Our Lady's RC High School, Manchester M9 0RP

Surface Water Management Plan

Report Ref: CWC338-RP-01 Rev 4

Client: Our Lady's Roman Catholic High School

Corner Water CONSULTING

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QUALITY ASSURANCE RECORD

Contributors for Corner Water Consulting:

Name	Role
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Document Status and Revision History:

Version	Date	Project Contact	Status / Comment
1	23/02/2024	Alan Corner	First Issue
2	08/03/2024	Alan Corner	Issue to address client comments on pitch levels and sub-surface layers
3	24/04/2024	Alan Corner	Updated to address redesign of pitches and drainage surveys
4	2/5/2024	Alan Corner	Updated to suit amended pitch levels and construction approach

Limitation of liability and use

The work described in this report was undertaken for the party or parties stated, for the purpose or purposes stated, to the time and budget constraints stated. No liability is accepted for use by other parties or for other purposes, or unreasonably beyond the terms and parameters of its commission and its delivery to normal professional standards. Circumstances, regulations, assessment methodology and professional standards do change which could subsequently affect the validity of this Report.

The methodologies adopted plus the sources of information used by Corner Water Consulting Ltd (CWC) in providing its services are outlined within this Report. Any information provided by third parties and referred to herein has not been checked or verified by CWC, unless otherwise expressly stated within this Report. This Report was checked and approved for issue on the date of issue shown, all data, parameters and methodology are valid on this date.

1. INTRODUCTION

1.1 Purpose

1.1.1 Corner Water Consulting was commissioned by Our Lady's Roman Catholic High School working with Hemstock Design to undertake a surface water management plan in support of a planning application for the development of outdoor sports pitches at Our Lady's RC High School, Manchester (M9 0RP). One is a synthetic turf pitch (STP) created over the current land area. A grass pitch will be formed by adding white lines to the area south of the STP and then inserting new sand slits and buried drainage pipes to allow the grass surface to drain effectively. There will be up to 100mm of additional topsoil added across the footprint of the grass pitch to ensure a playable surface.

1.1.2 The baseline conditions show open land to the rear of Our Lady's School, with short vegetation and scrubs.

1.1.3 All the conclusions drawn from this assessment were based on a desk study and information from site-specific investigations.

1.2 Sources of information

1.2.1 The following data was utilised:

- British Geological Survey: web viewer;
- The DEFRA Magic Map;
- The Flood Map for Planning and the Long-Term Flood Risk Map;
- The Non-Statutory SuDS Standards;
- Utility Survey ref. S21256-U-1, by Survey and Engineering Projects (February 2021);
- Ground Investigation and Updated Risk Assessment Report at Our Lady's RC High School ref. 4465-23 PII, by GEOENVIRO (December 2023);
- Proposed Drainage GA ref. 9670-WML-ZZ-XX-DR-C-1001 T01, WML Consulting (May 2021).

2 BACKGROUND

2.1 Site Location

2.1.1 The site is located to the north of Manchester, at Our Lady's RC Highschool – Figure 1.

2.1.2 The site is located to the rear of Our Lady's RC High School. The area is bound by Boothroyden Road along its western boundary, by internal access roads to the north and south, and by the school building to the east.

2.1.3 Manchester City Council has the roles of Local Planning Authority and Lead Local Flood Authority for the area.

2.2 Geology

2.2.1 This design is informed by a Phase 2 Ground Investigation and Updated Risk Assessment Report, which comprises an assessment of the geology and soil conditions, alongside a contamination report.

2.2.2 All the exploratory boreholes have shown significant contents of made ground, comprising cohesive made ground materials, with sandy gravelly clay.

2.2.3 The investigations show that whilst the general testing undertaken across the site identified contaminants, the levels detected were all below site-specific guideline values. However, the report recommends that no infiltration SuDS are placed in made ground, which could mobilise contaminants due to the presence of made ground. Therefore attenuation SuDS are utilised.

Figure 1 – Site location plan. Site boundary identified in red.

2.3 Topographical & Utility Survey

2.3.1 Various topographical surveys have been used throughout this report to inform the drainage strategy – Appendix A.

2.3.2 The topographical survey shows ground levels in the open land to range between 102.00m AOD and 104.50m AOD, with a relatively flat surface.

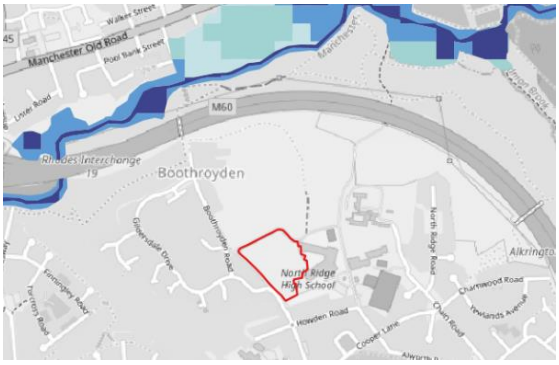
2.3.3 The utility survey shows a number of services to the southwest of the site, including surface water drains, foul water drains, gas mains, electric ducts and potable water mains.

2.4 Nearest Flood Risk Sources

2.4.1 The site is located within Flood Zone 1 i.e. at a very low risk, detailed as a yearly chance of flooding of 0.1% or less from rivers and the sea - Figure 2a.

2.4.2 The Long-Term Flood Risk Map shows the site to be at 'very low' risk from surface water flooding i.e. at a yearly chance of flooding lower than 0.1% - Figure 2b.

Figure 2 – Fluvial and surface water flood risk affecting the site – extracts from the EA's Long-Term Flood Risk Map.



a) Fluvial flood risk

b) Surface water flood risk

3 SURFACE WATER MANAGEMENT PLAN

3.1 Drainage Philosophy

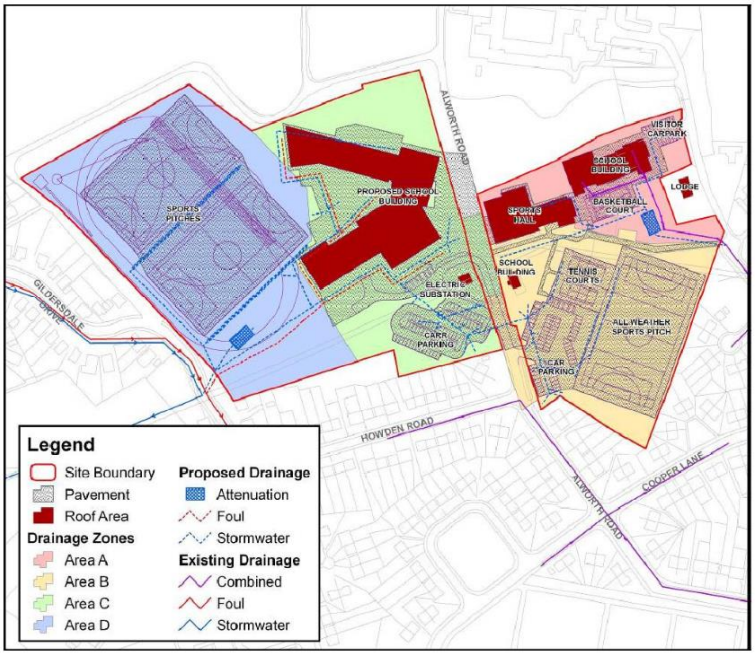
3.1.1 The proposals of the development consist of ground reprofiling to create one artificial synthetic turf pitch (STP) outdoors sports pitch with a flat upper surface.

