

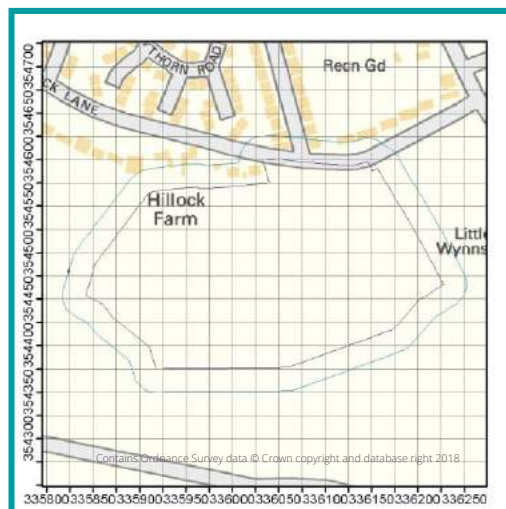
SuDSmart Pro



Report reference:	Report status:	Date issued:	Report prepared for:
72009R4	FINAL	2020-06-19	Delamere Homes

Site address: Land off Hillock Lane, Gresford

Overview: A combination of SuDS features, comprising rainwater harvesting butts, permeable paving, soakaways, swales, filter strips and an infiltration basin will reduce surface run-off and infiltrate surface water to ground. This would ensure run-off rates and volumes are managed for the lifetime of the development in all events up to and including the 1 in 100 year storm event, including a 40% allowance for climate change. Foul water from the proposed development should be discharged into the nearby foul sewers following confirmation of approval to connect.



GeoSmart Information Ltd
Suite 9-11, 1st Floor,
Old Bank Buildings, Bellstone,
Shrewsbury, SY1 1HU



t. +44(0)1743 298 100
e. info@geosmartinfo.co.uk
www.geosmartinfo.co.uk

Registered office: Suite 9-11, 1st Floor, Old Bank Buildings, Bellstone, Shrewsbury, SY1 1HU. Registered in England and Wales, number 5475394

1. Executive summary

This report assesses the feasibility of a range of Sustainable urban Drainage Scheme (SuDS) options in support of the Site development process and provides a proposed strategy to manage surface water runoff, over the lifetime of the proposed development.

The proposed strategy has been formulated with particular consideration given to the Building Regulations Approved Document H (2015) and the Sustainable Drainage Systems Standards for Wales (2018).

SuDS suitability

Risk	Issue	Result
SuDS suitability	What is the infiltration potential at the Site?	High
	What is the potential to discharge to surface water features?	Low
	What is the potential to discharge to sewers?	Low
Flooding	What is the overall flood risk at the Site?	Negligible
Pollution	Is the groundwater a protected resource?	Partially
	Is the surface water feature a protected resource?	N/A

Compliance with Welsh Standards

In January 2019 the Flood and Water Management Act 2010 (schedule 3) came into effect and requires new developments in Wales to incorporate SuDS features that comply with national standards. The Welsh government have published 6 statutory standards for SuDS which are outlined below, confirmation of how the proposed SuDS strategy meets these standards is included below.

S1. Surface water runoff destination

According to GeoSmart's SuDS Infiltration Potential (SD50) map, the Site has a high potential for infiltration, primarily due to the high permeability of the underlying geology (sand and gravel). Site investigation including infiltration testing has been undertaken by Geocon in November 2019 which confirmed an infiltration rate of 1.4×10^{-5} m/s to 3.12×10^{-4} m/s. Infiltration to ground is therefore considered feasible.

There are no nearby surface watercourses for the Site to discharge into.

There are no nearby surface water sewers for the Site to discharge into.

Based on above surface water for the Site should be infiltrated to ground.

S2. Surface water runoff hydraulic control

Surface water will be infiltrated to ground.

S3. Water Quality

The existing site is greenfield and has a low pollution hazard. The proposed development is of low pollution hazard according to Table G3.1 of the Sustainable Drainage Systems Standards for Wales (2018).

Soakaways, permeable paving, swales, filter strips and an infiltration basin would offer sufficient treatment stages (storage/attenuation, filtration through sub-base and filtration through the unsaturated soil zone).

S4. Amenity

The proposed SuDS features keep surface water at/or close to ground level to help provide amenity benefits. Green/blue SuDS such as the proposed swales, filter strips and infiltration basin provide a variety of benefits such as health and wellbeing benefits and biodiversity.

The proposed rainwater harvesting butts provide amenity benefits by providing a security of water supply. Captured water can be used to water trees, vegetation and crops and ensure their long term viability as amenity features.

S5. Biodiversity

Locally, biodiversity reflects the character of the plants and wildlife that share the space in which humans live, work and play. The use of a variety of SuDS components and variations in topography in the proposed SuDS scheme should include planting of grasses within SuDS features to maximise the biodiversity of the development.

The proposed swales, filter strips and infiltration basin will provide biodiversity benefits to the Site via the creation of new habitats and rehabilitation/enhancing of existing habitats.

S6. Design of drainage for Construction, Operation and Maintenance and Structural Integrity

During the construction phase of the development, careful consideration must be given to the implementation of the proposed SUDS features.

Appropriate drainage features such as temporary filtration systems, swales and basins should be considered to help manage run off from the Site during the construction phase. Bunds could also be used to prevent run off from the Site and to direct the runoff into the swales or basins where it could be infiltrated to ground.

The management and maintenance of the SuDS features, in line with the details and schedules outlined in Section 18 (Table 15) of this report, will be undertaken by contractors appointed by the owners and occupiers of the new residential building, where payments of the works will form part of the property deeds and / or rental agreements.

Where soakaways drain a single property, the proposed soakaways will be privately managed by the owners of each property.

Where SuDS features are shared between properties, such as the permeable paving driveways and some soakaways, the responsibility for maintenance should be adopted by the SAB. A mechanism for funding of any required future maintenance will need to be determined and outlined within the deeds of the proposed dwellings.

As the proposed swales, filter strips and infiltration basin will drain just the adoptable highway then these features should be adopted and maintained by the local highways team or SAB. If

the local highways team or SAB will not adopt these SuDS features than a maintenance company will need to be appointed.

Foul Drainage

The proposals are to drain foul water from the development to the nearby public foul sewer located within Stancliffe Avenue at a rate of 5.047 l/s, subject to approval from Welsh Water. Due to the topography of the Site, foul discharge will need to be pumped from a pumping station located in the south of the Site. Where this is not possible foul water should be treated and infiltrated by a drainage field subject to approval from NRW. The total population (P) of the development equals 598P which when multiplied by a reduction factor of 0.8 gives a final P of 478P, the equivalent of 71,700 litres and 71.7 m³ per day.

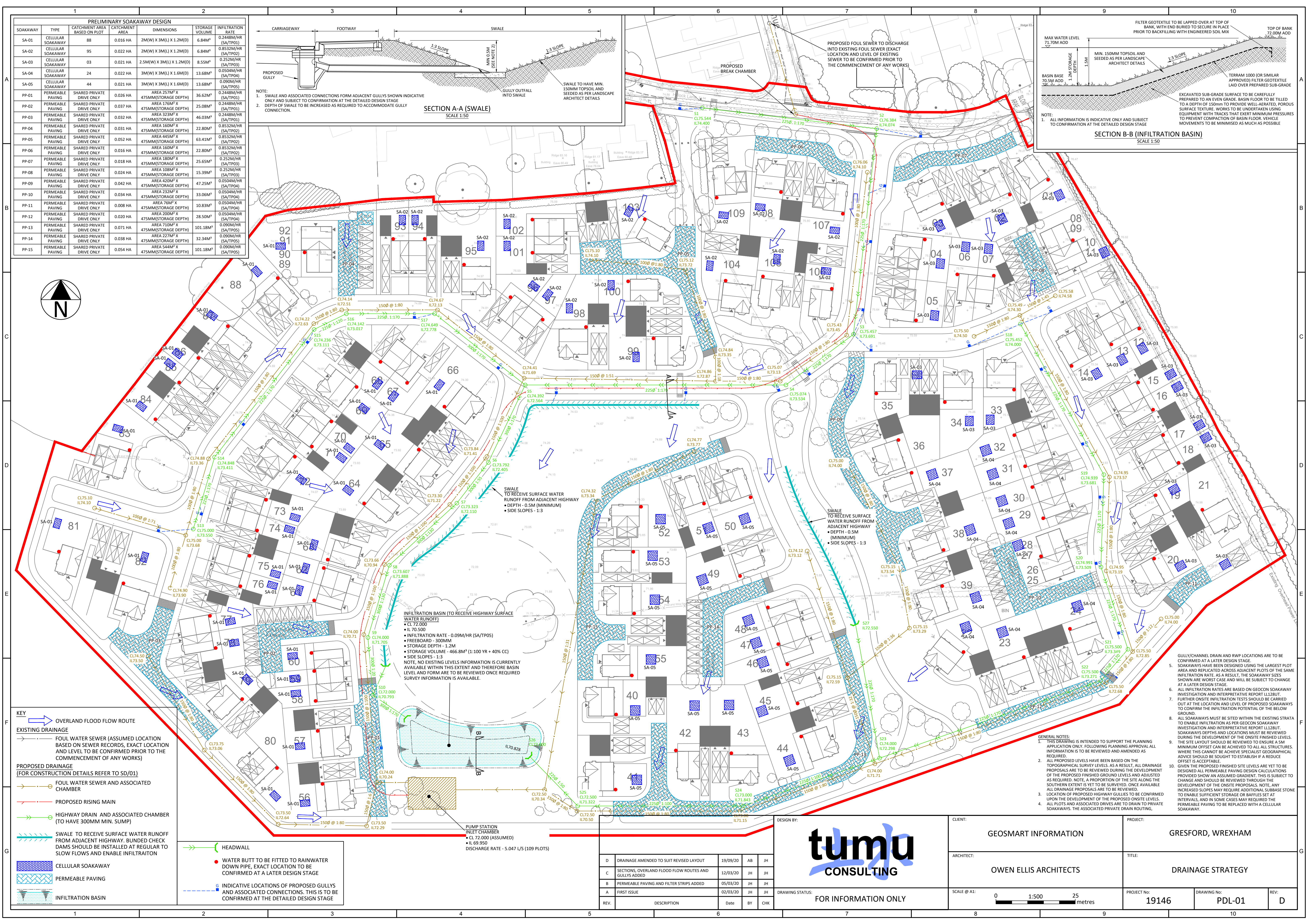
Environmental and ecological considerations:

The Site is not located within a Special Protection Area (SPA) or a Site of Special Scientific Interest (SSSI).

CDM considerations:

If your development is defined as 'Construction Work' under CDM 2015, you or the organisation that is having the work carried out will be defined as 'the Client' and have specific duties under the Regulations. A full list of CDM considerations and our Terms and Conditions can be found on our website, the links can be found in Section 23 at the back of this report.

2. Proposed SuDS strategy layout



PRELIMINARY SOAKAWAY DESIGN									
SOAKAWAY	TYPE	CATCHMENT AREA BASED ON PLOT	CATCHMENT AREA	DIMENSIONS	STORAGE VOLUME	INFILTRATION RATE	INFLTRATION RATE	INFLTRATION RATE	INFLTRATION RATE
SA-01	CELLULAR SOAKAWAY	88	0.016 HA	2M(W) X 3M(L) X 1.2M(D)	6.84M³	0.2448M³/HR (SA/TP01)	0.2448M³/HR (SA/TP01)	0.2448M³/HR (SA/TP01)	0.2448M³/HR (SA/TP01)
SA-02	CELLULAR SOAKAWAY	95	0.022 HA	2M(W) X 3M(L) X 1.2M(D)	6.84M³	0.8532M³/HR (SA/TP02)	0.8532M³/HR (SA/TP02)	0.8532M³/HR (SA/TP02)	0.8532M³/HR (SA/TP02)
SA-03	CELLULAR SOAKAWAY	03	0.021 HA	2.5M(W) X 3M(L) X 1.2M(D)	8.55M³	0.252M³/HR (SA/TP03)	0.252M³/HR (SA/TP03)	0.252M³/HR (SA/TP03)	0.252M³/HR (SA/TP03)
SA-04	CELLULAR SOAKAWAY	24	0.022 HA	3M(W) X 3M(L) X 1.6M(D)	13.68M³	0.0504M³/HR (SA/TP04)	0.0504M³/HR (SA/TP04)	0.0504M³/HR (SA/TP04)	0.0504M³/HR (SA/TP04)
SA-05	CELLULAR SOAKAWAY	44	0.021 HA	3M(W) X 3M(L) X 1.6M(D)	13.68M³	0.090M³/HR (SA/TP05)	0.090M³/HR (SA/TP05)	0.090M³/HR (SA/TP05)	0.090M³/HR (SA/TP05)
PP-01	PERMEABLE PAVING	SHARED PRIVATE DRIVE ONLY	0.026 HA	AREA 257M² X 475MM(STORAGE DEPTH)	36.62M³	0.2448M³/HR (SA/TP01)	0.2448M³/HR (SA/TP01)	0.2448M³/HR (SA/TP01)	0.2448M³/HR (SA/TP01)
PP-02	PERMEABLE PAVING	SHARED PRIVATE DRIVE ONLY	0.037 HA	AREA 176M² X 475MM(STORAGE DEPTH)	25.08M³	0.2448M³/HR (SA/TP01)	0.2448M³/HR (SA/TP01)	0.2448M³/HR (SA/TP01)	0.2448M³/HR (SA/TP01)
PP-03	PERMEABLE PAVING	SHARED PRIVATE DRIVE ONLY	0.032 HA	AREA 323M² X 475MM(STORAGE DEPTH)	46.03M³	0.2448M³/HR (SA/TP01)	0.2448M³/HR (SA/TP01)	0.2448M³/HR (SA/TP01)	0.2448M³/HR (SA/TP01)
PP-04	PERMEABLE PAVING	SHARED PRIVATE DRIVE ONLY	0.031 HA	AREA 160M² X 475MM(STORAGE DEPTH)	22.80M³	0.8532M³/HR (SA/TP02)	0.8532M³/HR (SA/TP02)	0.8532M³/HR (SA/TP02)	0.8532M³/HR (SA/TP02)
PP-05	PERMEABLE PAVING	SHARED PRIVATE DRIVE ONLY	0.052 HA	AREA 445M² X 475MM(STORAGE DEPTH)	63.41M³	0.8532M³/HR (SA/TP02)	0.8532M³/HR (SA/TP02)	0.8532M³/HR (SA/TP02)	0.8532M³/HR (SA/TP02)
PP-06	PERMEABLE PAVING	SHARED PRIVATE DRIVE ONLY	0.016 HA	AREA 160M² X 475MM(STORAGE DEPTH)	22.80M³	0.8532M³/HR (SA/TP02)	0.8532M³/HR (SA/TP02)	0.8532M³/HR (SA/TP02)	0.8532M³/HR (SA/TP02)
PP-07	PERMEABLE PAVING	SHARED PRIVATE DRIVE ONLY	0.018 HA	AREA 180M² X 475MM(STORAGE DEPTH)	25.65M³	0.252M³/HR (SA/TP03)	0.252M³/HR (SA/TP03)	0.252M³/HR (SA/TP03)	0.252M³/HR (SA/TP03)
PP-08	PERMEABLE PAVING	SHARED PRIVATE DRIVE ONLY	0.024 HA	AREA 108M² X 475MM(STORAGE DEPTH)	15.39M³	0.252M³/HR (SA/TP03)	0.252M³/HR (SA/TP03)	0.252M³/HR (SA/TP03)	0.252M³/HR (SA/TP03)
PP-09	PERMEABLE PAVING	SHARED PRIVATE DRIVE ONLY	0.042 HA	AREA 420M² X 475MM(STORAGE DEPTH)	47.25M³	0.0504M³/HR (SA/TP04)	0.0504M³/HR (SA/TP04)	0.0504M³/HR (SA/TP04)	0.0504M³/HR (SA/TP04)
PP-10	PERMEABLE PAVING	SHARED PRIVATE DRIVE ONLY	0.034 HA	AREA 232M² X 475MM(STORAGE DEPTH)	33.06M³	0.0504M³/HR (SA/TP04)	0.0504M³/HR (SA/TP04)	0.0504M³/HR (SA/TP04)	0.0504M³/HR (SA/TP04)
PP-11	PERMEABLE PAVING	SHARED PRIVATE DRIVE ONLY	0.008 HA	AREA 76M² X 475MM(STORAGE DEPTH)	10.83M³	0.0504M³/HR (SA/TP04)	0.0504M³/HR (SA/TP04)	0.0504M³/HR (SA/TP04)	0.0504M³/HR (SA/TP04)
PP-12	PERMEABLE PAVING	SHARED PRIVATE DRIVE ONLY	0.020 HA	AREA 200M² X 475MM(STORAGE DEPTH)	28.50M³	0.0504M³/HR (SA/TP04)	0.0504M³/HR (SA/TP04)	0.0504M³/HR (SA/TP04)	0.0504M³/HR (SA/TP04)
PP-13	PERMEABLE PAVING	SHARED PRIVATE DRIVE ONLY	0.071 HA	AREA 710M² X 475MM(STORAGE DEPTH)	101.18M³	0.090M³/HR (SA/TP05)	0.090M³/HR (SA/TP05)	0.090M³/HR (SA/TP05)	0.090M³/HR (SA/TP05)
PP-14	PERMEABLE PAVING	SHARED PRIVATE DRIVE ONLY	0.038 HA	AREA 227M² X 475MM(STORAGE DEPTH)	32.34M³	0.090M³/HR (SA/TP05)	0.090M³/HR (SA/TP05)	0.090M³/HR (SA/TP05)	0.090M³/HR (SA/TP05)
PP-15	PERMEABLE PAVING	SHARED PRIVATE DRIVE ONLY	0.054 HA	AREA 544M² X 475MM(STORAGE DEPTH)	101.18M³	0.090M³/HR (SA/TP05)	0.090M³/HR (SA/TP05)	0.090M³/HR (SA/TP05)	0.090M³/HR (SA/TP05)

KEY

OVERLAND FLOOD FLOW ROUTE

EXISTING DRAINAGE

FOUL WATER SEWER (ASSUMED LOCATION BASED ON SEWER RECORDS, EXACT LOCATION AND LEVEL TO BE CONFIRMED PRIOR TO THE COMMENCEMENT OF ANY WORKS)

PROPOSED DRAINAGE (FOR CONSTRUCTION DETAILS REFER TO SD/01)

FOUL WATER SEWER AND ASSOCIATED CHAMBER

PROPOSED RISING MAIN

HIGHWAY DRAIN AND ASSOCIATED CHAMBER (TO HAVE 300MM MIN. SUMP)

SWALE TO RECEIVE SURFACE WATER RUNOFF FROM ADJACENT HIGHWAY. BUNDLED CHECK DAMS SHOULD BE INSTALLED AT REGULAR TO SLOW FLOWS AND ENABLE INFILTRATION

CELLULAR SOAKAWAY

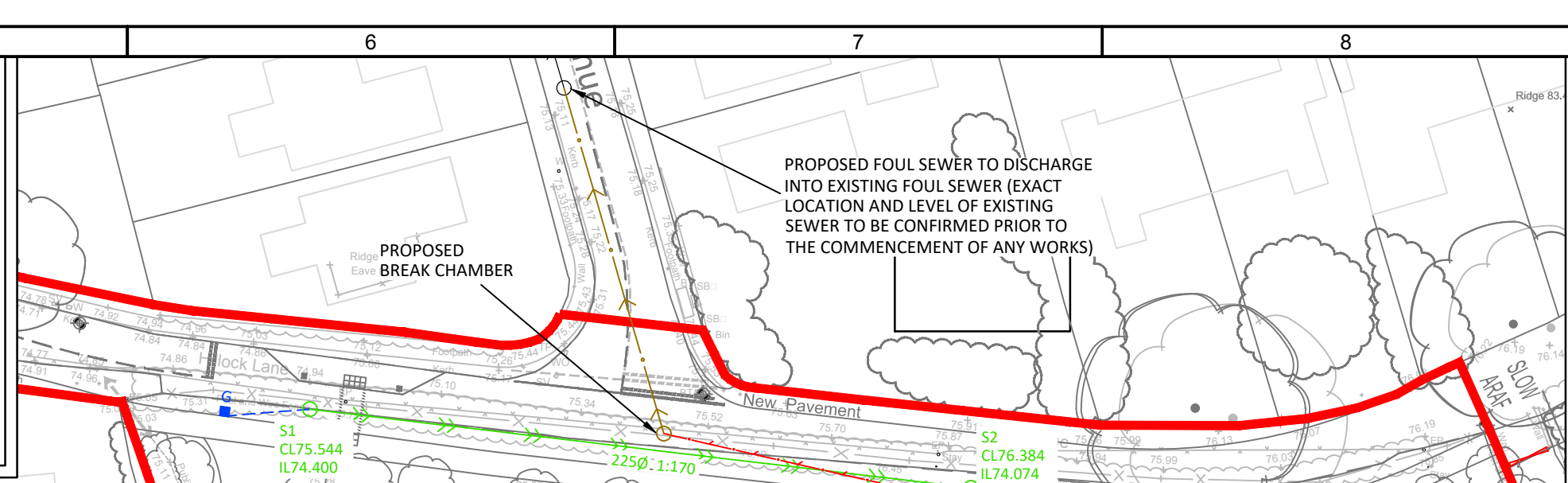
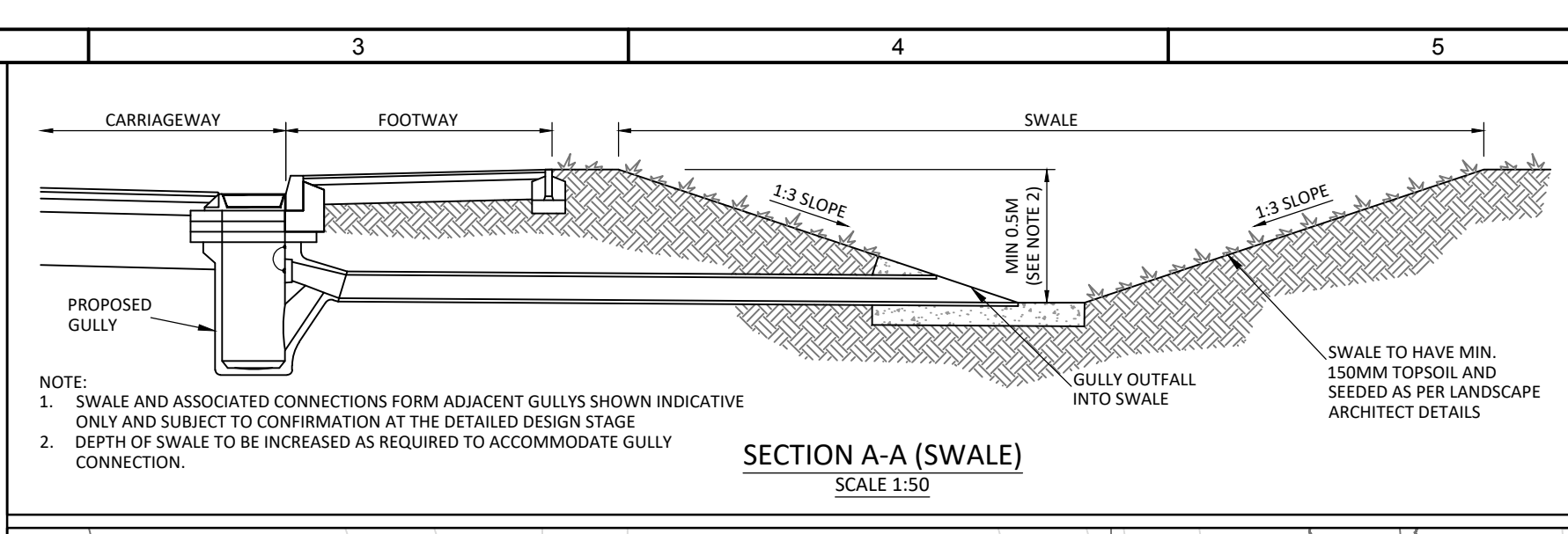
PERMEABLE PAVING

INFILTRATION BASIN

HEADWALL

WATER BUTT TO BE FITTED TO RAINWATER DOWN PIPE, EXACT LOCATION TO BE CONFIRMED AT A LATER DESIGN STAGE

INDICATIVE LOCATIONS OF PROPOSED GULLIES AND ASSOCIATED CONNECTIONS. THIS IS TO BE CONFIRMED AT THE DETAILED DESIGN STAGE



DESIGN BY:

tumu CONSULTING

CLIENT:

GEOSMART INFORMATION

ARCHITECT:

OWEN ELLIS ARCHITECTS

PROJECT:

GRESFORD, WREXHAM

TITLE:

DRAINAGE STRATEGY

SCALE AT A1:

0 1:500 25 metres

PROJECT No:

19146

DRAWING No:

PDL-01

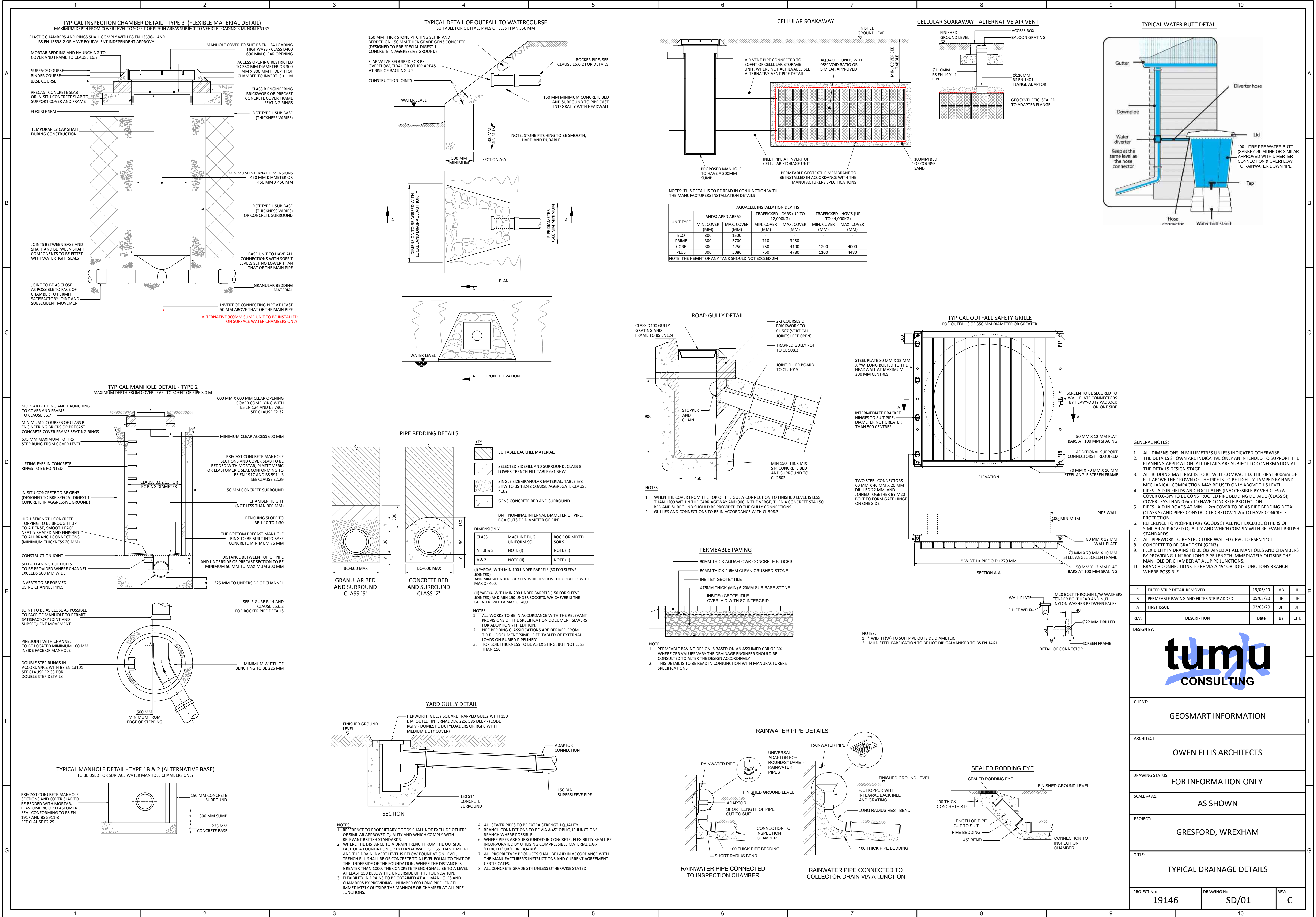
REV:

