conisbee | Consulting Structural Engineers
Consulting Civil Engineers

London
1– 5 Offord Street
London N1 1DH
Telephone 020 7700 6666

Norwich
6 Upper King Street
Norwich NR3 1HA
Telephone 01603 628 074

Cambridge
16 Signet Court Swann Road
Cambridge CB5 8LA
Telephone 01223 656 058

design@conisbee.co.uk
www.conisbee.co.uk

St. Helen's School, Northwood

Changing Room

Drainage Strategy Report

INVESTORS IN PEOPLE
We invest in people Silver

CYBER ESSENTIALS CERTIFIED

Ref: 220206/ J Courtney

Approved By: J Waugh

Date: 1st July 2022

Version: 1.2

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Table of Contents

1.0 EXECUTIVE SUMMARY

Conisbee have been appointed by St. Helen's School to prepare a drainage strategy for the proposed new changing room that will included in the planning application.

This design report provides an overview of the drainage principles used in the proposed development. Foul and surface water drainage will be connected back to the existing drainage serving the school, which in turn discharges to the public sewer network.

Surface water discharge will be restricted to a maximum of 2.0 L/s for all storm events up to the 1 in 100 year + 40% storm, this will be achieved by including a vortex flow control at the outfall from the site, attenuation storage will be provided by a geocellular below ground tank.

2.0 EXISTING SITE CONDITIONS AND DRAINAGE

2.1 Existing Site Conditions

The site is located within St. Helen's School, Eastbury Road, Northwood, HA6 3AS (NGR: 509381, 191542). The area of the new building is located to the west of the existing sports hall and is currently occupied by a sports pavilion which will be removed before construction starts.

The topographic survey shows that the area of the new building slopes from north to south with a fall of approximately 1 m over the length of the site, the southern boundary of the site is supported by a retaining wall.

Currently there is a channel drain on the site, the utility survey has shown that this is probably connected into the existing surface water drain run which runs along the north side of the sports hall. There is no foul water drainage in the immediate area of the proposed building.

Based on flood maps from The Environment Agency, the site is located in Flood Zone 1 with a low probability of flooding.

2.2 Geotechnical and Groundwater Information

Intrusive site investigations have previously carried out to inform the construction of the adjacent sports hall. This investigation demonstrated that the ground conditions consisted of a variable depth of made ground overlying London Clay to a depth of approximately 20 m, the bedrock geology consisted of silts and clays of the Reading Formation.

Ground water was encountered during the investigation and was assessed as consisting of perched water above the impermeable clay layer.

3.0 PLANNING POLICY

The relevant planning requirements are set out in London Borough of Hillingdon Local Plan Policy DMEI 10 a-f.

> **Policy DMEI 10: Water Management, Efficiency, and Quality**
>
> **A) Applications for all new build developments (not conversions, change of use, or refurbishment) are required to include a drainage assessment demonstrating that appropriate sustainable drainage systems (SuDS) have been incorporated in accordance with the London Plan Hierarchy (Policy 5.13: Sustainable drainage).**
>
> **B) All major new build developments, as well as minor developments in Critical Drainage Areas or an area identified at risk from surface water flooding must be designed to reduce surface water run-off rates to no higher than the pre-development greenfield run-off rate in a 1:100 year storm scenario, plus an appropriate allowance for climate change for the worst storm duration. The assessment is required regardless of the changes in impermeable areas and the fact that a site has an existing high run-off rate will not constitute justification.**
>
> **C) Rain Gardens and non householder development should be designed to reduce surface water run-off rates to Greenfield run-off rates.**
>
> **D) Schemes for the use of SuDS must be accompanied by adequate arrangements for the management and maintenance of the measures used, with appropriate contributions made to the Council where necessary.**
>
> **E) Proposals that would fail to make adequate provision for the control and reduction of surface water run-off rates will be refused.**
>
> **F) Developments should be drained by a SuDs system and must include appropriate methods to avoid pollution of the water environment. Preference should be given to utilising the drainage options in the SuDS hierarchy which remove the key pollutants that hinder improving water quality in Hillingdon. Major development should adopt a 'treatment train' approach where water flows through different SuDS to ensure resilience in the system.**

Figure 1 Local Plan Policy DMEI 10 points a-f

According to the West London Strategic Flood Risk Assessment online policy map the site is located in a critical drainage area therefore in accordance with Policy DMEI 10 b surface water run-off rates should be restricted to greenfield rates for the 1:100 year storm scenario plus climate change.

4.0 PROPOSED SURFACE WATER DRAINAGE STRATEGY

Infiltration is not considered to be viable for the site because of the depth of made ground and underlying impermeable clays. Instead surface water discharge from the site will be directed to the existing below ground storm water piped network.

In accordance with local policy requirements the site will use SUDS features to manage and reduce surface water runoff from the development.

Surface water will initially be directed into a below ground attenuation tank at the front of the building. The ultimate discharge from the site will be controlled by a vortex flow control installed in the last manhole of the new system prior to discharge to the existing network.

Policy requirements recommend restricting the discharge rate from the site to greenfield runoff rates, greenfield rates for the area of the proposed development have been calculated in accordance with IH124, the calculations are included in Appendix C and summarised in Table 1. The greenfield rates for the site are very low and it is considered that restricting offsite flows to these rates would create two potential problems; the flow control would need to be restricted to a very low opening size that would be vulnerable to being blocked, and the flow in the pipe work downstream of the flow control would be very low which could lead to the pipe becoming silted up. Both these problems have a high likelihood of leading to blockages in the pipe work that could cause flooding to the proposed development and surrounding buildings. As a compromise it is proposed to restrict runoff from the site to 2.0 L/s which is considered to be a reasonable balance between restricting the runoff from the site, while also ensuring that the proposed drainage is sufficiently robust and resilient to be fit for purpose.

A pre-planning enquiry has been submitted to Thames Water to confirm that there is sufficient capacity within the existing sewer network to accommodate these flows, but a response has not yet been received.

Return Period	Greenfield Runoff (L/s)	Post Development Runoff (L/s)
1 year	0.1	2.0
30 years	0.3	2.0
100 years	0.4	2.0
100 year +40% climate change		2.0

A maintenance schedule for the proposed SUDS features is provided in Table 1 below.

Table 1 Below Ground Tank Maintenance Schedule

Maintenance Schedule	Required Action	Frequency
Regular maintenance	Inspect and identify any areas that are not operating correctly. If required, take remedial action.	Monthly for 3 months, then annually.
	Remove debris from the catchment surface (where it may cause risks to performance)	Monthly
	For systems where rainfall infiltrates into the tank from above, check surface of filter for blockage by sediment, algae or other matter, remove and replace surface infiltration medium as necessary.	Annually
	Remove sediment from pre-treatment structures and/or internal forebays.	Annually, or as requested
Remedial actions	Repair/rehabilitate inlets, outlet, overflows and vents.	As required
Monitoring	Inspect/check all inlets, outlets, vents and overflows to ensure that they are in good condition and operating as designed.	Annually
	Survey inside of the tank for sediment build –up and remove if necessary	Every 5 years or as required

5.0 PROPOSED FOUL WATER DRAINAGE STRATEGY

Foul water from the new building will be picked up by a below ground drain and connected back by gravity into the existing site drainage.

A pre-planning enquiry has been submitted to Thames Water to confirm that there is sufficient capacity within the existing sewer network to accommodate these flows, but a response has not yet been received.

6.0 CONCLUSION

The site is located in Flood Zone 1, and the site investigation has shown that the underlying ground consists of clays with no infiltration potential.

Surface and foul water will be connected back to the existing networks serving the current school buildings, there is sufficient gradient for both these connections to be made by gravity. Surface water will be attenuated by the below ground tank. Surface Water discharge from the scheme will be restricted to a maximum of 2.0 L/s, this will be achieved by providing a vortex flow control.

