FEASIBILITY STUDY AND REPORT

ON THE WORKS REQUIRED

TO IMPROVE THE DRAINAGE AND CONDITION OF

WINTER GAMES FACILITIES

AT

FERRYSIDE RECREATION GROUND

CARMARTHENSHIRE

Client:

St Ishmaels Community Council

Consultant:

GEO Turf Consulting Limited

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APPENDICES

1.0 PURPOSE

To visit and inspect a Ferryside Recreation Ground and to comment on existing site conditions. To produce a report into the works required to improve the quality and drainage of the area to a standard able to accommodate winter games use. To provide anticipated timescales and up-to-date budget costings for the work involved, and to advise on suitably experienced contractors capable of carrying out the works.

2.0 ADDRESS OF SITE

Ferryside Recreation Ground
Carmarthen Road
Ferryside
Carmarthenshire
Wales

3.0 DATE OF INSPECTION

The recreation ground was inspected on 4th April 2011.

4.0 BACKGROUND & OBSERVATIONS

4.1 Introduction

The recreation has poor surface evenness and is reported to suffer from poor surface drainage through the wetter winter months. The Community Council is seeking improve the quality of the playing surfaces and this feasibility study was commissioned to assist with this process.

The facility inspected was:

Ferryside Recreation Ground Approximate Area = 2.4Ha

4.2 Soil Profile

After a spell of wetter weather prior to the GEO Turf Consulting Ltd inspection on 4th April 2011 the upper soil profile over the entire area was moist and soft. There was no standing water at the playing surface.

The Soil Survey of England and Wales (Soils and Their Use in Wales: Bulletin No. 11) classifies the area of the recreation ground as lying within the Milford soil association.

The Soil Survey describes the naturally occurring Devonian sandstone siltstone, mudstone and slate of the Milford association as; *"…Well drained fine loamy soils often over rock.*

Examination of the soils on site would indicate that although rather more clayey than would be expected from the descriptions, the soil profiles do not precisely match the description of the association. This is probably due to the report that the area was originally very low lying and approximately thirty years ago the height of the ground was increased by importing demolition waste and covering this with subsoil and topsoil. It is unclear as to whether the original in-situ subsoil and topsoil was used to cover the imported made ground.

A visual examination of three trial holes (see Appendix 1 photograph 1 for the approximate locations) within the upper soil profile, revealed approximately 200mm depth of friable red/brown loamy sand topsoil over loose clay subsoil or stony made ground.

The topsoil was in good physical condition being friable and uniformly moist. Stone content was generally low but tended to increase with depth. Photographs of the site and soil profile are given in Appendix 1.

The visual inspections of each trial hole revealed:

Trial Hole 1

Depth (mm)	**Description**
0 – 200	Moist red/brown loamy sand topsoil – friable and well structured. Large cobble noted.
200 – 500	Red clay subsoil - friable and loose with large amount of stone.
500 – 800	Moist and friable clay-based made ground with coal fragments.
Notes	No Groundwater noted.

Trial Hole 2

Depth (mm)	**Description**
0 – 200	Very moist red/brown loamy sand topsoil – friable and well structured with low stone content.
200 – 800	Friable sandy clay subsoil.
800 – 1000	Wet sandy subsoil
Notes	Possible groundwater below 800mm depth.

Trial Hole 3

Depth (mm)	**Description**
0 – 200	Moist red/brown loamy sand topsoil - friable and well structured.
200 – 300	Made ground. Large yellow angular stone.
Notes	Depth of excavation limited due to presence of hard angular stone.

4.3 Topsoil Properties

A sample of topsoil was taken from trial hole 1 and forwarded to Lancrop Laboratory for detailed analysis. The analysis indicated that the upper profile comprised of a loamy sand topsoil. The soil test report is presented in Appendix 2.

The soil physics results show a loamy sand soil, with 3.5% clay, 23.5% silt and 73.0% sand. Although described as loamy sand the soil has nearly 27% fines. Such soils can tend to have poor drainage characteristics and are liable to compaction under play in wet conditions. If well structured they can perform reasonably well, however for Winter sports use a close-centred drainage scheme and secondary drainage is recommended, as detailed in this report.

The soil did appear to be of a relatively low shrinkage type by the absence of cracks. This will hopefully reduce the settlement often experienced by drainage schemes in clay-based soils. Provision should always be made to top up drain lines.

pH

The pH of the soil is low with a value of 5.3 which is below Sport England parameters for winter sports. This is low for ideal growing conditions and the addition of an approved agricultural lime at 10 tonnes/ha should be considered to raise the pH toward neutral. Further information can be obtained on the following web link. *http://www.aglime.org.uk/index.htm*.

Phosphorus

Phosphorus was 19ppm and would be classified as low. The field would therefore benefit from the addition of fertilisers containing high levels of phosphorus. Phosphorus is key in the development of good root systems and the development of higher levels would help to ensure good grass growth if supplemented with potassium.

Potassium

Potassium levels were 79ppm and classified as low. Potassium would be required for good growth and is required for general plant health and hardiness.

Organic Matter

Organic matter levels were recorded at 6.2% which is satisfactory for sports turf use. However, when levels increase above 10% then the organic matter can tend to dominate the properties of the topsoil with it becoming more moisture retentive and susceptible to wear.

4.4 Topography

During the site visit a basic level survey was undertaken with a laser level and the results of this indicate that the there no overall gradient in any direction and the whole area is relatively flat.

Localised surface evenness was generally poor and this will be exacerbating the poor drainage problems being experienced with surface water tending to shed and pond in dips. The surface would therefore benefit from laser grading to remove undulations and dips.

No indication was seen at the surface or at the boundaries of any underground services or utilities that may cross the site with the exception of a culvert which appears to channel water which flows under the site from south to north. If the site is developed it will be important to check all records and with service providers to confirm the existence, or otherwise, of any underground utilities, etc. A company called Groundwise are able to provide this service for a fee of approximately £300.00 exc VAT. Further details can be found at the following web link http://www.groundwise.com/

4.5 Surface Vegetation

The existing grass sward comprises a variable density (60% - 90% cover) mixture of perennial ryegrass and annual meadow-grass. Weeds were noted, the most common weed species being clover, dandelion and daisy. The height of cut appeared to be between 80mm and 150mm and ideally this should be reduced to between 40mm and 50mm.

4.6 Water Infiltration Rates

Surface water infiltration rates were measured with a double ring infiltrometer adjacent to the three trial holes.

Infiltration rates recorded were:

Trial pit 1	28mm/hour
Trial pit 2	18mm/hour
Trial pit 3	32mm/hour

The average value of all infiltration rate tests was 26 mm/hour.

Sport England Design Guidance suggests that pitches reliant on piped drains alone are susceptible to cancellations in wet weather and in most areas are only suitable as dry weather pitches. The guidance notes suggest that, in most instances, for pitches to drain adequately pipe drainage system would need to be supplemented with a form of secondary drainage. Such drainage systems installed into sites with

poor drainage properties, if maintained to a satisfactory standard, can give drainage rates in the order of 10mm/hour for grassroots facilities.

