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SPECIFICATION FOR THE RENOVATION AND DRAINAGE OF AN EXISTING FOOTBALL PITCH AT SPITALFIELD, WELLAND, WR13 6NE.

14TH MARCH 2017

TGMS1048.2

REVISION RECORD					
Rev	**Date**	**Description**	**Prepared**	**Checked**	**Approved**
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1. PART I: JCT 2016 MINOR WORKS BUILDING CONTRACT - PRELIMINARIES SUMMARY

1.1 PROJECT PARTICULARS

1.1.1 The Project

- Name: The renovation and drainage of an existing football pitch at Spitalfield.
- Nature: Sports field construction
- Location: Welland, WR13 6NE
- Length of contract: 5 Weeks + agronomic maintenance

1.1.2 Employer (Client)

- Name: Little Malvern and Welland Parish Council
- Address: 20 Farley Rd, Malvern WR14 1NF
- Contact: David Sharp
- Telephone: 01684 573213
- Email: dasharp@lineone.net

1.1.3 Principal Contractor (CDM)

- Name: TBC
- Address:
- Contact:
- Telephone:
- E-mail:

1.1.4 Architect / Contract Administrator

- Name: TGMS Limited
- Address: 4 Doolittle Mill, Froghall Road, Ampthill, Bedfordshire, MK45 2ND
- Contact: Matt Young
- Telephone: 01525 307060
- Email: matt.young@tgms.co.uk

1.1.5 CDM Administrator

- Name: N/A
- Address:
- Contact:
- Telephone:
- Email:

1.2 FORM OF CONTRACT

The form of contract will be the Joint Contracts Tribunal Ltd Minor Works Building Contract 2016 Edition incorporating all current published amendments.

The Clauses are scheduled within this document but the Contractor must inspect the draft form for the full details of these Clauses and is to allow such sum/s as may deem necessary for carrying out the obligations and services required by the Contract.

Payment terms are amended to 30 days.

All information contained within this document is subject to the conditions of the above stated contract.

1.3 THE RECITALS

1.3.1 First Recital

The work comprises the renovation and drainage of an existing football pitch.

1.3.2 Second Recital

All construction information is found in the specification section (**REF: TGMS1048.2**) and on the Drawings scheduled in Table 1 below.

1.3.3 Third Recital

The Contractor is to supply the Employer with a copy of the priced Work Schedules.

1.3.4 Forth Recital

Is the Employer a 'contractor' for the purposes of CIS? **No.**

1.3.5 Sixth Recital

The Contract is not supplemented by a Framework Agreement.

1.4 THE ARTICLES

Article 2: Contract Sum: **TBC**

Article 3: ~~Architect~~/Contract Administrator: **TGMS Ltd**.

Article 4 The Principal Designer for the purposes of the CDM Regulations is the ~~Architect~~/Contract Administrator

Article 5 The Principal Contractor for the purposes of the CDM Regulations is the Contractor.

Article 7: Is dispute resolution to be by arbitration? **Yes**

1.5 CONTRACT PARTICULARS

Fourth Recital & Schedule 2

Base Date: **10 days before tender return date**

Fourth Recital & Clause 4.2

Is the Employer a 'contractor' for the purposes of CIS? **No**

Fifth Recital

CDM Regulations **The project is not notifiable.**

Section 2.2

Works commencement date **May 2017**

Date for completion: **TBC.**

Section 2.8

Liquidated damages: **£50 per day or part thereof.**

Section 2.10

Rectification period: **12 months from the date of practical completion.**

Section 4.3 Date of first interim payments

30 days from start date.

Section 4.3 Interim payments

95% of total work value etc. up to practical completion.

Percentage of the total amount to be paid to the contractor on or after practical completion: **97.5%**

Section 4.8.1 Final certificate and final payment

Supply of documentation for computation of amount to be finally certified: **3 months**

Section 4.3 and 4.8 Fluctuations provision

Schedule 2 (Fluctuations Option): **Does not apply.**

Section 5.3

Contractor's Public Liability insurance: injury to persons or property – the required level of cover is not less than **£1 million**

Section 5.4A, 5.4B and 5.4C Insurance of the Works.

Insurance of the works: **Option A Applies**.

Percentage to cover professional fees: **15%**

Section 7.2 Settlement of Disputes – Adjudication

The Adjudicator is: **Chartered Institute of Arbitrators**

Nominating body: **Chartered Institute of Arbitrators**

Appointor of Arbitrator (and of any replacement**): President or a Vice-President of the Chartered Institute of Arbitrators.**

Attestation

Method of execution: **Under hand**

1.6 FORM OF TENDER

PROJECT TITLE: **The renovation and drainage of an existing football pitch at Spitalfield, Welland.**

We..... (Tenderer's name to be entered) hereby tender and undertake to perform the whole of the works/services required in and associated with the Project for **Little Malvern and Welland parish Council** according to the Specification, Work Schedules, Preliminaries and Drawings examined by us for the firm price sum of:

.....……..... (pounds)

.....……..... (pence)

(£ : p) excluding VAT.

Further we are prepared, when called upon to do so, to enter into and sign a contract, the full terms of which we have read, for the due and proper completion of the works/services.

We understand that we are tendering at our own expense and that the Client is not bound to accept the lowest or any tender.

We declare that we are not party to any scheme or agreement under which:

- we inform any other person the amount of our tender; and/or
- we have fixed the amount of any tender in accordance with a price fixing arrangement.

We accept that the Client is entitled to cancel the contract and to recover from us the amount of any loss resulting from such cancellation if it is discovered that there has been any corrupt or fraudulent act or omission by us which in any way induced the Client to enter into the contract.

We declare that all goods materials and workmanship will meet the appropriate British Standard Specification or British Standard Code of Practice issued by the British Standards Institution or equivalent European standard current at the date of the contract.

We undertake in respect of all persons employed by us or with whom we sub-contract to comply with the Disability Discrimination Act 1995 and the Commission for Racial Equality's Code of Practice issued under the Race Relations Act 1976 aimed at eliminating discrimination and promoting equality of opportunity.

We undertake not to transfer, assign, or sub-let any portion of the contract nor create any lien or charge on premises, goods or equipment connected with or forming part of the contract, without the written consent of the Client or its duly authorised officer.

We agree that if, before acceptance of this tender, an error in computation of the tender is detected in the priced document submitted by us we will be given details of the error and the opportunity of confirming the total tender sum or withdrawing the tender.

We agree that the insertion by us of any qualifications to this tender or any unauthorised alterations to any of the tender documents will not affect the original text but will cause the tender to be liable to rejection.

We agree that this tender will remain open for acceptance by the Client and will not be withdrawn by us for a period of 90 days from the last date fixed for the receipt of tenders or any notified extension thereof.

We certify that this is a bona fide tender.

Tenderer's Name

.....

Address

.....

.....

.....

Telephone

.....

Facsimile

.....

Signature*

.....

Name

.....

Date

.....

Witness

.....

Name

.....

Date

.....

* Where the Tenderer is an incorporated association the Company Secretary or a duly authorised Director should sign. In the case of a partnership a Partner should sign. In the case of an individual the Proprietor should sign.

2. PART II: DESIGN SPECIFICATION

2.1 INTRODUCTION AND SITE INFORMATION

A Feasibility Study to investigate the proposed sports field improvements was carried out by TGMS Ltd on 5th October 2016. An abridged report is shown in the Appendix.

2.1.1 Site location and access

- The site for the proposed works is Spitalfield, Welland.
- Nearest Post Code: WR13 6NE
- The grid reference for the centre of the development area is: OSGB 379700 240108

The site currently comprises an existing winter sports pitch. The pitch has been suffering from recurring waterlogging leading to saturated surface conditions. These conditions have contributed to the cancellation of fixtures with the pitch unplayable for extended periods of time, more so during the winter months. The aim of the project is to improve the standards of the existing pitch and to increase usage levels to those more in line with Sport England guidance.

The site is bounded by agricultural fields to the immediate North and West, and residential/urban developments to the South and East.

2.1.2 Arrangements to visit the site can be made by contacting:

Special arrangements to visit the site can be made by contacting:

David Sharp, Parish Clerk, Little Malvern and Welland Parish Council

- Email: dasharp@lineone.net
- Telephone: 01684 573213

2.2 GENERAL SCOPE

The work proposed in this specification shall be as follows:

PART A DRAINAGE INSTALLATION AND ESTABLISHMENT

- Spray off and remove existing vegetation.
- Primary cultivation to bury organic matter residue.
- Subsoil decompaction works
- In situ stone removal works.
- Installation of a piped drainage scheme at 5 m centres.
- Installation of secondary drainage (Koro topdrain or similar).
- Application of a 50 mm Rootzone carpet.
- Cultivations, fertilisation and seeding.

PART B INITIAL AGRONOMIC MAINTENANCE – 12 MONTHS

- Mowing.
- Fertiliser application.
- Aeration.
- Over-seeding.
- Herbicide (if required).
- Pesticide/Fungicide application (if required).

These specifications relate to the earthworks, drainage and pitch improvement works only. These specifications do not include provision for site security such as fencing and gates etc. The contractor will be required to provide all temporary fencing to ensure site security and protect the public. Please refer to the Schedule of Drawings (Table 1) for earthworks, pipe sizes and layout.

