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A REPORT TO BROUGHTON PARK RUFC

A feasibility report for the relocation and improvement of natural turf sports pitches at Broughton Park RUFC, Lancashire GAA and associated clubs St Peter's and Fullen Gaels.

6th July 2023
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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, PSD/ TGMS accepts no design liability or responsibility for subsequent works based on the information contained within this report.

1 EXECUTIVE SUMMARY

Broughton Park RUFC

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

1.1 Site information

1	Objective: To conduct a detailed site investigation for the proposed pitch relocation and improvement works at Broughton RUFC, Manchester.
2	Site visit: A detailed site investigation was conducted on the 23 rd of June 2023.
3	Site location: As part of an ongoing venture to find new suitable sites that will be able to host the GAA Northern games and to grow and develop players that will secure the future of Gaelic sports. Broughton Park, once previously considered as a venue for improvement has now been selected with full support from MCC, MCR Active and Broughton Park RUFC. This entails relocating the existing 2 pitches to a new location on this site and developing pitches that are playable 12 months of the year. The site currently facilitates 6nr rugby/ Gaelic sports pitches, 18nr football pitches in a variety of dimensions and cricket facilities.
4	Hydrology: Outfall was identified as a wider site drainage scheme located within the car park. Additionally, a brook (Red Lion Brook) is located to the northeast of the site. Should the installation of any new land drain scheme be installed into the pitches, the Client must confirm a suitable outfall along with any permissions for the discharge of drainage water. Climate data obtained from the Flood Estimation Handbook (FEH) indicate that the standard-period average annual rainfall (SAAR) for this catchment is 846 mm which is marginally lower than the national average of 855 mm/year.
5	Existing land drainage system: No existing drainage scheme was noted within the footprint of the sports pitches.
6	Land drainage flow rates: The predicted drainage rates for the site are greater than the Greenfield Runoff rates, and so the installation of a land drainage system will result in greater flow rates than the greenfield condition. It is therefore concluded that additional attenuation measures should be a prerequisite for the installation of any drainage scheme. Drainage design (if required) should account for at least the 1:30 +20% return period outfall rate of 8.5 l/s/ha for the site over a 24-hour period.
7	Flood risk: Based on information obtained from the Environment Agency (EA) via gov.uk, the site is at a low risk of flooding from both rivers and seas and surface water with an annual probability of flooding of 0.1% – 1% (1 in 1000 years to 1 in 100 years).
8	Landfill: Based on information obtained from data.gov.uk, the site is not located over a historic or permitted landfill site which could have affected the nature of any remodelling earthworks.
9	Groundwater Source Protection Zones: Based on information obtained from magic.defra.gov.uk, the site is not located within a Groundwater Source Protection Zone. If it was, then this could have restricted 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 gradients: Topographical data has not been provided by the client. The site visually appears to fall northwards with gradients in the line of play and across play compliant with Sport England guidance. However, significant undulations are evident across the site and non-compliant with Sport England surface evenness guidance (>25 mm). There is a need to address the undulating nature of the pitch surfaces, and so it is recommended that if a new land drainage scheme is proposed, the pitch surface should be regraded at the same time.
11	Pitch orientation: Sport England (SE) 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. Both proposed pitches comply with the guidance, and orientation is approximately 120°.
12	Soil maps: According to Sheet 3 of the Soil Survey of England and Wales 1:250,000 soil map (1983), the indigenous soil in this area is not mapped due to being in an urbanised area, however soil surveys in close proximity to the site comprises the BRICKFIELD 3 Soil Association. The geological origin is Drift from Palaeozoic sandstone and shale, and the soils are characterised by “Slowly permeable seasonally waterlogged fine loamy over clayey and clayey soils.

13	Geology: According to the BGS Geology Viewer, the superficial deposits overlying the site comprise Devensian - Sand and gravel. Sedimentary superficial deposit formed between 116 and 11.8 thousand years ago during the Quaternary period. These overlie bedrock geology comprising Wilmslow Sandstone Formation - Sandstone. Sedimentary bedrock formed between 252.2 and 247.1 million years ago during the Triassic period.
14	Soil profile pit description: In summary, the site is characterised by 200 mm of SANDY LOAM topsoil overlying SAND subsoil. However, material in TP 2 appeared to be more CLAY LOAM in nature. Therefore, site soils may be inconsistent. Whilst the topsoil can provide adequate drainage rates if managed well through aeration practices, light-textured soil, such as Sandy Loams are particularly susceptible to compaction as it tends not to re-structure naturally through shrink and swell processes that would usually be associated with clay dominated soils.
15	Stone content: Observations made during the initial site visit identified a minimal stone content within the trial pits.
16	Agronomic condition: Grass cover across the pitches is currently >80% at a height of 100 mm and comprised mainly Ryegrass (<i>Lolium perenne</i>), a high weed content (~20%) was observed mainly comprised as Clover (<i>Trifolium repens</i>) and Dandelion (<i>Taraxacum</i>). Thatch/ soil organic matter was noted as ~10-15 mm. The surface exhibited as hydrophobic in areas.
17	Usage: The pitches at present are undrained and therefore should only support under 2 hours of use per week before pitches deteriorate. It is difficult to predict with any accuracy the hours of play achievable if the pitch surface was to be regraded and a new drainage scheme installed as this depends on local weather conditions, schedule of use, age of participants and the quality of the on-going maintenance. Installation of a Sport England Type 4 or Type 5 construction the 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).
18	Performance Quality Standards: Performance Quality Standards (PQS) represent a recommended minimum quality standard for the construction and maintenance of natural turf pitches. the site currently meets minimum performance requirements for five out of eleven elements assessed (ground cover, surface hardness, surface hardness, slope in the direction of play, slope across of play and stone content), but fails on a further six (broad leaved weeds, sward height, thatch depth, water infiltration rate, surface evenness).

1.2 Recommendations

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

Craig Parry, July 2023.

2 INTRODUCTION AND OBJECTIVES

PSD Agronomy has been commissioned by MCR Active to conduct a detailed site investigation for the feasibility of improving an area of natural turf which currently has existing rugby pitches and converting the area into 2 Nr of Gaelic football pitches.

The objectives of the feasibility study are as follows:

- To undertake a site investigation in order to characterise the underlying soil profile and the effects this soil profile may have on natural turf surface performance.
- To evaluate the topography of the site and its impact on pitch performance including any drainage and potential outfall arrangements.
- To prepare a set of development options for construction of the pitch including any recommended drainage schemes and earthworks.
- To derive indicative construction and remediation costs for budgetary purposes and present costed options where applicable.
- To provide an indicative work programme for the possible phasing and duration of the proposed construction and remediation works. This will also indicate when the sports facilities may be available for use.

3 PHYSICAL SITE SURVEY

Craig Parry of PSD/ TGMS Sports Surface Consultants conducted a detailed site visit on the 23rd of June 2023 to evaluate current performance of the area, soil types, agronomic condition, and drainage status.

