Surface Water Drainage Strategy for Planning

Prepared for:
Stag Construction Services LTD

Location:
9 Station Parade
Tarring Road
West Sussex
BN11 4SS

September 2022

Our reference:
92090-210722-Daniel-StationPrd

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Document Issue Record

Location:	9 Station Parade, Tarring Road, West Sussex, BN11 4SS				
Application:	Erection of new single-storey 1-bedroom dwelling unit attached to rear (south) elevation of no.9				
Prepared for:	Stag Construction Services LTD				
Title:	Surface Water Drainage Strategy for Planning				
Project No.:	92090	**Date:**	28th September 2022	**Issue No.:**	1.0
Written By:	A. Rousou BSc (Hons)	**Checked By:**	E.Bouet, BSc (Hons)	**Authorised By:**	E.Bouet, BSc (Hons)

1. Introduction

1.1. This Surface Water Drainage Strategy has been prepared by Unda Consulting Limited on behalf of Stag Construction Services LTD, in support of a planning application for the erection of new single-storey 1-bedroom dwelling unit attached to rear (south) elevation of no.9. The development is proposed at 9 Station Parade, Tarring Road, West Sussex BN11 4SS. This report assesses surface water drainage arrangements for the proposed development.

1.2. The proposed planning application is for the *erection of new single-storey 1-bedroom dwelling unit attached to rear (south) elevation of no.9.* The extension that will be attenuated as part of this strategy will cover approximately 43m².

1.3. In order to mitigate flood risk posed by post development runoff, adequate control measures will be required within the site. This will ensure that surface water runoff is dealt with at source and the flood risk off site is not increased.

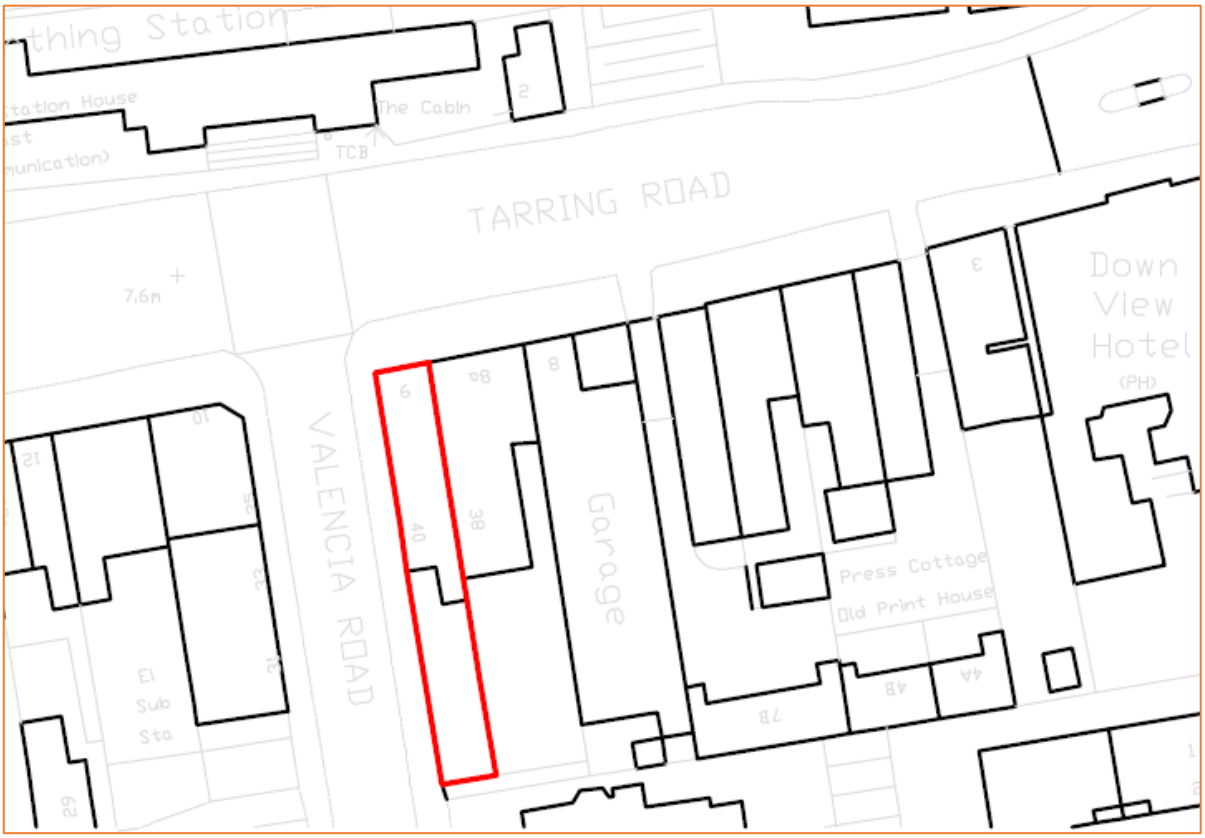

Figure 1: Site Location Plan (Source: bpm Architectural Services Ltd)

2. Existing Site:

2.1. The majority of the site is currently occupied by car parking spaces.

Figure 2: Site location (Source: Google)

Site Topography:

2.2. Environment Agency LiDAR has been used to assess the topography across the site and wider area. Light Detection and Ranging (LIDAR) is an airborne mapping technique, which uses a laser to measure the distance between the aircraft and the ground surface. Up to 100,000 measurements per second are made of the ground, allowing highly detailed terrain models to be generated at high spatial resolutions. The EA's LIDAR data archive contains digital elevation data derived from surveys carried out by the EA's specialist remote sensing team. Accurate elevation data is available for over 70% of England. The LiDAR technique records an elevation accurate to +0.3m every 2m. This dataset is derived from a combination of the full dataset which has been merged and re-sampled to give the best possible coverage. The dataset can be supplied as a Digital Surface Model (DSM) produced from the signal returned to the LIDAR (which includes heights of objects, such as vehicles, buildings and vegetation, as well as the terrain surface) or as a Digital Terrain Model (DTM) produced by removing objects from the Digital Surface Model. 1.0m horizontal resolution DTM LiDAR data has been used for the purposes of this study.

