



BALL STRIKE RISK ASSESSMENT

Client	Blakeney Strategic Land Ltd	
Site / Project	Land Adjacent to Hambridge Way, Pirton	
Report Reference	BSC-26-0001	
Version Number & Date	1.0	18/09/2026
Report Status	FINAL	
Report Prepared By	Dr Michael Thelwell	

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1. EXECUTIVE SUMMARY

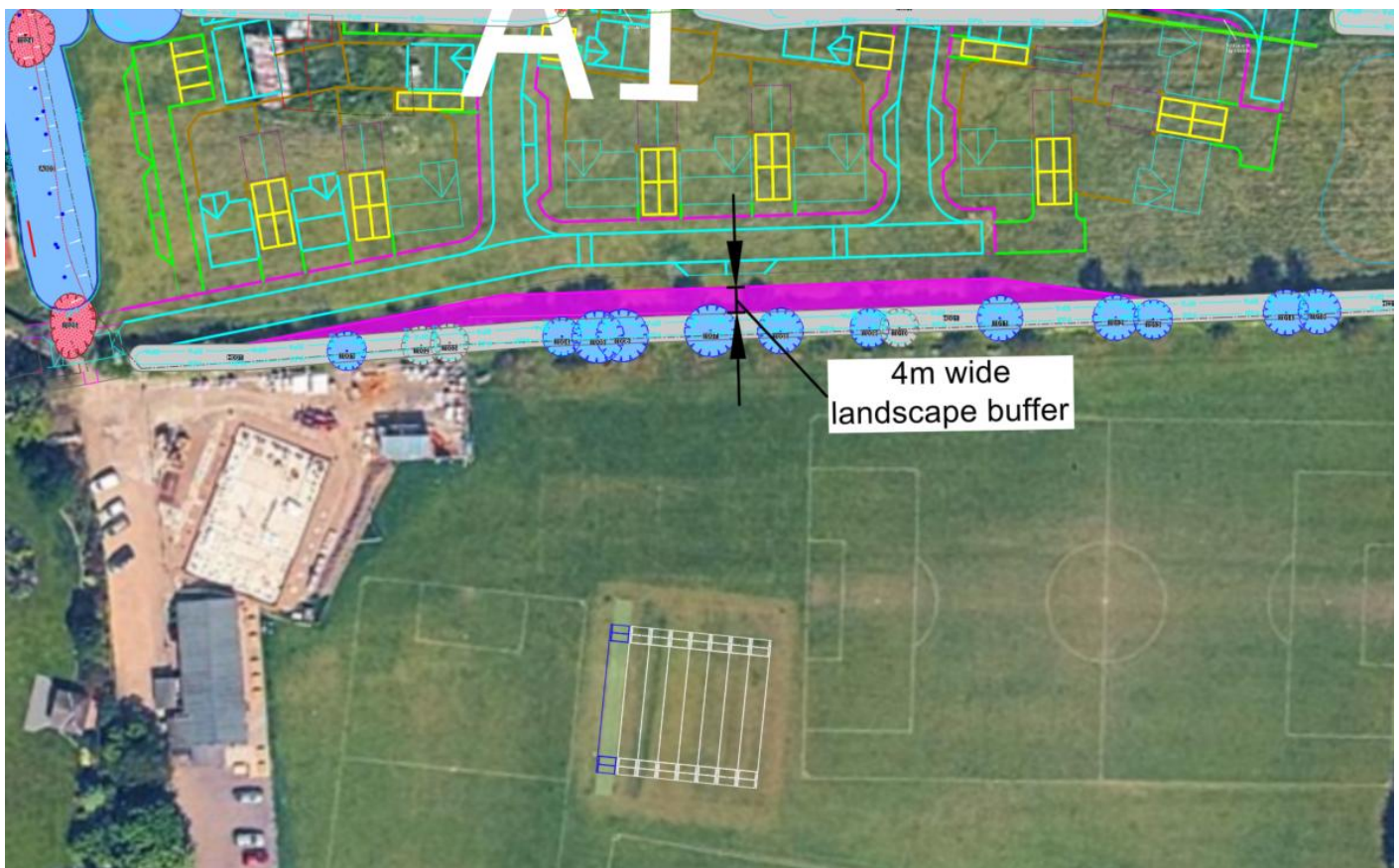
The purpose of this assessment is to evaluate the potential risk of cricket balls surpassing the boundaries of a cricket pitch at Pirton Recreation Ground, Pirton, Hitchin and propose evidence-based mitigation recommendations to provide protection to a proposed development in the adjacent land if required.

Using a 3D ball trajectory model and probabilistic analysis it was determined that there is a possibility cricket balls could surpass the northern boundary of Pirton Recreation Ground and enter the proposed development. **Therefore, there is a need for mitigation to protect users of the proposed development from the risk of ball strikes.**

To provide sufficient protection against the risk of ball strikes, this report recommends either of the following two mitigation solutions:

- **Option 1 – Publicly inaccessible landscape buffer along development boundary.**

To prevent cricket balls impacting on users of the new development, a wider publicly inaccessible landscape buffer area of mixed scrub habitat could be added along the southern site boundary. This inaccessible, undeveloped landscaped area could include, for example, dense hawthorn, blackthorn and holly planting, which would prevent users of the site from accessing the area next to the site boundary, removing the need for any additional mitigation (netting). The area that it is recommended be made publicly inaccessible are shown in the image below and appears to be in an area of minimal planned development.



