150 Holborn

DISCHARGE OF PLANNING CONDITIONS
Condition Reference 32b & 33 (Evidence of drainage)

Rev B. 15th June 2022

Planning Requirement:

Condition 32b

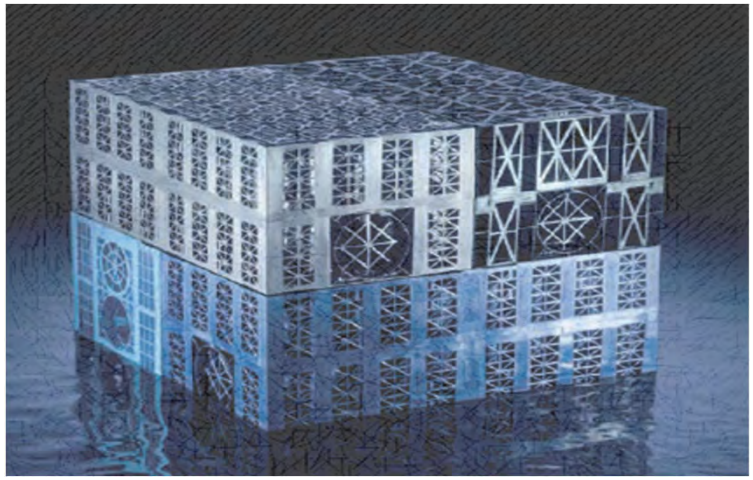
Prior to occupation of the development, evidence that the sustainable drainage system has been implemented in accordance with the approved details shall be submitted to the local planning authority and approved in writing. The systems shall thereafter be retained and maintained in accordance with the approved maintenance plan.

Reason: To reduce the rate of surface water run-off from the buildings and limit the impact on the storm-water drainage system in accordance with policies CC1, CC2 and CC3 of the Camden Local Plan June 2017.

Condition 33

Prior to occupation, evidence that the system has been implemented in accordance with the approved details required by condition 32 as part of the development shall be submitted to the Local Authority and approved in writing. The systems shall thereafter be retained and maintained in accordance with the approved maintenance plan.

Reason: To reduce the rate of surface water run-off from the buildings and limit the impact on the storm-water drainage system in accordance with policies CC1, CC2 and CC3 of the Camden Local Plan June 2017.



Development Proposals – Sustainable Urban Drainage Methods

SUDs control surface water run-off from developed sites thereby minimising flooding and other environmental damage.

Basins, ponds, filter strips and swales have been discounted due to the restricted nature of the development site and its urban location which preclude these due to the constraints they dictate. Infiltration methods have also been excluded due to the impermeable nature of the underlying London Clay. This impermeable layer would only allow a minimal infiltration rate meaning infiltration methods are impractical.

Permeable surfacing has been considered but due to the minimal ground level areas and the lack of infiltration these have been deemed impractical. It is therefore proposed that the surface water drainage system will incorporate a tanked system with attenuation tanks both below ground level, adjacent to the Fox Court basement ramp, and within the blue roofs.

The SUDS Hierarchy

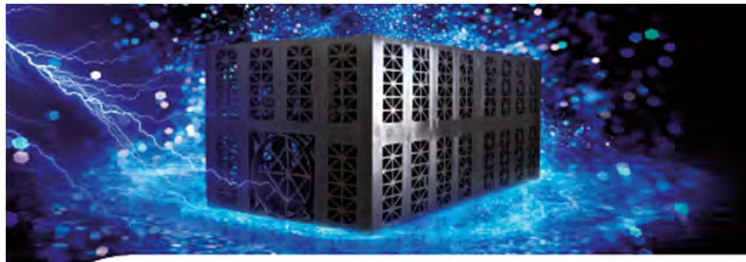
	SUDS technique	Flood Reduction	Pollution Reduction	Landscape & Wildlife Benefit
Most Sustainable	Living roofs	✔	✔	✔
	Basins and ponds - Constructed wetlands - Balancing ponds - Detention basins - Retention ponds	✔	✔	✔
	Filter strips and swales	✔	✔	✔
	Infiltration devices - soakaways - infiltration trenches and basins	✔	✔	✔
	Permeable surfaces and filter drains - gravelled areas - solid paving blocks - porous paviors	✔	✔	
Least Sustainable	Tanked systems - over-sized pipes/tanks - storms cells	✔		

Both the office and the residential building roof areas have been designed and installed with Blue roofs, which act as an attenuation system below all hard and green roof finishes. The seventh floor residential roof has been designed to support a green roof.

The blue roofs provide a means of attenuation water at source and incorporates an element of living roof and permeable paving as part of their design. As such, a SUDS compliant scheme has been implemented that fits within the constraints imposed by the development location.
An element of rainwater harvesting has also been implemented into the design and install as a secondary source for the grey water harvesting system.

On the next page we provide details and confirmation of the installed attenuation system ……

Installed Attenuation Tank



wavin

PRODUCT INFORMATION SHEET

AquaCell Core-R

Description

AquaCell Core-R has been designed for use in deep applications, subject to regular and heavy traffic loadings, e.g. cars and HGV's. AquaCell Core-R can also be used in both landscaped and deep soakaway applications.

Technical specification

Cat code	6LB150	**Void ratio**	95%
Colour	Black	**Material**	Recycled PP
Dimensions	1m x 0.5m x 0.4m	**Vertical loading**	66.9 tonnes/m² (669 kN/m²)
Weight	11.5kg	**Lateral loading**	12.3 tonnes/m² (123 kN/m²)
Storage volume	190 litres	**BBA approval**	Pending (Certificate 03/4018)

Maximum installation depths

Typical soil type	Maximum depth of installation – to base of units (m)[1]				
	Soil weight kN/m³	Angle of internal friction φ (degrees)[2, 3]	Landscaped areas	Vehicle mass <9 tonnes[4, 5]	Vehicle mass <44 tonnes
Over consolidated stiff clay	20	24	3.85	3.61	3.36
Silty sandy clay	19	26	4.35	4.09	3.83
Loose sand and gravel	18	30	5.34	5.06	4.78
Medium dense sand and gravel	19	34	5.94	5.68	5.41
Dense sand and gravel	20	38	6.68	6.43	6.18

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BBA APPROVAL INSPECTION TESTING CERTIFICATION
TECHNICAL APPROVALS FOR CONSTRUCTION

Agrément Certificate
03/4018
Product Sheet 6

WAVIN AQUACELL ATTENUATION AND INFILTRATION SYSTEMS

AQUACELL CORE-R

This Agrément Certificate Product Sheet[1] relates to AquaCell Core-R, comprising black polypropylene modular units for use either as below-ground storage tanks or as a soakaway to manage run-off from impermeable surfaces.

(1) Hereinafter referred to as 'Certificate'.

CERTIFICATION INCLUDES:

- factors relating to compliance with Building Regulations where applicable
- factors relating to additional non-regulatory information where applicable
- independently verified technical specification
- assessment criteria and technical investigations
- design considerations
- installation guidance
- regular surveillance of production
- formal three-yearly review.

KEY FACTORS ASSESSED

Hydraulic design — data is provided in this Certificate to assist in the design of a below-ground water management system using the product (see section 6).

Structural performance — the product has adequate strength and stiffness to resist short- and long-term loading when used in accordance with this Certificate (see section 7).

Maintenance — data is provided to assist in planning the maintenance of a completed system installation (see section 11).

Durability — the product will have a design life in excess of 50 years when installed in accordance with this Certificate (see section 12).

The BBA has awarded this Certificate to the company named above for the product described herein. This product has been assessed by the BBA as being fit for its intended use provided it is installed, used and maintained as set out in this Certificate.

