

Mr M Betts,
MGR Homes
The Old Mill,
Kings Mill,
Kings Mill Lane,
South Nutfield,
Surrey RH1 5NB

06/07/2026

Ref: Land at Badger's Brook, London Road, Bolney – Drainage Strategy

Revision A

Dear Mr Betts,

The following report summarises our findings and recommendations in relation to the surface water and foul water drainage systems to serve the proposed residential development at Badger's Brook, Bolney.

The Local Authority Drainage Engineer will wish to see a Sustainable Drainage Strategy (SUDS) implemented for surface water disposal at the site, based on the following hierarchy:

1. Infiltration/soakaway drainage
2. Discharge to a watercourse at greenfield rates
3. Discharge to a sewer at agreed rates

Testing has confirmed that infiltration rates at the site are very poor, a small unnamed watercourse flows south along the eastern boundary.

The preliminary designs in this report are therefore based on an attenuated discharge to the watercourse, illustrating that a SUDS compliant solution is possible regardless of ground conditions.

Anticipated Ground Conditions

The British Geological Survey (BGS) indicates the area to be underlain by The Upper Tunbridge Wells Sand. There is no record of superficial deposits but nearby boreholes indicate sand to a depth of 2.3m with clay below.

The level of ground water was recorded in a nearby borehole (ref TQ 22 SE 33) as a strike at 1m depth, with standing water after drilling at 1.65m depth.

The Soilscales website, which deals with overlying soil conditions, indicates 'Slightly acid loamy and clayey soils with slightly impeded drainage'.

Infiltration Rate

Infiltration tests to BRE365, were attempted in May 2026, the water level in the first test took over 5 hours to fall only 20mm. The test failed and the ground is considered impermeable.

As Infiltration was found to be ineffective discharge to the adjacent watercourse will be adopted using on-site attenuation storage to limit discharge to a rate as close as practicable to the greenfield rate.

Surface Water Drainage Strategy

OPTION 1 - Infiltration

Infiltration has been found to be ineffective at this site due to impermeable sub-soils.

OPTION 2 – Attenuation

Fortunately, there is an adjacent watercourse following the eastern boundary with a water level approximately 2.0m lower than the lowest site ground level.

Option 2 will use porous paving and water that does not infiltrate into the subsoil will percolate to a geocellular tank at the lowest point. Roof water will drain directly to the attenuation tank. Discharge will be via a flow control device to the watercourse, at the greenfield rate (Q_{bar}).

The total area of paving on site is 1070m² and the total roof area is 1106m², giving a design impermeable area of 2176m² (0.22ha).

The greenfield discharge rate for the site is 5.4 l/s/ha (refer to attached printout from Microdrainage Source Control software), giving a greenfield rate (0.22 hectares) of 1.2 l/s.

The attached calculation sheet shows that a storage volume of 155.5m³ is required to accommodate the 100 year (+40%) rainfall event.

A storage volume of 156m³ can be provided within a geocellular crate tank below the paving at the lowest part of the site (4m wide x 24m long x 0.8m deep), along with supplementary storage in the porous paving sub-base above. (refer to attached calculations)

It is proposed to provide a simple orifice flow control device to attenuate flows to 1.2l/s.

It is noted that the run-off from the site currently flows to the watercourse and therefore these proposals will not increase flows therein.

Discharge from the site is restricted to Q_{bar} (roughly equivalent to the 1:2 year greenfield event) for all storms up to the 100 year storm, plus climate change.

Flows will therefore be reduced for all storms above 1:2 year return period.

The watercourse has been surveyed, and a copy of the survey report is attached.

It is a substantial ditch feature, with several lateral connections, which discharges to a large

culvert structure a few meters south of the site. The culvert joins the drainage network associated with the A23 dual carriageway, discharging south to the upper waters of the river Adur.

The entrance to the culvert is protected by a grille, however the grille is substantially blocked by debris and silt and will be cleared prior to discharge from the site.

