



J ROBERTS DESIGN LTD
STRUCTURAL AND CIVIL ENGINEERING CONSULTANTS

9 Broom Close

Kendray

Barnsley

S70 3EG


DRAINAGE DESIGN

Client – J. Wade

4370 / Feb 2025

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Introduction

The following report and calculations are in justification of the surface and foul water solutions for a proposed residential project for 3No dwellinghouses.


In accordance with Building Regulations 2000 Part H3 surface water from a development should discharge to once of the following in priority order:

- Soakaway or Infiltration System
- Watercourse
- Public Sewer

Percolation testing has been completed in accordance with BRE365 in 1No. test pit, dug to 1.7m. Based on the information provided to us the achieved infiltration rates demonstrate that the site is suitable for infiltration SuDS structures. Water was encountered at the base of the excavation, however this was due to the wet weather conditions at the time of the testing and surface water entering the pit. The results are therefore considered to be conservative.

The BGS website reports that that the bedrock is Oaks rock (sandstone) with no superficial deposits. Boreholes in the area indicate the ground strata is made ground atop silty/sandy clay with sandstone and mudstone at depth.

Foul water will discharge to an existing drain on east of the site. This private drain connects to a Yorkshire Water foul sewer to the North.

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Standards and References

- Bettess, R (1996) *Infiltration drainage – manual of good practice*, R156, CIRIA, London, UK
- CIRIA C635 :2007 Design for Exceedance in Urban Drainage – Good Practice
- CIRIA C735 :2015 The SUDS Manual
- DEFRA – Sustainable Drainage Systems – Non statutory technical standards for sustainable drainage systems dated March 2015
- LASOO – Non statutory technical standards for sustainable drainage systems dated 2015
- BS EN 12056-2:2000 Gravity Drainage Systems Inside Buildings
- Building Regulations Part H
- BS EN 752:2008 Drain and sewer systems outside buildings
- BS EN 12056-2:2000 Gravity Drainage systems inside buildings
- Building Regulations - Pt H Drainage and waste disposal
- British Water – (CoP) Flows and Loads – 4 Sizing Criteria, Treatment Capacity for Sewerage Treatment Systems

Construction, Design and Management (CDM)

J Roberts Design Ltd have undertaken the role of Designer for this project. It is assumed that an Architect has been appointed to the role of Principal Designer and has advised the Client of their responsibilities under the act.

If an Architect has not been appointed, the roles and responsibilities under the CDM regulations normally pass to the principal contractor.

Under CDM 2015 it is our duty as designers to provide adequate information about any significant risks associated with the design project.


Our scope of work on this project is:

- Surface Water Drainage.
- Foul Water Drainage.

The concept and form of construction of the proposed work are conventional. In our opinion, the design solution reduces foreseeable risk to an acceptable level and no significant risks remain from the structural design in the construction or use that could reasonably have been avoided. We believe that the level of residual risk is normal for this type of project and would be obvious to a competent contractor.

Additional information regarding the responsibility of a client commissioning domestic building work under the CDM regulations 2015 can be found on the HSE website:

<http://www.hse.gov.uk/construction/cdm/2015/responsibilities.htm>


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Software

Microdrainage

Design information to be read in conjunction with

Construction (Design and Management) Regulations 2015,
 CDM 2015 – Domestic Clients: Roles and responsibilities,
 The Buildings Regulations 2010 - Part H 2015 Edition

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Consideration and Drainage Strategy

SuDS Hierarchy

1. Into the ground

It is proposed to discharge to the ground via soakaways.

2. To a surface water body – See above.
3. To a surface water sewer, highway drain or other drainage system – See above.
4. To a combined sewer – See above.

It is proposed to discharge foul water to the public sewer network via a private on-site drain which is already connected, subject to a S106 agreement.

Effective pre-treatment through the use of Silt Bloks will prevent siltation of the soakaway. A factor of safety of 1.5 is applied to the infiltration rate. The level of confidence in the ground strata is relatively high. The safety factor reflects some minor siltation of the base potentially causing a reduction in permeability over time.

CIRIA C753 SuDS Manual Chapter 13

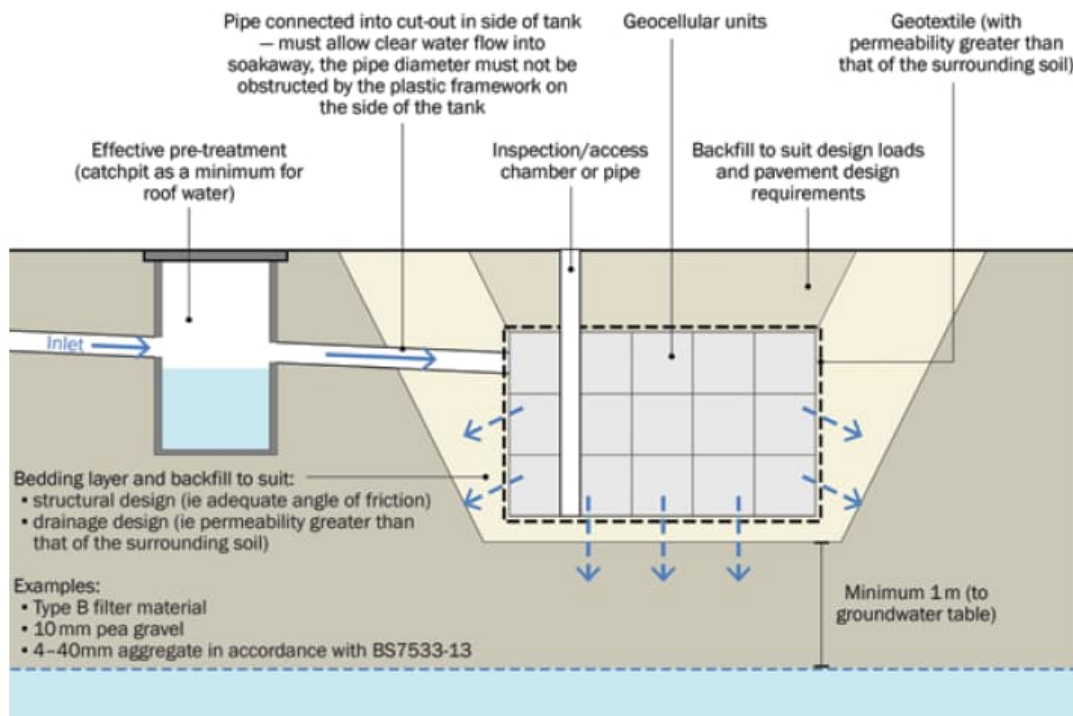




Figure 13.1 Soakaway details (including a pre-treatment system)

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SuDS to be Considered

In considering the appropriate SuDS components for the site Table 7.1 of CIRIA C753 indicates the benefits the components provide. The SuDS suitable for this site have been highlighted.

Component Type	Description	Collection Mechanism	Design Criteria					
			Peak Runoff Rates	Runoff Volumes		Water Quality	Amenity	Biodiversity
				Small Events	Large Events			
Rainwater Harvesting	Systems that collect runoff from the roof of a building or other paved surface for use.	P		●	●		●	
Green Roofs	Planted soil layers on the roof of buildings that slow and store runoff.	S	○	●		●	●	●
Infiltration Systems	Systems that collect and store run-off, allowing it to infiltrate into the ground.	P	○	●		●	●	●
Proprietary Treatment Systems	Subsurface structures designed to provide treatment of runoff.	P				●		
Filter Strips	Grass strips that promote sedimentation and filtration as runoff is conveyed over the surface.	L		●		●	○	○
Filter Drains	Shallow stone-filled trenches that provide attenuation, conveyance and treatment of runoff.	L	●	○		●	○	○
Swales	Vegetated channels (sometimes planted) used to convey and treat runoff.	L	●	●	●	●	●	●
Bioretention Systems	Shallow landscaped depressions that allow runoff to pond temporarily on the surface, before filtering through the vegetation and underlying soils.	P	○	●	○	●	●	●
Trees	Trees with soil-filled tree pits, tree planters or structural soils used to collect, store and treat runoff.	P	●	●		●	●	●
Pervious Pavements	Structural Paving through which runoff can soak and subsequently be stored in the sub-base beneath, and/or allowed to infiltrate into the ground below.	S	●	●	●	●	○	○
Attenuation Storage Tanks	Large, below-ground voided spaces used to temporarily store run-off before infiltration, controlled release or use.	P	●					
Detention Basins	Vegetated depressions that store and treat runoff.	P	●	●	●	●	●	●
Ponds and Westlands	Permanent pools of water used to facilitate treatment or runoff – runoff can also be stored in an attenuation zone above the pool.	P	●			●	●	●
Key P – Point, L-Lateral, S-Surface ● Likely valuable contribution to delivery design criterion ○ Some Potential contribution to delivery of design criterion, if specifically included in the design								

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SURFACE WATER DRAINAGE DESIGN

Percolation testing was undertaken with the findings appended to this report. Soakaway testing was undertaken in accordance with BRE Digest 365 Soakaway Testing.

