

Proposed dwelling

at

**86 Ancton Way
Bognor Regis
PO22 6JP**

Management of Surface Water Run-off

March 2026

Version 2

(all revisions highlighted)



HERBERT STUMPP
L I M I T E D

Civil & Structural Engineers
Construction Health & Safety
Party Wall Surveyors



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1. INTRODUCTION

Herbert Stumpp Limited have been appointed to prepare this document in respect of a proposed replacement dwelling at 86 Ancton Way, Bognor Regis, PO22 6JP.

The purpose of this document is to demonstrate that a surface water drainage system to serve the proposed development has been designed to meet the requirements of the relevant statutory guidance and publications.

A site meeting was held on 17th March 2026 to discuss the proposals for surface water drainage. Present were the applicant, Kathryn Welch, Arun DC planning officer; Paul Cann, Arun DC drainage engineer; Joe Dixon, Arun DC drainage engineer; and Philip Pitman, engineer for Herbert Stumpp Ltd.

The site occupies an area of approximately 240m² (0.024Ha). A site location plan is shown in **Figure 1.1** below.

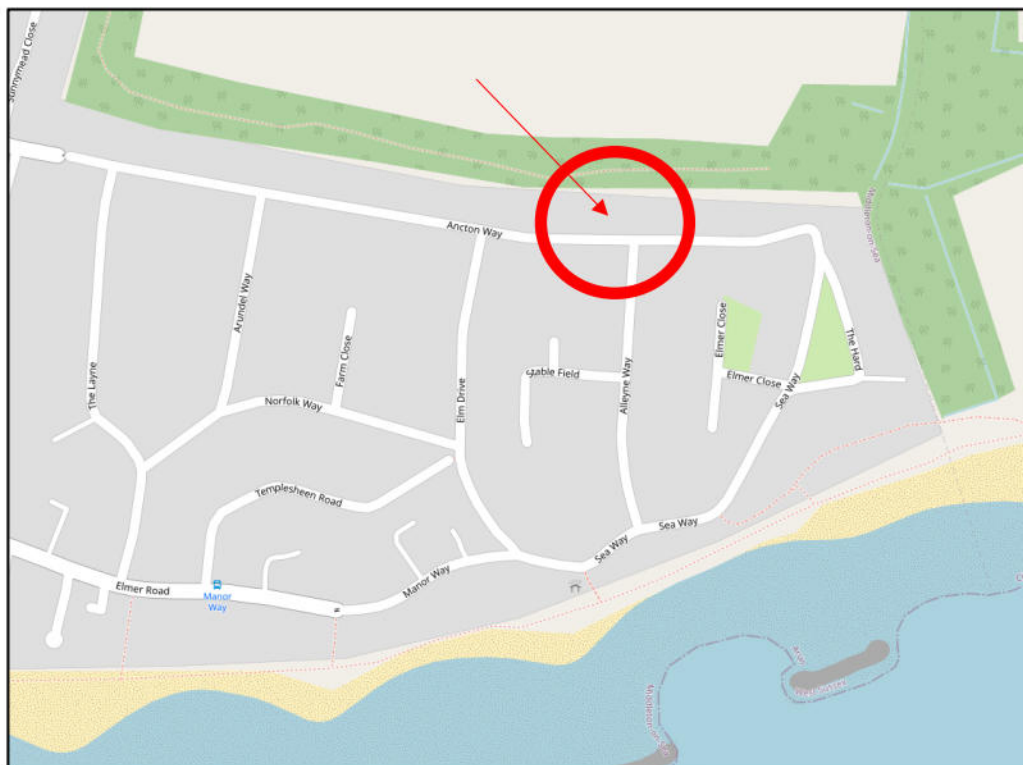


Figure 1.1: Site Location Plan © OpenStreetMap contributors

THE MANAGEMENT OF SURFACE WATER RUN-OFF

This document has been prepared in line with guidance found in the following:

- *Arun District Council Level 1 & Level 2 Strategic Flood Risk Assessments (SFRA)*
- *West Sussex LLFA policy for the management of surface water*
- *Arun District Council Surface Water Drainage Guidance*
- *Code of practice for the structural design of pavements using modular paving units*
- *Building Regulations Approved Document H*
- *CIRIA Report 753 – ‘The SuDS Manual’*
- *‘National standards for sustainable drainage systems (SuDS)’* Published by the Department for Environment, Food & Rural Affairs (DEFRA) July 2025
- *Tools for the design and evaluation of sustainable drainage systems (SuDS) published by UKSuDS (HR Wallingford)*
- *‘Flood risk assessments: Climate change allowances’* published by the Environment Agency • BS 8582:2013. *‘Code of practice for surface water management for development sites’*

The proposed surface water drainage layout and associated construction details are shown on Drawing 006 included in **Appendix 1**.

2. SURFACE WATER DRAINAGE – DESIGN PRINCIPLES

CIRIA Report 753 – The SuDS Manual sets out the design approach and the design criteria to be used when preparing the designs for a sustainable drainage system; and *‘National standards for sustainable drainage systems (SuDS)’* Published by the Department for Environment, Food & Rural Affairs (DEFRA) July 2025 sets out the standards for sustainable drainage systems. These standards are used in conjunction with the National Planning Policy Framework (NPPF) and Planning Practice Guidance and have been applied when preparing the design for this development.

In order to meet the requirements of these publications, planning policy and current best practice guidance, the following are now considered and discussed:

- Underlying geology
- Climate change
- National Standards

2.1 Underlying geology

Interrogation of British Geological Survey Mapping indicates that the site is underlain by chalk (bedrock geology) with superficial deposits of river terrace deposits and raised beach deposits. An extract from the mapping is shown in **Figure 2.1**.

Trial pits were excavated in the rear garden and in a small area of grass in the front driveway of No 88 Ancton Way, adjacent to the boundary with No. 86. Excavations confirmed that river terrace deposits and raised beach deposits were present. The material excavated was a sandy silty material.

Inspections of the trial pits were carried out by Kathryn Welch, Paul Cann and Joe Dixon of Arun District Council during the site meeting on 17th March 2026.

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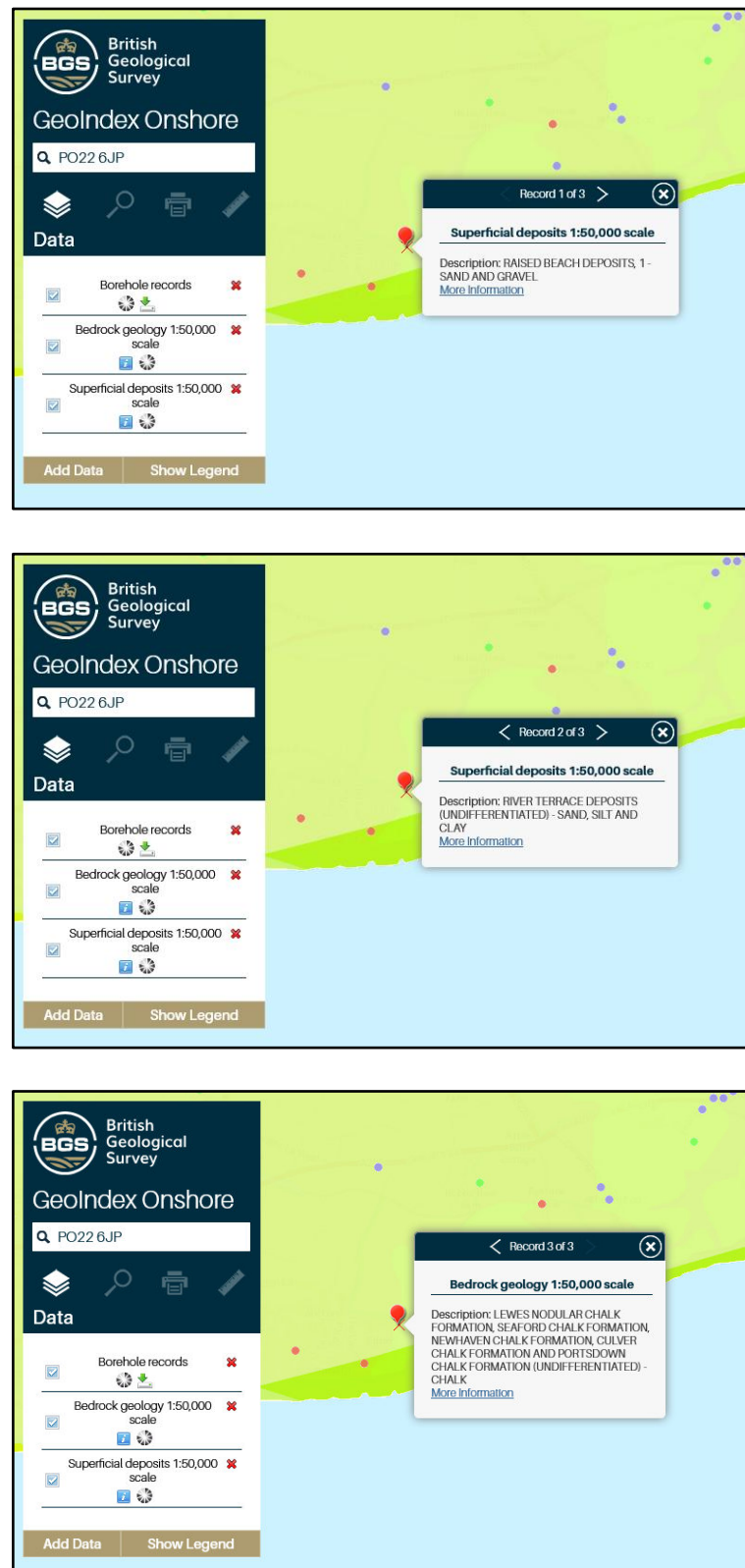


Figure 2.1 – extract from British Geological Survey mapping
© British Geological Survey

2.2 Climate change

'Flood risk assessments: climate change allowances' prepared by the Environment Agency recommends varying levels of allowance for climate change and requires that allowances for climate change are applied to the peak rainfall intensities used in the design storms to be considered.

