

Westchurch Homes Limited

A Feasibility Study for Development of Soccer Pitches on Land Adjacent to Radcliffe Moor Road, Bradley Fold, Bury.

O/002/RMR/1721/R-PL/210917



TABLE OF CONTENTS

1	Executive Summary
2	Introduction & Objectives
3	Physical Site Survey
4	Proposed Layout and Gradients
5	Pitch Usage
6	Principle Factors Affecting Site Development
7	Development Options
8	Conclusions
9	Implications of Works on Future Maintenance, System Longevity and Usage
10	Timescales/Programme
11	Confidentiality
12	Contact Details

Appendices

Appendix 1	Topographical Survey
Appendix 2	ETL Soil Analysis Results
Appendix 3	Proposed Layout/Levels
Appendix 4	Indicative Maintenance Programme

Please Note: The Aim of this report is to assess the condition of 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.

REVISION RECORD					
Rev	Date	Description	Prepared	Checked	Approved
O	17/09/21	Document Creation	GO	GO	GO

1.0 EXECUTIVE SUMMARY

1.1 Site Information

The proposed site for the relocation of Wyresdale AFC is adjacent to Radcliffe Moor Road and currently under agricultural use.

	1. The excessive gradients on site will require the proposed earthworks to provide 4 pitches that fall within SE/NGB gradient guidelines.
	2. Earthworks will need to take into account the presence of the gas pipeline running across the site.
	3. Soil type, pitch usage levels and pitch standards required dictate that as a minimum a pipe/slit drainage system will be required for each pitch.
	4. The presence of a sandstone water aquifer below the site dictates a suitable outfall must be provided for the pitch drainage water.
	5. It is anticipated that the outfall will be into the pond immediately outwith the sites southern elevation and that, if necessary, attenuation pond will be installed to control the flow rate.
	6. Drainage of the grass areas between the pitches will be necessary to ensure access for the spectators and for the areas to be appropriately maintained.
	7. The soil analysis results indicate the topsoil will require the addition of lime and fertiliser to correct the deficiency in pH, phosphorus and potassium levels.
	8. The EA records indicate the site is not located on historic landfill although the GIR identified past use of part of the site for a refuse tip. Disposal of material off-site may be required.
	9. Earthworks should allow for pipe and Koro drain arisings to be disposed on site to mitigate expensive off-site disposal.
	10. Sand amelioration of the topsoil, although not essential, is strongly recommended on all pitches to improve the soils physical characteristics and the playing surfaces long-term sustainability.
	11. It would be appropriate to consider specific access routes to the pitches for players, spectators and maintenance equipment.
	12. It is recommended that the specialist sports turf contractor that undertakes the earthworks, drainage and pitch construction also implements the 12 month establishment and maintenance programme to
	13. Irrigation is not considered essential but would be useful for reestablishment of worn areas in spring/early summer.
	14. The proposed earthworks will provide 3 pitches orientated in accordance with SE/NGB guidelines, but 1 pitch will be outwith the guidelines due to site dimensional constraints. This is not considered an
	15. Topsoil depth of 200-220mm is sufficient to surface the pitches.
	16. The site is located in Flood Zone 1 and therefore earthworks will not be interfering with the dynamics of
	17. EA records indicate the site is not susceptible to surface water flooding, nor by rivers /sea or from reservoirs.
	18. The adjacent road will allow a suitable access for contractor's equipment and material deliveries.

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

1.2 Recommendations

The site requires bulk earthworks to provide pitches of the required dimensions and gradients.

Following bulk earthworks, the installation of a pipe drainage scheme incorporating a bypass system (Koro sand slits), preferably supplemented by sand topdressing or sand amelioration is required to provide a playing surface capable of sustaining the required usage level.

Four development options are presented below all of which provide Sport England Type 5 equivalent pitches which is PSD's recommendation for this site. A detailed breakdown is given in Section 4.

Options for Type 5 standard pitches are:

Option 1 – Installation of a primary drainage scheme comprising pipe drainage at 5m centres supplemented by secondary gravel slits at 1m centres, vertidrainage and sand topdressing.

Option 2 – Installation of a primary drainage scheme comprising pipe drainage at 3m centres supplemented by secondary Koro sand slits at 500mm centres, vertidrainage and sand topdressing.

Option 3 – option 1 plus sand amelioration of the topsoil.

Option 4 – option 2 plus sand amelioration of the topsoil.

Note:

- i) Of the two secondary drainage options presented, PSD's recommendation for this site and situation would be for Koro sand slits which can be installed at the time of seeding as opposed to gravel slits which require the sward to be suitably established before they can be installed.
- ii) For both options, the contractor undertaking the works should be responsible for implementing a 12 month maintenance/establishment programme following seeding.
- iii) Sand amelioration of the topsoil is recommended for both options to amend the soil texture, improve natural drainage properties/characteristics and offer protection to minimize capping of the secondary drainage system. Should budgets not permit sand amelioration, gravel slits (Option 1) plus 3 sand topdressings is recommended.

2.0 INTRODUCTION AND OBJECTIVES

2.1 Westchurch Homes Ltd (WHL) are looking to relocate a soccer club, Wyresdale AFC and provide a pitch complex to satisfy their long-term requirements.

2.2 Professional Sportsturf Design (NW) Ltd were instructed by WHL to undertake an agronomic Feasibility Study on land adjacent to Radcliffe Moor Road to determine its suitability for pitch development. The address of the land is:

Radcliffe Moor Road,
Bradley Fold,
Bury.

2.3 The site survey was undertaken by Mike Harbridge of PSD on 29th June 2021.

2.4 The objectives of the feasibility study are as follows:

- To review the proposed pitch layout and gradients.
- To characterise the underlying near surface profile and drainage properties.
- To cross reference site observations with the Ground Investigation Report (GIR).
- To prepare a development proposal for the construction, drainage and maintenance of the pitches.
- To derive indicative construction costs for budgetary purposes and present costed options where applicable.
- To provide an indicative work programme for the proposed construction works. This also indicating when the pitches may be brought into use.

3.0 PHYSICAL SITE SURVEY

3.1 Site Location & Access

- 3.1.1 The site is currently agricultural land and overgrown by grass and a range of weeds.
- 3.1.2 The site is bounded by Radcliffe Moor Road to the east, Bury New Road to the north a reservoir and agricultural land to the west, and fishing ponds/recreational area to the south. The proposed access will be off Radcliffe Moor Road.
- 3.1.3 The Ground Investigation Report (GIR) reference's other past activities on site including a refuse tip in one area, a gas pipeline crossing the site and a deep well/pump used in historical mining works.



Figure 1: Site Location



Plate 1: Extent of proposed development area within red line, trial pit locations and site access.

3.2 Topography

- 3.2.1 A topographical survey was provided by WHL (Appendix 1) and indicated steep and undulating gradients generally from north to south across the site.
- 3.2.2 The northern section of the site processed a gradient of circa 1:13 and the lower part circa 1:20.

3.3 Geomorphology and Climate.

3.3.1 Hydrology

No significant water courses are within or abut the site.

There are fishing ponds immediately to the south but there was no obvious water outlet into these from the site.

The nearest water course is Blackshaw Brook to the west of the site (see Fig. 3) It is probable water from the site and fishing ponds discharges in this direction.

