



**DRAINAGE IMPACT &
FLOOD RISK ASSESSMENT**

for

Proposed New Dwelling on land adjacent to
Griffen House, School Lane
Appledore
Kent, TN26 2BA

on behalf of

Mr & Mrs Hill

Document Control Sheet

Project Title Proposed New Dwelling on land adjacent to
Griffen House, School Lane, Appledore

Document Title Drainage Impact & Flood Risk Assessment

Job No. T-2025-034

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1.0 STATUS

- 1.1 This Report is prepared for the sole use of Mr & Mrs Hill and their agents in connection with the forthcoming planning application. No responsibility can be assumed for the Report if used by others.
- 1.2 For the purposes of the Contracts (Rights of Third Parties) Act 1999, nothing in this Report shall confer on any third party any right to enforce or benefit from any terms of this Report

2.0 INTRODUCTION

Background

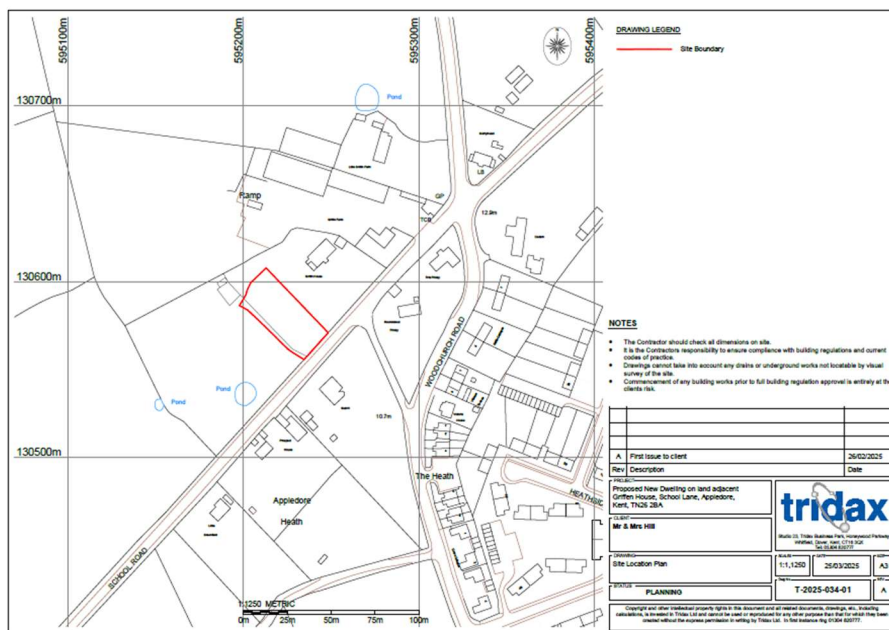
2.1 Tridax Ltd have been commissioned by Mr & Mrs Hill and requested to prepare a Drainage Impact and Flood Risk Assessment to support a forthcoming planning application for the proposed new dwelling on land adjacent to Griffen House, School Lane, Appledore, Kenr, TN26 2BA

2..2 This Report is in accordance with the Technical Guidance to the National Planning Policy Framework (NPPF), and the Kent County Council Local Flood Risk Management Strategy ~ Guidance on Consultation.

2.3 The Report details the observations, calculates the probable flows that may be generated by the development and makes recommendations for the disposal of the foul and surface water and identifies any special mitigation measures required to reduce the risks of flooding.

Site Location

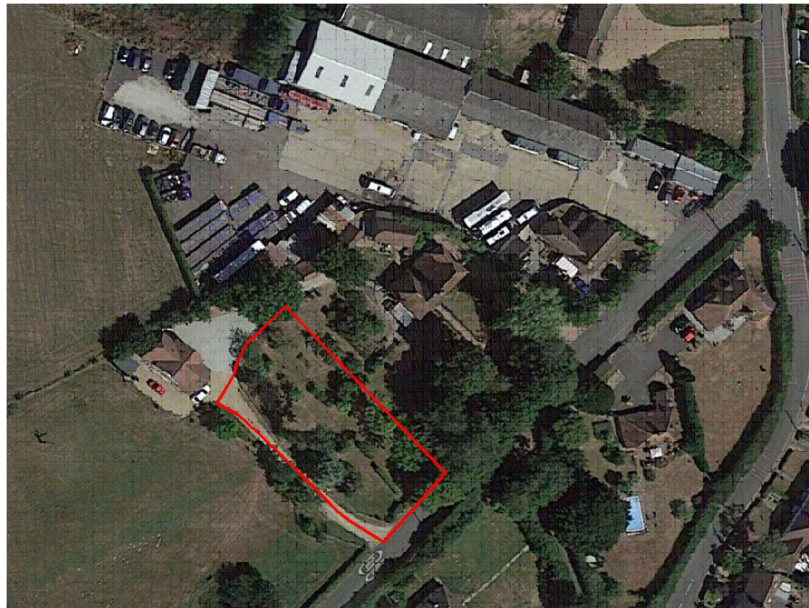
2.4 The proposed new dwelling is accessed from School Lane as indicated on the site location drawing T-2025-034-01 enclosed in Appendix A and the extract as Frame 1 below. The total site area (Red Line) is approximately 1,182m² (0.12ha) and is centred at Ordnance Survey reference (595213mE, 130607mN).



Frame 1 – Site Location Plan Extract

Existing Site Layout

- 2.5 The site forms the garden to the adjacent property at Griffen House, as shown on the satellite image below as frame 2. The site is a 'Greenfield' development. Inspection of LIDAR data indicates the site to be relatively flat at an approx. elevation of 13.00mAOD.

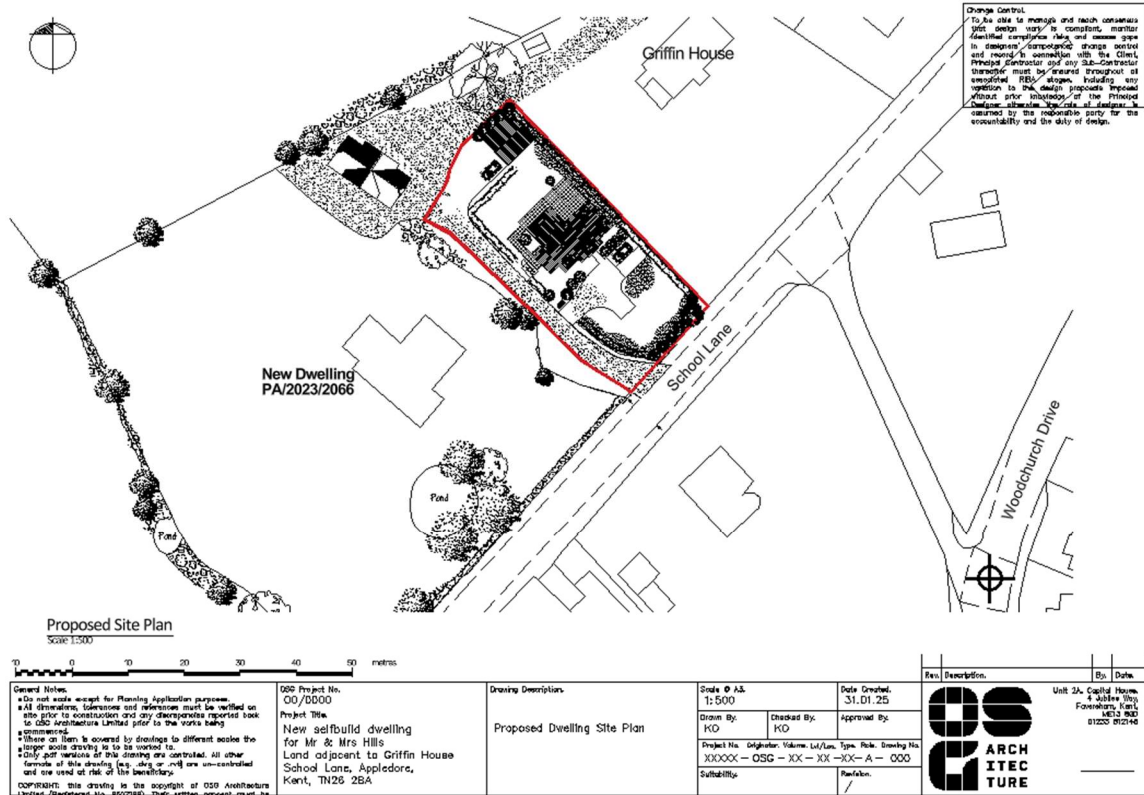


Frame 2 – Satellite Image

- 2.6 Inspection of the sewer records indicates a 150mm \varnothing public foul water sewer fronting the site within School Lane.
- 2.7 No intrusive site investigation has yet been commissioned although reference to the British Geological Survey maps indicates the site to underlain by Tunbridge Wells Sand Formation consisting of sandstone and siltstone. For outline design purposes a filtration rate of 5.1×10^{-6} m/s (0.018m/hr) as been assumed from details of previous investigations for similar soils in the local area. Subject to a successful planning, an intrusive investigation will be required to inform the detailed design of the SUDS structures.