Soakaway testing was performed in 1No. trial pit which is appropriate given the size of the site. The trial pit was tested 3No. times.

Effective pre-treatment through the use of Silt Bloks will prevent siltation of the soakaway. Test pit 1 was dug to 1.7m (deep). The lowest infiltration rate was 2.62718×10^{-6} m/s or 0.0095m/hr (see Table 1).

Table 1 - Infiltration Test Results

Test Number	Geology	Calc. Infiltration Result (m/s)	Calc. Infiltration Rate (m/hr)
Test 1	Oaks Rock Sandstone	9.2424×10^{-6}	0.0333
Test 2		2.93467×10^{-6}	0.0106
Test 3		2.62718×10^{-6}	0.0095

The most conservative result will be used to size the soakaways. When positioning the soakaways they are to be 2.5m from site boundaries and 5.0m away from buildings. Driveways will be permeable. The dwelling areas have an additional 10% allowance for urban creep.

In the software the values are rounded (up) to the nearest 10m^2 .


The available space is limited so the 3No. plots will share the soakaways, with the rear roofs being directed towards the rear garden and the front roofs to a soakaway under the parking spaces. To avoid clashing with the foul drainage the rear roof of plot 1 and half of plot 2 will be directed around the building to the front soakaway. This is also a requirement of the design as the soakaways are sized for different areas of run-off. The total drained areas per soakaway are as follows:

Front (west) soakaway – $128.7\text{m}^2 + 10\% \text{ Urban Creep} = 141.57\text{m}^2 \approx 0.015\text{ha}$

Rear (east) soakaway – $42.9\text{m}^2 + 10\% \text{ Urban Creep} = 47.19\text{m}^2 \approx 0.005\text{ha}$

The soakaway required for the front is $9.0 \times 4.0 \times 0.4\text{m}$ dp. The soakaway required for the rear is $8.0 \times 1.5 \times 0.4\text{m}$. The soakaways are not predicted to flood during the 1 in 1-year, 1 in 30-year + 30%CC or 1 in 100-year +40%CC scenarios.

The design standard for the assessment will be 1 in 30yr + 30% climate change allowance with a half drain time less than 1440mins (Front Soakaway = 1015mins, Rear Soakaway = 859 mins). A capacity check has been undertaken for a design standard of 1 in 100yr + 40% climate to check for flooding; no flooding is predicted to occur.

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Soakaway (Front) – 9.0m long x 4.0m wide x 0.4m deep cellular storage crates (95% void ratio)

Roof Area = 141.57m² + 10% urban creep (0.015ha)

Storage Provided: 9.0m x 4.0m x 0.4m x 0.95 (voids) = 13.68m³

1 in 30 yr + 30% climate change:

- Maximum Water Depth 255mm
- Half Drain time 1015 minutes ≤ 1440 minutes

1 in 100yr + 40% climate change:

- Maximum Water level 375mm.

Soakaway (Rear) – 8.0m long x 1.5m wide x 0.4m deep cellular storage crates (95% void ratio)

Roof Area = 42.9m² + 10% urban creep (0.005ha)

Storage Provided: 8.0m x 1.5m x 0.4m x 0.95 (voids) = 4.56m³

1 in 30 yr + 30% climate change:

- Maximum Water Depth 246mm
- Half Drain time 859 minutes ≤ 1440 minutes

1 in 100yr + 40% climate change:

- Maximum Water level 360mm.

See Appendix B for calculations.

Permeable Paving

Permeable paving serves it's own catchment.

Area = 176m²

Sub-base depth = 225mm


Inf. Coefficient = 0.0095 m/hr

Porosity = 0.3 (30%)

1 in 100yr + 40% climate change:


- Maximum Water level 192mm < 225mm
- Half Drain time 367 minutes ≤ 1440 minutes

See Appendix B for calculations.

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FOUL WATER DRAINAGE DESIGN

The development will drain via gravity via the existing foul water stub on site, which flows east off site and then north. The sewer has been surveyed 20m along its length and appears to be clear and viable.


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MAINTENANCE

As the surface and foul water drainage systems are proposed to remain in private ownership, the individual plot owners will have responsibility for the maintenance of their own drainage systems.

Below Ground Drainage and drainage channels

1. No work shall be carried out on the drainage system without permission from a nominated person, who has access to information/a working knowledge of the system.
2. Maintenance/inspection work shall be carried out in a safe/planned manner.
3. All work is to be carried out by competent persons suitably trained and equipped in accordance with current statutory safe working policies.
4. Entry into confined spaces shall be kept to a minimum and be restricted to suitably qualified/equipped persons working in accordance with current statutory safe working policies.
5. High levels of hygiene shall be maintained at all times, with adequate welfare facilities being provided for the personnel.
6. Drainage systems shall be inspected on a regular basis or should any problems be suspected. Any debris/ defects discovered shall be recorded and a programme of cleaning/ repair initiated. Urgent repairs/ cleaning shall be actioned as soon as practicable.
7. The following operations should be carried out annually.
 - a) Covers of inspection chambers and manholes shall be removed and the sides, benchings and channels cleared.
 - b) Accumulated deposits of silt in soakaways, catchpit manholes, drainage channels, gullies etc. shall be removed. Any traps shall then be plunged and thoroughly flushed out with clean water.
 - c) Main and branch drains shall be cleared as required and afterwards be flushed with clean water. Any obstructions found shall be removed and not flushed down the system.
 - d) Covers of inspection chambers, manholes, gullies etc. shall be replaced, bedded in suitable grease or other sealing material as required and bolted/locked down as appropriate. Missing bolts and broken items shall be replaced in accordance with the manufacturer's details.
8. Trapped gullies shall be checked and replenished as necessary in order to maintain the seal, preventing the escape of odours.
9. Clearing of the drainage system can be achieved by a number of methods depending on the nature of the work
 - a) Rodding – Manual/Mechanical with flexible rods.
 - b) Jetting – High pressure water jetting.
 - c) Plunging.


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Maintenance Schedules

<i>Regular Maintenance</i>		
Element	Maintenance / Action Required	Frequency
Crate Structures	CCTV / jetting through central channel to assess and clear any build-up of silt	Annually – Autumn after leaf fall
Permeable Paving	Jet Wash and suction sweeper	
<i>Regular Monitoring</i>		
Inlets / outlets / vents	Inspect all inlets / outlets and vents to ensure in a good working condition and operating as designed	Annually and after large storms
<i>Remedial Actions</i>		
Inlets / outlets / vents	Repair as necessary	As required.
Crates	Inspect and replace crate where necessary	As required.

