



HydroGround Civils

Drainage Strategy

Location: Land at 18 St James Road, East Grinstead, West
Sussex, RH19 1DL

Client: Town & Country Planning Solutions

Project: Proposed residential redevelopment for the erection
of five dwellings.

Revision: A

Reference: RH041501

Date: 29 June 2026

Author: CM
Chartered Civil Engineer
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Drainage Strategy Summary

To provide a concise overview of the proposed drainage strategy, Table 1 summarises the principal characteristics of the development and the key drainage design parameters. Further detail relating to each item is provided within the subsequent sections of this report.

Table 1: Drainage Strategy Summary

Item	Summary
Development	Proposed residential development comprising 5 dwellings
Site Area	Approximately 0.07 ha
Positive Drainage Area	Approximately 350 m ² (0.035 ha)
Existing Flood Zone	Flood Zone 1
Bedrock Geology	Grinstead Clay Member – Mudstone (no superficial deposits)
Surface Water Drainage Hierarchy	Priority 4 – Discharge to existing public surface water sewer
Surface Water Drainage Destination	Existing Southern Water public surface water sewer in St James Road (via MH SW S-9395)
Foul Water Drainage Destination	Existing Southern Water public foul sewer in St James Road via a new manhole
Surface Water Discharge Rate	1.0 l/s
Surface Water Attenuation	14.0 m × 3.0 m × 0.40 m geocellular attenuation tank (approximately 15.96 m ³ effective storage)
Flow Control	Hydro-Brake vortex flow control
Hydraulic Modelling Software	Causeway Flow v18
Rainfall Methodology	FEH22
Climate Change Allowance	45% increase in rainfall intensity
Proposed Drainage System	Gravity surface water and foul drainage systems

1.0 Introduction

1.1 Background

1.1.1 HydroGround Civils Ltd was commissioned by Town & Country Planning Solutions, acting on behalf of Park Lane Homes Ltd, to prepare a Drainage Strategy Report in support of a full planning application for the proposed residential redevelopment of land adjacent to 18 St James Road, East Grinstead, West Sussex RH19 1DL.

1.1.2 The commission follows an instruction from Town & Country Planning Solutions to provide a drainage strategy for the revised residential development proposals and to advise on the most appropriate means of surface water disposal, together with the preparation of the supporting drainage layout and hydraulic calculations required for planning.

1.1.3 The site previously gained planning permission under reference DM/23/0026 for the erection of three terraced dwellings. The current proposal seeks planning permission for a revised development comprising five residential dwellings, together with associated parking, landscaping and external works. Consequently, an updated drainage strategy has been prepared to reflect the revised site layout, increased impermeable area and current drainage requirements.

1.2 Purpose of Report

1.2.1 The purpose of this report is to demonstrate that both surface water and foul water generated by the proposed development can be managed in a sustainable manner without increasing flood risk either on-site or elsewhere.

1.2.2 Specifically, this report has been prepared to:

- Describe the existing drainage characteristics of the site.
- Assess the site against the surface water drainage hierarchy.
- Demonstrate that an appropriate drainage strategy can be achieved.
- Present the proposed surface water and foul water drainage proposals.
- Summarise the hydraulic modelling undertaken using Causeway Flow.
- Demonstrate that runoff from the development will be appropriately attenuated before discharge to the public sewer.
- Confirm that the proposed drainage strategy accords with national and local planning policy.

- 1.2.3 The report should be read in conjunction with the accompanying drainage layout drawing, hydraulic calculations and supporting appendices.

1.3 Scope

- 1.3.1 The drainage strategy has been prepared using information available at the time of writing, including:

- Proposed architectural site layout.
- Topographical survey.
- Existing public sewer records.
- Southern Water consultation and capacity information.
- Previous planning documentation.
- Causeway Flow hydraulic modelling.
- Relevant national and local planning policy.

- 1.3.2 This report demonstrates the drainage strategy proposed for planning purposes. Detailed construction information, specifications and adoption requirements will be developed during the detailed design stage where necessary.

2.0 Site Description

2.1 Site Location

- 2.1.1 The application site is located on land immediately adjacent to 18 St James Road, East Grinstead, West Sussex, RH19 1DL.

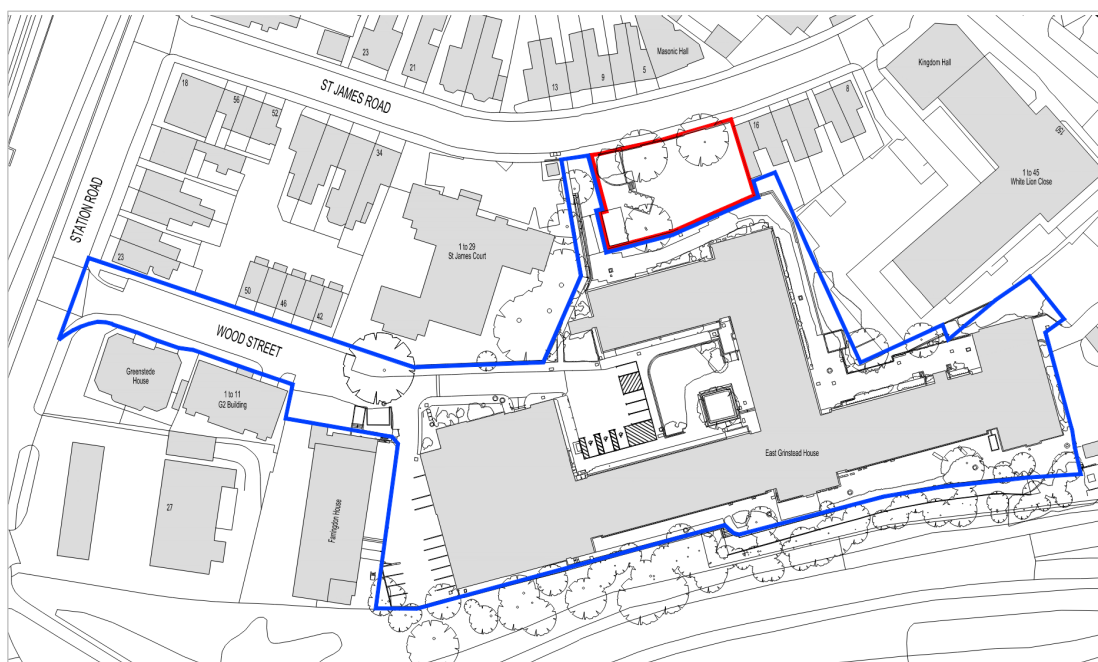


Figure 1: Application site

- 2.1.2 The application site occupies approximately 0.07 hectares and comprises previously developed urban land situated within an established residential area. St James Road bounds the site to the north, existing residential properties bound the site to east and west, whilst Newcare House lies to the south. The application site is approximately centred at National Grid Reference TQ 39023 38375 (Easting 539023, Northing 138375).

2.2 Topography

- 2.2.1 The existing site is mainly bounded by a brick wall along St James Road and is accessed from the west via an entrance adjacent to a curved brick wall (BW), leading to a flight of steps which provide access to the main grassed area occupying the eastern part of the site. Further south along the access road is an existing detached garage and a concrete ramp. Immediately east of the garage and south of the steps is an enclosed container area with gated access.