Proposed Development

2.8 The proposed development comprises the construction of a new dwelling with associated access and parking. Refer to the Architects planning drawings and the extract shown below as frame 3 below.



Frame 3 –Extracts of Architects Site Plan

3.0 FOUL WATER DRAINAGE

Existing Discharge

3.1 There is no existing foul water discharge from the site.

Proposed Discharge

3.2 The application relates to the construction of a single dwelling. The design flow from the proposed development using 'sewers for adoption' 7th Edition is calculated as 0.05 litres/second

3.3 Included within Appendix A is drawing T-2025-034-02 indicating the outline foul water disposal layout with a new connection to the public foul water sewer via gravity at TQ95302501.

Consents

3.4 Subject to a successful planning application, a Section 106 Water Industry Act application to connect to the public sewer via an existing manhole will need to be made to and approved by Southern Water Services. A foul water infra-structure charge would be applied once the connection is made.

4.0 SURFACE WATER DRAINAGE

Existing Discharge

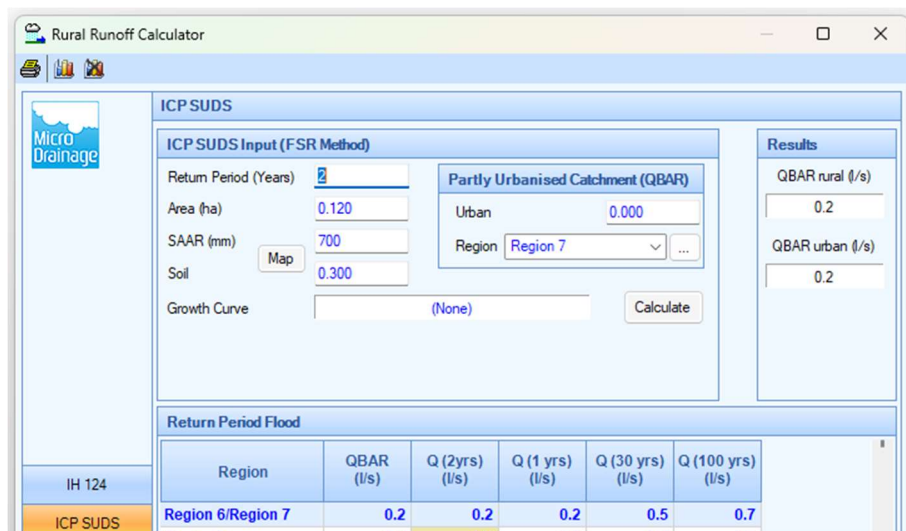
4.1 The requirement of NPPF is that the run-off from the development proposals replicates the natural drainage characteristics of the pre-developed site. In the case of ‘Brownfield’ development, the drainage proposal will be measured against the existing performance of the site, although it is preferable for solutions to provide characteristics similar to ‘Greenfield’ development wherever possible.

4.2 The existing site characteristics are summarised as below;

Total Site Area	1,182m ² (0.12 hectares)
Current Site Condition	Greenfield
Existing Impermeable Area	0m ² Total (0%)
Proposed Impermeable Area	160m ² of roof water <u>105m² of parking</u> 265m ² Total (22%)
Existing Surface Water Discharge Method	none

4.3 Greenfield Profile

Using the Institute of Hydrology Report 124 – Flood Estimation of Small Catchments (ICP SUDS) method, the mean annual flood flow (Q_{bar}) for small catchments is calculated as 0.2l/s;



Frame 4 – Pre-Development Run-off Rates

4.4 The existing Greenfield run-off rate for the site is calculated as **1.7 l/s/ha**. (0.2l/s / 0.12 ha). The pre-development run-off volume from a 1in100 year return period storm of 6hr duration is calculated as 34.5m³ as per the run-off calculator results as frame 5 below.



Frame 5 – Pre-Development Run-off Calculator Results

Sustainable Urban Drainage Systems (SUDS)

4.5 A range of typical SUDS components that can be used following the hierarchy of sustainability, as established by the Environment Agency and included in the Environment Agency publication: *SUDS – A Practical Guide*, are listed below with the relative benefits of each feature and the appropriateness for the subject site.

SUDS Feature	Environmental Benefit	Water Quality Improved	Suitability for low permeability Soil	Ground water Recharge	Site specific restrictions	Appropriate for the Site?
Wetlands	✓	✓	x	x	Limited site area	No
Retention Ponds	✓	✓	✓	x	As above	No
Soakaways	x	✓	x	✓	None	Yes
Swales	✓	✓	✓	✓	Domestic (risk to children)	No
Underground Storage	x	x	✓	x	No surface water sewer/watercourse	No
Permeable Paving	x	✓	x	✓	None	No
Green Roofs	✓	✓	✓	x	Steep Roofs	No
Water Butts	✓	x	✓	x	None	Yes
Rainwater Harvesting	x	x	✓	x	None	Yes

4.6 From the table above it can be seen that there are a limited number of SUDS elements that are potentially suitable for this site. The highest ranking and most sustainable solution for this site would be to use a combination of soakaways and permeable paving. The following considerations taken in reaching this conclusion

- The use of ponds and swales is not appropriate for small domestic site with a risk to young children in private gardens.
- reference to the British Geological Survey maps indicates the site to underlain by Tunbridge Wells Sand Formation providing a low to moderate soakage potential
- The site is relatively flat with a permeable underlying formation making permeable paving appropriate.
- The use of water butts is encouraged although the use is ignored for surface water disposal assuming such structures are full at the time of the critical storm.

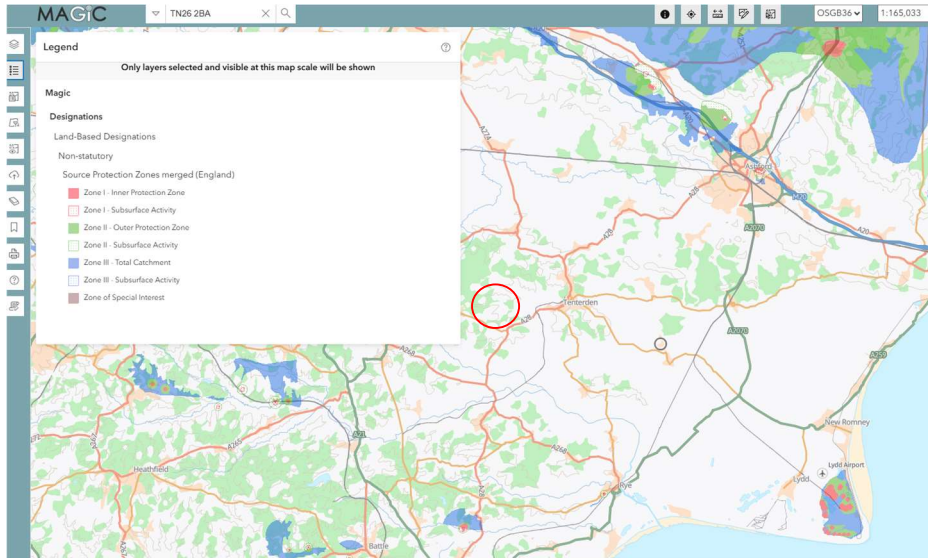
Pollution Protection

4.7 To protect the groundwater resources that contribute to public supply abstractions, three levels of Source Protection Zones (SPZ) are delineated around abstraction points. Each of these zones has different requirements for the quality of the water that can be discharged to it and consequently the type of development from which run-off may infiltrate. Below as frame 6 the table shows the development types that are permissible in each zone and the techniques required to control pollution before it is discharged, based on the recommendations from the CIRIA Report 156 Infiltration Techniques.