Maintenance Schedule for Silt Traps

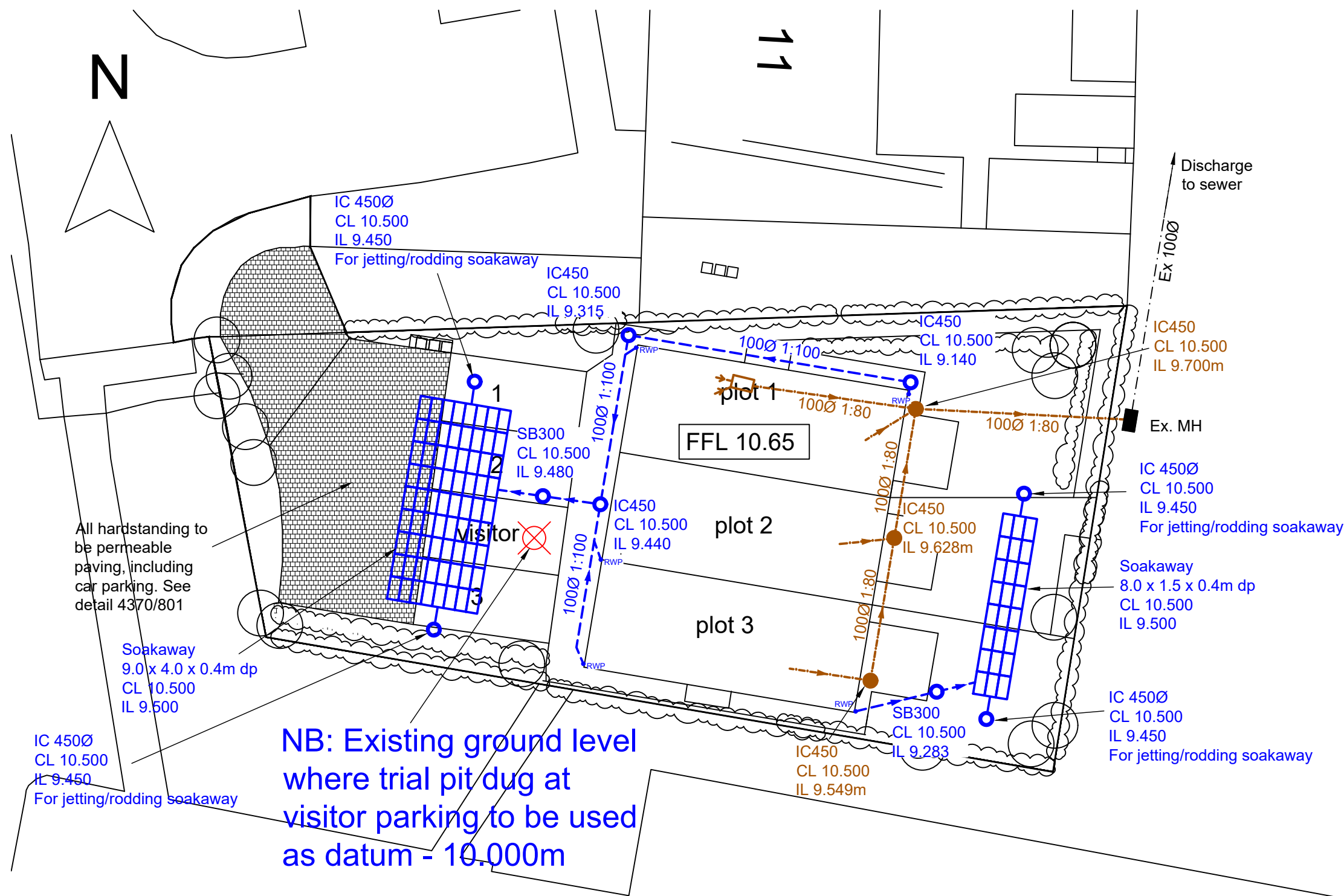
<i>Regular Maintenance</i>		
Element	Maintenance / Action Required	Frequency
Silt Traps	Remove filter and clean of debris and sediment (siltblok). Clear any build-up of silt from bottom of silt trap. Refer to manufacturer guidance from SILTBLOK.	Annually – Autumn after leaf fall
<i>Regular Monitoring</i>		
Inlets / outlets / filters	Inspect all inlets / outlets and vents to ensure in a good working condition and operating as designed	Annually and after large storms
<i>Remedial Actions</i>		
Inlets / outlets / filters	Repair as necessary	As required.
Filters	Inspect and replace filter where necessary	As required.

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APPENDIX A – Drawings

NOTES

1. DO NOT SCALE - Use figured dimensions only.
2. All dimensions shown are in millimetres unless otherwise stated.
3. The Contractor is to verify all dimension on site before commencing work or preparing shop drawings.
4. This drawing is to be read in conjunction with all Engineers and Architects drawings and specifications.



All handstanding to be permeable paving, including car parking. See detail 4370/801

NB: Existing ground level where trial pit dug at visitor parking to be used as datum - 10.000m

P1	Initial Issue	LM	JR	20/02/2025
Rev	Description	Dr	Ch	Date
Drawing Status: Preliminary				

Client	J. Wade
Project	9 Broom Close, Kendray Barnsley, S70 3EG
Title	Drainage Layout

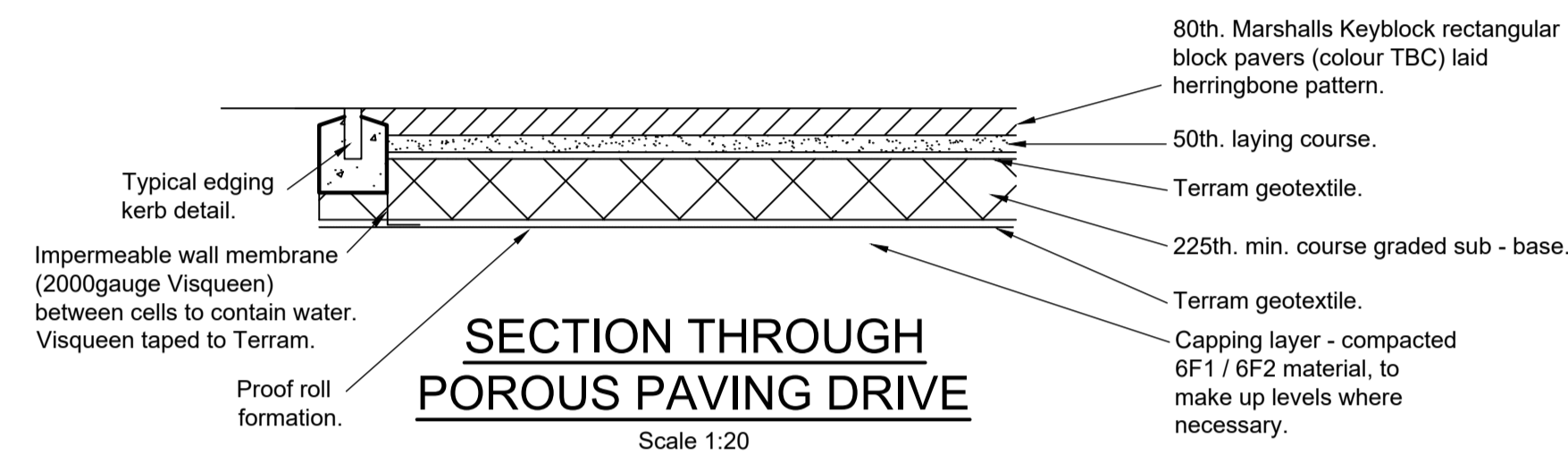
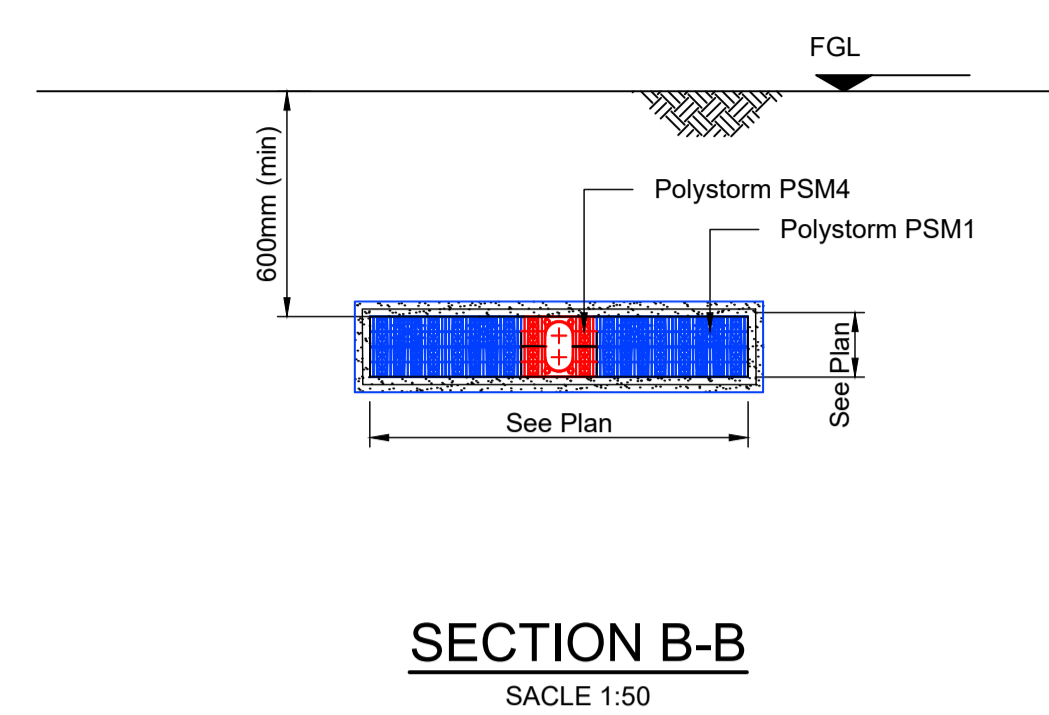
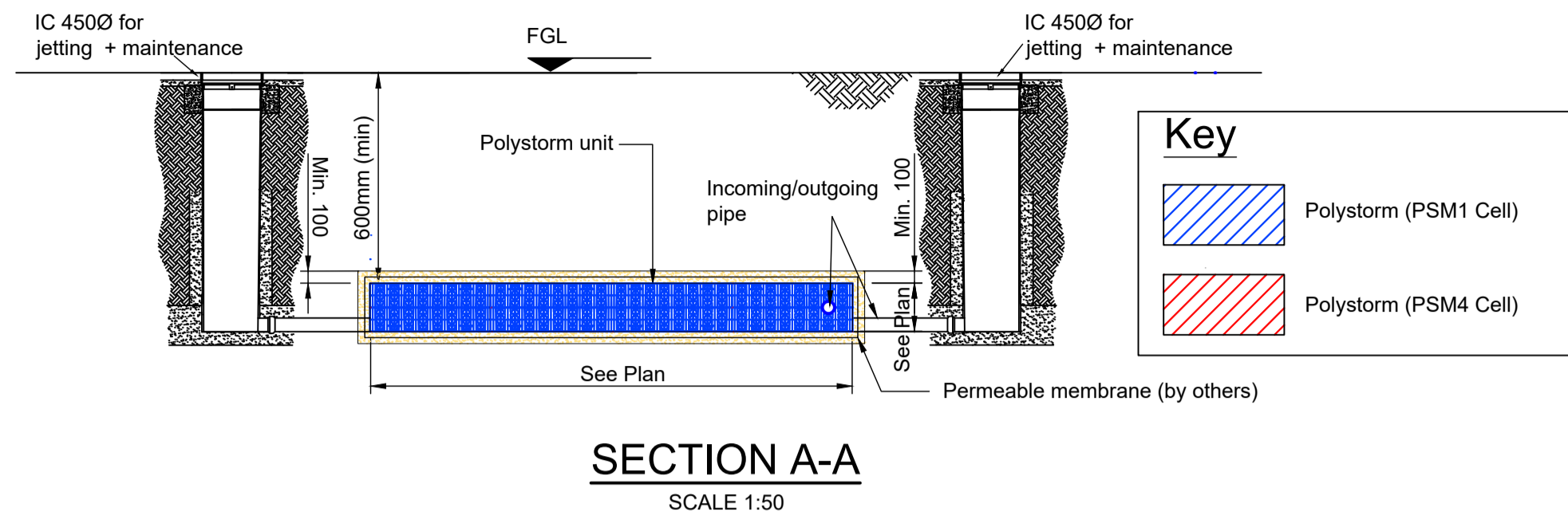
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Sheet Size	A3
Drawn	LM
Checked	JR
Approved	-

