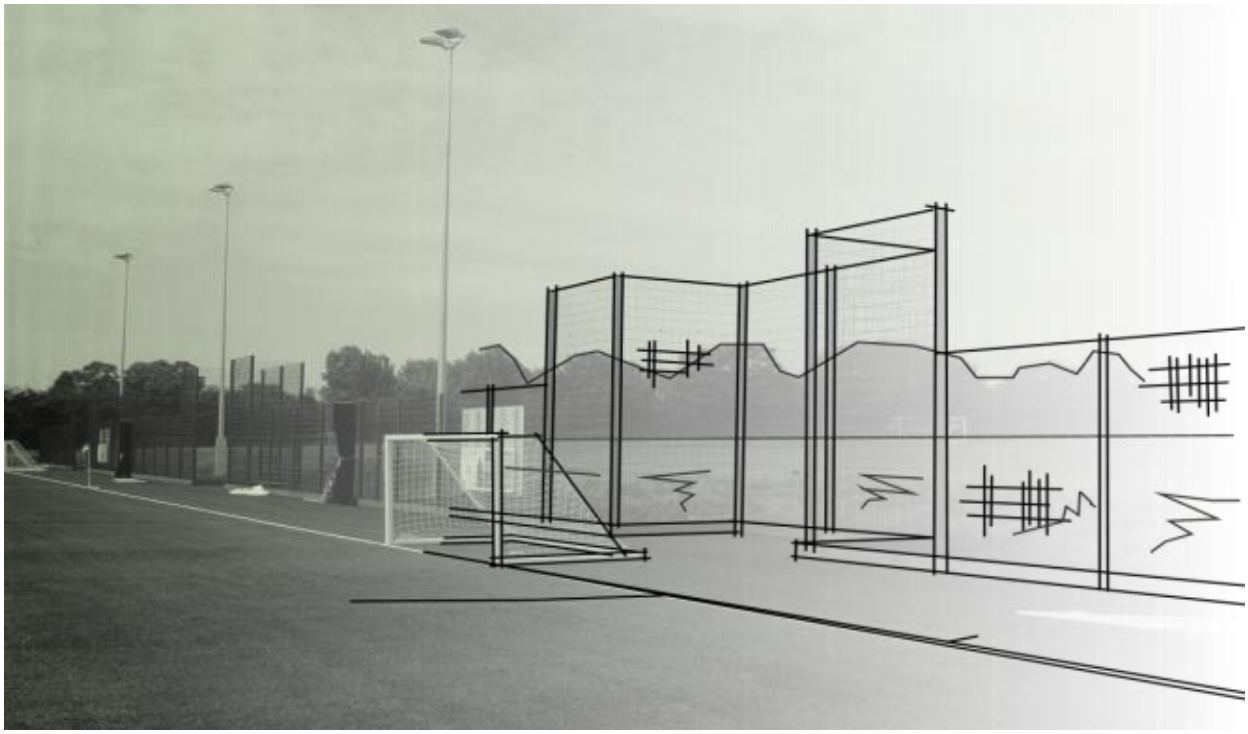
Southwick Football Club

Redevelopment of the Former Southwick Football Club, comprising the replacement of existing turf pitch with 3G pitch and replacement floodlights, demolition of existing clubhouse and erection of replacement Sports Hub Building, erection of spectator stand along with other ancillary infrastructure, including 8m high ball stop netting and 4.5m high ball stop fence

AGP Drainage Strategy



Client	Southwick Football Club, Old Barn Way, Southwick Brighton BN42 4NT		
Project	Redevelopment of the Former Southwick Football Club, comprising the replacement of existing turf pitch with 3G pitch and replacement floodlights, demolition of existing clubhouse and erection of replacement Sports Hub Building, erection of spectator stand along with other ancillary infrastructure, including 8m high ball stop netting and 4.5m high ball stop fence		
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1. Introduction

Surfacing Standards Limited has been appointed to consider and develop an application for full planning permission for the Redevelopment of the Former Southwick Football Club, comprising the replacement of existing turf pitch with 3G pitch and replacement floodlights, demolition of existing clubhouse and erection of replacement Sports Hub Building, erection of spectator stand along with other ancillary infrastructure, including 8m high ball stop netting and 4.5m high ball stop fence.

The assessment has been carried out in accordance with the guidance set out in the National Planning Policy Framework (NPPF).

2. Site Details

2.1. The Proposal

The proposed development will include the creation of an Artificial Grass Pitch (AGP) with new fencing and hard standing pathways as shown within table 1.

Table 1 – Area of pitch and associated development

Aspect	**Area**
3G artificial grass pitch area	7,462m2
Spectator Stands	40m2
Total Development Area	**7,502m2**

2.2. Subject Area

The proposed development is situated at Southwick Football Club, Old Barn Way, Southwick, Brighton, BN42 4NT



Figure 1 – Site Location

2.3. Site Description

The site comprises an existing grassed floodlit stadia football pitch, centred at an approximate grid reference of 525029, 105367. The associated clubhouse buildings are located adjacent to the northeast side of the pitch. To the north of the pitch is a car park. Along the western side is a narrow strip of landscaping and spectator hardstanding with telecoms masts located adjacent to the southwest corner and central west of the pitch. The floodlighting appears to be attached to these. Adjacent to the south is a small triangular area of landscaping with a small, presumed outbuilding in the south west corner. There is also a strip of landscaping along the southern half of the eastern side.