Impermeable Area	Zone I (Inner Zone)	Zone II (Outer Zone)	Zone III (Total Catchment)
Roof Drainage	No objection (provided for sole use of roof drainage)	No objection	No objection
Public/Amenity	Not acceptable	Acceptable	Acceptable
Large Car Parks	Not acceptable	Acceptable (with interceptor)	Acceptable (with interceptor)
Lorry Parks	Not acceptable	Presumption Against	Acceptable (with interceptor)
Garage Forecourts	Not acceptable	Presumption Against	Acceptable (with interceptor)
Major Roads	Not acceptable	Presumption Against, Acceptable only in exceptional circumstances	Acceptable only if investigation favourable and with adequate precautions
Industrial Sites	No objection	Presumption Against	Acceptable only if investigation favourable and with adequate precautions

Frame 6- Recommended discharges for Source Protection Zones

4.6 Inspection of the Groundwater Protection Zone map indicates that the site is not located within a Source Protection Zone (SPZ). Reference to Frame 6 above indicates no objection to small residential schemes and therefore the site would have no limitations on the use of filtration.



Frame 7- Groundwater Source Protection Zones

4.7 Reference to Table 4.3 of Chapter 4 of the Ciria’s SUDS design manual indicates that a simple index approach for the site would be appropriate with a Low Pollution Hazard Level. The use of permeable paving would comply with Tables 26.2 & 26.4 as below to provide the appropriate mitigation index.

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 (eg cul de sacs, homezones and general access roads) and non-residential car parking with infrequent change (eg schools, offices) ie < 300 traffic movements/day	Low	0.5	0.4	0.4

Frame 8 – Ciria Sud’s Manual Table 26.2

TABLE 26.4 Indicative SuDS mitigation indices for discharges to groundwater			
Characteristics of the material overlying the proposed infiltration surface, through which the runoff percolates ¹	TSS	Metals	Hydrocarbons
A layer of dense vegetation underlain by a soil with good contaminant attenuation potential ² of at least 300 mm in depth ³	0.6 ⁴	0.5	0.6
A soil with good contaminant attenuation potential ² of at least 300 mm in depth ³	0.4 ⁴	0.3	0.3
Infiltration trench (where a suitable depth of filtration material is included that provides treatment, ie graded gravel with sufficient smaller particles but not single size coarse aggregate such as 20 mm gravel) underlain by a soil with good contaminant attenuation potential ² of at least 300 mm in depth ³	0.4 ⁴	0.4	0.4
Constructed permeable pavement (where a suitable filtration layer is included that provides treatment, and including a geotextile at the base separating the foundation from the subgrade) underlain by a soil with good contaminant attenuation potential ² of at least 300 mm in depth ³	0.7	0.6	0.7
Bioretention underlain by a soil with good contaminant attenuation potential ² of at least 300 mm in depth ³	0.8 ⁴	0.8	0.8
Proprietary treatment systems ^{5, 6}	These must demonstrate that they can address each of the contaminant types to acceptable levels for inflow concentrations relevant to the contributing drainage area.		

Frame 9 – Ciria Sud’s Manual Table 26.4

Proposed Discharge

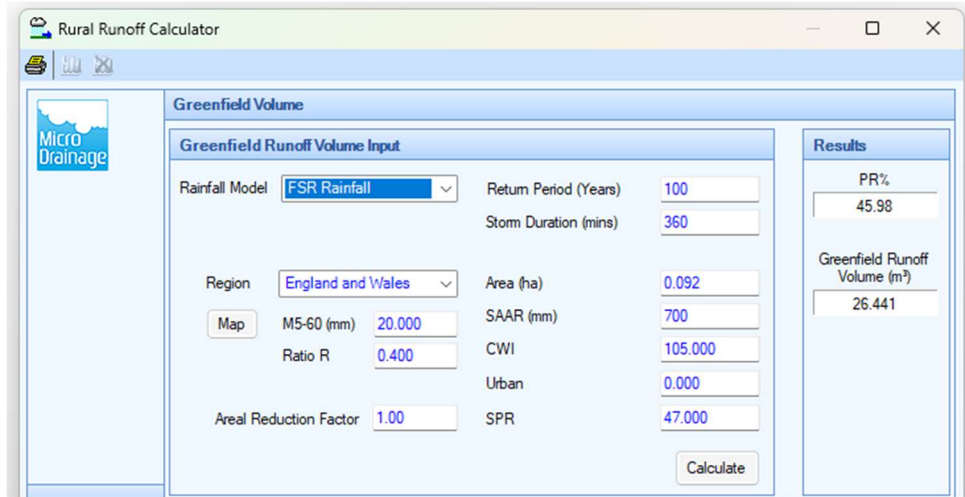
4.8 The proposed development will create 160m² of roof water and a 105m² of drive. The intention is to discharge the roof water to a cellular soakaway and use permeable paving for drive as shown on the Drainage Strategy Plan T-2025-034-02 included within Appendix A.

4.9 Included within Appendix B are the MicroDrainage design calculations to demonstrate that the proposed SUDSs structures would be adequate to cater for a 1in100year return period with a 45% allowance for future climate change. The drainage calculations provided comply with the new Kent County Council SUDS guidance;

- FSR manually increased to 26.25mm
- System sensitivity tested for 45% Climate Change
- Half-drain time for 30year return < 24hours

4.10 Note that the 45% sensitivity test indicates that there would be no flooding from the site with all flows contained within the structures.

4.11 With introduction of a positive drainage system and discharge via filtration, the post development run-off from the remaining site is reduced to 26.4m³, a reduction of 8.1m³ from the pre-development run-off volume of 34.5m³.



Frame 10 – Post-Development Run-off Calculator Results

Consents

4.12 No formal consents are required for the surface water disposal

5.0 FLOOD RISK

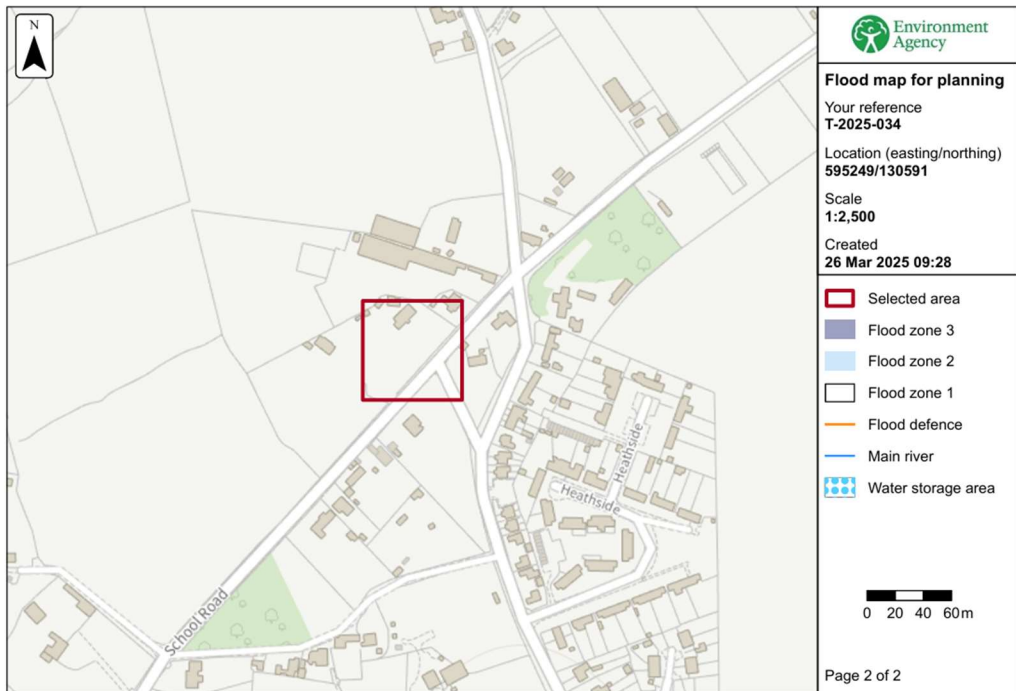
Requirement for Flood Risk Assessment

- 5.1 Flood risk is primarily regulated through planning policy. Key requirements with respect to flooding are outlined in the National Planning Policy Framework (NPPF) which was published in December 2023 and replaces and builds on the requirements of Planning Policy Statement 25: Development and Flood Risk (PPS25).
- 5.2 The NPPF requires that an FRA should be submitted with planning applications for all sites over one ha in area and all smaller sites within Flood Zones 2 and 3 to determine the risks of flooding at a development site (from all sources including rivers, the sea, sewers and groundwater).
- 5.3 Guidance on the content of FRAs is contained in Technical Guidance to the National Planning Policy Framework and within Planning Policy Statement 25: Development and Flood Risk Practice Guide. These documents have been used to inform the scope and content of this FRA.
- 5.4 The primary resource for reviewing fluvial and tidal flood risks is via the Environment Agency (EA) indicative floodplain maps. These classify risks as follows:
- Flood Zone 1 (Low Probability): annual probability of flooding less than 1 in 1,000 (<0.1%);
 - Flood Zone 2 (Medium Probability): annual probability of flooding more than 1 in 1,000 (0.1%) but less than 1 in 100 (1%) for fluvial flooding or 1 in 200 (0.5%) for tidal flooding; and
 - Flood Zone 3 (High Probability): annual probability of flooding more than 1 in 100 (1%) for fluvial flooding or 1 in 200 (0.5%) for tidal flooding.