Table 1 Schedule of Drawings

Drawing No.	Title
TGMS1048.2-1	Drainage Design

General Notes

- All drainage and earthworks to be carried out using equipment fully equipped with laser grade control.
- All ancillary equipment to be fitted with low ground pressure tyres.
- The position and layout of the drainage system, as indicated on the attached drawing, may be amended to take account of local factors encountered on site.
- Contractors must be aware: allowance shall be made for topping up trench lines following settlement occurring during the 12-month period following drainage installation, including as a result of natural soil shrinkage in dry weather.
- Diesel or any other deleterious matter shall be prevented from contaminating the site etc. Any such matter allowed to pollute the site shall be removed together with all affected soil and/or plant material and carted to tip at the Contractor's own expense. Any material necessary to make good the soil formation or plant material will be provided by the Contractor and will be of the type and quality of the original material prior to damage, and must be approved by the Contract Administrator.
- Stones are a particular safety hazard and are a key component of Performance Quality Standards. The Contractor should note the specification requirements for stone removal and price accordingly. Provisional sums will not be considered as a compliant bid, and the specification must be achieved for the price stated by the Contractor in the tender return documents.
- It is the Contractor's responsibility to conduct searches to determine the presence of any services and utilities running through, over and/or around the working area. Contractors

should conduct site investigations to determine the location of any service or utilities as per good health and safety procedures. All this should be before the commencement of any work on site.

- Prior to start on site, the Contractor shall prepare a photographic Schedule of Condition and agree same with the Contract Administrator.

2.3 DETAILED SPECIFICATION

PART A: DRAINAGE INSTALLATION AND ESTABLISHMENT

Item	Operation
P1	The Contractor shall allow for all necessary fencing and signage in order to secure the working and site compound areas and haulage routes in order to protect members of the public from the works. It is anticipated that Heras fencing shall be used to demarcate the working areas and site compound. Footpath crossing points shall be marked appropriately. The location for deep excavations (e.g. inspection chamber construction) shall be protected with Heras (or similar) fencing.
P2	The Contractor shall allow for compliance with all relevant Health and Safety regulations including the Construction Design and Management regulations (CDM) 2015.
P3	The Contractor shall allow for the provision of all welfare facilities for staff.
P4	The Contractor shall allow for the mobilisation and demobilisation of all necessary plant to complete the project.
P5	The contractor shall allow for compliance with all Conditions of Contract.
P6	If floodlights are present on site, the contractor shall locate and mark the path of the electrical cables that feed the floodlights around the project area. The contractor will be responsible for making good any damage caused by construction.
A1	**Setting out and enabling works**
A1.1	The Contractor shall set out the working area. Please refer to Drawing No. **TGMS1048.2-1** (Drainage design) for details. If the contractor requires, TGMS can provide a setting out service for a fee (fee available on request).
A2	**Site clearance**
A2.1	Spray off the existing vegetation in the working area with an approved, systemic, non-residual total herbicide in accordance with the manufacturer's instructions and an appropriate COSHH assessment by qualified personnel. A period of 14 days shall elapse between spraying and undertaking cultivations to allow sufficient time for the vegetation to senesce. A second application of total herbicide may be required just prior to cultivation to ensure complete vegetation control. Extreme care should be taken to avoid spraying hedgerows on site.
A2.2	Any remaining vegetation and stubble on the site shall be flail-mowed and the clippings removed to disposal off-site.
A3	**Topsoil cultivation, grading and de-compaction works**
A3.1	Once the vegetation has senesced and ground conditions are suitable (topsoil in a dry and friable state), the working area shall be rotary cultivated to a depth of approximately 100 mm in order to incorporate any remaining organic matter residue and to provide a suitable tilth for surface grading.
A3.2	Under suitable ground conditions (i.e. topsoil in a dry and friable state), the development area shall be de-compacted to a depth of 300 mm **(pitch only**). A verti-drain will not be considered appropriate for this operation and the contractor will put forward their proposed methodology within the method statement. Details of the compacted layer can be found in the trial pit descriptions contained within the appended feasibility report.

A3.3 Following decompaction procedures and under suitable ground conditions (i.e. topsoil in a dry and friable state), the topsoil shall be cultivated and graded to restore surface levels following decompaction **(pitch area only)**, removing minor undulations and depressions and achieve smooth, flowing contours within the overall grade of the site.

A3.4 A stone separation operation shall be undertaken to remove all stones >20 mm in any dimension from at least the upper 100 mm depth of topsoil by stone picking or in-situ stone separation techniques. All sharp stones shall be removed from the upper 75 mm. These operations shall be undertaken with a modified potato harvester, beech cleaner or other suitable approved equipment and may require multiple passes to achieve the specification. Stone burying/stone raking alone in preparation for final cultivations/seeding will not be an acceptable method to meet stone content specifications. Further hand picking may be necessary. The stones shall be disposed of on-site in an approved location. The contractor should make themselves aware of the soil descriptions in the appended Feasibility report and price accordingly.

A3.5 Following this, the surface shall be cultivated and graded to restore surface levels. Surface level uniformity of the finished surface shall achieve a tolerance of no more than a 10 mm deviation beneath a 3.0 m straight edge.

A4 Drainage installation

A4.1 Trench excavation

4.1.1 Please refer to the accompanying Drawing **TGMS1048.2-1** for the layout of the drainage scheme. Drain cross sections are also presented on Drawing **TGMS1048.2-1**

4.1.2 The trenches shall be clean cut, with a level base, to the dimensions given in **Item A4.2**.

4.1.3 All trenches shall be excavated with machinery fitted with laser grade control.

4.1.4 Excavation shall begin at the outfall, the profile to be established at the outfall, and carried upstream with adjustments for grade and depth as work proceeds.

4.1.5 Any under drains encountered are to be marked so they can be renovated and connected into the new system if considered viable.

4.1.6 All spoil from this operation shall be disposed of on-site.

A4.2 Trench dimensions

4.2.1 Lateral drains (80 mm ∅ plastic perforated pipe)

- 0.450 m below nominal ground level (this may vary).
- Grade at natural fall of finished surface and not less than 0.50% (1:200).
- 5.0 m spacing.
- Not more than 0.150 m wide.

4.2.2 Collector drain (160 mm ∅ plastic perforated pipe)

- Depth 0.500 m below nominal ground level.
- Engineer grade at -0.20% from IC1 to IC2.
- Not more than 0.200 m wide.

4.2.3 Main drain (150 mm ∅ solid twin wall plastic pipe)

- Depth varies
- Main drain should outfall into the existing brook, depth to be confirmed.

A4.3 Gravel backfill for lateral and collector drains

4.3.1 The material shall be clean, hard, gravel or chippings (e.g. quartz or quartzite) with dimensions not greater than 6 mm and not less than 2 mm. The calcium carbonate content shall not exceed 10%.

4.3.2 The material shall be free of fines and placed in a 25 mm layer on the trench floor prior to laying the pipe (unless the trencher cuts a "V" shaped trench base when the pipe can be laid directly on the trench floor).

4.3.3 The gravel backfill shall be placed immediately and carefully over the pipe to the permeable fill surface level. Any damage to the pipe shall be made good at the Contractor's expense.

A4.4 Sand fill material for lateral and collector drains

4.4.1 The sand shall comply with the following grading:

- V. coarse sand (2.0 – 1.0 mm) <5%
- Coarse sand (1.0 – 0.5 mm) 10 – 20%
- Medium sand (0.5 – 0.25 mm) 55 – 70%
- Fine sand (0.25 – 0.15 mm) 10 – 20%
- V. fine sand (0.15 – 0.05 mm) <5%

4.4.2 The sand shall have a capillary rise of no more than 250 mm when compact (1.65 Mg/m^3),

4.4.3 The sand shall have at least 15% air-filled porosity in the top 50 mm of the capillary rise, and

4.4.4 The sand shall have a saturated hydraulic conductivity of at least 300 mm/h when compact (1.65 Mg/m^3).

4.4.5 The sand shall be non-saline (electrical conductivity < 0.75 dS/m), and contain less than 0.5% (w/w) $CaCO_3$.

4.4.6 The sand shall have a pH in the range of 5.5 – 7.0.

4.4.7 Allowance shall be made for topping up trench lines following settlement occurring during the 12-month period following drainage installation, including as a result of natural soil shrinkage in dry weather such that a level playing surface is achieved. This shall be taken into account when preparing cost estimates.

A4.5 Backfill for 150 mm diameter main drain

4.5.1 The drain shall be backfilled with spoil derived from the drain trench.

A4.6 Pipe laying

4.6.1 Pipes shall be laid to the correct depth stipulated above and to an even grade.

4.6.2 Drainage depth is to be measured from finished ground levels (unless indicated otherwise).

4.6.3 The pipe shall be corrugated plastic corresponding to EN1401-1:1998. There should be no damage to the pipe. Upper ends of drain runs shall be plugged to prevent ingress of soil or animals.

4.6.4 The main drains shall be solid, smooth, twin-walled plastic pipe to EN1401-1:1998.

A4.7 Junctions and connections

4.7.1 Connection of lateral drains to the collector drains shall be made with purpose made junctions (80/160).

4.7.2 The collector drains shall be let into the inspection chamber and caulked with a sand/cement mix concrete to make good the pipe/wall seal.

A4.8 Inspection Chambers

4.8.1 The inspection chambers are to be positioned as indicated on the accompanying plans and detailed in the work schedules.