Surrounding the site to the north is a car park, to the east is an access road and northeast, Old Barn Way with residential housing beyond. To the south is the Southwick railway line. To the northwest is Southwick Leisure Centre with car park to the south of this and south of this is the Adur Indoor Bowling Club. To the southwest is an area of open space. Beyond these to the west are grassed sports fields, and surfaced sports courts in the north, of Southwick Park. There are occasional trees along the southern end of the site and a row of presumed leylandii trees along the northern edge through the car park.

2.4. Site History

Historical mapping from the early 1900s shows the site as open space with Eastbrook Barn located to the northeast corner and a building with a well within the southeast corner of the pitch area, with the land directly to the east recorded as a Brick Field. By 1914, the site comprises Winan's Trotting Track. By 1950s/60s, the track is no longer mapped, and the adjacent site recorded as recreation ground with the subject site recorded as a football ground with spectator stands along the western edge. The building and well in the southeast corner are no longer recorded. Eastbrook Barn buildings are recorded to the northeast.

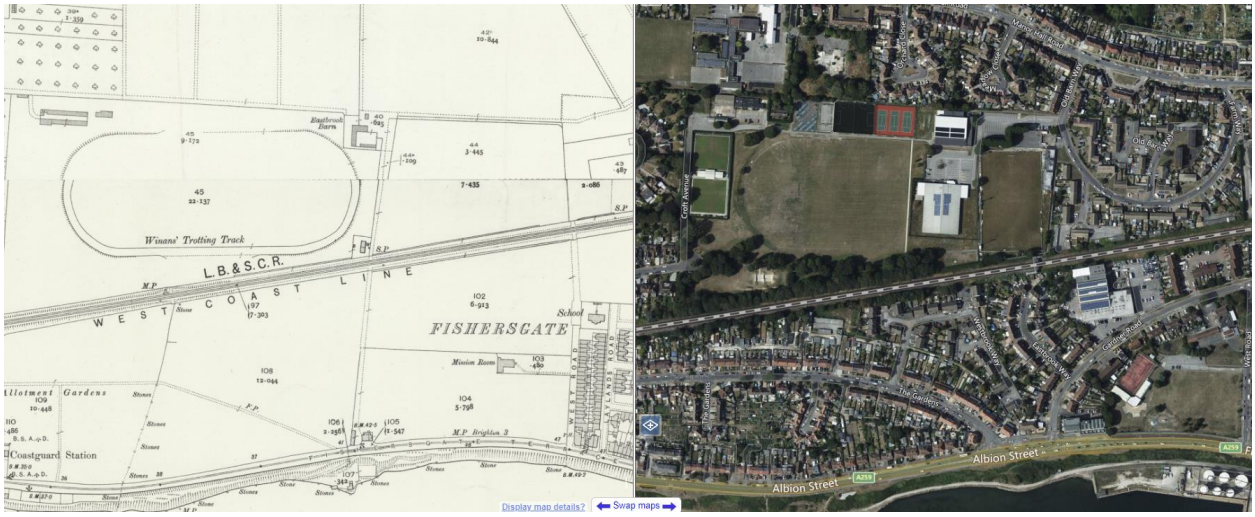

Figure 2 – Side by side imagery of the proposed development (1892-1914 – Left, present day – Right).

Aerial imagery dated 2001 shows the site to comprise a floodlit grassed stadia pitch. To the north and northwest is a car park, and to the east is the clubhouse. To the south is Southwick railway line and to the west a large bowling club. The most recent aerial imagery dated 2022 shows relatively little changes except for vegetation growth.



Figure 3 – Satellite imagery from 2001

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2.5. Site Topography

The topography over the pitch area shows a fall from the northeast to the southwest by approximately 1.29m.

2.6. Local Watercourses

The closest watercourse to site is the River Adur - Shoreham Harbour, approximately 300m south from site making a connection unfeasible.

2.7. Existing Drainage

The site currently has no formal drainage. Figure 4 below shows the Strahler Analysis for the site which demonstrates the direction that surface water runoff would follow with the branches getting darker the further "downstream". Therefore, the surface water runoff would accumulating on the pitch and run off to the southwest, towards the south of the playing fields to the west of the site alongside the railway tracks.



Figure 4 – Strahler Analysis

2.8. Source Protection Zone

The site is not located within a Source Protection Zone.

2.9. Coal Mining

Coal Authority mapping data shows the site does not lie within a Coal Mining Reporting Area.

2.10. Ground Conditions Encountered

A covering of Topsoil was encountered in the exploratory boreholes and hand pits around the perimeter of the pitch up to depths of between 0.2m to 0.4m bgl and generally comprised of a silty sandy Topsoil with gravels of flint, rare ash and rare brick. WS03, WS04 and WS05 were carried out within hardstanding around the proposed building and encountered Made Ground from ground level down to depths of between 0.6m to 3.0m bgl. It generally comprised a shallow covering of concrete underlain by variable reworked clayey Made Ground and granular demolition type rubble with anthropogenic materials such as brick and concrete.