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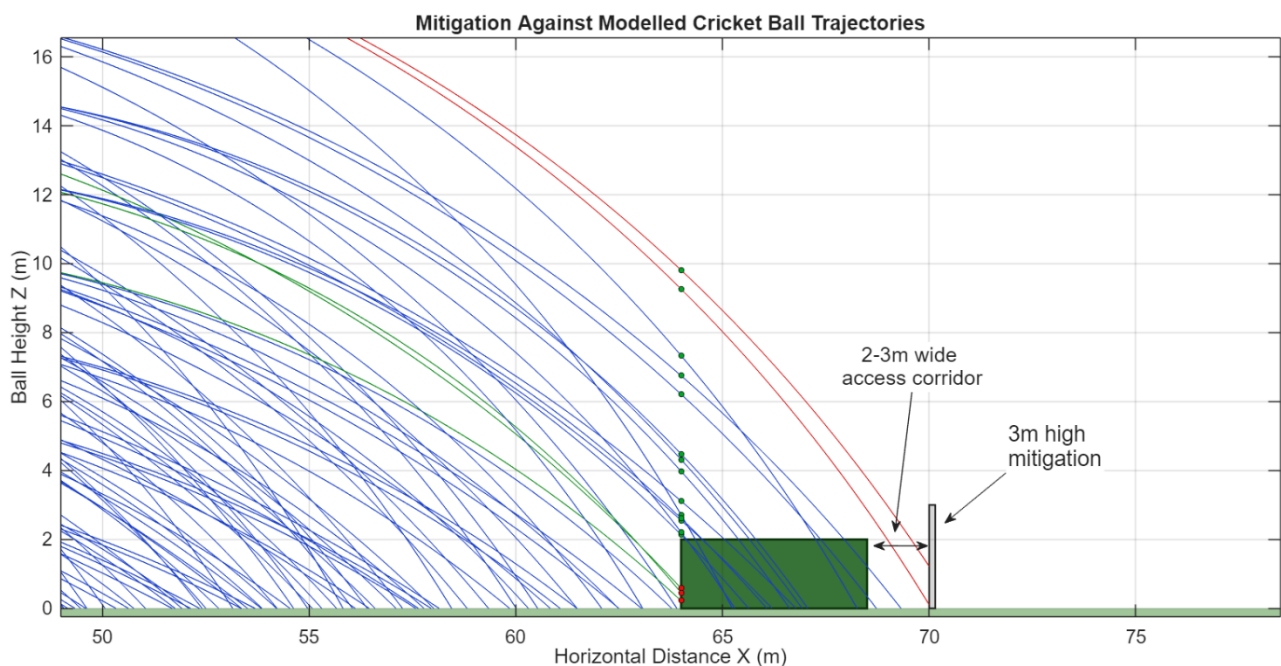
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- Option 2 – Ball stop netting

Alternatively, if this area along the development boundary cannot be amended to be made publicly inaccessible through planting, this report recommends the erection of ball stop mitigation (fencing/netting) to provide protection to users of the development, in the locations indicated below. Based on the findings of this assessment, 95% of all cricket balls that are predicted to surpass the site boundary would be prevented from entering the proposed development by 3m high ball stop mitigation.



Due to the presence of the existing hedgerow/treeline, it is recommended that a 2-3m wide access channel is left between the hedgerow/treeline and the proposed mitigation to allow access for maintenance and prevent impacting on its roots or any wildlife, as illustrated below.



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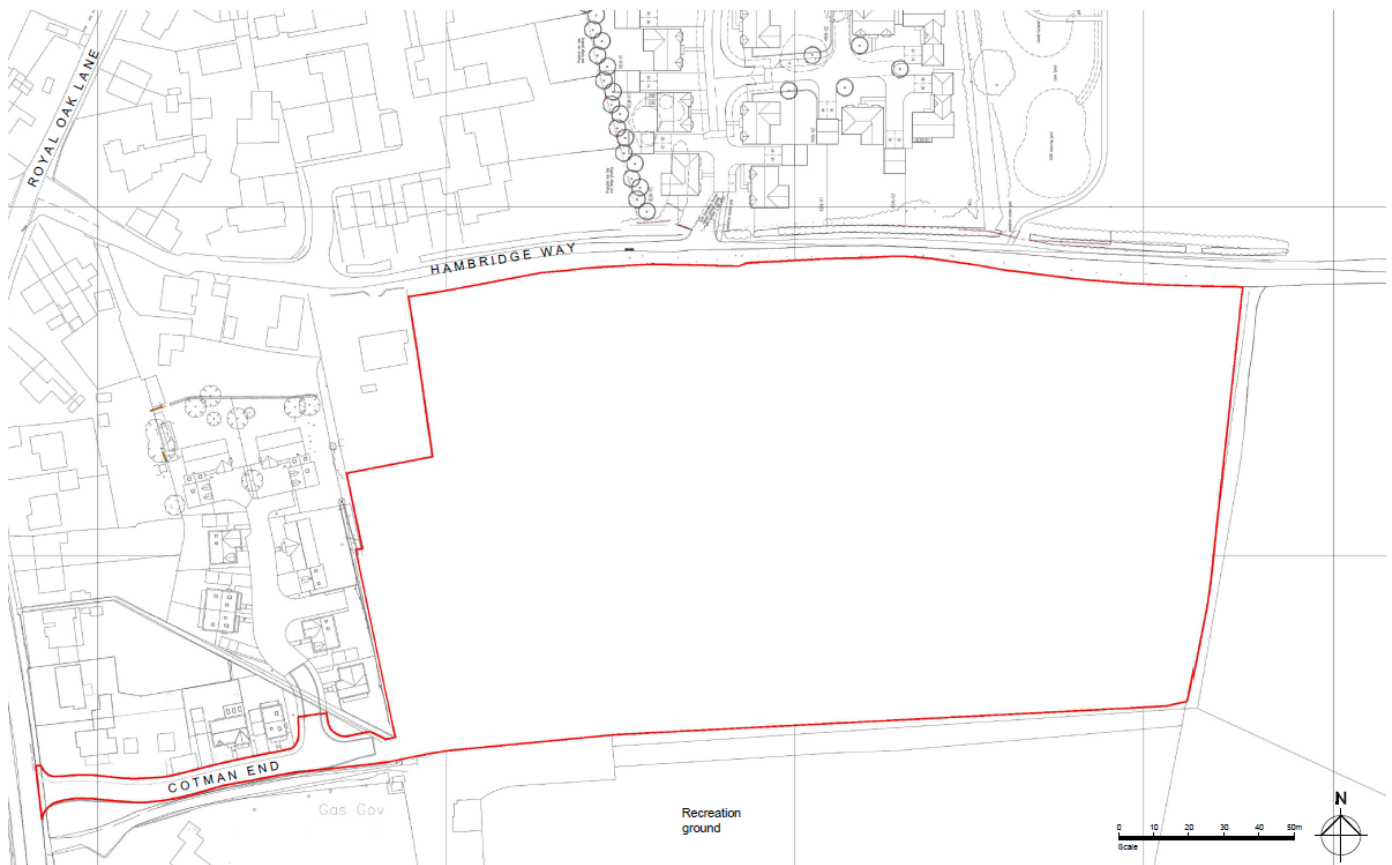
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2. INTRODUCTION