4.8.2 Chambers can be constructed of brick, concrete or plastic (conforming to BS 7158).

4.8.3 They shall be large enough to permit access for cleaning, jetting and rodding.

4.8.4 A sump of at least 150 mm below the lowest pipe shall be incorporated to act as a silt trap.

4.8.5 The top of the chambers shall be set level with the ground surface.

4.8.6 The cover loading (to BS EN 124) for the inspection chambers on the playing surface shall be Class B125.

4.8.7 Synthetic turf shall be fixed to the inspection chamber covers (in turf areas only).

A4.9 Initial cultivations

4.9.1 Upon completion of the installation of drainage infrastructure, it is acceptable to cultivate the topsoil over the drain lines to mitigate potential settlement within the drain lines; a maximum of 75 mm soil cover shall be present over the drain lines.

A5 Secondary drainage installation (pitch area only)

A5.1 The sand bands shall be installed as indicated on drawing **TGMS1048.2-1 (pitch area only).**

A5.2 Sand bands shall be cut through the surface at approximately a 90^{o} angle to the lateral drains. The sand bands shall be installed at 0.5 m centres to 0.2 m depth using a Koro Top Drain or similar. Installation should ensure connection with the permeable fill of the piped drainage scheme identified above. All spoil will be deposited on site.

A5.3 The sand bands are to be filled with washed sand of predominantly 0.125 to 1.0 mm particles. The sand shall:

5.3.2 Comply with the following grading:

- V. coarse sand (2.0 – 1.0 mm) <5%
- Coarse sand (1.0 – 0.5 mm) 10 – 20%
- Medium sand (0.5 – 0.25 mm) 55 – 70%
- Fine sand (0.25 – 0.15 mm) 10 – 20%
- V. fine sand (0.15 – 0.05 mm) <5%

5.3.3 have a capillary rise of no more than 150 mm when compact (1.65 Mg m^{-3})

5.3.4 have at least 10 % air-filled porosity in the top 50 mm of the capillary rise.

5.3.5 have a saturated hydraulic conductivity of at least 300 mm/h when compact (1.65 Mg m^{-3}) at 15 cm tension.

5.3.6 be non-saline (electrical conductivity < 0.75 dS/m), and contain less than 0.5% (w/w) $CaCO_3$.

5.3.7 have a pH in the range of 5.5 – 7.0.

A5.4 It is important that limited settlement occurs prior to the installation of a rootzone carpet, therefore the material within the sand bands shall be satisfactorily consolidated and the sand backfill surcharged to 10 mm proud of the surface. Any settlement below stated levels during the first 12 months' post installation should be made good at the Contractor's expense.

A5.5 If necessary, flat roll the surface to restore surface levels.

A5.6 Following the installation of primary and secondary drainage, an additional hand stone pick will be required to remove all stones lying on the surface as a result of the drainage installation. The upper soil profile shall be free of stone and sharps as per the stone separation specifications outlined in **section A3.3**.

A6 Rootzone carpet installation (pitch area only)

A6.1 Once the drainage infrastructure has been approved by TGMS Ltd, the rootzone carpet shall be placed on the pitch area only.

A6.2 The rootzone material shall be of the following specification:

6.2.1 Comprise 70% sand compliant with the following grading:

- V. coarse sand (2.0 – 1.0 mm) <5%
- Coarse sand (1.0 – 0.5 mm) 10 – 20%
- Medium sand (0.5 – 0.25 mm) 55 – 70%
- Fine sand (0.25 – 0.15 mm) 10 – 20%
- V. fine sand (0.15 – 0.05 mm) <5%7

6.2.2 The sand shall be non-saline (electrical conductivity < 0.75 dS/m), and contain less than 0.5% (w/w) $CaCO_3$.

6.2.3 The rootzone shall also:

- Comprise 30% sandy soil.
- Contain a minimum organic matter content of 2% (LOI)
- Incorporate a slow release fertiliser
- Have a capillary rise of no more than 250 mm at a dry bulk density of 1.6 g/cm^3
- Have at least 15% air-filled porosity in the top 50 mm of the capillary rise
- Have a hydraulic conductivity of at least 150 mm/h at 20 cm tension and a dry bulk density of 1.60 g/cm^3

6.2.4 The Contractor shall supply an independent laboratory report on the proposed rootzone to include a particle size distribution (with appropriate sieve sizes to determine 6.2.1, calcium carbonate content, pH, organic matter content, saturated hydraulic conductivity, air filled porosity and capillary rise at the stated dry bulk density.

A6.3 The rootzone shall be placed to a depth of 50 mm over the pitch and safety margin areas. Great care should be taken to ensure that the sand backfill of the sand slits does not become contaminated with indigenous topsoil during this operation as this could compromise the efficacy of the drainage scheme.

A6.4 The rootzone shall be consolidated (but not overly compacted) to achieve a dry bulk density of approximately 1.5 g/cm^3.

A6.5 Once placed, the rootzone shall be graded such that the surface level uniformity shall achieve a tolerance of no more than a 10 mm deviation beneath a 3.0 m straight edge.

A7 Fertilisation

A7.1 The cultivated area shall be fertilised with an appropriate pre-germination fertiliser of 10:15:10 formulation at a rate of 70 g m^{-2} at least 3 days prior to seeding. This should be lightly worked into the seedbed during final cultivations.

A8 Seeding

A8.1 A suitable 100% Perennial Ryegrass seed mix shall be drilled @ 50 g/m^2 in at least three directions. The seed mix shall be made up from at least three varieties each with a minimum rating for the mean of live ground cover and visual merit of 7.0 as listed in the latest BSPB Turf grass Seed Book, Table S1: Perennial Ryegrass, Sports Uses.

A8.2 The seed shall have a certified germination of not less than 80% and a certified purity of not less than 90%. Total weed seed content shall not be more than 0.5% and the total content of other crop seeds shall not exceed 1%.

A8.3 If necessary, the seeded area shall be lightly rolled to settle and firm the surface.

A9 Reinstatement of damage

A9.1 All damage caused by plant and vehicle movement to the playing fields and identified / agreed with the Contract Administrator shall be made good by:

9.1.1 Cultivating the affected area to below the depth of damage using a rotary cultivator or similar equipment. Care must be taken with the timing of this operation to avoid smearing on the base of the cultivation. Any weeds, rubbish and stones over 20 mm gauge must be removed and disposed of on-site as directed by the Contract Administrator.

9.1.2 A seedbed should then be prepared using a power harrow.

9.1.3 Pre-seeding fertiliser (10:15:10) to be applied @ 70 g m^{-2} over the reinstated area a minimum of 5 days prior to seeding.

9.1.4 A suitable Perennial Ryegrass dominated seed mix shall be drilled at a rate of 35 g m^{-2} in two directions. The seed mix shall be made up from at least three varieties each with a minimum rating for the mean of live ground cover and visual merit of 7.0 as listed in the latest BSPB Turf grass Seed Book, Table S1: Perennial Ryegrass, Sports Uses.

9.1.5 The seed shall have a certified germination of not less than 80% and a certified purity of not less than 90%. Total weed seed content shall not be more than 0.5% and the total content of other crop seeds shall not exceed 1%.

9.1.6 The finished levels for seeding shall, unless otherwise indicated on the drawings, be perfect to the surrounding contours and 25 mm above any adjacent hard surfaces.

PART B: INITIAL AGRONOMIC MAINTENANCE (TO HANDOVER)

P1 The Contractor shall allow for all necessary fencing and signage in order to secure the working and site compound areas and haulage routes in order to protect members of the public from the works. It is anticipated that high visibility mesh fencing shall be used to demarcate the working areas. The site compound shall be secured with Heras (or similar) fencing. Footpath crossing points shall be marked appropriately. The location for deep excavations (e.g. inspection chamber construction) shall be protected with Heras (or similar) fencing.

P2 The Contractor shall allow for compliance with all relevant Health and Safety regulations including the Construction Design and Management regulations (CDM) 2015.

P3 The Contractor shall allow for the provision of all welfare facilities for staff.

P4 The Contractor shall allow for the mobilisation and demobilisation of all necessary plant to complete the project.

P5 The Contractor shall allow for compliance with all Conditions of Contract.

B1 Mowing. The Contractor shall carry out the first cut with a rotary mower when the grass has reached a height of 60 mm. The first three cuts shall maintain the grass at 50 mm. Checks for stones; hand–picking will be carried out if necessary before each cut. After the first three cuts, the Contractor shall cut the development area at a height of 35 mm with low ground pressure cylinder mowing equipment for the remainder of the contract period. During this period the grass must never be allowed to exceed a height of 50 mm. It is anticipated that **30 cuts** will be required in total.

B2 Fertiliser. The contractor shall allow for 3 fertiliser applications to maintain healthy growth and colour throughout the contract period. Plan for the application of fertiliser to commence 4 weeks after grass establishment using the following programme as a guide:

Mar 10:5:15 at 350 kg/ha
Jun 15:5:15 at 350 kg/ha
Aug 15:5:15 at 350 kg/ha

B3 Weed control. The contractor shall plan for the application of an approved selective herbicide 6 months after establishment at a time TBC by the contract administrator. This shall be applied at least two weeks after any fertiliser treatment and at a time when grass growth is strong and healthy. Do not apply herbicide during periods of potential turf stress i.e. if the weather is hot and dry or if the weather is frosty. Apply herbicide strictly according to the manufacturer's label recommendations.

B4 Overseeding (if required). The development area shall be overseeded using the same seed mixture as that used in the original establishment of the site at a rate of 25 g/m^2.