Investigations into the drainage of the site into the fishing ponds are ongoing but these would appear to be the main outlet for the site.

3.3.2 Predicted Drainage Discharge Rates for New Land Drainage Scheme

With respect to climate, data gained from the Flood Estimation Handbook (FEH) indicate that the standard – period average annual rainfall (SAAR) equals 1102mm for this location. The predicted Greenfield run-off rates (FEH) plus drainage outfall rates based on the 6 hour and 24-hour event (FEH) for different return periods are given in Table 1. The predicted drainage outfall rates are lower than Greenfield run-off rates, and so the installation of a new drainage scheme would not cause fast or greater flow than the Greenfield condition.

Drainage design should account for at least the 1:30, 24-hour outfall rate of 7.5l/s; this figure is conservative given that the entire area will not be drained. A flow restriction device or attenuation area on the southern boundary could be used to control outflow if required, which will assist to gain the relative discharge consents and protect land downstream.

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

Return Period	Greenfield Runoff Rate (FEH method L/s)	Drainage Outfall Rate (6hr FEH rainfall event L/s)	Drainage Outfall Rate (24hr FEH rainfall event L/s)
1:1	10.35	2.3	3.9
1:30	23.75	5.3	7.5
1:100	30.20	6.8	9.4

3.3.3 Environment Agency Data

Based on information obtained from the EA, the site is located within Flood Zone 1 (Fig. 2) i.e., low risk, and is not in an area effected by flooding from rivers or reservoirs (Fig. 3 & 4).



Figure 2: Flood Zone 1



Figure 3: Flooding from Rivers and Sea



Figure 4: Flooding from Reservoirs



Figure 5: Historical Landfill

The site is not shown to be located in an area formerly used for landfill (Fig. 5) although the GIR records an area on the site was used for a period of time for a refuse tip. This area will need to be inspected during the bulk earthworks operations and potentially some material may require disposing off-site.

Given this information, it should be feasible to undertake site remodelling works without affecting the volumes or dynamics of a flood plain, but it will not be permissible to construct a deep bored soakaway for the discharge of surface water.

3.3.4 Soils & Geology

The Soil Survey of England & Wales indicated the site would probably comprise the Brickfield 3 Association. The Association consists predominantly of loamy and clayey surface water gley soils. The parent material is a greyish till or Head derived from Carboniferous and other Palaeozoic sandstone and shales. The loamy textures are due to the preponderance of sandstone in the drift.

The main soils are seasonally waterlogged (Wetness Class IV) but with satisfactory agricultural drainage, may be in Wetness Class III where annual rainfall is less than about 900mm. They have slowly permeably loamy and clayey subsurface arisings which cause surface waterlogging. Surplus winter rainfall mainly moves away laterally at shallow depth and underdrainage is essential.

Much of the Association is under permanent grass for livestock and grass growth in spring is often retarded by cold, wet land.

The bedrock geology map (Fig.6) indicates the dominance of sandstone within the area. The GIR confirmed drift over sandstone rock with the latter shown at around 7 m below ground level.

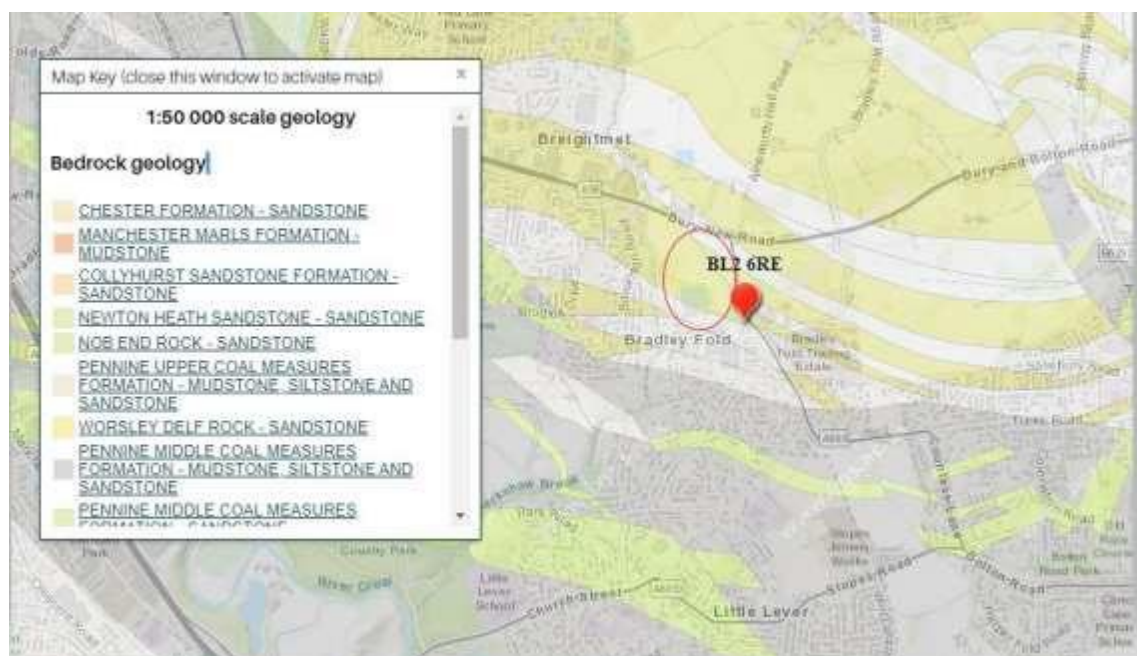


Figure 6: Bedrock Geology

3.3.5 Climatic Data/Assessment

Climate records for the period 1981-2010 were obtained from the Rochdale Meteorology station and they are provided in Table 2 below.

Location: 53.6, -2.183 Altitude: 110 m above mean sea level Station type: Observing Site

Average tables	Average graphs	Location comparison	Average maps				
Station: Rochdale, 1981-2010							
Month	Maximum temperature (°C)	Minimum temperature (°C)	Days of air frost (days)	Sunshine (hours)	Rainfall (mm)	Days of rainfall ≥1 mm (days)	Monthly mean wind speed at 10 m (knots)
January	6.6	1.1	10.3	31.5	112.2	15.9	5.1
February	6.8	1	11	47	83	12.4	5.3
March	9.1	2.6	6.2	91.3	92.2	14.2	5.5
April	11.6	4	2.9	143.3	70.5	12.1	5.3
May	15.3	6.9	0.5	189.9	62.8	10.9	4.9
June	17.8	9.6	0	143	77.9	11.9	4.5
July	19.7	11.6	0	188	79.7	11.6	3.9
August	19.5	11.5	0	153.1	91.8	11.1	3.5
September	16.8	9.6	0	115.7	92.6	12.3	3.7
October	13	6.6	1.5	80.6	119.3	15.2	4.1
November	9.3	3.5	5.1	41.8	114.5	15.9	4.3
December	6.8	1.1	10.9	27.4	122.3	16.2	4.5
Annual	12.7	5.8	48.4	1212.4	1118.6	161.7	4.5

Table 2 – Climate Records

A further source of data is the Agricultural Climate for England and Wales (Technical Bulletin 35) which provides details of the climate in various areas for the period 1941- 70. The data obtained from the source is summarised in Table 3 Below.