D

REV.	DESCRIPTION	Date	BY	CHK
D	DRAINAGE AMENDED TO SUIT REVISED LAYOUT	19/09/20	AB	JH
C	SECTIONS, OVERLAND FLOOD FLOW ROUTES AND	12/03/20	JH	JH
B	PERMEABLE PAVING AND FILTER STRIPS ADDED	05/03/20	JH	JH
A	FIRST ISSUE	02/03/20	JH	JH

GENERAL NOTES:

- THIS DRAWING IS INTENDED TO SUPPORT THE PLANNING APPLICATION ONLY. FOLLOWING PLANNING APPROVAL ALL INFORMATION IS TO BE REVIEWED AND AMENDED AS REQUIRED.
- ALL PROPOSED LEVELS HAVE BEEN BASED ON THE TOPOGRAPHICAL SURVEY LEVELS. AS A RESULT, ALL DRAINAGE PROPOSALS ARE TO BE REVIEWED DURING THE DEVELOPMENT OF THE PROPOSED FINISHED GROUND LEVELS AND ADJUSTED AS REQUIRED. NOTE, A PROPORTION OF THE SITE ALONG THE SOUTHERN EXTENT IS YET TO BE SURVEYED. ONCE AVAILABLE ALL DRAINAGE PROPOSALS ARE TO BE REVISED.
- LOCATION OF PROPOSED HIGHWAY GULLIES TO BE CONFIRMED UPON THE DEVELOPMENT OF THE PROPOSED ONSITE LEVELS. ALL PLOTS AND ASSOCIATED DRIVES ARE TO DRAIN TO PRIVATE SOAKAWAYS. THE ASSOCIATED PRIVATE DRAIN ROUTING, GULLY/CHANNEL DRAIN AND RWP LOCATIONS ARE TO BE CONFIRMED AT A LATER DESIGN STAGE.
- SOAKAWAYS HAVE BEEN DESIGNED USING THE LARGEST PLOT AREA AND REPLICATED ACROSS ADJACENT PLOTS OF THE SAME INFILTRATION RATE. AS A RESULT, THE SOAKAWAY SIZES SHOWN ARE WORST CASE AND WILL BE SUBJECT TO CHANGE AT A LATER DESIGN STAGE.
- ALL INFILTRATION RATES ARE BASED ON GEOCON SOAKAWAY INVESTIGATION AND INTERPRETATIVE REPORT LL128UT.
- FURTHER ONSITE INFILTRATION TESTS SHOULD BE CARRIED OUT AT THE LOCATION AND LEVEL OF PROPOSED SOAKAWAYS TO CONFIRM THE INFILTRATION POTENTIAL OF THE BELOW GROUND.
- ALL SOAKAWAYS MUST BE SITED WITHIN THE EXISTING STRATA TO ENABLE INFILTRATION AS PER GEOCON SOAKAWAY INVESTIGATION AND INTERPRETATIVE REPORT LL128UT.
- SOAKAWAYS DEPTHS AND LOCATIONS MUST BE REVIEWED DURING THE DEVELOPMENT OF THE ONSITE FINISHED LEVELS.
- THE SITE LAYOUT SHOULD BE REVIEWED TO ENSURE A 5M MINIMUM OFFSET CAN BE ACHIEVED TO ALL ALL STRUCTURES WHERE THIS CANNOT BE ACHIEVE SPECIALIST GEOGRAPHICAL ADVICE SHOULD BE SOUGHT TO ESTABLISH IF A REDUCE OFFSET IS ACCEPTABLE.
- GIVEN THE PROPOSED FINISHED SITE LEVELS ARE YET TO BE DESIGNED ALL PERMEABLE PAVING DESIGN CALCULATIONS PROVIDED SHOW AN ASSUMED GRADIENT. THIS IS SUBJECT TO CHANGE AND SHOULD BE REVIEWED THROUGH THE DEVELOPMENT OF THE ONSITE PROPOSALS. NOTE, ANY INCREASED SLOPES MAY REQUIRE ADDITIONAL SUBBASE STONE TO ENABLE SUFFICIENT STORAGE OR BAFFLES SET AT INTERVALS, AND IN SOME CASES MAY REQUIRE THE PERMEABLE PAVING TO BE REPLACED WITH A CELLULAR SOAKAWAY.



3. Site location

Report prepared for:
Delamere Homes

Site area:
61,037m²

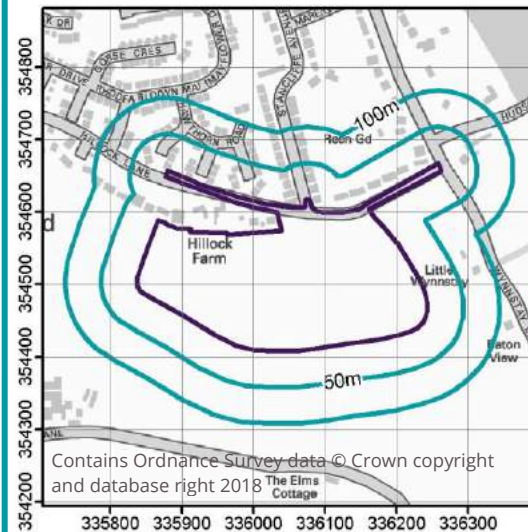
Current use:
Greenfield

Proposed use:
109 residential dwellings

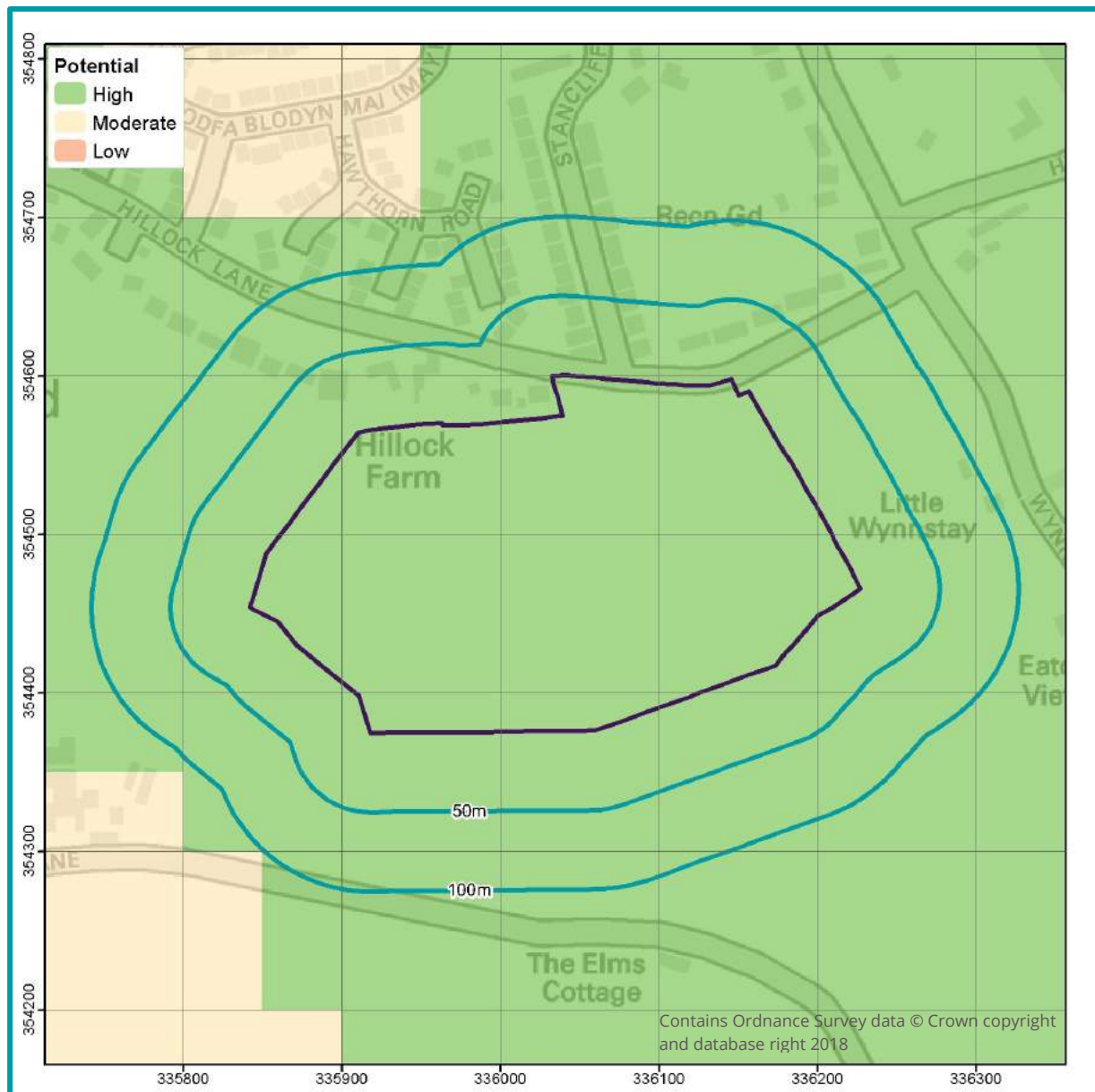
Report author:
David South

Report checker:
Alan White

Report reviewer:
Mike Piotrowski



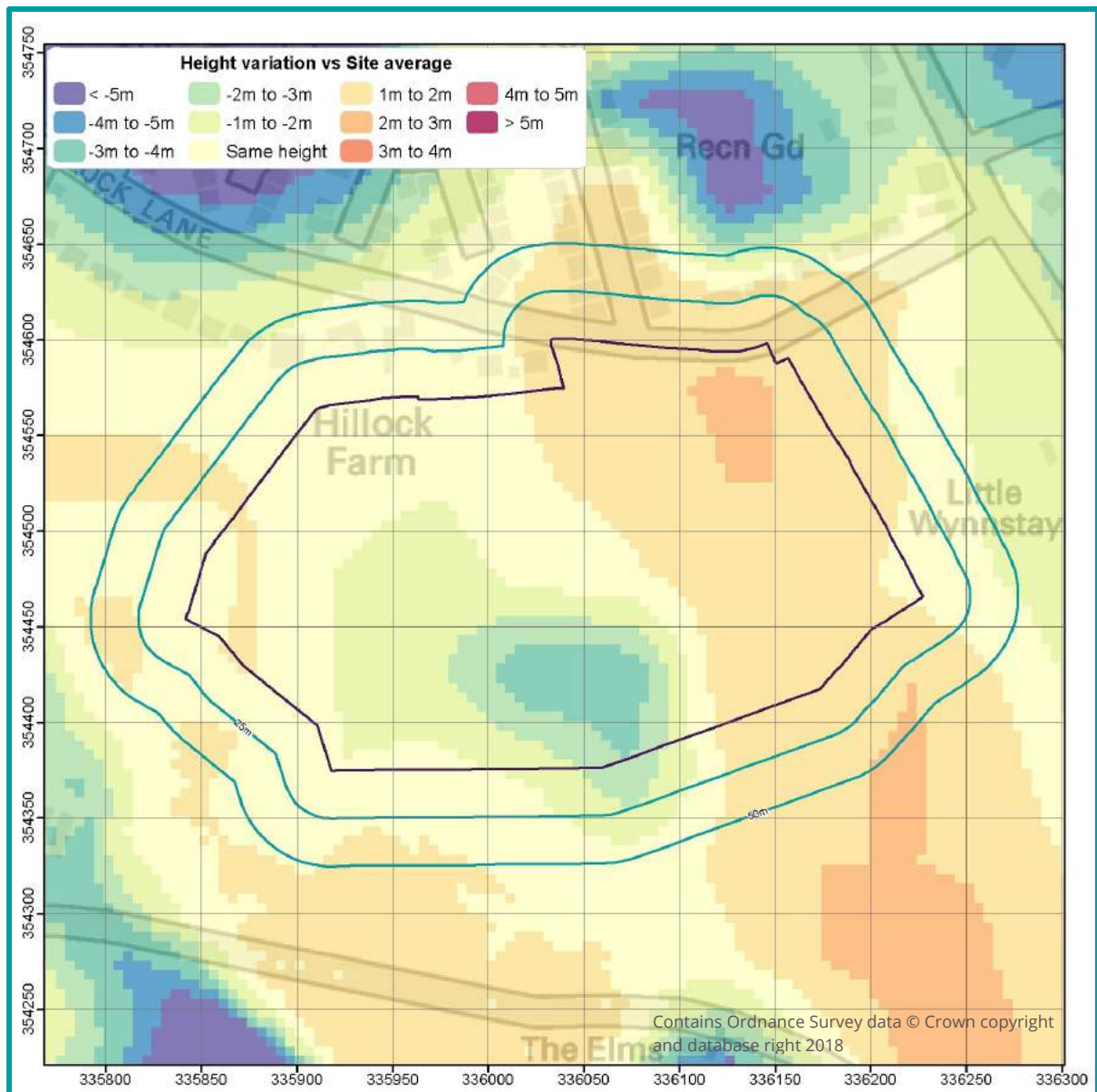
4. SuDS infiltration suitability (SD50) map



The GeoSmart SuDS Infiltration Suitability (SD50) Map screens the potential for infiltration drainage at the Site and indicates where further assessment is recommended. The map combines information on the thickness and permeability of the underlying material and the depth to the high groundwater table. According to the SD50 map, there is a high potential for infiltration SuDS within the Site.

Site investigation including infiltration testing has been undertaken by Geocon in November 2019. The investigation consisted of infiltration tests to BRE DIGEST 365 standards at 6 locations across the Site and confirmed an infiltration rate of 1.4×10^{-5} m/s to 3.12×10^{-4} m/s.

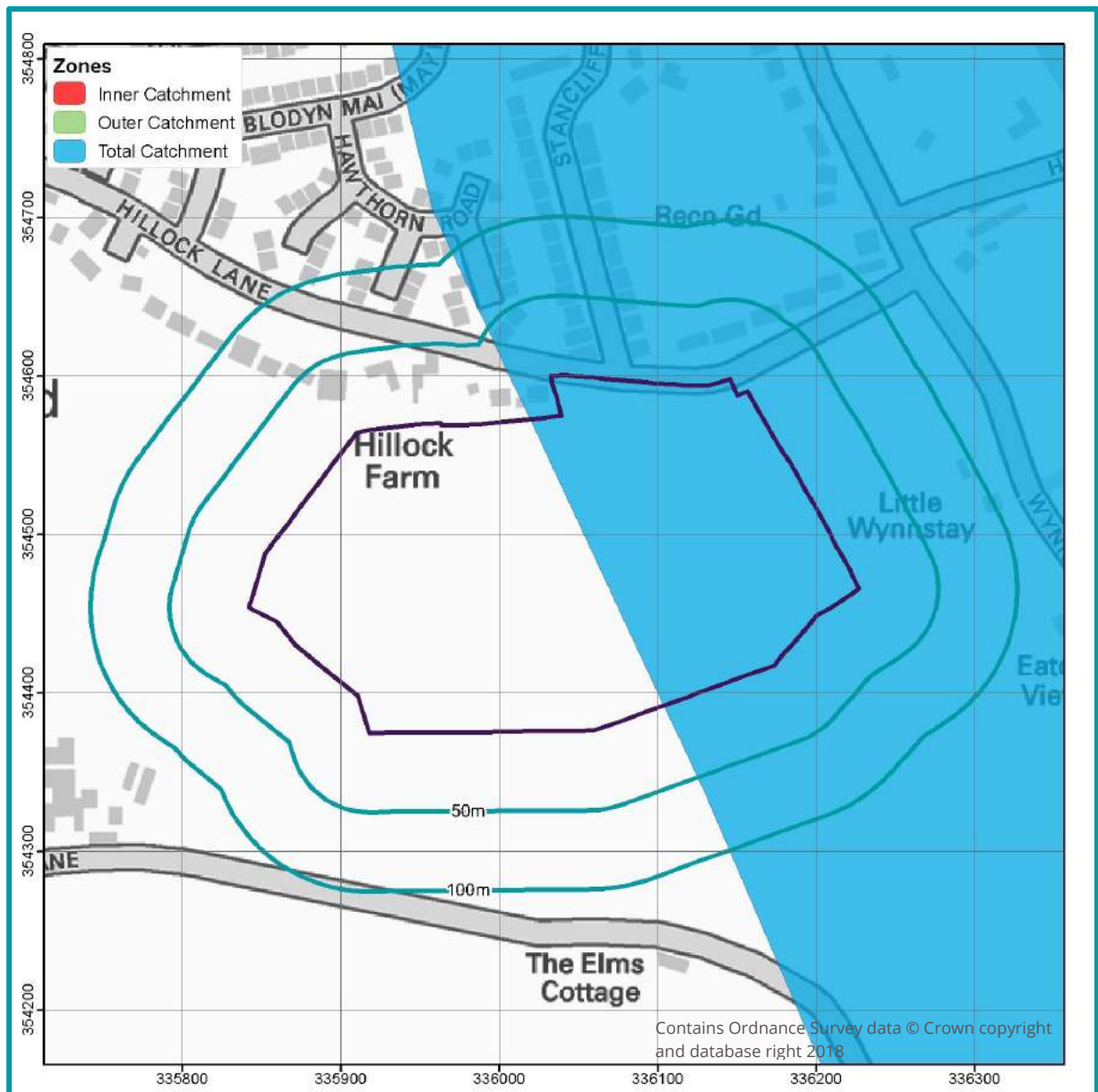
5. Site topography



GeoSmart have undertaken an assessment of the topography at the Site and within its vicinity, using LiDAR elevation data from Natural Resources Wales (NRW). The mapping shows a comparison between average ground levels on the Site with ground levels in the surrounding area.

According to OS data, the general level of the Site is higher in the North East, at c. 75 mAOD, with a lower level along the Southern boundary at c. 71 mAOD. The NRW LiDAR elevation obtained for the Site was to a 1m resolution with a vertical accuracy of ± 150 mm.

6. Source protection zone map

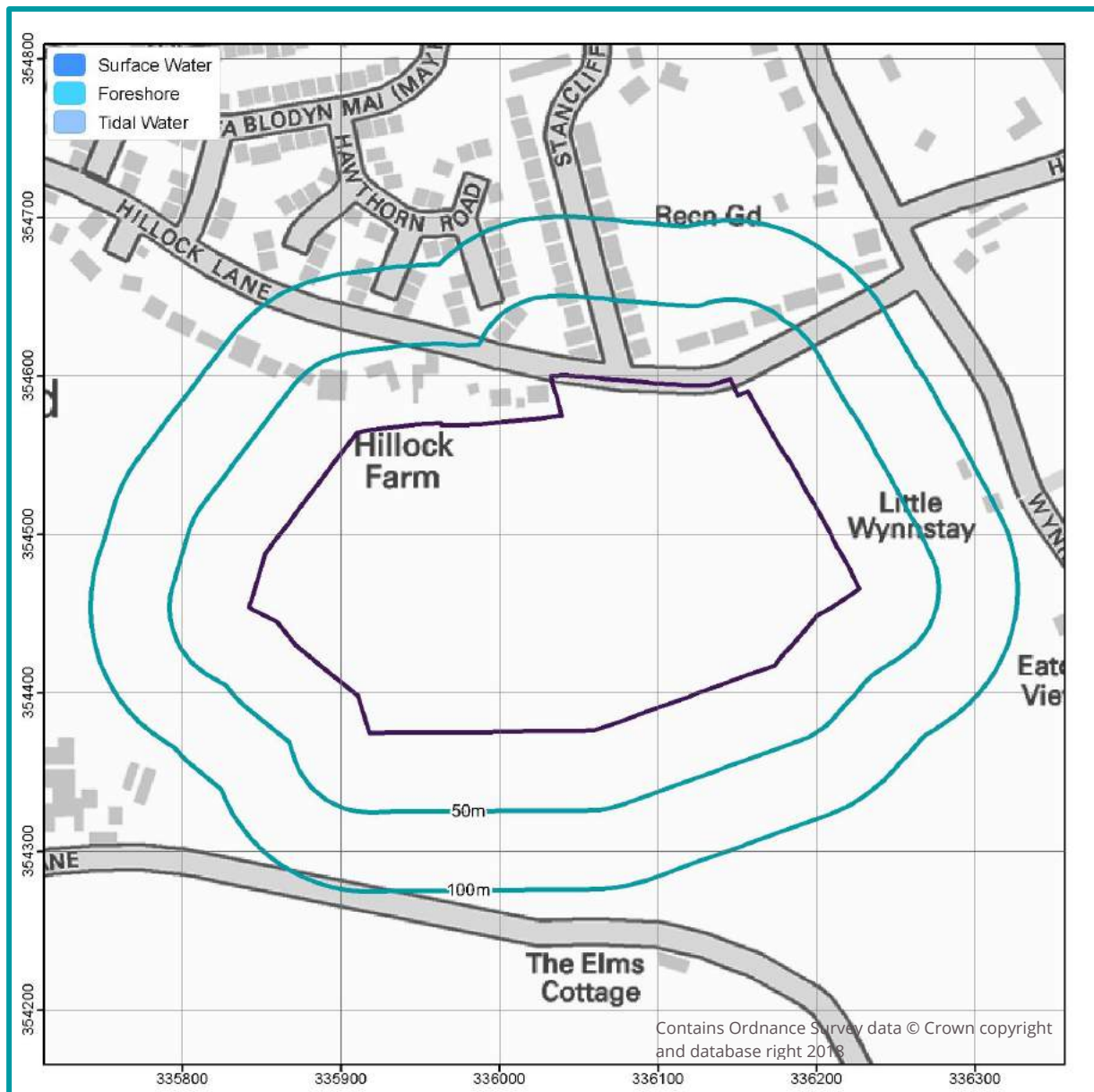


GeoSmart have undertaken an assessment of NRW's groundwater Source Protection Zones (SPZ) within the vicinity of the Site.

The west of the Site is not located within an SPZ while the east of the Site is located within a Total Catchment SPZ.

Infiltration to the ground is therefore likely to be acceptable providing suitable mitigation measures are in place if required to prevent an impact on water quality from the proposed or historical land use and contaminated land.

7. Surface water features map

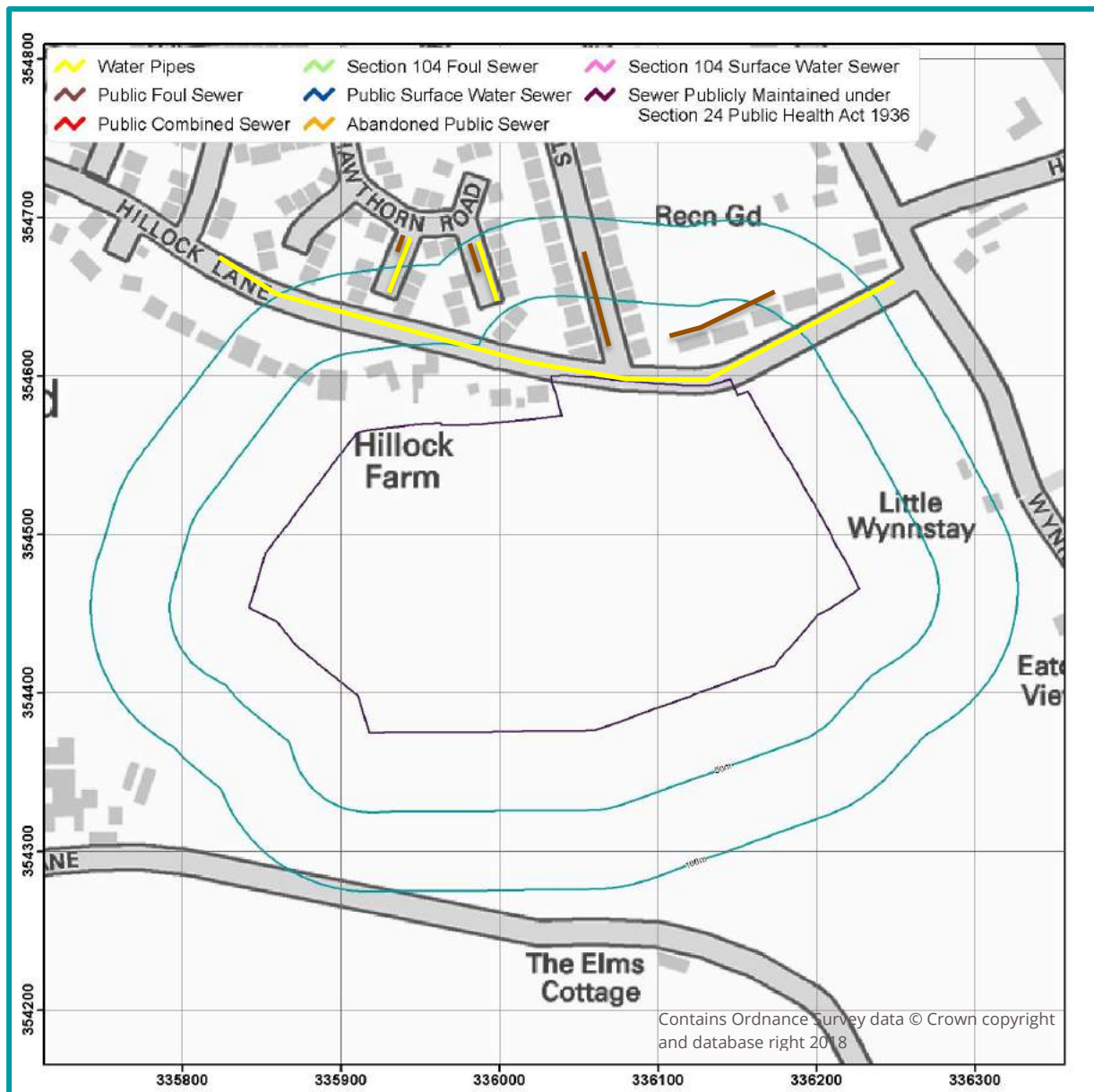


GeoSmart have undertaken an assessment of the location of surface water features within the vicinity of the Site. The Site is >100m from a surface water body. Discharge to surface water is unlikely to be appropriate.

