PROTECTED LEVEL CROSSING RISK ASSESSMENT

Anglia Route

Level Crossing Narrative Risk Assessment

Milton Fen AHB Crossing

Planned 4th December 2021

1. LEVEL CROSSING OVERVIEW AND ENVIRONMENT

1.1 LEVEL CROSSING OVERVIEW

This is a risk assessment for Milton Fen level crossing.

Crossing Details	
Name	Milton Fen
Type	AHB
Crossing status	Public Highway
Overall crossing status	Open
Route name	ANGLIA
Engineers Line Reference	BGK – 59m 10ch
OS grid reference	TL485624
Number of lines crossed	2
Line speed (mph)	75 MPH
Electrification	No DC provided but OHLE present.
Signal box	Cambridge

Risk Assessment Details	
Name of assessor	Andrew Waling
Post	Level Crossing Manager.
Date completed	04-12-2021
Next due date	05-03-2023
Email address	andrew.waling@networkrail.co.uk
Phone number	07860500842

ALCRM Risk Score	
Risk per traverse risk	**D**
Collective risk	**2**
FWI	**0.013098895**

For Safety performance (Fatality weighted injuries (FWI), this crossing is ranked 8th in Anglia route and 19th nationally compared to other AHB's

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.

1.2 INFORMATION SOURCES

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

Consulted	Attended site
LOMS, MOMS,BTP and signallers.	No
Crossing users and local residents.	Yes
Police (BTP/Home Office Force)	No

Stakeholder consultation and attendance notes:

All of the above were contacted with regards to this risk assessment and none attended the site meeting apart from local residents and dog walkers that were using the crossing on the day of the data collection.
The rest were either contacted via email or telephone after the site meeting.

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.

1.3 ENVIRONMENT

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

The level crossing is located on Fen Road. The road approach speed is estimated to be Less than 30mph.

It is a Public Highway level crossing.

At Milton Fen level crossing the orientation of the road/path from the north is 130°; the orientation of the railway from the north to the up line in the up direction is 220°.

Sun glare

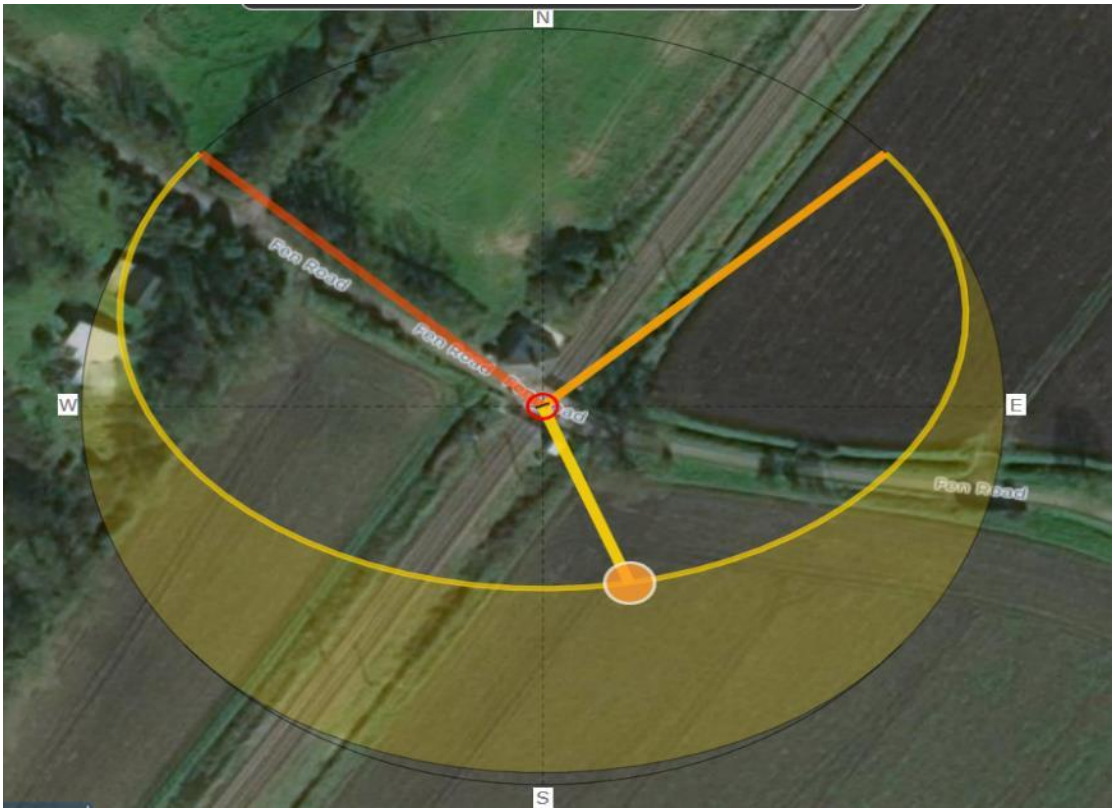
LCG13 assessing sun glare at public road level crossings has been completed and records risk as Tolerable with detailed sun glare risk assessment not needed

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.