The purpose of this assessment is to evaluate the potential risk of cricket balls surpassing the boundaries of a cricket pitch at Pirton Recreation Ground, Pirton, Hitchin and impacting on a proposed new development in the adjacent land, South of Hambridge Way (shown below). Planning has been granted for permission to build 50 new dwellings on this adjacent land parcel subject to the findings of a Ball Strike Risk Assessment. Ball Strike Consultants Ltd have been commissioned by Blakeney Strategic Land Ltd to carry out a Ball Strike Risk Assessment at this location.

To assess this risk, Ball Strike Consultants Ltd will review the site distances and topography to determine the likelihood of cricket balls surpassing the northern boundary of the recreation ground and entering the proposed development site. The analysis uses an evidence-based cricket ball trajectory model that has been developed by Ball Strike Consultants Ltd. If required, the report will recommend mitigation solutions to minimise the potential risks.



Note: This is a desk study, Ball Strike Consultants Ltd have not visited the site, taken measurements, or carried out a visual inspection. All measurement information has been provided by the client and any error in measurements are not the responsibility of Ball Strike Consultants Ltd. This assessment is undertaken on the basis of accurate data.

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3. SCOPE AND OBJECTIVES

The purpose of this assessment is to evaluate the potential risk of cricket balls surpassing the boundaries of a cricket pitch at Pirton Recreation Ground, Pirton, Hitchin and impacting on a proposed new development in the adjacent land, South of Hambridge Way.

The objectives of this report are as follows:

- Identify distances from the cricket pitch to specific areas of concern within the proposed development.
- Referring to peer-reviewed published studies, identify the maximal speed and angles that cricket players of a relevant standard can launch balls.
- Develop and implement a trajectory model to assess the likelihood of a ball surpassing the site boundary.
- Evaluate existing control measures and propose evidence-based mitigation recommendations to provide protection against the risk of ball strikes if required.

4. SITE OVERVIEW

Proposed development

The image below shows an illustrative site layout and framework overlay of the proposed development South of Hambridge Way, Pirton. As indicated below, the proposed development is adjacent to existing recent residential developments off Walnut Tree Road/Cotman End. Along the southern boundary of the proposed new development, there is planned to be an access road, residential properties and a dry attenuation feature.



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Pirton Recreation Ground

The image below shows an aerial image of Pirton Recreation Ground adjacent to the proposed development, which is the location of Pirton Sports & Social Club <https://www.pirtonssc.co.uk/>. Pirton Sports & Social Club is a hub for the residents of Pirton and the surrounding areas, offering a range of sporting and leisure activities. In addition to the cricket square, there are also three football pitches and tennis courts. However, the focus for this assessment will be cricket ball trajectories only. The cricket square location has been identified as being in close proximity to the southern boundary of the proposed development. There is a risk that cricket balls hit in a northerly direction from the cricket square could surpass the boundary of the development, leading to injury and/or property damage.



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Standard of cricket played at Pirton Recreation Ground.

The cricket pitch is part of Pirton Sports & Social Club, located at the Pirton Recreation Ground in Hertfordshire. The ground hosts adult and junior fixtures, youth programs, and community matches managed alongside Pirton Cricket Club. Pirton CC play Sunday friendly cricket, with their Sunday 1st XI currently playing in the Hertfordshire Village Trophy Cup Competition, as indicated on the ECB's website: <https://pirton.play-cricket.com/home>. Pirton CC also have Colts teams at Under 11 & 15. It is our understanding that junior and adult recreational level cricket is played on all pitches on the cricket square at Pirton Recreation Ground. It is on this basis that this assessment has been carried out and recommendations in this report have been made.

Areas of risk to be considered.

At the instruction of the client, this assessment will only evaluate possible cricket ball trajectories hit in a northerly direction from the cricket square towards the proposed development. The focus on the analysis is based on the shortest distances from the nearest cricket pitches on the square to the potential areas of risk adjacent to the southern boundary of the development.

Existing mitigation measures.

At present, there are no specific ball stop mitigation measures to prevent sports balls from leaving the sports pitches at Pirton Recreation Ground. As shown in the image below, there is a hedgerow/treeline that runs along the boundary between the recreation ground and the proposed development site.



However, this report does not account for any existing, or planned planting (trees, hedges etc). It is our informed opinion that planting cannot be relied upon to provide protection against ball trajectories. The planting may not be sufficiently dense to stop the ball, nor homogeneous across the length. The planting may also change during the seasons, or indeed be cut back or removed.

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Site measurements



The above diagram illustrates the minimum distances from the cricket square at Pirton Recreation Ground to the hedgerow/treeline that makes up the site boundary. The hedgerow is approximately 4.5m wide.

