

SuDS and Drainage Report

Land Adj The Hollies, Barnham Road, Barnham PO22 0ES

Rev: **P3**

Ref: **C3876**

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Document Control

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Revision History

Date	Revision	Author	Approved
05.11.2025	P	LH	CS
13.11.2025	P1	LH	CS
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24.02.2026	P3	LH	CS

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1 Introduction

- 1.1.1 CGS Civils Ltd has been appointed to undertake a drainage strategy report for a proposed development at Land Adj The Hollies, Barnham Road in Barnham, West Sussex.
- 1.1.2 The proposed development will consist of the construction of 2 No. dwellings which will be utilised by the adjacent care home. The proposed development is located as OS Grid Reference SU 95757 04556 and has the post code PO22 0ES.
- 1.1.3 The purpose of this drainage strategy is to demonstrate how the development area can be satisfactorily drained without increasing flood risk onsite and elsewhere. In addition, the report is intended to supply the relevant data:
 - The results of an assessment into the potential for disposing of surface water by means of Sustainable Drainage System (SuDS).
 - The appropriate design standard for the surface water drainage scheme must be the 1 in 100 year return period with a 45% allowance for climate change.

Fig 1. Site Location



2 Executive Summary:

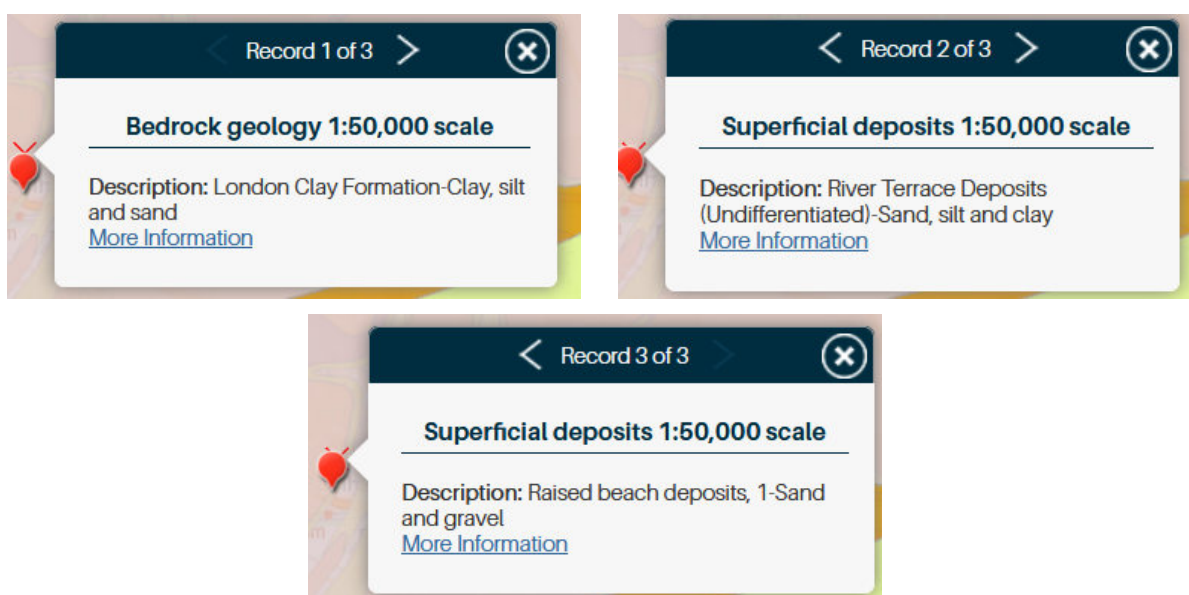
- 2.1.1 The discharge of surface water to ground confirmed to not be suitable after infiltration test failed. Winter groundwater monitoring was carried out in late 2022 and early 2023 which recorded a highest groundwater level of 1.0mgb. Infiltration features are therefore not viable under Arun District Council policy.
- 2.1.2 It is therefore proposed that surface water runoff is to be discharged into an existing surface water sewer located within Market Close at a restricted rate of 0.5l/s. Storage will be supplied within the sub-base of a tanked permeable parking area and within an attenuation tank.
- 2.1.3 The proposed network has been designed to cater for 1 in 100-year +45% CCA storm +10% urban creep.
- 2.1.4 The proposed foul water network is to be connected into the existing foul water system on site via the construction of a new chamber over the existing drain. Remedial works have been carried out on the foul drainage system and it is now flowing freely.

3 Site Geology

3.1 British Geological Survey information

- 3.1.1 The British Geological Survey confirms the bedrock geology to be made up of London Clay Formation. The BGS website confirms the superficial deposits on site to be made up of River Terrace Deposits and Raised Beach Deposits. The geology is noted to be comprised of Clay, Silt and Sand.
- 3.1.2 The British Geological survey also holds records of historical boreholes near the site which give some insight into the ground geology.
 - Borehole SU90SE54 (Located approx. 170m Southwest of the site) – Clay and sand

Fig 2. British Geological Survey



3.2 Geological Assessment

- 3.2.1 A groundwater monitoring well was installed on site in 2022 and monitoring was conducted during the winter period of late 2022 and early 2023. Further monitoring was undertaken on site during February 2026 to confirm any changes in groundwater levels.
- 3.2.2 During the monitoring window in both 2022-2023 and within February 2026, the highest recorded groundwater level was 1.0mbgl which rules out the use of infiltration on site. Therefore, as per National Standards for SuDS guidelines in addition to Arun DC policy, the use of infiltration features is not possible as there will be insufficient easement between base of infiltration feature and highest groundwater level. See **Appendix F**.
- 3.2.3 In addition to the ground water monitoring, an infiltration test to BRE365 was conducted within February 2023. A trial pit measuring 0.3 x 1m x 0.9m deep was excavated and rapidly filled with water; which failed to drain within a sufficient time period and is therefore considered a failure.
- 3.2.4 Photos of both the groundwater monitoring wells and the infiltration test can be found in Fig 3. Below.

Fig 3. Groundwater Monitoring Well locations and soakaway test photographs



4 Existing Drainage

4.1.1 A CCTV Drainage Survey was conducted on the existing The Hollies. It was confirmed that both the foul and surface water runoff from the property discharges via a combined drain into the foul water sewer within Barnham Road.

5 Proposed Drainage Strategy

5.1 SuDS Hierarchy

5.1.1 All options for the destination of run-off generated on site have been assessed in line with the SuDS hierarchy as set out in Building Regulations Part H document and DEFRA’s Draft National Standards for SuDS.

Table 1. SuDS Hierarchy

Discharge Destination	
Rainwater Harvesting	Rainwater harvesting has been designed into drainage network.
Discharge to Ground	No – Infiltration test failed and groundwater was recorded at 1.0mbgl.
Discharge to Watercourse	None nearby
Discharge to Surface Water Sewer	Yes – Discharge into surface water sewer within Market Close adjacent to the site. Discharge rate to be restricted to 0.5l/s.
Discharge to Other Sewer	N/A due to above.

5.2 Proposed Hydraulic Calculation Specifications:

Table 2. SuDS Hierarchy

Hydraulic Calculations Settings:	
Rainfall Methodology	FEH-22
Volumetric Run-off Coefficient Cv	1
CV Winter and Summer	1
Additional Storage (m ³ / ha)	0.0
Maximum Rainfall (mm/hr)	75
Flow Control	1.30m Head @ 0.5l/s discharge
Attenuation Tank Design	Base Coefficient (m/hr): 0.00000
	Side Coefficient (m/hr): 0.00000
	Factor of Safety: 2
	Porosity: 95%
Carpark Design	Base Coefficient (m/hr): 0.00000
	Side Coefficient (m/hr): 0.00000
	Factor of Safety: 2
	Porosity: 30%

5.3 Surface Water Drainage

- 5.3.1 Due to the failure on on-site infiltration testing it is confirmed that the discharge of surface water runoff via infiltration is not viable. It is therefore determined that all surface water runoff from the site is to be discharged into an existing surface water sewer located within Market Close at a restricted discharge rate of 0.5l/s which is the minimum practical rate to ensure self-cleansing velocity within the network and reducing the risks of blocking the orifice within the flow control chamber.
- 5.3.2 The hard paved areas are to be constructed from a permeable surface with the sub-base wrapped in an impermeable geomembrane which will allow the permeable paved areas to act as a blanket attenuation tank. Distribution tanks are to be located within the sub-base to allow runoff to convey between the sub-base and the remainder of the surface water network.
- 5.3.3 Rainwater harvesting tanks are to be installed along the drainage network which will allow harvested rainwater to be re-used within the properties.
- 5.3.4 Bioretention planters are also to be utilised within the drainage design which will intercept surface water runoff whilst also providing amenity and biodiversity. Additionally bioretention planters will provide treatment to the surface water and therefore will tackle all 4 pillars of SuDS.
- 5.3.5 An attenuation tank is to be installed to provide the additional storage required to cater for the 1 in 100-year +45% storm + 10% Urban Creep.
- 5.3.6 Greenfield Runoff and Hydraulic calculations have been carried out which can be found at Appendix C. The urban creep has been applied directly to the catchment area on the calculations to accommodate for this increase on roof areas only and not hard paved areas.
- 5.3.7 The proposed discharge to the Southern Water sewer has been agreed in principle by Southern Water who provided the following response:

“Dear Luke, Thank you for your comments. At this stage, I can confirm that Southern Water has no objections to the proposal, provided that all relevant Southern Water policies and standards are fully adhered to. To progress the application to technical review and for Approval to be granted we require full planning permission, as previously stated”
- 5.3.8 It has also been confirmed that a connection is possible via gravity with the levels of the existing surface water sewer provided on the drainage layout being taken from Southern Water sewer records – See **Appendix E**.