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APPENDIX A TOPOGRAPHICAL SURVEY

This survey is related to OSGB36(15) coordinate system 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.

Note: The underground services information has been supplied by Amethyst Surveys Ltd.

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ABBREVIATIONS

AC	ASBESTOS CEMENT	LP	LAMP POST
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Client

IID ARCHITECTS

Project

**ST HELEN'S SCHOOL
EASTBURY ROAD
NORTHWOOD, HA6 1AG**

Title

UTILITY SURVEY

Drawing Number

TS22-136-1

Revision	Description	Rev. By	Date

Scale 1:200@A1 — Sheet 1 of 3

Drawn by	Checked by	Date of Survey
SC-ASL	PG	MARCH 2022

TERRAIN SURVEYS
Tel: 01438 841300
www.terrainsurveys.co.uk
enquiries@terrainsurveys.co.uk

Accreditations:

chartered ices
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Client
IID ARCHITECTS

Project
ST HELEN'S SCHOOL
EASTBURY ROAD
NORTHWOOD, HA6 1AG

Title
UTILITY SURVEY

Drawing Number
TS22-136-2

Revision	Description	Rev. By	Date

Scale 1:200@A1 — Sheet 2 of 3

Drawn by	Checked by	Date of Survey
SC-ASL	PG	MARCH 2022

TERRAIN SURVEYS
Tel: 01438 841300
www.terrainsurveys.co.uk
enquiries@terrainsurveys.co.uk

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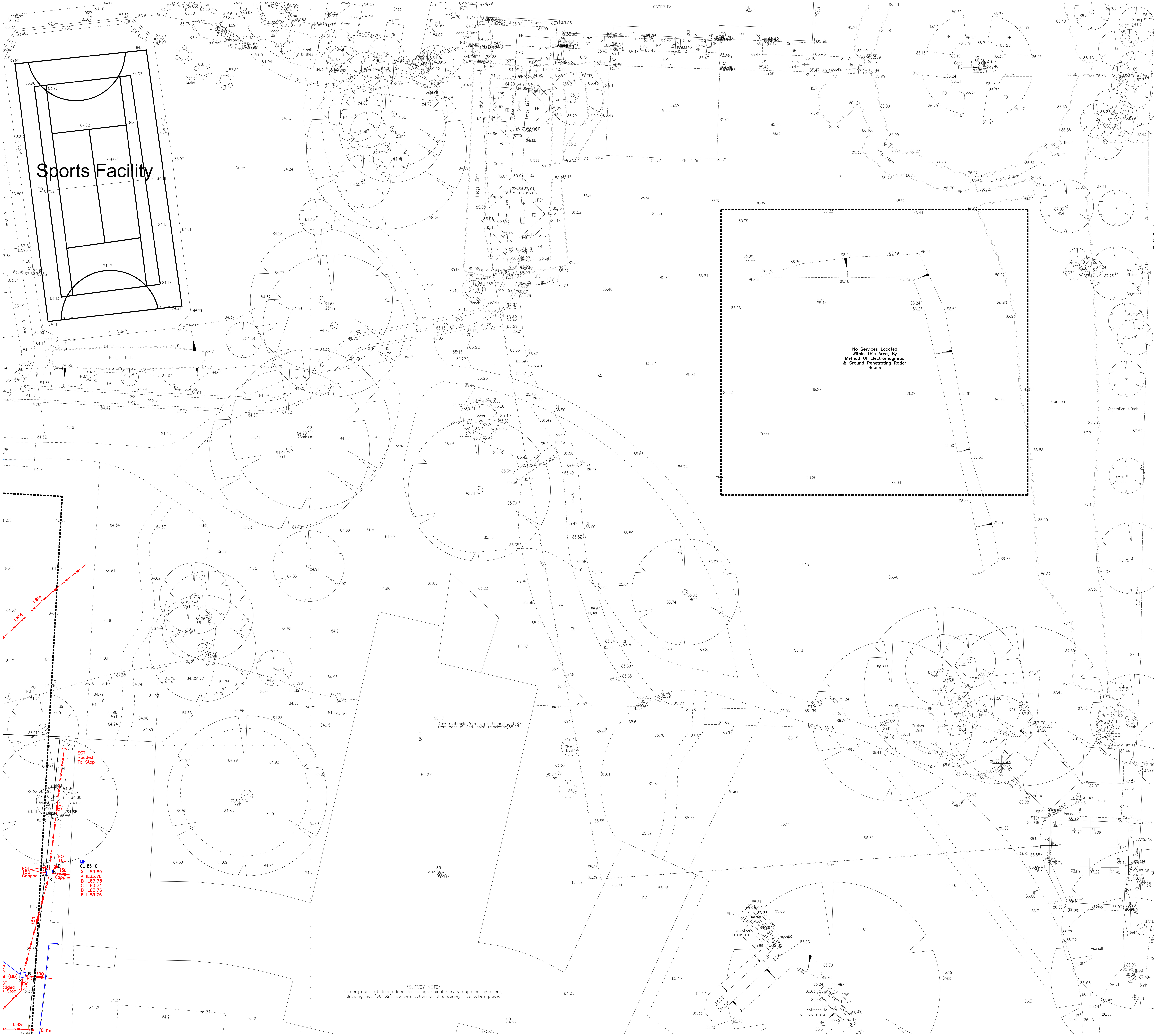

SHEET LAYOUT

SHEET 3

North

This survey is related to OSGB36(15) coordinate system 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.

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UTILITY SURVEY

Drawing Number

TS22-136-3

Revision	Description	Rev. By	Date

Scale 1:200@A1 — Sheet 3 of 3

Drawn by	Checked by	Date of Survey
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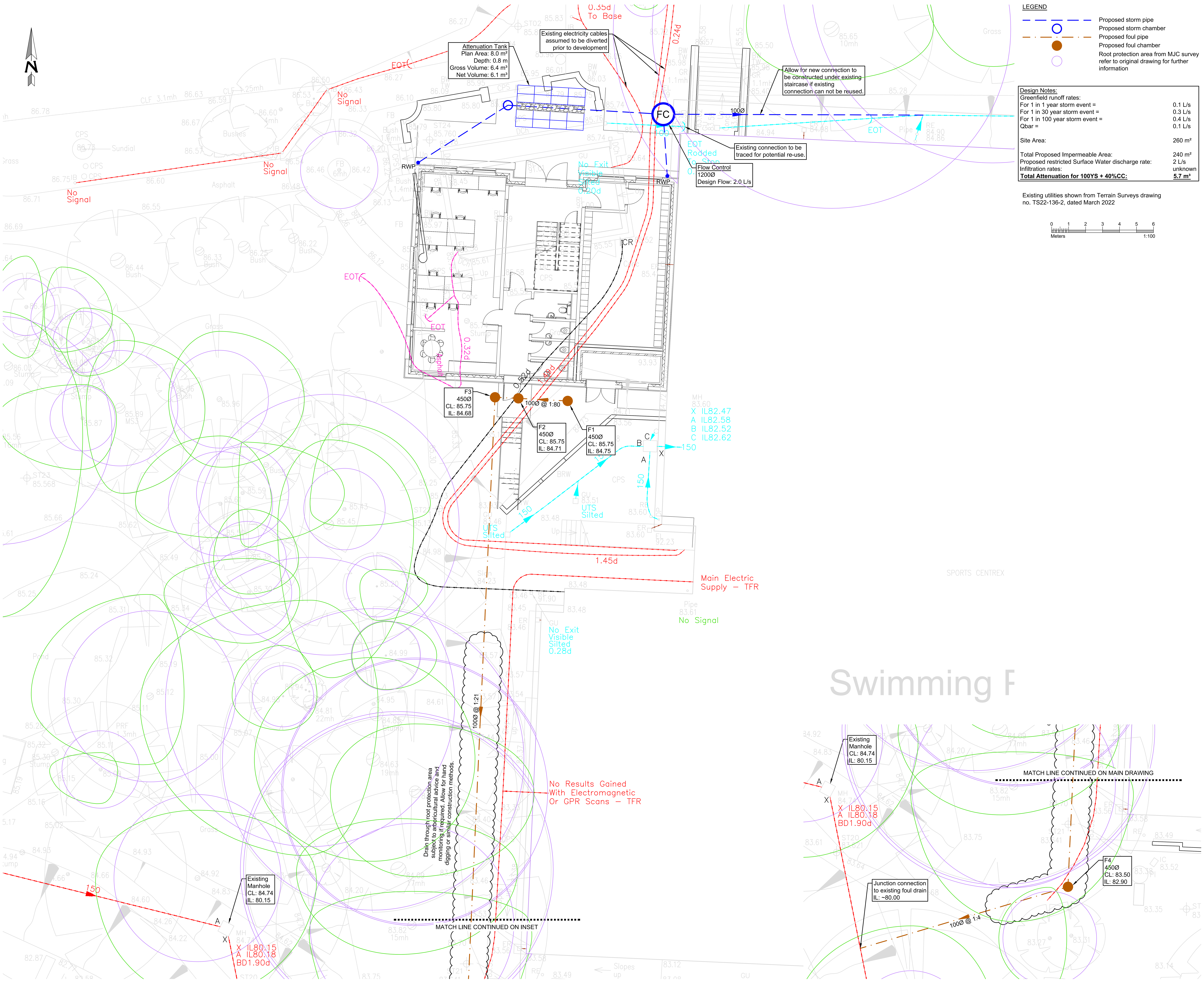
APPENDIX B DRAINAGE STRATEGY DRAWING