3.1 Site location

The site address is:

2 Hough End Crescent,
Manchester,
M21 7TL

Grid reference (centre of red dash line).
OS X (Eastings) 383280,
OS Y (Northings) 393313

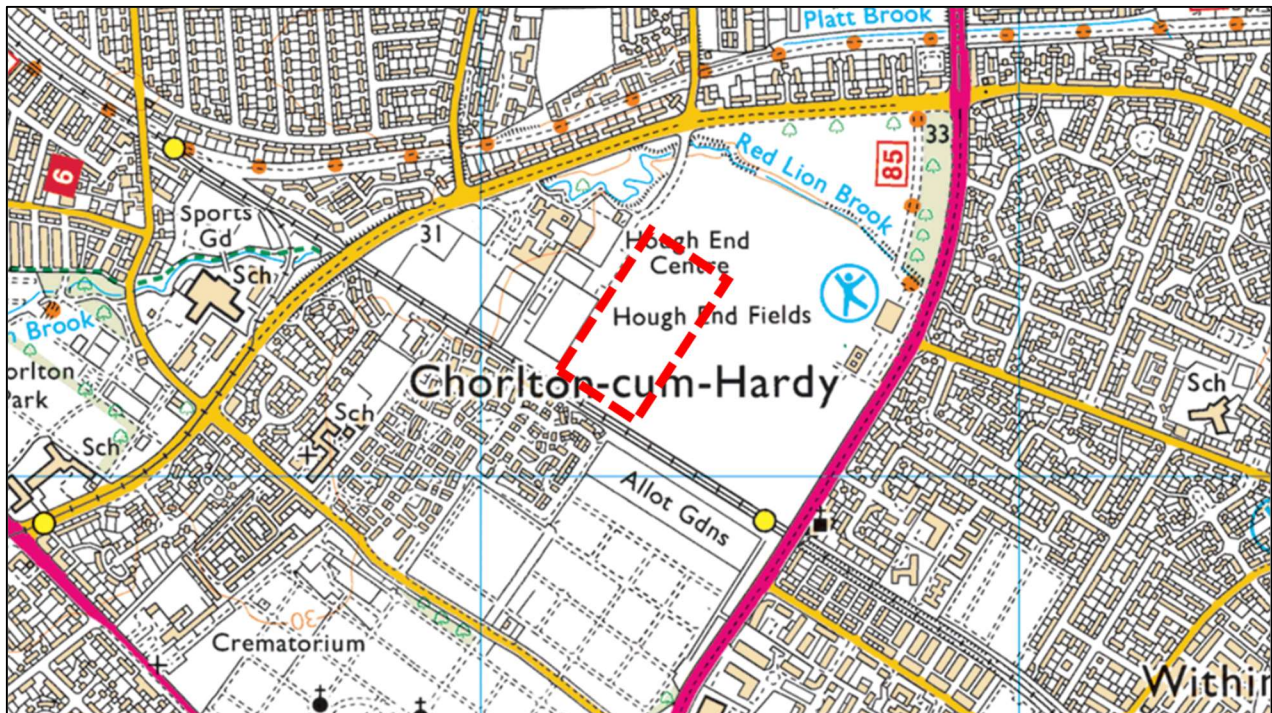


Figure 1. Site location (dashed red line). Location indicative only and not to scale.

As part of an ongoing venture to find new suitable sites that will be able to host the GAA Northern games and to grow and develop players that will secure the future of Gaelic sports. Broughton Park, once previously considered as a venue for improvement has now been selected with full support from MCC, MCR Active and Broughton Park RUFC. This entails relocating the existing 2 pitches to a new location on this site and developing pitches that are playable 12 months of the year.

The site currently facilitates 6nr rugby/ Gaelic sports pitches, 18nr football pitches in a variety of dimensions and cricket facilities.

The entirety of the site is bounded by residential areas north, east, west, and south, additionally an allotment is situated southeast.

Access to the site can be gained via Mauldeth Road.

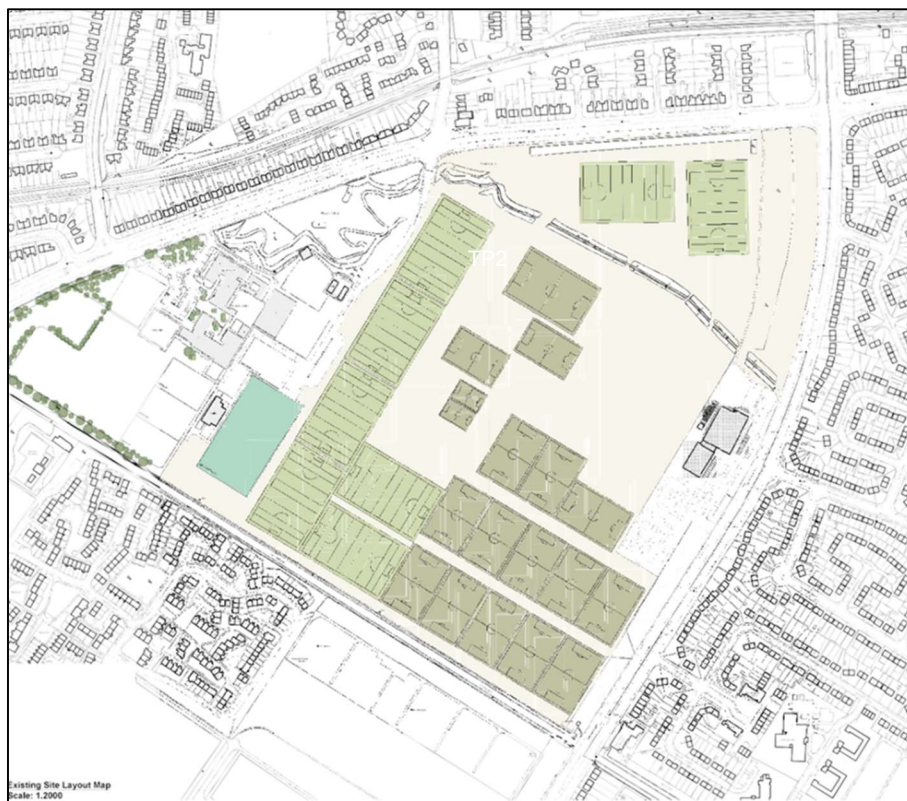


Figure 2. Existing pitch layout (courtesy of MCR Active)