Table 3. Greenfield Runoff Calculations

Greenfield Runoff Calculations			
Storm period	Greenfield runoff rate (l/s)	Proposed Discharge Rate (l/s)	Difference (l/s)
Q _{BAR}	0.1	0.5	+ 0.4
1	0.1	0.5	+ 0.4
2	0.1	0.5	+ 0.4
30	0.2	0.5	+ 0.3
100	0.2	0.5	+ 0.3

5.4 Water Quality

- 5.4.1 A key requirement of any SuDS system is that it protects the receiving water body from the risk of pollution.
- 5.4.2 Frequent and short duration rainfall events are those that are most loaded with potential contaminants (silts, fines, heavy metals, and various organic and inorganic contaminants) Therefore the first 5-10mm of rainfall should be adequately treated with SuDS.
- 5.4.3 The new SuDS Manual (Ciria C753, November 2015) introduces slightly different approach compared to the previous version for the water quality management of surface water. The Manual describes risks posed by the surface water runoff to the receiving environment as a function of:
- The pollution hazard at a particular site (i.e., the pollution source)
 - The effectiveness of SuDS treatment components in reducing levels of pollutants to environmentally acceptable levels
 - The sensitivity of the receiving environment
- 5.4.4 The recommended approaches for water quality risk management are given in the SuDS Manual Table 26.1.

Table 26.1 from SuDS manual. Approaches to Water Quality Risk Management

Table 26.1 Approaches to Water Quality Risk Management			
Design method	Hazard Characterisation	Risk Reduction	
		For Surface Water	For Groundwater
Simple Index Approach	Simple pollution hazard indices based on land use (Table 26.2)	Simple SuDS hazard mitigation indices (Table 26.3)	Simple SuDS hazard mitigation indices (Table 26.4)
Risk Screening	Factors characterising traffic density and extent of infiltration likely to occur (Table 26.5)	N/A	Factors characterising unsaturated soil depth and type, and predominant flow type through the soils (Table 26.5)
Detailed Risk Assessment	Site specific information used to define likely pollutants and their significance	More detailed, component specific performance information used to demonstrate that the proposed SuDS components reduce the hazard to acceptable levels	
Process-based treatment modelling	Time series rainfall used with generic pollution characteristics to determine statistical distributions of likely concentrations and loadings in the runoff	Models that represent the treatment processes in the proposed SuDS components give estimates of reductions in even mean discharge concentrations and total annual load reductions delivered by the system	

- 5.4.5 As per Table 26.1 Simple Index approach will be used as a design method for this site.
- 5.4.6 Table 26.2 will provide hazard classification of different land uses. The land uses for the surface water drainage for this site are.
- Residential Roofs
 - Individual Property driveways and residential car parks
 - Low traffic roads

5.4.7 To deliver adequate treatment, the selected SuDS components should have a total pollution mitigation index for each contaminant type that equals or exceeds the pollution hazard index for each contaminant type. Therefore, the following must be achieved for the surface running off the site.

Total SuDS mitigation index \geq pollution hazard index

5.4.8 Pollution Hazard Indices are given for different land uses in Table 26.2 of the SuDS manual;

Table 26.2 from SuDS manual. Pollution Hazard Indices for Different Land Use Classifications

Table 26.2 Pollution hazard indices for different land use classifications				
Land Use	Pollution Hazard Level	Total Suspended solids (TSS)	Metals	Hydro-Carbons
Residential roofs	Very Low	0.2	0.2	0.05
Other roofs (Typically commercial/industrial roofs)	Low	0.3	0.2 (up to 0.8 where there is potential for metals to leach from the roof)	0.05
Individual property driveways, residential car parks, low traffic roads (e.g., cul-de-sacs, homezones and general access roads) and non-residential car parking with infrequent change (e.g., schools, offices) i.e., < 300 traffic movements/day	Low	0.5	0.4	0.4
Commercial yard and delivery areas, non-residential car parking with frequent change (e.g., hospitals, retail), all roads except low traffic roads and trunk roads/motorways	Medium	0.7	0.6	0.7
Sites with heavy pollution (e.g., haulage yards, lorry parks, highly frequented lorry approaches to industrial estates, waste sites), sites where chemicals and fuels (other than domestic fuel oil) are to be delivered, handled, stored, used or manufactured; industrial sites; trunk roads and motorways	High	0.8	0.8	0.9

5.4.9 From Table 26.2 the following information is tabulated in Table 3

Table 3: Pollution hazard index and destination of runoff for the proposed site

Table 3: Pollution Hazard Index and Destination of runoff for the proposed Site						
Land Use	Destination of Runoff	Pollution Hazard Level	Total Suspended Solids	Metals	Hydrocarbons	
Residential Roof	Surface Water	Very Low	0.2	0.2	0.05	
Individual driveways, residential car parks and low traffic roads	Surface water	Low	0.5	0.4	0.4	

5.4.10 The SuDS mitigation index will be obtained from Table 26.4 (for groundwater) of the SuDS manual.

Table 26.4 from SuDS manual. Indicative SuDS Mitigation Indices for discharges to ground waters.

5.4.11 SuDS mitigation index are tabulated in Table 5 as followed.

Table 26.4 Indicative SuDS mitigation indices for discharges to surface waters			
Type of SuDS Components	Mitigation Indices		
	TSS	Metals	Hydrocarbons
Filter Strip	0.4	0.4	0.5
Filter Drain	0.4	0.4	0.4
Swale	0.5	0.6	0.6
Bioretention System	0.8	0.8	0.8
Permeable Pavement	0.7	0.6	0.7
Detention Basin	0.5	0.5	0.6
Pond	0.7	0.7	0.5
Wetland	0.8	0.8	0.8
Proprietary treatment systems	These must demonstrate that they can address each of the contaminant types to acceptable levels for inflow concentrations relevant to the contributing drainage area		

Table 4: SuDS mitigation index

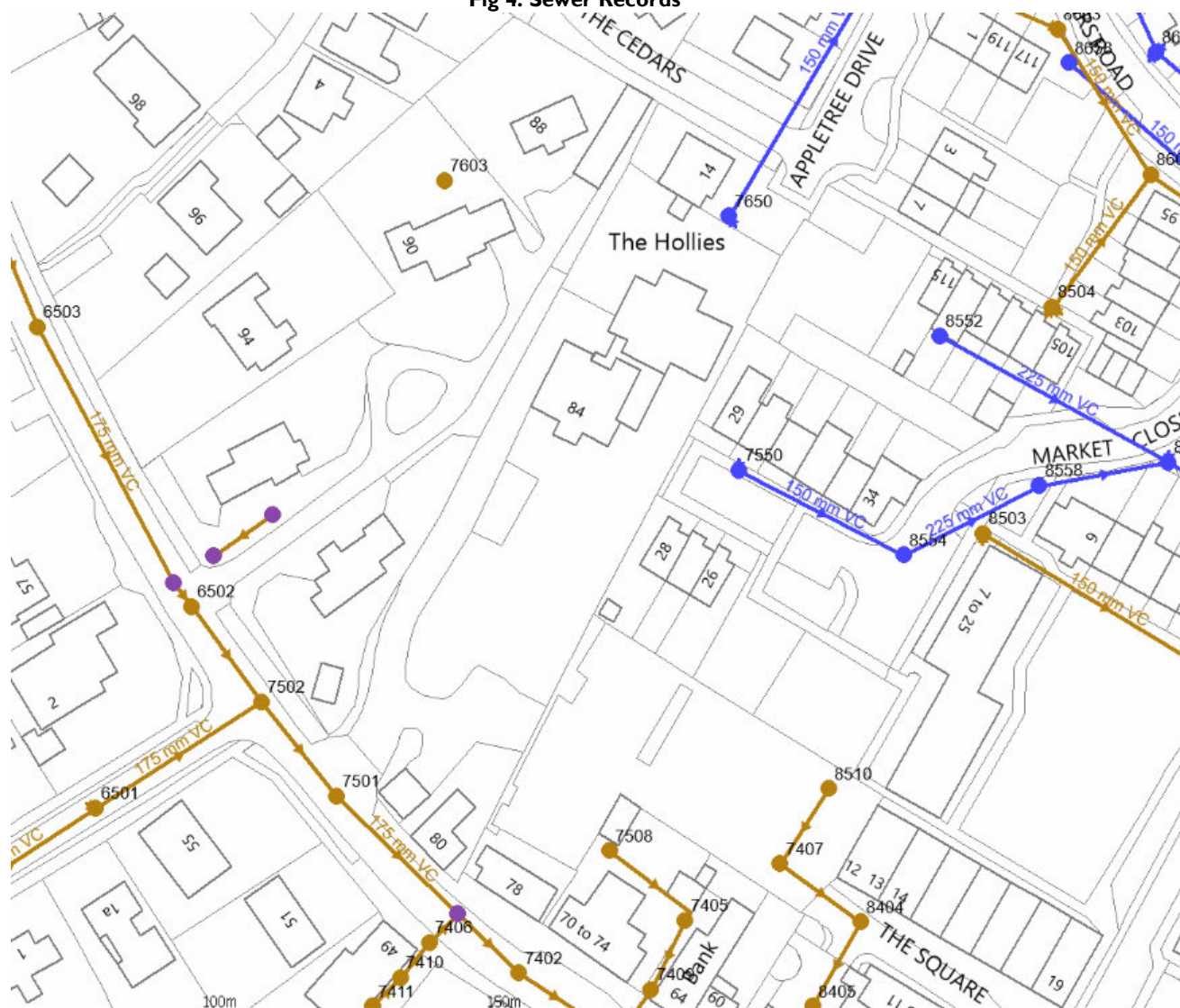
Table 4 Mitigation Indices						
Runoff Source	Destination of Runoff	Mitigation Index Source	Type of SuDS Component	Total Suspended Solids (TSS)	Metals	Hydrocarbons
Residential Roofs	Surface Water	Table 26.3	Bioretention System	0.8	0.8	0.8
Individual driveways, residential car parks and low traffic roads	Surface water	Table 26.3 (for surface waters)	Permeable Paving	0.7	0.6	0.7