On behalf of the British Board of Agrément

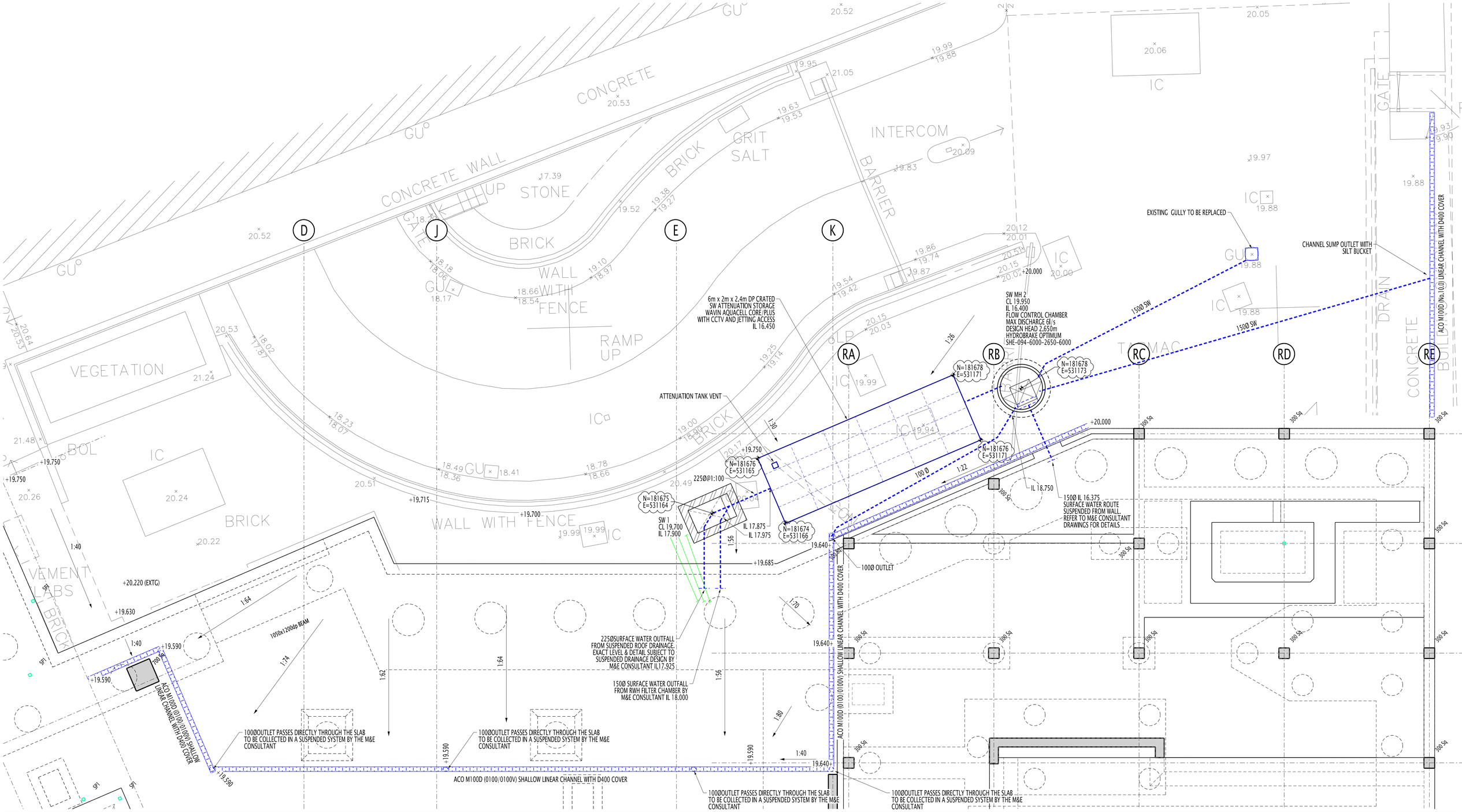
Date of First issue: 2 January 2020

Brian Moore
Director

The BBA is a UKAS accredited certification body – Number 113

SUD's Equipment Maintenance Schedule

Date Commissioned	Equipment Type	Manufacturer	Task	Frequency	Serial / Part / Model No.	Service Engineer name	Status
14/03/2020	Attenuation Tank	Aquacell AquaCell Core-R Drainage Collection System	CCTV inspection at every inspection point is recommended Silt traps prior to inlet pipework should be routinely inspected and cleaned out to minimise debris reaching the tank. It is important to prevent construction silt from entering the AquaCell structure.	After every major storm	6LB150		
18/03/2020	Hydrobrake Optimum	Hydro International	No moving parts, so no maintenance required	N/A	-		
22/09/2021	Pumps 1 & 2	New Haden Pumps Ltd	• Testing of insulation resistance • Fill level check of the seal chamber • Axial face seal must be checked for damage.	Before commissioning or after prolonged storage	ATC20D & ATP30M17/2D		
			• Check of the power input and voltage • Check of the used switchgears for resistance, sealed space control etc.	Monthly			
			• Visual inspection of the power supply leads • Visual inspection of the cable holders and the wiring • Visual inspection of accessories, such as for example suspension device, lifting devices, etc.	Every six months			
			• Monitoring the current consumption and voltage • Checking the used relays for positions, sealing room monitor, etc. • Visual inspection of the power supply cable • Visual inspection of the cable holder and the cable bracing • Visual inspection of accessories, e.g. the suspension device and hoisting gears	1,000 operating hours or after every six months, whichever is earlier			
			• Visual check for pumps with oil barrier chamber • Visual check for pumps without oil barrier chamber	3,000 operating hours			
			• Testing of insulation resistance • Operating fluid change in seal chamber • Inspection and repair, if necessary, of the coating. • Functional test of all safety and monitoring systems.	8,000 operating hours or after 2 years at the latest			
			• General factory overhaul	15,000 operating hours or after 5 years at the latest			



NOTES
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THE CONTRACTOR IS TO CHECK ALL DIMENSIONS AND EXISTING AND PROPOSED LEVELS PRIOR TO THE START OF WORKS, AND ANY ERRORS REPORTED TO THE ENGINEERS.

THIS DRAWING IS TO BE READ IN CONJUNCTION WITH THE LATEST ARCHITECTS AND STRUCTURAL ENGINEERS DRAWINGS.

NOTES

1. THE CONTRACTOR MUST CHECK THE SIZE, LOCATION AND LEVELS OF ALL DRAINAGE OUTFALLS PRIOR TO CONSTRUCTION OF ANY DRAINAGE, UNLESS OTHERWISE AGREED, TO ENSURE THE PROPOSED DESIGN MAY BE ACHIEVED.
2. ALL PRIVATE DRAINAGE WORKS TO BE IN ACCORDANCE WITH PART H OF THE CURRENT BUILDING REGULATIONS AND BS EN 752.
3. ALL ADOPTABLE DRAINAGE WORKS ARE TO BE IN ACCORDANCE WITH SEWERS FOR ADOPTION AND THE REQUIREMENTS OF THAMES WATER.
4. ALL DRAINAGE CONNECTIONS TO THE PUBLIC SEWER NETWORK ARE SUBJECT TO THE APPROVAL OF THAMES WATER UNDER SECTION 106 OF THE WATER INDUSTRY ACT AND SUBJECT TO ANY CONDITIONS THEY MAY APPLY.
5. ALL DRAINAGE CONNECTIONS TO THE PUBLIC SEWER ARE TO BE INSPECTED BY THAMES WATER AS REQUIRED.
6. ALL ADOPTABLE DRAINAGE TO BE EITHER:
   A. CONCRETE PIPES AND FITTINGS WITH FLEXIBLE JOINTS COMPLYING WITH THE RELEVANT REQUIREMENTS OF BS EN 1916 AND BS 5911.
   B. VITRIFIED CLAY PIPES AND FITTINGS WITH FLEXIBLE MECHANICAL JOINTS COMPLYING WITH THE REQUIREMENTS OF BS EN 295 AND BS 65 (SURFACE WATER ONLY).
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8. ALL DRAINAGE BENEATH BUILDINGS AND CAST INTO FOUNDATIONS TO BE DUCTILE IRON PIPES, FITTINGS AND JOINTS COMPLYING WITH THE RELEVANT PROVISIONS OF BS EN 598.
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10. ALL RWP LOCATIONS AND SIZES TO BE VERIFIED AND SET OUT BY THE ARCHITECT AND M&E CONSULTANT.
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15. WHERE FOUL, SURFACE WATER OR OTHER DRAINAGE PIPES CROSS AND THERE IS LESS THAN 100MM OF CLEARANCE SHORT LENGTHS OF BOTH RUNS ARE TO BE ENCASED IN CONCRETE.
16. FOR MANHOLE SCHEDULES REFER TO CNM DRAWING 150-CNM-Z3-00-DR-P-1013
17. FOR CONSTRUCTION DETAILS REFER TO CNM DRAWINGS 150-CNM-Z3-00-DR-P-1010 & 1012