Exceedance Flows

In any surface water design scenario it is possible that the peak design storm could be exceeded or the system could fail through damage or blockage. The exceedance flow route indicates how water will behave in this event, and must ensure that it is controlled and dispersed safely, without risk to property or persons.

In this case such flows will be directed safely to the south east corner of the site and directly into the watercourse. The constraints of the site make this the only safe exceedance flow route available, and replicates the existing exceedance route from the site.

Foul Water

There is a public foul water sewer, 150mm diameter, running through the site, parallel with the watercourse, approximately 10m from the eastern boundary. (refer to attached sewer records).

It is therefore proposed to connect all of the new houses to this sewer.

Consent to connect will be required from Southern Water under Section 106 of the Water Industry Act.

It will also be necessary to divert the sewer to avoid clashing with the proposed new dwellings.

Conclusion and Recommendations.

Infiltration rates are very poor at this site and preclude the use of infiltration drainage.

The access road and parking areas will be constructed in permeable paving.

Surface water generated from the roof areas will be directed to the paving sub-base and a geocellular attenuation tank.

Attenuated discharge to the adjacent watercourse will ensure that a sustainable approach to surface water drainage can be achieved.

In the event of failure by blockage, or an event greater than the design storm, exceedance flows will be directed safely to the watercourse.

Foul drainage from the new dwellings will discharge to an existing public sewer which crosses the site. This sewer will require diverting in order to accommodate the development.

It is therefore concluded that foul water drainage and a sustainable surface water drainage system are practical and can be implemented at this site in line with the Building Regulations

SUDS hierarchy and current planning policy.

Calculations and preliminary proposals are appended to this report.

Kind regards

A handwritten signature in black ink, appearing to read 'M. Taylor', with a horizontal line drawn underneath it.

Mark Taylor
Flow Drainage Design

Enc.

Qbar Calculation

Attenuation System Design Calculations

Borehole Record TQ 22 SE 33

Sewer Record

Preliminary drainage proposals

Ditch Survey



Date 05/03/2023 11:36
File

Designed by Mark
Checked by

Micro Drainage

Source Control 2016.1.1

IH 124 Mean Annual Flood

Input

Return Period (years)	100	Soil	0.450
Area (ha)	50.000	Urban	0.000
SAAR (mm)	832	Region Number	Region 7

Results l/s

QBAR Rural	268.9
QBAR Urban	268.9

Q100 years	857.7
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Q1 year	228.5
Q2 years	236.9
Q5 years	344.1
Q10 years	435.5
Q20 years	538.6
Q25 years	577.5
Q30 years	609.3
Q50 years	704.4
Q100 years	857.7
Q200 years	1008.2
Q250 years	1056.6
Q1000 years	1387.3

Qbar 50ha = 270 l/s

Qbar 1ha = 5.4 l/s

Qbar 0.ssha = 1.2 l/s

Qbar for the site is 1.2 l/s

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' = **0.50**
proposed discharge rate 'v₁' [litre/s] = **1.20**
proposed discharge rate 'v₂' [litre/s] = **0.00**
allowance for climate change: **40%**

SUMMARY OF CALCULATIONS

required storage volume for discharge rate 'v₁' = **155.50** m³
required storage volume for discharge rate 'v₂' = m³

AREA DATA

impermeable area 'A₁' [m²] = **2176**
landscaping and/or green roof area 'A₂' [m²] =
other partially permeable area 'A₃' [m²] =

