4 Doolittle Mill
Froghall Road
Ampthill
Bedfordshire
MK45 2ND

Tel: 01525 307060

Email: richard.earl@tgms.co.uk
Web: www.tgms.co.uk

HENLEY TOWN COUNCIL

A feasibility study for the proposed natural turf pitch improvement works at Jubilee Park, 357 Reading Road, Henley-on-Thames, RG9 4HA.

13th November 2023 [Revision 3, 23rd February 2024]

TGMS1315.2 [ABRIDGED VERSION]

STATUS – FOR REVIEW

TABLE OF CONTENTS

Please note, important: The aim of this report is to appraise the current conditions at the site specified in ‘Physical Site Survey’ below only. This is not a design document and does not include detailed design or design information and should not be used for this purpose. As such, TGMS accepts no design liability or responsibility for subsequent works based on the information contained within this report.

REVISION RECORD					
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1 EXECUTIVE SUMMARY JUBILEE PARK, HENLEY

KEY: **No action required** **Action may be required** **Action required**

1.1 Site information

	1	**Objective:** To conduct a feasibility study for proposed natural turf pitch improvement works at Jubilee Park, 357 Reading Road, Henley-on-Thames, RG9 4HA. The focus of the study is to explore scope for optimising the pitch area remaining following the proposed construction of a new 3G pitch towards the centre of the site, along with changing rooms and a car park towards the north-western boundary. In addition, to consider the potential to purchase and incorporate a plot of land of approximately 4,200 m^2 immediately to the south-east of the site.
	2	**Site visit:** A detailed site investigation was conducted on the 3rd of May 2023.
	3	**Site location:** The site is an established sports ground which is home to AFC Henley Football Club, and comprises a block of natural turf pitches that are bounded by a Tesco superstore to the north-west, a railway line and agricultural land to the north-east, residential properties to the south-east, and Reading Road (A4155) to the south-west.
	4	**Hydrology:** Catchment data obtained from the Flood Estimation Handbook (FEH) Web Service indicate that the site forms part of a 41.47 km^2 catchment with an outlet into the River Thames ~500 m east of the site. A ditch enters the site from near the Reading Road entrance and runs north-eastwards towards the boundary with the railway line before turning south-eastwards, parallel with the railway line, to an old pond in a triangular fallow area. This watercourse exits the site via a culvert under the railway line and continues eastwards to the River Thames.
	5	**Land drainage flow rates:** The predicted drainage rates for the site for both a 6-hour and a 24-hour rainfall event are greater than the greenfield runoff rates, and so the installation of a land drainage system would result in greater flow rates than the greenfield condition. It is therefore concluded that if a land drainage system is installed, then additional attenuation in the form of a flowrate regulator will be required for this site. Drainage design should account for at least the 1:30 return period outfall rate of 6.6 l/s/ha for the site over a 24-hour period.
	6	**Flood risk from rivers and seas:** Based on information obtained from the Environment Agency (EA) via gov.uk, the majority of the site is at medium risk of flooding from rivers and seas (between 1% and 3.3% (1 in 100 and 1 in 30 years)).
	7	**Flood risk from surface water:** Based on information obtained from the Environment Agency (EA) via gov.uk, the main area of the site is at very low risk of surface water flooding (<0.1%, (<1 in 1000 years)), whereas the south-eastern area is a low risk (between 0.1% and 1% each year (1 in 1000 and 1 in 100 years)).
	8	**Landfill:** Based on information obtained from environment.data.gov.uk, the site is not located in an area of historic or permitted landfill, however it is known that a fallow triangular area in the south-eastern corner of the site has been used in the past to dump material on an unofficial basis.
	9	**Groundwater Source Protection Zones:** Based on information obtained from magic.defra.gov.uk, the site is located within the Total Catchment of a Groundwater Source Protection Zone. This could restrict the construction of a deep bored soakaway (depending upon geology) as a means of achieving drainage outfall from the site should a more convenient means of water disposal not be available.
	10	**Pitch dimensions and gradients:** With reference to a topographical survey conducted by Peter J H Roberts, the six pitches marked out on the day of the survey equate to a total pitch area, excluding safety margins, of 14,900 m^2. With reference to the proposed construction of a 3G pitch, car park and changing rooms, TGMS has conducted a pitch re-sizing and re-locating exercise to explore how the natural turf pitch provision can be reconfigured to optimise use of the area remaining after construction of the new facilities. A proposed layout based on the current site boundary equates to a total pitch area, excluding safety margins, of 15,098 m^2 (a modest increase of 198 m^2). A proposed pitch layout based on the assumption that it will be possible to purchase the additional plot of land to the south-east, and bury the overhead power lines in the fallow triangular area, equates to a total pitch area, excluding safety margins, of 19,605 m^2 (an increase of 4,705 m^2). Sport England recommends that the maximum slope along and across the direction of play should not exceed 1.25% and 2.00% respectively. It is concluded that the proposed arrangement will comply with the guideline values stipulated by Sport England.
	11	**Pitch orientation:** Sport England has published guidance on optimum pitch orientation for a range of sports. For winter games pitches, this ranges from 285° to 20° in order to mitigate against the effects of low winter sunshine projection. For the existing pitch layout, two smaller pitches near Reading Road are orientated at 334° and therefore comply with the guidance. The remaining four

		larger pitches are orientated at 64° which is outside the guidance. For the proposed layout within the existing boundary, a Youth pitch near Reading Road and two pitches near the power lines are orientated at 334° and therefore comply with the guidance. A Youth pitch near the hockey pitch is orientated at 64° which is outside the guidance, but given the geometry of the site, re-orientation is not possible. For the proposed layout based on additional land purchase, a Youth pitch near Reading Road and larger pitches over the footprint of the purchased land are orientated between 334° and 346°and therefore comply with the guidance. Youth pitches near the hockey pitch and near the neighbouring tennis court are orientated at 64° which is outside the guidance, but given the geometry of the site, re-orientation is not recommended.
	12	**Soil maps:** According to Sheet 6 of the Soil Survey of England and Wales 1:250,000 soil map (1983), the indigenous soil comprises the Hucklesbrook Soil Association. The geological origin is River terrace drift, and the soils are characterised by "*well drained coarse loamy and some sandy soils, commonly over gravel. Some similar permeable soils affected by groundwater. Usually on flat land*".
	13	**Geology:** According to the BGS Geology Viewer, the underlying geology comprises superficial deposits of the Kempton Park Gravel Member - Sand and gravel. Sedimentary superficial deposit formed between 116 and 11.8 thousand years ago during the Quaternary period. These overlie the Lewes Nodular Chalk Formation, Seaford Chalk Formation and Newhaven Chalk Formation - Chalk. Sedimentary bedrock formed between 93.9 and 72.1 million years ago during the Cretaceous period.
	14	**Soil profile pit description:** In summary, the area in the vicinity of the overhead power lines comprises made ground, whereas the majority of the site is characterised by ~100 mm of SANDY LOAM topsoil overlying very stony SANDY LOAM subsoil. SANDY LOAM soil is desirable for playing field construction as it is associated with moderate to good natural drainage rates however this soil type is also susceptible to compaction and so routine decompaction operations will need to be conducted as part of the ongoing agronomic maintenance schedule. Both the topsoil and subsoil are stony and so stone burial / removal operations will be required as part of the construction works. It is concluded that the soil from the footprint of the proposed 3G pitch, car park and pavilion is suitable for re-use as part of the pitch construction works near the overhead power lines and the plot of land to the south-east (if purchased). It is recommended that new pitches constructed in these areas are capped off with an imported 50 mm deep rootzone (sand/soil mix) carpet to mitigate the risk of upward migration of stones.
	15	**Drainage status:** Although SANDY LOAM soil is generally associated with moderate to good natural drainage rates, there is a propensity for finer particles to dislocate and migrate towards, and block, larger interstices during play. This compaction of the upper profile results in poor drainage status which is likely to persist over the winter months when the rate of precipitation exceeds the rate at which water is removed through water infiltration through the pitch surface, or evapotranspiration. This will tend to encourage the development of saturated conditions towards the surface following significant rainfall. Following soil importation from the 3G pitch, car park and pavilion construction works, and re-grading earthworks to create the desired pitch gradients, the installation of a land drainage scheme that is designed to intercept rain water at the surface before it has had an opportunity to soak in to the soil profile is recommended.
	16	**Soil nutrient status:** The topsoil is generally in good order aside from a deficiency in the macro nutrient Potassium near Reading Road, and so it is recommended that, following pitch construction, the fertiliser programme be amended to address this deficiency. Soil pH of 8.1 (near the overhead power lines) is above (alkaline) the recommended range for the cultivation of Perennial ryegrass species (5.5 to 7.5). An alkaline environment will reduce the availability of certain nutrients - particularly P, K, B, Co, Cu, Fe, Mn and Zn. An elevated pH will also impact on beneficial soil fungal populations and activity. In other areas, the soil pH of 5.6 to 6.0 is at the lower end (acidic) of the recommended range for the cultivation of Perennial ryegrass species (5.5 to 7.5). An acidic environment will reduce soil nutrient availability and the efficiency of any applied fertilisers or organic materials. A sub optimum pH will also impact on soil microbial populations and rates of activity. It is therefore recommended that a granulated form of carbonate of lime is applied during pitch construction to increase the pH to a more neutral reaction.
	17	**Agronomic condition:** There are numerous minor surface depressions across the site, and ~25 mm of surface thatch, and so areas outside of the proposed 3G pitch and car park development works would benefit from enhanced agronomic maintenance and overseeding with a suitable grass sward using a sports-specific ryegrass-dominated seed mix. The area in the vicinity of the overhead power lines has been fallow for some time and is now covered with ~0.50 m of volunteer vegetation. There will be a need to remove this vegetation prior to soil importation and pitch construction works and the establishment of a suitable grass sward using a sports-specific ryegrass-dominated seed

		mix. If this area were to be extended into the paddock to the south-east that could potentially be for sale, there will be a need to arrange for two trees (a sycamore and blue spruce) to be removed.
	18	**Water supply:** A standpipe is located towards the north-western corner in the treeline, with a nearby stop-cock which isolates a supply to another standpipe located near the culvert under a concrete bridge.
	19	**Site usage:** Following pitch construction and the installation of a land drainage system, the proposed natural turf pitches may be able to support 3 to 6 hours of usage per week in the winter (4.5 to 9 hours per week for players 15 years of age and under).
	20	**Performance Quality Standards:** The existing pitches in Jubilee Park pass nine of the eleven PQS parameters assessed (ground cover, broad-leaved weeds, sward height, surface hardness, water infiltration rate, slope in the direction of play, slope across play, pH and stone content / diameter), but fail the remaining two (thatch depth and surface evenness). The area near the overhead power lines passes only three of the eleven PQS parameters assessed (slope in the direction of play, slope across play and stone content / diameter), but fails the remaining eight (ground cover, broad-leaved weeds, sward height, surface hardness, water infiltration rate, thatch depth, surface evenness and pH).

1.2 Recommendations.

Based on the findings from the site assessment, recommended pitch construction works are set out in Section 5 of this report.

Dr Richard Earl – February 2024

2 INTRODUCTION AND OBJECTIVES

TGMS has been commissioned by Henley Town Council to conduct a feasibility study for the proposed natural turf pitch improvement works at Jubilee Park, 357 Reading Road, Henley-on-Thames, RG9 4HA.

It is understood that a new 3G pitch is to be constructed in the western area of the park along with a car park and pavilion along the northern boundary. Separate to this, consideration is also being given to ways of improving areas of natural turf, which may include:

1. The batter sloped area near Reading Road.
2. The possible presence of concrete below the surface near the tennis courts.
3. The potential to culvert part of the watercourse to increase the useable area.
4. General improvements to the southern area.
5. General improvements to the "tufty" area near the eastern boundary.
6. The future potential of purchasing and incorporating additional land to the south-east of the site.

The objectives of the feasibility study are as follows:

- To undertake a baseline Performance Quality Standard Assessment using Sport England guidelines.
- To undertake a detailed site investigation in order to characterise the underlying soil profile with a view to developing the optimum pitch provision.
- To determine appropriate development options for the pitches in consultation with the Client such that the requisite Performance Quality Standards (PQS) specified by Sport England are met whilst minimising construction costs.
- To derive indicative construction costs for budgetary purposes and present costed options where applicable.
- To provide an indicative work programme in order that the Client has a clear picture of the duration of the proposed construction works and when the pitches may be available for use.

3 PHYSICAL SITE SURVEY

Dr Richard Earl of TGMS conducted a detailed site investigation of the site on the 3rd of May 2023 to evaluate the agronomic condition and drainage status of the site.

3.1 Site location.

The site is an established sports ground which is home to AFC Henley Football Club and comprises a block of natural turf pitches. The site address is:

Jubilee Park
355 Reading Road
Henley-on-Thames
RG9 4HA

Grid reference (centre of the field).

OS X (Eastings)	476923
OS Y (Northings)	181343
Nearest Post Code	RG9 4HF

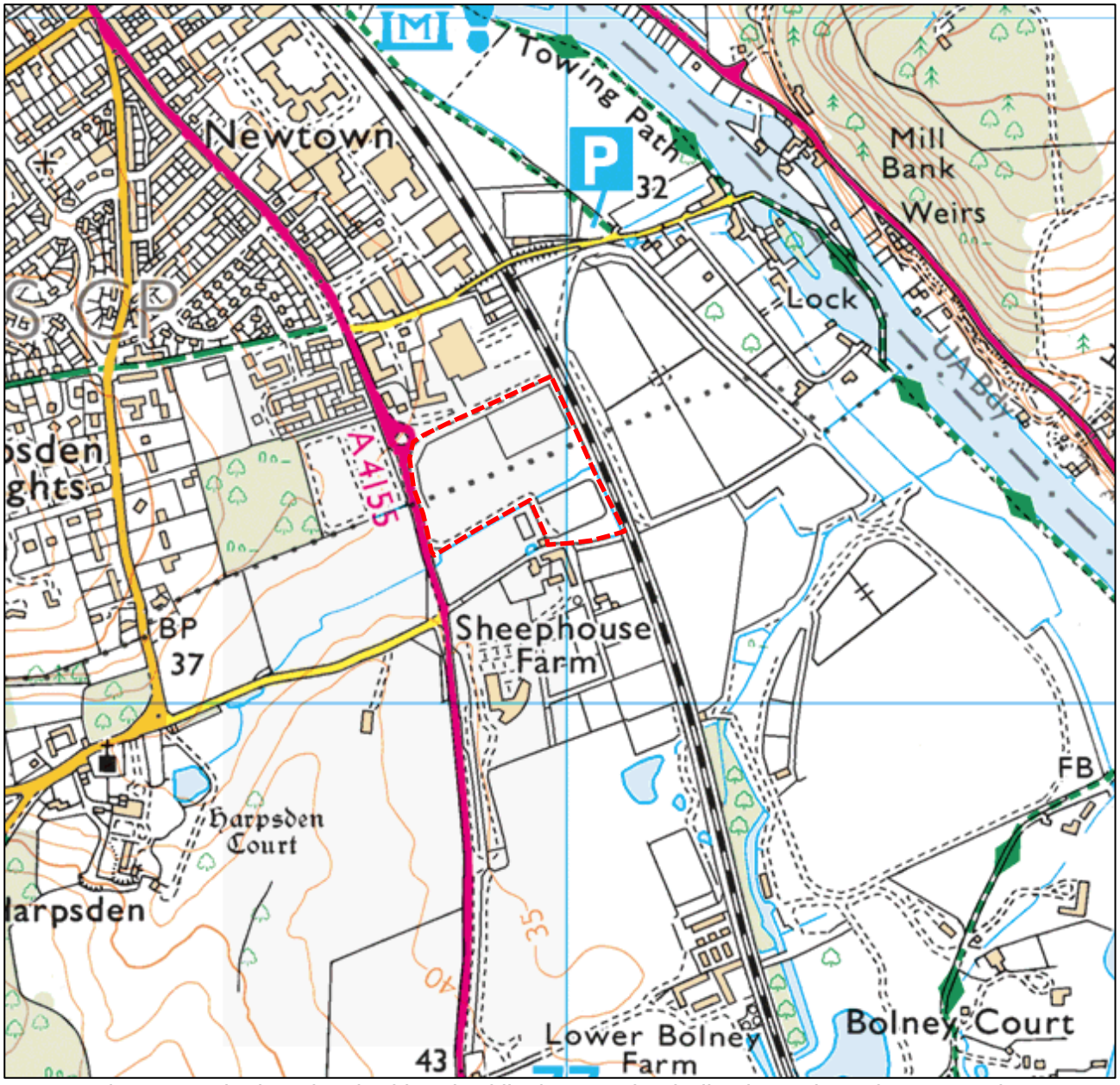


Figure 1. Site location (red hatched line). Location indicative only and not to scale.

