainly consist of passenger and some freight, but trains can run up to 24 hours a day, 7 days a week including bank holidays (UK only), these non-timetabled trains can be engineering trains or on track plant and can run in any direction on any line.

At the level crossing there are overhead line wires which are 16ft-6" high and carry a live current of 25KVH, these are live at all times

On the downside there is a nature reserve approximately 300 metres from the crossing which is used frequently by local people and especially dog walkers, most of them would have to cross over Meldreth Road AHB either on foot or by bicycle but since the start of the coronavirus pandemic footfall has risen over the crossing mainly by local people taking exercise.

Options to be considered: -

Closure by any means – By Diversionary Route would normally be the preferred option and in reality, this could be achieved from an alternative route along the busy and congested A10, but this may involve a detour of up to 8km. On this basis, it may not be considered feasible to close the crossing without an alternative means of crossing the railway at the site of the current crossing. Therefore, this option would be very difficult to achieve. **By Bridge or Under-Pass** - There are residences either side of the road at the crossing, which would make a bridge technically difficult and expensive. There is also a significant skew, which would require a longer bridge increasing the potential cost. There are dykes in the vicinity of the crossing on the Upside. The potential for flooding would have to be considered in the design. Hence the costs of an underpass are considered to be higher than for a bridge. Again, this option looks difficult to achieve.

Closure by By-Pass - There is potential to divert Meldreth Road to Barrington Road and cross the railway at Shepreth station (now an MCB-CCTV Crossing). This option requires the construction of about 800m of new undesignated road and there may need to be an additional footbridge to maintain pedestrian access along Meldreth Road. Bus routes that currently pass down Meldreth Road would have to be diverted past the station and down the new road. Overall cost would be difficult to quantify and may need to be considered as part of a major highways project/if at all after conversion of Shepreth Station crossing. There may also be objections to the construction of the road and the re-routing of traffic. At the optioneering meeting held on the 12/02/20 these was rejected due to cost being disproportionate to benefit. At the last optioneering meeting held on the 05th of May 2021 these options were rejected due to the cost being disproportionate to safety benefit. **At the optioneering meeting held on the 20th of July 2022, these options were rejected due to the cost being disproportionate to safety benefit.**

Upgrade to MCB-OD/CCTV - It is not clear if an MCB-OD is feasible in this location due to proximity to the MERLIN radio telescope and it may not be possible to get a licence. It is understood that Meldreth Road lies just inside the 6.5km contour and that even if the scanner is directed away from the MERLIN radio telescope, there is theoretical potential for interference within 6.5km. Possible barrier down times would need to be considered if this type of option were to be taken forward. It may again as per Shepreth Station Crossing; be a better option to consider converting to MCB-CCTV or putting forward for AHB+ trial site possibly. At the last optioneering meeting held on the 12/02/20 this was accepted subject to feasibility. At the optioneering meeting held on the 05th of May 2021, this option was rejected due to the upgrading of current crossing to a CCTV crossing. **At the optioneering meeting held on the 20th of July 2022, this option was accepted as it is due to be completed late 2024.**

Install ANPR cameras - Preferred option if MCB/OD does not proceed or is delayed – passes CBA and whilst poor behaviour is not prevalent here would be an effective solution to encourage good continuous behaviour by road users. At the optioneering meeting held on the 12/02/20 this was rejected but will be revisited depending on census results. At the last optioneering meeting held on the 05th of May 2021, this option was put on hold depending the outcome of a new census. **At the optioneering meeting held on the 20th of July 2022, this option was rejected as the crossing is due to be upgraded to a MCB-CCTV crossing.**

Standing Red Man- Not really a high level of pedestrian usage recorded here but could be considered as an effective mitigation at this location. At the optioneering meeting held on the 12/02/20 this was accepted and passed over to the sponsor. At the last optioneering meeting held on the 05th of May 2021, this option was put on hold depending the outcome of a new census. **At the optioneering meeting held on the 20th of July 2022, this option was rejected as the crossing is due to be upgraded to a MCB-CCTV crossing.**

Safety campaign- This is ongoing by the level crossing manager on his regular visits and is supported by the BTP.

ANNEX A – ADDITIONAL PHOTOGRAPHS

Additional Photographs

Ariel view of the crossing.

Additional satellite view of the crossing.

Cambridge panel ‘A’.