Characteristic	Data	Comments
Annual rainfall Excess winter rain (median) Excess winter rain (quartile range)	1,133mm 600mm 460-720mm	All represent high readings
Return to field capacity End of field capacity Period of field capacity	11 September 13 May 245 days	The pitches will be at field capacity for the majority of the season
Growing season Grass drought factor Potential transpiration	2 April- 26 Nov (238 days) <5 days 442mm	Reasonably long growing season; little need for irrigation

Table 3: Historical Climate Data

It is noted the information in Table 3 is for the area generally and the data from Rochdale is for that specific site. There will be some difference, between them but at least the data gives a guide as to what can be expected

Average rainfall for the area is high at 1133mm per year.

The median excess winter rainfall which is the amount of rainfall that needs to be discharged through the profile and the drainage system over the winter period is recorded as 600mm (excess winter rain does vary from year to year and the quartile range given is 460-720mm).

Field capacity is that state in which the soil is holding maximum amount of water after free drainage has ceased. It is useful to know this since it indicates the time of year about which drainage will start to occur and also that period of time when soil compaction is most likely to happen. Fine textured soils in particular are susceptible to compaction from physical forces when at field capacity or above. The median date for return to field capacity is 11 September for this area and the end of capacity given as 13 May. This equates to the topsoil being at field capacity for 245 days and the majority of the winter sport season.

The grass drought factor gives an indication of the number of days when the soil moisture deficit exceeds 50mm within the main rootzone. Such a soil moisture deficit is likely to lead to the growth of grass being impeded due to a lack of regularly available soil moisture. In this area the grass drought factor is estimated to be under 5 days.

The determination of the growing season is not easy as it depends upon a number of different factors. However, in this case it is defined as the length of time that the top 300mm of soil remains above 6 degree C. For this site the growing season is said to be 238 days (2 April – 26 November) and will provide a significant recovery period between seasons, assuming that the pitches are not excessively used for summer activities/usage.

In summary, excess winter rainfall is high and will need to be removed by an efficient drainage system given the presence of the impermeable clay subsoil. Deterioration of the topsoil structural condition especially at the surface, would be expected given it would be at field capacity for much of the football season. Supplementing the pipe drainage system with sand slits to bypass the deteriorated topsoil must be considered as a component of the works along with sand amelioration of the topsoil or heavy sand topdressing to improve its natural drainage properties. The sand will also firm-up the surface reducing susceptibility to divoting.

The need to irrigate to enable the sward to recover following renovations at the end of the soccer season in spring is assessed as not being essential but useful according to historical weather data. Nevertheless, a late summer sowing would normally be preferred for establishment of the pitches if the project timescales permitted.

3.4 Soil Assessment, Sampling and Analysis

3.4.1 Soil Profile

To evaluate soil type and structural condition, 5 soil profiles were excavated at targeted locations (Plate 1) using a spade and hand auger to gain an overall view of the site.

SP1 was excavated towards the northern end of the site and was characterised by a 225mm thick brown sandy clay loam in a well-structured condition (crumb/granular), a well-developed root system throughout the topsoil depth and the occasional worm present. It was slightly stony with occasional well-rounded pebbles/stones. A pale brown consolidated sandy clay was below the topsoil (225-750mm) which contained small fragments of sandstone. No iron staining or mottling indicative of reduced permeability was observed.

SP2 was characterised by the same topsoil layer as SP1 and also contained sandstone fragments. Occasional rusty mottling was observed on root channels. An orangery pale brown relatively dense clay was present from 220–750mm with mottling evident in the upper layer and a more greyish colouration at depth. Distinct iron and manganese deposits were observed in the subsoil which was generally stoneless at the depth examined.



Plate 2 - SP1 - 225mm thick well-structured topsoil overlying a slightly stony sandy clay.



Plate 3 - SP2 - 225mm thick well-structured topsoil overlying a silty clay.

SP3 was characterised by a 200mm thick dark brown sandy clay loam with occasional small stones and a well-developed fibrous root system. It was generally well structured but strong mottling plus iron staining was pronounced along the root channels. An orangey brown clay (200-650mm) was below the topsoil, and this merged into a brown greyish clay with distinct mottling evident. Occasional small stones were resented.

SP4 was characterised by a 220mm thick dark brown sandy clay loam containing occasional small stones and occasional worms. It was well-structured and possessed a well-developed root system. Slight mottling was present in the upper 80mm and the intensity increased towards the topsoil base. A stiff but soft greyish clay characterised by strong mottling was present 220-600mm below ground level. The clay was stoneless.

SP5 was excavated towards the southern end of the site. It was characterised by a 200mm thick dark grey sandy clay loam with strong mottling throughout. A 30mm thatch layer was present at the surface. The root system was well developed, an occasional sandstone fragment observed but no worms were encountered. Immediately below the topsoil was a 400mm thick plastic greyish brown stoneless clay characterised by strong ochreous mottling.



Plate 4 - Silty clay subsoil dominating majority of site



Plate 5 - Strong mottling/iron staining in topsoil present over much of site centre and southern area indicating wet ground conditions/poor drainage.

Site observations confirm the presence of the Brickfield 3 Association with a loamy topsoil containing sandstone fragments towards the northern end and a more clayey profile towards the mid-point and southern end of the site. The majority of profiles, although possessing topsoil in a well-structured condition presumably due to minimum activity, were characterised by impeded drainage which has resulted in surplus water sheading downslope to the pond along the southern edge. There was standing water in several areas at the southern end due to the slope being less and the underlying clay restricting gravitational discharge.

There was evidence of wet areas across much of the site in localised hollows. Wheel ruts and compaction were noted in some areas due to machinery trafficking and this highlighted the susceptibility of the well-structured topsoil to structural damage.

3.4.2 Soil Sampling

A representative topsoil sample was collected for lab analysis of texture and basic nutrient content.

3.4.3 Soil Texture

The textural analysis results are summarised in Table 4 below and provided in full in Appendix 2.

Combined Sample.	Depth (mm)	Sand (%)	Silt (%)	Clay (%)	Classification
1	0 – 150	42	46	12	Sandy Silt Loam

Table 4. Soil Textural Analysis.

The results confirm the textural classification of the topsoil as a sandy silt loam.

Reference to Appendix 2 will indicate that the sand particles are dominated by the fine and very fine sand ranges and therefore the bulk of the particles are all less than 0.25mm in diameter. In combination with the silt and clay content, this results in the total fines content (i.e., particles less than 0.125mm in diameter) being approximately 71%. The high fines content will dominate its physical characteristics.

A topsoil of this texture would require to be in a well-structured condition (i.e., particles aggregated into structural units) for drainage rates to be satisfactory. The soil will be water retentive and when used during moist to wet conditions will be soft and easily divot. Surface traction will be poor. The relatively low clay content will result in the topsoil being structurally unstable and therefore in moist to wet conditions during play, it would be very susceptible to structural deterioration and hence interpacking of particles. The resulting effect being compaction within the surface and combined with the underlying clay subsoil the soil profile would effectively be of low permeability.

3.4.4 Soil PH and nutrient status

The results are tabulated in table 6 below.

Combined Sample.	Depth (mm)	Phosphorous (ppm)	Index	Potassium (ppm)	Index	Magnesium (ppm)	Index	pH
1	0 -150	15	1.8	61	1.0	94	2.9	5.3

Table 5. Topsoil nutrient and pH results.

