

A REPORT TO EASTLEIGH BOROUGH COUNCIL

A feasibility study for the development of 2 Nr. cricket squares and outfield within Lapstone Playing Fields.

7th August 2018

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Please note: The aim of this report is to assess the feasibility of the sports pitch development 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.

REVISION RECORD					
Rev	Date	Description	Prepared	Checked	Approved
0	07/08/2018	Document Creation	MY	TC	TC
1	25/08/2018	Inclusion of context of use versus cost following discussion with the ECB. Addition of ball stop netting and a non-turf pitch in indicative costs.	MY	ITJ	ITJ
2	16/11/2018	Inclusion of an Addendum to the report following the receipt of an additional brief from Eastleigh BC based on an alternative layout for the provision of two cricket squares.	MY	ITJ	ITJ
3	25/11/2020	Creation of a stand-alone new Feasibility based on a revised layout which in principal, has been reviewed as acceptable by the ECB.	MY	RE	RE

1 EXECUTIVE SUMMARY - Eastleigh Borough Council

KEY: No action required Action may be required Action required

Site information

	1. The principal objective of this project is to provide a feasibility study for the proposed development of 2 Nr. natural turf cricket facilities within Lapstone Playing Fields, Fair Oak, Eastleigh.
	2. The key deliverables for the Lapstone Playing Fields brief are two natural turf cricket facilities comprising: A (minimum) 6-wicket natural turf cricket square (9 wicket desirable) and a 8-wicket natural turf cricket square (9 wicket desirable) and outfield to meet the playing needs of Fair Oak CC Junior, women's and men's 3 rd and 4 th XI's, pitch to be serviced by the existing onsite cricket pavilion, both grounds to meet Sport England/ECB recommended boundary sizes dimensions for a 6-pitch cricket square as best as possible, Pitches should be designed to ensure compliance with the minimum performance quality standards of the ECB for natural turf pitches.
	3. To deliver the brief will require significant earthworks to extend an in-situ culvert and to fill an existing drainage ditch which runs east to west across the playing fields. The ditch is within the footprint of the proposed location of the cricket outfield of one of the proposed squares. Further assessment will be required from the local lead water authority.
	4. Indicative designs indicate that it is possible to construct 2 Nr. 9-pitch cricket squares with minimum ECB boundaries with the addition of an artificial cricket pitch on both squares.
	5. An indicative proposed layout shows ~30 metres between boundaries, as recommended by the ECB. therefore, it is envisaged that ball-stop netting will not be required which is neither desired nor appropriate given the nature of the park in terms of public access.
	6. It is feasible to utilise the existing square during the construction and maintenance of any proposed squares provided the client understands that ingress onto the new squares should not be permitted, even for ball retrieval (in the early post construction period).
	7. The topography of the site predominantly complies with SE/ECB guidelines for slopes for sports pitches aside from the drainage culvert and swale running through the site. Compliant gradients are possible to achieve following material import, however there may be a requirement for a retaining structure on the western boundary due to the difference in the existing and proposed levels.
	8. Significant tree removal will be required prior to earthworks. An arboriculture and ecology report will be required as will understanding the limitations regarding tree work and bird nesting season.
	9. The site comprises a poorly structured layer of predominantly SANDY LOAM topsoil containing a moderate to high stone content overlying CLAY LOAM subsoils. Following any cut and fill earthworks it is recommended that as a minimum, a primary land drainage system is installed, if possible, with supplementary secondary drainage (only within the footprint of the cut and fill).
	10. According to the British Geological Survey, the site lies over two separate geologies, to the north of the ditch, the soil overlies the Whitecliff Sand Member - Sand. Sedimentary Bedrock formed approximately 23 to 66 million years ago in the Palaeogene Period. Local environment previously dominated by shallow seas. To the south of the ditch, the soil overlies the Wittering Formation - Sand, Silt and Clay. Sedimentary Bedrock formed approximately 41 to 56 million years ago in the Palaeogene Period. Local environment previously dominated by shallow seas. The geology may be suitable for use as outfall provided a bespoke point prognosis report is commissioned along with BRE 365 infiltration testing.
	11. A comprehensive drainage scheme has been installed into the football pitch situated to the north of the proposed development area and within the proposed northern outfield. Any development works must not compromise the efficacy of any current schemes. All CAD designed indicative options have taken the football pitch area into account.
	12. The existing artificial cricket nets will require removal. Due to the age of the system, it is likely that very little of the system will be salvageable for future use
	13. It is important to clarify whether a project with high capital costs can fulfil the needs of the cricket club in terms of fixture fulfilment and club development. In terms of viability, this would be considered a high cost project for limited playing capacity

Recommendations

1.	The site is an existing playing area which has been earmarked for the development of 2 Nr. natural turf cricket squares and outfield. The focus of this report is on the potential construction of the cricket squares with regards to certain site-specific constraints which could affect the feasibility of the development. The report is in line with the working brief provided by Eastleigh Borough Council.			
2.	The preferred recommendation for the development of the cricket square and outfield is Option 1 . This development comprises the removal of existing trees and vegetation, culvert extension, cut and fill earthworks to produce levels in line with ECB/Sport England Guidelines (on a single plane, within the footprint of the culvert), topsoil cultivations, installation of 2 Nr. cricket wickets and irrigation points, drainage installation at 3 m centres plus a secondary surface bypass drainage scheme (sand grooves) and re-establishment of turf grass from seed (within the culvert area). Estimated costs are summarised below (excluding professional fees and VAT). More information on the development costs can be found in section 4.2.1.			
Options	Construction	Maintenance (outfield)	Maintenance (cricket square)	Total ex VAT
Earthworks Option 1 (Fig 16)	£185,255.46	£4,850.00		£190,105.46
Cricket Squares + ancillary items	£187,731.50		£16,700.00	£204,431.50

Matt Young – December 2020

2 INTRODUCTION AND OBJECTIVES

TGMS Sports Surface Consultants under PSD Agronomy has been commissioned by Eastleigh Borough Council to conduct a detailed feasibility of Lapstone Playing Fields for the development of two new cricket squares and outfield. The planned development will provide Fair Oak Cricket Club with additional facilities to accommodate the increasing number of teams using the current square.

An original feasibility report was produced for an area to the north of the existing cricket pitch and outfield and between two existing football pitches which are heavily used, however the scope of works has since changed and the need for winter sports pitches has been reduced following pitch relocation to another site. This feasibility report therefore focuses solely on the development of additional natural turf cricket facilities in line with the document: Lapstone Playing Fields: Second Cricket Wicket Feasibility Brief – received from Eastleigh Borough Council.

The objectives of the feasibility study are as follows:

- To undertake a detailed site investigation in order to characterise the underlying soil profile, current agronomic condition of the site, topography of the site and its impact on playability, drainage and any potential outfall arrangements.
- To prepare a set of development options for the location of the cricket squares and outfield based on the key deliverables.
- 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.

In line with the Eastleigh Borough Council brief, the key deliverables for the project are:

- A (minimum) 6-wicket natural turf cricket square (9 wicket desirable) and outfield to meet the playing needs of Fair Oak CC
- An 8-wicket natural turf cricket square (9 wicket desirable) and outfield to meet the playing needs of Fair Oak CC Junior, women's and men's 3rd and 4th XI's, pitch to be serviced by the existing onsite cricket pavilion.
- Both grounds to meet Sport England/ECB recommended boundary sizes dimensions
- Pitches should be designed to ensure compliance with the minimum performance quality standards of the ECB for natural turf pitches.

In line with the brief there are various constraints affecting the site, not least of all the presence of a drainage culvert running through the centre of the proposed location of the northern square and outfield, significant topographical issues in creating a level playing field, the presence of mature trees which will require removal and the relocation of existing artificial cricket nets.

The site is currently maintained by Fair Oak Parish Council and will continue to do so following development of the site. It is also important that the existing football pitches are to be relocated to another development area (off-site).

The focus of the development, aside from creating additional facilities for Fair Oak CC, is to encourage community use and meet the needs of local disabled teams and schools.

3 PHYSICAL SITE SURVEY

TGMS carried out an initial site survey on the 24th July 2018. The area was surveyed in order to produce topographical data (RTK-GPS) and to establish the degree of variation in the type and condition of the soil at different locations (Electro-magnetic inductance scan). Matt Young of TGMS Ltd conducted a follow-up detailed site investigation on the 31st August 2018 to evaluate the site with regards to the potential development of a cricket square.

3.1 Site location and access

The site for redevelopment is within Lapstone Playing Fields, Fair oak, Eastleigh, SO50 7PS.

Vehicular access to the site is from Pavilion Close which leads to an external and internal gated car park. There are numerous pedestrian access surrounding the site. Vehicular access will be made available for any construction works.

The grid reference for the centre of the development area (SOSC) is: OSGB 449353, 117897.

Nearest Postcode: SO50 7PS

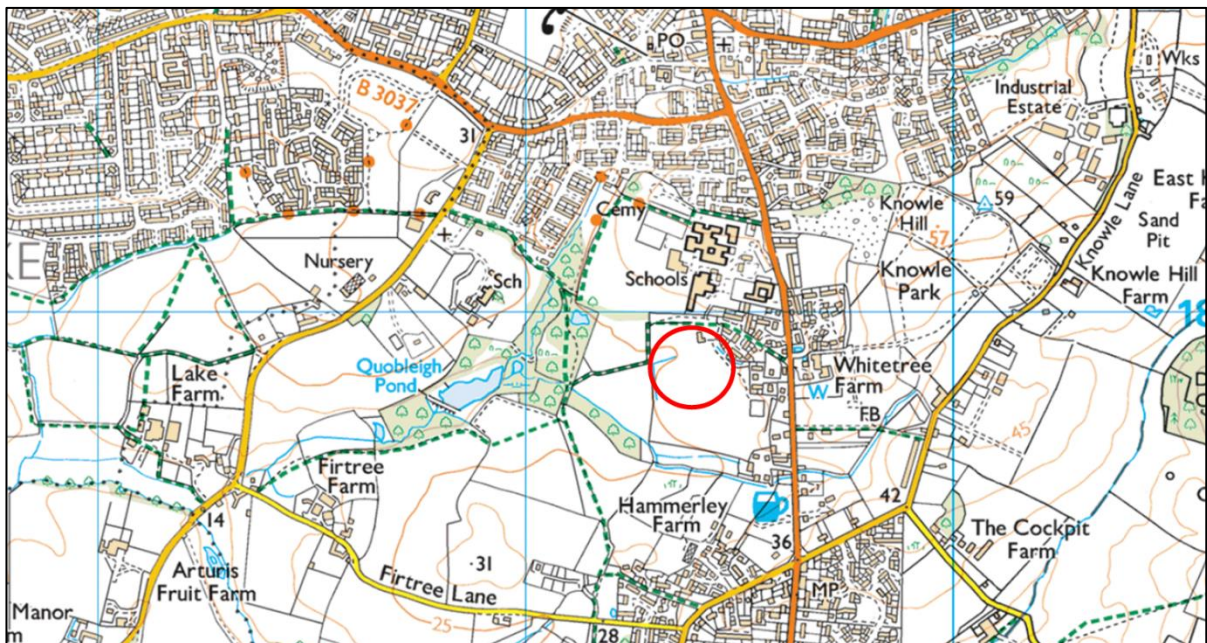


Figure 1 Site location (Red circle). Location indicative only and not to scale.