5.4.12 The above analysis demonstrates that the SuDS devices within the design will mitigate any pollution present within the surface water system.

5.5 Foul water drainage

- 5.5.1 The foul water will discharge into the local foul water sewer via the construction of a new chamber on the existing private foul water drainage on site. The foul water drain discharges into the Southern Water sewer located within Barnham Road.
- 5.5.2 Due to the location of the site, the foul water sewer discharges into the Lidsey Wastewater Treatment Works (WwTW), which is subject to stricter sewage capacity requirements. It is to be noted that only foul water from the development will discharge into the public foul sewer, ensuring that only domestic wastewater is directed to Lidsey WwTW in accordance with Southern Water’s requirements and best practice for sustainable drainage design.
- 5.5.3 A CCTV drainage survey was carried out on the existing drainage network which recorded a blockage downstream of the proposed connection point. Remedial works have been carried out on the foul system and it is now clear of blockages and flowing freely.

Fig 4. Sewer Records

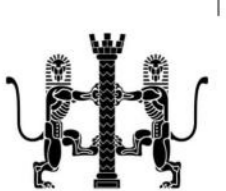


6 Summary and Conclusions

- 6.1.1 CGS Civils has been instructed to produce a Drainage statement under National Planning Policy Framework (NPPF) to support the Planning Application for the construction of 2 No. dwellings that is to be utilised by the adjacent care home.
- 6.1.2 The Surface Water will discharge to an existing surface water sewer located within Market close. The surface water discharge rate is to be restricted to 0.5 l/s and will utilise attenuations tanks and a attenuated sub-base of a car park in order to cater for the 1 in 100-year +45% storm +10% urban creep.
- 6.1.3 The proposed foul water network is to be connected into the existing foul water system on site via the construction of a new chamber over the existing drain. Remedial works have been carried out on the foul system and it is now clear of blockages and flowing freely.
- 6.1.4 The report has demonstrated that the proposed drainage measures ensure that suitable means of surface water drainage can be achieved for the proposed development.

7 Appendices

7.1 Appendix A – Site Plan



Car Park

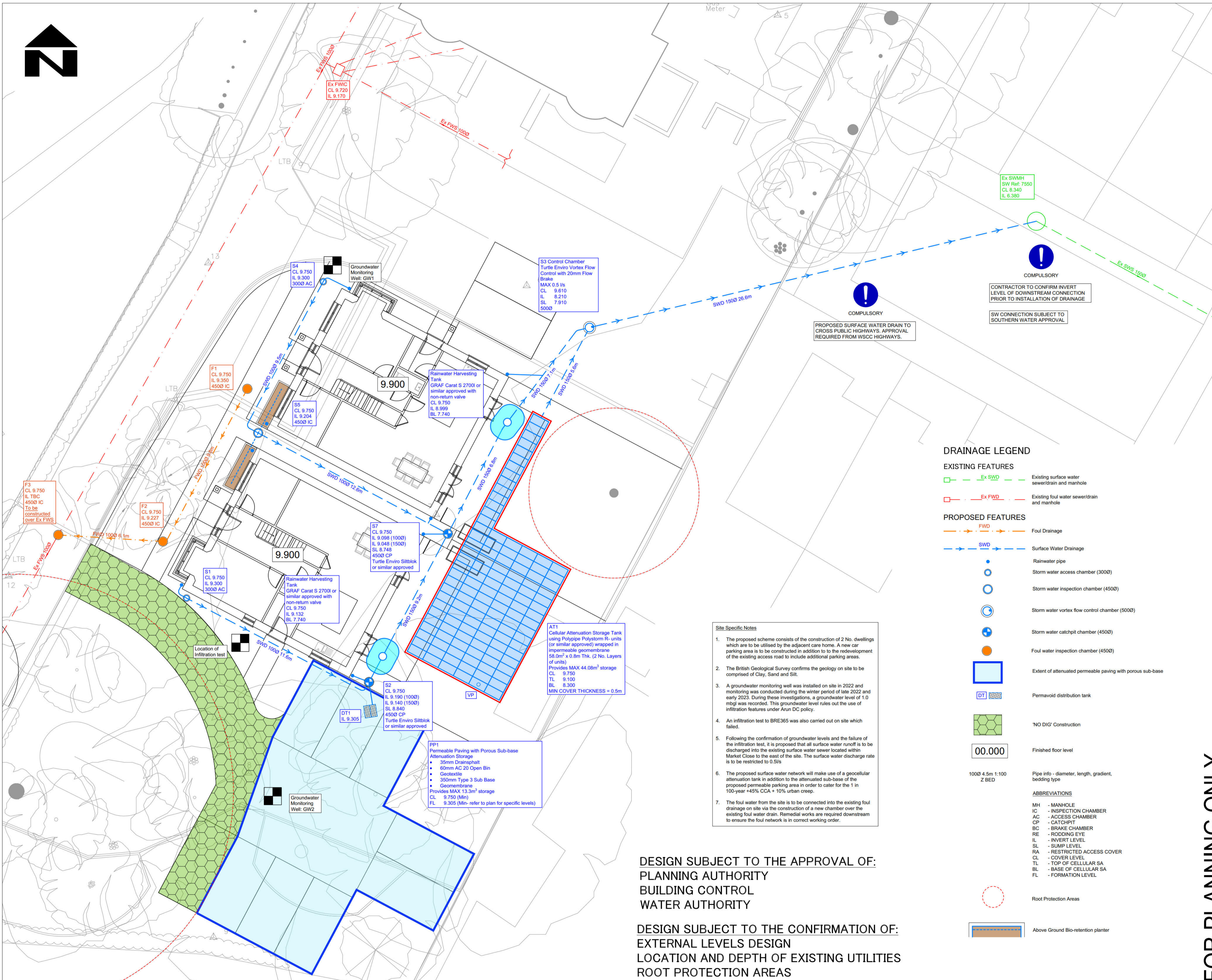
Client	Elberry Estates Ltd				
Job title	84 Barnham Road Barnham West Sussex PO22 0ES				
Drawing title	Proposed Site Plan				
Drawn	Date	Checked	Date	Scale at A1	
AE	Sep 25	CJP	Sep 25	1:200	
Job No.	Pro.	Org.	Zone	Type	Rev.
23-087	BHR	MHA	XX	00	DR A 0043 P05
Purpose of Issue					
PRELIMINARY					

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United Company
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7.2 **Appendix B – Drainage Layout**