All of the infiltration rate tests show that the drainage rates are in excess of this value. It should however be noted that the topsoil sample tested contained 27% fines (silt plus clay) and is classed as a loamy sand. When wet, such soils are prone to compaction which in turn can result in reduced drainage rates. It should be noted that, when tested, the topsoil was in generally good physical condition and therefore under sports use one would expect drainage rates to reduce.

Given this fact and the reported poor natural drainage characteristics of the area the installation of a drainage system to the area is recommended. The pipe drainage would also help in controlling any groundwater which may be present and subject to tidal influence.

4.8 Sport England Standards

Sport England (as a part of the Lottery Funding Scheme) has produced a guideline for the standards for grassroots winter games pitches. The field would fail on a number of the more critical parameters detailed in the guidelines, most notably:

- Ground cover
- Broad-leaved weed content
- Sward height
- Surface evenness
- Soil pH value

A completed copy of the SE Performance Quality Standards Table is included for additional information (Appendix 3).

5.0 DISCUSSION & RECOMMENDATIONS

5.1 General

The site visit undertaken shows that the upper soil profile has the potential to exhibit poor natural drainage under increased use which could result in poor drainage of the pitches to be developed. Consequently, if used as natural turf sports facilities in wet weather the surface would become waterlogged and muddied, prone to marking and divoting, providing a poor and inconsistent playing surface. The surface would have restricted use during wetter weather and when the surface is holding water, particularly through much of the winter games season.

The field appears to have no drainage system and in order to achieve a playing surface of a standard acceptable for modern day use, and to accommodate increased use; a new drainage system should be installed.

Any new drainage system would need to be based on the installation of a comprehensive system of trenched, piped, land drains. Due to the poor drainage potential of the existing soils on site, it is possible that additional work (e.g. sand slitting/grooving) would be required, to further enhance the drainage potential of the playing surface. There are, however, a number of important implications to be considered in installing such secondary drainage enhancement systems.

The installation of a comprehensive system of trenched, piped, land drains will improve considerably the drainage profile of the playing surface. However, during wetter periods through the winter it is likely that a trenched, piped, system alone would not provide the standard of drainage to the playing surface, anticipated. Slit drains/gravel bands provide a system for the quicker transfer of water from the playing surface to the underlying pipe drains. However the installation of such drainage enhancements would involve a considerable increase in maintenance operations and costs, to ensure the best chances of continuing operational efficiency of the system and safety of the playing surface.

During longer spells of dry and/or hot weather, heavier soils, in particular, have a tendency to shrink, causing the slits to widen or open-up and the aggregate backfill to settle deeper into the trench. This can result in a potentially dangerous surface, if the slits are not topped-up on a regular basis. Additionally, it is recommended that any area with sand slits installed should be top-dressed with sand (at the rate of approx. 80 tonnes-100 tonnes/ha) at least once a year. The cost of each such operation (once or, preferably, twice a year) would be in the region of £4,250.00 per hectare, if carried out by a specialist contractor. The area of the field is approximately 2.4 Ha and consequently if fully developed there would be an ongoing maintenance revenue cost implication of some £10,000.00 per year for sand top-dressing operations alone.

More recently, advancements in secondary drainage systems have seen the development of sand banding techniques that introduce narrower and shallower, sand filled, ‘bands’ at far closer centres (e.g. Blec ‘SandMaster’). These systems

do not appear to be so reliant on ongoing sand dressings (although they are helpful) in maintaining the integrity and efficiency of the secondary system.

The installation of a comprehensive, trenched pipe land drainage system, into an existing playing surface would best be carried out while ground and weather conditions are reasonably firm and dry (to minimise damage to the existing surface). Consequently the works should to be timed to be carried out during the drier months of late Spring, Summer and/or early Autumn. Additional allowance would need to be made for further renovations, etc., during the following Winter, Spring and Summer, until the new system had been allowed to 'settle-in' and the playing surface fully reinstated.

The installation of the trenched system would result in the lines of the trenches being topped with rootzone (free-draining sandy soil/compost) and seeded. The rootzone would be particularly prone to kicking out and/or other surface disturbance and would require frequent topping-up if the pitches were in use.

Large areas have very poor localised levels. The levels in these areas could be cultivated, graded using topsoil removed from the surface of more level areas of the site and then reseeded. It should be noted that at least 150mm depth of topsoil should remain in place over the subsoil following grading work. The work could be carried out at the same time as installing the drainage system, but the treated area would not be available for any use for at least one year and only light use for the 2nd year.

It should be noted that in some more uneven areas the above works may not be adequate or practical and these areas may only be levelled by stripping the topsoil to stockpile and grading the subsoil and then replacing the topsoil to a minimum 150mm depth. Ideally the area should be subjected to a detailed topographic survey so that the degree and extent of unevenness can be fully assessed.

Following grading, sand should be incorporated into the upper 100mm of the soil profile, improving further the stability and drainage of the playing surface. Additionally, any problems of establishing grass cover, etc., along the drain runs installed into an existing grass surface would be avoided.

The presence of clay was evident in the lower sub-formations over the area of the field. As noted above, the introduction of a trenched, piped, land drainage system, to improve the drainage at the playing surface will have the tendency to exacerbate any potential shrink: swell effect, particularly of clay sub-soils. The result can be that, through more prolonged dry spells, particularly in the summer, the shrinkage is concentrated along the lines of the drainage trenches. The trenches can 'widen' and settlement of the aggregate backfill can lead to collapse along the lines of the drains.

Allowance will therefore need to be made to correct any potential collapse/settlement of the aggregate in the drainage trenches. Currently there are two major lines of approach:

- Installation and use of an irrigation system to water the pitches during periods of drier weather.
- Allowance for regular topping up of any sinking drain runs.

Generally, as the drainage system becomes more established, the severity of the tendency for collapse along the lines of the drain trenches decreases.

Any design of a new drainage, etc., system would best be based on a topographical or level survey, combined with a final service/utility search. The topographical survey would be reasonably straightforward, as the area has an open aspect.

5.2 Drainage System Outlet Options

The three options for a positive drainage outlet point for a new drainage system were assessed and are as detailed below:

600mm dia Culvert

A 600mm dia concrete culvert appears to cross the site. The southern end of the culvert is shown in Appendix 1 photograph 7. From an extract of a map presented to Jonathan Smith while on site it appears that this culvert runs through the length of the site from south to north and is located approximately 20m in from the eastern site boundary. The soffit of the culvert at the southern end appears to be just below ground level. If the culvert remains at the same depth through the site, then it would be very difficult to connect a new pipe drainage system into this pipe. This is a problem because there is no fall on the site and any new pipe drains would therefore need to be installed with a minimum fall of 1:250. This would mean that the invert of the main outlet pipe would need to be between approximately 1.2m and 1.8m below ground level depending on the design of the drainage system. The invert of the 600mm pipe at the southern end of the site was approximately 700mm. this problem could however be over come if a float pump was installed to the main outlet chamber. This however would require a power supply and maintenance and is not ideal.