B5 Aeration. Verti-drain/groundbreak the development area on one occasion when ground conditions are suitable (sufficient water content to allow penetration of Verti-drain tines to full operating depth).

B6 Pest and disease control. Pest and diseases should be controlled using an approved control agent if required.

2.4 WORK SCHEDULES

Please refer to the accompanying MS Excel spreadsheet:

TGMS1048.2 Little Malvern and Welland PC Work Schedules 14 03 17.xlsx

2.5 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

	Year 1 (2017)												Year 2 (2018)											
Construction Works	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 + drainage																								
12-months maintenance period																								
Overseeding																								
Ground ready for play																								

Notes:

N.B. 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.

2.6 DESIGNERS ASSESSMENT OF RESIDUAL RISK

2.6.1 The Project

- Name: The renovation and drainage of an existing football pitch at Spitalfield.
- Nature: Sports field construction
- Location: Welland, WR13 6NE

2.6.2 Nature of work:

PART A DRAINAGE INSTALLATION AND ESTABLISHMENT

- Spray off and remove existing vegetation.
- Primary cultivation to bury organic matter residue.
- Subsoil decompaction works
- In situ stone removal works.
- Installation of a piped drainage scheme at 5 m centres.
- Installation of secondary drainage (Koro topdrain or similar).
- Application of a 50 mm Rootzone carpet.
- Cultivations, fertilisation and seeding.

PART B INITIAL AGRONOMIC MAINTENANCE – 12 MONTHS

- Mowing.
- Fertiliser application.
- Aeration.
- Over-seeding.
- Herbicide (if required).
- Pesticide/Fungicide application (if required).

2.6.3 Timescale for works:

5 weeks + Agronomic Maintenance

2.6.4 Existing drawings:

Table 2 Schedule of Drawings

Drawing No.	Title
TGMS1048.2	Drainage Design

2.6.5 Existing environment:

The site currently comprises an existing winter sports pitch plus a pavilion.

2.6.6 Residual risk to construction workers:

1. Tetanus.
2. Injury from vehicle movements in and around site.
3. Potential fall hazard from exposed trenches prior to backfilling.
4. Fertiliser application.
5. Herbicide application.
6. Materials handling.

2.6.7 Residual risk to construction workers:

1. Tetanus.
2. Injury from vehicle movements in and around site.
3. Potential fall hazard from exposed trenches prior to backfilling.
4. Fertiliser application.

5. Herbicide application.
6. Materials handling.

2.6.8 Residual maintenance risks

1. Handling, storage and application of pesticides
2. Handling, storage and application of fertilisers
3. Dust (soil)
4. Manual handling
5. Use of machinery including tractors, mowers, rollers and others.
6. Vibration
7. Cutting grass on slopes (using strimmer or appropriate methodology).
8. Maintenance of high voltage floodlight and irrigation equipment.
9. Use of pressurised water (through irrigation system)
10. Work at height (to maintain fencing and floodlighting)
11. Confined, deep spaces (maintenance of inspection chambers)

2.6.9 Residual operator risks

1. Risk of acute and chronic sport injury – this risk has been minimised through the use of industry approved products and systems, material selection, the use of industry best practice design and the use of performance testing. It is the Client's responsibility to maintain the surfaces so that these performance and safety standards are maintained.
2. The use of sports facilities during the construction phase (this risk is owned by the Contractor and the Client and behaviour, coordination and communication are as important as physical control measures such as fencing and signage).

2.6.10 Construction materials that are hazardous to health:

1. Herbicide
2. Fertiliser
3. Soil

2.6.11 Site wide elements:

The working areas and haul routes shall be fenced with Heras fencing, or similar, to delineate these areas. This fencing shall be maintained until handover to the Client.

2.6.12 Method statements & risk assessments to be provided by contractor:

1. Drainage installation.
2. Decompaction procedure as outlined in section A3.2 – A extensive methodology will be required.
3. Sand band installation with Koro topdrain or similar.
4. Rootzone carpet installation.
5. Fertiliser applications.

2.7 METHOD STATEMENTS

ITEM	Brief method statement (Continue on additional sheets if required)	Type/ name of equipment you intend to use	Is equipment owned by the contractor?	Is equipment rented?	Will work be sub-contracted?	How many staff will be on site?
Drainage installation						
Decompaction procedure as outlined in section A3.2 – A extensive methodology will be required						
Sand band installation with Koro topdrain or similar						
Rootzone carpet installation						
Fertiliser application						

2.8 SUBCONTRACTORS

Please specify the names and contact details for any subcontractors that you intend to use during the project (please continue on a separate sheet if necessary):

Name:	Contact Details:	Role:

2.9 REFERENCES

Please provide references from three recent (last 2 years) schemes where you have carried out work of a similar nature and value. Please give name, address and telephone number for the referees.

Name:	Contact Details:	Nature of work / project value (£):

2.10 CONFIDENTIALITY

This presentation is confidential and is only for the use of officers of Little Malvern and Welland Parish Council. Without the specific consent in writing of TGMS Limited, no copies of this presentation are to be made and information contained herein should not be communicated to any third party. At the request of TGMS Limited all copies of this document, in whatever form, are to be returned.

2.11 CONTACT DETAILS

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APPENDIX 1 ABRIDGED FEASIBILITY STUDY

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A REPORT TO LITTLE WELLAND AND MALVERN PARISH COUNCIL

A feasibility study for the renovation of an existing winter sports pitch at Spitalfield, Welland, WR13 6NE.

5th October 2016

TGMS1048.2

Certificate Number 11324
ISO 9001

Directors: Dr Richard Earl, Tim Colclough, Dr Iain James

Registered Office: TGMS Limited ♦ 4 Doolittle Mill ♦ Froghall Road ♦ Ampthill ♦ Bedfordshire ♦ MK45 2ND.

Company Registration Number: 06623973

TABLE OF CONTENTS

Please note, important: This report aims to appraise the current conditions on site at the site specified in 'Physical Site Survey' below only. This is not a design document and does not include detailed design or design information and should not be used for this purpose. As such, TGMS accepts no design liability or responsibility for subsequent works based on the information contained within this report.

REVISION RECORD					
Rev	**Date**	**Description**	**Prepared**	**Checked**	**Approved**
0	05/10/2016	Document Creation	MY	EW	EW

1 EXECUTIVE SUMMARY Little Malvern and Welland PC

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 renovation of an existing winter sports pitch at Spitalfield, Welland, WR13 6NE.
	2.	The proposed site is located in Flood Zone 1 which has a very low risk of flooding from Rivers and Seas and Surface water. The site is also not located within a Groundwater Source Protection Zone or over existing landfill.
	3.	The soil on site was mapped by the Soil Survey of England and Wales. Based on data obtained and field observations, it is likely that the soil is from the 'BROCKHURST 1' association, described as 'slowly permeable seasonally waterlogged reddish fine loamy over clayey soils. Some similar soils with slowly permeable subsoils and slight seasonal waterlogging'. Soil characteristics would suggest these soils have relatively poor permeability i.e. < 5mm/hour.
	4.	Data from the Flood Estimation handbook indicates annual rainfall to be 688 mm for this catchment. Based on the ADAS 345 method, a drainage scheme should be designed to accommodate a peak drain flow rate of approximately **8.2 L s^{-1} ha^{-1}** or **4.4 L s^{-1}** for the total site.
	5.	The site is characterised by a CLAY LOAM topsoil containing moderate stone content, overlying a heavily compacted CLAY subsoil. Whilst 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, it is very likely that its drainage capacity will be sub-optimal (i.e. < 5 mm/hour) for winter sports use.
	6.	The surface level at the lowest part of the pitch (North West corner) is 40.25 m above Ordnance Datum (AOD); the surface level at the highest part of the pitch (South East corner) is 41.55 m AOD. Gradients along the direction of play (W – E) and gradients across the direction of play (S – N) are within Sport England guidelines for recommended slopes for sports pitches, therefore cut and fill earthworks are not envisaged.
	7.	The existing football pitch is orientated at 49° and is therefore non-compliant with Sport England guidelines. Pitches orientated with their playing direction east-west are susceptible to a low winter sun. However, due to the shape and size of the development area, it may not be feasible to orientate the pitch as per Sport England guidelines.
	8.	Aerial imagery suggests a drainage scheme may be present with distinct drainage laterals running in a northerly direction to a collector drain, which outfalls into the small stream located along the northern perimeter of the site. The lateral drains are at approximately 15 m centres, which in today's standards would be deemed inadequate. Additionally, a large amount of silt/soil was present within the upper profile of the gravel drainage layer of TP2 (drainage line); this will further compromise the efficiency of any drainage scheme. Based on site conditions and the indigenous soil characteristics, a more intensive scheme with a secondary bypass system would be recommended.
	9.	Nutrient status and soil pH is within the recommended guidelines to support good grass growth.
	10.	Observations made during the initial site visit identified a moderate level of stone content running through the topsoil. Stone content comprised primarily flints and cobbles and pose a significant injury risk to patron using the facilities if not dealt with properly during the construction phase via stone separation techniques.

Matt Young – October 2016

2 INTRODUCTION AND OBJECTIVES

TGMS Limited has been commissioned by Little Malvern and Welland Parish Council to conduct a detailed site investigation for the renovation of an existing winter sports pitch at Spitalfield, Welland.

The objectives of the feasibility study are as follows:

- To undertake a detailed site investigation in order to characterise the underlying soil profile.
- To prepare a set of development options for drainage of the winter sports pitch.
- 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.