Since this is a risk assessment the worst-case scenarios are considered; consequently, the measurements from the closest pitch on the cricket square are shown. However, cricket ball trajectories from all pitches on the square are considered in the assessment. The cricket square is made up of 6 strips with an artificial turf pitch on the western end of the square. Measures shown below have been taken from the stumps on both ends of the nearest pitch on the square to both sides of the hedgerow along the site boundary. The following distances have been used to calculate the projected height of the ball for different shot conditions as specified below:

Measured Distance	Shortest Boundary (m)	Shot Type
North – Closest stump to recreation ground side of hedgerow	Circa 43.9 m	Reduced speed shot
North – Closest stump to development side of hedgerow	Circa 48.3 m	Reduced speed shot
North** – Furthest stump to recreation ground side of hedgerow	Circa 64.0 m	Full speed shot
North** – Furthest stump to development side of hedgerow	Circa 68.2 m	Full speed shot

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5. ASSESSMENT METHODOLOGY

To carry out this assessment, a three-dimensional cricket ball trajectory model was developed to assess the potential flight paths of balls struck from the cricket square towards the site boundary and the proposed development. This model simulates a range of ball launch conditions from multiple locations on the cricket square, allowing the spatial distribution and relative frequency of potential ball trajectories to be evaluated. Each trajectory is calculated using a time-stepping numerical simulation from the point at which the ball is struck until it either reaches the ground or surpasses the boundary.

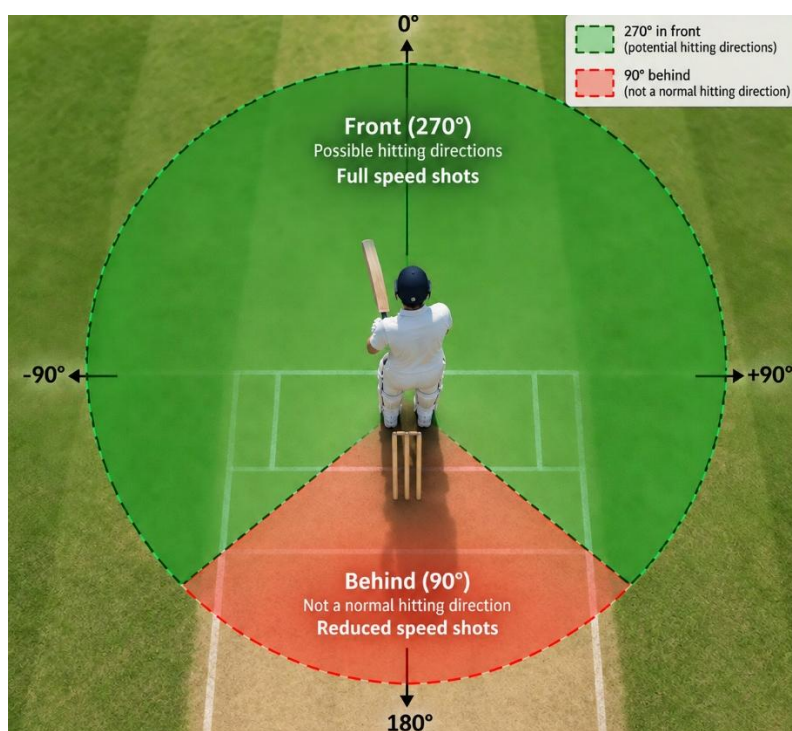
The principal inputs and assumptions used within the assessment and the trajectory model are as follows:

Player characteristics

The basis on which mitigation recommendations in this report is partly according to the level of players at the cricket club in question, which is determined by the league/competitions the club currently plays in. As stated previously, the highest level of cricket played by Pirton CC is that of their Sunday 1st XI team, which currently competes in the Hertfordshire Village Trophy Cup Competition. Therefore, for the purposes of this assessment, the level of competition taking place at this site would be classed as adult recreational level cricket.

Horizontal ball launch angle

The horizontal launch direction of cricket ball trajectories will be considered in two main scenarios, indicated in the image below. Full speed shots are those trajectories hit within the 270° region in front of the stumps, such as a 'straight drive'. Whereas trajectories hit within the 90° sector behind the stumps are considered reduced speed shots, such as a 'late cut' or 'late glance', which typically do not achieve the same peak velocity. This horizontal launch direction of travel is represented using an azimuth angle. An azimuth of 0° corresponds to travel in the positive X direction from the stump, with positive and negative angles representing lateral deviation to either side.



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Vertical ball launch angle and velocity

In cricket, the ball can be hit in any direction with a wide range of velocities and vertical launch angles. This risk assessment uses a probabilistic approach to consider what proportion of ball trajectories across a plausible distribution of launch parameters could surpass a given site boundary. Previous researchers have made accurate measurements of ball velocities, vertical launch angles and spin rates using high speed video and motion capture technologies. The table below summarises observed cricket ball launch parameters demonstrated by male cricketers from two recent studies by Peploe et al. (2019) and McErlain-Naylor et al. (2021).

Parameter	Group/Playing Standard	Peploe et al. (2019)	McErlain-Naylor et al. (2021)
Ball launch velocity (ms ⁻¹)	All participants	32.3 ± 2.5	33.5 ± 2.6
	International	34.5 ± 1.7	-
	County / England U19	32.6 ± 1.4	-
	Premiership Club	31.6 ± 1.8	-
	Recreational Club	30.0 ± 1.6	-
Vertical ball launch angle (°)	All participants	28.3 ± 14.5	-
Total ball carry distance (m)	All participants	-	80.7 ± 10.0
	International	72.3 ± 15.8	-
	County / England U19	68.8 ± 12.5	-
	Premiership Club	57.6 ± 24.9	-
	Recreational Club	53.6 ± 15.5	-

The characteristics of participants assessed in these two studies were as follows:

- [Peploe et al. \(2019\)](#)

Twenty male cricket batsmen (22.5 ± 3.1 years, 1.82 ± 0.04 m, 80.0 ± 7.8 kg) participated in this investigation, including international (n = 3), county (n = 9), premiership club (n = 5), and recreational club (n = 3).

