

Caulmert Limited

Engineering, Environmental & Planning
Consultancy Services

Purbrook Park School

Proposed Sports Field

Flood Risk Assessment

Caulmert Limited

Cattermole Building, Market Place, Codnor, Derbyshire, DE5 9QA

Tel: 01773 749132

Fax: 01773 746280

Web: www.caulmert.com

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Project Director: Paul Savile

Project Manager: Faraj Arfa-Zangeneh

Caulmert Limited: Cattermole Buildings, Market Place, Codnor, Derbyshire, DE5 9QA

Telephone: 01773-749132

Author	John Cowx BSc, MSc	Date	June 2014
Author	Faraj Arfa-Zangeneh BSc, MSc, MICE, CEng, MCIWEM, C.WEM, CEnv	Date	June 2014
Reviewer	Paul Saville BEng(Hons) CEng MIStructE	Date	26 th June 2014
Approved	Faraj Arfa-Zangeneh BSc, MSc, MICE, CEng, MCIWEM, C.WEM, CEnv	Date	1 st July 2014

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EXECUTIVE SUMMARY

Background

Caulmert Ltd was commissioned by Purbrook Park School authority to carry out a Flood Risk Assessment for the proposed Sports Field their school in Havant, Hampshire.

The Environment Agency Flood Map, shows that the school hence the areas for the proposed Sports Field are located within Flood Zone 1, and hence classified as 'Low Probability' of flooding according to the Technical Guidance to the National Planning Policy Framework^(Ref.1).

Methodology

The risk of flooding from fluvial (river flooding), surface water, groundwater, the existing drainage, the proposed drainage and reservoirs were considered.

Flood Risk

The flood risk assessment concludes that:

- The site is situated within Flood Zone 1 (Low Probability) of the Environment Agency indicative flood outline, hence, the site is not at risk of fluvial flooding
- The risk of flooding from surface water, groundwater, proposed drainage and reservoir inundation are considered to be low.
- There is no risk of flooding from the existing pond to the north east of the site.

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Appendix 3	Proposed Site Drainage
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1.0 INTRODUCTION

1.1 Terms of Reference

- 1.1.1 Caulmert Ltd was commissioned by Purbrook Park School (the School) authority to carry out a Flood Risk Assessment (FRA) for the proposed Sports Field Development within the School boundary in Purbrook, Hampshire.
- 1.1.2 An FRA is required to establish the suitability of the site for the proposed Sports Field Development in relation to flooding. The FRA reported herein has been carried out in accordance with the requirements of the National Planning Policy Framework (NPPF)^(Ref.1) and its accompanying Technical Guidance^(Ref.2).

2.0 CONTEXT AND SCOPE OF WORK

2.1 Requirements

- 2.1.1 This FRA follows guidance provided in section 10 of NPPF and its Technical Guidance.
- 2.1.2 In accordance with NPPF, a site specific FRA must demonstrate that the proposed Sports Field Development will be safe for its lifetime taking account of the vulnerability of its users, without increasing flood risk elsewhere, and, where possible, will reduce the overall flood risk of the area.
- 2.1.3 Where appropriate, the following aspects of flood risk should be addressed by all planning applications in flood risk areas:
- The existing area liable to flooding.
 - The probability of flooding occurring now and over time.
 - The extent and standard of existing flood defences and their effectiveness over time.
 - The likely depth of flooding.
 - The rates of flow likely to be involved.
 - The likelihood of impacts to neighbouring areas, properties and habitats.
 - The effects of climate change.
 - The nature and currently expected lifetime of the proposed Sports Field Development and the extent to which it is designed to deal with flood risk.

3.0 SOURCES OF INFORMATION

3.1 Relevant Studies

Previous Studies

- 3.1.1 No previous studies have been carried out for the proposed Sports Field Development in relation to flood risk.

Preliminary Flood Risk Assessment

- 3.1.2 In 2011, Preliminary Flood Risk Assessment (PFRA)^(Ref.3) was prepared by Hampshire County Council (the Council) as Lead Local Flood Authority (LLFA) to assist in meeting its duties to manage local flood risk and to deliver the requirements of the Flood Risk Regulations 2009.
- 3.1.3 The Preliminary Flood Risk Assessment provides a high level overview of flood risk from a variety and combination of flood sources including surface water, ground water and ordinary watercourses as well as the interaction with main rivers, the sea and reservoir flooding.
- 3.1.4 According to PFRA, although there are no nationally significant flood risk areas within Hampshire, the PFRA report and the data collected will be used to identify local flood risk areas, and areas where further information is required to better determine and understand local flood risk across Hampshire. In turn, this will be used to inform the Local Flood Risk Management Strategy (LFRMS) required under the Flood and Water Management Act 2010 (the Act) and to identify additional areas where surface water management plans or other work may be required.
- 3.1.5 The location of the School has not been identified as potential flood risk in the PFRA study. However, according to PFRA report every effort is made to ensure that new or proposed developments within Council's area will not increase local flood risk and where practicable, actually reduce local flood risk.

Hampshire Local Flood Risk Management Strategy

- 3.1.6 The Hampshire Local Flood Risk Management Strategy (LFRMS)^(Ref 4) is an important new tool to help individuals, communities, businesses and authorities understand and manage flood risk within the county. Its primary focus is on local flooding from surface water, groundwater or ordinary watercourses such as streams and ditches. The Council is responsible for managing this type of flood risk.
- 3.1.7 Due to the small scale of the mapping on the LFRMS's flood maps, it is difficult to clearly locate the School site.

South East Hampshire Catchment Flood Management Plan

- 3.1.8 The South East Hampshire Catchment Flood Management Plan (CFMP)^(Ref.5) was produced by the Environment Agency (EA) in 2009 as part of their flood management and development policy across the catchment. According to the CFMP, the proposed Development site falls within Sub-Area 4, Havant and Denmead and Policy Option 4 which is described as:

'Areas of low, moderate or high flood risk where we (the EA) are already managing the flood risk effectively but where we (the EA) may need to take further actions to keep pace with climate change.'

- 3.1.9 According to the CFMP:

'This policy will tend to be applied where the risks are currently deemed to be appropriately-managed, but where the risk of flooding is expected to significantly rise in the future. In this case we (the EA) would need to do more in the future to contain what would otherwise be increasing risk. Taking further action to reduce risk will require further appraisal to assess whether there are socially and environmentally sustainable, technically viable and economically justified options.'

Strategic Flood Risk Assessment

- 3.1.10 In 2007, Partnership for Urban South Hampshire (PUSH) produced a Strategic Flood Risk Assessment (SFRA)^(Ref.6) in accordance with Planning Policy Statement 25 (PPS25)^(Ref.7). PPS25 was replaced by NPPF in March 2012.
- 3.1.11 The purpose of the SFRA is to assess and map all forms of flood risk, from groundwater, surface water, impounded water bodies, sewer and river sources, taking into account future climate change predictions, to allow PUSH to use this as an evidence base to locate future development primarily in low flood risk areas.
- 3.1.12 The location of the School has not been identified as potential flood risk in the SFRA.