The site is bounded by a Tesco superstore to the north-west, a railway line and agricultural land to the north-east, residential properties to the south-east, and Reading Road (A4155) to the south-west (Figure 2).

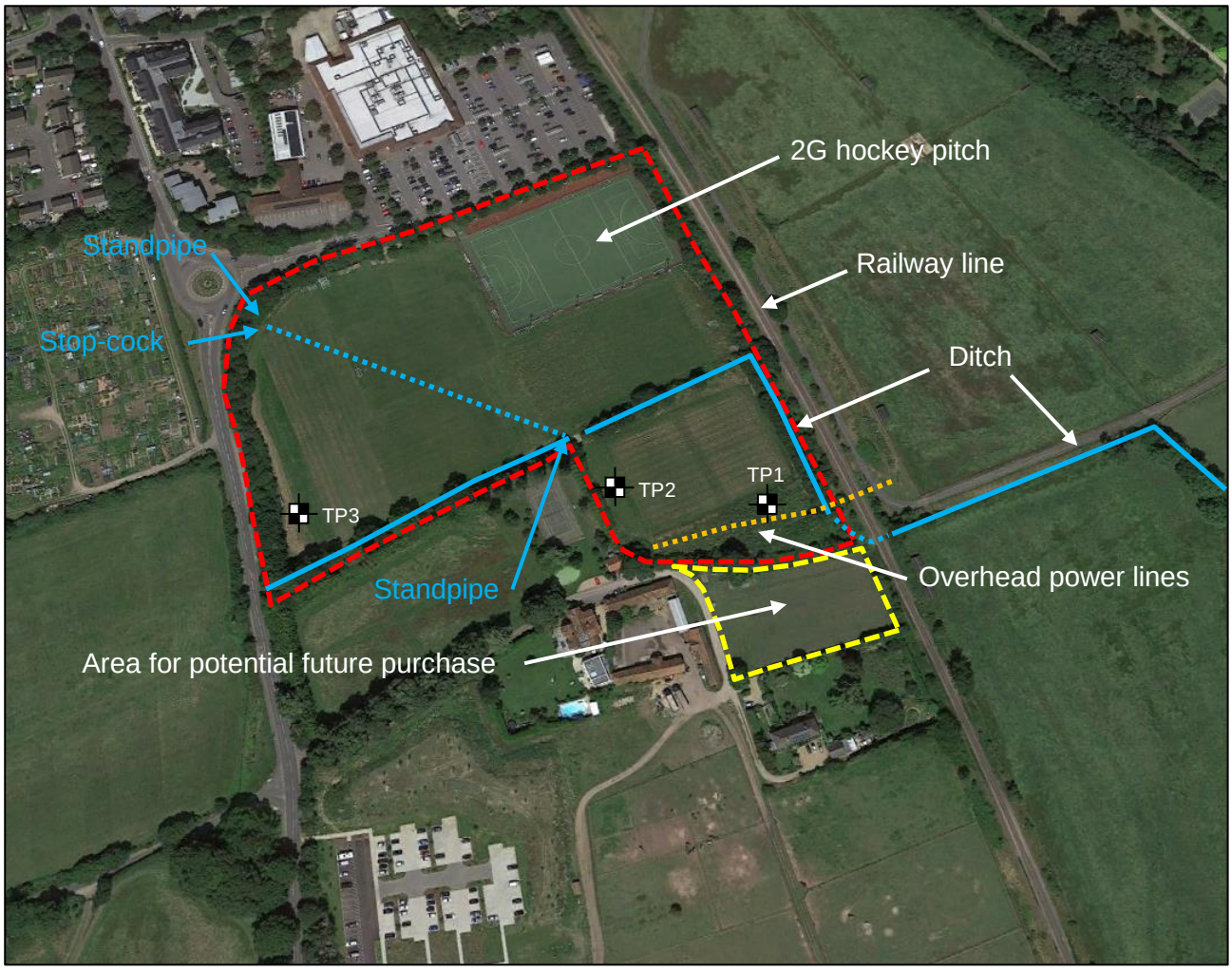


Figure 2. Site overview. The red hatched line demarcates the extent of the site, and the yellow hatched line demarcates an area for potential future purchase (indicative and not to scale). TP1 to TP3 mark the approximate locations of the test pits.
(Aerial photograph courtesy of Google Earth Pro).

It is proposed to construct a new 3G pitch towards the centre of the site, along with changing rooms and a car park towards the north-western boundary Figure 3.

Clearly, this will result in the loss of a significant proportion of the natural turf playing space, and so the objective of this feasibility study is to explore scope for optimising the remaining area, including the potential to purchase and incorporate a plot of land of approximately 4,200 m^2 immediately to the south-east of the site (Figure 2).

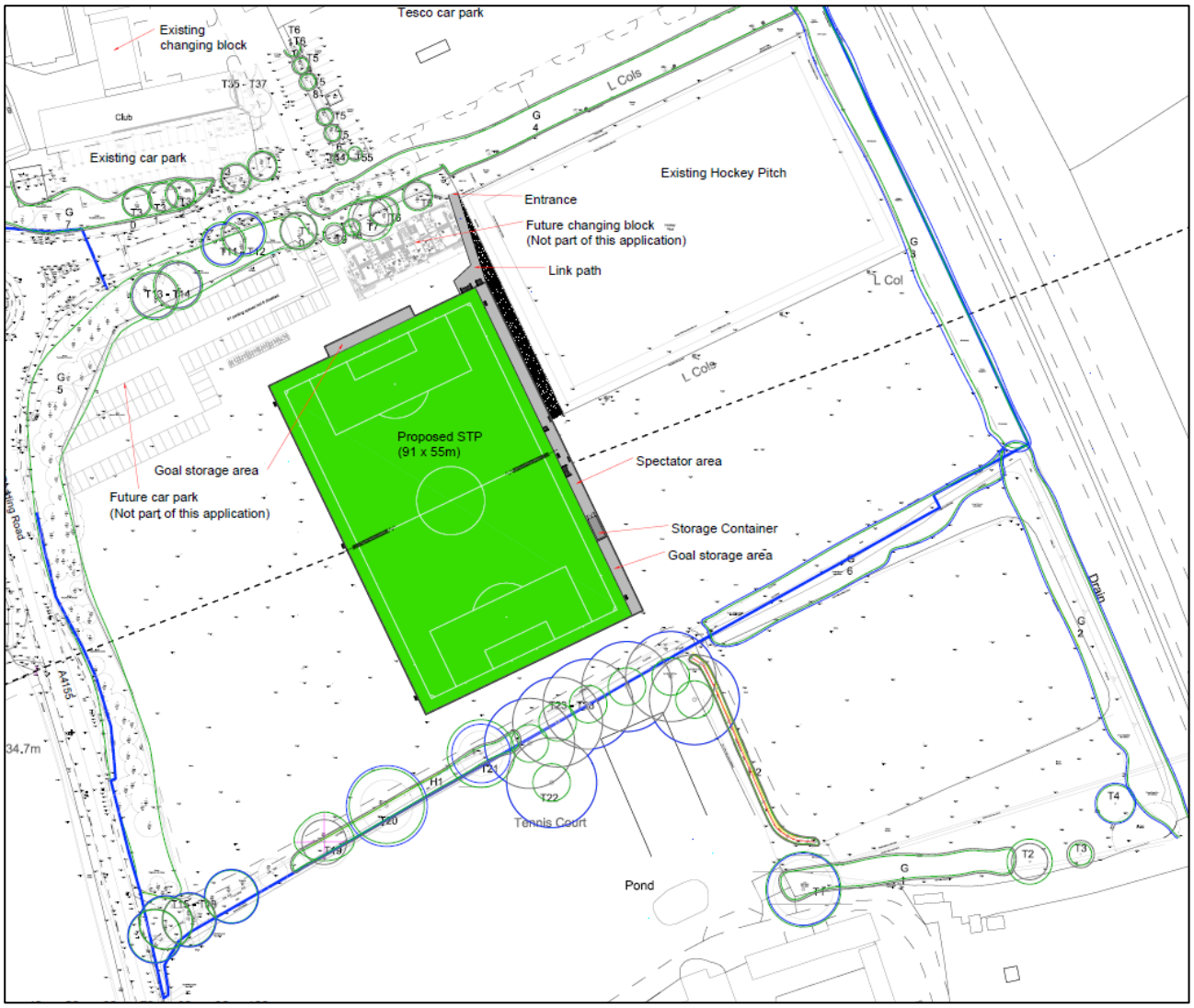


Figure 3. Proposed site layout.
(Excerpt from drawing MCA-MUK2942-07 courtesy of McArdle Sport Tec).

Photographs from a walkover survey are presented in Figures 4 to 23.

Figure 4. Site entrance near Tesco.

Figure 5. Site entrance from Reading Road.

Figure 6. General view along the north-western boundary towards the south-west (designated to become a new car park).

Figure 7. General view along the south-western boundary (parallel with Reading Road) from the north-western corner.

Figure 8. General view of the north-western corner near the entrance from Reading Road.

Figure 9. General view across the main area of the site from the south-eastern boundary towards the north-west.

Figure 10. Concrete bridge over a ditch that runs along the south-eastern boundary.

Figure 11. General view along the south-eastern ditch line towards the north-east.

Figure 12. General view along the north-eastern boundary towards the north-west (parallel with the railway line).

Figure 13. General view along the other side of the south-eastern ditch line (taken from the concrete bridge).

Figure 14. General view Across the south-eastern pitch area towards the south-east (taken from the concrete bridge).

Figure 15. General view along the south-eastern boundary of the south-eastern pitch area immediately adjacent to the fallow triangular area.

Figure 16. Gate into the fallow triangular area.

Figure 17. General view across the fallow triangular area towards the south.

Figure 18. Overhead power lines in the fallow triangular area.

Figure 19. Overhead power lines in the fallow triangular area..

Figure 20. General view across the fallow triangular area towards the south-west.

Figure 21. Old pond in the eastern corner of the fallow triangular area.

Figure 22. General view across the south-eastern plot potentially for sale.

Figure 23. General view across the south-eastern plot potentially for sale.

3.2 Geomorphology and climate.

3.2.1 Hydrology.

A ditch enters the site from near the Reading Road entrance and runs north-eastwards towards the boundary with the railway line before turning south-eastwards, parallel with the railway line, to an old pond in a triangular fallow area. This watercourse exits the site via a culvert under the railway line and continues eastwards to the River Thames.

Standard period annual rainfall.

Climate data obtained from the Flood Estimation Handbook (FEH) indicate that the standard-period average annual rainfall (SAAR6190) for this catchment is 718 mm which is below the national average of 855 mm/year (Figure 24).

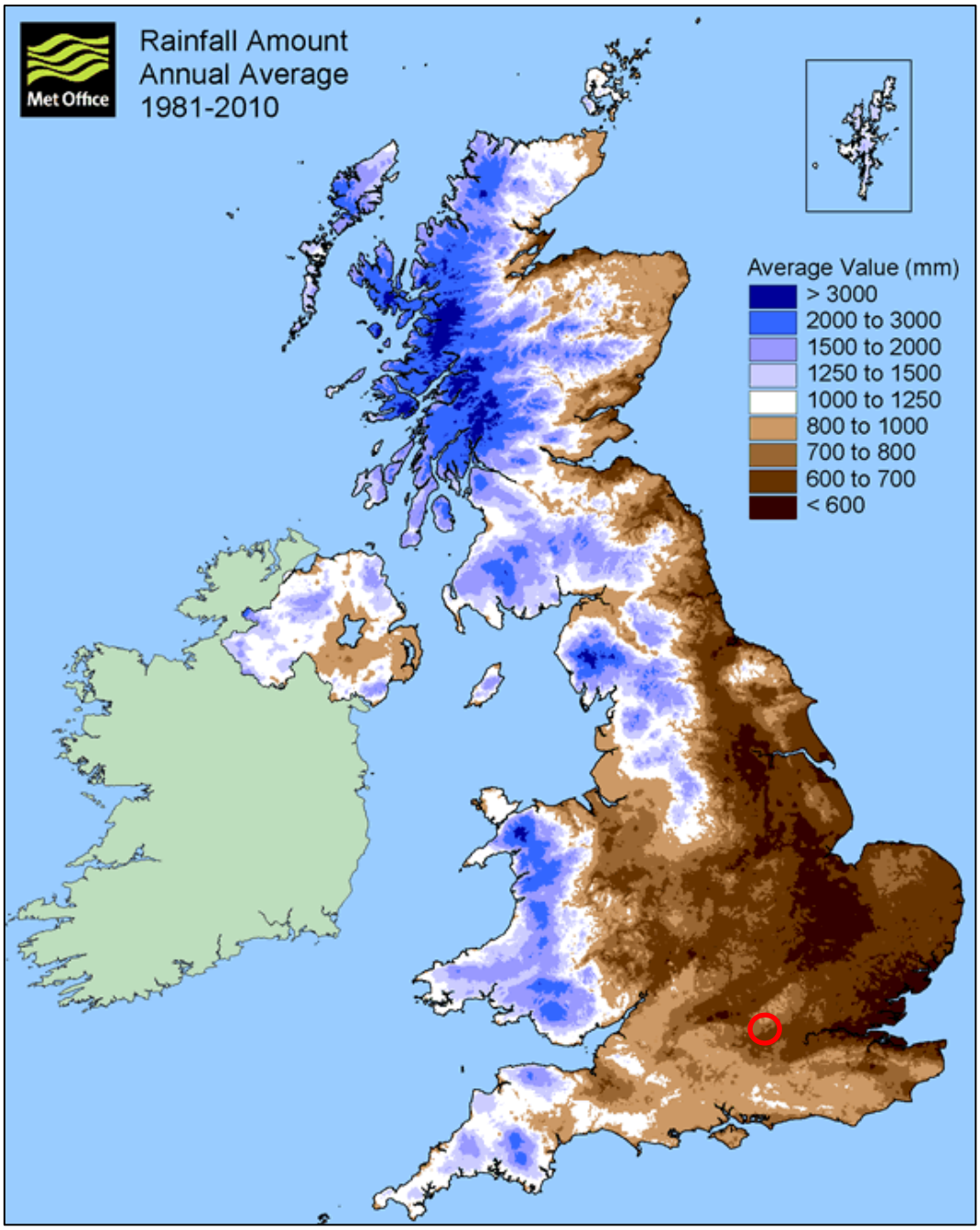


Figure 24. MET office rainfall statistics (1981-2010). Red circle indicates the location of the development area.

Drainage catchment.

Catchment data obtained from the Flood Estimation Handbook (FEH) Web Service indicate that the site forms part of a 41.47 km^2 catchment with an outlet into the River Thames ~500 m east of the site (Figure 25).