What are considered to be natural Head Deposits were encountered beneath the topsoil or Made Ground to depths of between 1.6 to 2.0m bgl and generally comprised a soft to firm brown slightly gravelly silty clay and light brown mottled off white gravelly clayey silt with gravels of flint and chalk. Beneath the Head Deposits were deposits considered to be River Terrace Deposits which generally comprised a variable deposit and sequence of sandy silty gravelly Clay, clayey sandy gravelly Silt and silty sandy clayey Gravel with gravels consisting of fine to coarse, subrounded to angular flint and chalk. The boreholes were terminated at 4.0 and 5.0m bgl within such deposits due to SPT refusal/blow count of 50 for limited penetration.

2.11. Groundwater

No groundwater encountered during the investigation to maximum depths of 5.0m bgl.

2.12. Infiltration Potential

Indicative infiltration testing suggests that the natural near surface Head Deposits are not suitable for soakaways. The underlying River Terrace Deposits did include some granular deposits however these appear to be variable laterally and vertically suggesting the granular layers may not be continuous and could therefore have limited capacity for supporting soakaways. In addition, discharging into the underlying granular deposits presents an increased risk of water entering the deeper chalk and increasing the risk of chalk dissolution features forming. On this basis, soakaways may not be viable and an alternative positive outfall is recommended

Following CIRIA C574, the guidance suggests that where chalk is of low density (assumed to be the case for the site in the absence of testing to confirm otherwise), any soakaways/infiltration system into the ground should be sited at least 10m from foundations, structures and boundaries

2.13. Assessment Context

The proposed pitch development area is approximately 0.75ha.

2.14. Flood Map

The Government websites confirm the proposed development area is located within a flood zone 1.

Flood zone 1 - This zone comprises land assessed as having a less than 1 in 1,000 annual probability of river or sea flooding (<0.1%). The likelihood of flooding from the rivers or the sea at the proposed development site is very low.



Figure 5 – Flood map for planning

2.15. Risk of Flooding from Rivers and Sea

The Government website confirms the proposed development area is at no risk of flooding from rivers or sea, which happens when there are high tides and stormy conditions.

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2.16. Risk of Flooding from Surface Water

The Government website confirms the proposed development area is at very low risk of flooding from surface water, which happens when rainwater does not drain away through the normal drainage systems or soak into the ground but lies on or flows over the ground instead.

Very low risk means that each year this area has a chance of flooding of less than 0.1%.

Flooding from surface water is difficult to predict as rainfall location and volume are difficult to forecast. In addition, local features can greatly affect the chance and severity of flooding.

2.17. Development Proposals and Flood Risk Vulnerability

Whilst the proposal is situated within a flood zone 1, a comparison of the proposal against flood risk vulnerability classifications is required as the development site is larger than 1ha.

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3. Framework & Flood Risk Policy

3.1. National Planning Policy Framework (2023)

Section 14 – Meeting the Challenge of Climate Change, Flooding and Coastal Change

Policy extract:
Paragraph 167:
When determining any planning applications, local planning authorities should ensure that flood risk is not increased elsewhere. Where appropriate, applications should be supported by a site-specific flood-risk assessment55. Development should only be allowed in areas at risk of flooding where, in the light of this assessment (and the sequential and exception tests, as applicable) it can be demonstrated that:
a) within the site, the most vulnerable development is located in areas of lowest flood risk, unless there are overriding reasons to prefer a different location;
b) the development is appropriately flood resistant and resilient such that, in the event of a flood, it could be quickly brought back into use without significant refurbishment;
c) it incorporates sustainable drainage systems, unless there is clear evidence that this would be inappropriate;
d) any residual risk can be safely managed; and
e) safe access and escape routes are included where appropriate, as part of an agreed emergency plan.

Department for Environment, Food and Rural Affairs
Sustainable Drainage Systems
Non-statutory technical standards for sustainable drainage systems
March 2015

The surface water drainage scheme must be in accordance with the Non-Statutory Technical Standards for Sustainable Drainage Systems (March 2015) or any subsequent replacement national standards and unless otherwise agreed in writing by the Local Planning Authority, no surface water shall discharge to the public sewerage system either directly or indirectly.

To assist the application for full planning permission and to facilitate the satisfactory implementation and delivery of the project; an assessment of flood risk and a sustainable drainage proposal is required in accordance with national policies.

With reference to Table 2 of Planning Practice Guidance to the National Planning Policy Framework, the proposed development for an outdoor sports facility would be classified as Water Compatible Development.

Table 2 - Extract from Table 2 of the PPG for Flood Risk and Coastal Change is replicated below in Table 2.

Flood Risk Vulnerability Classification	
Vulnerability	**Development types**
Water Compatible Development	Flood control infrastructure Water transmission infrastructure and pumping stations 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
Source: Planning Practice Guidance - 2014	

3.2. Flood Risk Vulnerability and Flood Zone Compatibility

Based on the above assessment of the site being located within a flood zone 1 and classified as a 'water compatible development' and with reference to Planning Practice Guidance for 'Flood Risk and Coastal Change' to the National Planning Policy Framework (Table 3), the proposed development of this site would be considered "appropriate".