NOTE-
THE SURFACE WATER DRAINAGE SYSTEM IS DESIGNED TO SPECIFICALLY USE SPECIFIED FLOW CONTROL DEVICE. ANY CHANGE WILL REQUIRE A DESIGN CHECK AND POTENTIAL INCREASE IN ATTENUATION VOLUME.

Rev	Revision Note	Date	Drawn By	Checked By
C01	ISSUED FOR CONSTRUCTION	06.03.19	J.V	MDF
P2.1	ISSUED FOR STAGE 4	13.07.18	DTE	MLS

Contract
150 HOLBORN

PROPOSED
GROUND FLOOR
DRAINAGE LAYOUT

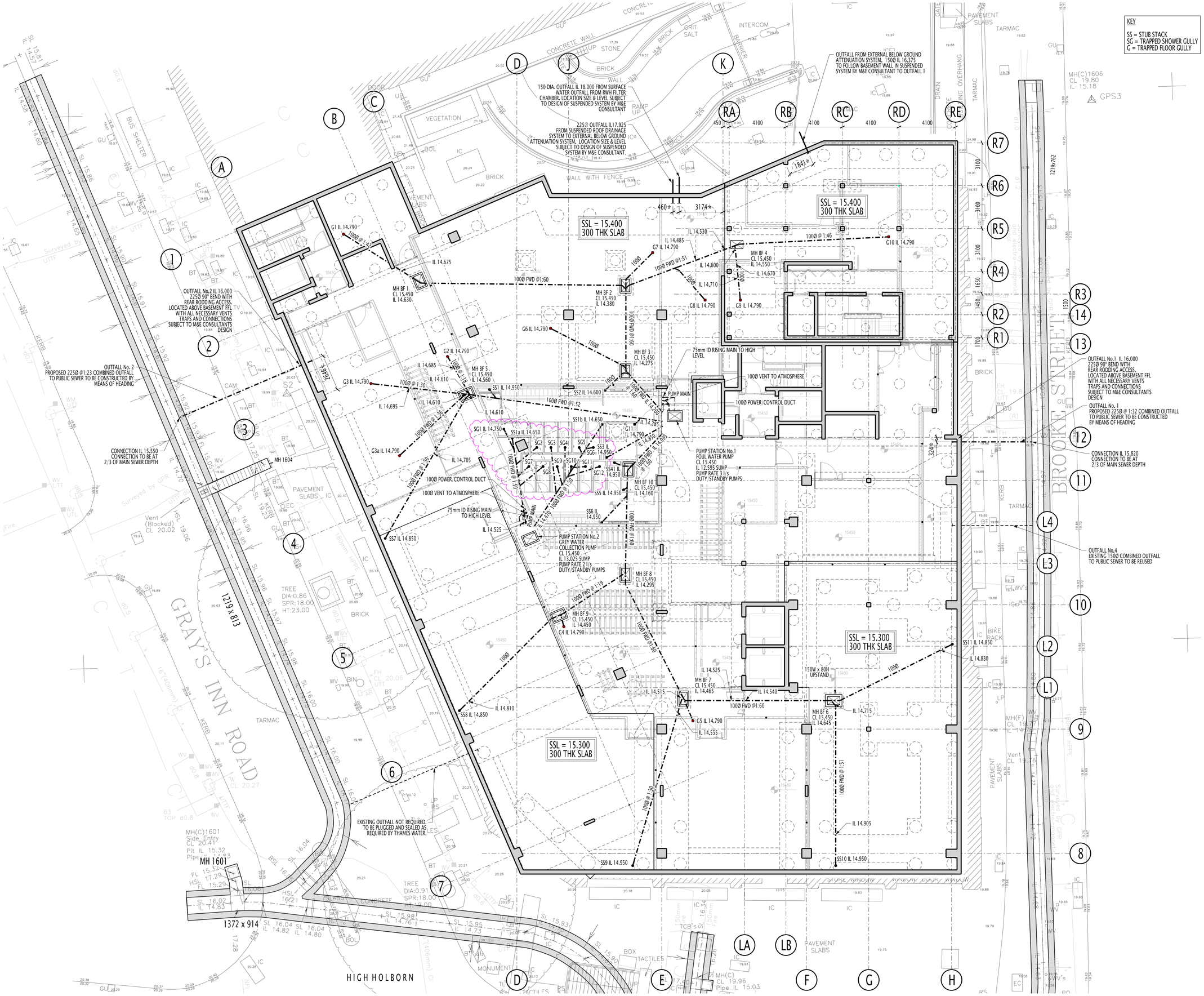
Architect
PERKINS + WILL

cnm Clarke Nicholls Marcel
CIVIL & STRUCTURAL ENGINEERS
Glen House, 22-24 Glenthorne Road
Hammersmith, London W6 0NG
t 020 8748 8611
f 020 8741 8171
www.clarkenichollsmarcel.com

Drawing Status	CONSTRUCTION		CDE Code A
Drawn By	DTE	Checked By	MDF
Date	1036010	Scale @ A1	1:50

Drawing No.
150-CNM-Z0-00-DR-P-1002

C01



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17. FOR CONSTRUCTION DETAILS REFER TO CNM DRAWING 150-CNM-ZO-ZZ-DR-P-1012
18. FOR SETTING OUT OF DRAINAGE POINTS REFER TO CNM DRAWING 150-CNM-ZO-B1-DR-P-1003

SETTING OUT OF DRAINAGE PENETRATIONS THROUGH WALLS TO BE CONFIRMED UPON RECEIPT OF ABOVE GROUND DRAINAGE DESIGN FROM M&E DESIGN CONSULTANT

Rev	Revision Note	Revision Date	Drawn By	Checked By
C05	SHOWER GULLY LOCATIONS UPDATED	24.12.19	J.V	MDF
C04	INVERT LEVELS UPDATED AND NOTE ADDED.	23.10.19	J.V	MDF
C03	FW DRAIN RUN AMENDED	04.10.19	DTE	MDF
C02	PUMP STATION VENT PIPE/ RISING MAIN/POWER DUCT LOCATION AMENDED TO MISS FOUNDATIONS	09.04.19	J.V	MDF
C01	ISSUED FOR CONSTRUCTION	06.03.19	J.V	MDF

Contract

150 HOLBORN

PROPOSED BASEMENT DRAINAGE LAYOUT

Architect

PERKINS + WILL

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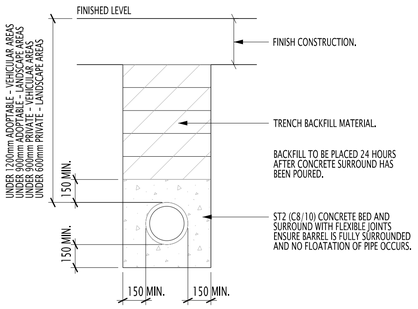
CDE Status	CONSTRUCTION	CDE Code
		A
Drawn By: DTE	Checked By: MLS	
Project: 1036010	Scale @ A1: 1:125	

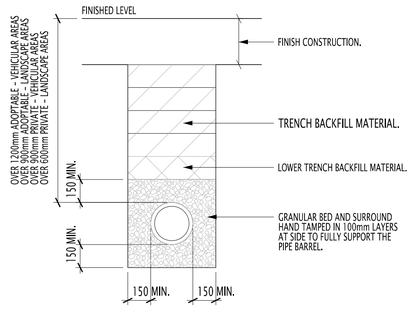
Drawing No.