The preferred pH range for a mineral soil to sustain a perennial ryegrass dominant sward is 6.0-6.5. The test result was 5.3 and therefore this falls below the preferred range. Incorporation of a suitable lime material during future improvement works will be required to raise the pH to within its preferred range.

The extractable levels of nutrient reflect the availability of that nutrient to the growing plant. General guidelines indicate the preferred range for nutrients is in the index range of 2.0 to 4.0. Both the phosphorus and potassium levels are low and below the lower limit of the preferred range. The magnesium level is satisfactory being around the midpoint of the preferred range. However, both the phosphorus and potassium content of the topsoil will require to be raised to a satisfactory level during future pitch development works especially if the topsoil is sand ameliorated. This can be achieved by incorporating a suitable base fertiliser (e.g., 0% N: 20% P₂O₅: 20% K₂O).

3.4.5 Soil Summary

Overall, the analysis results indicate the topsoil to be fine textured and therefore it will possess behavioural characteristics which will require any future pipe drainage to be supplemented by surface drainage systems such as slit drainage, sand grooves and/or sand amelioration. It is also deficient in phosphorus and borderline in potassium which will require correcting to ensure the development of a healthy sward following cultivation and seeding. Significant drainage input will be required if the site is to be developed to provide a soccer pitches capable of sustaining medium to high usage levels.

3.5 Existing Drainage and Services

Drainage is referred to in section 3.3.1.

In terms of services the GIR recorded a high-pressure gas pipeline running across the middle of the site roughly oriented east-west with marker posts close were it crosses hedge lines.

3.6 Agronomic Assessment

An agronomic assessment was not directly relevant given the sight is not existing pitches and will be subject to bulk earthworks during development.

However, the site was supporting a mixed grass sward which was very long and overgrown. Root systems were well developed and hence the topsoil will provide the basis for the future playing surfaces.

There were broadleaved weeds present, notably creeping buttercup which is a characteristic of wet ground. There was a higher proportion of buttercup towards the southern end indicating increased wetness. Rushes/sedges and increasing amounts of bent grass at the south end also confirmed the increasing soil wetness level.



Plate 6- Vegetation typical of wet ground conditions at the southern end of the site.



Plate 7 - Pond immediately outwith the southern boundary.

4.0 PROPOSED LAYOUT & GRADIENTS

4.1 Gradients

Sport England have provided useful guidelines on the maximum acceptable slopes for natural turf sports pitches. In summary, the maximum slope along the direction of play should not exceed 1.25%, whilst the maximum cross fall should not exceed 2.0% however, it is not desirable for the longitudinal and the cross falls to be at these maximum values. Sport England guidance, along with the proposed gradients for the pitches are presented in Table 6 below. Refer to Appendix 3 for the proposed pitch layout and levels.

Pitch	SE Guidance (%)		Proposed pitch Gradients (%)	
	Length	Width	Length	Width
P1			0.47	<0.1
P2	1.25	2.00	0.64	<0.1
P3			0.47	<0.1
P4			0.56	<0.1

Table 6: Summary of maximum recommended slopes by Sport England compared with proposed pitch levels

Reference to Table 6 illustrates that all pitches have a suitable longitudinal fall with the cross fall being negligible. They all fall within SE/NGB gradient guidelines.

4.2 Pitch Dimensions

The pitch dimensions illustrated on the proposed layout drawing (Appendix 3) are summarised in Table 7 below.

Pitch	Dimensions (m)	Pitch description	FA Dimensions (m)
1	106.0 x 69.4	Full size	100.0x 64.0
2	79.2 x 50.4	u13/u14	82.0 x 50.0
3	106.0 x 69.4	Full size	100.0 x 64.0
4	88.0 x 56.0	u15/u16	91.0 x 55.0

Table 7: Proposed Pitch Dimensions

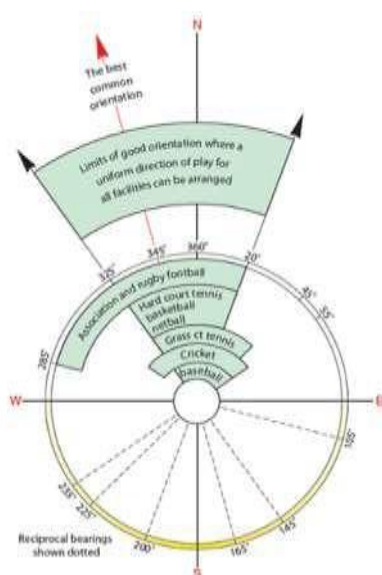
All pitches have a 3m run-off at the same gradient as the pitch.

The FA dimensions are given in the table, and it is suggested that, subject to earthwork calculations, the plateau dimensions be fine-tuned to allow pitches of these dimensions plus a minimum 3m run-off.

Larger plateaux would be acceptable allowing an increased run-off and space for manager, substitutes and spectators.

Ball stop netting will be required in several locations given the layout of the site and proximity of the boundaries (e.g., road, fishing pond etc.).

4.3 Pitch Orientation



In terms of pitch orientation, Sport England has published guidance on optimum pitch orientation for a range of sports (Fig.7). For example, the limits of orientation for winter sports pitches are 285 deg and 20 deg.

With reference to the proposed layout, pitches 1, 3 and 4 fall within the optimum orientation guidelines but pitch 2 does not. This is not considered an issue especially given the site constraints and therefore no action on a revised layout is required.

Figure 7: Sport England Pitch Orientation

5 Club Background and Pitch Usage

5.1 Bolton Wyersdale AFC

The Club has been in existence for 127 years and their current site was acquired by the Trustees in 1955 using the Memorial Fund.

There are 2 adult grass pitches with their standard being described as poor especially in relation to drainage. The pitches are reported to waterlog regularly in the winter and remain unplayable for long periods of time.

The amount of funding/ income has been very limited in recent years and has not allowed an appropriate annual pitch maintenance programme or any drainage remedial works.

The main maintenance activity has been mowing undertaken by Club volunteers.

At its peak the Club had run the following teams:

- 4 x Adult Saturday teams – Bolton Combination and Lancashire Amateur League.
- 1x Junior Team
- 1 x Vets Team
- Rounders
- Keep fit Classes

Mainly due to the inadequate playing facilities currently present, the number of teams at the moment have reduced to:

- 2 x Adult Teams – Lancashire Amateur League
- 1 x Vets Team

The proposed new facility is envisaged as being able to provide equal/improved facilities in line with Sport England requirements and the Trustees require increased participation and community use in line with the Charity Status which the Club is currently applying for. This will also assist in implementing appropriate annual maintenance and renovation programmes to sustain the good standard playing surfaces to be provided.

5.2 Pitch Usage

Based on the Clubs current number of teams and their future expansion plans to include community participation and use, it is envisaged the pitches are likely to be used 3-6 hrs per week for games, training and non- soccer activities (e.g., rounders). Sport England give an approximate weekly guide to usage hours dependent on a variety of construction and drainage profile types for natural sports pitches, particularly winter sports. The guidelines are presented in Table 8 below.

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 circa 50% for players 15 years of age and younger.