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Drawing Number	4370/800	Rev	P1
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Sub - base specification - 4/20mm.
Min 30% void ratio.:-

Material supplied should be non - frost susceptible (Los Angeles Abrasive test < 25%).
10% fines > 100µm (BS 812 : Part 111 : 1990)
Flakiness index < 25% (BS 812 : Section 105 : 1989).

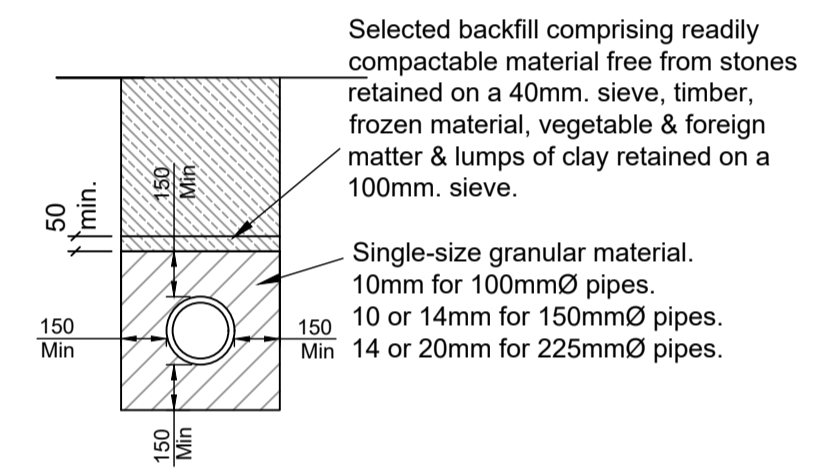
Should be laid in 100 - 150mm. layers & compacted to ensure that the maximum density is achieved for the particular material type & grading, without crushing the individual particles or reducing the void ratio below the design value, within a tolerance of +20mm. to -15mm. of the design.
Any soft spots should be excavated first & backfilled with suitable well compacted material.

Laying course - Type 2/6.3 course washed aggregate (in accordance with BS. EN 13242 : 2002 and BS 7533-13: 2009.

Course graded aggregate - 4/20mm. 30% min void ratio, course washed aggregate (in accordance with BS. EN 13242 : 2002. Hard crushed rock aggregates are preferable for internal stability.

The permeable sub-base shall not be used as a temporary access road for general site traffic or as a hard standing area.

