

A REPORT TO ALDI

A feasibility study for the improvement of the natural turf rugby pitches at North Manchester Rugby Club

11th August 2023

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Please note, important: The aim of this report is to appraise the current conditions on site 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 NORTH MANCHESTER RUGBY CLUB

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

Site information

1	Objective: To conduct a feasibility study for the proposed improvement of natural turf sports pitches at North Manchester Rugby Club.
2	Site visit: A detailed site visit was conducted by Craig Parry of TGMS on the 8 th August 2022.
3	Hydrology: Climate data obtained from the Flood Estimation Handbook (FEH) indicate that the standard-period average annual rainfall (SAAR) is 989 mm/year for this catchment which is higher than the national average of 855 mm/year and is within the fourth category for the whole of the UK
4	Flood risk: Both the risk of flooding from surface water and rivers and seas has been modelled as very low risk (0.1%) chance of flooding.
5	Landfill: The site is not located over a registered landfill.
6	Topography: No topographical data has been provided to PSD-TGMS. However, site gradients visually appeared to be within Sport England guidance. It is envisaged that significant earth works will not be required.
7	Pitch orientation: Pitches 1 and 2 are orientated within Sport England recommendations.
8	Dimensions: Both pitches are non-compliant with SE guidelines. Due to the size and geometry of the site, it would not be feasible to increase pitch dimensions.
9	Geology: The soil on site has not been mapped by the Soil Survey of England and Wales due to being in an urbanised area. Based on field studies the closest soil to the site is likely classified as the NEWPORT 1 association, described as 'deep well drained sandy and coarse loamy soils. Some sandy soils affected by groundwater. Risk of wind and water erosion.
10	Soils: in summary, the site is characterised by a SANDY LOAM topsoil containing a minimal stone content overlying CLAY subsoil.
11	Stones: Observations during the initial site visit identified a minimal stone content within the topsoil. A grit layer containing moderate stone content was observed lower down in the profile, between the topsoil and subsoil. (Circa 200 mm depth).
12	Existing drainage: On site observations and satellite imagery confirms no drainage infrastructure is present on the two pitches. If drainage were to be installed, a suitable outfall would need to be established for these pitches. In terms of the outfall, inspection chambers have been located on the main road. .
13	Agromony: Vegetation cover was circa 85%. Turf cover was ~70% comprising perennial ryegrass (<i>Lolium perenne</i>) and Annual meadow grass (<i>Poa annua</i>). The overall sward exhibited thin/ weak areas (figure 18) with significant debris (grass clippings) evident on the surface. Sward height was observed to be ~50-80 mm and inconsistent throughout. Weed content was observed to be >10% as daisy (<i>Betula pendula</i>) and plantain (<i>Plantago major</i>). Thatch levels were also very high at ~20 mm. Thatch can cause issues with infiltration whilst providing an environment for less desirable grasses and disease. Thatch also increases hydrophobicity at the surface exhibiting as localised dry patch (LDP) and poor turf quality
15	Site usage: Site usage has been provided to PSD-TGMS by Adam Westwell (Lamb and Swift), The sites main age range of players has been confirmed as ages 11-17 years with the following usage: 12-15 hours split over two pitches (6-7.5 hour per pitch). Site usage capacity is estimated based on the drainage status of the site and can increase 50% with age ranges 15 and under. The pitches present status is undrained (SE Type 1) which SE estimate can tolerate under 2 hours play per week or 3 for ages 15 under. Current usage hours are 6 - 7.5 hours with a variety of age ranges, indicating that the site is already being overused at full capacity and cannot be expected to accommodate additional matches
16	Performance Quality Standards: The development area audited for North Manchester Rugby Club passes 3 elements (of 8 measured) of Sport England's Performance Quality Standards, they are: Ground Cover, Evenness and Slope.

Summary of Recommendations

Summary of Recommendations

1.	1.1.1 Summary of project costs for total development area (10,656m² & 162m²)																													
<table><tr><th>Development area</th><th>Construction</th><th>Maintenance</th><th>Total ex VAT</th><th>VAT</th><th>Total Inc. VAT</th></tr><tr><td>Existing sports pitches</td><td>£116,080.80</td><td>£17,821.00</td><td>£133,901.80</td><td>£26,780.36.</td><td>£160,682.16</td></tr><tr><td>Additional playing field</td><td>£6,352.50</td><td>£1,559.00</td><td>£7,911.50</td><td>£1,582.30</td><td>£9,493.80</td></tr><tr><td>Enhanced maintenance scheme</td><td></td><td>£26,600.00</td><td>£26,600.00</td><td>£5,320.00</td><td>£31,920.00</td></tr></table>							Development area	Construction	Maintenance	Total ex VAT	VAT	Total Inc. VAT	Existing sports pitches	£116,080.80	£17,821.00	£133,901.80	£26,780.36.	£160,682.16	Additional playing field	£6,352.50	£1,559.00	£7,911.50	£1,582.30	£9,493.80	Enhanced maintenance scheme		£26,600.00	£26,600.00	£5,320.00	£31,920.00
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Please note: The costs represented above are for the development area and based on 10,656 & 162 square metres. Actual costs may vary as much as ± 20% depending on contractor availability, prices of aggregates and time of year. These above costs <u>do not</u> include professional fees (ex VAT) for design and specification, tender production and evaluation and contract administration (supervision).																														
2.	With respect to timescales for completing the project, it is essential that construction works take place in good, dry ground conditions. 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.																													

(All above costs exclude the cost of permissions, planning etc.)

Please note that the Client should determine whether or not planning permission from the Local Authority is required for the proposed works. The outfall of drainage water into surrounding areas will be subject to permission from the Local Lead Flood Authority and/or the Internal Drainage Board. The costs for obtaining this permission, or any conditions of permission, are not included in the estimates in this document and are the responsibility of the Client.

Craig Parry – August 2022

2 INTRODUCTION AND OBJECTIVES

PSD-TGMS have been commissioned by Aldi to conduct a detailed site investigation for the feasibility of improving the natural turf rugby pitches at North Manchester Rugby Club and integrating a new area of playing field approximately 162 m² in the northwest of the site. The works form mitigation proposals for the loss of playing field approximately 1278 m² for a new Aldi development.