The allowances to be used are obtained directly from that publication and it can be seen from the extract reproduced as **Figure 2.2** that the allowances vary between 20% and 45%, depending upon the lifespan of the development and the exceedance rainfall event. It is considered that as the development is of a residential nature, a life span for the development of 100 years is appropriate, which means that the development will be in use until, say, 2126. The 1% annual exceedance rainfall event is appropriate and the central and upper end allowances for this event are 25% and 45%. An allowance of 45% will therefore be used.

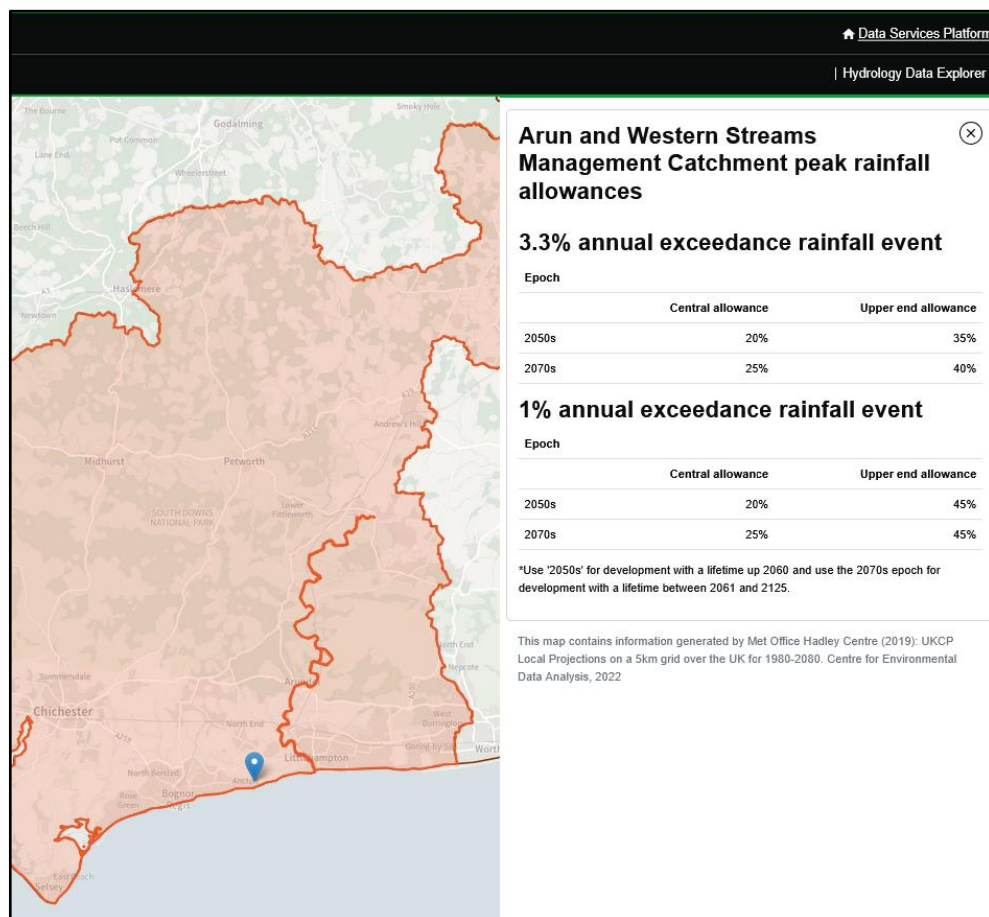


Figure 2.2 – peak rainfall allowances

2.3 National Standards

'National standards for sustainable drainage systems (SuDS)' requires that seven standards are considered when during the design of a surface water drainage system. These standards are:

Standard 1: Run-off destination

Standard 2: Interception drainage

Standard 3: Extreme rainfall and flooding

Standard 4: Water quality

Standard 5: Amenity

Standard 6: Biodiversity

Standard 7: Construction, operation, maintenance, decommissioning & structural integrity

These are now discussed in turn.

2.3.1 Standard 1: Run-off destination

'National standards for sustainable drainage systems (SuDS)' state and give guidance on the run-off destination via a drainage hierarchy. This is:

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

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

Note 1: priority 1 is the highest priority and priority 5 is the lowest.

- **Priority 1: Collected for non-potable use**

'National standards for sustainable drainage systems (SuDS)' steer developments to collect surface water run-off for non-potable use.

2nr rainwater butts will be provided to the rear of the property to store rainwater for garden use. These will overflow when full into a rain garden. The storage of rainwater for larger-scale re-use has been discounted because the area that would receive surface water is relatively small and to serve the property reliably, an overly large tank would be required to be sited below ground. This is considered impractical.

- **Priority 2: Infiltrated into the ground**

Where infiltration drainage is proposed, *'National standards for sustainable drainage systems (SuDS)'* require at least 1m between the base of the infiltration feature and the groundwater table. A groundwater monitoring point was installed at the site in April 2023 and water levels were observed and recorded regularly. The monitoring

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point comprised a 1.5m length of perforated plastic pipe inserted into the ground to a depth of 1.45m and surrounded with shingle. A photographic record is included in **Appendix 2**. The results of the monitoring are tabulated in **Table 2.1**. Monitoring took place between April 2024 and April 2025. The location of the monitoring point is shown on Drawing 006. The ground level at the monitoring point is 9.600m and the highest ground water level recorded was 220mm above the base of the monitoring point., i.e. 8.370m.

Date	Depth of water above base
27.04.2024	95mm
16.05.2024	75mm
25.05.2024	Dry
07.06.2024	Dry
30.06.2024	Dry
20.07.2024	Dry
02.08.2024	Dry
08.08.2024	Dry
06.09.2024	Dry
11.10.2024	150mm
01.11.2024	Dry
15.11.2024	Dry
23.12.2024	Dry
18.01.2025	Dry
30.01.2025	220mm
14.02.2025	Dry
18.03.2025	Dry
20.04.2025	Dry

Table 2.1 – Groundwater levels

To establish whether or not infiltration drainage is feasible, soakage testing is required, and such testing was carried out over the weekend of 22nd/23rd March 2026. Two trial pits were excavated for the purposes of these tests, one located in the grassed area of the front driveway of No.88 Ancton Way, and one located in the rear garden of 86 Ancton Way adjacent to the boundary with no.88, both as agreed on site with Arun DC.

The results of the tests are included in **Appendix 3** and the calculated soil infiltration rates demonstrate that infiltration drainage is feasible. It is therefore the selected method for the dispersal of surface water run-off. The lower of the two figures obtained during the tests is used for the purposes of design, which is discussed in section 3.

To achieve the required 1m between the base of any proposed infiltration feature and the groundwater table, no formation level is permitted to be lower than 9.370m. The proposed formation levels are shown on Drawing 006.

- **Priority 3: discharged to an above ground surface water body**

There is no above ground surface water body to discharge to, so this has been discounted. In any case, this option is lower down the hierarchy than the proposed infiltration drainage techniques.

- **Priority 4: Discharged to a surface water sewer, or another piped surface water drainage system**

There is no surface water sewer or piped drainage system to discharge to so this has been discounted. In any case, this option is lower down the hierarchy than the proposed infiltration drainage techniques.

- **Priority 5: discharged to a combined sewer**

There is no combined sewer to discharge to so this has been discounted. In any case, this option is lower down the hierarchy than the proposed infiltration drainage techniques.

2.3.2 Standard 2: Interception drainage

2nr rainwater downpipes will be provided on the rear of the proposed dwelling to pick up surface water run-off from the roof. Each downpipe will flow into a rainwater butt and then into a rain garden. Two rain gardens will be provided - one alongside each side boundary in the rear garden.

2.3.3 Standard 3: Extreme rainfall and flooding

A flood risk assessment (FRA) has been prepared and is a separate document. The FRA shows that the site is at low risk of flooding from surface water and this is confirmed by inspection of Arun DC's own SFRA. Flooding is from tidal sources and there is no evidence that the site is at risk from flooding by fluvial sources. This is confirmed by Product 4 data included with the FRA.

2.3.4 Standard 4: Water quality

The principal source of surface water run-off is from the roof of the proposed dwelling. Surface water run-off from roofs is generally considered 'safe' in terms of pollutant types and levels of pollutants, although airborne particles which settle on these areas can contain elevated levels of pollutants and these particles are generally washed off with the first flush of rainfall and conveyed into the drainage system. The roof will discharge into rain gardens where the planting, retention of the surface water run-off, and subsequent microbial and natural action will break down the pollutants into their less harmful components. This is well-documented. Any new hard landscaping around the site will be permeable, and again any pollutants will be treated by microbial and natural action in the drainage media beneath them.

Table 4.3 of '*CIRIA Report 753 – The SuDS Manual*' sets out the design approach to be

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used when considering SuDS components and likely pollutants. An extract from the relevant part of this table has been reproduced as **Figure 2.3**.

TABLE 4.3 Minimum water quality management requirements for discharges to receiving surface waters and groundwater			
Land use	Pollution hazard level	Requirements for discharge to surface waters, including coasts and estuaries ²	Requirements for discharge to groundwater
Residential roofs	Very low	Removal of gross solids and sediments only	
Individual property driveways, roofs (excluding residential), residential car parks, low traffic roads (eg cul de sacs, home zones, general access roads), non-residential car parking with infrequent change (eg schools, offices)	Low	Simple index approach ² <i>Note: extra measures may be required for discharges to protected resources¹</i>	

Figure 2.3: Water quality management requirements

It can be seen from Figure 2.1 that the removal of gross solids and sediments only is required for the treatment of run-off from the roof of the proposed development. It can also be seen that the simple index approach is appropriate for this development in respect of requirements for the treatment of run-off from driveways/parking areas of the proposed development. It is noted that extra measures may be required for discharges to protected resources. Run-off from the roofs and from the driveways are now discussed.