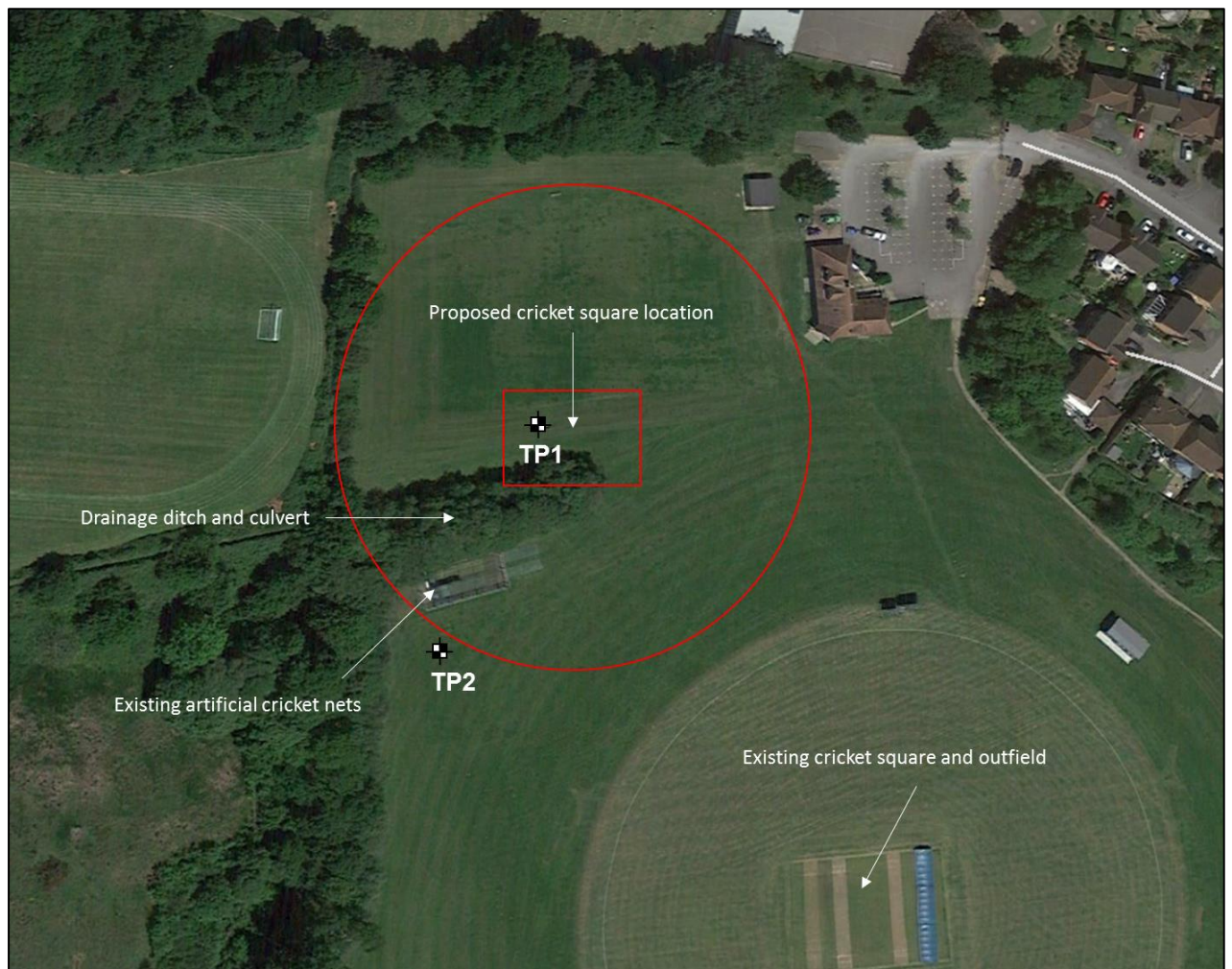


Figure 2 An image showing an overview of the initial site survey including area of interest (pitches indicative only). Existing cricket pitch to be relocated to the south of the development area. TP1 and TP2 mark the location of trial pits.

3.2 Geomorphology and climate

3.2.1 Hydrology

A drainage ditch runs east to west through the centre of the site towards Quobleigh Pond. The nature of the drainage ditch has not been established however a balancing pond to the east of the pavilion also utilises the drainage ditch as outfall as does existing piped drainage from the sports pitches. It is likely that the outfall eventually leads to the River Itchen however further information from the local lead authority will be required to ascertain the exact nature of the drainage ditch.

The drainage ditch is culverted within the playing area and opens out upon reaching the trees. The ditch is circa 2 metres deep but varies in depth to outfall, surface levels on the base of the ditch were not surveyed due to dense tree cover however levels of the bank and headwall were surveyed and this will assist with calculating the required quantity of fill.

Climate data obtained from the Flood Estimation Handbook (FEH) indicate that the standard-period average annual rainfall (SAAR) is 799 mm for this catchment, marginally below the average UK rainfall of 885 mm/year (see Figure 4).

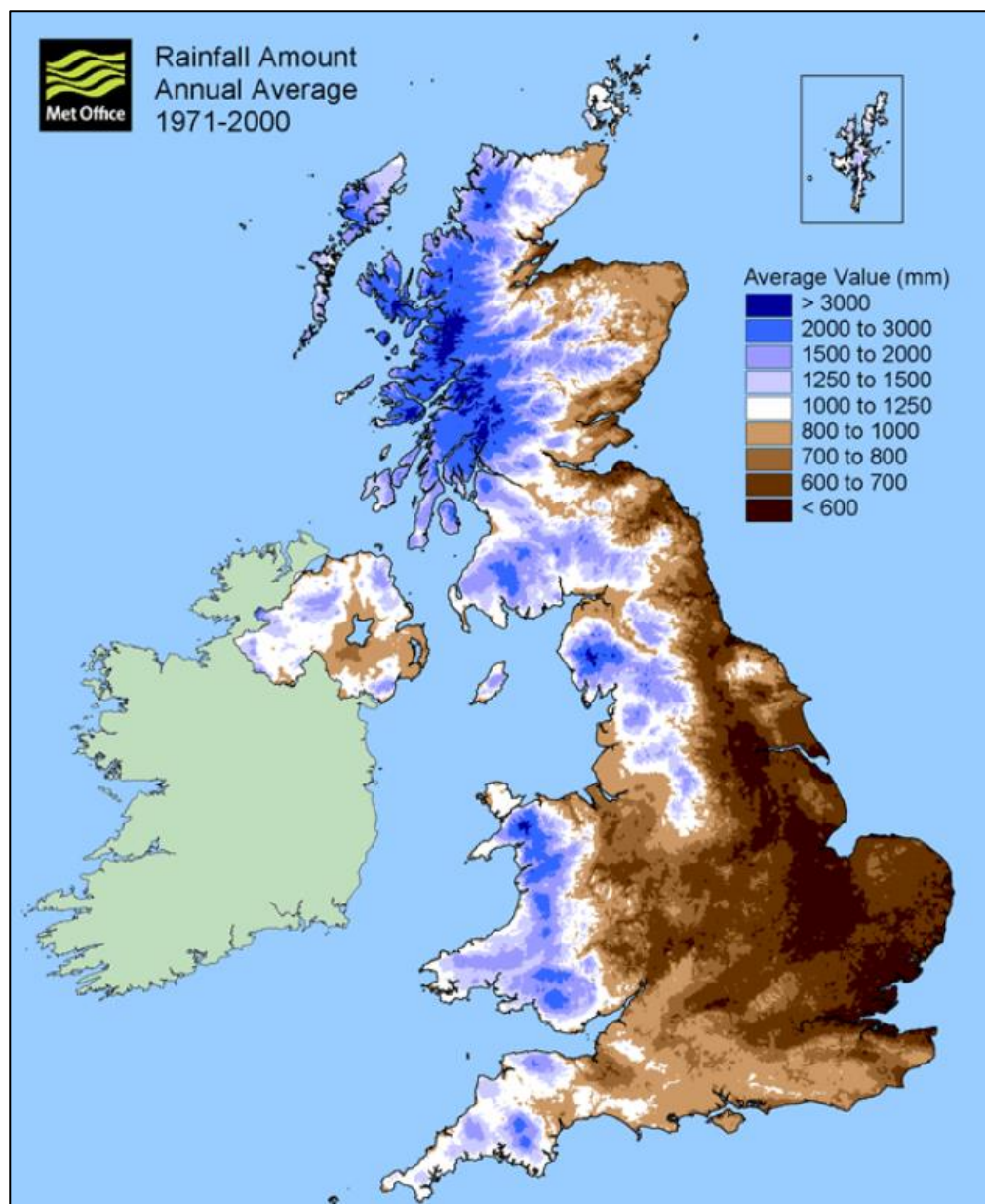


Figure 3 Rainfall amount Annual Average Courtesy of the Met Office (1981-2010)