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:

Milton Fen AHB is situated on the outskirts of the village of Milton on fen road which is a semi-rural location on a single-track road with passing places along the way.

Fen road is a dead-end road that leads to the river Cam and Baits Bite Lock which is a popular place for people to attend especially during lunchtime hours and weekends during the summer months.

No new known developments within the vicinity of the crossing, this has been checked with South Cambridgeshire District Planning Department and Network Rail Town Planning.

Sun glare could be an issue on the approach to the crossing from the North during the summer months, but the crossing is fitted with LED wig wags that mitigate against this.

2. LEVEL CROSSING USAGE

2.1 RAIL

The train service over Milton Fen level crossing consists of Passenger and Freight trains. There are 186 trains per day. The highest permissible line speed of trains is 75 mph. Trains are timetabled to run for 19 hours per day.

Assessor's notes:

As stated, above, trains are timetabled to run for 19 hours per day, but lines are open 24 hours a day 365 days a year including Bank Holidays (UK only) 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 06-06-2018 by TRACSIS. The census applies to 100% of the year.

The census taken on the day is as follows:

Cars / car-based vans / quad bikes	63
Large vans / small lorries / large 4x4s	12
Buses / coaches	0
HGVs	3
Tractors / large farm vehicles	2
Pedal / motor cyclists	154

Pedestrians	227
Horse riders	0
Animal herders	0

Assessor's general census notes:

A full 9-day was undertaken by TRACSIS on the 6/6/18 and the average worked out from that data gathered.

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

Vulnerable user observations:

Pushchair users, elderly pedestrian users, joggers using crossing (may be less aware of barriers especially depending on what side of the road they are on) this is only 5% of the total use but vulnerable usage has been applied

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

Irregular user observations:

No known irregular users as it mostly local people from the village of Milton that use the crossing.

Site visit night / dusk user observations:

From the census data there is no night-time usage but a 1% has been applied to this risk assessment as this cannot be discounted.

2.3 USER CENSUS RESULTS

ALCRM calculates the usage of the crossing to be 80 road vehicles and 381 pedestrians and cyclists per day.

Notes on daily, annual, seasonal usage:

The crossing is used on a daily basis by the few residents that live over the crossing in the lock keepers' cottages and is a regular route for both pedestrians and cyclists that leads along the river Cam eastwards to Water-beach or westwards to Cambridge.

As already stated above in this risk assessment, the crossing is used more during the summer months especially during weekends and bank holidays as people head to the nearby Baits Bite Lock.

3. RISK OF USE

3.1 CROSSING APPROACHES

The road approach speed for vehicles on the up side of the crossing is Less than 30mph and the approach speed on the down side of the crossing is Less than 30mph.

None of the approach roads to Milton Fen 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:

On the approach to Milton Fen AHB crossing there are 4x RLT signals and these are visible on the approach to the crossing form both directions as follows: Upside nearside approach = 124mtrs Upside offside approach = 123mtrs Downside nearside approach = 218mtrs Downside offside approach = 98mtrs Also, there is a house on downside approach next to crossing that could distract a driver, track entrance to field next to crossing on UP side could be used by tractors at certain times of year - depending on the length of the vehicle; turning into this could cause blocking back on the crossing but never known to occur. Both approaches are narrow as this is a single-track road with passing places on both sides. Fields used for farming nearby, the use of these will change seasonally and therefore the amount of farm vehicles (tractors, trailers, combines etc), will change depending on the season.

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:

Mud on crossing from tractors mainly during the winter especially from October-November when the farmers are harvesting sugar beet, this also involves quite a few articulated lorry's using the crossing to collect the sugar beet from the nearby fields. Ice during the winter months can cause an issue as this road is not on a regular gritting route. Fog at certain times in the year, approach roads are narrow, uneven and roadside vegetation can cause an issue if not regularly cut back.