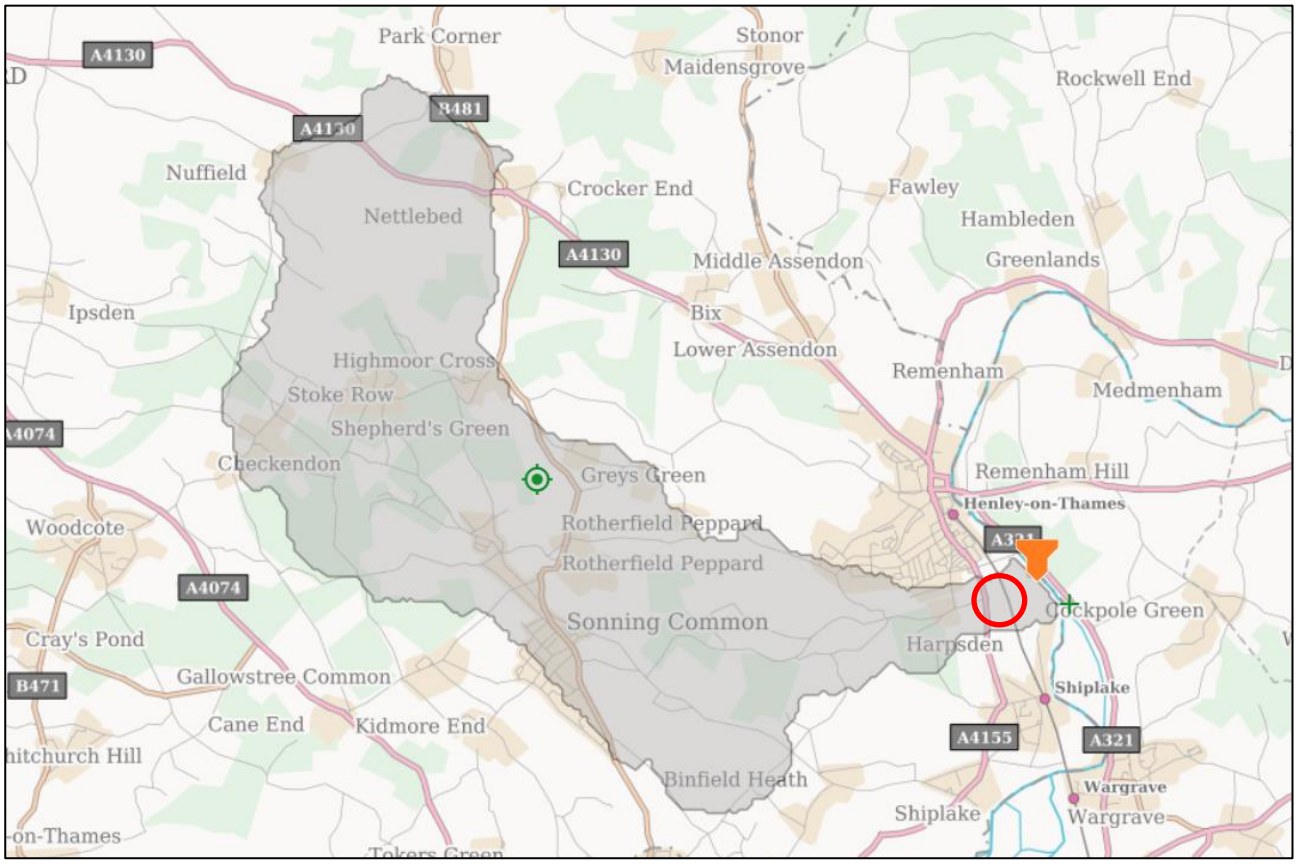


Figure 25. Land drainage catchment (grey polygon) for the site (red circle) and catchment outlet (orange marker).

Predicted drainage outfall rates.

Drainage outfall rates have been calculated using the ADAS 345 method (Table 1).

Greenfield runoff rates for the site have been calculated using the Flood Estimation Handbook method and are also presented in Table 1. It is important to note that both rates are based on one hectare.

The predicted drainage rates for the site for both a six-hour and a twenty four-hour rainfall event are greater than the greenfield runoff rates, and so the installation of a land drainage system would result in greater flow rates than the greenfield condition. It is therefore concluded that if a land drainage system is installed, then additional attenuation in the form of a flowrate regulator will be required for this site. Drainage design should account for at least the 1:30 return period outfall rate of 6.6 l/s/ha for the site over a 24-hour period.

Table 1. Greenfield run off rate (FEH method) and drainage outfall rates (ADAS 345 Method) for the proposed site for 6 hr and 24 hr duration events for the return periods shown.

Return period	Greenfield Runoff Rate (FEH method) (l/s/ha)	Drainage Outfall Rate (6 hr FEH rainfall event) l/s/ha)	Drainage Outfall Rate (24 hr FEH rainfall event) (l/s/ha)
1:1	0.75	2.2	3.3
1:30	2.02	5.0	6.6
1:100	2.81	6.2	8.1

3.2.2 Risk of flooding from rivers and seas.

Based on information obtained from the Environment Agency (EA) via gov.uk (Figure 26), the majority of the site is at medium risk of flooding from rivers and seas (between 1% and 3.3% (1 in 100 and 1 in 30 years)).

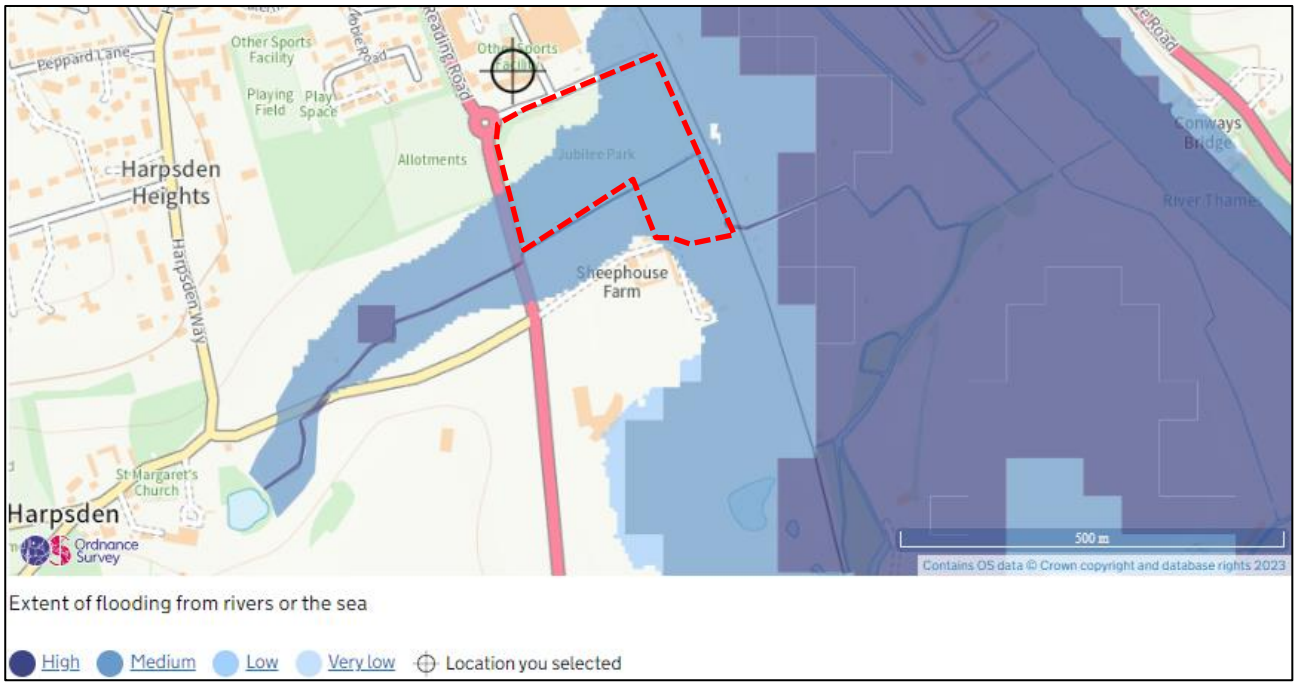


Figure 26. Risk of flooding from rivers and seas (courtesy of gov.uk).

3.2.3 Risk of flooding from surface water.

Based on information obtained from the Environment Agency (EA) via gov.uk (Figure 27), the main area of the site is at very low risk of surface water flooding (<0.1%, (<1 in 1000 years)), whereas the south-eastern area is a low risk (between 0.1% and 1% each year (1 in 1000 and 1 in 100 years)).

Figure 27. Risk of flooding from surface water (courtesy of gov.uk).

Given this information, it should be possible to undertake site remodelling works to address adverse levels and gradient without affecting the volume or dynamics of a flood plain.

3.2.4 Landfill.

Based on information obtained from environment.data.gov.uk, the site is not located in an area of historic landfill (Figure 28) or permitted landfill (Figure 29). It should be noted that it is known that the fallow triangular area has been used in the past to dump material on an unofficial basis.

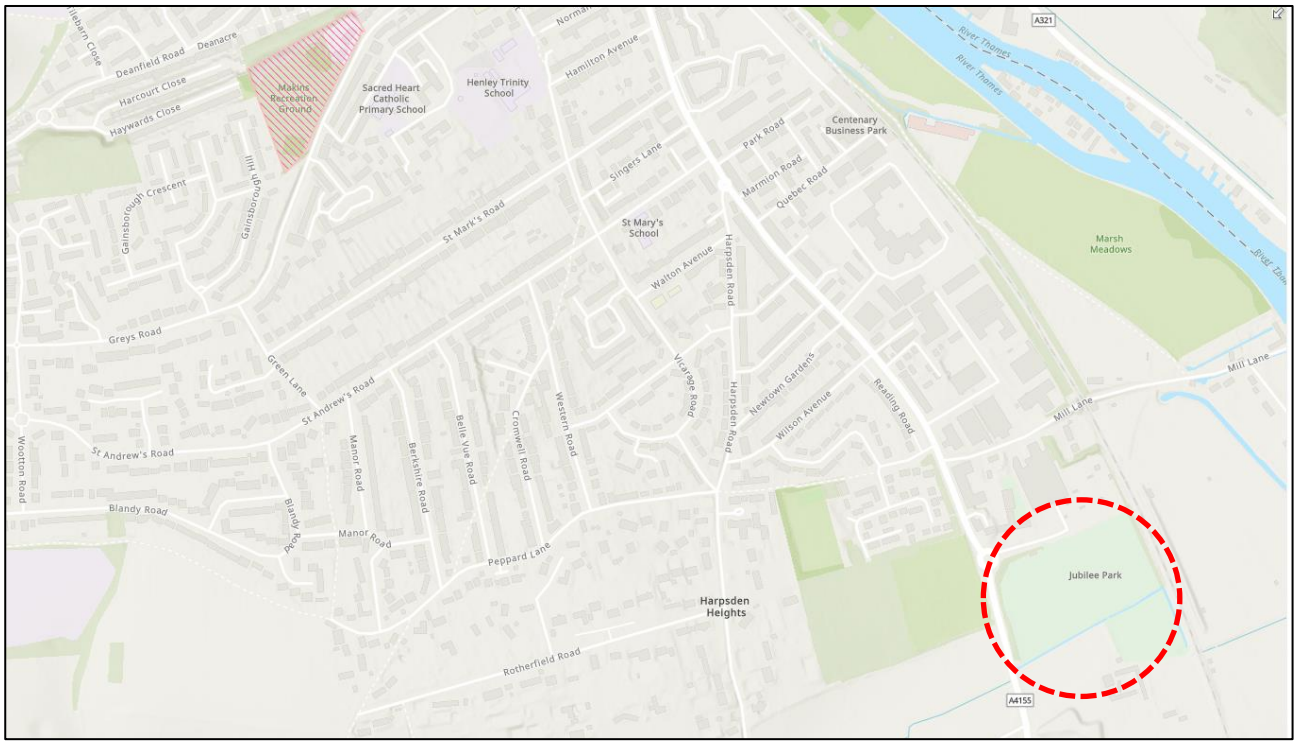


Figure 28. Historic landfill (pink hatched polygons) courtesy of environment.data.gov.uk.

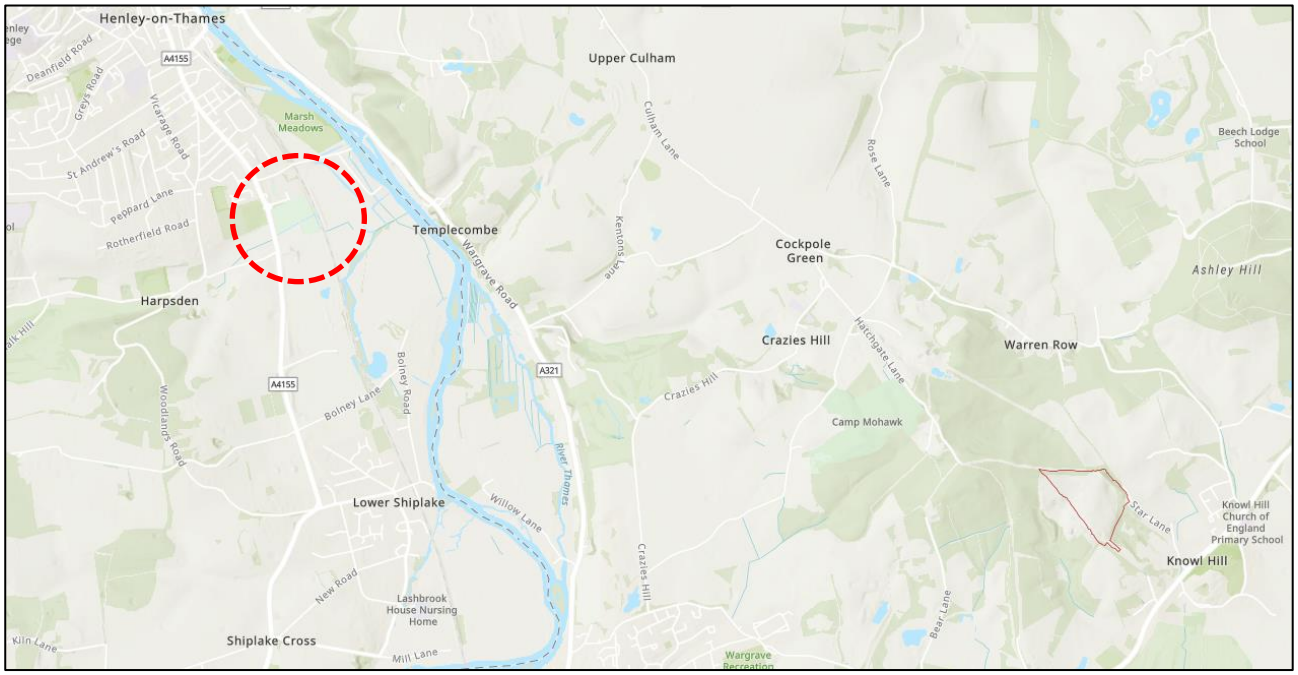


Figure 29. Permitted landfill (red outlined polygons) courtesy of environment.data.gov.uk.

3.2.5 Groundwater source protection

Based on information obtained from magic.defra.gov.uk, the site is located within the Total Catchment of a Groundwater Source Protection Zone (Figure 30). This could restrict the construction of a deep bored soakaway (depending upon geology) as a means of achieving drainage outfall from the site should a more convenient means of water disposal not be available.