LEGEND

- Proposed storm pipe
- Proposed storm chamber
- Proposed foul pipe
- Proposed foul chamber
- Root protection area from MJC survey refer to original drawing for further information

Design Notes:	
Greenfield runoff rates:	
For 1 in 1 year storm event =	0.1 L/s
For 1 in 30 year storm event =	0.3 L/s
For 1 in 100 year storm event =	0.4 L/s
Qbar =	0.1 L/s
Site Area:	260 m²
Total Proposed Impermeable Area:	240 m²
Proposed restricted Surface Water discharge rate:	2 L/s
Infiltration rates:	unknown
Total Attenuation for 100YS + 40%CC:	**5.7 m³**

Existing utilities shown from Terrain Surveys drawing no. TS22-136-2, dated March 2022

0 1 2 3 4 5 6
Meters 1:100

GENERAL NOTES

1. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL RELEVANT ARCHITECTS, ENGINEERS AND SPECIALIST DRAWINGS AND SPECIFICATIONS
2. DO NOT SCALE FROM THIS DRAWING IN EITHER PAPER OR DIGITAL FORM. USE WRITTEN DIMENSIONS ONLY.

GENERAL DRAINAGE NOTES

1. Invert levels and positions of existing drains / chambers / sewers where new connections are to be made must be checked and confirmed to the engineer prior to the commencement of any works.
2. All drainage works shall be carried out in accordance with the requirements of the local authority, the environment agency and in conjunction with all relevant British Standards, codes of practice and 'Sewers for Adoption' 7th edition and any addendums as appropriate.
3. All drainage shall comply with the typical details and the requirements of BS EN 752 and part H of the building regulations.
4. Any part of the existing drainage system to be retained as part of the new scheme shall be cleaned and inspected. Any structural defects shall be repaired using appropriate and approved means.
5. For setting-out dimensions of SVP's, RWP's etc, refer to architect's or mechanical engineer's drawings. positions shown are indicative and subject to final design.
6. All foul and RWP connections shall be 100mm diameter unless otherwise specified.
7. All precast concrete units used in the drainage works shall be manufactured using sulphate resisting cement.
8. Manhole covers and frames shall be to BS EN 124 and shall be kitemarked. Covers and frames shall be heavy duty D400 in carriageways and vehicular areas and medium duty B125 in footways and soft landscaping. In block/concrete paved areas covers shall be recessed fabricated steel. All recessed covers shall in accordance with the FACTA association gradings.
9. All internal inspection chambers to be recessed, double sealed with screw down covers.
10. Cover levels are to be adjusted locally to suit finished ground levels.
11. At least one soil pipe at the head of each foul run shall vent to the atmosphere.
12. Existing drainage to be removed is to be broken out to bed level and void backfilled with granular material, compacted in layers not exceeding 250mm.
13. All drain runs from SVP's, stub stacks or FW gullies to be laid at 1:40 gradient unless otherwise stated. All RWP's to be laid 1:80 min unless otherwise stated.
14. All manholes / inspection chambers in block paved areas, to have recessed covers. MH covers in paved areas to have cover & frame orientated 'square' with paving to minimise cut slabs or blocks.
15. All private drainage to be laid to levels shown using flexibly jointed pipes, either UPVC to BS 4660 and BS 5481 or vitrified clayware to BS EN 295. pipes below structural building slabs or basements shall be cast iron to BS 437.
16. Rodding eyes, etc are to be laid to manufacturers minimum cover and depth to allow adequate fall from adjoining unit.
17. All proposed trees to have appropriate tree barrier details linking pits to ensure roots are directed away from drainage.
18. Where new sewers are constructed within 5m of a new or existing tree the sewer shall be concrete encased against root intrusion. refer to drainage details.
19. All new drainage to be jetted and CCTV surveyed on completion. Contractor to make sure that the drainage is fully operational. Refer to drainage maintenance manual for maintenance details.
20. All runs connecting into the public drainage network to be vitrified clay, extra length to BS EN 295 or BS65 with plain sleeved or socketed flexible joints.
21. CDM note: all pipework, silt traps, catchpits, trapped gullies and attenuation tanks to be regularly inspected every three months and cleared out on a regular frequency for the first nine months. After this period the frequency can be reduced to every six months. Porous surface to be regularly swept three times a year to remove the silt.
22. This drawing is to be read in conjunction with all relevant Conisbee drawings.
23. Health and safety: the works shall be carried out by specialist competent and experienced contractors who are members of a recognised national organisation.operatives shall have received full and appropriate training for the operations they are to undertake. all work shall be carried out in accordance with all pertinent health and safety regulations.

NOT FOR CONSTRUCTION

Rev	Date	Description	Drawn	Check
P3	01.07.22	Connection point to existing drainage and route through trees updated.	JC	JC
P2	13.05.22	Updated following client comments	JC	JC
P1	04.05.22	Issued for Information	JC	JC

conisbee
Consulting Structural Engineers
Consulting Civil Engineers
London • Cambridge • Norwich
1-5 Offord St London N1 1DH
Telephone 020 7700 6666
www.conisbee.co.uk