Western Ditch on Network Rail Land

A ditch was evident of the Network Rail land located on the opposite site of Carmarthen Road located to the west of the site. It was not possible to inspect or survey this ditch at the time of the site visit. This may be a possible outlet point for a new drainage system but permission from the land owner would obviously be required.

There would also be a requirement take the outlet pipe across Carmarthen road from the recreation ground to the ditch and this could be quiet costly and disruptive.

Again as the site is flat then the pipe drains will need to be installed with a minimum fall of 1:250 this means that the invert of the outlet pipe is likely to be in the order of 1.6m to 2.2m below ground level depending on how much of the site is drained and the drainage design. This may well be below the invert of the ditch on the Network land. If this is the case then this drainage outlet point would not be a feasible option unless a pumped outlet was installed as for the 600mm dia culvert.

Well/sump Adjacent To Learning Centre

A large diameter well or sump is present between the northern side of the Learning Centre and the southern site boundary. The sump is shown in Appendix 1 photograph 8. If the land owners give permission to investigate and to potentially use this feature, then ideally soak-away tests should be undertaken on it to establish the drainage capacity. It would also be advisable to monitor ground water levels in the sump over a period of time to ensure that this would not impact on the ability of the feature to discharge drainage water at an adequate rate and prevent possible flooding of the area around the sump. It should be noted that if it is feasible to use this feature then the invert of the drainage outlet pipe connecting into it could be in the order of approximately 1.6m to 2.2m below ground level depending on how much of the site is drained and the drainage design.

Drainage Outlet Options Conclusions

Prior to any site works being undertaken the drainage design should be discussed and agreed with the landowners, the local Environment Agency and or Local Authority. The proposed works represent the installation of a new drainage system and therefore land drainage consent and permits will be required. This should also be discussed with the local Environment Agency and or Local Authority.

Unless a pumping system is installed it is unlikely that it will be feasible to use the existing culvert and the ditch on the Network Rail land due to the possible restricted invert depths of these features. However these options should be investigated and considered further.

The most promising option for a positive gravity drainage outlet point appears to be the well/sump located adjacent to the Learning Centre. This option should therefore be investigated further. It should be noted that placing drainage water into this feature may impact on the adjacent building and specialist advice should be taken from structural and hydrology Engineers if this option is to be pursued.

If the above options are not feasible and not approved then it may possible to construct a soak-away on site. A series of on site soak-away tests should be undertaken in accordance with BRE Digest 365 and then the soak-aways should be designed after calculating peak drainage follows for different rainfall return periods. It is recommended that ground water levels are also monitored over a

period of time as the presence of an elevated groundwater table would impact on the feasibility of soak-aways.

The works required to install a new, piped, system of land drains with regrading, etc. should be the subject of a full design and specification, tendered for by specialist playing field contractors, followed by appropriate supervision of the subsequent construction. A broad outline of the principles involved would be:

5.3 Site Access & Storage Compound

The access route to the site is not restricted and the area to be allocated for a contractor's compound should be defined and agreed. The area of the works should be fenced or otherwise marked, to prevent and users of the site and/or other unauthorised public access on to the working area. As noted above, the contractor's access and any traffic management requirements should be agreed, prior to work commencing.

5.4 Site Clearance & Preparation

The existing grass and other vegetation, over the area of the field should be cut to a height of no more than 50mm and the arisings removed off site. The whole of the area to be re-developed should then be sprayed with a total, non-residual herbicide to kill off any remaining vegetation. The herbicide should be applied strictly according to the manufacturer's instructions and to all COSHH, Local Education Authority and other relevant regulations. Sufficient time should be allowed for the herbicide to be effective before any cultivation is allowed (usually about 7 days). It is important that any possibility of drift be avoided and on no account should the herbicide be allowed to come into contact or otherwise affect beyond the working boundary of the site.

The whole of the area should be cultivated to thoroughly break up the surface topsoil to a depth of approx. 100mm-125mm, taking care to not cut through to the underlying sub-soil.

5.5 Laser Grading

After cultivation of the topsoil the whole area should be carefully graded to as far as possible to eliminate all dips, depressions and undulations. However, grading should be carried out in such a manner that at no point is there a depth of topsoil less than 150mm. Care must be taken to avoid over compaction and it may be necessary to carry out sub-soil cultivation, provisionally at a depth of 350mm, at 600mm centres. Any sub-soil cultivation should be carried out in such a way that that there is no possibility of the topsoil being contaminated with underlying material. In the areas with poorer levels it may be necessary to strip the topsoil grade the subsoil and replace the topsoil.

5.6 Piped Drainage

Following grading of the surface a trenched, piped, land drainage system should be installed, to the proposed areas and surrounds using 80mm diameter, perforated, plastic, lateral drains laid at 5.0m centres. The drains should be installed with an invert that should be a minimum 600mm below finished levels. The drains should be laid on the (clean) bed of the trench, which should be at least 150mm wide. The trench bottom must be shaped to bed, fit and secure the pipe centrally at the required invert depths.

The trench should be backfilled to within 150mm of surface levels with (approved) 5 -10mm grade, clean, hard (non-calcareous), angular gravel or broken stone.

The trench should then be topped to the surface using approved lime-free sand with a grading curve in the central range of the diagram at Appendix 4.

The lateral drains should be laid diagonally into the main drains. The main drains should be installed using 125mm, 150mm and/or 200mm diameter pipes (size depending on the area accommodated and the fall/gradient available), the pipes being laid to a minimum invert depth of 750mm. The main drains should be aligned to, as far as possible, fall with the maximum fall of the field and wherever possible should be aligned along the sides of the field, rather than through the centre. Main drain trenches should be cut to a minimum width 50mm wider than the outside diameter of the pipe. Pipes should be laid in the trenches and the trenches backfilled, as appropriate, as described above.

All lateral and main drains should be laid to true line and gradient, depth and angle, using specialist laser guided equipment and laid to a minimum fall of 1:250.

All trench excavations and other spoil should be carefully collected and loaded, as work proceeds and disposed of to the contractor's own tip off the site.

5.7 Cultivations and Imported Sand

The topsoil should be cultivated to relieve any compaction and to create a good tilth, to a depth of 100mm. The graded, cultivated, topsoil (to a depth of 100mm) should be cleared of all stones having a dimension greater than 16mm by the use of appropriate, approved, machinery. The final depth of topsoil should be no less than 125mm. Any sub-soil compaction should be relieved, as before described.

Approved fine-medium sand should be spread to form an even layer 30mm deep over the entire area. The sand should be worked into the upper 50mm surface of the soil (80mm ameliorated depth) with a Blec Blecavator stone burrier.