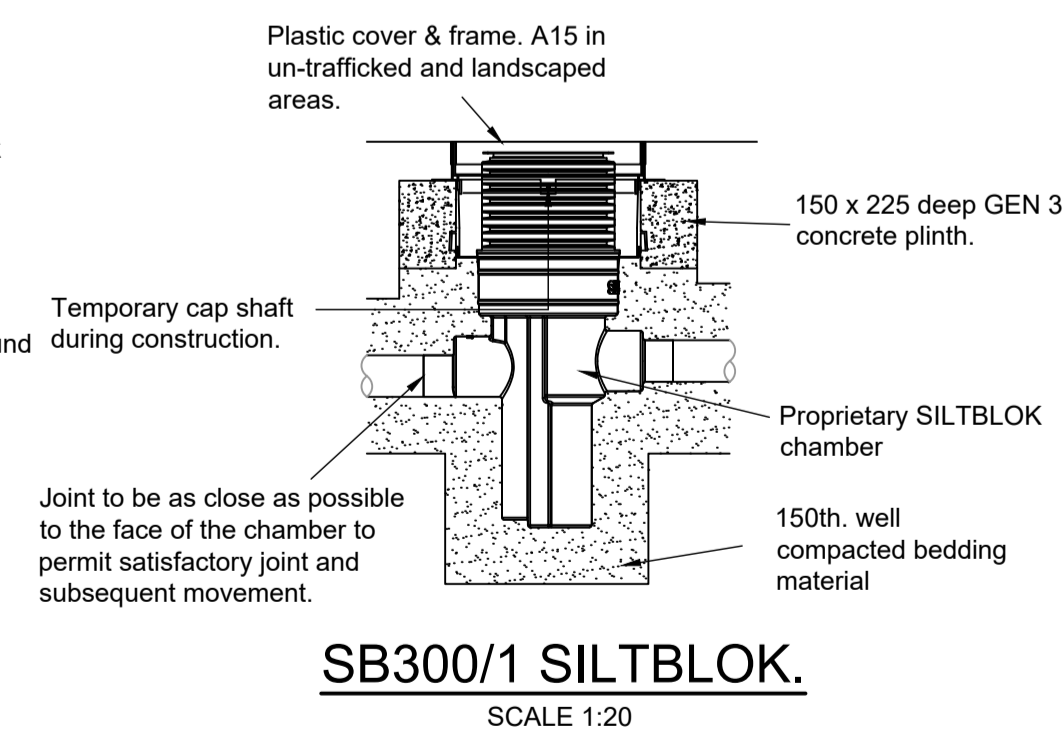
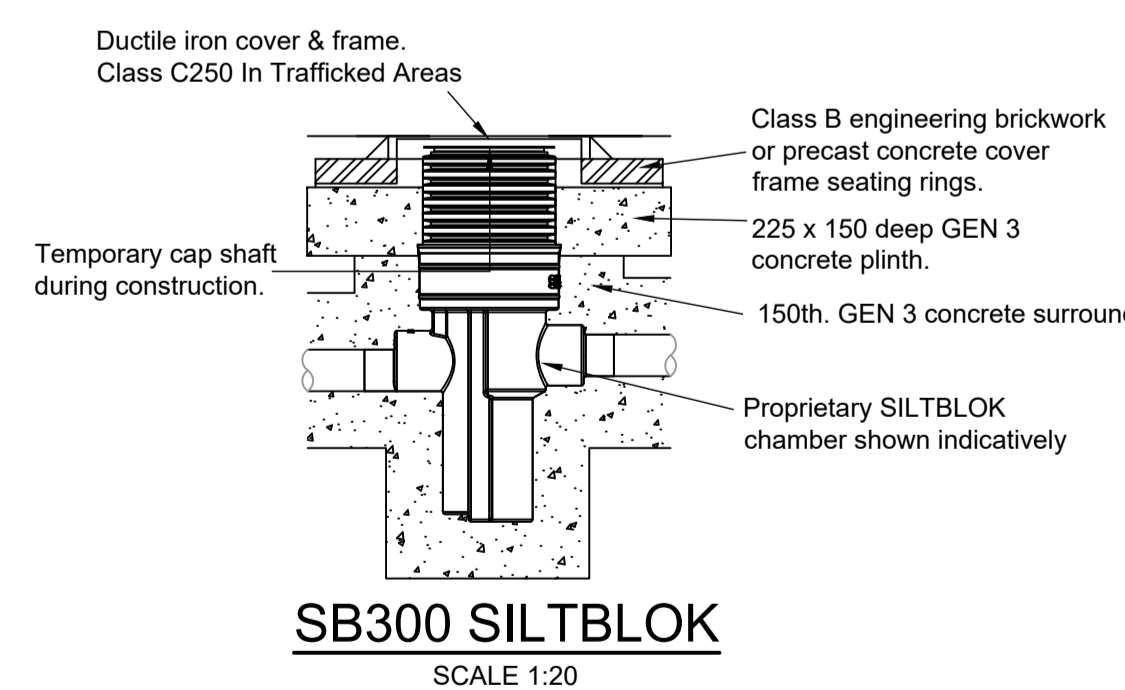
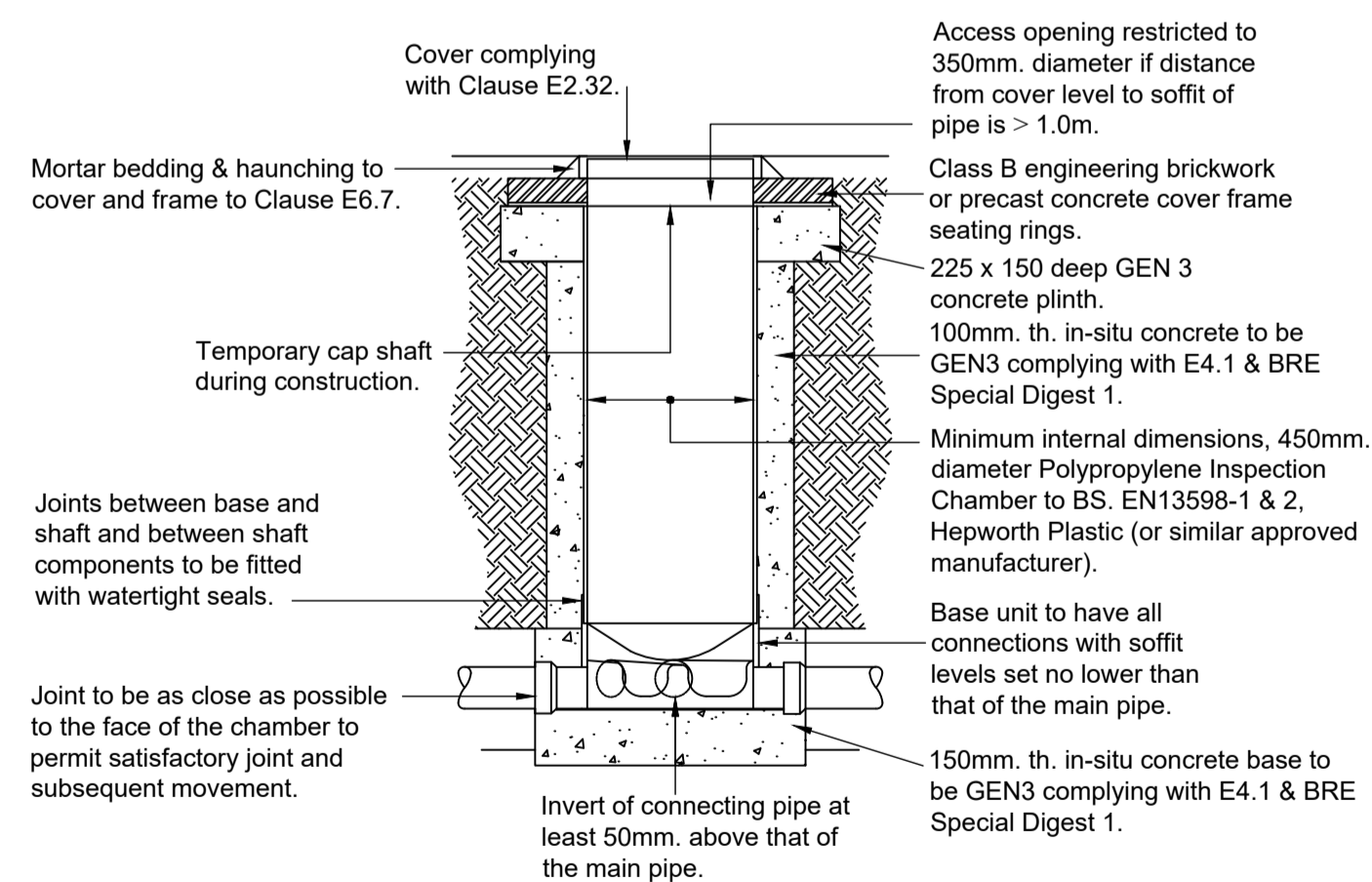
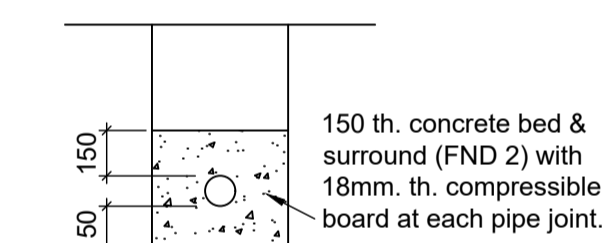
The works shall be undertaken in such a way that contaminants such as soil and mud are prevented entering the base and pavement surface both during and after construction.



Boxing/sheeting to be removed progressively during placement of the main backfill above the pipe to prevent displacement of the granular material.

Sidfill material to be placed evenly on both sides of the pipe taking care to work material under the lower quadrant of the pipe whilst ensuring the pipe is not lifted. Both sides of the trench should be filled simultaneously to avoid horizontal movement of the pipe.

Trench fill under roads to conform with Highways requirements.