The Vicarage Moss SSSI is located approximately 170m south of the Site.

Further analysis could be undertaken by visiting the Site or by contacting the Local Council and Natural Resources Wales to confirm the presence, location and condition of these watercourses.

8. Sewer features map

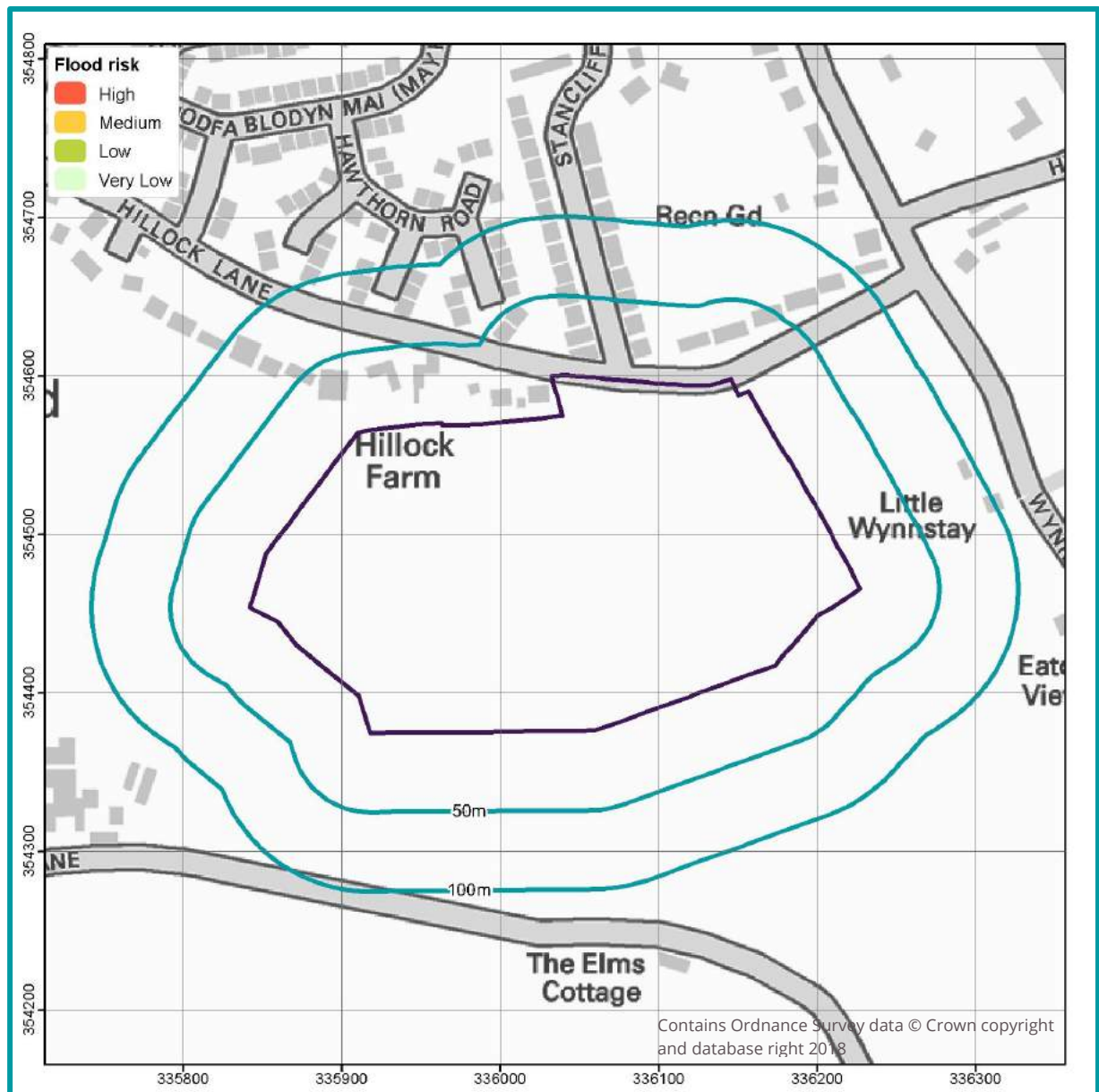


GeoSmart have undertaken an assessment of the location of sewer features within the vicinity of the Site. The Site is further than 100m from a public surface water or combined sewer. Discharge of surface water to sewer is unlikely to be appropriate.

Further analysis of the connections and condition of the public surface water and foul drainage systems should be undertaken by carrying out a CCTV survey, or by contacting the drainage provider or the LA to confirm the presence, location and condition of these sewers.

Consultation with the drainage provider would also be required to determine that sufficient capacity is available to accept the proposed discharge, and to gain permission to connect if required.

9. Risk of flooding from rivers & sea map

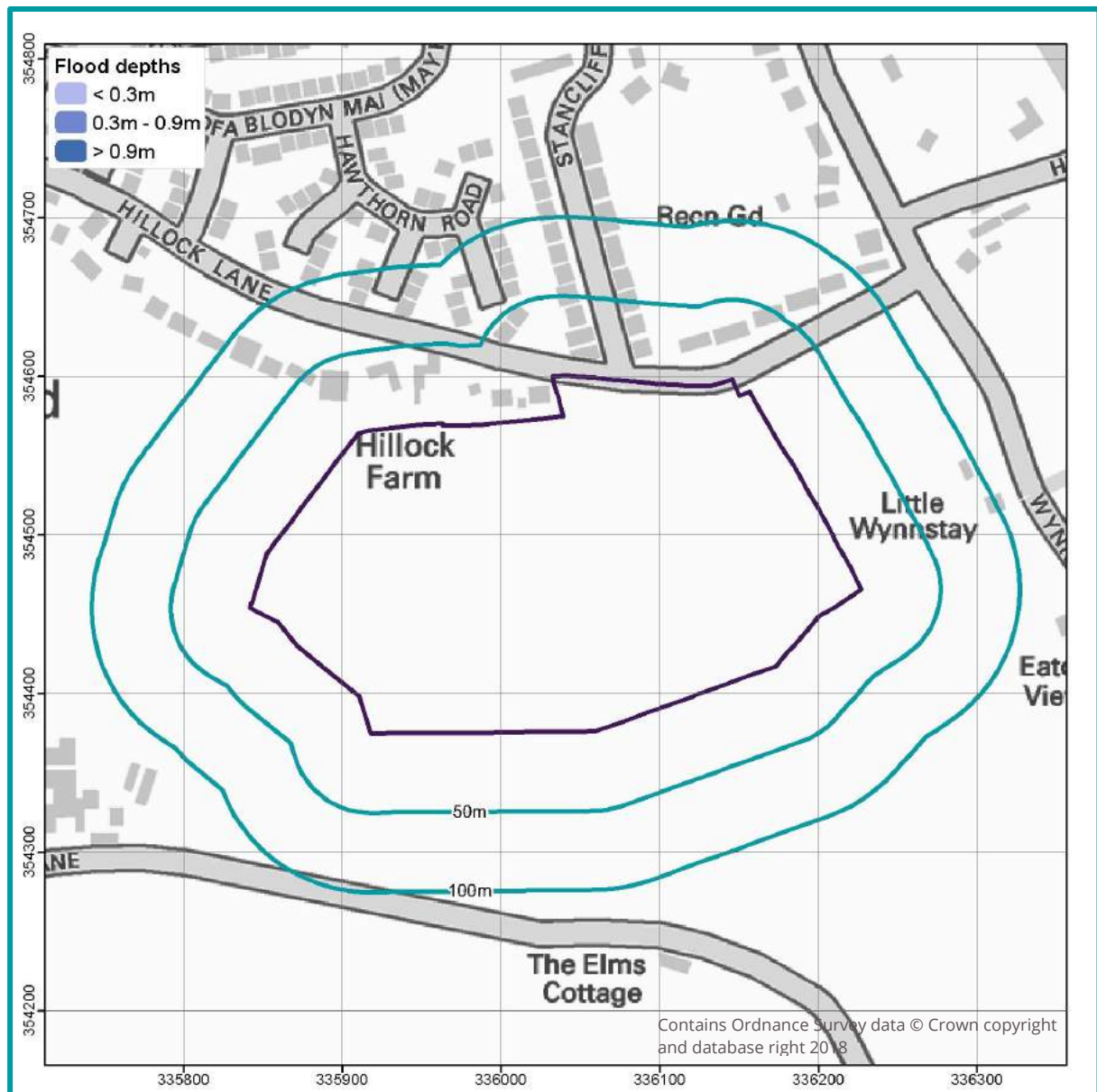


GeoSmart have undertaken an assessment of the risk of flooding from the rivers and the sea within the vicinity of the Site.

The Site has a negligible risk of fluvial or coastal flooding.

A separate Flood Consequence Assessment (FCA) has been undertaken by GeoSmart (ref:72009.03R1) in 2019.

10. Risk of surface water flooding map

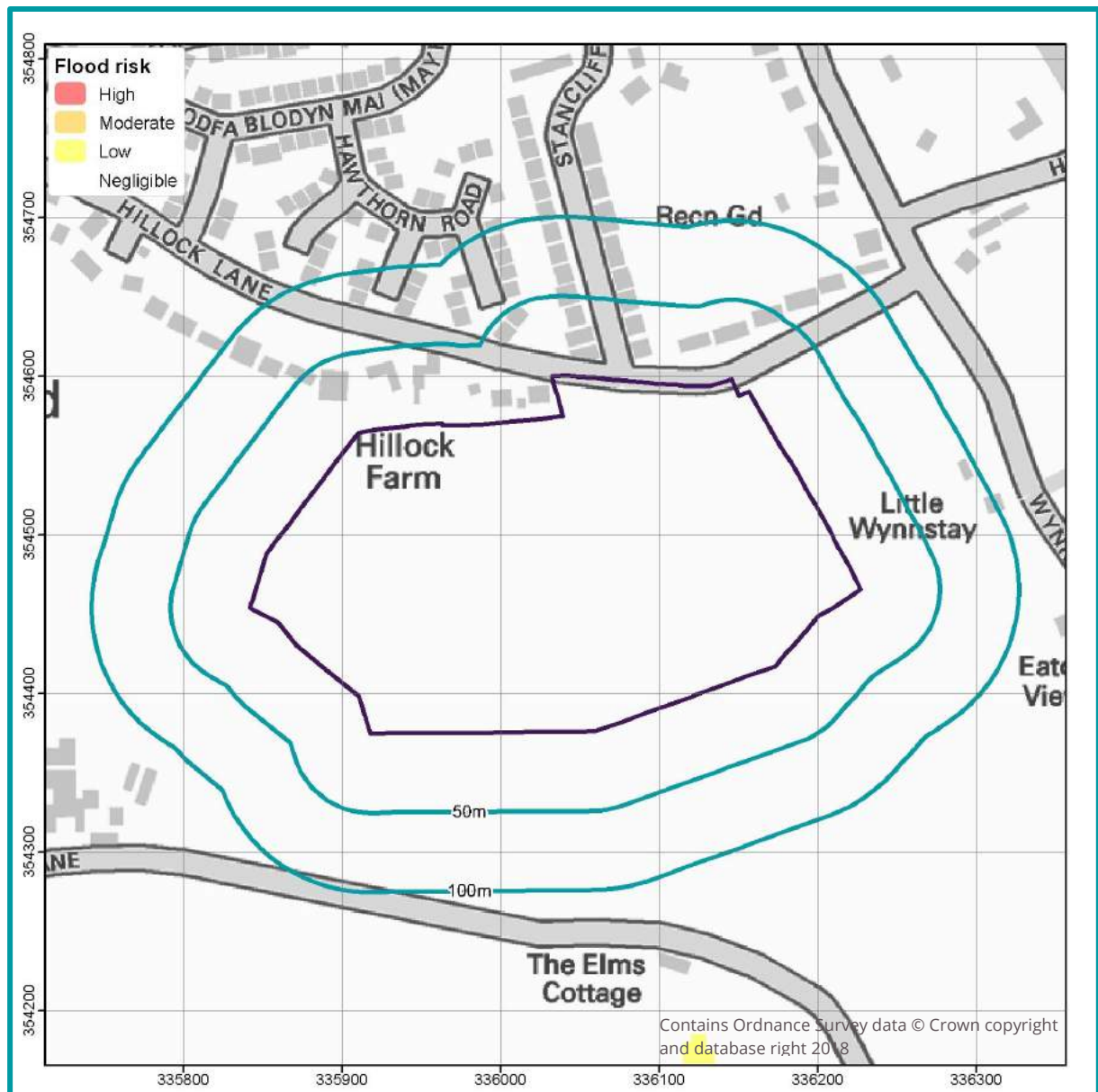


GeoSmart have undertaken an assessment of the risk of flooding from pluvial sources within the vicinity of the Site.

According to the NRW's Risk of Flooding from Surface Water (pluvial) maps, the Site has a very low risk of surface water flooding.

A separate FCA has been undertaken by GeoSmart (ref:72009.03R1) in 2019.

11. Groundwater flood risk (GW5) map



According to GeoSmart's Groundwater Flood Risk (GW5) map, the Site has a negligible risk of groundwater flooding.

A separate FCA has been undertaken by GeoSmart (ref: 72009.03R1) in September 2019.

12. Site context



Site information

The purpose of this report is to assess the potential for disposing of surface water through a sustainable drainage system (SuDS) for Hillock Lane, Gresford, Wrexham (the Site). The Site is located in the south east of Gresford, Wrexham in a setting of agricultural and residential use, National Grid Reference SJ 36155 54505. According to OS data, the general level of the Site is higher in the North East, at c. 75 mAOD, with a lower level along the Southern boundary at c. 71 mAOD. Site plans and drawings are provided in Appendix A.



Development

The Site is currently greenfield. Development proposals comprise of a residential development of circa 109 homes.



Geology, permeability and thickness

British Geological Survey (BGS) national superficial and bedrock geology mapping confirms different geological formations underlying the site and each formation may have a range of permeability.

Table 1: Site Geology

Geology present on site		Potentially permeable?
Superficial geology	Glaciofluvial Sheet Deposits -Sand and Gravel	✓
Bedrock geology (majority of the Site)	Kinnerton Sandstone Formation	✓
Bedrock geology (west of the Site)	Salop Formation - Mudstone, Sandstone and Conglomerate	✓

According to the BGS website there are no nearby boreholes from which the underlying geology at the Site can be inferred.

Site investigation including infiltration testing has been undertaken by Geocon in November 2019. The investigation consisted of infiltration tests to BRE DIGEST 365 standards at 6 location across the Site. The site investigation indicated the underlying material comprises of made ground to a maximum depth of 0.5m below ground level (bgl) underlain by sand and gravels to a maximum depth of 2.1 m bgl with the SA/TP06 encountering till deposits from 0.4 mbgl to a depth of

2.1m bgl. The permeability of the underlying material mapped by BGS at the Site is high and the site investigation confirmed an infiltration rate of 1.4×10^{-5} m/s to 3.12×10^{-4} m/s.



Depth to groundwater

According to the Groundwater Flood Risk (GW5) map within Section 11 of this report, the Site has a Negligible risk of groundwater flooding. There are no nearby boreholes that note the depth to water table that can be used to infer likely groundwater conditions at the Site

The base of the infiltration system needs to be 1 m above the expected seasonal high water table. Passage through unsaturated soil is important for improving the quality of infiltrating water before it reaches the water table. The infiltration system should be designed to operate in periods of extreme groundwater levels.

Guidance

'It is essential that the consideration of sustainable drainage takes place at the land acquisition due diligence stage'

LASOO (2015), Practice Guidance, Local Authority SuDS Officer Organisation.



Ground conditions

A Site-specific review of underlying ground conditions is recommended to ensure focused infiltration does not cause ground instability as a result of landslide or collapse associated with dissolution or shallow mining. Hazards that should be considered include soluble rocks, landslides, compressible ground, collapsible ground, shrink-swell clays, running sand and shallow mining.

Focused infiltration features such as Soakaways should be a minimum of 5m away from the foundations of a habitable building. Where this cannot be achieved, specialist geographical advice should be sought to establish if a reduced offset is acceptable.



Water quality

Infiltration systems should not be used where there is a risk of contaminating groundwater by infiltrating polluted runoff or where receiving groundwater is particularly sensitive.

The influence of surface runoff on water quality will depend on whether there is a source of contamination on Site and the sensitivity of the receiving environment, either groundwater or surface water. The intervening pathway from source to receptor including mitigation and natural attenuation will determine the final impact.

The impact of contaminants on the groundwater will be reduced by travel and natural attenuation through the unsaturated soil zone. A greater depth of unsaturated zone and the presence of significant clay and organic material will provide greater protection for the underlying groundwater. Rapid flow through

fractures will provide less protection than intergranular flow around soil and rock particles.

13. National & local policy context

National guidance and policy

The Flood and Water Management Act 2010 (Schedule 3), which came into effect in Wales on 7 January 2019, requires new developments to include SuDS features that comply with national standards.

All new developments of more than 1 house or where the construction area is 100m² or more, will require sustainable drainage systems (SuDS) for managing surface water.

- Drainage systems for all new developments must be designed and built in accordance with statutory SuDS standards.
- Local authorities will become the SuDS Approving Body (SAB).
- SuDS schemes must be approved by the local authority acting in its SAB role before construction work begins. The SAB will have a duty to adopt compliant SuDS so long as it is built and functions in accordance with the approved proposals, including any SAB conditions of approval.

The requirement for SAB approval will not apply to single dwellings and developments with a construction area of less than 100 m².

CIRIA SuDS Manual (C753) (2015)

A development should utilise sustainable drainage systems (SUDS) unless there are practical reasons for not doing so, and should aim to achieve greenfield run-off rates and ensure that surface water run-off is managed as close to its source as possible in line with the drainage hierarchy.

Sustainable Drainage System Standards for Wales (2018)

Surface water runoff destination:

Priority Level 1: Surface water runoff is collected for use;

Priority Level 2: Surface water runoff is infiltrated to ground;

Priority Level 3: Surface water runoff is discharged to a surface water body;

Priority Level 4: Surface water runoff is discharged to a surface water sewer, highway drain, or another drainage system;

Priority Level 5: Surface water runoff is discharged to a combined sewer.

Infiltration to ground:

Infiltration systems can be designed for any scale of event and any size of runoff area. The larger the event or contributing area, the larger the required storage volume and/or infiltration area will be. The optimum size will depend on the rate of infiltration, the space available and cost of storage, and the feasibility and costs associated with managing events larger than that for which the system is designed.

The infiltration component should discharge from full to half-full within a reasonable time so that the risk of it not being able to manage a subsequent rainfall event is minimised. Where

components are designed to manage the 1 in 10 year or 1 in 30 year event, it is usual to specify that half emptying occurs within 24 hours. If components are designed to infiltrate events greater than the 1 in 30 year event, designing to half empty in 24 hours can result in very large storage requirements and, with agreement from the drainage approving body, it may be appropriate to allow longer half emptying times. This decision should be based on an assessment of the performance of the system and the risk and consequences of consecutive rainfall events occurring.

Discharge to combined sewer:

Surface runoff not discharged in accordance with Levels 1 to 4 may be discharged to a public combined sewer with the agreement of the sewerage undertaker; providing it has capacity to accommodate the additional flows.

The risks associated with surface water runoff entering the combined sewer and resultant possible pollution from backflow or surcharge should be guarded against, including consideration of the use of non-return valves at appropriate locations. Provision should be made for separation and removal of sediments and oils before connection to a combined sewer.

Runoff rates:

Reducing the impact of surface water runoff from the development on flood risk associated with the receiving water body, is based on limiting the peak runoff rate and runoff volume for extreme events. The 1:100 year return period rainfall event is the criterion normally used.

Aiming to replicate greenfield runoff rates for extreme events helps ensure that the flood risk associated with the receiving watercourse/sewer is not increased by the development.

Where controlling runoff to greenfield volumes is considered unachievable, then the runoff volume should be reduced as much as possible and any additional volume should be stored and released at a low rate which will not increase downstream flood risk (normally 2 l/s/ha is considered an appropriate rate).

Climate change guidance

The climate change allowances for rainfall runoff and surface water flooding in Wales is based upon the Environment Agency's National Planning Policy Guidance (NPPG, 2016). This confirms the following

As the proposed development is residential, where the lifespan of the development is approximately 100 years, the requirements for climate change should allow up to the 2115 scenario.

Table 2: Climate change rainfall allowances

Applies across all of England	Total potential change anticipated for the '2020s' (2015 to 2039)	Total potential change anticipated for 2040 to 2059	Total potential change anticipated for 2060 to 2115
Upper end	10%	20%	40%
Central	5%	10%	20%

14. SuDS approval and adoption

The Flood and Water Management Act 2010 (Schedule 3) requires new developments to include Sustainable Drainage Systems (SuDS) features that comply with national standards.

Schedule 3 of the Flood and Water Management Act 2010 (FWMA) establishes SuDS Approval Bodies (SABs) in county councils. The Act gives us statutory responsibility for approving and adopting the approved drainage systems.

The SAB is established to:

- Evaluate and approve drainage applications for new developments where construction work has drainage implications, and
- Adopt and maintain surface water drainage systems according to Section 17 of Schedule 3 (FWMA).

An application demonstrating compliance with the Statutory SuDS Standards for the design, construction, operation and maintenance of surface water drainage systems serving new developments, must be submitted to the SAB.

Applications may be submitted to the SAB for determination either directly as a free standing application or alongside the planning application.

It is important to note that construction work which has drainage implications must not be commenced unless the drainage system for the work has been approved by the SAB.

The SAB approves and adopts any part of a drainage system that serves more than a single property.

Developers will need to enter into a legal adoption agreement as a part of the SAB consent process.

The SAB approves but will not adopt a drainage system in a publicly maintained road. Publicly maintained roads are those to which section 41 of the Highways Act 1980 applies.

Where a connection to an existing public sewer is required, an adoption agreement must be in place prior to any connection being made to the public sewer.

15. Storage, volume and peak flow rate

Suggested minimum and aspirational storage requirements for an infiltration or attenuation SuDS scheme for the development footprint are set out below, with more detail provided in subsequent sections. Storage volumes may be reduced (but not below the minimum level) if the design incorporates off-site discharge.

Guidance

"G2.34 Flood protection to a suitable level of service should be provided to people and property on (or adjacent to) the site. There are three principal criteria which would normally be applied to the drainage design:

- Protection against surface flooding for roads and other access areas for the 1:30 year return period rainfall event. Lower levels of service may be used for certain locations depending on the impact on site users.
- Protection against internal flooding of properties for the 1:100 year return period (or greater). Critical infrastructure and roads where access is essential may also be protected to the same level of service (or greater).
- Freeboard against flooding of any structure should be appropriate to the uncertainty in providing the level of protection required and the consequence of the flooding occurring."

(Statutory National Standards for SuDS. Welsh Government. October 2018)

Surface water runoff

An increase in impermeable area on site will result in greater rainfall runoff. A reduction in impermeable area will result in a lesser volume of runoff, which will help mitigate flood risk both on and off site. Further information on the surface water runoff calculations is provided in Section 20 'Background Information'.

Table 5: Change in impermeable area associated with the development

Total site area	67,792 m ²
Impermeable area (and as a percentage of the total area of the proposed development footprint of 66,277 m ²)	
Pre-development	Post-development
0 m ² (0%)	16,717 m ² (25%)
Permeable Land use: landscaped areas	New impermeable land use: 7,512 m ² adoptable roads and 9,205 m ² buildings New permeable land use: landscaped areas and permeable paving

Peak discharge rates

The table below presents peak discharge rates for a range of storm events used to assess the impact of the proposed development and select the maximum permitted discharge rate. Further information on the calculation and control of peak discharge rates is provided in Section 20 'Background Information'.

Table 6: Peak discharge rates associated with the development

Rainfall event	Greenfield runoff rates (l/s)	Existing runoff rates ¹ (l/s)	Potential runoff rates without attenuation (l/s)	Potential minus existing (l/s)
QBAR	1.15	1.15	N/A	N/A
6 hour 1 in 1 year	0.98	0.98	23.35	16.21
6 hour 1 in 10 year	1.63	1.63	40.28	27.61
6 hour 1 in 30 year	2.02	2.02	56.42	39.17
6 hour 1 in 100 year	2.51	2.51	75.12	52.15
6 hour 1 in 100 year + 20% CC	N/A	N/A	90.15	67.17
6 hour 1 in 100 year + 40% CC	N/A	N/A	105.17	82.20

¹Assumes 100% runoff from impermeable surfaces. Assumes Greenfield runoff from permeable surfaces calculated using the loH124 method.

Relevant local and national policy have been consulted to determine restrictions on runoff from the Site. In some cases, greenfield rates may be requested, although in practice it is difficult to restrict discharge rates at any one control point to less than 2 l/s.

Issues associated with blockages within the drainage network where open SuDS features (e.g. swales, attenuation basins) are used can arise at outfalls, where the rate is any lower than 2 l/s. However, in systems which are closed (i.e. direct attenuation within geo-cellular storage), the risks of blockage are considered to be much less and a lower flow rate can be applied.

Total discharge volumes

The table below presents discharge volumes for a range of storm events used to assess the impact of the proposed development and calculate the required storage volumes. Further information on the calculation of total discharge volumes is provided in Section 19 'Methodology and Limitations'.

Table 7: Total discharge volumes associated with the development

Rainfall event	Greenfield runoff volume (m ³)	Existing runoff volume ² (m ³)	Potential runoff volume without attenuation (m ³)	Potential minus existing (m ³)
QBAR	164.64	164.64	N/A	N/A
6 hour 1 in 1 year	154.18	154.18	504.33	350.10
6 hour 1 in 10 year	273.57	273.57	870.14	596.48
6 hour 1 in 30 year	372.55	372.55	1218.67	846.00
6 hour 1 in 100 year	496.05	496.05	1622.66	1126.44
6 hour 1 in 100 year + 20% CC	N/A	N/A	1947.19	1450.97
6 hour 1 in 100 year + 40% CC	N/A	N/A	2271.72	1775.50

² Assumes 100% runoff from impermeable surfaces. Assumes Greenfield runoff from permeable surfaces calculated using the IoH124 method.

Guidance

"For previously developed sites, the surface water management system should be designed so the volume of surface water runoff discharged from the site for the 1:100 year, 6 hour event is kept as close to greenfield conditions as possible. The runoff volume for the pre-development scenario may be very high and may be contributing to downstream flood risk – it should therefore only be allowed for the new development if the drainage approving body agrees that it is acceptable. Wherever runoff volumes cannot be sufficiently reduced, they should be discharged from the site at a rate of 2 l/s/ha or less"

(Statutory National Standards for SuDS. Welsh Government. October 2018)

Critical storm duration and volume requirements

Storage volumes for a range of storm events from the 1 in 30 year to the 1 in 100 year plus climate change event have been calculated within Microdrainage to assess the maximum range of impacts of the proposed development. Please see Appendix B for full calculations.