2.3. Lidar indicates that levels on site range from approximately 7.86mAOD to 7.64mAOD.

Existing Ground Conditions:

2.4. The British Geological Survey (BGS) Map indicates that the bedrock underlying the site is Seaford Chalk Formation - Chalk, with superficial deposits of River Terrace Deposits (Undifferentiated) - Sand, Silt And Clay.

2.5. The soil type in the area taken from the UKSO Website is relatively deep soils of Sand Lowes soil parent material, with a silt to sand soil texture.

2.6. No boreholes are located within the site boundary.

2.7. The published Environment Agency Groundwater Source Protection Zone map shows the site is not located within a Source Protection Zone.

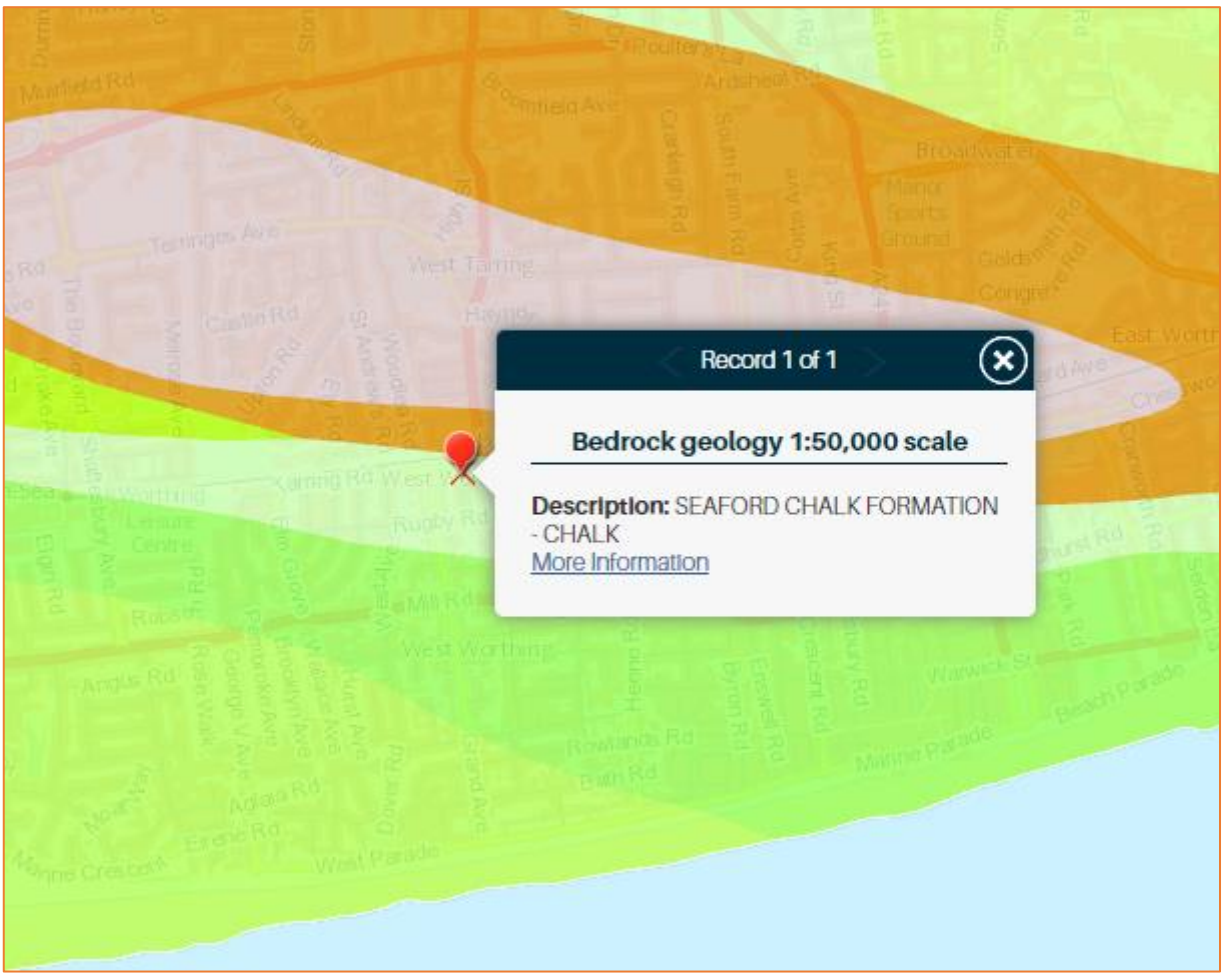

Figure 3: BGS Bedrock Geology (Source: BGS)