Note: The amelioration of the existing topsoil with sand would help to improve water infiltration and bearing strength of the soil, to maintain a drier and firmer playing surface.

The sand should have a grading curve in the central region of the diagram at Appendix 5.

5.8 Seed Bed Preparation

A fine, firm, seedbed should be prepared, incorporating a general granular fertilizer such as 10:15:10 at the rate of 500 kg/ha.

The surface should be adequately firmed but not over-compacted and should have a smooth, even surface free from ridges, ruts, hollows, humps or other undulations. The final preparation should be carried out using equipment with low ground pressure tyres.

During the final seedbed preparation a further stone picking should be carried out and all stones or other debris, with any dimension greater than 16 mm, should be collected and removed, to contractor's tip off the site.

5.9 Seeding

The whole area should be sown with a high quality sports turf seed mixture containing a high proportion of wear-tolerant ryegrass comprising at least three different cultivars of perennial ryegrass, rated not less than 7.2 for Live Ground Cover in Table S1, Pages 6-7 of Turfgrass Seed 2011 (published by the STRI and BSPB Amenity Committee). An appropriate mixture would be:

80% perennial ryegrass
20% smooth-stalked meadow-grass.

The seed should be sown at the rate of 350 kg/ha, ensuring an even and uniform cover and should be lightly raked or otherwise worked-in, taking care not to ridge or otherwise disturb the surface. (The works should, preferably, be programmed to allow for a late summer/early autumn seeding.)

5.10 Reinstatement

The contractor(s) should clear all protective fencing, compound and storage areas, etc., and reinstate the access. Any and all defects and/or reinstatement works should be remedied and completed in an approved manner.

5.11 Maintenance

When the grass has grown to approximately 35mm in height the whole of the area should be inspected and all stones or other debris having a dimension greater than 16mm should be collected from the surface and removed to the contractor's tip off

the site. The whole area should then be carefully rolled, with a flat roller, during suitable ground and weather conditions.

When the grass is no longer than 60mm the whole area should be mown, with the height of cut set at 35mm-40mm, using sharp gang mowers. Subsequent cuts should gradually reduce the height of cut to 25mm-35mm and the grass cut as frequently as required to not allow the length to exceed 50mm.

A fertilizer programme should be carried out to include for a minimum of 1 No. application of a proprietary autumn/winter fertilizer and 2 No. applications of a proprietary spring/summer fertilizer, all at the appropriate season.

5.12 Sand Top Dressing, Over-seeding & Reinstatement

On completion of the grass establishment the whole area field should be deep tine spiked (Verti-Drain, or similar) and top-dressed with sand, with a grading curve in the central region of the diagram at Appendix 5, at the rate of 125 tonnes/ha. Any stones or other debris flicked to the surface during the deep tine spiking operation should be collected and removed off site. The sand should be thoroughly worked into the base of the sward, to prevent any blinding or smothering of the existing grass sward.

The whole area, particularly, the lines of the drain runs, etc., should be overseeded with a high quality sports turf seed mixture containing a high proportion of wear tolerant ryegrass (rated not less than 7.2 for Live Ground Cover in Table S1, Pages 6-7 of Turfgrass Seed 2011 (published by the STRI and BSPB Amenity Committee). An appropriate mixture would be:

80% perennial ryegrass
20% smooth-stalked meadow-grass.

The seed should be sown at the rate of 250-350 kg/ha using an approved over-seeder/drill over the general area of the field and at the rate of 6.0 g/m along the lines of the drains, carefully raked-in by hand.

The contractor should ensure that the whole site is left in a clean and tidy condition with all works completed, unwanted materials and spoil removed and any and all reinstatements of damage, etc., to approved condition.

5.13 Sand Banding

Approximately six months after seeding a system of sand bands should be installed using a Blec ‘SandMaster’ or approved equivalent. The sand bands should be introduced at 250mm-260mm centres and to a minimum depth of 175mm. The sand should comply with the particle size distribution within the central section of the grading curve, reproduced as Appendix 6.

If the complete recultivation option is chosen the sand banding should be carried out once the grass has begun to establish, in the year after seeding.

5.14 Topping Up Drain Runs

Allowance must be made for topping up the lines of the drains, as required, and for the judicious use of watering to mitigate the effects of drought conditions.

5.15 Future Maintenance

Following drainage and/or redevelopment of the playing surface it would be essential to implement an ongoing comprehensive maintenance programme. It would be important to consider the employment of a specialist Agronomy Advice Service to ensure the optimum potential performance from the winter games playing surface.

Verti-Draining

The area should be Verti-Drained twice per year, once in April following top dressing and again in August/September prior to the start of the season once the soil conditions become soft enough.

Slitting

Every two to three weeks the area should be slit tined to allow passage of air into the rootzone.

Top Dressing

For the next two to three years the pitches should be top dressed with at least 50-80 tons of sand per pitch. This should be Verti-Drained and thoroughly brushed in to avoid a sand layer occurring on the surface.

Overseeding

Following renovation in April the pitches should be overseeded using a three or four variety ryegrass mix. The varieties should be checked against the STRI Turfgrass Seed booklet enclosed with this report. The rate should be between 25 and 35g/m^2 depending on the level of cover at the time of top dressing.

Fertiliser

Due to the relatively heavy nature of the soil it is anticipated that only one fertiliser dressing will be necessary per annum. This should be of a 9:7:7 N:P:K formulation applied at 35 g/m^2 during late April.

Cutting

Cutting should be maintained at the beginning of the season at between 35 and 40 mm. This would naturally help to protect the grasses from extensive wear and damage. To ensure a relatively low sward for play the grasses can then be brushed or lightly rolled using the mower.

5.16 Feasibility Stage Risk Register

An initial brief risk register for the proposals is included as Appendix 7.

6.0 ESTIMATE OF COSTS

Detailed measurements of, and quantities involved in, the work of draining and/or developing the area at this stage, not been finalised. The designs would need to be based on a full topographical and service utility survey of the area, and after discussions about ongoing maintenance implications, topping-up drain runs, etc. However, a brief outline of costs of the works outlined above would be:

Topsoil Grading & Drainage

	COST PER HA
Contract Preliminaries	5,000.00
Set-up site, access, compound, etc…	1,000.00
Site clearance	1,000.00
Grading	3,500.00
Land drainage	23,000.00
Import sand and spread (1 No. application)	14,000.00
Sand banding (Blec 'SandMaster' or equivalent)	11,500.00
Cultivations, fertilizer and seeding	6,000.00
Grass establishment	3,500.00
Initial maintenance… Verti-drain, sand top dressing, seeding, etc	7,000.00

GUIDELINE TOTAL COST PER HA exc VAT …	**£75,500.00**
GUIDELINE TOTAL COST FOR THE FIELD AREA APPROXIMATELY 2.4 HA exc VAT…	**£181,200.00**

The above costs assume that the new land drainage system could be installed unimpeded and that it is not affected by the presence of underground structures, concrete etc.