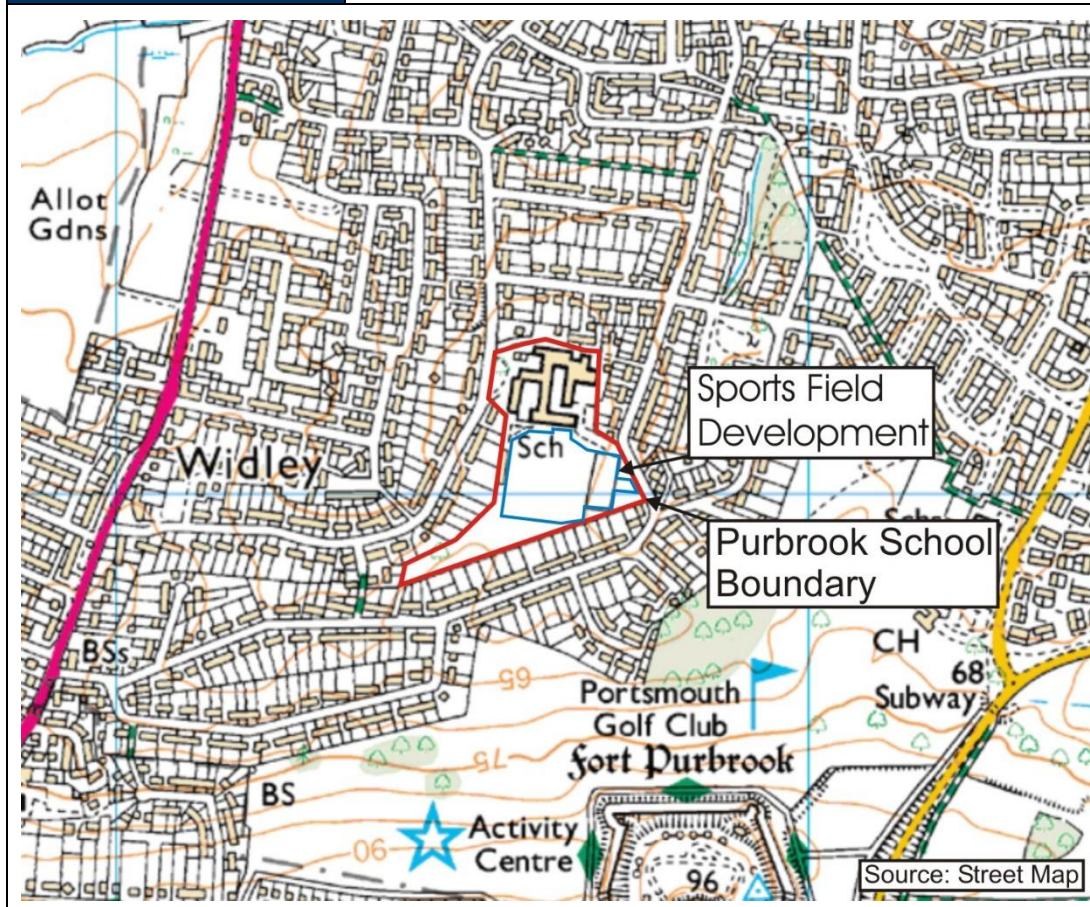
4.0 SITE DESCRIPTION**4.1 Location and Details**

- 4.1.1 The locations of the proposed Sports Field Development site within the School boundary are included in Appendix 1. The School is bordered on all sides by residential properties and roads.

4.1.2 Figure 1 provides details of the proposed Sports Field Development.

Figure 1: Purbrook Park School Development Location.

Site Name	Purbrook Park School
Site Area	1.8ha
Purpose of Development	Sports Field
Existing Land-Use	Existing Sports Field
OS NGR	467612E, 107163N
Country	England
County	Hampshire
Local Planning Authority	Hampshire county council
Other Authorities	N/A



4.2 Topography

4.2.1 The existing topographic survey of the proposed area for Sports Field Development varies between 58.5m AOD on the north and 54.50m AOD on the south of the site.

4.2.2 A plan showing the existing topographic survey is included in Appendix 2

4.3 Geology

4.3.1 Information obtained from the British Geological Survey website^(Ref.8), provided an indicative representation of the geology beneath the School boundary. It shows the School is directly

underlain by Head superficial deposits comprising of clay, silt, sand and gravel. The bedrock varies between Wittering Formation (sedimentary bedrock formed of clay, silt and sand) and London Clay Formation (sedimentary bedrock formed of clay, silt and sand).

4.4 Water Bodies

4.4.1 The site falls within the catchment of a small watercourse which is a tributary of Wallington River. The small watercourse lies approximately 900m to the northwest of the School and runs through urban area of Purbrook, first in a northerly and then in a westerly direction. The small watercourse is classified as a 'Main River' by Defra and the EA is responsible for its maintenance. The watercourse falls within the EA's River Basin District of South East.

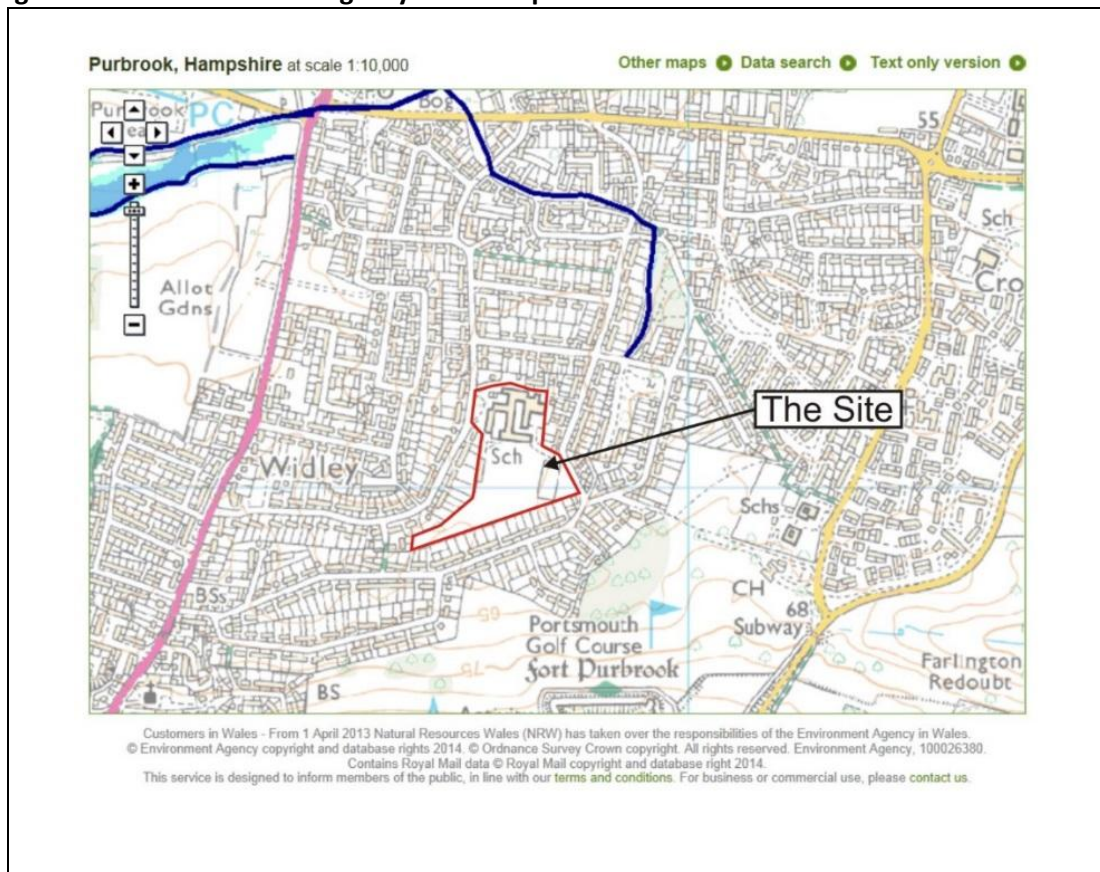
4.4.2 There is an existing pond which is located about 880m to the northeast of the School on lower elevation of about 49m AOD.

4.5 Flood Zones

4.5.1 The EA has developed a Flood Map which shows the risk of flooding in England and Wales for different return period events. Flood Zones assume that no defences are present and so where defences do exist they are only indicative of the potential flood.

4.5.2 Based on the EA's Flood Map, see Figure 2, the proposed redevelopment is located within Flood Zone 1 and is therefore classified as being at a 'Low Risk' of flooding.

Figure 2: The Environment Agency Flood Map



4.6 Historic flooding

- 4.6.1 No historic flooding has been documented at the School. However based on the local knowledge there is localised surface water flooding at the School in periods of heavy rainfall.

5.0 CLIMATE CHANGE

5.1 Technical Guidance Recommendations to the National Planning Policy Framework

- 5.1.1 Global climate change may have a significant effect on the frequency and intensity of flood events in Britain and could have wide-ranging impacts on flood risk. More precise and detailed information will gradually emerge in future.
- 5.1.2 The Technical guidance to NPPF considers both sea level changes and rainfall intensity changes that are related to potential future changes in climate. As tidal influence is not applicable to this site, the climate change influence will be concentrated on changes to rainfall and river flow. Table 1 summarises the current NPPF recommendations.