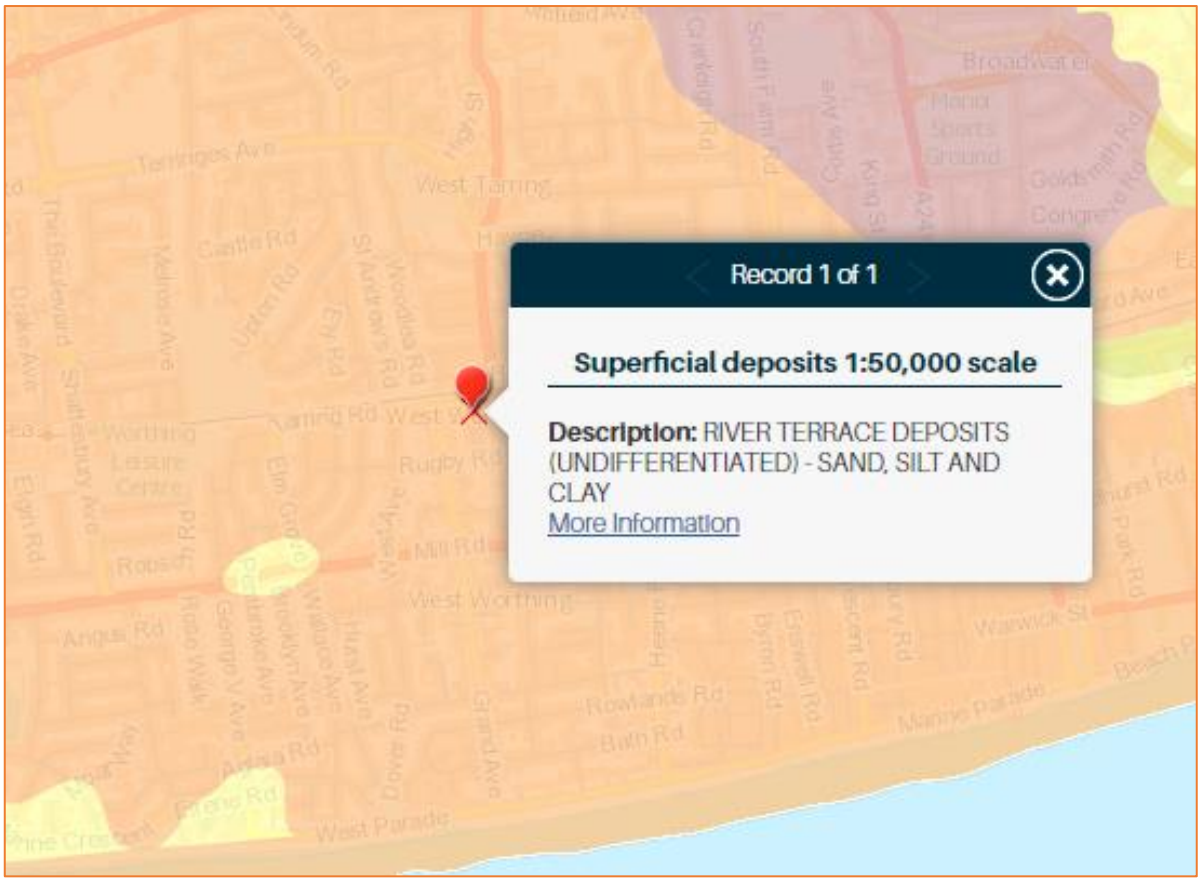

Figure 4: Superficial Deposits (Source: BGS)

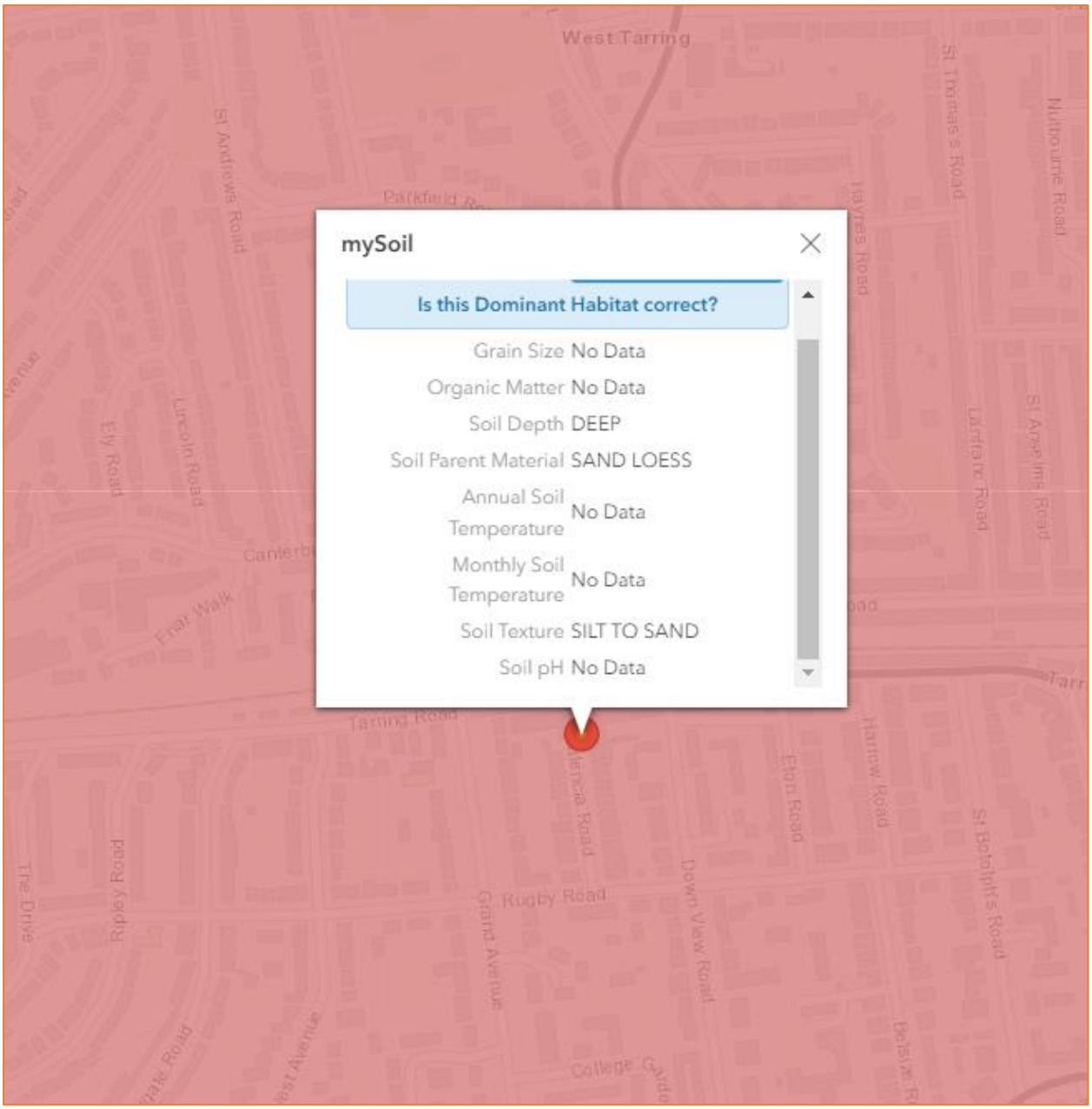

Figure 5: Soil Map (Source: UK Soils, BGS)

Nearby Watercourses / Drainage Features:

2.8. The nearest watercourse/ waterbody to the site is the English Channel located approximately 1.32km to the south.

Existing Drainage:

2.9. It is understood that the existing site discharges to sewer at an unattenuated rate.

3. Development Proposals:

Proposed Development:

3.1. The proposed planning application is for the *erection of new single-storey 1-bedroom dwelling unit attached to rear (south) elevation of no.9.* The extension that will be attenuated as part of this strategy will cover approximately 43m².