- [McErlain-Naylor et al. \(2021\)](#)

Fifteen male cricket batters (age 21 ± 3 years; height 1.83 ± 0.05 m; mass 80.4 ± 9.3 kg) participated in this study. Participants included university (n = 5), professional county (n = 7) and international (n = 3) players.

In addition, a study by Coutis (1998) modelled the projectile motion of a cricket ball for vertical launch angles between 15-45° which was deemed a representative range of launch angles for all abilities.

Based on the findings of these previously published studies, the following ball velocities and vertical launch angles will be used in our ball trajectory model to simulate full speed shots for the specific standard of players being considered:

Playing standard	Parameter		
	Ball launch velocity (ms ⁻¹)	Vertical ball launch angle (°)	Typical ball carry distance (m)
International	35.0 +	20-50	72.3 ± 15.8
County / Premiership	31.0 – 35.0	20-50	68.8 ± 12.5
Recreational Club	≤ 31.0	20-50	53.6 ± 15.5

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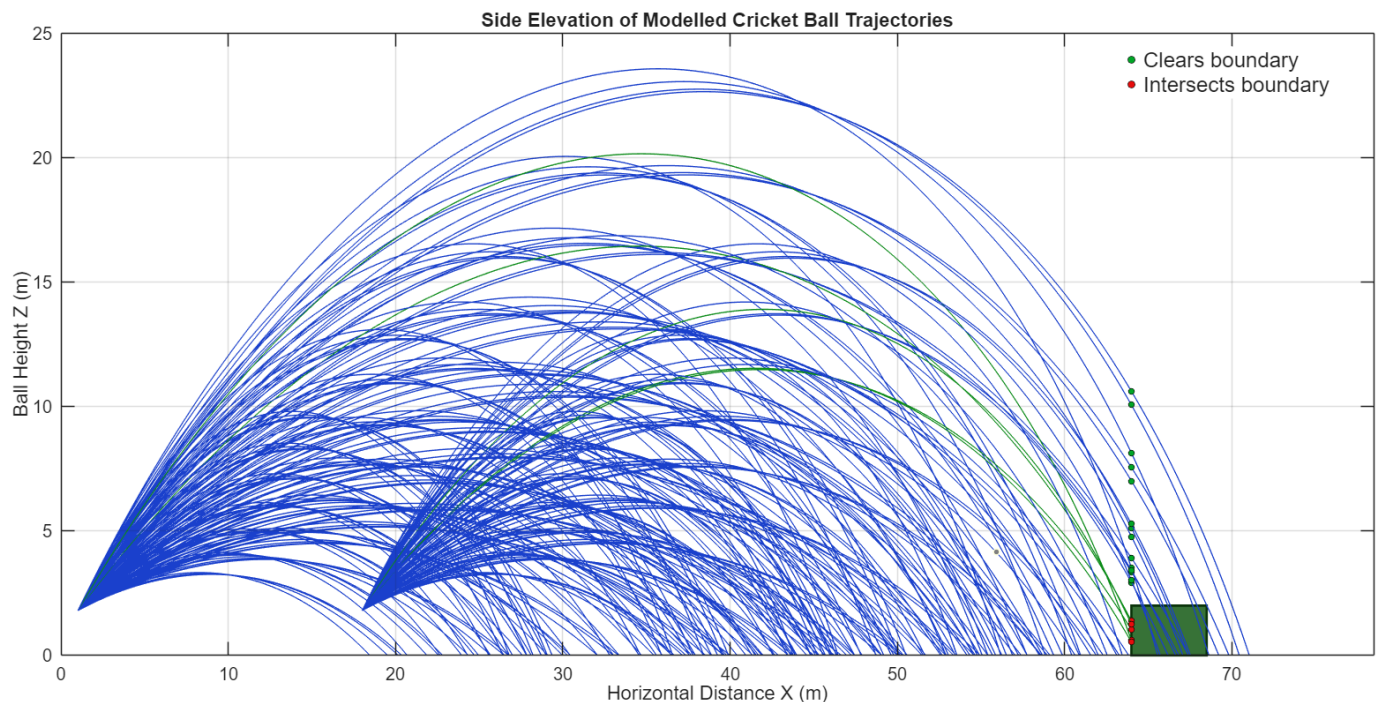
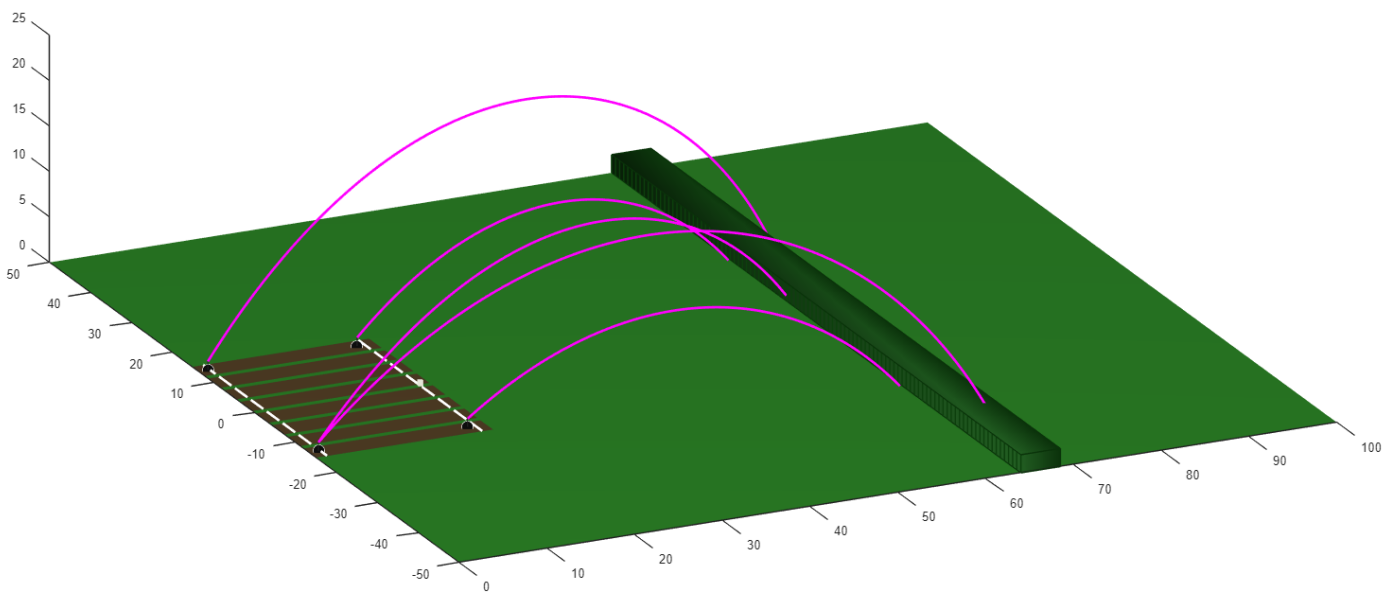
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6. BALL STRIKE RISK ASSESSMENT