Drawing Status
PRELIMINARY

Project
ST. HELEN'S SCHOOL
CHANGING ROOM

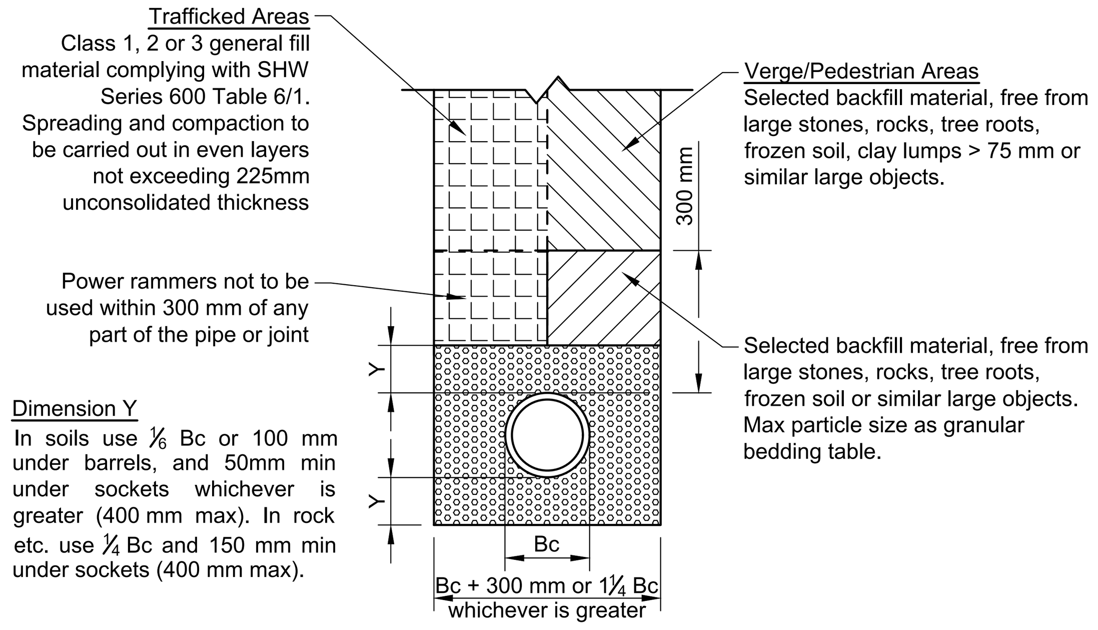
Date MAY 2022
Scale 1:100@A1
Drawn JC
Engineer JC

Title
DRAINAGE STRATEGY

Project No
220206

Drawing No
220206-CON-XX-00-DR-C-1000

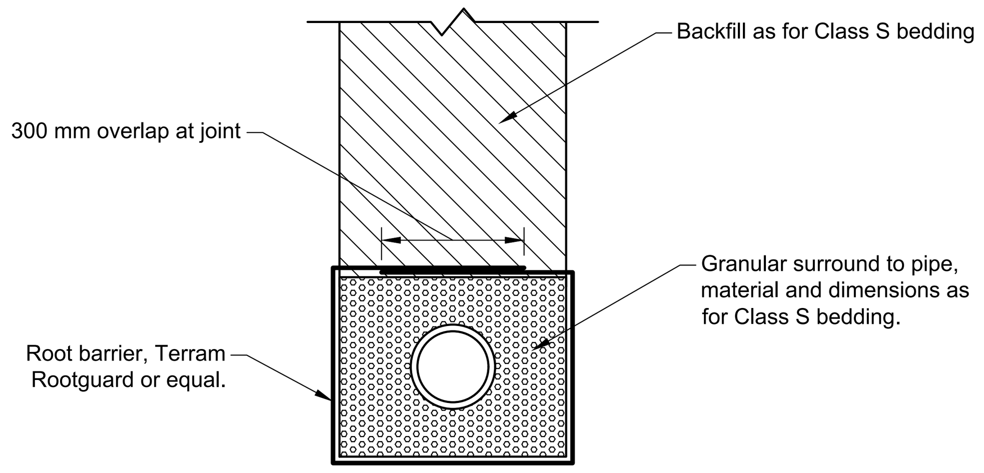
Revision
P3



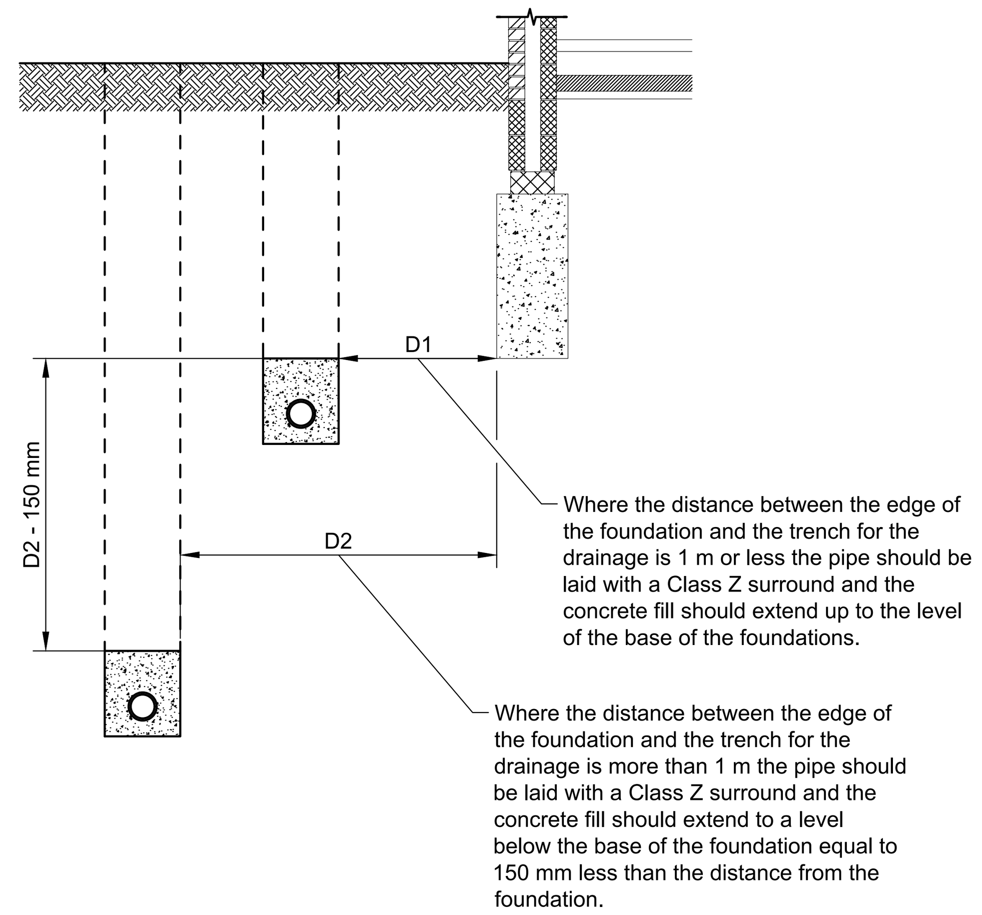
PROCESSED AND AS-DUG GRANULAR BEDDING FOR PIPES		
Pipe nominal size (mm)	Nominal maximum particle size (mm)	Suitable Materials
100	10	10 mm nominal single size
Over 100 to 150	16	10 or 14mm nominal single-size or 14mm to 5mm graded
Over 150 to 300	20	10, 14 or 20mm nominal single-size or 14mm to 5mm graded or 20mm to 5mm graded
Over 300 to 550	20	14 or 20mm nominal single-size or 14 to 5mm graded or 20 to 5mm graded
Over 550	40	14, 20 or 40mm nominal single sized crushed rock or 14mm to 5mm graded or 20mm to 5mm graded or 40mm to 5mm graded