16. Runoff destination

Options for the destination for the runoff generated on-site have been assessed in line with the prioritisation set out in the Building Regulations Part H document (HM Government, 2010) and the Statutory SuDS Standards for Wales (S1) (2018). The drainage hierarchy is as follows:

Priority Level 1) Surface water runoff is collected for use;

Priority Level 2) Surface water runoff is infiltrated to ground;

Priority Level 3) Surface water runoff is discharged to a surface water body;

Priority Level 4) Surface water runoff is discharged to a surface water sewer, highway drain, or another drainage system;

Priority Level 5) Surface water runoff is discharged to a combined sewer.

Priority Level 1: Surface water runoff collection

Rainwater harvesting butts should be used at the Site to collect and store rainwater from the proposed development roofs. Rainwater could then be used to irrigate gardens.

Priority Level 2: Surface water runoff infiltrated to ground

As discussed earlier in this report, the Site has high potential for infiltration, with permeable underlying superficial sand and gravel deposits.

Site investigation including infiltration testing has been undertaken by Geocon in November 2019 which confirmed an infiltration rate of 1.4×10^{-5} m/s to 3.12×10^{-4} m/s. Infiltration to ground is therefore considered feasible.

There are no known issues identified relating to site contamination, but the Site is partially located within an SPZ.

Priority Level 3: Surface water runoff discharge to a surface water body

There are no nearby watercourses for the Site to discharge into.

Priority Level 4: Surface water runoff discharge to a surface water sewer, highway drain, or another drainage system

There are no nearby public surface water sewers for the Site to discharge into.

Priority Level 5: Surface water runoff discharge to a combined sewer

There are no nearby public combined sewers for the Site to discharge into.

Guidance

"G1.1 As much of the runoff as possible (subject to technical or cost constraints) should be discharged to each destination before a lower priority destination(level) is considered.

G1.2 Depending on the site characteristics, drainage from different parts of the site could have different drainage destinations.

G1.3 Depending on the quantity of runoff and the potential for a particular destination to manage that runoff, small events may discharge to a higher level while larger events may need to make use of lower priority destinations."

(Statutory National Standards for SuDS. Welsh Government. October 2018)

17. Water quality

A key requirement of any SuDS system is that it protects the receiving water body from the risk of pollution. This can be effectively managed by an appropriate “train” or sequence of SuDS components that are connected in series. The frequent and short duration rainfall events are those that are most loaded with potential contaminants (silts, fines, heavy metals and various organic and inorganic contaminants). Therefore, the first 5-10 mm of rainfall (first flush) should be adequately treated with SuDS.

Guidance

“Standard S3 - Surface water quality management

Treatment for surface water runoff should be provided to prevent negative impacts on the receiving water quality and/or protect downstream drainage systems, including sewers.

Runoff from roads, commercial and other urban environments can, in particular, contain grit, sediments, oils and poly-aromatic hydrocarbons (PAHs), metals, and dissolved salts– each of which has the potential to cause pollution of receiving surface water or groundwater. SuDS can be effective at reducing a wide range of these pollutants through enabling sedimentation, filtration and a range of photolytic, chemical and biological processes”

(Statutory National Standards for SuDS. Welsh Government. October 2018)

The minimum number of treatment stages will depend on the sensitivity of the receiving water body and the potential hazard associated with the proposed development SuDS Manual (CIRIA, 2015).

Table 8: Level of hazard

Hazard	Source of hazard
Very Low	Residential roof drainage
Low	Residential, amenity uses including low usage car parking spaces and roads, other roof drainage.
Medium	Commercial, industrial uses including car parking spaces and roads (excluding low usage roads, trunk roads and motorways).
High	Areas used for handling and storage of chemicals and fuels, handling of storage and waste (incl. scrap-yards).

The proposed development is a combination of very low (roof water) to low hazard (runoff from car parking and road). The Site lies partially within a source protection zone however due to the very low level of hazard from the roof runoff multiple treatment stages are unlikely to be required.

The recommended minimum number treatment stages suggested for the different runoff waters identified for the proposed development is highlighted in Table 9.

Table 9: Minimum number of treatment stages for runoff

		Sensitivity of the receiving water body		
		Low	Medium	High
Hazard	Low	1	1	1
	Med	2	2	2
	High	3	3	3

18. Proposed sustainable drainage systems

It is recommended the drainage system has the capacity to accommodate the 1 in 30 year event before flooding occurs and finished floor levels are raised appropriately to avoid internal property flooding during the 1 in 100 year event.

The proposed surface water drainage strategy set out in Tables 12 and 13 below (summarised in Section 2 of this report) would intercept, attenuate and treat surface water runoff.

Adoptable Roads

Table 10: Proposed Sustainable Drainage Strategy (SuDS)

SuDS type	Source control (interception) and infiltration SuDS.
SuDS features	Swales, filter strips and an infiltration basin.
Discharge location	Infiltration to ground.
Discharge rate	0.09 m/hr.

Table 11: Potential SuDS sizing (dimensions) and attenuation volumes:

Swales/filter strips	Swales and filter strips are proposed to receive flows from the adjacent highway and convey water into the proposed infiltration basin.
Infiltration basin	An infiltration basin with an attenuation volume of 466.8m ³ would be sufficient to attenuate the 1 in 100 year plus 40% climate change event based upon an infiltration rate of 0.09 m/hr (taken from trial pit SA/TP05). The infiltration basin will have a storage depth of 1.2m with a 0.3m freeboard and side slopes of 1:3. Please see Appendix B for Microdrainage calculations.
Total Attenuation Provided	466.8 m ³
Total Attenuation Required	466.8 m ³

Pipework

The connecting pipework for the features are an integral part of the proposed drainage design. Sewers for Adoption 8 (2018) recommend the following when designing the pipework to an adoptable standard.

The minimum size for a gravity surface water sewer should be 150 mm nominal internal diameter, except where a 100 mm nominal internal diameter is permitted, in accordance with C7.2.1.2 of SfA8.

The minimum size for a gravity surface water lateral drain should be 100 mm nominal internal diameter.

To provide a self-cleansing regime within surface gravity sewers, the minimum flow velocity should be 1 m per second at pipe full flow. Where this requirement cannot be met, then this criterion would be considered to be satisfied if:

- a) a 150 mm nominal internal diameter gravity sewer is laid to a gradient not flatter than 1:150; or
- b) a 100 mm nominal internal diameter lateral drain is laid to a gradient not flatter than 1:100.

Swales are flat bottomed, shallow open channels used to attenuate surface water which work to decrease flow velocity by ponding run-off temporarily. Grass swales have a bottom width of 0.5-0.2m and should allow for shallow flows and water quality treatment. Longitudinal slopes should be between 0.5-6% with a maximum side slope of 1 in 3 (33%) with a depth of 500mm. The treatment process within SuDS features is linked to velocity and retention time of run-off. Swales can offer primary and secondary treatment stages and can work to reduce sediment loads which enter the off-Site discharge route. As swales retain their vegetative state, the feature is able to remove coarse sediments through groundcover while the underlying soil can help to remove finer particles. The risk of swale erosion can be reduced with the implementation of inlets and flow spreaders (CIRIA, 2015).



An infiltration basin is proposed to store run-off and infiltrate collected water gradually into the ground. An infiltration basin would provide temporary storage, biological treatment of the water and improve the biodiversity of the location prior to infiltrating water into the ground. A buffer should be employed around the proposed pond to allow for further expansion and for safety.



Exceedance Flow Route:

Where possible, exceedance flows should be directed away from buildings and into non-essential areas of the Site. The SuDS system recommended for the Site should provide enough storage that this method would only be utilized during a worst case scenario.

Dwellings

Table 12: Proposed Sustainable Drainage Strategy (SuDS)

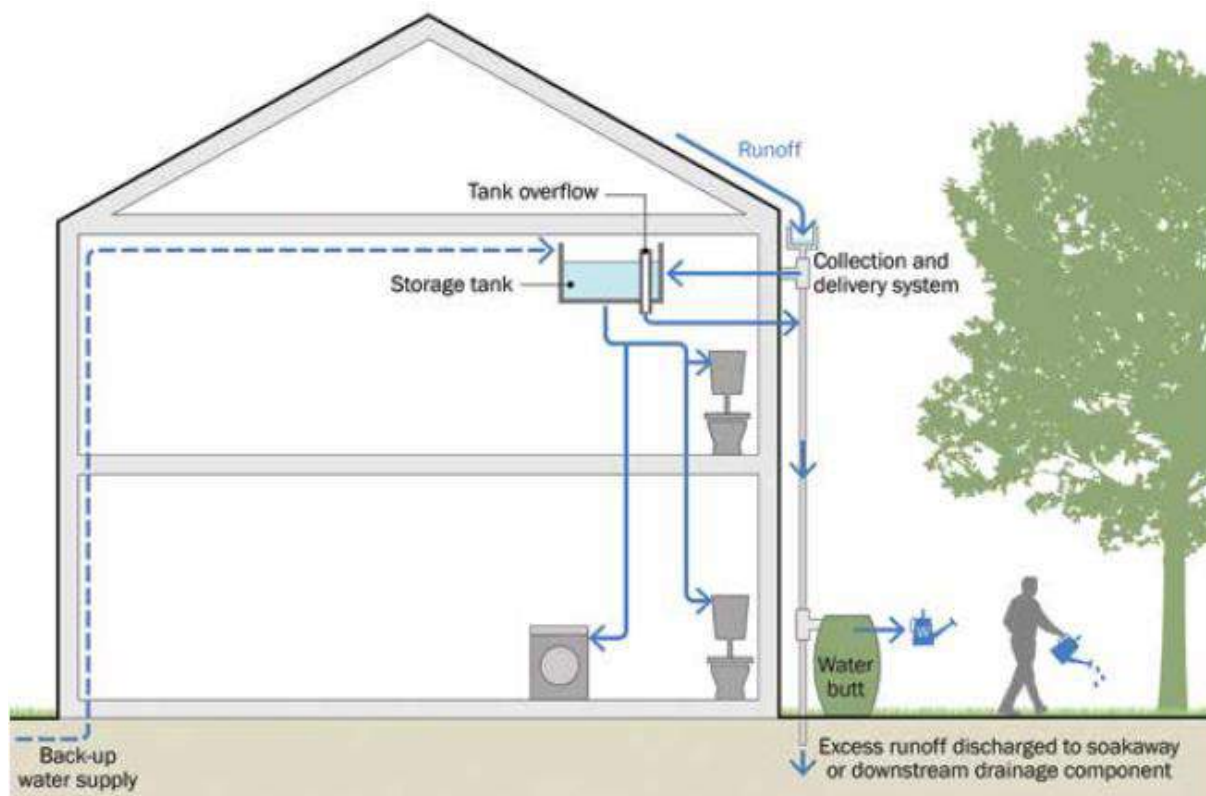
SuDS type	Source control (interception) and infiltration SuDS.
SuDS features	Rainwater harvesting butts, permeable paving and soakaways.
Discharge location	Infiltration to ground.
Discharge rate	0.0505 m/hr to 0.8532 m/hr.

Table 13: Potential SuDS sizing (dimensions) and attenuation volumes:

Rainwater harvesting butts	Rainwater harvesting butts should be established for each proposed development. In terms of attenuation storage within this SuDS scheme, volume of run-off which could be attenuated by Rainwater Harvesting has not been considered within the Preliminary SuDS schematic.
Permeable paving	Permeable paving is proposed for the driveways and parking areas to ensure as much of the Site drains as close to greenfield as possible.
Soakaways	Soakaways are proposed to infiltrate surface water runoff from the proposed dwellings and private drives. Please see Appendix B for Microdrainage calculations.

Rainwater harvesting butts should be established for each proposed dwelling. The run-off from the proposed development roof should be led into rainwater harvesting butts via rainwater downpipes and guttering to catch run-off from the extension roof. Overflow from the butts should be discharged into the storage system provided by the permeable paving.

Due to the relatively insignificant amounts of attenuation provided by rainwater harvesting tanks in this instance and the requirement to retain water for non-potable uses such garden maintenance, the volume of run-off which could be attenuated by rainwater harvesting has not been considered within the report.



As there is an issue with the storage capability of Rainwater Harvesting tanks, this method should have a fixed attenuation volume and a controlled outlet to discharge into the proposed infiltration feature. An overflow system will be required for implementation on the Site due to exceedance events (where the pumps fail or there is a blockage within the system / or the number of residents and subsequent water usage is reduced).

Roof run-off is generally less polluted than run-off from road surfaces but can still generate pollutants such as sediments. Pollutants would be captured by the collection and filtration system and, by reducing the volume of run-off generated from the Site. Primary screening devices are used to prevent leaves and other debris from entering the butt and first flush devices can be designed to divert the first part of the rainfall away from the main storage tank and can pick up most of the dirt, debris and contaminants that collect on a residential roof.

Permeable paving is proposed for the driveways and parking areas to ensure as much of the Site drains as close to greenfield as possible.

Soakaways should be used to store run-off and infiltrate collected water gradually into the ground. Proposed topographic data indicates roof water could be collected and conveyed by underground pipes to the features which are located at the Site. The base of the infiltration features should lie at an elevation at least 1 m above the highest winter groundwater levels, to ensure there is sufficient space for surface water to discharge. Soakaway excavation should be outside of the root zone of any protected trees and dimensions will depend on the depth to the sand layer where the soakaway is eventually situated.

Draining via soakaways means that property owners are less likely to pay for the utility company to drain surface water. In terms of future ownership and maintenance, where a

soakaway drains a single property, the ownership and maintenance would be the property owner's responsibility.

Exceedance Flow Route:

Where possible, exceedance flows should be directed away from buildings and into non-essential areas of the Site. The SuDS system recommended for the Site should provide enough storage that this method would only be utilized during a worst case scenario.

Foul water strategy

The foul water from the proposed development should be drained as sustainably as possible for the lifetime of the proposed buildings.

Proposed drainage regime

The proposals are to drain foul water from the development to the nearby public foul sewer located within Hillock Lane, subject to approval from Welsh Water. Where this is not possible foul water should be treated and infiltrated by a drainage field subject to approval from NRW.

Proposed drainage volumes

The proposed volume of foul water has been calculated using the British Water guidance "Flows and Loads - 4" based on the following:

Residential development (comprised of dwellings):

- 6 no. 1 bed dwelling (3P) = 18P
- 21 no. 2 bed dwelling (4P) = 84P
- 23 no. 3 bed dwelling (5P) = 115P
- 32 no. 4 bed dwelling (6P) = 192P
- 27 no. 5 bed dwelling (7P) = 189P

Total population (P) equals 598P which when multiplied by a reduction factor of 0.8 gives a final P of 478P, the equivalent of 71,700 litres and 71.7 m³ per day.

SuDS maintenance

The developer should ensure that any components not adopted by the water company are constructed as designed. They should also make arrangements to ensure their future operation and maintenance in perpetuity. These can include adoption by another body. The developer should provide details of these arrangements in their S104 application.

Regular maintenance is essential to ensure effective operation of the SuDS over the intended lifespan of the proposed development. The SuDS Manual (C753) (CIRIA, 2015) provides a maintenance schedule for SuDS with details of the necessary required actions as shown in the Table below and the following is recommended in line with Sewers for Adoption 8 (2018):

- Developers should engage early with the LA (both the Local Planning Authority (LPA) and the Lead Local Flood Authority (LLFA)) and the water company to agree a drainage strategy and maintenance plan, for any size development (i.e. major and minor), prior to making any planning or S104 application.
- If connection to a sewer is required for surface water, water companies will expect that, upon making a S104 application to adopt a sewer system, a developer will be able to present robust evidence discounting the discharge of surface water to ground via infiltration or to a watercourse for all or part of the site and that this evidence has been reviewed by the LLFA and accepted by the LPA.

Table 14: SuDS operation and recommended maintenance requirements

Asset type	Maintenance schedule (and frequency)	Maintenance responsibility
Rainwater Harvesting	Regular maintenance: • Inspection of tank for debris and sediment build up (annually and following poor performance). • Inspection of inlets, outlets, overflow areas, pumps and filters (annually and following poor performance). • Cleaning of tank, inlets, outlets, gutters, roof drain filters and withdrawal devices (annually or as required). Remedial actions: Repair or overflow erosion damage or damage to tank and associated components (as required)	Site owner.
Soakaways	Regular maintenance: • Remove sediment and debris from pretreatment and inspection chamber. Clean gutters, filters, downpipes. Trim roots prevent blockages (annually). • Reconstruct/ clean if performance deteriorates, replace clogged geotextile (as required) Monitoring: • Inspect inlets/outlets, silt traps – note rate of accumulation (monthly). • Check water levels and emptying time (annually).	Where soakaways drain a single property: Site owner. Where soakaways drain multiple properties: SAB.

Permeable Pavements	Regular maintenance: • Brushing and vacuuming (three times per year). • Trimming any roots and surrounding grass and weeds that may be causing blockages (annually or as required). Monitoring: • Initial inspection (monthly). Inspect for poor performance and inspection chambers (annually).	Where permeable paving drains a single property: Site owner. Where permeable paving drains multiple properties: SAB.
Swales	Regular maintenance: • Remove litter and debris from basin (monthly). • Trimming any roots and surrounding grass that may be causing blockages (monthly or as required). • Inspect inlets, outlets and overflows for blockages (monthly). • Remove and replace mulching (annually). • Inspect vegetation coverage (monthly for 6 months, quarterly for 2 years) • Inspect inlets, outlets and overflows for silt accumulation (monthly). Remedial Actions (as required) • Repair erosion or other damage • Relevel uneven surfaces • Remove build-up of sediment on upstream gravel trench, flow spreader or top of filter strip	SAB or highways.
Filter Strip	Regular maintenance: • Remove litter and debris from basin (monthly). • Trimming any roots and surrounding grass blockages (as required). Monitoring: Inspect inlets, outlets and overflows for blockages, (monthly or after a heavy storm). Inspect inlets and outlets for silt accumulation (half yearly). Inspect infiltration surfaces for compaction and ponding (monthly).	SAB or highways.

Infiltration basin	Regular maintenance: • Remove litter and debris from basin (annually). • Trimming any roots and surrounding grass that may be causing blockages (annually or as required). Monitoring: • Inspect inlets, outlets and overflows for blockages (monthly). • Inspect banksides, structures and pipework's for blockages (monthly). • Inspect infiltration surfaces for compaction and ponding (monthly).	SAB or highways.
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Client checklist

A drainage strategy has been recommended as suitable on the basis of the information provided. Prior to installation of the site drainage system it is recommended that the client carries out the following checks to confirm the development proposals. Geosmart would be able to support with any updates required to the drainage scheme, please contact us and we would be happy to provide you with a proposal to undertake the work.

Table 15: Potential SuDS limitations

Conditions in Draft National Standards (Welsh Government, 2018), limitations to infiltration SuDS	Do these conditions arise at the site?
Is the surface runoff greater than the rate at which water can infiltrate into the ground?	
Is there an unacceptable risk of ground instability?	
Is there an unacceptable risk of mobilising contaminants?	
Is there an unacceptable risk of pollution to groundwater?	
Is there an unacceptable risk of groundwater flooding?	
Is the infiltration system going to create a high risk of groundwater leakage to the combined sewer?	

Table 16: SuDS design considerations

Confirm that potential flooding on site in excess of the design storm event and exceedance flow routes have been considered.	
Review options for the control of discharge rates (e.g. hydrobrake).	
Confirm the owners/adopters of the drainage system. Consider management options for multiple owners.	
Is there an unacceptable risk of pollution to groundwater?	
Review access and way leave requirements.	
Review maintenance requirements.	

Health and safety considerations for SuDS

GeoSmart Pro reports may include outline strategies or designs to support with development plans. Any drawings or advice provided do not comprise any form of detailed design. Implementation of any conceptual scheme options may constitute 'Construction Work' as defined by CDM Regulations (2015).

The CDM Regulations place specific Health and Safety duties on those commissioning, planning and undertaking construction works. If you are uncertain what this means you should seek the advice of your architect, builder or other competent professional.

GeoSmart does not provide health and safety advisory services but we are required to advise you of your general responsibilities under CDM (visit <http://geosmartinfo.co.uk/knowledge-hub/cdm-2015/> for more information).

Please remember that detailed design work should be undertaken by a competent professional who might be your engineer, architect, builder or another competent party.

19. Methodology and limitations of study

This report assesses the feasibility of infiltration SuDS and alternative drainage strategies in support of the Site development process. From April 6th, 2015 SuDS are regulated by Local Planning Authorities and will be required under law for major developments in all cases unless demonstrated to be inappropriate. What is considered appropriate in terms of costs and benefits by the Planning Authority will vary depending on local planning policy, and Site setting. The Lead Local Flood Authority will require information as a statutory consultee on major planning applications with surface water drainage implications. The National Planning Policy Framework requires that new developments in areas at risk of flooding should give priority to the use of SuDS and demonstrate that the proposed development does not increase flood risk downstream to third parties.

How was the suitability of SuDS estimated for the Site?

There are a range of SuDS options available to provide effective surface water management that intercept and store excess runoff. When considering these options, the destination of the runoff should be assessed using the order of preference outlined in the Building Regulations Part H document (HM Government, 2010) and Sustainable Drainage Systems Standards for Wales (2018):

1. Discharge to the ground;
2. Discharge to a surface water body;
3. Discharge to a surface water sewer;
4. Discharge to a local highway drain; and
5. Discharge to a combined sewer.

Data sets relating to each of the potential discharge options have been analysed to assess the feasibility of each option according to the hierarchy set out above. Hydrogeological characteristics for the Site are assessed in conjunction with the occurrence of SPZ's to assess infiltration suitability. The Site has been screened to determine whether flood risk from groundwater, surface water, fluvial or coastal sources may constrain SuDS. The distance to surface water bodies and sewers has been reviewed gauge whether these provide alternative options.

GeoSmart SuDS Infiltration Suitability Map (SD50)

The GeoSmart SuDS Infiltration Suitability Map (SD50) screens the suitability for infiltration drainage in different parts of the Site and indicates where further assessment is recommended. In producing the SuDS Infiltration Suitability Map (SD50), GeoSmart used data from the British Geological Survey on groundwater levels, geology and permeability to screen for areas where infiltration SuDS may be suitable. The map classifies areas into 3 categories of High, Medium and Low suitability for infiltration SuDS. This can then be used in conjunction with additional data on Site constraints to give recommendations for SuDS design and further investigation.

The primary constraint on infiltration potential is the minimum permeability of the underlying material and in some cases the range in permeability may be considerable, ranging down to

low. The map classifies these areas as moderate infiltration suitability requiring further investigation. In cases where the thickness of the receiving permeable horizon is less than 1.5 meters then additional Site investigation is recommended. If the Site is at risk of groundwater flooding for up to the 1% annual occurrence the map classifies these areas as moderate infiltration suitability requiring further investigation.

The GeoSmart SuDS Infiltration Suitability Map (SD50) is a national screening tool for infiltration SuDS techniques but a Site specific assessment should be used before final detailed design is undertaken. Further information on the GeoSmart SuDS Infiltration Suitability Map (SD50) is available at www.geosmartinfo.co.uk.

How is the suitability to discharge to sewers and watercourses calculated?

The suitability to discharge to discharge to sewers and watercourses has been calculated using the distance from the Site to both. For example, where the Site is within 50 m of a surface water body. Discharge to surface water is potentially appropriate subject to land access arrangements and a feasibility assessment. Where the Site is within 50 m of a sewer, discharge to sewer is potentially appropriate subject to land access arrangements and a feasibility assessment. The utility company should be contacted to agree connection feasibility and sewer capacity.

Further information relating to sewers available in the area can be found in Appendix C in Section 24 of this report.

What is a Source Protection Zone?

The Environment Agency have defined Source Protection Zones (SPZs) for 2000 groundwater sources such as wells, boreholes and springs used for public drinking water supply. These zones show the risk of contamination from any activities that might cause pollution in the area. The closer the activity, the greater the risk. The maps show three main zones (inner, outer and total catchment) and a fourth zone of special interest, which is occasionally applied. The zones are used to set up pollution prevention measures in areas which are at a higher risk. The shape and size of a zone depends on the condition of the ground, how the groundwater is removed, and other environmental factors. Inner zone (Zone 1) is defined as the 50 day travel time from any point below the water table to the source (minimum radius of 50 metres). Outer zone (Zone 2) is defined by a 400 day travel time. Total catchment (Zone 3) is defined as the area around a source within which all groundwater recharge is presumed to be discharged at the source.

How was surface water runoff estimated from the site?

In accordance with The SuDS Manual (C753) (CIRIA, 2015), the Greenfield runoff from the Site has been calculated using the IoH124 method and is assumed representative of the runoff generated on the undeveloped surfaces that are affected by the proposed development. The method used for calculating the runoff complies with the NPPF (DGLC, 2014). For the impermeable surfaces, it has been assumed that 100% runoff will occur (calculations provided in Appendix B). Rainfall data is derived from the Flood Estimation Handbook (FEH) CD-ROM, developed by NERC (2009). Only areas affected by the proposed development are considered in the flow and volume calculations. Permeable areas that remain unchanged are

not included in the calculations as it is assumed these will not be actively drained and attenuated.

What is the peak discharge rate?

An estimation of peak runoff flow rate and volume is required to calculate infiltration, storage and discharge requirements. The peak discharge rate is the maximum flow rate at which surface water runoff leaves the site during a particular storm event, without considering the impact of any mitigation such as storage, infiltration or flow control. Proposed discharge rates (with mitigation) should be no greater than existing rates for all corresponding storm events. If all drainage is to infiltration there will be no discharge off site. Discharging all flow from site at the existing 1 in 100 event would increase flood risk during smaller events. Flow restriction is generally required to limit the final discharge from site during all events as a basic minimum to the green field QBAR rate. A more complex flow restriction which varies the final discharge rate from the site depending on the storm event will reduce the volume of storage required on site. Drainage to infiltration SuDS is subtracted from the total discharge off site to achieve a beneficial net affect.

What is the total discharge volume?

The total discharge volume is calculated on the basis of the surface water runoff that has the potential to leave the site as a result of the assumed 6 hour duration design storm event. The runoff is related to the underlying soil conditions, impermeable cover, rainfall intensity and duration of the storm event. The total volume generated by the current site is compared to the potential total volume from the developed site (not taking into consideration any mitigation). The difference provides the minimum total volume that will need to be stored and infiltrated on site or released at a controlled rate. Guidance indicates that the total discharge volume should never exceed the runoff volume from the development site prior to redevelopment for that event and should be as close as is reasonably practicable to the Greenfield runoff volume.