The objectives of the feasibility study are as follows:

- To undertake a detailed site investigation in order to characterise the underlying soil profile and the effects this soil profile may have on current pitch performance.
- To evaluate the topography of the site and its impact on pitch performance including any drainage and potential outfall arrangements.
- To evaluate the topography of the site to ascertain the extent of any earthworks required.
- To prepare a set of development options for pitch improvement based on the information gathered during the visit including any recommended drainage schemes and earthworks.
- To derive indicative construction 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 works. This will also indicate when the sports facilities may be available for use.

Sport England require:

1. Details of the works required to the 162sqm of land to brought into use as playing field. The schedule of works should be prepared and undertaken by a sports turf specialist and in accordance with Sport England's 'Natural Turf for Sport' guidance. This could be dealt with via condition if required.
2. There is an overall quantitative loss of approximately 1,278sqm of playing field land as a result of the proposed development. It does not appear feasible to provide a new area of playing field land within the site and therefore Sport England would consider qualitative improvements to the two rugby pitches in lieu of a quantitative replacement in this case. A schedule of works should be prepared and carried out by a sports turf specialist and in accordance with Sport England's 'Natural Turf for Sport' guidance. This could be dealt with via condition if required.
3. Ball Trajectory Assessment to inform the type, height and location of ball stop netting required. The submitted plans will need to be amended to show the location, type and height of the ball stop netting as this cannot be dealt with via condition given ball stop netting often has a visual amenity impact. As noted by the RFU the location of the ball stop netting should be on the developer's side of the boundary and be managed and maintained by the developer or their appointed management company. This is to comply with paragraph 187 of the NPPF (agent of change principle).
4. Details of the location of the relocated sports lighting and type of sports lighting heads. The lux levels will need to comply with RFU requirements, and that element should be discussed with the RFU.

5. Details of the works to the land drains as cited in the Rugby Clubs letter in Appendix 1 of the Planning Statement.
6. Details of how the works required to the Rugby Club will be secured given this area falls outside of the applications red line boundary.
7. Any works to the Rugby Club will need to be implemented prior to loss of any part of the playing field. This can be written into any associated conditions and/or legal agreement if necessary.

3 PHYSICAL SITE SURVEY

Craig Parry of PSD-TGMS conducted a detailed site visit on 8th August 2022 to evaluate current pitch performance, soil types, agronomic condition, and drainage potential of the sports pitches.

Site location and access:

North Manchester Rugby Club, Victoria Avenue, Manchester, M40 5SH

The grid reference for the development area is approximately: OSGB 388388, 403367

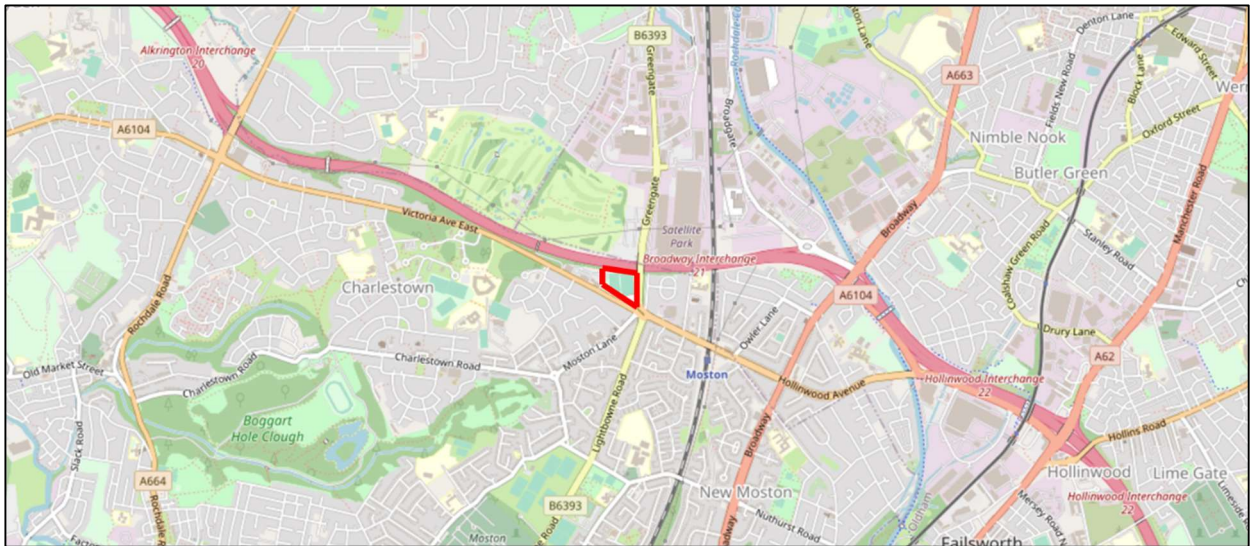


Figure 1 Site location (Red line). Location indicative only and not to scale.

North Manchester rugby club comprises of two natural turf rugby pitches. The facilities are also used by a local archery club, Assheton Bowmen. The approx. area of the site is 2 hectares.

The site is bound by the M60 road and golf course to the north, residential buildings east and south, and private gym/ sports facilities are situated to the west.

Access to the site can be gained from Victoria Avenue E through gates off the road.



Figure 2 Pitch locations



Figure 3 Trial pit locations (TP1-TP3 mark the approximate location of the trial pits)



Figure 4 Proposed development



Figure 5 Overview west



Figure 6 Overview south pitch 1



Figure 4 Overview south pitch 2



Figure 5 Overview north pitch 2

3.1 Geomorphology and climate

3.1.1 Hydrology

No water courses lie within or about the site.

Climate data obtained from the Flood Estimation Handbook (FEH) indicate that the standard-period average annual rainfall (SAAR) is 989 mm/year for this catchment which is higher than the national average of 855 mm/year and is within the fourth category for the whole of the UK (see Figure 8).

Greenfield runoff rates and drainage outfall rates for the site have been calculated using the Flood Estimation Handbook method and are presented in Table 1. It is important to note that both rates are based on 1 hectare, and therefore these rates may differ depending on the scope of work. Greenfield runoff rates and drainage rates do not differ for both 6hr and 24hr rainfall events. The installation of a new drainage scheme would **not** cause faster or greater flow than the current greenfield condition. These drainage rates are for information only, and more accurate drainage rates will need to be established prior to the design process, depending on the point of outfall and any relevant flow restrictions.