- STANDARD DRAINAGE NOTES**
- DO NOT SCALE FROM THIS DRAWING. REFER TO FIGURED DIMENSIONS ONLY. THE CONTRACTOR SHOULD CHECK ALL DIMENSIONS ON SITE.
 - ALL DIMENSIONS IN MILLIMETRES AND ALL LEVELS ARE IN METERS UNLESS NOTED OTHERWISE.
 - THIS DRAWING SHOULD BE READ IN CONJUNCTION WITH ALL OTHER RELEVANT ARCHITECT AND ENGINEERING DETAILS, DRAWINGS AND SPECIFICATIONS.
 - ANY DISCREPANCIES SHOULD BE REPORTED TO THE ARCHITECT AND/OR ENGINEER IMMEDIATELY, SO THAT CLARIFICATION CAN BE SOUGHT PRIOR TO THE COMMENCEMENT OF WORK.
 - BEFORE COMMENCING CONSTRUCTION THE CONTRACTOR MUST CHECK THE INVERT LEVELS OF EXISTING SEWERS TO WHICH CONNECTIONS ARE MADE. IN ADDITION THE CONTRACTOR MUST LOCATE AND DETERMINE INVERT LEVELS OF THE EXISTING SPURS TO WHICH CONNECTIONS ARE PROPOSED. ANY DISCREPANCIES ARE TO BE NOTIFIED TO THE ENGINEER IMMEDIATELY, PRIOR TO CONSTRUCTION.
 - ALL DRAINAGE WORKS SHOULD COMMENCE AT THE PROPOSED DOWNSTREAM CONNECTION POINT. THE WORKS CONTINUING UPSTREAM FOLLOWING CONFIRMATION OF THE TIE-IN INVERT LEVELS TO THE ENGINEER. CONNECTIONS TO MANHOLES OR LARGER SIZED PIPES ETC. SHOULD BE SOFFIT TO SOFFIT UNLESS OTHERWISE INSTRUCTED BY THE ENGINEER, IF THIS IS NOT POSSIBLE INFORM THE ENGINEER IMMEDIATELY.
 - COVER LEVELS SHOWN ARE APPROXIMATE. COVERS AND FRAMES SHALL BE SET TO FINISHED GROUND LEVELS AND FALLS.
 - ALL UN-REFERENCED PIPES ARE TO BE 100mm DIA.
 - ALL PIPES TO BE ADOPTED, OR CONNECTING TO ADOPTED SEWERS, TO BE VITRIFIED CLAY TO BS EN 295 AND BS65 (SWS ONLY), OR CONCRETE PIPES TO BE EN 1916 AND BS5911:PART 1.
 - ROAD GULLY OUTLET PIPES ARE TO BE 150mm DIA. WITH CONCRETE SURROUND AND FLEXIBLE JOINTS. ALL GULLIES SHALL BE FITTED WITH GRADE D400 GRATINGS AND FRAMES TO BS EN124, UNLESS OTHERWISE STATED.
 - ALL ADOPTABLE SEWERS SHALL BE CONSTRUCTED TO THE STANDARDS AND SPECIFICATION LAID DOWN IN 'SEWERS FOR ADOPTION' 6th EDITION, WITH A VIEW TO ADOPTION UPON COMPLETION OF WORKS.
 - ALL PRIVATE DRAINAGE TO BE IN ACCORDANCE WITH THE BUILDING REGULATIONS APPROVED DOCUMENT PART-H, AND TO THE SATISFACTION OF THE BUILDING CONTROL INSPECTOR.
 - THE CONTRACTOR IS TO KEEP A RECORD OF ANY VARIATIONS MADE ON SITE, INCLUDING THE RELOCATION OF SEWERS OR DRAINS, SO THAT AN AS CONSTRUCTED DRAWING CAN BE PREPARED UPON COMPLETION OF THE PROJECT.
 - STUB CONNECTIONS TO ADOPTABLE MANHOLES SHALL BE MADE FROM VITRIFIED CLAY AND CONSIST OF TWO ROCKER PIPES LAID AT THE SAME GRADIENT AS THE UP OR DOWNSTREAM PIPE.
 - IF ANY SUB SOIL DRAINAGE SYSTEMS ARE UNCOVERED DURING THE WORKS CONTACT THE ENGINEER FOR INSTRUCTIONS. SUB SOIL DRAINS ARE TO BE DIVERTED AROUND NEW WORKS AND CONNECTED INTO THE SURFACE WATER.
 - NO PRIVATE AREAS ARE TO DRAIN ONTO ADOPTABLE AREAS AND VICE VERSA.
 - ALL EXISTING MANHOLE COVERS, GULLIES, ETC. ARE TO BE RAISED/LOWERED TO SUIT NEW LEVELS.
 - IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO CONFIRM THE LOCATION AND DEPTH OF ALL EXISTING SERVICES AND UTILITIES THAT MAY BE PRESENT.
 - UPON COMPLETION BUT PRIOR TO HANDOVER, CONTRACTOR TO CARRY OUT FULL CCTV SURVEY OF DRAINAGE SYSTEM WHICH IS TO BE REVIEWED BY ENGINEER TO ENSURE SATISFACTORY INSTALLATION.
 - PROPRIETARY PRODUCTS TO BE INSTALLED IN FULL ACCORDANCE WITH MANUFACTURER'S GUIDANCE.
 - MANHOLE AND CHAMBER COVER GRADES:
 - 'A15' IN ALL LANDSCAPED AREAS AND ON FOOTPATHS
 - 'B125' IN ALL DRIVEWAYS
 - 'C250' IN PRIVATE PARKING AREAS
 - 'D400' IN CARRIAGEWAY/ACCESS ROAD

DRAINAGE LEGEND

- EXISTING FEATURES**
- Ex SWD - Existing surface water sewer/drain and manhole
 - Ex FWD - Existing foul water sewer/drain and manhole
- PROPOSED FEATURES**
- SWD - Surface Water Drainage
 - FWD - Foul Drainage
 - Rainwater pipe
 - Storm water access chamber (3000)
 - Storm water inspection chamber (4500)
 - Storm water vortex flow control chamber (5000)
 - Storm water catchpit chamber (4500)
 - Foul water inspection chamber (4500)
 - Extent of attenuated permeable paving with porous sub-base
 - Permeavid distribution tank
 - 'NO DIG' Construction
 - Finished floor level
 - 1000 4.5m 1:100 Z BED
- ABBREVIATIONS**
- MH - MANHOLE
 - IC - INSPECTION CHAMBER
 - AC - ACCESS CHAMBER
 - CP - CATCHPIT
 - BC - BRAKE CHAMBER
 - RE - RODDING EYE
 - IL - INVERT LEVEL
 - SL - SUMP LEVEL
 - RA - RESTRICTED ACCESS COVER
 - CL - COVER LEVEL
 - TL - TOP OF CELLULAR SA
 - BL - BASE OF CELLULAR SA
 - FL - FORMATION LEVEL
- Root Protection Areas
- Above Ground Bio-retention planter

Prefixed to drawing numbers shall signify the following:-

- PL = PLANNING **Shall not be used for contract or construction purposes**
- P = PRELIMINARY **Shall not be used for contract or construction purposes**
- T = TENDER **Shall not be used for construction purposes**
- C = CONSTRUCTION **These are the only drawings that shall be used for construction purposes**
- R = RECORD **Record of actual completed work**

- Site Specific Notes**
- The proposed scheme consists of the construction of 2 No. dwellings which are to be utilised by the adjacent care home. A new car parking area is to be constructed in addition to the redevelopment of the existing access road to include additional parking areas.
 - The British Geological Survey confirms the geology on site to be comprised of Clay, Sand and Silt.
 - A groundwater monitoring well was installed on site in 2022 and monitoring was conducted during the winter period of late 2022 and early 2023. During these investigations, a groundwater level of 1.0 mbgl was recorded. This groundwater level rules out the use of infiltration features under Arun DC policy.
 - An infiltration test to BRE365 was also carried out on site which failed.
 - Following the confirmation of groundwater levels and the failure of the infiltration test, it is proposed that all surface water runoff is to be discharged into the existing surface water sewer located within Market Close to the east of the site. The surface water discharge rate is to be restricted to 0.5ls.
 - The proposed surface water network will make use of a geocellular attenuation tank in addition to the attenuated sub-base of the proposed permeable parking area in order to cater for the 1 in 100-year 45% CCA + 10% urban creep.
 - The foul water from the site is to be connected into the existing foul drainage on site via the construction of a new chamber over the existing foul water drain. Remedial works are required downstream to ensure the foul network is in correct working order.