20. Background SuDS information

SuDS control surface water runoff close to where it falls. SuDS are designed to replicate, as closely as possible, the natural drainage from the Site before development to ensure that the flood risk downstream does not increase as a result of the Site being developed, and that the Site will have satisfactory drainage under current and likely future climatic conditions. SuDS provide opportunities to reduce the causes and impacts of flooding; remove pollutants from urban runoff at source; and combine water management with green space with benefits for amenity, recreation and wildlife. Government planning policy and planning decisions now include a presumption in favour of SuDS being used for all development Sites, unless they can be shown to be inappropriate.

For general information on SuDS see our web site: <http://geosmartinfo.co.uk/>.

Infiltration SuDS

Government policy for England is to introduce sustainable drainage systems (SuDS) via conditions in planning approvals. Guidance indicates that capturing rainfall runoff on site and infiltrating it into the ground (infiltration SuDS) is the preferred method for managing surface water without increasing flood risk downstream.

The greatest benefit to general flood risk is if all runoff is infiltrated on site, however, this may not be feasible due to physical and economic constraints in which case infiltration may be considered as a part of an integrated drainage solution. The final design capacity for an infiltration SuDS system depends on the site constraints and the requirements of the individual Planning Authority and the Lead Local Flood Authority.

The capacity of the ground to receive infiltration depends on the nature, thickness and permeability of the underlying material and the depth to the high groundwater table. The final proportion of the site drained by infiltration will depend on topography, outfall levels and a suitable drainage gradient. It is important to note that, even if the whole site cannot be drained by infiltration, the use of partial infiltration is encouraged, with the remainder of runoff discharged via other SuDS systems.

Types of infiltration SuDS

Infiltration components include infiltration trenches, soakaways, swales and infiltration basins without outlets, rain gardens and permeable pavements. These are used to capture surface water runoff and allow it to infiltrate (soak) and filter through to the subsoil layer, before returning it to the water table below.

An infiltration trench is usually filled with permeable granular material and is designed to promote infiltration of surface water to the ground. An infiltration basin is a dry basin or depression designed to promote infiltration of surface water runoff into the ground. Soakaways are the most common type of infiltration device in the UK where drainage is often connected to over-sized square or rectangular, rubble-filled voids sited beneath lawns. According to the guidance in Building Research Establishment (BRE) Digest 365 (2007) a soakaway must be able to discharge 50% of the runoff generated during a 1 in 10 year storm event within 24 hours in readiness for subsequent storm flow. This is the basic threshold criteria for a soakaway design and the internal surface area of the proposed soakaway design

options should be calculated on this basis by taking into account the soil infiltration rate for the Site.

Developers need to ensure their design takes account of the construction, operation and maintenance requirements of both surface and subsurface components, allowing for any machinery access required.

SuDS maintenance and adoption

Regular maintenance is essential to ensure effective operation of the soakaway(s) over the intended lifespan of the proposed development. A maintenance schedule for SuDS is required. Sewerage undertakers or Local Authorities may adopt SuDS and will require maintenance issues to be dealt with in accordance with their Management Plan. If the SuDS will not be adopted other provision is required with associated financial implications. Maintenance is a long-term obligation requiring the upkeep of all elements of the SuDS, including mechanical components (e.g. pumps), as well as inspections, regular maintenance and repair.

Additional background SuDS information can be found on our website:

<http://geosmartinfo.co.uk/>.

21. References and glossary

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Glossary³

Attenuation	Reduction of peak flow and increased duration of a flow event.
Combined sewer	A sewer designed to carry foul sewage and surface water in the same pipe.
Detention basin	A vegetated depression, normally is dry except after storm events, constructed to store water temporarily to attenuate flows. May allow infiltration of water to the ground.
Evapotranspiration	The process by which the Earth's surface or soil loses moisture by evaporation of water and by uptake and then transpiration from plants.
FEH	Flood Estimation Handbook, produced by Centre for Ecology and Hydrology, Wallingford (formerly the Institute of Hydrology).
Filter drain or trench	A linear drain consisting of a trench filled with a permeable material, often with a perforated pipe in the base of the trench to assist drainage, to store and conduct water, but may also be designed to permit infiltration.
First flush	The initial runoff from a site or catchment following the start of a rainfall event. As runoff travels over a catchment it will collect or dissolve pollutants, and the "first flush" portion of the flow may be the most contaminated as a result. This is especially the case for intense storms and in small or more uniform catchments. In larger or more complex catchments pollution.
Flood plain	Land adjacent to a watercourse that would be subject to repeated flooding under natural conditions (see Environment Agency's Policy and practice for the protection of flood plains for a fuller definition).
Greenfield runoff	This is the surface water runoff regime from a site before development, or the existing site conditions for brownfield redevelopment sites.
Impermeable surface	An artificial non-porous surface that generates a surface water runoff after rainfall.
Permeability	A measure of the ease with which a fluid can flow through a porous medium. It depends on the physical properties of the medium, for example grain size, porosity and pore shape.
Runoff	Water flow over the ground surface to the drainage system. This occurs if the ground is impermeable, is saturated or if rainfall is particularly intense.
Sewerage undertaker	This is a collective term relating to the statutory undertaking of water companies that are responsible for sewerage and sewage



	disposal including surface water from roofs and yards of premises.
Soakaway	A subsurface structure into which surface water is conveyed to allow infiltration into the ground.
Treatment	Improving the quality of water by physical, chemical and/or biological means.

3 The terms included in this glossary have been taken from CIRIA (2015) guidance.

22. Further information

Disclaimer

This report has been prepared by GeoSmart in its professional capacity as soil and groundwater specialists, with reasonable skill, care and diligence within the agreed scope and terms of contract and taking account of the manpower and resources devoted to it by agreement with its client and is provided by GeoSmart solely for the internal use of its client.

The advice and opinions in this report should be read and relied on only in the context of the report as a whole, taking account of the terms of reference agreed with the client. The findings are based on the information made available to GeoSmart at the date of the report (and will have been assumed to be correct) and on current UK standards, codes, technology and practices as at that time. They do not purport to include any manner of legal advice or opinion. New information or changes in conditions and regulatory requirements may occur in future, which will change the conclusions presented here.

This report is confidential to the client. The client may submit the report to regulatory bodies, where appropriate. Should the client wish to release this report to any other third party for that party's reliance, GeoSmart may, by prior written agreement, agree to such release, provided that it is acknowledged that GeoSmart accepts no responsibility of any nature to any third party to whom this report or any part thereof is made known. GeoSmart accepts no responsibility for any loss or damage incurred as a result, and the third party does not acquire any rights whatsoever, contractual or otherwise, against GeoSmart except as expressly agreed with GeoSmart in writing.

Further information

Information on confidence levels and ways to improve this report can be provided for any location on written request to info@geosmartinfo.co.uk or via our website. Updates to our model are ongoing and additional information is being collated from several sources to improve the database and allow increased confidence in the findings. Further information on groundwater levels and flooding are being incorporated in the model to enable improved accuracy to be achieved in future versions of the map. Please contact us if you would like to join our User Group and help with feedback on infiltration SuDS and mapping suggestion.

Important consumer protection information

This search has been produced by GeoSmart Information Limited, Suite 9-11, 1st Floor, Old Bank Buildings, Bellstone, Shrewsbury, SY1 1HU.

Tel: 01743 298 100

Email: info@geosmartinfo.co.uk

GeoSmart Information Ltd is registered with the Property Codes Compliance Board (PCCB) as a subscriber to the Search Code. The PCCB independently monitors how registered search firms maintain compliance with the Code.

The Search Code:

- provides protection for homebuyers, sellers, estate agents, conveyancers and mortgage lenders who rely on the information included in property search reports undertaken by subscribers on residential and commercial property within the United Kingdom,
- sets out minimum standards which firms compiling and selling search reports have to meet,
- promotes the best practice and quality standards within the industry for the benefit of consumers and property professionals,
- enables consumers and property professionals to have confidence in firms which subscribe to the code, their products and services, and
- by giving you this information, the search firm is confirming that they keep to the principles of the Code. This provides important protection for you.

The Code's core principles

Firms which subscribe to the Search Code will:

- display the Search Code logo prominently on their search reports,
- act with integrity and carry out work with due skill, care and diligence,
- at all times maintain adequate and appropriate insurance to protect consumers,
- conduct business in an honest, fair and professional manner,
- handle complaints speedily and fairly,
- ensure that products and services comply with industry registration rules and standards and relevant laws, and
- monitor their compliance with the Code.

Complaints

If you have a query or complaint about your search, you should raise it directly with the search firm, and if appropriate ask for any complaint to be considered under their formal internal complaints procedure. If you remain dissatisfied with the firm's final response, after your complaint has been formally considered, or if the firm has exceeded the response timescales, you may refer your complaint for consideration under The Property Ombudsman scheme (TPOs). The Ombudsman can award compensation of up to £5,000 to you if he finds that you have suffered actual loss as a result of your search provider failing to keep to the Code.

Please note that all queries or complaints regarding your search should be directed to your search provider in the first instance, not to TPOs or to the PCCB.

TPOs contact details:

The Property Ombudsman scheme

Milford House, 43-55 Milford Street, Salisbury, Wiltshire SP1 2BP

Tel: 01722 333306 Fax: 01722 332296 Email: admin@tpos.co.uk

You can get more information about the PCCB from www.propertycodes.org.uk.

Please ask your search provider if you would like a copy of the search code.

GeoSmart Complaints procedure

GeoSmart Information Limited is registered with the Property Codes Compliance Board as a subscriber to the Search Code. A key commitment under the Code is that firms will handle any complaints both speedily and fairly.

If you want to make a complaint, we will:

- Acknowledge it within 5 working days of receipt.
- Normally deal with it fully and provide a final response, in writing, within 20 working days of receipt.
- Keep you informed by letter, telephone or e-mail, as you prefer, if we need more time.
- Provide a final response, in writing, at the latest within 40 working days of receipt.
- Liaise, at your request, with anyone acting formally on your behalf.

If you are not satisfied with our final response, or if we exceed the response timescales, you may refer the complaint to The Property Ombudsman scheme (TPOs): Tel: 01722 333306, E-mail: admin@tpos.co.uk. We will co-operate fully with the Ombudsman during an investigation and comply with his final decision.

Complaints should be sent to:

Alan White
Operations Manager
GeoSmart Information Limited
Suite 9-11, 1st Floor,
Old Bank Buildings,
Bellstone,
Shrewsbury,
SY1 1HU
alanwhite@geosmartinfo.co.uk

23. Terms and conditions, CDM regulations and data limitations

Terms and conditions can be found on our website:

<http://geosmartinfo.co.uk/terms-conditions/>

CDM regulations can be found on our website:

<http://geosmartinfo.co.uk/knowledge-hub/cdm-2015/>

Data use and limitations can be found on our website:

<http://geosmartinfo.co.uk/data-limitations/>

24. Appendices

Appendix A

Site plans

Affordable Housing Provision

28 No. (25% of 109 No. Residential Units)

Comprising	
1 Bed Apartment	6
2 Bed Apartment	6
2 Bed Semi-Detached House	8
2 Bed Mid-Terrace House	0
3 Bed Mid-Terrace House	1
3 Bed End-Terrace House	2
3 Bed Semi-Detached House	4
4 Bed Detached House	1
5 Bed Detached House	0

Group 1	9 No.	06 07 08 09 10 11 12 13 & 14
Group 2	6 No.	25 26 27 28 29 & 30
Group 3	3 No.	46 47 & 48
Group 4	2 No.	67 & 68
Group 5	2 No.	75 & 76
Group 6	6 No.	90 91 92 93 & 94.

Affordable Housing Units



4 No. Apartments with communal garden space, parking and bin storage.

Existing tree T11 (A), located in garden of plot 88, to be retained.

New hedgerow to be planted along East Boundary.

Existing tree T9 (C), located in garden of plot 83, to be retained.

New planted hedgerow border strip to extend into new hedgerow along North boundary.

Area H. Open green space boundary footpath with planted hedgerow border strip along South and West boundaries.
1106.3m2 0.11063 Hectares

Overall Application Site Area
6.7134 Hectares (67134 m2)

Public Green Space

(Area required 0.4 Hectares per 50 houses)
0.8720 Hectares (8720 m2) Area Required
1.4236 Hectares (14236 m2) Area Provided

Development Land Area

(Area of application site excluding Public Green Space)
5.2898 Hectares (52898 m2)

Housing Density (Houses per Hectare)

109 Houses / Apartments
20.60 Housing Density for Development Site Area
16.23 Housing Density for overall Application Site Area

Area A. Site boundary and Footpath / Emergency Access Route
602.0m2 0.0602 Hectares

Proposed Priority Giveway arrangement with pedestrian crossing, road markings and Signage

2.4x43M Visibility Spay
Line of existing Footpath Kirb Line

New footpath to tie into existing.

3.5m wide emergency access route with bollards

Existing road widened with new road junction for site entrance.
8m wide Carriageway with R10.0m Rad. Kirb
K2.4x43M Visibility Spay to both sides.
For new junction see Engineers drawings for full details of road layout, markings and Signage.

New pavement with R6.0M at corner of Stancliff Avenue and 2.4x43M Visibility Spay with 1m offset into carriageway

Current 'SLOW' road markings in front of Sub Station to be relocated East of proposed access road. see engineers dwg.

Area B. Public green space / site boundary
140.7m2 0.01407 Hectares

Existing Elec. Sub Station with overhead wire in Easement along site boundary.

Existing trees and hedgerow along East boundary to be retained.

Area C. Open Green Space
321.0m2 0.0321 Hectares

Area D. Open Green Space / Footpath
2998.8m2 0.29988 Hectares

Area E. Open Green Space
8088.1m2 0.8088.1 Hectares

Area F. Open Green Space / Perimeter Footpath
541.9m2 0.05419 Hectares

Area G. Open green space boundary footpath with planted hedgerow border strip along South boundary
0.437.9m2 0.04379 Hectares

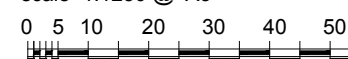
Public green space with public footpath and hedgerow along south boundary.

Public green space with new public footpath link to existing footpath route.

GA SITE PLAN:

Proposed Housing Development Accommodation.

scale 1:1250 @ A3

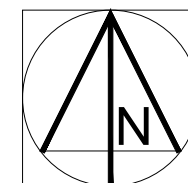


KEY: House Types

6 No.	1 Bed Apartment	Apartment Type 2 - Ground Floor 43.16 m2 (464 sq ft) 1.5 Parking Space per apartment
6 No. 1 Bed	2 Bed Apartment	Apartment Type 1 - Ground Floor 49.41 m2 (531 sq ft) overall area 47.91 m2 (515 sq ft) First Floor 1.5 Parking Space per apartment
6 No.	2 Bed Apartment	Apartment Type 3 - First Floor 64.60 m2 (678 sq ft) overall area 61.58 m2 (662 sq ft) First Floor 2 Parking Spaces
1 No.	2 Bed Mid-Terrace	Apartment Type 4 - First Floor 72.65m2 (781 sq ft) overall area 2 Parking Spaces
14 No.	2 Bed Semi	2 Bedroom 82.25m2 (885 sq ft) 81.08m2 (872 sq ft) 2 Parking Spaces
21 No. 2 Bed	3 Bed Mid-Terrace	3 Bedroom Mid-Terrace 93.77 m2 (1009 sq ft) 3 Parking Spaces
4 No.	3 Bed End-Terrace	3 Bedroom End-Terrace 88.68 m2 (954 sq ft) 3 Parking Spaces
18 No.	3 Bed Semi	3 Bedroom 90.51m2 (974 sq ft) 3 Parking Spaces plus detached Garage
23 No. 3 Bed	4 Bed Detached	4 Bedroom - including garage 143.9 m2 (1546 sq ft) 3 Parking Spaces plus integral Garage
10 No.	4 Bed Detached	4 Bedroom 145.3 m2 (1564 sq ft) 3 Parking Spaces plus detached Garage
22 No.	5 Bed Detached	5 Bedroom 177 m2 (1905 sq ft) 4 Parking Spaces plus detached Double Garage
32 No. 4 Bed	5 Bed Detached	5 Bedroom 177 m2 (1905 sq ft) 4 Parking Spaces plus detached Double Garage
27 No.	5 Bed Detached	5 Bedroom 177 m2 (1905 sq ft) 4 Parking Spaces plus detached Double Garage
27 No. 5 Bed	5 Bed Detached	5 Bedroom 177 m2 (1905 sq ft) 4 Parking Spaces plus detached Double Garage
109 No. Residential Total		

Existing trees and bushes, (G6# Arboricultural report) along field boundary, to be retained

Existing trees and hedgerow bushes, along existing field boundary, to be retained



PLANNING DRAWING

owen ellis
Architects

Honeycomb, Edmund Street
Liverpool L3 9NG
TEL: 0151 227 1555
email: info@owenellis.co.uk
web: www.owenellis.co.uk

Housing Development
Land off Hillock Lane, Gresford

GA Site Plan
Proposed Housing Development Accommodation

DRAWING NUMBER	REVISION	DATE
4124 / SK 19	-	April 2020
		SCALE 1:1250 @ A3

Appendix B

Rainfall runoff calculations

Tumu Consulting		Page 0
20 East Sands	19146 Gresford, Wrexham	
Burbage Marlborough	Prelim Drainage Design	
Wiltshire SN8 3AN	19146-SW-NT 1-B	
Date 19/06/2020 08:10	Designed by jason	
File 19146-SW-NT 1-B_DRAINAGE	Checked by	
Micro Drainage	Network 2018.1	

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for 19146-SW-NT 1-B DRAINAGE STRATEGY.SWS

Pipe Sizes 162686_SWS_NT1_C Manhole Sizes 162686_SWS_NT1_C

FSR Rainfall Model - England and Wales			
Return Period (years)	2	PIMP (%)	100
M5-60 (mm)	18.000	Add Flow / Climate Change (%)	0
Ratio R	0.342	Minimum Backdrop Height (m)	0.200
Maximum Rainfall (mm/hr)	50	Maximum Backdrop Height (m)	0.000
Maximum Time of Concentration (mins)	30	Min Design Depth for Optimisation (m)	1.200
Foul Sewage (l/s/ha)	0.000	Min Vel for Auto Design only (m/s)	0.75
Volumetric Runoff Coeff.	0.750	Min Slope for Optimisation (1:X)	500

Designed with Level Soffits

Time Area Diagram for 19146-SW-NT 1-B DRAINAGE STRATEGY.SWS

Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.201	4-8	0.577	8-12	0.084

Total Area Contributing (ha) = 0.862

Total Pipe Volume (m³) = 42.635

Network Design Table for 19146-SW-NT 1-B DRAINAGE STRATEGY.SWS

« - Indicates pipe capacity < flow

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S1.000	55.367	0.326	170.0	0.039	5.00	0.0	0.600	o	225	Pipe/Conduit	
S1.001	65.231	0.384	170.0	0.039	0.00	0.0	0.600	o	225	Pipe/Conduit	
S1.002	26.603	0.156	170.0	0.039	0.00	0.0	0.600	o	225	Pipe/Conduit	
S1.003	82.153	0.483	170.0	0.039	0.00	0.0	0.600	o	225	Pipe/Conduit	
S2.000	23.640	0.139	170.0	0.039	5.00	0.0	0.600	o	225	Pipe/Conduit	
S2.001	51.000	0.300	170.0	0.039	0.00	0.0	0.600	o	225	Pipe/Conduit	
S2.002	11.308	0.094	120.0	0.039	0.00	0.0	0.600	o	225	Pipe/Conduit	
S2.003	27.819	0.164	170.0	0.039	0.00	0.0	0.600	o	225	Pipe/Conduit	
S2.004	36.321	0.214	169.7	0.039	0.00	0.0	0.600	o	300	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S1.000	50.00	5.92	74.400	0.039	0.0	0.0	0.0	1.00	39.8	5.3
S1.001	50.00	7.01	74.074	0.078	0.0	0.0	0.0	1.00	39.8	10.6
S1.002	49.04	7.45	73.691	0.117	0.0	0.0	0.0	1.00	39.8	15.5
S1.003	45.21	8.82	73.534	0.156	0.0	0.0	0.0	1.00	39.8	19.1
S2.000	50.00	5.39	73.550	0.039	0.0	0.0	0.0	1.00	39.8	5.3
S2.001	50.00	6.24	73.411	0.078	0.0	0.0	0.0	1.00	39.8	10.6
S2.002	50.00	6.40	73.111	0.117	0.0	0.0	0.0	1.19	47.4	15.8
S2.003	50.00	6.87	73.017	0.156	0.0	0.0	0.0	1.00	39.8	21.1
S2.004	49.30	7.37	72.778	0.195	0.0	0.0	0.0	1.20	85.1	26.0

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Network Design Table for 19146-SW-NT 1-B DRAINAGE STRATEGY.SWS

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S1.004	27.063	0.159	170.0	0.039	0.00	0.0	0.600	o	300	Pipe/Conduit	
S1.005	16.222	0.295	55.0	0.039	0.00	0.0	0.600	o	300	Pipe/Conduit	
S1.006	28.887	0.222	130.0	0.039	0.00	0.0	0.600	o	300	Pipe/Conduit	
S1.007	23.754	0.183	130.0	0.039	0.00	0.0	0.600	o	300	Pipe/Conduit	
S1.008	18.241	0.912	20.0	0.039	0.00	0.0	0.600	o	300	Pipe/Conduit	
S1.009	22.501	0.132	170.5	0.039	0.00	0.0	0.600	o	300	Pipe/Conduit	
S3.000	54.285	0.319	170.0	0.039	5.00	0.0	0.600	o	225	Pipe/Conduit	
S3.001	29.121	0.171	170.0	0.039	0.00	0.0	0.600	o	225	Pipe/Conduit	
S3.002	27.288	0.161	170.0	0.039	0.00	0.0	0.600	o	225	Pipe/Conduit	
S3.003	13.170	0.077	170.0	0.039	0.00	0.0	0.600	o	225	Pipe/Conduit	
S3.004	73.743	0.434	170.0	0.037	0.00	0.0	0.600	o	225	Pipe/Conduit	
S4.000	42.759	0.252	170.0	0.084	5.00	0.0	0.600	o	225	Pipe/Conduit	
S3.005	45.594	0.456	100.0	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
S3.006	52.095	0.521	100.0	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
S3.007	24.662	0.493	50.0	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
S3.008	28.743	0.169	170.0	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
S1.010	16.978	0.017	1000.0	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S1.004	44.29	9.20	72.564	0.390	0.0	0.0	0.0	1.20	85.0	46.8
S1.005	43.98	9.33	72.405	0.429	0.0	0.0	0.0	2.12	150.2	51.1
S1.006	43.17	9.67	72.110	0.468	0.0	0.0	0.0	1.38	97.4	54.7
S1.007	42.53	9.96	71.888	0.507	0.0	0.0	0.0	1.38	97.4	58.4
S1.008	42.34	10.05	71.705	0.546	0.0	0.0	0.0	3.53	249.6	62.6
S1.009	41.68	10.36	70.793	0.585	0.0	0.0	0.0	1.20	84.9	66.0
S3.000	50.00	5.90	74.000	0.039	0.0	0.0	0.0	1.00	39.8	5.3
S3.001	50.00	6.39	73.681	0.078	0.0	0.0	0.0	1.00	39.8	10.6
S3.002	50.00	6.85	73.509	0.117	0.0	0.0	0.0	1.00	39.8	15.8
S3.003	50.00	7.06	73.349	0.156	0.0	0.0	0.0	1.00	39.8	21.1
S3.004	46.61	8.29	73.271	0.193	0.0	0.0	0.0	1.00	39.8	24.4
S4.000	50.00	5.71	72.550	0.084	0.0	0.0	0.0	1.00	39.8	11.4
S3.005	45.08	8.88	72.298	0.277	0.0	0.0	0.0	1.31	52.0	33.8
S3.006	43.48	9.54	71.843	0.277	0.0	0.0	0.0	1.31	52.0	33.8
S3.007	42.97	9.76	71.322	0.277	0.0	0.0	0.0	1.85	73.7	33.8
S3.008	41.93	10.24	70.828	0.277	0.0	0.0	0.0	1.00	39.8	33.8
S1.010	40.51	10.94	70.500	0.862	0.0	0.0	0.0	0.49	34.6	94.6

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Area Summary for 19146-SW-NT 1-B DRAINAGE STRATEGY.SWS

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
1.000	-	-	100	0.039	0.039	0.039
1.001	-	-	100	0.039	0.039	0.039
1.002	-	-	100	0.039	0.039	0.039
1.003	-	-	100	0.039	0.039	0.039
2.000	-	-	100	0.039	0.039	0.039
2.001	-	-	100	0.039	0.039	0.039
2.002	-	-	100	0.039	0.039	0.039
2.003	-	-	100	0.039	0.039	0.039
2.004	-	-	100	0.039	0.039	0.039
1.004	-	-	100	0.039	0.039	0.039
1.005	-	-	100	0.039	0.039	0.039
1.006	-	-	100	0.039	0.039	0.039
1.007	-	-	100	0.039	0.039	0.039
1.008	-	-	100	0.039	0.039	0.039
1.009	-	-	100	0.039	0.039	0.039
3.000	-	-	100	0.039	0.039	0.039
3.001	-	-	100	0.039	0.039	0.039
3.002	-	-	100	0.039	0.039	0.039
3.003	-	-	100	0.039	0.039	0.039
3.004	-	-	100	0.037	0.037	0.037
4.000	-	-	100	0.084	0.084	0.084
3.005	-	-	100	0.000	0.000	0.000
3.006	-	-	100	0.000	0.000	0.000
3.007	-	-	100	0.000	0.000	0.000
3.008	-	-	100	0.000	0.000	0.000
1.010	-	-	100	0.000	0.000	0.000
				Total	Total	Total
				0.862	0.862	0.862

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Network Classifications for 19146-SW-NT 1-B DRAINAGE STRATEGY.SWS

PN	USMH Name	Pipe Dia (mm)	Min Cover Depth (m)	Max Cover Depth (m)	Pipe Type	MH Dia (mm)	MH Width (mm)	MH Ring Depth (m)	MH Type
S1.000	S1	225	0.919	2.085	Unclassified	1240	675	0.919	Unclassified
S1.001	S2	225	1.541	2.085	Unclassified	1200	0	2.085	Unclassified
S1.002	S3	225	1.315	1.541	Unclassified	1200	0	1.541	Unclassified
S1.003	S4	225	1.116	1.315	Unclassified	1240	675	1.315	Unclassified
S2.000	S13	225	1.212	1.306	Unclassified	1240	675	1.225	Unclassified
S2.001	S14	225	0.900	1.243	Unclassified	1240	675	1.212	Unclassified
S2.002	S15	225	0.894	0.900	Unclassified	1240	675	0.900	Unclassified
S2.003	S16	225	0.900	1.571	Unclassified	1240	675	0.900	Unclassified
S2.004	S17	300	1.492	1.571	Unclassified	1200	0	1.571	Unclassified
S1.004	S5	300	1.087	1.528	Unclassified	1200	0	1.528	Unclassified
S1.005	S6	300	0.913	1.087	Unclassified	1240	675	1.087	Unclassified
S1.006	S7	300	0.834	1.419	Unclassified	1240	675	0.913	Unclassified
S1.007	S8	300	1.419	1.995	Unclassified	1240	675	1.419	Unclassified
S1.008	S9	300	0.907	1.995	Unclassified	1200	0	1.995	Unclassified
S1.009	S10	300	0.907	1.039	Unclassified	1240	675	0.907	Unclassified
S3.000	S18	225	1.006	1.227	Unclassified	1240	675	1.227	Unclassified
S3.001	S19	225	1.033	1.257	Unclassified	1240	675	1.033	Unclassified
S3.002	S20	225	1.257	1.926	Unclassified	1240	675	1.257	Unclassified
S3.003	S21	225	1.926	2.004	Unclassified	1200	0	1.926	Unclassified
S3.004	S22	225	0.937	2.004	Unclassified	1200	0	2.004	Unclassified
S4.000	S27	225	1.225	1.477	Unclassified	1240	675	1.225	Unclassified
S3.005	S23	225	0.932	1.477	Unclassified	1240	675	1.477	Unclassified
S3.006	S24	225	0.932	0.953	Unclassified	1240	675	0.932	Unclassified
S3.007	S25	225	0.947	0.953	Unclassified	1240	675	0.953	Unclassified
S3.008	S26	225	0.947	1.116	Unclassified	1240	675	0.947	Unclassified
S1.010	S11	300	1.200	1.217	Unclassified	1240	675	1.200	Unclassified