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

Return period	Greenfield Runoff Rate (FEH method) (L/s)	Drainage Outfall Rate (6 hr FEH rainfall event) (L/s)	Drainage Outfall Rate (24 hr FEH rainfall event) (L/s)
1:1	9.6	2.3	3.8
1:30	18.76	5.5	8.0
1:100	22.96	7.4	9.9

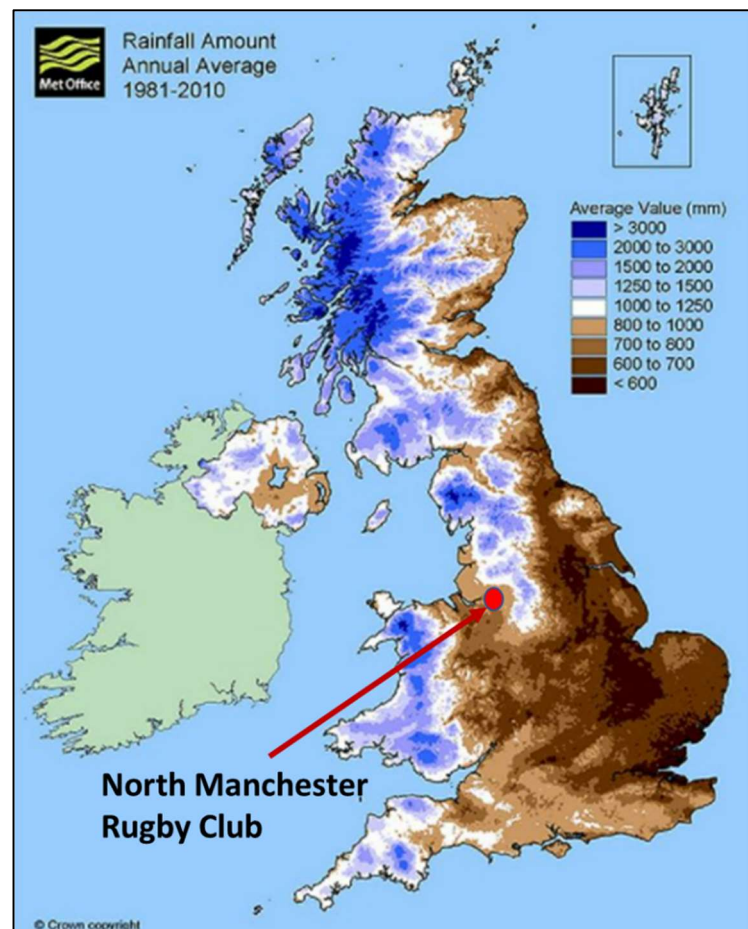


Figure 6 Approx. location of development area within MET office rainfall statistics (1981-2010)

3.1.2 Risk of flooding from surface water

Based on information obtained from the Environment Agency (EA), the site has a very low risk of flooding from surface water with a chance of flooding (<0.1 %).

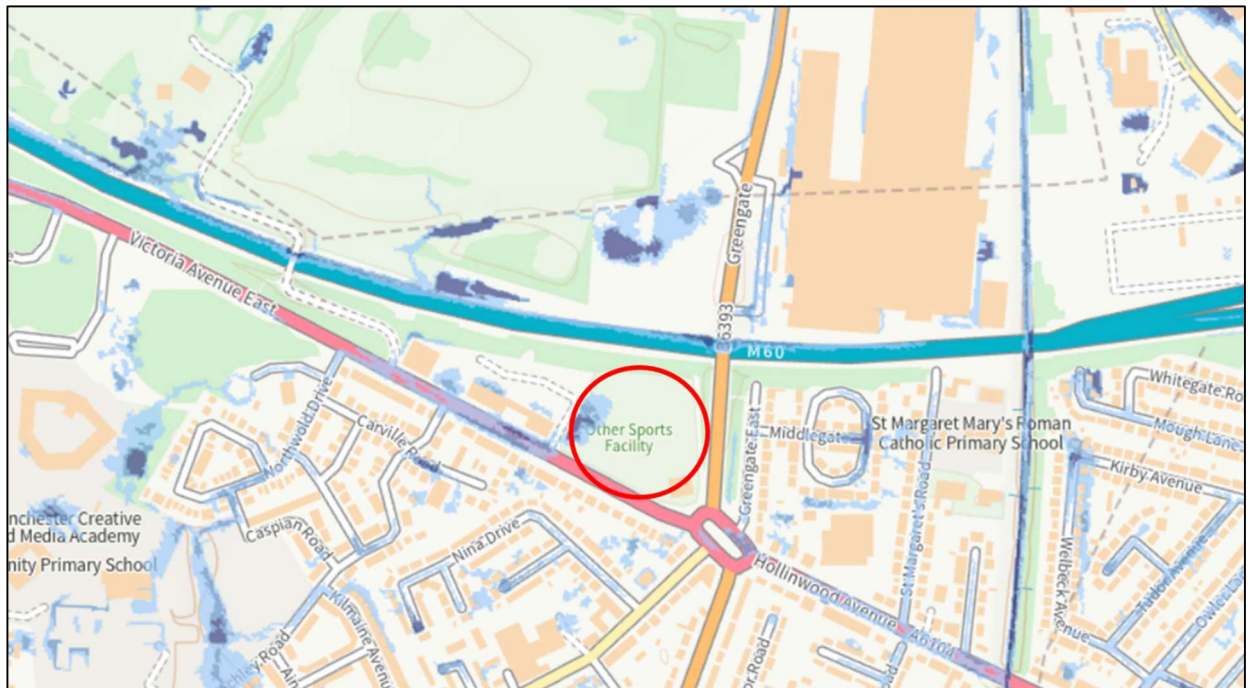


Figure 7 Extent of flooding from Surface Water (courtesy of Gov.uk)

3.1.3 Risk of flooding from Rivers and Seas

Based on information obtained from the Environment Agency (EA), the site has a very low risk of flooding from rivers and seas with a chance of flooding (<0.1%).