impermeability [%]
effective area [m²]
100.00 2176
80.00 0
20.00 0

AREA DRAINED TO ATTENUATION TANK = 2176 m²

REQUIRED STORAGE VOLUME PER RAINFALL DURATION FOR DISCHARGE RATE v₁

rainfall duration [min]	rainfall factor Z1	M5-D rainfalls [mm]	M10-D			M20-D			M100-D			outflow from attenuation tank [m ³]	required storage [m ³]
			Z2	rainfalls [mm]	inflow [m ³]	Z2	rainfalls [mm]	inflow [m ³]	Z2	rainfalls [mm]	inflow [m ³]		
5	0.39	7.80	1.21	13.18	28.68	1.39	15.16	32.98	1.86	20.28	44.13	0.36	43.77
10	0.54	10.80	1.22	18.49	40.24	1.41	21.39	46.55	1.92	29.07	63.26	0.72	62.54
15	0.65	13.00	1.23	22.42	48.79	1.43	25.99	56.55	1.96	35.64	77.54	1.08	76.46
30	0.82	16.40	1.24	28.47	61.95	1.44	33.13	72.08	2.00	45.95	99.98	2.16	97.82
60	1.00	20.00	1.24	34.72	75.55	1.45	40.60	88.35	2.03	56.84	123.68	4.32	119.36
120	1.19	23.80	1.24	41.32	89.91	1.44	48.06	104.58	2.01	67.13	146.08	8.64	137.44
240	1.38	27.60	1.23	47.51	103.39	1.43	55.24	120.20	1.99	76.86	167.25	17.28	149.97
360	1.51	30.20	1.22	51.56	112.19	1.42	60.00	130.57	1.97	83.22	181.10	25.92	155.18
600	1.68	33.60	1.21	56.88	123.77	1.41	66.12	143.88	1.94	91.31	198.70	43.20	155.50
1440	2.03	40.60	1.19	67.57	147.04	1.38	78.30	170.39	1.89	107.15	233.17	103.68	129.49

* Z2 is a growth factor from M5 rainfalls

REQUIRED STORAGE VOLUME PER RAINFALL DURATION FOR DISCHARGE RATE v₂

rainfall duration [min]	rainfall factor Z1	M5-D rainfalls [mm]	M10-D			M30-D			M100-D			outflow from attenuation tank [m ³]	required storage [m ³]
			Z2	rainfalls [mm]	inflow [m ³]	Z2	rainfalls [mm]	inflow [m ³]	Z2	rainfalls [mm]	inflow [m ³]		
5	0.39	7.80											
10	0.54	10.80											
15	0.65	13.00											
30	0.82	16.40											
60	1.00	20.00											
120	1.19	23.80											
240	1.38	27.60											
360	1.51	30.20											
600	1.68	33.60											
1440	2.03	40.60											