- **Run-off from roofs**

Surface water run-off from roofs is generally considered 'safe' in terms of pollutant types and levels of pollutants, although airborne particles which settle on these areas can contain elevated levels of pollutants and these particles are generally washed off with the first flush of rainfall and conveyed into the drainage system.

- **Run-off from driveways**

The site is not located within a Source Protection Zone (SPZ) and this can be seen from the extract from MAGIC Map published by DEFRA reproduced as **Figure 2.4**. In broad terms, SPZs are defined according to how long it will take a pollutant to travel from the point under consideration to the source from where groundwater is taken. These definitions are: inner zones (SPZ1), outer zones (SPZ2) and total catchments (SPZ3).

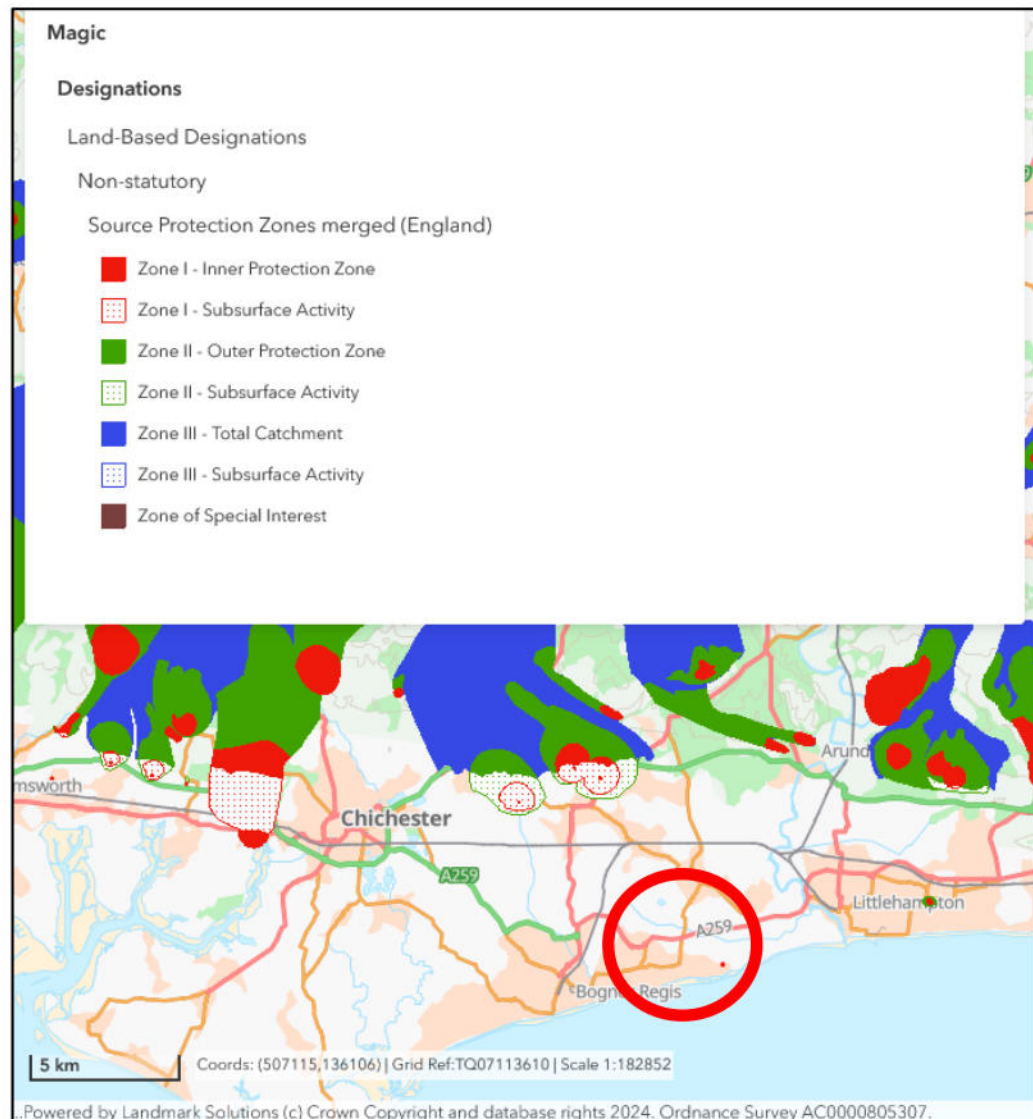


Figure 2.4 – extract from Magic Map

© DEFRA

The parking area is a potential source of pollutants such as hydrocarbons, phosphates, glycols, alcohols and heavy metals. Engines can leak, and accidental spillages can occur. It is well-documented that drainage blankets assist with removing pollutants such as these. The majority of silt and the pollutants which become attached to it are usually trapped within the top 30mm of the drainage blanket, and organic pollutants such as petrol and diesel tend to biodegrade due to the length of time they are retained, during which microbial and natural action break down these pollutants into their less harmful components

The SuDS Manual sets out the approach to be adopted for maintaining water quality. The simple index approach is appropriate for this site, and the procedure is contained within section 26 of the *SuDS Manual*. Table 26.2 of the *SuDS Manual*, which has been reproduced as **Figure 2.5**, provides the pollution hazard indices for the different land

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uses, and it can be seen from that table that for residential roofs the pollution hazard level is very low. It can also be seen from that table that the pollution hazard level for the driveways is low. The table gives the pollution indices for the various pollutants to be considered. The simple index approach requires that these figures are added together to give the pollution hazard index. This index must be less than or equal to the total SuDS mitigation index.

TABLE 26.2 Pollution hazard indices for different land use classifications				
Land use	Pollution hazard level	Total suspended solids (TSS)	Metals	Hydrocarbons
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

Figure 2.5: Pollution Hazard Indices

The SuDS mitigation indices for discharges to groundwater are given in Table 26.4 of the SuDS Manual. This table has been reproduced as **Figure 2.6**. The results have been tabulated in **Figure 2.7** and show that the SuDS mitigation indices for each of the pollutants are equal to or greater than the sums of the pollution hazard indices and the proposed SuDS components are acceptable and thus meet the requirements of Standard 4.

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

Figure 2.6: SuDS mitigation Indices

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Parking area to front of development			
	Total suspended solids	Metals	Hydrocarbons
Residential Roofs	Nil contribution	Nil contribution	Nil contribution
Driveways	0.5	0.4	0.4
Total pollution hazard indices (sum of above)	0.5	0.4	0.4
SuDS Mitigation Index for permeable pavements (must be equal to or greater than total pollution hazard indices)	0.7 (>0.5 and therefore satisfactory)	0.6 (>0.4 and therefore satisfactory)	0.7 (>0.4 and therefore satisfactory)
Roof of development to rear rain gardens			
Residential Roofs	0.2	0.2	0.05
Driveways	Nil contribution	Nil contribution	Nil contribution
Total pollution hazard indices (sum of above)	0.2	0.2	0.05
SuDS Mitigation Index for permeable pavements (must be equal to or greater than total pollution hazard indices)	0.6 (>0.2 and therefore satisfactory)	0.5 (>0.26 and therefore satisfactory)	0.6 (>0.05 and therefore satisfactory)

Figure 2.7: Summary of pollution hazard indices vs SuDS mitigation indices

2.3.5 Standard 5: Amenity

The rain gardens will slow surface water run-off and will provide a garden feature for the use and enjoyment by the occupants of the dwelling. A project of this size has little potential to offer amenity on a wider scale, e.g. beyond the confines of the site.

2.3.6 Standard 6: Biodiversity

The rain gardens will be planted with native, nectar-rich plants, which will provide food for pollinators such as butterflies and bumblebees, and will attract birds. It will also enhance the natural habitat.

2.3.7 Standard 7: Construction, operation, maintenance, decommissioning & structural integrity

Construction details and maintenance requirements are considered in this document, with various details shown on Drawing 006. Management and maintenance are discussed in section 2.7. Structural design is discussed in section 4.

3. DETAILED DESIGN

The proposed surface water drainage layout and various construction details are shown on the drawing included in Appendix 1.

The parking area and hard landscaped areas will be permeably surfaced, and beneath which will be a layer of coarse graded aggregate through which run-off will permeate directly into the ground.

The run-off from the roof will be conveyed to rain gardens located in the rear garden of the proposed dwelling.

This section considers the following topics:

- Structural performance
- Hydraulic performance

3.1 Structural performance

The parking area and the patio will be permeably surfaced and will be constructed to meet the requirements of the anticipated traffic loads. The minimum depth of aggregate sub-base which will be used to form the drainage blanket beneath these areas will be either the depth required to provide the satisfactory storage volume or the depth required to provide satisfactory structural performance, whichever is the greater of the two.

The parking area will be subjected to light car use and will be surfaced with unbound stone contained in a cellular system such as Bodpave by Green-Tech or a Geoweb system. Examples are included in **Appendix 4**. This surface requires at least 200mm of aggregate beneath it for satisfactory structural performance.

The patio will be subjected to pedestrian traffic only and will be designed to meet the structural requirements of Traffic Category 1 of BS 7533. For satisfactory structural performance, the patio requires a minimum of 100mm depth of open graded crushed rock sub base (drainage aggregate).

3.2 Hydraulic performance

Planning policies and current guidance require the surface water drainage system to be designed to receive flows from a 1 in 30 year +45% climate change event without flooding. The system has been designed to receive flows from a 1 in 100 year +45% climate change event without flooding, which exceeds the requirement.