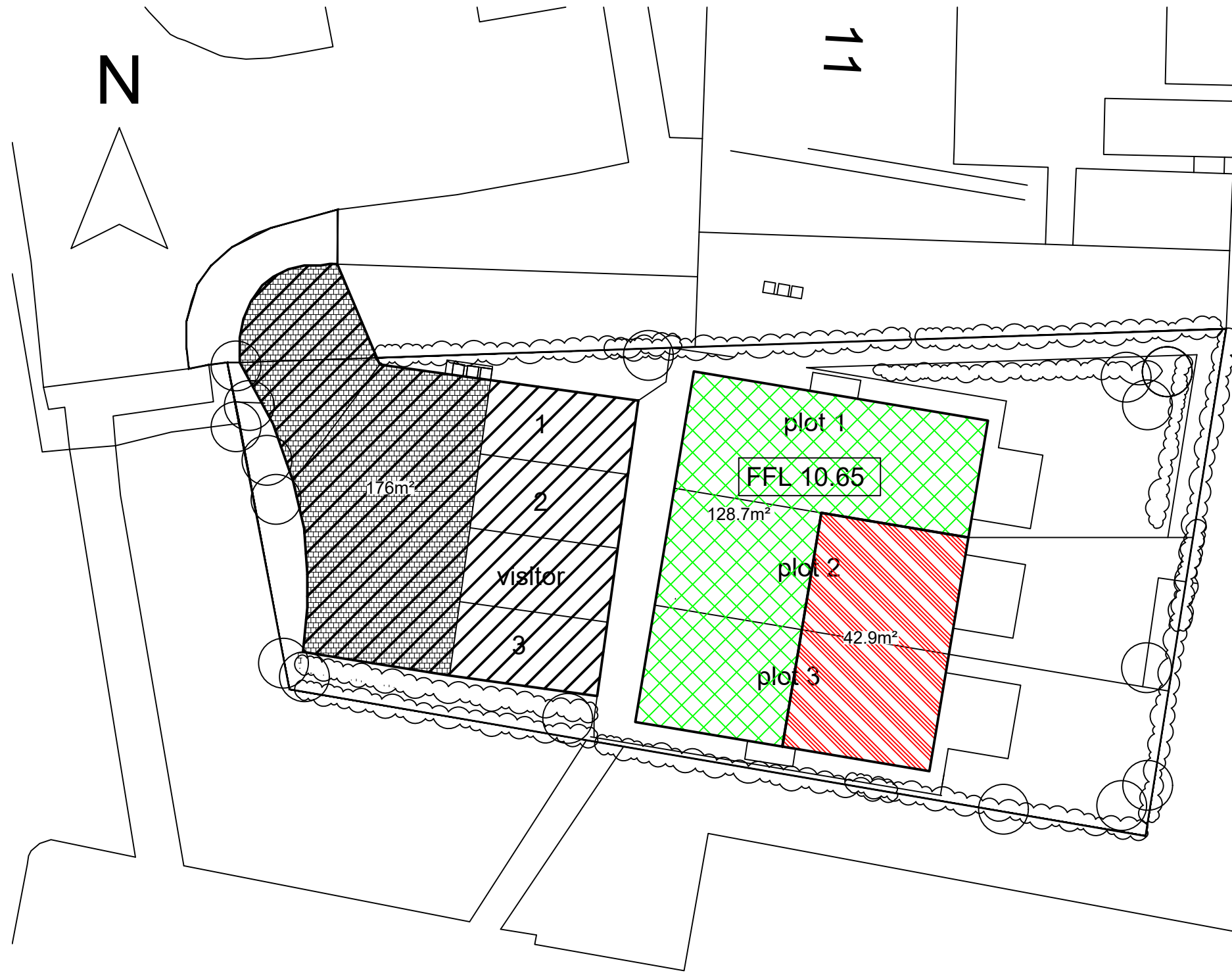


P1	Initial Issue	LM	JR	21/02/2025
Rev	Description	Dr	Ch	Date
Drawing Status Preliminary				
Client J. Wade				
Project 9 Broom Close, Kendray Barnsley, S70 3EG				
Title Drainage Details				
Sheet Size A1		Scale As Shown		
Drawn LM	Drawing Number		Rev	
Checked JR	4370/801		P1	
Approved -				






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Key

-  To front soakaway
-  To rear soakaway
-  Permeable Paving

P1	Initial Issue	LM	JR	20/02/2025
Rev	Description	Dr	Ch	Date
Drawing Status		Preliminary		

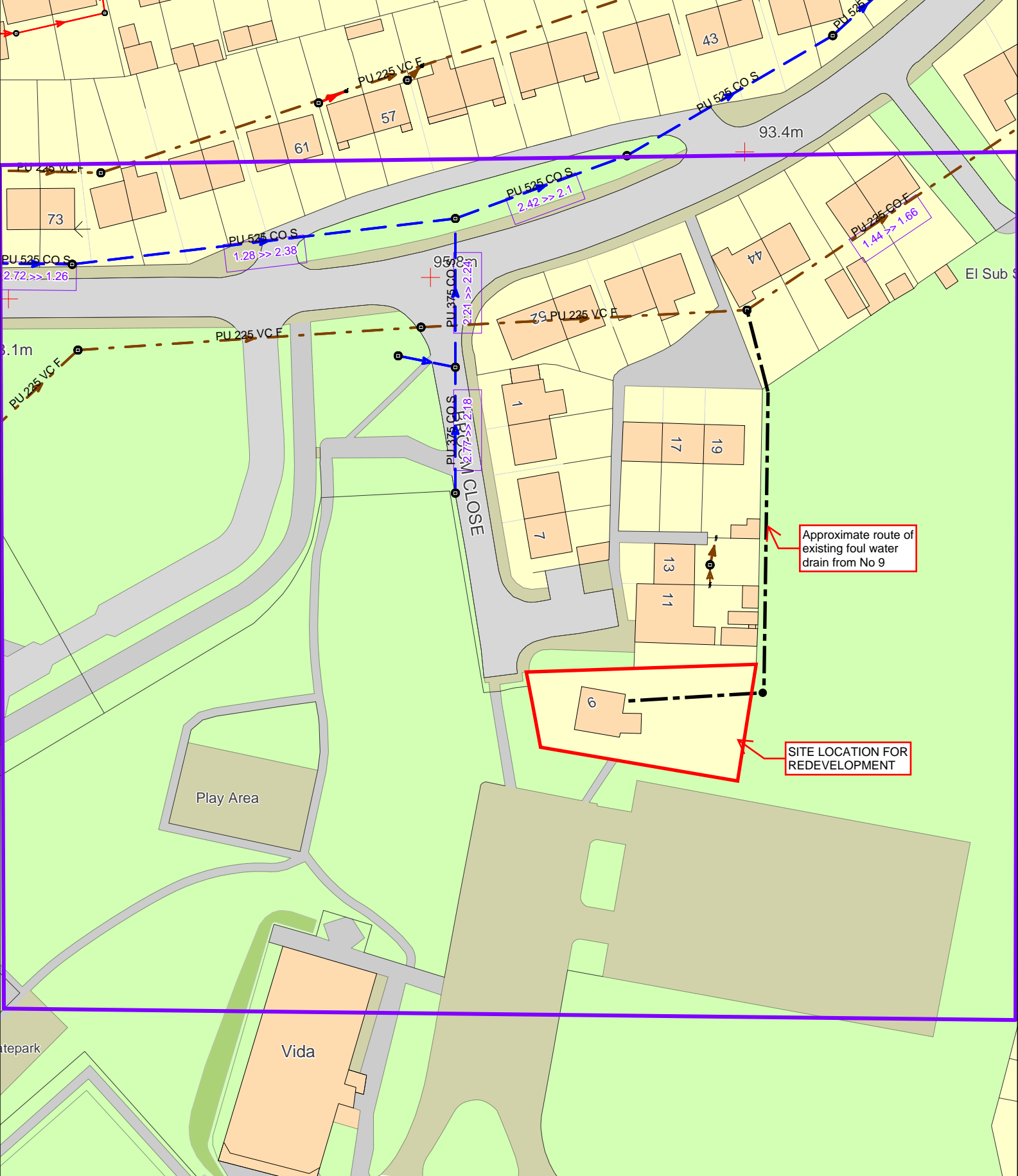
Client	J. Wade
Project	9 Broom Close, Kendray Barnsley, S70 3EG
Title	Areas Plan

Scale	1:200
Sheet Size	A3
Drawn	LM
Checked	JR
Approved	-




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Public Waste Water Network 29/01/2025 11:07:09 OS Grid Coordinates: 436438 : 404662 Map Name : SE3604NW svcGISSafeMovePD

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APPENDIX B – Drainage Calculations

11 The Point

9 Broom Close, Kendray

Bradmarsh Business Park

Barnsley, S70 3EG

Rotherham, S60 1BP

Front 1 in 30 + 30%CC

Date 19/02/2025

Designed by LM

File Front Storage Estimate 1 in

Checked by JR



Innovyze

Source Control 2020.1.3

Summary of Results for 30 year Return Period (+30%)

Half Drain Time : 1015 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m ³)	Status
15 min Winter	9.397	0.097	0.1	3.3	O K
30 min Winter	9.428	0.128	0.1	4.4	O K
60 min Winter	9.461	0.161	0.1	5.5	O K
120 min Winter	9.494	0.194	0.1	6.6	O K
180 min Winter	9.512	0.212	0.1	7.3	O K
240 min Winter	9.524	0.224	0.1	7.7	O K
360 min Winter	9.539	0.239	0.1	8.2	O K
480 min Winter	9.547	0.247	0.1	8.5	O K
600 min Winter	9.552	0.252	0.1	8.6	O K
720 min Winter	9.555	0.255	0.1	8.7	O K
960 min Winter	9.555	0.255	0.1	8.7	O K
1440 min Winter	9.549	0.249	0.1	8.5	O K
2160 min Winter	9.536	0.236	0.1	8.1	O K
2880 min Winter	9.520	0.220	0.1	7.5	O K
4320 min Winter	9.486	0.186	0.1	6.4	O K
5760 min Winter	9.454	0.154	0.1	5.3	O K
7200 min Winter	9.425	0.125	0.1	4.3	O K
8640 min Winter	9.401	0.101	0.1	3.4	O K
10080 min Winter	9.380	0.080	0.1	2.7	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m ³)	Time-Peak (mins)
15 min Winter	90.597	0.0	26
30 min Winter	59.957	0.0	40
60 min Winter	38.009	0.0	70
120 min Winter	23.400	0.0	126
180 min Winter	17.428	0.0	184
240 min Winter	14.074	0.0	242
360 min Winter	10.378	0.0	358
480 min Winter	8.359	0.0	474
600 min Winter	7.062	0.0	586
720 min Winter	6.152	0.0	698
960 min Winter	4.944	0.0	912
1440 min Winter	3.629	0.0	1146
2160 min Winter	2.660	0.0	1604
2880 min Winter	2.133	0.0	2056
4320 min Winter	1.560	0.0	2940
5760 min Winter	1.248	0.0	3752
7200 min Winter	1.050	0.0	4536
8640 min Winter	0.911	0.0	5200
10080 min Winter	0.809	0.0	5856