The costs presented do not included for the construction of drainage water attenuation features and these may be required as part of any discharge permits. Costs for such attenuation systems can range from approximately £10,000.00 to £30,000.00 exc VAT per pitch depending on design and the soak-away capacity of the ground.

If approval for positive drainage outfall cannot be granted then the ground should be tested to establish if it is possible to install a soak-away. The cost of testing the ground undertaking drainage calculations, designing and installing a soak-away could be in the order of £5,000.00 to £30,000.00 exc VAT. Again these costs depend on the soak-away capacity of the ground.

If the area is to be developed then there may be a requirement to replace the artificial cricket pitch. The cost for such a facility would be approximately £10,000.00 to £14,000.00 exc VAT depending on design and specification.

It would be expedient to allow an additional figure of 10% for contingencies.

Also, a further 7%-10% of the capital costs should be allowed for professional and design fees to cover preparation of Contract documents, administration and supervision of the contract and works and the appointment of a Planning Co-ordinator to mange the health and safety process as required by the 2007 CDM Regulations.

Prices do not include VAT. The estimate is based on current, specialist, playing field construction Contractors' rates, working on similar projects to that proposed, although lately prices have been rather variable and increased rapidly.

7.0 ADDITIONAL POINTS

This report does not constitute a specification, only the principles involved.

Successful drainage and/or redevelopment of the grassland area should involve the preparation of a full design and specification and the skilled implementation of the designed works. It must be appreciated that the preparation of sports turf surfaces involves a great deal of skill and care. Materials, particularly soils on site, are variable. The way in which the works are implemented and especially the weather conditions prevailing at the time are as important as the methods used.

The work would best be carried out during the drier months of early Summer and the Summer, with an aim for completion and/or seeding in early Autumn. If the field is regraded and seeded the grass would take a minimum 12 months to establish, prior to the pitches being brought into initially light use.

Following the drainage, etc., improvements work it would be essential that the area should be adequately maintained, receiving a full maintenance programme designed around the individual requirements of the site. The maintenance should be carried out by qualified staff, during the correct ground and weather conditions and at the appropriate season.

The majority of the works should fall within the scope of a competent contractors' health and safety arrangements.

In addition, provision may have to be made for compliance with 2007 CDM Regulations with the engagement of a Planning Co-ordinator (if the site works take more than 30 days or 500 person working days), plus the preparation of Health and Safety files. Further information can be obtained from the Association for Project Safety for CDM Co-ordinators. This association keeps a database of individual and registered practices who can act as CDM Co-ordinators.

http://www.opsi.gov.uk/si/si2007/uksi_20070320_en.pdf

The Planning Co-ordinator is appointed to manage the Health and Safety process and to ensure that the Client, Contractor and Designer discharge their legal responsibilities under the 2007 CDM Regulations.

A full service check (gas, electricity, water, telecomm, drainage etc) would be required for the site.

8.0 CONTRACTORS

The improvement work should be tendered for, and carried out, by suitably qualified and experienced Contractors, who could include:

MJ Abbott Ltd
Bratch Lane
Dinton
Salisbury
Wiltshire SP3 5EB Tel: 01722 716361

Inscapes
Wyndham Close
Bridgend
CF31 2AN Tel: 01656 650 460

Kestrel Contractors Limited
Willowbank Farm
Chandlers Green
Mattingley
Hook
Hampshire RG27 8LH Tel: 01256 880488

South Wales Sports Grounds
Summerleaze Acres
Magor
Monmouthshire
NP26 3DE Tel: 01633 880493

White Horse Contractors Ltd
Lodge Hill
Abingdon
Oxfordshire OX14 2JD Tel: 01865 736272

The list should not be regarded as final or definitive and should be reviewed just prior to seeking tenders.

9.0 CONCLUSIONS

The recreation ground is reported to currently suffer poor surface drainage through the wetter Winter months. The area fails a number of the criteria set within Sport England's Performance Quality Standards for grassroots sports pitches, and the present condition would not support the proposed use.

Approximately half of the field has poor surface evenness, and in some areas localised levels are very uneven. Levels could be corrected by complete grading of the upper soil profile and moving topsoil into low areas. Some of the poorest areas may require the topsoil to be stripped and the subsoil graded followed by topsoil replacement.

It is evident that the field is poorly drained and would be too wet for play through the seasonally wetter periods of Winter without the installation of an intensive drainage system. Drainage improvements would best involve the installation of a comprehensive piped land drainage system and if required complemented by a secondary sand band system (Blec 'SandMaster' or similar).

There may be a tendency for shrinkage of the sub-soils, particularly along the lines of installed drains and it would be necessary to top up the drains if settlement does occur.

Questions remain as to a suitable drainage water outlet point and it is imperative that this issue is resolved prior to embarking on the installation of the pipe drainage system. If the new drainage system is to be connected to a positive outfall then drainage discharge permits will be required and this may put limits on the quantity and quality of water which may be discharged. If this is the case then some form of on-site attenuation of drainage water may be required.

If the ground has suitable soak-away capacity then discharging drainage water to an on-site soak-away may be possible. It should however be noted that the feasibility of installing a soak-away could be impacted by high ground water levels which may be under tidal influence especially during the winter period.

If the project were to proceed, the re-development of the area would best be achieved by commissioning further site investigation work, a full design and specification for the work involved in construction, obtaining tenders from experienced playing field construction contractors and appropriate supervision of the actual construction work.

Once the improvement works are completed the pitch surfaces will need to be the subject of a comprehensive maintenance programme, tailored to the particular requirements of the site.

APPENDIX 1

PHOTOGRAPHS

Photograph 1 - Aerial photograph showing approximate location of site boundary and trial holes

Photograph 2 – TH01 – Loamy sand topsoil with increasing stone content with depth over sandy/clay subsoil.

Photograph 3 – TH02 – Loamy sand topsoil with increasing clay content subsoil with depth.

Photograph 4 – TH03 –Loamy sand topsoil over stony made-ground subsoil.

Photograph 5 – Poor surface evenness

Photograph 6 – Poor surface evenness which is potentially hazardous

.