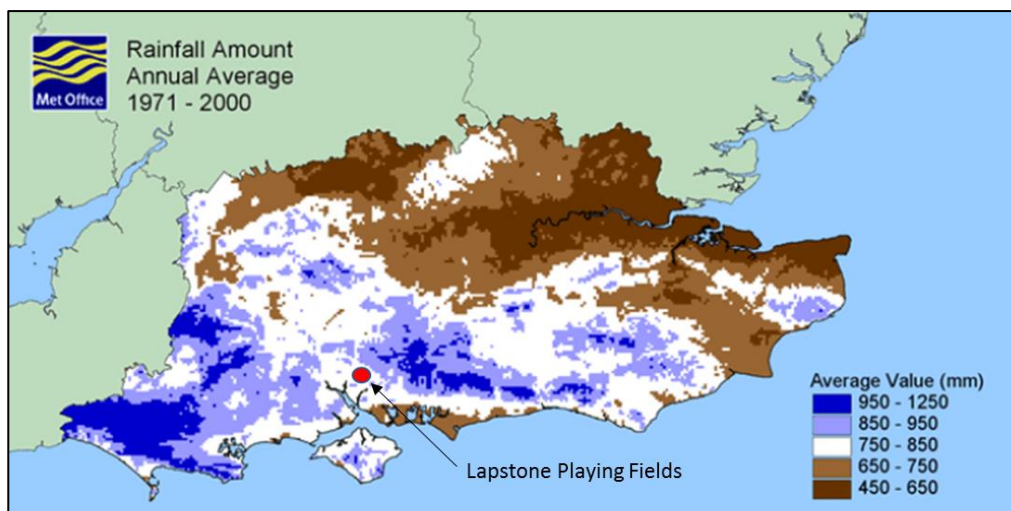


Figure 4 Close up of location in relation to annual precipitation.

Greenfield runoff rates and drainage outfall rates (for the fill area only) have been calculated using the Flood Estimation Handbook method and are presented in Table 1. The installation of a new drainage scheme within the fill area would not cause faster or greater flow than the current Greenfield condition. Drainage design should account for at least the 1:30 return period outfall rate over a 24-hour period of 1.5 L/s.

Table 1 Greenfield run off rate (FEH method) and Drainage outfall rates (ADAS 345 Method) for the 6 hr and 24 hr duration events for the return periods shown (0.2 ha – fill area).

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	1.11	0.5	0.8
1:30	2.99	1.1	1.5
1:100	4.15	1.4	1.8

3.2.2 Risk of flooding from Surface water

Based on information obtained from the Environment Agency (EA), the development area has a low risk (between 0.1 and 1%) of flooding from surface water.

3.2.3 Risk of flooding from Rivers and Seas

Based on information obtained from the Environment Agency (EA), the development area has a very low risk (<0.1%) of flooding from Rivers and Seas.

3.2.4 Landfill

Based on information obtained from the Environment Agency (EA), the development area is not located over any former landfill sites.

3.2.5 Groundwater

Based on information obtained from the Environment Agency (EA) the development area is not located within a Groundwater Source Protection Zone. There may be potential to construct a deep-bored soakaway for the discharge of surface water should a more convenient method of outfall not be available and the geology is suitable.

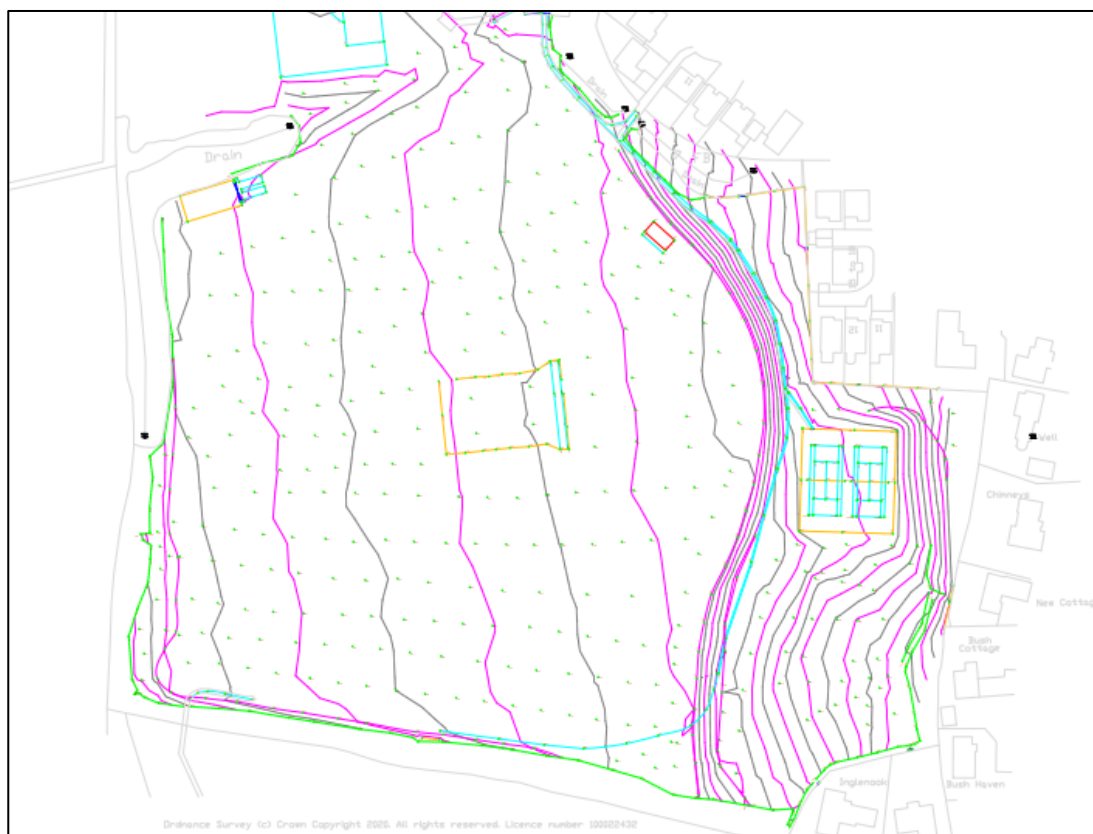
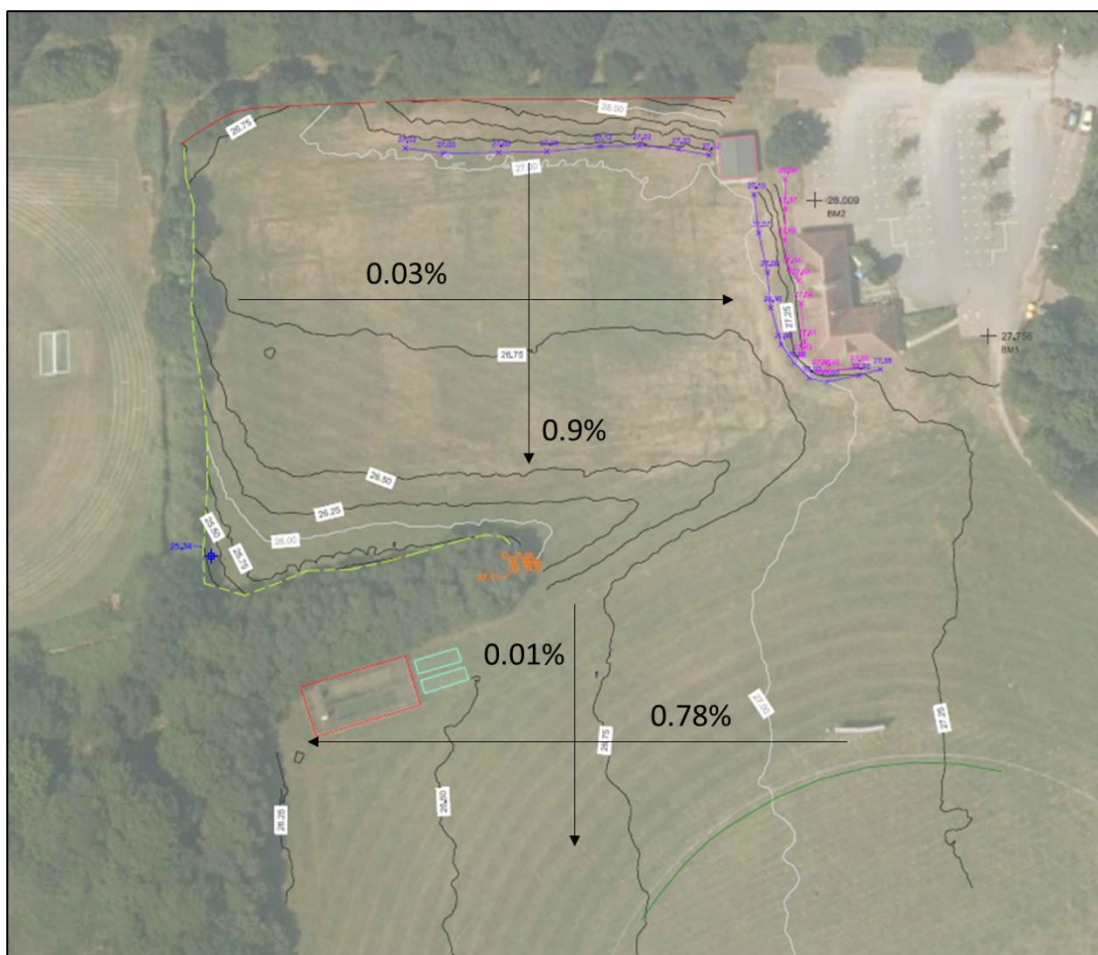
3.3 Topographical (levels) survey

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

The site is inherently flat aside from the topography of the drainage ditch situated within the proposed location of the northern cricket square. The football pitch to the north of the proposed cricket square has a gradient of 0.9% falling from north to south and a gradient of 0.03% falling from east to west, the gradients are compliant with Sport England guidelines for slopes for sports pitches (football).