A copy of Table 3 is presented below to confirm the assessment above.

Table 3 - No exception test

Flood risk vulnerability and flood zone compatibility					
Flood risk vulnerability classification	**Essential infrastructure**	**Water compatible**	**Highly vulnerable**	**More vulnerable**	**Less vulnerable**
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

3.3. Sequential Test

As the site is located within a flood zone 1, a sequential test is not required and it is worth noting the site is used (and historically designated) as a sports complex (active playing field) the development can be deemed to have passed the sequential test.

3.4. Current Conditions

The proposed development will replace part of an existing playing field.

3.5. Surface Water Disposal Requirements

In accordance with the National Planning Policy Framework (NPPF) and the National Planning Practice Guidance (NPPG), the site should be drained in the most sustainable way. No foul sewage will be created as part of this development.

The NPPG clearly outlines the hierarchy to be investigated by the developer when considering a surface water drainage strategy. As such, the developer must consider the following drainage options in the following order of priority:

A. Into the ground (infiltration);
B. To a surface water body;
C. To a surface water sewer, highway drain, or another drainage system;
D. To a combined sewer.

This is necessary to promote sustainable development, secure proper drainage and to manage the risk of flooding and pollution. This condition is imposed considering policies within the NPPF and NPPG.

3.6. Flood Compensation

Flood compensation measures will not be required as finished (floor) levels will not affect current flood plain storage onsite.

3.7. Overland Flows

There is a risk of the critical storm event being exceeded, albeit this risk is considered very low.

In such an event the proposed drainage systems will become overwhelmed and overland flows could occur.

4. Surface Water Drainage Strategy

4.1. Surface Water Disposal Solution

In accordance with the National Planning Policy Framework (NPPF) and the National Planning Practice Guidance (NPPG), the site should be drained on a separate system with foul water draining to the public sewer and surface water draining in the most sustainable way.

The NPPG clearly outlines the hierarchy to be investigated by the developer when considering a surface water drainage strategy in the following order of priority:

A. Into the ground (infiltration);

B. To a surface water body;

C. To a surface water sewer, highway drain, or another drainage system;

D. To a combined sewer.

4.2. Surface Water Disposal Options

A. Soak away

No sufficient fall in water was observed which suggests that the natural near surface Head Deposits are not suitable for soakaways. The assumed deeper rates of 6.4x10-6 would require a soakaway sized 42x1x2m to sufficiently soakaway the required volume, however the half drain down time is 166 hours. Furthermore, there is a strong potential for chalk dissolution, meaning soakaways should be located 10m away from any structures which is not possible on the site. Therefore, soakaways for the pitch drainage have been deemed unfeasible.

B. Surface Water Body

The nearest surface water body is Nearest surface water feature is River Adur - Shoreham Harbour approximately 300m south from site, making a connection unfeasible.

C. Surface Water Sewer

The nearest surface water sewer is located to the northeast of the pitch development in the road Old Barn Way. This SWS is 40m away upstream of the pitch development the other side of the clubhouse development, making a connection unfeasible.

D. Combined Sewer

There is a foul sewer crossing the southeast corner of the site which is the proposed outfall for the pitch drainage.

4.3. Surface Water Drainage Strategy

FIFA's Quality Concept for Football Turf (Handbook of Requirements January 2015 Edition) requires a 3G artificial turf to provide water permeability (for outdoor uses) >180mm/hr and advises that to ensure adequate drainage of a field, all individual elements of the football turf should satisfy this requirement.

A positive drainage scheme (land drainage); shall be installed beneath the Artificial Grass Pitch (AGP) area comprising UPVC perforated carrier and lateral pipe drains.

The granular pitch substrate (typically consisting of Type 3 unbound (SHW 800 Series) to comply with BSEN 13285) is intended to provide onsite containment and attenuation within the granular sub-base, before surface water enters the proposed outfall to the west of the site.

The designed surface water drainage solution should be based upon the following criteria, to maintain satisfactory system performance:

- Provide adequate functionality over a period of twenty years.
- Prevent the risk of uncontrolled flooding elsewhere (to land adjacent to the development).
- Comply with all applicable Sustainable Urban Drainage System (SUDS) requirements with attenuated flows (containment within the granular pitch sub-base) incorporated wherever necessary, without affecting the performance of the pitch.

This is achieved through the surface water being attenuated / stored within the construction make up of the artificial turf pitch that has 37% void space acting as the surface water drainage and the drainage system attenuation an additional 70m3.

As shown below the calculated volume for storage to meet a 1 in 100 year storm event + 45% climate change is 577m3. The attenuation calculated within the base of the pitch and proposed drainage system allows the controlled storage onsite up to 741m3 as detailed within LANO-CLS041 02 – Proposed AGP Drainage Strategy.

The proposed development and associated surface drainage strategy from this site is such that the surface water will be managed and disposed of within the existing surface water drainage, thus complying with the Technical Guidance to the National Planning Policy Framework.