* Z2 is a growth factor from M5 rainfalls

Badgers Brook

01/03/2023

Orifice Discharge

$$Q = C_d(1/4 * 3.142 * D^2) \text{SQRT}(2gh)$$

Cd 0.6 Sharp orifice

D 0.024 m

g 9.81

h 1 m

Q 0.001202457 m³/s
1.2 l/s

24mm orifice = 1.2l/s discharge

Storage Volume - Porous Paving

Width 4.0 m

Length 24.0 m

Depth 0.35 m

Void 30 %

Volume = 10.08 m³

Storage Volume - Tank

Width 4 m

Length 24 m

Depth 0.8 m

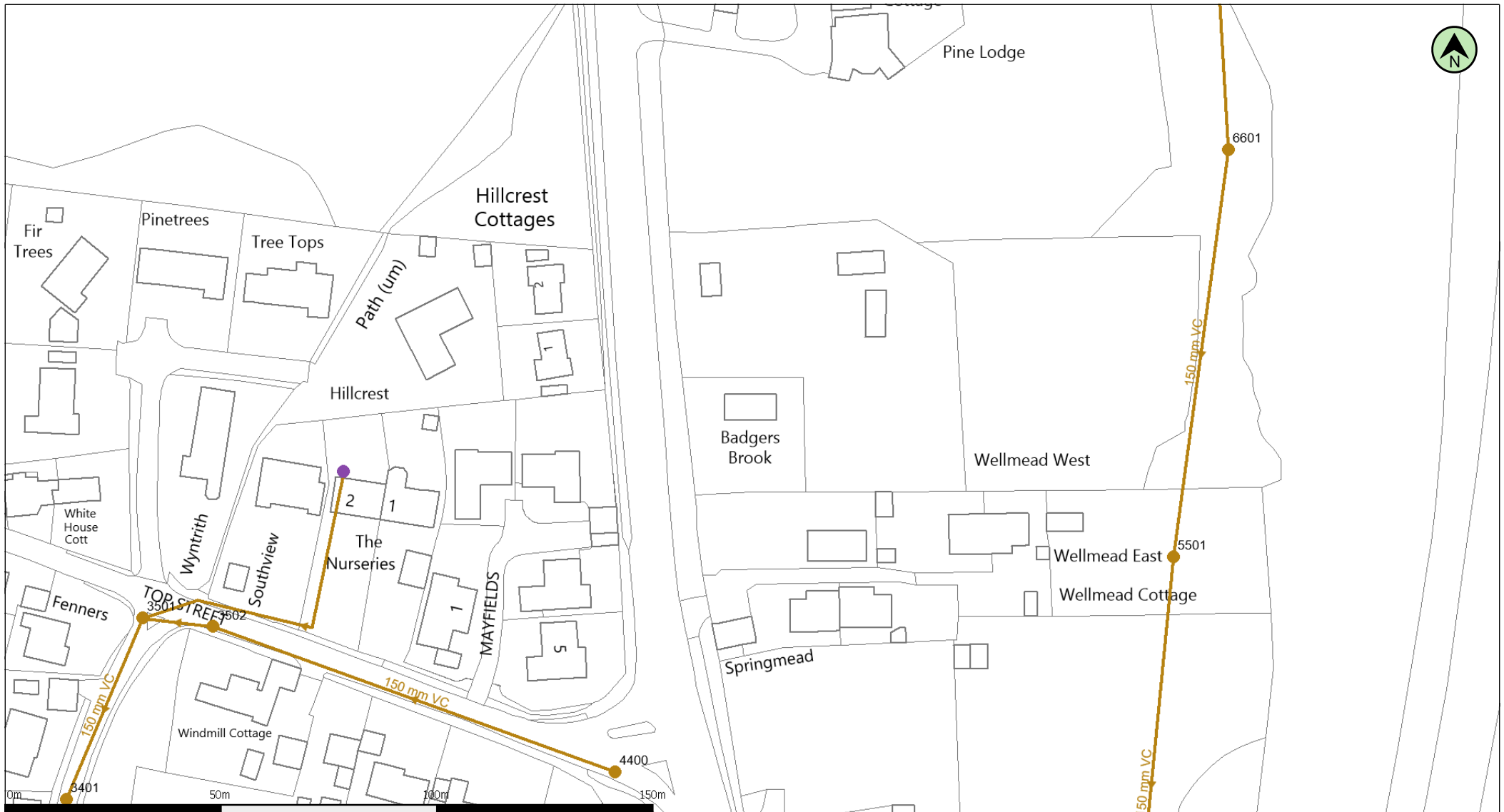
Number of 2

Void 95 %

Volume = 145.92 m³

Total 156.00 m³

Boring method		Shell and Auger		Location Embankment Chainage 280m					
Boring equipment		Pilson Wayfarer 30		National Grid Reference		TQ 26432 23691		Sheet 1 of 1	
Boring diameter (mm)		150 to 4.00m		Contractor WIMPEY LABORATORIES LIMITED				Date Commenced 21.1.80	
Casing diameter (mm)		150 to 3.50m		Contractors Job Reference		S/16465		Ground Level (m) AOD 63.70	
Depth (m)	Sample	In situ test	Date & casing depth (m)	Depth to Water (m)	Strata Thickness (m)	Strata Depth (m)	Strata Description	Level (m) AOD	Legend
0.30	D		21/1		0.30	0.30	TOPSOIL	63.40	
0.50	U		Nil		0.50	0.80	Soft mottled brown and grey sandy CLAY	62.90	
0.95	D		Nil	1.00*			Medium dense to dense orange-brown, locally light grey, silty fine to coarse SAND		
1.00	D								
1.15	D	S35							
1.50	BD				1.50				
1.65	D	S24	1.50						
2.00	BD								
2.15	D	S18	2.00			2.30		61.40	
			2.50	1.80					