Photograph 7 – Inlet into 600 mm dia culvert

Photograph 8 – Well/sump adjacent to Learning Centre

Photograph 9 – Very poor grass cover and levels on mini football pitch

APPENDIX 2

SOIL TEST REPORT

Lancrop Laboratories

Analysis Results (SOIL)

Customer GEO TURF

Distributor GEO TURF CONSULTING LTD
82 COG ROAD
SULLY
PENARTH
VALE OF GLAMORGAN
CF64 5TA

Sample Ref FERRYSIDE REC

Sample No D13639

Crop

Date Received 06/04/2011

Analysis	Result	Comments
pH	5.3	
Sand (%)	73.0	
Silt (%)	23.5	
Clay (%)	3.5	
Stones >2mm (%)	2.3	
Stones >20mm (%)	None Recordable	
Stones >50mm (%)	None Recordable	
Texture	Loamy Sand	
Sharps (%)	None Recordable	
Plastics (%)	None Recordable	
Organic Matter (%)	6.2	
Nitrogen Total (mg/kg)	3111	
C:N Ratio	12	
Phosphorus (ppm)	19	(Index 2.3)
Potassium (ppm)	79	(Index 1.3)
Magnesium (ppm)	87	(Index 2.7)
Nickel (mg/kg)	21.8	
Sodium (ppm)	25	
E.Conductivity (micSiem)	2050.00	(Index 0)
CaCO3 Total (%)	< 1.0	
E.S.P. (%)	None Recordable	
Zinc (mg/kg)	75.0	
Copper (mg/kg)	18.7	
Lime Req. (t/ha)	10.0	

ISOQAR QUALITY ASSURED

Analytical Services
Tel: + 44(0) 1759 309116
Yara UK Limited - Pocklington
Email.ypl.laboratory@yara.com

Date Printed : 14/04/2011

APPENDIX 3

SPORT ENGLAND
PERFORMANCE QUALITY STANDARDS TABLE

Project Title: Ferryside Recreation Ground - Physical Site Survey date: 4th April 2011

ELEMENT	LIMITS	METHOD OF TEST	VISIT 1	VISIT 2	NOTES
			Pass (✓)	Fail (x)	
Ground cover %	>70 for SH 25-30 >80 for SH 30-35	BS 7370 : P3 A6		x	Failed in areas especially small football pitch
Broad-leaved weeds %	<10	BS 7370 : P3 A6		x	
Sward height mm	20-60 PS 20-75 SM	Visual or relevant British Standards/ STRI test		x	Grass too long
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/hr	5	BS 7370 : P3 A8	✓		The silty upper soil (topsoil) profiles held water at the surface and drainage rates would deteriorate with increase use.
Evenness – 2 metre straight edge	<20 mm	BS 7370 : P3 A6		x	In places very uneven localised levels.
Slope – Direction of play – Across play	<1.80 <1:40	BS 7370 : P3 A5	✓ ✓		No slope present which will impede drainage
pH value	5.5 – 7.5	ISO 10390		x	10 tonne per HA lime required based on laboratory analysis.
GUIDANCE FOR ROOTZONE LAYER					
Maximum diameter	<32 mm	Particle Size Distribution	✓		Very few stones seen at playing surface but increased with depth.

KEY: SH = Sward height PS = Playing season SM = Summer maintenance

***** These characteristics will be assessed by means of predictions from a mechanical analysis of the soil.

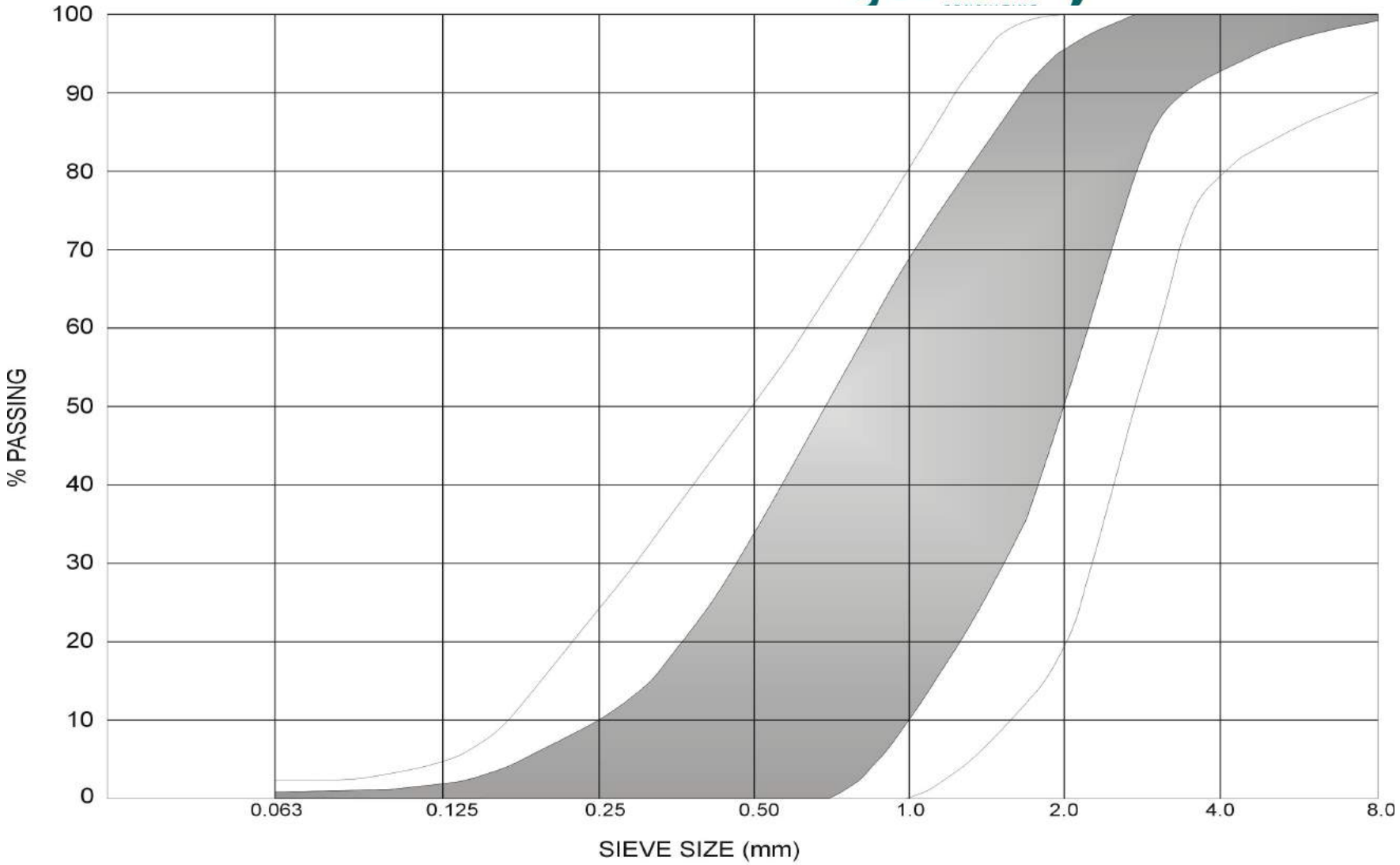
Visual assessment is an acceptable alternative method of testing, if undertaken by a turfgrass consultant who is able to satisfy the selection criteria identified within the Turfgrass Consultants – Construction/Upgrade Brief.