Table 8: Estimated usage levels for different pitch types

In the type of situation for the proposed development, Sport England would generally recommend a Type 4 (sand injected grooves) or Type 5 (excavated gravel/sand slits) pitch. The information provided on the following pages are extracts from “Natural Turf for Sport” guidance developed by Sport England and describes the requirement and suitability for both a Type 4 and a Type 5 pitch.

The higher specification Type 5 pitch with pipe and excavated slit drains is recommended in this situation due to soil profile condition and the average rainfall levels being around 1,133mm per annum and the excess winter rainfall circa 600mm. However, there are concerns regarding settlement of traditional gravel slit drain lines, especially on clay soils resulting in uneven surfaces and an ongoing requirement to top-up the slit levels.

Where previously a trend towards closer pipe drain spacings and installation of sand grooves (non-excavated slits) to counteract the settlement (i.e., Type 4 pitch) and ongoing maintenance issues, the development of the 100% sand slit Type 5 pitch which can be installed at the time of the seeding is often preferred for new pitches.

The recommended secondary drainage option for this situation if sand amelioration can be afforded is excavated sand slits (e.g., Koro sand slits). Being narrower than the standard gravel slit, installed at closer centres and backfilled exclusively with sand, some settlement can still occur but too less of a degree than in a gravel slit. The absence of gravel in the slit also avoids a dense stone/soil/sand matrix being formed in future years. The sand alone having a long-term beneficial effects on the soil’s physical characteristics.

Both the Type 4 and 5 Pitch cross sections show a sand ameliorated layer present (sand incorporated by cultivation) at the surface. The topsoil on site has a very high fines content and therefore a sand ameliorated layer is strongly recommended given the indigenous topsoil. In the absence of an ameliorated surface, excavated gravel slits would be preferred over 100% sand slits with 3no. number surface sand topdressings essential to help maintain the integrity of the connection of the sand slits at the surface. If these become capped with soil particles the drainage efficiency of the system will be significantly reduced.

Type 4: Pipe drained with sand grooves

This type of construction is now becoming the most frequently used type of drainage system where an effective pitch construction is required, and provides an intensive and effective method for intercepting water from the pitch surface. It is cost-effective to construct and maintain as well as reducing the potentially serious problems of shrinkage associated with the pipe drained with slit drainage form of construction.

The pitch construction is similar to that of the pipe drained pitch above with the addition of a series of sand grooves, approximately 150 mm deep and 20 mm wide, introduced by a machine at a spacing of 260 mm. These grooves are forced into the soil with a tine rather than being created by excavating a narrow trench, and can be filled with sand or fine grit. It is essential that the sand grooves connect efficiently with the permeable backfill of the pipe drainage system below.

Heavy top dressings of suitable sand are essential for the successful construction and management of pipe drainage and sand grooved pitches:

- The dressing should be applied immediately after installation of the sand grooving and subsequently reapplied as part of routine maintenance works in the close season. This process will be necessary for at least three to five years following installation.

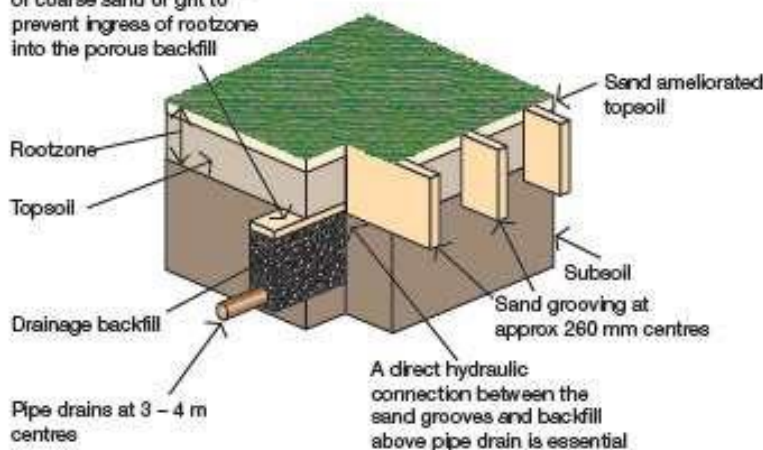


Sand grooves installed at 260 mm centres

- Each application of dressing should be in the region of 60-100 tonnes, depending on the size of pitch.

Pipe drainage with a secondary drainage system is considered to be the most suitable type of construction for the creation of good quality pitches that can meet the necessary PQS.

Where coarse porous backfill material is used, it may be necessary to include a 50 mm deep blinding layer of coarse sand or grit to prevent ingress of rootzone into the porous backfill



Pipe drainage construction on cultivated topsoil with supplementary sand grooving

Type 5: Pipe drained with slit drains

Supplementary slit drains will significantly improve the removal of water into pipe drains. Basically the construction mirrors that of a pipe drained system with the addition of a series of narrow, commonly 50 mm wide, sand and gravel filled trenches excavated across, and into the porous backfill of the lateral drains. Slit drains are typically 250 - 350 mm deep and installed at 0.5 - 2.0 m spacing.

Heavy top dressings of suitable sand are essential for the successful construction and management of slit drained pitches.

The dressing should be applied immediately after installation of the slits and subsequently reapplied as part of routine maintenance works in the close season. This process will be necessary for at least three to five years following installation.

Each application of dressing should be in the region of 60 - 100 tonnes, depending on the size of the pitch.

A drawback of slit drains is that they can become capped and sealed over with topsoil, which can



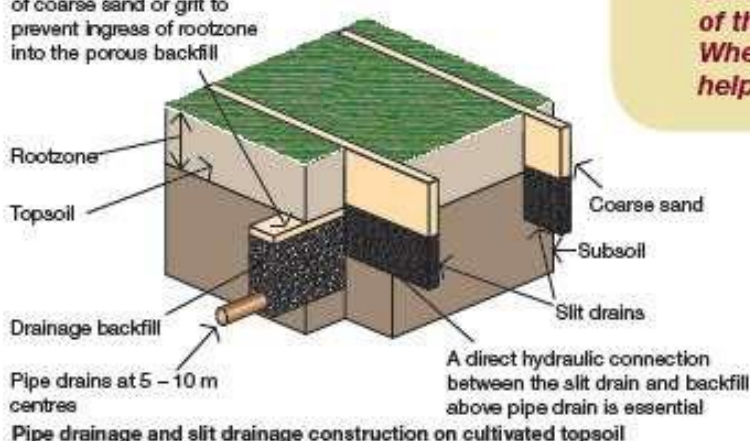
Combined pipe and slit drainage will significantly improve the drainage of most pitches

render them ineffective. Also, slit drains installed in clay soil can be prone to settlement in dry weather due to the clay shrinking on drying. They therefore require frequent topping up, particularly during the first year following installation, to prevent an uneven and possibly dangerous surface developing. It is for this reason that 'Type 3' constructions, comprising narrowly spaced sand grooves, are becoming the industry standard for improving the surface drainage of pitches.

Adequate maintenance is essential in order to produce and maintain a vigorous, dense sward.



Where coarse porous backfill material is used, it may be necessary to include a 50 mm deep blinding layer of coarse sand or grit to prevent ingress of rootzone into the porous backfill



It should be noted that pipe drained surfaces with slit drains might:

- ***Be uneven during the first season.***
- ***Settle in the summer months due to shrinkage in clay soils. These must be monitored and filled with sand to maintain the safety and quality of the surface and the effectiveness of the drainage system. Where available, irrigation will help to reduce this problem.***

It is noted that the usage hours in Table 8 are increased by circa 50% for use by players under the age of 15yrs, which will be the case for some of the use at the proposed development.