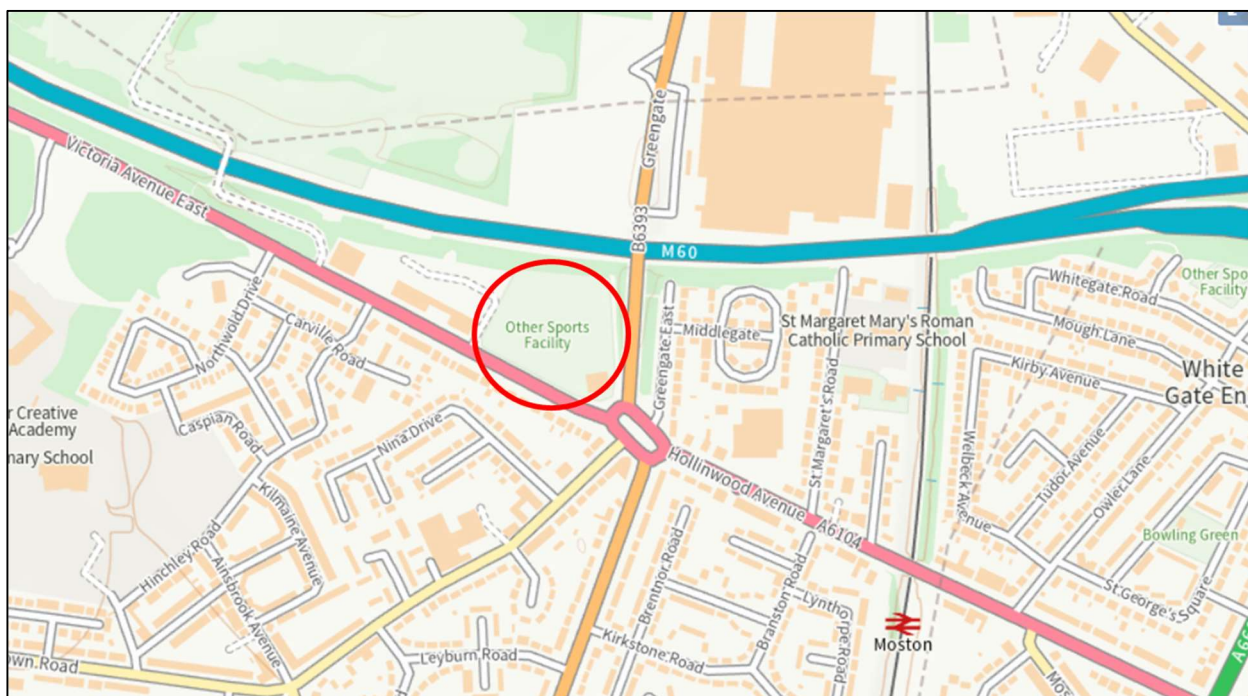


Figure 7 Extent of flooding from Rivers and seas (courtesy of Gov.uk)

3.1.4 Landfill and groundwater source protection

Based on information obtained from the Gov.UK, the site is not located over former landfill sites, which could affect the nature of any significant earthworks; the site is not located within a

Groundwater Source Protection Zone. If it were, this could restrict the construction of a deep bored soakaway (depending upon geology) to achieve drainage outfall from the site.

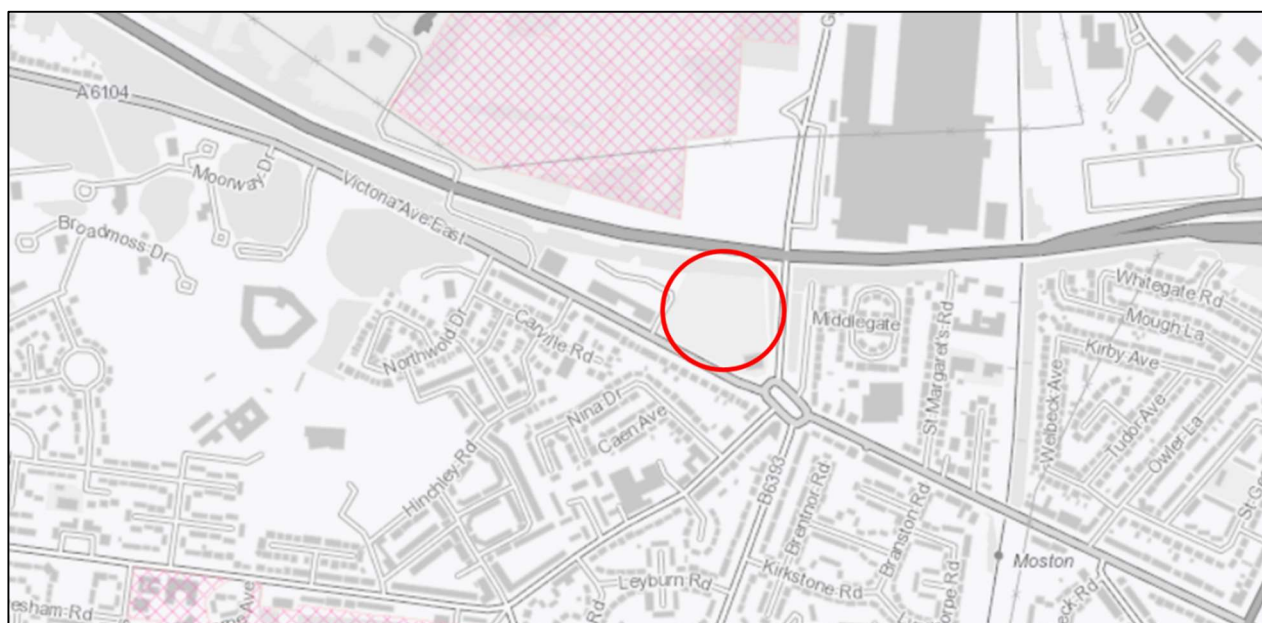


Figure 8 Map of landfill data.

3.2 Topographical (levels) survey and existing layout

An essential aspect of site evaluation and remediation is the appropriate utilisation of the natural grade (slope) of the site to optimise future earthworks and effect rapid removal of excess water.

No topographical data has been provided to PSD-TGMS. However, site gradients visually appeared to be within Sport England guidance. It is envisaged that significant earth works will not be required.

Sport England recommends that the maximum slope along the direction of play should not exceed 1.25% and that the maximum cross-fall should not exceed 2.00%. It is not desirable for both the longitudinal and cross-falls to be at these maximum values.

3.3 Pitch orientation and dimensions

Sport England has published guidance on optimum pitch orientation for a range of sports (see Figure 9), predominantly to avoid issues with visibility caused by the setting sun.