Consultation

- 5.5 Inspection of the Environment Agency Website indicates the site to lie within a Flood Zone 1 (Low Probability), and as the application site is less than one hectare in area, an FRA will not be required by the Planning Authority.

- 5.6 No Consultation with the Environment Agency has been carried apart from inspection of their website.



Frame 11 – Extract of Environment Agency Flood Maps

- 5.7 In this zone, developers and local authorities should seek opportunities to:
 - reduce the overall level of flood risk in the area through the layout and form of the development and the appropriate application of sustainable drainage systems;

NATIONAL PLANNING POLICY FRAMEWORK CONTEXT

- 5.8 Inspection of the Environment Agency Website identifies the proposed site to be within the extent of the Flood Zone 1 (Low Probability). This zone comprises land assessed as having a less than 1in1000 annual probability of river or sea flooding (<0.1%). All uses of land are appropriate within this zone.
- 5.9 Reference to Table 1 of the Technical Guidance to NPPF, confirms that all uses of land are appropriate in this zone.

<p>Zone 1 - low probability</p> <p>Definition This zone comprises land assessed as having a less than 1 in 1,000 annual probability of river or sea flooding (<0.1%).</p> <p>Appropriate uses All uses of land are appropriate in this zone.</p> <p>Flood risk assessment requirements For development proposals on sites comprising one hectare or above the vulnerability to flooding from other sources as well as from river and sea flooding, and the potential to increase flood risk elsewhere through the addition of hard surfaces and the effect of the new development on surface water run-off, should be incorporated in a flood risk assessment. This need only be brief unless the factors above or other local considerations require particular attention.</p> <p>Policy aims In this zone, developers and local authorities should seek opportunities to reduce the overall level of flood risk in the area and beyond through the layout and form of the development, and the appropriate application of sustainable drainage systems².</p>

Frame 12 - Extract of NPPF Table 1 – Flood Zones

Sequential Test

- 5.10 Local Planning Authorities (LPA) are encouraged to take a risk-based approach to proposals for developments in or affecting flood risk areas through the application of the Sequential Test and the objectives of this test are to steer new development away from high-risk areas towards those at lower risk of flooding.

A Sequential Test has not been undertaken as the proposed development is located in the lowest flood risk zone and all development is appropriate and is located in an

area at low risk of flooding from all other sources. The development cannot be in a lower risk area and therefore a Sequential Test can be considered as passed.

Exception Test

5.11 An Exception Test is not required with the proposed development appropriate to the flood zone.

Flood Hazards

5.12 Technical Guidance to NPPF identifies six potential sources of flooding and requires that all potential sources that could affect the proposed development should be considered;

- Flooding from rivers or fluvial flooding
- Flooding from the sea or tidal flooding
- Flooding from land
- Flooding from groundwater
- Flooding from sewers
- Flooding from reservoirs, canals, and other artificial sources

5.13 Flooding from rivers or fluvial flooding

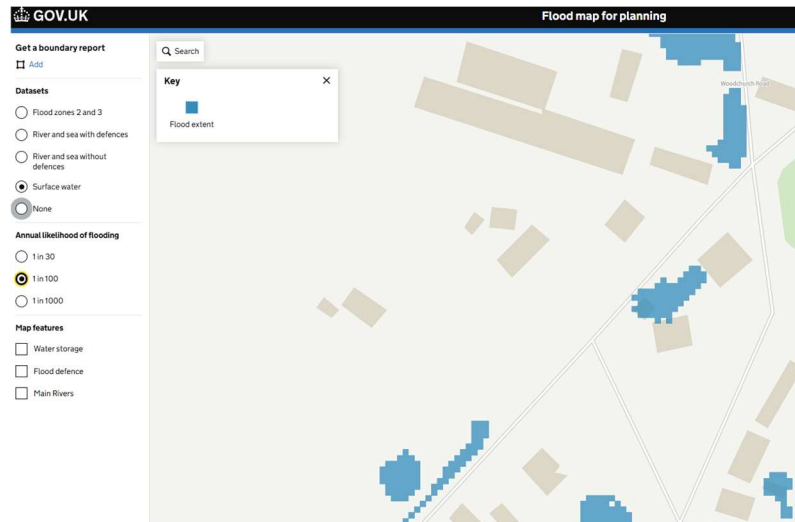
The development area is identified to lie within Flood Zone 1 (Low Probability): annual probability of flooding less than 1 in 1,000 (<0.1%);

5.14 Flooding from the sea or tidal flooding

The development area is identified to lie within Flood Zone 1 (Low Probability): annual probability of flooding less than 1 in 1,000 (<0.1%);

5.15 Flooding from surface water run-off and overland

Inspection of the surface water flooding maps does not indicate the site to be risk.



Frame 13 – Surface Water Flooding

5.16 Flooding from groundwater

The groundwater in the local area is controlled by The Royal Military Canal to the south is no risk from rising groundwater.

5.17 Flooding from sewers

The site is unlikely to be affected by surcharging sewers with the prominent elevation from the nearest cover level of the foul sewer network

5.18 Flooding from reservoirs, canals, and other artificial sources

Inspection of Environment Agency flood mapping does not indicate the site to be at risk from reservoirs.

Risk and Controls

5.19 The risk summary below indicates a low risk of flooding.

<u>Flood Hazards</u>	<u>Risk Summary</u>
• Flooding from rivers or fluvial flooding	Low
• Flooding from the sea or tidal flooding	Low
• Flooding from land	Low
• Flooding from groundwater	Low
• Flooding from sewers	Low
• Flooding from reservoirs	Low

Off Site Impact

- 5.20 With introduction of a positive drainage system and discharge via filtration, the post development run-off from the remaining site is reduced to 26.4m³, a reduction of 8.1m³ from the pre-development run-off volume of 34.5m³ providing an improvement to the local area.