Surface water management and disposal performance will be achieved by the following physical implications to the development (the Artificial Grass Pitches):

1. Adequate attenuation (water storage) within pitch bases (comprising a permeable granular sub-base) to ensure that excess volumes, which would be experienced during a critical storm event, does not bypass the control system, as calculated with the FEH22 data;

2. Restricted flow rate to 2.0 l/s before discharging into the foul sewer to the southeast of the site.

The drainage solution is designed to ensure no above ground flooding occurs up to and including the 1 in 100 year event plus a 45% allowance for climate change.

Minimum Storage Required: **270 m^3** **incl cc allowance**

FACTOR	VALUE	SOURCE
Return Period (yrs):	30	Environment Agency, Water Authority, etc.
Limiting Discharge (l/s):	2	Environment Agency, Water Authority, etc.
Contributing Area (ha):	0.7502	Site plans
Impervious, PIMP (%):	100	Site plans
M5-60min (mm):	20	Volume 3 maps and site location
SAAR (mm/yr):	742	Volume 3 maps and site location
Ratio, r:	0.3	Volume 3 maps and site location
Soil Type:	1	Volume 3 maps and site location
SOIL:	0.15	Soil Type and Volume 1, Section 7.4
UCWI:	79	SAAR and Volume 1, Figure 9.7
Calculated PR	72.15	
Percentage Runoff =	72.15	

FACTOR	VALUE
Additional Inflow (l/s):	0
Calculate/Specify PR:	Calculate
Specify PR:	100
Climate Change Allowance	0

M-D values taken from FEH for storm durations of 15 minutes or greater

Duration, D (min)	M5-60 (mm)	Z1 for r=0.30	M5-D (mm)	Z2 for M30	M30-D (mm)	incl climate change	Area C (ha)	PR (%)	Runoff (m3)	Add. Runoff (m3)	Total Runoff (m3)	Limiting Discharge (m3/min)	Limiting Runoff (m3)	Storage Required (m3)
5	20	0.34	6.8	1.45	9.9	9.9	0.75	72	53.4	0.0	53.4	0.12	0.6	52.8
10	20	0.50	10.0	1.49	14.9	14.9	0.75	72	80.6	0.0	80.6	0.12	1.2	79.4
15					20.6	20.6	0.75	72	111.3	0.0	111.3	0.12	1.8	109.5
30					27.4	27.4	0.75	72	148.0	0.0	148.0	0.12	3.6	144.4
60					34.8	34.8	0.75	72	188.2	0.0	188.2	0.12	7.2	181.0
120					42.8	42.8	0.75	72	231.9	0.0	231.9	0.12	14.4	217.5
240					51.6	51.6	0.75	72	279.3	0.0	279.3	0.12	28.8	250.5
360					56.8	56.8	0.75	72	307.4	0.0	307.4	0.12	43.2	264.2
480					60.4	60.4	0.75	72	327.1	0.0	327.1	0.12	57.6	269.5
600					63.3	63.3	0.75	72	342.4	0.0	342.4	0.12	72.0	270.4
720					65.6	65.6	0.75	72	354.9	0.0	354.9	0.12	86.4	268.5
840					67.6	67.6	0.75	72	365.7	0.0	365.7	0.12	100.8	264.9
1440					74.7	74.7	0.75	72	404.1	0.0	404.1	0.12	172.8	231.3
2160					80.7	80.7	0.75	72	436.8	0.0	436.8	0.12	259.2	177.6
2880					85.7	85.7	0.75	72	463.8	0.0	463.8	0.12	345.6	118.2

Figure 6 – 1 in 30 year attenuation volumes to 2.0 l/s

Minimum Storage Required: **340 m^3** **incl cc allowance**

FACTOR	VALUE	SOURCE
Return Period (yrs):	30	Environment Agency, Water Authority, etc.
Limiting Discharge (l/s):	2	Environment Agency, Water Authority, etc.
Contributing Area (ha):	0.7502	Site plans
Impervious, PIMP (%):	100	Site plans
M5-60min (mm):	20	Volume 3 maps and site location
SAAR (mm/yr):	742	Volume 3 maps and site location
Ratio, r:	0.3	Volume 3 maps and site location
Soil Type:	1	Volume 3 maps and site location
SOIL:	0.15	Soil Type and Volume 1, Section 7.4
UCWI:	79	SAAR and Volume 1, Figure 9.7
Calculated PR	72.15	
Percentage Runoff =	72.15	

FACTOR	VALUE
Additional Inflow (l/s):	0
Calculate/Specify PR:	Calculate
Specify PR:	100
Climate Change Allowance	20