3.2. Therefore, the SuDS sizing within the strategy has been based on the proposed extension thus betterment will be provided post development.

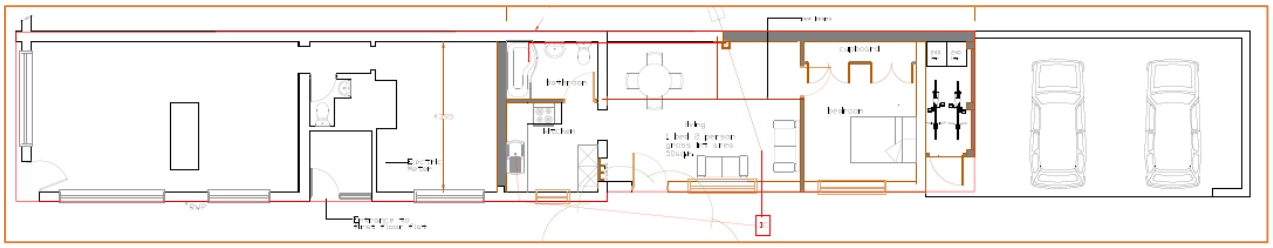

Figure 6: Proposed Site Layout Plan (Source: Caldotec Ltd)

4. Surface Water Drainage Strategy:

4.1. In order to mitigate flood risk posed by post development runoff, adequate control measures will need to be considered within the site. This will ensure that surface water runoff is dealt with at source and flood risk is not increased elsewhere.

Drainage Hierarchy:

4.2. The drainage strategy for the site has been prepared according to the drainage discharge hierarchy from CIRIA C753 The SuDS Manual, as follows:

- Infiltration to the maximum extent that is practical;
- Discharge to surface waters;
- Discharge to surface water sewer.

Infiltration Potential:

4.3. The 1:43,000 BGS map shows the site to be located upon the bedrock of Seaford Chalk Formation - Chalk. However, due to site constraints deep infiltration SuDS are not viable.

Proposed Discharge Rate:

4.4. The greenfield runoff rates for the area of the site being attenuated has been calculated as 0.0 l/s for the 1:1 annual runoff event, 0.0 l/s for the 1:30 year event and 0.1 l/s for the 1:100 year event. Refer to calculations in appendix.

4.5. Runoff from proposed extension will be directed into cellular storage located beneath the parking spaces. This will discharge into to the Southern Water surface water pipework located beneath Valencia Road at attenuated rate of 0.1l/s via an orifice plate. If a gravity connection is not viable a pump will be utilised.

4.6. The car parking spaces will be constructed from permeable paving, therefore allowing runoff to infiltrate into the ground below.

Cellular Storage Attenuation:

4.7. Runoff from the proposed extension (43m^2) will discharge into the sites surface water pipework via a cellular storage attenuation.

4.8. The proposed development comprises some 43m^2 of potentially impermeable surfacing. In order to comply with CIRIA C753 The SuDS Manual, a 10% allowance will be added to take into account future urban creep. Applying a 10% allowance to all new impermeable surfacing (43m^2) gives a value of 47.3m^2. Therefore, all drainage calculations have been made on the basis of a total impermeable area of 47.3m^2.

4.9. Preliminary calculations indicate that cellular storage with dimensions of 9m^2 x 0.4m deep x 0.95 (voids) will be sufficient to accommodate all runoff from 47.3m^2 of impermeable surfacing arising from the critical 1:100 year + 45% climate change event.

4.10. Preliminary calculations indicated that some 3.42m^3 of storage is required to attenuate the runoff for all storms up to and including the 1 in 100 year + 45% climate change event.

4.11. *Please note that the levels of the cellular storage within the Micro drainage calculations are arbitrary for modelling purposes.*

4.12. All preliminary surface water drainage calculations have been undertaken using MicroDrainage software. Refer to the appendix.

Water Quality:

4.13. Water quality has been assessed in line with the Simple Index approach from Chapter 26 of CIRIA C753 The SuDS Manual:
Step 1 – Allocate suitable pollution hazard indices for the proposed land use.
Step 2 – Select SuDS with a total pollution mitigation index that equals or exceeds the pollution hazard index.

4.14. The highest pollution hazard level for the proposed land use is Low (residential car parks and low trafficked roads). The pollution hazard indices for this land use are shown in Table 2 below.

Total suspended solids (TSS)	Metals	Hydrocarbons
0.5	0.4	0.4

Table 3: Pollution Hazard Indices for the proposed site (from Table 26.2 of CIRIA C753 The SuDS Manual)

4.15. All SuDS components are assessed for their effectiveness in pollutant removal prior to discharge to sewer in Table 26.3 in CIRIA C753 The SuDS Manual. The pollution mitigation indices for permeable pavements are show in Table 3 below.

Total suspended solids (TSS)	Metals	Hydrocarbons
0.7	0.6	0.7

Table 4: Pollution Mitigation Indices for permeable pavements (from Table 26.3 of CIRIA C753 The SuDS Manual)

4.16. The Pollution Mitigation Indices for permeable pavement are greater than the Pollution Hazard Indices for car parks and low trafficked roads. Therefore, permeable pavements will provide sufficient water quality treatment prior to discharge to ground.

4.17. Runoff from roof areas is considered to be uncontaminated and does not warrant any form of treatment process to improve water quality. Nevertheless, it is suggested to include debris / sediment traps on any new drainage.

Design Exceedance:

4.18. Should the onsite drainage system fail under extreme rainfall events or blockage, flooding may occur within the site. In the event of the drainage system failure, the runoff flow can be managed through detailing the new external levels to direct water away from structures.