Maximum Compaction Fraction value for all granular bedding: 0.15

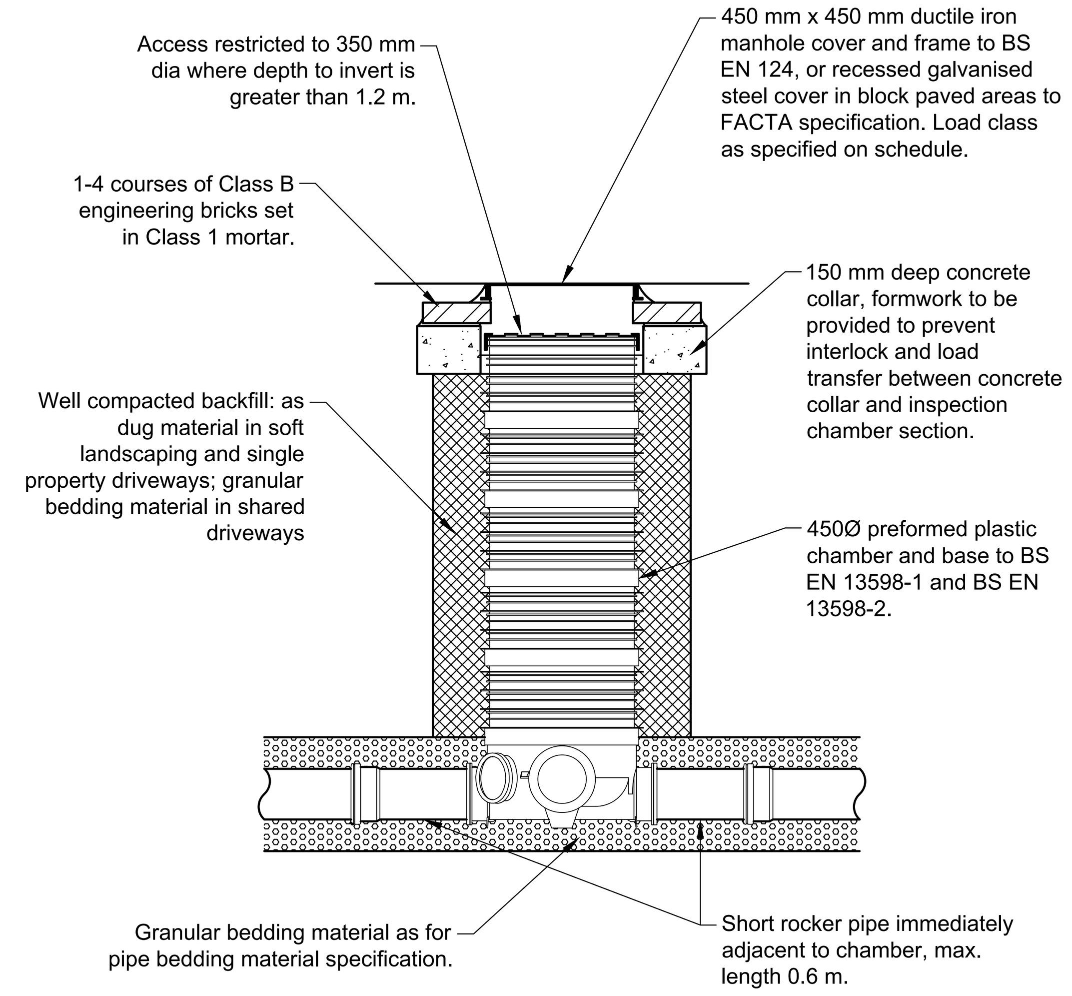
CLASS S BEDDING FOR RIGID AND FLEXIBLE PIPES



ROOT PROTECTION BARRIER TO PIPES



TRENCH FILL NEAR BUILDINGS
Strip, pad and raft foundations



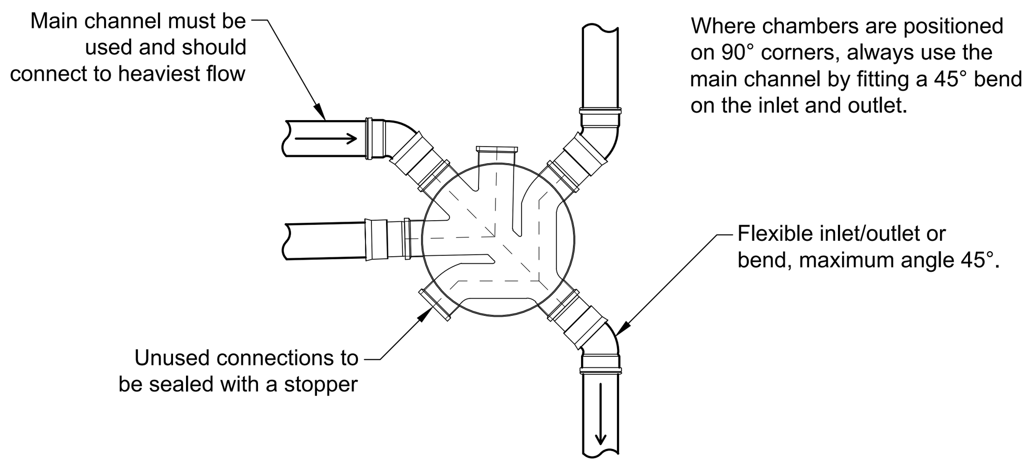
450 Ø INSPECTION CHAMBER

GENERAL NOTES

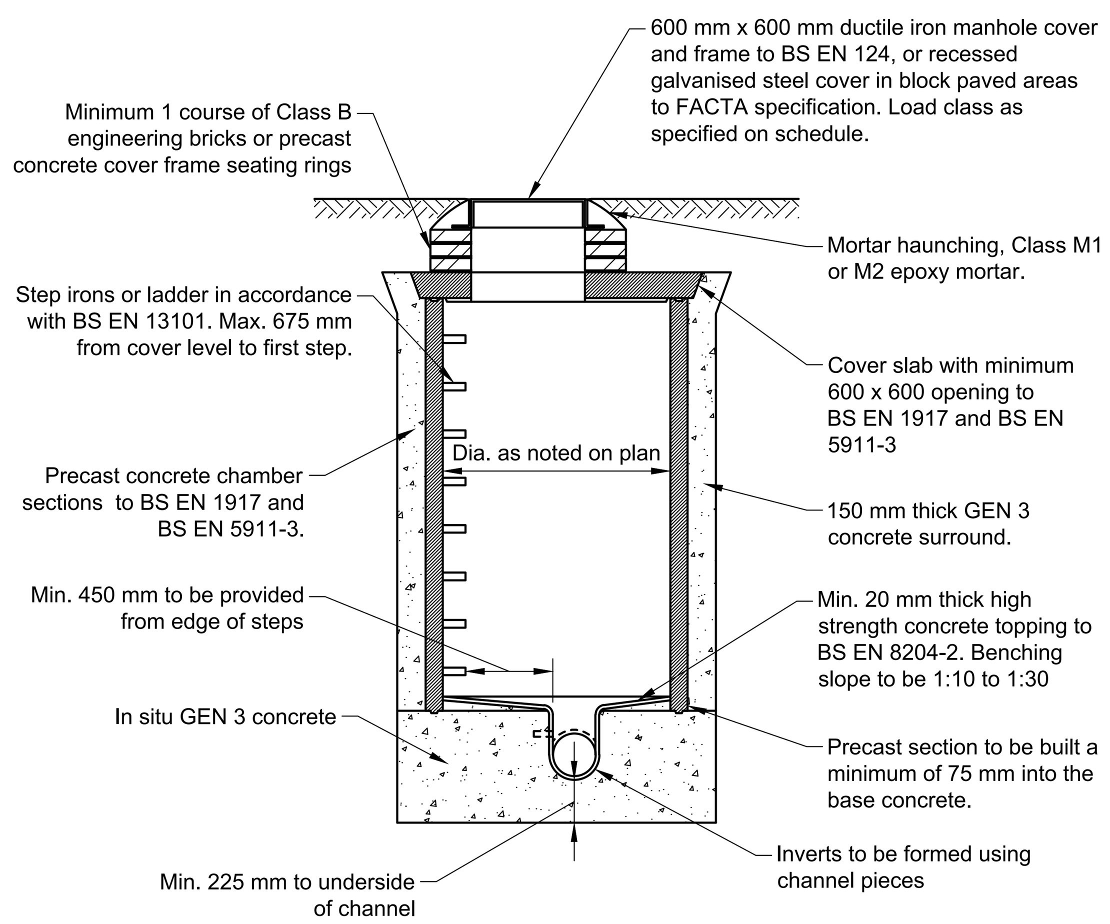
1. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL RELEVANT ARCHITECTS, ENGINEERS AND SPECIALIST DRAWINGS AND SPECIFICATIONS
2. DO NOT SCALE FROM THIS DRAWING IN EITHER PAPER OR DIGITAL FORM. USE WRITTEN DIMENSIONS ONLY.