Residual Risk

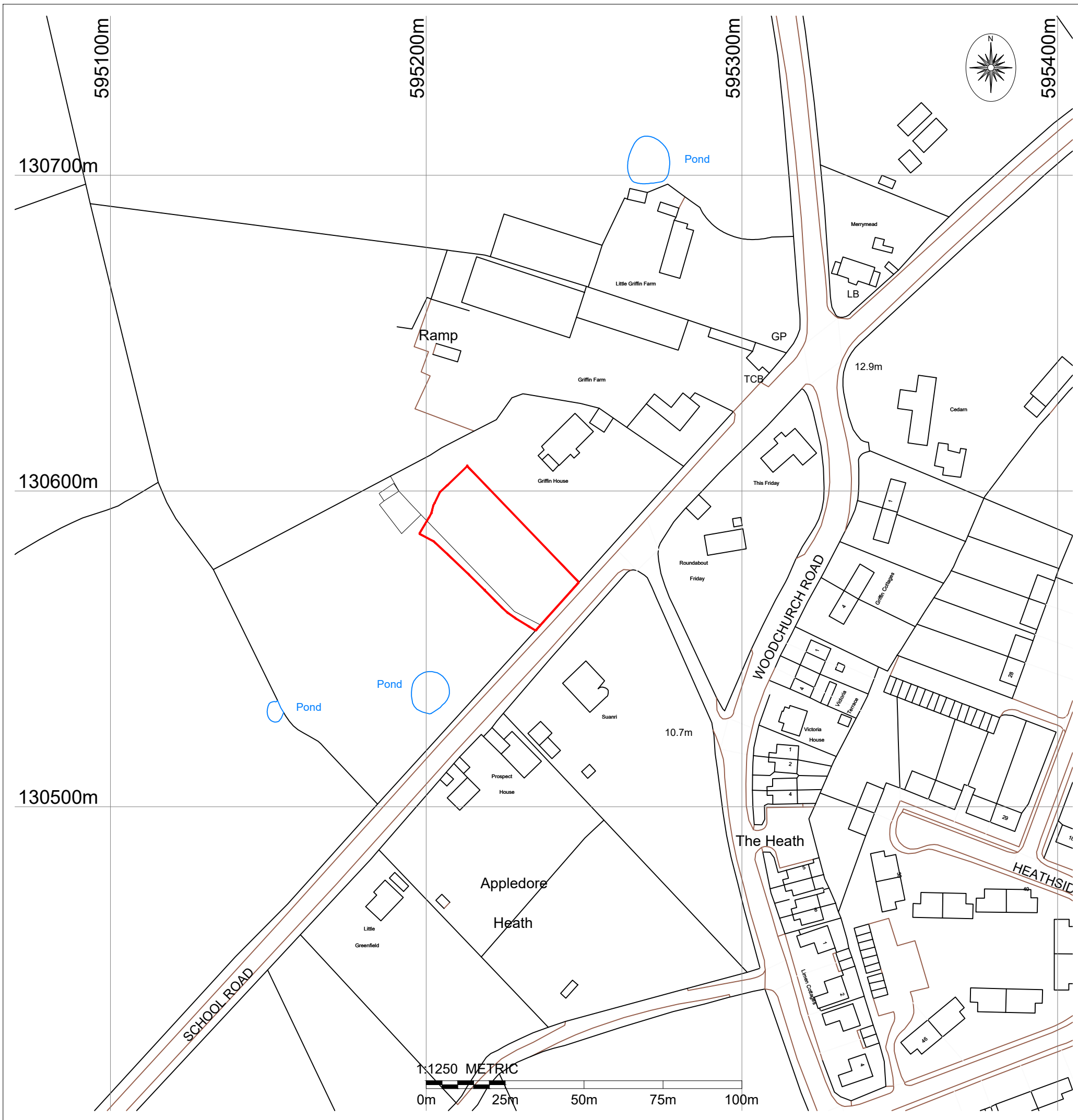
- 5.21 The potential for harm to life or damage to property for this site is considered to be low level.

6.0 CONCLUSION

- 6.1 Tridax Ltd have been commissioned by Mr & Mrs Hill and requested to prepare a Drainage Impact and Flood Risk Assessment to support a forthcoming planning application for the proposed new dwelling on land adjacent to Griffen House, School Lane, Appledore, Kenr, TN26 2BA
- 6.2 The foul water discharge from the site is to connect to the public foul water sewer via gravity.
- 6.3 The intention is to discharge the surface water via a combination of cellular soakaways and permeable paving as shown on the Drainage Strategy Plan T-2025-034-02 included within Appendix A. The soakaways are design to cater for a 1in100 year return period with a 45% allowance for future climate change.
- 6.4 The site is indicated to be within the extent of the Flood Zone 1 (Low Probability). This zone comprises land assessed as having a less than 1 in 1000 (0.1%) of flooding. Others forms of flooding have been considered with the risk summary indicating a low risk from all forms of flooding.
- 6.5 In accordance with the requirements of the Technical Guidance to the National Planning Policy Framework (NPPF), and the Kent County Council Local Flood Risk Management Strategy ~ Guidance on Consultation, we conclude that the site can be adequately drained and is sustainable in terms of flood risk and that the proposals reduce the risk to the neighbouring properties.

APPENDIX A

Tridax Drawings
T-2025-034-01 – Site Location
T-2025-034-02 – Drainage Strategy Plan
T-2025-034-03 – Drainage Details



DRAWING LEGEND

— Site Boundary

NOTES

- The Contractor should check all dimensions on site.
- It is the Contractors responsibility to ensure compliance with building regulations and current codes of practice.
- Drawings cannot take into account any drains or underground works not locatable by visual survey of the site.
- Commencement of any building works prior to full building regulation approval is entirely at the clients risk.

A	First issue to client	26/02/2025
Rev	Description	Date

PROJECT
Proposed New Dwelling on land adjacent Griffin House, School Lane, Appledore, Kent, TN26 2BA

CLIENT
Mr & Mrs Hill

DRAWING
Site Location Plan

STATUS
PLANNING

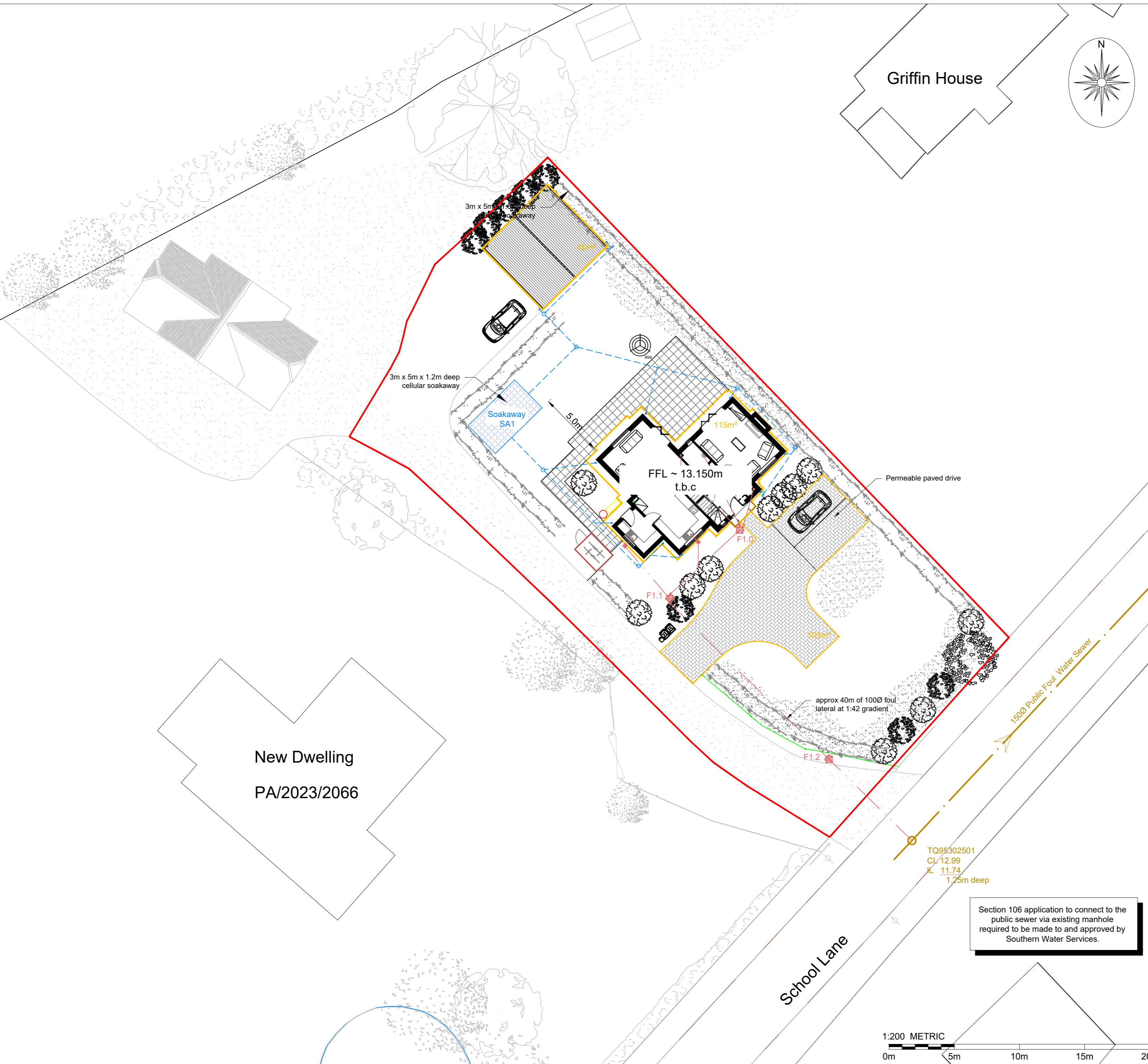


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Dwg No.	REV.
T-2025-034-01	A