150-CNM-ZO-B1-DR-P-1001

C01 C02 C03 C04 C05



CLASS Z



CLASS S

TYPICAL PIPE BEDDING DETAILS

TRENCH BACKFILL MATERIAL

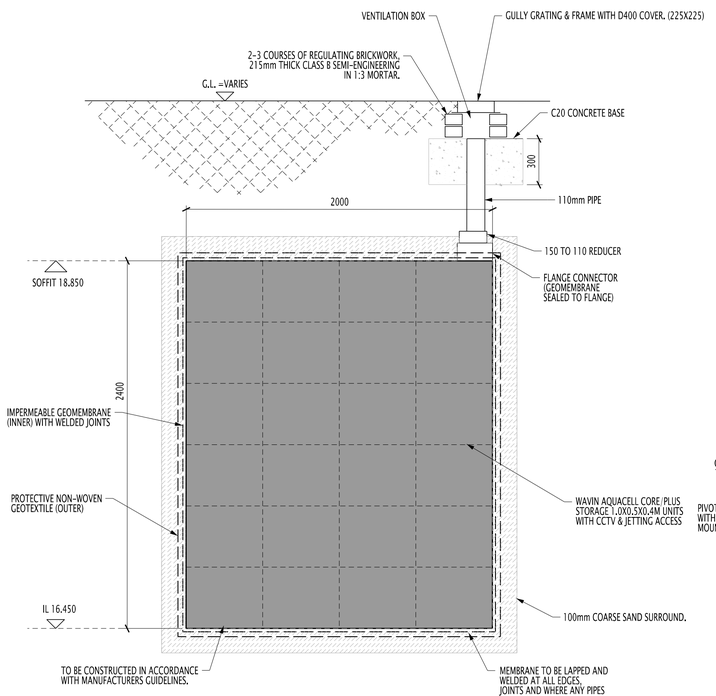
WELL COMPACTED SELECTED FILL MATERIAL (150mm LAYERS) FREE FROM STONES AND LUMPS OF CLAY RETAINED ON A 40MM SIEVE AND FREE FROM TIMBER, ORGANIC MATTER, FROZEN MATERIAL AND ALL OTHER DELETERIOUS MATERIALS. COMPLIANT WITH CLASS 1, 2 OR 3 MATERIAL TO TABLE 6/1 OF THE SPECIFICATION FOR HIGHWAY WORKS VOLUME 1 SERIES 600 TABLE 6/1 AND COMPACTED IN ACCORDANCE WITH TABLE 6/4 AND CLAUSE 612. ALTERNATIVELY CLASS 6F1 OR 6F2 MAY BE UTILISED.

LOWER TRENCH BACKFILL MATERIAL

150MM OF LIGHTLY COMPACTED SELECTED FILL MATERIAL FREE FROM STONES AND LUMPS OF CLAY RETAINED ON A 40MM SIEVE AND FREE FROM TIMBER, ORGANIC MATTER, FROZEN MATERIAL AND ALL OTHER DELETERIOUS MATERIALS. COMPLIANT WITH CLASS 8 MATERIAL TO TABLE 6/1 OF THE SPECIFICATION FOR HIGHWAY WORKS VOLUME 1 SERIES 600 TABLE 6/1 AND COMPACTED BY HAND.

GRANULAR BED AND SURROUND MATERIAL

	GRANULAR MATERIAL SIZE	
PIPE SIZE (mm)	SINGLE SIZE (mm)	COARSE GRADED (mm)
100/110	10	N/A
150/160	10 or 14	14/5
161 to 300	10 or 14 or 20	14/5 or 20/5
301 to 550	14 or 20	14/5 or 20/5
ABOVE 551	14 or 20 or 40	14/5 or 20/5 or 40/5



BACKFILL SPECIFICATION

NON TRAFFICKED AREAS: CAN BE BACKFILLED WITH SELECTED DUG MATERIAL FREE FROM SHARP MATERIALS OR GRAVEL ABOVE 75MM DIAMETER. TO BE COMPACTED TO 90% MAXIMUM DRY DENSITY.
A MINIMUM OF 300MM WORKING SPACE WILL BE REQUIRED AROUND THE UNITS TO ALLOW COMPACTION.

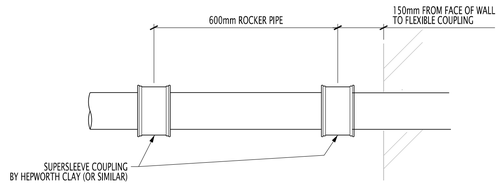
TRAFFICKED AREAS: TO BE BACKFILLED WITH TYPE 1 OR TYPE 2 MATERIAL AS DEFINED IN THE SPECIFICATION FOR HIGHWAY WORKS TABLE 6/1 OR 8/1 AND TAKING INTO ACCOUNT THE RECOMMENDED MAXIMUM ROLLER WEIGHT.

NOTES

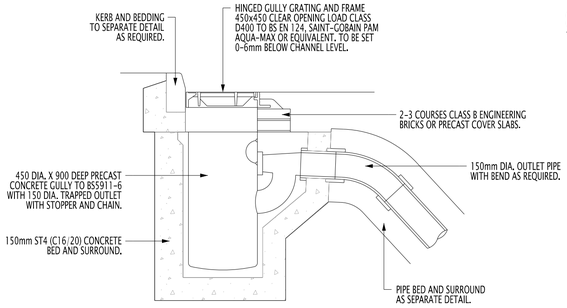
300G PROTECTIVE NON-WOVEN GEOTEXTILE SUITABLE IN MOST SITUATIONS, WHERE SOILS EXHIBIT A HIGH DEGREE OF FINES OR CONTAMINATION CONTRACTOR SHOULD SEEK FURTHER ADVICE.

THE USE OF A ROBUST GEOMEMBRANE NO LESS THAN 1MM IN THICKNESS IS RECOMMENDED TO ENSURE THE INTEGRITY OF THE UNITS.