Free Flowing Outfall Details for 19146-SW-NT 1-B DRAINAGE STRATEGY.SWS

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
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S1.010	S12	72.000	70.483	0.000	0	0
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Simulation Criteria for 19146-SW-NT 1-B DRAINAGE STRATEGY.SWS

Volumetric Runoff Coeff	0.750	Additional Flow - % of Total Flow	0.000
Areal Reduction Factor	1.000	MADD Factor * 10m ³ /ha Storage	2.000
Hot Start (mins)	0	Inlet Coefficient	0.800
Hot Start Level (mm)	0	Flow per Person per Day (l/per/day)	0.000
Manhole Headloss Coeff (Global)	0.500	Run Time (mins)	60
Foul Sewage per hectare (l/s)	0.000	Output Interval (mins)	1

Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 0
Number of Online Controls 1 Number of Storage Structures 1 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Summer
Return Period (years)	2	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	18.000	Storm Duration (mins)	30
Ratio R	0.342		

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Storage Structures for 19146-SW-NT 1-B DRAINAGE STRATEGY.SWS

Infiltration Basin Manhole: S11, DS/PN: S1.010

Invert Level (m) 70.500 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.09000 Porosity 1.00
Infiltration Coefficient Side (m/hr) 0.09000

Depth (m)	Area (m ²)	Depth (m)	Area (m ²)
0.000	216.0	1.500	686.0

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1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for 19146-SW-NT 1-B DRAINAGE STRATEGY.SWS

Simulation Criteria

Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 0.000
Hot Start (mins) 0 MADD Factor * 10m³/ha Storage 2.000
Hot Start Level (mm) 0 Inlet Coefficient 0.800
Manhole Headloss Coeff (Global) 0.500 Flow per Person per Day (l/per/day) 0.000
Foul Sewage per hectare (l/s) 0.000

Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 0
Number of Online Controls 1 Number of Storage Structures 1 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR M5-60 (mm) 18.000 Cv (Summer) 0.750
Region England and Wales Ratio R 0.341 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0
Analysis Timestep 2.5 Second Increment (Extended)
DTS Status ON
DVD Status OFF
Inertia Status OFF

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440
Return Period(s) (years) 1, 30, 100
Climate Change (%) 0, 0, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water	Surcharged
									Level (m)	Depth (m)
S1.000	S1	15 Winter	1	+0%	100/15 Winter				74.452	-0.173
S1.001	S2	15 Winter	1	+0%	100/15 Summer				74.145	-0.155
S1.002	S3	15 Winter	1	+0%	100/15 Summer				73.777	-0.139
S1.003	S4	15 Winter	1	+0%	100/15 Summer				73.631	-0.128
S2.000	S13	15 Winter	1	+0%	100/15 Summer				73.603	-0.172
S2.001	S14	15 Winter	1	+0%	100/15 Summer				73.483	-0.153
S2.002	S15	15 Winter	1	+0%	100/15 Summer				73.195	-0.141
S2.003	S16	15 Winter	1	+0%	30/15 Summer				73.119	-0.123
S2.004	S17	15 Winter	1	+0%	100/15 Summer				72.879	-0.199
S1.004	S5	15 Winter	1	+0%	30/15 Summer				72.710	-0.154
S1.005	S6	15 Winter	1	+0%	100/15 Summer				72.519	-0.186
S1.006	S7	15 Winter	1	+0%	30/15 Summer				72.257	-0.153
S1.007	S8	15 Winter	1	+0%	30/15 Summer				72.042	-0.146
S1.008	S9	15 Winter	1	+0%	100/15 Winter				71.801	-0.204
S1.009	S10	15 Winter	1	+0%	30/15 Summer				70.974	-0.119
S3.000	S18	15 Winter	1	+0%	100/15 Summer				74.052	-0.173
S3.001	S19	15 Winter	1	+0%	100/15 Summer				73.752	-0.153
S3.002	S20	15 Winter	1	+0%	30/15 Summer				73.598	-0.137
S3.003	S21	15 Winter	1	+0%	30/15 Summer				73.455	-0.119
S3.004	S22	15 Winter	1	+0%	30/15 Summer				73.383	-0.113
S4.000	S27	15 Winter	1	+0%	30/15 Winter				72.629	-0.146
S3.005	S23	15 Winter	1	+0%	30/15 Summer				72.418	-0.106
S3.006	S24	15 Winter	1	+0%	30/15 Summer				71.960	-0.108
S3.007	S25	15 Winter	1	+0%	30/15 Winter				71.419	-0.127
S3.008	S26	15 Winter	1	+0%	30/15 Summer				70.969	-0.084
S1.010	S11	360 Winter	1	+0%	1/120 Winter				70.834	0.034

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1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for 19146-SW-NT 1-B DRAINAGE STRATEGY.SWS

PN	US/MH Name	Flooded		Pipe		Status	Level Exceeded
		Volume (m³)	Flow / Cap.	Overflow (l/s)	Flow (l/s)		
S1.000	S1	0.000	0.12		4.4	OK	
S1.001	S2	0.000	0.21		7.9	OK	
S1.002	S3	0.000	0.31		11.4	OK	
S1.003	S4	0.000	0.38		14.9	OK	
S2.000	S13	0.000	0.12		4.5	OK	
S2.001	S14	0.000	0.21		8.1	OK	
S2.002	S15	0.000	0.29		11.8	OK	
S2.003	S16	0.000	0.42		15.5	OK	
S2.004	S17	0.000	0.24		19.0	OK	
S1.004	S5	0.000	0.48		36.5	OK	
S1.005	S6	0.000	0.31		39.4	OK	
S1.006	S7	0.000	0.48		42.2	OK	
S1.007	S8	0.000	0.52		45.1	OK	
S1.008	S9	0.000	0.22		47.7	OK	
S1.009	S10	0.000	0.67		50.3	OK	
S3.000	S18	0.000	0.12		4.4	OK	
S3.001	S19	0.000	0.22		8.2	OK	
S3.002	S20	0.000	0.32		11.8	OK	
S3.003	S21	0.000	0.45		15.5	OK	
S3.004	S22	0.000	0.49		18.9	OK	
S4.000	S27	0.000	0.26		9.7	OK	
S3.005	S23	0.000	0.54		27.0	OK	
S3.006	S24	0.000	0.53		26.5	OK	
S3.007	S25	0.000	0.39		26.5	OK	
S3.008	S26	0.000	0.71		26.4	OK	
S1.010	S11	0.000	0.00		0.0	SURCHARGED	

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30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for 19146-SW-NT 1-B DRAINAGE STRATEGY.SWS

Simulation Criteria

Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 0.000
 Hot Start (mins) 0 MADD Factor * 10m³/ha Storage 2.000
 Hot Start Level (mm) 0 Inlet Coefficient 0.800
 Manhole Headloss Coeff (Global) 0.500 Flow per Person per Day (l/per/day) 0.000
 Foul Sewage per hectare (l/s) 0.000

Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 0
 Number of Online Controls 1 Number of Storage Structures 1 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR M5-60 (mm) 18.000 Cv (Summer) 0.750
 Region England and Wales Ratio R 0.341 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0
 Analysis Timestep 2.5 Second Increment (Extended)
 DTS Status ON
 DVD Status OFF
 Inertia Status OFF

Profile(s) Summer and Winter
 Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440
 Return Period(s) (years) 1, 30, 100
 Climate Change (%) 0, 0, 40

										Water	Surcharged
PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surge	First (Y) Flood	First (Z) Overflow	Overflow Act.		Level (m)	Depth (m)
S1.000	S1	15 Winter	30	+0%	100/15 Winter					74.484	-0.141
S1.001	S2	15 Winter	30	+0%	100/15 Summer					74.198	-0.101
S1.002	S3	15 Winter	30	+0%	100/15 Summer					73.851	-0.064
S1.003	S4	15 Winter	30	+0%	100/15 Summer					73.747	-0.012
S2.000	S13	15 Winter	30	+0%	100/15 Summer					73.636	-0.139
S2.001	S14	15 Winter	30	+0%	100/15 Summer					73.538	-0.098
S2.002	S15	15 Winter	30	+0%	100/15 Summer					73.322	-0.014
S2.003	S16	15 Winter	30	+0%	30/15 Summer					73.266	0.024
S2.004	S17	15 Winter	30	+0%	100/15 Summer					72.999	-0.079
S1.004	S5	15 Winter	30	+0%	30/15 Summer					72.923	0.059
S1.005	S6	15 Winter	30	+0%	100/15 Summer					72.690	-0.015
S1.006	S7	15 Winter	30	+0%	30/15 Summer					72.528	0.118
S1.007	S8	15 Winter	30	+0%	30/15 Summer					72.248	0.060
S1.008	S9	15 Winter	30	+0%	100/15 Winter					71.856	-0.149
S1.009	S10	15 Winter	30	+0%	30/15 Summer					71.255	0.163
S3.000	S18	15 Winter	30	+0%	100/15 Summer					74.084	-0.141
S3.001	S19	15 Winter	30	+0%	100/15 Summer					73.819	-0.087
S3.002	S20	15 Winter	30	+0%	30/15 Summer					73.776	0.041
S3.003	S21	15 Winter	30	+0%	30/15 Summer					73.694	0.121
S3.004	S22	15 Winter	30	+0%	30/15 Summer					73.612	0.116
S4.000	S27	15 Winter	30	+0%	30/15 Winter					72.825	0.050
S3.005	S23	15 Winter	30	+0%	30/15 Summer					72.783	0.260
S3.006	S24	15 Winter	30	+0%	30/15 Summer					72.193	0.126
S3.007	S25	15 Winter	30	+0%	30/15 Winter					71.554	0.007
S3.008	S26	30 Winter	30	+0%	30/15 Summer					71.243	0.190
S1.010	S11	360 Winter	30	+0%	1/120 Winter					71.226	0.426

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Micro Drainage	Network 2018.1	

30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for 19146-SW-NT 1-B DRAINAGE STRATEGY.SWS

PN	US/MH Name	Flooded		Pipe		Status	Level Exceeded
		Volume (m³)	Flow / Overflow Cap. (l/s)	Flow (l/s)			
S1.000	S1	0.000	0.28	10.8		OK	
S1.001	S2	0.000	0.54	20.7		OK	
S1.002	S3	0.000	0.83	30.5		OK	
S1.003	S4	0.000	1.00	38.7		OK	
S2.000	S13	0.000	0.30	11.1		OK	
S2.001	S14	0.000	0.58	22.0		OK	
S2.002	S15	0.000	0.78	31.2		OK	
S2.003	S16	0.000	1.08	40.0		SURCHARGED	
S2.004	S17	0.000	0.61	47.5		OK	
S1.004	S5	0.000	1.20	91.6		SURCHARGED	
S1.005	S6	0.000	0.74	94.5		OK	
S1.006	S7	0.000	1.12	98.6		SURCHARGED	
S1.007	S8	0.000	1.18	102.4		SURCHARGED	
S1.008	S9	0.000	0.50	106.9		OK	
S1.009	S10	0.000	1.51	113.5		SURCHARGED	
S3.000	S18	0.000	0.28	10.8		OK	
S3.001	S19	0.000	0.57	21.2		OK	
S3.002	S20	0.000	0.76	28.0		SURCHARGED	
S3.003	S21	0.000	1.04	35.8		SURCHARGED	
S3.004	S22	0.000	1.13	43.5		SURCHARGED	
S4.000	S27	0.000	0.61	22.9		SURCHARGED	
S3.005	S23	0.000	1.17	58.1		SURCHARGED	
S3.006	S24	0.000	1.12	55.7		SURCHARGED	
S3.007	S25	0.000	0.80	54.4		SURCHARGED	
S3.008	S26	0.000	1.40	52.0		SURCHARGED	
S1.010	S11	0.000	0.00	0.0		SURCHARGED	

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Micro Drainage		Network 2018.1

100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for 19146-SW-NT 1-B DRAINAGE STRATEGY.SWS

Simulation Criteria

Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 0.000
Hot Start (mins) 0 MADD Factor * 10m³/ha Storage 2.000
Hot Start Level (mm) 0 Inlet Coefficient 0.800
Manhole Headloss Coeff (Global) 0.500 Flow per Person per Day (l/per/day) 0.000
Foul Sewage per hectare (l/s) 0.000

Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 0
Number of Online Controls 1 Number of Storage Structures 1 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR M5-60 (mm) 18.000 Cv (Summer) 0.750
Region England and Wales Ratio R 0.341 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0
Analysis Timestep 2.5 Second Increment (Extended)
DTS Status ON
DVD Status OFF
Inertia Status OFF

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440
Return Period(s) (years) 1, 30, 100
Climate Change (%) 0, 0, 40

										Water	Surcharged
PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.		Level (m)	Depth (m)
S1.000	S1	15 Winter	100	+40%	100/15 Winter					74.722	0.097
S1.001	S2	15 Winter	100	+40%	100/15 Summer					74.675	0.376
S1.002	S3	15 Winter	100	+40%	100/15 Summer					74.505	0.589
S1.003	S4	15 Winter	100	+40%	100/15 Summer					74.365	0.606
S2.000	S13	15 Winter	100	+40%	100/15 Summer					74.325	0.550
S2.001	S14	15 Winter	100	+40%	100/15 Summer					74.294	0.658
S2.002	S15	15 Winter	100	+40%	100/15 Summer					74.154	0.818
S2.003	S16	15 Winter	100	+40%	30/15 Summer					74.073	0.831
S2.004	S17	15 Winter	100	+40%	100/15 Summer					73.794	0.716
S1.004	S5	15 Winter	100	+40%	30/15 Summer					73.670	0.806
S1.005	S6	15 Winter	100	+40%	100/15 Summer					73.321	0.616
S1.006	S7	15 Winter	100	+40%	30/15 Summer					73.046	0.636
S1.007	S8	15 Winter	100	+40%	30/15 Summer					72.549	0.361
S1.008	S9	15 Winter	100	+40%	100/15 Winter					72.054	0.049
S1.009	S10	360 Winter	100	+40%	30/15 Summer					71.692	0.599
S3.000	S18	15 Winter	100	+40%	100/15 Summer					74.873	0.648
S3.001	S19	15 Winter	100	+40%	100/15 Summer					74.827	0.922
S3.002	S20	15 Winter	100	+40%	30/15 Summer					74.750	1.016
S3.003	S21	15 Winter	100	+40%	30/15 Summer					74.627	1.054
S3.004	S22	15 Winter	100	+40%	30/15 Summer					74.513	1.016
S4.000	S27	15 Winter	100	+40%	30/15 Winter					73.862	1.087
S3.005	S23	15 Winter	100	+40%	30/15 Summer					73.785	1.262
S3.006	S24	30 Winter	100	+40%	30/15 Summer					72.887	0.819
S3.007	S25	30 Winter	100	+40%	30/15 Winter					72.022	0.475
S3.008	S26	60 Winter	100	+40%	30/15 Summer					71.701	0.647
S1.010	S11	360 Winter	100	+40%	1/120 Winter					71.683	0.883

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Micro Drainage	Network 2018.1	

100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for 19146-SW-NT 1-B DRAINAGE STRATEGY.SWS

PN	US/MH Name	Flooded		Pipe		Status	Level Exceeded
		Volume (m³)	Flow / Cap.	Flow / Cap.	Flow (l/s)		
S1.000	S1	0.000	0.50		19.3	SURCHARGED	
S1.001	S2	0.000	0.74		28.5	SURCHARGED	
S1.002	S3	0.000	1.04		38.4	SURCHARGED	
S1.003	S4	0.000	1.22		47.2	SURCHARGED	
S2.000	S13	0.000	0.47		17.2	SURCHARGED	
S2.001	S14	0.000	0.73		28.0	SURCHARGED	
S2.002	S15	0.000	0.96		38.7	FLOOD RISK	
S2.003	S16	0.000	1.37		50.8	FLOOD RISK	
S2.004	S17	0.000	0.79		62.3	SURCHARGED	
S1.004	S5	0.000	1.51		115.3	SURCHARGED	
S1.005	S6	0.000	0.97		124.0	SURCHARGED	
S1.006	S7	0.000	1.51		132.7	FLOOD RISK	
S1.007	S8	0.000	1.64		141.7	SURCHARGED	
S1.008	S9	0.000	0.71		153.3	SURCHARGED	
S1.009	S10	0.000	0.65		48.4	SURCHARGED	
S3.000	S18	0.000	0.40		15.5	SURCHARGED	
S3.001	S19	0.000	0.69		25.6	FLOOD RISK	
S3.002	S20	0.000	1.02		37.7	FLOOD RISK	
S3.003	S21	0.000	1.43		49.1	SURCHARGED	
S3.004	S22	0.000	1.52		58.8	SURCHARGED	
S4.000	S27	0.000	0.92		34.6	FLOOD RISK	
S3.005	S23	0.000	1.50		74.7	FLOOD RISK	
S3.006	S24	0.000	1.38		69.0	FLOOD RISK	
S3.007	S25	0.000	0.95		64.6	SURCHARGED	
S3.008	S26	0.000	1.52		56.3	FLOOD RISK	
S1.010	S11	0.000	0.00		0.0	SURCHARGED	

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Micro Drainage		Source Control 2018.1

Summary of Results for 100 year Return Period (+40%)

Half Drain Time : 18 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
15 min Summer	99.709	0.314	2.3	3.3	Flood Risk
30 min Summer	99.750	0.355	2.7	4.1	Flood Risk
60 min Summer	99.770	0.375	2.8	4.6	Flood Risk
120 min Summer	99.761	0.366	2.7	4.4	Flood Risk
180 min Summer	99.739	0.344	2.6	3.9	Flood Risk
240 min Summer	99.716	0.321	2.4	3.4	Flood Risk
360 min Summer	99.676	0.281	2.1	2.6	O K
480 min Summer	99.645	0.250	1.9	2.1	O K
600 min Summer	99.621	0.226	1.7	1.7	O K
720 min Summer	99.601	0.206	1.5	1.4	O K
960 min Summer	99.570	0.175	1.3	1.0	O K
1440 min Summer	99.531	0.136	1.0	0.6	O K
2160 min Summer	99.497	0.102	0.8	0.3	O K
2880 min Summer	99.477	0.082	0.6	0.2	O K
4320 min Summer	99.455	0.060	0.4	0.1	O K
5760 min Summer	99.444	0.049	0.4	0.1	O K
7200 min Summer	99.440	0.045	0.3	0.1	O K
8640 min Summer	99.436	0.041	0.3	0.1	O K
10080 min Summer	99.434	0.039	0.2	0.1	O K
15 min Winter	99.734	0.339	2.5	3.8	Flood Risk
30 min Winter	99.775	0.380	2.8	4.8	Flood Risk
60 min Winter	99.789	0.394	2.9	5.1	Flood Risk
120 min Winter	99.765	0.370	2.8	4.5	Flood Risk
180 min Winter	99.731	0.336	2.5	3.7	Flood Risk

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
15 min Summer	115.660	0.0	15
30 min Summer	78.386	0.0	24
60 min Summer	50.812	0.0	40
120 min Summer	31.860	0.0	74
180 min Summer	23.904	0.0	106
240 min Summer	19.362	0.0	138
360 min Summer	14.282	0.0	198
480 min Summer	11.513	0.0	258
600 min Summer	9.732	0.0	318
720 min Summer	8.478	0.0	378
960 min Summer	6.814	0.0	498
1440 min Summer	4.997	0.0	736
2160 min Summer	3.657	0.0	1100
2880 min Summer	2.926	0.0	1468
4320 min Summer	2.133	0.0	2184
5760 min Summer	1.702	0.0	2912
7200 min Summer	1.427	0.0	3552
8640 min Summer	1.237	0.0	4312
10080 min Summer	1.097	0.0	4960
15 min Winter	115.660	0.0	15
30 min Winter	78.386	0.0	25
60 min Winter	50.812	0.0	44
120 min Winter	31.860	0.0	78
180 min Winter	23.904	0.0	112

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Micro Drainage Source Control 2018.1		

Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
240 min Winter	99.699	0.304	2.3	3.1	O K
360 min Winter	99.648	0.253	1.9	2.1	O K
480 min Winter	99.611	0.216	1.6	1.5	O K
600 min Winter	99.583	0.188	1.4	1.2	O K
720 min Winter	99.562	0.167	1.2	0.9	O K
960 min Winter	99.531	0.136	1.0	0.6	O K
1440 min Winter	99.496	0.101	0.8	0.3	O K
2160 min Winter	99.469	0.074	0.6	0.2	O K
2880 min Winter	99.454	0.059	0.4	0.1	O K
4320 min Winter	99.441	0.046	0.3	0.1	O K
5760 min Winter	99.436	0.041	0.3	0.1	O K
7200 min Winter	99.433	0.038	0.2	0.0	O K
8640 min Winter	99.430	0.035	0.2	0.0	O K
10080 min Winter	99.428	0.033	0.2	0.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
240 min Winter	19.362	0.0	144
360 min Winter	14.282	0.0	204
480 min Winter	11.513	0.0	264
600 min Winter	9.732	0.0	322
720 min Winter	8.478	0.0	382
960 min Winter	6.814	0.0	500
1440 min Winter	4.997	0.0	736
2160 min Winter	3.657	0.0	1100
2880 min Winter	2.926	0.0	1464
4320 min Winter	2.133	0.0	2156
5760 min Winter	1.702	0.0	2936
7200 min Winter	1.427	0.0	3592
8640 min Winter	1.237	0.0	4344
10080 min Winter	1.097	0.0	5000

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Micro Drainage		Source Control 2018.1

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)	18.000	Shortest Storm (mins)	15
Ratio R	0.335	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.026

Time (mins)		Area
From:	To:	(ha)
0	4	0.026

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Micro Drainage	Source Control 2018.1	

Model Details

Storage is Online Cover Level (m) 100.000

Porous Car Park Structure

Infiltration Coefficient Base (m/hr)	0.24480	Width (m)	5.5
Membrane Percolation (mm/hr)	1000	Length (m)	46.0
Max Percolation (l/s)	70.3	Slope (1:X)	40.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	99.395	Cap Volume Depth (m)	0.475

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Micro Drainage	Source Control 2018.1	

Summary of Results for 100 year Return Period (+40%)

Half Drain Time : 26 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
15 min Summer	99.785	0.390	3.2	5.5	Flood Risk
30 min Summer	99.826	0.431	3.5	6.7	Flood Risk
60 min Summer	99.845	0.450	3.7	7.3	Flood Risk
120 min Summer	99.833	0.438	3.6	6.9	Flood Risk
180 min Summer	99.809	0.414	3.4	6.2	Flood Risk
240 min Summer	99.784	0.389	3.2	5.5	Flood Risk
360 min Summer	99.741	0.346	2.8	4.3	Flood Risk
480 min Summer	99.706	0.311	2.5	3.5	Flood Risk
600 min Summer	99.678	0.283	2.3	2.9	O K
720 min Summer	99.654	0.259	2.1	2.4	O K
960 min Summer	99.618	0.223	1.8	1.8	O K
1440 min Summer	99.570	0.175	1.4	1.1	O K
2160 min Summer	99.528	0.133	1.1	0.6	O K
2880 min Summer	99.502	0.107	0.9	0.4	O K
4320 min Summer	99.473	0.078	0.6	0.2	O K
5760 min Summer	99.457	0.062	0.5	0.1	O K
7200 min Summer	99.447	0.052	0.4	0.1	O K
8640 min Summer	99.443	0.048	0.4	0.1	O K
10080 min Summer	99.440	0.045	0.3	0.1	O K
15 min Winter	99.813	0.418	3.4	6.3	Flood Risk
30 min Winter	99.855	0.460	3.8	7.6	Flood Risk
60 min Winter	99.869	0.474	3.9	8.1	Flood Risk
120 min Winter	99.843	0.448	3.7	7.2	Flood Risk
180 min Winter	99.806	0.411	3.4	6.1	Flood Risk

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
15 min Summer	115.660	0.0	15
30 min Summer	78.386	0.0	24
60 min Summer	50.812	0.0	42
120 min Summer	31.860	0.0	76
180 min Summer	23.904	0.0	108
240 min Summer	19.362	0.0	140
360 min Summer	14.282	0.0	200
480 min Summer	11.513	0.0	262
600 min Summer	9.732	0.0	320
720 min Summer	8.478	0.0	382
960 min Summer	6.814	0.0	500
1440 min Summer	4.997	0.0	736
2160 min Summer	3.657	0.0	1100
2880 min Summer	2.926	0.0	1468
4320 min Summer	2.133	0.0	2160
5760 min Summer	1.702	0.0	2936
7200 min Summer	1.427	0.0	3648
8640 min Summer	1.237	0.0	4400
10080 min Summer	1.097	0.0	5128
15 min Winter	115.660	0.0	16
30 min Winter	78.386	0.0	26
60 min Winter	50.812	0.0	44
120 min Winter	31.860	0.0	80
180 min Winter	23.904	0.0	114

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Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
240 min Winter	99.771	0.376	3.1	5.1	Flood Risk
360 min Winter	99.713	0.318	2.6	3.6	Flood Risk
480 min Winter	99.669	0.274	2.2	2.7	O K
600 min Winter	99.636	0.241	2.0	2.1	O K
720 min Winter	99.610	0.215	1.8	1.7	O K
960 min Winter	99.572	0.177	1.4	1.1	O K
1440 min Winter	99.527	0.132	1.1	0.6	O K
2160 min Winter	99.492	0.097	0.8	0.3	O K
2880 min Winter	99.473	0.078	0.6	0.2	O K
4320 min Winter	99.452	0.057	0.5	0.1	O K
5760 min Winter	99.443	0.048	0.4	0.1	O K
7200 min Winter	99.439	0.044	0.3	0.1	O K
8640 min Winter	99.435	0.040	0.3	0.1	O K
10080 min Winter	99.433	0.038	0.2	0.1	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
240 min Winter	19.362	0.0	146
360 min Winter	14.282	0.0	208
480 min Winter	11.513	0.0	268
600 min Winter	9.732	0.0	326
720 min Winter	8.478	0.0	384
960 min Winter	6.814	0.0	502
1440 min Winter	4.997	0.0	738
2160 min Winter	3.657	0.0	1100
2880 min Winter	2.926	0.0	1460
4320 min Winter	2.133	0.0	2176
5760 min Winter	1.702	0.0	2888
7200 min Winter	1.427	0.0	3600
8640 min Winter	1.237	0.0	4360
10080 min Winter	1.097	0.0	5064

