

# LONDON BOROUGH OF HAVERING

## Feasibility report on proposed development of new football pitches at Dagnam Park, Romford

STRI



Prepared by: James Westwood  
Date of Visit: 8<sup>th</sup> May 2012



STRI is completely independent and has no alliances to commercial products, services or contractors. This ensures that our research, design, project management and advisory services provide the best solutions for each individual client.



## Contents

	PAGE
1.0 INTRODUCTION	
2.0 SITE DESCRIPTION	
2.1 Location	
2.2 General Layout	
2.3 Existing Vegetation	
2.4 Soil Profile	
2.5 Topography	
2.6 Drainage Features	
3.0 DISCUSSION	
4.0 RECOMMENDATIONS	
4.1 Further Site Investigations	
4.2 Topographical Survey	
4.3 Pitch Development – Option A	
4.4 Pitch Development – Option B	
5.0 TIMING/ESTABLISHMENT	
6.0 COSTS	
6.1 Option A	
6.2 Option B	
6.3 Additional costs	
7.0 SUMMARY	
APPENDIX 1 - Site plan of proposed pitch location	
APPENDIX 2 - Particle size analysis results of topsoil sample	
APPENDIX 3 – Flood map of area	
APPENDIX 4 – Photographic record of site	

## 1.0 Introduction

A new housing development is to take place on Albemarle fields in Harold Hill which will result in the loss of playing field provision within the borough. As part of a local 106 Agreement, provision is to be made for the development of new football pitches within Dagnam Park in mitigation against this loss.

The STRI was engaged to undertake a feasibility study on the proposed development of the pitches within the park and provide guidance on the works required to achieve this and the likely costs involved.

## 2.0 Site Description

### 2.1 Location

Dagnam Park is located on the north-eastern outskirts of Harold Wood lying just outside the town of Romford. The main vehicular access into the park is via Settle Road which terminates at its southern most boundary. A section of the M25 motorway runs to the north-east of the park and Maylands Golf Course is situated on its eastern boundary. There is a further area of woodland known as Hatters Wood and the Harold Hill estate which lies to the west of the park.

### 2.2 General Layout

Dagnam Park is an historic landscaped park which includes ancient woodland, a variety of grassland and ponds. From the southern site entrance, a track continues into the park and terminates at a small car park from which access can be gained via numerous pathways to the open parkland to the north and east, as well as Hatters Wood to the west.

The proposed location of the pitches is set out on the layout drawing produced by the Council lies immediately to the north and north-east of the car park, as set out in Appendix 1 of this report. Within the proposed pitch area, there are two distinct clusters of mature trees which help provide the parkland nature of the site.

The area is well used by dog walkers and fouling is quite extensive together with deposits left by the local deer population.

### 2.3 Existing Vegetation

The sections of the proposed pitches are to be developed are on open grassland which has clearly not been intensively managed for some time. The turf comprises a mixture of both coarse and fine leaved meadow grasses including perennial ryegrass, Yorkshire fog, tall fescue and bent grasses and some of these were growing in distinct tussocks. Broad leaved weeds are also quite extensive, these including bulbous buttercup, clover, yarrow and dandelion.

### 2.4 Soil Profile

A series of trial holes was excavated over both of the proposed pitch areas and these indicate a consistent upper soil profile. There was generally a 200 mm depth of a dark grey finer textured topsoil overlying a yellow/brown mottled clay subsoil, the latter being quite stony in nature with shattered and rounded flinted stones up to 30-40 mm in size being present.

At the immediate turf base, there was a 20-25 mm accumulation of fibrous material which at the time of the site investigation was generally in a saturated state following the recent heavy rain showers. Indeed, the upper topsoil profile was generally in a saturated condition, although this was more apparent on the western most pitch area.

A representative sample of top soil was collected from the site for the laboratory analysis. This confirms that the topsoil has the textural classification of a clay loam and contains 81% fines (i.e. very fine sand silt and clay). A copy of the particle size analysis of the sample collected is included in Appendix 2 of this report.

According to the Soil Survey of England and Wales, the top soil which occurs around the north eastern outskirts of Romford belongs to the Windsor Soil Association. This comprises slowly permeable clay soils which in their natural state remain waterlogged for long periods in the winter when left undrained.

## 2.5 Topography

A feature of the park is the generally rolling nature of the terrain, although the land generally falls in an easterly direction towards the golf course. The proposed location of the pitches lies on one of the more elevated parts of the park.