2.50	U		22/1	1.80			Hard fissured mottled light grey, light brown, orange and red silty CLAY		
2.95	D								
3.00	U		3.00						
3.45	D								
3.50	U		3.50						
3.95	D					4.00		59.70	
END OF BOREHOLE									
Remarks Ground-water was encountered at a depth of 1.00m as a seepage which was not sealed off by casing. Water was added to assist boring below 1.00m depth. After withdrawing casing water level stood at 1.65m below ground level.									
Key to symbols & abbreviations in Preface notes									
A23 BOLNEY TO BRIGHTON									Figure 10



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Date: 03/03/23

Scale: 1:1250

Map Centre: 526497,123571

Data updated: 27/02/23

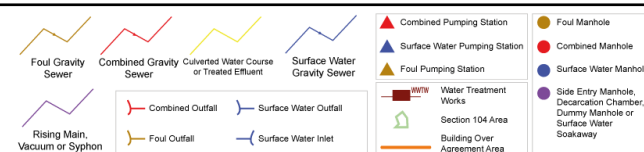
Our Ref: 1101049 - 1

Wastewater Plan A4

The positions of pipes shown on this plan are believed to be correct, but Southern Water Services Ltd accept no responsibility in the event of inaccuracy. The actual positions should be determined on site. This plan is produced by Southern Water Services Ltd (c) Crown copyright and database rights 2023 Ordnance Survey 100031673. This map is to be used for the purposes of viewing the location of Southern Water plant only. Any other uses of the map data or further copies is not permitted.

WARNING: BAC pipes are constructed of Bonded Asbestos Cement.

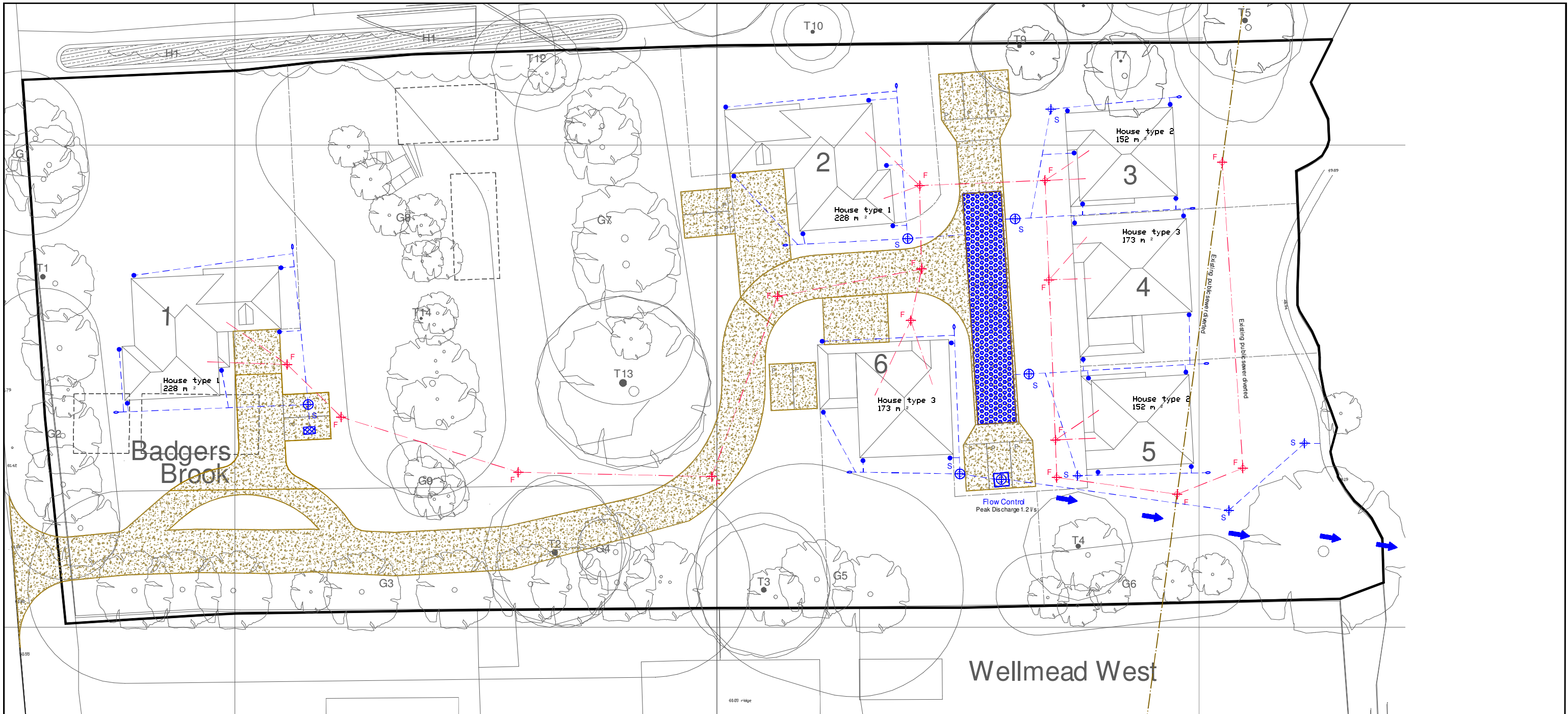
WARNING: Unknown (UNK) materials may include Bonded Asbestos Cement.