DRAINAGE NOTES

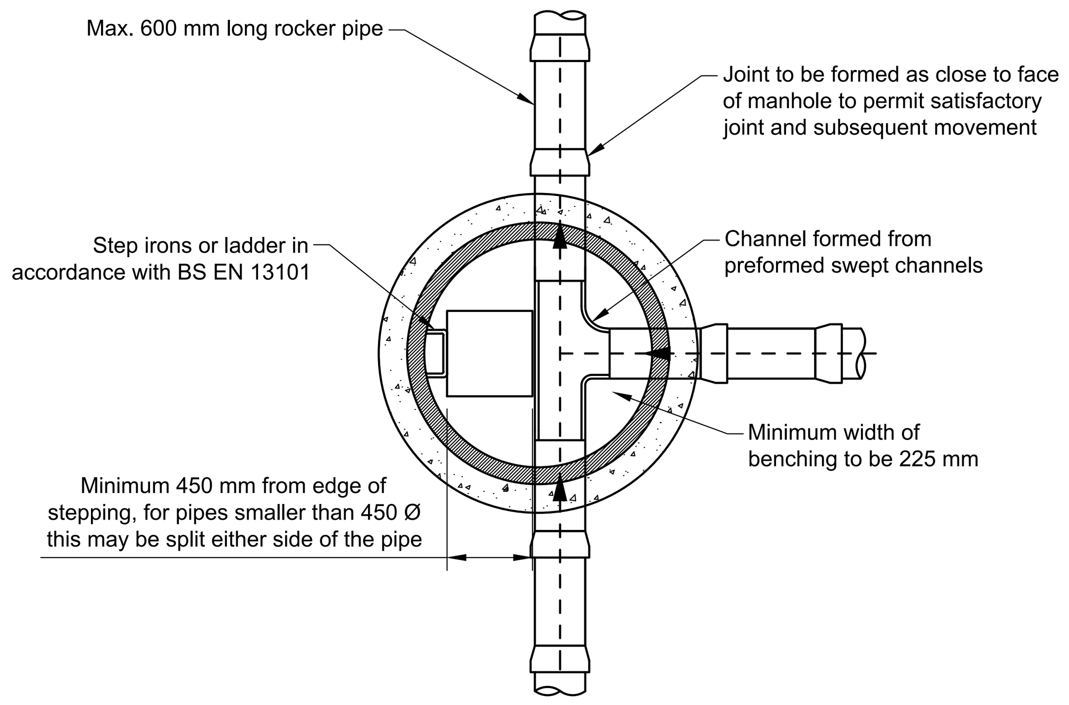
1. ALL DIMENSIONS IN MILLIMETRES (MM) UNLESS NOTED OTHERWISE.
2. CDM NOTE: ALL PIPE WORK, SILT TRAPS, CATCHPITS, TRAPPED GULLIES, ATTENUATION TANKS AND PUMP CHAMBERS TO BE REGULARLY INSPECTED EVERY THREE MONTHS AND CLEARED OUT ON A REGULAR FREQUENCY FOR THE FIRST NINE MONTHS. AFTER THIS PERIOD THE FREQUENCY CAN BE REDUCED TO EVERY SIX MONTHS. POROUS SURFACE TO BE REGULARLY SWEPT THREE TIMES A YEAR TO REMOVE ALL SILT. GREASE TRAPS/INTERCEPTORS TO BE INSPECTED/EMPTIED AT LEAST ONCE A MONTH AND PREFERABLE EVERY TWO WEEKS.
3. HEALTH AND SAFETY: THE WORKS SHALL BE CARRIED OUT BY SPECIALIST COMPETENT AND EXPERIENCED CONTRACTORS WHO ARE MEMBERS OF A RECOGNISED NATIONAL ORGANISATION. OPERATIVE SHALL HAVE RECEIVED FILL AND APPROPRIATE TRAINING FOR THE OPERATIONS THEY ARE TO UNDERTAKE. ALL WORK SHALL BE CARRIED OUT IN ACCORDANCE WITH ALL PERTINENT HEALTH AND SAFETY REGULATIONS.
4. REFER TO THE MANUFACTURER'S INSTALLATION GUIDANCE FOR ALL SPECIFIED PRODUCTS.