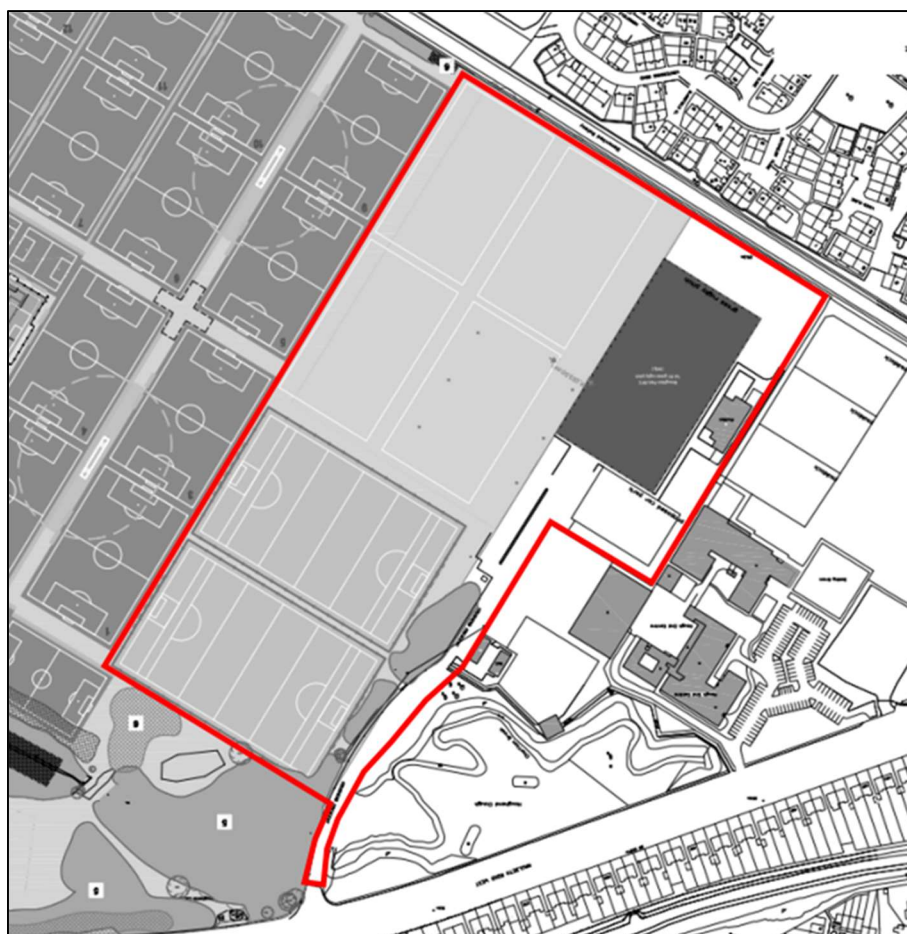


Figure 3. Proposed pitch layout – Gaelic sports pitches located in red dashed line. (Courtesy of MCR Active).



Figure 4. Site overview. TP1 to TP2 mark the approximate locations of the test pits.
(Aerial photograph courtesy of Google Earth Pro).



Figure 5. General view across the site towards the north.



Figure 6. General view across the site towards the west.



Figure 7. General view across the site towards the northeast.



Figure 8. General view across the site towards the east

3.2 Geomorphology and climate

3.2.1 Hydrology

Outfall was identified as a wider site drainage scheme located within the car park. Additionally, a brook (Red Lion Brook) is located to the northeast of the site. Should the installation of any new land drain scheme be installed into the pitches, the Client must confirm a suitable outfall along with any permissions for the discharge of drainage water. No existing drainage scheme was noted within the footprint of the sports pitches.



Figure 9. IC overview toward the west.



Figure 10. IC overview towards the southeast.

Standard period annual rainfall

Climate data obtained from the Flood Estimation Handbook (FEH) indicate that the standard-period average annual rainfall (SAAR) for this catchment is 846 mm which is marginally lower than the national average of 855 mm/year (Figure 11).

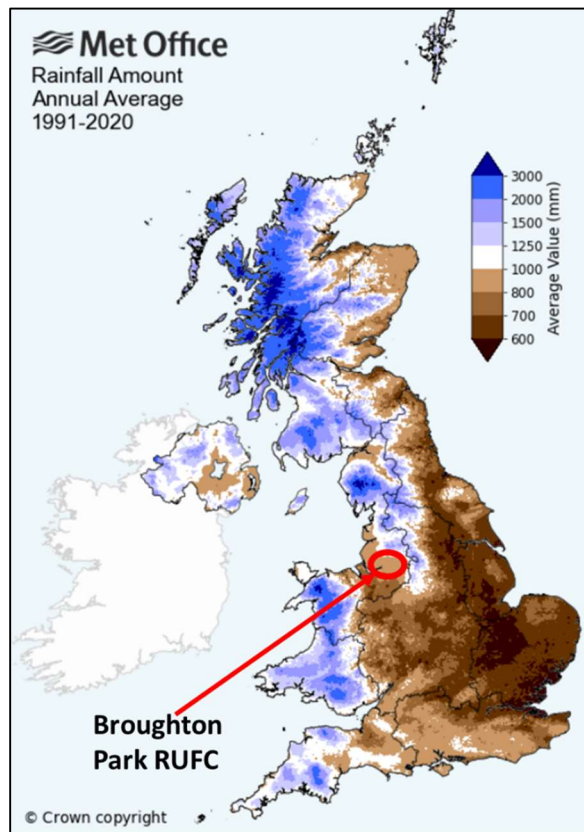


Figure 11. MET office rainfall statistics (1981-2010). Red circle indicates the location of the development area.

Drainage catchment

Catchment data obtained from the Flood Estimation Handbook (FEH) Web Service indicate that the site forms part of a 28.61 km² catchment area overlaying a high productivity aquifer 1A (intergranular).

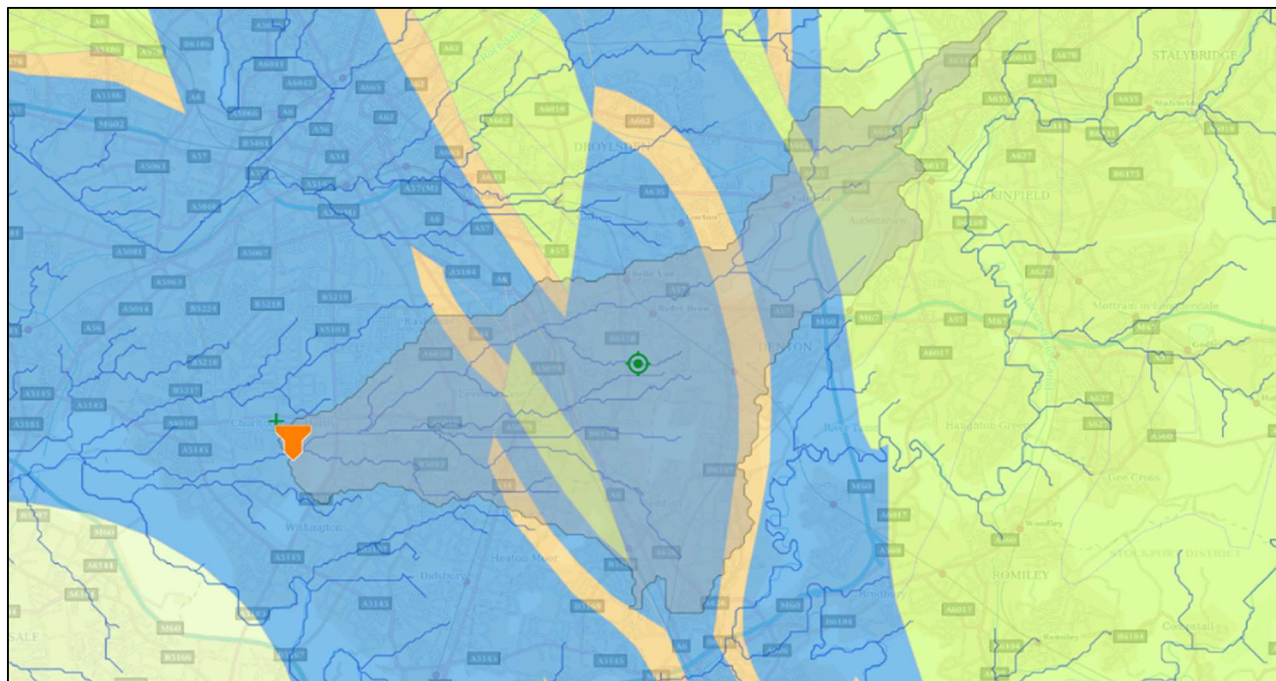


Figure 12. Land drainage catchment (grey polygon) for the site (orange point) and catchment outlet (orange marker).

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.

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	2.25	2.1	3.4
1:30	4.39	5.1	7.1
1:100	5.37	7.0	9.2

Climate change uplift

Data accessed from Defra indicates Broughton Park RUFC forms part of the Upper Mersey Management Catchment for peak rainfall allowances. Land drain systems typically have a life span of 25 years; therefore, it is recommended an additional allowance of 20% for peak rainfall events of 3.3% (1 in 30 years) and an allowance of 25% for peak rainfall events of 1% (1 in 100 years).