DESIGN SUBJECT TO THE APPROVAL OF:
 PLANNING AUTHORITY
 BUILDING CONTROL
 WATER AUTHORITY

DESIGN SUBJECT TO THE CONFIRMATION OF:
 EXTERNAL LEVELS DESIGN
 LOCATION AND DEPTH OF EXISTING UTILITIES
 ROOT PROTECTION AREAS

REV	DATE	DESCRIPTION	BY	CHK	APP
P3	24.02.26	INCLUDED GWM AND INF TEST LOCATIONS	LH	CS	CS
P2	30.01.26	REVISED TO SUIT ADC COMMENTS	LH	CS	CS
P1	13.11.25	REVISED TO SUIT CLIENTS COMMENTS AND TO INCLUDE FOUL WATER DRAINAGE	LH	CS	CS
P	11.11.25	PRELIMINARY ISSUE	LH	CS	CS

FOR PLANNING ONLY

cgs civils
Consulting Civil Engineers

CLIENT: **ELBERRY PROPERTIES LTD**

ARCHITECT: **MH ARCHITECTS**

JOB TITLE: **LAND ADJ THE HOLLIES BARNHAM**

DRAWING TITLE: **DRAINAGE STRATEGY**

DRAWN	ENGINEER	CHECKED	APPROVED
LH	C SLADE	CS	CS

DATE: **NOV 2025** SCALE: @ A1 **1:100**

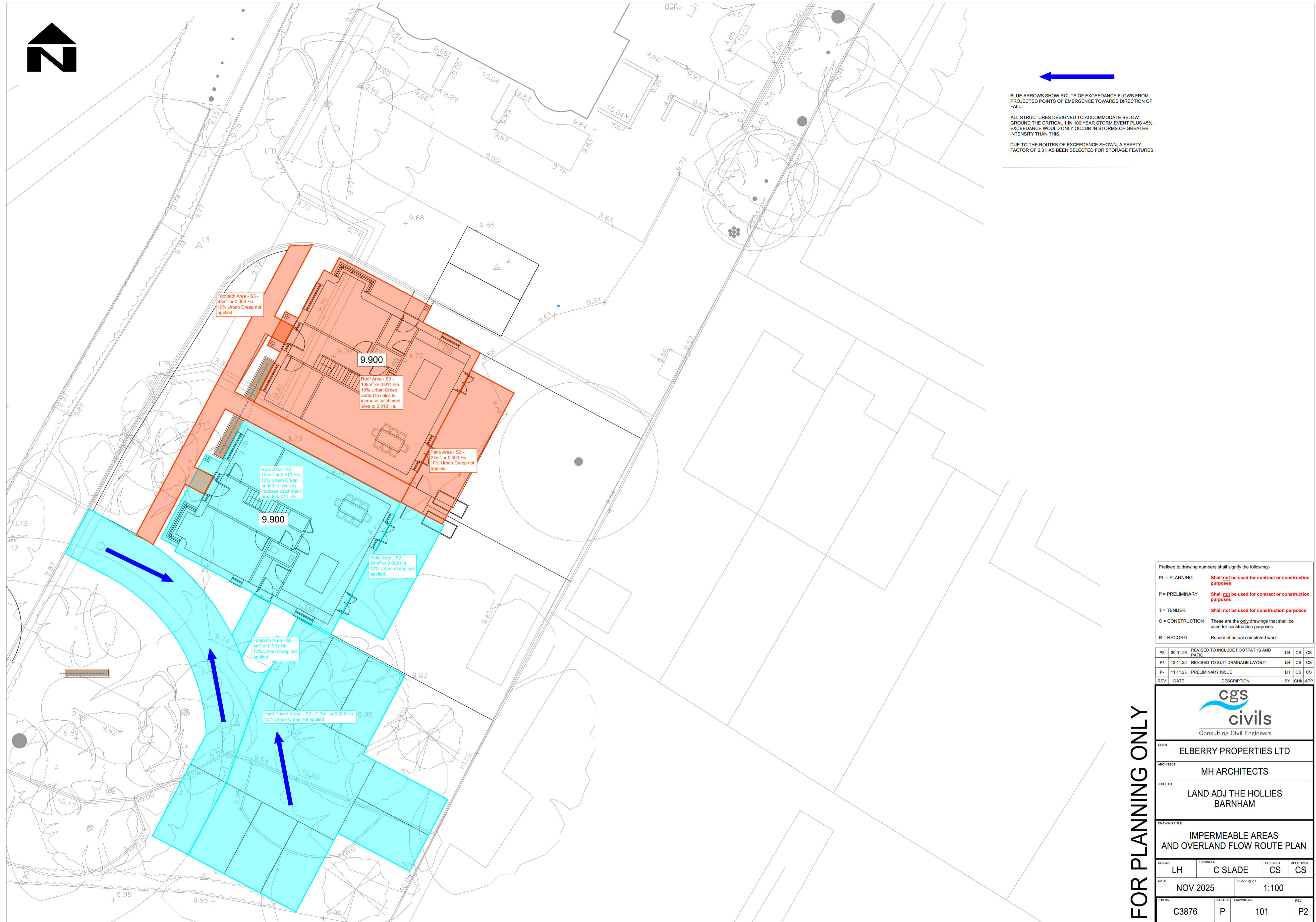
JOB No.	STATUS	DRAWING No.	REV.
C3876	P	101	P3



BLUE ARROWS SHOW ROUTE OF EXCEEDANCE FLOWS FROM PROJECTED POINTS OF EMERGENCE TOWARDS DIRECTION OF FALL.

ALL STRUCTURES DESIGNED TO ACCOMMODATE BELOW GROUND THE CRITICAL 1 IN 100 YEAR STORM EVENT PLUS 45%. EXCEEDANCE WOULD ONLY OCCUR IN STORMS OF GREATER INTENSITY THAN THIS.

DUE TO THE ROUTES OF EXCEEDANCE SHOWN, A SAFETY FACTOR OF 2.0 HAS BEEN SELECTED FOR STORAGE FEATURES.



Footpath Area - S3 - 43m² or 0.004 Ha
10% Urban Creep not applied

9.900

Roof Area - S3 - 109m² or 0.011 Ha
10% Urban Creep added to calc to increase catchment area to 0.012 Ha

Patio Area - S3 - 27m² or 0.003 Ha
10% Urban Creep not applied

9.900

Roof Area - S2 - 104m² or 0.010 Ha
10% Urban Creep added to calc to increase catchment area to 0.011 Ha

Patio Area - S2 - 24m² or 0.002 Ha
10% Urban Creep not applied

9.74

Footpath Area - S2 - 4m² or 0.001 Ha
10% Urban Creep not applied

9.99

Hard Paved Areas - S2 - 217m² or 0.022 Ha
10% Urban Creep not applied

Prefixed to drawing numbers shall signify the following:-

PL = PLANNING **Shall not be used for contract or construction purposes**

P = PRELIMINARY **Shall not be used for contract or construction purposes**

T = TENDER **Shall not be used for construction purposes**

C = CONSTRUCTION These are the only drawings that shall be used for construction purposes

R = RECORD Record of actual completed work

P2	30.01.26	REVISED TO INCLUDE FOOTPATHS AND PATIO	LH	CS	CS
P1	13.11.25	REVISED TO SUIT DRAINAGE LAYOUT	LH	CS	CS
P	11.11.25	PRELIMINARY ISSUE	LH	CS	CS
REV	DATE	DESCRIPTION	BY	CHK	APP



CLIENT ELBERRY PROPERTIES LTD

ARCHITECT MH ARCHITECTS

JOB TITLE LAND ADJ THE HOLLIES BARNHAM

DRAWING TITLE IMPERMEABLE AREAS AND OVERLAND FLOW ROUTE PLAN

DRAWN	ENGINEER	CHECKED	APPROVED
LH	C SLADE	CS	CS

DATE NOV 2025 SCALE @ A1 1:100

JOB No.	STATUS	DRAWING No.	REV.
C3876	P	101	P2

FOR PLANNING ONLY

7.3 **Appendix C – Surface Water Calculations**

Design Settings

Rainfall Methodology	FEH-22	Minimum Velocity (m/s)	1.00
Return Period (years)	2	Connection Type	Level Soffits
Additional Flow (%)	0	Minimum Backdrop Height (m)	0.200
CV	1.000	Preferred Cover Depth (m)	0.350
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)	75.0		

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)	Invert Level (m)
S2	0.036	5.00	9.750	450	495750.094	104541.613	0.610	9.140
S3	0.018	5.00	9.610	1200	495761.520	104563.110	1.400	8.210
ExSWMH	0.000		8.340	1050	495788.529	104568.165	1.960	6.380
ExSWS			8.340	1200	495791.178	104566.728	1.990	6.350

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	S2	S3	24.345	0.600	9.140	8.210	0.930	26.2	150	5.21	55.9
1.001	S3	ExSWMH	27.478	0.600	8.210	6.380	1.830	15.0	150	5.38	55.2
1.002	ExSWMH	ExSWS	3.014	0.600	6.380	6.350	0.030	100.5	150	5.43	55.0



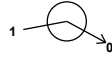

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
1.000	1.976	34.9	7.3	0.460	1.250	0.036	0.0	47	1.569
1.001	2.613	46.2	10.8	1.250	1.810	0.054	0.0	49	2.131
1.002	1.002	17.7	10.7	1.810	1.840	0.054	0.0	84	1.048

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	24.345	26.2	150	Circular	9.750	9.140	0.460	9.610	8.210	1.250
1.001	27.478	15.0	150	Circular	9.610	8.210	1.250	8.340	6.380	1.810
1.002	3.014	100.5	150	Circular	8.340	6.380	1.810	8.340	6.350	1.840