INSPECTION CHAMBER TYPICAL BASE ARRANGEMENT

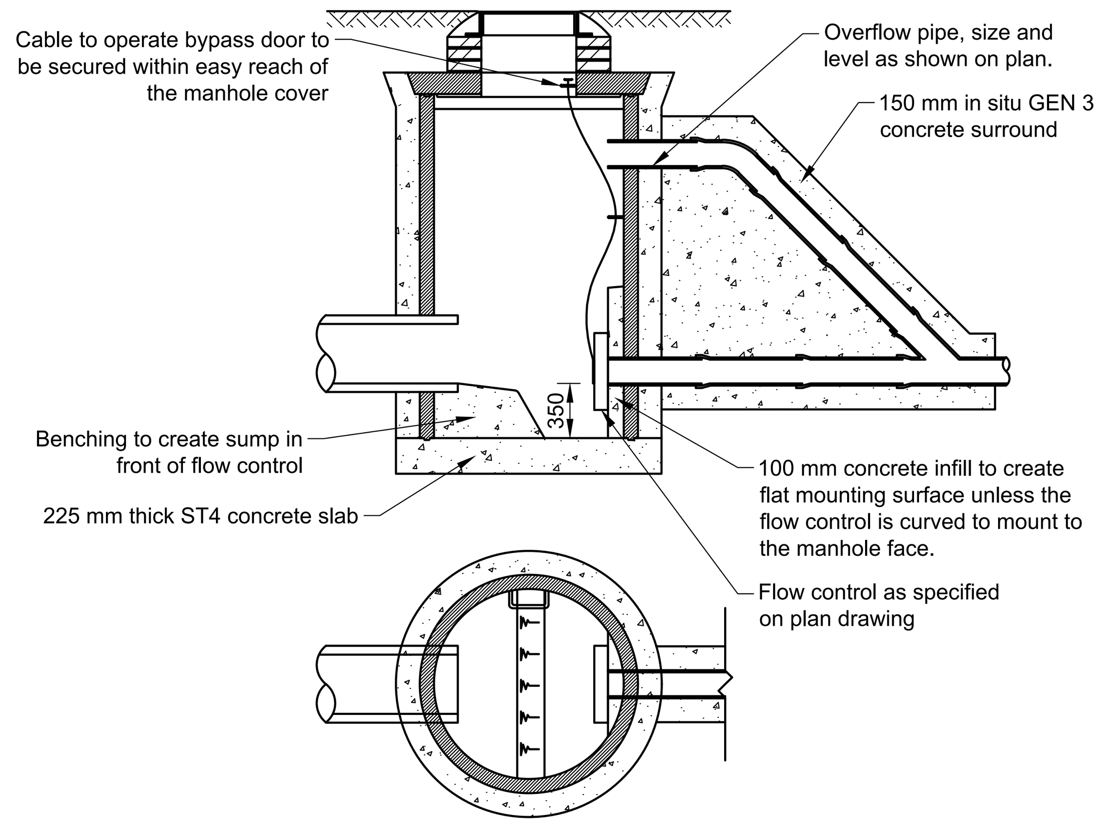


PRECAST CONCRETE MANHOLE



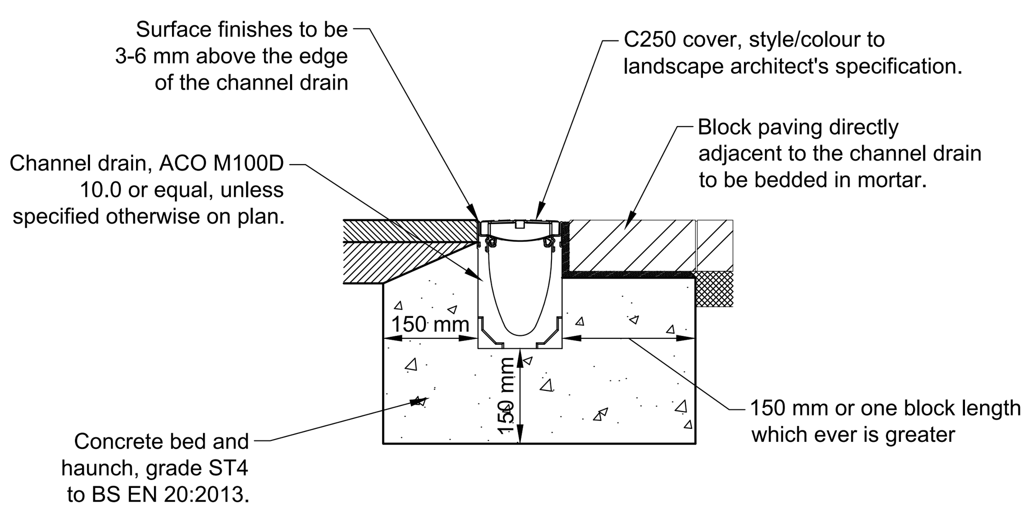
PRECAST CONCRETE MANHOLE TYPICAL BASE ARRANGEMENT

1. Unless noted otherwise all details are as per the detail for a typical precast concrete manhole.
2. Installation to be strictly in accordance with the manufacturer/supplier's requirements.

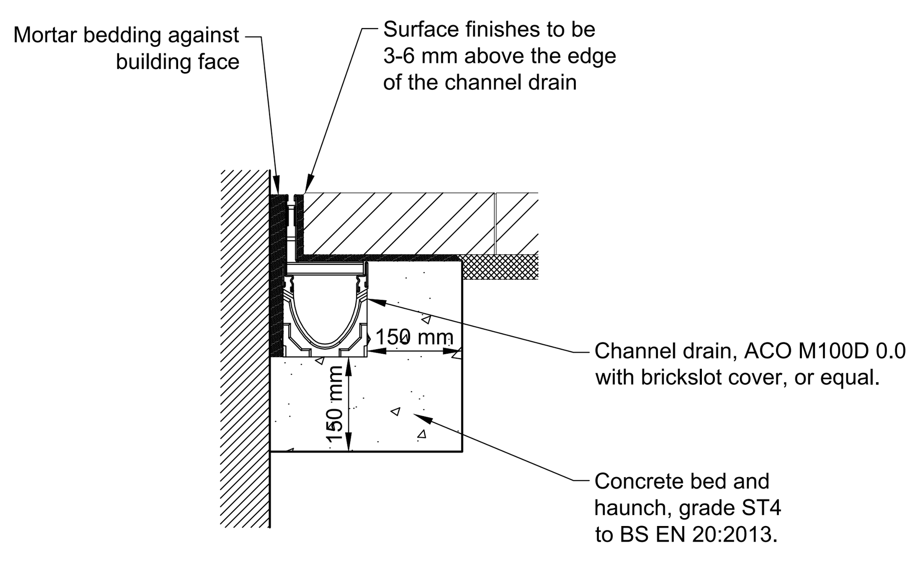


TYPICAL VORTEX FLOW CONTROL

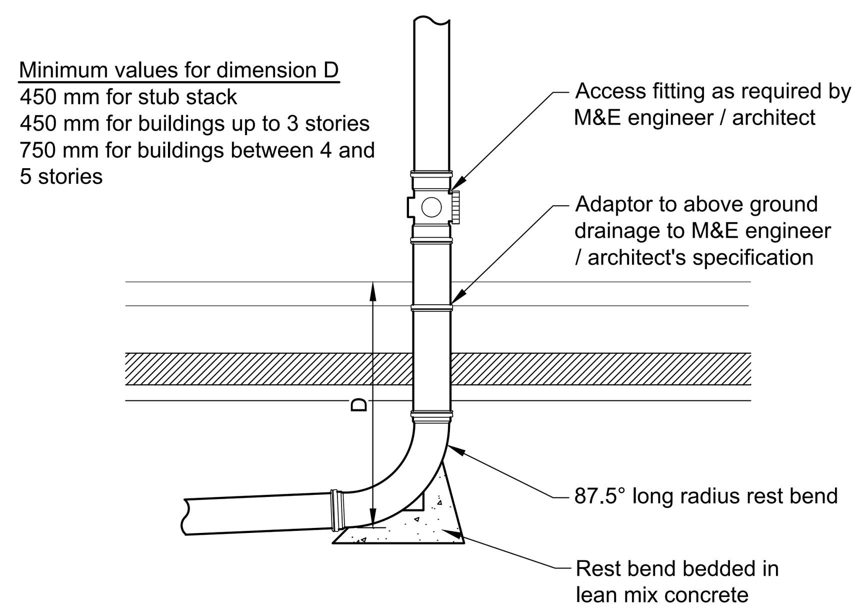
NOT FOR CONSTRUCTION



CHANNEL DRAIN
Low/medium traffic applications



SLOT DRAIN AT BUILDING THRESHOLD



SOIL VENT PIPE OR STUB STACK TO DRAIN

Rev	Date	Description	Drawn	Check
P1	04.05.22	Issued for information	JC	JC

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Consulting Structural Engineers
Consulting Civil Engineers
London • Cambridge • Norwich
1-5 Offord St London N1 1DH
Telephone 020 7700 6666
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Drawing Status
PRELIMINARY

Project
ST. HELEN'S SCHOOL
CHANGING ROOM

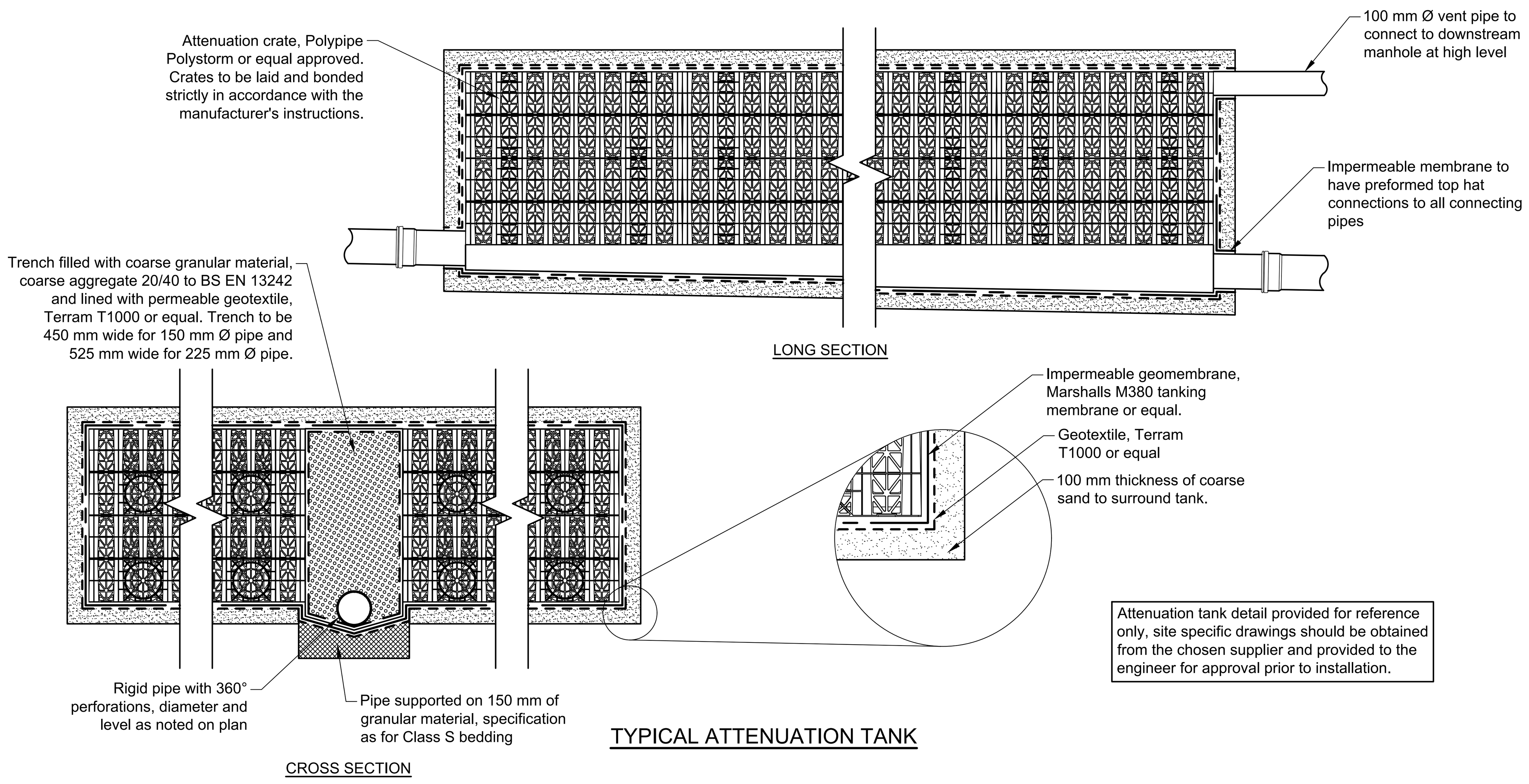
Date MAY 2022
Scale NTS
Drawn JC
Engineer JC