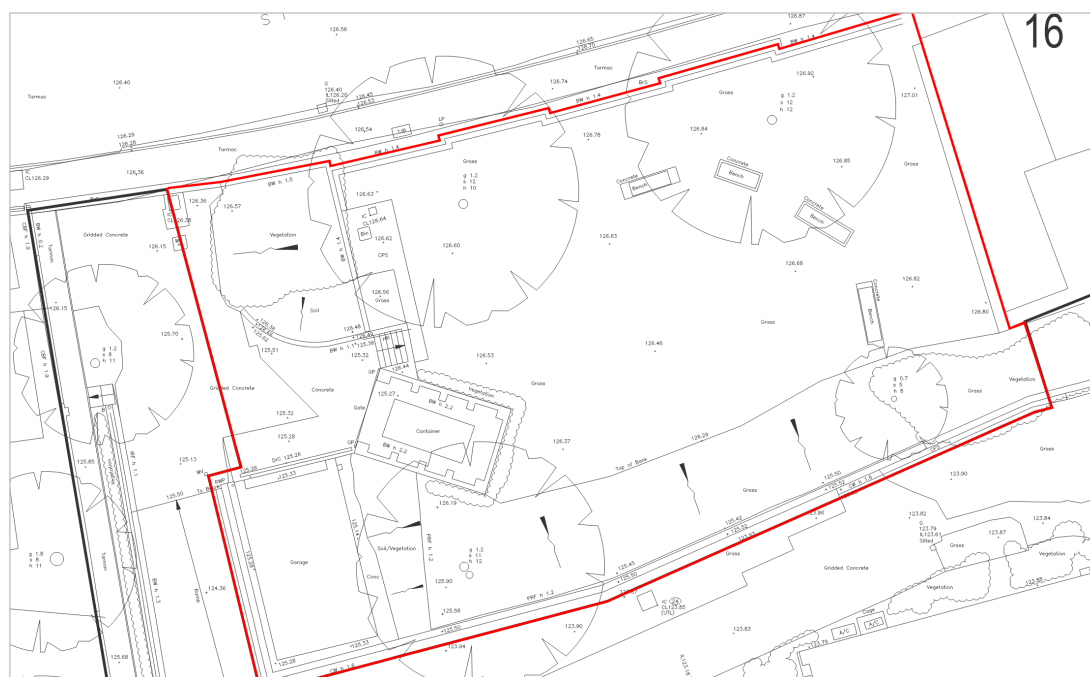


Figure 2: Topographical survey

- 2.2.2 Four mature trees are located within the application site boundary, comprising two trees towards the northern part of the site and two towards the south, the latter situated within the existing sloping embankment. The site also contains areas of grass, vegetation, existing hardstanding and boundary walls, together with localised changes in level associated with the existing access arrangements.
- 2.2.3 The topographical survey indicates that the principal grassed area of the site generally falls from north to south, with the southern part of the site forming a natural embankment. Existing spot levels range from approximately 127.1mAOD adjacent to the northern boundary with St James Road in the northeast to approximately 126.29mAOD along the top of bank. The principal development area falls approximately 0.7 m from north to south.
- 2.2.4 Topographical survey can be found in **Appendix A**.

3.0 Planning History

- 3.1 The site previously received planning permission under application reference DM/23/0026 for the erection of three two-bedroom terraced dwellings with associated amenity space.
- 3.2 Planning permission was granted by Mid Sussex District Council on 29 June 2023.
- 3.3 Whilst the current application relates to a revised development comprising five dwellings, the previous permission is relevant insofar as it established the principle of residential development on the site and identified the key drainage requirements to be addressed.
- 3.4 The previous planning permission included drainage-related conditions requiring:
- Submission and approval of detailed foul and surface water drainage proposals prior to commencement.
 - Submission of a management and maintenance plan for the lifetime of the development.
 - Confirmation from the statutory sewer undertaker that sufficient capacity existed within the receiving public sewer network before any surface water connection was made.
- 3.5 The drainage strategy presented within this report has therefore been developed having regard to those previous planning conditions, whilst reflecting the revised site layout and current drainage design.
- 3.6 The proposed strategy incorporates on-site attenuation, controlled discharge and new gravity drainage networks designed in accordance with current best practice.

Planning policy

3.8 National Planning Policy Framework

3.8.1 This drainage strategy has been prepared having regard to the National Planning Policy Framework (NPPF) (December 2024).

3.8.2 The NPPF requires planning decisions to ensure that development is appropriately flood resilient, does not increase flood risk elsewhere and incorporates sustainable drainage systems wherever appropriate.

- The proposed development has therefore been designed to:
- Safely manage runoff generated by the development.
- Restrict discharge to the receiving public sewer.
- Provide on-site attenuation for exceedance events.
- Avoid increasing flood risk to neighbouring land.
- Incorporate sustainable drainage principles where reasonably practicable

3.9 Mid Sussex District Plan Policy DP41

3.9.1 Policy DP41 of the Mid Sussex District Plan (2014–2031) requires development proposals to demonstrate that satisfactory drainage arrangements can be provided and that development will not increase flood risk on-site or elsewhere.

3.9.2 The proposed drainage strategy has been developed to satisfy these objectives by:

- Following the approved surface water drainage hierarchy.
- Providing attenuation storage within the site boundary.
- Restricting discharge to a rate where there is capacity in the public sewer system.
- Managing runoff generated by the proposed development up to the 1 in 100-year rainfall event including an allowance for climate change.
- Providing an ongoing maintenance regime for the lifetime of the development

3.9.3 Accordingly, it is considered that the proposed drainage strategy accords with the requirements of Policy DP41.

4.0 Existing Site Drainage

4.1 The application site currently comprises of approximately 78% of grassed and vegetative areas. With the remaining 22% comprising of part of the gridded concrete access, roof of the existing garage and the container area.

4.2 The topographical survey identifies several existing drainage assets, highlighted green in Figure 3 both within and immediately adjacent to the application site.

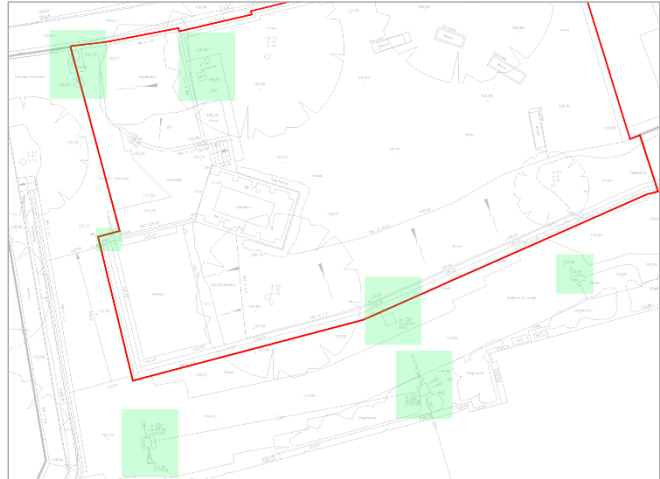


Figure 3: Existing drainage assets on site

4.3 An existing inspection chamber is located close to the site entrance on the northwestern boundary, with additional inspection chambers located to the south of the application site outside the red line boundary.

4.4 The site's topography indicates that ground levels generally fall from north to south. Consequently, it is reasonable to infer that the existing drainage network also follows this general direction of fall, with drainage conveyed towards the southern part of the site before continuing downstream.

4.5 An existing road gully is located adjacent to the garage access ramp and appears, based on the topographical survey, to connect to inspection chamber IC25. In addition, a rainwater downpipe (RWP) serving the existing garage likely discharges towards the same chamber. Although no CCTV survey has been undertaken to confirm the pipe connectivity, the orientation of the pipework arrows on the topographical survey suggests that both the gully and the garage rainwater downpipe discharge into IC25.

4.6 From inspection chamber IC25, the survey indicates an existing drain run extending eastwards towards IC23, before continuing south beyond the application boundary. This suggests the presence of an existing private drainage system serving the current development. The inferred drainage arrangement is based solely on interpretation of the topographical survey and has not been verified by CCTV survey.

4.7 Southern Water GIS map (Figure 4) shows the presence of a public foul sewer and public surface water sewer on St James' Road. This can also be found in **Appendix B**.