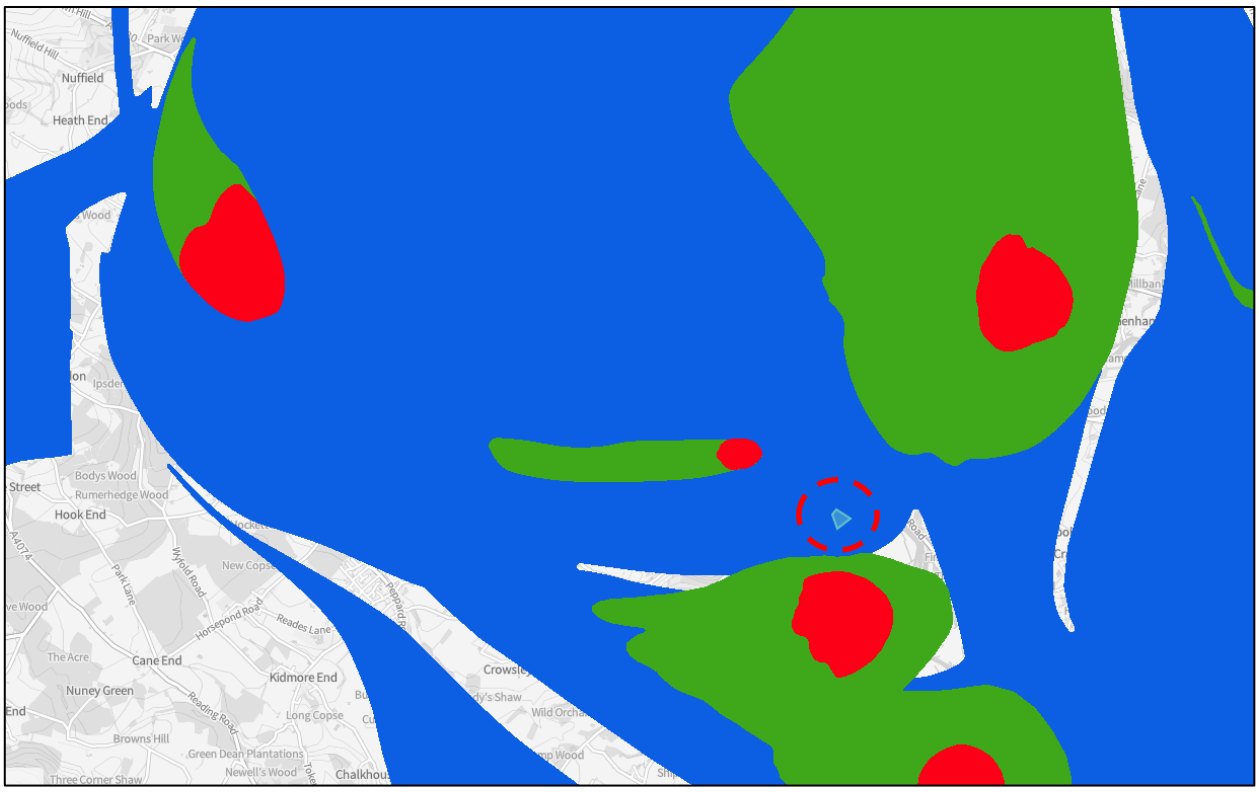


Figure 30. Groundwater source protection zones (courtesy of magic.defra.gov.uk).

Key: = *Inner Zone*
= *Outer Zone*
= *Total Catchment*

3.3 Existing and proposed pitch dimensions.

With reference to a topographical survey conducted by Peter J H Roberts (Figure 31), the six pitches marked out on the day of the survey were for the following dimensions:

- 1 Nr. 91 m x 50 m (100 x 55 yards).
- 2 Nr. 64 m x 45.7 m (70 x 50 yards).
- 1 Nr. 45.7 m x 27 m (50 x 30 yards).
- 1 Nr. 42.5 m x 27 m (46.5 x 30 yards).
- 1 Nr. 55 m x 36.5 m (60 x 40 yards).

This equates to a total pitch area, excluding safety margins, of 14,900 m^2.

Figure 31. Excerpt from a topographical survey drawing by Peter J H Roberts.

With reference to the proposed site layout for the 3G pitch, car park and changing rooms (Figure 3), TGMS has conducted a pitch re-sizing and re-locating exercise to explore how the natural turf pitch provision can be reconfigured to optimise use of the area remaining after construction of the new facilities.

The layout presented in Figure 32A is based on reconfiguring the pitches within the current pitch areas (i.e. not extending into the rough triangular area to the south-east with the electricity pylons). The layout in Figure 32B is based on extending the pitch provision into the “pylon” area, but not removing the pylons, whereas those presented in Figures 33 and 34 are based on the assumption that it will be possible to purchase the additional plot of land to the south-east, and bury the cables.

With reference to Figure 32A:

1. To the west (near Reading Road), it may be possible to fit in a Youth (U15/U16 11v11) 91 m x 55 m (plus 3 m safety margin) pitch.
2. As an alternative, this pitch can be marked out with two Mini-soccer pitches (U9/U10 7v7 54.9 m x 36.6 m plus 3 m safety margins and 2 m Respect Zone) running across it (hatched green lines).
3. It is also proposed to level a triangular area near the site entrance (red hatching) to provide additional space.
4. The north-eastern area (next to the existing hockey pitch) can accommodate a Youth (U15/U16 11v11 90 m x 50 m plus 3 m safety margin pitch.

5. If the south-eastern area (next to the “pylons” area) is enlarged by removing a hardcore track and a soil bund, it may just be able to accommodate a Youth (U15/U16 11v11 82.3 m x 45.75 m plus 3 m safety margin) pitch running approximately east-west (hatched red lines).
6. Alternatively, this area can be marked out with two Mini-soccer (U9/U10 7v7 54.9 m x 36.6 m plus 3 m safety margin) pitches.

Figure 32A. Proposed pitch reconfiguration (maintaining existing pitch area boundaries).

This arrangement equates to a total pitch area, excluding safety margins, of 13,524 m^2 which is less (1,376 m^2) than the pitch provision presented in Figure 31.

With reference to Figure 32B:

1. The south-eastern area (including the “pylon” area) could be developed using soil arisings from construction of the proposed 3G pitch, car park and changing block to accommodate:
    I. A Youth (U11/U12 9v9 70 m x 40 m plus 3 m safety margin) pitch.
    II. A Mini-soccer (U9/U10 7v7 54.9 m x 36.6 m plus 3 m safety margin) pitch.
    III. Six 10 m x 10 m training grids.
2. Alternatively, this area can be marked out with a Youth (U15/U16 11v11 82.3 m x 45.75 m plus 3 m safety margin) pitch running approximately east-west.

This arrangement equates to a total pitch area, excluding safety margins, of 14,914 m^2 which is marginally greater (14 m^2) than the pitch provision presented in Figure 31.

Figure 32B. Proposed pitch reconfiguration (including extension into the triangular "pylon" area).

With reference to Figure 33, which is based on the assumption that it will be possible to purchase the additional plot of land to the south-east, and that the overhead power lines in the fallow triangular area can be buried:

1. To the west (near Reading Road), it may be possible to fit in a Youth pitch (U15/U16 11v11 91 m x 55 m plus 3 m safety margin).
2. As an alternative, this pitch can be marked out with two Mini-soccer pitches (U9/U10 7v7 55 m x 37 m plus 3 m safety margins and 2 m Respect Zone) running across it (hatched pink lines).
3. The north-eastern area (next to the existing hockey pitch) can accommodate a Youth pitch (U13/U14 11v11 82 m x 50 m plus 3 m safety margin).
4. As an alternative, this pitch can be marked out with two Mini-soccer pitches (U7/U8 5v5 37 m x 27 m plus 3 m safety margins and 8 m Respect Zone) running across it (hatched blue lines).
5. The south-eastern area (near the pylons) may be able to accommodate:
    I. A Youth pitch (U13/U14 11v11 82 m x 50 m plus 3 m safety margin).
    II. A Youth pitch (U11/U12 9v9 73 m x 46 m plus 3 m safety margin).
6. This lower area is quite tight, and so there will be a need to remove the hardcore track and the soil bund that run along the south-western boundary (adjacent to the neighbouring tennis court).

Figure 33. Proposed pitch reconfiguration (including additional land purchase, and burial of overhead power lines).

This arrangement equates to a total pitch area, excluding safety margins, of 16,560 m^2 which is 1,663 m^2 greater than the pitch provision presented in Figure 31.

With reference to Figure 34, which is based on the assumption that it will be possible to purchase the additional plot of land to the south-east, and that the overhead power lines in the fallow triangular area can be buried:

1. To the west (near Reading Road), it may be possible to fit in a Youth pitch (U15/U16 11v11 91 m x 55 m plus 3 m safety margin).
2. As an alternative, this pitch can be marked out with two Mini-soccer pitches (U9/U10 7v7 55 m x 37 m plus 3 m safety margins and 2 m Respect Zone) running across it (hatched pink lines).
3. The north-eastern area (next to the existing hockey pitch) can accommodate a Youth pitch (U13/U14 11v11 82 m x 50 m plus 3 m safety margin).
4. As an alternative, this pitch can be marked out with two Mini-soccer pitches (U7/U8 5v5 37 m x 27 m plus 3 m safety margins and 8 m Respect Zone) running across it (hatched blue lines).
5. The south-eastern area (near the pylons) may be able to accommodate:
    I. Either a Youth pitch (U13/U14 11v11 82 m x 50 m plus 3 m safety margin), or a Youth pitch (U11/U12 9v9 73 m x 46 m plus 3 m safety margin).
    II. Alternatively, it may just be possible to fit in a Senior pitch (Over 18 11v11 100 m x 64 m plus 3 m safety margin - red lines).

6. This lower area is quite tight, and so there will be a need to remove the hardcore track and the soil bund that run along the south-western boundary (adjacent to the neighbouring tennis court).

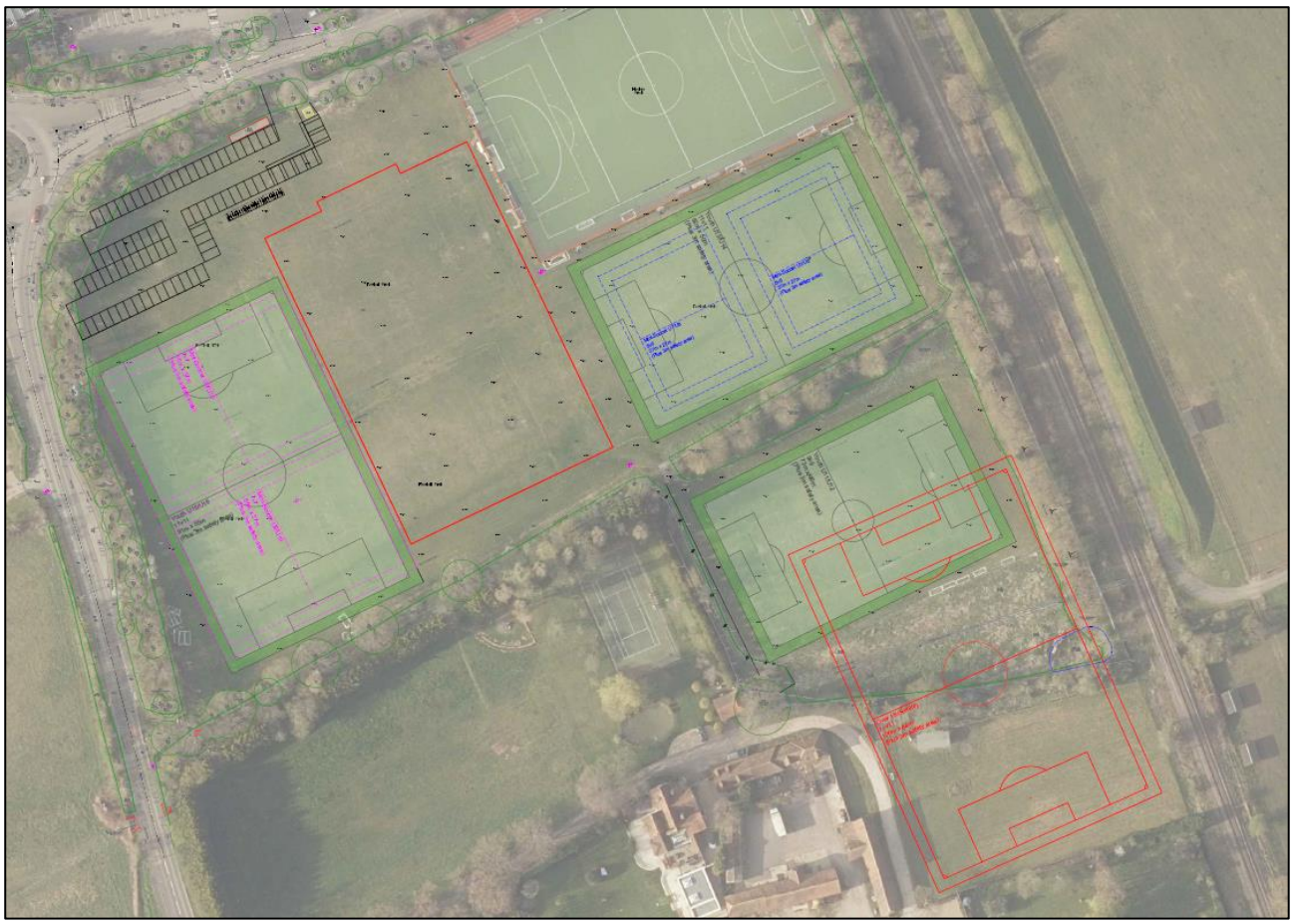


Figure 34. Proposed pitch reconfiguration (including additional land purchase, and burial of overhead power lines).

This arrangement equates to a total pitch area, excluding safety margins, of 19,605 m^2 which is 4,705 m^2 greater than the pitch provision presented in Figure 31.

Sport England recommends that the maximum slope along and across the direction of play should not exceed 1.25% and 2.00% respectively. As the gradients across the site are very gentle (~0.35% from west to east), it is concluded that any of the proposed arrangements will comply with the guideline values stipulated by Sport England.

3.4 Pitch orientation.

Sport England (SE) has published guidance on optimum pitch orientation for a range of sports (Figure 35). For winter games pitches, this ranges from 285° to 20° in order to mitigate against the effects of low winter sunshine projection.

With reference to Figure 31 (existing pitch layout) the two smaller pitches near Reading Road are orientated at 334° and therefore comply with the guidance. The remaining four larger pitches are orientated at 64° which is outside the guidance.

With reference to Figures 32A and 32B (proposed layouts) the Youth pitch near Reading Road and the two pitches near the power lines are orientated at 334° and therefore comply with the guidance. The Youth pitch near the hockey pitch is orientated at 64° which is outside the guidance, but given the geometry of the site, re-orientation is not possible.

With reference to Figures 33 and 34 (proposed layouts including land purchase) the Youth pitch near Reading Road and larger pitches over the footprint of the purchased land are orientated between 334° and 346°and therefore comply with the guidance. The Youth pitches near the hockey pitch and near the tennis court are orientated at 64° which is outside the guidance, but given the geometry of the site, re-orientation is not recommended.

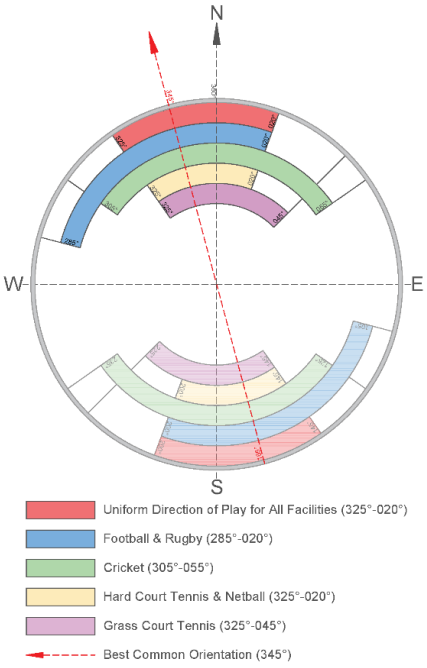


Figure 35. Optimum pitch orientations (Sport England).

3.5 Soils and geology.

According to Sheet 6 of the Soil Survey of England and Wales 1:250,000 soil map (1983), the indigenous soil comprises the Hucklesbrook Soil Association.

The geological origin is River terrace drift, and the soils are characterised by "*well drained coarse loamy and some sandy soils, commonly over gravel. Some similar permeable soils affected by groundwater. Usually on flat land*".

According to the BGS Geology Viewer, the underlying geology comprises superficial deposits of the Kempton Park Gravel Member - Sand and gravel. Sedimentary superficial deposit formed between 116 and 11.8 thousand years ago during the Quaternary period.