Assessment undertaken by:…Jonathan Smith **Consultancy:** …GEO Turf Consulting

APPENDIX 4

GRADING CURVE
BLINDING SAND - PIPE DRAINS

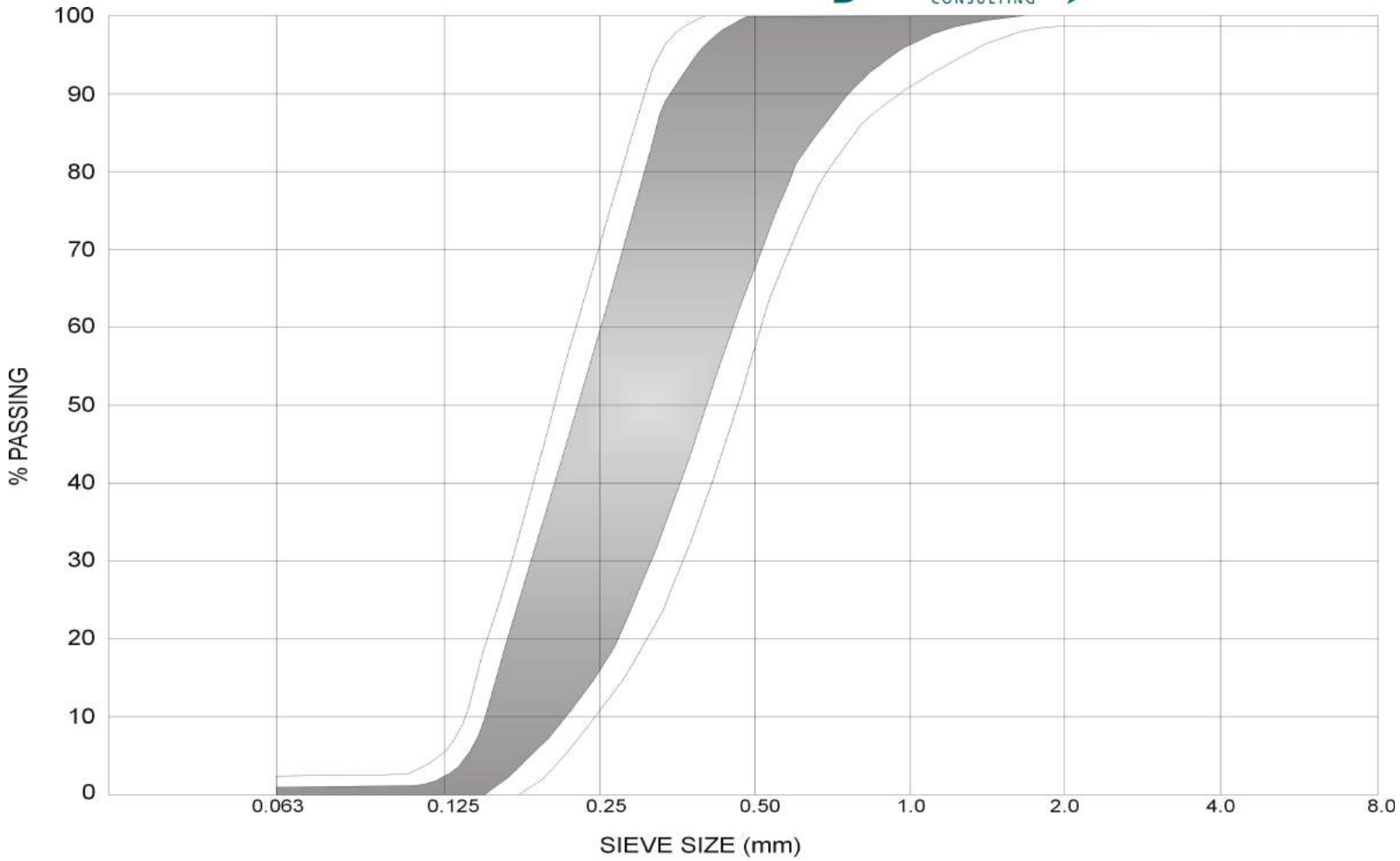
DRAINAGE LAYER BLINDING SAND GRADING CURVE



Grading curve defining recommended and acceptable limits of sand size for blinding a 5-10mm drainage aggregate.