Table 2. Greenfield run off rate (FEH method) and drainage outfall rates (ADAS 345 Method) with amended climate change uplift rates.

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)
1:30 +20%	5.2	6.1	8.5
1:100 +25%	6.7	8.7	11.5

The predicted drainage rates for the site are greater than the Greenfield Runoff rates, and so the installation of a land drainage system will result in greater flow rates than the greenfield condition. It is therefore concluded that additional attenuation measures should be a prerequisite for the installation of any drainage scheme. Drainage design (if required) should account for at least the 1:30 +20% return period outfall rate of 8.5 l/s/ha for the site over a 24-hour period.

3.2.2 Risk of flooding from rivers and seas

Based on information obtained from the Environment Agency (EA) via gov.uk (Figure 13), the site is a **low** risk of flooding from rivers and seas with an annual probability of flooding of 0.1% and 1% (1 in 1000 years to 1 in 100 years). It should be noted the northwest of the site (not in pitch footprint) is a medium risk with a probability of flooding between 1% and 3.3% (1 in 100 years to 1 in 1000 years).

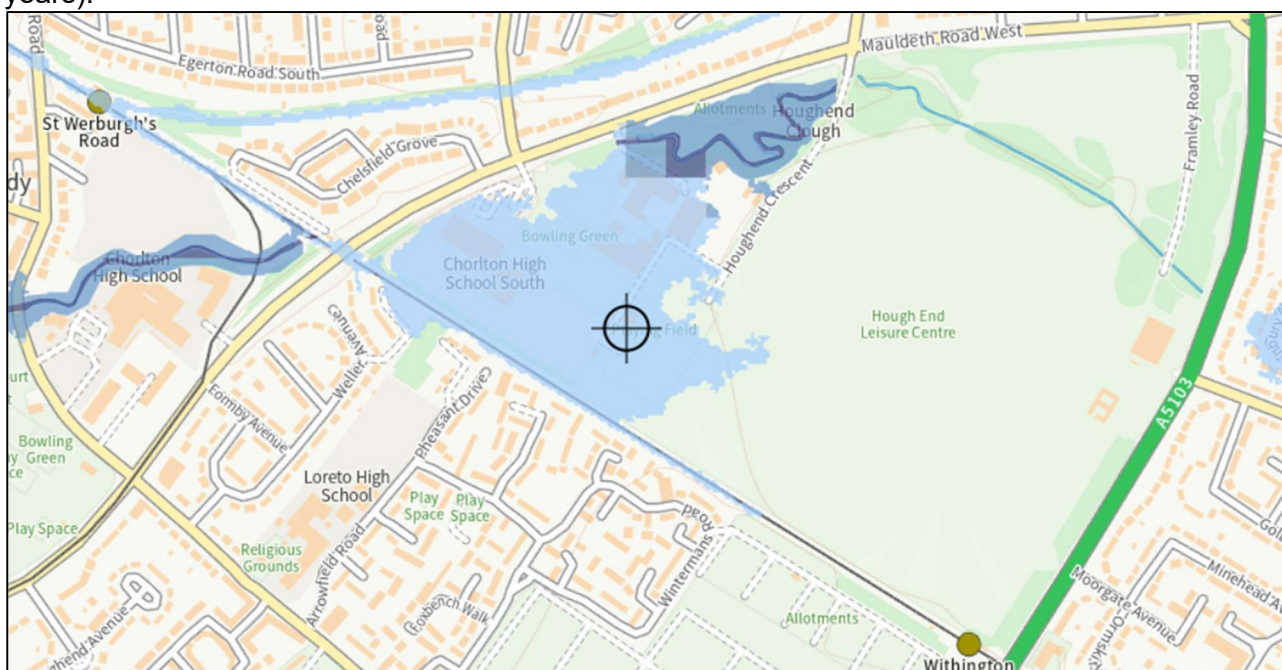


Figure 13. Risk of flooding from rivers and seas (courtesy of gov.uk).

3.2.3 Risk of flooding from surface water

Based on information obtained from the Environment Agency (EA) via gov.uk (Figure 14), the site is a **low** risk of flooding from surface water with an annual probability of flooding of 0.1% and 1% (1 in 1000 years to 1 in 100 years).

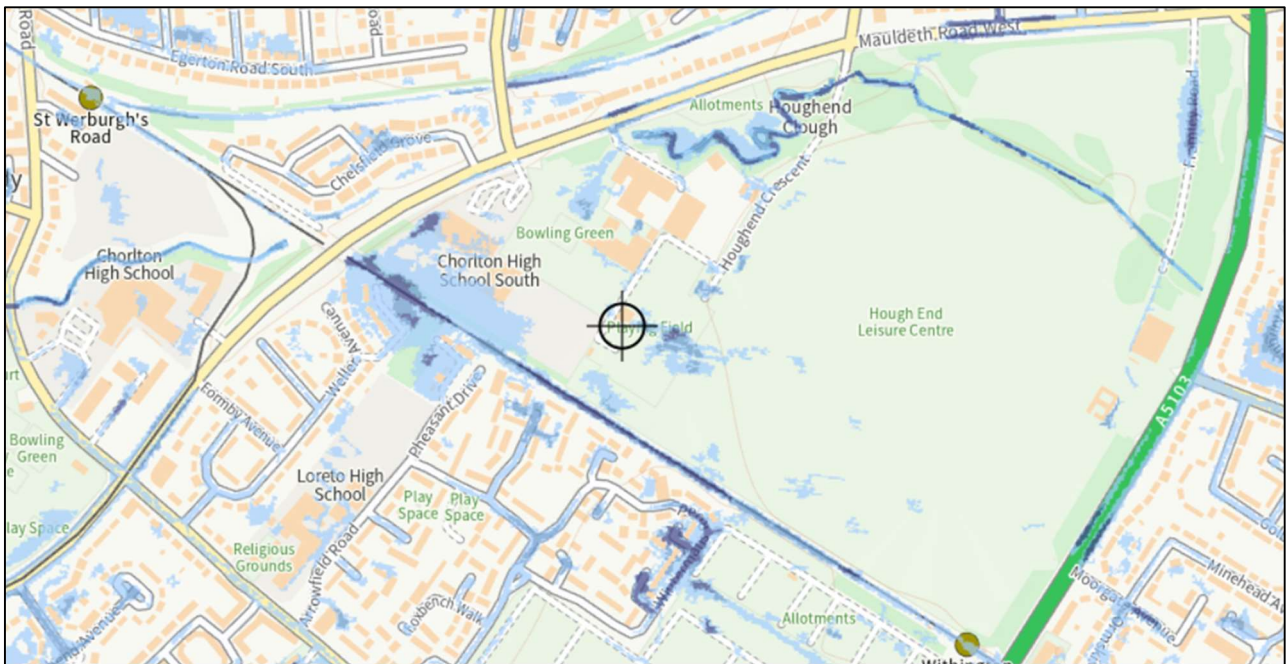


Figure 14. Risk of flooding from surface water (courtesy of gov.uk).

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 15) or permitted landfill (Figure 16).