Table 1: Recommended National Precautionary Sensitivity Ranges for Peak Rainfall Intensity and Peak Flow

Parameter	1990 to 2025	2025 to 2055	2055 to 2085	2085 to 2115
Peak rainfall intensity	+5%	+10%	+20%	+30%
Peak River flow	+10%	+20%		
Offshore wind speed	+5%		+10%	
Extreme wave height	+5%		+10%	

Source NPPF

6.0 DEVELOPMENT PROPOSALS

- 6.1.1 The development proposal comprises of a Sports Field within the boundary of the School. The proposed development is included in Appendix 1.

6.2 The Existing Drainage

- 6.2.1 The Sports Field does not contain a positive drainage system and it is often waterlogged during intense rainfalls.

6.3 Infiltration Tests

- 6.3.1 The Infiltration tests which were carried out as part of the Re-Development of the School in April 2014, generally indicated poor coefficient of permeability.

7.0 SURFACE WATER RUNOFF STRATEGY

7.1 Proposed Development Drainage

- 7.1.1 The proposed drainage for the sports field includes a series of main drains (160mm), interceptor drains (100mm) and lateral drains (50mm) as well as drainage grooves as shown

the drawings in Appendix 3. The proposed outfall will be the existing pond with overflow into Southern Water surface water sewer system.

8.0 POTENTIAL SOURCE AND IMPACT OF FLOODING

8.1 Potential Sources of Flooding

8.1.1 The flood risk to the proposed Sports Field Development has been assessed against the following form of flooding:

- Tributary of Wallingford River (fluvial)
- Surface water
- Groundwater
- Existing drainage
- Proposed drainage
- Reservoirs

8.2 Flooding from Tributary of Wallingford River (Fluvial)

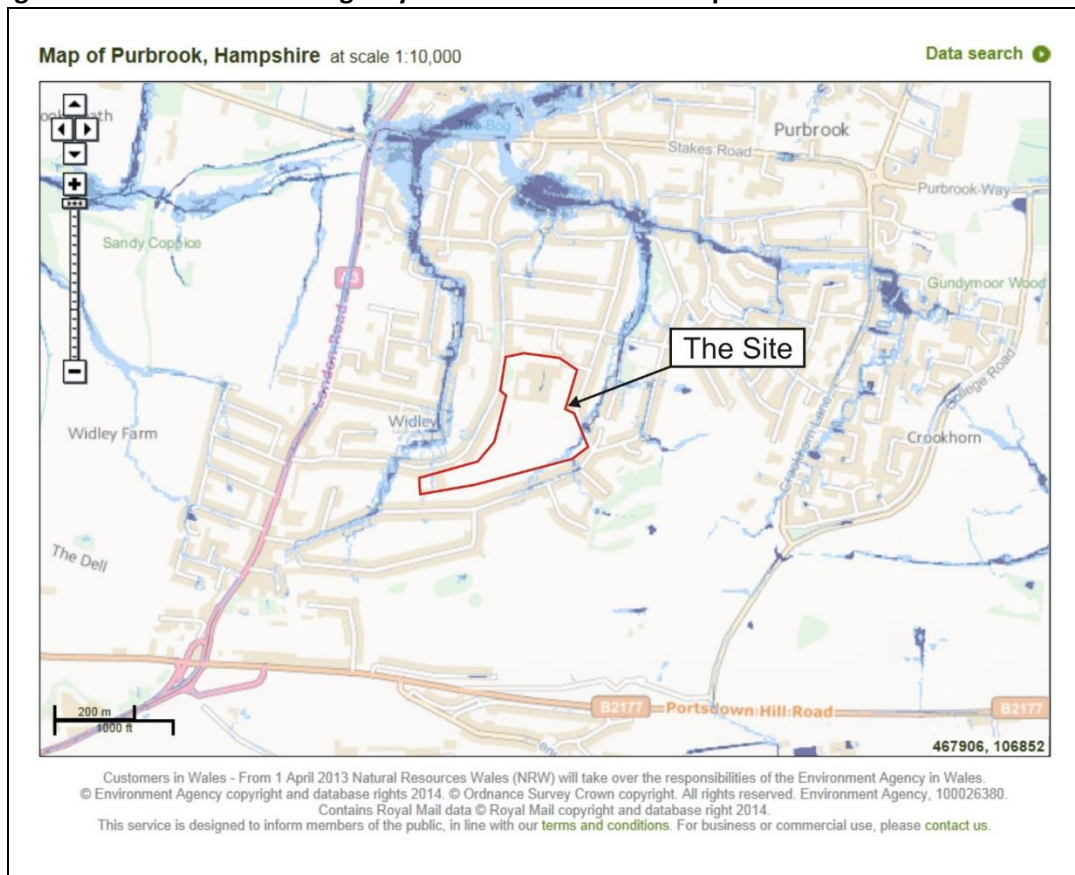
8.2.1 The proposed Sports Field Development is located within Flood Zone 1, 'Low Probability' of flooding according to the EA's Flood Map, see Figure 2. Hence, there is no risk of fluvial flooding to the proposed Sports Field Development from the small water course a tributary of Wallingford River.

8.3 Flooding from Surface Water

8.3.1 Flooding from overland flow may occur when intense rainfall exceeds the infiltration capacity of the ground and any surface water drainage systems, both on site and in the surrounding areas. Overland flow may originate from the development area itself or from adjoining land or from blockage or failure of the sewer system at a higher elevation from which flow migrates onto the development area.

8.3.2 The EA developed a Surface Water Flood Map in December 2013, which provides a general indication of areas that may be at risk of surface water flooding, see Figure 3. The map indicates that within the School boundary there is risk of surface water flooding in the southeast corner of the School playing fields and the courtyard located within the main school block.

8.3.3 There is virtually no risk of the proposed Sports Field Development suddenly being inundated with surface water floodwater which could create danger to life.

Figure 3: The Environment Agency Surface Water Flood Map

8.4 Flooding from Groundwater

- 8.4.1 There is limited information currently available on groundwater flooding in this area. However, groundwater flooding would result in a shallow depth of water which with the tendency to pond in the lowest areas of site, where the drainage gullies are located, it is unlikely that groundwater flooding will affect the proposed Sports Field Development and the students.

8.5 Flooding from the Proposed Drainage

- 8.5.1 During intense rainfall events, when runoff exceeds the capacity of the proposed drainage system, the runoff would flow over the Sports Field embankment towards the existing pond on the eastern corner of the site. There is no risk of the heavy rainfall runoff causing danger to life.

8.6 Flooding from Reservoirs

- 8.6.1 The EA has published, on their website, indicative flood outlines in the event of reservoir embankments and structure failure. The maps were created showing how far flood water would spread from the reservoir in a worst case scenario assuming complete failure of the retaining structure and controls. These maps provide emergency services and councils with information they need to put plans in place to protect people.

8.6.2 According to the EA's reservoir indicative flood map, there is no risk of flooding from reservoirs to the site.

8.6.3 Furthermore, there is no risk of flooding from the existing pond which is located approximately 880m to the north of the School boundary on lower elevation of 49m AOD.

9.0 PLANNING CONTEXT

9.1 Applicable Planning Policy

9.1.1 National Planning Policy Framework (NPPF)^(Ref.1) section 10 deals specifically with development planning and flood risk using a sequential characterisation of risk based on planning zones and the EA Flood Map. The main study requirement is to identify the flood zones and vulnerability classification relevant to the proposed development, based on an assessment of current and future conditions.

9.2 NPPF Flood Zones and Land Use Vulnerability

9.2.1 Within Technical Guidance^(Ref.2) to the NPPF each flood zone has a list of appropriate land uses dependent on vulnerability to flooding. The flood zones are described in Table 1, flood risk vulnerability classification in Table 2 and flood risk vulnerability and flood zone compatibility in Table 3. These tables are reproduced in Appendix 4.