Confirmed dimensions have not been provided to PSD-TGMS; however, using satellite imagery, the following table shows the estimated dimensions (excluding run offs):

Pitch No.	Estimated dimensions not including run-off (metres)	Playing Orientation
No1 pitch	104 x 60	354°
No2 Pitch	92 x 48	355°

Table 3 Estimated playing dimensions and playing orientation of Pitches 1 & 2 (North Manchester Rugby Club)

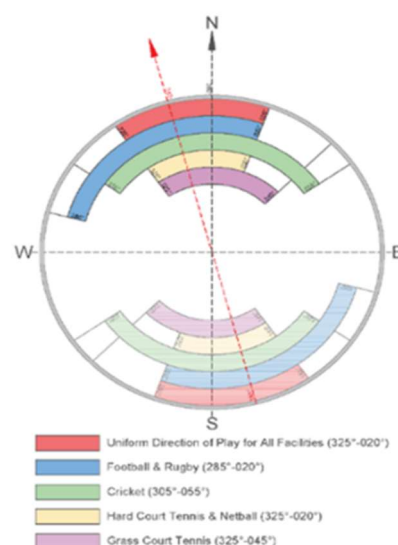


Figure 9 Sport England Orientation Guidelines

Sport England guidance for pitch dimensions indicates pitch length should be 106-144m including in goal areas, pitch width is recommended as 68-70m. Both pitches are non-compliant with SE guidelines. Due to the size and geometry of the site, it would not be feasible to increase pitch dimensions.

In terms of playing orientation, Pitches 1 and 2 are orientated within Sport England guidelines.

3.4 Soils and Geology

The soil on site has not been mapped by the Soil Survey of England and Wales due to being in an urbanised area. Based on field studies the closest soil to the site is likely classified as the NEWPORT 1 association, described as 'deep well drained sandy and coarse loamy soils. Some sandy soils affected by groundwater. Risk of wind and water erosion.

Data from the British Geological Survey indicates that the soil overlies the Pennine Middle Coal Measures Formation - Mudstone, siltstone and sandstone. Sedimentary bedrock formed between 318 and 309.5 million years ago during the Carboniferous period.

Peat. Sedimentary superficial deposit formed between 2.588 million years ago and the present during the Quaternary period.

Publicly accessible records of Boreholes – The closest accessible borehole to North Manchester Rugby Club is borehole 841 – M66 Manchester outer ring road. Soil characteristics comprise black cindery ash fill to 0.9 m depth, clay (firm, brown, sandy) from 0.9 to 12.2, sand (brown, fine, medium) from 12.2 to 13.7, clay (firm, brown, sandy) from 13.7 to 15.9, sand (brown, medium, fine gravel) from 15.9 to 54.7, clay (brown, sandy) from 54.7 to 65.5.

BGSID: 27711 BGS Reference: SD80SE114
British National Grid (27700): 388410, 403310.

[Page 1 | Borehole SD80SE114 | Borehole Logs \(bgs.ac.uk\)](#)

3.5 Soil sampling

3.5.1 Trial Pit Profile Descriptions

Three soil trial pits (TP1 – TP3, see Figure 3) were excavated by hand at targeted locations to characterise the underlying soil profile and to determine water table depth. Two representative soil samples of topsoil and subsoil was sent for laboratory analysis to determine soil texture and pH (from Trial Pits 1 & 3).



Topsoil depth	190 mm	190 mm	190 mm
Topsoil texture	Sandy loam	Sandy loam	Sandy loam
Stones	Minimal stones	Minimal stones	Minimal stone content
Thatch content	~20 mm	~20 mm	~20 mm
Subsoil texture and depth	Clay 300 mm Hit stone	Clay 700 mm	Clay 700 mm
Groundwater	None encountered	None encountered	None encountered
Ground cover	>80% Ryegrass/ meadow grass and 20% weed content.	>80% Ryegrass/ meadow grass and 20% weed content.	>80% Ryegrass/ meadow grass and 20% weed content.
Surface level uniformity	Minimal Surface depressions exceeding SE PQS (> 20mm)	Minimal Surface depressions exceeding SE PQS (> 20mm)	Minimal Surface depressions exceeding SE PQS (> 20mm)

3.5.2 Soil Texture

Laboratory analysis of soil texture was similar to field observations (see Table 3).

Table 5 Soil Texture (Sand 2.00 mm – 0.063 mm; Silt 0.063 mm – 0.002 mm; Clay <0.002 mm).

Trial Pit	Depth (m)	Sand (%)	Silt (%)	Clay (%)	Gravel (%)	Classification
1 TS	0.000 – 0.200	67.0	25.3	7.7	22.5	SANDY LOAM
1 SS	0.200 – 0.600	23.8	40.4	35.8	3.2	CLAY

3.5.3 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 4.

Table 6. Topsoil nutrient and pH results.

Location	Horizon	pH	Phosphorus (ppm)	Index	Potassium (ppm)	Index	Magnesium (ppm)	Index
TP1	Topsoil	5.0	17	2.1	104	1.7	74	2.5

Indices of 2 and above indicate that there is sufficient supply of a particular nutrient. With reference to Table 6, the topsoil is deficient in the macro nutrient Potassium and so it is recommended that, following pitch construction works, the fertiliser regime be tailored to address this deficiency. A fertiliser containing magnesium would not be required. It should be noted that for reasons of soil chemistry this analysis does not include nitrogen which is often limiting to grass plant growth. Soil pH of 5.0 is categorised as low (acidic) of the recommended range for the cultivation of Perennial ryegrass species (5.5 to 7.5). The use of lime will increase pH.

3.5.4 Soils summary

Therefore, in summary, the site is characterised by a SANDY LOAM topsoil containing a minimal stone content overlying CLAY subsoil.

The texture of the topsoil will offer moderate drainage rates if managed well with respect to the development and maintenance of good soil structure; however, it is important to note that the soils contain high silt content which can significantly reduce indigenous infiltration rates by blocking pores in the soil that are typically associated with the transmission of drainage water and aeration. Light-textured soils, 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.

Regarding subsoil, once clay contents exceed approximately 30%, they can significantly and adversely affect the rate at which water can percolate through the profile (i.e., characterised by low hydraulic conductivity). Given that the clay content of the top and subsoil is considered high (at greatest 35.8%), it is expected that drainage rates through this material could be very low (<1 mm/hour). This is further compounded by the very high silt contents (40.4%); similar to topsoil status, silt particles tend to migrate towards and block pores in the soil that are normally associated with the transmission of drainage water and aeration.

Developing the new part of playing field (northwest of site), material import will be required, the ramifications of which will impact the rate at which water moves downwards through the soil profile, particularly during the winter months when the rate of precipitation exceeds that 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.

In order to correct this situation, consideration should be given to the installation of a surface by-pass drainage system. These systems work by intercepting rainwater at the surface before it has had an opportunity to soak into the soil profile, and then removing this water to a system of piped drains. Typical systems would comprise Koro top drain sand slits. (Figure 14) linked into a system of lateral drains beneath the playing field.