Urban creep must also be considered, and the current allowance of 10% is included in the calculations.

Soakage testing to determine the soil infiltration rate was carried out on site in two locations

agreed with Arun DC, and in each location, three tests were carried out. The tests in the rear garden gave the lowest soil infiltration rate, and this is the figure which has been used throughout. The figure is 2.9×10^{-5} m/s.

Calculations are included in **Appendix 5** to show the design for the planar infiltration. The calculations have been prepared using the tool provided by UKSuDS (HR Wallingford) and are based on FEH Rainfall data.

The calculations for the permeably paved areas (11 sq.m. of patio and 53 sq.m of parking area) show that for every 71 sq.m. of surface (64 sq.m. plus 10% allowance for urban creep), and for a 1 in 100 year event plus 45% allowance for climate change, and a depth of aggregate of 83mm, the required base area (plan area of the planar infiltration) is 70 sq.m.

The proposed 83mm depth of aggregate required for satisfactory hydraulic performance needs to be compared to the minimum depth of sub-base (drainage aggregate) that is required for satisfactory structural performance of the patio paving and of the cellular system, and the greater of the figures used in the design. This comparison is summarised in **Table 4.2**, and from that table it can be seen that 200mm of aggregate is required beneath the parking area and that 100mm of aggregate is required beneath the patio paving.

Construction format	Minimum depth required for:		Minimum depth to be provided
	Structural design	Hydraulic design	
Cellular system (parking bay)	200mm	83mm	200mm
Patios/paving etc	100mm	83mm	125mm

Table 4.2: Depth of drainage aggregate required

The roof area including a 10% allowance for urban creep is 85 sq.m and the proposed area of rain garden 20 sq.m, giving a total area of 105 sq.m. The calculations for the rain gardens show that for 105 sq.m. of surface, and for a 1 in 100 year event plus 45% allowance for climate change, and assuming a 350mm depth of rain garden, the required base area (of rain garden) is 20 sq.m. 2nr gardens will be provided, each 10.5m long x 1.0m wide x 0.35m deep.

4 ADDITIONAL INFORMATION

4.1 Exceedence flows

The proposed ground levels within the site will remain largely as they are at present. Overland flows resulting from flooding of the drainage system in the event that the 1 in 100 year + 45% climate change event is exceeded would flow as they do at present (i.e. prior to development). Flows generated in this way will be rare and will present a very low risk.

4.2 Timetable for implementation

The proposed surface water drainage system will be constructed as part of the development of the site and will be operational prior to occupation.

4.3 Management and maintenance

Responsibility for maintenance will rest with the owner of the proposed dwelling, and regular inspection and maintenance of the drainage system, its components and its contributing areas will be required. The construction details and the proposed drainage layout drawing show that the drainage system complies with the relevant requirements of Part H of the Building Regulations in respect of maintenance, access, pipe diameters and gradients; and they also show that the proposed materials are of a suitable nature for the intended use. Construction of the drainage system and installation of individual components will be tested where required in accordance with the Building Regulations, current codes of practice and manufacturer's recommendations.

The maintenance requirements for the drainage system are summarised as follows:

Gutters

Materials: Plastic/composite/steel gratings, plastic gutters and gullies, precast concrete channels

Maintenance requirements: Monthly inspections to assess condition and to ensure no accumulations of debris or silt. Remove any debris and carry out jetting/flushing and repairs as necessary to ensure continued operation.

Permeable paving

Materials: Clay/concrete pavers with stone media beneath

Maintenance requirements: Sweeping of the surface 2 – 4 times per year, removal of any surface debris as it appears, and the removal of any weed and plant growth. Sweeping can be carried out manually or mechanically. Mechanical sweeping should only be carried out with the suction feature turned off to prevent the accidental removal of any surface grit.

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Water butts & diverters

Materials: Plastic

Maintenance requirements: Twice yearly inspections to assess condition of water butts and to ensure no accumulations of debris or silt. Remove any debris as necessary. Regular inspection of diverter inlet and outlet pipes to ensure no blockages

Rain gardens

Materials: Live plants

Maintenance requirements: Design: Careful selection of plants to ensure they are appropriate for the conditions.

Rain gardens require a number of maintenance activities to ensure the effective long-term function of the system and plant health is maintained. These are as follows:

Regular inspection of plants to assess their health and replacement of dead and dying plants.

Plants will require regular watering in the first two years as they establish. Once established, rain garden plants do not typically require watering.

Check for sediment deposition 3 monthly and after rain. Remove sediment from inlets, forebays and other pre-treatment measures, and the surface of rain gardens

Check for holes, erosion and scour 3 monthly and after rain

Inspect for build-up of oily or clayey sediment on the surface of the filter media 3 monthly and after rain. Reduced surface porosity reduces infiltration capacity

Clear away and mulch on the surface and lightly rake over the surface of the filter media between plants every three months.

Check for litter in and around treatment areas 3 monthly and after rain. Remove rubbish, leaves and other debris from surrounding areas. Flow paths and infiltration may be hindered.

Assess plants for disease or pest infection, signs of stunted growth or die off, or over-crowding every 3 months, or as required to maintain plant health. Poor plant health can be a sign of too much or too little water, or poor flow control. For too

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much water, replace plants with species more tolerant of wet conditions and rejuvenate filter media to design infiltration capacity. For too little water, replant with species more tolerant of dry conditions. Treat diseases/pests or replant as necessary. Do not add fertiliser to rain gardens and only use pesticides or herbicides suitable for use near waterways.

Check for presence of weeds 3 monthly, or as necessary. Weeds can reduce aesthetics and treatment capacity because some plants are more effective at pollutant removal than others. Manually remove weeds where possible, where this is not feasible, spot spray weeds with a herbicide appropriate for use near waterways.

In addition to regular maintenance tasks outlined above, major maintenance and replacement will need to take place on a periodic basis. The frequency of these tasks will depend on how well the regular maintenance is undertaken, and on the sediment and other contaminant loads. Possible major maintenance tasks and frequency may include the removal and disposal of sediments (including replacement with new media) every 20 years, complete replanting every 20 years, or major maintenance of drainage system, e.g. replacement of parts, every 10 years.

The rain gardens are an important feature and a reduced or a lack of maintenance of them will result in flooding. It is important therefore that the regular upkeep of the rain gardens is continued for the life of the property, and particularly following changes in ownership of the property. When the property is first sold, the liability for maintenance and upkeep will necessarily pass to the first owner who will be made aware of their obligations to maintain the rain gardens throughout their ownership by the inclusion of a suitably worded maintenance clause inserted into the deeds. This clause will apply to the first owner and to all future successors in title.

In addition, a maintenance handbook will be provided to the first owner of the property and this will contain comprehensive instructions for the maintenance and upkeep of the rain gardens.

APPENDIX 1

TAKE TIME TO READ AND UNDERSTAND THIS DRAWING AND FAMILIARISE YOURSELF WITH ITS CONTENT. DO THIS IN GOOD TIME BEFORE COMMENCING ANY WORK, AND IN THE EVENT OF ANY QUERY, REFER TO HERBERT STUPP LTD IN A TIMELY MANNER.

Do not scale from this drawing for construction or fabrication. Work to figured dimensions only.

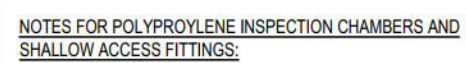
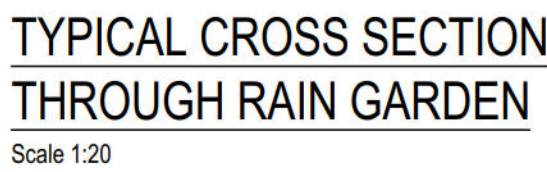
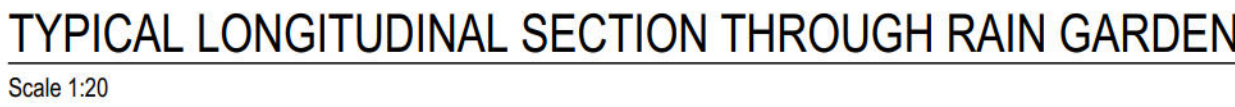
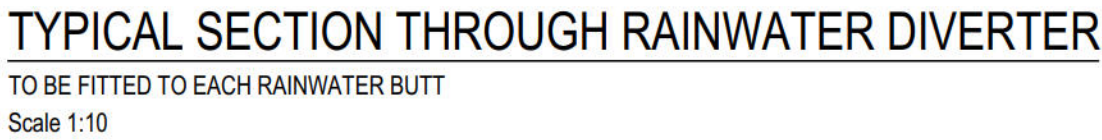
This drawing is to be read in conjunction with all other relevant Architect's and Engineer's drawings

The contractor's attention is drawn to the drawing status and is to note the following:

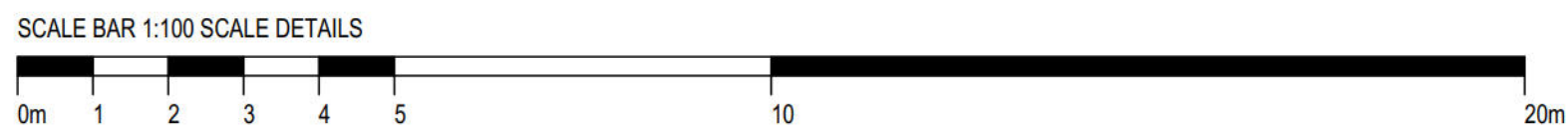
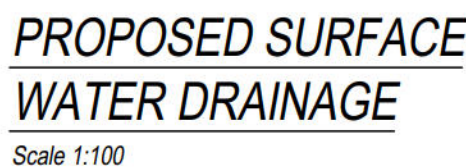
PLANNING (P):	The drawing is for planning only
TENDER (T):	The drawing is for pricing purposes only
PRELIMINARY (P):	The drawing has not received technical approval from the relevant approving authority
CONSTRUCTION (C):	The drawing is for construction

THE CONTRACTOR MUST BE AWARE THAT ANY WORKS CARRIED OUT BASED UPON DRAWINGS MARKED TENDER OR PRELIMINARY ARE CARRIED OUT AT THE CONTRACTOR'S OWN RISK.