However, it is still unrealistic to expect significant use through winter months or prolonged heavy rainfall with the presence of just a piped drainage system even for younger age range of users, particularly given the rainfall, soil type and the natural drainage characteristics of the site.

6. Principal Factors Affecting Site Development

- 6.1 The principal objective is to optimise the number of pitches onsite and construct them to a good standard capable of sustaining use over the long term.
- 6.2 The proposed layout drawing provides 4 pitches with appropriate gradients, suitable dimensions and apart from the U13/U14 pitch to the preferred orientation.
- 6.3 Bulk earthworks will be required to provide the proposed layout and the works will need to take into account the gas pipeline across the sites. Protective measures will need to be in place during the earthworks to prevent contamination of the ponds by surface runoff of silt, debris, etc, given the gradients on site.
- 6.4 Based on EA data the site is not located in an indicated flood plain or an area used historically for landfill. It is noted that the GIR report recorded part of the site had been used as a waste/refuse tip. Mitigation (e.g., soil disposal offsite) during the earthworks may be required.
- 6.5 It is understood the underlying sandstone is an aquifer and should therefore be considered as a Groundwater source protection zone. This will prevent pitch drainage water being discharged via deep drilled soakaways.
- 6.6 The topsoil was around 200 – 225mm thick and will require careful stripping, stockpiling and respreading to minimise structural damage.
- 6.7 The subsoil is clay of low permeability, and this will necessitate the installation of a pipe drainage system at relatively close centres.
- 6.8 The topsoil texture (sandy slit loam), local climatic conditions, standard of use required, and pitch usage levels will dictate a combination of sand amelioration and/or sand topdressing and sand slits will be required.
- 6.9 Climatic data indicated annual average rainfall of 1133mm with the excess winter rain being 600mm; the soil being at field capacity during the period 11 Sept to 13 May and hence susceptible to damage during the majority of the soccer season; the grass drought factor was recorded as <5 days.
- 6.10 It would be worthwhile for drainage spoil arisings to be disposed on-site as a component of the earthworks thereby avoiding expensive off-site disposal costs.
- 6.11 The bulk earthworks and pitch construction / drainage should be undertaken late spring/summer aiming for a September sowing.
- 6.12 The specialist sports turf contractor constructing, draining and seeding the pitch should be responsible for establishing and monitoring the pitches during the 12-month establishment period.

- 6.13 Drainage of the areas inbetween the pitches including cut off drains at the base of embankments, will be required to permit maintenance operations and movement of players and spectators around the site.
- 6.14 Specific routes for machinery, players and spectators to the pitches could be considered.
- 6.15 Access around the site for end of season renovations, including material storage areas will be required.
- 6.16 Ball stop fencing will be required on some elevations.
- 6.17 The Club must implement an appropriate maintenance and renovation programme to sustain the pitches over the long term.

7. Development Options

- 7.1 Based on site observations and the evidence available, Sport England would generally recommend a Type 5 Pitch, for suitable playing surfaces to be provided with appropriate Performance Quality Standards.
- 7.2 The following options for the works to the proposed area for the new pitches are provided with site clearance and bulk earthworks undertaken prior to the specialist sports ground contractor inheriting the site.
- 7.3 The pitch and run offs should be surfaced to the same standard.

7.4 Option 1:

The works include the following:

- Trimming /grading the already spread plateau topsoil to the required level.
- Type 5 Pitch pipe drainage – main drain, lateral drain at 5m centres, inspection chambers and cut-of drains.
- Final grading/trimming, cultivations, fertilising and seeding.
- Disposal of pipe drain arisings on-site within the earth works plan.
- 12 months establishment and maintenance – mowing, 4 no. fertilisers, overseeding as required, stone picking, 1 x herbicide and 1 x fungicide.
- Gravel slits at 1m centres following sward establishment.
- Slit arisings disposed off-site to the Contractor's tip.
- 3 no. sand topdressings, vertidrainage and drag matting.
- Preparation and seeding of peripheral areas; excludes the landscape planting illustrated on the proposed layout drawing.

7.5 Option 2:

The works include the following:

- Trimming /grading the already spread plateau topsoil to the required level.
- Type 5 Pitch drains – main drains, lateral drains at 3m centres, inspection chambers and cut-of drains.
- Installation of Koro slit drains at 500mm centres.
- Final grading/trimming, cultivations, fertilising and seeding.
- Disposal of pipe and Koro slit drain arisings on-site within the earth works plan.
- 12 months establishment and maintenance – mowing, 4 no. fertilisers, overseeding as required, stone picking, 1 x herbicide and 1 x fungicide.
- 3 no. sand topdressings, vertidrainage and drag matting.
- Preparation and seeding of peripheral areas; excludes the landscape planting illustrated on the proposed layout drawing.

7.6 Option 3:

The works are as per Option 1 plus the amelioration of the topsoil with a 50mm thick sand layer prior to seeding. This option would allow the reduction in the sand topdressings and vertidrainings from 3 to 2 during the establishment period.

7.7 Option 4:

The works are as per Option 2 plus sand amelioration of the topsoil with a 50mm thick sand layer prior to installation of Koro top drains. Again, the sand topdressing/vertidrainage operations in the establishment period can be reduced to 2.

Note:

- Of the two secondary drainage options presented, PSD's recommendation for this site and situation would be for Koro sand slits which can be installed at the time of seeding as opposed to gravel slits which require the sward to be suitably established before they can be installed.
- For both options, the contractor undertaking the works should be responsible for implementing a 12 month maintenance/establishment programme following seeding.
- Sand amelioration of the topsoil is recommended for both options to amend the soil texture, improve natural drainage properties of the topsoil and offer protection to minimize capping of the secondary drainage system.
- Any construction works to be carried out should be undertaken by a recognised and experienced Sports Turf Contractor.
- Works of the nature outlined within this report should only be undertaken under suitable weather and ground conditions, ideally during the summer months with a seeding date of late summer. (Refer to Indicative Programme).
- Future use of the sports field will need to be managed appropriately during wet weather conditions to avoid unnecessary surface damage, reduction of surface sward quality and decreased surface contact and efficiency of the installed drainage systems.
- Should the recommended works above be carried out, the future efficiency of the drainage system and pitch quality will only be sustained through significant annual investment in maintenance and end of season renovation programmes. A typical maintenance/renovation programme is attached in Appendix 4.

- The guideline costs do not include any consultancy fees for design, tender and project management. PSD can provide a quotation to undertake and manage these services throughout the project from start to completion, which includes advisory information relating to annual maintenance and renovation programmes, selecting competent specialist Contractors and ensuring any improvement works are undertaken to a satisfactory standard when ground and weather conditions are favourable and use of approved materials.

8. Conclusion

8.1 There are a number of factors to consider when selecting the development works to be undertaken. These are summarised as follows:

- Current issues highlighted within the design of the sports field
- Age range and standard of users
- Weekly usage hours, especially during winter months
- Annual maintenance and renovation inputs
- Geographical location and climatic data
- Budget availability

8.2 From the development options in section 7 above, PSD would recommend the works outlined in Option 4 are undertaken to ensure the required standard of pitch is provided (SE Type 5).