3.1.2 A second outdoor pitch will be created for the school by adding white lines to the area south of the STP. There will be up to 100mm of additional topsoil added across the footprint of the grass pitch to ensure a playable even surface. To ensure this grass pitch can drain the playing surface effectively new sand slits and buried drainage pipes will be added. These will require ongoing maintenance to ensure they remain effective.

3.1.3 These pitches are part of the entire wider school development that was assessed in a FRA by Laing O'Rourke which set the entire proposed school scheme to discharge at less than Greenfield Rates, see Figure 3. The pitches connect to a part of the drainage network installed as part of the school construction – a branch sewer installed specifically for the pitches.

3.1.4 3.1.6 As detailed later in this report the SuDS design for the pitches ensures that they achieve actual outflow rates of less than Qbar into the overall school flow control chamber and outfall sewer. This ensures betterment compared to Greenfield Rates.

Figure 3 – School FRA Areas Considered



3.1.5 The school wide Greenfield Rates were assessed and are ensured by a flow control chamber numbered manhole S34 located in the southwest part of the school grounds, as shown in Figure 5. The flow control specification plus details are shown in Figure 4. The SuDS system includes a 600m^3 geocellular tank set out as 20m x 15m x 2m deep, located south of the pitches and adjacent to the flow control chamber, to assist in attenuating the peak flows - tank shown in Figure 5.

Figure 4 – Flow Control Arrangement Based on FRA

TOTAL AREA = 5.727 Ha

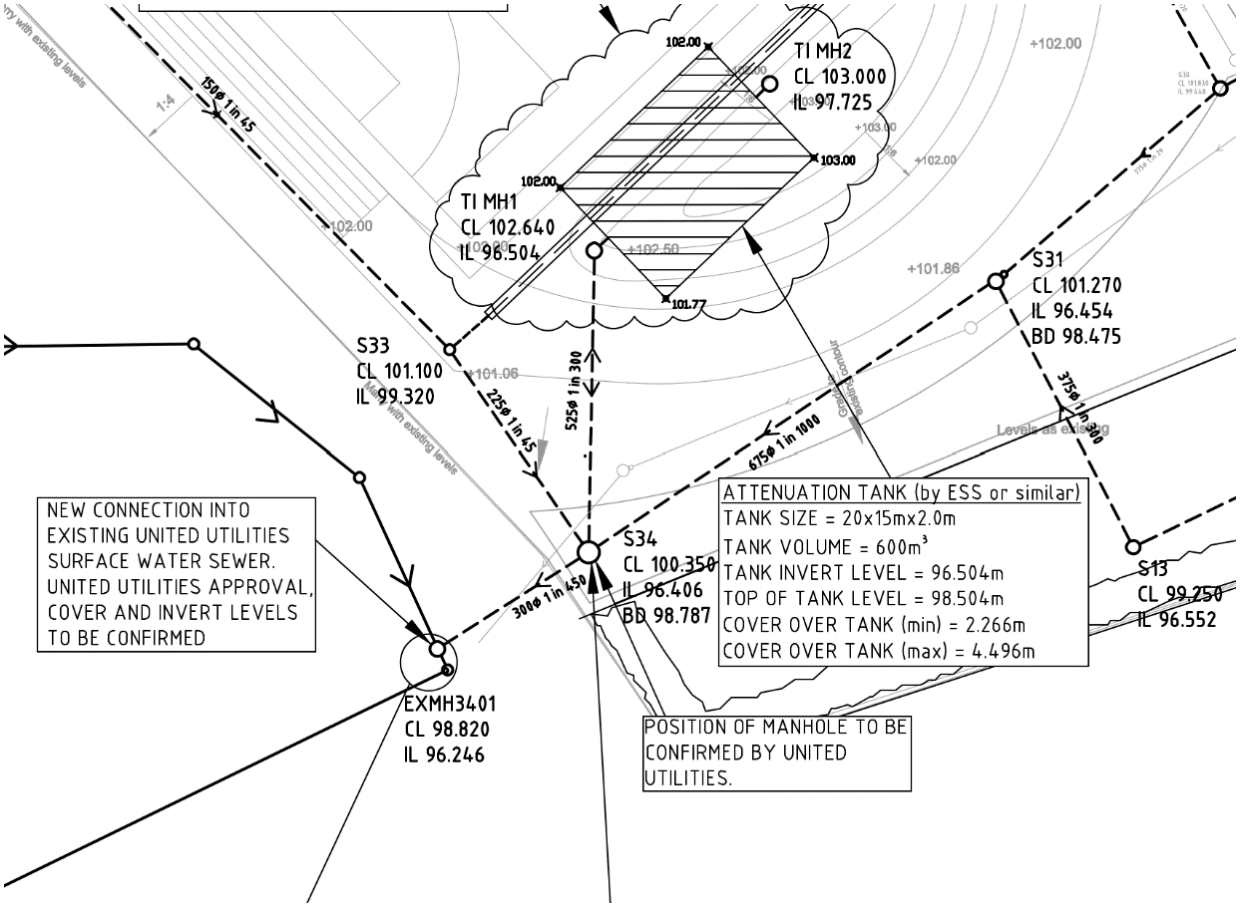
CROWN VORTEX VALVE TYPE C3, DESIGN HEAD - 1.50m

MAXIMUM DISCHARGE FOR 1 IN 1 YR STORM AND ABOVE = 4.1 l/s/Ha = 23 l/s

MAXIMUM DISCHARGE FOR 1 IN 30 YR STORM AND ABOVE = 7.045 l/s/Ha = 40l/s

MAXIMUM DISCHARGE FOR 1 IN 100 YR STORM AND ABOVE =8.702 l/s/Ha = 50l/s

Figure 5 – SuDS Attenuation Tank Adjacent to Flow Control Chamber



3.1.6 Any additional elements added to the school, such as the 2021 WML Consulting designed two Storey standalone teaching block which includes classrooms and a library shown in Figure 6, that is positioned within the southwest corner of the site follows the Greenfield Rate approach. To ensure this additional building footprint and its impermeable areas did not change the previously agreed outflow rates for the original 5.727ha school it has an outlet downstream of manhole S34, the overall school flow control chamber detailed in Section 3.1.5. The outfall drainage arrangement for the new teaching block is shown in