3 PHYSICAL SITE SURVEY

TGMS Ltd conducted a topographical and geophysical survey of the site on the 7th September 2016. Matt Young of TGMS Ltd conducted a detailed site visit on the 8th September 2016 to identify current issues on site and to evaluate the efficacy of any existing drainage infrastructure.

3.1 Site location and access

The site for the proposed renovation (Spitalfield) is situated to the east of Welland Village off Marlbank Road, Welland, WR13 6NE. Vehicular access is from a car park located on Marlbank Road, which can be found 100 metres prior to/or after the crossroad.

The grid reference for the site is approximately: OSGB 379700 240108.

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

The site currently comprises an existing winter sports pitch. The renovation is part of section 106 funds which have been earmarked for the improvement of sports facilities within the parish. The pitch has been suffering from recurring waterlogging leading to saturated surface conditions. These conditions have contributed to the cancellation of fixtures with the pitch unplayable for extended periods of time, more so during the winter months. The aim of the project is to improve the standards of the existing pitch and to increase usage levels to those more in line with Sport England guidance.

The site is bounded by agricultural fields to the immediate North and West, and residential/urban developments to the South and East.

Figure 2 General View of site looking North West

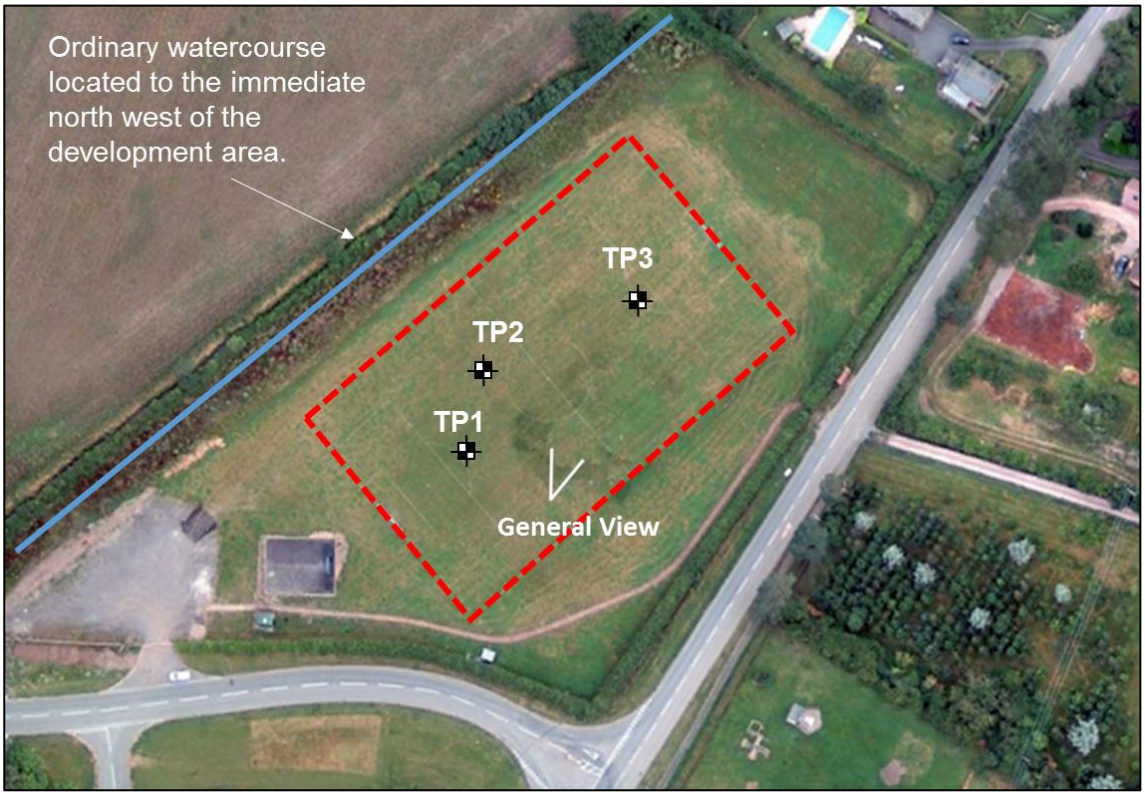

Figure 3 TP1 – TP3 mark the location of the trial pits. The general view refers to Figure 2. Location indicative only and not to scale.

3.2 Geology and climate

3.2.1 Hydrology

To the immediate North West of the development area, a small stream/drainage ditch is located. This ordinary watercourse extends along the northern perimeter of the field where the development is situated (See Figure 3).

Climate data obtained from the Flood Estimation Handbook (FEH) indicate that the standard-period average annual rainfall (SAAR) is 688 mm for this catchment. Drainage outfall rates have been calculated using the ADAS 345 method and are shown in Table 1. Drainage design should account for at least the 1:30 return period outfall rate. On a per unit area basis this is 8.2 L/s/ha and if the whole grass area is to be drained then outfall capacity should be designed at 4.4 L/s.

Table 1 ADAS 345 Small Catchment Drainage Outfall Rates per unit area and from the whole site (0.54 ha).

Return period	Per unit area Drainage Outfall Rate (L/s/ha)	Whole field Drainage Outfall Rate (L/s)
1:2	4.5	2.4
1:10	6.2	3.3
1:30	8.2	4.4
1:100	11.2	6.0

3.2.2 Risk of flooding from Rivers and Seas

Based on information obtained from the Environment Agency (EA), the site has a very low risk of flooding from rivers and seas with a chance of flooding of less than 1 in 1000 (0.1%).

3.2.3 Risk of flooding from Surface water

Based on information obtained from the Environment Agency (EA), the site has a very low risk of flooding from surface water with a chance of flooding of less than 1 in 1000 (0.1%).

3.2.4 Landfill

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

3.2.5 Groundwater

Based on information obtained from the Environment Agency (EA) the site is not located within a Groundwater Source Protection Zone.

Given this information, it may be permissible to conduct site remodelling works without affecting the volume or dynamics of a flood plain. 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 geology is suitable.

3.2.6 Soils and geology

The soil on site was mapped by the Soil Survey of England and Wales. Based on data obtained and field observations, it is likely that the soil is from the 'BROCKHURST 1' association, described as 'slowly permeable seasonally waterlogged reddish fine loamy over clayey soils. Some similar soils with slowly permeable subsoils and slight seasonal waterlogging'.

According to the British Geological Survey (BGS), the soil overlies 'Head - Clay, Silt, Sand and Gravel'. Superficial Deposits formed up to 3 million years ago in the Quaternary Period. Local environment previously dominated by subaerial slopes.

This overlies bedrock of the 'Sidmouth Mudstone Formation – Mudstone'. Sedimentary Bedrock formed approximately 217 to 250 million years ago in the Triassic Period. Local environment previously dominated by hot deserts.

Site geology is in-line with findings from a non-confidential borehole situated in the vicinity of the site, which indicated TOPSOIL to a depth of ~0.6 m, overlying GRAVEL (drift) to a depth of ~0.9 m, overlying red CLAY (mudstone) to an overall depth of ~62.0 m.

http://scans.bgs.ac.uk/sobi_scans/boreholes/269872/images/10536655.html
BGS ID: 269872, BGS Reference: SO74SE3
British National Grid (27700): 379680,240040

This bedrock may not be suitable for the installation of either shallow or deep bored soakaways due to its inherently poor permeability characteristics; however, further investigation would be required through commissioning a borehole prognosis report from the British Geological Society.

3.3 Electromagnetic inductance (EMI)

EMI scanning is a non-invasive method for assessing the degree of variation in soil type and/or condition. The results are predominately affected by clay content and water content and, therefore, the technique provides a rapid means for determining the most appropriate locations around a site for conducting more detailed analyses of the soil, including the excavation of soil test pits. Very often, the EMI scan can also detect the presence of existing drainage infra-structure, electricity cables or water mains.

EMI maps of the results of scans of the top 0.75 m (termed 'Horizontal EMI Scan') of the soil beneath the surface of the site is appended (Figures A2 respectively). With reference to these figures, lighter coloured areas typically represent drier and/or less clayey conditions whereas darker coloured areas typically represent wetter and/or more clayey conditions.

The horizontal scan shows minor variation across the site. The area where the pitch is located is reasonably consistent with predominantly lighter coloured areas indicating drier soil conditions. Darker areas indicating more wetter/clayey soil conditions are located predominantly to the north, outside the pitch area. The Horizontal scan shows no indication of any piped infrastructure or services across the site, however this does not necessarily mean that services are not present.

The vertical scan shows slightly greater variation across the site. However, similar to the horizontal scan, the lighter colours exist within the area of the pitch and darker areas are located predominantly to the north and outside the perimeter of the pitch. Soil sampling pits were excavated based on the EMI scan and consultants experience.

3.4 Topographical (levels) survey and pitch orientation

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. Topographical data were collected at a sampling density of approximately 10,000 data points / ha using RTK-GPS equipment, which is accurate to within ± 3 cm; these data are appended using 0.25 m contour intervals (Figure A1). The surface level at the lowest part of the pitch (North West corner) is 40.25 m above Ordnance Datum (AOD); the surface level at the highest part of the pitch (South East corner) is 41.55 m AOD.

Sport England has usefully provided some guidance on the maximum acceptable slopes for natural turf sports pitches. In summary, the maximum slope along the direction of play should not exceed 1.25%, whilst the maximum cross-fall should not exceed 2.00%. However, it is not desirable for both the longitudinal and cross-falls to be at these maximum values.