9.2.2 The Flood Zones refer to the probability of river and sea flooding, ignoring the presence of defences.

9.3 Sequential and Exception Test

9.3.1 The Sequential Test is required to assess flood risk and NPPF Technical Guidance recommends that the test be applied at all stages of the planning process to direct new development to areas with the lowest probability of flooding (i.e. Flood Zone 1).

9.3.2 The proposed redevelopment site is located in Flood Zone 1 (Low Probability), according to Table 1 of NPPF Technical Guidance '*all uses of land are appropriate in this zone*' hence the Sequential and Exception Tests are not required.

10.0 CONCLUSIONS

10.1.1 The proposed Sports Field is classified as 'Water-compatible development' according to NPPF. The following table summarises the conclusions and recommendations of this FRA.

1	Development description and location
a	What type of development is proposed and where will it be located? Outdoor Sports
b	What is its flood risk vulnerability classification? Water-compatible development
c	Is the proposed development consistent with the Local Plan for the area? Not applicable
d	What evidence can be provided that the Sequential Test and where necessary the Exception Test has/have been applied in the selection of this site for this development type? Development is located within Flood Zone 1, the Sequential and Exception Tests are not required
e	Will your proposal increase overall the number of occupants and/or users of the building/land, or the nature or times of occupation or use, such that it may affect the degree of flood risk to these people? The Proposed Sports Field Development will replace the existing sports field and hence the number of users will not increase and the nature and times of occupation will not change.
2	Definition of the flood hazard
a	What sources of flooding could affect the site? Risk of flooding from all sources is very low
b	For each identified source in box 2a above, can you describe how flooding would occur, with reference to any historic records where these are available? See above
c	What are the existing surface water drainage arrangements for the site? The existing Sports Field does contain a positive drainage system.
3	Probability
a	Which flood zone is the site within? Flood Zone 1.
b	If there is a Strategic Flood Risk Assessment covering this site, does this show the same or a different flood zone compared with the Environment Agency's flood map? Yes, the site is not affected by fluvial flooding; hence the site will remain in Flood Zone 1.
c	What is the probability of the site flooding, taking account of the maps of flood risk from rivers and the sea and from surface water, on the Environment Agency's web site, and the Strategic Flood Risk Assessment, and of any further flood risk information for the site? Greater than the 1000-year (0.1% AEP) flood events.
d	If known, what (approximately) are the existing rates and volumes of surface water run-off generated by the site? The 100-year (1% AEP) existing peak runoff is estimated to be 680 l/sec. The 100-year total volume is estimated to be about 1200m3 based on 6 hours rainfall duration.

4	Climate change
a	How is flood risk at the site likely to be affected by climate change? • No change
5	Detailed development proposals
a	Where appropriate, are you able to demonstrate how land uses most sensitive to flood damage have been placed in areas within the site that are at least risk of flooding (including providing details of the development layout)? • The proposed Sport Field development is located in Flood Zone 1. For details of the Proposed Development see Appendix 1.
6	Flood risk management measures
a	How will the site/building be protected from flooding, including the potential impacts of climate change, over the development's lifetime? • The proposed Sport Field development is located in Flood Zone 1 and will not be affected by climate change.
7	Off site impacts
a	How will you ensure that your proposed development and the measures to protect your site from flooding will not increase flood risk elsewhere? • The proposed development is located in Flood Zone 1.
b	How will you prevent run-off from the completed development causing an impact elsewhere? • During intense rainfall events, when runoff exceeds the capacity of the proposed drainage system, there will be standing water on the area of Sports Field. The risk of flooding from the proposed Sports Field Development to students and surrounding area is considered to be low.
c	Are there any opportunities offered by the development to reduce flood risk elsewhere? • Controlled proposed drainage system
8	Residual risks
a	What flood-related risks will remain after you have implemented the measures to protect the site from flooding? • N/A
b	How, and by whom, will these risks be managed over the lifetime of the development? • By Purbrook Park School management

10.2 Summary

10.2.1 The study has established that the site is situated within Flood Zone 1 (Low Probability) of the EA indicative flood outline.

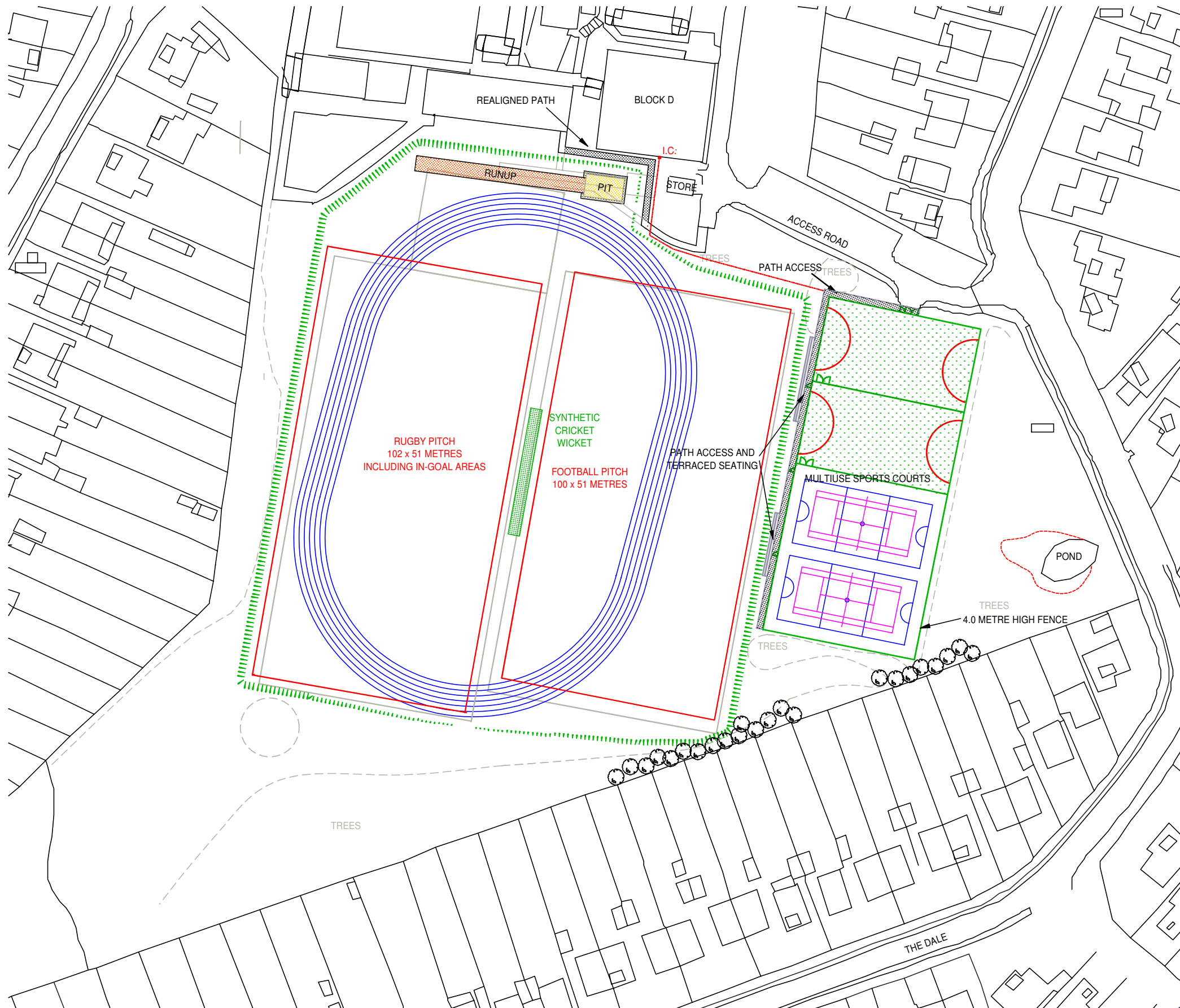
10.2.2 Potential residual surface water flood risk exists as a result of heavy intense rainfall on the sports field, but the risk is considered to be low.

10.2.3 Other flood risks considered included, groundwater, proposed drainage and reservoir inundation. These are not considered to pose a flood risk to the proposed development.