M-D values taken from FEH for storm durations of 15 minutes or greater

Duration, D (min)	M5-60 (mm)	Z1 for r=0.30	M5-D (mm)	Z2 for M30	M30-D (mm)	incl climate change	Area C (ha)	PR (%)	Runoff (m3)	Add. Runoff (m3)	Total Runoff (m3)	Limiting Discharge (m3/min)	Limiting Runoff (m3)	Storage Required (m3)
5	20	0.34	6.8	1.45	9.9	11.8	0.75	72	64.1	0.0	64.1	0.12	0.6	63.5
10	20	0.50	10.0	1.49	14.9	17.9	0.75	72	96.8	0.0	96.8	0.12	1.2	95.6
15					20.6	24.7	0.75	72	133.5	0.0	133.5	0.12	1.8	131.7
30					27.4	32.8	0.75	72	177.6	0.0	177.6	0.12	3.6	174.0
60					34.8	41.7	0.75	72	225.9	0.0	225.9	0.12	7.2	218.7
120					42.8	51.4	0.75	72	278.2	0.0	278.2	0.12	14.4	263.8
240					51.6	61.9	0.75	72	335.1	0.0	335.1	0.12	28.8	306.3
360					56.8	68.2	0.75	72	368.9	0.0	368.9	0.12	43.2	325.7
480					60.4	72.5	0.75	72	392.5	0.0	392.5	0.12	57.6	334.9
600					63.3	75.9	0.75	72	410.9	0.0	410.9	0.12	72.0	338.9
720					65.6	78.7	0.75	72	425.9	0.0	425.9	0.12	86.4	339.5
840					67.6	81.1	0.75	72	438.9	0.0	438.9	0.12	100.8	338.1
1440					74.7	89.6	0.75	72	485.0	0.0	485.0	0.12	172.8	312.2
2160					80.7	96.8	0.75	72	524.1	0.0	524.1	0.12	259.2	264.9
2880					85.7	102.8	0.75	72	556.6	0.0	556.6	0.12	345.6	211.0

Figure 7 – 1 in 30 year + 20% CC attenuation volumes to 2.0 l/s

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Minimum Storage Required: 364 m^3 incl cc allowance

FACTOR	VALUE	SOURCE
Return Period (yrs):	100	Environment Agency, Water Authority, etc.
Limiting Discharge (l/s):	2	Environment Agency, Water Authority, etc.
Contributing Area (ha):	0.7502	Site plans
Impervious, PIMP (%):	100	Site plans
M5-60min (mm):	20	Volume 3 maps and site location
SAAR (mm/yr):	742	Volume 3 maps and site location
Ratio, r:	0.3	Volume 3 maps and site location
Soil Type:	1	Volume 3 maps and site location
SOIL:	0.15	Soil Type and Volume 1, Section 7.4
UCWI:	79	SAAR and Volume 1, Figure 9.7
Calculated PR	72.15	
Percentage Runoff =	72.15	

FACTOR	VALUE
Additional Inflow (l/s):	0
Calculate/Specify PR:	Calculate
Specify PR:	100
Climate Change Allowance	0

M-D values taken from FEH for storm durations of 15 minutes or greater

Duration, D (min)	M5-60 (mm)	Z1 for r=0.30	M5-D (mm)	Z2 for M100	M100-D (mm)	incl climate change	Area C (ha)	PR (%)	Runoff (m3)	Add. Runoff (m3)	Total Runoff (m3)	Limiting Discharge (m3/min)	Limiting Runoff (m3)	Storage Required (m3)
5	20	0.34	6.8	1.84	12.5	12.5	0.75	72	67.6	0.0	67.6	0.12	0.6	67.0
10	20	0.50	10.0	1.91	19.1	19.1	0.75	72	103.4	0.0	103.4	0.12	1.2	102.2
15					26.0	26.0	0.75	72	140.4	0.0	140.4	0.12	1.8	138.6
30					34.8	34.8	0.75	72	188.2	0.0	188.2	0.12	3.6	184.6
60					44.5	44.5	0.75	72	241.0	0.0	241.0	0.12	7.2	233.8
120					53.8	53.8	0.75	72	291.2	0.0	291.2	0.12	14.4	276.8
240					64.3	64.3	0.75	72	348.1	0.0	348.1	0.12	28.8	319.3
360					71.0	71.0	0.75	72	384.2	0.0	384.2	0.12	43.2	341.0
480					75.9	75.9	0.75	72	411.0	0.0	411.0	0.12	57.6	353.4
600					79.9	79.9	0.75	72	432.3	0.0	432.3	0.12	72.0	360.3
720					83.1	83.1	0.75	72	449.9	0.0	449.9	0.12	86.4	363.5
840					85.9	85.9	0.75	72	464.8	0.0	464.8	0.12	100.8	364.0
1440					95.6	95.6	0.75	72	517.3	0.0	517.3	0.12	172.8	344.5
2160					103.4	103.4	0.75	72	559.5	0.0	559.5	0.12	259.2	300.3
2880					109.4	109.4	0.75	72	592.2	0.0	592.2	0.12	345.6	246.6

Figure 8 – 1 in 100 year attenuation volumes to 2.0 l/s

Minimum Storage Required: 577 m^3 incl cc allowance

FACTOR	VALUE	SOURCE
Return Period (yrs):	100	Environment Agency, Water Authority, etc.
Limiting Discharge (l/s):	2	Environment Agency, Water Authority, etc.
Contributing Area (ha):	0.7502	Site plans
Impervious, PIMP (%):	100	Site plans
M5-60min (mm):	20	Volume 3 maps and site location
SAAR (mm/yr):	742	Volume 3 maps and site location
Ratio, r:	0.3	Volume 3 maps and site location
Soil Type:	1	Volume 3 maps and site location
SOIL:	0.15	Soil Type and Volume 1, Section 7.4
UCWI:	79	SAAR and Volume 1, Figure 9.7
Calculated PR	72.15	
Percentage Runoff =	72.15	