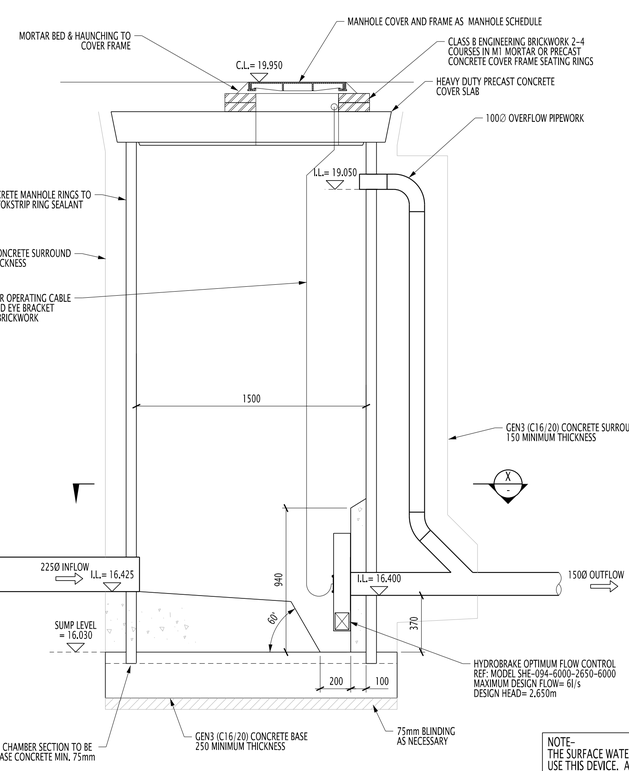
ATTENUATION TANK DETAIL



TYPICAL ROCKER PIPE DETAIL

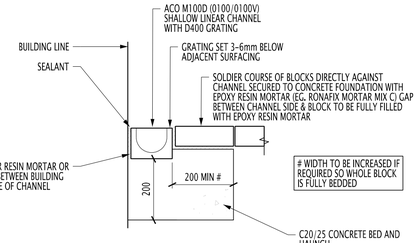


ROAD GULLY DETAIL



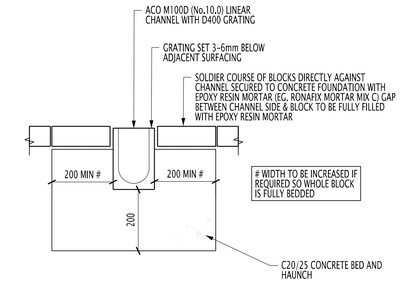
SECTION THROUGH HYDROBRAKE MANHOLE

ALTERNATIVELY PRECAST HUDROBRAKE CHAMBER MAY BE UTILISED



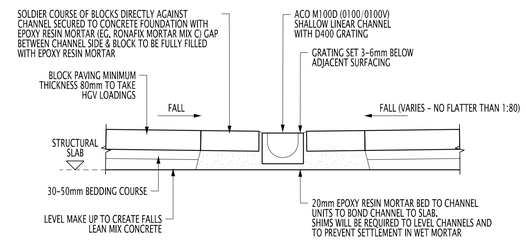
CHANNEL DRAIN AGAINST BUILDING

SCALE 1:10



CHANNEL DRAIN ACROSS ENTRANCE

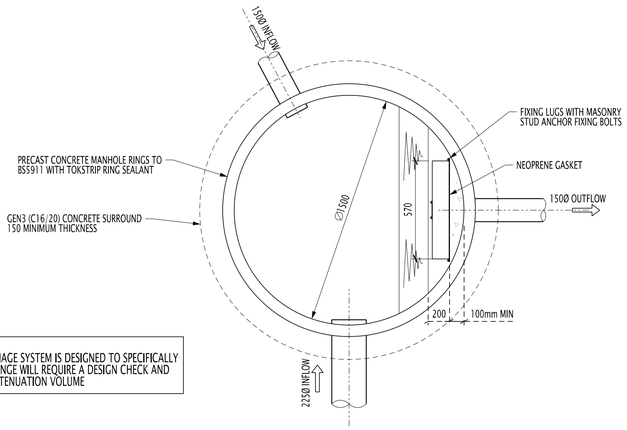
SCALE 1:10



LINEAR CHANNEL DETAIL OVER BASEMENT

SCALE 1:10

NOTE-
THE SURFACE WATER DRAINAGE SYSTEM IS DESIGNED TO SPECIFICALLY USE THIS DEVICE. ANY CHANGE WILL REQUIRE A DESIGN CHECK AND POTENTIAL INCREASE IN ATTENUATION VOLUME



SECTION X HYDROBRAKE MANHOLE

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THIS DRAWING IS TO BE READ IN CONJUNCTION WITH THE LATEST ARCHITECTS AND STRUCTURAL ENGINEERS DRAWINGS.

NOTES

1. THE CONTRACTOR MUST CHECK THE SIZE, LOCATION AND LEVELS OF ALL DRAINAGE OUTFALLS PRIOR TO CONSTRUCTION OF ANY DRAINAGE, UNLESS OTHERWISE AGREED, TO ENSURE THE PROPOSED DESIGN MAY BE ACHIEVED.
2. ALL PRIVATE DRAINAGE WORKS TO BE IN ACCORDANCE WITH PART H OF THE CURRENT BUILDING REGULATIONS AND BS EN 752.
3. ALL ADOPTABLE DRAINAGE WORKS ARE TO BE IN ACCORDANCE WITH SEWERS FOR ADOPTION AND THE REQUIREMENTS OF THAMES WATER.
4. ALL DRAINAGE CONNECTIONS TO THE PUBLIC SEWER NETWORK ARE SUBJECT TO THE APPROVAL OF THAMES WATER UNDER SECTION 106 OF THE WATER INDUSTRY ACT AND SUBJECT TO ANY CONDITIONS THEY MAY APPLY.
5. ALL DRAINAGE CONNECTIONS TO THE PUBLIC SEWER ARE TO BE INSPECTED BY THAMES WATER AS REQUIRED.
6. ALL ADOPTABLE DRAINAGE TO BE EITHER:
   A. CONCRETE PIPES AND FITTINGS WITH FLEXIBLE JOINTS COMPLYING WITH THE RELEVANT REQUIREMENTS OF BS EN 1916 AND BS 5911.
   B. VITRIFIED CLAY PIPES AND FITTINGS WITH FLEXIBLE MECHANICAL JOINTS COMPLYING WITH THE REQUIREMENTS OF BS EN 295 AND BS 65 (SURFACE WATER ONLY).
   C. DUCTILE IRON PIPES, FITTINGS AND JOINTS COMPLYING WITH THE RELEVANT PROVISIONS OF BS EN 598.
7. ALL PRIVATE DRAINAGE TO BE EITHER:
   A. CONCRETE PIPES AND FITTINGS WITH FLEXIBLE JOINTS COMPLYING WITH THE RELEVANT REQUIREMENTS OF BS EN 1916 AND BS 5911.
   B. VITRIFIED CLAY PIPES AND FITTINGS WITH FLEXIBLE MECHANICAL JOINTS COMPLYING WITH THE REQUIREMENTS OF BS EN 295 AND BS 65 (SURFACE WATER ONLY).
   C. DUCTILE IRON PIPES, FITTINGS AND JOINTS COMPLYING WITH THE RELEVANT PROVISIONS OF BS EN 598.
   D. UNPLASTICISED PVC PIPES, JOINTS AND FITTINGS COMPLYING WITH THE RELEVANT CLAUSES OF BS 4460 AND BS EN 1401-1.
8. ALL DRAINAGE BENEATH BUILDINGS AND CAST INTO FOUNDATIONS TO BE DUCTILE IRON PIPES, FITTINGS AND JOINTS COMPLYING WITH THE RELEVANT PROVISIONS OF BS EN 598.
9. TRANSITION IN PIPE MATERIALS TO BE MADE AT NEAREST CHAMBER OR ROCKER PIPE WHERE IT PASSES THROUGH FOUNDATIONS.
10. ALL RWP LOCATIONS AND SIZES TO BE VERIFIED AND SET OUT BY THE ARCHITECT AND M&E CONSULTANT.
11. ALL FOUL DRAINAGE 'POP-UP' LOCATIONS AND SIZES TO BE VERIFIED AND SET OUT BY THE ARCHITECT AND M&E CONSULTANT.
12. ALL FOUL GULLY LOCATIONS AND SIZES TO BE VERIFIED AND SET OUT BY THE ARCHITECT AND M&E CONSULTANT.
13. ALL FOUL DRAINAGE FLOW RATES ARE TO BE PROVIDED BY THE M&E CONSULTANT TO VERIFY SIZE OF BELOW GROUND DRAINAGE.
14. WHERE DRAINAGE LATERALS CONNECT DIRECT TO THE BELOW GROUND SYSTEM VIA PREFORMED JUNCTIONS RODDING ACCESS IS TO BE PROVIDED. THIS IS TO BE VIA REMOVABLE TRAPS IN GULLIES OR ACCESS PIPES IN VERTICAL PIPEWORK ABOVE GROUND.
15. WHERE FOUL, SURFACE WATER OR OTHER DRAINAGE PIPES CROSS AND THERE IS LESS THAN 100MM OF CLEARANCE SHORT LENGTHS OF BOTH RUNS ARE TO BE ENCASED IN CONCRETE.
16. FOR MANHOLE SCHEDULES REFER TO CNM DRAWING 150-CNM-Z3-00-DR-P-1013