The Construction (Design and Management) Regulations 2015 apply to this project. It is the contractor's responsibility to ensure that the requirements of the Regulations are satisfactorily addressed prior to commencement of any works.



1. Provide a 100mm thickness bed of selected sub-grade or granular material. Ground conditions are unacceptable use a 150mm thick bed of 150mm grad 574 concrete. Place the pre-formed polycarbonate base of the chamber in position whilst the concrete is still soft so that it may adopt the shape of the chamber.
2. Polycarbonate inspection chamber shaft sections are to provide set inverts using standard height shaft sections and are to provide inverts as specified by site cutting shaft sections to required height.
3. A minimum 100mm thickness of selected sub-grade or granular material to be placed and rammed firmly around pipes and fittings until adequate support is achieved.
4. A 150mm minimum thickness grade 574 concrete casting to be provided around the top of the shaft to provide sealing for cover and frame where the chamber is located in non-voided areas. This is to be placed in or set against areas where there is access by construction traffic.
5. A minimum 150mm thick grade 574 concrete bed and surround is required where chambers are located in soft land conditions. This is to be constructed as follows:
 - a. Proprietary lift adaptors are to be used to connect 150mm diameter shaft sections.
 - b. Unused lifters are to be sealed off using proprietary blanking-up plates or



Revisions:	
PL1:	Draft issue
PL2 19.02.2025:	Issued for planning
PL3 27.03.2026:	Surface water drainage revised
PL4 07.05.2023:	Rain garden levels revised

ORIGINAL DRAWING SIZE: A1



Project
86 ANCTON WAY, BOGNOR REGIS, WEST SUSSEX PO22 6JP

PROPOSED SURFACE WATER DRAINAGE

Drawing status
PLANNING
Drawn by
PP
Drawing Number
006

Date
January 2025
Scale
As shown
Revision
PL 4

APPENDIX 2







APPENDIX 3



Soakage pit excavated at front (driveway)

Calculations to determine Soil Infiltration Rate (f) FRONT SOAKAGE TEST (DRIVEWAY)			Site address 88 Ancton Way Bognor Regis PO22 6JP																										
			Date March 2026																										
Soil Infiltration Rate (f) is given by $f = Vp75-25 / (As50 \times Tp75-25 \times 60)$																													
DETAILS OF TRIAL PIT																													
Trial pit dimensions			Outflow $O = L \times W \times (Vp75-Vp25)$		$As50 = (L \times 0.5 \times D \times 2) + (W \times 0.5 \times D \times 2)$																								
Length (L)	1.000	m	O=	0.0675	cu.m																								
Width (W)	0.450	m																											
Depth (D)	0.300	m			As50= 0.435 sq.m																								
Vp75	0.225	m																											
Vp25	0.075	m																											
DETAILS OF TESTS																													
Test 1			Test 2		Test 3																								
Time	Elapsed time		Time	Elapsed time	Time	Elapsed time																							
Start	08:00	hh:mm Minutes	Start	09:30 hh:mm Minutes	Start	11:00 hh:mm Minutes																							
75% full	08:05	00:05 5	75% full	09:36 00:06 6	75% full	11:08 00:08 8																							
25% full	08:09	00:09 9	25% full	09:41 00:11 11	25% full	11:15 00:15 15																							
Empty	08:25	00:25 25	Empty	09:57 00:27 27	Empty	11:35 00:35 35																							
<table><tr><td></td><td colspan="3">Time</td></tr><tr><td>Depth</td><td>Test 1</td><td>Test 2</td><td>Test 3</td></tr><tr><td>0</td><td>0</td><td>0</td><td>0</td></tr><tr><td>75</td><td>5</td><td>6</td><td>8</td></tr><tr><td>225</td><td>9</td><td>11</td><td>15</td></tr><tr><td>300</td><td>25</td><td>27</td><td>35</td></tr></table>							Time			Depth	Test 1	Test 2	Test 3	0	0	0	0	75	5	6	8	225	9	11	15	300	25	27	35
	Time																												
Depth	Test 1	Test 2	Test 3																										
0	0	0	0																										
75	5	6	8																										
225	9	11	15																										
300	25	27	35																										
RESULTS OF TESTS (CALCULATED SOIL INFILTRATION RATE)																													
Test 1			Test 2		Test 3																								
Tp75-25	4	min	Tp75-25	5	min	Tp75-25	7	min																					
f=	6.466E-04	m/second	f=	5.172E-04	m/second	f=	3.695E-04	m/second																					
SOIL INFILTRATION RATE TO USE (THE MINIMUM VALUE FROM THE THREE TESTS):							3.695E-04	m/sec																					
INFILTRATION RATES <table><caption>Graph Data Points</caption><thead><tr><th>Top Water Level Below Ground Level (mm)</th><th>Test 1 Elapsed Time (min)</th><th>Test 2 Elapsed Time (min)</th><th>Test 3 Elapsed Time (min)</th></tr></thead><tbody><tr><td>0</td><td>0</td><td>0</td><td>0</td></tr><tr><td>75</td><td>5</td><td>6</td><td>8</td></tr><tr><td>225</td><td>9</td><td>11</td><td>15</td></tr><tr><td>300</td><td>25</td><td>27</td><td>35</td></tr></tbody></table>									Top Water Level Below Ground Level (mm)	Test 1 Elapsed Time (min)	Test 2 Elapsed Time (min)	Test 3 Elapsed Time (min)	0	0	0	0	75	5	6	8	225	9	11	15	300	25	27	35	
Top Water Level Below Ground Level (mm)	Test 1 Elapsed Time (min)	Test 2 Elapsed Time (min)	Test 3 Elapsed Time (min)																										
0	0	0	0																										
75	5	6	8																										
225	9	11	15																										
300	25	27	35																										



Soakage pit excavated at rear (rain gardens)

**Calculations to determine Soil Infiltration Rate (f)
REAR SOAKAGE TEST (RAIN GARDENS)**

Site address

88 Ancton Way
Bognor Regis
PO22 6JP

Date

March 2026

Soil Infiltration Rate (f) is given by $f = Vp75-25 / (As50 \times Tp75-25 \times 60)$

DETAILS OF TRIAL PIT

Trial pit dimensions			Outflow O = L x W x (Vp75-Vp25)			As50 = (L x 0.5 x D x 2) + (W x 0.5 x D x 2)		
Length (L)	1.000	m	O=	0.1008	cu.m	As50=	0.450	sq.m
Width (W)	0.800	m						
Depth (D)	0.250	m						
Vp75	0.188	m						
Vp25	0.062	m						

DETAILS OF TESTS

Test 1				Test 2				Test 3			
Time		Elapsed time		Time		Elapsed time		Time		Elapsed time	
Start	08:00	hh:mm	Minutes	Start	15:00	hh:mm	Minutes	Start	08:00	hh:mm	Minutes
75% full	09:00	01:00	60	75% full	16:05	01:05	65	75% full	09:10	01:10	70
25% full	10:55	02:55	175	25% full	18:05	03:05	185	25% full	11:16	03:16	196
Empty	13:50	05:50	350	Empty	21:40	06:40	400	Empty	16:02	08:02	482

Depth	Time		
	Test 1	Test 2	Test 3
0	0	0	0
75	60	65	70
225	175	185	196
300	350	400	482

RESULTS OF TESTS (CALCULATED SOIL INFILTRATION RATE)