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
1.000	S2	450	Manhole	Adoptable	S3	1200	Manhole	Adoptable
1.001	S3	1200	Manhole	Adoptable	ExSWMH	1050	Manhole	Adoptable
1.002	ExSWMH	1050	Manhole	Adoptable	ExSWS	1200	Manhole	Adoptable

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
S2	495750.094	104541.613	9.750	0.610	450				
						0	1.000	9.140	150
S3	495761.520	104563.110	9.610	1.400	1200				
						0	1.001	8.210	150
ExSWMH	495788.529	104568.165	8.340	1.960	1050				
						0	1.002	6.380	150
ExSWS	495791.178	104566.728	8.340	1.990	1200				
						1	1.002	6.350	150

Simulation Settings

Rainfall Methodology	FEH-22	Skip Steady State	x	1 year (l/s)	0.1
Rainfall Events	Singular	Drain Down Time (mins)	240	10 year (l/s)	0.3
Summer CV	1.000	Additional Storage (m ³ /ha)	0.0	30 year (l/s)	0.3
Winter CV	1.000	Starting Level (m)	8.210	100 year (l/s)	0.4
Analysis Speed	Normal	Check Discharge Rate(s)	✓	Check Discharge Volume	x

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	45	0	0
10	45	0	0
30	45	0	0
100	45	0	0

Pre-development Discharge Rate

Site Makeup	Greenfield	Growth Factor 30 year	1.95
Greenfield Method	FEH	Growth Factor 100 year	2.48
Positively Drained Area (ha)	0.136	Betterment (%)	0
SAAR (mm)	762	QMed	0.2
Host	7	QBar	0.2
BFIHost	0.790	Q 1 year (l/s)	0.1
Region	1	Q 10 year (l/s)	0.3
QBar/QMed conversion factor	1.111	Q 30 year (l/s)	0.3
Growth Factor 1 year	0.85	Q 100 year (l/s)	0.4
Growth Factor 10 year	1.45		

Node S3 Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	x	Sump Available	✓
Invert Level (m)	8.210	Product Number	CTL-SHE-0030-5000-1300-5000
Design Depth (m)	1.300	Min Outlet Diameter (m)	0.075
Design Flow (l/s)	0.5	Min Node Diameter (mm)	1200

Node S3 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	8.300
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.95	Time to half empty (mins)	

Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)
0.000	58.0	58.0	0.800	58.0	79.6	0.801	0.0	79.6

Results for 1 year +45% CC Critical Storm Duration. Lowest mass balance: 72.32%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m ³)	Flood (m ³)	Status
15 minute summer	S2	10	9.184	0.044	6.5	0.0070	0.0000	OK
360 minute summer	S3	360	8.478	0.268	2.9	10.1446	0.0000	SURCHARGED
15 minute summer	ExSWMH	1	6.507	0.127	0.3	0.1103	0.0000	OK
15 minute summer	ExSWS	1	6.464	0.114	16.5	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m ³)	Discharge Vol (m ³)
15 minute summer	S2	1.000	S3	6.5	0.677	0.185	0.2498	
360 minute summer	S3	1.001	ExSWMH	0.3	0.494	0.007	0.0170	
15 minute summer	ExSWMH	1.002	ExSWS	16.5	1.085	0.931	0.0457	5.3

Results for 10 year +45% CC Critical Storm Duration. Lowest mass balance: 88.72%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m ³)	Flood (m ³)	Status
15 minute summer	S2	10	9.219	0.079	19.0	0.0125	0.0000	OK
480 minute winter	S3	472	8.785	0.575	3.2	27.3785	0.0000	SURCHARGED
15 minute summer	ExSWMH	1	6.507	0.127	0.3	0.1103	0.0000	OK
15 minute summer	ExSWS	1	6.464	0.114	16.5	0.0000	0.0000	OK
Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m ³)	Discharge Vol (m ³)
15 minute summer	S2	1.000	S3	19.0	1.238	0.544	0.3286	
480 minute winter	S3	1.001	ExSWMH	0.4	0.517	0.008	0.0190	
15 minute summer	ExSWMH	1.002	ExSWS	16.5	1.085	0.931	0.0457	5.2

Results for 30 year +45% CC Critical Storm Duration. Lowest mass balance: 91.14%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m ³)	Flood (m ³)	Status
15 minute summer	S2	10	9.233	0.093	24.6	0.0148	0.0000	OK
480 minute winter	S3	472	8.928	0.718	3.9	35.4334	0.0000	SURCHARGED
15 minute summer	ExSWMH	1	6.507	0.127	0.3	0.1103	0.0000	OK
15 minute summer	ExSWS	1	6.464	0.114	16.5	0.0000	0.0000	OK
Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m ³)	Discharge Vol (m ³)
15 minute summer	S2	1.000	S3	24.6	1.525	0.703	0.3537	
480 minute winter	S3	1.001	ExSWMH	0.4	0.531	0.008	0.0203	
15 minute summer	ExSWMH	1.002	ExSWS	16.5	1.085	0.931	0.0457	5.2

Results for 100 year +45% CC Critical Storm Duration. Lowest mass balance: 92.93%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m ³)	Flood (m ³)	Status
600 minute winter	S2	585	9.448	0.308	2.7	0.0490	0.0000	SURCHARGED
600 minute winter	S3	585	9.448	1.238	4.1	45.5355	0.0000	FLOOD RISK
15 minute summer	ExSWMH	1	6.507	0.127	0.3	0.1103	0.0000	OK
15 minute summer	ExSWS	1	6.464	0.114	16.5	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m ³)	Discharge Vol (m ³)
600 minute winter	S2	1.000	S3	2.7	0.225	0.077	0.4286	
600 minute winter	S3	1.001	ExSWMH	0.5	0.569	0.011	0.0241	
15 minute summer	ExSWMH	1.002	ExSWS	16.5	1.085	0.931	0.0457	5.6

Node Name	S2	S3	E2	E3	E4
<p>A4 drawing</p> <p>Hor Scale 1500</p> <p>Ver Scale 100</p> <p>Datum (m) 2.000</p>					
Link Name	1.000	1.001	1		
Section Type	150mm	150mm	1		
Slope (1:X)	26.2	15.0	1		
Cover Level (m)	9.750	9.610	8.340		
Invert Level (m)	9.140	8.210	6.380	6.380	6.380
Length (m)	24.345	27.478	3		