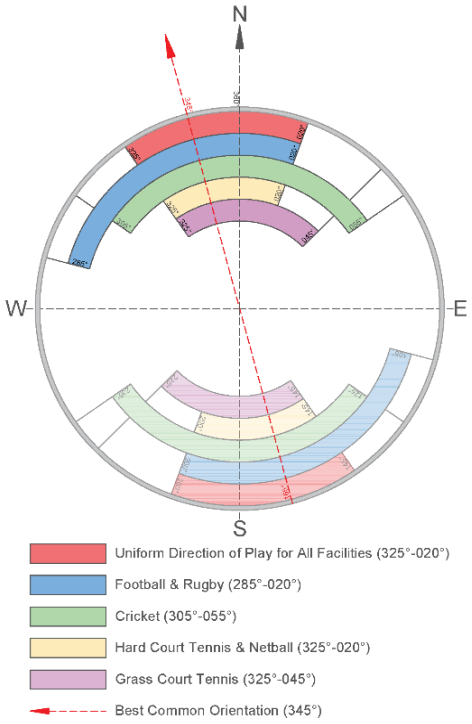

Figure 4 Optimum pitch orientations (Sport England).

The gradients of the existing pitch can be seen within Table 2. Gradients along the direction of play (W – E) and across the direction of play (S – N) are within Sport England guidelines for recommended slopes for sports pitches, therefore cut and fill earthworks are not envisaged.

In terms of pitch orientation, Sport England (SE) has published guidance on optimum pitch orientation for a range of sports (Figure 4).

The existing football pitch is orientated at 49º and is therefore non-compliant with Sport England guidelines. Pitches orientated with their playing direction east-west are susceptible to a low winter sun. However, due to the shape and size of the development area, it may not be feasible to orientate the pitch as per Sport England guidelines.

Table 2 Summary of maximum recommended slopes for sports pitches as specified by Sport England compared with actual onsite gradients (Red box denotes gradient is outside Sport England recommendations).

Pitch	Sport England Guidance		Onsite Gradients	
	Direction of play	*Across play*	*Direction of play (W – E)*	*Across play (S – N)*
Football pitch	1.25%	2.00%	0.81%	0.30%

3.5 Soil sampling

Three soil trial pits (TP1, TP2 and TP3, see Figure 3) 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.

3.5.1 Trial Pit Profile Description

TP1 was located in the south side of the existing pitch, in an area of medium elevation (~41 AOD).

The soil profile comprised ~100 mm depth of well-structured CLAY LOAM topsoil, overlying a heavily compacted CLAY to a depth of ~300 mm (see Figure 5). Further excavation was not

possible due to the hardness of the sub-base. This highly compacted pan will prevent the percolation of water through the subsoil and into the drainage layer, in effect creating a perched water table which will contribute to saturated surface conditions. There was evidence of de-compaction works and sand topdressing with a distinct layer of sand in the upper ~20 mm. Stones were present within the upper soil profile and predominantly comprised of sharp flints and cobbles (~30 mm in longest axis).

Rooting depth was typically ~100 mm and consistent with the time of year with grass heights maintained at ~30 mm. Thatch depth was ~10-15 mm, which is considered high and outside Sport England Performance Quality Standards. Grass cover was good (>90%) with sward composition consisting of perennial ryegrass (*Lolium Spp*.) and shallow rooting grasses such as Annual meadow grass (*Poa annua)*. Weed content was moderate (~10-15%) and predominantly comprised of Greater plantain *(Plantago major),* Clover (*Trifolium repens*), Daisy (*Bellis perennis*) and Dandelion *(Taraxacum officinale)*.

No drainage/piped infrastructure was encountered within the trial pit. Surface uniformity was very good, presenting no obvious areas whereby which surface water could accumulate during and after heavy rainfall events.

Figure 5 Overview of TP1 soil profile (CLAY LOAM overlying a heavily compacted CLAY)

Figure 6 Overview of sharp flints and cobbles (~30 mm in longest axis)

TP2 was excavated over an existing drain line to assess the immediate profile and efficacy of the drain. The TP was located in a central area of the existing pitch, in an area of medium elevation (~40 AOD).

The profile comprised ~200 mm depth of CLAY LOAM topsoil, overlying granite chippings (~80 mm in longest axis) interspersed with soil (figure 7). Further excavation to the pipe was not possible due to the chippings forming an impenetrable layer (for hand tools). It was evident that soil migration into the drainage layer had taken place, therefore reducing the efficacy of the drainage scheme. What was particularly pertinent was the absence of any aggregates i.e. rootzone or sand, which are commonplace materials found within constructed drainage trenches.

Agronomic condition was very similar to **TP1**. Rooting depth was typically ~100 mm and consistent with the time of year with grass heights maintained at ~30 mm. Thatch depth was ~10-15 mm, which is considered high and outside Sport England Performance Quality Standards. Grass cover was good (>90%) with sward composition consisting of perennial ryegrass (*Lolium Spp*.) and shallow rooting grasses such as Annual meadow grass (*Poa annua)*. Weed content was moderate (~10-15%) and predominantly comprised of Greater plantain *(Plantago major),* Clover (*Trifolium repens*), Daisy (*Bellis perennis*) and Dandelion *(Taraxacum officinale)*.

Surface uniformity was very good, presenting no obvious areas whereby which surface water could accumulate during and after heavy rainfall events.

Figure 7 Overview of TP2 soil profile showing granite chippings

TP3 was located in the north side of the pitch, in an area of lower elevation (~40 AOD).

The soil profile was consistent with **TP1**, and comprised ~100 mm depth of well-structured CLAY LOAM topsoil, overlying a heavily compacted CLAY to a depth of ~300 mm (see Figure 8). Further excavation was not possible due to the hardness of the sub-base. There was further evidence of de-compaction works with sand topdressing present within the upper soil profile. Stones were present within the upper soil profile and predominantly comprised of sharp flints and cobbles (~30 mm in longest axis).

Agronomic condition was very similar to **TP1** and **TP2**. Rooting depth was typically ~110 mm and consistent with the time of year with grass heights maintained at ~30 mm. Thatch depth was ~10 mm, which is considered high and outside Sport England Performance Quality Standards. Grass cover was good (>90%) with sward composition consisting of perennial ryegrass (*Lolium Spp*.) and shallow rooting grasses such as Annual meadow grass (*Poa annua)*. Weed content was moderate (~10-15%) and predominantly comprised of Greater plantain *(Plantago major),* Clover (*Trifolium repens*), Daisy (*Bellis perennis*) and Dandelion *(Taraxacum officinale)*.

No drainage/piped infrastructure was encountered within the trial pit. Surface uniformity was very good, presenting no obvious areas whereby which surface water could accumulate during and after heavy rainfall events.

Figure 8 Overview of TP3 soil profile (CLAY LOAM overlying a heavily compacted CLAY)

Figure 9 Overview of TP3 excavation

3.5.2 Soil Texture

Laboratory analysis of soil texture was in general alignment with the field observations (see Table 3). The topsoil was classed as CLAY LOAM and subsoil was classed as CLAY.

Table 3 Soil Texture

Trial Pit	Depth (m)	Sand (%)	Silt (%)	Clay (%)	Classification
1	0.000 – 0.100	36	35	29	CLAY LOAM
1	0.100 – 0.300	22	41	37	CLAY
2	0.000 – 0.200	36	35	29	CLAY LOAM
3	0.000 – 0.100	39	32	29	CLAY LOAM

3.5.3 Topsoil Nutrient Status

Samples of topsoil were sent to a contract laboratory for analysis of nutrient status. All pH values fell within the recommended range to support good grass growth. Indices of 2 and above indicate that there is sufficient supply of a particular nutrient. With reference to Table 4, nutrient status is good.

Table 4 Topsoil nutrient status

Trial Pit	pH	Phosphorus (P) (mg/l)	Index	Potassium (K) (mg/l)	Index	Magnesium (Mg) (mg/l)	Index
1	7.4	35.8	3	180	2-	353	6
2	7.1	32.0	3	243	3	421	6
3	7.5	24.8	2	177	2-	474	6

In summary, the site is characterised by a CLAY LOAM topsoil containing moderate stone content, overlying a heavily compacted CLAY subsoil. Whilst 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, it is very likely that its drainage capacity will be sub-optimal (i.e. < 5 mm/hour) for winter sports use.

Once clay contents exceed approximately 30%, they can significantly and adversely affect the rate at which water can percolate through the profile (i.e. characterised by low hydraulic conductivity). Given that the clay content of the subsoil was 37%, it is expected that drainage rates through this material could be very low (<1 mm/hour). This is further compounded by the high silt content (41%); silt particles tend to migrate towards and block pores in the soil that are normally associated with the transmission of drainage water and aeration.

Therefore, during the winter months when the rate of precipitation exceeds that rate at which water is removed through drainage or evapotranspiration, water will tend to accumulate within the topsoil. 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 pores should be air-filled).

In order to correct this situation, consideration should be given to the installation of a surface by-pass drainage system. These systems work by intercepting rain water at the surface before it has had an opportunity to soak in to the soil profile, and then removing this water to a system of piped drains. Typical systems would comprise sand grooves (Figure 10) linked into a system of lateral drains beneath the playing field.