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- DRAWING LEGEND**
- Site Boundary
 - Public foul water sewer
- PROPOSED PRIVATE DRAINAGE**
- - - Private foul water drainage
 - □ MH Private foul water manhole
 - SVP Soil vent pipe
 - BIG Back Inlet Gully
 - - - Private surface water drainage
 - □ MH Private surface water manhole
 - RWP Rainwater downpipe
 - Cellular Soakaway
 - Permeable Paving
 - Impermeable Areas

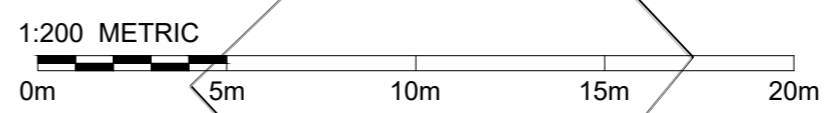
Pre-Development Discharge	Pre-Development Parameters
2 Year Return ~ 0.2l/s	'Greenfield' Development
30 Year Return ~ 0.5l/s	Site Area ~ 1,183m²
100 Year Return ~ 0.7l/s	Impermeable Area ~ 0m²
Discharge Volume 100year 360min ~ 34.5m³	Qbar = 0.2l/s / 0.12ha = 1.7l/s/ha

Post-Development Discharge	Post-Development Parameters
2 Year Return ~ 0.1l/s	Site Area ~ 1,183m²
30 Year Return ~ 0.4l/s	Impermeable Area ~ 265m² (22%)
100 Year Return ~ 0.5l/s	
Discharge Volume 100year 360min ~ 26.4m³	

New Dwelling
PA/2023/2066

Section 106 application to connect to the public sewer via existing manhole required to be made to and approved by Southern Water Services.

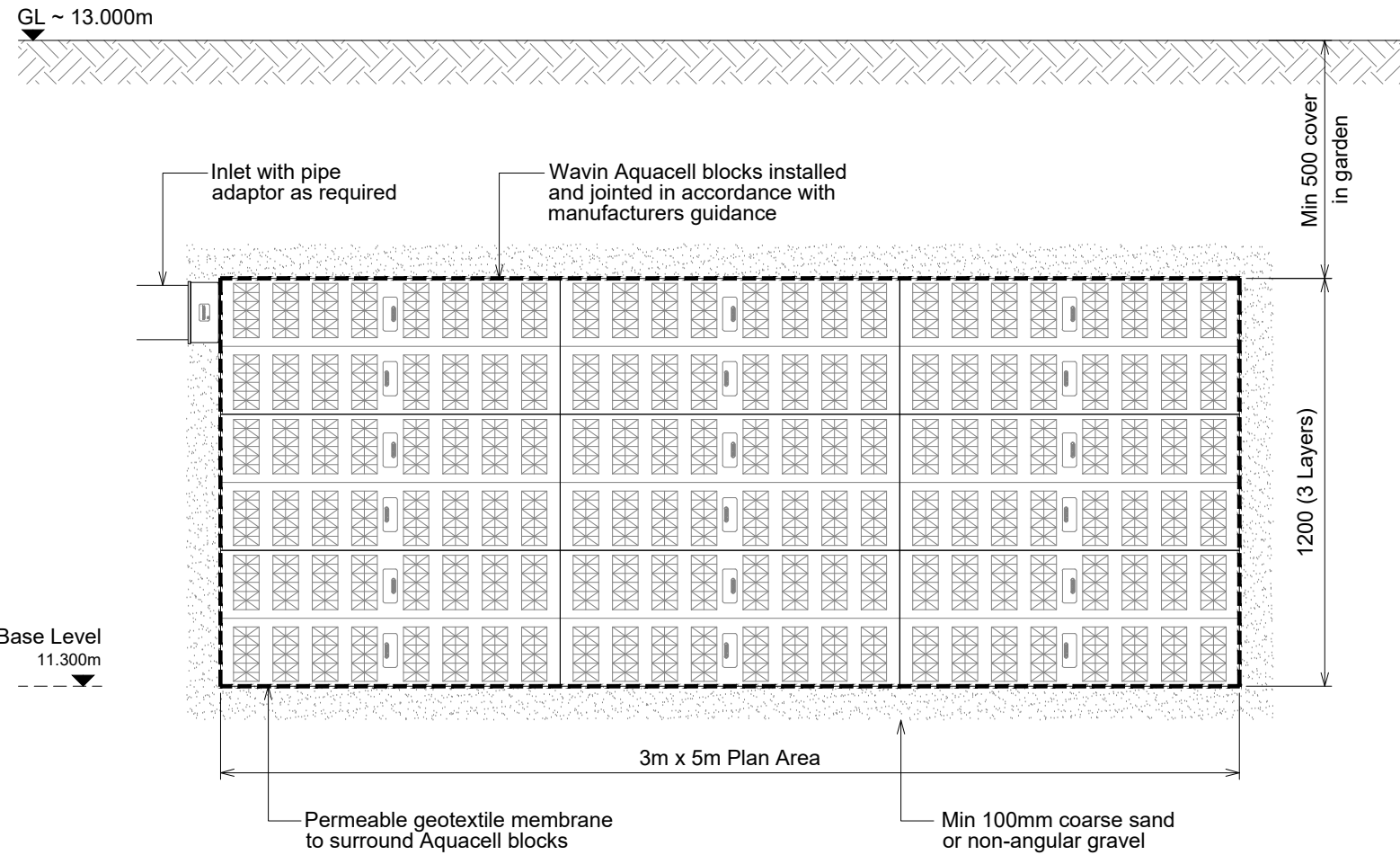
TQ95302501
CL 12.99
IL 11.74
1.25m deep



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Cellular Soakaway

scale 1:20



Aquacell Installation Notes: (Contractor to consult manufacturers literature for full details)

1. Excavate the trench to the required depth ensuring that the plan area is slightly greater than that of the AquaCell units.
2. Lay 100mm bed of coarse sand or non angular granular material, level and compact.
3. Lay the geotextile membrane over the base and up the sides of the trench.
4. Lay the AquaCell units parallel with each other. In multiple layer applications, wherever possible, continuous vertical joints should be avoided. AquaCell units can be laid in a 'brick bonded' formation (i.e. to overlap the joints below) For single layer applications use AquaCell Clips and for multi layers use AquaCell Clips and AquaCell Shear Connectors (vertical rods).
5. Fix the pipe adaptors to the AquaCell units as required to suit the incoming pipework.
6. In order to prevent silt from entering the tank, clogging the inlet pipework and reducing the storage capacity, it is recommended that a silt trap / catchpit is installed upstream of the tank inlet.
7. Wrap and overlap the geotextile covering the entire AquaCell structure, minimum lap to be in the order of 300mm.
8. Lay 100mm of coarse sand or non angular granular material between the trench walls and the AquaCell structure and compact being careful not to damage either the blocks or the geotextile membrane.
9. Lay 100mm of coarse sand or non angular granular material over the geotextile and compact.
10. Backfill tank with suitable clean material, free of organic matter and debris.

See manufacturers literature for details of block arrangement / fixing and selection.

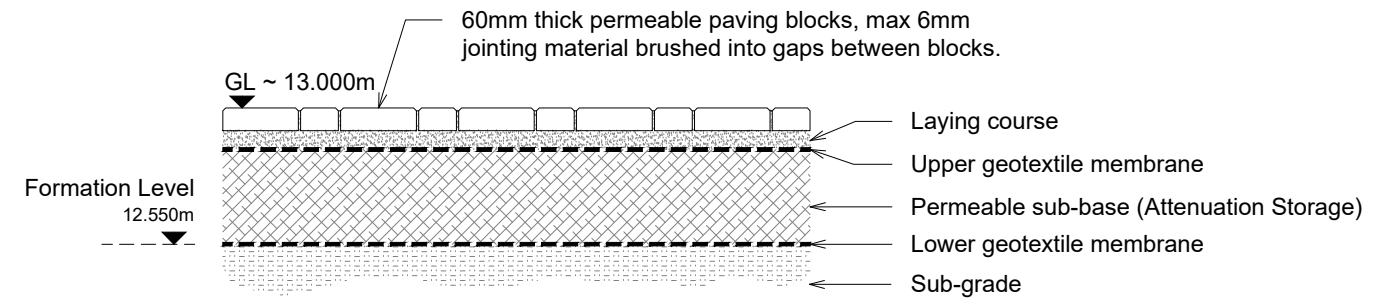
As strength varies between block models, the contractor is to consult the manufacturer to ascertain the correct block selection for each installation.