Adoption and Maintenance:

4.19. It is proposed that the cellular storage attenuation will be privately maintained by the end user.

4.20. A draft Maintenance Schedule is outlined in the Table below.

Cellular Storage

4.21. It is not envisaged that silt build up within the cellular crate systems will require a rigorous maintenance regime so long as silt is removed from upstream catch pits and inspection chambers on a regular basis. Notwithstanding this, a suitable maintenance regime for the systems will comprise of routine inspection and silt removal (as necessary). Inspection should be undertaken using CCTV equipment offered up the inspection tunnels located within the crate system. Camera access can be gained via inspection chambers and inlet pipework located at each end of the tunnels.

4.22. Silt removal can be achieved by jetting the inspection tunnels. Jetting should be undertaken in accordance with current jetting guidelines, in particular the Code of Practice for Sewer Jetting published by The Water Research Centre. Jetting at 143bar at 300l/min should be more than adequate in removing any build-up of material within the tunnel. The crate system will take higher pressures. However, unlike regular jetting which relies heavily on high pressure to remove hardened deposits on the inner bore of pipes, effective cleansing of a crate system relies more on the delivery flow rate to flush solids back through the system.

4.23. A standard jet head with rear facing nozzles should be used. The head should be fed to the far end of the crate tunnel via the nearest inspection chamber, activated and retracted. As the nozzle is removed, debris will be swept back into the inspection chamber where it can then be removed with the use of a standard gully sucker. This method will ensure the effective removal of gross solids (carrier bags, cans, leaf litter etc.) from the system. Whilst 100% removal cannot be guaranteed, it has been shown that this jetting method will also remove an element of finer material which would otherwise be 'lost' within the system.

Infiltration Permeable Paving

4.24. Permeable surfaces need to be regularly cleaned of silt and other sediments to preserve their infiltration capability. A brush and suction cleaner, which can be a lorry-mounted device or a smaller precinct sweeper, should be used and the sweeping regime should be as follows:

1. End of winter (April) – to collect winter debris.
2. Mid-summer (July/August) – to collect dust, flower and grass-type deposits.
3. After autumn leaf fall (November).

4.25. If reconstruction is necessary, the following procedure should be followed:

1. Lift surface layer and laying course.
2. Remove any geotextile filter layer.
3. Inspect sub-base and remove, wash and replace if required.
4. Renew any geotextile layer.
5. Renew laying course, jointing material and concrete block paving.

4.26. Materials removed from the voids or the layers below the surface of the paving may contain hazardous substances such as heavy metals and hydrocarbons which may need to be disposed of as controlled waste.

Proposed Surface Water Drainage Pipework and Catchpits

4.27. It is not envisaged that silt build up within the pipework systems will require a rigorous maintenance regime so long as silt is removed from upstream catch pits on a regular basis. A suitable maintenance regime for the systems will comprise of routine inspection (every six months) and silt removal (as necessary).

Drainage Element	Maintenance Requirement	Frequency
Gutters & downpipes	Inspect and remove silt/ debris	To be inspected every three months and silt/ debris removed as necessary.
Inspection Chambers and Catch Pits	Inspect and remove silt	To be inspected every three months and silt/ debris removed as necessary. Flow control to be checked for blockages.
Cellular Storage	Inspect and remove debris	CCTCV inspection following first storm event. Monthly CCTV inspections for first 3 months. 6 monthly CCTV inspections thereafter. Jetting to remove silt as necessary.
Flow Controls	Inspected for blockage and blockage / debris build up removed	Every six months
Infiltration Permeable Paving	Sweeping/vacuuming to remove build-up of silt or other sediments	Three times a year or as necessary
	▪ Removal of weeds ▪ Replacement of cracked paving blocks Remedial work to cracks and depressions	As required

Table 3: Suggested Maintenance Regime for Elements of the Drainage Infrastructure

Note: In addition to the above maintenance requirements, it is recommended that all drainage elements are inspected:

- Following the first storm event;
- Monthly for the first 3 months following commissioning.

5. Discussion and Conclusions:

5.1. This Surface Water Drainage Strategy has been prepared by Unda Consulting Limited on behalf of Stag Construction Services LTD, in support of a planning application for the erection of new single-storey 1-bedroom dwelling unit attached to rear (south) elevation of no.9. The development is proposed at 9 Station Parade, Tarring Road, West Sussex BN11 4SS. This report assesses surface water drainage arrangements for the proposed development.

5.2. The proposed planning application is for the *erection of new single-storey 1-bedroom dwelling unit attached to rear (south) elevation of no.9.* The extension that will be attenuated as part of this strategy will cover approximately 43m².

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5.19. The Pollution Mitigation Indices for permeable pavement are greater than the Pollution Hazard Indices for car parks and low trafficked roads. Therefore, permeable pavements will provide sufficient water quality treatment prior to discharge to ground.

5.20. Runoff from roof areas is considered to be uncontaminated and does not warrant any form of treatment process to improve water quality. Nevertheless, it is suggested to include debris / sediment traps on any new drainage.

5.21. This drainage strategy has been undertaken in accordance with the principles set out in NPPF. We can conclude that providing the development adheres to the conditions advised above, the said development proposals can be accommodated without increasing flood risk within the locality in accordance with objectives set by Central Government and the EA.

Unda Consulting Limited

September 2022

6. Appendix

A - Topographic Survey:

- Proposed Plans – Caldotec Ltd;

B - MicroDrainage Calculations:

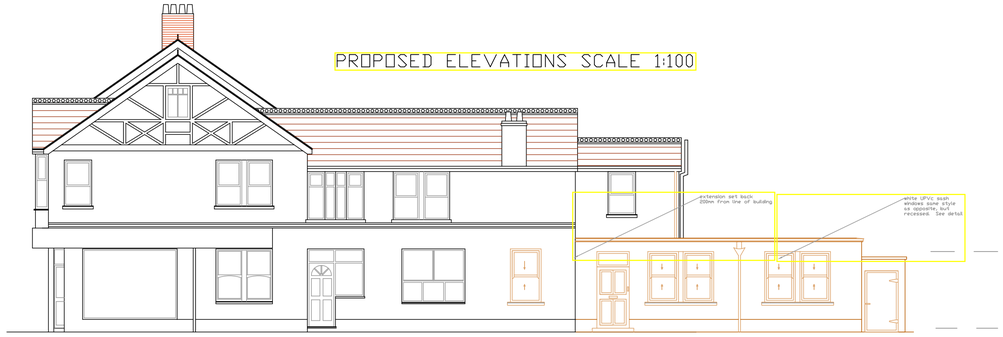
- ICP SUDS Rural Runoff Calculations;
- Cellular Storage Calculations.