8.3 A pipe drain system is required to remove water from the clay dominant subsoil and provide a transport mechanism for a secondary drainage system comprising Koro sand slits to remove surface water more efficiently, bypassing the fine textured topsoil. The sand amelioration process and subsequent sand topdressing (2 No.) and vertidrainage items will improve surface conditions (i.e., reduce the softness of the sandy silty loam topsoil) and natural drainage characteristics as well as providing a link to, and protection of, the pipe and Koro sand slit drains.

8.4 Gravel slits, Options 1 and 3, can be prone to settlement when soil shrinkage is experienced in summer months, whereas Koro sand slits are less susceptible.

8.5 The works outlined in all options would require a 12-month establishment period where the area is seeded following pipe drainage and cultivation works and should be undertaken by the pitch contractor.

8.6 Given soil and site conditions, absence of any irrigation facilities, climatic data for the region and the current Club standard/level of use, Option 4 provides the best outline works to provide a pitch of the appropriate Performance Quality Standard without placing excessive demands on annual budgets for maintenance inputs. Sand topdressing, vertidrainage and overseeding must be given thought for inclusion in future annual budgets post improvement works.

9. Implications of Works on Future Maintenance, System Longevity and Usage

9.1 Maintenance issues

- With surface bypass drainage systems, such as that recommended, it is essential that adequate allowance is made for annual sand topdressing as this helps to protect the tops of the sand slits from contamination with topsoil. As a guide it is recommended that a 5mm depth of sand should be applied annually as part of the renovations programme. A 5mm depth of sand would equate to approximately 60 tonnes for a full-sized football pitch at a cost of approximately £2,525 + VAT respectively (2021 prices).
- 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 drains are kept topped up.
- In general terms, a maintenance budget of ~£10-12k / 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 4)

9.2 Drainage system longevity

- Whilst only a guide, the piped drainage system should have an operational lifespan of approximately 25 years if well maintained (e.g., silt traps regularly inspected and emptied, and collector drains flushed).
- If managed well (i.e., annual sand topdressing) and not over-used (please see usage below), slit drains should have an operational lifespan of 8 – 10 years, hence a sinking fund should be in place to repeat this operation periodically. The cost for re-installing sand slit drains in a senior pitch is estimated to be approximately £16,325 + VAT (2021 prices), therefore an appropriate sum should be set aside annually for this purpose.

9.3 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.

10. Timescales/Programme

- 10.1 The works should ideally be undertaken to achieve a late summer sowing (e.g., seed end August). This would ensure the earthworks, drainage and cultivations would be undertaken during a period when the topsoil's condition was less likely to be susceptible to damage.
- 10.2 The Contractor undertaking the construction works should establish and maintain the pitch for 12 months prior to hand over.
- 10.3 A typical programme for option 4 is given below.

	2022												2023											
	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S			
Design/Tender																								
Contract Award																								
Earthworks																								
Pipe Drainage																								
Sand Amelioration and seeding																								
Establishment																								
Koro sand slits																								
Bring into use																								

Table 9: Typical Programme for Senior Pitch Development

Note: Koro slit drains can be installed immediately prior to seeding or in spring of the establishment year.

11. Confidentiality

This presentation is confidential and is only for the use of Whitchurch Homes. Without the specific consent in writing of Professional Sportsturf Design (NW) Ltd, no copies of this presentation are to be made and information contained herein should not be communicated to any third party. At the request of Professional Sportsturf Design (NW) Ltd all copies of this document, in whatever form, are to be returned.

12. Contact Details

Mr Gary Owen
Professional Sportsturf Design (NW) Ltd
Wigan Road
Leyland
Lancashire
PR25 5XW

Tel: 01772 297830

APPENDIX 1

RADCLIFFE MOOR ROAD TOPOGRAPHICAL SURVEY

PROJECT: [illegible]
 SHEET: [illegible]
 DATE: [illegible]
 DRAWN BY: [illegible]
 CHECKED BY: [illegible]
 SCALE: [illegible]
 NORTH ARROW: [illegible]



PROJECT: [illegible]
 SHEET: [illegible]
 DATE: [illegible]
 DRAWN BY: [illegible]
 CHECKED BY: [illegible]
 SCALE: [illegible]
 NORTH ARROW: [illegible]

1:1000	1:1000
1:1000	1:1000
1:1000	1:1000
1:1000	1:1000

[illegible]
 [illegible]
 [illegible]

1:1000	1:1000
1:1000	1:1000
1:1000	1:1000
1:1000	1:1000

[illegible]
 [illegible]
 [illegible]

APPENDIX 2

RADCLIFFE MOOR ROAD ETL SOIL ANALYSIS RESULTS

17139/1	PARTICLE SIZE DISTRIBUTION		
	SAND / SILT / CLAY		
	Test Report: Number 17139/A Page 1 of 2		
100%	Project 1721: Sample RMR/TS/12342		
	** Stones present > 12mm **		
13/07/21	Sample Received Date & Sample Test Date		
moist	Sample Moisture (very wet, wet, moist, dry, n/a)		
friable	Sample Consistency (hard, friable, plastic, n/a)		
high	Sample Homogeneity (high, medium, low, n/a)		
	Particle Size Distribution – Not Covered by A2LA Accreditation **		
SA	Angularity (VA, A, SA, SR, R, WR, n/a)		
M	Sphericity (H, M, L, n/a)		
% Retained			
1.3	% Coarse Gravel > 3.4 mm		
0.3	% Fine Gravel 2 to 3.4 mm		
1.6	% Very Coarse Sand 1 to 2 mm		
4.0	% Coarse Sand 0.5 to 1 mm		
8.0	% Medium Sand 0.25 to 0.5 mm		
13.3	% Fine Sand 0.125 to 0.25 mm		
14.7	% Very Fine Sand 0.05 to 0.125 mm		
44.8	% Silt 0.002 to 0.05 mm		
11.8	% Clay less than 0.002 mm		
3.2	% greater than 1mm		
12.0	% Coarse + Medium Sand		
13.3	% Fine Sand		
71.3	% Fines less than 0.125 mm		

** Test Not Covered by A2LA Accreditation

Continued on Page 2

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

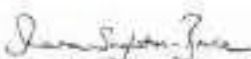
Continued from Page 1

17139/1				PARTICLE SIZE DISTRIBUTION SAND / SILT / CLAY
				Test Report Number 17139/A Page 2 of 2
				Coarse Gravel Criterion
				Gravel / Very Coarse Sand Criterion
				Coarse / Medium Sand Criterion
				Fine Sand Criterion
				Very Fine Sand Criterion
				Total Fines Criterion
				Silt Criterion
				Clay Criterion

Angularity codes: VA, very angular; A, angular; SA, sub-angular; SR, sub-rounded; R, rounded; WR, well rounded.
 Sphericity codes: H, high; M, medium; L, low

These results refer only to the samples provided. No guarantee is given that they are representative of the bulk material.
 Full terms and conditions are set out in document 'ETL / Conditions' which is available on request.
 This report shall not be reproduced except in full without the written approval of ETL.