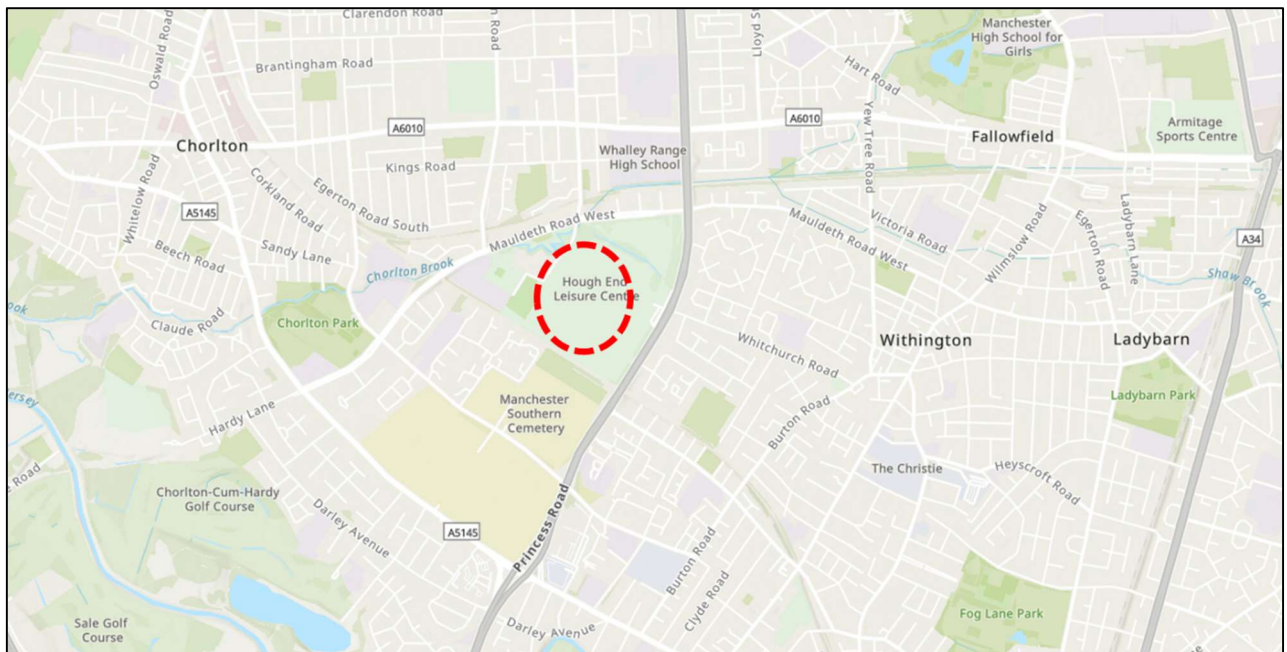


Figure 15. Historic landfill (courtesy of environment.data.gov.uk).

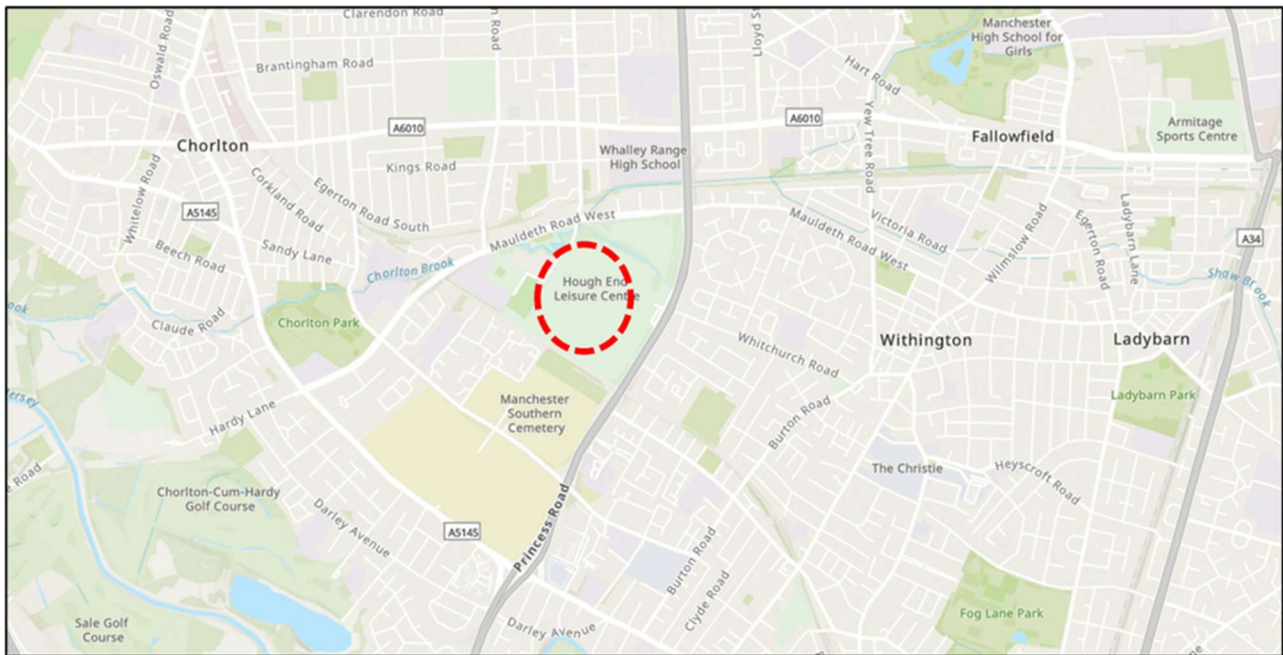


Figure 16. Permitted landfill (courtesy of environment.data.gov.uk).

3.2.5 Groundwater source protection

Based on information obtained from magic.defra.gov.uk, the site is not located within a Groundwater Source Protection Zone (Figure 17). If it was, then this could have restricted 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.