11 The Point
 Bradmarsh Business Park
 Rotherham, S60 1BP

9 Broom Close, Kendray
 Barnsley, S70 3EG
 Front 1 in 30 + 30%CC



Date 19/02/2025
 File Front Storage Estimate 1 in

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Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	30	Cv (Summer)	1.000
Region	England and Wales	Cv (Winter)	1.000
M5-60 (mm)	19.000	Shortest Storm (mins)	15
Ratio R	0.363	Longest Storm (mins)	10080
Summer Storms	No	Climate Change %	+30

Time Area Diagram

Total Area (ha) 0.015

Time (mins)		Area	Time (mins)		Area	Time (mins)		Area
From:	To:	(ha)	From:	To:	(ha)	From:	To:	(ha)
0	4	0.005	4	8	0.005	8	12	0.005

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11 The Point Bradmarsh Business Park Rotherham, S60 1BP	9 Broom Close, Kendray Barnsley, S70 3EG Front 1 in 30 + 30%CC	
Date 19/02/2025 File Front Storage Estimate 1 in	Designed by LM Checked by JR	
Innovyze	Source Control 2020.1.3	

Model Details

Storage is Online Cover Level (m) 12.000

Cellular Storage Structure

Invert Level (m) 9.300 Safety Factor 1.5
 Infiltration Coefficient Base (m/hr) 0.00950 Porosity 0.95
 Infiltration Coefficient Side (m/hr) 0.00950

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	36.0	36.0	0.400	36.0	46.4	0.401	0.0	46.4

11 The Point

9 Broom Close, Kendray

Bradmarsh Business Park

Barnsley, S70 3EG

Rotherham, S60 1BP

Front 1 in 100 + 40%CC

Date 19/02/2025

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File Front Storage Estimate 1 in

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Source Control 2020.1.3

Summary of Results for 100 year Return Period (+40%)

Half Drain Time : 1407 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m ³)	Status
15 min Winter	9.436	0.136	0.1	4.7	O K
30 min Winter	9.481	0.181	0.1	6.2	O K
60 min Winter	9.530	0.230	0.1	7.8	O K
120 min Winter	9.578	0.278	0.1	9.5	O K
180 min Winter	9.605	0.305	0.1	10.4	O K
240 min Winter	9.622	0.322	0.1	11.0	O K
360 min Winter	9.644	0.344	0.1	11.8	O K
480 min Winter	9.657	0.357	0.1	12.2	O K
600 min Winter	9.666	0.366	0.1	12.5	O K
720 min Winter	9.671	0.371	0.1	12.7	O K
960 min Winter	9.675	0.375	0.1	12.8	O K
1440 min Winter	9.670	0.370	0.1	12.7	O K
2160 min Winter	9.654	0.354	0.1	12.1	O K
2880 min Winter	9.636	0.336	0.1	11.5	O K
4320 min Winter	9.597	0.297	0.1	10.1	O K
5760 min Winter	9.558	0.258	0.1	8.8	O K
7200 min Winter	9.521	0.221	0.1	7.6	O K
8640 min Winter	9.488	0.188	0.1	6.4	O K
10080 min Winter	9.459	0.159	0.1	5.4	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m ³)	Time-Peak (mins)
15 min Winter	126.235	0.0	26
30 min Winter	84.341	0.0	41
60 min Winter	53.779	0.0	70
120 min Winter	33.133	0.0	128
180 min Winter	24.607	0.0	186
240 min Winter	19.793	0.0	244
360 min Winter	14.498	0.0	360
480 min Winter	11.625	0.0	476
600 min Winter	9.787	0.0	592
720 min Winter	8.499	0.0	706
960 min Winter	6.796	0.0	930
1440 min Winter	4.951	0.0	1354
2160 min Winter	3.599	0.0	1688
2880 min Winter	2.867	0.0	2140
4320 min Winter	2.077	0.0	3036
5760 min Winter	1.650	0.0	3920
7200 min Winter	1.380	0.0	4752
8640 min Winter	1.192	0.0	5536
10080 min Winter	1.054	0.0	6256

11 The Point
 Bradmarsh Business Park
 Rotherham, S60 1BP

9 Broom Close, Kendray
 Barnsley, S70 3EG
 Front 1 in 100 + 40%CC



Date 19/02/2025
 File Front Storage Estimate 1 in

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Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	1.000
Region	England and Wales	Cv (Winter)	1.000
M5-60 (mm)	19.000	Shortest Storm (mins)	15
Ratio R	0.363	Longest Storm (mins)	10080
Summer Storms	No	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.015

Time (mins)	Area	Time (mins)	Area	Time (mins)	Area
From:	To:	From:	To:	From:	To:
	(ha)		(ha)		(ha)
0	4 0.005	4	8 0.005	8	12 0.005

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11 The Point Bradmarsh Business Park Rotherham, S60 1BP	9 Broom Close, Kendray Barnsley, S70 3EG Front 1 in 100 + 40%CC	
Date 19/02/2025 File Front Storage Estimate 1 in	Designed by LM Checked by JR	
Innovyze	Source Control 2020.1.3	

Model Details

Storage is Online Cover Level (m) 12.000

Cellular Storage Structure

Invert Level (m) 9.300 Safety Factor 1.5
 Infiltration Coefficient Base (m/hr) 0.00950 Porosity 0.95
 Infiltration Coefficient Side (m/hr) 0.00950

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	36.0	36.0	0.400	36.0	46.4	0.401	0.0	46.4

11 The Point
 Bradmarsh Business Park
 Rotherham, S60 1BP

9 Broom Close, Kendray
 Barnsley, S70 3EG
 Rear 1 in 30 + 30%CC



Date 19/02/2025
 File Rear Storage Estimate 1 in 30

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Source Control 2020.1.3

Summary of Results for 30 year Return Period (+30%)

Half Drain Time : 859 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m ³)	Status
15 min Winter	9.397	0.097	0.0	1.1	O K
30 min Winter	9.428	0.128	0.0	1.5	O K
60 min Winter	9.460	0.160	0.0	1.8	O K
120 min Winter	9.493	0.193	0.0	2.2	O K
180 min Winter	9.511	0.211	0.0	2.4	O K
240 min Winter	9.522	0.222	0.0	2.5	O K
360 min Winter	9.535	0.235	0.0	2.7	O K
480 min Winter	9.542	0.242	0.0	2.8	O K
600 min Winter	9.545	0.245	0.0	2.8	O K
720 min Winter	9.546	0.246	0.0	2.8	O K
960 min Winter	9.545	0.245	0.0	2.8	O K
1440 min Winter	9.538	0.238	0.0	2.7	O K
2160 min Winter	9.524	0.224	0.0	2.5	O K
2880 min Winter	9.506	0.206	0.0	2.4	O K
4320 min Winter	9.471	0.171	0.0	2.0	O K
5760 min Winter	9.440	0.140	0.0	1.6	O K
7200 min Winter	9.413	0.113	0.0	1.3	O K
8640 min Winter	9.390	0.090	0.0	1.0	O K
10080 min Winter	9.371	0.071	0.0	0.8	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m ³)	Time-Peak (mins)
15 min Winter	90.597	0.0	26
30 min Winter	59.957	0.0	40
60 min Winter	38.009	0.0	68
120 min Winter	23.400	0.0	126
180 min Winter	17.428	0.0	184
240 min Winter	14.074	0.0	240
360 min Winter	10.378	0.0	356
480 min Winter	8.359	0.0	470
600 min Winter	7.062	0.0	582
720 min Winter	6.152	0.0	688
960 min Winter	4.944	0.0	886
1440 min Winter	3.629	0.0	1102
2160 min Winter	2.660	0.0	1564
2880 min Winter	2.133	0.0	2016
4320 min Winter	1.560	0.0	2856
5760 min Winter	1.248	0.0	3648
7200 min Winter	1.050	0.0	4400
8640 min Winter	0.911	0.0	5104
10080 min Winter	0.809	0.0	5752

11 The Point
 Bradmarsh Business Park
 Rotherham, S60 1BP

9 Broom Close, Kendray
 Barnsley, S70 3EG
 Rear 1 in 30 + 30%CC



Date 19/02/2025
 File Rear Storage Estimate 1 in 30

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Innovyze Source Control 2020.1.3

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	30	Cv (Summer)	1.000
Region	England and Wales	Cv (Winter)	1.000
M5-60 (mm)	19.000	Shortest Storm (mins)	15
Ratio R	0.363	Longest Storm (mins)	10080
Summer Storms	No	Climate Change %	+30