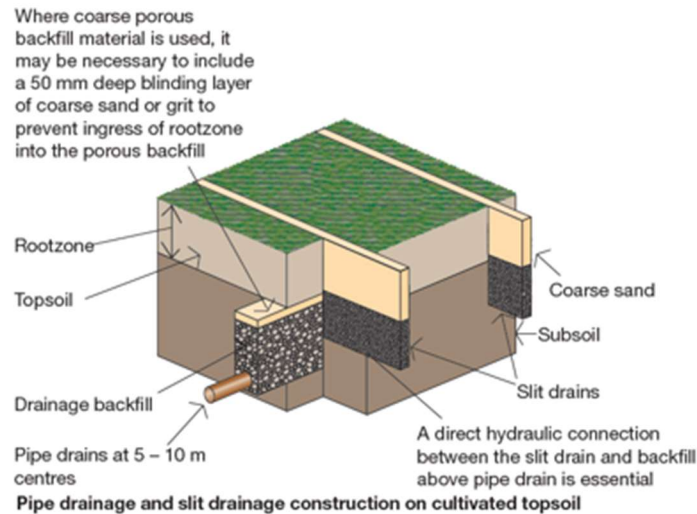


Figure 8 Typical slit drain-based surface by-pass drainage system (Ref: Sport England Design Guidance Note "Natural Turf for Sport", 2011).

3.5.5 Issues with Stone Content

Observations during the initial site visit identified a minimal stone content within the topsoil. A grit layer containing moderate stone content was observed lower, between the topsoil and subsoil. (Circa 200 mm depth). The stones are deep enough that there should be no concern with them migrating towards the surface. However, if these are disturbed during any remediation/drainage works, they could pose a significant injury risk to patrons using the facilities.

If stones were to surface, methods to deal with stones during construction works 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.

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.



Figure 9 Grit layer.



Figure 10 Typical stone content

3.6 Existing drainage infrastructure and outfall

On site observations and satellite imagery confirms no drainage infrastructure is present on the two pitches. If drainage were to be installed, a suitable outfall would need to be established for these pitches. In terms of the outfall, inspection chambers have been located on the main road. No further outfall has been located on-site which could provide a means to discharge drainage water for the other pitches.

In the absence of a water course, it may be prudent to contact relevant bodies to ascertain whether any existing drainage infrastructure can be used as outfall. The use of soakaways can be high risk and the suitability of utilising the indigenous site geology as outfall must be tested through BRE365 infiltration testing to accurately size the soakaway.



Figure 17 Inspection chambers located near to road.

3.7 Agronomic condition

Vegetation cover was circa 85%. Turf cover was ~70% comprising perennial ryegrass (*Lolium perenne*) and Annual meadow grass (*Poa annua*). The overall sward exhibited thin/ weak areas (figure 18) with significant debris (grass clippings) evident on the surface. Sward height was observed to be ~50-80 mm and inconsistent throughout. Weed content was observed to be >10% as daisy (*Betula pendula*) and plantain (*Plantago major*).

Thatch levels were also very high at ~20 mm. Thatch can cause issues with infiltration whilst providing an environment for less desirable grasses and disease. Thatch also increases hydrophobicity at the surface exhibiting as localised dry patch (LDP) and poor turf quality.



Figure 18 Typical sward condition



Figure 11 Surface debris



Figure 20 Typical weed content



Figure 21 Typical thatch content

3.8 Site usage

Site usage has been provided to PSD-TGMS by Adam Westwell (Lamb and Swift). The sites main age range of players has been confirmed as ages 11-17 years with the following usage: 12-15 hours split over two pitches (6-7.5 hour per pitch).

Site usage capacity is estimated based on the drainage status of the site and can increase 50% with age ranges 15 and under. The pitches present status is undrained (SE Type 1) which SE estimate can tolerate under 2 hours play per week or 3 for ages 15 under. Current usage hours are 6 - 7.5 hours with a variety of age ranges, indicating that the site is already being overused at full capacity and cannot be expected to accommodate additional matches.

It is difficult to predict with any accuracy the likely usage levels in hours of play achievable if the pitches were to be constructed with 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 to represent a reasonable estimation (Ref: Natural Turf for Sport, 2000, ISBN 1 86078 103 9 – 2nd Edition, 2011).

Table 7 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.

A SE Type 4 or Type 5 system, with primary pipe drains and secondary sand grooves or slits, would be expected to achieve 3 – 6 hrs/week usage based on SE estimations, (4.5-9 hours for players 15 years of age and under).

3.9 Performance Quality Standards (PQS)

Performance Quality Standards (PQS) provide a recommended minimum quality standard for the construction and maintenance of natural turf pitches 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 I and summarised below.

The development area audited for North Manchester Rugby Club passes 3 elements (of 8 measured) of Sport England's Performance Quality Standards, they are: Ground Cover, evenness and Slope. Although infiltration testing was not carried out it is likely, based on the soils assessment, that infiltration rates could be as low as <5 mm/hour during the wetter months and therefore borderline passing Sport England PQS guidelines.

In general, the development area is moderate in terms of current conditions although there are works which could be implemented to further improve the playing and agronomic performance of the pitches.

Summary of Performance Quality Standards presented in Appendix I

Client: North Manchester Rugby Club Physical Site Survey date: 8th August 2022
 Project Title: A feasibility study for pitch improvements North Manchester Rugby Club

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	x
Sward height mm	20-60 PS 20-75 SM	BS 7370: P3 A3	x
Thatch depth mm	<5	BS 7370: P3 A7	x
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	n/a
*Water infiltration rate mm h ⁻¹	5	BS 7370: P3 A8	Not tested but expected to fail during wetter months
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	x
GUIDANCE FOR ROOTZONE LAYER			
Maximum diameter (stones)	<32 mm	Particle Size Distribution	x/✓

3.10 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 if drainage works are to be implemented.
- **Planning permission** – Where cut and fill earthworks or drainage 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 drought 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 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 local 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.
- **Maintenance scheme** – With any development, it is imperative that a well-structured intensive maintenance programme is implemented to maintain the pitch following large scale investment. Failure to implement the recommended maintenance operations will result in a deterioration of pitch condition and subsequent availability for use.