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Micro Drainage		Source Control 2018.1

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)	18.000	Shortest Storm (mins)	15
Ratio R	0.335	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.037

Time (mins)		Area
From:	To:	(ha)
0	4	0.037

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Micro Drainage	Source Control 2018.1	

Model Details

Storage is Online Cover Level (m) 100.000

Porous Car Park Structure

Infiltration Coefficient Base (m/hr)	0.24480	Width (m)	6.0
Membrane Percolation (mm/hr)	1000	Length (m)	29.0
Max Percolation (l/s)	48.3	Slope (1:X)	40.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	99.395	Cap Volume Depth (m)	0.475

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Micro Drainage		Source Control 2018.1

Summary of Results for 100 year Return Period (+40%)

Half Drain Time : 20 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
15 min Summer	99.746	0.351	2.6	4.1	Flood Risk
30 min Summer	99.793	0.398	3.0	5.2	Flood Risk
60 min Summer	99.819	0.424	3.2	5.9	Flood Risk
120 min Summer	99.814	0.419	3.1	5.8	Flood Risk
180 min Summer	99.792	0.397	3.0	5.2	Flood Risk
240 min Summer	99.768	0.373	2.8	4.6	Flood Risk
360 min Summer	99.725	0.330	2.5	3.6	Flood Risk
480 min Summer	99.691	0.296	2.2	2.9	O K
600 min Summer	99.664	0.269	2.0	2.4	O K
720 min Summer	99.641	0.246	1.8	2.0	O K
960 min Summer	99.606	0.211	1.6	1.5	O K
1440 min Summer	99.560	0.165	1.2	0.9	O K
2160 min Summer	99.520	0.125	0.9	0.5	O K
2880 min Summer	99.496	0.101	0.8	0.3	O K
4320 min Summer	99.468	0.073	0.5	0.2	O K
5760 min Summer	99.453	0.058	0.4	0.1	O K
7200 min Summer	99.444	0.049	0.4	0.1	O K
8640 min Summer	99.441	0.046	0.3	0.1	O K
10080 min Summer	99.438	0.043	0.3	0.1	O K
15 min Winter	99.775	0.380	2.8	4.8	Flood Risk
30 min Winter	99.822	0.427	3.2	6.0	Flood Risk
60 min Winter	99.842	0.447	3.3	6.6	Flood Risk
120 min Winter	99.822	0.427	3.2	6.0	Flood Risk
180 min Winter	99.788	0.393	2.9	5.1	Flood Risk

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
15 min Summer	115.660	0.0	16
30 min Summer	78.386	0.0	24
60 min Summer	50.812	0.0	42
120 min Summer	31.860	0.0	74
180 min Summer	23.904	0.0	108
240 min Summer	19.362	0.0	138
360 min Summer	14.282	0.0	200
480 min Summer	11.513	0.0	260
600 min Summer	9.732	0.0	320
720 min Summer	8.478	0.0	380
960 min Summer	6.814	0.0	500
1440 min Summer	4.997	0.0	736
2160 min Summer	3.657	0.0	1100
2880 min Summer	2.926	0.0	1468
4320 min Summer	2.133	0.0	2180
5760 min Summer	1.702	0.0	2888
7200 min Summer	1.427	0.0	3632
8640 min Summer	1.237	0.0	4280
10080 min Summer	1.097	0.0	5120
15 min Winter	115.660	0.0	16
30 min Winter	78.386	0.0	26
60 min Winter	50.812	0.0	44
120 min Winter	31.860	0.0	80
180 min Winter	23.904	0.0	114

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Micro Drainage		Source Control 2018.1

Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
240 min Winter	99.754	0.359	2.7	4.2	Flood Risk
360 min Winter	99.697	0.302	2.3	3.0	O K
480 min Winter	99.655	0.260	1.9	2.2	O K
600 min Winter	99.623	0.228	1.7	1.7	O K
720 min Winter	99.598	0.203	1.5	1.4	O K
960 min Winter	99.562	0.167	1.2	0.9	O K
1440 min Winter	99.519	0.124	0.9	0.5	O K
2160 min Winter	99.486	0.091	0.7	0.3	O K
2880 min Winter	99.468	0.073	0.5	0.2	O K
4320 min Winter	99.448	0.053	0.4	0.1	O K
5760 min Winter	99.441	0.046	0.3	0.1	O K
7200 min Winter	99.437	0.042	0.3	0.1	O K
8640 min Winter	99.434	0.039	0.2	0.0	O K
10080 min Winter	99.431	0.036	0.2	0.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
240 min Winter	19.362	0.0	146
360 min Winter	14.282	0.0	206
480 min Winter	11.513	0.0	266
600 min Winter	9.732	0.0	326
720 min Winter	8.478	0.0	384
960 min Winter	6.814	0.0	500
1440 min Winter	4.997	0.0	736
2160 min Winter	3.657	0.0	1100
2880 min Winter	2.926	0.0	1456
4320 min Winter	2.133	0.0	2152
5760 min Winter	1.702	0.0	2880
7200 min Winter	1.427	0.0	3648
8640 min Winter	1.237	0.0	4352
10080 min Winter	1.097	0.0	5024

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Micro Drainage		Source Control 2018.1

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)	18.000	Shortest Storm (mins)	15
Ratio R	0.335	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.032

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

0	4	0.032
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Micro Drainage	Source Control 2018.1	

Model Details

Storage is Online Cover Level (m) 100.000

Porous Car Park Structure

Infiltration Coefficient Base (m/hr)	0.24480	Width (m)	5.5
Membrane Percolation (mm/hr)	1000	Length (m)	58.0
Max Percolation (l/s)	88.6	Slope (1:X)	40.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	99.395	Cap Volume Depth (m)	0.475

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Micro Drainage		Source Control 2018.1

Summary of Results for 100 year Return Period (+40%)

Half Drain Time : 5 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m ³)	Status
15 min Summer	99.675	0.280	8.0	2.8	O K
30 min Summer	99.684	0.289	8.2	3.0	O K
60 min Summer	99.660	0.265	7.5	2.5	O K
120 min Summer	99.611	0.216	6.2	1.7	O K
180 min Summer	99.576	0.181	5.2	1.2	O K
240 min Summer	99.551	0.156	4.4	0.9	O K
360 min Summer	99.517	0.122	3.5	0.5	O K
480 min Summer	99.495	0.100	2.9	0.4	O K
600 min Summer	99.481	0.086	2.4	0.3	O K
720 min Summer	99.470	0.075	2.1	0.2	O K
960 min Summer	99.456	0.061	1.7	0.1	O K
1440 min Summer	99.442	0.047	1.3	0.1	O K
2160 min Summer	99.436	0.041	0.9	0.1	O K
2880 min Summer	99.431	0.036	0.7	0.0	O K
4320 min Summer	99.426	0.031	0.6	0.0	O K
5760 min Summer	99.423	0.028	0.4	0.0	O K
7200 min Summer	99.420	0.025	0.4	0.0	O K
8640 min Summer	99.419	0.024	0.3	0.0	O K
10080 min Summer	99.417	0.022	0.3	0.0	O K
15 min Winter	99.690	0.295	8.4	3.1	O K
30 min Winter	99.688	0.293	8.3	3.1	O K
60 min Winter	99.647	0.252	7.2	2.3	O K
120 min Winter	99.582	0.187	5.3	1.3	O K
180 min Winter	99.543	0.148	4.2	0.8	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m ³)	Time-Peak (mins)
15 min Summer	115.660	0.0	12
30 min Summer	78.386	0.0	20
60 min Summer	50.812	0.0	36
120 min Summer	31.860	0.0	66
180 min Summer	23.904	0.0	96
240 min Summer	19.362	0.0	126
360 min Summer	14.282	0.0	186
480 min Summer	11.513	0.0	246
600 min Summer	9.732	0.0	306
720 min Summer	8.478	0.0	366
960 min Summer	6.814	0.0	484
1440 min Summer	4.997	0.0	728
2160 min Summer	3.657	0.0	1076
2880 min Summer	2.926	0.0	1452
4320 min Summer	2.133	0.0	2132
5760 min Summer	1.702	0.0	2888
7200 min Summer	1.427	0.0	3576
8640 min Summer	1.237	0.0	4400
10080 min Summer	1.097	0.0	4968
15 min Winter	115.660	0.0	13
30 min Winter	78.386	0.0	21
60 min Winter	50.812	0.0	38
120 min Winter	31.860	0.0	68
180 min Winter	23.904	0.0	96

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Micro Drainage Source Control 2018.1		

Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
240 min Winter	99.517	0.122	3.5	0.5	O K
360 min Winter	99.486	0.091	2.6	0.3	O K
480 min Winter	99.469	0.074	2.1	0.2	O K
600 min Winter	99.458	0.063	1.8	0.1	O K
720 min Winter	99.449	0.054	1.5	0.1	O K
960 min Winter	99.442	0.047	1.2	0.1	O K
1440 min Winter	99.435	0.040	0.9	0.1	O K
2160 min Winter	99.429	0.034	0.7	0.0	O K
2880 min Winter	99.426	0.031	0.5	0.0	O K
4320 min Winter	99.421	0.026	0.4	0.0	O K
5760 min Winter	99.419	0.024	0.3	0.0	O K
7200 min Winter	99.417	0.022	0.3	0.0	O K
8640 min Winter	99.415	0.020	0.2	0.0	O K
10080 min Winter	99.414	0.019	0.2	0.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
240 min Winter	19.362	0.0	126
360 min Winter	14.282	0.0	184
480 min Winter	11.513	0.0	244
600 min Winter	9.732	0.0	304
720 min Winter	8.478	0.0	368
960 min Winter	6.814	0.0	492
1440 min Winter	4.997	0.0	726
2160 min Winter	3.657	0.0	1084
2880 min Winter	2.926	0.0	1452
4320 min Winter	2.133	0.0	2220
5760 min Winter	1.702	0.0	2888
7200 min Winter	1.427	0.0	3464
8640 min Winter	1.237	0.0	4312
10080 min Winter	1.097	0.0	5168

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Micro Drainage		Source Control 2018.1

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)	18.000	Shortest Storm (mins)	15
Ratio R	0.335	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.031

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

0	4 0.031
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Micro Drainage	Source Control 2018.1	

Model Details

Storage is Online Cover Level (m) 100.000

Porous Car Park Structure

Infiltration Coefficient Base (m/hr)	0.85320	Width (m)	6.0
Membrane Percolation (mm/hr)	1000	Length (m)	26.0
Max Percolation (l/s)	43.3	Slope (1:X)	40.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	99.395	Cap Volume Depth (m)	0.475

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Micro Drainage		Source Control 2018.1

Summary of Results for 100 year Return Period (+40%)

Half Drain Time : 7 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
15 min Summer	99.785	0.390	10.2	5.0	Flood Risk
30 min Summer	99.819	0.424	11.0	5.9	Flood Risk
60 min Summer	99.802	0.407	10.6	5.5	Flood Risk
120 min Summer	99.746	0.351	9.2	4.1	Flood Risk
180 min Summer	99.698	0.303	7.9	3.0	O K
240 min Summer	99.660	0.265	6.9	2.3	O K
360 min Summer	99.607	0.212	5.5	1.5	O K
480 min Summer	99.573	0.178	4.6	1.0	O K
600 min Summer	99.549	0.154	4.0	0.8	O K
720 min Summer	99.531	0.136	3.5	0.6	O K
960 min Summer	99.505	0.110	2.9	0.4	O K
1440 min Summer	99.476	0.081	2.1	0.2	O K
2160 min Summer	99.454	0.059	1.5	0.1	O K
2880 min Summer	99.444	0.049	1.2	0.1	O K
4320 min Summer	99.437	0.042	0.9	0.1	O K
5760 min Summer	99.432	0.037	0.7	0.0	O K
7200 min Summer	99.429	0.034	0.6	0.0	O K
8640 min Summer	99.427	0.032	0.5	0.0	O K
10080 min Summer	99.425	0.030	0.5	0.0	O K
15 min Winter	99.813	0.418	10.9	5.8	Flood Risk
30 min Winter	99.834	0.439	11.4	6.4	Flood Risk
60 min Winter	99.797	0.402	10.5	5.3	Flood Risk
120 min Winter	99.714	0.319	8.3	3.4	Flood Risk
180 min Winter	99.655	0.260	6.8	2.2	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
15 min Summer	115.660	0.0	13
30 min Summer	78.386	0.0	21
60 min Summer	50.812	0.0	38
120 min Summer	31.860	0.0	68
180 min Summer	23.904	0.0	98
240 min Summer	19.362	0.0	128
360 min Summer	14.282	0.0	188
480 min Summer	11.513	0.0	248
600 min Summer	9.732	0.0	308
720 min Summer	8.478	0.0	368
960 min Summer	6.814	0.0	488
1440 min Summer	4.997	0.0	734
2160 min Summer	3.657	0.0	1080
2880 min Summer	2.926	0.0	1420
4320 min Summer	2.133	0.0	2192
5760 min Summer	1.702	0.0	2872
7200 min Summer	1.427	0.0	3608
8640 min Summer	1.237	0.0	4288
10080 min Summer	1.097	0.0	4976
15 min Winter	115.660	0.0	13
30 min Winter	78.386	0.0	22
60 min Winter	50.812	0.0	38
120 min Winter	31.860	0.0	70
180 min Winter	23.904	0.0	100

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Micro Drainage Source Control 2018.1		

Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m ³)	Status
240 min Winter	99.613	0.218	5.7	1.6	O K
360 min Winter	99.560	0.165	4.3	0.9	O K
480 min Winter	99.529	0.134	3.5	0.6	O K
600 min Winter	99.509	0.114	3.0	0.4	O K
720 min Winter	99.494	0.099	2.6	0.3	O K
960 min Winter	99.475	0.080	2.1	0.2	O K
1440 min Winter	99.453	0.058	1.5	0.1	O K
2160 min Winter	99.441	0.046	1.1	0.1	O K
2880 min Winter	99.436	0.041	0.9	0.1	O K
4320 min Winter	99.430	0.035	0.6	0.0	O K
5760 min Winter	99.427	0.032	0.5	0.0	O K
7200 min Winter	99.424	0.029	0.4	0.0	O K
8640 min Winter	99.422	0.027	0.4	0.0	O K
10080 min Winter	99.420	0.025	0.3	0.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m ³)	Time-Peak (mins)
240 min Winter	19.362	0.0	128
360 min Winter	14.282	0.0	188
480 min Winter	11.513	0.0	246
600 min Winter	9.732	0.0	306
720 min Winter	8.478	0.0	368
960 min Winter	6.814	0.0	486
1440 min Winter	4.997	0.0	714
2160 min Winter	3.657	0.0	1072
2880 min Winter	2.926	0.0	1432
4320 min Winter	2.133	0.0	2148
5760 min Winter	1.702	0.0	2840
7200 min Winter	1.427	0.0	3472
8640 min Winter	1.237	0.0	4416
10080 min Winter	1.097	0.0	5088

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Micro Drainage		Source Control 2018.1

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)	18.000	Shortest Storm (mins)	15
Ratio R	0.335	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.052

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

0 4 0.052

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Micro Drainage		Source Control 2018.1

Model Details

Storage is Online Cover Level (m) 100.000

Porous Car Park Structure

Infiltration Coefficient Base (m/hr)	0.85320	Width (m)	5.5
Membrane Percolation (mm/hr)	1000	Length (m)	80.0
Max Percolation (l/s)	122.2	Slope (1:X)	40.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	99.395	Cap Volume Depth (m)	0.475

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20 East Sands Burbage Marlborough Wiltshire SN8 3AN	19146 Gresford, Wrexham Prelim Soakaway Design 19146-PP-06-B	
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Micro Drainage		Source Control 2018.1

Summary of Results for 100 year Return Period (+40%)

Half Drain Time : 3 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m ³)	Status
15 min Summer	99.603	0.208	4.4	1.2	O K
30 min Summer	99.614	0.219	4.7	1.3	O K
60 min Summer	99.593	0.198	4.2	1.1	O K
120 min Summer	99.553	0.158	3.4	0.7	O K
180 min Summer	99.525	0.130	2.8	0.5	O K
240 min Summer	99.505	0.110	2.4	0.3	O K
360 min Summer	99.480	0.085	1.8	0.2	O K
480 min Summer	99.465	0.070	1.5	0.1	O K
600 min Summer	99.454	0.059	1.3	0.1	O K
720 min Summer	99.447	0.052	1.1	0.1	O K
960 min Summer	99.441	0.046	0.9	0.1	O K
1440 min Summer	99.434	0.039	0.7	0.0	O K
2160 min Summer	99.429	0.034	0.5	0.0	O K
2880 min Summer	99.425	0.030	0.4	0.0	O K
4320 min Summer	99.421	0.026	0.3	0.0	O K
5760 min Summer	99.418	0.023	0.2	0.0	O K
7200 min Summer	99.416	0.021	0.2	0.0	O K
8640 min Summer	99.415	0.020	0.2	0.0	O K
10080 min Summer	99.414	0.019	0.1	0.0	O K
15 min Winter	99.614	0.219	4.7	1.3	O K
30 min Winter	99.615	0.220	4.7	1.3	O K
60 min Winter	99.580	0.185	3.9	0.9	O K
120 min Winter	99.528	0.133	2.8	0.5	O K
180 min Winter	99.498	0.103	2.2	0.3	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m ³)	Time-Peak (mins)
15 min Summer	115.660	0.0	12
30 min Summer	78.386	0.0	20
60 min Summer	50.812	0.0	36
120 min Summer	31.860	0.0	66
180 min Summer	23.904	0.0	96
240 min Summer	19.362	0.0	126
360 min Summer	14.282	0.0	184
480 min Summer	11.513	0.0	244
600 min Summer	9.732	0.0	306
720 min Summer	8.478	0.0	362
960 min Summer	6.814	0.0	490
1440 min Summer	4.997	0.0	714
2160 min Summer	3.657	0.0	1068
2880 min Summer	2.926	0.0	1456
4320 min Summer	2.133	0.0	2124
5760 min Summer	1.702	0.0	2856
7200 min Summer	1.427	0.0	3648
8640 min Summer	1.237	0.0	4344
10080 min Summer	1.097	0.0	4968
15 min Winter	115.660	0.0	12
30 min Winter	78.386	0.0	21
60 min Winter	50.812	0.0	36
120 min Winter	31.860	0.0	66
180 min Winter	23.904	0.0	96

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20 East Sands Burbage Marlborough Wiltshire SN8 3AN	19146 Gresford, Wrexham Prelim Soakaway Design 19146-PP-06-B	
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Micro Drainage Source Control 2018.1		

Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m ³)	Status
240 min Winter	99.479	0.084	1.8	0.2	O K
360 min Winter	99.458	0.063	1.3	0.1	O K
480 min Winter	99.446	0.051	1.1	0.1	O K
600 min Winter	99.441	0.046	0.9	0.1	O K
720 min Winter	99.438	0.043	0.8	0.1	O K
960 min Winter	99.434	0.039	0.6	0.0	O K
1440 min Winter	99.428	0.033	0.5	0.0	O K
2160 min Winter	99.424	0.029	0.4	0.0	O K
2880 min Winter	99.421	0.026	0.3	0.0	O K
4320 min Winter	99.417	0.022	0.2	0.0	O K
5760 min Winter	99.414	0.019	0.2	0.0	O K
7200 min Winter	99.413	0.018	0.1	0.0	O K
8640 min Winter	99.412	0.017	0.1	0.0	O K
10080 min Winter	99.411	0.016	0.1	0.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m ³)	Time-Peak (mins)
240 min Winter	19.362	0.0	126
360 min Winter	14.282	0.0	184
480 min Winter	11.513	0.0	248
600 min Winter	9.732	0.0	306
720 min Winter	8.478	0.0	366
960 min Winter	6.814	0.0	482
1440 min Winter	4.997	0.0	712
2160 min Winter	3.657	0.0	1076
2880 min Winter	2.926	0.0	1428
4320 min Winter	2.133	0.0	2148
5760 min Winter	1.702	0.0	2904
7200 min Winter	1.427	0.0	3440
8640 min Winter	1.237	0.0	4080
10080 min Winter	1.097	0.0	4800

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20 East Sands Burbage Marlborough Wiltshire SN8 3AN	19146 Gresford, Wrexham Prelim Soakaway Design 19146-PP-06-B	
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Micro Drainage		Source Control 2018.1

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)	18.000	Shortest Storm (mins)	15
Ratio R	0.335	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.016

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

0	4 0.016
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20 East Sands Burbage Marlborough Wiltshire SN8 3AN	19146 Gresford, Wrexham Prelim Soakaway Design 19146-PP-06-B	
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Micro Drainage	Source Control 2018.1	

Model Details

Storage is Online Cover Level (m) 100.000

Porous Car Park Structure

Infiltration Coefficient Base (m/hr)	0.85320	Width (m)	4.5
Membrane Percolation (mm/hr)	1000	Length (m)	35.0
Max Percolation (l/s)	43.8	Slope (1:X)	40.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	99.395	Cap Volume Depth (m)	0.475

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20 East Sands Burbage Marlborough Wiltshire SN8 3AN	19146 Gresford, Wrexham Prelim Soakaway Design 19146-PP-07-B	
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Micro Drainage		Source Control 2018.1

Summary of Results for 100 year Return Period (+40%)

Half Drain Time : 15 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
15 min Summer	99.678	0.283	1.8	2.2	O K
30 min Summer	99.715	0.320	2.0	2.8	Flood Risk
60 min Summer	99.732	0.337	2.1	3.1	Flood Risk
120 min Summer	99.719	0.324	2.0	2.8	Flood Risk
180 min Summer	99.696	0.301	1.9	2.5	O K
240 min Summer	99.674	0.279	1.8	2.1	O K
360 min Summer	99.637	0.242	1.5	1.6	O K
480 min Summer	99.609	0.214	1.3	1.2	O K
600 min Summer	99.587	0.192	1.2	1.0	O K
720 min Summer	99.569	0.174	1.1	0.8	O K
960 min Summer	99.542	0.147	0.9	0.6	O K
1440 min Summer	99.508	0.113	0.7	0.3	O K
2160 min Summer	99.479	0.084	0.5	0.2	O K
2880 min Summer	99.462	0.067	0.4	0.1	O K
4320 min Summer	99.445	0.050	0.3	0.1	O K
5760 min Summer	99.439	0.044	0.2	0.1	O K
7200 min Summer	99.435	0.040	0.2	0.0	O K
8640 min Summer	99.433	0.038	0.2	0.0	O K
10080 min Summer	99.430	0.035	0.2	0.0	O K
15 min Winter	99.702	0.307	1.9	2.5	Flood Risk
30 min Winter	99.737	0.342	2.2	3.2	Flood Risk
60 min Winter	99.746	0.351	2.2	3.3	Flood Risk
120 min Winter	99.720	0.325	2.0	2.9	Flood Risk
180 min Winter	99.686	0.291	1.8	2.3	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
15 min Summer	115.660	0.0	15
30 min Summer	78.386	0.0	23
60 min Summer	50.812	0.0	40
120 min Summer	31.860	0.0	74
180 min Summer	23.904	0.0	106
240 min Summer	19.362	0.0	136
360 min Summer	14.282	0.0	196
480 min Summer	11.513	0.0	256
600 min Summer	9.732	0.0	316
720 min Summer	8.478	0.0	376
960 min Summer	6.814	0.0	492
1440 min Summer	4.997	0.0	736
2160 min Summer	3.657	0.0	1100
2880 min Summer	2.926	0.0	1468
4320 min Summer	2.133	0.0	2184
5760 min Summer	1.702	0.0	2840
7200 min Summer	1.427	0.0	3584
8640 min Summer	1.237	0.0	4376
10080 min Summer	1.097	0.0	5120
15 min Winter	115.660	0.0	15
30 min Winter	78.386	0.0	25
60 min Winter	50.812	0.0	44
120 min Winter	31.860	0.0	78
180 min Winter	23.904	0.0	110

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20 East Sands Burbage Marlborough Wiltshire SN8 3AN	19146 Gresford, Wrexham Prelim Soakaway Design 19146-PP-07-B	
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Micro Drainage Source Control 2018.1		

Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m ³)	Status
240 min Winter	99.656	0.261	1.6	1.8	O K
360 min Winter	99.609	0.214	1.3	1.2	O K
480 min Winter	99.576	0.181	1.1	0.9	O K
600 min Winter	99.552	0.157	1.0	0.7	O K
720 min Winter	99.533	0.138	0.9	0.5	O K
960 min Winter	99.508	0.113	0.7	0.3	O K
1440 min Winter	99.478	0.083	0.5	0.2	O K
2160 min Winter	99.456	0.061	0.4	0.1	O K
2880 min Winter	99.444	0.049	0.3	0.1	O K
4320 min Winter	99.437	0.042	0.2	0.0	O K
5760 min Winter	99.432	0.037	0.2	0.0	O K
7200 min Winter	99.429	0.034	0.1	0.0	O K
8640 min Winter	99.427	0.032	0.1	0.0	O K
10080 min Winter	99.425	0.030	0.1	0.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m ³)	Time-Peak (mins)
240 min Winter	19.362	0.0	140
360 min Winter	14.282	0.0	202
480 min Winter	11.513	0.0	260
600 min Winter	9.732	0.0	320
720 min Winter	8.478	0.0	378
960 min Winter	6.814	0.0	492
1440 min Winter	4.997	0.0	734
2160 min Winter	3.657	0.0	1088
2880 min Winter	2.926	0.0	1456
4320 min Winter	2.133	0.0	2140
5760 min Winter	1.702	0.0	2880
7200 min Winter	1.427	0.0	3672
8640 min Winter	1.237	0.0	4272
10080 min Winter	1.097	0.0	4968

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20 East Sands Burbage Marlborough Wiltshire SN8 3AN	19146 Gresford, Wrexham Prelim Soakaway Design 19146-PP-07-B	
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Micro Drainage		Source Control 2018.1

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)	18.000	Shortest Storm (mins)	15
Ratio R	0.335	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.018

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

0	4 0.018
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20 East Sands Burbage Marlborough Wiltshire SN8 3AN	19146 Gresford, Wrexham Prelim Soakaway Design 19146-PP-07-B	
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Micro Drainage		Source Control 2018.1

Model Details

Storage is Online Cover Level (m) 100.000

Porous Car Park Structure

Infiltration Coefficient Base (m/hr)	0.25200	Width (m)	4.5
Membrane Percolation (mm/hr)	1000	Length (m)	40.0
Max Percolation (l/s)	50.0	Slope (1:X)	40.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	99.395	Cap Volume Depth (m)	0.475