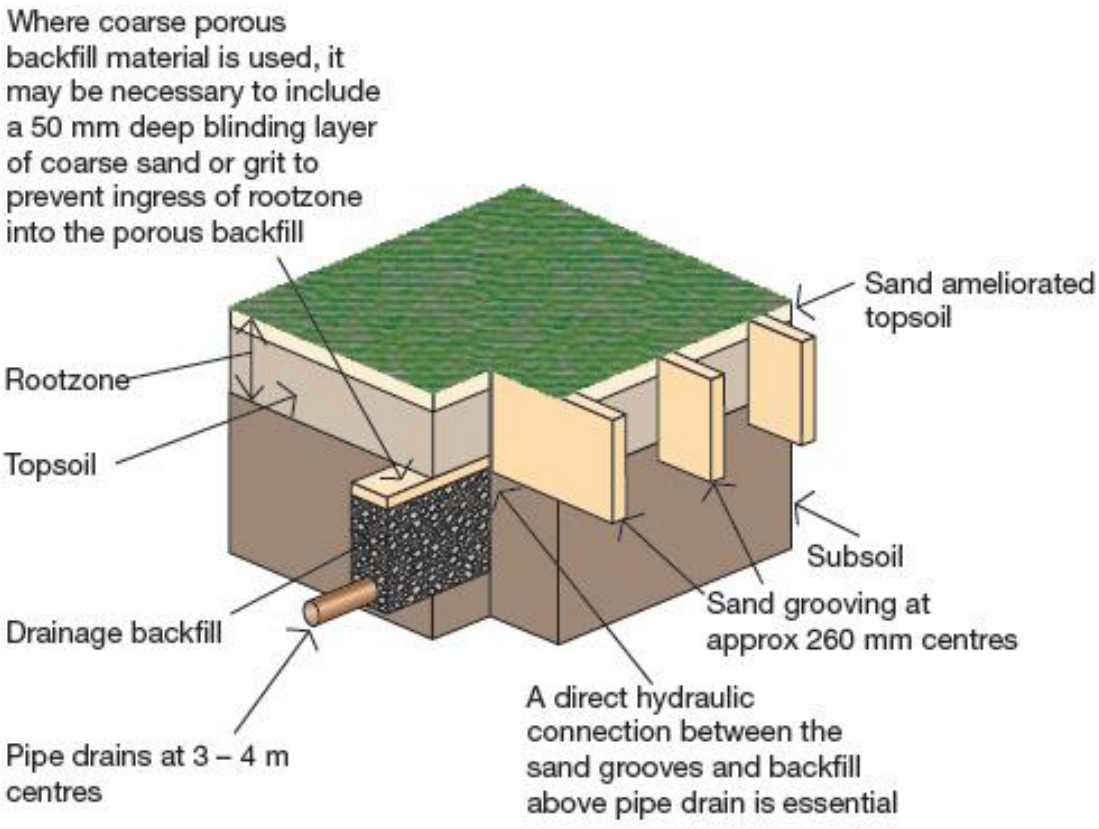

Figure 10 Typical sand groove based drainage system (Ref: Sport England Design Guidance Note "Natural Turf for Sport", 2011

3.6 Existing drainage infrastructure

Aerial imagery suggests a drainage scheme is present (see Figure 11), as it shows distinct drainage laterals connecting to a collector drain, which outfalls into the small stream located along the northern perimeter of the site (this outfall pipe was identified at the north of the site during the site investigation, see Figure 12).

The lateral drains are at approximately 15 metre centres, which in today's standards, with a desire to increase usable hours per week on natural turf pitches, would be deemed inadequate to provide the requisite performance whilst maintaining sustainable turf surfaces. Sport England Design Guidance Notes for Natural Turf stipulate primary drainage at 3-4 metre centres and depending on soil type are frequently supplemented by secondary drainage schemes.

Additionally, trial pit 2 was purposely excavated to review an existing drainage channel. A large amount of silt/soil was present within the upper profile of the gravel drainage layer of TP2. To this end, based on site conditions, the current system would be considered insufficient. Based on site geology and the indigenous soil characteristics on site, a more intensive scheme with a secondary bypass system would be recommended.

Due to the current system discharging into the ordinary water course (as identified), it is likely that any new drainage development will also discharge into this area. If this is not possible then it would be necessary to obtain the relevant permissions including discharge consents and planning requirements obtained from the Environment Agency, landowners or local authorities. These procedures can significantly delay proceedings and prior investigation may be necessary at feasibility stage.

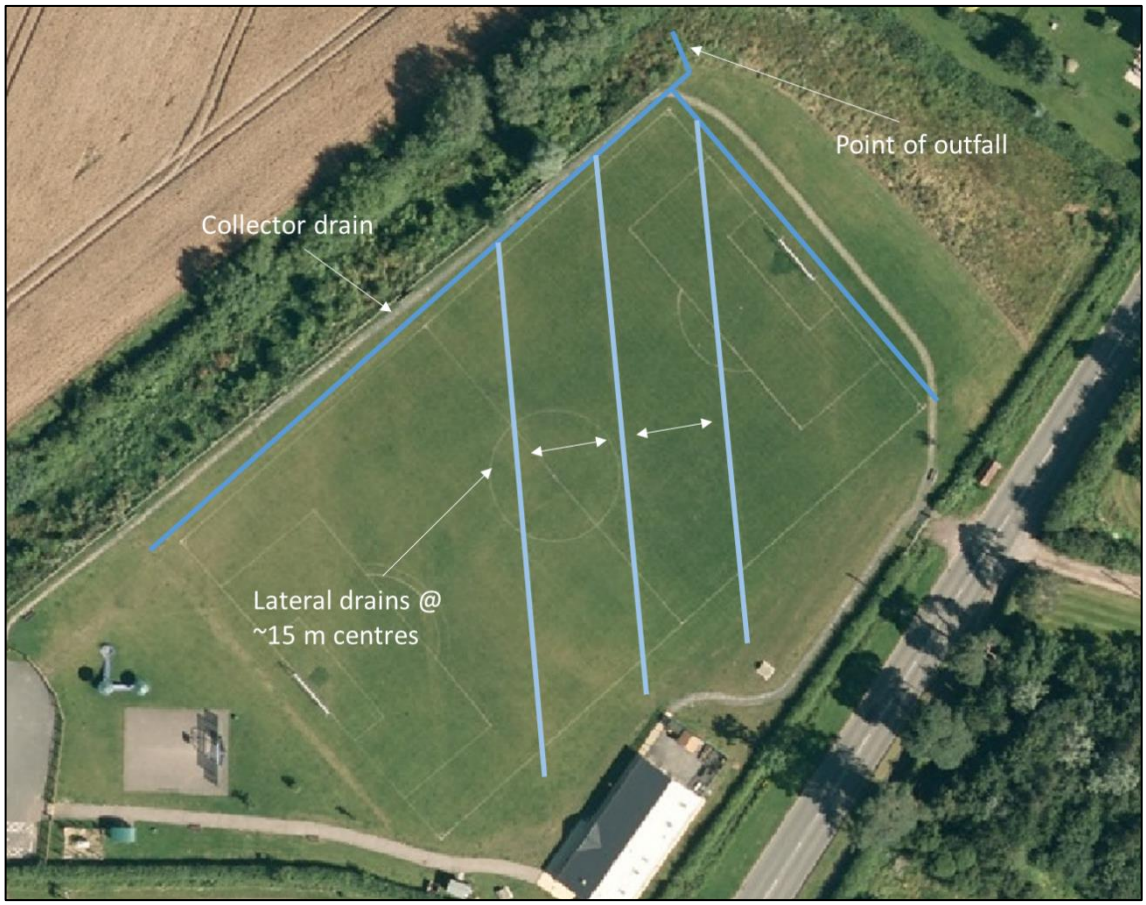

Figure 11 Overview of existing drainage scheme showing lateral drains, collector drains and point of outfall

3.7 Agronomic assessment

Specific agronomic detail has been provided in the description of trial pits in Section 3.5.1 however the following provides an overview of current conditions.

1. **Mixed sward composition** – Comprising a mixture of sports specific perennial ryegrass *(Lolium Spp.)* and annual meadow grass (*Poa annua*), a shallow rooting grass more susceptible to drought and disease which has weakened sufficiently to allow the ingress of tap rooted and creeping weed species such as plantains, undesirable components for sports pitches.

2. **Thatch** – A thatch layer of approximately 10-15 mm was identified within the upper soil profile. Thatch presents numerous problems:
   - Turf grass roots tend to grow in the thatch layer making plants more susceptible to stress whilst also encouraging shallow rooted grasses (*Poa annua*).
   - interferes with water, air and nutrient movement
   - Soil beneath thatch becomes easily compacted because of poor root development.
   - Increases insect and disease potential.

3. **Uniform playing surface** – Gradients of the existing pitch is within SE guidelines for the recommended slopes for playing pitches. Surface uniformity is also very good, presenting no obvious areas whereby which surface water could accumulate during and after heavy rainfall events.

4. **Nutrient content** – Nutrient status and soil pH is within the recommended guidelines to support good grass growth.

5. **Good ground cover** – Good ground cover was evident across the site indicative of managed use, resulting in minimal wear and tear.

In summary, the site is in good agronomic condition with a high proportion of desirable grasses constituting a good grass cover. The whole site would benefit (although not essential) from the removal of existing grasses (which would be necessary for topsoil cultivation), surface re-grading and reseeding with new sports-specific perennial rye grass.