Rev	Revision Note	Revision Date	Drawn By	Checked By
C01	ISSUED FOR CONSTRUCTION	06.03.19	JJV	MDF
P2.1	ISSUED FOR STAGE 4	13.07.18	DTE	MLS
P1.01	ISSUED FOR STAGE 3	08.09.17	DTE	MLS
P1	PRELIMINARY STAGE 3 - ISSUED FOR COSTING	16.09.16	DTE	MLS

Contract

150 HOLBORN

TYPICAL GROUND LEVEL DRAINAGE DETAILS

Architect

PERKINS + WILL

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CDE Status	CONSTRUCTION	CDE Code
		A
Drawn By	DTE	Checked By MLS
Project	1036010	Scale @ A1 1:20

Drawing No.

150-CNM-Z0-ZZ-DR-P-1010

P1 | P1.01 | P2.1 | C01


Nestlé
Pure Life
GLB150


LEISTER


Water
Management


Nestlé
Pure Life
GLB150


LEISTER


Water
Management

Surface Water Drainage

The surface water drainage system is designed for a 1:100 year return storm event with a 40% increase in peak rainfall intensity to allow for the predicted effects of climate change. The surface water drainage is designed to comply with the Essential Standard of the Mayor's London Plan to attenuate the developed site to 50% of the predevelopment run-off. This is reasonable as the site was previously fully developed and drained all its surface water to sewer.

The existing surface water runoff flow rate has been calculated at 35.0l/s using the Modified Rational Method, based on a site area of 2850m^2 and a rainfall intensity of 50mm/hr.

In order to meet the essential standard of the Mayor's London Plan, the flow rate will be reduced by just over 50% to a maximum discharge rate of 17.0l/s from the site into the existing public combined sewer network. This requires on site attenuation to accommodate the excess flow until it can discharge at the reduced rate.

A surface water drainage strategy has been developed to deal with the surface water generated by the design rainfall events such that it discharges to the public sewer in a controlled manner.

This takes the following form;

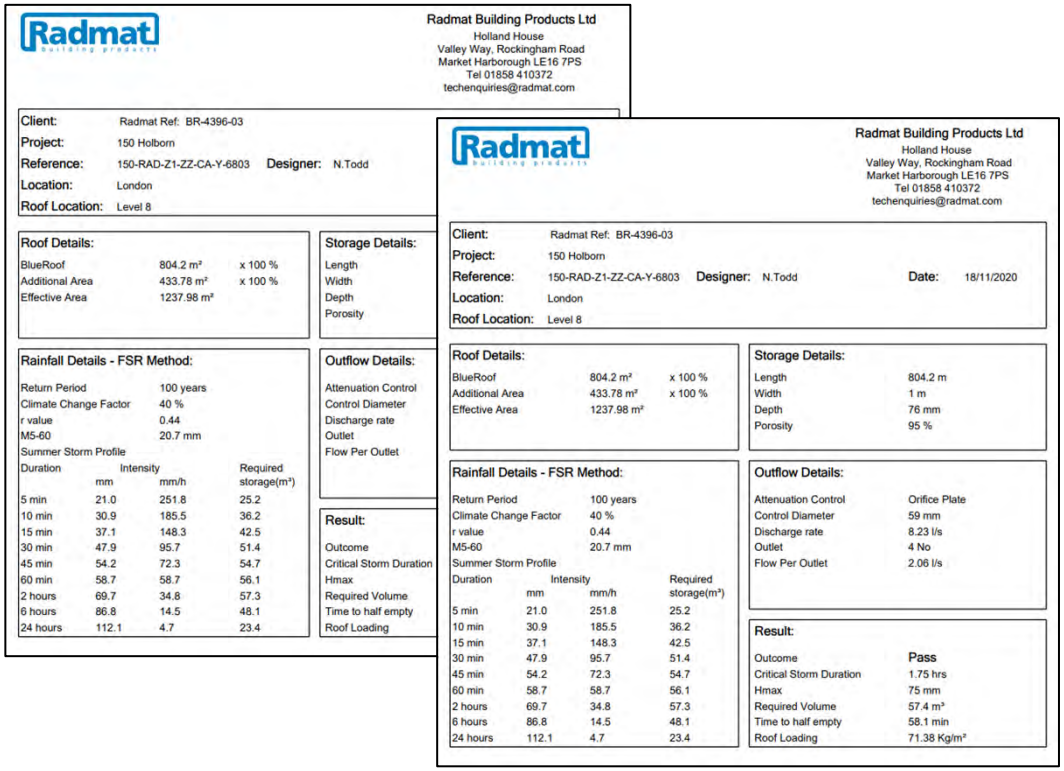
- Underground Attenuation tank has a discharge rate o 6.0l/s
- The eighth floor terrace is a blue roof with a maximum 76mm deep attenuation zone and a maximum discharge rate of 8.23l/s. The roof over the access core area will also drain to the eighth floor terrace.
- The sixth floor commercial terrace is also a blue roof with a maximum 50mm deep attenuation zone and a maximum discharge rate of 1.95l/s.
- The seventh floor residential roof area is a blue roof with a maximum 50mm deep attenuation layer and a maximum discharge rate of 0.79l/s.
- Total Discharge rate is 16.97 l/s, therefore within 17.0 l/s

SWB/SWG Geocells provide attenuation as part of a Blue Roof system that is designed to manage and control incident rainfall at a rate in line with the SuDS strategy or the attenuation requirements for a development.

All other roof, terrace and ground floor areas will drain via a system suspended within the basement to the externally located attenuation tank with a maximum discharge rate of 6.0l/s. This will give a compliant maximum discharge rate.

The below ground drainage system has been modelled to ensure that the site drainage network complies with the above requirements for all design rainfall events. The final discharge rate is subject to the approval of the Lead Local Flood Authority (i.e. London Borough of Camden) and is enforced by the planning process. The LLFA's Surface Water Drainage Proforma has been completed and submitted based on an earlier proposal. The final discharge rate and main principles remain unchanged.

The volumes required have been calculated using Microdrainage software and the Radmat blue roof calculations, the specialist blue roof supplier, as detailed on the next two pages, including photos evidence on the install.