3.1.7 Figure **7**.

Figure 6 – Additional Teaching Block Building Designed in 2021

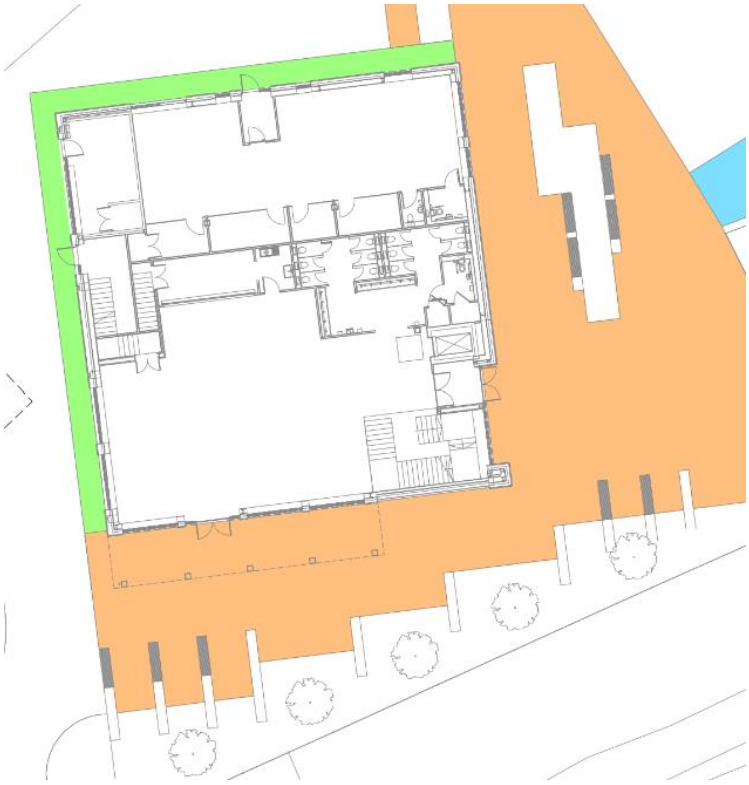
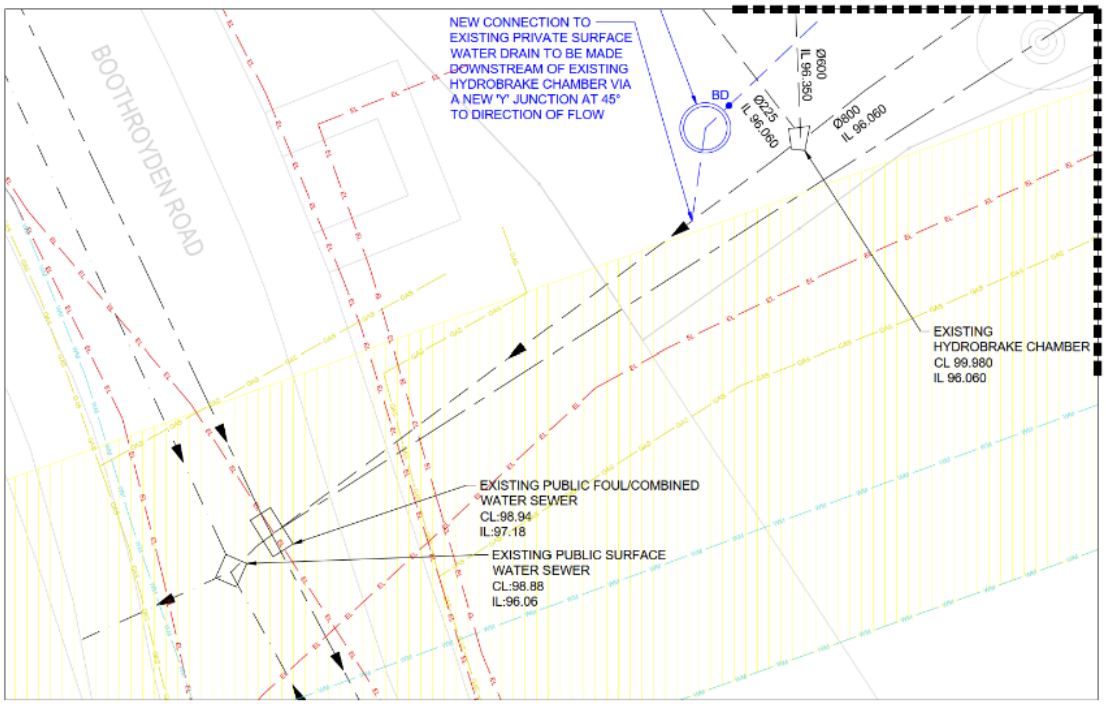


Figure 7 – 2021 Additional Teaching Block Outlet Drainage



3.1.8 There are no impermeable areas as a result of the development, but the soil compaction inherent to the process of construction within the sub-base layers and the presence of the cohesive soil would likely prevent deeper infiltration. As discussed in Section 2.2.3, the ground investigation report detailed that infiltration SuDS are not recommended

3.1.9 As a result, a surface water drainage strategy featuring attenuation is deemed required to mitigate the impacts of climate change causing an increase in runoff.

3.1.10 The STP has a permeable surface underlain by a voided stone layer that can absorb large amounts of rainfall. The grassed pitch will have regular parallel sand slits connected to 80mm buried pipes inside stone trenches – again laid at regular intervals and parallel to ensure rainwater is effectively removed from the surface to allow playing in the winter. All pitch drainage has been undertaken by Hemstock Design and is shown on their drawings. The grass pitch therefore has some below ground attenuation within the sand slits, drainage pipes plus the pipe surrounds. To supplement this a 600mm high earth bund has been added across the southern part of the pitch to contain any ponding at a maximum depth of 125mm along the southern edge of the pitch.

3.1.11 The NPPF drainage hierarchy is the overarching guidance of the present drainage strategy:

i) Discharge into the ground i.e. infiltration
ii) Discharge to a surface water body
iii) Discharge to a surface water sewer
iv) Discharge to a combined sewer

3.1.12 In the absence of watercourses within the land owned by the client and in accordance with the third priority of the drainage hierarchy, **the drainage strategy will attenuate runoff within an aggregate layer that forms part of the sub-base of the Synthetic Turf Pitch, within the buried drainage element of the grass pitch plus contained by an earth bund on the grass pitch, all to restrict discharge rates to the pre-development Q_{bar} rate.** The sub-base stone layer was assumed to have a depth of 250mm, at a void ratio of 30%.

3.1.13 Attenuating post-development runoff rates to pre-development Q_{bar} ensures that any additional runoff is released at a slow and acceptable rate, as per the methodology described in the CIRIA SuDS Manual. The site discharges at less than the equivalent Greenfield Rates.

3.2 Rainfall and Pre-development Discharge rates

3.2.1 The pre-development Q_{bar} was estimated via ReFH2 as 8.90 l/s/ha and the greenfield runoff rates for the 50%AEP, 3.3%AEP and 1%AEP storm events are shown in Table 1.

Table 1 – Pre-development greenfield runoff rates

Storm event	Q' (l/s/ha)	Q (l/s)		
		STP Pitch (7,440m^2)	**Grass Pitch** (5,376m^2)	**Total site** (11,802m^2)
50%AEP *	8.90	6.60	4.80	11.40
3.3%AEP	20.96	15.59	11.27	26.86
1%AEP	27.01	20.09	14.52	34.61

* Taken as Q_{bar} for the purpose of this assessment

3.2.2 The design retains all rainfall within either the sub-base of the STP pitch, or within a combination of buried and surface ponding behind a bund at the grass pitch, for up to the 1%AEP event plus a climate change allowance of 45%. This Climate Change allowance has been taken as the Upper End as per the latest guidance from the Environment Agency, source Climate change allowances for peak river flow in England (data.gov.uk). This allowance was directly applied to the FEH22 rainfall dataset in the Flow by Causeway hydraulic modelling software.

3.2.3 No allowance for urban creep has been made as there are no impermeable surfaces as part of the development.

3.3 Drainage arrangements and post-development discharge rates

3.3.1 In terms of surface water treatment and pollution control, no specific mitigation measures are proposed as the development is limited to ground reprofiling plus the finished surfaces are sports pitches.

3.3.2 In terms of the SuDS drainage strategy, the attenuation within the sub-base of the STP is maximised by having the pitch completely level, so the sub-base will take in and hold the collected rainfall within the 250mm of aggregate sub-base, as Source Control, until it can be released see Figure 8. An orifice flow control ensures the storage is used and the required outflow rate is achieved.

3.3.3 For the grass pitch there will be sand slitting and below ground drainage pipes at regular intervals to ensure that after a rainfall event the water can leave the surface, see Figure 9 and Figure 10. This buried drainage sums up to 80m^3 of attenuation provision. Further storage is provided by the bund around the southern part of the pitch. A detailed drainage layout plan is shown in drawing ref. CWC338-DR-01 in Appendix B.