Figure 4: Southern Water GIS sewer map

- 4.8 As no CCTV survey or drainage record information has been made available, the precise condition, ownership and function of the existing drainage network remain unknown. The proposed development will therefore comprise a new private surface water and foul drainage system designed independently of the existing private drainage infrastructure, with new connections made to the existing Southern Water public sewer network in accordance with the approved drainage strategy.

5.0 Geology

5.1 A review of the British Geological Survey (BGS) online mapping (Figure 5) indicates that the application site is underlain by the Grinstead Clay Member – Mudstone of the Lower Greensand Group, dating from the Cretaceous Period. No superficial deposits are recorded beneath the site.

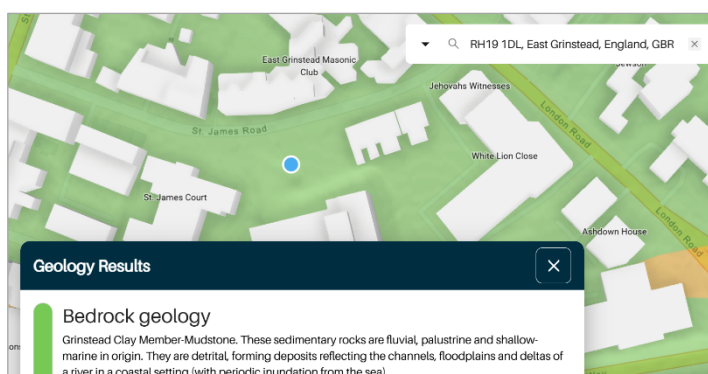


Figure 5: Bedrock geology (BGS)

5.2 BGS describes the lithology of this bedrock as *“Grey to greenish grey mudstones, commonly very silty with subordinate thin beds of siltstone, nodular clay ironstone and shelly limestone. Rootlet horizons and plant-rich beds common. Over part of its outcrop the member is divided by a bed of calcareous sandstone, the Cuckfield Stone Bed, into the informally named lower and upper Grinstead Clay”*.

5.3 The Grinstead Clay Member comprises predominantly mudstones deposited within fluvial, floodplain and shallow marine environments. Clay formations are generally characterised by relatively low permeability when compared with granular soils such as sands and gravels.

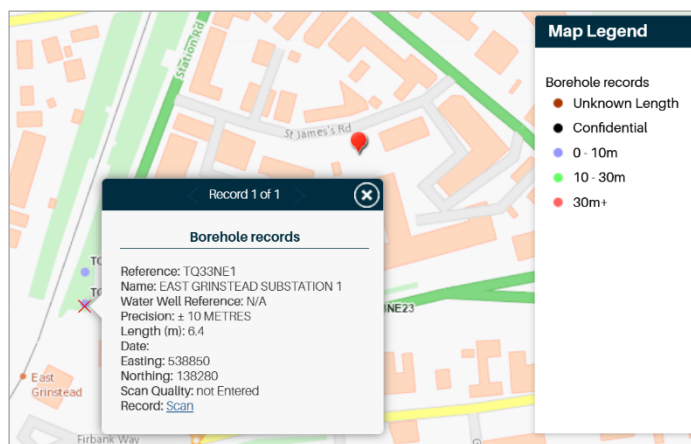


Figure 6: Borehole records (BGS)

Consequently, they are typically less favourable for infiltration-based surface water drainage systems.

5.4 BGS borehole records for a site (Figure 6) approximately 170m southwest of the application site indicate very clayey soil. These records can be found in **Appendix C**.

5.5 Whilst no site-specific ground investigation or BRE365 infiltration testing has been undertaken as part of this application, infiltration has not been selected as the preferred method of disposal given these geological findings.

6.0 Proposed Drainage

6.1 Surface Water Management & SuDS Hierarchy

6.1.1 National standards for Sustainable Drainage Systems (SuDS) published on 30 July 2025 give the hierarchy to follow for the disposal of surface water.

6.1.2 Runoff from the development shall be discharged to the following final destinations, to the maximum extent practicable, in accordance with the below hierarchy:

- **priority 1:** collected for non-potable use
- **priority 2:** infiltrated to ground
- **priority 3:** discharged to an above ground surface water body
- **priority 4:** discharged to a surface water sewer, or another piped surface water drainage system
- **priority 5:** discharged to a combined sewer

6.1.3 For priority 1, the guidance discusses rainwater harvesting and highlights that one of the reasons for such systems to be considered is if there is a “demand for non-potable water and available contributing catchment area that will deliver safe and efficient water savings”.

6.1.4 Rainwater harvesting has been assessed and not considered appropriate. For this small residential development, the available roof catchment area is insufficient to provide a reliable non-potable supply, and the projected household demand is too low to justify the installation, maintenance and energy requirements of a pumped RWH system. Such systems also require consistent turnover to maintain water quality, which cannot be achieved here. There is limited space within the plots for viable tank installation without compromising private amenity areas. As confirmed by CIRIA C753 and typical LLFA practice for small residential developments, RWH is generally unsuitable for small-scale residential schemes due to poor whole-life efficiency and minimal contribution to managing runoff volume. On this basis, Priority 1 is not appropriate for this development.

6.1.5 Infiltration has now been ruled out as method of surface water disposal given the geological findings in Section 5.0.

6.1.6 There are no surface water bodies in the vicinity of the application site.

6.1.7 Following the SuDS hierarchy above, this strategy adopts priority 4, which is also in line with the approved strategy.

6.2 Surface Water Drainage Proposal

- 6.2.1 The application site measures approximately 710 square metres (0.07 hectare). The south will form part of the residential gardens and thus will not be positively drained. Hardstanding areas and the roof make up approximately 350 square metres (0.035 hectare) and these are the areas taken into consideration for positive drainage.
- 6.2.2 Liaison with Southern Water in the previous scheme has confirmed capacity of 1.0 l/s in the nearest public surface water sewer manhole SW S-9395. This is the manhole the previous drainage scheme (Figure 7) proposed to connect to.

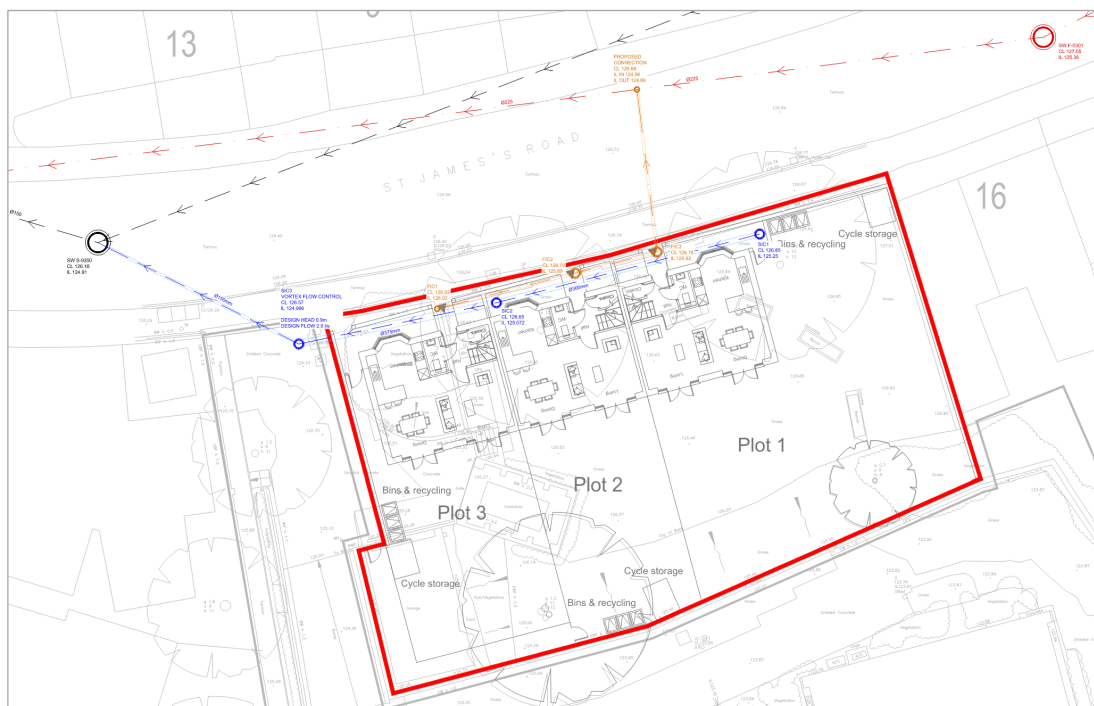
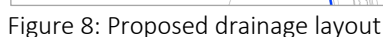