11.0 REFERENCES

1. Communities and Local Government (March 2012), *National Planning Policy Framework*
2. Communities and Local Government (March 2012), *Technical Guidance to the National Planning Policy Framework*
3. Hampshire County Council (2011) *Preliminary Flood Risk Assessment Report*
4. Hampshire County Council (July 2013), Hampshire Local Flood Risk Management Strategy
5. Environmental Agency (December 2009), *South East Hampshire Catchment Flood Management Plan*
6. Partnership for Urban South Hampshire (December 2007), *Strategic Flood Risk Assessment Final Report*
7. Communities and Local Government (Mar 2010), *Planning Policy Statement 25 – Development and Flood Risk*.
8. *British Geological society (2013), Geology of Britain Viewer*

APPENDIX 1
Proposed Sports Field Development



KEY

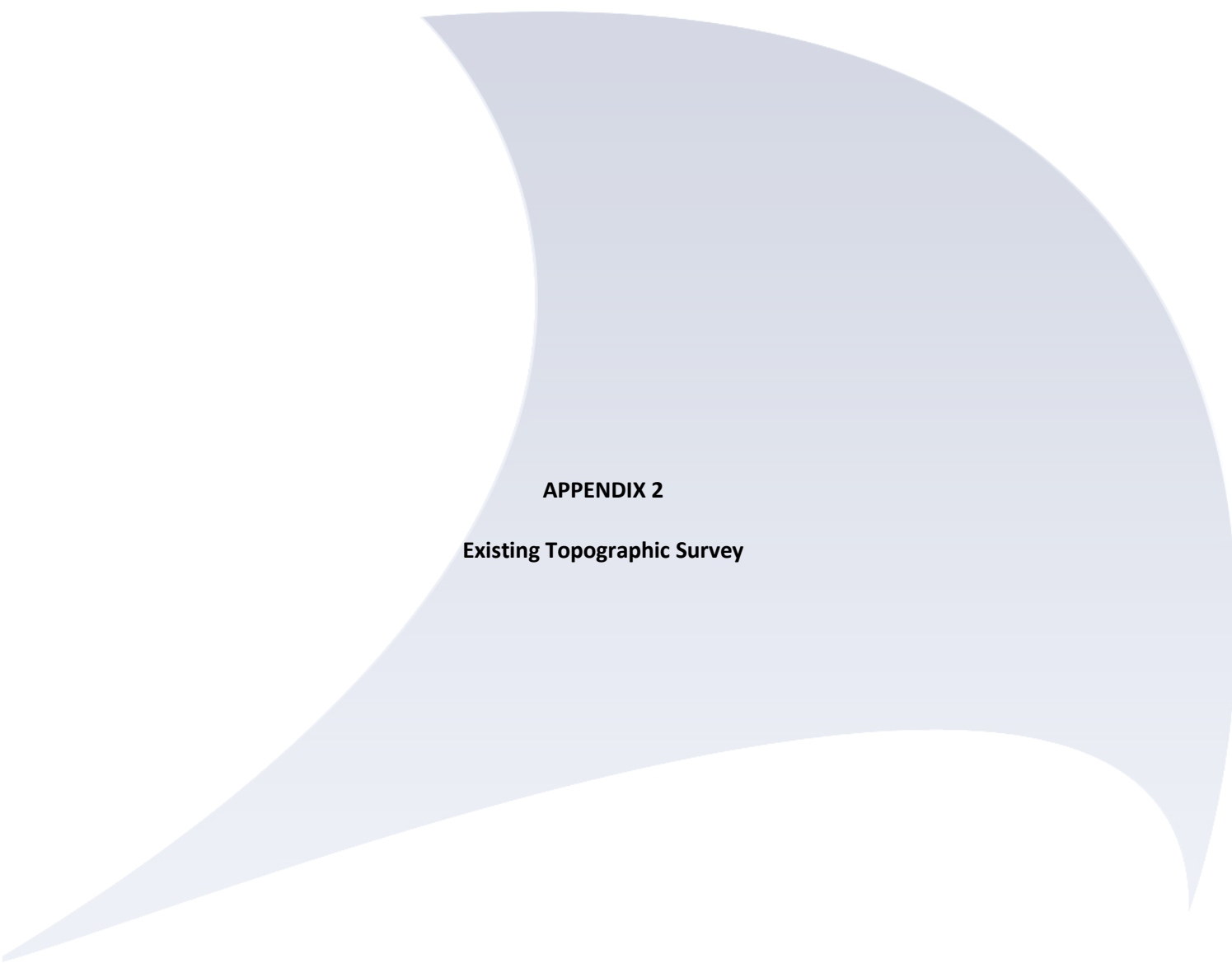
EXTENT OF TREE CANOPY	
EXISTING PITCHES AND STRUCTURES	
NEW FOOTBALL AND RUGBY PITCHES	
300M ATHLETICS TRACK	
MULTIUSE GAMES AREA FENCE	
NETBALL LINES	
TENNIS LINES	
3G SYNTHETIC GRASS SURFACE	
SPECTATOR TERRACED SEATING	
CRICKET CARPET	
NEW MACADAM PATHS	
JUMPING PIT	
JUMPING PIT RUNUP	
JUMPING PIT PAVED SURROUND	
NEW EMBANKMENTS	
NEW PLANTING	
100mm DUCT	

PROPOSED DEVELOPMENT OF SPORTSFIELD
AT PURBROOK PARK SCHOOL

PROPOSED SITE LAYOUT

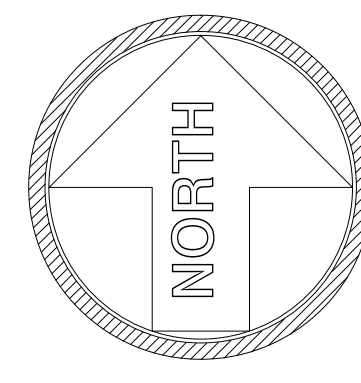
Scale	Date	Drawing No.	Rev.
1:1000 @ A3	April 2014	PPS/03	E

Plan Prepared by:
Richard MacGregor
Sports Ground Design Limited
Sandhill Cottage
Hushwaite
York YO61 4PQ
Tel: 01347 868 536



APPENDIX 2

Existing Topographic Survey



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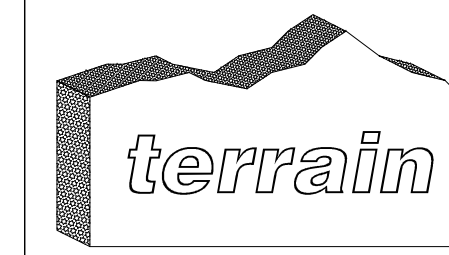
Co-ordinate Table			
Station	Easting	Northing	Level
1	467709.088	107065.562	53.927
2	467677.098	107082.113	55.600
3	467597.769	107096.617	56.856
5	467733.626	106991.870	52.869

GPS Note:
This survey is related to Ordnance Survey National Grid by GPS 'rapid static' methods. No scale factor has been applied to the survey information. All horizontal distances taken from this drawing are ground distances.