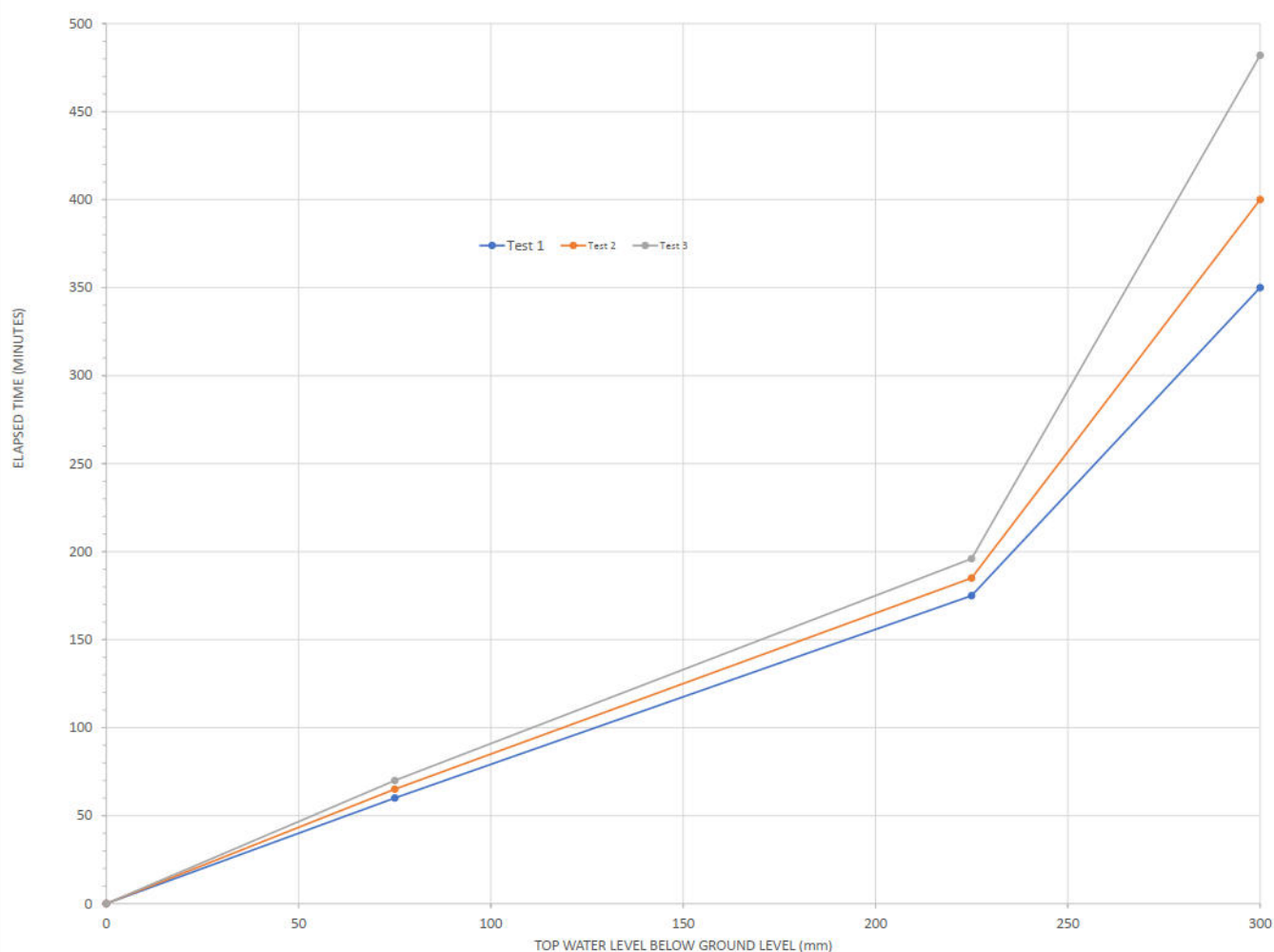
Test 1			Test 2			Test 3		
Tp75-25	115	min	Tp75-25	120	min	Tp75-25	126	min
f=	3.246E-05	m/second	f=	3.111E-05	m/second	f=	2.963E-05	m/second

SOIL INFILTRATION RATE TO USE (THE MINIMUM VALUE FROM THE THREE TESTS):

2.963E-05

m/sec

INFILTRATION RATES



APPENDIX 4

Technical Data Sheet

BODPAVE™ 85

GRASS SURFACES



Ground, Wind, Weed
and Erosion Control

Bodpave™ is an interlocking cellular porous plastic paving grid system for ground surface stabilisation.

Applications

- Car and light vehicle parking
- Pedestrian walkways
- Golf buggy paths
- Cycle paths
- Driveways
- Residential parking
- Sustainable Drainage Systems (SuDS)

Design

Most Bodpave™ installations will require a new sub-base (pavement foundation layer) to be constructed. The thickness and type of granular material used to form the sub-base will generally depend on the following factors;

- Strength of the underlying ground (sub-grade) measured in CBR* %
- Water permeability of the underlying ground (sub-grade) k measured in m/s
- Type of underlying ground (sub-grade) e.g. clay/silt/sand/gravel/rock
- Type of vehicle traffic (HGV/LGV/car/cycles/pedestrian)
- Frequency of traffic (occasional/regular)

*California Bearing Ratio Test

A comprehensive ground investigation survey with suitable testing is highly recommended to ensure the sub-base for a Bodpave™ surface is suitably strong and sufficiently durable for the anticipated use. **This design guide can be used for estimating ground conditions and producing preliminary pavement designs but it is not a substitute for site specific ground investigation works and a detailed pavement design by a suitably qualified civil engineer.**

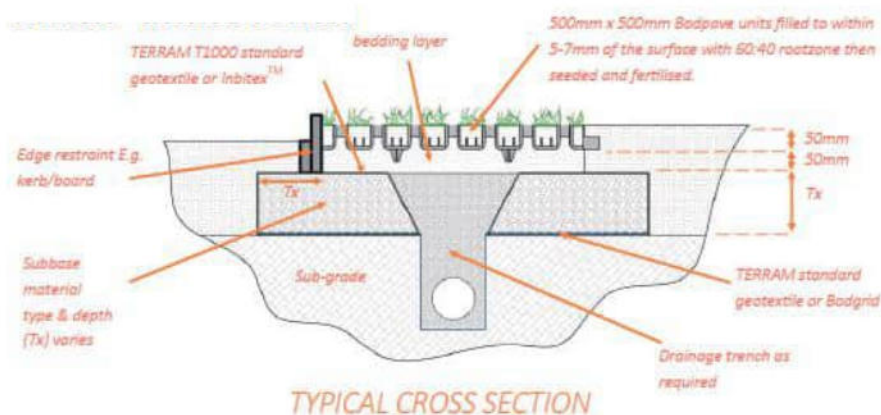
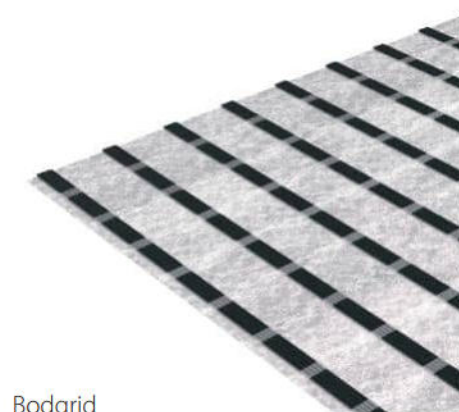


Table 1 - Minimum Sub-base Thickness (Tx) with Bodgrid

Sub Grade CBR* %	Cars/Light Vehicles (#)		Coaches/Heavy Goods/ Emergency Vehicles		Overlap (mm)
	Thickness (mm)	Bodgrid	Thickness (mm)	Bodgrid	
1	300	GC30	400	GC30	600
2	150	GC30	250	GC30	500
3	125	GC30	175	GC30	450
4	125	GC30	150	GC30	400
5+	100	GC30	125	GC30	300



Bodgrid

Table 2 - Minimum Sub-base Thickness (Tx) without Bodgrid

Sub Grade CBR* %	Cars/Light Vehicles (#)		Coaches/Heavy Goods/ Emergency Vehicles		Overlap (mm)
	Thickness (mm)	Standard Geotextile	Thickness (mm)	Standard Geotextile	
1	450	T2000	600	T2000	600
2	225	T1500	375	T1500	500
3	200	T1000	300	T1000	450
4	200	T1000	225	T1000	400
5+	150	T1000	200	T1000	300



Standard geotextile

*California Bearing Ratio Test

Regular tight turning of vehicles and "dry" steering may cause damage to the Bodpave™ units and/or displace gravel infill; vehicle manoeuvring should be carefully considered at specification/design stage. Gravel filled units may require some maintenance when subjected to regular channelised and turning traffic loadings. Terram Bodpave™ 85 and Truckpave™ pavours are generally recommended for occasional overrun or regular HGV traffic respectively. If construction traffic axle load exceeds 60kN (6 tonnes), minimum sub-base thickness over Terram Bodgrid should be 200mm.

Table 3 - Field Guidance for Estimating Sub-grade Strength

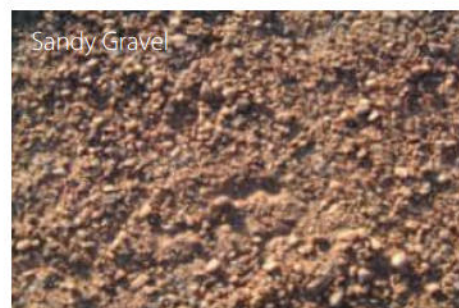
Consistency	Indicator		Mechanical (test) SPT	Strength	
	Tactile	Observation		CBR %	Cu Kv/SQM
Very Soft	Sample squeezes through fingers	Person standing will sink >75mm	<2	<1	<25
Soft	Easily moulded by finger pressure	Person walking sinks 50-70mm	2-4	~1	~25
Medium	Moulded moderate finger pressure	Person walking sinks 25mm	4-8	1-2	25-40
Firm	Moulded by strong finger pressure	Utility truck ruts 10-25mm	8-15	2-4	40-75
Stiff	Can be indented by thumb	Loaded construction vehicle ruts by 25mm	15-30	4-6	75-150



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Table 4 - Typical Soil Types and Properties

Soil Type	Plasticity	CBR% Depth of Water Table Below Formation Level		Typical Range for Coefficient of Permeability K (m/s)	Infiltration
Heavy Clay	70	2	1	10^{-10} to 10^{-8}	No
	60	2	1.5		
	50	2.5	2		
	40	3	2		
Silty Clay	30	5	3	10^{-9} to 10^{-8}	No
Sandy Clay	20	6	4	10^{-9} to 10^{-6}	Partial
	10	7	5		
Silt	Non-plastic	2	1	10^{-8} to 10^{-6}	Partial
Poorly Graded Sand	Non-plastic	20	10	10^{-7} to 10^{-6}	Partial
Well Graded Sand	Non-plastic	40	15	10^{-6} to 10^{-4}	Total
Well Graded Sandy Gravel	Non-plastic	60	20	10^{-5} to 10^{-3}	Total



This field guide is provided as an aid to assessing the mechanical stabilisation requirements in commonly encountered site conditions.