Figure 7: Previous scheme drainage strategy (Link Engineering drawing no. EGS-LE-GEN-XX-DR-CE-500)

- 6.2.3 The previous scheme was based on three dwelling units, the current scheme is based on 5 dwelling units and a lower allowable discharge rate of 1.0 l/s, it is therefore to introduce an attenuation storage for this increased catchment area with a lower discharge rate.
- 6.2.4 The proposed drainage strategy proposes sending all runoff to the rear of the dwelling units to an attenuation storage. From this storage, water will drain to a flow control chamber to the northwest corner of the application site. The flow control will discharge to the public surface water sewer manhole at no greater than 1.0 l/s for all critical storm events up to the 1 in 100-year storm plus 45% increase in rainfall intensity due to climate change.



6.2.6 It is recommended that water butts are used to retain some of the roof runoff to be used for non-potable uses such as gardening.

6.3.1 Foul water generated by the proposed residential development will discharge to the existing Southern Water public foul sewer located within St James Road.

6.3.2 Each dwelling will discharge via a new private gravity foul drain comprising 100 mm diameter pipe before discharging the public foul sewer on St James Road.

6.3.3 Both surface water and foul water drainage connections will require the applicant to enter into a Section 106 Agreement with Southern Water. It is worth noting that Southern Water requires a planning consent to process a Section 106 application.

6.3.4 Drainage layouts and surface water hydraulic model out are included within **Appendix D**.

7.0 Management and Maintenance Plan

- 7.1 Maintenance of the proposed surface water and foul water drainage systems will be the responsibility of the future homeowner.
- 7.2 Regular inspection and maintenance will assist in ensuring the continued performance of the drainage systems and minimising the risk of blockage, flooding or pollution.
- 7.3 Generally, responsibility for maintenance for any private infrastructure should lie with the homeowner, and for any shared infrastructure should lie with a management company.

Table 2: Proposed Drainage Maintenance Regime

Maintenance Activity	Description	Frequency	Responsibility
Water Butts	Inspect for debris, damage, leaks and overflow operation. Remove accumulated sediment and organic matter as necessary.	Every 6 months and after significant storms	Homeowner
Gutters and Downpipes	Remove leaves, moss and debris to ensure free flow to the drainage system.	Every 6 months and during autumn leaf fall	Management company
Surface Water Pipework	Inspect accessible chambers and pipework for blockage, silt accumulation or damage. Jetting or cleansing to be undertaken if required.	Annually and following severe storm events	Management company
Silt Traps	Inspect and remove accumulated silt, sediment and debris to maintain storage and flow capacity.	Every 6 months	Homeowner within their curtilage
Geocellular Attenuation Tank	Inspect upstream silt traps and access chambers for sediment accumulation. Jetting and cleansing of the tank system to be undertaken if required.	Annually	Management company
Hydrobrake Flow Control	Inspect flow control chamber for blockage, sediment accumulation or damage. Clean as necessary to maintain unrestricted operation.	Annually and after severe storms	Management company
Foul Drainage Pipework and Chambers	Inspect accessible chambers and foul drainage pipework for blockage, surcharge or damage. Jetting to be undertaken if required.	Annually	Homeowner within their curtilage

8.0 Conclusion

- 8.1 HydroGround Civils Ltd has prepared this Drainage Strategy Report in support of a planning application for the proposed residential redevelopment of land adjacent to 18 St James Road, East Grinstead.
- 8.2 The report demonstrates that satisfactory foul and surface water drainage can be achieved for the proposed development through the provision of a new gravity drainage network, below-ground attenuation storage and controlled discharge to the existing Southern Water public sewer network.
- 8.3 The proposed drainage strategy has been developed in accordance with the recognised drainage hierarchy and reflects the physical constraints of the site, the underlying geology and the availability of existing public drainage infrastructure within St James Road.
- 8.4 Surface water runoff will be collected through a gravity drainage system before being conveyed to a modular geocellular attenuation tank. Runoff will then be restricted to 1.0 litres per second using a Hydro-Brake vortex flow control prior to discharge into the existing Southern Water public surface water sewer.
- 8.5 Foul water generated by the proposed development will discharge by gravity into the existing Southern Water public foul sewer via a new private drainage network.
- 8.6 Hydraulic modelling has been undertaken using Causeway Flow in accordance with the FEH22 rainfall methodology and current climate change guidance to demonstrate the performance of the proposed drainage system. The accompanying hydraulic calculations and drainage layout provide the detailed engineering information supporting the proposed design.
- 8.7 Southern Water has previously assessed the receiving drainage network, and the proposed discharge rate has been selected to reflect the confirmed capacity available within the public surface water sewer. Both the foul and surface water connections will be subject to the appropriate statutory approvals under Section 106 of the Water Industry Act 1991.
- 8.8 A comprehensive management and maintenance regime has been prepared to ensure that the drainage infrastructure continues to operate effectively throughout the lifetime of the development.
- 8.9 Accordingly, it is considered that the proposed drainage strategy provides a sustainable and appropriate solution for the development and demonstrates that the site can be satisfactorily drained without increasing flood risk on-site or elsewhere.

8.10 The proposed drainage strategy is therefore considered to accord with:

- The National Planning Policy Framework (December 2024).
- The Planning Practice Guidance relating to flood risk and sustainable drainage.
- The National Standards for Sustainable Drainage Systems (Defra, 2025).
- Policy DP41 of the Mid Sussex District Plan (2014–2031).
- The Mid Sussex District Council Flood Risk and Drainage Information Checklist (Application Stage).

8.11 Overall, it is considered that the proposed development will provide an improvement over the existing site through the introduction of formal attenuation storage, controlled discharge and modern drainage infrastructure, thereby providing a more sustainable approach to surface water management.