Revision	Description	Date

LEGEND

- Survey control station
 - Banking
 - Gate (single)
 - Gate (double)
 - Tree Spread and Girth shown to scale
 - Building
 - Fence
 - Contour 22.50
 - Wall
 - Ordnance Survey Value 15.37m
- Abbreviations**
- | | | | |
|------------------------|-----|-----------------------|-----|
| Bollard | BD | Pipe | PE |
| Borehole | BH | Road Sign | RS |
| British Telecom Box | BTB | Road Sign | RE |
| BT Inspection Cover | BT | Service Marker | MK |
| Concrete Paving Slabs | CPS | Sign Post | SP |
| Cable Television Cover | CTV | Sluice Valve | SV |
| Electricity Cable Pit | EC | Stop Tap | ST |
| Electricity Pole | EP | Stop Cock | SC |
| Earth Rod | ER | Telephone Pole | TP |
| Fire Hydrant | FH | Telephone Call Box | TB |
| Flag Staff | FS | Traffic Light | TL |
| Gas Valve | GV | Unsurpaved | US |
| Gate Post | GP | Vent Pipe | VP |
| Gully | G | Water Meter | WM |
| Inspection Cover | IC | Eaves Level | EL |
| Kerb Outlet | KO | Ridge Level | RL |
| Lamp Post | LP | Road Level | RFL |
| Manhole | MH | Soffit Level | SFL |
| Marker Post | MP | Threshold Level | THL |
| Parking Meter | PM | Parapet Wall Level | PWL |
| Post | P | Finished Floor Level | FFL |
| Retaining Wall | RTW | Cover Level | CL |
| Barbed Wire Fence | BWF | Invert Level | IL |
| Close Boarded Fence | CBF | No Visible Connection | NVC |
| Chainlink Fence | CLF | Unable to Lift | UTL |
| Chestnut Piling Fence | CPF | Flower Bed | F/B |
| Post and Chain Fence | PCF | Shrub Bed | S/B |
| Post and Rail Fence | PRF | Shrub Bed | S/B |
| Post and Wire Fence | PWF | Shrub Bed | S/B |
| Wooden Panel Fence | WPF | Shrub Bed | S/B |



Land and Architectural Surveys

Terrain Surveys Ltd
Bridge Gardens
28a High Street
Bury
Cheshire
M25 9LQ

Tel: 01438 841300
Fax: 01438 841301
email: info@terrainsurveys.co.uk
www.terrainsurveys.co.uk

Client

SPORTS GROUND DESIGN Ltd

Project

**PURBROOK PARK SCHOOL
PARK AVENUE
PURBROOK, PO7 5DS**

Title

TOPOGRAPHICAL SURVEY

Drawn by

MJW

Checked by

JL

Scale

1:200@A0

Date

MAR 2014

Drawing Number

TS14-122W\1

Revision

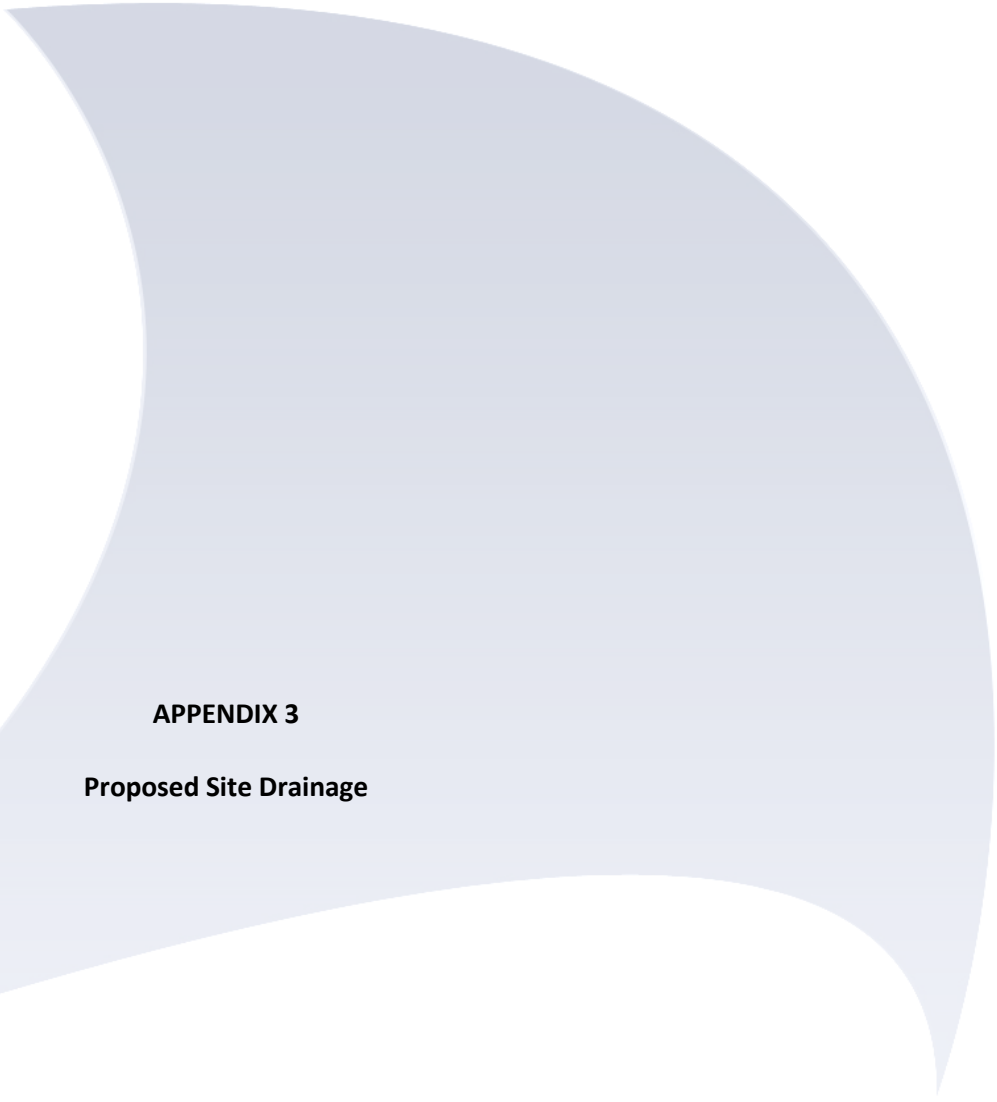
1 of 1

Sheet

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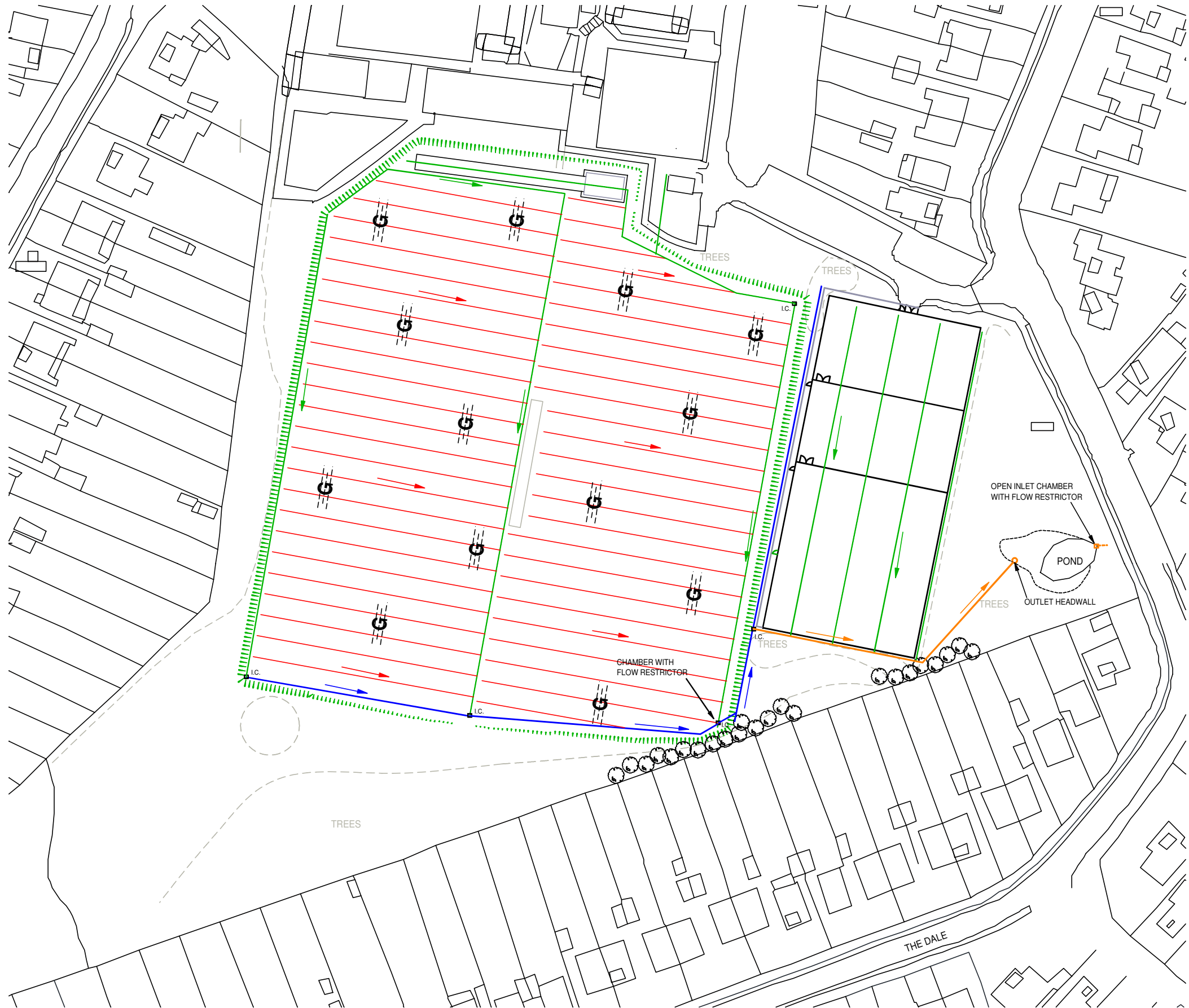
All levels related to Ordnance Survey GPS Network of Survey Station 3