1. Minimum sub-base thickness (Tx) can be selected from table 1 or 2 with ground strength and permeability estimated from tables 3 or 4 in the absence of any site specific ground investigation report.
2. If the Bodgrid layer is omitted, then the total sub-base layer thickness (Tx) must be increased by 50%. A standard geotextile separation layer should be specified with lower sub-grade strength (CBR value) requiring a more robust grade in accordance with BS8661:2019 (see table 2).
3. Bodpave™ units are an ideal surface for source control porous pavings SuDS with a permeable sub-base; DoT Type 3 (Type 1x) porous/open graded granular material as described in Specification for Highways Works clause 805. If a higher water storage (attenuation) capacity (void ratio) is required a hard crushed angular "clean stone" such as a coarse graded aggregate (CGA) type 4/20 (4mm minimum and 20mm maximum particle size) can be used. The type of SuDS design (attenuation, total or partial infiltration) will depend upon the underlying ground conditions and not all sites are suitable for infiltration. Weak and low-permeability cohesive sub-grades are generally unsuitable for infiltration (permeability coefficient $k < 10^{-6}$ m/s). Clays with a low plasticity index (<20%) will reduce in strength when saturated; a full attenuation system with an impermeable membrane directly on top of the sub-grade is recommended (see table 4). Specific advice on suitable drainage and construction over very weak ground (CBR <1%) is available.
4. Alternatively traditional 'DoT Type 1' well graded granular material may be used for the sub-base provided that an adequate drainage system is installed. Typical drainage details; 100mm diameter perforated pipe drain laid at minimum gradient 1:100, bedded on gravel in trench backfilled with SHW Clause 505 'Type A' drainage aggregate (or CGA type 4/20), covered or wrapped with Terram T1000 standard non-woven geotextile and leading to a suitable outfall or soakaway. Drains placed down the centre

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or along the edge of access routes up to 5m wide. Wider areas may require additional drainings at 5m - 10m centres.

5. The sub-base must be covered with a layer of Terram T1000 standard or Inbitex™ non-woven geotextile to prevent settlement due to mixing of the bedding and sub-base layers and to provide filtration and pollution control.
6. Bedding layer material should be either free-draining clean angular hard aggregate gravel chippings or coarse grit sand. Bodpave units should be filled with free-draining clean angular hard aggregate gravel chippings. **Rounded pea shingle is not suitable.** See table 6 for more details.
7. The final pavement and drainage design should be undertaken by a suitably qualified civil engineer and based on specific site conditions.
8. Maximum advised gradient for traffic applications is 12% (1:8) 7°, Bodpave units have specific fixing points for **steel u-pins** if required for steep slope applications.

Table 5 - Products

Bodpave™ 85	
Dimensions	500mm x 500mm x 50mm + 35mm ground spike
Compressive Strength	<400 tonnes (400kN)/SQM (gravel filled)
Connection Strength	7kN/Lm
Material	100% recycled plastic
Coverage	4 units/SQM
White Markers	215mm x 70mm

Inbitex™ Non-woven Geotextile	
Standard Roll Dimensions	4.5m wide x 100m long
Tensile Strength kN/m	8.5
Elongation	30%
CBR Puncture Resistance kN	1.6
Oil Absorption and Removal	<400g/SQM year

Non-woven Standard Geotextile	
Standard Roll Dimensions	4.5m x 100m long
Grades	T1000/T1500/T2000
BS8661 Classification	1/2/3
Tensile Strength kN/m	8.0/12.5/14.5
Elongation	60%
CBR Puncture Resistance kN	1.5/2.25/2.75

Bodgrid GC30	
Standard Roll Dimensions	4.8m wide x 50m long
Tensile Strength kN	30
Tensile Elongation	7%
Functions	Separation, filtration, stabilisation



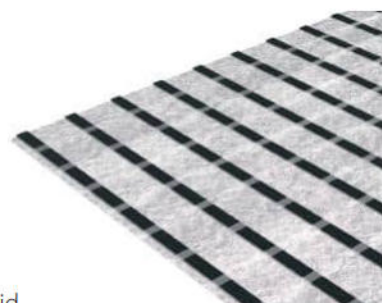
Bodpave™ 85 & White Markers



Inbitex



Standard geotextile



Bodgrid

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Table 6 - Fill Materials

Rootzone (Bodpave surface fill and bedding layer material)

Description	Propriety mix of high quality, free draining sand and compost
Blend Ratio	60:40 or 70:30 sand:compost
Particle Size Range	0 to 2mm
Example	Green-tree Rootzone
Comments	Site won topsoil is not suitable



Rootzone

Grass Seed

Description	Low maintenance hard wearing amenity mix
Varieties and Suggested Blend	50% amenity perennial rye grass (Turf PRG) 25% creeping red fescue 25% smooth stalked meadow grass
Application Rate	35-50g/sqm (new grass) 25g/sqm (overseeding)
Example	John Chambers Grass Seed Parks



Site won topsoil



Fertiliser



Grass Seed Mix

Fertilisers

Description	Pre-seeder fertiliser to encourage early grass growth to enhance seed establishment and improving root development
Example	Pre-seeder fertiliser 8-12-8+3MGO+ZN
Description	Spring Summer Fertiliser
Example	ICL Sportsmaster Spring Summer 9-7-7 Fertiliser



Type 1

Sub-base (3 options)

Description	Option 1 - well graded granular DoT Type 1 (with filter drains)
Aggregate Size	0 < 63mm
Grading to BS EN 13242 or 12620	GC 75/32 1/31.5 (SHW Clause 803)
Description	Opt 2 - permeable open graded granular DoT Type 3 (Type 1x)
Aggregate Size	0 to 40mm
Grading to BS EN 13242 or 12620	GC 80/25 1/40 (SHW Clause 805)
Description	Opt 3 - clean stone, coarse graded aggregate type 4/20
Aggregate Size	4 to 20mm
Grading to BS EN 13242 or 12620	GC 90/15 4/20



Type 3 (1x) - permeable



CGA Type 4/20 (clean stone) - permeable

UNCOMPACTED

COMPACTED

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Installation

1. Excavate ground to the required formation level.
2. Unroll Terram all-in-one Bodgrid geocomposite (white geotextile below, black geogrid above) or Terram standard geotextile onto the prepared sub-grade with a minimum of 300mm overlap at the joints.
3. Place and compact type 3 (*) open graded granular material on top of the Terram layer to the required compacted thickness determined by the designer (minimum 100mm) to form a strong permeable sub-base layer.

* Type 3 is an open graded granular material as described in Specification for Highways Works clause 805. If a higher water storage (attenuation) capacity (void ratio) is required, a hard crushed angular "clean stone" such as a coarse graded aggregate (CGA) type 4/20 (4mm minimum and 20mm maximum particle size) can be used. Traditional well graded type 1 aggregate (with suitable drainage) may be used to form the sub-base layer as determined by the designer.

4. Install edge restraints as specified; traditional precast concrete kerbs, steel, plastic or treated timber boards/sleepers.
5. Install a second layer of Terram standard geotextile on top of the sub-base with a minimum of 300mm overlap at the joints.
6. Place, compact and screed rootzone to a minimum uniform thickness of 50mm. See material specification section for more guidance on suitable bedding materials.
7. Start in the corner of the longest straight edge (kerb) leaving a 25mm expansion gap around the perimeter.
8. Place pre-connected set of four Bodpave units (1m x 1m) with the loop connectors facing outwards as a "leading edge" towards the remainder of the prepared bedding layer. Apply firm pressure so that the ground spikes are pressed fully into the bedding and the base of the units sit flat on the bedding layer surface.
9. Connect adjacent Bodpave units together by slotting the edge half cells down into the edge loops. Progress in rows (LOOPS ALWAYS LEAD) locking units in place with firm pressure over the snap-fit clips. If separation is required, clips can be dislocated using careful, firm hand or screwdriver pressure or by gently twisting the pavers.
10. Cut pavers to fit around obstructions and at the end of rows using a fine toothed hand or circular power saw. Partial units should be fixed using snap-fit clips and additional UV resistant nylon cable ties.
11. Install snap-fit markers as required before filling Bodpave units.
12. Once all Bodpave units have been installed, fill pavers with rootzone brushing away any surplus off the surface so that the tops of all the Bodpave units are visible. A single pass of a light vibrating plate compactor may be used to consolidate the pavers and settle the rootzone. Fill so the finished level is 5mm below the top of the units. Do not overfill or over compact.



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13. The rootzone infill should be seeded with a lawn mixture containing plenty of hard-wearing amenity perennial rye grass (Turf PRG) and some fescues to bind the sward and Bodpave units together, a pre-seeder fertiliser followed by frequent watering. A light top dressing may be applied to just cover the seed and to provide adequate germination conditions. Do not overfill the paver cells.

14. Once seeded, the area should be cordoned off to protect the young grass from traffic damage and allow the root sward to fully develop which may take 8+ weeks or 3-4 cuts during the growing season.

Maintenance

A grass filled Bodpave 85 porous surface should last for many years with very little maintenance. Maintaining a healthy grass filled Bodpave surface is dependent upon many factors including a successful initial installation, the frequency and intensity of traffic loading, sufficient irrigation, sunshine and regular growth recovery periods. The following maintenance should be considered:-

- 1.** Regular mowing of the grass during the growing season (Spring/Summer/Autumn) and removal of clippings.
- 2.** Application of suitable fertiliser and Spring and Autumn.
- 3.** Irrigation during hot and dry conditions.
- 4.** Removal of fallen leaves, sticks and other debris from the surface as needed.
- 5.** Weeds - ideally removed by hand or using a biodegradable weed killer once or twice a year.
- 6.** Rotation of areas subject to seasonal traffic with frequent growth recovery periods. A minimum of 3 days per week without any traffic is recommended during the growing season, a longer recovery period may be required if the grass is in poor condition.
- 7.** If Bodpave units are damaged consult us for advice on repair.



Green-tech endeavour to ensure that the information given on this technical data sheet is accurate but accept no liability for its use or suitability for particular application.