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

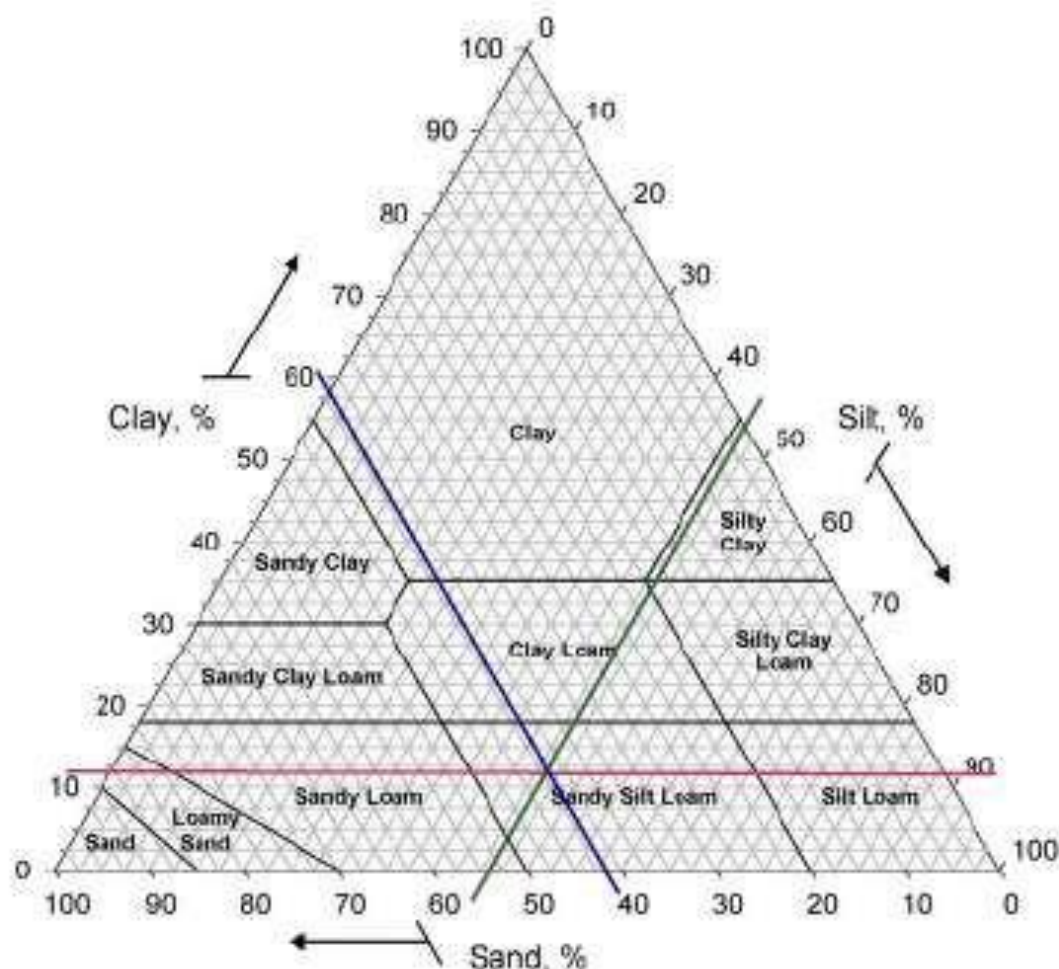
Approved by: 

Date: 19th July 2021

Managing Director, for European Turfgrass Laboratories Ltd

Triangle of Texture : Soil Classification

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



Soil Sample: PSD (NW) Ltd

Project 1721

Sample	% Gravel	After removal of gravel			Soil Texture Classification
		% Sand	% Silt	% Clay	
Sample RMR/TS/12542	1.6	42.4	45.6	12.0	Sandy Silt Loam

Signed: *Sharon Singleton-Bruce*

Date: 19th July 2021

for European Turfgrass Laboratories Ltd



Analysis Results (SOIL)

Customer: 1721 Distributor: P.S.D. (NW) LTD
WIGAN ROAD
LEYLAND
LANCS
PR25 5XW

Sample Ref: RMR/TS/12543 Date Received: 12/07/2021 (Date Issued: 13/07/2021)

Sample No: E449104

Crop: GRASS GROWTH

Analysis	Result	Guideline	Interpretation	Comments
pH	5.3	6.0	Low	Low. An acidic environment will reduce soil nutrient availability and the efficiency of any applied fertilisers or organic materials. A sub-optimum pH will also impact on soil microbial populations and rates of activity. Refer to lime requirement.
Phosphorus (ppm)	15	16	Low	(Index 1.8) 80 kg/ha P ₂ O ₅ (64 units/acre).
Potassium (ppm)	61	121	Low	(Index 1.8) 80 kg/ha K ₂ O (64 units/acre).
Magnesium (ppm)	94	51	Normal	(Index 2.9) Apply 25 kg/ha MgO (20 units/acre) every three to four years.

Additional Comments

The analyses and Interpretations for P & K have been carried out in accordance with RB209. PLEASE NOTE: The recommendations should be adjusted if organic manures are used. See RB209 for more information.
Where applicable soil applied P, K and pH recommendations are taken from AHDB Nutrient Management Guide (RB209)

Any Indicated Lime Requirement assumes a medium textured soil.
Additional technical bulletins are available at www.lancrop.com.

Please Note

Whilst every care is taken to ensure that the Results from Analysis are as accurate as possible, it is important to note that the analysis relates to the sample received by the laboratory, and is representative only of that sample. No warranty is given by the laboratory that the Results from Analysis relates to any part of a field or growing area not covered by the sample received. It is important to ensure that any soil, leaf, silage or fruit/seed sample sent for analysis is representative of the area requiring analysis and that samples are obtained in accordance with established sampling techniques. A leaflet containing instructions on how to take soil, leaf, herbage, silage and fruit samples for analysis is available from the laboratory on request. Uncertainty measurements of results are available on request.

Released by *Chris Lindley* Laboratory Manager on behalf of Lancrop Laboratories

APPENDIX 3

RADCLIFFE MOOR ROAD PROPOSED LAYOUT/LEVELS



CLIENT:	PROJECT:	DRAWING TITLE:	DATE:
	PROPOSED FOOTBALL PITCHES, RADCLIFFE MOOR ROAD BURY	PROPOSED LAYOUT	June 2021
			LAYOUT:
			ISO A4

APPENDIX 4

RADCLIFFE MOOR ROAD

INDICATIVE MAINTENANCE PROGRAMME

Mowing. The grass shall be maintained between a height of 25 - 40 mm 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:

May (end of playing season when renovated)	12:6:6 at 350 kg/ha
June/July (during warm wet spell)	12:6:6 at 350 kg/ha
September (if needed)	5:5:10 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/May) 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. Usually only needed every 3 years or so.

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 pitch 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 approved medium-fine sand suitable for sports use during the renovations period (e.g. mid May) at the rate of approximately 65 t/senior-sized pitch. After each application, the sand should be worked into the surface with brushes or drag mats.

Overseeding. Overseed the pitch area and safety margins as required at the application rate of approximately 200kg/ha (20g/m²) immediately after the topdressing application in May. 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 5mm below the surface.

Harrowing [Playing season as required]. To maintain surface levels, it is recommended to chain harrow / drag mat the pitch 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, e.g. goal mouths, 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.