On the area of the south-western pitch, the land falls away to the east and within the general slope, the land tends to gently undulate. On the north-eastern most pitch there is an overall fall in an easterly to south-easterly direction although here, the ground levels are more evenly graded.

A brief survey of spot levels was undertaken on each pitch location in order to assess the current falls across the proposed playing surfaces. On south-western pitch area, there is a general grade across this part of the site of approximately 1:30 in a south-easterly direction. Along the line of play, the land falls along its length by between 2.12-2.93 m with an overall gradient of 1 in 40. On north-eastern pitch, there is a slightly steeper overall cross fall of approximately 1:26 in a south-easterly direction. Along the line of play, the land falls between 1.9 – 2.43 m with an overall gradient in the region of 1 in 45.

## 2.6 Drainage Features

The noticeable feature walking across the site (In particular on the south-western pitch) was the soft, squelchy nature of the ground underfoot following the recent period of rainfall. Some of areas of standing water were evident along the tarmac footpath which runs along the western end of the proposed park from the car park.

During the course of the site investigation, no traces of any existing drainage systems could be seen in the form of drain lines and or/inspection chambers within the proposed pitch locations. However, a local dog walker who used to play on the original pitches provided within the park did recall pipe drains being present including various inspection chambers, but these have either been removed or become overgrown with vegetation.

The only evidence of any formal drainage structures was a somewhat dilapidated brick built headwall at the head of a small ditch channel located to the east of the proposed pitch locations. Here the headwall has broken away from the adjoining embankment, although a steady trickle of water was seen discharging from the outlet pipe behind it and down into the ditch. At its head, the channel is approximately 4 m wide at ground level, 600 mm wide at its base and approximately 1 m deep. At the time of the site investigation there was approximately 100 mm of water running along the bottom of the ditch. From this point, the channel follows down the slope in a north-easterly

direction and its route is marked by the presence of predominately hawthorn trees and brambles growing along either side of it. On the more low lying sections of the ditch, there are a couple of small holding ponds along its route. The ditch would appear to continue onto the adjoining golf course and it is assumed that this eventually discharges into Weald Brook which is located approximately 1km to the east running alongside and beneath the adjoining M25 motorway.

The presence of this headwall and the flow of water discharging from the adjoining embankment would suggest that there is some formalised drainage system present on this part of the park, although the extent of this was unclear.

### 3.0 Discussion

Historically, the park has been used for the venue for various winter games pitches including football and rugby as well as cricket. Indeed, when examining satellite imagery of the site, the presence of the old cricket square and outfield can be seen to the north-west of the proposed new pitch locations and traces of old football pitch line markings are visible to the north and north-east. It was also reported by the local resident that there used to be a good quality football pitch located immediately to the south of the cricket ground on a section of the park which has now become overgrown with quite dense scrubby vegetation. However, it is understood that the park has not been used for any formal recreation purposes for some considerable time.

On the Council drawing showing the proposed pitch layouts, the two pitches shown have dimensions of 90 m x 45 m which would be regarded as a minimum size required for an adult sized pitch. Indeed, under Sport England guidelines, the minimum dimensions for a pitch serving under 17-18 age group and senior football teams, the minimum dimensions are stated as being 90 m x 45.5 m. Therefore slightly wider pitches of say 50 m each might be considered to fully comply with Sport England requirements.

Owing to the open nature of the park, the proposed pitches could be accommodated without necessitating any removal of trees or relocation of pathways etc. However, the brief survey of levels taken on each pitch location confirmed that there is a significant fall across each of the proposed playing surfaces. As previously detailed, the gradient along the line of proposed play vary between 1 in 40 and 1 in 45 which significantly exceeds the maximum slope recommended under Sport England guidelines i.e. 1 in 80 or 1.25% along the line of play. Therefore, in order to achieve full compliance with these guidelines, allowance would need to be made for re-grading of the ground on each pitch location, thereby producing grading platforms to the required slope. This process would involve stripping the existing topsoil cover and re-grading the exposed subsoil layers by the process of cut and full, after which the topsoil would be replaced. If the pitches were to be provided with the maximum gradient along their length of 1in 80, then this would necessitate cutting into the more elevated sections by between 500-650 mm and the lower lying sections would be built up by a similar amount.

Even if major re-grading was not undertaken, it is likely that some minor surface grading would be necessary on the south-western pitch owing to the generally undulating nature of the ground here.