Figure 8 – Typical Synthetic Turf Pitch Surface Drainage

Figure 9 – Typical Grass Pitch Surface Drainage

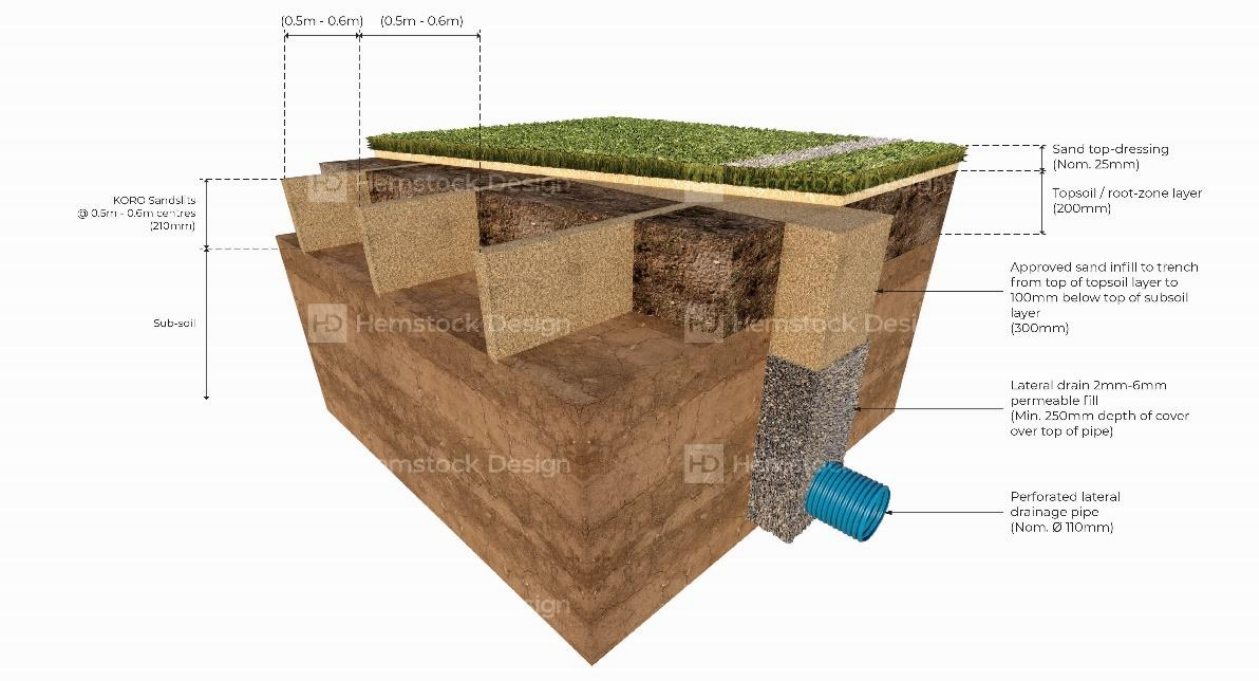


Figure 10 – Typical Result of Sand Slitting

3.3.4 The attenuated surface water run-off will be discharged into a private surface water drain within the Application Site, which was installed prior to the around 2021 school extension. That school extension also connects into the on site sewer. This on site surface water network connects to a surface water sewer in Boothroyden Road.

3.3.5 A comparison between pre and post-development (discharge) runoff rates is presented in Table 2. The results show a significant betterment for all the return periods up to the 1%AEP, including a climate change allowance under post-development conditions. The Qbar limit is 11.4 l/s which is never exceeded.

3.3.6 The full hydraulic modelling outputs are included in Appendix C.

Table 2 – Comparison of pre and post-development runoff rates

Storm event	Discharge rates, l/s (Total site area)		
	Pre-development Greenfield*	Post-development	Betterment (%)
50%AEP	11.4	9.6	16
3.3%AEP35CC	26.9	10.7	60
1%AEP45CC	34.6	10.7	69

* Not inclusive of rainfall climate change allowance

3.4 Drainage maintenance and exceedance flows

3.4.1 Due to the simple and robust nature of the SuDS utilised in the scheme, no specific maintenance activities are deemed required. Other than visual inspection of significant ponding on the pitches that may suggest partial failure or blockage of the playing surface drainage mechanisms. Plus cleaning of gravel trenches along the perimeter of the pitches and regular inspection of manhole chambers to remove any debris present in these – not expected as runoff is filtered upstream. The grass pitch may require regular sand slitting replacement and/or maintenance of the playing surface rainwater removal mechanisms to ensure the playing surface recovers and remains useable a short time after heavy rainfall.

3.4.2 In terms of exceedance flows, the STP is flat and the grass pitch has a surface that falls southwards, meaning that any exceedance flows will initially fill the STP to ground level, plus fill the bund to its maximum storage capacity. The existing earth bund along the western boundary of the site will also contain overland flows. All of these arrangements promote ponding of exceedance flows within the site.

4 CONCLUSIONS

4.1.1 The development is for the creation of 2 no. outdoor sports pitches at Our Lady's RC High School, Manchester. These 2 pitches complete the original school layout and connect to drainage provided as part of the original school construction.

4.1.2 The artificial synthetic turf pitch (STP) is flat and is created after some earthworks to provide a level sub-grade. The grass pitch is created by adding white lines to an area south of the STP, plus spreading up to 100mm of topsoil to make the pitch playable and even.

4.1.3 The EA flood map for planning, plus the long-term flood risk map, show no significant flood risk sources to the site.

4.1.4 The surface water drainage strategy will rely on attenuation within or above the pitches followed by a discharge into a private surface water drain within the site that was installed for this purpose during the construction of the school. The school network ultimately connects to a United Utilities public sewer.

4.1.5 The design ensures that flows into the school network are lower than the required Greenfield Rate for the pitches area. This design also ensures that the outflow rate would be a maximum of Qbar. By limiting flows to the singular Qbar rate, rather than equivalent Greenfield Rates, the proposal ensures any additional runoff generated as a result of the development is released at a relatively slow and acceptable rate.

4.1.6 As detailed in Section 3.3 the actual peak design outflow rate for the area of the pitches is a minimum of 16% lower than the equivalent Qbar or 50%AEP Greenfield rate. The betterment rises to over 60% improvement versus the Greenfield Rates for the 50%AEP and 1%AEP storms.

4.1.7 The maximum post-development discharge for the 1%AEP45CC due to the SuDS provision was assessed by the hydraulic modelling software as 10.7 l/s. This translates into a betterment of over 6% under the Qbar rate of 11.4 l/s.

4.1.8 Within the site there is no flooding despite the betterment below the target outfall rates. This applies to all storm events up to the 1%AEP45CC.

4.1.9 The new proposed drainage connects to the pipes provided for this purpose within the school private drainage network. The connection is at a point upstream of the existing flow control chamber Manhole S34, since this was always intended within the original school drainage design and the construction work that followed. This arrangement does not change the discharge rates conveyed into UU’s public sewer as the pitches are part of the 5.727ha total catchment allowed for.

