DRAINAGE REPORT

flow
DRAINAGE DESIGN
t: 07837 685280
e: info@flowdrainagedesign.co.uk
w: www.flowdrainagedesign.co.uk

Project: 1 Eastfield Road

Made by:	Date:	Project No:	Checked by:	Approved by:	Pages	Rev
M Taylor	06/02/24	2407		MT	3	

Item	Details and Design Rationale	References and output
Overview	It is proposed to extend the existing house on the site and convert the whole into flats. Surface water flows from new developments should be dealt with in the following order of preference: 1. Soakaways (infiltration drainage), 2. Discharge to a water course, 3. Discharge to a sewer. Details of the proposed drainage system for approval are contained in this report and the attached calculations and drawings. Infiltration tests carried out in January 24 found the subsoil at the site to be a clayey sand and infiltration tests were too slow to provide useable infiltration rates. The subsoil is effectively impermeable. Currently 50% of the roof discharges to the onsite combined sewer. To ensure a sustainable approach the system will adopt attenuated drainage for the new impermeable areas, with discharge limited to the pre-development rate. Surface water flows will be directed to the on-site combined sewer via a flow control chamber and associated attenuation storage. Attenuation storage is provided by a geocellular tank under a the rear courtyard. Designs are based on the design standards published within NPPF i.e. 100 year return period, with an appropriate allowance for future climate change, currently set at 40% for developments with an estimated lifespan of 100 years.	

Calculations	The existing roof discharging to the combined sewer has an area of 37.7m2. Design flows for underground drainage are based on a rainfall intensity of 50mm per hour (building regs Part H) giving a pre-development discharge rate of: 37.7 x 0.05 = 1.88m3 per hour x 1000 = 1880 litres per hour. 1880 / 3600 = 0.52 litres per second A maximum discharge rate of 0.5 l/s is proposed to ensure a safe and durable system with flows no greater than pre-development rates. The new roof area discharging to the combined sewer has an area of 92.2m2. Storage of excess flows is provided in a geocellular tank below the rear courtyard to accommodate all storms up to the 100 yr +40% climate change event. The attached calculation sheets indicate what volume of storage is required and how it will be provided. To summarise: Impermeable area = 92.2m^2 Volume of storage required = 3.44m^3 Stored Volume: Tank: 4.0 x 2.0 x 0.4 x 95% (void) = 3.04m^3 Control Chamber: 0.6 x 0.6 x 1.1 = 0.4m^3 TOTAL = 3.44m^3 Flow control: 15mm diameter orifice Please refer to the attached calculation sheets for further details.	

Conclusion	New impermeable area will be 92.2m2. Discharge rate to the onsite combined sewer will be restricted to 0.5l/s, the pre-development rate. The proposed drainage systems will accommodate all flows up to the 100 year event (all durations), plus a 40% allowance for climate change, in line with the design parameters stated in NPPF. Flow control is by way of an orifice control system, with excess flows stored in an attenuation tank below the rear courtyard.	

Enclosures:
Calculations and drawings:

- Storage Volume Required Calculation
- Storage Volume Provided & Orifice Diameter Calculation
- Drawing 2407/01 – Drainage Layout and Details

Flow Drainage Design
info@flowdrainagedesign.co.uk
Tel: 07837685280

Eastfield Road		Revision	
Job No:	**2407**	Page:	**C/01**
Section: **Attenuation Volume Calculation**	Prepared By:	**MT**	Date: **06/02/2024**

GENERAL DATA	
site location:	**England and Wales**
60 min rainfall depth of 5 year return period 'R' *[mm]* =	**20**
M5-60 to M5-2d rainfall ratio 'r' =	**0.40**
proposed discharge rate 'v_1' *[litre/s]* =	**0.50**
proposed discharge rate 'v_2' *[litre/s]* =	
allowance for climate change:	**40%**

SUMMARY OF CALCULATIONS		
required storage volume for discharge rate 'v_1' =	**3.44**	m^3
required storage volume for discharge rate 'v_2' =		m^3

AREA DATA		impermeability *[%]*	effective area *[m^2]*
impermeable area 'A_1' *[m^2]* =	**92.2**	100.00	92.2
landscaping and/or green roof area 'A_2' *[m^2]* =		**80.00**	0
other partially permeable area 'A_3' *[m^2]* =		**20.00**	0
AREA DRAINED TO ATTENUATION TANK =			**92.2 m^2**