Radmat

Radmat Building Products Ltd
Holland House
Valley Way, Rockingham Road
Market Harborough LE16 7PS
Tel 01858 410372
techenquiries@radmat.com

Client: Radmat Ref: BR-4396-03
Project: 150 Holborn
Reference: 150-RAD-Z1-ZZ-CA-Y-6803 Designer: N.Todd
Location: London
Roof Location: Level 8

Roof Details:

BlueRoof	804.2 m²	x 100 %
Additional Area	433.78 m²	x 100 %
Effective Area	1237.98 m²	

Storage Details:

Length	
Width	
Depth	
Porosity	

Rainfall Details - FSR Method:

Return Period	100 years
Climate Change Factor	40 %
r value	0.44
M5-60	20.7 mm

Summer Storm Profile

Duration	Intensity mm	Intensity mm/h	Required storage(m³)
5 min	21.0	251.8	25.2
10 min	30.9	185.5	36.2
15 min	37.1	148.3	42.5
30 min	47.9	95.7	51.4
45 min	54.2	72.3	54.7
60 min	58.7	58.7	56.1
2 hours	69.7	34.8	57.3
6 hours	86.8	14.5	48.1
24 hours	112.1	4.7	23.4

Outflow Details:

Attenuation Control	
Control Diameter	
Discharge rate	
Outlet	
Flow Per Outlet	

Result:

Outcome	
Critical Storm Duration	
Hmax	
Required Volume	
Time to half empty	
Roof Loading	

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Client: Radmat Ref: BR-4396-03
Project: 150 Holborn
Reference: 150-RAD-Z1-ZZ-CA-Y-6803 Designer: N.Todd Date: 18/11/2020
Location: London
Roof Location: Level 8

Roof Details:

BlueRoof	804.2 m²	x 100 %
Additional Area	433.78 m²	x 100 %
Effective Area	1237.98 m²	

Storage Details:

Length	804.2 m
Width	1 m
Depth	76 mm
Porosity	95 %

Rainfall Details - FSR Method:

Return Period	100 years
Climate Change Factor	40 %
r value	0.44
M5-60	20.7 mm

Summer Storm Profile

Duration	Intensity mm	Intensity mm/h	Required storage(m³)
5 min	21.0	251.8	25.2
10 min	30.9	185.5	36.2
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2 hours	69.7	34.8	57.3
6 hours	86.8	14.5	48.1
24 hours	112.1	4.7	23.4

Outflow Details:

Attenuation Control	Orifice Plate
Control Diameter	59 mm
Discharge rate	8.23 l/s
Outlet	4 No
Flow Per Outlet	2.06 l/s

Result:

Outcome	Pass
Critical Storm Duration	1.75 hrs
Hmax	75 mm
Required Volume	57.4 m³
Time to half empty	58.1 min
Roof Loading	71.38 Kg/m²

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Client:	Radmat Ref: BR-4396-04				
Project:	150 Holborn				
Reference:	150-RAD-Z1-ZZ-CA-Y-6803	Designer:	N.Todd	Date:	02/09/2021
Location:	London				
Roof Location:	Level 8				

Roof Details:

BlueRoof	804.2 m²	x 100 %
Additional Area	433.78 m²	x 100 %
Effective Area	1237.98 m²	

Storage Details:

Length	804.2 m
Width	1 m
Depth	76 mm
Porosity	95 %

Rainfall Details - FSR Method:

Return Period	100 years
Climate Change Factor	40 %
r value	0.44
M5-60	20.7 mm

Summer Storm Profile

Duration	Intensity mm	mm/h	Required storage(m³)
5 min	21.0	251.8	25.2
10 min	30.9	185.5	36.2
15 min	37.1	148.3	42.5
30 min	47.9	95.7	51.4
45 min	54.2	72.3	54.7
60 min	58.7	58.7	56.1
2 hours	69.7	34.8	57.3
6 hours	86.8	14.5	48.1
24 hours	112.1	4.7	23.4

Outflow Details:

Attenuation Control	Orifice Plate
Control Diameter	59 mm
Discharge rate	8.23 l/s
Outlet	4 No
Flow Per Outlet	2.06 l/s

Result:

Outcome	Pass
Critical Storm Duration	1.75 hrs
Hmax	75 mm
Required Volume	57.4 m³
Time to half empty	58.1 min
Roof Loading	71.38 Kg/m²

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Client:	Radmat Ref: BR-4396-04				
Project:	150 Holborn				
Reference:	150-RAD-Z1-ZZ-CA-Y-6803	Designer:	N.Todd	Date:	02/09/2021
Location:	London				
Roof Location:	Level 6				

Roof Details:

BlueRoof	185.72 m²	x 100 %
Additional Area	23.08 m²	x 100 %
Effective Area	208.8 m²	

Storage Details:

Length	185.72 m
Width	1 m
Depth	50 mm
Porosity	95 %

Rainfall Details - FSR Method:

Return Period	100 years
Climate Change Factor	40 %
r value	0.44
M5-60	20.7 mm

Summer Storm Profile

Duration	Intensity mm	mm/h	Required storage(m³)
5 min	21.0	251.8	4.2
10 min	30.9	185.5	6.0
15 min	37.1	148.3	6.9
30 min	47.9	95.7	8.1
45 min	54.2	72.3	8.5
60 min	58.7	58.7	8.7
2 hours	69.7	34.8	8.6
6 hours	86.8	14.5	6.5
24 hours	112.1	4.7	3.2

Outflow Details:

Attenuation Control	Orifice Plate
Control Diameter	45 mm
Discharge rate	1.95 l/s
Outlet	2 No
Flow Per Outlet	0.97 l/s

Result:

Outcome	Pass
Critical Storm Duration	1.35 hrs
Hmax	50 mm
Required Volume	8.8 m³
Time to half empty	37.5 min
Roof Loading	47.38 Kg/m²

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Client:	Radmat Ref: BR-4396-04				
Project:	150 Holborn				
Reference:	150-RAD-Z1-ZZ-CA-Y-6803	Designer:	N.Todd	Date:	02/09/2021
Location:	London				
Roof Location:	Residential				

Roof Details:

BlueRoof	113 m²	x 100 %
Additional Area	0 m²	x 100 %
Effective Area	113 m²	

Storage Details:

Length	113 m
Width	1 m
Depth	100 mm
Porosity	95 %

Rainfall Details - FSR Method:

Return Period	100 years
Climate Change Factor	40 %
r value	0.44
M5-60	20.7 mm

Summer Storm Profile

Duration	Intensity mm	mm/h	Required storage(m³)
5 min	21.0	251.8	2.3
10 min	30.9	185.5	3.3
15 min	37.1	148.3	3.8
30 min	47.9	95.7	4.6
45 min	54.2	72.3	4.9
60 min	58.7	58.7	5.0
2 hours	69.7	34.8	5.1
6 hours	86.8	14.5	4.1
24 hours	112.1	4.7	1.8

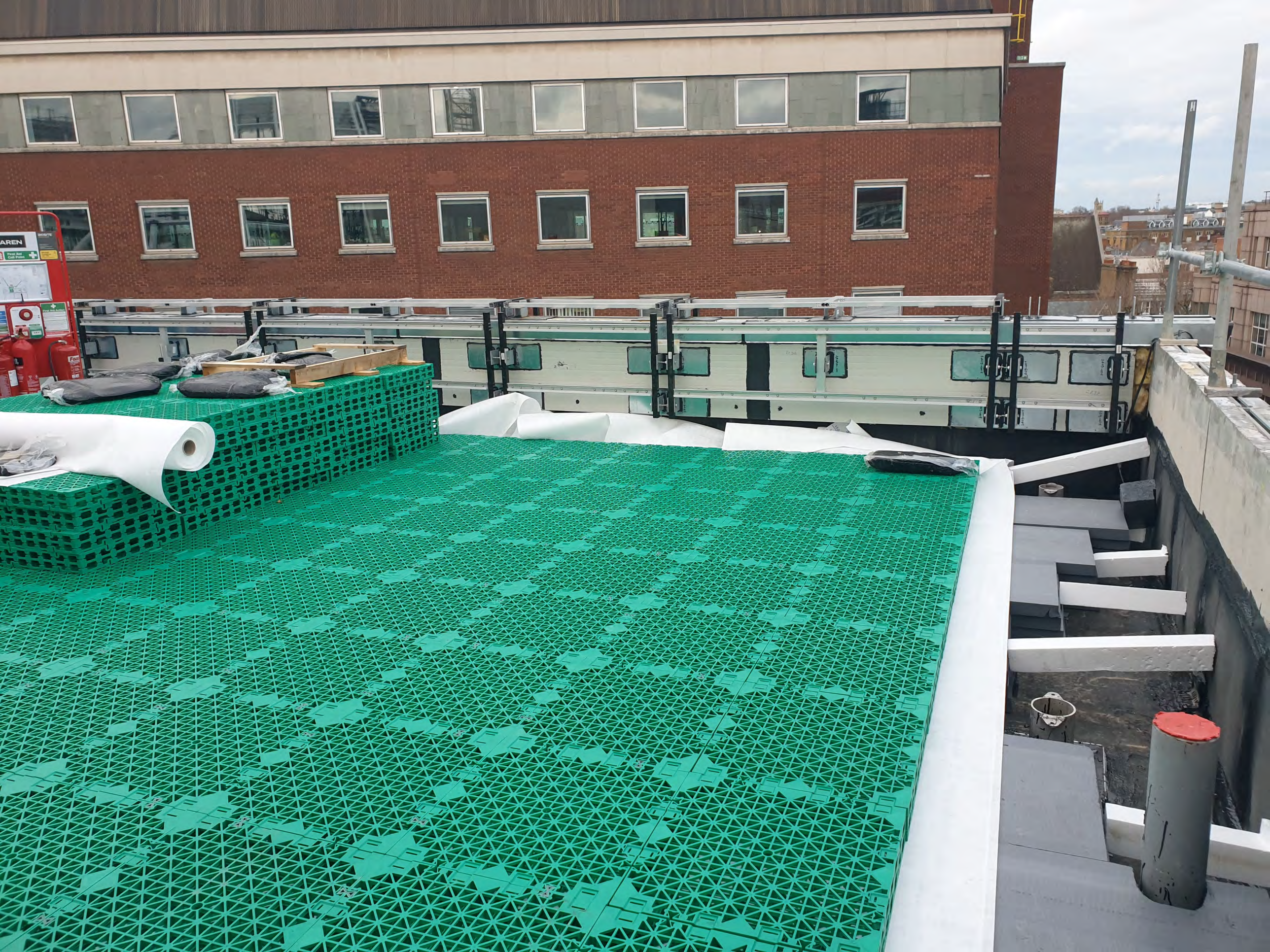
Outflow Details:

Attenuation Control	Orifice Plate
Control Diameter	29 mm
Discharge rate	0.79 l/s
Outlet	2 No
Flow Per Outlet	0.4 l/s

Result:

Outcome	Pass
Critical Storm Duration	1.58 hrs
Hmax	47 mm
Required Volume	5.1 m³
Time to half empty	53.7 min
Roof Loading	45.13 Kg/m²


Radmat
McLAREN
Fire Point
First Aid Call Point
BIOSITE



Grey Water Drainage

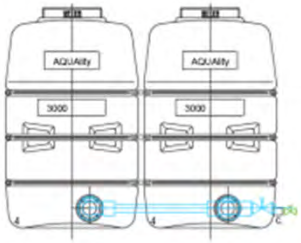
The office grey water drainage at ground floor and above is collected into a suspended system at high level within the basement and connected to the harvesting system, located in the basement north-western core area.

The grey water collection drainage from the showers in the basement are served by a separate system with the installation of a separate pumping station. The system will pump to high level and connect to the suspended grey water system.

Similar to the basement foul water system, the pumping station is designed to provide 24 hours storage of inflow in the event of a total failure in accordance with Building Regulations.

PE Non-potable water storage tanks

Item Nos: G12116, G12117, G12118, G12119, G12120, G12121



two 3,000l tanks with interconnection and suction nozzle (c.)

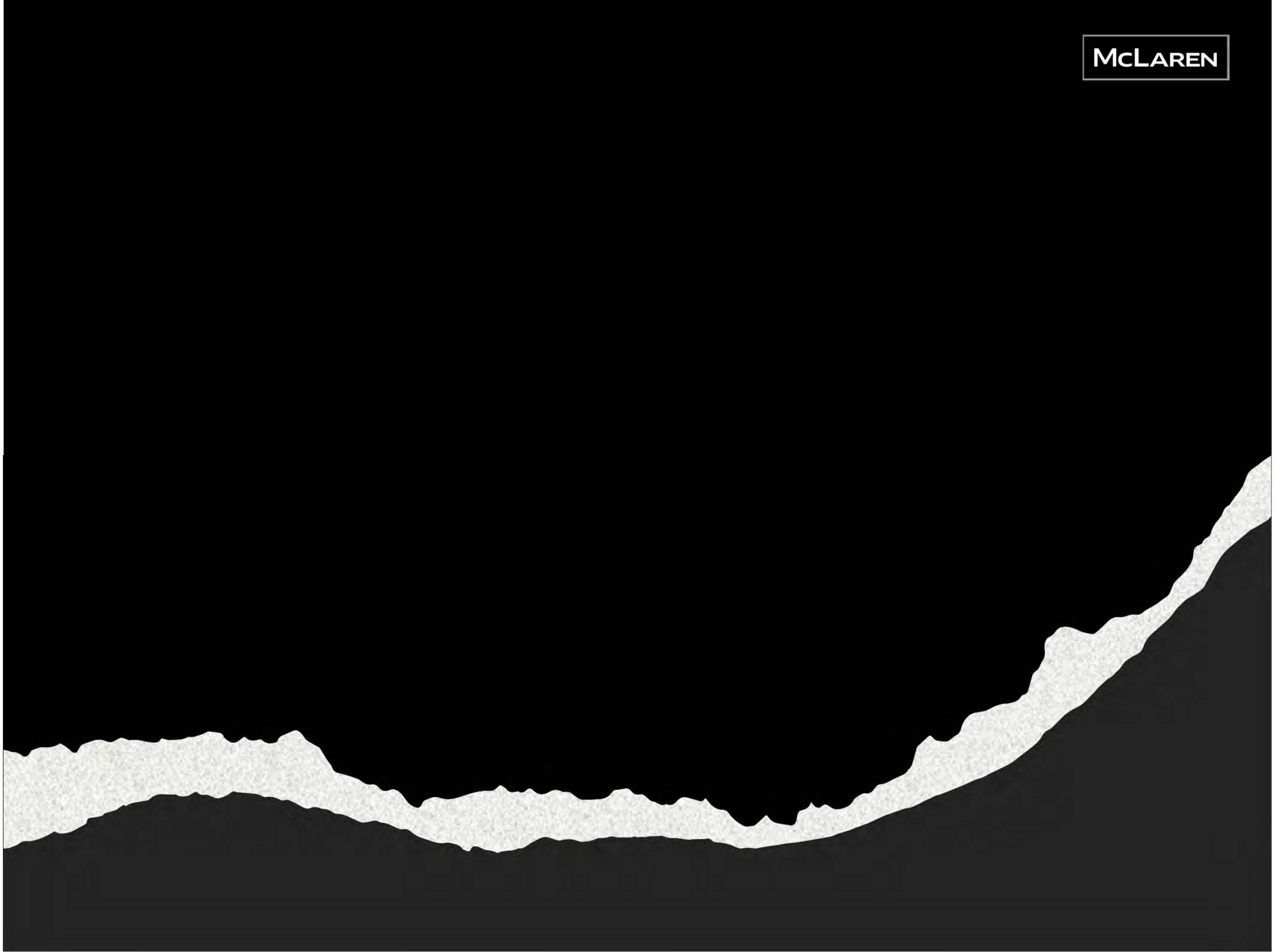
battery of tanks, separately lockable (optional)

Typical applications:

- As modular **rainwater** or **greywater buffer** or **combined non-potable water** storage tanks in plant rooms or outdoors above ground
- As mains water top-up break tanks with AA-type air gap

Features:

- Black opaque PE material prevents algae growth
- Highly flexible modular design for use as single tanks or interconnected in rows.
- Calmed inlets, overflow siphons and other lips seals, nozzles, sensor connections etc. can be ready prepared on manufacture for easy deployment on site
- Easy transportation with handles
- Standard inspection manhole 400mm
- Plug-in connections and push-in fittings
- Bottom flange connection for connecting tanks or connecting suction pipes


McLaren