FACTOR	VALUE
Additional Inflow (l/s):	0
Calculate/Specify PR:	Calculate
Specify PR:	100
Climate Change Allowance	45

M-D values taken from FEH for storm durations of 15 minutes or greater

Duration, D (min)	M5-60 (mm)	Z1 for r=0.30	M5-D (mm)	Z2 for M100	M100-D (mm)	incl climate change	Area C (ha)	PR (%)	Runoff (m3)	Add. Runoff (m3)	Total Runoff (m3)	Limiting Discharge (m3/min)	Limiting Runoff (m3)	Storage Required (m3)
5	20	0.34	6.8	1.84	12.5	18.1	0.75	72	98.1	0.0	98.1	0.12	0.6	97.5
10	20	0.50	10.0	1.91	19.1	27.7	0.75	72	149.9	0.0	149.9	0.12	1.2	148.7
15					26.0	37.6	0.75	72	203.7	0.0	203.7	0.12	1.8	201.9
30					34.8	50.4	0.75	72	272.9	0.0	272.9	0.12	3.6	269.3
60					44.5	64.6	0.75	72	349.5	0.0	349.5	0.12	7.2	342.3
120					53.8	78.0	0.75	72	422.2	0.0	422.2	0.12	14.4	407.8
240					64.3	93.2	0.75	72	504.7	0.0	504.7	0.12	28.8	475.9
360					71.0	102.9	0.75	72	557.0	0.0	557.0	0.12	43.2	513.8
480					75.9	110.1	0.75	72	596.0	0.0	596.0	0.12	57.6	538.4
600					79.9	115.8	0.75	72	626.8	0.0	626.8	0.12	72.0	554.8
720					83.1	120.5	0.75	72	652.4	0.0	652.4	0.12	86.4	566.0
840					85.9	124.5	0.75	72	674.0	0.0	674.0	0.12	100.8	573.2
1440					95.6	138.6	0.75	72	750.1	0.0	750.1	0.12	172.8	577.3
2160					103.4	149.9	0.75	72	811.3	0.0	811.3	0.12	259.2	552.1
2880					109.4	158.7	0.75	72	858.7	0.0	858.7	0.12	345.6	513.1

Figure 9 – 1 in 100 year + 45% CC attenuation volumes to 2.0 l/s

A hydraulic model has not been developed to simulate the flows within and flooding from the piped drainage network. It is not possible to simulate the pitch drainage within the hydraulic modelling software to accurately simulate the flow within a perforated pipe network which uses the pitch sub-base as attenuation and storage, as is the case with this particular drainage network.

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The design of the pitch sub-base and the associated drainage network is such that additional surface water flows that cannot be accommodated within the piped drainage network will enter the pitch sub-base via the perforated pipe network, and will be attenuated in the sub-base until such a time and the flows within the piped network have subsided to a level which will allow the surface water to re-enter the piped network and discharge downstream into the drainage ditch.

As such, in the case of surface water networks for pitches, which use the sub-base as a storage area, it is accepted that confirming that there is adequate storage within the pitch to accommodate any flooding, is an acceptable work-around for the shortfall.

Further information on the design and attenuation volumes within such events can be seen within:

LANO-CLS041 01 – Proposed AGP Drainage Layout
LANO-CLS041 02 – Proposed AGP Drainage Strategy

4.4. Foul Water Drainage Strategy

There will be no foul water produced as part of the AGP development.

4.5. Surface Drainage Maintenance

The drainage system will be designed to minimise maintenance requirements; however, a full maintenance scheme will be established for those elements not being offered for adoption.

Maintenance operations will be carried out by Southwick Football Club in perpetuity post development and the 5. Drainage Management & Maintenance is displayed below within ***section 5***.

4.6. AGP Drainage Proposals Conclusions

- The proposed development includes the creation of a new external artificial grass pitch with perimeter ball-stop fencing, and clean accesses.
- The proposed development area will occupy land and replace an existing sports area.
- Surface water is to be disposed of into a surface water body;
- Adequate attenuation within pitch base and upper surface (comprising a permeable granular sub-base) to ensure that excess volumes, which would be experienced during a critical storm event, does not bypass the control system.
- This drainage strategy is designed to ensure no above ground flooding occurs up to and including the 1 in 100 year event + 45% allowance for climate change.
- The surface water drainage from this site, post development, is such that the surface water will be managed and disposed of within the site boundary, thus complying with the Planning Practice Guidance for 'Flood Risk and Climate Change' to the National Planning Policy Framework.
- Based on the above and providing the above strategies are adopted; the developed site will not contribute further to flood risk thus satisfying the principles of the National Planning Policy Framework.

4.7. Construction Surface Water Management

The existing surface is permeable, and the principal of the sports pitch uses the pitch sub-base as attenuation and storage.