REQUIRED STORAGE VOLUME PER RAINFALL DURATION FOR DISCHARGE RATE v_1

rainfall duration *[min]*	rainfall factor Z1	**M5-D** rainfalls *[mm]*	ignore Z2	ignore rainfalls *[mm]*	ignore inflow *[m^3]*	ignore Z2	ignore rainfalls *[mm]*	ignore inflow *[m^3]*	**M100-D** Z2	**M100-D** rainfalls *[mm]*	**M100-D** inflow *[m^3]*	outflow from attenuation tank *[m^3]*	required storage *[m^3]*
5	0.37	7.47							1.85	19.33	1.78	0.15	1.63
10	0.52	10.47							1.92	28.10	2.59	0.30	2.29
15	0.63	12.67							1.95	34.63	3.19	0.45	2.74
30	0.80	16.07							2.00	44.95	4.14	0.90	3.24
60	1.00	20.00							2.03	56.84	5.24	1.80	**3.44**
120	1.21	24.13							2.01	68.03	6.27	3.60	2.67
240	1.45	28.93							1.98	80.14	7.39	7.20	0.19
360	1.60	32.07							1.95	87.70	8.09	10.80	0.00
600	1.79	35.87							1.92	96.56	8.90	18.00	0.00
1440	2.24	44.80							1.85	116.13	10.71	43.20	0.00

** Z2 is a growth factor from M5 rainfalls*

REQUIRED STORAGE VOLUME PER RAINFALL DURATION FOR DISCHARGE RATE v_2

rainfall duration *[min]*	rainfall factor Z1	**M5-D** rainfalls *[mm]*	ignore Z2	ignore rainfalls *[mm]*	ignore inflow *[m^3]*	ignore Z2	ignore rainfalls *[mm]*	ignore inflow *[m^3]*	**M100-D** Z2	**M100-D** rainfalls *[mm]*	**M100-D** inflow *[m^3]*	outflow from attenuation tank *[m^3]*	required storage *[m^3]*
5	0.37	7.47											
10	0.52	10.47											
15	0.63	12.67											
30	0.80	16.07											
60	1.00	20.00											
120	1.21	24.13											
240	1.45	28.93											
360	1.60	32.07											
600	1.79	35.87											
1440	2.24	44.80											

** Z2 is a growth factor from M5 rainfalls*

Eastfield Road

Orifice Discharge

Q=Cd(1/4*3.142*D^2)SQRT(2gh)