The nature of the indigenous soil profile is such that it has inherently poor drainage characteristics, which is not ideal for the provision of winter games facilities. Therefore, if these pitches are to be developed, an integral part of this would be the provision of quite extensive piped drainage systems to help regulate the local water table and provide more consistent playing conditions during the winter months. In addition, consideration should be given to further enhancements such as

amelioration of the topsoil with a suitable grade of sand, possibly in conjunction with supplementary drainage in the forms of sand bands.

Before the installation of any drainage systems can be considered, a positive outfall needs to be established into which drainage water can be discharged. Fortunately, the ditch channel which lies on the lower lying ground to the east would potentially provide a suitable outfall location. However, the utilisation of this channel would need to be subject to approval by the Environment Agency, although the fact that there is already a headwall and drain outlet at the head of the channel would suggest that a precedent had already been set for this. On checking the Environment Agency website the elevated nature of the park means that the proposed pitch locations are well away from any flooding events which would appear to be restricted to the immediate banks of the Weald Brook approximately 1 km to the east. The relevant flood map of this area is included in Appendix 3 of this report.

Whilst the combination of re-grading and installation of pipe drains on the proposed pitch areas will provide a good standard of playing surface, ongoing management will play an equally important role in sustaining their playability during the winter months. Treatments including compaction relief measures (e.g. Verti-draining) and fertilizer applications will be particularly beneficial, the intensity of such being determined by the intensity of usage of the facilities.

## 4.0 Recommendations

### 4.1 Further Site Investigations

There would be merit in undertaking a review of any existing drawings of the site which might show the presence of any old surface water drainage systems, possibly associated with the headwall found at the end of the ditch channel. If there is a system of formalised drains on the site including associated chambers, then it may be possible to utilise these as outfall points, assuming that these are in a functioning condition.

As previously intimated, the Environment Agency should be consulted if the scheme goes ahead and it is proposed to divert the drainage water from any new drainage systems into the existing ditch channel.

### 4.2 Topographical Survey

Prior to undertaking any design for the new pitches, a preliminary requirement will be the commissioning of a full topographical survey of the proposed pitch locations and their outer surrounds. This will help to produce a contoured scale drawing which will enable the appropriate earthwork calculations to be undertaken for the design of the graded platforms required. The survey should also include the upper western end of the ditch channel, including its invert depth.

### 4.3 Pitch Development – Option A

Under this option, the existing ground contours are maintained (assuming that full compliance with Sport England slope guidelines are not required) and a new pipe drainage system is installed over each proposed pitch area. There is also an assumption that a positive outfall can be established by utilising the existing ditch channel and that appropriate permissions have been obtained. In addition, the existing grass cover would need to be improved by appropriate management techniques.

The more detailed requirements of the pitch drainage system and management treatments are set out in the following sections:

#### 4.3.1 Pipe Drainage System

It is anticipated that the drainage system will consist of a series of lateral drains running across the main fall on each pitch area, these connecting up with main collecting drains running down the lower edges of each pitch. In view of the impervious nature of the existing soil profile it is recommended that lateral drains are installed at 4 m centres.

- i. Over the pitch area the lateral drains will comprise 80 mm diameter perforated plastic pipes, these connecting up with main 125 mm diameter perforated plastic main drains. Purpose made junctions would be provided connecting the mains to the laterals. All drains would need to be installed with a definite fall along their length (ideally no less than 1 in 200) and the final arrangement of drains would be dependent upon the findings of the topographical survey.
- ii. The drain trenches would be excavated using specialist laser guiding equipment with each trench being a minimum 150 mm wide with lateral drains being introduced at an invert depth of 600 mm, whilst the main drains would normally be slightly deeper at around 700 mm to invert.
- iii. Once pipe drains have been laid and connected, the backfilling of the trenches would commence with a 6 mm gauge angular gravel or broken stone, this being brought up to within 150 mm of the surface. The remainder of the trench would then be backfilled with either an imported sandy loam topsoil or alternatively a proprietary sand/soil/compost mixture.
- iv. At the end of the main drain runs a silt chamber would be installed, this allowing access to the drainage system for silt removal as well as monitoring of the drainage flow and facilitating rodding/jetting operations whenever required.
- v. From the final silt chamber, a sealed outlet drain would be installed running to the outfall, which in this case would be the head of the adjoining ditch channel. Typically the outlet drain would be a 150 mm diameter twin wall plastic pipe laid with a suitable fall (i.e. no less than 1 in 200).
- vi. Once the drain trenches have been backfilled up to ground level a pre-seeding fertiliser would be applied along the line of each drain run and the grass cover restored by seeding with a perennial ryegrass base seed mixture.