Trajectory simulation

The ball trajectory model used for this assessment was built within the MATLAB numerical programming software and incorporated aerodynamic drag and lift forces, as well as the complexities arising from the ball's spin rate. Approximately 1,000 ball trajectories were simulated with varying ball launch parameters. The figures below visualise all the simulated cricket ball trajectories from the cricket square towards the site boundary adjacent to the proposed development within a 3D modelled environment. The dimensions of this modelled analysis environment are based on the site measurements detailed in Section 4.



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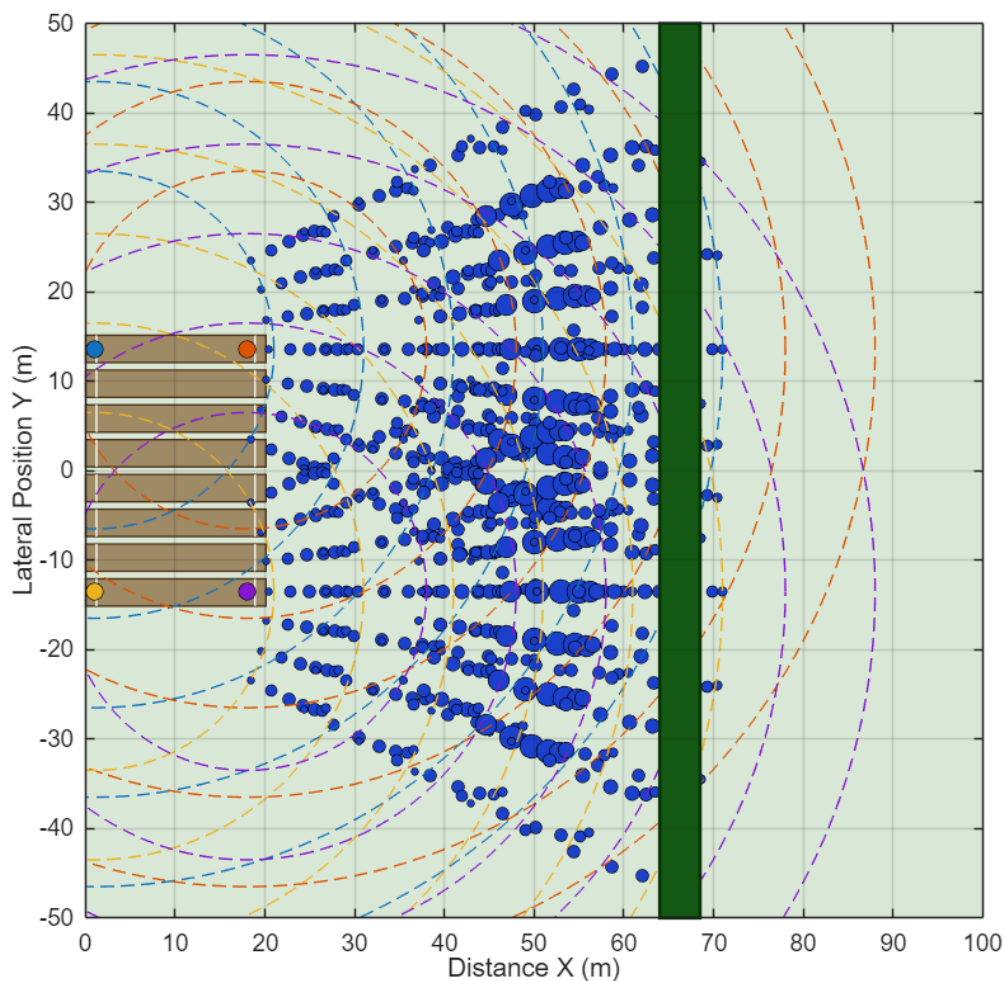
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Estimated ball height analysis.

According to the developed model, there is a possibility cricket balls could surpass the northern boundary of Pirton Recreation Ground and enter the proposed development in the adjacent land. To further investigate the likelihood of cricket balls surpassing the site boundary and assess what height of mitigation would be needed to prevent them landing within the development a probabilistic analysis was carried out. This analysis determined what percentage of trajectories either returned to the ground before reaching the boundary, intersected the boundary or cleared the boundary completely. If a ball cleared the boundary, its height was interpolated at the point it intercepts the far side of the boundary. Based on this simulation, it is estimated that the maximum possible height a ball could reach when surpassing the hedgerow/treeline of the site boundary would be 4.58m.

Sensitivity analysis - Probability density analysis

A probability density analysis was carried out to assess the likelihood of balls landing in the land adjacent to the cricket ground. The figure below provides a spatial representation of the relative frequency and distribution of predicted cricket ball landing locations. Areas with higher landing probability indicate locations where balls are predicted to land more frequently under the modelled batting conditions, while lower-probability areas represent less frequent outcomes. Based on this analysis, approximately 7% of all modelled cricket ball trajectories, hit from both ends of the cricket square, are predicted to land beyond the site boundary inside the development.