- **Settlement of drain lines** – Land drains can be prone to differential settlement (i.e. there can be some sinkage of the drain lines, particularly in high clay areas which is pertinent to the development area) 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 drains are kept topped up.
- **Secondary drainage** – Secondary drainage relies on annual topdressing to maintain a direct hydraulic connection between the surface and piped infrastructure, the costs of which can be approximately £2-3k per annum (per pitch). This should be factored into yearly budgets to optimise the efficacy of the land drainage scheme.

4 Recommendations

4.1 Development options – Natural turf pitch areas

The objective of the feasibility study was to assess current conditions of the development area and provide details of the works for the improvement of both pitches and an area that is to be converted from car park into playing field northwest of the site.

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.

The development options focus on providing a natural turf sports pitch which can perform in winter (e.g. rugby) during inclement weather conditions and provide the necessary carrying capacity for the site. The location in terms of rainfall is associated with average rates of precipitation than the UK average (989 mm/year as opposed to the average of 855 mm/year, Figure 5). The high silt content nature of the soils and high thatch content will have a detrimental effect on playability and carrying capacity before pitch conditions deteriorate.

High emphasis needs to be placed on the site's current (6-7.5 hours per pitch) and future usage. The site is already receiving the higher rates of foot fall than is recommended by SE especially as the status of the site is undrained. With pitch improvements, increased usage has not been quantified but can be expected to occur placing additional strain on surface conditions and pitch performance.

It is therefore recommended that a minimum requirement is installation of a pipe and secondary slit drainage scheme such equivalent to SE Type 5 is installed within the development area to remove surface water as quickly and efficiently as possible, thus reducing the risk of soil de-structuring which could subsequently manifest as wear and tear and muddy surface conditions.

The following development option is recommended for the upgrading of a natural turf football pitch to Sport England Type 5 standard.

4.1.1 Existing sports pitches: Light surface grading, installation of a primary drainage system @ 4 metre centres plus installation of a secondary bypass scheme (excavated sand slits)

This is the recommended option for the development of any of the winter sports pitch at North Manchester Rugby Club and incorporates site regrading to remove minor undulations. This option includes the installation of a primary drainage system and secondary bypass scheme (if required). This will provide a land drainage system which will perform well during periods of inclement weather and is the most sustainable given the average annual rainfall (SAAR) for the site.

- 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 club. This is to ensure the recipient receives the pitches in the correct condition and the contractor has the necessary time to implement all specified operations.

The works would comprise the following:

1. **Removal of existing vegetation** – prior to cultivations, the vegetation should be cut and collected, and the remaining vegetation sprayed off using a total herbicide.
2. **Primary cultivations** – cultivations to bury any remaining organic matter residue.
3. **Cultivation of topsoil** – Cultivation of topsoil to 200 mm depth to provide a suitable tilth prior to drainage installation.
4. **Stone removal** – in situ stone works e.g. stone burying.

5. **Installation of a pipe drainage scheme at 4 metre centres** – outfall to be confirmed by client (land drainage consents will be required and should be obtained by the client).
6. **Establishment of a new grass sward from seed (including seeding and fertiliser)** – it is recommended that a suitable 100% Rye Grass seed is used.
7. **Installation of secondary drainage** – Secondary drainage in the form of excavated slit drain.
8. **Application of sand topdressing** – to maintain hydraulic connectivity with the drainage scheme.

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 slits from contamination with the topsoil.

4.1.2 Additional playing field (northwest of site): Site regrading, installation of a primary drainage system @ 3 metre centres

This is the recommended option for the development of the increased area and comprises the import of a nominal depth of 0.5 metres of subsoil and a nominal depth of 0.2 metres of imported topsoil, graded to playing gradients compliant with Sport England guidance. This option also includes the installation of a primary land drainage system.

1. **Site clearance** – Removal of all building materials including, but not limited to foundations, rubble, cement, aggregates etc. to 0.70 metres below finished pitch level (**undertaken by others**).
2. **Management of existing soils for reuse** – Strip and stockpile any Site Won material appropriate for reuse either as sub-base material or topsoil, and present soil samples for analysis in case contaminants are present.
3. **Subsoil importation** – Import, place and grade clean subsoil (to make up any shortfall) to be used as the remaining sub-base prior to topsoil.
4. **Topsoil importation placement** – import and place topsoil (200 mm depth).
5. **Installation of a pipe drainage scheme at 3 metre centres** – outfall to be confirmed by the client (land drainage consents will be required and should be obtained by the client).
6. **Final Cultivation** – To produce a suitable tilth for seeding and to restore surface levels.
7. **Establishment of a new grass sward from seed (including seeding and fertiliser)** – it is recommended that a suitable 100% Rye Grass seed is used.
9. **Sand topdressing** – to maintain hydraulic connectivity with the drainage scheme.

4.1.3 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:

- Mowing.
- Fertiliser application.
- Compaction alleviation (e.g. Verti-draining).
- Selective weed control (as required).
- Pest and disease control (as required).
- Overseeding (as required)

4.1.4 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.

4.2 Indicative cost estimates – Winter sports

4.2.1 Natural turf pitch works (based on a development area of 10,656 m²).

Please note that these costs are indicative only and true cost can only be established by competitive tender. The costs are based on total development area.

Item	Option 1 Cost (10,656m ²)
Spray off vegetation – total herbicide application.	£800.00
Removal vegetation	£8,400.00
Primary Cultivations	£3,000.00
Topsoil cultivation (ca 100 mm depth).	£1,300.00
Installation of a pipe drainage scheme @ 4 m centres, incl. collectors, main drains and junctions – outfall to be confirmed by the client.	£39,500.00
Stone pick	£1,172.00
Final cultivations.	£6,000.00
Establishment of a new grass sward (includes seeding and fertiliser).	£4,472.00
Installation of secondary drainage i.e. Excavated sand slits	£21,312.00
Sand application (2 x 8 mm) (if required)	£10,912.00
Overseeding/fertilising	£4,200.00
Subtotal (ex VAT)	£96,828.00
Prelims, mobilisation, setting out and reinstatement	£8,700.00
Subtotal (ex VAT)	£105,528.00
Contingency (10%)	£10,552.80
Total (ex VAT)	£116,080.80

4.2.2 12-months maintenance post-construction (based on a development area of 10,656 m²)

Item	Cost (10,656 m ²)
Mowing (30 cuts)	£9,570.00
Fertiliser x3	£1,500.00
Verti-draining/spiking x2	£1,500.00
Selective herbicide (as required)	£350.00
Pest and disease control (as required)	£1,065.00
Overseeding	£3,836.00
Subtotal (ex VAT)	£17,821.00