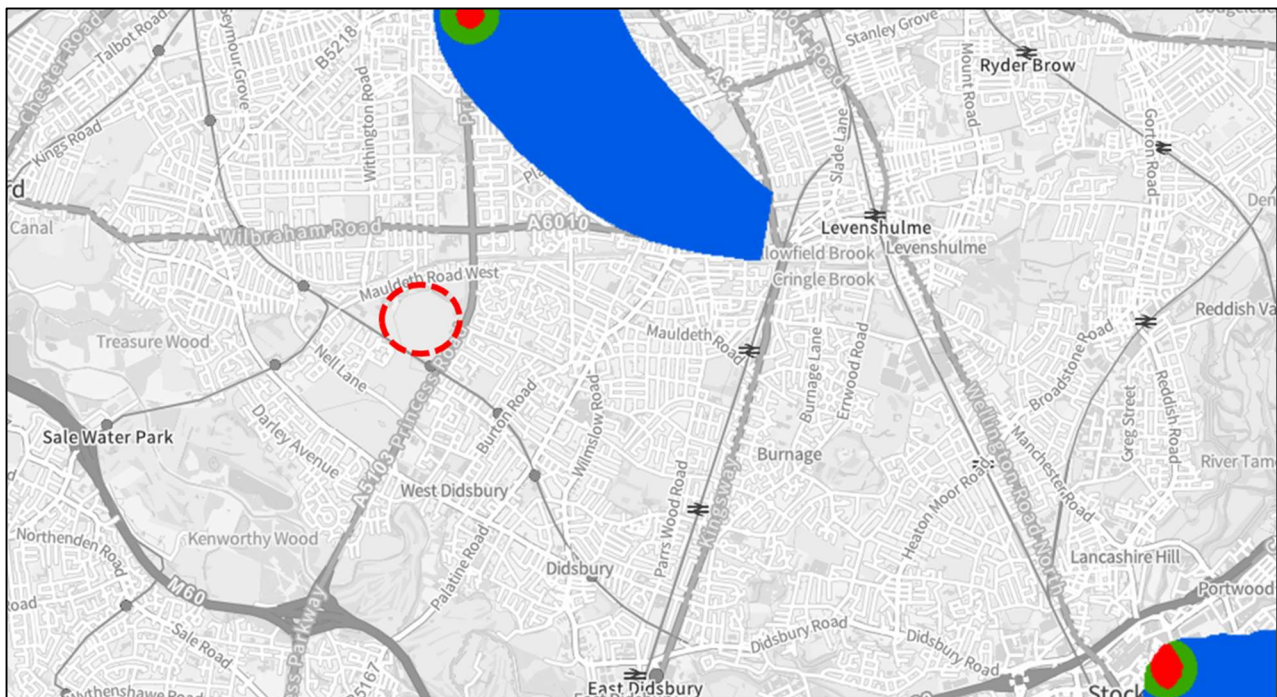


Figure 17. Groundwater source protection zones (courtesy of magic.defra.gov.uk).

Key:

- = Inner Zone
- = Outer Zone
- = Total Catchment

3.3 Pitch gradients

Topographical data has not been provided by the client.

The site visually appears to fall northwards with gradients in the line of play and across play compliant with Sport England guidance. However, significant undulations are evident across the site and non-compliant with Sport England surface evenness guidance (>25 mm). There is a need to address the undulating nature of the pitch surfaces, and so it is recommended that if a new land drainage scheme is proposed, the pitch surface should be regraded at the same time.

Sport England recommends that the maximum slope along and across the direction of play should not exceed 1.25% and 2.00% respectively.

3.4 Pitch dimensions and orientation

Sport England (SE) has published guidance on optimum pitch orientation for a range of sports (Figure 18).

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 18 and the provided layout (Figure 3) both proposed pitches comply with the guidance, and orientation is approximately 120°.

There is no set constant size for a GAA pitch. However, for official games at above U15 level GAA pitches should be 130 – 145 m in length and 80 – 90 m wide with a minimum 4 m safety margin.

Dimensions have not been provided for the proposed pitches, however once relocated pitch dimensions should adhere to GAA guidance for official games.

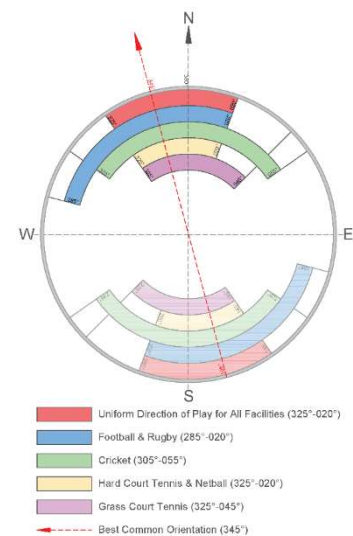


Figure 18. Sport England guidance for orientation.

3.5 Soils and geology

According to Sheet 3 of the Soil Survey of England and Wales 1:250,000 soil map (1983), the indigenous soil in this area is not mapped due to being in an urbanised area, however soil surveys in close proximity to the site comprises the BRICKFEILD 3 Soil Association. The geological origin is Drift from Palaeozoic sandstone and shale, and the soils are characterised by “*Slowly permeable seasonally waterlogged fine loamy over clayey and clayey soils*”.

According to the BGS Geology Viewer, the superficial deposits overlying the site comprise Devensian - Sand and gravel. Sedimentary superficial deposit formed between 116 and 11.8 thousand years ago during the Quaternary period. These overly bedrock geology comprising Wilmslow Sandstone Formation - Sandstone. Sedimentary bedrock formed between 252.2 and 247.1 million years ago during the Triassic period.

According to the BGS GeoIndex, records for a non-confidential borehole (Reference: SJ89SW44, Name: HOUGHEND CLOUGH, Water Well Reference: N/A, Precision: ± 10 METRES, Length (m): 200, Date: N/A, Easting 383280, Northing: 393500.) located to the west of the site. No record of bore hole material logged.

<https://api.bgs.ac.uk/sobi-scans/v1/borehole/scans/items/864927>

3.6 Soil sampling

3.6.1 Test Pit Profile Descriptions

Two soil test pits (TP1 to TP2, Figure 4) were excavated using hand tools to characterise the underlying soil profile.

TP1 The soil profile was found to comprise 200 mm of SANDY SILT LOAM topsoil, over lighter LOAMY SAND subsoil containing minimal stone content which extended beyond the maximum excavation depth of 0.50 m and appeared dry and powdery. (Figures 19 to 20).



Figure 19. TP1 – Sandy Silt loam topsoil.



Figure 20. TP1 – Loamy sand subsoil.

TP2. The soil profile was found to comprise 200 mm of CLAY LOAM topsoil, over light brown SANDY CLAY LOAM subsoil containing minimal stone content which extended beyond the maximum excavation depth of 0.50 m and appeared soft, friable, and trench able (Figures 21 to 22).



Figure 21. TP2 – Top and subsoil overview.



Figure 22. TP2 – Stones.

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 3. The results concur with observations made during the site investigation.

Table 3. 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	pH
TP1	Topsoil	68.9	21.0	10.1	Sandy Loam	4.27
	Subsoil	89.3	7.8	2.9	Sand	

Soil pH is 4.27 and below the recommended range for the cultivation of Perennial ryegrass species (5.5 to 7.5). Application of calcareous lime is recommended to adjust pH levels to a neutral status.

3.6.3 Soils summary

In summary, the site is characterised by 200 mm of SANDY LOAM topsoil overlying SAND subsoil. However, material in TP 2 appeared to be more CLAY LOAM in nature. Therefore, site soils maybe inconsistent. Whilst the topsoil can provide adequate drainage rates if managed well through aeration practices, light-textured soil, such as Sandy Loams are particularly susceptible to compaction as it tends not to re-structure naturally through shrink and swell processes that would usually be associated with clay dominated soils. Therefore, the site would benefit from routine de-compaction operations such as Verti-draining or ground-breaking.

It should be noted that the topsoil comprises a moderate silt content (greatest at 21%). 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. Silt content will reduce the effective life on 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.

Significant construction compaction across the site (during construction earthworks to correct gradients) will further limit the rate at which water moves downwards through the soil profile, particularly during the winter months when the rate of precipitation exceeds the rate at which water is removed through natural drainage or evapotranspiration. This leads to saturated conditions at the surface, which may prevail throughout the winter. In extreme circumstances, this is manifest by standing water at the surface, but more typically, the soil becomes prone to excessive wear, and tear, the grass sward suffers 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.

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 23.