Value N/A



APPENDIX 3

Proposed Site Drainage



KEY

- 60mm PLASTIC DRAINAGE PIPES
- 100mm PLASTIC DRAINAGE PIPES
- 160mm PLASTIC DRAINAGE PIPES
- 200mm PLASTIC DRAINAGE PIPES
- OUTFALL TO POND
- INSPECTION CHAMBERS WITH SILT TRAPS
- DRAINAGE GROOVES
- SOAKAWAY AREA

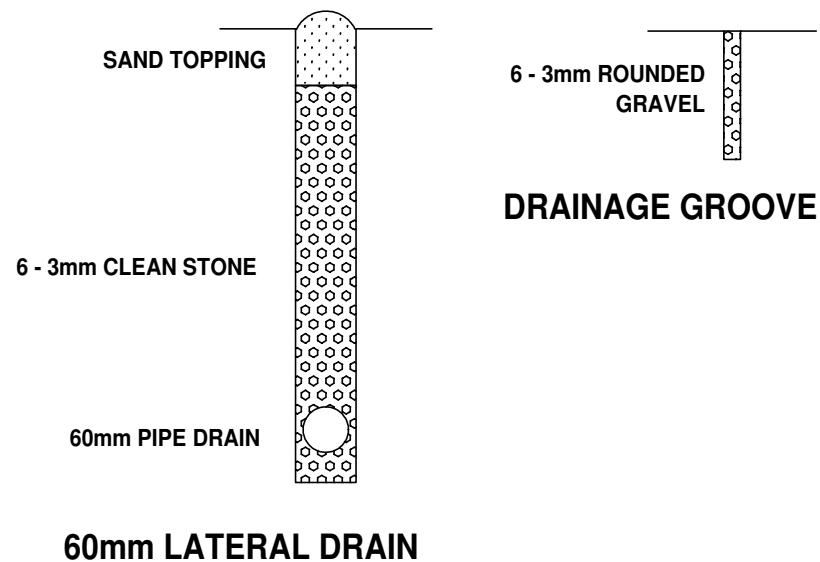
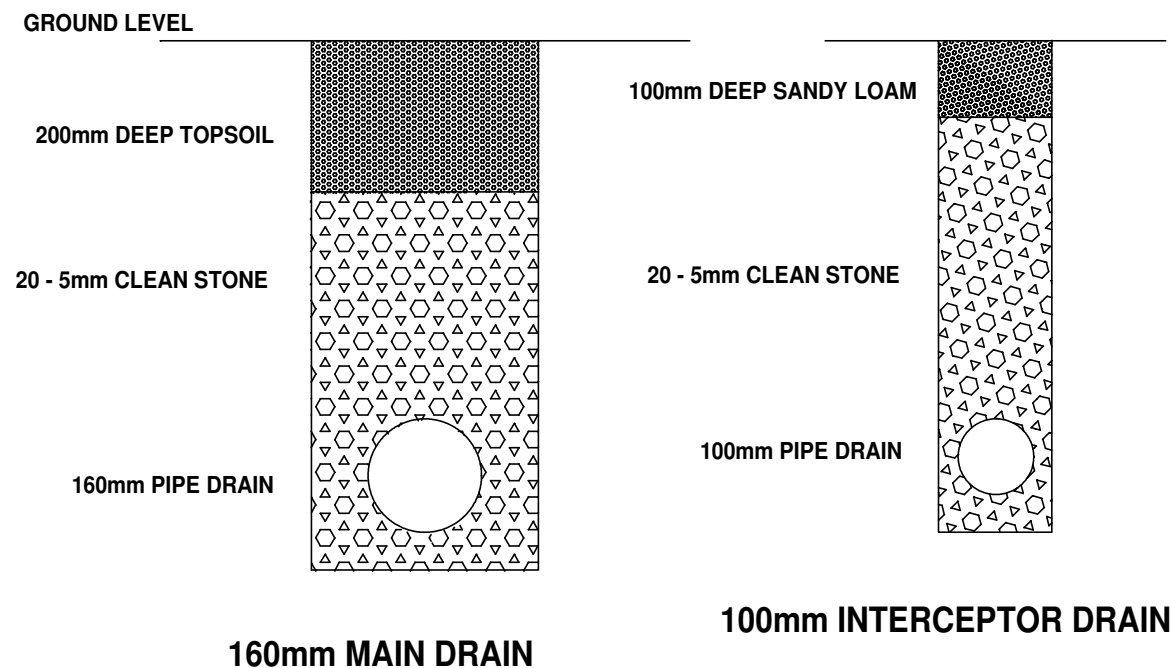
**PROPOSED DEVELOPMENT OF SPORTSFIELD
AT PURBROOK PARK SCHOOL**

PROPOSED DRAINAGE

Scale	Date	Drawing No.	Rev.
1:1000 @ A3	May 2014	PPS/10	D

Plan Prepared by:
Richard MacGregor
Sports Ground Design Limited
Sandhill Cottage
Husthwaite
York YO61 4PQ