#### 4.3.2 Sand Banding

As previously indicated, supplementary drains could be provided in the form of sand band which would comprise slits cut into the ground, these being some 15-20 mm wide and 150 mm deep. Once formed, the slits would immediately be backfilled with a medium to coarse sand up to ground level. Such banding can be undertaken with a specialist tractor mounted machine such as the BLEC Vibrating Sandmaster.

The presence of these bands would help to provide a more rapid movement of water from the surface down into the underlying pipe drains. In conjunction with the sand banding operation, a general top dressing with a fine to medium sand should be given to the pitch areas to help produce a more stable and free draining surface and one that is less prone to mud formation once the grass cover has been lost. For this, the sand should be applied at a rate of around 100 tonnes per hectare, this ideally being applied in a dry condition to a dry surface and once spread this would then be thoroughly brushed or matted into the turf base.

#### 4.3.3 Maintenance Improvement Works

In order to improve the quality of the existing grass cover on the pitch areas, provision should be made for undertaking a selective weed control treatment using a product which is appropriate for the weeds present. Ideally spraying should be undertaken when the grass weeds are displaying good growth.

In order to reduce the amount of thatch and organic matter at the base of the turf, provision should be made for carrying out a through scarification of the proposed pitch areas and their immediate surrounds using a tractor mounted combined scarifier/collector.

The overall density and quality of the grass cover will need to be improved and this could be achieved by over seeding the pitch areas with a perennial ryegrass seeds mixture. Ideally, this work should be undertaken with a seed drill type machine which would cut shallow grooves into the surface into which the seed would be dropped so that it lies just below the immediate surface. However, it is important that any over seeding operations are left until the period of some 6-8 weeks following any weed control measures to ensure that there is no residual product remaining in the soil which could affect new grass growth.

The overall grass cover could also be further improved through the application of a high nitrogen granular fertiliser this being applied during a period when heavy rain showers can be expected in the following 24 hour period.

#### 4.4 Pitch Development – Option B

This would be a more disruptive option involving re-grading of the surface on each pitch area and ultimately restoring the grass cover by seeding.

Such re-levelling works would enable pitches to be produced that conform to current Sport England guidelines in terms of finished grades on the playing surfaces. In addition to the marked out pitch areas, an allowance should be made for including an outer safety margin around the pitch which should be incorporated in the graded platform. Typically such a margin would be some 3-5 m in width.

The main stages in this option are listed in the following sections:

##### 4.4.1 Spraying

The existing grass cover would be destroyed by spraying with a total non-residual herbicide based on glyphosate, this being left for period of 7-10 days before carrying out any further works.

##### 4.4.2 Removal of surface vegetation

Again, in view of the fibrous nature of the existing old turf, allowance should be made for removing as much of this as possible, prior to stripping the topsoil. This would most easily be carried out using a machine such as the Koro Fieldtopmaker which is a tractor mounted would plane off and remove the turf layer.

##### 4.4.3 Topsoil Strip

The existing topsoil cover would be stripped off the working area on each pitch working to a depth of around 150-200mm, this being carefully stockpiled inside for eventual use.



#### 4.4.4 Grading

The exposed subsoil bases will then be re-graded with the main intention of reducing the longitudinal fall over each pitch to a maximum of 1 in 80 and the fall across the width of the pitch should not exceed 1 in 40.

This work would involve the use of heavy duty tracked earthmoving equipment such as a dozer and blade and or/360° excavator which would be used to cut into the higher sections on each area with this material being used to build up the lower lying sections as appropriate. The main aim would be to produce an even balance between the cut and fill material so that there is no need to remove any surplus materials of site.

The building up and filling of the lower lying sections would be carried out in layers, these not exceeding 225 mm in depth with each layer being consolidated before spreading the next.

Where any cutting or filling has taken place then corresponding embankments will be formed where each plateau reduced marries into the undisturbed ground. These embankments would normally be graded with the maximum slope of around 1 in 3 which will facilitate mowing with ride on equipment once a full grass cover has been restored on them.

#### 4.4.5 Subsoil Cultivation

Following on from the re-grading works, any compaction on the upper subsoil profile would be relieved by ripping the surface by using a tractor mounted subsoiling unit. This would help to break up any compaction within the profile and make it more porous, although it may be necessary to follow up this treatment with a light blade grading operation in order to restore surface levels.