Time Area Diagram

Total Area (ha) 0.005

Time (mins)		Area	Time (mins)		Area	Time (mins)		Area
From:	To:	(ha)	From:	To:	(ha)	From:	To:	(ha)
0	4	0.002	4	8	0.002	8	12	0.001

11 The Point
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9 Broom Close, Kendray
 Barnsley, S70 3EG
 Rear 1 in 30 + 30%CC



Date 19/02/2025
 File Rear Storage Estimate 1 in 30

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Innovyze Source Control 2020.1.3

Model Details

Storage is Online Cover Level (m) 12.000

Cellular Storage Structure

Invert Level (m) 9.300 Safety Factor 1.5
 Infiltration Coefficient Base (m/hr) 0.00950 Porosity 0.95
 Infiltration Coefficient Side (m/hr) 0.00950

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	12.0	12.0	0.400	12.0	19.6	0.401	0.0	19.6

11 The Point
 Bradmarsh Business Park
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9 Broom Close, Kendray
 Barnsley, S70 3EG
 Rear 1 in 100 + 40%CC



Date 19/02/2025
 File Rear Storage Estimate 1 in

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Innovyze

Source Control 2020.1.3

Summary of Results for 100 year Return Period (+40%)

Half Drain Time : 1138 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m ³)	Status
15 min Winter	9.436	0.136	0.0	1.6	O K
30 min Winter	9.481	0.181	0.0	2.1	O K
60 min Winter	9.529	0.229	0.0	2.6	O K
120 min Winter	9.577	0.277	0.0	3.2	O K
180 min Winter	9.603	0.303	0.0	3.4	O K
240 min Winter	9.619	0.319	0.0	3.6	O K
360 min Winter	9.638	0.338	0.0	3.9	O K
480 min Winter	9.650	0.350	0.0	4.0	O K
600 min Winter	9.656	0.356	0.0	4.1	O K
720 min Winter	9.659	0.359	0.0	4.1	O K
960 min Winter	9.660	0.360	0.0	4.1	O K
1440 min Winter	9.650	0.350	0.0	4.0	O K
2160 min Winter	9.634	0.334	0.0	3.8	O K
2880 min Winter	9.613	0.313	0.0	3.6	O K
4320 min Winter	9.571	0.271	0.0	3.1	O K
5760 min Winter	9.532	0.232	0.0	2.6	O K
7200 min Winter	9.497	0.197	0.0	2.2	O K
8640 min Winter	9.466	0.166	0.0	1.9	O K
10080 min Winter	9.439	0.139	0.0	1.6	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m ³)	Time-Peak (mins)
15 min Winter	126.235	0.0	26
30 min Winter	84.341	0.0	40
60 min Winter	53.779	0.0	68
120 min Winter	33.133	0.0	126
180 min Winter	24.607	0.0	184
240 min Winter	19.793	0.0	242
360 min Winter	14.498	0.0	358
480 min Winter	11.625	0.0	474
600 min Winter	9.787	0.0	586
720 min Winter	8.499	0.0	698
960 min Winter	6.796	0.0	914
1440 min Winter	4.951	0.0	1158
2160 min Winter	3.599	0.0	1620
2880 min Winter	2.867	0.0	2076
4320 min Winter	2.077	0.0	2948
5760 min Winter	1.650	0.0	3808
7200 min Winter	1.380	0.0	4608
8640 min Winter	1.192	0.0	5368
10080 min Winter	1.054	0.0	6152

11 The Point
 Bradmarsh Business Park
 Rotherham, S60 1BP

9 Broom Close, Kendray
 Barnsley, S70 3EG
 Rear 1 in 100 + 40%CC



Date 19/02/2025
 File Rear Storage Estimate 1 in

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Innovyze Source Control 2020.1.3

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	1.000
Region	England and Wales	Cv (Winter)	1.000
M5-60 (mm)	19.000	Shortest Storm (mins)	15
Ratio R	0.363	Longest Storm (mins)	10080
Summer Storms	No	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.005

Time (mins)		Area	Time (mins)		Area	Time (mins)		Area
From:	To:	(ha)	From:	To:	(ha)	From:	To:	(ha)
0	4	0.002	4	8	0.002	8	12	0.001

11 The Point
 Bradmarsh Business Park
 Rotherham, S60 1BP

9 Broom Close, Kendray
 Barnsley, S70 3EG
 Rear 1 in 100 + 40%CC



Date 19/02/2025
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Innovyze Source Control 2020.1.3

Model Details

Storage is Online Cover Level (m) 12.000

Cellular Storage Structure

Invert Level (m) 9.300 Safety Factor 1.5
 Infiltration Coefficient Base (m/hr) 0.00950 Porosity 0.95
 Infiltration Coefficient Side (m/hr) 0.00950

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	12.0	12.0	0.400	12.0	19.6	0.401	0.0	19.6

11 The Point Bradmarsh Business Park Rotherham, S60 1BP	4370 9 Broom Close, Barnsley 100y+40% CC
Date 20/02/2025 16:03 File Permeable Paving.SRCX	Designed by LM Checked by JR



Innovyze Source Control 2020.1.3

Summary of Results for 100 year Return Period (+40%)

Half Drain Time : 367 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m ³)	Status
15 min Winter	11.731	0.086	0.2	4.6	Flood Risk
30 min Winter	11.762	0.117	0.2	6.3	Flood Risk
60 min Winter	11.792	0.147	0.2	7.9	Flood Risk
120 min Winter	11.819	0.174	0.2	9.4	Flood Risk
180 min Winter	11.831	0.186	0.2	10.0	Flood Risk
240 min Winter	11.836	0.191	0.2	10.3	Flood Risk
360 min Winter	11.837	0.192	0.2	10.3	Flood Risk
480 min Winter	11.833	0.188	0.2	10.1	Flood Risk
600 min Winter	11.829	0.184	0.2	9.9	Flood Risk
720 min Winter	11.824	0.179	0.2	9.7	Flood Risk
960 min Winter	11.813	0.168	0.2	9.0	Flood Risk
1440 min Winter	11.786	0.141	0.2	7.6	Flood Risk
2160 min Winter	11.749	0.104	0.2	5.6	Flood Risk
2880 min Winter	11.719	0.074	0.2	4.0	Flood Risk
4320 min Winter	11.691	0.046	0.2	2.5	O K
5760 min Winter	11.682	0.037	0.2	2.0	O K
7200 min Winter	11.676	0.031	0.1	1.7	O K
8640 min Winter	11.672	0.027	0.1	1.4	O K
10080 min Winter	11.668	0.023	0.1	1.3	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m ³)	Time-Peak (mins)
15 min Winter	127.694	0.0	25
30 min Winter	83.909	0.0	39
60 min Winter	52.595	0.0	68
120 min Winter	31.908	0.0	124
180 min Winter	23.529	0.0	180
240 min Winter	18.854	0.0	238
360 min Winter	13.689	0.0	346
480 min Winter	10.911	0.0	408
600 min Winter	9.146	0.0	472
720 min Winter	7.914	0.0	548
960 min Winter	6.295	0.0	700
1440 min Winter	4.552	0.0	986
2160 min Winter	3.286	0.0	1376
2880 min Winter	2.606	0.0	1728
4320 min Winter	1.876	0.0	2332
5760 min Winter	1.485	0.0	3056
7200 min Winter	1.237	0.0	3752
8640 min Winter	1.066	0.0	4480
10080 min Winter	0.939	0.0	5240

11 The Point
 Bradmarsh Business Park
 Rotherham, S60 1BP

4370
 9 Broom Close, Barnsley
 100y+40% CC



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Innovyze Source Control 2020.1.3

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	1.000
Region	England and Wales	Cv (Winter)	1.000
M5-60 (mm)	18.600	Shortest Storm (mins)	15
Ratio R	0.401	Longest Storm (mins)	10080
Summer Storms	No	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.018

Time (mins)		Area	Time (mins)		Area	Time (mins)		Area
From:	To:	(ha)	From:	To:	(ha)	From:	To:	(ha)
0	4	0.006	4	8	0.006	8	12	0.006

11 The Point
 Bradmarsh Business Park
 Rotherham, S60 1BP

4370
 9 Broom Close, Barnsley
 100y+40% CC



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Innovyze Source Control 2020.1.3

Model Details

Storage is Online Cover Level (m) 12.000

Porous Car Park Structure

Infiltration Coefficient Base (m/hr)	0.00950	Width (m)	18.0
Membrane Percolation (mm/hr)	1000	Length (m)	10.0
Max Percolation (l/s)	50.0	Slope (1:X)	0.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	11.645	Membrane Depth (m)	130