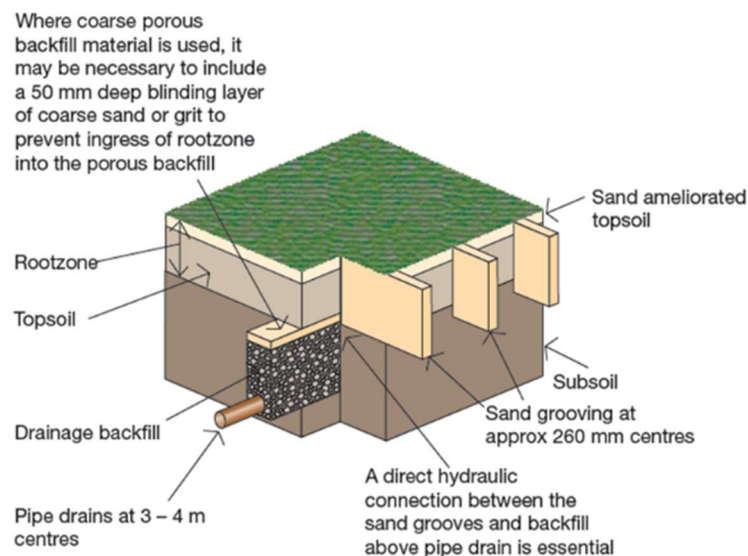


Figure 23. Typical sand groove-based surface by-pass drainage system (Ref: Sport England Design Guidance Note "Natural Turf for Sport", 2011).

3.6.4 Issues with stone content

Observations made during the initial site visit identified a minimal stone content within the trial pits. Trial pit 2 contained a small amount of stone and appeared to be <25 mm. The test trial pits are a sample of a small area and therefore PSD cannot guarantee the soil profile will contain sharps (glass, ceramics etc) and additional stone content.

If stones are encountered near the surface during pitch construction works, methods to deal with them include stone burial, stone removal, and topsoil screening. Each method has limitations and complete stone removal is neither practical nor possible.

Significant de-structuring of the soil can occur through intensive stone removal/screening operations, which can inadvertently decrease infiltration rates of the indigenous soil without significant de-compaction works. Due to the methodology for stone buying/picking, only stones over certain dimensions can be effectively buried/removed, often leaving smaller sharp-edged flints on or near the surface. It is these stones that can cause significant injury in the form of cuts and abrasions.

The only method that will potentially mitigate the risk of stones/sharps is the importation of ~ 50 mm of screened topsoil or rootzone (to act as a buffer) to be spread across the entirety of the site. This is an expensive process and costs associated with this operation are presented in the indicative development/cost options should this be required following vegetation removal and initial cultivation.

It is recommended that following any aeration or scarification works which are implemented as part of good maintenance, a thorough inspection of the pitches is undertaken to identify any stones which may have been brought up to the surface following the works. Industry Standards suggest there should be no stones greater than 20 mm in longest axis within the upper 75 mm of the soil profile and no sharp stones within this zone. Following any remediation works, it could not be guaranteed that these criteria for stone content could be achieved without the importation of additional soil/rootzone to act as a buffer.

3.7 Agronomic condition

Grass cover across the pitches is currently >80% at a height of 100 mm and comprised mainly Ryegrass (*Lolium perenne*), a high weed content (~20%) was observed mainly comprised as Clover (*Trifolium repens*) and Dandelion (*Taraxacum*). Thatch/ soil organic matter was noted as ~10-15 mm. The surface exhibited as hydrophobic in areas.



Figure 24. Typical sward overview.



Figure 25. Sward overview with weed content.

3.7.1 Thatch

Thatch is the accumulation of organic material which is trapped between the turf surface and the underlying soil. Thatch is composed primarily of turfgrass stems and root tissue and is continually accumulating and breaking down over the course of the year. It is not unusual to accumulate 5 mm thatch per year. Excessive thatch is problematic, and levels of thatch over 10 mm can significantly influence the quality of fine turf.

- Thatch directly influences water movement in and around the grass plant.
- Thatch directly interferes with air movement thus creating potential anaerobic conditions.
- Thatch creates a favourable environment for turf disease and pests (e.g., leatherjackets, chafer grubs).
- Thatch can affect the efficacy of fertilisers and chemical applications.
- Thatch can affect mowing quality (due to soft and spongy conditions)
- Thatch can prevent the movement of water down through the profile leading to dry patch (particularly in hot dry periods).

Excessive thatch build-up occurs when the rate of accumulation exceeds the rate of natural decomposition. This can occur when grass swards are too heavily fertilised and watered too frequently, this encourages vigorous turf growth and production of organic material which cannot be broken down sufficiently quickly by the beneficial organisms within the soil (fungi and bacteria).

In general, small levels of thatch are desirable (>5 mm) to help protect the turf surface however any greater amounts should be managed via an intensive maintenance regime incorporating scarification and verti-cutting.

3.8 Site usage

The pitches at present are undrained and therefore should only support under 2 hours of use per week before pitches deteriorate. It is difficult to predict with any accuracy the hours of play achievable if the pitch surface was to be regraded and a new drainage scheme installed 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 5) 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.

It is therefore concluded that, following the installation of a Sport England Type 4 or Type 5 construction the 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).

3.9 Performance Quality Standards (PQS)

Performance Quality Standards (PQS) represent a recommended minimum quality standard for the construction and maintenance of natural turf pitches. PQS were originally developed via a voluntary technical consortium 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.

Element	Broughton Park RUFC
	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 site currently meets minimum performance requirements for five out of eleven elements assessed (ground cover, surface hardness, surface hardness, slope in the direction of play, slope across of play and stone content), but fails on a further six (broad leaved weeds, sward height, thatch depth, water infiltration rate, surface evenness).

3.10 Other items

Issues which can arise from natural grass pitch construction / improvement works 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.
- **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 local 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 Appendix I.
- **Settlement of drain lines** – Land drains can be prone to settlement as the soil surrounding the drainpipe 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

- 1 **Objective:** To conduct a detailed site investigation for the proposed pitch relocation and improvement works at Broughton RUFC, Manchester.
- 2 **Site visit:** A detailed site investigation was conducted on the 23rd of June 2023.
- 3 **Site location:** As part of an ongoing venture to find new suitable sites that will be able to host the GAA Northern games and to grow and develop players that will secure the future of Gaelic sports. Broughton Park, once previously considered as a venue for improvement has now been selected with full support from MCC, MCR Active and Broughton Park RUFC. This entails relocating the existing 2 pitches to a new location on this site and developing pitches that are playable 12 months of the year.

The site currently facilitates 6nr rugby/ Gaelic sports pitches, 18nr football pitches in a variety of dimensions and cricket facilities.

- 4 **Hydrology:** Outfall was identified as a wider site drainage scheme located within the car park. Additionally, a brook (Red Lion Brook) is located to the northeast of the site. Should the installation of any new land drain scheme be installed into the pitches, the Client must confirm a suitable outfall along with any permissions for the discharge of drainage water.

Climate data obtained from the Flood Estimation Handbook (FEH) indicate that the standard-period average annual rainfall (SAAR) for this catchment is 846 mm which is marginally lower than the national average of 855 mm/year.

- 5 **Existing land drainage system:** No existing drainage scheme was noted within the footprint of the sports pitches.
- 6 **Land drainage flow rates:** The predicted drainage rates for the site are greater than the Greenfield Runoff rates, and so the installation of a land drainage system will result in greater flow rates than the greenfield condition. It is therefore concluded that additional attenuation measures should be a prerequisite for the installation of any drainage scheme. Drainage design (if required) should account for at least the 1:30 +20% return period outfall rate of 8.5 l/s/ha for the site over a 24-hour period.
- 7 **Flood risk:** Based on information obtained from the Environment Agency (EA) via gov.uk, the site is at a low risk of flooding from both rivers and seas and surface water with an annual probability of flooding of 0.1% – 1% (1 in 1000 years to 1 in 100 years).
- 8 **Landfill:** Based on information obtained from data.gov.uk, the site is not located over a historic or permitted landfill site which could have affected the nature of any remodelling earthworks.
- 9 **Groundwater Source Protection Zones:** Based on information obtained from magic.defra.gov.uk, the site is not located within a Groundwater Source Protection Zone. If it was, then this could have restricted 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 gradients:** Topographical data has not been provided by the client.