#### 4.4.6 Topsoil Replacement

On completion of the regarding/ripping works, the preserved topsoil would then be re-spread uniformly over the working area of each pitch. Ideally, there should be a minimum 150 mm cover of topsoil remaining on completion.

#### 4.4.7 Pipe Drainage

At this stage, comprehensive pipe drainage should be introduced on each of the pitches, as outlined in Option A. However under this option, when backfilling the drain trenches, the gravel should be brought up within 150 mm of the surface and blinded up to ground level with a coarse, gritty sand, the upper portion of which would become ameliorated with topsoil during the subsequent cultivations.

#### 4.4.8 Cultivations

Once the drains have been introduced, the upper top soil profile would then be thoroughly cultivated using power harrows and or/tine cultivators and further light grading may be necessary in order to maintain smooth and uniformed levels.

#### 4.4.9 Sand Layer

At this stage, provision should also be made of the supply and spreading of a minimum 25 mm depth of a fine to medium sand over each pitch area and its immediate surrounds, this being lightly cultivated into the equivalent depth of the underlying topsoil.

#### 4.4.10 Seed Bed Preparation

A fine and evenly consolidated seed bed tilth would be prepared by a combination of rolling and raking during the course of which any stones with a single diameter of 20 mm or more would be removed. A pre-seeding fertiliser would then be prepared to help support initial grass establishment.

#### 4.5.11 Seeding

The prepared pitch areas would be over-seeded with a perennial ryegrass based seeds mixture using a tractor mounted seed broadcasting unit. Ideally, two or three passes should be made sowing at a total rate of 35 g/m<sup>2</sup>.

#### 4.5.12 Initial Maintenance

Once the seed has germinated, an initial cut would be undertaken when the young grass has reached the height of around 50-60 mm and the sward should then be maintained at a height of around 35 mm, topping as regularly as required to encourage tillering and general thickening of the turf. As part of the initial maintenance programme, allowance may need to be made for a further application of higher nitrogen granular fertiliser to assist the development of the young sward.

#### 4.5.13 Sand Banding

Once a reasonably mature and complete grass cover has been established on the pitches, then provision should be made for supplementary drainage in the form of sand banding as detailed in Option A.

#### 4.5.14 Additional Works

The heavy clay nature of the indigenous soil profile is such that where drain trenches have been excavated and backfilled with porous materials including gravel and sand, then there is always a possibility of shrinkage occurring within the soil profile during any subsequent long spells of dry weather. This could result in the drain trenches widening slightly which in turn may encourage settlement of the backfill material within them. In extreme cases this could lead to a loss of levels along the lines of the drains which may necessitate further topping up with topsoil/rootzone along the affected sections and further over seeding in order to restore a grass cover on them.

To ensure that provision is made for such an eventuality, it is normal practice to allow for additional items in the specification for the contractor returning to site in order to top the drains up if there has been any subsequent settlement. However, it is still a requirement of the contractor to ensure that the drains are properly backfilled and consolidated during the course of their initial installation.

## 5.0 Timing/Establishment

When carrying out any large scale earthworks and drainage operations, these would best be undertaken during the dry ground and weather conditions which would normally be experienced during the late spring and summer months.

If the works are restricted to Option A, then ideally once the drain lines have been seeded, a period of 2-3 months should be allowed to restore a grass cover on drain lines. This will however be dependent upon the amount of rain and subsequent weeks, as regular rain showers will be necessary to achieve a reasonably rapid germination and establishment of the young grasses.

Under Option B, the works would best be undertaken during the late summer period with a view to seeding around late August early September. Assuming an autumn seeding, then the pitches should be ready for play by the following autumn period, although this will be subject to them receiving

appropriate management during the interim period. In view of the open nature of the site, the seeded areas would need to be protected by temporary fencing of the Heras type in order to discourage any unauthorised access on to the pitch areas, at least until the full grass cover has been established on them.

## 6.0 Costs

The following cost estimates are based on the works being undertaken by a specialist sports ground contractor and these are based on the development of two pitches, each measuring 96 m x 56 m (including outer safety margins).