Appendix A

Topographical Survey



Masonic Hall

5

9

13

16

ST JAMES'S ROAD

12

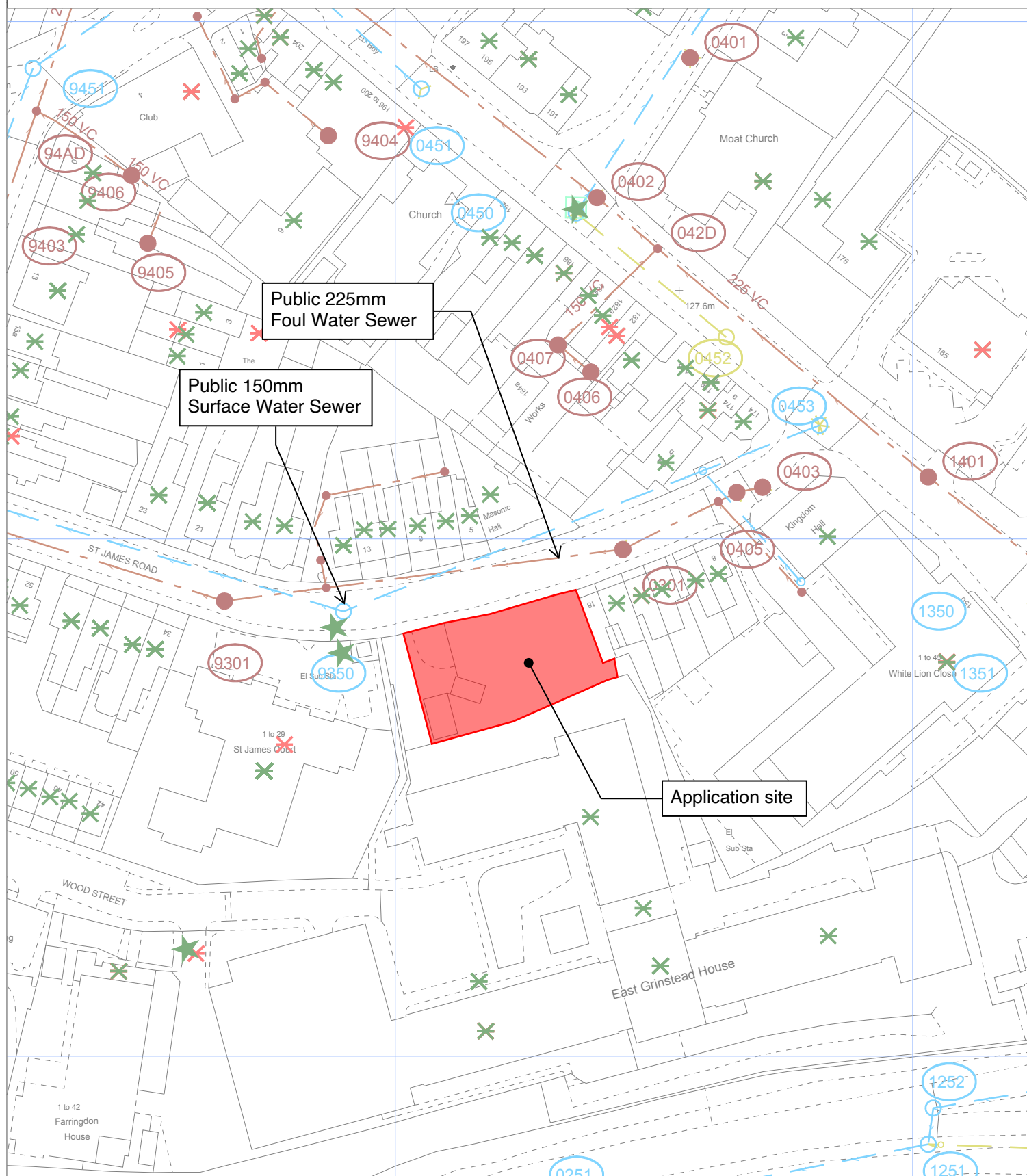


Appendix B

Southern Water GIS Sewer Records



SOUTHERN WATER



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.

Based upon Ordnance Survey Digital Data with the permission of the controller of H.M.S.O. Crown Copyright Reserved Licence No. WU 298530

O.S. REF: TQ3938SW

Scale: 1:1000

Screen Print

WARNING: BAC pipes are constructed of Bonded Asbestos Cement

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



Printed By: BoregoS

Date: 17-2-2023

Southern Water MapGuide Browser

Requested By:

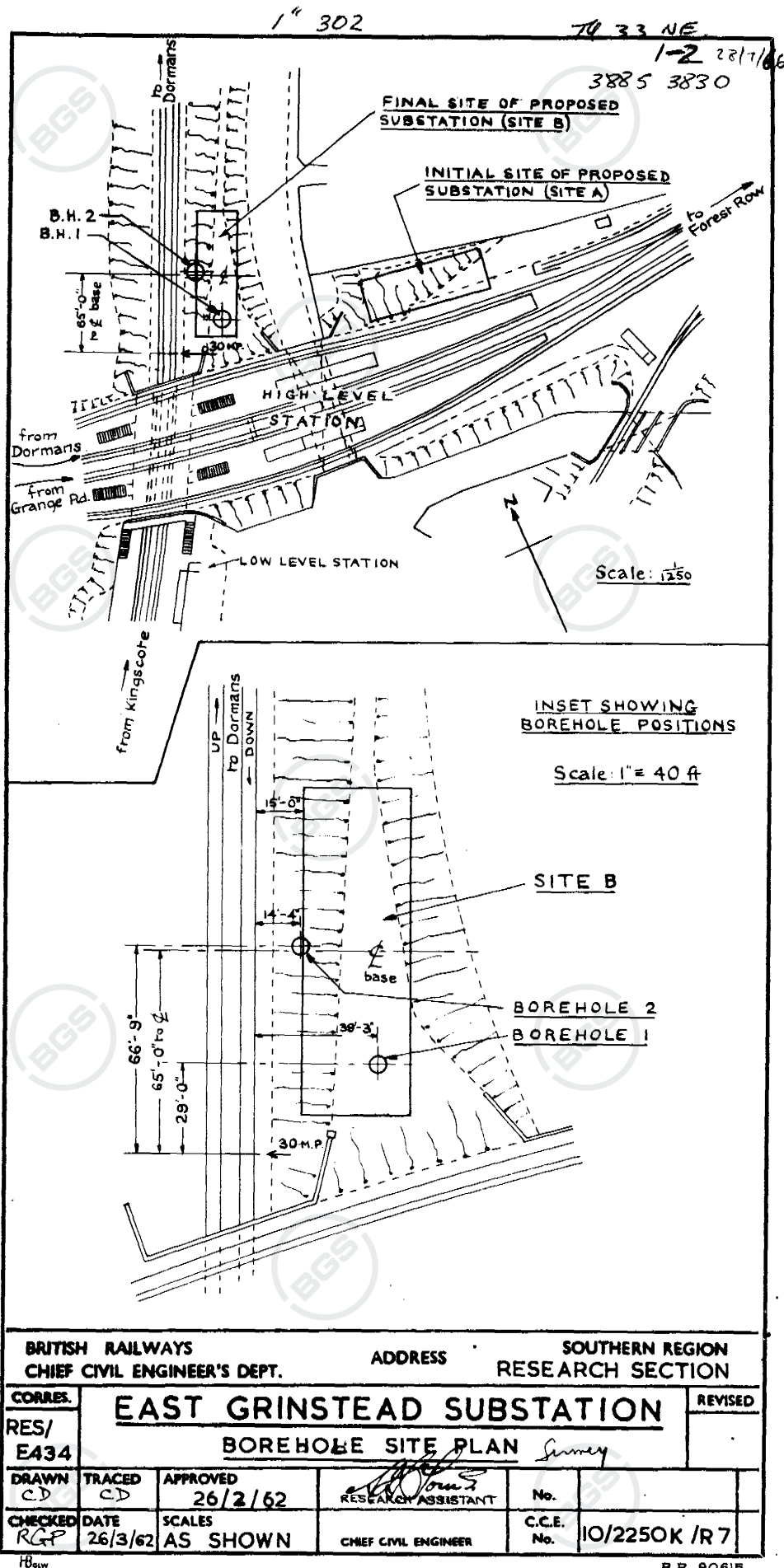




Appendix C

BGS Borehole Records







BOREHOLE No. 1

SHEET No 1

1" 302
TQ/33 NE1
3885 3828

SITE: EAST GRINSTEAD SUBSTATION

DATUM FOR LEVELS :- GROUND LEVEL

GROUND LEVEL :- 12'-3" above rail level

POSITION :- SEE SITE PLAN: No. 10/225OK/R 7

DATE :- 16/8/61 to 23/8/61

RESEARCH SECTION,
SOUTH SIDE OFFICES,
WATERLOO, EXT. 2786.