The gradient of the playing field to the south of the proposed cricket square location has a fall of 0.01% falling from north to south and 0.78% grade from east to west (gradients measured within the footprint of any proposed outfield as part of the cricket square construction). These gradients also fall within Sport England guidelines for slopes for sports pitches (cricket).

Provided the drainage ditch can be filled with imported material to match the existing gradients to the north and south of the development, gradients will comfortably fall within recommended gradients for cricket outfields as stipulated within the ECB TS4 document.



Additional topographic information was provided by Eastleigh Borough Council which shows the contours of the remaining area to the south which will also accommodate a new cricket square and outfield. Figure 6 clearly shows that the original playing field development was subjected to cut and fill earthworks and there is a consistent fall from east to west with gradients in line with ECB recommendations as per the TS4 document.

3.3.1 Pitch orientation

Sport England (SE) has also published guidance on optimum pitch orientation for a range of sports (see Figure 7). The proposed indicative layout (see Figure 8) shows the orientation of the cricket pitch is 0° and therefore compliant with ECB guidelines of between 305° and 055°.

Development options have been explored to determine the potential boundary sizes possible following cut and fill earthworks. In terms of boundary size, the outermost pitches have boundaries of 45.72 m which is considered the ECB minimum boundary size to accommodate community and club cricket and therefore boundary sizes will increase for the inner pitches. The boundary to the west abuts the hedge line and drainage ditch, further works will be required to ensure a suitable buffer between the playing area and the existing outfall; further information regarding the proposed indicative layouts and subsequent cut and fill earthworks can be found in **Section 3.9 – Proposed Indicative Layout**.

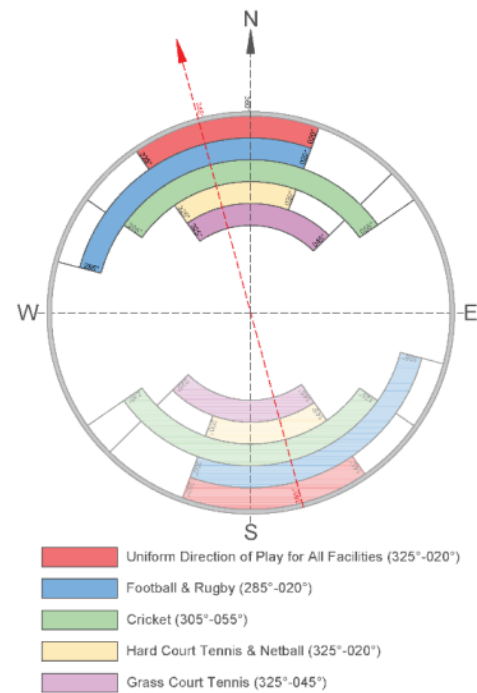


Figure 7 Optimum pitch orientation (Sport England)

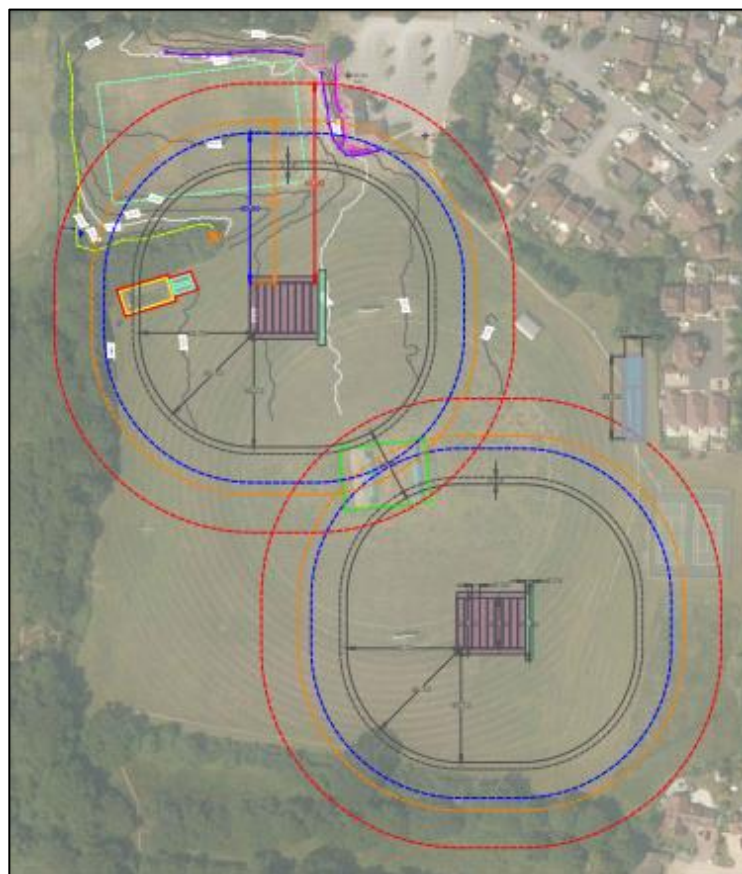


Figure 8 Image showing proposed layout of the cricket squares and outfields.

3.4 Soils and geology

The soil on site was borderline between unmapped and mapped areas due to the sites urban location. Based on the surrounding soils and data from the Soil Survey of England and Wales, it is likely that the soil is classified as the WICKHAM 4 association, described as, 'slowly permeable seasonally waterlogged fine loamy over clayey and fine silty over clayey soils associated with similar clayey soils, often with brown subsoils'. The geology is Drift over Tertiary clay.

Data from the British Geological Survey indicates the following:

Superficial Deposits – None recorded

Bedrock Geology - The site lies over two separate geologies, to the north of the ditch, the soil overlies the Whitecliff Sand Member - Sand. Sedimentary Bedrock formed approximately 23 to 66 million years ago in the Palaeogene Period. Local environment previously dominated by shallow seas. To the south of the ditch, the soil overlies the Wittering Formation - Sand, Silt and Clay. Sedimentary Bedrock formed approximately 41 to 56 million years ago in the Palaeogene Period. Local environment previously dominated by shallow seas.

This geological information would indicate that the site is split into two distinct rock types, the nature of the bedrock to the north of the ditch may be suitable for the installation of a deep bored soakaway whilst the geology to the south of the ditch may be less conducive. Given the nature of the current outfall on site (drainage ditch), the use of deep bored soakaways as outfall may be considered impractical.

3.4.1 Publicly accessible boreholes

Publicly accessible records of boreholes situated in the vicinity of the site (to the north in the more efficacious site geology) indicate topsoil (type unknown) over made ground comprising silty sand with wood and rootlets to a depth of 3 m below ground level (bgl) over Bagshot sands to depths in excess of 10 metres bgl.

http://scans.bgs.ac.uk/sobi_scans/boreholes/15952510/images/15270842.html

BGS ID: 15952510: BGS Reference: SU41NE321

British National Grid (27700): 449010,118820

It is anticipated that the site geology will offer moderate to high permeability and could therefore be considered for the installation of a deep bored soakaway to be used as drainage outfall. It is recommended in the event that no drainage outfall is identified e.g. highways drainage, connection to existing infrastructure, that a bespoke point prognosis report from the British Geological Survey is commissioned to fully evaluate the suitability of the indigenous bedrock coupled with BRE 365 infiltration testing.

3.5 Soil sampling

Two soil trial pits (see Figure 8) were excavated by hand at targeted locations to characterise the underlying soil profile. Soil samples were removed for laboratory analysis to determine soil texture and basic nutrient status. Whilst not pertinent for the development due to the majority of soil being imported fill, the soil analysis does provide additional information for any future drainage works.

3.5.1 Trial Pit Profile Descriptions

Lapstone
Playing Fields



Topsoil depth	200 mm	220 mm
Topsoil texture	Poorly structured Clay Loam topsoil	Moderate structure with evidence of cracks and fissures, very friable dry Clay Loam topsoil, heavily compacted in the upper 100 mm
Stones	High stone content within both the topsoil and subsoil, comprising predominantly flints and cobbles up to 70 mm in longest axis.	Moderate stone content within both the topsoil and subsoil, comprising predominantly flints and cobbles up to 50 mm in longest axis.
Thatch depth	~20 mm	~20 mm
Subsoil texture and depth	De-structured subsoil, very friable, slight mottling at 700 mm bgl indicating a changing water table – Clay Loam	Very hard sub-soil, excavation deeper than 500 mm was not possible
Groundwater	None encountered	None encountered
Ground cover	Moderate, ~70% with the sward droughting off	Moderate, ~70% with the sward droughting off
Surface levels	Moderate with only minor undulations, gradients in line with SE PQS	Moderate with only minor undulations, gradients in line with SE PQS
Surface conditions	Very dry due to a prolonged period of drought, reflected in the condition of the sward.	Very dry due to a prolonged period of drought, reflected in the condition of the sward

3.5.2 Soil Texture

Laboratory analysis of soil texture differed from field observations (Table 3) with the presence of sandier, siltier soils, characterised within the topsoil and subsoil profiles. A sample of the drainage backfill was removed from a drain within the football pitches, this was tested to ascertain the suitability of the backfill for future drainage.

Table 3 Soil Texture.

Trial Pit	Depth (m)	Sand (%)	Silt (%)	Clay (%)	Classification
TP1	0.000 – 0.200	59	27	14	SANDY LOAM
	0.200 – 0.800	39	39	22	CLAY LOAM
Drainage Backfill	0.000 – 0.200	81	13	6	LOAMY SAND*

*Acceptable backfill material for primary drainage schemes which should offer the requisite drainage characteristics.

3.5.3 Topsoil Nutrient Status

Samples of topsoil were sent to a contract laboratory for analysis of nutrient status. pH values are sufficient for the cultivation of Perennial ryegrass without the need for additional fertiliser. With regards to nutrients, indices of 2 and above indicate that there is sufficient supply of a particular nutrient. With reference to Table 4, generally nutrient status is very good. An additional fertiliser regime would be required in conjunction with pitch construction and good agronomic maintenance.

Table 4 Topsoil nutrient status.