4.1.10 Offsite there will be no flooding, as the rate of discharge is much lower than the required Greenfield rates.

APPENDIX A: TOPOGRAPHICAL SURVEY AND SCHOOL DRAINAGE PROVISION

SURVEY STATIONS			
Number	Easting	Northing	Height
JP1	385442.299	404522.510	102.172
JP2	385438.375	404551.524	102.166
JP3	385379.861	404501.697	102.812
JP4	385412.704	404467.104	102.440

deciduous tree
defined by one point at centre & one point on spread
d= .5
trunk radius as drawn
(girth size and position +/- 50mm)

conifer tree (defined as above)

station

trial pit

gate

bush

borehole

window sample

- note heights / points / lines all same colour
- e.g. for channel, all crosses / lines / heights are magenta

56.24
spot level

bottom of batter / wood / ridge / timber face / gutter

top of batter

break line / discontinuity

wall (see text nearby for height / width / type)

retaining wall (see text nearby for height / width / type)

channel (all levels at channel unless noted)

kerb levels (shown parallel to channel -)

railway

drain / river / canal

overhead lines / buildings (not surveyed unless specified)

concrete / ramp

building
stone

face of cladding / flower bed

canopy

verge

fence (see text nearby for height / width / type)
(panel / security / etc.)

columns / gridlines / conveyors / column face

brick

cycle lane / bus lane / white line (see text)

tanks / decking

hedge scaled to width

line may be as above, if just one edge
i.e. for level specific surveys both sides
measured not to show level change
(see text for type / height / width / etc)
path / window / door

track
143
142.5

contours

can't lift - can't lift
cl=65.23
i=59.78

pipe line

bt cable

electric cable

gas

tarmac

footpath

- only manholes found on site during survey marked
- other manholes may be present but covered
- all invert levels taken where possible at main channel

	?	unknown cover	STANDARD FENCE ABBREVIATIONS
	ac box	air conditioning box	b/w - barbed wire
	av	air valve	c/l - chain link
	bb	building beacon	cl/b - close boarded
	bh	bat box	cl - corrugated iron
	bt	bt line	con/pan - concrete panel
	bt	bt manhole	cr/ba - crash barrier
	bt	bt post	hr - hand rail
	bt box	bt box	ir - iron rail
	bm	OSBM	pal - palisade
	block	blocked manhole	panel - panel
	bus shelter	bus shelter	p/b - public barrier
	cable	cable	pick - picket
	can't lift	can't lift	p/r - post & rail
	ctv box	cable tv box	p/w - post & wire
	ctv	cable tv manhole	sec. - security fence
	data mh	data manhole	wood - wooden fence
	dk	drop kerb	
	ds&g	down spout (with gulley)	
	dsr	recessed downspout	STANDARD ABBREVIATIONS
	ds	building step back	conc. - concrete
		not surveyed	conc. boll. - concrete bollard
	el. post	electric post	conc. wall - concrete wall
	el.	electric	edg.cut grass - edge cut grass
	el. mh	electric manhole	el.sub st. - elec. substation
	el box	electric box	face conc. - face of concrete
	earth	earth strap/spike	face clad. - face of cladding
	f.hydr	fire hydrant	face tim. - face of timber
	gas	gas	trel - trellis
	gas mh	gas man hole	hr pr. gas - high pressure gas
	gas box	gas box	no rt. turn - no right turn
	gun5.68	gulley top	rough ground - rough ground
	guy	guy rope/stay	ret. wall - retaining wall
	.5 dia	pipe diameter	sur. drain - surface drain
	light	light	ped. studs - pedestrian studs
	lp	lamp post	
	lt	left turn arrow	cl=5.32 (manhole cover level)
	peg	peg	dpc=56.45 (dpc level)
	phone box	phone box	eav=34.29 (eaves level)
	post box	post box	ffl=5.34 (finished floor level)
	pipe	pipe	gu=34.29 (gulley level)
	planter	planter	gutter=34.29 (gutter level)
	post	post	hip=34.29 (hip level)
	rod. eye	rodding eye	in=5.34 (invert level)
	rsj	steel rsj	oh=5.34 (overhead level)
	rt	right turn	ramp=5.34 (ramp level)
	salt	salt box	rid=34.29 (ridge level)
	security cam	security camera	sill:l=5.34 (sill level)
	seat	seat	sill=5.34 (sill level)
	si	sign - with indicative text	sill:t=5.34 (sill level)
	slab=3.19	slab (generally conc.)	slab=5.34 (slab level)
	st.tap	stop tap	top conc=5.34 (top of concrete)
	str.	straight on	tp=60.67dia.15 (top of pipe)
	sv.	sluice valve	t.st.=10.36 (top of step)
	tactile paving	tactile paving	twl=56.72 (top of wall)
	ts.	traffic signal	wal=56.19 (water level)
	ts. mh	traffic signal manhole	cfl=5.67 (cellar floor level)
	ts.box	traffic signal box	.05level step (level step)
	tmp	trap	gu &dia=34.29
	utility	utility (unknown)	(gulley with downspout level)
	utility mh	utility manhole (unknown)	
	utility box	utility box (unknown)	windowtop=13.59
	water	water	windowbottom=14.41
	water mh	water manhole	
	water box	water box	
	wo	wash out valve	
	tap	tap	
	parking meter	parking meter	
	cycle rack	cycle rack	
	cycle shelter	cycle shelter	

J. ENGLISH LTD
site engineering

Client / Location: Our Lady's RC High School
Alworth Road, Higher Blackley, Manchester

J. English Ltd
The Croft, Lane Side Farm
Alston Lane, Longridge
Preston, Lancashire
PR33BN
Tel: 07749522374

To local grid based on ostn15/osgm15

Drawing Number:	369-Our Lady's RC High School		Revision:A
Drawn By:	JE	Checked By:	PS
Date:	19/11/2023	Scale:	1:200 @ A0

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N

PLAN GRID NORTH

File Name: 521256-U-Manchester.dwg

LEGEND

AV	AIR VALVE	BT	BT - Verification
BT	BT INSPECTION COVER	CABLE DUCT	Duct - Verification
C	CATCH PIT / GULLY	CABLE DUCT STAT RECORD	Duct - Assumed route
CCTV	CCTV CAMERA POST	CABLE TV	CA - Verification
COM	COMMUNICATIONS COVER	CABLE TV STAT RECORD	CA - Assumed route
CP	CONTROL POST	CCTV	CCTV - Verification
DC	DRAINAGE CHANNEL	CCTV STAT RECORD	CCTV - Assumed route
DP	DOWN PIPE	ELECTRIC	EC - Verification
EB	ELEC. BOX	ELECTRIC STAT RECORD	EC - Assumed route
EIC	ELEC. INSPECTION COVER	TELECOMS STAT RECORD	TC - Verification
EM	ELEC. METER	EARTH ROD STAT RECORD	TC - Assumed route
ER	EARTH ROD	EARTHING	ER - Verification
EV	ELEC. VENT PIPE	ELECTRIC	ER - Assumed route
FF	FINISHED FLOOR LEVEL	ELECTRIC STAT RECORD	EC - Verification
FH	FIRE HYDRANT	FIBRE OPTICS	FO - Verification
G	GULLY	FIBRE OPTICS STAT RECORD	FO - Assumed route
GL1	GROUND LIGHT	FUEL LINE	FL - Verification
GST	GAS TAP	FUEL LINE STAT RECORD	FL - Assumed route
GV	GAS VALVE	GAS / GAS MAIN LINE	GM - Verification
IC	INSPECTION COVER	MAINS GAS	GM - Assumed route
IL	INVERT LEVEL	MAINS GAS STAT RECORD	GM - Verification
LC	LAMP COLUMN	MAINS WATER	WM - Verification
LP	LAMP POST	MAINS WATER STAT RECORD	WM - Assumed route
MH	MANHOLE	SEWER CW	SW - Verification
OP	OUTFALL PIPE	SEWER CW STAT RECORD	SW - Assumed route
OP	OUTFALL	SEWER FW	FW - Verification
P	PILLAR	SEWER FW STAT RECORD	FW - Assumed route
PP	PETROL PUMP	SEWER SW	SW - Verification
RG	RODDING EYE	SEWER SW STAT RECORD	SW - Assumed route
RWP	RAINWATER PIPE	TRAFFIC SIGNAL CABLE	TS - Verification
SOF	SOFFIT LEVEL	TRAFFIC SIGNALS	TS - Assumed route
TB	TELEPHONE BOX	UNIDENTIFIED DUCT	UD - Verification
TCB	TELEPHONE CALL BOX	UNIDENTIFIED CABLE	UD - Assumed route
TL	TRAFFIC LIGHT	UNIDENTIFIED PIPE	UP - Verification
TP	TELEPHONE POLE	UNIDENTIFIED CABLE	UP - Assumed route
TP	TELEGRAPH POLE	VDC STAT RECORD	
WV	WATER METER	SURVEY BOUNDARY	
WM	WATER VALVE	EXTENT OF SURVEY	
WST	WATER STOP TAP		
WT	WATER TANK / SILO		