### 6.1 Option A

Site establishment	£3,000
Scarification of existing turf	£3,000
Pipe drainage at 4m centres	£30,000
Sand banding	£7,700
Sand top dressing	£2,750
Fertiliser application	£385
Overseeding	£1,100
Selective weed control	£450
<b>Total</b>	<b>£48,385</b>

### 6.2 Option B

Site establishment	£5,000
Spraying	£550
Remove existing turf with Koro machine	£8,000
Topsoil strip (200mm)	£5,500
Grading (assumed 3,000 m <sup>3</sup> )	£8,750
Sub soil cultivation/blade grading	£2,000
Topsoil replacement	£5,500
Pipe drainage at 4m centres	£30,000
Cultivations	£750
Light grade	£550
Stone picking	£1,650
Sand amelioration (25mm layer)	£12,000
Prepare seed bed	£1,350
Pre-seeding fertiliser	£450
Supply and sow seed	£1,500
Initial maintenance	£2,500
Sand banding	£7,700
<b>Total</b>	<b>£93,750</b>

### 6.3 Additional Costs

In addition to the figures indicated in the previous sections, there will be additional costs incurred with the removal of the spoil from the drain trenches which would need to be taken off site to a



licensed tip facility and the costs associated with this could be in the region of £5,000-£10,000 or more.

When tendering for such work, it is normal practice to add a 10% contingency sum to the total to cover any unforeseen costs which may arise during the course of the works. In this case, the Option A would be in the region of £53K whilst Option B costs would be approximately £103K.

All the above figures are exclusive of VAT.

## 7.0 Summary

The London Borough of Havering is considering the development of two football pitches within Dagnam Park on the outskirts of Romford. The proposed works are to be funded by a local 106 Agreement following the loss of existing provision due to an approved housing development elsewhere in the Borough.

It is proposed that two senior sized football pitches shall be located within open parkland within the south-western corner of the park, these being reasonably close to the main site entrance as well as the existing small car parking area. The park has previously been used for marking out winter games pitches as well as a cricket ground, although these have been abandoned for some time.

The new pitches are to be located on existing open grassland, although the turf here does contain a mixture of both coarse and fine leaved grasses as well as numerous broad leaved weeds. Each pitch is also situated on relatively sloping ground with gradients ranging between 1 in 25 and 1 in 30 with gradients along the proposed length of play varying between 1 in 40 and 1 in 45. The existing gradients on this part of the site exceed the recommended maximum slopes under Sport England guidelines and if these facilities are to conform to these, then re-grading of each pitch area will be required.

Another feature of the location is the heavy clay nature of the indigenous top soil profile which has inherently poor drainage characteristics.

If the two pitches are to be developed at the proposed locations, then in order to meet Sport England guidelines allowance will need to be made for re-grading the sloping ground at each location. This will necessitate stripping off the existing topsoil and levelling of the exposed subsoil to produce graded platforms complying with Sport England slope requirements. On completion, the indigenous topsoil would be replaced followed by the installation of intensive pipe drainage systems. Water movement through the upper soil profile could be enhanced through the amelioration of the upper topsoil profile with a suitable fine to medium sand in conjunction with the installation of supplementary drains such as sand bands.

Before any drainage systems can be installed, a positive outfall needs to be established on the site. Fortunately, there is an existing ditch channel located within the park quite close to the proposed pitch locations and it would be quite easy to divert an outlet drain from the pitches into this. However, before utilising this an outfall, approval would need to be obtained from the Environmental Agency, although there is already drainage discharging into this from what would appear to be existing drainage systems within the park and therefore a precedent has been set for this.



Prior to undertaking any design work for the pitch developments, a topographical survey would need to be carried out on this part of the site to enable the appropriate design work to be completed. In addition, further investigation is recommended as to the presence of existing drainage systems on the site (dating back to the original pitches) which may be utilised for the new drainage systems, assuming that these are still in a functioning condition.

Signed:

A handwritten signature in black ink, appearing to read 'James R Westwood', with a horizontal line underneath.