C - Drainage Layout Plans:

- Proposed Drainage Layout [92090-01].

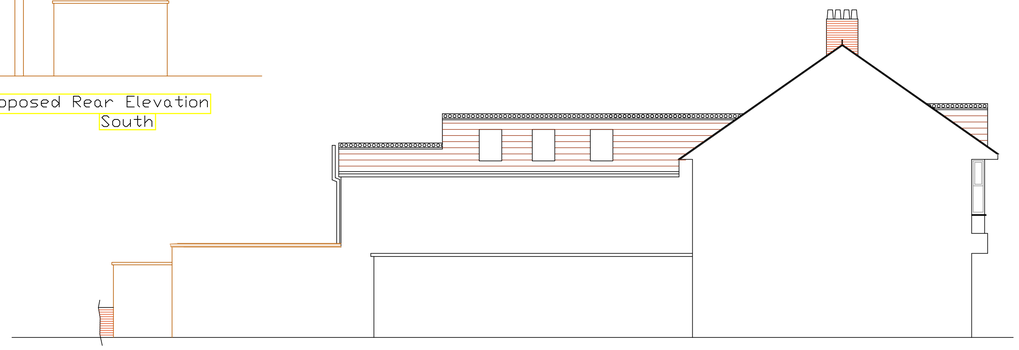
PROPOSED ELEVATIONS SCALE 1:100

Proposed Front Elevation
North

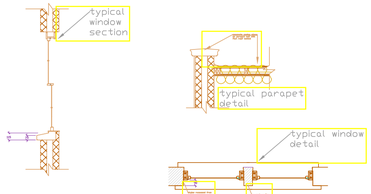


Proposed Side Elevation
West

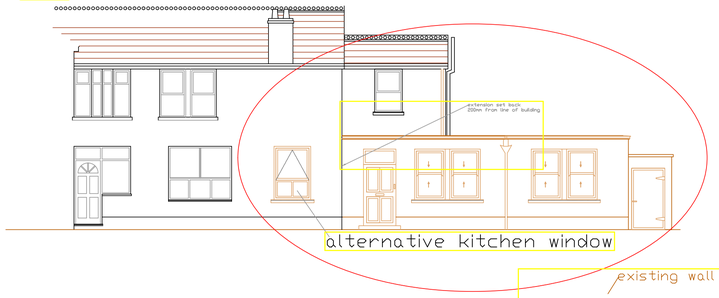
Proposed Rear Elevation
South



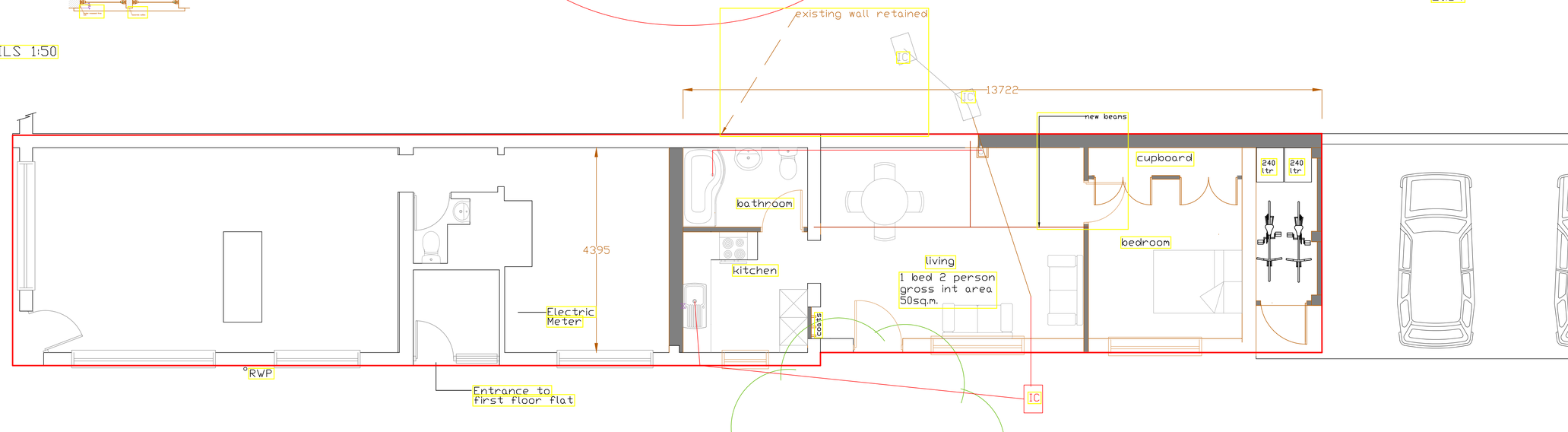
Proposed Side Elevation
East



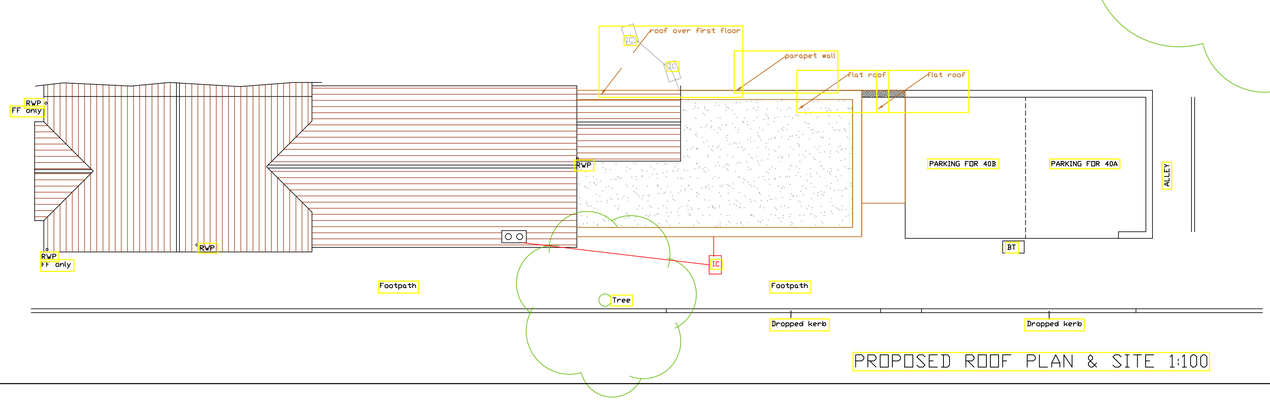
DETAILS 1:50



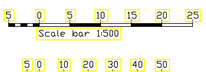
alternative kitchen window

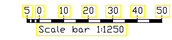


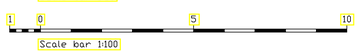
Proposed Ground Floor Plan SCALE 1:50



PROPOSED ROOF PLAN & SITE 1:100







CALDOTEC LTD
11 THE PARADE
WILLOWHAYNE CRESCENT
EAST PRESTON
WEST SUSSEX
BN16 1NS
Telephone 01903 859176

PROPOSED OPTIONAL SCHEMES

9 Station Parade
Rear of Dovetail Interiors
Tarring
BN11 4SS

CLIENT: Messrs Hurdley & Atkins

Issue	Details	By	Date
r2	Amends for Planning	LG	10/11/17
r1	Amends for Planning	LG	20/09/17

SCALE: AS SHOWN on A1
DATE: 10/11/17
DRAWING NUMBER: 17057/02r2

ICP SUDS Mean Annual Flood

Input

Return Period (years)	100	Soil	0.400
Area (ha)	0.005	Urban	0.000
SAAR (mm)	700	Region Number	Region 7

Results l/s

QBAR Rural	0.0
QBAR Urban	0.0
Q100 years	0.1
Q1 year	0.0
Q30 years	0.0
Q100 years	0.1

Summary of Results for 100 year Return Period (+45%)

Half Drain Time : 234 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	9.737	0.137	0.0	0.1	0.1	1.2	Flood Risk
30 min Summer	9.780	0.180	0.0	0.1	0.1	1.5	Flood Risk
60 min Summer	9.821	0.221	0.0	0.1	0.1	1.9	Flood Risk