ANNEX B – HAZARD IDENTIFICATION AND RISK CONTROLS

The table below is intended for use by risk assessors when identifying hazards and risk control solutions. It is not an exhaustive list or presented in a hierarchical order.

	Hazard	Control
Road vehicle and train collision risk	Examples at the crossing include: • insufficient sighting and / or train warning for all vehicle types; known to be exacerbated by the driving position, e.g. tractor • level crossing equipment and signage is not conspicuous or optimally positioned • instructions for safe use might be misunderstood e.g. signage clutter detracts from key messages, conflicting information given • high volume of unfamiliar users, e.g. irregular visitors, migrant workers • known user complacency leading to high levels of indiscipline, e.g. failure to use telephone, gates left open • type of vehicle unsuitable for crossing; - large, low, slow making access or egress difficult and / or vehicle is too heavy for crossing surface - risk of grounding and / or the severity of the gradient adversely affects ability to traverse • poor decking panel alignment / position on skewed crossing • where telephones are provided, users experience a long waiting time due to:	Controls can include: • optimising the position of equipment and / or signs • removing redundant and / conflicting signs • engaging with signalling engineers to optimise strike in times • upgrading of asset to a higher form of protection • downgrading of crossing by removing vehicle access rights • optimising sighting lines and / or providing enhanced user-based warning system, e.g. MSL • re-profiling of crossing surface • engaging with stakeholders / authorised users to reinforce safe crossing protocol, legal responsibilities and promote collaborative working • widening access gates and / or improving the crossing surface construction material • realigning or installing additional decking panels to accommodate all vehicle types • implementing train speed restriction or providing crossing attendant

	Hazard	Control
	- long signal section (Signaller unaware of exact train location) - high train frequency • insufficient or excessive strike in times at MSL crossings • high chance of a second train coming • high line speed and / or high frequency of trains • unsuitable crossing type for location, train service, line speed and vehicle types	
Pedestrian and train collision risk	Examples include: • insufficient sighting and / or train warning • ineffective whistle boards; warning inaudible, insufficient warning time provided, known high usage between 23:00 and 07:00 • high chance of a second train coming • high line speed and / or high frequency of trains • level crossing equipment and signage is not conspicuous or optimally positioned • location and position of level crossing gates mean that users have their backs to approaching trains when they access the level crossing, i.e. users are initially unsighted to trains approaching from their side of the crossing • instructions for safe use might be misunderstood e.g. signage clutter detracts from key messages, conflicting information given • surface condition or lack of decking contribute to slip trip risk	Controls can include: • optimising the position of equipment and / or signs • removing redundant and / conflicting signs • upgrading of asset to a higher form of protection • optimising sighting lines, e.g. de-vegetation programme, repositioning of equipment or removal of redundant railway assets • implementing train speed restriction or providing crossing attendant • providing enhanced user-based warning system, e.g. MSL • engaging with stakeholders / authorised users to reinforce safe crossing protocol, legal responsibilities and promote collaborative working • installing guide fencing and / or handrails to encourage users to look for approaching trains, read signage or cross at the designed decision point

	Hazard	Control

	• known high level of use during darkness
	• increased likelihood of misuse, e.g. crossing is at station
	• free wicket gates might result in user error
	• high volume of unfamiliar users, e.g. irregular visitors / ramblers, equestrians
	• complacency leading to high levels of indiscipline, e.g. users are known to rely on knowledge of timetable
	• high level of use by vulnerable people
	• where telephones are provided i.e. bridleways, users experience a long waiting time due to:
	  - long signal section (Signaller unaware of exact train location)
	  - high train frequency
	• insufficient or excessive strike in times at MSL crossings
	• unsuitable crossing type for location, train service, line speed and user groups
	• high usage by cyclists
	• degree of skew over crossing increases traverse time and users' exposure to trains
	• crossing layout encourages users not to cross at the designed decision point; egress route unclear especially during darkness
	schools, local amenities or other attractions are known to contribute towards user error
		• re-design of crossing approach so that users arrive at the crossing as close to a 90° angle as possible
		• installing lighting sources
		• engaging with signalling engineers to optimise strike in times
		• providing decking or improving crossing surface, e.g. holdfast, strail, non-slip surface
		• providing cyclist dismount signs and / or chicanes
		• straightening of crossing deck