QUALITY LEVEL

A = Verification

B1 = Horizontal/Vertical location using multiple techniques

B2 = Horizontal/Vertical location using a single technique

B3 = Horizontal location using a single technique

B4 = Assumed route

C = SUA Reconnaissance

D = Desktop utility records search

NOTES:

All levels relate to O.S (Newlyn) Datum. Established using network RTK. Survey plotted on a plane local grid, orientated to National Grid.

This Underground Utilities survey was conducted in compliance with the BSI PAS128:2014 standards.

Symbols beginning/say text indicating first an abbreviation of the services' function (eg. is = Electric Cable) followed by the Quality Level to which that service was recorded (eg. B4 = Assumed route).

Quality Level descriptions shown in the above legend are for reference purposes only and are abbreviated from standard descriptions.
For full information on Quality Levels please consult the BSI PAS128:2014 standards document.

Lines annotated as GPR indicate a series of consistent subsurface anomalies detected by the GPR survey which could not be attributed to any other Quality Level B2. The nature of these anomalies could not be determine by non-invasive means. GPR lines that were identifiable as a service are shown as their respective service.

DISCLAIMER:

At SEP we use skilled and experienced staff, modern up to date techniques and top of the range electromagnetic and radar technology to locate and trace sub-surface utilities. However the performance of the equipment employed in non-invasive surveys can be adversely affected by factors outside the control of SEP. Therefore SEP cannot guarantee that all utilities present on site have been located. It is the responsibility of the Client to consult regional authority records and undertake trial digs where appropriate.

Where similar services run in close proximity it may be impossible to separately trace individual services as the trace signal can experience interference. In such cases, services will be shown as a single, annotated line. The displayed depth will refer to the shallowest detected utility.

Successful tracing of non-conductive materials may be limited. Drainage gulleys are dye tested where possible to prove connectivity but it is not always possible to introduce the sonde due to narrow pipe sizes and/or accumulated silt.

Depth information of underground services/features are generally accurate to within +/- 10% (i.e. a pipe at 3m deep may be accurate to +/-300mm) but this cannot be guaranteed. Depths shown usually refer to the top of the service. Gravity sewer and drain depths are usually to invert (base of drainage channel) unless otherwise stated.

Some above ground features may have been obscured at time of survey. It is not always possible to operate the Ground Penetrating Radar in areas including, but not limited to, dense vegetation, rubble, debris and/or rough/uneven ground.

Existing record information that was made available to SEP by the Client or by the statutory utility provider should be regarded only as an indication and cannot be guaranteed.

Excavation in the vicinity of services shown should be carried out with due allegience (Ref. HSG47).

SHEET LAYOUT

0 2m 4m 8m 12m 16m

SCALE BAR

REV	DATE	DESCRIPTION

SURVEY & ENGINEERING PROJECTS

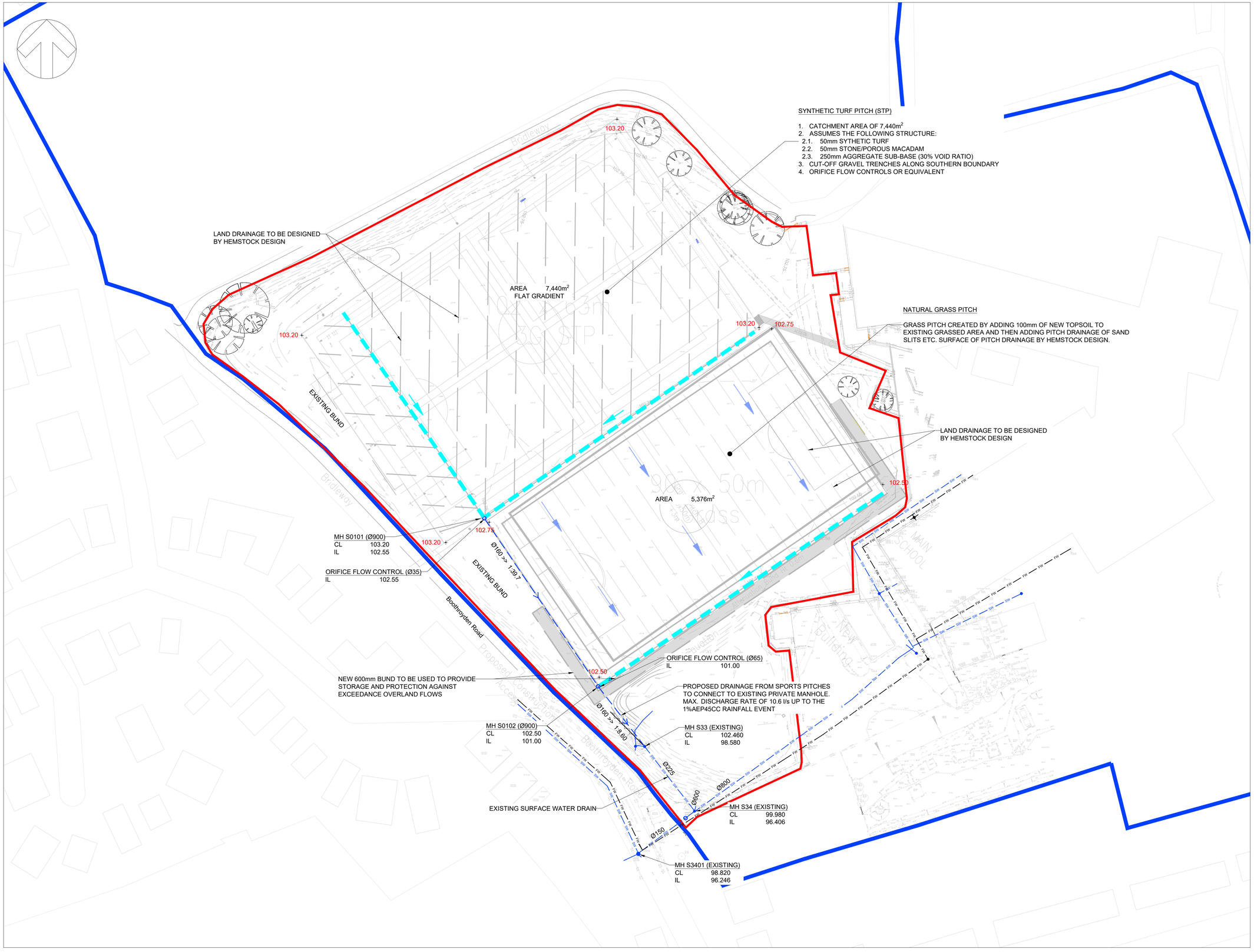
Client
Kilhey Consultancy Limited
24 Ellis Road
Billinge
Wigan
WN5 7RT

Project Title
Utility Survey of Land at:
Our Ladys Roman Catholic High School
Alworth Road
Manchester
M9 0RP