BRITISH RAILWAYS, SOUTHERN REGION,
CHIEF CIVIL ENGINEER'S DEPARTMENT,
WATERLOO STATION, S.E.1.

STRATA	THICK NESS	DEPTH	KEY	WATER LEVELS	SAMPLES	REMARKS
		0'-0"				
Yellow clayey friable Topsoil		0'-0" (0.03m)				
	1'-9"	1'-9"				
Stiff grey/brown mottled fissured silty CLAY		0.73m				

BOREHOLE No. 1" 302
TQ/33 NE 1 SHEET No 2
3885 382 8

SITE : EAST GRINSTEAD SUBSTATION

RESEARCH SECTION,
SOUTH SIDE OFFICES,
WATERLOO. EXT. 2786.

BRITISH RAILWAYS, SOUTHERN REGION,
CHIEF CIVIL ENGINEER'S DEPARTMENT,
WATERLOO STATION, S.E.1.

STRATA	THICK NESS	DEPTH	KEY	WATER LEVEL	SAMPLES	REMARKS
CONTINUED FROM SHEET 1 Very stiff grey/brown mottled fissured silty CLAY with pockets of brown silt		16'-0" (4.9m)				
END OF BORE		21'-6" penetrated (6.55m)				No water encountered

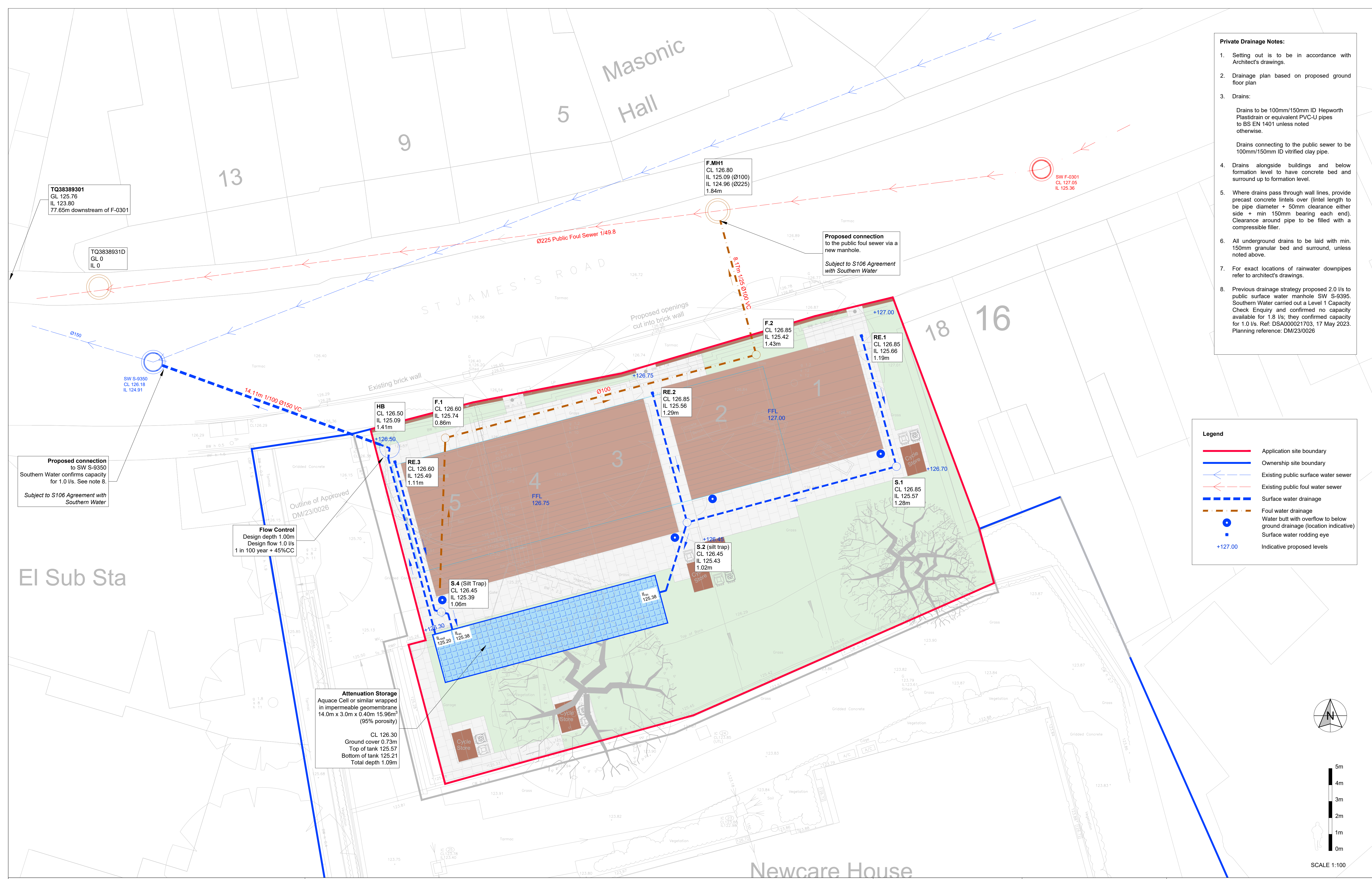
PENETRATION TEST		N° No. OF BLOWS FOR STANDARD PENETRATION.			
☒ UNDISTURBED CORE ☐ DISTURBED SAMPLE ☐ WATER SAMPLE	FIELD WORK	RGP	DATE	SCALE	2 FT. TO 1 IN.
	DRAWN	CD	21/2/62		
	CHECKED	R.E.P.	21/2/62	C.C.E. No	10/2250K/R9



Appendix D

Drainage layout & Causeway Flow Hydraulic Model Output





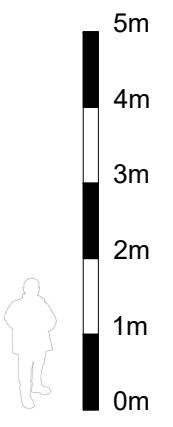
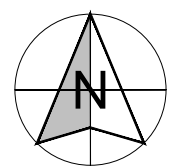
- Private Drainage Notes:**
- Setting out is to be in accordance with Architect's drawings.
 - Drainage plan based on proposed ground floor plan
 - Drains:

Drains to be 100mm/150mm ID Hepworth Plastidrain or equivalent PVC-U pipes to BS EN 1401 unless noted otherwise.

Drains connecting to the public sewer to be 100mm/150mm ID vitrified clay pipe.
 - Drains alongside buildings and below formation level to have concrete bed and surround up to formation level.
 - Where drains pass through wall lines, provide precast concrete lintels over (lintel length to be pipe diameter + 50mm clearance either side + min 150mm bearing each end). Clearance around pipe to be filled with a compressible filler.
 - All underground drains to be laid with min. 150mm granular bed and surround, unless noted above.
 - For exact locations of rainwater downpipes refer to architect's drawings.
 - Previous drainage strategy proposed 2.0 l/s to public surface water manhole SW S-9395. Southern Water carried out a Level 1 Capacity Check Enquiry and confirmed no capacity available for 1.8 l/s; they confirmed capacity for 1.0 l/s. Ref: DSA000021703, 17 May 2023. Planning reference: DM/23/0026

Legend

- Application site boundary
- Ownership site boundary
- Existing public surface water sewer
- Existing public foul water sewer
- Surface water drainage
- Foul water drainage
- Water butt with overflow to below ground drainage (location indicative)
- Surface water rodding eye
- +127.00 Indicative proposed levels



SCALE 1:100

- GENERAL NOTES**
- This drawing is to be read in conjunction with all relevant architects, engineers drawings & specifications.
 - The contractor is to be responsible for all dimensions & for the correct setting out of the works on site.
 - Do not scale from this drawing.