7.4 **Appendix D – Borehole Logs**

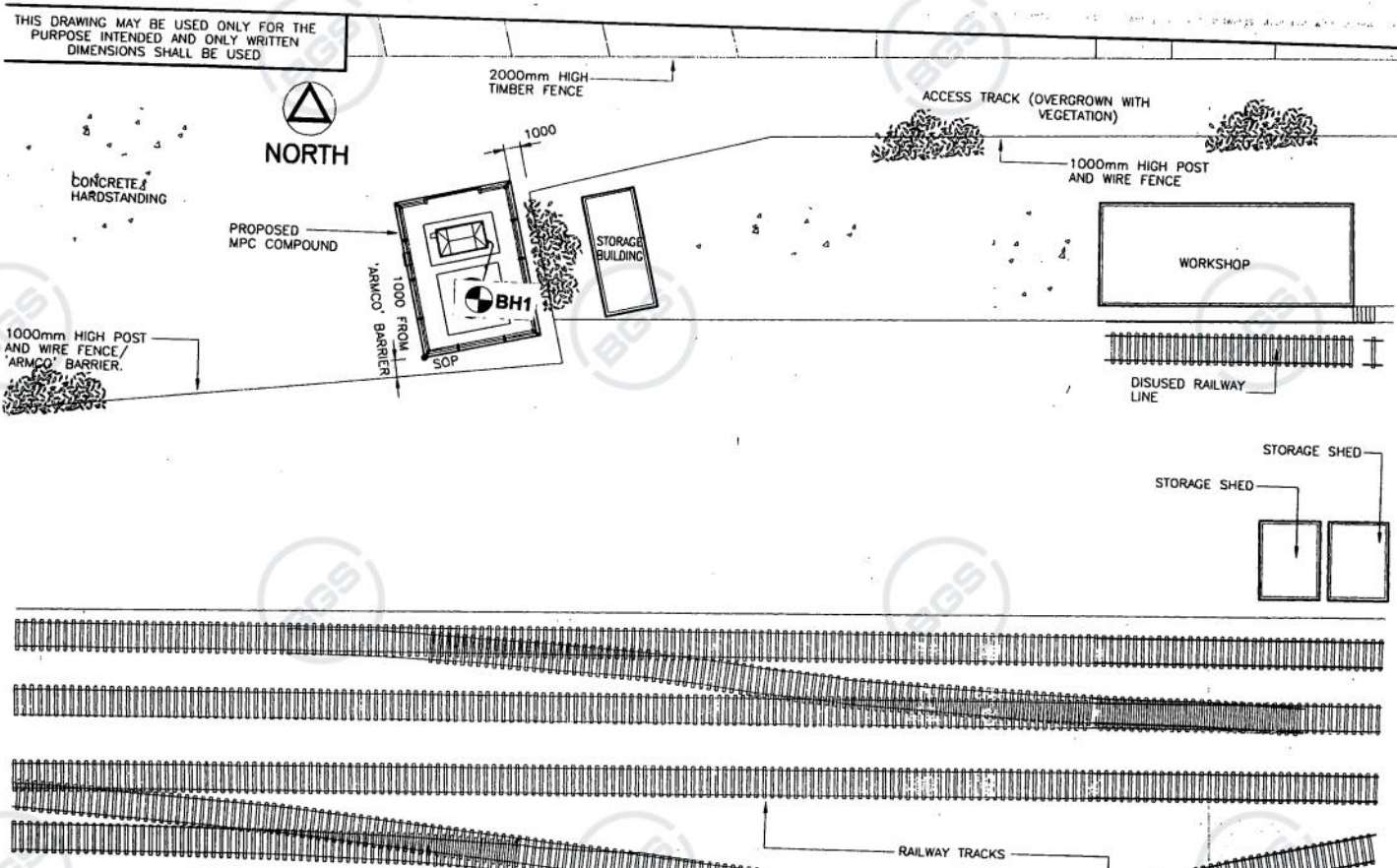


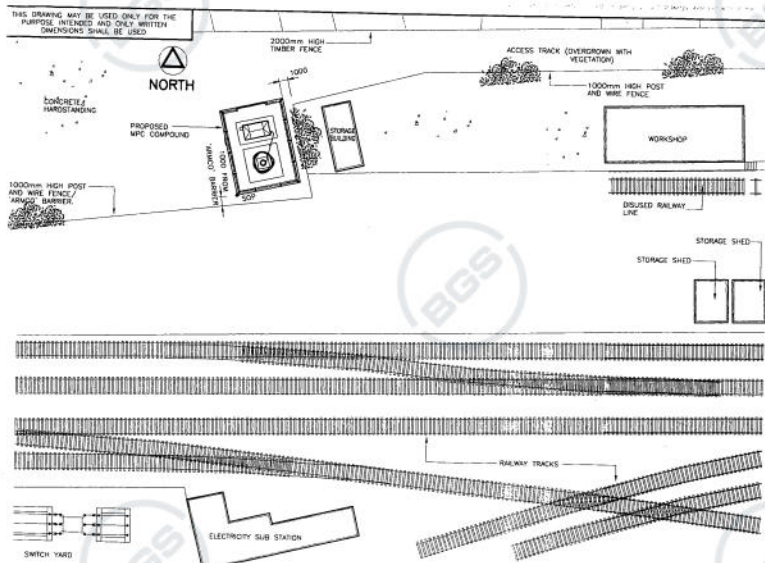
CLIENT SCOTTISH POWER TECHNOLOGY		JOB NO C9984	LOCATION BARNHAM STATION, BOGNOR REGIS		BOREHOLE NO BH1		
DATE FEBRUARY 1999		SCALE 1 to 50	BORING METHOD DYNAMIC SAMPLING		Sheet: 1		
Drilling & Coaling Progress	SAMPLE/TEST		SPT N - value or COHESION	DESCRIPTION	O D LEVEL	LEGEND	DEPTH
	Type & No.	Depth(M)					
19TH				MADE GROUND - Concrete.			0.0
				MADE GROUND - Medium dense, fine to coarse sand and gravel.			0.20
				MADE GROUND - Black sandy "silty" clay with some fine to coarse gravel and traces of crushed brick and ash.			0.40
				Stiff light to medium brown/orange sandy CLAY with some fine to coarse gravel and occasional fragments of flint.			0.60
				Generally medium dense, moist, orange clayey/silty SAND with occasional fine gravel and occasional fragments/nodules of flint/chert.			0.90
19TH	U	5.00	> 240.00	Very stiff, moist, dark grey silty CLAY.			4.75
							5.00

DUNELM DRILLING CO

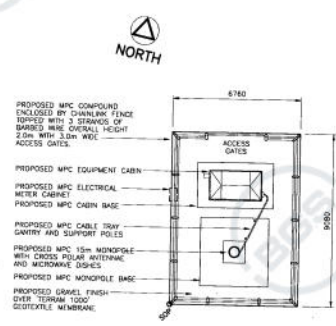
BOREHOLE LOGSHEET

Water Observations, Remarks, Etc
Water ingress noted at 1.00m.
Standing level recorded at 1.20m after 40mins.
Borehole backfilled to within 3.40m.

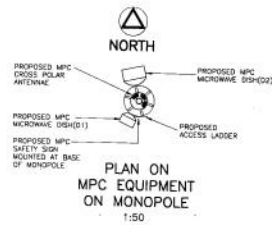




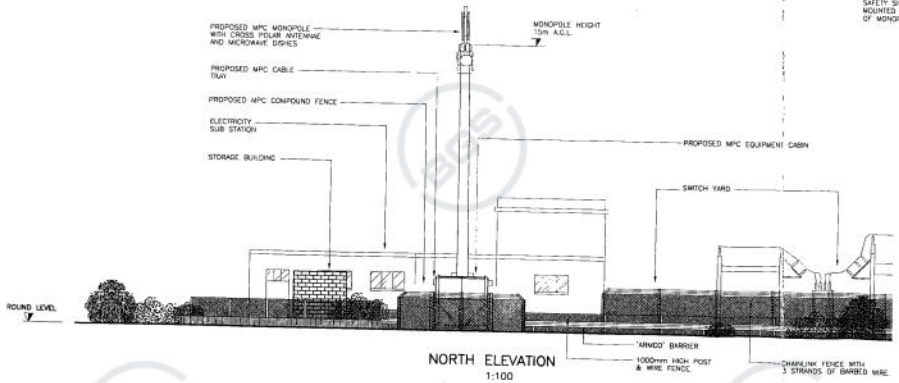
SITE LAYOUT
1:200



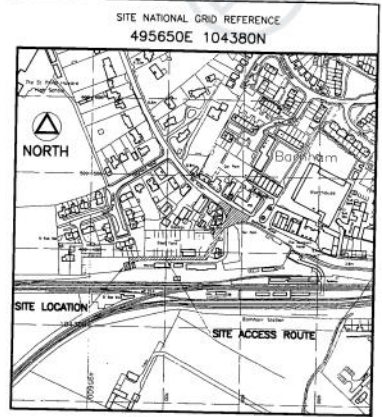
MPC COMPOUND LAYOUT
1:100



PLAN ON MPC EQUIPMENT ON MONOPOLE
1:50



NORTH ELEVATION
1:100



SITE LOCATION PLAN
1:2500
Reproduced from or based upon the OS map with the sanction of the Controller of the Stationery Office (Crown Copy Reserved)
BARNHAM STATION, BARNHAM, BOGNOR REGIS, WEST SUSSEX. PO22 0ER.

NOTES:
1. ALL DIMENSIONS ARE IN MILLIMETRES AND ALL LEVELS ARE IN METRES UNLESS NOTED OTHERWISE.
2. ALL PROPOSALS WILL BE SUBJECT TO LOCAL AUTHORITY AND OTHER STATUTORY CONSENTS.

MPC EQUIPMENT:

EQUIPMENT CABIN SCHEDULE	
MPC ID	PORTABLE HDI CABIN
SIZE(mm)	2780x1580x2800 HIGH
MATERIAL	STEEL
COLOUR	LIGHT GREY (BS10-A-03)

TOWER SCHEDULE

TOWER SCHEDULE	
MPC ID	15/PS/CP/BU/3/N

MICROWAVE DSH SCHEDULE

DSH ID	D1	D2
DSH SIZE	0.4	0.8
HEIGHT (MAGL)	15	T.B.C.
BEARING (°EN)	T.B.C.	T.B.C.
SITE LMK	703332	T.B.C.
SITE NAME	FITZLETT HOUSE	T.B.C.