These overlie the Lewes Nodular Chalk Formation, Seaford Chalk Formation and Newhaven Chalk Formation - Chalk. Sedimentary bedrock formed between 93.9 and 72.1 million years ago during the Cretaceous period.

With reference to the BGS GeoIndex Viewer, BGS records indicate that a borehole was installed ~200 m to the south of the site in 1977:

Reference: SU78SE32
Name: SHEEPHOUSE FARM HENLEY
Water Well Reference: N/A
Precision: ± 10 METRES
Length (m): 15.24
Date: 1977
Easting: 476980
Northing: 181110

The underlying strata were found to comprise topsoil to 0.30 m, over SAND and GRAVEL to 6.70 m, over CHALK and FLINT to 12.80 m over CHALK which extended beyond the maximum excavation depth of 15.24 m.

3.6 Soil sampling.

3.6.1 Test Pit Profile Descriptions.

Three soil test pits (TP1 to TP3, Figure 2) were excavated using hand tools to characterise the underlying soil profile.

TP1 was located towards the centre of the fallow area near the overhead power lines. A lot of stone and fragments of building materials were evident on the surface (Figures 36 and 37), and the soil profile was found to comprise a mix of SANDY LOAM topsoil, stones and made ground, which extended beyond the maximum excavation depth of 0.40 m (Figures 38 and 39).

Figure 36. TP1 – Stones and fragments of building materials on the surface.

Figure 37. TP1 – Stones and fragments of building materials on the surface.

Figure 38. TP1 – Sandy loam topsoil mixed with stones and made ground.

Figure 39. TP1 – High stone content.

TP2 was located towards halfway along an old track immediately adjacent to a neighbouring tennis court (Figure 3). The soil profile was found to comprise 100 mm of SANDY LOAM topsoil over very stony SANDY LOAM subsoil. The stones were predominantly flints of up to 100 mm in their longest axis, and the excavation was aborted at 200 mm depth (Figures 40 and 41).

Figure 40. TP2 – Sandy loam topsoil with a high stone content.

Figure 41. TP2 – Sandy loam topsoil.

TP3 was located on the batter slope near the site entrance off Reading Road (Figure 3). The soil profile was found to comprise 25 mm of thatch (organic material) over 0.10 m of brown SANDY LOAM topsoil, over very stony SANDY LOAM subsoil, which extended beyond the maximum excavation depth of 0.30 m (Figures 42 and 43).

Figure 42. TP3 – Sandy loam topsoil.

Figure 43. TP3 – Sandy loam topsoil over very stony sandy loam subsoil.

3.6.2 Soil textural analysis.

The results from a soil textural analysis of samples sent to contract laboratory are appended, and a summary is presented in Table 2. The results concur with observations made during the site investigation.

Table 2. Soil texture results (Sand 2.00–0.063 mm; Silt 0.063 mm–0.002 mm; Clay <0.002 mm).

Location	Horizon	Sand (%)	Silt (%)	Clay (%)	Classification
TP1	Topsoil 0.00m-0.40m	53.8	32.4	13.8	SANDY LOAM MADE GROUIND
	Made ground	-	-	-	MADE GROUND
TP2	Topsoil 0.00m-0.10m	50.3	37.0	12.7	SANDY LOAM
	Subsoil >0.10 m	-	-	-	SANDY LOAM
TP3	Topsoil 0.00m-0.03m	-	-	-	THATCH
	Topsoil 0.03m-0.13m	59.2	31.5	9.3	SANDY LOAM
	Subsoil >0.13 m	-	-	-	SANDY LOAM

3.6.3 Topsoil nutrient status.

The results from an analysis of the nutrient status of samples of topsoil sent to contract laboratory are appended, and a summary is presented in Table 3.

Table 3. Topsoil nutrient and pH results.

Location	Horizon	pH	Phosphorus (ppm)	Index	Potassium (ppm)	Index	Magnesium (ppm)	Index
TP1	Topsoil	8.1	44	3.9	203	2.7	44	1.7
TP2	Topsoil	6.0	19	2.3	166	2.4	97	2.9
TP3	Topsoil	5.6	19	2.3	35	0.6	85	2.7

Indices of 2 and above indicate that there is sufficient supply of a particular nutrient. With reference to Table 3, the topsoil is generally in good order aside from a deficiency in the macro nutrient Potassium in the vicinity of TP3, and so it is recommended that, following pitch construction, the fertiliser programme be amended to address this deficiency. Soil pH of 8.1 (near the overhead power lines) is above (alkaline) the recommended range for the cultivation of Perennial ryegrass species (5.5 to 7.5). An alkaline environment will reduce the availability of certain nutrients - particularly P, K, B, Co, Cu, Fe, Mn and Zn. An elevated pH will also impact on beneficial soil fungal populations and activity. In other areas, soil pH of 5.6 to 6.0 is at the lower end (acidic) of the recommended range for the cultivation of Perennial ryegrass species (5.5 to 7.5). An acidic environment will reduce soil nutrient availability and the efficiency of any applied fertilisers or organic materials. A sub optimum pH will also impact on soil microbial populations and rates of activity. It is therefore recommended that a granulated form of carbonate of lime is applied during pitch construction to increase the pH to a more neutral reaction.

3.6.4 Soils summary.

In summary, the area in the vicinity of the overhead power lines comprises made ground, whereas the majority of the site is characterised by ~100 mm of SANDY LOAM topsoil overlying very stony SANDY LOAM subsoil. SANDY LOAM soil is desirable for playing field construction as it is associated with moderate to good natural drainage rates however this soil type is also susceptible to compaction and so routine decompaction operations will need to be conducted as part of the ongoing agronomic maintenance schedule. Both the topsoil and subsoil are stony and so stone burial / removal operations will be required as part of the construction works. It is concluded that the soil from the footprint of the proposed 3G pitch, car park and pavilion is suitable for re-use as part of the pitch construction works near the overhead power lines and the plot of land to the south-east (if purchased). It is recommended that new pitches constructed in these areas are capped off with an imported 50 mm deep rootzone (sand/soil mix) carpet to mitigate the risk of upward migration of fragments of brick, glass shards and stones.

Although SANDY LOAM soil is generally associated with moderate to good natural drainage rates, there is a propensity for finer particles to dislocate and migrate towards, and block, larger interstices during play. This compaction of the upper profile results in poor drainage status which is likely to persist over the winter months when the rate of precipitation exceeds the rate at which water is removed through water infiltration through the pitch surface, or evapotranspiration. This will tend to encourage the development of saturated conditions towards the surface following significant rainfall. In extreme situations, this may be manifest as surface water ponding which will have a tendency to migrate from higher elevation to lower elevation, accumulating in surface depressions. However, more typically, the soil will become soft and susceptible to structural damage thereby causing excessive wear and tear, and the grass sward will suffer due to poor aeration status (i.e. the soil pores that are normally air-filled become filled with water leading to anaerobic conditions; in order for grass to thrive, at least 10% of the soil volume should comprise air-filled pores).

It should be noted that the topsoil comprises a moderate silt content of 31.5 to 37.0%. Silt particles have a propensity to migrate through the soil matrix and block larger soil pores that are associated with drainage and aeration unlike sand particles which are too large, or clay particles which, although very small, are electrically bonded to each other thereby creating much larger, stable aggregates.

This moderate silt content will gradually reduce the effective life of any land drainage scheme that is installed, but this can be mitigated to some extent by routine maintenance involving regular (annual) clearing of silt traps.

Following soil importation from the 3G pitch, car park and pavilion construction works, and re-grading earthworks to create the desired pitch gradients, the installation of a land drainage scheme that is designed to intercept rain water at the surface before it has had an opportunity to soak in to the soil profile is recommended.

These systems work by using a primary drainage system comprising closely spaced, deep lateral drains combined with a secondary drainage system of closely spaced sand grooves or sand bands cut into the surface that link into the primary system below.

A typical arrangement is presented in Figure 44.

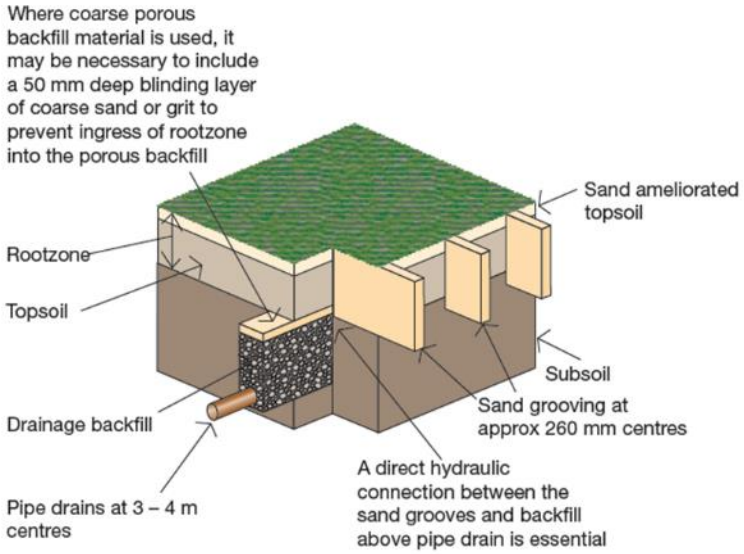


Figure 44. Typical sand groove-based surface by-pass drainage system (Ref: Sport England Design Guidance Note "Natural Turf for Sport", 2011).

3.7 Agronomic condition.

There are numerous minor surface depressions across the site, and ~25 mm of surface thatch, and so areas outside of the proposed 3G pitch and car park development works would benefit from enhanced agronomic maintenance and overseeding using a sports-specific ryegrass-dominated seed mix (Figures 45 and 46).

Figure 45. Surface depressions.

Figure 46. Rolling surface.

The area in the vicinity of the overhead power lines has been fallow for some time and is now covered with ~0.50 m of volunteer vegetation (Figures 47 and 48), which will require removal prior to any works.

Figure 47. Volunteer vegetation.

Figure 48. Volunteer vegetation.

There will be a need to remove this vegetation prior to soil importation and pitch construction works and the establishment of a suitable grass sward using a sports-specific ryegrass-dominated seed mix. If this area were to be extended into the paddock to the south-east that could potentially be for sale, there will be a need to arrange for two trees (a sycamore and blue spruce) to be removed (Figures 49 and 50).

Figure 49. Sycamore.

Figure 50. Blue spruce.

The paddock area to the south-east that is potentially for sale currently comprises grass grazing land (Figures 51 and 52).

Figure 51. Grazing land to the south-east.

Figure 52. Grazing land to the south-east.

3.8 Water supply.

With reference to Figure 2, a standpipe is located towards the north-western corner in the treeline, with a nearby stop-cock which isolates a supply to another standpipe located near the culvert under the concrete bridge (Figures 53 and 56).

Figure 53. Approximate location of the north-western standpipe and stop-cock.

Figure 54. The stop-cock.

Figure 55. The north-western standpipe.

Figure 56. The southern standpipe.

3.9 Site usage.

It is difficult to predict with any accuracy the hours of play achievable if new pitches were to be constructed as this depends on local weather conditions, schedule of use, age of participants and the quality of the on-going maintenance, however Sport England considers the following (Table 4) to represent a reasonable estimation for winter sports (Ref: Natural Turf for Sport, 2000, ISBN 1 86078 103 9 – 2nd Edition, 2011).

Table 4. Sport England estimated usage levels

Drainage status	Adult weekly use* (hours)
Undrained	Under 2
Pipe-drained	2 - 3
Pipe-drained with mole drains	2 - 4
Pipe-drained with sand grooves	3 - 6
Pipe-drained with slit drains	3 - 6
Pipe-drained with topsoil and drainage layer	3 - 6
Pipe and slit drained	3 - 6
Pipe-drained with suspended water table	4 - 6

*The usage levels shown will increase by ~50 % for players 15 years of age and under.

3.10 Performance Quality Standards (PQS)

Performance Quality Standards (PQS) provide a recommended minimum quality standard for the construction and maintenance of natural turf pitches. PQS were originally developed via a voluntary technical consortium with representation from the Sports Turf Research Institute, National Playing Fields Association and the Institute of Groundsmanship, and have now been adopted by Sport England and Governing Bodies of Sport (Ref: Appendix 4 of Natural Turf for Sport, 2000, ISBN 1 86078 103 9 – 2nd Edition, 2011).

Sport England has produced a pro forma for summarising the condition of natural turf sports pitches by conducting a Performance Quality Standard assessment and comparing the results for a given site against minimum standards. The results of this assessment are presented in Appendix II and summary of the results is presented in Table 5.

Table 5. Summary of Performance Quality Assessments.

	Jubilee Park pitches	Power line area
Element	Pass / fail	Pass / fail
Ground cover	✓	
Broad-leaved weeds	✓	
Sward height	✓	
Thatch depth	×	
Surface hardness	✓	
Water infiltration rate	✓	
Surface evenness	×	
Slope: Direction of play	✓	✓
Slope: Across play	✓	✓
pH value	✓	
Stone content / diameter	✓	

With reference to Table 5, the existing pitches in Jubilee Park pass nine of the eleven PQS parameters assessed (ground cover, broad-leaved weeds, sward height, surface hardness, water infiltration rate, slope in the direction of play, slope across play, pH and stone content / diameter), but fail the remaining two (thatch depth and surface evenness).

The area near the overhead power lines passes only three of the eleven PQS parameters assessed (slope in the direction of play, slope across play and stone content / diameter), but fails the remaining

eight (ground cover, broad-leaved weeds, sward height, surface hardness, water infiltration rate, thatch depth, surface evenness and pH).

3.11 Other items

Issues which can arise from natural grass pitch construction can be summarised as follows:

- **Services** – It is recommended that the client obtains up to date service plans of the site prior to any development works. It is important to note that the presence of services may inhibit the scope of works. This is particularly pertinent for site re-modelling and land drainage works.
- **Planning permission** – Where cut and fill remodelling earthworks and the installation of a land drainage scheme are required, it may be prudent to obtain guidance from the local planning department as to whether planning permission is necessary.
- **Irrigation** – The construction of natural grass pitches relies on optimal weather conditions to aid germination and grass plant establishment. In some cases, when construction is carried out in summer and during droughty conditions, supplementary irrigation may be required, the costs of which should be factored into the budget. It is the responsibility of the Client to provide sufficient irrigation during the duration of project construction phase and subsequent initial maintenance phase.
- **Irrigation (following handover) –** It is important that the recipient of the pitch understands that in the absence of irrigation, pitch conditions will deteriorate with a potential loss of ground cover and an increase in hardness (more so in summer). Pitch drain runs may also settle as the surrounding clay soils shrink. Invariably, the grass will return following sufficient precipitation however supplementary irrigation may be required should drought conditions persist.
- **Outfall** – When discharging into existing drainage infrastructure or natural water courses, it may be necessary to obtain the relevant permissions including discharge consents and/or land drainage consent from the Environment Agency, landowner or lead flood authority. These procedures can significantly delay proceedings and prior investigation may be necessary at feasibility stage. It is the responsibility of the Client to obtain the appropriate consents.
- **Cut and fill earthworks** – Cut and fill involves significant earthmoving using large plant machinery e.g. dozers, excavators and dumper trucks. The nature of the works inevitably destroys the natural soil structure (cracks, fissures, worm holes and root holes) that has built up over many years resulting in a significant reduction in drainage rates. Differential settlement is also not uncommon. Following cut and fill remodelling earthworks, the installation of a drainage scheme will be necessary in order to mitigate the effect of the earthworks on natural drainage rates.
- **Maintenance scheme** – For any natural turf pitch development, it is essential that a well-structured, intensive maintenance programme is implemented to maintain the pitch(es) following construction. Failure to implement the recommended maintenance schedule will result in a deterioration of pitch condition and subsequent reduction in availability for use. A generic agronomic maintenance programme is presented in Appendices I.
- **Settlement of drain lines** – Land drains can be prone to settlement as the soil surrounding the drain pipe dries out and shrinks (perfectly normal in new constructions). Whilst topping up drain lines is usually covered by the Contractor during the first 12-months following construction, it is possible that drains may continue to sink to some extent after this time. Therefore, there should be some allowance within the maintenance programme to ensure that drain lines are kept topped up and overseeded.