120 min Summer	9.851	0.251	0.0	0.1	0.1	2.1	Flood Risk
180 min Summer	9.858	0.258	0.0	0.1	0.1	2.2	Flood Risk
240 min Summer	9.860	0.260	0.0	0.1	0.1	2.2	Flood Risk
360 min Summer	9.859	0.259	0.0	0.1	0.1	2.2	Flood Risk
480 min Summer	9.854	0.254	0.0	0.1	0.1	2.2	Flood Risk
600 min Summer	9.848	0.248	0.0	0.1	0.1	2.1	Flood Risk
720 min Summer	9.841	0.241	0.0	0.1	0.1	2.1	Flood Risk
960 min Summer	9.827	0.227	0.0	0.1	0.1	1.9	Flood Risk
1440 min Summer	9.799	0.199	0.0	0.1	0.1	1.7	Flood Risk
2160 min Summer	9.766	0.166	0.0	0.1	0.1	1.4	Flood Risk
2880 min Summer	9.741	0.141	0.0	0.1	0.1	1.2	Flood Risk
4320 min Summer	9.705	0.105	0.0	0.1	0.1	0.9	Flood Risk
5760 min Summer	9.682	0.082	0.0	0.1	0.1	0.7	O K
7200 min Summer	9.666	0.066	0.0	0.1	0.1	0.6	O K
8640 min Summer	9.655	0.055	0.0	0.0	0.0	0.5	O K
10080 min Summer	9.646	0.046	0.0	0.0	0.0	0.4	O K
15 min Winter	9.754	0.154	0.0	0.1	0.1	1.3	Flood Risk

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	130.577	0.0	1.2	18
30 min Summer	87.772	0.0	1.6	33
60 min Summer	56.310	0.0	2.1	62
120 min Summer	34.877	0.0	2.6	120
180 min Summer	25.960	0.0	2.9	158
240 min Summer	20.900	0.0	3.1	190
360 min Summer	15.369	0.0	3.5	254
480 min Summer	12.349	0.0	3.7	324
600 min Summer	10.413	0.0	3.9	392
720 min Summer	9.053	0.0	4.1	462
960 min Summer	7.253	0.0	4.3	598
1440 min Summer	5.297	0.0	4.8	864
2160 min Summer	3.860	0.0	5.2	1236
2880 min Summer	3.079	0.0	5.5	1616
4320 min Summer	2.236	0.0	6.0	2336
5760 min Summer	1.779	0.0	6.4	3056
7200 min Summer	1.489	0.0	6.7	3752
8640 min Summer	1.289	0.0	7.0	4496
10080 min Summer	1.141	0.0	7.2	5240
15 min Winter	130.577	0.0	1.4	18