P01	CM	28 Jun 2026	Planning Issue
REV	BY	DATE	Revision Notes

PROJECT NAME
Land Adj to 18 St Jame's Road
East Grinstead
RH19 1DL

PROJECT DESCRIPTION
Below Ground Drainage
Surface Water & Foul Water

Revision	Prepared	CM	Approved	CM
Original	Approved	CM	Date	28 June 2026
STATUS	For Planning			

Scale:	Dwg No:	REVISION
1:xxx (A1)	RH041501/5010	P01



Simulation Settings

Rainfall Methodology	FEH-22	Analysis Speed	Detailed	Starting Level (m)	
Rainfall Events	Singular	Skip Steady State	x	Check Discharge Rate(s)	x
Summer CV	1.000	Drain Down Time (mins)	720	Check Discharge Volume	x
Winter CV	1.000	Additional Storage (m³/ha)	20.0		

Storm Durations

15 | 30 | 60 | 120 | 180 | 240 | 360 | 480 | 600 | 720 | 960 | 1440

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
1	0	0	0
30	0	0	0
30	40	0	0
100	0	0	0
100	45	0	0

Design Settings

Rainfall Methodology	FEH-22	Minimum Velocity (m/s)	1.00
Return Period (years)	1	Connection Type	Level Soffits
Additional Flow (%)	0	Minimum Backdrop Height (m)	0.200
CV	1.000	Preferred Cover Depth (m)	1.200
Time of Entry (mins)	5.00	Include Intermediate Ground	✓
Maximum Time of Concentration (mins)	30.00	Enforce best practice design rules	✓
Maximum Rainfall (mm/hr)	200.0		

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)	Invert Level (m)
RE.1	0.005	5.00	126.850	150	539033.083	138387.511	1.190	125.660
S.1	0.006	5.00	126.850	450	539035.187	138379.644	1.280	125.570
S.2	0.006	5.00	126.450	450	539022.459	138376.239	1.010	125.440
RE.2	0.006	5.00	126.850	150	539020.354	138384.105	1.290	125.560
AT			126.300		539016.397	138370.137	1.100	125.200
RE.3	0.006	5.00	126.600	150	539004.697	138379.917	1.110	125.490
S.4	0.006	5.00	126.450	500	539007.519	138370.790	1.060	125.390
HB			126.500	1200	539004.369	138380.794	1.640	124.860
SW S-9350			126.180	1200	538989.997	138385.994	1.240	124.940

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
1.000	RE.1	S.1	8.143	0.600	125.660	125.580	0.080	101.8	150	5.14	35.3
1.001	S.1	S.2	13.176	0.600	125.570	125.440	0.130	101.4	150	5.36	34.8
2.000	RE.2	S.2	8.143	0.600	125.560	125.480	0.080	101.8	150	5.14	35.3
3.000	RE.3	S.4	9.553	0.600	125.490	125.390	0.100	95.5	150	5.15	35.3
1.002	S.2	AT	4.500	0.600	125.440	125.380	0.060	75.0	150	5.42	34.6
3.001	S.4	AT	1.160	0.600	125.390	125.380	0.010	116.0	150	5.18	35.2
1.003	AT	HB	11.080	0.600	125.200	125.120	0.080	138.5	150	5.64	34.1
1.004	HB	SW S-9350	14.107	0.600	125.120	124.940	0.180	78.4	150	5.84	33.6

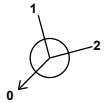
Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
1.000	0.996	17.6	0.6	1.040	1.120	0.005	0.0	20	0.470
1.001	0.998	17.6	1.4	1.130	0.860	0.011	0.0	28	0.594
2.000	0.996	17.6	0.8	1.140	0.820	0.006	0.0	21	0.497
3.000	1.028	18.2	0.8	0.960	0.910	0.006	0.0	21	0.504
1.002	1.162	20.5	2.9	0.860	0.770	0.023	0.0	38	0.820
3.001	0.932	16.5	1.5	0.910	0.770	0.012	0.0	31	0.582
1.003	0.852	15.1	4.3	0.950	1.230	0.035	0.0	55	0.735
1.004	1.136	20.1	4.3	1.230	1.090	0.035	0.0	47	0.901

Pipeline Schedule

Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
1.000	8.143	101.8	150	Circular	126.850	125.660	1.040	126.850	125.580	1.120
1.001	13.176	101.4	150	Circular	126.850	125.570	1.130	126.450	125.440	0.860
2.000	8.143	101.8	150	Circular	126.850	125.560	1.140	126.450	125.480	0.820
3.000	9.553	95.5	150	Circular	126.600	125.490	0.960	126.450	125.390	0.910
1.002	4.500	75.0	150	Circular	126.450	125.440	0.860	126.300	125.380	0.770
3.001	1.160	116.0	150	Circular	126.450	125.390	0.910	126.300	125.380	0.770
1.003	11.080	138.5	150	Circular	126.300	125.200	0.950	126.500	125.120	1.230
1.004	14.107	78.4	150	Circular	126.500	125.120	1.230	126.180	124.940	1.090

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
1.000	RE.1	150	Manhole	Adoptable	S.1	450	Manhole	Adoptable
1.001	S.1	450	Manhole	Adoptable	S.2	450	Manhole	Adoptable
2.000	RE.2	150	Manhole	Adoptable	S.2	450	Manhole	Adoptable
3.000	RE.3	150	Manhole	Adoptable	S.4	500	Manhole	Adoptable
1.002	S.2	450	Manhole	Adoptable	AT		Junction	
3.001	S.4	500	Manhole	Adoptable	AT		Junction	
1.003	AT		Junction		HB	1200	Manhole	Adoptable
1.004	HB	1200	Manhole	Adoptable	SW S-9350	1200	Manhole	Adoptable

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
RE.1	539033.083	138387.511	126.850	1.190	150				
						0	1.000	125.660	150
S.1	539035.187	138379.644	126.850	1.280	450				
						0	1.001	125.570	150
						1	2.000	125.480	150
S.2	539022.459	138376.239	126.450	1.010	450				
						2	1.001	125.440	150
						0	1.002	125.440	150
RE.2	539020.354	138384.105	126.850	1.290	150				
						0	2.000	125.560	150
AT	539016.397	138370.137	126.300	1.100					
						1	3.001	125.380	150
						2	1.002	125.380	150
						0	1.003	125.200	150
RE.3	539004.697	138379.917	126.600	1.110	150				
						0	3.000	125.490	150
S.4	539007.519	138370.790	126.450	1.060	500				
						1	3.000	125.390	150
						0	3.001	125.390	150

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)	
HB	539004.369	138380.794	126.500	1.640	1200		1	1.003	125.120	150
							0	1.004	125.120	150
SW S-9350	538989.997	138385.994	126.180	1.240	1200		1	1.004	124.940	150

Node HB Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	x	Sump Available	✓
Invert Level (m)	125.120	Product Number	CTL-SHE-0047-1000-1000-1000
Design Depth (m)	1.000	Min Outlet Diameter (m)	0.075
Design Flow (l/s)	1.0	Min Node Diameter (mm)	1200

Node AT Soakaway Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Invert Level (m)	125.200	Depth (m)	0.400
Side Inf Coefficient (m/hr)	0.00000	Time to half empty (mins)	200	Inf Depth (m)	
Safety Factor	2.0	Pit Width (m)	3.000	Number Required	1
Porosity	0.95	Pit Length (m)	14.000		