	Hazard	Control
Pedestrian and road vehicle collision risk	Examples include: • a single gate is provided for pedestrian and vehicle users where there is a high likelihood that both user groups will traverse at the same time • the position of pedestrian gate forces / encourages pedestrian users to traverse diagonally across the roadway • road / footpath inadequately separated; footpath not clearly defined • condition of footpath surface increases the likelihood of users slipping / tripping into the path of vehicles	Controls can include: • providing separate pedestrian gates • clearly defining the footpath; renew markings • positioning pedestrian gates on the same side of the crossing • improving footpath crossing surface so it is devoid of potholes, excessive flangeway gaps and is evenly laid • improving crossing surface, e.g. holdfast, strail, non-slip surface
Personal injury	Examples include: • skewed crossing with large flangeway gaps results in cyclist, mobility scooter, pushchair or wheelchair user being unseated • condition of footpath surface increases the likelihood of users slipping / tripping • degraded gate mechanism or level crossing equipment • barrier mechanism unguarded / inadequately protected	Controls can include: • improving fence lines • reducing flangeway gaps and straightening where possible • providing decking or improving crossing surface, e.g. holdfast, strail, non-slip surface • straighten / realign gate posts • fully guarding barrier mechanisms

ANNEX C – ALCRM RISK SCORE EXPLANATION

ALCRM calculates the level of risk to individual users (per traverse) and the combined risks for all users, train staff and passengers at level crossings. It provides a consistent and robust quantitative methodology that is supplemented by the local knowledge and professional judgement of risk assessors.

Risk is expressed in fatalities and weighted injuries (FWI). The following values help to explain what this means:

- 1 = 1 fatality per year or 10 major injuries or 200 minor RIDDOR events or 1000 minor non-RIDDOR events
- 0.1 = 20 minor RIDDOR events or 100 minor non-RIDDOR events
- 0.005 = 5 minor non-RIDDOR events

RISK PER TRAVERSE

This is the level of calculated risk to an individual crossing user. It applies to a single traverse of the level crossing or each time the crossing is used by an individual.

Risk per traverse:

- Can be calculated for crossing users, train staff and passengers. Ranking is based on the risk to users only.
- Does not increase with the number of users.
- Is presented as a simplified ranking A to M. A is highest, L is lowest, and M is 'zero risk' e.g. temporary closed, dormant or crossings on mothballed lines.
- Allows risks to individuals on a per traverse basis to be assessed even if usage and Collective Risk is low.
- Can help in the prioritisation of risk mitigation and investment in safety.

Risk Per Traverse Ranking	Probability		FWI/traverse	
	Upper	Lower	Upper	Lower
A	1 in 1	1 in 500000	1	0.000002
B	1 in 500000	1 in 2500000	0.000002	0.0000004
C	1 in 2500000	1 in 12500000	0.0000004	0.00000008
D	1 in 12500000	1 in 62500000	0.00000008	0.000000016
E	1 in 62500000	1 in 125000000	0.000000016	0.000000008
F	1 in 125000000	1 in 250000000	0.000000008	0.000000004
G	1 in 250000000	1 in 500000000	0.000000004	0.000000002
H	1 in 500000000	1 in 1000000000	0.000000002	0.000000001
I	1 in 1000000000	1 in 2000000000	0.000000001	0.0000000005
J	1 in 2000000000	1 in 5000000000	0.0000000005	0.0000000002
K	1 in 5000000000	1 in 10000000000	0.0000000002	0.0000000001
L	1 in 10000000000	Greater than 0	0.0000000001	Greater than 0
M	0	0	0	0

COLLECTIVE RISK

This is the total calculated risk for the crossing and includes the risk to users (pedestrian and vehicle), train staff and passengers.

Collective risk:

- Is presented as a simplified ranking 1 to 13. 1 is highest, 12 is lowest, and 13 is 'zero risk' e.g. temporary closed, dormant or crossings on mothballed lines.
- Can help in the prioritisation of risk mitigation and investment in safety.

Collective Risk Ranking	Upper Value (FWI)	Lower Value (FW)
1	Theoretically infinite	Greater than 5.00E-02
2	0.050000000	0.010000000
3	0.010000000	0.005000000
4	0.005000000	0.001000000
5	0.001000000	0.000500000
6	0.000500000	0.000100000
7	0.000100000	0.000050000
8	0.000050000	0.000010000
9	0.000010000	0.000005000
10	0.000005000	0.000001000
11	0.000001000	0.000000500
12	0.0000005	0
13	0.00E+00	0.00E+00