Surveyed	Drawn	Checked
L Morris	C Holland	J Gardner

Scale	Date	Drawing Ref.	No.	Size	Rev
1:200	Feb 21	521256-U	1	A0	--

APPENDIX B: DRAINAGE LAYOUT PLAN



GENERAL ARRANGEMENT

SCALE 1:500 @ A1

DO NOT SCALE

NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETRES (mm) AND ALL LEVELS ARE IN METRES ABOVE ORDNANCE DATUM (mAOD) UNLESS STATED OTHERWISE.
2. THIS DRAINAGE LAYOUT PLAN IS SUBJECT TO AN INTER-DISCIPLINE STANDARD REVIEW.
3. THIS VERSION OF THE DRAINAGE LAYOUT PLAN SHOULD ONLY BE USED FOR COMMENT BETWEEN THE CLIENT AND THE DESIGNER. NO LIABILITY AS A RESULT OF THE USE OF THIS DRAWING FOR OTHER PURPOSES IS ACCEPTED.
4. STRUCTURAL FEATURES ASSOCIATED WITH DRAINAGE APPARATUS ARE SUBJECT TO A STRUCTURAL AND GEO-TECHNICAL DESIGN AT THE DETAILED DESIGN STAGE.
5. DRAIN/SEWER DIAMETERS AND INVERT LEVELS INFORMED BY DRAWING REF. OL_SKM_DR_G_04_AZ_NS_5014.
6. DESIGN SUBJECT TO UTILITIES CLASH DETECTION PRIOR TO CONSTRUCTION. NO LIABILITY IS TAKEN ARISING AS A RESULT OF CONSTRAINTS CAUSED BY EXISTING UTILITIES.
7. QBAR GREENFIELD FLOW ASSESSED AS 11.40 l/s FOR A COMBINED AREA OF 12,820m2 (SYNTHETIC TURF PITCH AND NATURAL GRASS PITCH).

KEY:

- SITE BOUNDARY
- LANDOWNERSHIP BOUNDARY
- SURFACE WATER NETWORK
- EXISTING SURFACE WATER DRAIN
- EXISTING FOUL WATER DRAIN
- ABANDONED DRAIN
- CUT-OFF GRAVEL TRENCH
- 102.75 + FINISHED SURFACE LEVELS

REV	DATE	BY	DESCRIPTION	CHK	APP
P05	01/05/2024	JG	REDESIGN TO SUIT CLIENT COMMENTS	AC	AC
P04	24/04/2024	JG	REDESIGN TO SUIT NEW PITCHES	AC	AC
P03	02/02/2024	JG	ISSUE TO ADDRESS CLIENT COMMENTS	AC	AC
P02	25/02/2024	JG	ISSUE TO ADDRESS CLIENT COMMENTS	AC	AC
P01	19/02/2024	JG	FIRST ISSUE	AC	AC

CLIENT:

HEMSTOCK DESIGN

SITE/PROJECT:

OUR LADY'S RC HIGH SCHOOL, MANCHESTER

TITLE:

SURFACE WATER DRAINAGE LAYOUT PLAN

SCALE @ A1:	DESIGNED:	CHECKED:
1:500	JG	AC

STATUS:	DATE:
FOR PLANNING APPROVAL	MAY 2024

DRAWING No: CWC338-DR-01 P05

REV: P05

CORNER WATER CONSULTING

File name C:\USERS\JPOSO\CWC\EXTRANET ANA MESQUITA - CWC338 MANCHESTER 3G PITCH\3 WIP\0 DRAWINGS\2 CAD\CWC338-DR-01 P05.DWG, printed on 02 May 2024 11:13:44, by Joao Gil

APPENDIX C: DRAINAGE MODELLING OUTPUTS

Design Settings

Rainfall Methodology	FEH-22	Minimum Velocity (m/s)	1.00
Return Period (years)	100	Connection Type	Level Inverts
Additional Flow (%)	45	Minimum Backdrop Height (m)	0.200
CV	0.750	Preferred Cover Depth (m)	0.500
Time of Entry (mins)	5.00	Include Intermediate Ground	✓
Maximum Time of Concentration (mins)	30.00	Enforce best practice design rules	x
Maximum Rainfall (mm/hr)	200.0		

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
3G_02	0.745	5.00	103.200	100	385316.427	404522.992	0.550
S0101			103.700	900	385317.191	404509.114	1.150
GRASS_01	0.402	20.00	102.625	300	385360.735	404473.159	0.625
GRASS_02			103.100		385358.594	404465.778	1.162
S0102			102.500	900	385357.012	404463.829	1.500
S33			102.460	900	385369.473	404448.114	3.880
S34			99.980	900	385383.216	404430.123	3.400

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
1.000	3G_02	S0101	5.000	0.600	102.650	102.580	0.070	71.4	160	5.07	148.0
1.001	S0101	S0102	60.303	0.600	102.550	101.030	1.520	39.7	160	5.67	142.5
2.000	GRASS_01	GRASS_02	5.000	0.600	102.000	101.938	0.062	80.6	160	20.07	152.8
2.001	GRASS_02	S0102	2.510	0.600	101.950	101.030	0.920	2.7	160	20.08	78.8
1.002	S0102	S33	20.056	0.600	101.000	98.655	2.345	8.6	160	20.17	78.6
1.003	S33	S34	22.639	0.600	98.580	96.580	2.000	11.3	225	20.27	78.4

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
1.000	1.242	25.0	433.1	0.390	0.960	0.745	0.0	160	1.265
1.001	1.671	33.6	417.1	0.990	1.310	0.745	0.0	160	1.702
2.000	1.168	23.5	241.3	0.465	1.002	0.402	0.0	160	1.190
2.001	6.409	128.9	124.5	0.990	1.310	0.402	0.0	127	7.271
1.002	3.614	72.7	354.3	1.340	3.645	1.146	0.0	160	3.681
1.003	3.911	155.5	353.4	3.655	3.175	1.146	0.0	225	3.982

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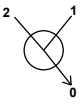
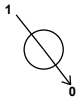
Pipeline Schedule

Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
1.000	5.000	71.4	160	Circular	103.200	102.650	0.390	103.700	102.580	0.960
1.001	60.303	39.7	160	Circular	103.700	102.550	0.990	102.500	101.030	1.310
2.000	5.000	80.6	160	Circular	102.625	102.000	0.465	103.100	101.938	1.002
2.001	2.510	2.7	160	Circular	103.100	101.950	0.990	102.500	101.030	1.310
1.002	20.056	8.6	160	Circular	102.500	101.000	1.340	102.460	98.655	3.645
1.003	22.639	11.3	225	Circular	102.460	98.580	3.655	99.980	96.580	3.175

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
1.000	3G_02	100	Manhole	Adoptable	S0101	900	Manhole	Adoptable
1.001	S0101	900	Manhole	Adoptable	S0102	900	Manhole	Adoptable
2.000	GRASS_01	300	Manhole	Adoptable	GRASS_02		Junction	
2.001	GRASS_02		Junction		S0102	900	Manhole	Adoptable
1.002	S0102	900	Manhole	Adoptable	S33	900	Manhole	Adoptable
1.003	S33	900	Manhole	Adoptable	S34	900	Manhole	Adoptable