4 SUMMARY AND RECOMMENDATIONS

1. **Objective:** To conduct a feasibility study for proposed natural turf pitch improvement works at Jubilee Park, 357 Reading Road, Henley-on-Thames, RG9 4HA. The focus of the study is to explore scope for optimising the pitch area remaining following the proposed construction of a new 3G pitch towards the centre of the site, along with changing rooms and a car park towards the north-western boundary. In addition, to consider the potential to purchase and incorporate a plot of land of approximately 4,200 m^2 immediately to the south-east of the site.

2. **Site visit:** A detailed site investigation was conducted on the 3rd of May 2023.

3. **Site location:** The site is an established sports ground which is home to AFC Henley Football Club, and comprises a block of natural turf pitches that are bounded by a Tesco superstore to the north-west, a railway line and agricultural land to the north-east, residential properties to the south-east, and Reading Road (A4155) to the south-west.

4. **Hydrology:** Catchment data obtained from the Flood Estimation Handbook (FEH) Web Service indicate that the site forms part of a 41.47 km^2 catchment with an outlet into the River Thames ~500 m east of the site. A ditch enters the site from near the Reading Road entrance and runs north-eastwards towards the boundary with the railway line before turning south-eastwards, parallel with the railway line, to an old pond in a triangular fallow area. This watercourse exits the site via a culvert under the railway line and continues eastwards to the River Thames.

5. **Land drainage flow rates:** The predicted drainage rates for the site for both a 6-hour and a 24-hour rainfall event are greater than the greenfield runoff rates, and so the installation of a land drainage system would result in greater flow rates than the greenfield condition. It is therefore concluded that if a land drainage system is installed, then additional attenuation in the form of a flowrate regulator will be required for this site. Drainage design should account for at least the 1:30 return period outfall rate of 6.6 l/s/ha for the site over a 24-hour period.

6. **Flood risk from rivers and seas:** Based on information obtained from the Environment Agency (EA) via gov.uk, the majority of the site is at medium risk of flooding from rivers and seas (between 1% and 3.3% (1 in 100 and 1 in 30 years)).

7. **Flood risk from surface water:** Based on information obtained from the Environment Agency (EA) via gov.uk, the main area of the site is at very low risk of surface water flooding (<0.1%, (<1 in 1000 years)), whereas the south-eastern area is a low risk (between 0.1% and 1% each year (1 in 1000 and 1 in 100 years)).

8. **Landfill:** Based on information obtained from environment.data.gov.uk, the site is not located in an area of historic or permitted landfill, however it is known that a fallow triangular area in the south-eastern corner of the site has been used in the past to dump material on an unofficial basis.

9. **Groundwater Source Protection:** Based on information obtained from magic.defra.gov.uk, the site is located within the Total Catchment of a Groundwater Source Protection Zone. This could restrict the construction of a deep bored soakaway (depending upon geology) as a means of achieving drainage outfall from the site should a more convenient means of water disposal not be available.

10. **Pitch dimensions and gradients:** With reference to a topographical survey conducted by Peter J H Roberts, the six pitches marked out on the day of the survey equate to a total pitch area, excluding safety margins, of 14,900 m^2. With reference to the proposed construction of a 3G pitch, car park and changing rooms, TGMS has conducted a pitch re-sizing and re-locating exercise to explore how the natural turf pitch provision can be reconfigured to optimise use of the area remaining after construction of the new facilities. A proposed layout based on reconfiguring the pitches within the current pitch areas (i.e. not extending into the rough triangular area to the south-east with the electricity pylons) equates to a total pitch area, excluding safety margins, of 13,524 m^2 (a reduction of 1,376 m^2). A proposed layout

based on extending the pitch provision into the "pylon" area, but not removing the pylons equates to a total pitch area of 14,914 m^2 (a marginal increase of 14 m^2). A proposed pitch layout based on the assumption that it will be possible to purchase the additional plot of land to the south-east, and bury the overhead power lines in the fallow triangular area, equates to a total pitch area, excluding safety margins, of 19,605 m^2 (an increase of 4,705 m^2).

Sport England recommends that the maximum slope along and across the direction of play should not exceed 1.25% and 2.00% respectively. It is concluded that the proposed arrangements will comply with the guideline values stipulated by Sport England.

11. **Pitch orientation:** Sport England has published guidance on optimum pitch orientation for a range of sports. For winter games pitches, this ranges from 285° to 20° in order to mitigate against the effects of low winter sunshine projection. For the existing pitch layout, two smaller pitches near Reading Road are orientated at 334° and therefore comply with the guidance. The remaining four larger pitches are orientated at 64° which is outside the guidance. For the proposed layouts within the existing boundary, a Youth pitch near Reading Road and two pitches near the power lines are orientated at 334° and therefore comply with the guidance. A Youth pitch near the hockey pitch is orientated at 64° which is outside the guidance, but given the geometry of the site, re-orientation is not possible. For the proposed layout based on additional land purchase, a Youth pitch near Reading Road and larger pitches over the footprint of the purchased land are orientated between 334° and 346°and therefore comply with the guidance. Youth pitches near the hockey pitch and near the neighbouring tennis court are orientated at 64° which is outside the guidance, but given the geometry of the site, re-orientation is not recommended.

12. **Soil maps:** According to Sheet 6 of the Soil Survey of England and Wales 1:250,000 soil map (1983), the indigenous soil comprises the Hucklesbrook Soil Association. The geological origin is River terrace drift, and the soils are characterised by "*well drained coarse loamy and some sandy soils, commonly over gravel. Some similar permeable soils affected by groundwater. Usually on flat land*".

13. **Geology:** According to the BGS Geology Viewer, the underlying geology comprises superficial deposits of the Kempton Park Gravel Member - Sand and gravel. Sedimentary superficial deposit formed between 116 and 11.8 thousand years ago during the Quaternary period. These overlie the Lewes Nodular Chalk Formation, Seaford Chalk Formation and Newhaven Chalk Formation - Chalk. Sedimentary bedrock formed between 93.9 and 72.1 million years ago during the Cretaceous period.

14. **Soil profile pit descriptions:** In summary, the area in the vicinity of the overhead power lines comprises made ground, whereas the majority of the site is characterised by ~100 mm of SANDY LOAM topsoil overlying very stony SANDY LOAM subsoil. SANDY LOAM soil is desirable for playing field construction as it is associated with moderate to good natural drainage rates however this soil type is also susceptible to compaction and so routine decompaction operations will need to be conducted as part of the ongoing agronomic maintenance schedule. Both the topsoil and subsoil are stony and so stone burial / removal operations will be required as part of the construction works. It is concluded that the soil from the footprint of the proposed 3G pitch, car park and pavilion is suitable for re-use as part of the pitch construction works near the overhead power lines and the plot of land to the south-east (if purchased). It is recommended that new pitches constructed in these areas are capped off with an imported 50 mm deep rootzone (sand/soil mix) carpet to mitigate the risk of upward migration of stones.

15. **Drainage status:** Although SANDY LOAM soil is generally associated with moderate to good natural drainage rates, there is a propensity for finer particles to dislocate and migrate towards, and block, larger interstices during play. This compaction of the upper profile results in poor drainage status which is likely to persist over the winter months when the rate of precipitation exceeds the rate at which water is removed through water infiltration through the pitch surface, or evapotranspiration. This will tend to encourage the development of saturated conditions towards the surface following significant rainfall. Following soil

importation from the 3G pitch, car park and pavilion construction works, and re-grading earthworks to create the desired pitch gradients, the installation of a land drainage scheme that is designed to intercept rain water at the surface before it has had an opportunity to soak in to the soil profile is recommended.

16. **Soil nutrient status:** The topsoil is generally in good order aside from a deficiency in the macro nutrient Potassium near Reading Road, and so it is recommended that, following pitch construction, the fertiliser programme be amended to address this deficiency. Soil pH of 8.1 (near the overhead power lines) is above (alkaline) the recommended range for the cultivation of Perennial ryegrass species (5.5 to 7.5). An alkaline environment will reduce the availability of certain nutrients - particularly P, K, B, Co, Cu, Fe, Mn and Zn. An elevated pH will also impact on beneficial soil fungal populations and activity. In other areas, the soil pH of 5.6 to 6.0 is at the lower end (acidic) of the recommended range for the cultivation of Perennial ryegrass species (5.5 to 7.5). An acidic environment will reduce soil nutrient availability and the efficiency of any applied fertilisers or organic materials. A sub optimum pH will also impact on soil microbial populations and rates of activity. It is therefore recommended that a granulated form of carbonate of lime is applied during pitch construction to increase the pH to a more neutral reaction.

17. **Agronomic condition:** There are numerous minor surface depressions across the site, and ~25 mm of surface thatch, and so areas outside of the proposed 3G pitch and car park development works would benefit from enhanced agronomic maintenance and overseeding with a suitable grass sward using a sports-specific ryegrass-dominated seed mix. The area in the vicinity of the overhead power lines has been fallow for some time and is now covered with ~0.50 m of volunteer vegetation. There will be a need to remove this vegetation prior to soil importation and pitch construction works and the establishment of a suitable grass sward using a sports-specific ryegrass-dominated seed mix. If this area were to be extended into the paddock to the south-east that could potentially be for sale, there will be a need to arrange for two trees (a sycamore and blue spruce) to be removed.

18. **Water supply:** A standpipe is located towards the north-western corner in the treeline, with a nearby stop-cock which isolates a supply to another standpipe located near the culvert under a concrete bridge.

19. **Usage:** Following pitch construction and the installation of a land drainage system, the proposed natural turf pitches may be able to support 3 to 6 hours of usage per week in the winter (4.5 to 9 hours per week for players 15 years of age and under).

20. **Performance Quality Standards (PQS):** The existing pitches in Jubilee Park pass nine of the eleven PQS parameters assessed (ground cover, broad-leaved weeds, sward height, surface hardness, water infiltration rate, slope in the direction of play, slope across play, pH and stone content / diameter), but fail the remaining two (thatch depth and surface evenness). The area near the overhead power lines passes only three of the eleven PQS parameters assessed (slope in the direction of play, slope across play and stone content / diameter), but fails the remaining eight (ground cover, broad-leaved weeds, sward height, surface hardness, water infiltration rate, thatch depth, surface evenness and pH).

5 DEVELOPMENT OPTIONS

Please note: the following is not a detailed design specification and merely constitutes options for consideration at the feasibility stage. TGMS will only warrant a full design specification following the production of a specification of method, materials and performance outcomes. Based on the findings from the site assessment and subsequent discussion with Henley Town Council and AFC Henley Football Club, it is proposed works are to be split into the following two phases:

Phase 1 [May to August 2024]

1. Level a small triangular area near the Reading Road entrance and install a French drain.
2. Trim back as far as is practically possible hedge and tree lines abutting pitch areas (to be conducted by others ahead of the works and before March).
3. Increase the size of the Youth U15/U16 11v11 pitch immediately adjacent to the hockey pitch to 90 m x 50 m plus 3 m safety margin (no additional works anticipated).
4. Keeping within the existing site boundary (i.e. not going into the triangular powerline plot to the south-east), remove a bund and reinstate a hardcore track to extend the pitch area in the south-east of the site to accommodate two Mini-Soccer U9/U10 7v7 54.90 m x 36.60 m pitches plus 3 m safety margins (running approximately north-south). As an alternative, this area could accommodate a single U15/U16 11v11 82.3 m x 45.75 m pitch plus 3 m safety margin (running approximately east-west).
5. Enhanced agronomic maintenance for all natural turf areas.

Phase 2 [Ideally May to August 2025, but dependent on the 3G construction programme].

1. Remove the fence between the south-eastern area and the triangular powerline plot.
2. Use the SANDY LOAM soil arisings from the 3G project to cover the triangular powerline plot (which comprises landfill) and grade this into the existing pitches in the south-east to create a single uniform plateau to accommodate a Mini-Soccer U9/U10 7v7 54.90 m x 36.60 m pitch plus 3 m safety margin and a Youth U11/U12 9v9 70 m x 40 m pitch plus 3 m safety margin (running approximately north-south), plus two blocks of three 10 m x 10 m training grids. As an alternative, the pitch area could accommodate a single U15/U16 11v11 82.3 m x 45.75 m pitch plus 3 m safety margin (running approximately east-west).

5.1 Phase 1. Existing site boundary excluding the “pylon” area.

5.1.1 Part A: Triangular area - near reading road [657 m^2].

The works by a specialist sports pitch contractor would comprise the following:

- Setting out.
- Fraise mowing (to remove thatch layer).
- Initial cultivations.
- Topsoil strip and stockpile.
- Cut & fill remodelling earthworks to increase the “flat” area.
- Return of site-won topsoil over “flat” area and batter slope.
- Cultivation and grading.
- Stone separation and removal.
- Surface re-grading.
- Installation of a French drain.
- Disposal of excavation spoil (on-site).
- Sand topdressing (10 mm).
- Fertilisation and seeding.
- Reinstatement of damage.
- As-built survey, O&M Manual and H&S File.

5.1.2 Part B: Bund and track removal - south-eastern pitch area [306 m^2].

The works by a specialist sports pitch contractor would comprise the following:

- Setting out.
- Removal of vegetation from the bund.
- Excavation and removal of the hardcore track.
- Disposal of track arisings in the "pond" area.
- Excavation and removal of the bund to temporary stockpile.
- Cut & fill remodelling earthworks to increase the pitch area.
- Return of bund topsoil.
- Importation of additional topsoil.
- Stone separation and removal.
- Surface re-grading.
- Sand topdressing (10 mm).
- Fertilisation and seeding.

N.B. Earthworks should only be carried out under suitable weather and ground conditions (i.e. soil in a dry and friable state) to avoid structural damage.

5.1.3 Part C: Enhanced agronomic maintenance – all pitch areas [25,500 m^2]

The natural turf area would benefit from an enhanced agronomic maintenance programme to optimise its condition. The works would comprise the following:

1. **Deep scarification** – Scarification in two directions to a depth of ~ 30 mm to decrease levels of organic material (thatch).
2. **Selective herbicide –** Application of a selective herbicide to control broad leaved weeds.
3. **Surface de-compaction** – Aeration operations using a combination of deep tining with heave (such as a Verti-drainer) and linear de-compaction treatments (such as an Earthquake or Shockwave). This process creates cracks and fissures underneath the soil surface which improve gas and air exchange, root depth and water infiltration.
4. **Sand topdressing** – This will improve the uniformity of the surface, increase moisture holding capacity, improve infiltration rates (marginally) and dilute thatch build up.
5. **Fertilising** – To improve the strength and vigour of the grass. Frequent fertiliser applications will reduce the grass's susceptibility to disease, create a better turf surface in terms of playability, and promote plant development which, in turn, will utilise more moisture contained within the soil profile.
6. **Overseeding** – To create a sward with a greater proportion of sports specific Perennial ryegrass. Sports specific Perennial ryegrass is hardier, more durable and recovers more quickly than shallow rooting grasses such as Annual Meadow Grass. Ryegrass is also less prone to disease and more drought resistant.

It is important to note that this is not a drainage solution and solely an improved maintenance option which should increase sward quality and may increase carrying capacity.

5.2 Phase 2. Existing site boundary including the "pylon" area.

5.2.1 Part A: Extension of the south-eastern area into the pylon area [9,120 m^2].

The works by a specialist sports pitch contractor would comprise the following:

- Setting out.
- Site clearance (volunteer vegetation in the "pylon" area).
- Fraise mowing (existing pitch area).
- Initial cultivations.
- Topsoil strip and stockpile (existing pitch area).
- Importation, placement and spreading of subsoil (from 3G, car park and pavilion).
- Cut & fill remodelling earthworks.
- Importation, placement and spreading of topsoil (from 3G, car park and pavilion).
- Return of site-won topsoil (from the existing pitch area).
- Cultivation and grading.
- Stone separation and removal.
- Surface re-grading.
- Sand topdressing (10 mm).
- Fertilisation and seeding.
- Reinstatement of damage.
- As-built survey, O&M Manual and H&S File.