Due to the nature of the construction works, little onsite material storage is required. During the processes when it is required it will be for relatively short periods of time.

Below is a brief description of the key construction works for an Artificial Grass Pitch and associated activities:

- Once the base is put into place the new drainage system shall be installed with the process taking approximately 3 days to complete. The materials largely involve the delivery of pea shingle material stockpiled within the development footprint with 80mm and 150mm Ø UPVC perforated corrugated plastic carrier drainage pipes to EN1401-1:1998 laid into geotextile lined, gravel-filled trenches. The UPVC perforated corrugated plastic carrier pipes shall be stored onsite within the designated fenced and enclosed storage areas prior to being securely laid and covered within the ground.
- The boundary of the development shall be lined with PCC kerb edging detail and the necessary fence posts, floodlighting foundations that involves concrete foundations. These materials will be stored within the designated storage area in bulk delivery with each being heavily weighted with minimal risk of movement.
- At this stage the fencing system shall be erected and in place around the development footprint and any/all materials within the development will be safely secured.
- The development area shall then be surfaced with tarmacadam. The process of tarmac surfacing requires material to be delivered and laid at set temperatures and therefore no materials will be storage onsite for this process and works and shall take approximately 5 days to complete.
- Upon completion of the base works the artificial surfacing shall be delivered in bulk to the pitch base within the secure fenced area. The material is rolled out and laid with the boundary of the surfacing being clamped and secured to the edging detail so that the material stays insitu and cannot be removed during any flood event or otherwise.

The development location itself acts as a sediment trap / barrier that retains surface water within the site boundary with any/all surface water run off going through the existing infrastructure of the hard-standing surfacing, stone foundation, geotextile membrane and entering into the existing and proposed drainage network that is lined with a geotextile membrane, pea shingle and drainage channels that each connect to a silt trap inspection chamber. This process will adequately trap and retain sediment throughout the construction process.

The existing and proposed levels and gradients of the site lead across the sports pitch. Whilst travelling across the development through the natural fall of levels the surface water will infiltrate through the stone foundation, geotextile membrane and entering into the existing and proposed drainage network that is lined with a geotextile membrane, shingle and drainage channels that each connect to a silt trap inspection chamber. This process will adequately trap and retain sediment throughout the construction process. Any run off that travels through the site prior to naturally infiltrating through the base would be retained within the development boundary. Surface water would sit within the development area until it naturally infiltrates through the existing hard-standing surfacing, stone foundation, geotextile membrane and entering into the existing and proposed drainage network that is lined with a geotextile membrane, shingle and drainage channels that each connect to a silt trap inspection chamber.

Throughout the development works the areas and development footprint will be cleared, cleaned and jet washed with the silt traps collecting all sediment and being emptied as / when required until all construction works are completed.

Run-off rates from the site will be managed so they are no greater than pre-development or in keeping with the best practice guidance to minimise risk of blockage.

Run-off control will include provision of appropriate levels / grading to direct any water from the construction site to remain on site.

5. Drainage Management & Maintenance

GULLIES, PIPEWORK, INSPECTION CHAMBERS AND CONTROLS	
Required Action	**Frequency**
Regular Maintenance	
Remove cover and inspect chambers and pipework ensuring water is flowing freely and that the exit route for water is unobstructed.	Annually
Undertake inspection after leaf fall in autumn, remove leaves from gullies, chambers and pipes	Every autumn
Inspect silt traps and clear of silt	Every 6 months or as required
Inspect catchpits and clear of silt	Every 6 months or as required
Remedial work	
Remove debris, silt and leaves from inspection chambers and flow control chambers.	As required
Remove debris and silt from pipework through high pressure jet washing.	As required
Repair physical damage if necessary	As required
Monitoring	
CCTV survey to establish condition of pipe runs. Cleansing or repair of physical damage to be conducted if necessary	Every 5 years or as required

PERMEABLE AND POROUS SURFACES	
Required Action	**Frequency**
Regular Maintenance	
Brushing and vacuuming (standard cosmetic sweep over whole surface)	Once a year, after autumn leaf fall, or reduced frequency as required, based on site-specific observations of clogging or manufacturer's recommendations – pay particular attention to areas where water runs onto pervious surface from adjacent impermeable areas as this area is most likely to collect the most sediment
Occasional Tasks	
Stabilise and mow contributing and adjacent areas	As required
Removal of weeds or management using glyphospate applied directly into the weeds by an applicator rather than spraying	As required and in accordance with manufacturer's recommendations
Remedial Work	

Remedial work to any depressions, rutting and cracked or broken blocks considered detrimental to the structural performance or a hazard to users, and replace lost material.	As required

Rehabilitation of surface and upper substructure by remedial sweeping	Every 10 to 15 years or as required
If efficiency of water percolating to the sub-base drops, jet washing and suction cleaning could substantially reinstate paving to 90% efficiency (as per recent experience).	As required
Monitoring	
Initial inspection	Monthly for three months after installation
Inspect for evidence of poor operation and/or weed growth – if required, take remedial action	Three-monthly, 48h after large storms in first six months
Inspect silt accumulation rates and establish appropriate brushing frequencies	Annually
Monitor inspection chambers	Annually