Cd	0.6	Sharp orifice
D	0.015	m
g	9.81	
h	1.1	m

Q	0.00049	m3/s
	0.49	l/s

15mm orifice = 0.5l/s peak discharge

Storage Volume

Tank

Length	4.00	m
Width	2.00	m
Depth	0.40	m
Void	95.0%	
Volume	3.04	m3

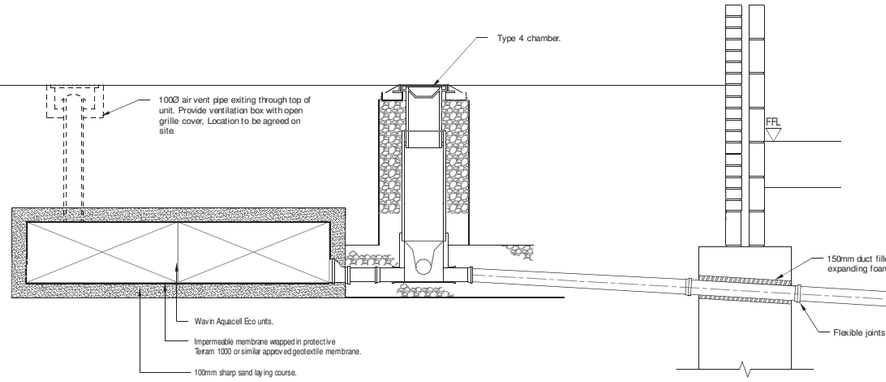
Chamber

Length	0.60	m
Width	0.60	m
Depth	1.10	m
Void	100.0%	
Volume	0.40	m3

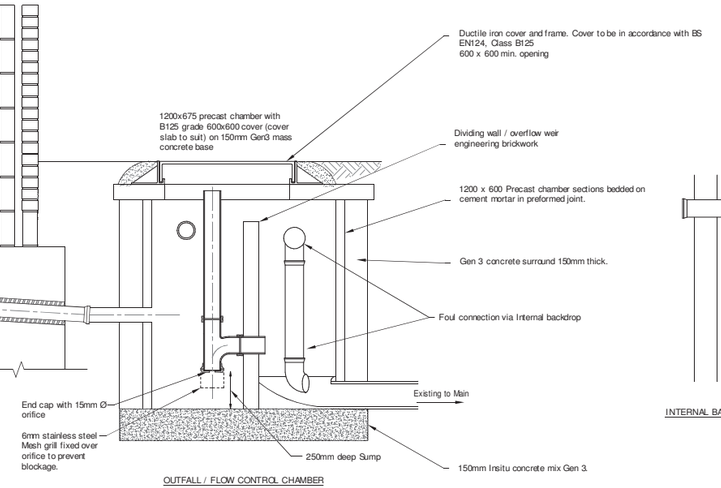
TOTAL	3.44	m3

AQUACELL INSTALLATION NOTES

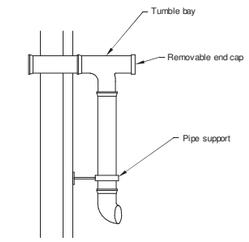
1. Excavate the trench to the required depth ensuring that the plan area is slightly greater than that of the AquaCell Units.
2. Lay 100mm bed of coarse sand or non angular granular material, level and compact.
3. Lay the geotextile* over the base and up the sides of the trench.
4. Lay the AquaCell Units parallel with each other. In multiple layer applications, wherever possible, continuous vertical joints should be avoided. AquaCell units can be laid in a 'brick bonded' formation (i.e. to overlap the joints below). For single layer applications use the Wavin Clips and for multi layers use the Wavin Clips and the Wavin Shear Connectors.
5. Fix the Wavin Adaptors to the AquaCell Units as required and connect pipework.
6. In order to prevent silt from entering the tank, clogging inlet pipework and reducing storage capacity, it is recommended that the Wavin Silt Trap (6LB600) is installed prior to the inlet pipework.
7. Wrap and overlap the geotextile covering the entire AquaCell structure.
8. Lay 100mm of coarse sand or non angular granular material between the trench walls and the AquaCell structure and compact.
9. Lay 100mm of coarse sand or non angular granular material over the geotextile and compact. Backfill with stone free as-dug material.
10. Rainwater from roof areas may discharge directly into the soakaway but rainwater from carparks must discharge through a catchpit manhole or a petrol interceptor.