Figure 12 Overview of batter slope located to the north of the site beyond the existing football pitch

Figure 13 Overview of area where outfall pipe can be identified

Figure 14 Overview of outfall pipe

Figure 15 Overview of pitch looking north

3.8 Site usage

It is difficult to predict with any accuracy the hours of play following 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.

3.9 Performance Quality Standards (PQS)

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

3.10 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 natural grass pitches relies on optimal weather conditions to aid germination and grass plant establishment. In some cases, when construction is carried out in summer and during drought conditions, supplementary irrigation may be required, the costs of which should be factored in to the budget. It is the responsibility of the Client to provide sufficient irrigation during the duration of project construction and subsequent maintenance.

- **Outfall** – When discharging into existing drainage or natural water courses, it may be necessary to obtain the relevant permissions including discharge consents and planning requirements obtained 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 it is imperative that a well-structured intensive maintenance programme is implemented to maintain the pitch following large scale investment. Failure to implement the recommended maintenance operations will result in a deterioration of pitch conditions and subsequent availability for use.

- **Drainage installation –** Based on the indigenous soil characteristics on site, it is likely that settlement may occur following drainage installation. Topping up of drain lines may be required as part of a maintenance scheme.

- **Secondary drainage** – In some cases, secondary drainage will be recommended, particularly on sites which exhibit high clay content. Secondary drainage relies on annual topdressing to maintain a direct hydraulic connection between the surface and piped infrastructure, the costs of which can be approximately £2-3k per annum, this should be factored in to yearly budgets to ensure the efficacy of the drainage.

- **Primary and drainage schemes** – Primary and secondary drainage incorporates high levels of sand and aggregates within the drainage; during periods of drought, especially during summer, grass sward may suffer without irrigation as sand has minimal moisture holding capacity.

4 SUMMARY AND RECOMMENDATIONS

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 renovation of an existing winter sports pitch at Spitalfield, Welland, WR13 6NE.
2. The proposed site is located in Flood Zone 1 which has a very low risk of flooding from Rivers and seas and Surface water. The site is also not located within a Groundwater Source Protection Zone or over existing landfill.
3. The soil on site was mapped by the Soil Survey of England and Wales. Based on data obtained and field observations, it is likely that the soil is from the 'BROCKHURST 1' association, described as 'slowly permeable seasonally waterlogged reddish fine loamy over clayey soils. Some similar soils with slowly permeable subsoils and slight seasonal waterlogging'. Soil characteristics would suggest these soils have relatively poor permeability i.e. < 5mm/hour.
4. Data from the Flood Estimation handbook indicates annual rainfall to be 688 mm for this catchment. Based on the ADAS 345 method, a drainage scheme should be designed to accommodate a peak drain flow rate of approximately **8.2 L s^{-1} ha^{-1}** or **4.4 L s^{-1}** for the total site.
5. The site is characterised by a CLAY LOAM topsoil containing moderate stone content, overlying a heavily compacted CLAY subsoil. Whilst 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, it is very likely that its drainage capacity will be sub-optimal (i.e. < 5 mm/hour) for winter sports use.
6. The surface level at the lowest part of the pitch (North West corner) is 40.25 m above Ordnance Datum (AOD); the surface level at the highest part of the pitch (South East corner) is 41.55 m AOD. Gradients along length (W – E) and across width (S – N) are within Sport England guidelines for recommended slopes for sports pitches, therefore cut and fill earthworks are not envisaged.
7. The existing football pitch is orientated at 49^{o} and is therefore non-compliant with Sport England guidelines. Pitches orientated with their playing direction east-west are susceptible to a low winter sun. However, due to the shape and size of the development area, it may not be feasible to orientate the pitch as per Sport England guidelines.
8. Aerial imagery suggests a drainage scheme may be present with distinct drainage laterals running in a northerly direction to a collector drain, which outfalls into the small stream located along the northern perimeter of the site. The lateral drains are at approximately 15 m centres, which in today's standards would be deemed inadequate. Additionally, a large amount of silt/soil was present within the upper profile of the gravel drainage layer of TP2 (drainage line); this will further compromise the efficiency of any drainage scheme. Based on site conditions and the indigenous soil characteristics, a more intensive scheme with a secondary bypass system would be recommended.
9. Nutrient status and soil pH is within the recommended guidelines to support good grass growth.
10. Observations made during the initial site visit identified a moderate level of stone content running through the topsoil. Stone content comprised primarily flints and cobbles and pose a significant injury risk to patron using the facilities if not dealt with properly during the construction phase via stone separation techniques.

4.2 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. Play/use shall recommence upon approval from the Contract Administrator.

Indicative work programme

	Year 1												Year 2											
Construction Works	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. Re-grading and drainage																								
12-months maintenance period																								
Sand groove installation (where applicable)																								
Over-seeding																								
Ground ready for play																								

N.B. 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.

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

4.5.1 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 slits) 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 Option 1, 5 mm depth of sand over the whole development area would equate to circa 45 t at a cost of approximately **-** (2016 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 **-** per senior pitch is normally required to maintain the facility in good condition. This figure would include the cost for annual sand topdressing.

4.5.2 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 grooving for Option 1 is estimated to be approximately **-** (2016 prices. Therefore, a sum of approximately **-** (Option 1) should be set aside annually (over 7 years) for this purpose.

4.5.3 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.

5 CONFIDENTIALITY

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6 CONTACT DETAILS

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7 APPENDICES

Appendix I: Performance Quality Standards

Client: Little Welland and Parish Council Physical Site Survey date: 8th September 2016

Project Title: The renovation of an existing winter sports pitch at Spitalfield, Welland.

ELEMENT	LIMITS	METHOD OF TEST	Visit 1	Visit 2
Ground cover %	>70 for SH 25-30 >80 for SH 30-35	BS 7370 : P3 A6	✓	
Broad-leaved weeds %	<10	BS 7370 : P3 A6	×	
Sward height mm	20-60 PS 20-75 SM	BS 7370 : P3 A3	✓	
Thatch depth mm	<5	BS 7370 : P3 A7	×	
Hardness in g	35-200	STRI method of test using a 0.5 kg Clegg Impact Hammer from a drop height of 0.55 m	×	
*Water infiltration rate mm h^{-1}	5	BS 7370 : P3 A8	×	
Evenness (2 metre straight edge)	<20 mm	BS 7370 : P3 A6	n/a	
Slope: Direction of play Across play	<1.25% <2.00%	BS 7370 : P3 A5	✓	
pH value	5.5 – 7.5	ISO 10390	✓	
GUIDANCE FOR ROOTZONE LAYER				
Maximum diameter	<32 mm	Particle Size Distribution	✓	

KEY: SH = Sward Height PS = Playing Season SM = Summer Maintenance

* Based on previous experience of pitches on similar soils it is expected that once the soils are wet to depth during the winter, the rate of infiltration will decline to less than 5 mm / hr.

Visual assessment is an acceptable alternative method of testing, if undertaken by a turfgrass consultant who is able to satisfy the selection criteria identified within the Turfgrass Consultants – Construction/Upgrade Brief.

Assessment undertaken by: Matt Young Consultancy: TGMS Limited

Appendix II: Outline Maintenance Recommendations

Mowing. The grass shall be maintained between a height of 20 and 25 mm using cylinder mowing equipment. The grass should never be allowed to exceed a height of 30 mm. If the grass does become too long, the height of cut should be reduced gradually over 3 – 4 cuts allowing some time for recovery in between. N.B. On no account should the grass height be reduced by more than 50% on any one occasion. Overall, approximately 30 mowing operations may be required each year, depending on weather and growing conditions.

Fertiliser application. Allowance should be made for a sufficient number of fertiliser applications to maintain healthy growth and colour. The fertiliser regime should be based on the results of annual soil sampling to determine nutrient concentrations, but the following programme is provided as a guide:

- April 12:6:6 at 350 kg/ha
- September 5:5:20 at 350 kg/ha

Fertiliser shall be applied with appropriate equipment that ensures a uniform distribution.

Weed control. Apply a selective herbicide in the spring (if required) to combat the weeds present. This to be applied at least two weeks after the first fertiliser treatment (April) and at a time when grass growth is strong and healthy. NB. Do not apply herbicide during periods of potential turf stress, i.e. if the weather is hot and dry or if frosts are forecast. Apply herbicide strictly according to the manufacturers label recommendations and only by suitably qualified personnel.

Pesticide/Fungicide [If required]. A pesticide/fungicide application may be required should disease be present within the grass sward. An approved fungicide should be used with activity against the pathogens present and be applied following the manufacturers label recommendations by suitably qualified personnel.

Aeration / Compaction Alleviation. Verti-drain (or other similar de-compaction treatment) the pitches on at least two occasions in the spring and autumn. Use 18 mm diameter solid tines working to a minimum depth of 200 mm below the surface set to provide some heave. Verti-draining must not be carried out if ground conditions are too soft or during frost.

Additional aeration treatments (e.g. slitting or spiking) during the playing season would also be highly beneficial to maintain surface drainage rates. These treatments should only be undertaken when ground conditions are suitable.

Sand topdressing. Supply and spread an approved medium-fine sand suitable for sports use during the renovations period at the rate of 85 t/ha. After each application, the sand should be worked into the surface with brushes or drag mats.

Overseeding. Overseed the pitches and safety margins as required at the application rate of approximately 200 kg/ha immediately after the end of season topdressing application. Use at least three cultivars of perennial ryegrass chosen form 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.