James R Westwood  
Design Consultant  
23<sup>rd</sup> May 2012

# APPENDIX 1

## SITE PLAN SHOWING PROPOSED NEW PITCH LOCATIONS





# APPENDIX 2

## RESULTS OF LABORATORY ANALYSES OF TOPSOIL SAMPLE

### SOIL PARTICLE SIZE ANALYSIS

CLIENT: LONDON BOROUGH OF HAVERING DATE : 21/05/12

RESULTS TO : JRW

DESCRIPTION: DAGNAM PARK

SAMPLE NO : A10694/2

CATEGORY	DIAMETER mm	%
Stones	>8	0
Coarse gravel	8-4	T
Fine gravel	4-2	T

Particle size distribution of mineral matter smaller than 2mm

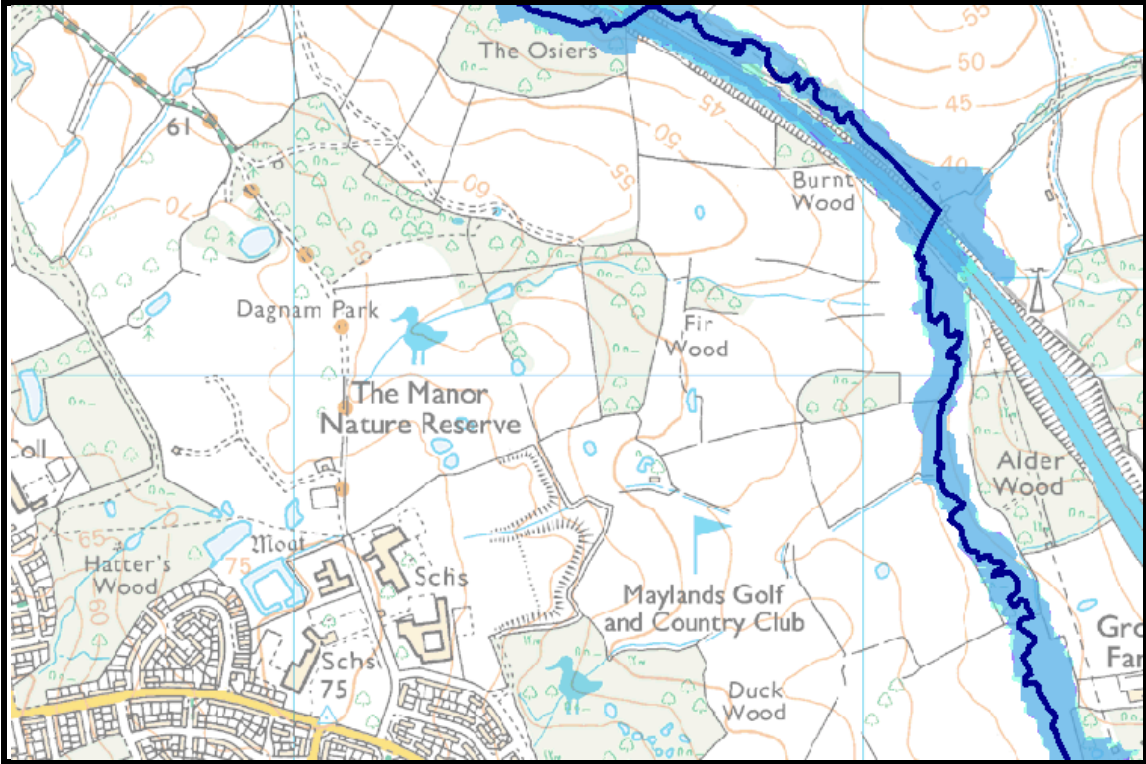
Very coarse sand	2-1	1
Coarse sand	1.0-0.5	3
Medium sand	0.50-0.25	10
Fine sand	0.250-0.125	8
Very fine sand	0.125-0.050	11
Silt	0.050-0.002	42
Clay	<0.002	25
Loss on ignition (% of oven-dry fine earth)		6.2
Calcium carbonate %		NIL
SOIL TEXTURE		CLAY LOAM

T = TRACE

THESE RESULTS PERTAIN ONLY TO THE SAMPLE(S) SUBMITTED AND TESTED

# APPENDIX 3

## ENVIRONMENT AGENCY MAP SHOWING EXTENT OF LOCAL FLOODING





# APPENDIX 4

PHOTOGRAPH RECORD OF SITE MADE ON 8<sup>th</sup> MAY 2012



Photograph 1: Looking north-eastwards over south-western pitch.



Photograph 2: Footpath which runs from car park along western edge of south-western pitch.



Photograph 3: Looking south across north-eastern pitch.



Photograph 4: Site of proposed north-eastern pitch showing coarse, tussocky nature of existing grass cover and extent of slope across the playing surface.



Photograph 5: Trial hole excavation showing depth of clay loam topsoil overlying impervious clay subsoil.



Photograph 6: Site of existing broken headwall at head of ditch channel on lower ground to the east of proposed pitch locations.