4.2.3 Additional area of playing field (based on a development area of 162m²).

Item	Cost (162 m ²)
Importation of subsoil	TBC
Importation of topsoil (200 mm depth)	£3,500.00
Installation of a pipe drainage scheme @ 3 m centres, incl. collectors, main drains, and junctions – outfall to be confirmed by the client.	£700.00
Final cultivations	£150.00
Establishment of a new grass sward (includes final surface prep, seeding and fertiliser).	£120.00
Sand application (3 x 8 mm)	£215.00
Overseeding/fertilising	£90.00
Subtotal (ex VAT)	£4,775.00
Prelims, mobilisation, setting out and reinstatement	£1000.00
Subtotal (ex VAT)	£5,775.00
Contingency (10%)	£5,77.50
Subtotal (ex VAT)	£6,352.50

4.2.4 12-months maintenance post-construction (based on a development area of 162 m²)

Item	Cost (162m ²)
Mowing (30 cuts)	£300.00
Fertiliser x3	£380.00
Verti-draining/spiking x2	£500.00
Selective herbicide (as required)	£105.00
Pest and disease control (as required)	£116.00
Overseeding	£158.00
Subtotal (ex VAT)	£1,559.00

4.2.5 Option 3 – Enhanced maintenance scheme (1ha).

Item	Cost (10,000 sq. m)
Deep Scarification (x2) and removal of material off-site	£3,250.00
Selective herbicide	£650.00
Surface decompaction (x3)	£1,800.00
Sand topdressing (x3) (circa 25 mm in total)	£16,000.00
Fertilising (x3)	£2,400.00
Overseeding	£1,300.00
Subtotal (ex VAT)	£25,400.00
Prelims, mobilisation, setting out and reinstatement	£1,200.00
Subtotal (ex VAT)	£26,600.00
Total (excl. VAT)	£26,600.00

NOTES TO TABLES:

- Costs are based on a general estimation of the works required. If conducted in isolation, the costs are like to increase and would need to be costed accordingly.
- Costs assume that the arisings associated with drainage installation will be disposed of on-site.
- Costs do not include temporary irrigation which may be required if dry weather is experienced during grass establishment.
- Costs are based on recent Contractors rates (2022).

4.2.6 Summary of project costs for total development area (10,656 & 162 ^{M2})

Development area	Construction	Maintenance	Total ex VAT	VAT	Total Inc. VAT
Existing sports pitches	£116,080.80	£17,821.00	£133,901.80	£26,780.36	£160,682.16
Additional playing field	£6,352.50	£1,559.00	£7,911.50	£1,582.30	£9,493.80
Enhanced maintenance scheme		£26,600.00	£26,600.00	£5,320.00	£31,920.00

Please note: The costs represented above are for the development area and based on 10,656 & 162 square metres. Actual costs may vary as much as ± 20% depending on contractor availability, prices of aggregates and time of year.

These above costs do not include professional fees (ex VAT) for design and specification, tender production and evaluation and contract administration (supervision).

4.3 Indicative work programme

With respect to timescales for completing the project, it is essential that construction works take place in good, dry ground conditions. 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.

Indicative work programme for– Natural Turf Pitch

Activity	Year 1												Year 2											
	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D
Contractor mobilisation																								
Removal of existing vegetation																								
Primary cultivations																								
Topsoil cultivation and grading																								
Stone removal																								
Drainage installation																								
Final cultivations, fertiliser and seeding																								
Excavated sand slit installation																								
Initial agronomic maintenance																								
Pitches ready for play (full use)																								

Indicative work programme for– Additional playing field

Activity	Year 1												Year 2											
	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D
Contractor mobilisation																								
Removal existing ground																								
Subsoil importation																								
Topsoil importation																								
Drainage installation																								
Final cultivations, fertiliser and seeding																								
Initial agronomic maintenance																								
Pitches ready for play (full use)																								

N.B. (in all cases)

1. It is essential that earthworks only take place in good, dry ground conditions, which limits the window for these works to the late spring / summer; i.e. the period between the end of one season and the beginning of the next. Normally, the grass must be allowed to establish a healthy and deep root network and mature canopy prior to first use and a full 12 months maintenance period is recommended.

4.4 Implications of works on future maintenance, system longevity and usage

4.4.1 Maintenance issues – Natural Turf pitches only

- It is essential that adequate allowance is made for annual sand topdressing as this helps to protect the sand bands/grooves from contamination with topsoil. As a guide it is recommended that a minimum 5 mm depth of sand should be applied annually as part of the renovations programme.
- 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 drains are kept topped up.
- In general terms, a maintenance budget of **~£5-7k** is normally required to maintain a single pitch in good condition. This figure would include the cost for annual sand topdressing but excludes irrigation. Without good maintenance, the pitches will become unusable relatively quickly. With good maintenance the pitches will be usable when many of the club's neighbour's pitches are not.

4.4.2 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).

4.5 Outline Project Risk Assessment – Natural turf pitches only

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 Contractor appointed has the scale of operation and capacity to deliver this project on time and with 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, 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 the drains work) 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. Routine watering and fertiliser applications to the drain run during establishment will be essential.
4. **Spoil:** Spoil from the drainage installation shall be disposed of on-site unless the Client would prefer off-site removal. Off-site removal of spoil will significantly increase costs and should be considered at the early stages of the project.

5. **Ongoing operational finance:** The Client should consider carefully the maintenance demand (in terms of time, skill and cost) for the proposed surfaces.

5 CONFIDENTIALITY

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6 CONTACT DETAILS

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7 APPENDICES

Appendix I Performance Quality Standards.
Appendix II Outline Maintenance Recommendations.

Appendix I: Performance Quality Standards

Client: North Manchester Rugby Club

Physical Site Survey date: 8th August 2022

Project Title: A feasibility study for the improvement a natural turf pitches at North Manchester Rugby Club

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	n/a
*Water infiltration rate mm h ⁻¹	5	BS 7370 : P3 A8	Not tested but expected to fail
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 Sports Surface Consultants

Appendix II: Outline Maintenance Recommendations

Mowing. The grass shall be maintained between a height of 20 and 25 mm using cylinder mowing equipment. The grass should never be allowed to exceed a height of 30 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.

Overseeding. Overseed the pitches and safety margins as required at the application rate of approximately 200 kg/ha immediately after the end of season topdressing application. 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.

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.