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7. MITIGATION OPTIONS AND RECOMMENDATIONS

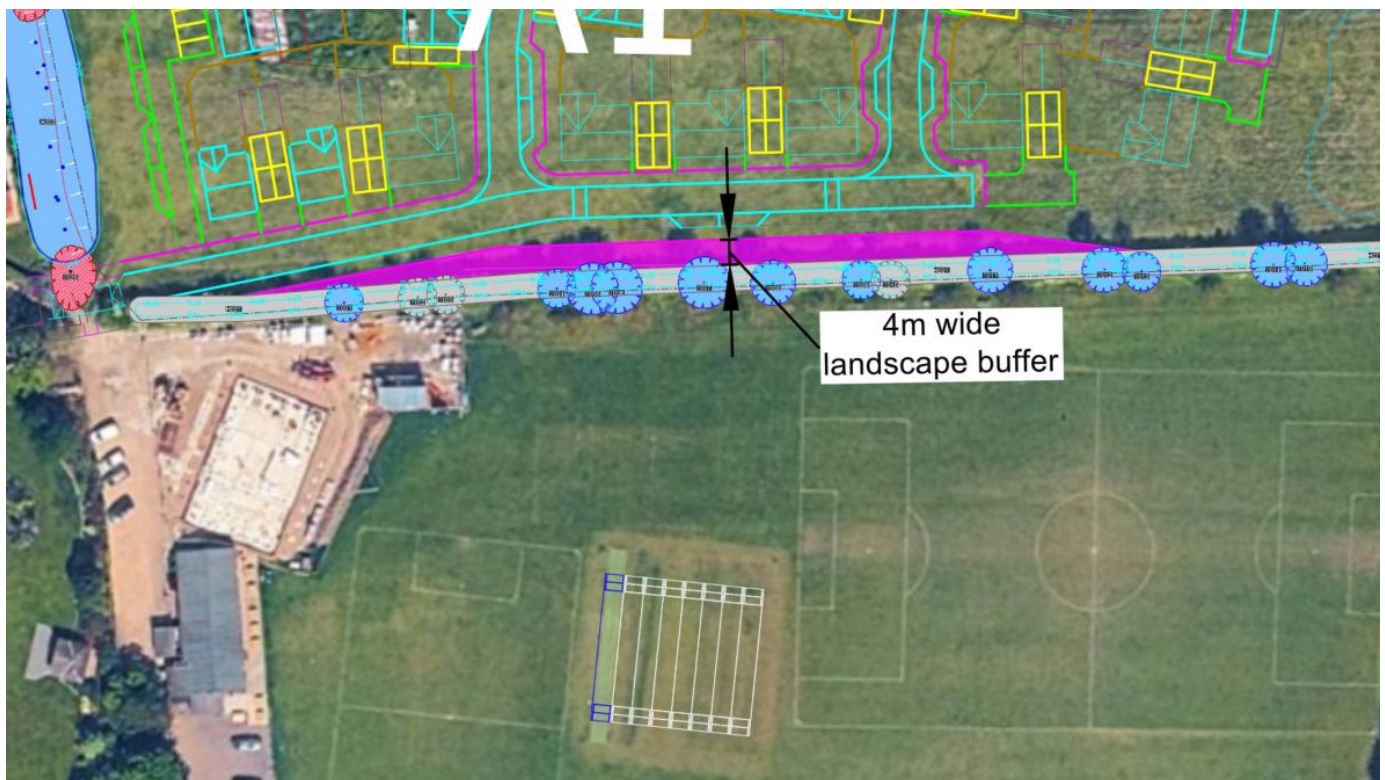
This report has been prepared to assess the potential risk of cricket balls surpassing the boundaries of Pirton Recreation Ground and advise on the type and level of mitigation recommended to provide a suitable level of protection to the proposed development. The exact frequency of events resulting in a cricket ball being hit into the adjacent area is unknown and impossible to predict with certainty (player skills and many other factors can influence this) hence a proportionate approach needs to be taken to provide safety to these users. In practice, there may be a further than expected trajectory, but a balanced risk mitigation strategy needs to be implemented that is proportionate to reduce the likely risk.

Recommendation

The findings of this ball strike assessment analysis demonstrates that although there is a low probability of cricket balls surpassing the boundary between Pirton Recreation Ground and the proposed development (<10%), there is a need for mitigation to protect users of the proposed development from the risk of ball strikes. To provide sufficient protection against the risk of ball strikes, this report recommends either of the following two mitigation solutions:

- **Option 1 – Publicly inaccessible landscape buffer along development boundary.**

To prevent cricket balls impacting on users of the new development, a wider publicly inaccessible landscape buffer area of mixed scrub habitat could be added along the southern site boundary. This inaccessible, undeveloped landscaped area could include, for example, dense hawthorn, blackthorn and holly planting, which would prevent users of the site from accessing the area next to the site boundary, removing the need for any additional mitigation (netting). The area that it is recommended be made publicly inaccessible are shown in the image below and appears to be in an area of minimal planned development.