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
3G_02	385316.427	404522.992	103.200	0.550	100	0	1.000	102.650	160
S0101	385317.191	404509.114	103.700	1.150	900	1	1.000	102.580	160
						0	1.001	102.550	160
GRASS_01	385360.735	404473.159	102.625	0.625	300	0	2.000	102.000	160
GRASS_02	385358.594	404465.778	103.100	1.162		1	2.000	101.938	160
						0	2.001	101.950	160
S0102	385357.012	404463.829	102.500	1.500	900	 1	2.001	101.030	160
						2	1.001	101.030	160
						0	1.002	101.000	160
S33	385369.473	404448.114	102.460	3.880	900	 1	1.002	98.655	160
						0	1.003	98.580	225
S34	385383.216	404430.123	99.980	3.400	900	1	1.003	96.580	225

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Simulation Settings

Rainfall Methodology	FEH-22	Skip Steady State	x	Check Discharge Rate(s)	x
Summer CV	0.750	Drain Down Time (mins)	240	Check Discharge Volume	x
Analysis Speed	Normal	Additional Storage (m³/ha)	20.0		

Storm Durations

15	30	60	120	180	240	360	480	600	720	960	1440

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
2	0	0	0
30	0	0	0
30	35	0	0
100	45	0	0

Node S0101 Online Orifice Control

Flap Valve	x	Invert Level (m)	102.550	Discharge Coefficient	0.600
Replaces Downstream Link	✓	Diameter (m)	0.035		

Node S0102 Online Orifice Control

Flap Valve	x	Invert Level (m)	101.000	Discharge Coefficient	0.600
Replaces Downstream Link	✓	Diameter (m)	0.065		

Node 3G_02 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00360	Safety Factor	2.0	Invert Level (m)	102.650
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Time to half empty (mins)	

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	2000.0	3560.0	0.250	2000.0	3560.0	0.251	7440.0	3560.0	0.550	7440.0	3560.0

Node GRASS_01 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00360	Safety Factor	2.0	Invert Level (m)	102.100
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Time to half empty (mins)	123

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	240.0	2688.0	0.400	240.0	2688.0

Node GRASS_01 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	102.500
Side Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Time to half empty (mins)	46

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	0.0	0.0	0.125	2660.0	0.0

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Results for 2 year Critical Storm Duration. Lowest mass balance: 99.81%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
600 minute summer	3G_02	435	102.806	0.156	16.8	97.8035	0.0000	OK
600 minute summer	S0101	435	102.806	0.256	3.1	0.1626	0.0000	SURCHARGED
120 minute summer	GRASS_01	84	102.231	0.231	19.9	12.4387	0.0000	SURCHARGED
120 minute summer	GRASS_02	86	102.220	0.282	10.3	0.0000	0.0000	SURCHARGED
120 minute summer	S0102	86	102.213	1.213	10.8	0.7717	0.0000	FLOOD RISK
120 minute summer	S33	86	98.619	0.039	9.6	0.0245	0.0000	OK
120 minute summer	S34	86	96.618	0.038	9.6	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
600 minute summer	3G_02	1.000	S0101	3.1	0.460	0.123	0.0998	
600 minute summer	3G_02	Infiltration		1.8				
600 minute summer	S0101	Orifice	S0102	1.2				
120 minute summer	GRASS_01	2.000	GRASS_02	10.3	1.512	0.439	0.1002	
120 minute summer	GRASS_01	Infiltration		1.3				
120 minute summer	GRASS_02	2.001	S0102	10.0	1.662	0.077	0.0503	
120 minute summer	S0102	Orifice	S33	9.6				
120 minute summer	S33	1.003	S34	9.6	2.157	0.062	0.1006	66.1

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Results for 30 year Critical Storm Duration. Lowest mass balance: 99.81%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
960 minute summer	3G_02	735	102.931	0.281	24.1	226.1901	0.0000	FLOOD RISK
960 minute summer	S0101	735	102.931	0.381	3.4	0.2421	0.0000	SURCHARGED
60 minute summer	GRASS_01	58	102.540	0.540	54.5	55.7888	0.0000	FLOOD RISK
60 minute summer	GRASS_02	58	102.515	0.577	12.8	0.0000	0.0000	SURCHARGED
60 minute summer	S0102	45	102.500	1.500	14.3	0.9540	6.2436	FLOOD
60 minute summer	S33	45	98.621	0.041	10.7	0.0259	0.0000	OK
60 minute summer	S34	45	96.620	0.040	10.7	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
960 minute summer	3G_02	1.000	S0101	3.4	0.464	0.136	0.1002	
960 minute summer	3G_02	Infiltration		1.8				
960 minute summer	S0101	Orifice	S0102	1.5				
60 minute summer	GRASS_01	2.000	GRASS_02	12.8	1.539	0.545	0.1002	
60 minute summer	GRASS_01	Infiltration		1.3				
60 minute summer	GRASS_02	2.001	S0102	12.8	1.738	0.099	0.0503	
60 minute summer	S0102	Orifice	S33	10.7				
60 minute summer	S33	1.003	S34	10.7	2.226	0.069	0.1087	101.8

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Results for 30 year +35% CC Critical Storm Duration. Lowest mass balance: 99.81%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
1440 minute summer	3G_02	1080	102.979	0.329	24.0	334.0641	0.0000	FLOOD RISK
1440 minute summer	S0101	1080	102.978	0.428	2.5	0.2724	0.0000	SURCHARGED
60 minute summer	GRASS_01	59	102.562	0.562	73.6	81.2132	0.0000	FLOOD RISK
60 minute summer	GRASS_02	59	102.523	0.585	15.9	0.0000	0.0000	SURCHARGED
120 minute summer	S0102	70	102.500	1.500	17.1	0.9540	24.2718	FLOOD
180 minute summer	S33	100	98.621	0.041	10.7	0.0259	0.0000	OK
15 minute summer	S34	23	96.620	0.040	10.7	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
1440 minute summer	3G_02	1.000	S0101	2.5	0.467	0.099	0.1002	
1440 minute summer	3G_02	Infiltration		1.8				
1440 minute summer	S0101	Orifice	S0102	1.6				
60 minute summer	GRASS_01	2.000	GRASS_02	15.9	1.562	0.676	0.1002	
60 minute summer	GRASS_01	Infiltration		1.3				
60 minute summer	GRASS_02	2.001	S0102	15.9	2.022	0.123	0.0503	
120 minute summer	S0102	Orifice	S33	10.7				
180 minute summer	S33	1.003	S34	10.7	2.226	0.069	0.1087	163.9

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Results for 100 year +45% CC Critical Storm Duration. Lowest mass balance: 99.81%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
1440 minute summer	3G_02	1260	103.060	0.410	33.3	516.7726	0.0000	FLOOD RISK
1440 minute summer	S0101	1260	103.059	0.509	3.3	0.3238	0.0000	SURCHARGED
60 minute summer	GRASS_01	61	102.586	0.586	101.8	121.0842	0.0000	FLOOD RISK
60 minute summer	GRASS_02	61	102.532	0.594	18.7	0.0000	0.0000	SURCHARGED
240 minute summer	S0102	124	102.500	1.500	19.3	0.9540	56.2186	FLOOD
15 minute summer	S33	18	98.621	0.041	10.7	0.0259	0.0000	OK
15 minute summer	S34	18	96.620	0.040	10.7	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
1440 minute summer	3G_02	1.000	S0101	3.3	0.462	0.133	0.1002	
1440 minute summer	3G_02	Infiltration		1.8				
1440 minute summer	S0101	Orifice	S0102	1.8				
60 minute summer	GRASS_01	2.000	GRASS_02	18.7	1.581	0.797	0.1002	
60 minute summer	GRASS_01	Infiltration		1.3				
60 minute summer	GRASS_02	2.001	S0102	18.7	1.887	0.145	0.0503	
240 minute summer	S0102	Orifice	S33	10.7				
15 minute summer	S33	1.003	S34	10.7	2.226	0.069	0.1087	98.2

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