Tel: 01347 868 536



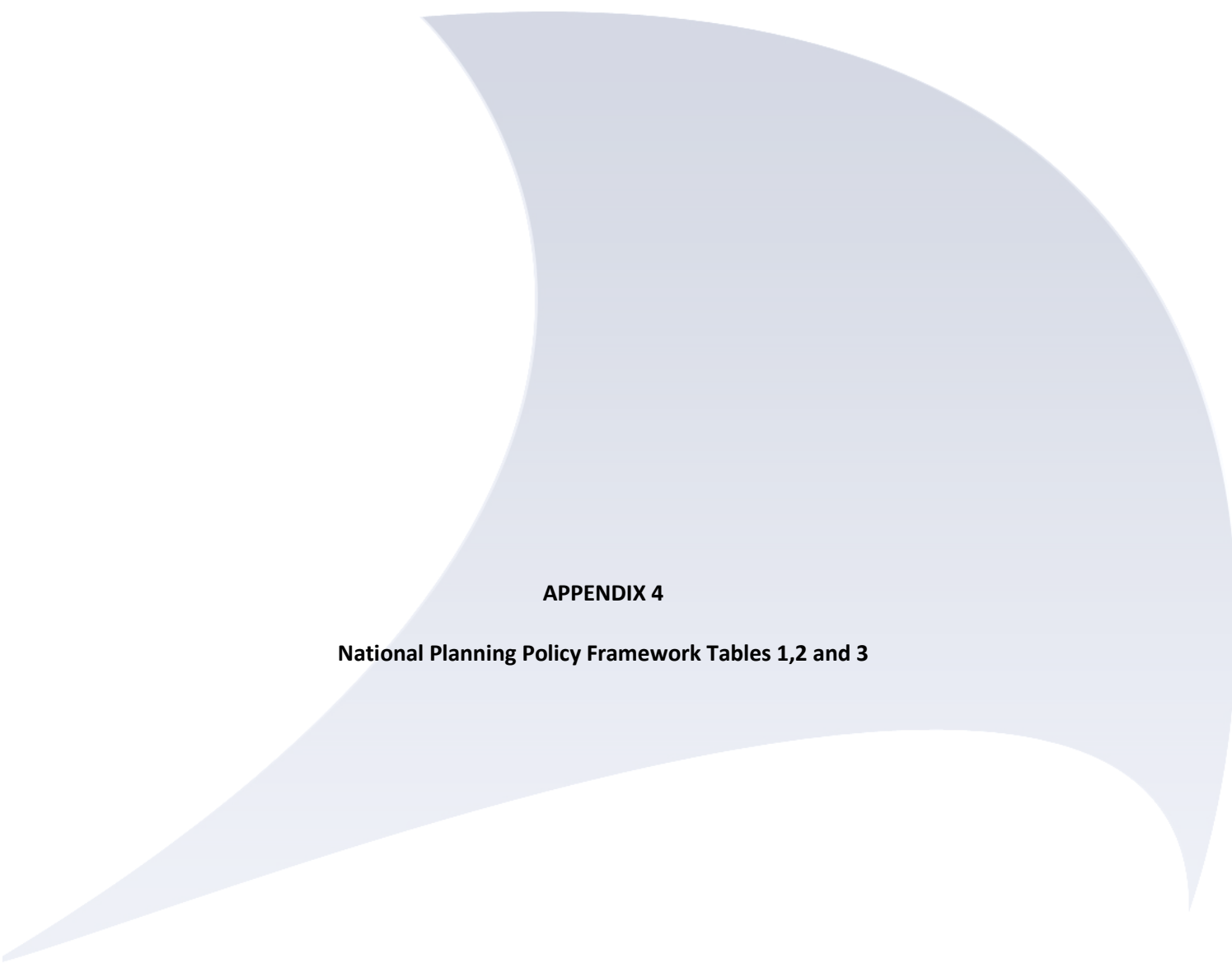
PROPOSED DEVELOPMENT OF SPORTS FIELD AT PURBROOK PARK SCHOOL

DRAIN SECTIONS

Scale	Date	Drawing No.	Rev.
1:10 @ A4	December 2013	PPS/11	

Plan Prepared by:
Richard MacGregor
Sports Ground Design Limited
Sandhill Cottage
Husthwaite
York YO61 4PQ

Tel: 01347 868 536



APPENDIX 4

National Planning Policy Framework Tables 1,2 and 3

These Flood Zones refer to the probability of river and sea flooding, ignoring the presence of defences. They are shown on the Environment Agency's Flood Map for Planning (Rivers and Sea), available on the Environment Agency's web site, as indicated in the table below.

Table 1: Flood Zones	
Flood Zone	Definition
Zone 1 Low Probability	Land having a less than 1 in 1,000 annual probability of river or sea flooding. (Shown as 'clear' on the Flood Map – all land outside Zones 2 and 3)
Zone 2 Medium Probability	Land having between a 1 in 100 and 1 in 1,000 annual probability of river flooding; or Land having between a 1 in 200 and 1 in 1,000 annual probability of sea flooding. (Land shown in light blue on the Flood Map)
Zone 3a High Probability	Land having a 1 in 100 or greater annual probability of river flooding; or Land having a 1 in 200 or greater annual probability of sea flooding. (Land shown in dark blue on the Flood Map)
Zone 3b The Functional Floodplain	This zone comprises land where water has to flow or be stored in times of flood. Local planning authorities should identify in their Strategic Flood Risk Assessments areas of functional floodplain and its boundaries accordingly, in agreement with the Environment Agency. (Not separately distinguished from Zone 3a on the Flood Map)

Note: The Flood Zones shown on the Environment Agency's Flood Map for Planning (Rivers and Sea) do not take account of the possible impacts of climate change and consequent changes in the future probability of flooding. Reference should therefore also be made to the Strategic Flood Risk Assessment when considering location and potential future flood risks to developments and land uses.

Table 2 - Flood Risk Vulnerability Classification
Essential Infrastructure • Essential transport infrastructure (including mass evacuation routes) which has to cross the area at risk. • Essential utility infrastructure which has to be located in a flood risk area for operational reasons, including electricity generating power stations and grid and primary substations; and water treatment works that need to remain operational in times of flood. • Wind turbines.
Highly Vulnerable • Police and ambulance stations; fire stations and command centres; telecommunications installations required to be operational during flooding. • Emergency dispersal points. • Basement dwellings. • Caravans, mobile homes and park homes intended for permanent residential use. • Installations requiring hazardous substances consent. (Where there is a demonstrable need to locate such installations for bulk storage of materials with port or other similar facilities, or such installations with energy infrastructure or carbon capture and storage installations, that require coastal or water-side locations, or need to be located in other high flood risk areas, in these instances the facilities should be classified as 'Essential Infrastructure').
More Vulnerable • Hospitals • Residential institutions such as residential care homes, children's homes, social services homes, prisons and hostels. • Buildings used for dwelling houses, student halls of residence, drinking establishments, nightclubs and hotels. • Non-residential uses for health services, nurseries and educational establishments. • Landfill* and sites used for waste management facilities for hazardous waste. • Sites used for holiday or short-let caravans and camping, subject to a specific warning and evacuation plan.
Less Vulnerable • Police, ambulance and fire stations which are not required to be operational during flooding. • Buildings used for shops; financial, professional and other services; restaurants, cafes and hot food takeaways; offices; general industry, storage and distribution; non-residential institutions not included in the 'More Vulnerable' class; and assembly and leisure. • Land and buildings used for agriculture and forestry. • Waste treatment (except landfill* and hazardous waste facilities). • Minerals working and processing (except for sand and gravel working). • Water treatment works which do not need to remain operational during times of flood. • Sewage treatment works, if adequate measures to control pollution and manage sewage during flooding events are in place.
Water-Compatible Development • Flood control infrastructure. • Water transmission infrastructure and pumping stations.

Table 2 - Flood Risk Vulnerability Classification

- Sewage transmission infrastructure and pumping stations.
- Sand and gravel working.
- Docks, marinas and wharves.
- Navigation facilities.
- Ministry of Defence defence installations.
- Ship building, repairing and dismantling, dockside fish processing and refrigeration and compatible activities requiring a waterside location.
- Water-based recreation (excluding sleeping accommodation).
- Lifeguard and coastguard stations.
- Amenity open space, nature conservation and biodiversity, outdoor sports and recreation and essential facilities such as changing rooms.
- Essential ancillary sleeping or residential accommodation for staff required by uses in this category, subject to a specific warning and evacuation plan.

* Landfill is as defined in Schedule 10 to the Environmental Permitting (England and Wales) Regulations 2010.

Table 3 – Table 3: Flood risk vulnerability and flood zone 'compatibility'					
Flood Zones	Flood Risk Vulnerability Classification				
	Essential infrastructure	Highly vulnerable	More vulnerable	Less vulnerable	Water compatible
Zone 1	✓	✓	✓	✓	✓
Zone 2	✓	Exception Test required	✓	✓	✓
Zone 3a †	Exception Test required †	✗	Exception Test required	✓	✓
Zone 3b *	Exception Test required *	✗	✗	✗	✓*

Key:

✓ Development is appropriate

✗ Development should not be permitted.

Notes to table 3:

- This table does not show the application of the Sequential Test which should be applied first to guide development to Flood Zone 1, then Zone 2, and then Zone 3; nor does it reflect the need to avoid flood risk from sources other than rivers and the sea;
- The Sequential and Exception Tests do not need to be applied to minor developments and changes of use, except for a change of use to a caravan, camping or chalet site, or to a mobile home or park home site;
- Some developments may contain different elements of vulnerability and the highest vulnerability category should be used, unless the development is considered in its component parts.

† In Flood Zone 3a essential infrastructure should be designed and constructed to remain operational and safe in times of flood.

* In Flood Zone 3b (functional floodplain) essential infrastructure that has to be there and has passed the Exception Test, and water-compatible uses, should be designed and constructed to:

- remain operational and safe for users in times of flood;
- result in no net loss of floodplain storage;
- not impede water flows and not increase flood risk elsewhere.



Registered Office: InTec, Parc Menai, Bangor, Gwynedd, LL57 4FG

Tel: 01248 672666

Fax: 01248 672601

Email: contact@caulmert.com

Web: www.caulmert.com