APPENDIX 5

GRADING CURVE
TOP DRESSING/SOIL MODIFICATION SAND

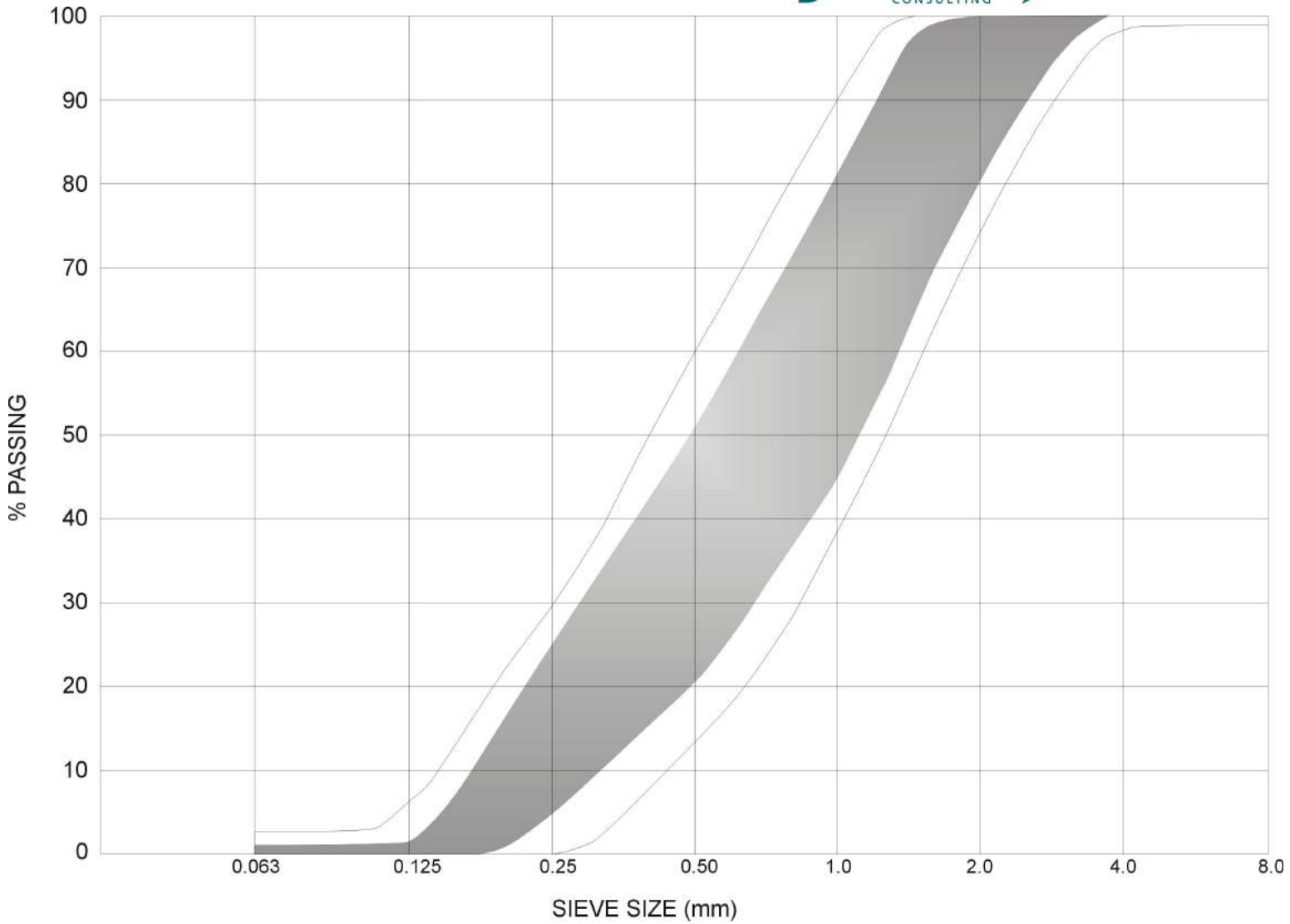


Grading curve defining recommended and acceptable limits of sand size for soil modification and top dressing of winter games pitches.

TOPSOIL AMERLIORATION SAND GRADING CURVE

APPENDIX 6

GRADING CURVE
COARSE SAND – SAND BANDS



Grading curve defining recommended and acceptable limits of sand size for slit drainage sands for placement over a 5-8mm gravel in the base of the slit.

BAND DRAIN SAND GRADING CURVE

APPENDIX 7

PROJECT RISK REGISTER (FEASIBILITY STAGE)

GEO TURF: PROJECT RISK REGISTER

Project: Ferryside Recreation Ground **Client:** St Ishmaels Community Council

Project No: GTC00161 **Project Stage:** Feasibility

Risk No.	Risk Element	Details	Impact	Probability of Occurrence	Risk Severity	Action Required
1.0	**Consents**					
1.1	Planning	Natural turf works may be subject to Planning Consent if ground levels will change.	Planning consent could be refused or restrictions placed on development	Medium	Low	Planning issues may restrict/modify the extent of project. Contact should be made with Planning Authority to discuss project
1.2	Drainage outlets	Outlet for new system into a new drainage outfall	New drainage will require EA/LA approval. Existing positive outlets may not be suitable. Soak-aways may need to be used if ground conditions suitable and high water-table not an issue	High	High	Liaise with Drainage Authority and Local Environment Agency to see if proposals need drainage discharge consent and permits.
2.0	**Site access**					
2.1	Heavy traffic on access route	Safe delivery of materials & equipment	Restrictions on delivery & delays to programme	Low	Low	Prepare and agree traffic management scheme.
3.0	**Existing Services**					
3.1	Underground services present	Only brief details of information available	Safety of excavations (drain trenches)	Medium	High	Undertake search with authorities/utilities. Investigate and locate services on site. Design to accommodate
4.0	**Topsoil conditions**					
4.1	Moderate fines (silt) content	Possible low permeability at playing surface when soils in poor condition	Wet and/or waterlogged playing surface. Cancellation of matches and restrictions on use	Medium	High	Install secondary sand band drainage system and top dress and/or amelioration of upper soil profile with sand, etc.
5.0	**Subsoil conditions**					
5.1	Possible Made Ground	Unforeseen ground conditions may be encountered when installing drainage system. Possibility of shrinkage along trench/slit lines	Made ground could possibly be contaminated and disrupt drainage installation. Contaminated drainage arising may be produced increasing disposal costs. Shrinkage could cause settlement of drainage trench backfill	Medium	Medium	.Undertake further site investigation works and test for presence of contamination. If present undertake risk assessments in relation to human health and environment. Ensure monitoring of playing surface, top up drain runs as appropriate. If possible install and use irrigation system to control upper soil water content
6.0	**Drainage systems**					
6.1	Poor permeability through upper (topsoil) and lower (sub-soil)	Install comprehensive primary piped	Inadequate drainage performance at	Medium	High	Install secondary sand band system (not slit). Top dress/ameliorate upper soil

	profiles	system. Trench/slit systems liable to settlement if shrinkage occurs	playing surface and settlement along drain runs			profile and ensure proper monitoring/topping up/ irrigation.
7.0	**Gradients/earthworks**					
7.1	Existing overall gradients flat with uneven localized levels	Cultivation and complete regrading. Topsoil stripping and subsoil grading may be required in areas	Loss of use of pitches for up to 2 years	High	High	Client to decide on long/short term advantages/ disadvantages and cost implications. Phased approach to works may be more acceptable?
8.0	**Pitch layout/ dimensions**					
8.1	Site dimensions	N/A				
9.0	**Programme**					
9.1	Recommend construction start date for or Spring/Summer	Construction needs to be carried out while ground condition are dry.	Potential dust nuisance could delay works	Medium	Medium	Delay in first use of pitches
10.0	**Use and Management**					
10.1	Short establishment period	Seeding of affected areas not established and/or new grass not fully mature for first matches	Excessive wear and damage to turf initially	Medium to High	Medium to high	Delay and/or restricted use of pitches. Ensure full maintenance (including irrigation) during establishment period
10.2	High usage levels required	High levels of turf wear	Standard of playing surface declines. Pitches become unplayable.	High	High	Increase standard of construction. Adopt intensive maintenance regime. Reduce usage on critical pitches if wear excessive
10.3	Turf maintenance during first season	Maintenance of newly established turf requires additional care.	Standard of new playing surface declines as a result of inappropriate maintenance	Medium	High	Consultant to monitor during Defects Liability Period. Agronomist to advise on turf maintenance during first year of establishment and use
10.4	Turf maintenance resources – skills	Increased standards and costs of maintenance required to achieve expected standard and usage levels	Standard of new playing surface declines as a result of inappropriate maintenance	Medium	High	Existing resources not sufficiently adequate. Recruit/employ additional skilled staff and/extend maintenance contracts. Agronomist to advise on turf maintenance during establishment and beyond
10.5	Turf maintenance resources - equipment	Maintenance/ Contractor equipment not adequate for area	Standard of new playing surface declines as a result of inappropriate maintenance	Medium	High	Purchase/hire new/ appropriate equipment
11.0	**Budget**					
11.1	High capital (redevelopment) and revenue (maintenance) costs	Insufficient funds to cover full construction, future maintenance	Inadequate standard of playing surface and potential for injury (settlement of drain trenches)	Medium	High	Ensure sufficient budget or prioritize after consultation. Ensure adequate budget for recommended maintenance programmes
12.0	**Special Sites**					
12.1	Archeology and Ecology	The site may have ecological or archeological value which may restrict development as spots pitches	Development of the site could be restricted or prevented	Low	High	Liaise with relevant authorities prior to purchasing and developing the land