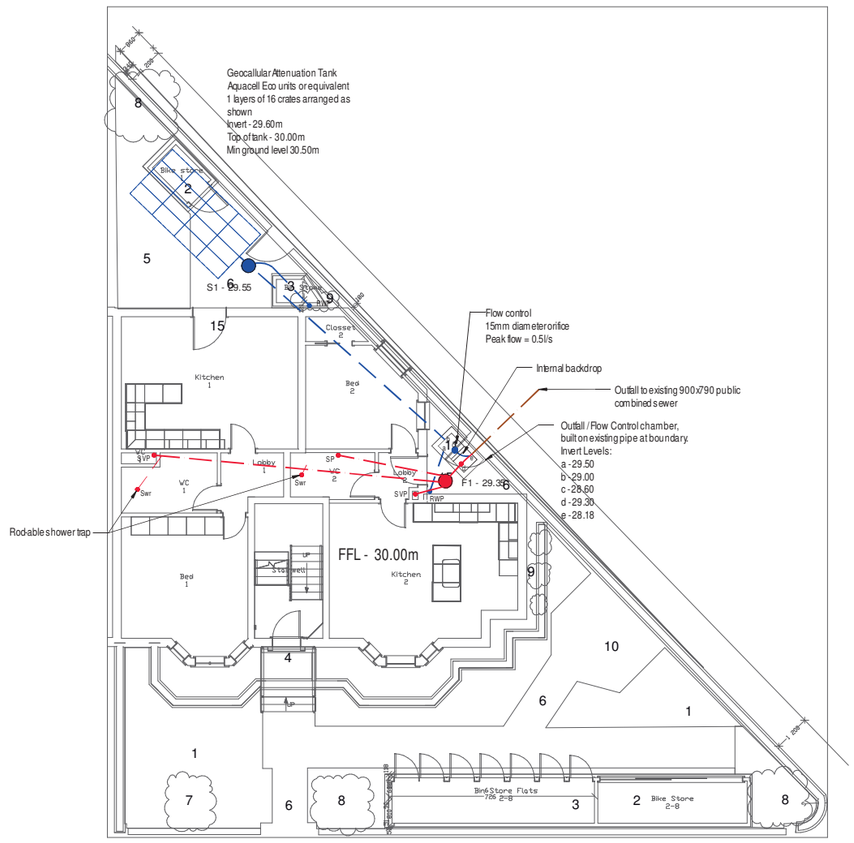
ATTENUATION TANK
Scale: NTS



OUTFALL / FLOW CONTROL CHAMBER



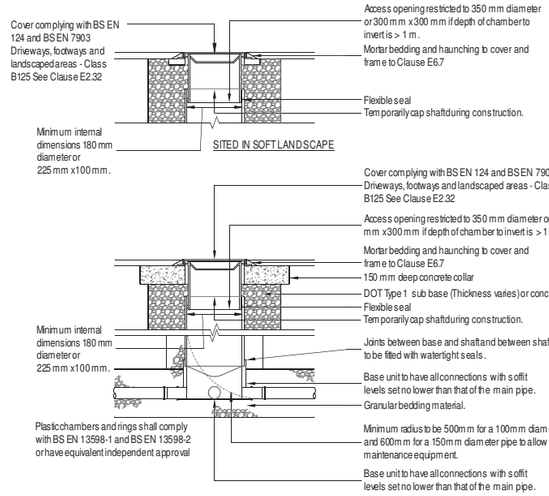
INTERNAL BACKDROP DETAIL



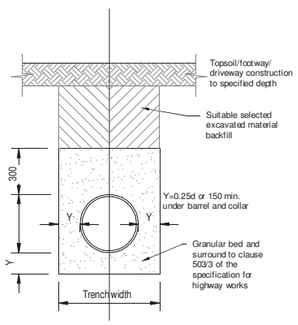
Drainage Layout
Scale 1:100 @ A1

Key

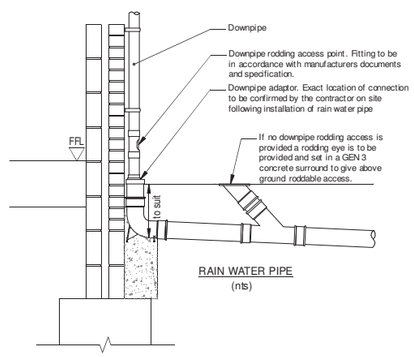
- Proposed surface water sewer (100mm Ø min gradient 1:100) (unless labelled otherwise)
- RE — Rain Water Pipe
- RWP
- S1 - 29.55 — Surface water chamber Type 4 (with invert level)
- Geocellular Attenuation Tank
- Proposed foul water sewer
- Existing foul water sewer
- SVP/SP — Soil Vent Pipe / Soil Outlet
- F1 - 29.53 — Proposed foul water chamber Type 4 (with invert level)



Type 4 Flexible Material Inspection Chamber
Scale 1:25



GRANULAR PIPE BEDDING DETAIL
(Cover more than 500mm)
(nts)



RAIN WATER PIPE
(nts)

NOTES: DRAINAGE

1. This drawing to be read in conjunction with all relevant documents and specifications.
2. Dimensions not to be scaled.
3. The Contractor shall carry out a level check of the existing drainage and confirm the results to the Engineer for confirmation of the design, prior to the laying of any new drainage.
4. Covers & frames to existing chambers to be adjusted to suit new levels.
5. All manhole chamber covers to be installed parallel to final kerbs, edgings, paving joints or building lines.
6. This drawing details all below ground drainage up to finished floor level. For details of drainage above finished floor level, refer to Architect's drawings.
7. External private pipework may be either VC, thermoplastic structured wall sewer pipe, or PCV-u to BSEN13476 160, and shall comply with WIS 4-35-01. Pipes shall be BSi Kitemarked, or have equivalent third party certification.
8. All open drainage connections, svp's, gullies, manholes, etc. shall be protected throughout the construction period to prevent the ingress of debris to the systems.
9. All drainage to be laid within ±10mm of the design invert levels and shall have a positive fall towards the outfall, no backfalls are permitted.
10. Pipe bedding and surround to be granular (type S).

Rev.	Description	Date	Chkd
P2	Flow control chamber rotated	06/02/24 MT	
P1	Preliminary Issue	23/01/24 MT	

flow DRAINAGE DESIGN
t: 07837 685280
e: info@flowdrainagedesign.co.uk
w: www.flowdrainagedesign.co.uk

Client :
Felix Hansen

Project :
1 Eastfield Road

Title :
Surface & Foul Water Drainage Layout & Details

Project Engineer :	M. Taylor	Scale :	As Shown @A1
Project Director :		Date :	Jan 2024
Status :	PRELIMINARY		

Drawing No. 2407/01 Rev. P2