The site visually appears to fall northwards with gradients in the line of play and across play compliant with Sport England guidance. However, significant undulations are evident across the site and non-compliant with Sport England surface evenness guidance (>25 mm). There is a need to address the undulating nature of the pitch surfaces, and so it is recommended that if a new land drainage scheme is proposed, the pitch surface should be regraded at the same time.

- 11 **Pitch orientation:** Sport England (SE) 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. Both proposed pitches comply with the guidance, and orientation is approximately 120°.
- 12 **Soil maps:** According to Sheet 3 of the Soil Survey of England and Wales 1:250,000 soil map (1983), the indigenous soil in this area is not mapped due to being in an urbanised area, however soil surveys in close proximity to the site comprises the BRICKFIELD 3 Soil Association. The geological origin is Drift from Palaeozoic sandstone and shale, and the soils are characterised by "Slowly permeable seasonally waterlogged fine loamy over clayey and clayey soils.
- 13 **Geology:** According to the BGS Geology Viewer, the superficial deposits overlying the site comprise Devensian - Sand and gravel. Sedimentary superficial deposit formed between 116 and 11.8 thousand years ago during the Quaternary period. These overlie bedrock geology comprising Wilmslow Sandstone Formation - Sandstone. Sedimentary bedrock formed between 252.2 and 247.1 million years ago during the Triassic period.
- 14 **Soil profile pit description:** In summary, the site is characterised by 200 mm of SANDY LOAM topsoil overlying SAND subsoil. However, material in TP 2 appeared to be more CLAY LOAM in nature. Therefore, site soils maybe inconsistent. Whilst the topsoil can provide adequate drainage rates if managed well through aeration practices, light-textured soil, such as Sandy Loams are particularly susceptible to compaction as it tends not to re-structure naturally through shrink and swell processes that would usually be associated with clay dominated soils.
- 15 **Stone content:** Observations made during the initial site visit identified a minimal stone content within the trial pits.
- 16 **Agronomic condition:** Grass cover across the pitches is currently >80% at a height of 100 mm and comprised mainly Ryegrass (*Lolium perenne*), a high weed content (~20%) was observed mainly comprised as Clover (*Trifolium repens*) and Dandelion (*Taraxacum*). Thatch/ soil organic matter was noted as ~10-15 mm. The surface exhibited as hydrophobic in areas.
- 17 **Usage:** The pitches at present are undrained and therefore should only support under 2 hours of use per week before pitches deteriorate. It is difficult to predict with any accuracy the hours of play achievable if the pitch surface was to be regraded and a new drainage scheme installed as this depends on local weather conditions, schedule of use, age of participants and the quality of the on-going maintenance.

Installation of a Sport England Type 4 or Type 5 construction the 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).

- 18 **Performance Quality Standards:** Performance Quality Standards (PQS) represent a recommended minimum quality standard for the construction and maintenance of natural turf pitches. the site currently meets minimum performance requirements for five out of eleven elements assessed (ground cover, surface hardness, surface hardness, slope in the direction of play, slope across of play and stone content), but fails on a further six (broad leaved weeds, sward height, thatch depth, water infiltration rate, surface evenness).

5 DEVELOPMENT OPTIONS

Site development options have been based on an area of 29,988 m² which utilises the full pitch dimensions of 145m by 90 m and a minimum 4 m safety margin. Should the maximum pitch sizes need to be reduced, indicative costings can be prorated.

Please note: the following is not a detailed design specification; these are options for consideration at the feasibility stage. PSD/ 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, the following development options for the two pitches are recommended:

5.1 Option 1: Site remodelling (cut and fill), installation of a primary drainage system @ 4 metre centres plus installation of a secondary bypass scheme (Koro Top drain)

1. Spray-off the vegetation on the existing pitch using a total herbicide.
2. Management of existing soils for re-use – strip and stockpile any Site Won material appropriate for re-use either as subsoil material or topsoil, and present soil samples for analysis in case contaminants are present.
3. Cut and fill remodelling works.
4. Respread topsoil (200 mm depth).
5. Re-grade the topsoil to final levels and tolerances.
6. Stone pick.
7. Install lateral drains at 4 m centres, connecting with a system of collector and main drains linked to an outfall.
8. Install secondary drainage – In the form of Koro topdrain at 0.5 m centres.
9. Sand amelioration – ameliorate 30 mm sand into 50 mm profile.
10. Seed bed preparation (including fertiliser and seed).
11. One of three applications of sand top dressing (8mm).

5.2 Option 2: Site remodelling (cut and fill), installation of a primary drainage system @ 5 metre centres plus installation of a secondary bypass scheme (Conventional sand slits)

Option 2 utilises the same construction methods as option 1, however comprises wider lateral drainage (5 m centres) and conventional sand slits (1 m centres).

Important, please note: It is recommended that following this type of construction, the pitch is maintained for a period of 12 months without use prior to handover back to the Client. This is to ensure the recipient receives the pitch in the correct condition and the contractor has the necessary time to implement all specified operations.

5.2.1 12-months maintenance post-construction

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

1. Mowing.
2. Fertiliser application.
3. Compaction alleviation (e.g. Verti-draining).
4. Selective weed control (as required).
5. Pest and disease control (as required).
6. Overseeding (as required)

N.B. With secondary drainage it is very important to note that frequent (minimum 3) sand topdressing applications would be required in the first 12 – 18 months post construction to protect the sand bands from contamination with the topsoil.

5.3 Option 3: Enhanced maintenance of the pitches to improve sward characteristics and improve the natural infiltration rates of the indigenous soils (1 ha).

If drainage installation is not feasible or outfall cannot be identified, then the following option will improve the agronomic conditions of the natural turf areas which may increase carrying capacity dependent on ongoing maintenance. This operation involves a concentrated maintenance regime which focuses on strengthening the current sward, improving infiltration rates through aeration operations and improving the upper soil profile and turf surface through sand topdressing.

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 tined Verti-drains 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 smoothness of the surface, increase moisture holding capacity, improve infiltration rates and reduce compaction.
5. **Over-seeding** – To create a sward with more sport's specific Perennial ryegrass characteristics. Sports specific Perennial ryegrass is hardier and 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.
6. **Fertilising** – To improve the strength and vigour of the grass. Frequent fertiliser applications will reduce the grasses susceptibility to disease, create a better turf surface in terms of playability, and provide more plant development in turn utilising more moisture contained within the soil profile.

It is important to note that this is not a drainage solution and solely an improved maintenance option. This will improve the surface and sward characteristics; however pitches will remain wet in inclement weather conditions.

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. 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. An indicative work programme is presented below.

[illegible][illegible]

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 drainpipe 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 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

- Provided the site is well maintained, the type of drainage system proposed for this site should allow 3 – 6 hours of use / week / pitch (4 ½ to 9 hours for U15s) on average without causing detriment to the grass sward or soil structure. In very wet conditions, usage may be less than this.

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

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11 APPENDICES

11.1 Appendix I: Outline Maintenance Recommendations [pitches]

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 from 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:	MCR Active	Physical Site Survey date:	23 /06 /2023
Project Title:	Broughton Park RUFC		
ELEMENT	LIMITS	METHOD OF TEST	Visit 1
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:	Craig Parry	Consultancy:	TGMS
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