N.B. Earthworks should only be carried out under suitable weather and ground conditions (i.e. soil in a dry and friable state) to avoid structural damage.

5.2.2 Part B: Initial agronomic maintenance - south-eastern / pylon area [9,120 m^2].

Depending on the construction timetable, it is possible that on-going maintenance will be required for the first 12-months following completion of the pitch construction works. This would include the following items:

- Mowing.
- Granular fertiliser application.
- Liquid fertiliser application.
- Slow-release granular fertiliser application.
- Plant growth regulator application.
- Selective herbicide application.
- Overseeding.
- Decompaction / aeration.
- Pest and disease control.
- Marking out and installation of permanent pitch corner markers.

6 INDICATIVE WORK PROGRAMME

With respect to timescales for completing the project, it is recommended that pitch construction works are only completed under suitable ground and weather conditions to avoid excessive compaction and smear. For the natural turf areas, grass is ideally sown in spring or early autumn to maximise the balance between moisture and temperature. Due to demand for the pitches, seeding is likely to take place at the end of May / early June and so there may be a need for to apply irrigation during prolonged dry periods. The responsibility for provision of irrigation lies with the Council / Club. The grass must be allowed to establish a healthy and deep root network and mature canopy to resist the stresses applied during play. The date for start of play for the pitch is highly dependent on weather conditions during the construction phase and growing-in period, more so in the absence of supplementary irrigation. An indicative work programme is presented below.

Jubilee Park – Phase 1	**2024**												**2025**											
	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D
Mobilisation of the specialist pitch contractor																								
Site clearance																								
Track and bund removal																								
Earthworks																								
Installation of a French drain																								
Importation of additional topsoil (if required)																								
Sand topdressing																								
Fertiliser application and seeding																								
Reinstatement of damage																								
Enhanced maintenance																								
Pitch area ready for use																								

Jubilee Park – Phase 2	**2025**												**2026**											
	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D
Mobilisation of the specialist pitch contractor																								
Site clearance																								
Earthworks																								
Sand topdressing																								
Fertiliser application and seeding																								
Reinstatement of damage																								
12 months of initial maintenance																								
Pitch area ready for use																								

7 IMPLICATIONS OF WORKS ON FUTURE MAINTENANCE, LONGEVITY AND USAGE

7.1 Maintenance issues

- Land drains can be prone to differential settlement (i.e. there can be some sinkage over the drain lines) as the soil surrounding the drain pipe dries out and shrinks; this is perfectly normal in new constructions. Whilst topping up drain lines is usually covered by the Contractor during the first 12-months following construction, it is possible that drains may continue to sink to some extent after this time. Therefore, there should be some allowance within the maintenance programme to ensure that drain runs are kept topped up.
- In general terms, a maintenance budget of ~£10 k / senior pitch is normally required to maintain the facility in good condition. This figure includes an allowance for annual sand topdressing.
- A routine maintenance schedule is appended (Appendix I)

7.2 Drainage system longevity

- Whilst only a guide, the piped drainage system should have an operational lifespan of approximately 25 years if well maintained (e.g. silt traps regularly inspected and emptied, and collector drains flushed).
- If managed well (i.e. annual sand topdressing) and not over-used (please see Item 8.3 below), sand bands beneath a rootzone carpet should have an operational lifespan of 10 – 20 years (dependent on the rate of silt ingress from the surrounding soil).

7.3 Usage

- At the request of the client, the majority of the site will be undrained and so pitch usage may be limited during periods of inclement weather.

8 OUTLINE PROJECT RISK ASSESSMENT

The following risks to the project should be considered:

1. **Weather:** Good dry weather during construction is essential for project progress. This is particularly sensitive once the vegetation has been removed and the topsoil has been stripped.
2. **Timeliness and quality of construction:** It is important that the specialist pitch contractor appointed has the scale of operation and capacity to deliver this project on time and to the requisite high quality. A premium for highly experienced, well-equipped contractors must be valued in the tender process. Cost should not be the only consideration.
3. **Drain line sinkage and establishment challenges:** Whenever piped drainage is installed there are challenges with settlement of the permeable drain back fill and getting grass to establish in the drain runs. Settlement occurs due to a combination of shrinkage of the surrounding soil on drying and natural settlement of the permeable backfill with time, and so construction method and monitoring of the contractor are essential. Grass establishment problems along the drain runs can occur because the backfill materials are freely draining (so that the drains function) and therefore do not retain much water and also readily leach nutrients. This is mitigated to an extent at the design stage by the specification of the construction method for mixing some topsoil into the tops of the drains, but this approach is dependent upon the inclusion of a secondary drainage scheme. Watering and fertiliser applications along the drain runs during establishment may be required during periods of drought.
4. **Spoil:** Spoil from the drainage installation shall be disposed of off-site unless the Client would prefer on-site disposal as a cost-cutting measure.
5. **Ongoing operational finance:** The Client should carefully consider the maintenance demand (in terms of time, skill and cost) for the proposed surfaces.

9 CONFIDENTIALITY

This presentation is confidential and is only for the use of officers of Henley Town Council and AFC Henley Football Club. Without the specific consent in writing of TGMS, no copies of this presentation are to be made and information contained herein should not be communicated to any third party. At the request of TGMS all copies of this document, in whatever form, are to be returned.

10 CONTACT DETAILS

TGMS
4 Doolittle Mill
Froghall Road
Ampthill
Bedfordshire
MK45 2ND

Tel: 01525 307060
Email: richard.earl@tgms.co.uk

11 APPENDICES

11.1 Appendix I: Outline Maintenance Recommendations

Mowing. The grass shall be maintained at a height of 30 using cylinder mowing equipment. The grass should never be allowed to exceed a height of 50 mm. If the grass does become too long, the height of cut should be reduced gradually over 3 – 4 cuts allowing some time for recovery in between. N.B. On no account should the grass height be reduced by more than 50% on any one occasion. Overall, approximately 30 mowing operations may be required each year, depending on weather and growing conditions.

Fertiliser application. Allowance should be made for a sufficient number of fertiliser applications to maintain healthy growth and colour. The fertiliser regime should be based on the results of annual soil sampling to determine nutrient concentrations, but the following programme is provided as a guide:

- April 12:6:6 at 350 kg/ha
- September 5:5:20 at 350 kg/ha

Fertiliser shall be applied with appropriate equipment that ensures a uniform distribution.

Weed control. Apply a selective herbicide in the spring (if required) to combat the weeds present. This to be applied at least two weeks after the first fertiliser treatment (April) and at a time when grass growth is strong and healthy. NB. Do not apply herbicide during periods of potential turf stress, i.e. if the weather is hot and dry or if frosts are forecast. Apply herbicide strictly according to the manufacturers label recommendations and only by suitably qualified personnel.

Pesticide/Fungicide [If required]. A pesticide/fungicide application may be required should disease be present within the grass sward. An approved fungicide should be used with activity against the pathogens present and be applied following the manufacturers label recommendations by suitably qualified personnel.

Aeration / Compaction Alleviation. Verti-drain (or other similar de-compaction treatment) the pitches on at least two occasions in the spring and autumn. Use 18 mm diameter solid tines working to a minimum depth of 200 mm below the surface set to provide some heave. Verti-draining must not be carried out if ground conditions are too soft or during frost.

Additional aeration treatments (e.g. slitting or spiking) during the playing season would also be highly beneficial to maintain surface drainage rates. These treatments should only be undertaken when ground conditions are suitable.

Sand topdressing. Supply and spread an approved medium-fine sand suitable for sports use during the renovations period at the rate of 85 t/ha. After each application, the sand should be worked into the surface with brushes or drag mats. Given the presence of the rootzone carpet, this may not be required until Year 4.

Overseeding. Overseed the pitches and safety margins as required at the application rate of approximately 200 kg/ha immediately after the end of season renovation. Use at least three cultivars of perennial ryegrass chosen form the latest Turfgrass Seed booklet with live ground cover and visual merit ratings of 6.5 or more. Make at least two passes with seeding equipment designed to place the seed approximately 5 mm below the surface.

Harrowing [Playing season as required]. To maintain surface levels, it is recommended to chain harrow / drag mat the pitches as opposed to flat rolling which tends to compact the pitch surface and exacerbate undulations. This should only be undertaken under suitable ground conditions.

Divot repair [Playing season]. After each match, divot and tread the divots back into position. This will remove any bare soil which allows weeds and weed grasses to germinate. Filling in divots with seed/soil mix will help to maintain better grass coverage.

Renovation of worn areas [Playing season]. Areas of high wear should be dressed and seeded using a divot repair mix (seed/rootzone) during the playing season as required in order to maintain good grass cover. These areas should be hand watered (if necessary) to ensure rapid grass germination and establishment.

Line Marking [Playing season]. Line marking should be undertaken on a weekly basis during the playing season.

Goal post safety. The posts should be regularly checked for damage and re-painted / re-paired as necessary following the manufacturer's guidance.

11.2 Appendix II: Performance Quality Standards

Client: Henley Town Council Physical Site Survey date: 03/05/2023

Project Title: Jubilee Park.

ELEMENT	LIMITS	METHOD OF TEST	Area 1	Area 2
Ground cover %	>70 for SH 25-30 >80 for SH 30-35	BS 7370 : P3 A6	✓	×
Broad-leaved weeds %	<10	BS 7370 : P3 A6	✓	×
Sward height mm	20-60 PS 20-75 SM	BS 7370 : P3 A3	✓	×
Thatch depth mm	<5	BS 7370 : P3 A7	×	×
Hardness in g	35-200	STRI method of test using a 0.5 kg Clegg Impact Hammer from a drop height of 0.55 m	✓	×
*Water infiltration rate mm h^{-1}	5	BS 7370 : P3 A8	✓	×
Evenness (2 metre straight edge)	<20 mm	BS 7370 : P3 A6	×	×
Slope: Direction of play Across play	<1.25% <2.00%	BS 7370 : P3 A5	✓ ✓	✓ ✓
pH value	5.5 – 7.5	ISO 10390	✓	×
GUIDANCE FOR ROOTZONE LAYER				
Maximum diameter	<32 mm	Particle Size Distribution	✓	×

KEY: SH = Sward Height PS = Playing Season SM = Summer Maintenance

* Based on previous experience of pitches on similar soils it is expected that once the soils are wet to depth during the winter, the rate of infiltration will decline to less than 5 mm / hr.

Visual assessment is an acceptable alternative method of testing, if undertaken by a turfgrass consultant who is able to satisfy the selection criteria identified within the Turfgrass Consultants – Construction/Upgrade Brief.

Assessment undertaken by: Dr Richard Earl Consultancy: TGMS

11.3 Appendix III: Soil sample analysis results

EUROPEAN TURFGRASS LABORATORIES
GEOTECHNICAL (PUTTING GREEN MATERIALS) CERTIFICATE NO. 903-01
ACCREDITED

Unit 6, Millar Court
Alloa Business Park
Alloa, FK10 3SA, Scotland
Tel: +44 (0) 1259 725060
Fax: +44 (0) 1259 722289
europeanturf@etl-ltd.com
www.etl-ltd.com

20023/1				**PARTICLE SIZE DISTRIBUTION** **SAND / SILT / CLAY** Test Report Number 20023/A Page 1 of 2
100%				Jubilee Park: TP1, Topsoil
				*** Stones present > 16mm *****
10/05/23				Sample Received Date & Sample Test Date
moist				Sample Moisture (very wet, wet, moist, dry, n/a)
friable				Sample Consistency (hard, friable, plastic, n/a)
high				Sample Homogeniety (high, medium, low, n/a)
				Particle Size Distribution – ASTM F1632-03 (Reapproved 2018)
53.8				% Sand 0.05 to 2.00 mm
32.4				% Silt 0.002 to 0.05 mm
13.8				% Clay less than 0.002 mm
Sandy Loam				Soil Classification

ASTM Method: F1632-03 (Reapproved 2018)
"Particle Size Analysis and Sand Shape Grading of Golf Course Putting Green and Sports Field Root Zone Mixes"

Professional Sportsturf Design (NW) Ltd, trading as TGMS
Wigan Road, Leyland, Lancashire, PR25 5XW

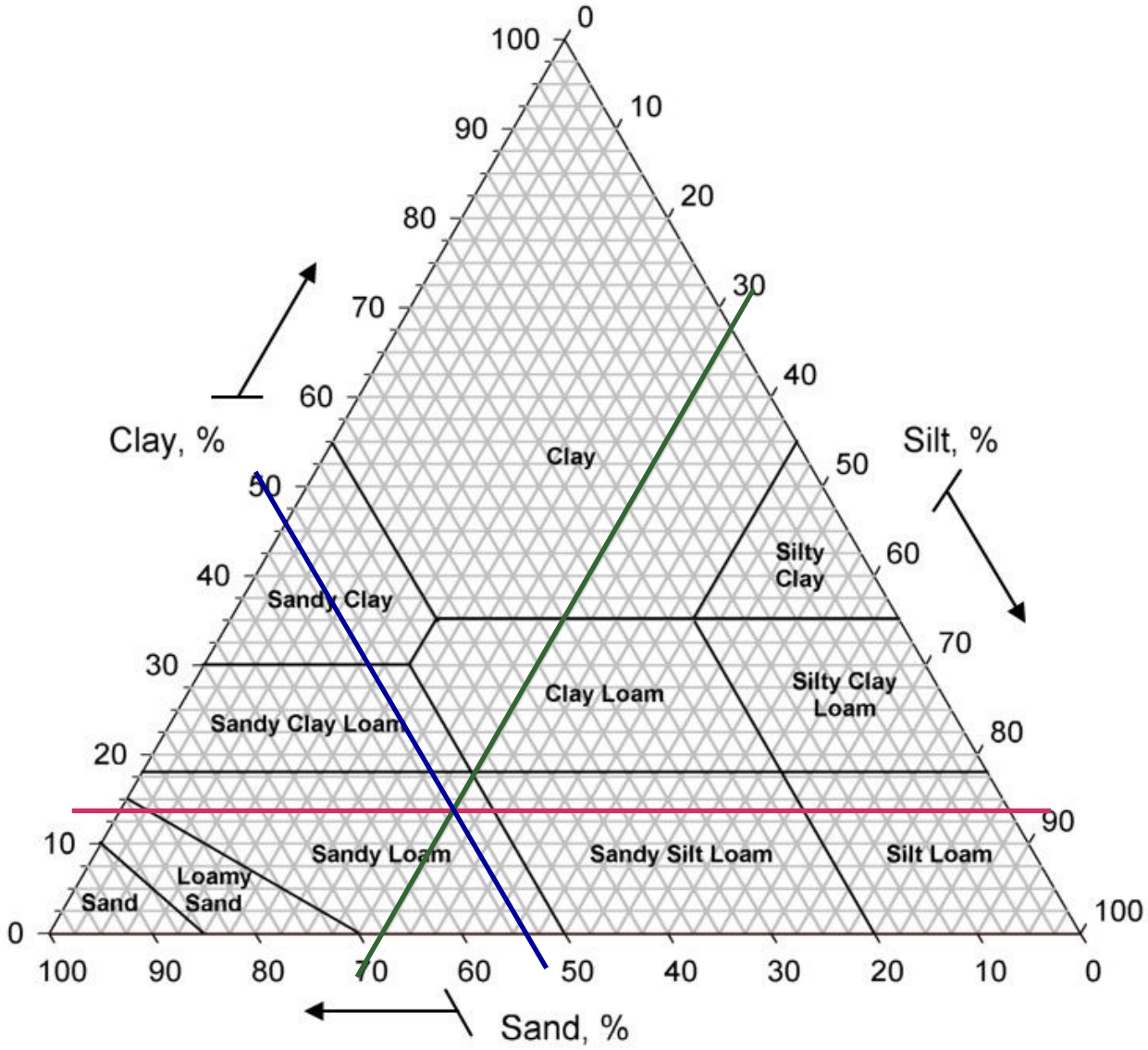
Approved by: Sara Singleton-Price **Date: 16th May 2023**