Title
DRAINAGE DETAILS
SHEET 2

Project No
220206

Drawing No
220206-CON-XX-XX-DR-C-1302

Revision
P1



TYPICAL ATTENUATION TANK

GENERAL NOTES

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DRAINAGE NOTES

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4. REFER TO THE MANUFACTURER'S INSTALLATION GUIDANCE FOR ALL SPECIFIED PRODUCTS.

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Rev	Date	Description	Drawn	Check
P1	04.05.22	Issued for information	JC	JC

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Consulting Civil Engineers
London • Cambridge • Norwich
1-5 Offord St London N1 1DH
Telephone 020 7700 6666
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Drawing Status
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Project
ST. HELEN'S SCHOOL
CHANGING ROOM

Title
DRAINAGE DETAILS
SHEET 3

Drawing No
220206-CON-XX-XX-DR-C-1303

Date MAY 2022
Scale NTS
Drawn JC
Engineer JC
Project No
220206
Revision
P1

APPENDIX C DRAINAGE STRATEGY CALCULATIONS

Greenfield runoff rate estimation for sites

www.uksuds.com | Greenfield runoff tool

Calculated by:	John Courtney
Site name:	Changing Room
Site location:	St Helen's School

Site Details

Latitude:	51.61204° N
Longitude:	0.42167° W
Reference:	2846699604
Date:	Apr 28 2022 14:24

This is an estimation of the greenfield runoff rates that are used to meet normal best practice criteria in line with Environment Agency guidance "Rainfall runoff management for developments", SC030219 (2013) , the SuDS Manual C753 (Ciria, 2015) and the non-statutory standards for SuDS (Defra, 2015). This information on greenfield runoff rates may be the basis for setting consents for the drainage of surface water runoff from sites.

Runoff estimation approach IH124

Site characteristics

Total site area (ha): 1

Methodology

Q_{BAR} estimation method:	Calculate from SPR and SAAR
SPR estimation method:	Calculate from SOIL type

Soil characteristics	Default	Edited
SOIL type:	4	4
HOST class:	N/A	N/A
SPR/SPRHOST:	0.47	0.47

Hydrological characteristics	Default	Edited
SAAR (mm):	669	669
Hydrological region:	6	6
Growth curve factor 1 year:	0.85	0.85
Growth curve factor 30 years:	2.3	2.3
Growth curve factor 100 years:	3.19	3.19
Growth curve factor 200 years:	3.74	3.74

Notes

(1) Is Q_{BAR} < 2.0 l/s/ha?

When Q_{BAR} is < 2.0 l/s/ha then limiting discharge rates are set at 2.0 l/s/ha.

(2) Are flow rates < 5.0 l/s?

Where flow rates are less than 5.0 l/s consent for discharge is usually set at 5.0 l/s if blockage from vegetation and other materials is possible. Lower consent flow rates may be set where the blockage risk is addressed by using appropriate drainage elements.

(3) Is SPR/SPRHOST ≤ 0.3?

Where groundwater levels are low enough the use of soakaways to avoid discharge offsite would normally be preferred for disposal of surface water runoff.

Results factored for true site area (260m²)

Greenfield runoff rates	Default	Edited		Results factored
Q_{BAR} (l/s):	4.58	4.58		0.12
1 in 1 year (l/s):	3.89	3.89		0.10
1 in 30 years (l/s):	10.53	10.53	X $\frac{0.0260}{1.0000}$	0.27
1 in 100 year (l/s):	14.61	14.61		0.38
1 in 200 years (l/s):	17.12	17.12		0.45

Design Settings

Rainfall Methodology	FSR	Maximum Time of Concentration (mins)	30.00
Return Period (years)	2	Maximum Rainfall (mm/hr)	50.0
Additional Flow (%)	0	Minimum Velocity (m/s)	1.00
FSR Region	England and Wales	Connection Type	Level Soffits
M5-60 (mm)	20.000	Minimum Backdrop Height (m)	0.200
Ratio-R	0.400	Preferred Cover Depth (m)	1.200
CV	0.750	Include Intermediate Ground	✓
Time of Entry (mins)	2.00	Enforce best practice design rules	✓

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Depth (m)
1	0.024	2.00	10.000	1200	2.000

Links (Input)

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	1	2	10.000	0.600	8.000	7.875	0.125	80.0	100	2.19	50.0
1.001	2	3	10.000	0.600	7.875	7.750	0.125	80.0	100	2.39	50.0

Simulation Settings

Rainfall Methodology	FSR	Analysis Speed	Normal
FSR Region	England and Wales	Skip Steady State	x
M5-60 (mm)	20.000	Drain Down Time (mins)	240
Ratio-R	0.400	Additional Storage (m³/ha)	20.0
Summer CV	0.750	Check Discharge Rate(s)	x
Winter CV	0.840	Check Discharge Volume	x

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 %)
1	0	0	0
30	0	0	0
100	0	0	0
100	40	0	0

Node 1 Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	✓	Sump Available	✓
Invert Level (m)	8.000	Product Number	CTL-SHE-0070-2000-0800-2000
Design Depth (m)	0.800	Min Outlet Diameter (m)	0.100
Design Flow (l/s)	2.0	Min Node Diameter (mm)	1200

Node 1 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	8.000
Side Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Time to half empty (mins)	30

Depth (m)	Area (m^2)	Inf Area (m^2)	Depth (m)	Area (m^2)	Inf Area (m^2)	Depth (m)	Area (m^2)	Inf Area (m^2)
0.000	7.0	0.0	0.800	7.0	0.0	0.801	0.0	0.0

Results for 1 year Critical Storm Duration. Lowest mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	1	11	8.103	0.103	4.0	0.8637	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	Outflow (l/s)	Discharge Vol (m³)
15 minute winter	1	Hydro-Brake®	1.8	1.6

Results for 30 year Critical Storm Duration. Lowest mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m^3)	Flood (m^3)	Status
30 minute winter	1	23	8.331	0.331	6.9	2.7734	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	Outflow (l/s)	Discharge Vol (m^3)
30 minute winter	1	Hydro-Brake®	2.0	5.0

Results for 100 year Critical Storm Duration. Lowest mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
30 minute winter	1	25	8.485	0.485	9.0	4.0625	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	Outflow (l/s)	Discharge Vol (m³)
30 minute winter	1	Hydro-Brake®	2.0	6.5

Results for 100 year +40% CC Critical Storm Duration. Lowest mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
30 minute winter	1	29	8.763	0.763	12.6	6.3856	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	Outflow (l/s)	Discharge Vol (m³)
30 minute winter	1	Hydro-Brake®	2.0	9.1