Trial Pit	pH	Phosphorus (P) (mg/l)	Index	Potassium (K) (mg/l)	Index	Magnesium (Mg) (mg/l)	Index
1	6.6	17.8	2	118	1	134	3
2	5.5	34.8	3	81	1	56	2

In summary, the soil is characterised by a layer of moderately structured SANDY LOAM topsoil containing a moderate to high stone content overlying CLAY LOAM subsoils. In general, it is concluded that the texture of both the topsoil and subsoil should offer reasonably good drainage rates if managed well with respect to the creation and maintenance of good soil structure. Light-textured soil, such as sandy loam, is particularly susceptible to compaction as it tends not to re-structure naturally through shrink and swell processes that would normally be associated with clay dominated soils. The site would therefore benefit from routine de-compaction operations such as verti-draining or ground-breaking.

The composition and texture of the soil profile is conducive to water and nutrient retention, i.e. the site should not be particularly drought prone and soil bound nutrients should not be readily leached. Topsoil characteristics would suggest that the drainage capacity could be equal to or greater than Sport England minimum recommendations of >5 mm/hour. Relatively high silt contents (39%, high) would have a moderate impact on indigenous drainage rates and indeed any piped drainage system in-situ which may require regular jetting and cleaning of silt traps.

It is pertinent to note that the site will require significant earthworks in the form of subsoil and topsoil import within the culver area to produce outfield gradients in line with ECB/Sport England guidelines. The nature of these works will invariably consolidate the materials such that indigenous drainage rates will be significantly reduced until a period whereby the soil has restructured though natural (shrink swell of soils) and mechanical means (Aeration procedure i.e. Verti-drain). Imported material will, through construction compaction, alter the porosity of the underlying soil profile and limit 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 drainage or evapotranspiration. This can lead 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 and 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 primary piped drainage scheme within the footprint of any imported materials (culvert area). Client reports indicate that the remaining outfield drains efficiently and given there will be no material changes apart from the culvert and installation of cricket squares, it is assumed that site wide outfield drainage will not be required.

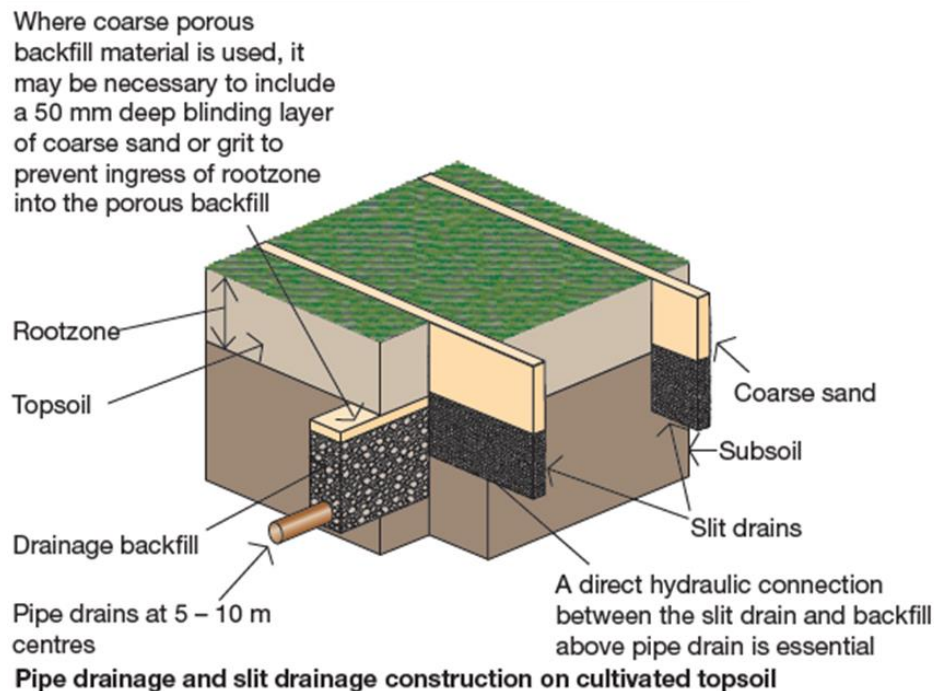


Figure 9 Typical sand band/slit-based drainage system (Ref: Sport England Design Guidance Note "Natural Turf for Sport", 2011)

3.5.4 Stone content

Observations made during the initial site visit identified a moderate to high stone content within the trail pits excavated. Stone content comprised primarily sharp-edged flints and cobbles/pebbles and pose a significant injury risk to users of the facilities if not dealt with properly during the construction phase.

Whilst the redevelopment comprises predominantly imported fill, there may be instances when the indigenous topsoil is excavated and laid bare, with this in mind it is important that a robust methodology is employed to deal with high stone content and mitigate the potential injury risk to patrons using the facility.

3.6 Existing drainage infrastructure and outfall

No existing drainage infrastructure was evident in the test pits excavated.

As per the initial brief, there is a comprehensive drainage scheme within the footprint of the football pitch to the north of the drainage ditch, whilst part of this area will be encompassed within the development of a cricket outfield, the drainage scheme can remain untouched and will only augment the drainage status of the outfield.

The area to the south of the drainage ditch and cricket nets has historically been a very wet area which in past seasons has been unusable during the winter and periods of inclement weather. This has recently been drained using sand slits and it would be preferable not to disturb this infrastructure.



Figure 10 Collector drain discharging into the drainage ditch to the west of the site



Figure 11 Sand slits entering the collector drain

3.6.1 Drainage ditch and culvert

The site is characterised by a central swale running in an east to west direction between the northern most football pitch and the cricket square and outfield to the south. The culvert is located below the swale and it continues for a distance of approximately 90 metres across the playing field before opening out into a tree lined ditch which continues to the western boundary.

In order to develop a square and outfield to the north, both the drainage ditch and swale will require filling with imported material to match the existing gradients surrounding the development area. Prior to any import, the culvert will require extension to the site perimeter on the west so as to not inhibit the flow of any drainage following fill import.

It is imperative that the local lead authority or whoever has tenure over the drainage culvert is consulted prior to any design stage. The proposed works are significant and further information regarding the nature of the drainage ditch including the eventual outfall is required. The development works could potentially utilise all available space along the western perimeter which is currently wetland due to the drainage outfall. The ditch may need culverting to the opposite side of the boundary to optimise the amounts of usable green space within Lapstone playing fields.

At the time of the survey it was not possible to enter and survey the base of the ditch or indeed the depth or width due to the dense trees surrounding the area. It is recommended that the ditch is surveyed in its entirety during the winter period when access and tree cover may be less. A total station survey is also recommended, as this does not rely on GPS and is therefore not affected by tree or building cover. A change in the depth and width of the drainage trench will affect the volumes of cut and fill required to match surrounding levels, therefore accurate dimensions will be a pre-requisite to accurately model the amounts of imported material required. For the purpose of the indicative costs, TGMS have taken the level of the bottom of the headwall, the width of the ditch from both tree lines and estimated falls within the trench of 2% and 5%. This will provide relatively accurate estimations for the purpose of indicative costings however this would not be considered a suitable methodology if the project enters the design stage.



Figure 12 Image of the swale extending towards the pavilion



Figure 13 Image showing the end of the culvert and beginning of the ditch



Figure 14 Close up of the culvert



Figure 15 End of ditch and outfall on western boundary

3.7 Artificial Cricket Nets

To the south of the drainage ditch are some existing artificial cricket nets with cage and surrounding fence. The proposed development will require the removal and reposition of the cricket nets in a location yet to be determined (likely to be to the east of the cricket squares). Due to the age and condition of the system and the methodology behind removal, it is unlikely that most of the net system could not be salvaged, aside from potentially the cage. It is recommended that an ECB approved net supplier/contractor assess the current condition of the nets prior to relocation.

3.8 Performance Quality Standards

Performance Quality Standards (PQS) provide a recommended minimum quality standard for the construction and maintenance of natural turf pitches. PQS were originally developed via a voluntary technical consortium with representation from the Sports Turf Research Institute, National Playing Fields Association and the Institute of Groundsmanship, and have now been

adopted by Sport England and Governing Bodies of Sport (Ref: Appendix 4 of Natural Turf for Sport, 2000, ISBN 1 86078 103 9 – 2nd Edition, 2011).

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

3.9 Proposed indicative layout

An indicative layout has been produced by TGMS to show the location of 2 new cricket squares and outfield following the proposed relocation of the winter sports pitches as part of the Horton Heath development. Due to the relocation of winter sports pitches, it is now more feasible to relocate both the existing square and add an additional square which best utilises the size and shape of the development area. In previous iterations, the existing square was to remain in its current location however the opportunity to reconstruct the southern square has enabled the positioning of two standalone cricket squares and outfield with boundary dimensions as per ECB guidelines, this layout reduces the need for additional ball stop netting (between boundaries) due to the original feasibility outlining the close proximity of adjacent boundaries. This proposed indicative layout provides a 30-metre buffer between adjacent outfield as per ECB recommendations.