Managing Director, for European Turfgrass Laboratories Ltd

EUROPEAN TURFGRASS LABORATORIES

Triangle of Texture : Soil Classification

Date of Issue: Sept 2019, Revision 1,
Issuing Authority: Sharon Singleton-Bruce



Soil Sample: TGMS

Test Report 20023/A

			After removal of gravel			
Sample	**% Gravel**		**% Sand**	**% Silt**	**% Clay**	**Soil Texture Classification**
Jubilee Park: TP1, Topsoil	15.8		53.8	32.4	13.8	**Sandy Loam**

Signed: Sharon Singleton-Bruce

Date: **16th May 2023** **for European Turfgrass Laboratories Ltd**

EUROPEAN TURFGRASS LABORATORIES
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Unit 6, Millar Court
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Alloa, FK10 3SA, Scotland
Tel: +44 (0) 1259 725060
Fax: +44 (0) 1259 722289
europeanturf@etl-ltd.com
www.etl-ltd.com

20023/2				**PARTICLE SIZE DISTRIBUTION** **SAND / SILT / CLAY** Test Report Number 20023/B Page 1 of 2
100%				Jubilee Park: TP2, Topsoil
				*** No Stones present *****
10/05/23				Sample Received Date & Sample Test Date
moist				Sample Moisture (very wet, wet, moist, dry, n/a)
friable				Sample Consistency (hard, friable, plastic, n/a)
high				Sample Homogeniety (high, medium, low, n/a)
				Particle Size Distribution – ASTM F1632-03 (Reapproved 2018)
50.3				% Sand 0.05 to 2.00 mm
37.0				% Silt 0.002 to 0.05 mm
12.7				% Clay less than 0.002 mm
Sandy Loam				Soil Classification

ASTM Method: F1632-03 (Reapproved 2018)
"Particle Size Analysis and Sand Shape Grading of Golf Course Putting Green and Sports Field Root Zone Mixes"

Professional Sportsturf Design (NW) Ltd, trading as TGMS
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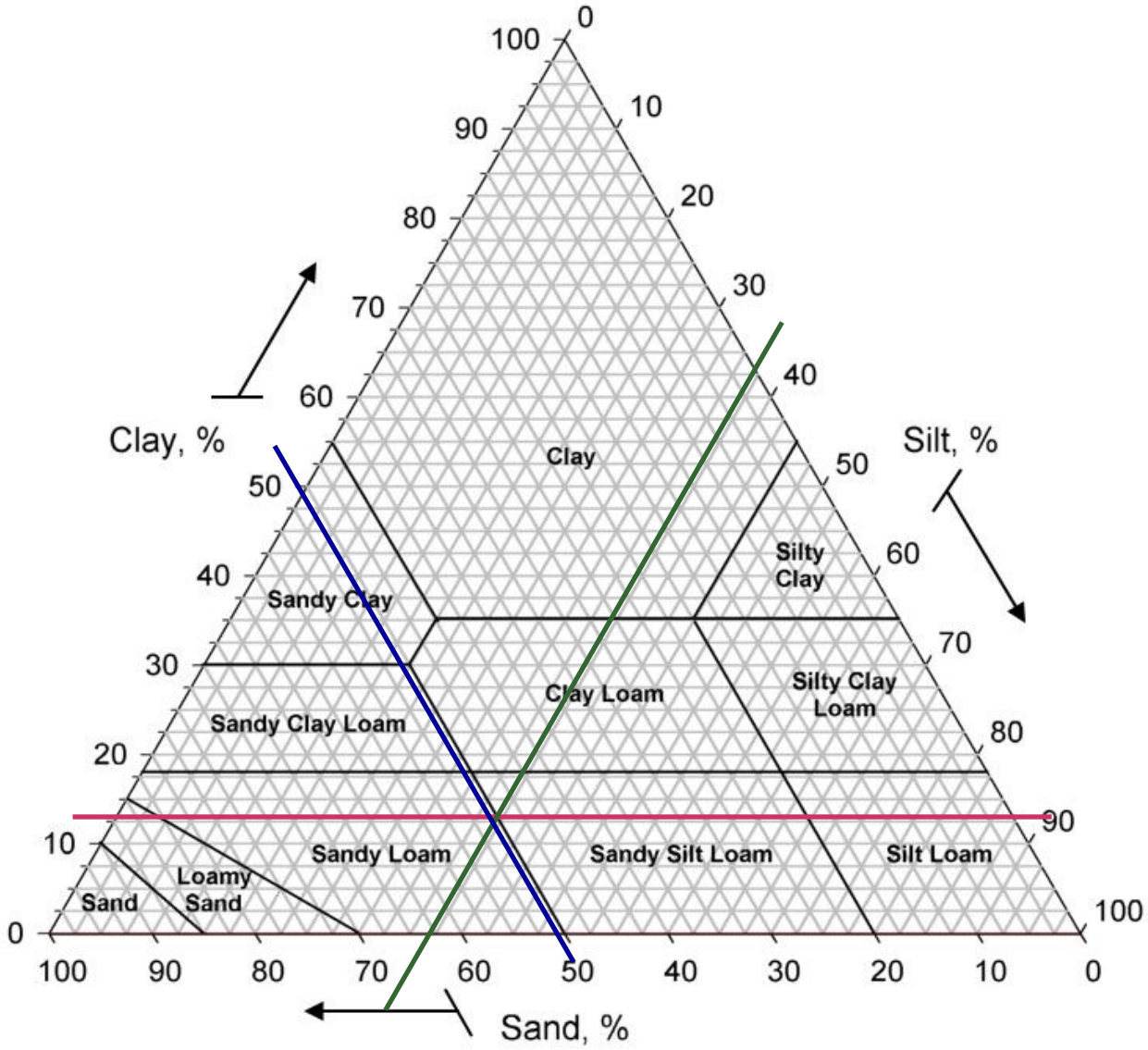
Triangle of Texture : Soil Classification

Date of Issue: Sept 2019, Revision 1,
Issuing Authority: Sharon Singleton-Bruce



Soil Sample: TGMS

Test Report 20023/B

			After removal of gravel			
Sample	**% Gravel**		**% Sand**	**% Silt**	**% Clay**	**Soil Texture Classification**
Jubilee Park: TP2, Topsoil	-		50.3	37.0	12.7	**Sandy Loam**

Signed: Sharon Singleton-Bruce

Date: **16th May 2023** **for European Turfgrass Laboratories Ltd**

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ACCREDITED

Unit 6, Millar Court
Alloa Business Park
Alloa, FK10 3SA, Scotland
Tel: +44 (0) 1259 725060
Fax: +44 (0) 1259 722289
europeanturf@etl-ltd.com
www.etl-ltd.com

20023/3				**PARTICLE SIZE DISTRIBUTION** **SAND / SILT / CLAY** Test Report Number 20023/C Page 1 of 2
100%				Jubilee Park: TP3, Topsoil
				*** Stones present > 16mm *****
10/05/23				Sample Received Date & Sample Test Date
moist				Sample Moisture (very wet, wet, moist, dry, n/a)
friable				Sample Consistency (hard, friable, plastic, n/a)
high				Sample Homogeniety (high, medium, low, n/a)
				Particle Size Distribution – ASTM F1632-03 (Reapproved 2018)
59.2				% Sand 0.05 to 2.00 mm
31.5				% Silt 0.002 to 0.05 mm
9.3				% Clay less than 0.002 mm
Sandy Loam				Soil Classification

ASTM Method: F1632-03 (Reapproved 2018)
"Particle Size Analysis and Sand Shape Grading of Golf Course Putting Green and Sports Field Root Zone Mixes"

Professional Sportsturf Design (NW) Ltd, trading as TGMS
Wigan Road, Leyland, Lancashire, PR25 5XW

Approved by: Sara Singleton-Price **Date: 16th May 2023**

Managing Director, for European Turfgrass Laboratories Ltd

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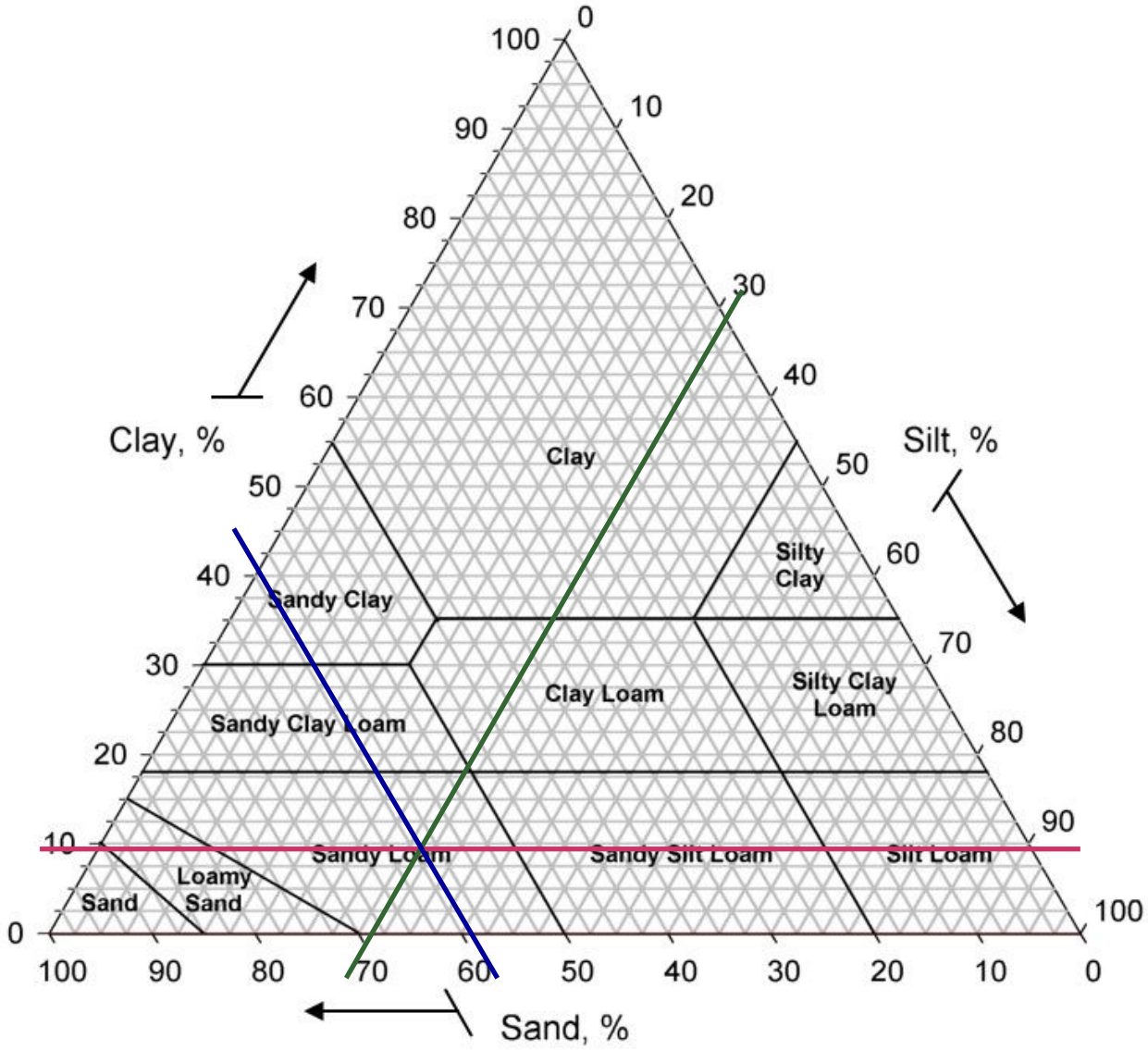
Triangle of Texture : Soil Classification

Date of Issue: Sept 2019, Revision 1,
Issuing Authority: Sharon Singleton-Bruce



Soil Sample: TGMS

Test Report 20023/C

			After removal of gravel			
Sample	**% Gravel**		**% Sand**	**% Silt**	**% Clay**	**Soil Texture Classification**
Jubilee Park: TP3, Topsoil	6.6		59.2	31.5	9.3	**Sandy Loam**

Signed: Sharon Singleton-Bruce

Date: **16th May 2023** **for European Turfgrass Laboratories Ltd**

EUROPEAN TURFGRASS LABORATORIES

Routine Nutrient Analysis Summary Report

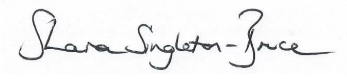
Client: **TGMS**

Date: **16/05/2023**

Order: **20023**

Sample: **Jubilee Park: TP1, Topsoil**

Analysis	Result	Guideline	Interpretation	Comments
pH	8.1	6.0	High	An alkaline environment will reduce the availability of certain nutrients - particularly P, K, B, Co, Cu, Fe, Mn and Zn. An elevated pH will also impact on beneficial soil fungal populations and activity.
Phosphorus (ppm)	44	16	High	(Index 3.9) Apply 30 kg/ha P_2O_5
Potassium (ppm)	203	121	Normal	(Index 2.7) Apply 40 kg/ha K_2O
Magnesium (ppm)	44	51	Low	(Index 1.7) Apply 50 kg/ha MgO (40 units/acre) every three to four years

Signed:  **Date: 16th May 2023**

Position: **Sharon Singleton-Bruce, Managing Director, European Turfgrass Laboratories Ltd**

This is a Sub-Contracted Test – this sample has not been tested by ETL
This statement is a direct interpretation of the sample tested

EUROPEAN TURFGRASS LABORATORIES

Routine Nutrient Analysis Summary Report

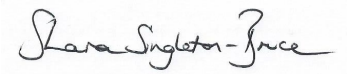
Client: **TGMS**

Date: **16/05/2023**

Order: **20023**

Sample: **Jubilee Park: TP2, Topsoil**

Analysis	Result	Guideline	Interpretation	Comments
pH	6.0	6.0	Normal	Maintain pH to ensure optimum nutrient availability and ideal conditions for an active soil biology
Phosphorus (ppm)	19	16	Normal	(Index 2.3) Apply 50 kg/ha P_2O_5
Potassium (ppm)	166	121	Normal	(Index 2.4) Apply 60 kg/ha K_2O
Magnesium (ppm)	97	51	Normal	(Index 2.9) Apply 25 kg/ha MgO (20 units/acre) every three to four years

Signed:  **Date:** **16th May 2023**

Position: **Sharon Singleton-Bruce, Managing Director, European Turfgrass Laboratories Ltd**

This is a Sub-Contracted Test – this sample has not been tested by ETL
This statement is a direct interpretation of the sample tested

EUROPEAN TURFGRASS LABORATORIES

Routine Nutrient Analysis Summary Report

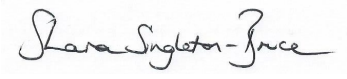
Client: **TGMS**

Date: **16/05/2023**

Order: **20023**

Sample: **Jubilee Park: TP3, Topsoil**

Analysis	Result	Guideline	Interpretation	Comments
pH	5.6	6.0	Slightly Low	An acidic environment will reduce soil nutrient availability and the efficiency of any applied fertilisers or organic materials. A sub optimum pH will also impact on soil microbial populations and rates of activity
Phosphorus (ppm)	19	16	Normal	(Index 2.3) Apply 50 kg/ha P_2O_5
Potassium (ppm)	35	121	Very Low	(Index 0.6) Apply 120 kg/ha K_2O
Magnesium (ppm)	85	51	Normal	(Index 2.7) Apply 25 kg/ha MgO (20 units/acre) every three to four years

Signed:  **Date:** **16th May 2023**

Position: **Sharon Singleton-Bruce, Managing Director, European Turfgrass Laboratories Ltd**

This is a Sub-Contracted Test – this sample has not been tested by ETL
This statement is a direct interpretation of the sample tested