mark@flowdrainage.co.uk

Badgers Brook





Surface Water Drainage Strategy:

OPTION 2 - ATTENUATION

Access road to be constructed with permeable systems percolating to attenuation tank below lowest part.

Roof water discharging via silt traps to geocellular attenuation tank, with additional stoarge in sub base of paving above.

Discharge via flow control chamber to watercourse at greenfield rate.

- KEY
- Proposed Surface water sewer
 - Proposed Foul water sewer
 - Existing Foul water sewer
 - Rain water pipe
 - Rodding eye
 - Access Chamber
 - Surface Water Silt Trap
 - Flow Control Chamber
 - Permeable Paving
 - Infiltration Blanket
 - Exceedance Flow Path

Rev	Description	Date	Chkd
flow DRAINAGE DESIGN 1 St John's Cross, Charington Shippton on Stour, CV36 5HR t: 07837 685280, e: info@flowconstructiondesign.co.uk			
Client:		MGR Homes	
Project:		Badger's Brook Bolney	
Title:		Proposed Surface Water Drainage OPTION 2 - Attenuation	
Project Engineer:		M. Taylor	Scale: 1:200 @ A1
Project Director:			Date: March 2023
Status:		APPROVAL	
Drawing No.		2325 / 02	Rev



Well defined ditch
1.2m wide x 0.7m deep



Well defined ditch
2.5m wide x 1.0m deep



Lateral connection



Culvert Pipe with Grille
Estimated 600mm diameter minimum
Requires clearing



Substantial 'Bagwork' channel
leading to concrete culvert headwall.
300mm dia side connection



OUTFALL DITCH SURVEY

P1	Preliminary Issue	17/01/24	MT
Rev.	Description	Date	Chkd
flow DRAINAGE DESIGN t: 07837 685280 e: info@flowdrainage.co.uk			
Client :	M Betts		
Project :	Badgers Brook		
Title :	Proposed Surface Water Outfall Route Ditch Survey		
Project Engineer :	M. Taylor	Scale :	NTS @ A1
Project Director :		Date :	July 2026
Status :	PRELIMINARY		
Drawing No.	2325/03	Rev	P1