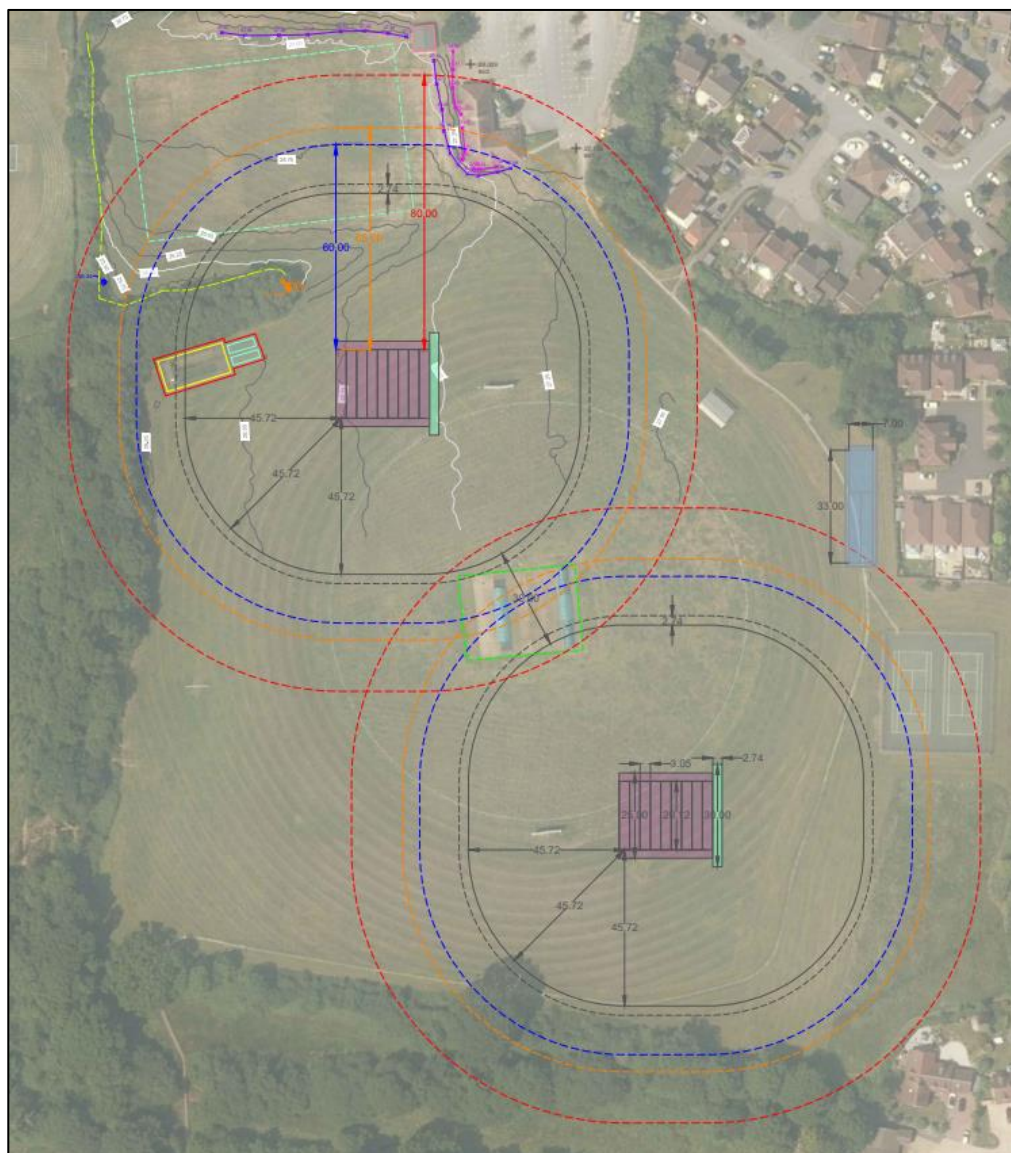


Figure 16 Proposed indicative layout including boundary dimensions, proximity to neighbouring infrastructure and indicative ball strike regions.

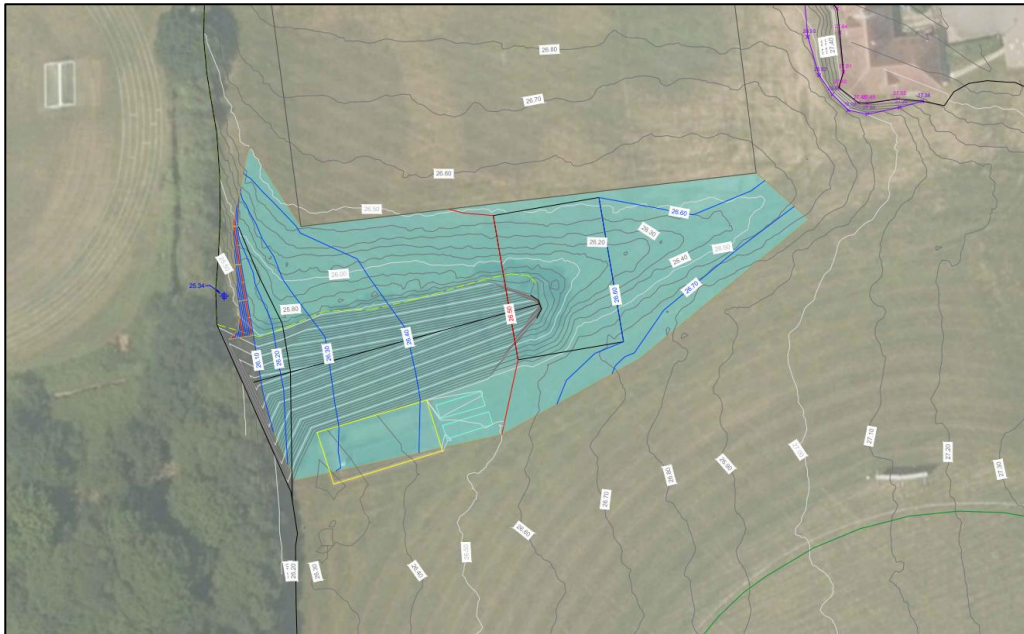


Figure 17 Indicative development option for cut and fill to address the culvert

With the proposed indicative layout (Figure 16) there would still be a requirement to undertake earthworks within the culverted area (mainly fill) to provide outfield gradients in line with ECB recommendations.

Option 1 (see Figure 17) shows the drainage ditch and swale filled using the starting gradient from the touchline of the adjacent football pitch. This option provides a cricket outfield with a gradient of 0.55%. Due to the nature of the topography, the fill element will provide a gradient falling from east to west to tie in with the gradients of the existing playing area to the south of the proposed square. This option does not impact on any of the recently installed drainage addressing the wetter areas to the south of the drainage ditch.

Due to the inability to accurately survey the extent of the drainage ditch (due to significant tree cover and dense vegetation), it has been assumed that the ditch runs east to west at an approximate grade of 2%, this is based on surface levels, levels of the headwall and levels of the surrounding banks. At 2% the amount of fill required to produce the levels as per option 1 would be circa 1700 m³. TGMS also modelled a fill exercise with the gradient of the ditch at 5% (steeper) and fill amounts were calculated to be on the region of 2000 m³.

This option would not impact on the newly installed drainage to the south of the existing cricket nets and due to the nature of cut and fill, particularly the construction compaction associated with extensive earthworks and loss of soil structure, it is recommended that a drainage scheme is installed within the footprint of any earthworks employed to address the culvert.

The indicative layout utilises all available space to the west of the proposed square to best facilitate both playing gradients and boundary sizes in terms of sustainable sports use. Where the fill area meets the western boundary, there is likely to be a significant drop down to existing drainage ditch levels. The proposed level (following fill) of the playing area on the western boundary is 26.10 m AOD, the indicative level of the base of the drainage ditch is 23.289 (based on the assumption that the drainage ditch falls at 2%), therefore there is likely to be a drop of ~3 metres from proposed levels to the surrounding area outside of the boundary perimeter. This may necessitate the construction of a retaining structure; otherwise the boundary will have to be significantly reduced in order to create sufficient space to construct a 1:3 batter slope as per Sport England guidelines.

These calculations are based on indicative levels of the drainage ditch and whilst calculations could be subject to change following a more accurate levels survey, the principal of a retaining structure remains pertinent due to the nature of the works.

3.9.1 Adjacent cricket outfield and existing boundaries

Previous iterations of the proposed layout identified the potential need for additional ball stop netting due to the proximity of adjacent boundaries, this was considered high risk from an ECB perspective whilst adding significant cost to the project

A new indicative layout (Figure 16) ensures there is a 30 metres buffer zone between adjacent boundaries which is acceptable and aligned with ECB guidance. What is pertinent to note from the layout is the close proximity of the existing pavilion to the northern most boundary and the existing tennis courts on the eastern perimeter of the proposed southern square and outfield.

Due to the close proximity of both outfields to neighbouring infrastructure, it may be necessary to commission a ball strike risk assessment to understand the requirement for any additional ball stop netting around the perimeter of the site.

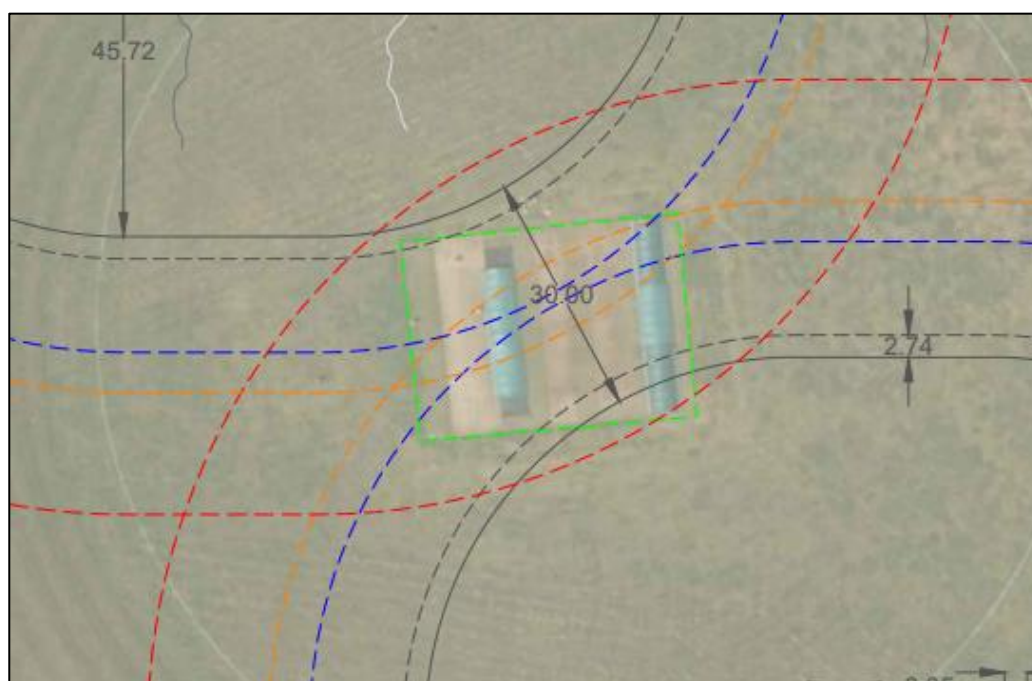


Figure 18 Image showing distance between proposed cricket outfields at 30 metres and aligned with ECB recommendations.

3.10 Agronomic assessment and site overview

An agronomic assessment of the existing football pitch to the north and the proposed new outfield to the south of the drainage ditch was carried out.