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

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	RE.1	11	125.679	0.019	0.6	0.0020	0.0000	OK
15 minute summer	S.1	11	125.598	0.028	1.3	0.0070	0.0000	OK
15 minute summer	S.2	11	125.478	0.038	2.7	0.0106	0.0000	OK
15 minute summer	RE.2	11	125.581	0.021	0.7	0.0023	0.0000	OK
120 minute summer	AT	80	125.252	0.052	2.3	2.0657	0.0000	OK
15 minute summer	RE.3	11	125.510	0.020	0.7	0.0025	0.0000	OK
15 minute summer	S.4	11	125.421	0.031	1.4	0.0097	0.0000	OK
120 minute summer	HB	82	125.262	0.142	2.3	0.1607	0.0000	OK
120 minute summer	SW S-9350	78	124.960	0.020	0.8	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	RE.1	1.000	S.1	0.6	0.460	0.034	0.0106	
15 minute summer	S.1	1.001	S.2	1.3	0.458	0.074	0.0376	
15 minute summer	S.2	1.002	AT	2.7	0.790	0.131	0.0154	
15 minute summer	RE.2	2.000	S.2	0.7	0.481	0.040	0.0119	
120 minute summer	AT	1.003	HB	2.3	0.239	0.151	0.1244	
15 minute summer	RE.3	3.000	S.4	0.7	0.350	0.039	0.0194	
15 minute summer	S.4	3.001	AT	1.4	0.549	0.085	0.0030	
120 minute summer	HB	1.004	SW S-9350	0.8	0.549	0.039	0.0202	4.2

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

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	RE.1	10	125.698	0.038	2.4	0.0039	0.0000	OK
15 minute summer	S.1	10	125.626	0.056	5.3	0.0142	0.0000	OK
15 minute summer	S.2	10	125.523	0.083	11.0	0.0232	0.0000	OK
15 minute summer	RE.2	10	125.603	0.043	2.9	0.0048	0.0000	OK
120 minute winter	AT	114	125.452	0.252	5.2	10.0608	0.0000	SURCHARGED
15 minute summer	RE.3	10	125.530	0.040	2.9	0.0051	0.0000	OK
15 minute summer	S.4	10	125.456	0.066	5.8	0.0206	0.0000	OK
120 minute winter	HB	114	125.452	0.332	2.0	0.3754	0.0000	SURCHARGED
15 minute summer	SW S-9350	27	124.961	0.021	0.8	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	RE.1	1.000	S.1	2.4	0.588	0.136	0.0331	
15 minute summer	S.1	1.001	S.2	5.2	0.656	0.298	0.1056	
15 minute summer	S.2	1.002	AT	11.0	1.138	0.534	0.0433	
15 minute summer	RE.2	2.000	S.2	2.9	0.702	0.164	0.0340	
120 minute winter	AT	1.003	HB	2.0	0.271	0.132	0.1951	
15 minute summer	RE.3	3.000	S.4	2.9	0.514	0.159	0.0541	
15 minute summer	S.4	3.001	AT	5.8	0.809	0.350	0.0083	
120 minute winter	HB	1.004	SW S-9350	0.8	0.557	0.041	0.0209	15.2

Results for 30 year +40% CC Critical Storm Duration. Lowest mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	RE.1	10	125.707	0.047	3.4	0.0048	0.0000	OK
15 minute summer	S.1	10	125.637	0.067	7.4	0.0170	0.0000	OK
180 minute winter	S.2	172	125.588	0.148	3.5	0.0410	0.0000	OK
15 minute summer	RE.2	10	125.611	0.051	4.0	0.0057	0.0000	OK
180 minute winter	AT	172	125.588	0.388	5.3	15.4634	0.0000	SURCHARGED
180 minute winter	RE.3	172	125.588	0.098	0.9	0.0123	0.0000	OK
180 minute winter	S.4	172	125.588	0.198	1.8	0.0612	0.0000	SURCHARGED
180 minute winter	HB	172	125.587	0.467	1.9	0.5286	0.0000	SURCHARGED
15 minute summer	SW S-9350	84	124.961	0.021	0.8	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	RE.1	1.000	S.1	3.4	0.624	0.192	0.0441	
15 minute summer	S.1	1.001	S.2	7.3	0.707	0.415	0.1359	
180 minute winter	S.2	1.002	AT	4.1	0.849	0.201	0.0791	
15 minute summer	RE.2	2.000	S.2	4.0	0.707	0.227	0.0507	
180 minute winter	AT	1.003	HB	1.9	0.249	0.126	0.1951	
180 minute winter	RE.3	3.000	S.4	0.9	0.375	0.050	0.1420	
180 minute winter	S.4	3.001	AT	1.8	0.589	0.109	0.0204	
180 minute winter	HB	1.004	SW S-9350	0.8	0.557	0.041	0.0209	23.6

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

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	RE.1	10	125.704	0.043	3.0	0.0044	0.0000	OK
15 minute summer	S.1	10	125.634	0.064	6.7	0.0161	0.0000	OK
15 minute summer	S.2	10	125.537	0.097	14.0	0.0270	0.0000	OK
15 minute summer	RE.2	10	125.609	0.049	3.7	0.0054	0.0000	OK
120 minute summer	AT	122	125.537	0.337	9.4	13.4396	0.0000	SURCHARGED
120 minute summer	RE.3	122	125.537	0.047	1.6	0.0059	0.0000	OK
120 minute summer	S.4	122	125.537	0.147	3.2	0.0455	0.0000	OK
120 minute summer	HB	122	125.537	0.417	2.7	0.4713	0.0000	SURCHARGED
15 minute summer	SW S-9350	65	124.961	0.021	0.8	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	RE.1	1.000	S.1	3.0	0.606	0.170	0.0402	
15 minute summer	S.1	1.001	S.2	6.6	0.690	0.376	0.1264	
15 minute summer	S.2	1.002	AT	13.9	1.199	0.675	0.0520	
15 minute summer	RE.2	2.000	S.2	3.7	0.698	0.209	0.0454	
120 minute summer	AT	1.003	HB	2.7	0.296	0.180	0.1951	
120 minute summer	RE.3	3.000	S.4	1.6	0.439	0.088	0.1061	
120 minute summer	S.4	3.001	AT	3.2	0.691	0.194	0.0204	
120 minute summer	HB	1.004	SW S-9350	0.8	0.557	0.041	0.0209	19.2

Results for 100 year +45% CC Critical Storm Duration. Lowest mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
180 minute winter	RE.1	176	126.233	0.573	1.0	0.0585	0.0000	SURCHARGED
180 minute winter	S.1	176	126.233	0.663	2.2	0.1678	0.0000	SURCHARGED
180 minute winter	S.2	176	126.233	0.793	4.6	0.2205	0.0000	FLOOD RISK
180 minute winter	RE.2	176	126.233	0.673	1.2	0.0747	0.0000	SURCHARGED
180 minute winter	AT	176	126.233	1.033	6.9	15.9800	0.0000	FLOOD RISK
180 minute winter	RE.3	176	126.233	0.743	1.2	0.0936	0.0000	SURCHARGED
180 minute winter	S.4	176	126.233	0.843	2.4	0.2614	0.0000	FLOOD RISK
180 minute winter	HB	176	126.233	1.113	2.4	1.2583	0.0000	FLOOD RISK
180 minute winter	SW S-9350	176	124.963	0.023	1.0	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
180 minute winter	RE.1	1.000	S.1	1.0	0.513	0.057	0.1434	
180 minute winter	S.1	1.001	S.2	2.2	0.526	0.125	0.2320	
180 minute winter	S.2	1.002	AT	4.6	0.911	0.226	0.0792	
180 minute winter	RE.2	2.000	S.2	1.2	0.562	0.068	0.1434	
180 minute winter	AT	1.003	HB	2.4	0.281	0.158	0.1951	
180 minute winter	RE.3	3.000	S.4	1.2	0.396	0.066	0.1682	
180 minute winter	S.4	3.001	AT	2.3	0.622	0.141	0.0204	
180 minute winter	HB	1.004	SW S-9350	1.0	0.596	0.052	0.0246	30.7