GEOWEB® 3D Solution Out-Performs Planar Geogrid System for Unpaved Roads and Platforms

1 Use Local Infill



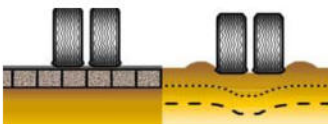
2 Confines Infill, Stabilizes Soils



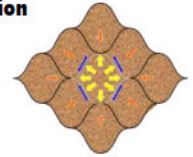
3 Reduces Rutting, Lowers Maintenance



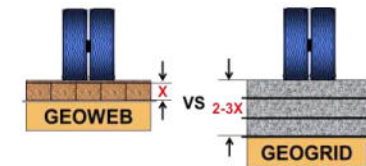
4 Decreases Rolling Resistance & Faster Cycle Times



5 Delivers Instantaneous Protection



6 Bridges Soft Subgrades with Single Layer



7 Deploys Directly Over Poor Soils



8 Increases Speed of Construction



1. Use Local Infill.

The Geoweb system can use locally-available, or onsite fill. Geogrids require clean aggregate, increasing material cost plus added hauling costs.

2. Confines Infill, Stabilizes Soils.

Infill is confined in the Geoweb 3D structure, preventing it from movement under loading.

3. Reduces Rutting, Lowers Maintenance.

The Geoweb system is a full depth solution. Geogrids do nothing to protect surface translation. As a result, Geogrids require more maintenance to maintain road surfaces.

4. Decrease Rolling Resistance & Faster Cycle Times.

Geogrids only control lateral movement in thin layers. The Geoweb 3D system gives full depth protection, creating a firm, stable surface that increases cycle times and reduces tire wear, tire replacement and fuel consumption.

5. Delivers Instantaneous Protection.

Geogrids require tension to activate, initiated by partial deformation. The Geoweb system's affect is immediate and works on a principal of hoop strength.

6 Bridges Soft Subgrades with Single Layer.

A single layer of Geoweb performs well over soft subgrades. Geogrids require 2-3 layers for same benefit, adding cost and time to construction.

7. Deploys Directly Over Poor Soils.

On multi-layer Geogrid solutions, low pressure equipment must be used. The Geoweb system allows heavy equipment to deliver structural fill right to the edge of construction.

8. Increases Speed of Construction.

Installation of the Geoweb system is up to 3 times faster to deploy than multi-grid systems.

APPENDIX 5

This is an estimation of the infiltration volumes and drain-down time to half empty the infiltration system in line with the on CIRIA infiltration drainage R156 guidance (1996) and CIRIA SuDS manual (C753, 2015). This information may be used as the basis for designing an infiltration system for the drainage of surface water runoff from sites.

Project details

Date	27/03/2026
Calculated by	P Pitman
Reference	PERMEABLY PAVED AREAS CALCS
Model version	2.2.3

Site details

Site name	86 Ancton Way
Site location	Bognor Regis

Infiltration system

Infiltration system	Planar infiltration
Type	Infiltration from base only

Geometry, porosity and infiltration

Infiltration coefficient (m/s)	0.000029	m/s
Porosity of fill material	30% - e.g. High-porosity sand/gravel	
Soakaway height (m)	0.083	m

Area to be drained

Total area (m ²)	71	m ²
Factor of safety	2	

Rainfall

Rainfall input type	FEH22 CSV file	
	FEH 86 Ancton Way.csv	
Return period (years)	100	
Climate change allowance factor	145%	

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Results

Minimum base area (m ²)	70	m ²
Time for half-emptying (hours)	0.2	hours
Critical duration (hours)	0.3	hours

Please note storage volume estimation are subject to uncertainty. Infiltration system height and base area are reported to the nearest 1m or 1m² value when the height or base area are greater than 10m or 10m²; and reported to the nearest to 0.1m or 0.1m² value when the height or base area are less than 10m or 10m².

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Appendix A – Rainfall Depths

Rainfall depths (mm) with climate change

Duration (minutes)	Duration (hours)	1 years	2 years	5 years	10 years	20 years	30 years	50 years	75 years	100 years	150 years	200 years	500 years	1000 years	10000 years
15	0.25	8.86	11.77	18.49	22.97	27.39	29.86	33.02	35.61	37.48	40.09	41.96	48.37	53.72	76.34
30	0.5	11.46	15.28	24.10	30.12	36.12	39.63	43.94	47.44	50.01	53.84	56.56	65.63	73.38	106.01
60	1	14.54	19.31	30.33	38.03	45.66	50.18	56.01	60.73	64.13	69.01	72.56	84.68	94.99	139.13
120	2	21.26	26.65	39.09	47.68	56.12	61.13	67.60	72.86	76.70	82.29	86.42	100.88	113.46	166.27
180	3	25.29	31.03	44.28	53.36	62.31	67.66	74.59	80.27	84.43	90.61	95.22	111.61	126.02	183.86
240	4	28.13	34.10	47.89	57.30	66.64	72.24	79.52	85.56	90.03	96.70	101.72	119.71	135.59	196.63
360	6	31.94	38.21	52.66	62.55	72.46	78.40	86.27	92.92	97.90	105.40	111.08	131.63	149.54	214.08
540	9	35.61	42.12	57.16	67.58	78.01	84.33	92.77	100.02	105.55	113.94	120.39	143.51	163.04	230.41
720	12	38.20	44.91	60.38	71.14	81.91	88.51	97.35	105.05	110.95	119.99	126.95	151.73	172.16	241.21
900	15	40.24	47.13	63.00	73.95	84.97	91.76	100.96	109.00	115.17	124.69	132.01	157.86	178.83	249.04
1080	18	41.99	49.02	65.25	76.36	87.55	94.50	104.01	112.30	118.70	128.59	136.17	162.82	184.16	255.24
1440	24	45.20	52.40	69.02	80.50	92.03	99.30	109.16	117.84	124.58	134.94	142.91	170.64	192.53	264.93
1800	30	48.05	55.42	72.41	84.16	95.98	103.41	113.56	122.54	129.48	140.19	148.41	176.81	199.07	272.27
2160	36	50.72	58.23	75.56	87.51	99.57	107.16	117.54	126.73	133.83	144.83	153.24	182.13	204.68	278.49
2880	48	55.65	63.44	81.40	93.70	106.17	113.93	124.71	134.20	141.53	152.92	161.59	191.20	214.21	288.99

Rainfall depths (mm) without climate change

Duration (minutes)	Duration (hours)	1 years	2 years	5 years	10 years	20 years	30 years	50 years	75 years	100 years	150 years	200 years	500 years	1000 years	10000 years
15	0.25	6.11	8.12	12.75	15.84	18.89	20.59	22.77	24.56	25.85	27.65	28.94	33.36	37.05	52.65
30	0.5	7.91	10.54	16.62	20.77	24.91	27.33	30.30	32.72	34.49	37.13	39.01	45.26	50.61	73.11
60	1	10.03	13.32	20.92	26.23	31.49	34.61	38.63	41.88	44.23	47.59	50.04	58.40	65.51	95.95
120	2	14.66	18.38	26.96	32.88	38.70	42.16	46.62	50.25	52.90	56.75	59.60	69.57	78.25	114.67
180	3	17.44	21.40	30.54	36.80	42.97	46.66	51.44	55.36	58.23	62.49	65.67	76.97	86.91	126.80
240	4	19.40	23.52	33.03	39.52	45.96	49.82	54.84	59.01	62.09	66.69	70.15	82.56	93.51	135.61
360	6	22.03	26.35	36.32	43.14	49.97	54.07	59.50	64.08	67.52	72.69	76.61	90.78	103.13	147.64
540	9	24.56	29.05	39.42	46.61	53.80	58.16	63.98	68.98	72.79	78.58	83.03	98.97	112.44	158.90
720	12	26.35	30.97	41.64	49.06	56.49	61.04	67.14	72.45	76.52	82.75	87.55	104.64	118.73	166.35
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1440	24	31.17	36.14	47.60	55.52	63.47	68.48	75.28	81.27	85.92	93.06	98.56	117.68	132.78	182.71
1800	30	33.14	38.22	49.94	58.04	66.19	71.32	78.32	84.51	89.30	96.68	102.35	121.94	137.29	187.77
2160	36	34.98	40.16	52.11	60.35	68.67	73.90	81.06	87.40	92.30	99.88	105.68	125.61	141.16	192.06
2880	48	38.38	43.75	56.14	64.62	73.22	78.57	86.01	92.55	97.61	105.46	111.44	131.86	147.73	199.30

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Infiltration volume design tool

www.uksuds.com | Infiltration volume design tool (<https://www.uksuds.com/>)

This is an estimation of the infiltration volumes and drain-down time to half empty the infiltration system in line with the on CIRIA infiltration drainage R156 guidance (1996) and CIRIA SuDS manual (C753, 2015). This information may be used as the basis for designing an infiltration system for the drainage of surface water runoff from sites.

Project details

Date	07/05/2026
Calculated by	Phil Pitman
Reference	RAIN GARDENS
Model version	2.2.3

Site details

Site name	86 Ancton Way
Site location	Bognor Regis

Infiltration system

Infiltration system	Planar infiltration
Type	Infiltration from base only

Geometry, porosity and infiltration

Infiltration coefficient (m/s)	0.000029	m/s
Porosity of fill material	75%	
Soakaway height (m)	0.35	m

Area to be drained

Total area (m ²)	105	m ²
Factor of safety	1.5	

Rainfall

Rainfall input type	FEH22 CSV file
	FEH_Point_Rainfall_FEH22_AM_498819_100375(2).csv
Return period (years)	100
Climate change allowance factor	145%

Results

Minimum base area (m²)	20	m²
Time for half-emptying (hours)	1.9	hours
Critical duration (hours)	1.0	hours

Please note storage volume estimation are subject to uncertainty. Infiltration system height and base area are reported to the nearest 1m or 1m² value when the height or base area are greater than 10m or 10m²; and reported to the nearest to 0.1m or 0.1m² value when the height or base area are less than 10m or 10m².

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