Vegetative cover was ~80% and predominantly comprised sports specific perennial ryegrass (*Lolium* spp.) and annual meadow grass (*Poa annua*). The broad-leaved weed population within this cover was low (<5%). Thatch (organic matter at the base of the grass sward) was evident at ~ 10 mm. Grass height is circa 35 mm and falls within grass height recommendations for winter sports pitches and is in line with Sport England Performance Quality Standards (~30-35 mm).

The grass sward was significantly stressed due to the drought period currently experienced within the UK. The grass plant has stopped respirating and photosynthesising due to limited water uptake, this is reflected in the turgidity of the leaf and pale colour of the sward. In general, the agronomic condition of the area would be considered good.

Client reports indicate that the surface water drainage scheme within the football pitch performs well. Certain areas immediately surrounding the drainage ditch and cricket nets are prone to waterlogging, with many of the areas unusable during the winter period and during inclement weather. These areas may be subjected to fill or re-grading during cut and fill earthworks, it is therefore recommended that additional drainage is installed to negate the effects that construction compaction will have on soil infiltration rates.

3.10.1 Trees

The removal of a significant number of trees will be required in order to site a cricket table in the proposed location. It is important that a thorough arboricultural assessment is implemented including any identification of protected species or tree preservation orders. Trees also provide habitats to indigenous species such as bats and birds, it is also statutory to implement bat surveys as part of a site wide ecology assessment. It is also pertinent to note that the bird nesting season runs from February to August and removal of trees within this period is likely to be prohibited.

3.11 Site usage

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

Table 5 Sport England estimated usage levels.

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

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

It is pertinent to note however that after cut and fill earthworks, if the outfield/pitches are undrained then it is likely that they would support under 1 hour of use per week before pitch conditions deteriorate. This is due to the aforementioned construction compaction, a by-product of cut and fill earthworks significantly altering the soil structure, in turn, the permeability of the indigenous soils.

3.12 Sports provision and cricket square usage

As per the brief provided by Eastleigh Borough Council, one of the key deliverables was to provide 2 Nr. Cricket squares and outfields, with a minimum of six pitches on each square although 9 is desirable, compliant with ECB guidelines to meet the playing needs of Fair Oak CC. As per section 3.9 – proposed indicative layout, both squares will be able to accommodate 9 pitches with 50-yard boundaries (ECB recommendation for Premier League Cricket) and therefore the client must consider the following:

- Does the size of the square meet the needs of the club in terms of fulfilling the necessary fixtures per season? (please note: excessive use of the same pitch can lead to playability and safety issues)
- Do the engineering requirements including capital costs to construct a square and outfield justify the limited number of ECB compliant pitches?
- Do the high maintenance costs for the project including the installation and maintenance of drainage justify the number of ECB compliant pitches?

- Does the close proximity of any neighbouring infrastructure affect playability of any new development and is there a potential need for ball stop netting to protect participants?

In terms of projected usage, typically each pitch will accommodate 3 Nr adult games plus 2 Nr Junior games and that each Junior pitch can accommodate up to 6 Nr games. Therefore, the capacity of a 6-pitch square would be:

$9 \times 3 = \underline{27 \text{ Adult games}}$ and $(9 \times 2) + (9 \times 4) = \underline{54 \text{ junior games.}}$

Depending on the league fixtures, it is possible that the new squares could host an adult league game once per week which would equate to approximately 18-20 home games per season, therefore a nine-pitch square would easily meet the full number of matches.

It is important that the client on behalf of the club are fully aware of the likely number of fixtures per season and whether the proposed cricket square could support those fixtures based on the above usage guidelines. It is recommended that a non-turf pitch is installed to cater for younger age-group junior cricket which would increase availability of the natural turf pitches for older juniors. The costs for a non-turf pitch will be included within section 4.3 Indicative costs.

3.13 Other items

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

- **Planning permission** – Where cut and fill earthworks are required resulting in a change of levels, or where drainage installation is recommended, it may be prudent to obtain guidance from the local planning department as to whether planning permission is necessary.
- **Irrigation** – The construction of a cricket square relies on optimal weather conditions to aid germination and grass plant establishment, including sufficient rainfall. In some cases, when construction is carried out in summer and during droughty conditions, supplementary irrigation may be required, the costs of which should be factored in to the budget. It is the responsibility of the Client to provide sufficient irrigation during the duration of the construction project and subsequent maintenance period.
- **Irrigation water point** – The maintenance of cricket squares requires an in-situ water point to ensure adequate preparation of the cricket wicket in line with ECB/Cranfield University guidelines. The installation of a water point should be factored in to any design and specifications document.
- **Outfall** – When discharging into existing drainage or natural water courses, it may be necessary to obtain the relevant permissions including land drainage consent from the Environment Agency, landowners or local authorities. These procedures can significantly delay proceedings and prior investigation may be necessary at feasibility stage.
- **Maintenance Scheme** - With any development of this size it is imperative that a well-structured intensive maintenance programme is implemented on an ongoing, long term basis to maintain the facilities following large scale investment. This should be with the appropriate equipment operated by suitably trained and qualified personnel. Failure to implement the recommended maintenance operations will result in a deterioration of pitch conditions and subsequent availability for use.
- **Compaction during earthworks** – Cut and fill earthworks involve significant earthmoving using large plant machinery e.g. dozers, excavators and dumper trucks. The nature of the works invariably changes the soil structure which can become compacted, resulting in a significant reduction in surface water infiltration rates.

Differential settlement is also not uncommon. With any cut and fill operations it is important that a drainage scheme is designed to mitigate the impact over-consolidation and loss of soil structure may have on natural infiltration rates.

- **Drainage settlement** - Land drains can be prone to differential settlement (i.e. there can be some sinkage over the drain lines) particularly when the underlying soils have a high clay content 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.
- **Services** - Due to the nature of the works incorporating significant drainage; a services search will be required prior to any development works at a cost to the client. It is assumed that an in-depth services search will be commissioned as part of the overall site feasibility.
- **Differential settlement** – Due to the nature of the works encompassing significant amounts of fill, there is the potential of differential settlement, particularly as organic matter within the materials break down thus creating voids. It is imperative that any fill material is imported in sufficient layers and consolidated appropriately prior to further import.

4 SUMMARY AND RECOMMENDATIONS (based on the additional addendum)

4.1 Principal factors affecting the condition of the site

1. The principal objective of this project is to provide a feasibility study for the proposed development of 2 Nr. natural turf cricket facilities within Lapstone Playing Fields, Fair Oak, Eastleigh.
2. The key deliverables for the Lapstone Playing Fields brief are two natural turf cricket facilities comprising: A (minimum) 6-wicket natural turf cricket square (9 wicket desirable) and a 8-wicket natural turf cricket square (9 wicket desirable) and outfield to meet the playing needs of Fair Oak CC Junior, women's and men's 3rd and 4th XI's, pitch to be serviced by the existing onsite cricket pavilion, both grounds to meet Sport England/ECB recommended boundary sizes dimensions for a 6-pitch cricket square as best as possible, Pitches should be designed to ensure compliance with the minimum performance quality standards of the ECB for natural turf pitches.
3. To deliver the brief will require significant earthworks to extend an in-situ culvert and to fill an existing drainage ditch which runs east to west across the playing fields. The ditch is within the footprint of the proposed location of the cricket outfield of one of the proposed squares. Further assessment will be required from the local lead water authority.
4. Indicative designs indicate that it is possible to construct 2 Nr. 9-pitch cricket squares with minimum ECB boundaries with the addition of an artificial cricket pitch on both squares.
5. An indicative proposed layout shows ~30 metres between boundaries, comfortably exceeding the 30 metres as recommended by the ECB. therefore, it is envisaged that ball-stop netting will not be required which is neither desired nor appropriate given the nature of the park in terms of public access.
6. It is feasible to utilise the existing square during the construction and maintenance of any proposed squares although boundary distances to the south may fall slightly short of ECB recommended guidelines.
7. The topography of the site predominantly complies with SE/ECB guidelines for slopes for sports pitches aside from the drainage culvert and swale running through the site. Compliant gradients are possible to achieve following material import, however there may be a requirement for a retaining structure on the western boundary due to the difference in the existing and proposed levels.
8. Significant tree removal will be required prior to earthworks. An arboricultural and ecology report will be required as will understanding the limitations regarding tree work and bird nesting season.
9. The site comprises a poorly-structured layer of predominantly SANDY LOAM topsoil containing a moderate to high stone content overlying CLAY LOAM subsoils. Following any cut and fill earthworks it is recommended that as a minimum, a primary land drainage system is installed, if possible, with supplementary secondary drainage.
10. According to the British Geological Survey, the site lies over two separate geologies, to the north of the ditch, the soil overlies the Whitecliff Sand Member - Sand. Sedimentary Bedrock formed approximately 23 to 66 million years ago in the Palaeogene Period. Local environment previously dominated by shallow seas. To the south of the ditch, the soil overlies the Wittering Formation - Sand, Silt and Clay. Sedimentary Bedrock formed approximately 41 to 56 million years ago in the Palaeogene Period. Local environment previously dominated by shallow seas. The geology may be suitable for use as outfall provided a bespoke point prognosis report is commissioned along with BRE 365 infiltration testing

11. A comprehensive drainage scheme has been installed into the football pitch situated to the north of the proposed development area and within the existing outfield. Any development works must not compromise the efficacy of any current schemes. All CAD designed indicative options have taken the football pitch area into account.
12. The existing artificial cricket nets will require removal. Due to the age of the system, it is likely that very little of the system will be salvageable for future use.
13. It is important to clarify whether a project with high capital costs can fulfil the needs of the cricket club in terms of fixture fulfilment and club development. In terms of viability, this would be considered a high cost project for limited playing capacity.