NOTE: Minimum cover depths. (Guidance Only)

- Heavy vehicle loading (i.e. large vehicles)
Cover to be not less than 1200mm.
- Light vehicle loading (i.e. parked cars)
Cover to be not less than 800mm.
- Non trafficked areas:
Cover to be not less than 500mm

Permeable Paved Areas

scale 1:20



Permeable Paved Highway Construction Specification

- 60mm Concrete Blocks specifically designed for permeable usage. Blocks to have max 6mm aggregate jointing material brushed into gaps between blocks. (architect to confirm block type and colour).
- 50mm Laying course comprising clean graded aggregate with particles within the range 3mm to 6mm.
- Upper geotextile membrane such as Terram 1000 or similar approved product.
- 225mm Minimum permeable sub-base material comprising clean graded 'no fines' crushed concrete within the range 20mm to 70mm.
- Lower geotextile membrane such as Terram 1000 or similar approved product.

450mm total formation depth.

Note. Outline designs based on an assumed filtration that is to be confirmed for the detailed design, subject to planning consent

Rev	Description	Date
A	First issue to Client	26/03/2025

PROJECT
Proposed New Dwelling on land adjacent Griffen House, School Lane, Appledore, Kent, TN26 2BA

CLIENT
Mr & Mrs Hill

DRAWING
Drainage Details

STATUS
PLANNING

Studio 23, Tridax Business Park, Honeywood Parkway, Whitfield, Dover, Kent, CT16 3QX
Tel: 01304 820777

SCALES
as shown

DATE
26/03/2025

SIZE
A3

Dwg No.
T-2025-034-03


REV.
A

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APPENDIX B

Surface Water Design Calculations

1. Soakaway Design
2. Permeable Paving Design


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Honeywood House Whitfield Kent CT16 3EH	Land Adj Griffen House Appledore Soakaway Design	
Date 26/03/2025 09:15 File T-2025-034 Soakaway.SRCX	Designed by prl Checked by	
XP Solutions		Source Control 2020.1.3

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

Half Drain Time : 1843 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m ³)	Status
15 min Summer	11.702	0.402	0.1	5.7	O K
30 min Summer	11.820	0.520	0.1	7.4	O K
60 min Summer	11.932	0.632	0.1	9.0	O K
120 min Summer	12.033	0.733	0.1	10.4	O K
180 min Summer	12.091	0.791	0.1	11.3	O K
240 min Summer	12.130	0.830	0.1	11.8	O K
360 min Summer	12.180	0.880	0.1	12.5	O K
480 min Summer	12.209	0.909	0.1	13.0	O K
600 min Summer	12.227	0.927	0.1	13.2	O K
720 min Summer	12.237	0.937	0.1	13.4	O K
960 min Summer	12.244	0.944	0.1	13.4	O K
1440 min Summer	12.227	0.927	0.1	13.2	O K
2160 min Summer	12.195	0.895	0.1	12.8	O K
2880 min Summer	12.161	0.861	0.1	12.3	O K
4320 min Summer	12.095	0.795	0.1	11.3	O K
5760 min Summer	12.039	0.739	0.1	10.5	O K
7200 min Summer	11.989	0.689	0.1	9.8	O K
8640 min Summer	11.943	0.643	0.1	9.2	O K
10080 min Summer	11.900	0.600	0.1	8.6	O K
15 min Winter	11.750	0.450	0.1	6.4	O K
30 min Winter	11.883	0.583	0.1	8.3	O K
60 min Winter	12.009	0.709	0.1	10.1	O K
120 min Winter	12.124	0.824	0.1	11.7	O K
180 min Winter	12.190	0.890	0.1	12.7	O K
240 min Winter	12.235	0.935	0.1	13.3	O K
360 min Winter	12.293	0.993	0.1	14.1	O K


Storm Event	Rain (mm/hr)	Flooded Volume (m ³)	Time-Peak (mins)
15 min Summer	192.260	0.0	19
30 min Summer	124.873	0.0	34
60 min Summer	76.528	0.0	64
120 min Summer	45.025	0.0	124
180 min Summer	32.838	0.0	184
240 min Summer	26.190	0.0	242
360 min Summer	18.990	0.0	362
480 min Summer	15.094	0.0	482
600 min Summer	12.621	0.0	602
720 min Summer	10.899	0.0	722
960 min Summer	8.640	0.0	960
1440 min Summer	6.218	0.0	1338
2160 min Summer	4.466	0.0	1668
2880 min Summer	3.528	0.0	2052
4320 min Summer	2.529	0.0	2896
5760 min Summer	1.999	0.0	3696
7200 min Summer	1.666	0.0	4536
8640 min Summer	1.436	0.0	5360
10080 min Summer	1.266	0.0	6152
15 min Winter	192.260	0.0	19
30 min Winter	124.873	0.0	34
60 min Winter	76.528	0.0	64
120 min Winter	45.025	0.0	122
180 min Winter	32.838	0.0	180
240 min Winter	26.190	0.0	240
360 min Winter	18.990	0.0	358

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

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
480 min Winter	12.328	1.028	0.1	14.7	O K
600 min Winter	12.351	1.051	0.1	15.0	O K
720 min Winter	12.365	1.065	0.1	15.2	O K
960 min Winter	12.378	1.078	0.1	15.4	O K
1440 min Winter	12.371	1.071	0.1	15.3	O K
2160 min Winter	12.329	1.029	0.1	14.7	O K
2880 min Winter	12.289	0.989	0.1	14.1	O K
4320 min Winter	12.203	0.903	0.1	12.9	O K
5760 min Winter	12.124	0.824	0.1	11.7	O K
7200 min Winter	12.051	0.751	0.1	10.7	O K
8640 min Winter	11.985	0.685	0.1	9.8	O K
10080 min Winter	11.925	0.625	0.1	8.9	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
480 min Winter	15.094	0.0	474
600 min Winter	12.621	0.0	590
720 min Winter	10.899	0.0	706
960 min Winter	8.640	0.0	932
1440 min Winter	6.218	0.0	1370
2160 min Winter	4.466	0.0	1748
2880 min Winter	3.528	0.0	2192
4320 min Winter	2.529	0.0	3112
5760 min Winter	1.999	0.0	4032
7200 min Winter	1.666	0.0	4896
8640 min Winter	1.436	0.0	5712
10080 min Winter	1.266	0.0	6560

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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)	26.250	Shortest Storm (mins)	15
Ratio R	0.400	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+45

Time Area Diagram

Total Area (ha) 0.016

Time (mins)	Area
From: To:	(ha)

0	4	0.016
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Honeywood House Whitfield Kent CT16 3EH	Land Adj Griffen House Appledore Soakaway Design	
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Model Details

Storage is Online Cover Level (m) 13.000

Cellular Storage Structure

Invert Level (m) 11.300 Safety Factor 2.0
 Infiltration Coefficient Base (m/hr) 0.01800 Porosity 0.95
 Infiltration Coefficient Side (m/hr) 0.01800

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	15.0	15.0	1.200	15.0	34.2	1.201	0.0	34.2

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Summary of Results for 30 year Return Period

Half Drain Time : 1219 minutes.


Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m ³)	Status
15 min Summer	11.511	0.211	0.0	3.0	O K
30 min Summer	11.571	0.271	0.0	3.9	O K
60 min Summer	11.629	0.329	0.1	4.7	O K
120 min Summer	11.683	0.383	0.1	5.5	O K
180 min Summer	11.713	0.413	0.1	5.9	O K
240 min Summer	11.733	0.433	0.1	6.2	O K
360 min Summer	11.756	0.456	0.1	6.5	O K
480 min Summer	11.768	0.468	0.1	6.7	O K
600 min Summer	11.773	0.473	0.1	6.7	O K
720 min Summer	11.774	0.474	0.1	6.8	O K
960 min Summer	11.770	0.470	0.1	6.7	O K
1440 min Summer	11.758	0.458	0.1	6.5	O K
2160 min Summer	11.736	0.436	0.1	6.2	O K
2880 min Summer	11.714	0.414	0.1	5.9	O K
4320 min Summer	11.671	0.371	0.1	5.3	O K
5760 min Summer	11.633	0.333	0.1	4.7	O K
7200 min Summer	11.598	0.298	0.0	4.3	O K
8640 min Summer	11.567	0.267	0.0	3.8	O K
10080 min Summer	11.538	0.238	0.0	3.4	O K
15 min Winter	11.536	0.236	0.0	3.4	O K
30 min Winter	11.604	0.304	0.0	4.3	O K
60 min Winter	11.670	0.370	0.1	5.3	O K
120 min Winter	11.731	0.431	0.1	6.1	O K
180 min Winter	11.766	0.466	0.1	6.6	O K
240 min Winter	11.789	0.489	0.1	7.0	O K
360 min Winter	11.817	0.517	0.1	7.4	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m ³)	Time-Peak (mins)
15 min Summer	101.239	0.0	19
30 min Summer	65.473	0.0	34
60 min Summer	40.257	0.0	64
120 min Summer	23.937	0.0	124
180 min Summer	17.563	0.0	182
240 min Summer	14.070	0.0	242
360 min Summer	10.271	0.0	362
480 min Summer	8.204	0.0	482
600 min Summer	6.888	0.0	600
720 min Summer	5.969	0.0	720
960 min Summer	4.758	0.0	894
1440 min Summer	3.453	0.0	1126
2160 min Summer	2.503	0.0	1516
2880 min Summer	1.990	0.0	1932
4320 min Summer	1.441	0.0	2764
5760 min Summer	1.146	0.0	3568
7200 min Summer	0.960	0.0	4328
8640 min Summer	0.830	0.0	5104
10080 min Summer	0.735	0.0	5856
15 min Winter	101.239	0.0	19
30 min Winter	65.473	0.0	33
60 min Winter	40.257	0.0	62
120 min Winter	23.937	0.0	122
180 min Winter	17.563	0.0	180
240 min Winter	14.070	0.0	238
360 min Winter	10.271	0.0	356

Summary of Results for 30 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m ³)	Status
480 min Winter	11.832	0.532	0.1	7.6	O K
600 min Winter	11.841	0.541	0.1	7.7	O K
720 min Winter	11.845	0.545	0.1	7.8	O K
960 min Winter	11.844	0.544	0.1	7.8	O K
1440 min Winter	11.827	0.527	0.1	7.5	O K
2160 min Winter	11.800	0.500	0.1	7.1	O K
2880 min Winter	11.769	0.469	0.1	6.7	O K
4320 min Winter	11.707	0.407	0.1	5.8	O K
5760 min Winter	11.651	0.351	0.1	5.0	O K
7200 min Winter	11.600	0.300	0.0	4.3	O K
8640 min Winter	11.555	0.255	0.0	3.6	O K
10080 min Winter	11.514	0.214	0.0	3.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m ³)	Time-Peak (mins)
480 min Winter	8.204	0.0	470
600 min Winter	6.888	0.0	584
720 min Winter	5.969	0.0	698
960 min Winter	4.758	0.0	914
1440 min Winter	3.453	0.0	1184
2160 min Winter	2.503	0.0	1624
2880 min Winter	1.990	0.0	2080
4320 min Winter	1.441	0.0	2984
5760 min Winter	1.146	0.0	3816
7200 min Winter	0.960	0.0	4680
8640 min Winter	0.830	0.0	5448
10080 min Winter	0.735	0.0	6248


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

Half Drain Time : 233 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m ³)	Status
15 min Summer	12.671	0.121	0.3	3.8	O K
30 min Summer	12.704	0.154	0.3	4.8	Flood Risk
60 min Summer	12.730	0.180	0.3	5.6	Flood Risk
120 min Summer	12.743	0.193	0.3	6.0	Flood Risk
180 min Summer	12.743	0.193	0.3	6.0	Flood Risk
240 min Summer	12.741	0.191	0.3	6.0	Flood Risk
360 min Summer	12.733	0.183	0.3	5.7	Flood Risk
480 min Summer	12.724	0.174	0.3	5.4	Flood Risk
600 min Summer	12.715	0.165	0.3	5.2	Flood Risk
720 min Summer	12.706	0.156	0.3	4.9	Flood Risk
960 min Summer	12.689	0.139	0.3	4.3	O K
1440 min Summer	12.658	0.108	0.3	3.4	O K
2160 min Summer	12.624	0.074	0.3	2.3	O K
2880 min Summer	12.603	0.053	0.3	1.7	O K
4320 min Summer	12.590	0.040	0.2	1.2	O K
5760 min Summer	12.583	0.033	0.2	1.0	O K
7200 min Summer	12.578	0.028	0.1	0.9	O K
8640 min Summer	12.574	0.024	0.1	0.8	O K
10080 min Summer	12.571	0.021	0.1	0.7	O K
15 min Winter	12.686	0.136	0.3	4.2	O K
30 min Winter	12.723	0.173	0.3	5.4	Flood Risk
60 min Winter	12.754	0.204	0.3	6.4	Flood Risk
120 min Winter	12.771	0.221	0.3	6.9	Flood Risk
180 min Winter	12.774	0.224	0.3	7.0	Flood Risk
240 min Winter	12.770	0.220	0.3	6.9	Flood Risk
360 min Winter	12.759	0.209	0.3	6.5	Flood Risk


Storm Event	Rain (mm/hr)	Flooded Volume (m ³)	Time-Peak (mins)
15 min Summer	192.260	0.0	18
30 min Summer	124.873	0.0	33
60 min Summer	76.528	0.0	62
120 min Summer	45.025	0.0	120
180 min Summer	32.838	0.0	172
240 min Summer	26.190	0.0	200
360 min Summer	18.990	0.0	260
480 min Summer	15.094	0.0	328
600 min Summer	12.621	0.0	396
720 min Summer	10.899	0.0	462
960 min Summer	8.640	0.0	596
1440 min Summer	6.218	0.0	850
2160 min Summer	4.466	0.0	1192
2880 min Summer	3.528	0.0	1528
4320 min Summer	2.529	0.0	2244
5760 min Summer	1.999	0.0	2944
7200 min Summer	1.666	0.0	3672
8640 min Summer	1.436	0.0	4408
10080 min Summer	1.266	0.0	5144
15 min Winter	192.260	0.0	18
30 min Winter	124.873	0.0	32
60 min Winter	76.528	0.0	62
120 min Winter	45.025	0.0	118
180 min Winter	32.838	0.0	174
240 min Winter	26.190	0.0	226
360 min Winter	18.990	0.0	282

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

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
480 min Winter	12.747	0.197	0.3	6.2	Flood Risk
600 min Winter	12.734	0.184	0.3	5.7	Flood Risk
720 min Winter	12.720	0.170	0.3	5.3	Flood Risk
960 min Winter	12.694	0.144	0.3	4.5	O K
1440 min Winter	12.648	0.098	0.3	3.1	O K
2160 min Winter	12.604	0.054	0.3	1.7	O K
2880 min Winter	12.592	0.042	0.2	1.3	O K
4320 min Winter	12.581	0.031	0.2	1.0	O K
5760 min Winter	12.575	0.025	0.1	0.8	O K
7200 min Winter	12.571	0.021	0.1	0.6	O K
8640 min Winter	12.568	0.018	0.1	0.6	O K
10080 min Winter	12.566	0.016	0.1	0.5	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
480 min Winter	15.094	0.0	358
600 min Winter	12.621	0.0	432
720 min Winter	10.899	0.0	506
960 min Winter	8.640	0.0	644
1440 min Winter	6.218	0.0	894
2160 min Winter	4.466	0.0	1192
2880 min Winter	3.528	0.0	1528
4320 min Winter	2.529	0.0	2248
5760 min Winter	1.999	0.0	2944
7200 min Winter	1.666	0.0	3672
8640 min Winter	1.436	0.0	4416
10080 min Winter	1.266	0.0	5144

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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)	26.250	Shortest Storm (mins)	15
Ratio R	0.400	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+45

Time Area Diagram

Total Area (ha) 0.011

Time (mins)	Area
From: To:	(ha)

0	4	0.011
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Model Details

Storage is Online Cover Level (m) 13.000

Porous Car Park Structure

Infiltration Coefficient Base (m/hr)	0.01800	Width (m)	10.2
Membrane Percolation (mm/hr)	1000	Length (m)	10.2
Max Percolation (l/s)	28.9	Slope (1:X)	0.0
Safety Factor	2.0	Depression Storage (mm)	0
Porosity	0.30	Evaporation (mm/day)	0
Invert Level (m)	12.550	Membrane Depth (m)	0