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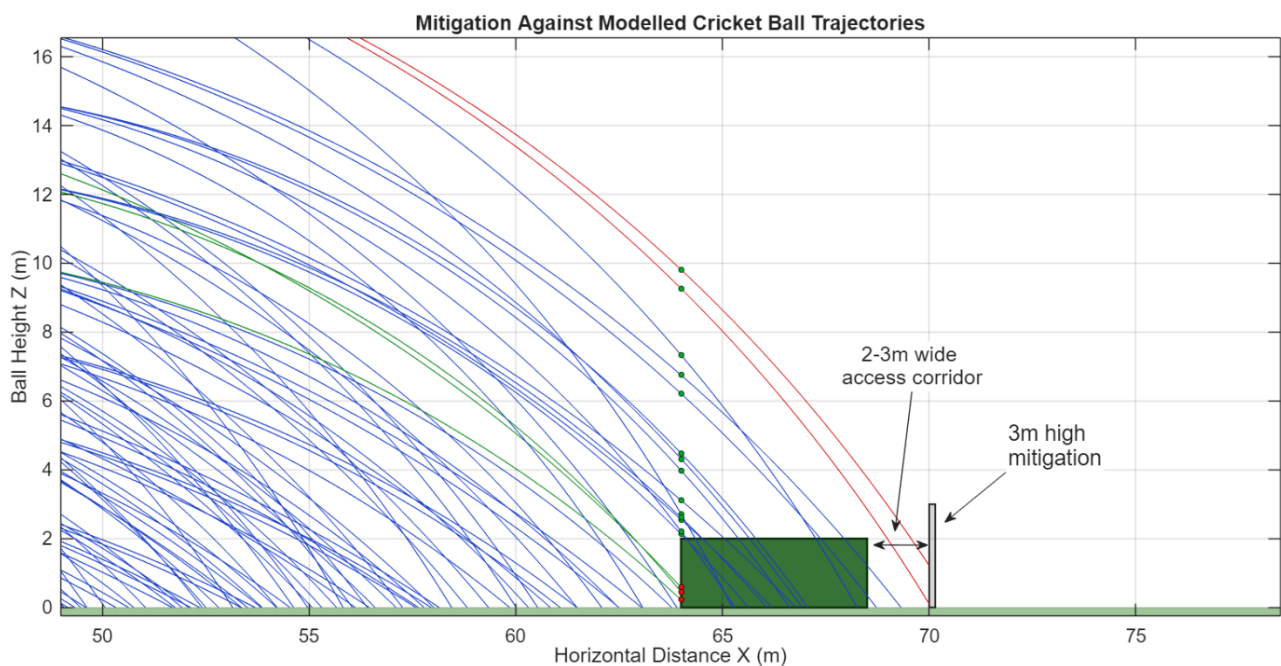
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- Option 2 – Ball stop netting

Alternatively, if this area along the development boundary cannot be amended to be made publicly inaccessible through planting, this report recommends the erection of ball stop mitigation (fencing/netting) to provide protection to users of the development, in the locations indicated below. Based on the findings of this assessment, 95% of all cricket balls that are predicted to surpass the site boundary would be prevented from entering the proposed development by 3m high ball stop mitigation.



Due to the presence of the existing hedgerow/treeline, it is recommended that a 2-3m wide access channel is left between the hedgerow/treeline and the proposed mitigation to allow access for maintenance and prevent impacting on its roots or any wildlife, as illustrated below.



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This report does not recommend the specific design of a mitigation system, however options could include:

- Ball stop netting
- Rigid panel fencing
- Permanent or temporary fencing structures



The best place to find examples/get quotes for the type of mitigation required for the site would be the Sports and Play Construction Association (SAPCA) website: <https://sapca.org.uk/members/>

If you go to this webpage and filter by 'Cricket Netting Facilities', you should be presented with a list of potential member companies and their contact details/websites.

It is recommended the client discuss design options with the relevant stakeholders including the LPA, the ECB and the cricket club.

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8. LIMITATIONS

It is important to note that the recommendations made in this report may not prevent all cricket balls from landing beyond the proposed mitigation location and impacting on the development, but it is predicted from the assessment of ball trajectory it will significantly reduce the likelihood and frequency of balls entering the development.

Trajectory models are known to exhibit high accuracy and Ball Strike Consultants Ltd have undertaken extensive experimental validation of this trajectory model to refine its accuracy. However, it is not possible to simulate the full complexity of the real world and this model does not account for variations in bat/ball restitution or wind (speed and direction). Due to these limitations, the model is regarded as an indicative prediction tool.

Finally, it should be noted that this is a desk study. Ball Strike Consultants Ltd have not visited the site, taken physical measurements, or carried out a visual inspection. All measurement information has been provided by the client and any error in measurements are not the responsibility of Ball Strike Consultants Ltd. This assessment is undertaken based on accurate data.

9. REFERENCES

Stuart A. McErlain-Naylor, Chris Peploe, James Grimley, Yash Deshpande, Paul J. Felton & Mark A. King (2021) Comparing power hitting kinematics between skilled male and female cricket batters, Journal of Sports Sciences, 39:21, 2393-2400, DOI: 10.1080/02640414.2021.1934289

C. Peploe, S.A. McErlain-Naylor, A.R. Harland, M.A. King (2019) Relationships between technique and bat speed, post-impact ball speed, and carry distance during a range hitting task in cricket, Human Movement Science, Volume 63, Pages 34-44, <https://doi.org/10.1016/j.humov.2018.11.004>.

Coutis, P. (1998). Modelling the projectile motion of a cricket ball. International Journal of Mathematical Education in Science and Technology, 29(6), 789–798. <https://doi.org/10.1080/0020739980290601>

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APPENDIX A – TECHNICAL DATA AND ASSUMPTIONS

Parameter	Model input	Units	Basis / description
Ball mass	0.156	kg	Cricket ball mass
Ball diameter	0.072	m	Ball diameter
Air density	1.225	kg/m ³	Assumed atmospheric density
Gravitational acceleration	9.81	m/s ²	Standard gravitational acceleration
Drag coefficient, Cd	0.45	-	Aerodynamic model assumption
Lift coefficient, Cl	0.12	-	Magnus/lift assumption
Ball spin rate	1,500	rpm	Assumed spin rate
Launch height	1.0	m	Ball height at impact
Launch speed	20-40	m/s	Modelled range
Elevation angle	20-50	degrees	Modelled range
Azimuth angle	-30 - 30	degrees	Modelled range
Simulation time step	0.005	s	Numerical integration interval
Maximum simulation time	8	s	Maximum trajectory duration

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