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 down side is easily sufficient - a vehicle would have surplus time to react if the crossing is activated

Assessor's general crossing approach notes:

House on downside approach next to crossing that could distract a driver. Track entrance to field next to crossing on UP side could be used by tractors at certain times of year? depending on the length of the vehicle; turning into this could cause blocking back on the crossing but this has never been known to occur.

3.2 AT THE CROSSING – GROUNDING RISK

The visual evaluation of the vertical profile of the road indicates that it does create a risk of vehicles grounding on the crossing.

Risk of grounding signs have been provided at the crossing.

Assessor's notes:

Crossing sits on a humped profile but has passed the SIN109 inspection and at the time of writing this risk assessment there has been new tarmac approaches on both sides of the level crossing.

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 no identified issues with the road layout, parked cars or other features that could stop traffic. In addition, the road is not a known diversionary route.

Assessor's notes:

Road is a no through road. Possibility for blocking back due to an entrance to a field on the UP nearside approach, but never known to have occurred.

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:

Trains are sometimes known to pass at the crossing, if train frequencies increases then the chance of another train coming will increase, and the risk that a user may choose to cross after seeing a train pass over the crossing in one direction, without realising another train could be coming in the other direction is a possibility. Upgrade to a full barrier crossing would help mitigate against this.

3.5 INCIDENT HISTORY

A level crossing safety event has been known to occur at Milton Fen level crossing in the last twelve months.

Assessor's incident history notes:

Sep 13, 2021 - Milton Fen At 21:05 hours Cambridge SSM advises of crossing misuse at Milton Fen AHB level crossing. The Driver of 1K93 reported a cyclist zig zagged past the barriers and over the crossing. Driver only applied service brake and was okay to continue. Not declared a near miss and no emergency brake applied. Cambridge MOM checked crossing - no issues at 22:45 hours. Cause: Deliberate misuse/User error. **Apr 28, 2021 -** Milton Fen At 09:49 hours a member of the public reported that one of the barriers of Milton Fen AHB level crossing had been knocked off. Road traffics lights were working, and trains cautioned. Signal protecting down road CA229 signal and Up road CA230 signal. Cambridge MOM took Level crossing on local control and managed to clear road traffic at 10:17 hours. There was no sign of the vehicle involved Normal running given at 11:32 hours following completion of repairs. MOM watched several trains pass over the crossing. Cause: Deliberate misuse/user error. **Apr 7, 2021 -** Milton Fen At 06:02 hours the driver of 1N41 05:57 Cambridge to Birmingham New Street reported that the train had struck a person on the Down Main line at Milton Fen AHB Level Crossing, between Cambridge North and Water-beach. Both lines were blocked, Emergency services and Network Rail staff attended at 06:20 hours. Services were suspended between Cambridge and Ely, with replacement transport provided in the form of coaches. **Historical** Feb 17, 2019 - LC Misuse - 1G59 14:25 Stansted Airport - Ely observed a stationary car in the middle of Milton Fen AHB level crossing with the barriers in the lowered position. No Near miss and no EBA. 07-Oct-16 NRV- road vehicle suspected to have knocked off Level Crossing barrier at Milton Fen AHB. 29-Jul-06 Barriers struck by road vehicle 10-Mar-07 1T10 reported a near miss with car 09-Dec-07 Car crossed in front of 2T70.

Red light violations / barrier weaving

The chance of a vehicle user deliberately misusing the crossing is estimated as Significantly lower than average.

Measures have been taken to mitigate deliberate misuse.

Assessor's incorrect use notes:

LED wig wags have been fitted at Milton Fen AHB and due to the incidents, that have been reported at the crossing there is a more visible BTP presence which has been noted by local residents and crossing users. Again, as already mentioned above in this risk assessment, upgrade of the crossing from a half barrier to a full barrier would help mitigate against this.

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	39s	Yes	No
Down line	39s	Yes	No

Assessor's notes and observations on strike in times:

The strike in times are adequate for this type of crossing and do not seem to be excessive. The LCM timed the strike in times when undertaking the data collection for this risk assessment and they are as follows, for a train to arrive at the crossing on the up road the strike in time was 29 seconds and for a train to arrive at the crossing on the down road the strike in time was 32 seconds.