Summary of Results for 100 year Return Period (+45%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
30 min Winter	9.803	0.203	0.0	0.1	0.1	1.7	Flood Risk
60 min Winter	9.849	0.249	0.0	0.1	0.1	2.1	Flood Risk
120 min Winter	9.885	0.285	0.0	0.1	0.1	2.4	Flood Risk
180 min Winter	9.895	0.295	0.0	0.1	0.1	2.5	Flood Risk
240 min Winter	9.895	0.295	0.0	0.1	0.1	2.5	Flood Risk
360 min Winter	9.892	0.292	0.0	0.1	0.1	2.5	Flood Risk
480 min Winter	9.885	0.285	0.0	0.1	0.1	2.4	Flood Risk
600 min Winter	9.875	0.275	0.0	0.1	0.1	2.3	Flood Risk
720 min Winter	9.864	0.264	0.0	0.1	0.1	2.3	Flood Risk
960 min Winter	9.842	0.242	0.0	0.1	0.1	2.1	Flood Risk
1440 min Winter	9.802	0.202	0.0	0.1	0.1	1.7	Flood Risk
2160 min Winter	9.757	0.157	0.0	0.1	0.1	1.3	Flood Risk
2880 min Winter	9.724	0.124	0.0	0.1	0.1	1.1	Flood Risk
4320 min Winter	9.684	0.084	0.0	0.1	0.1	0.7	O K
5760 min Winter	9.660	0.060	0.0	0.0	0.0	0.5	O K
7200 min Winter	9.646	0.046	0.0	0.0	0.0	0.4	O K
8640 min Winter	9.637	0.037	0.0	0.0	0.0	0.3	O K
10080 min Winter	9.630	0.030	0.0	0.0	0.0	0.3	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
30 min Winter	87.772	0.0	1.8	32
60 min Winter	56.310	0.0	2.4	60
120 min Winter	34.877	0.0	2.9	118
180 min Winter	25.960	0.0	3.3	172
240 min Winter	20.900	0.0	3.5	198
360 min Winter	15.369	0.0	3.9	272
480 min Winter	12.349	0.0	4.1	348
600 min Winter	10.413	0.0	4.4	424
720 min Winter	9.053	0.0	4.6	498
960 min Winter	7.253	0.0	4.9	642
1440 min Winter	5.297	0.0	5.3	910
2160 min Winter	3.860	0.0	5.8	1300
2880 min Winter	3.079	0.0	6.2	1672
4320 min Winter	2.236	0.0	6.8	2380
5760 min Winter	1.779	0.0	7.2	3112
7200 min Winter	1.489	0.0	7.5	3816
8640 min Winter	1.289	0.0	7.8	4496
10080 min Winter	1.141	0.0	8.0	5240

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	19.200	Shortest Storm (mins)	15
Ratio R	0.350	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+45

Time Area Diagram

Total Area (ha) 0.005

Time (mins) From:	To:	Area (ha)
0	4	0.005

Model Details

Storage is Online Cover Level (m) 10.000

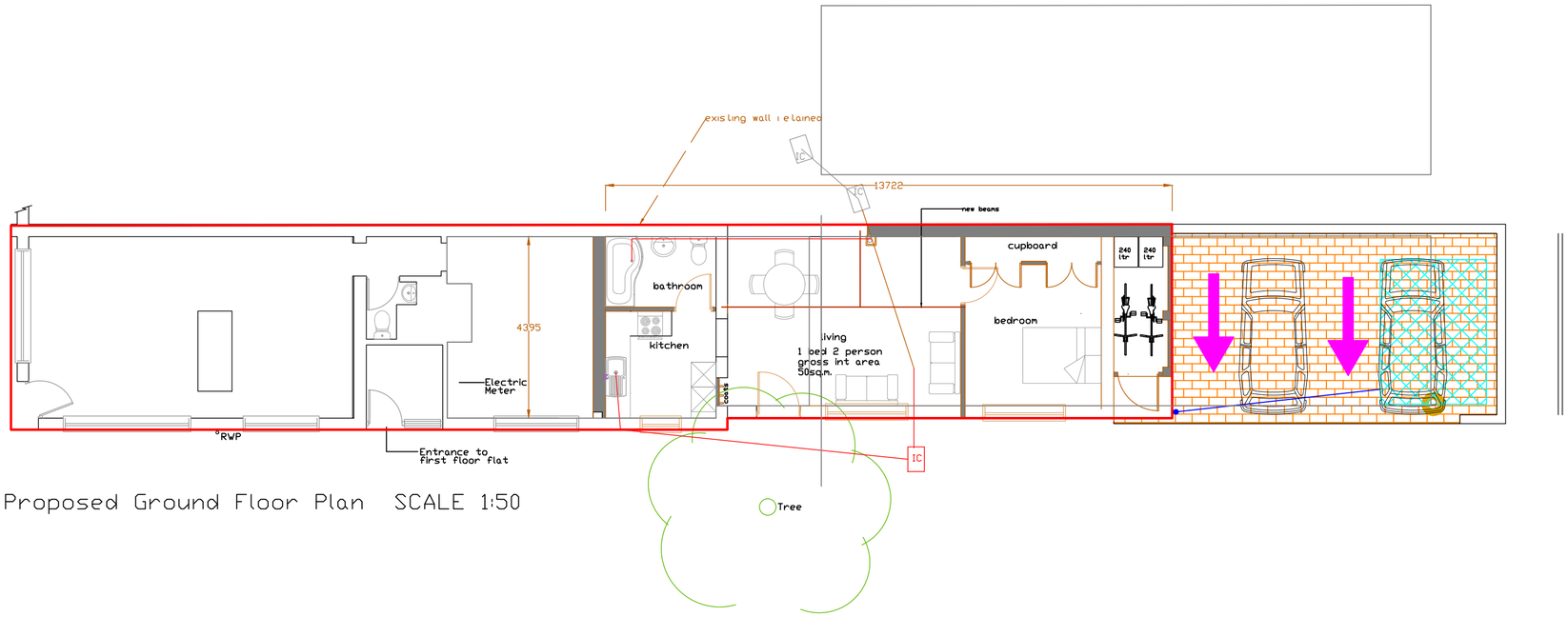
Cellular Storage Structure

Invert Level (m) 9.600 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	9.0	9.0	0.400	9.0	9.0

Orifice Outflow Control

Diameter (m) 0.010 Discharge Coefficient 0.600 Invert Level (m) 9.600



Proposed Ground Floor Plan SCALE 1:50

Notes:

1. Discharge of surface water via cellular storage attenuation. Preliminary calculations indicate that sufficient storage required to attenuate runoff arising from the proposed increase in impermeable areas, during the critical 1 in 100 year + 40% Climate Change event, can be provided within cellular storage of dimensions 9m^2 x 0.66m deep x 0.95 (voids).
2. Cellular Storage will discharge into the Southern Water surface water pipework located beneath Valencia Road.

Legend

- Proposed Permeable Paving
- Proposed Cellular Storage
- Proposed Surface Water pipework
- Proposed Surface Water Downpipe
- Proposed Orifice Plate
- Design Exceedance Route

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Job Reference:	Date:
92090-Daniel-StationPrd	22-Sep-22
Drawing Number:	**Revision:**
92090-01	v1

Designed by:	Drawn by:	Checked by:
AR	AR	EB

Scale: 1:100@A2

Disclaimer:
The drawings provided are for planning purposes only.