SECTOR ANTENNA SCHEDULE

ANTENNA ID	SECTOR 1	SECTOR 2	SECTOR 3
ANTENNA TYPE	CROSS POLAR ANTENNA DSH	CROSS POLAR ANTENNA DSH	CROSS POLAR ANTENNA DSH
HEIGHT (MAGL)	15	15	15
AZIMUTH	45	120	320

Mercury Personal Communications

91406

BARNHAM STATION
BARNHAM
BOGNOR REGIS
WEST SUSSEX
PO22 0ER

SITE LAYOUT

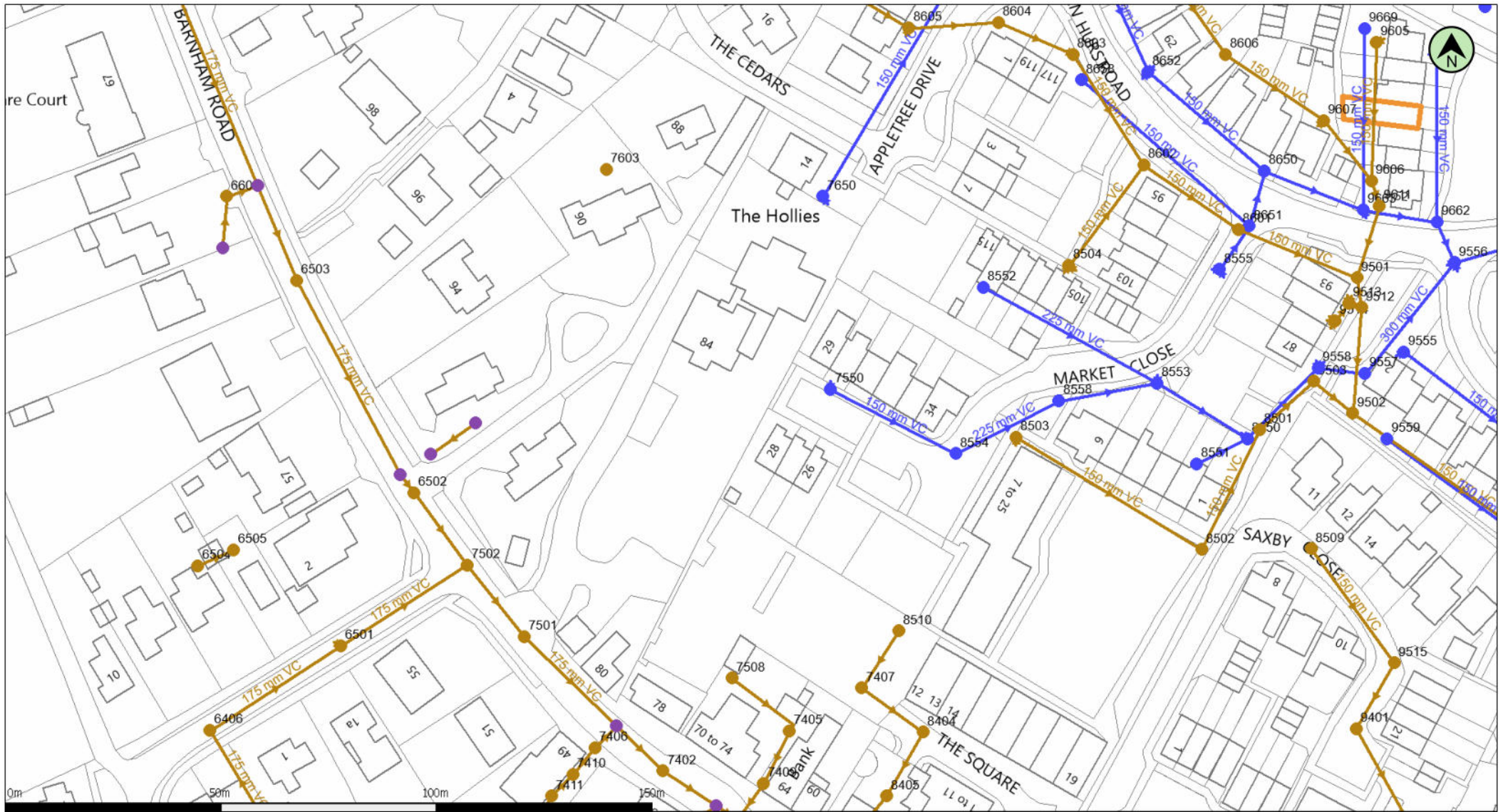
201

ScottishPower Technology

0032/201/002

7.5 **Appendix E – Sewer Records**





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Date: 03/03/22

Scale: 1:1250

Map Centre: 495770,104564

Data updated: 17/01/22

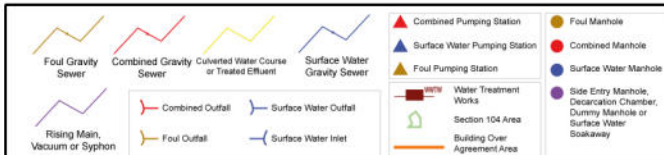
Our Ref: 796472 - 1

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 2022 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.



chris@cgscivils.co.uk	
84 Barnham Road	



Manhole Reference	Liquid Type	Cover Level	Invert Level	Depth to Invert
6406	F	9.12	6.96	-
6501	F	8.91	6.79	-
6502	F	8.83	5.00	-
6503	F	8.89	5.19	-
6504	F	0.00	0.00	-
6505	F	0.00	0.00	-
6602	F	0.00	0.00	-
7402	F	8.43	4.66	-
7405	F	0.00	0.00	-
7406	F	0.00	0.00	-
7407	F	0.00	0.00	-
7409	F	0.00	0.00	-
7410	F	0.00	0.00	-
7411	F	0.00	0.00	-
7501	F	8.84	4.88	-
7502	F	8.82	4.93	-
7508	F	0.00	0.00	-
7603	F	0.00	0.00	-
8404	F	0.00	0.00	-
8405	F	0.00	0.00	-
8501	F	7.42	5.37	-
8502	F	7.33	5.77	-
8503	F	8.02	6.18	-
8504	F	8.24	6.56	-
8509	F	6.63	4.96	-
8510	F	0.00	0.00	-
8601	F	7.82	5.57	-
8602	F	8.40	5.88	-
8603	F	8.74	6.24	-
8604	F	9.03	6.48	-
8605	F	8.97	6.76	-
8606	F	8.62	7.11	-

Manhole Reference	Liquid Type	Cover Level	Invert Level	Depth to Invert
9401	F	6.52	4.36	-
9501	F	7.48	5.23	-
9502	F	7.25	4.93	-
9503	F	7.45	5.09	-
9512	F	7.41	5.09	-
9513	F	7.51	6.13	-
9514	F	7.52	6.35	-
9515	F	6.44	4.50	-
9605	F	8.04	6.66	-
9606	F	7.67	5.82	-
9607	F	8.11	6.63	-
9611	F	7.59	5.49	-
7550	S	8.34	6.38	-
7650	S	8.88	8.06	-
8550	S	7.46	5.38	-
8551	S	7.28	7.27	-
8552	S	8.69	8.68	-
8553	S	7.78	5.54	-
8554	S	8.00	5.96	-
8555	S	7.73	6.37	-
8558	S	7.99	5.70	-
8650	S	8.09	6.14	-
8651	S	7.82	6.22	-
8652	S	8.60	6.78	-
8658	S	8.69	6.39	-
9555	S	7.06	6.13	-
9556	S	6.91	4.76	-
9557	S	7.20	5.17	-
9558	S	7.48	5.30	-
9559	S	6.96	6.95	-
9652	S	7.52	7.51	-
9662	S	7.19	5.04	-

7.6 **Appendix F – Groundwater monitoring results**

Groundwater Monitoring



Hole ID	Instrument ID	Instrument Type	Recorded Base of Instrument (mBGL)	Reading			
				Date	Water Level (mBGL)	Water level (mOD)	Ground Level m(OD)
GW1	1	SP	4m	04.10.22	1.60	8.18	9.78
				13.10.22	1.57	8.21	9.78
				27.10.22	1.52	8.26	9.78
				11.11.22	1.45	8.33	9.78
				22.11.22	1.50	8.28	9.78
				12.12.22	1.57	8.21	9.78
				06.01.23	1.48	8.30	9.78
				16.01.23	1.22	8.56	9.78
				30.01.23	1.00	8.78	9.78
				13.02.23	1.04	8.74	9.78
				27.02.23	1.00	8.78	9.78
				09.03.23	1.5	8.28	9.78
				09.01.26	1.24	8.34	9.78
				23.01.26	1.16	8.62	9.78
				05.02.26	1.03	8.75	9.78
				13.02.26	1	8.78	9.78
				20.02.26	1.1	8.68	9.78

GW2	2	SP	4m	04.10.22	1.61	8.33	9.94
				13.10.22	1.54	8.4	9.94
				27.10.22	1.52	8.42	9.94
				11.11.22	1.55	8.39	9.94
				22.11.22	1.68	8.26	9.94
				12.12.22	1.74	8.20	9.94
				06.01.23	1.33	8.61	9.94
				16.01.23	1.32	8.62	9.94
				30.01.23	1.05	8.89	9.94
				13.02.23	1.10	8.84	9.94
				27.02.23	1.04	8.90	9.94
				09.03.23	1.60	8.34	9.94
				09.01.26	1.35	8.59	9.94
				23.01.26	1.2	8.74	9.94
				05.02.26	1.10	8.84	9.94
				13.02.26	1.06	8.88	9.94
				20.02.26	1.00	8.84	9.94

Project: The Hollies, Barnham
 Project No: C3876
 Client: Elberry Properties Ltd

GWM