4. ALCRM CALCULATED RISK

Milton Fen 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), Road traffic accident, Second train coming
- Does not observe lights/barriers, Slips, trips, falls or snagged on crossing
- Unaware of crossing, slow moving / short warning, train unexpected
- Blocking back, Late braking, Incorrect use (e.g. non-adherence with level crossing road traffic light signals)
- Stuck or grounded on crossing, Fails to observe level crossing, Parked on level crossing
- Stranded / failed on crossing, Sunlight obscures crossing/lights or view up / down track
- Turns onto the railway, Poor crossing visibility,
- Failure to detect approaching train, lights / barriers or obstacle detection equipment fails to operate

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	0.000000012	0.000284598
Large vans / small lorries / large 4x4s		0.000054209
Buses / Coaches	0.000000003	0
HGVs		0.00000283
Tractors / large farm vehicles		0.000001887
Pedal / motor cyclists	0.000000091	0.005113702
Pedestrians		0.007537729
Horse Riders		0
Animal Herders		0
Vehicles user in pedestrian mode		0
Train Passengers	0	0.000002348
Train Staff	0.000000001	0.000086674
Derailment Risk		0.000014919
Weighted Average (Users)	**0.000000077**	
Total Risk		**0.013098895**
	Average Consequence	0.777747248
	Collision Frequency	0.016842098

5. OPTION ASSESSMENT AND CONCLUSIONS

5.1 OPTIONS EVALUATED

The options evaluated to mitigate the risks at Milton Fen crossing include:

Option	Term	Risk per Traverse	Collective Risk	FWI	FWI Difference	Cost	Benefit Cost Ratio	Status	Comments
Upgrade to MCB-OD/CCTV	Traffic Change Option	F	5	.000785897	-.012312998	£3,500,000	0.13	ACCEPT.	Natural Upgrade to MCB-OD could be considered here – would need to consider crossing redesign.
Close via overbridge	Long Term	M	13	0	-.013098895	£8,000,000	0.12	RECOMMENDED REJECT.	Closure via a bridge may prove difficult due to the current location of the level crossing but should this be viable the design would have to be of maximum height which may increase the cost.
Standing red man.	Traffic Change Option	D	2	.012837216	-.000261679	£25,000	0.57	ACCEPT.	Having the extra flashing pedestrian sign could help alert pedestrians even more than just the LED lights and Audible Alarms currently at this crossing.

Safety campaign	Short Term	D	2	.012968055	-.00013084	£500	N/A	Accept/ongoing.	This can be undertaken by the Level crossing manager on his regular inspection and can be supported by the BTP.

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:

Milton Fen is a half barrier Level crossing with 4 RTL's located on Fen Road which is a Public Highway approximately ½ mile from the village of Milton, the crossing is fitted with spoken warnings of a train approaching and should another train approach on the other line at the same time this also gives a verbal speaking warning of 'another train coming' and an increase in the yodels.

Milton is a large village 2 ½ miles north of the city of Cambridge and Fen Road where the level crossing is located is a single-track road which is the sole access to the river Cam and 'Bates Bite Lock' which proves to be a popular destination for people during the lunchtime hours and at weekends, there are a few dwellings and the road approach speed is estimated to be less than or equal to 30mph.

Fen Road has passing places on both sides of the road and there are no stations visible from the level crossing itself.

Milton Fen AHB crossing is situated between Ely station and Cambridge North station with direct services into both London Liverpool Street and London Kings Cross stations, the maximum permissible line speed is 75MPH and the line is open 24 hours a day 365 days a year including bank holidays (UK) only.

There are no immediate planned or apparent developments at present near the crossing which may lead to a change or increase in use or risk to the level crossing but there is a project looking at a leisure facility/rowing lake that could close 3 crossings (see map in additional photos).

The crossing is situated between farmland either side of the crossing which can be accessed by the approach. The approach to this level crossing can be prone to slight flooding due to poor drainage and the condition of the road, since the last risk assessment was undertaken the approaches to the level crossing have been re surfaced and new road markings throughout.

Options Considered: -

Closure via Overbridge –

Will totally mitigate all risk at the crossing may well be difficult to achieve as there is a homeowner nearby which may increase the cost further if this was to be taken forward regarding building a bridge. Optioneering panel held on the 18-11-20, this option was rejected as not reasonably practicable. **At the last optioneering meeting held on the 02.02.22 this option was rejected due to the cost being disproportionate to safety benefit.**

Upgrade to MCB-OD –

This option mitigates most of the risk at the level crossing the only concern is the downtime of the level crossing because this year there has been no misuse at this crossing but MCB's are possibly prone to misuse due to the length of time it closes the road for. Optioneering Meeting of 29/8/18 – In CP6 Plan for Upgrade. This option is part of the Cambridge re-signal/relocking project and at present is being taken forward by them to be completed in CP6. Optioneering panel held on the 18-11-20, This option was accepted and the S+T RAM to complete possibly by December 2023. **At the optioneering meeting held on the 02.02.22 this option was accepted as part of the Cambridge C3R project.**