5 DEVELOPMENT OPTIONS – LAPSTONE PLAYING FIELDS

The focus of the development is to situate two cricket squares and outfield within Lapstone Playing fields following relocation of winter sports pitches to the Horton Heath development. The development options outlined in the initial feasibility with regards to the filling of a drainage ditch, removal of trees, extension of a culvert and construction of a retaining structure are still pertinent. It is likely that Option 1 from the initial feasibility (Figure 17) is the most cost-effective option in terms of fill for producing the cricket outfield to the north of the development. The development options will also include the construction of two new cricket squares plus the removal and reinstatement of artificial cricket nets and the removal of the existing cricket square once the new squares are in play. A drainage scheme would also be recommended within the new outfield in the north of the development (as per the initial report within the footprint of fill).

5.1.1 Option 1: Site re-modelling including retaining structure, tree removal, artificial net removal and reinstatement, culvert extension including fill earthworks, installation of 2 Nr. 9-pitch cricket square plus 2 Nr. artificial cricket pitches and installation of a primary drainage system @ 3 metre centres and secondary bypass scheme (within the footprint of the cut and fill earthworks).

The works would comprise the following:

1. **Removal of existing trees** – removal of existing trees prior to any earthworks, completed by a competent arborist following tree assessment.
2. **Culvert extension** – extension of the in-situ culvert to the western site boundary, following consultation with the lead water authority/local authority.
3. **Removal of existing vegetation** - prior to topsoil strip the vegetation should be cut and collected and the remaining vegetation sprayed off using a total herbicide.
4. **Primary cultivations** – cultivations to incorporate organic matter and provide a suitable tilth for stripping.
5. **Topsoil strip** – Strip topsoil and stockpile for later use.
6. **Cut and Fill** – Remodel the area with the existing subsoil to create new levels including subsoil and topsoil importation (depending on option).
7. **Installation of a retaining structure (if required)** – Installation of a retaining structure along the western boundary.
8. **Topsoil replacement** – Replace the stockpiled topsoil on the sub formation and grade accordingly.
9. **Stone pick/bury** – Stone pick or bury as required, in the absence of a blinding layer/buffer, complete stone removal/burial will not be achieved.
10. **Installation of primary drainage** – Installation of drainage at 3 metre centres within the cut and fill earthworks area
11. **Final cultivations** – final cultivations prior to seeding.
12. **Establishment of a new grass sward from seed (including seeding and fertiliser)** – it is recommended that a suitable 100% Rye Grass seed is used.
13. **Installation of secondary drainage (if required)** - Installation of sand grooves based on performance of the primary drainage over the first winter.
14. **Application of sand topdressing (required if secondary drainage is installed)** – to maintain hydraulic connectivity with the drainage scheme.
15. **Installation of 2 Nr. cricket squares** – Installation of a cricket square using imported proprietary cricket loam.

16. **Installation of irrigation points** – Install a water point connected to mains water for the purpose of cricket pitch preparation and maintenance.
17. **Installation of 2 Nr. non-turf cricket pitch**
18. **Removal of existing cricket square once new squares are established**

N.B.: Earthworks should only be carried out under suitable weather and ground conditions (i.e. soil in a dry and friable state) to avoid structural damage. In order to maintain the playability of the surface in the longer-term, the site would benefit from light annual sand topdressing. This should be factored into the on-going maintenance budget for the site.

5.1.2 12-months maintenance post-construction (cricket only).

Depending on the construction timetable and funding requirements, it is possible that on-going maintenance on both the outfield and cricket squares will be required for the first 6-12 months following completion of the remediation works. This will include the following items:

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

5.2 Indicative cost estimates – Lapstone playing fields

5.2.1 The construction of 2 Nr. cricket squares and outfields

Cricket works (Lapstone Playing fields)	Earthworks Option 1 (Fig 16)
Ditch and Culverted area	
Removal of existing trees	£6,000.00
Culvert extension	£20,000.00
Removal of existing vegetation	£1,000.00
Primary cultivations	£1,300.00
Topsoil strip	£2,200.00
Cut and Fill Incl. subsoil importation (based on a 2% gradient)	£65,000.00
Installation of a retaining structure and safety fence (if required)	£25,250.00
Tree replacement	£10,000.00
Topsoil replacement	£1,970.00
Stone pick/bury	£1,566.00
Installation of a primary drainage scheme @ 3 metre centres within the cut and fill earthworks area	£7,900.00
Final cultivations	£940.00
Establishment of a new grass sward from seed (including seeding and fertiliser)	£1,127.00
Installation of secondary drainage (if required)	£2,800.00
Application of sand topdressing (required if secondary drainage is installed)	£3,500.00
Sub-total (ex VAT)	£150,553.00
Contractor preliminaries	£10,538.71
Subtotal	£161,091.71
Contingency (15%)	£24,163.75
TOTAL (ex VAT)	£185,255.46

Cricket Squares and ancillary items	
Installation of 2 Nr. 9 pitch cricket squares	£60,000.00
Installation of 2 Nr. irrigation points (category WRAS 5 compliant) with tanks	£25,000.00
Installation of 2 Nr. NTP (non-turf pitches)	£18,000.00
Removal of existing cricket nets and installation of new (location tbc)	£50,000.00
Removal of existing square, reinstatement and seeding and artificial pitch removal (off-site)	£6,500.00
Subtotal (ex VAT)	£159,500.00
Contractor Preliminaries	£11,165.00
Subtotal (ex VAT)	£170,665.00
Contingency (10%)	£17,066.50
Total (ex VAT)	£187,731.50

NOTES:

- 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 (2020).

5.2.2 12 months maintenance costs for Cricket square

Maintenance	18 wicket cricket square
Mowing (30 cuts)	£6,000.00
Fertiliser x 3	£1,650.00
Spiking x2	£1,200.00
Selective herbicide (if required)	£750.00
Over-seeding	£1,650.00
Scarification	£1,800.00
Pest and disease control	£750.00
Rolling	£1,800.00
Subtotal (ex VAT)	£15,600.00
Contractor preliminaries	£1,100.00
Subtotal (ex VAT)	£16,700.00

5.2.3 6 months maintenance of drained cut and fill area (options 1)

Maintenance	Option 1 (0.3 ha)
Mowing (15 cuts)	£1,100.00
Fertiliser x 3	£600.00
Verti-draining x2	£800.00
Selective herbicide (if required)	£250.00
Over-seeding (if required)	£600.00
Pest and disease control	£500.00
Contractor preliminaries	£1,000.00
Subtotal (ex VAT)	£4,850.00

5.2.4 Summary of project costs

Options	Construction	Maintenance (outfield)	Maintenance (cricket square)	Total ex VAT
Earthworks Option 1 (Fig 16)	£185,255.46	£4,850.00		£190,105.46
Cricket Squares + ancillary items	£187,731.50		£16,700.00	£204,431.50

Please note:

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

It is also pertinent to note that costs for the culvert extension and retaining structure are estimated based on similar projects and costs, both items could realistically decrease or increase and a robust tender process is required to provide more accurate figures.

The earthworks cut and fill costs are based on an estimation of the gradients within the drainage trench. Costs could change once accurate levels data is provided.

5.3 Indicative work programme

With respect to timescales for completing the project, it is recommended that the construction works are only completed under suitable ground and weather conditions to avoid any potential performance-related problems later on.

The date for start of play is highly dependent on weather conditions during the construction phase and growing-in period.

Indicative programme for Options 1

Construction Works	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
Mobilisation of Contractor(s)																								
Natural turf works incl. Cut and Fill and drainage																								
6-months maintenance period (outfield)																								
Cricket square construction																								
12-months maintenance period (cricket square)																								
Over-seeding																								
Ground ready for play (cricket)																								

Please note: The precise date for the return to play is highly dependent on the weather conditions that prevail during the construction works and growing-in period. Play/use shall recommence upon approval from the Contract Administrator.

Cricket squares generally require 18 months to mature for optimal performance. It is likely that performance on a cricket square in the first season following construction will be characterised by low and slow ball bounce, this is perfectly normal until an integrated intensive maintenance regime is implemented including the requisite rolling based on Cranfield's rolling guidelines.

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

5.4.1 Maintenance issues

- With surface bypass drainage systems, such as that recommended for the pitch here, it is essential that adequate allowance is made for annual sand topdressing as this helps to protect the sand grooves (or sand bands) 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. For Options 1 & 2, 5 mm depth of sand over the whole development area (0.3 – 0.6 hectares) would equate to circa between 40 t and 90 tonnes at a cost of approximately **£1,200.00** and **£2,600 + VAT** (2018 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 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 **~£2-4 k** per cricket pitch is normally required to maintain the facility in good condition. This figure would include the cost for annual loam topdressing.

5.4.2 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).
- If managed well (i.e. annual sand topdressing) and not over-used (please see Item 4.5.3 below), the sand grooves should have an operational lifespan of 5 – 7 years, hence a sinking fund should be in place to repeat this operation periodically. The cost for sand grooves for Option 1 is estimated to be approximately **£2,800 + VAT** (2017 prices). Therefore, a sum of approximately **£400 + VAT** (Option 1) should be set aside annually (over 7 years) for this purpose. The cost for sand grooves for Option 2 is estimated to be approximately **£6,000 + VAT** (2017 prices). Therefore, a sum of approximately **£860 + VAT** (Option 1) should be set aside annually (over 7 years) for this purpose.

5.4.3 Usage

- Provided the site is well maintained, the type of drainage system proposed for this site should allow reasonable use without causing detriment to the grass sward or soil structure. In very wet conditions, usage may be less

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8 APPENDICES

Appendix I Outline Maintenance Recommendations.

Appendix II: Outline Maintenance Recommendations

Outfield maintenance

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.

Cricket square maintenance

Mowing. The grass shall be maintained between a height of 15 - 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:

September	12:6:6 at 350 kg/ha
February	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 to the outfield and/or square in the spring (if required) to combat the weeds present. This to be applied at least four to six 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. Shallow spike the new square twice in the first full year after construction using a machine fitted with narrow needle tines working to 100mm depth.

Overseeding. Overseed the square areas and safety margins as required at the application rate of approximately 200 kg/ha in May and September 2013. 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.

Rolling. Consolidation but not compaction should be achieved in the 2013 establishment phase. Repeat mowing using a roller-based mower will help to firm the surface. Once stable, the weight of the machine should be increased to improve rolling results and build the depth of consolidation further into the soil profile.