Installation of flashing pedestrian signs –

Having the extra flashing pedestrian sign could help alert pedestrians even more than just the LED lights and Audible Alarms currently at this crossing. Optioneering Meeting of 29/8/18 – Accepted. These may be installed as part of the MCB-OD upgrade due to the amount of pedestrian use. Optioneering panel held on the 18-11-20, This option was accepted and the S+T RAM to complete with the above project. **At the optioneering meeting held on the 02.02.22 this option was accepted and will be added once the crossing has been upgraded to a full barrier crossing, this will involve liaising with the C3R project team.**

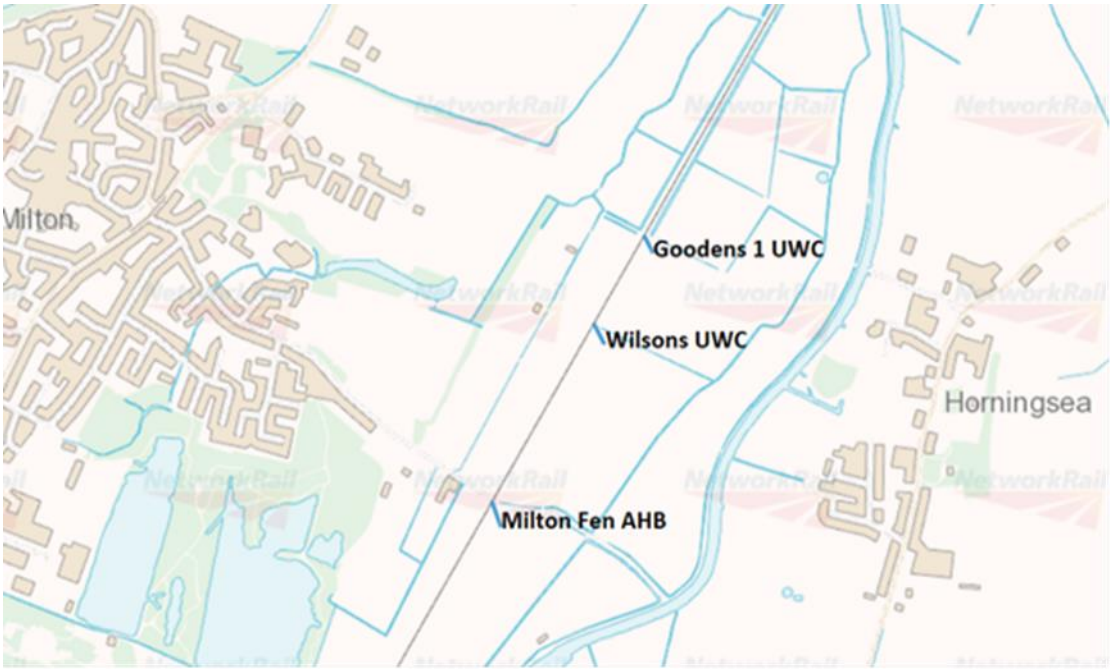
Safety Campaign – this is an ongoing requirement and is completed every time the Level Crossing Manager is at the crossing; this crossing is used predominantly by pedestrians and cyclists. Optioneering panel held on the 18-11-20, This option was accepted and for the LCM to complete when visiting the crossing. **At the optioneering meeting held on the 02.02.22 this option was accepted as ongoing by the LCM.**

ANNEX A – ADDITIONAL PHOTOGRAPHS

Additional Photographs

Location of crossing.

Surrounding area of the crossing.



Ariel view of the crossing.

Sectional appendix.

LOR	Seq.	Line of Route Description	ELR	Route	Last Updated
EA1161	011	Bishops Stortford to Ely North Jn	BGK	Anglia	12/11/2016

Location	Mileage M	Mileage Ch	Running lines & speed restrictions	Signalling & Remarks
				TCB Cambridge SB (CA) RA8 AC: Romford GSM-R
OHNS	58	71		
Milton Fen LC (AHBC)	59	10		
Waterbeach GSP	60	78		Up platform - 90m (97 yds)
Waterbeach LC (AHBC)	61	00		Down platform - 86m (93 yds)
WATERBEACH	61	01		
Burgess Drove LC (R/G-X)	61	20	Y	
Bottisham Road LC (AHBC)	61	48		
Bannolds LC (AHBC-X)	62	70	★	

Possible Sports complex which would close 3 crossings.

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