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Micro Drainage	Source Control 2018.1	

Summary of Results for 100 year Return Period (+40%)

Half Drain Time : 18 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
15 min Summer	99.700	0.305	2.6	3.4	Flood Risk
30 min Summer	99.730	0.335	2.8	4.0	Flood Risk
60 min Summer	99.739	0.344	2.9	4.3	Flood Risk
120 min Summer	99.721	0.326	2.7	3.8	Flood Risk
180 min Summer	99.697	0.302	2.5	3.3	O K
240 min Summer	99.675	0.280	2.3	2.8	O K
360 min Summer	99.638	0.243	2.0	2.1	O K
480 min Summer	99.610	0.215	1.8	1.7	O K
600 min Summer	99.587	0.192	1.6	1.3	O K
720 min Summer	99.570	0.175	1.5	1.1	O K
960 min Summer	99.543	0.148	1.2	0.8	O K
1440 min Summer	99.508	0.113	1.0	0.5	O K
2160 min Summer	99.480	0.085	0.7	0.3	O K
2880 min Summer	99.463	0.068	0.6	0.2	O K
4320 min Summer	99.445	0.050	0.4	0.1	O K
5760 min Summer	99.440	0.045	0.3	0.1	O K
7200 min Summer	99.436	0.041	0.3	0.1	O K
8640 min Summer	99.433	0.038	0.2	0.1	O K
10080 min Summer	99.431	0.036	0.2	0.0	O K
15 min Winter	99.722	0.327	2.7	3.9	Flood Risk
30 min Winter	99.751	0.356	3.0	4.6	Flood Risk
60 min Winter	99.753	0.358	3.0	4.6	Flood Risk
120 min Winter	99.722	0.327	2.7	3.8	Flood Risk
180 min Winter	99.687	0.292	2.5	3.1	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
15 min Summer	115.660	0.0	15
30 min Summer	78.386	0.0	23
60 min Summer	50.812	0.0	40
120 min Summer	31.860	0.0	74
180 min Summer	23.904	0.0	106
240 min Summer	19.362	0.0	136
360 min Summer	14.282	0.0	196
480 min Summer	11.513	0.0	256
600 min Summer	9.732	0.0	316
720 min Summer	8.478	0.0	376
960 min Summer	6.814	0.0	494
1440 min Summer	4.997	0.0	736
2160 min Summer	3.657	0.0	1100
2880 min Summer	2.926	0.0	1468
4320 min Summer	2.133	0.0	2136
5760 min Summer	1.702	0.0	2864
7200 min Summer	1.427	0.0	3568
8640 min Summer	1.237	0.0	4272
10080 min Summer	1.097	0.0	5104
15 min Winter	115.660	0.0	15
30 min Winter	78.386	0.0	24
60 min Winter	50.812	0.0	44
120 min Winter	31.860	0.0	78
180 min Winter	23.904	0.0	110

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20 East Sands	19146 Gresford, Wrexham	
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Micro Drainage	Source Control 2018.1	

Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
240 min Winter	99.656	0.261	2.2	2.5	O K
360 min Winter	99.609	0.214	1.8	1.7	O K
480 min Winter	99.576	0.181	1.5	1.2	O K
600 min Winter	99.552	0.157	1.3	0.9	O K
720 min Winter	99.534	0.139	1.2	0.7	O K
960 min Winter	99.508	0.113	1.0	0.5	O K
1440 min Winter	99.479	0.084	0.7	0.3	O K
2160 min Winter	99.456	0.061	0.5	0.1	O K
2880 min Winter	99.445	0.050	0.4	0.1	O K
4320 min Winter	99.437	0.042	0.3	0.1	O K
5760 min Winter	99.433	0.038	0.2	0.1	O K
7200 min Winter	99.430	0.035	0.2	0.0	O K
8640 min Winter	99.427	0.032	0.2	0.0	O K
10080 min Winter	99.425	0.030	0.2	0.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
240 min Winter	19.362	0.0	142
360 min Winter	14.282	0.0	202
480 min Winter	11.513	0.0	260
600 min Winter	9.732	0.0	320
720 min Winter	8.478	0.0	378
960 min Winter	6.814	0.0	492
1440 min Winter	4.997	0.0	734
2160 min Winter	3.657	0.0	1080
2880 min Winter	2.926	0.0	1452
4320 min Winter	2.133	0.0	2128
5760 min Winter	1.702	0.0	2848
7200 min Winter	1.427	0.0	3672
8640 min Winter	1.237	0.0	4416
10080 min Winter	1.097	0.0	5096

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20 East Sands	19146 Gresford, Wrexham	
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Micro Drainage	Source Control 2018.1	

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)	18.000	Shortest Storm (mins)	15
Ratio R	0.335	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.024

Time (mins)		Area
From:	To:	(ha)
0	4	0.024

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20 East Sands Burbage Marlborough Wiltshire SN8 3AN	19146 Gresford, Wrexham Prelim Soakaway Design 19146-PP-08-B	
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Micro Drainage	Source Control 2018.1	

Model Details

Storage is Online Cover Level (m) 100.000

Porous Car Park Structure

Infiltration Coefficient Base (m/hr)	0.25200	Width (m)	6.0
Membrane Percolation (mm/hr)	1000	Length (m)	18.0
Max Percolation (l/s)	30.0	Slope (1:X)	40.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	99.395	Cap Volume Depth (m)	0.475

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20 East Sands Burbage Marlborough Wiltshire SN8 3AN	19146 Gresford, Wrexham Prelim Soakaway Design 19146-PP-09-B	
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Micro Drainage		Source Control 2018.1

Summary of Results for 100 year Return Period (+40%)

Half Drain Time : 109 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
15 min Summer	99.731	0.336	0.9	6.5	Flood Risk
30 min Summer	99.793	0.398	1.1	9.1	Flood Risk
60 min Summer	99.841	0.446	1.2	11.5	Flood Risk
120 min Summer	99.869	0.474	1.3	12.9	Flood Risk
180 min Summer	99.878	0.483	1.3	13.4	Flood Risk
240 min Summer	99.880	0.485	1.3	13.5	Flood Risk
360 min Summer	99.873	0.478	1.3	13.2	Flood Risk
480 min Summer	99.863	0.468	1.3	12.6	Flood Risk
600 min Summer	99.851	0.456	1.2	12.0	Flood Risk
720 min Summer	99.838	0.443	1.2	11.3	Flood Risk
960 min Summer	99.814	0.419	1.1	10.1	Flood Risk
1440 min Summer	99.771	0.376	1.0	8.1	Flood Risk
2160 min Summer	99.721	0.326	0.9	6.1	Flood Risk
2880 min Summer	99.682	0.287	0.8	4.8	O K
4320 min Summer	99.627	0.232	0.6	3.1	O K
5760 min Summer	99.590	0.195	0.5	2.2	O K
7200 min Summer	99.564	0.169	0.5	1.6	O K
8640 min Summer	99.544	0.149	0.4	1.3	O K
10080 min Summer	99.528	0.133	0.4	1.0	O K
15 min Winter	99.757	0.362	1.0	7.6	Flood Risk
30 min Winter	99.823	0.428	1.1	10.5	Flood Risk
60 min Winter	99.874	0.479	1.3	13.2	Flood Risk
120 min Winter	99.903	0.508	1.4	14.8	Flood Risk
180 min Winter	99.911	0.516	1.4	15.3	Flood Risk

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
15 min Summer	115.660	0.0	18
30 min Summer	78.386	0.0	32
60 min Summer	50.812	0.0	60
120 min Summer	31.860	0.0	98
180 min Summer	23.904	0.0	130
240 min Summer	19.362	0.0	164
360 min Summer	14.282	0.0	232
480 min Summer	11.513	0.0	300
600 min Summer	9.732	0.0	368
720 min Summer	8.478	0.0	434
960 min Summer	6.814	0.0	560
1440 min Summer	4.997	0.0	810
2160 min Summer	3.657	0.0	1172
2880 min Summer	2.926	0.0	1532
4320 min Summer	2.133	0.0	2248
5760 min Summer	1.702	0.0	2952
7200 min Summer	1.427	0.0	3680
8640 min Summer	1.237	0.0	4408
10080 min Summer	1.097	0.0	5136
15 min Winter	115.660	0.0	18
30 min Winter	78.386	0.0	32
60 min Winter	50.812	0.0	60
120 min Winter	31.860	0.0	110
180 min Winter	23.904	0.0	138

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20 East Sands Burbage Marlborough Wiltshire SN8 3AN	19146 Gresford, Wrexham Prelim Soakaway Design 19146-PP-09-B	
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Micro Drainage Source Control 2018.1		

Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
240 min Winter	99.910	0.515	1.4	15.2	Flood Risk
360 min Winter	99.896	0.501	1.3	14.4	Flood Risk
480 min Winter	99.879	0.484	1.3	13.5	Flood Risk
600 min Winter	99.861	0.466	1.3	12.5	Flood Risk
720 min Winter	99.842	0.447	1.2	11.5	Flood Risk
960 min Winter	99.808	0.413	1.1	9.8	Flood Risk
1440 min Winter	99.750	0.355	1.0	7.2	Flood Risk
2160 min Winter	99.685	0.290	0.8	4.9	O K
2880 min Winter	99.640	0.245	0.7	3.4	O K
4320 min Winter	99.580	0.185	0.5	2.0	O K
5760 min Winter	99.544	0.149	0.4	1.3	O K
7200 min Winter	99.520	0.125	0.3	0.9	O K
8640 min Winter	99.503	0.108	0.3	0.7	O K
10080 min Winter	99.491	0.096	0.3	0.5	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
240 min Winter	19.362	0.0	176
360 min Winter	14.282	0.0	252
480 min Winter	11.513	0.0	324
600 min Winter	9.732	0.0	392
720 min Winter	8.478	0.0	462
960 min Winter	6.814	0.0	590
1440 min Winter	4.997	0.0	840
2160 min Winter	3.657	0.0	1208
2880 min Winter	2.926	0.0	1560
4320 min Winter	2.133	0.0	2252
5760 min Winter	1.702	0.0	2992
7200 min Winter	1.427	0.0	3680
8640 min Winter	1.237	0.0	4408
10080 min Winter	1.097	0.0	5136

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Micro Drainage		Source Control 2018.1

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)	18.000	Shortest Storm (mins)	15
Ratio R	0.335	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.042

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

0	4 0.042
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20 East Sands Burbage Marlborough Wiltshire SN8 3AN	19146 Gresford, Wrexham Prelim Soakaway Design 19146-PP-09-B	
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Micro Drainage	Source Control 2018.1	

Model Details

Storage is Online Cover Level (m) 100.000

Porous Car Park Structure

Infiltration Coefficient Base (m/hr)	0.05040	Width (m)	4.8
Membrane Percolation (mm/hr)	1000	Length (m)	87.5
Max Percolation (l/s)	116.7	Slope (1:X)	80.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	99.395	Cap Volume Depth (m)	0.475

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Micro Drainage	Source Control 2018.1	

Summary of Results for 100 year Return Period (+40%)

Half Drain Time : 118 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
15 min Summer	99.754	0.359	0.8	5.8	Flood Risk
30 min Summer	99.814	0.419	0.9	7.9	Flood Risk
60 min Summer	99.860	0.465	1.0	9.7	Flood Risk
120 min Summer	99.887	0.492	1.0	10.9	Flood Risk
180 min Summer	99.895	0.500	1.0	11.2	Flood Risk
240 min Summer	99.895	0.500	1.1	11.3	Flood Risk
360 min Summer	99.887	0.492	1.0	10.9	Flood Risk
480 min Summer	99.876	0.481	1.0	10.4	Flood Risk
600 min Summer	99.863	0.468	1.0	9.9	Flood Risk
720 min Summer	99.850	0.455	1.0	9.3	Flood Risk
960 min Summer	99.825	0.430	0.9	8.3	Flood Risk
1440 min Summer	99.782	0.387	0.8	6.7	Flood Risk
2160 min Summer	99.731	0.336	0.7	5.1	Flood Risk
2880 min Summer	99.692	0.297	0.6	4.0	O K
4320 min Summer	99.636	0.241	0.5	2.6	O K
5760 min Summer	99.598	0.203	0.4	1.8	O K
7200 min Summer	99.571	0.176	0.4	1.4	O K
8640 min Summer	99.550	0.155	0.3	1.1	O K
10080 min Summer	99.534	0.139	0.3	0.9	O K
15 min Winter	99.779	0.384	0.8	6.6	Flood Risk
30 min Winter	99.843	0.448	0.9	9.0	Flood Risk
60 min Winter	99.894	0.499	1.0	11.2	Flood Risk
120 min Winter	99.922	0.527	1.1	12.4	Flood Risk
180 min Winter	99.929	0.534	1.1	12.7	Flood Risk

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
15 min Summer	115.660	0.0	18
30 min Summer	78.386	0.0	32
60 min Summer	50.812	0.0	60
120 min Summer	31.860	0.0	98
180 min Summer	23.904	0.0	130
240 min Summer	19.362	0.0	164
360 min Summer	14.282	0.0	232
480 min Summer	11.513	0.0	302
600 min Summer	9.732	0.0	368
720 min Summer	8.478	0.0	434
960 min Summer	6.814	0.0	562
1440 min Summer	4.997	0.0	810
2160 min Summer	3.657	0.0	1172
2880 min Summer	2.926	0.0	1532
4320 min Summer	2.133	0.0	2248
5760 min Summer	1.702	0.0	2952
7200 min Summer	1.427	0.0	3680
8640 min Summer	1.237	0.0	4408
10080 min Summer	1.097	0.0	5136
15 min Winter	115.660	0.0	18
30 min Winter	78.386	0.0	32
60 min Winter	50.812	0.0	60
120 min Winter	31.860	0.0	110
180 min Winter	23.904	0.0	138

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Micro Drainage Source Control 2018.1		

Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
240 min Winter	99.927	0.532	1.1	12.6	Flood Risk
360 min Winter	99.911	0.516	1.1	12.0	Flood Risk
480 min Winter	99.893	0.498	1.0	11.2	Flood Risk
600 min Winter	99.874	0.479	1.0	10.3	Flood Risk
720 min Winter	99.855	0.460	1.0	9.5	Flood Risk
960 min Winter	99.820	0.425	0.9	8.1	Flood Risk
1440 min Winter	99.761	0.366	0.8	6.0	Flood Risk
2160 min Winter	99.696	0.301	0.6	4.1	O K
2880 min Winter	99.649	0.254	0.5	2.9	O K
4320 min Winter	99.588	0.193	0.4	1.7	O K
5760 min Winter	99.551	0.156	0.3	1.1	O K
7200 min Winter	99.527	0.132	0.3	0.8	O K
8640 min Winter	99.509	0.114	0.2	0.6	O K
10080 min Winter	99.496	0.101	0.2	0.5	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
240 min Winter	19.362	0.0	176
360 min Winter	14.282	0.0	252
480 min Winter	11.513	0.0	324
600 min Winter	9.732	0.0	394
720 min Winter	8.478	0.0	462
960 min Winter	6.814	0.0	596
1440 min Winter	4.997	0.0	850
2160 min Winter	3.657	0.0	1212
2880 min Winter	2.926	0.0	1560
4320 min Winter	2.133	0.0	2288
5760 min Winter	1.702	0.0	2992
7200 min Winter	1.427	0.0	3672
8640 min Winter	1.237	0.0	4408
10080 min Winter	1.097	0.0	5136

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Micro Drainage		Source Control 2018.1

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)	18.000	Shortest Storm (mins)	15
Ratio R	0.335	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.034

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

0	4	0.034
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Micro Drainage		Source Control 2018.1

Model Details

Storage is Online Cover Level (m) 100.000

Porous Car Park Structure

Infiltration Coefficient Base (m/hr)	0.05040	Width (m)	6.0
Membrane Percolation (mm/hr)	1000	Length (m)	38.0
Max Percolation (l/s)	63.3	Slope (1:X)	50.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	99.395	Cap Volume Depth (m)	0.475

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Micro Drainage	Source Control 2018.1	

Summary of Results for 100 year Return Period (+40%)

Half Drain Time : 66 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m ³)	Status
15 min Summer	99.601	0.206	0.3	1.2	O K
30 min Summer	99.635	0.240	0.3	1.7	O K
60 min Summer	99.658	0.263	0.4	2.0	O K
120 min Summer	99.671	0.276	0.4	2.2	O K
180 min Summer	99.672	0.277	0.4	2.2	O K
240 min Summer	99.668	0.273	0.4	2.2	O K
360 min Summer	99.657	0.262	0.4	2.0	O K
480 min Summer	99.645	0.250	0.3	1.8	O K
600 min Summer	99.633	0.238	0.3	1.6	O K
720 min Summer	99.623	0.228	0.3	1.5	O K
960 min Summer	99.604	0.209	0.3	1.3	O K
1440 min Summer	99.574	0.179	0.2	0.9	O K
2160 min Summer	99.543	0.148	0.2	0.6	O K
2880 min Summer	99.521	0.126	0.2	0.5	O K
4320 min Summer	99.492	0.097	0.1	0.3	O K
5760 min Summer	99.474	0.079	0.1	0.2	O K
7200 min Summer	99.462	0.067	0.1	0.1	O K
8640 min Summer	99.453	0.058	0.1	0.1	O K
10080 min Summer	99.447	0.052	0.1	0.1	O K
15 min Winter	99.617	0.222	0.3	1.4	O K
30 min Winter	99.653	0.258	0.3	1.9	O K
60 min Winter	99.677	0.282	0.4	2.3	O K
120 min Winter	99.688	0.293	0.4	2.5	O K
180 min Winter	99.686	0.291	0.4	2.4	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m ³)	Time-Peak (mins)
15 min Summer	115.660	0.0	17
30 min Summer	78.386	0.0	31
60 min Summer	50.812	0.0	52
120 min Summer	31.860	0.0	84
180 min Summer	23.904	0.0	120
240 min Summer	19.362	0.0	154
360 min Summer	14.282	0.0	220
480 min Summer	11.513	0.0	286
600 min Summer	9.732	0.0	350
720 min Summer	8.478	0.0	412
960 min Summer	6.814	0.0	536
1440 min Summer	4.997	0.0	778
2160 min Summer	3.657	0.0	1128
2880 min Summer	2.926	0.0	1496
4320 min Summer	2.133	0.0	2204
5760 min Summer	1.702	0.0	2936
7200 min Summer	1.427	0.0	3672
8640 min Summer	1.237	0.0	4400
10080 min Summer	1.097	0.0	5096
15 min Winter	115.660	0.0	17
30 min Winter	78.386	0.0	31
60 min Winter	50.812	0.0	58
120 min Winter	31.860	0.0	92
180 min Winter	23.904	0.0	128

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Micro Drainage	Source Control 2018.1	

Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
240 min Winter	99.679	0.284	0.4	2.3	O K
360 min Winter	99.662	0.267	0.4	2.0	O K
480 min Winter	99.644	0.249	0.3	1.8	O K
600 min Winter	99.628	0.233	0.3	1.6	O K
720 min Winter	99.614	0.219	0.3	1.4	O K
960 min Winter	99.589	0.194	0.3	1.1	O K
1440 min Winter	99.552	0.157	0.2	0.7	O K
2160 min Winter	99.516	0.121	0.2	0.4	O K
2880 min Winter	99.494	0.099	0.1	0.3	O K
4320 min Winter	99.468	0.073	0.1	0.2	O K
5760 min Winter	99.453	0.058	0.1	0.1	O K
7200 min Winter	99.444	0.049	0.1	0.1	O K
8640 min Winter	99.441	0.046	0.1	0.1	O K
10080 min Winter	99.438	0.043	0.1	0.1	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
240 min Winter	19.362	0.0	166
360 min Winter	14.282	0.0	236
480 min Winter	11.513	0.0	302
600 min Winter	9.732	0.0	368
720 min Winter	8.478	0.0	432
960 min Winter	6.814	0.0	556
1440 min Winter	4.997	0.0	794
2160 min Winter	3.657	0.0	1144
2880 min Winter	2.926	0.0	1500
4320 min Winter	2.133	0.0	2204
5760 min Winter	1.702	0.0	2936
7200 min Winter	1.427	0.0	3672
8640 min Winter	1.237	0.0	4368
10080 min Winter	1.097	0.0	5136

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Micro Drainage		Source Control 2018.1

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)	18.000	Shortest Storm (mins)	15
Ratio R	0.335	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.008

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

0	4 0.008
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Micro Drainage	Source Control 2018.1	

Model Details

Storage is Online Cover Level (m) 100.000

Porous Car Park Structure

Infiltration Coefficient Base (m/hr)	0.05040	Width (m)	4.8
Membrane Percolation (mm/hr)	1000	Length (m)	15.0
Max Percolation (l/s)	20.0	Slope (1:X)	40.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	99.395	Cap Volume Depth (m)	0.475

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Micro Drainage	Source Control 2018.1	

Summary of Results for 100 year Return Period (+40%)

Half Drain Time : 106 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
15 min Summer	99.723	0.328	0.4	3.1	Flood Risk
30 min Summer	99.784	0.389	0.5	4.4	Flood Risk
60 min Summer	99.830	0.435	0.6	5.4	Flood Risk
120 min Summer	99.857	0.462	0.6	6.1	Flood Risk
180 min Summer	99.865	0.470	0.6	6.4	Flood Risk
240 min Summer	99.866	0.471	0.6	6.4	Flood Risk
360 min Summer	99.859	0.464	0.6	6.2	Flood Risk
480 min Summer	99.849	0.454	0.6	5.9	Flood Risk
600 min Summer	99.837	0.442	0.6	5.6	Flood Risk
720 min Summer	99.824	0.429	0.6	5.3	Flood Risk
960 min Summer	99.800	0.405	0.5	4.7	Flood Risk
1440 min Summer	99.758	0.363	0.5	3.8	Flood Risk
2160 min Summer	99.709	0.314	0.4	2.8	Flood Risk
2880 min Summer	99.671	0.276	0.4	2.2	O K
4320 min Summer	99.618	0.223	0.3	1.4	O K
5760 min Summer	99.582	0.187	0.3	1.0	O K
7200 min Summer	99.556	0.161	0.2	0.7	O K
8640 min Summer	99.537	0.142	0.2	0.6	O K
10080 min Summer	99.522	0.127	0.2	0.5	O K
15 min Winter	99.749	0.354	0.5	3.6	Flood Risk
30 min Winter	99.813	0.418	0.6	5.0	Flood Risk
60 min Winter	99.862	0.467	0.6	6.3	Flood Risk
120 min Winter	99.889	0.494	0.7	7.0	Flood Risk
180 min Winter	99.896	0.501	0.7	7.2	Flood Risk

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
15 min Summer	115.660	0.0	18
30 min Summer	78.386	0.0	32
60 min Summer	50.812	0.0	60
120 min Summer	31.860	0.0	96
180 min Summer	23.904	0.0	128
240 min Summer	19.362	0.0	164
360 min Summer	14.282	0.0	232
480 min Summer	11.513	0.0	300
600 min Summer	9.732	0.0	366
720 min Summer	8.478	0.0	434
960 min Summer	6.814	0.0	560
1440 min Summer	4.997	0.0	808
2160 min Summer	3.657	0.0	1172
2880 min Summer	2.926	0.0	1528
4320 min Summer	2.133	0.0	2248
5760 min Summer	1.702	0.0	2944
7200 min Summer	1.427	0.0	3672
8640 min Summer	1.237	0.0	4408
10080 min Summer	1.097	0.0	5136
15 min Winter	115.660	0.0	18
30 min Winter	78.386	0.0	32
60 min Winter	50.812	0.0	60
120 min Winter	31.860	0.0	102
180 min Winter	23.904	0.0	138

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Micro Drainage Source Control 2018.1		

Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
240 min Winter	99.894	0.499	0.7	7.2	Flood Risk
360 min Winter	99.880	0.485	0.7	6.8	Flood Risk
480 min Winter	99.864	0.469	0.6	6.3	Flood Risk
600 min Winter	99.845	0.450	0.6	5.8	Flood Risk
720 min Winter	99.827	0.432	0.6	5.4	Flood Risk
960 min Winter	99.793	0.398	0.5	4.6	Flood Risk
1440 min Winter	99.736	0.341	0.5	3.4	Flood Risk
2160 min Winter	99.673	0.278	0.4	2.2	O K
2880 min Winter	99.629	0.234	0.3	1.6	O K
4320 min Winter	99.572	0.177	0.2	0.9	O K
5760 min Winter	99.537	0.142	0.2	0.6	O K
7200 min Winter	99.515	0.120	0.2	0.4	O K
8640 min Winter	99.498	0.103	0.1	0.3	O K
10080 min Winter	99.486	0.091	0.1	0.2	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
240 min Winter	19.362	0.0	176
360 min Winter	14.282	0.0	250
480 min Winter	11.513	0.0	322
600 min Winter	9.732	0.0	392
720 min Winter	8.478	0.0	458
960 min Winter	6.814	0.0	588
1440 min Winter	4.997	0.0	838
2160 min Winter	3.657	0.0	1208
2880 min Winter	2.926	0.0	1556
4320 min Winter	2.133	0.0	2252
5760 min Winter	1.702	0.0	2992
7200 min Winter	1.427	0.0	3672
8640 min Winter	1.237	0.0	4408
10080 min Winter	1.097	0.0	5072

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Micro Drainage		Source Control 2018.1

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)	18.000	Shortest Storm (mins)	15
Ratio R	0.335	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.020

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

0	4	0.020
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Micro Drainage	Source Control 2018.1	

Model Details

Storage is Online Cover Level (m) 100.000

Porous Car Park Structure

Infiltration Coefficient Base (m/hr)	0.05040	Width (m)	4.8
Membrane Percolation (mm/hr)	1000	Length (m)	41.0
Max Percolation (l/s)	54.7	Slope (1:X)	40.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	99.395	Cap Volume Depth (m)	0.475

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Micro Drainage	Source Control 2018.1	

Summary of Results for 100 year Return Period (+40%)

Half Drain Time : 71 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
15 min Summer	99.779	0.384	2.3	10.6	Flood Risk
30 min Summer	99.846	0.451	2.7	14.6	Flood Risk
60 min Summer	99.890	0.495	3.0	17.6	Flood Risk
120 min Summer	99.918	0.523	3.1	19.6	Flood Risk
180 min Summer	99.922	0.527	3.2	19.8	Flood Risk
240 min Summer	99.916	0.521	3.1	19.4	Flood Risk
360 min Summer	99.896	0.501	3.0	18.0	Flood Risk
480 min Summer	99.874	0.479	2.9	16.5	Flood Risk
600 min Summer	99.853	0.458	2.7	15.1	Flood Risk
720 min Summer	99.834	0.439	2.6	13.9	Flood Risk
960 min Summer	99.799	0.404	2.4	11.7	Flood Risk
1440 min Summer	99.743	0.348	2.1	8.7	Flood Risk
2160 min Summer	99.684	0.289	1.7	6.0	O K
2880 min Summer	99.642	0.247	1.5	4.4	O K
4320 min Summer	99.587	0.192	1.2	2.6	O K
5760 min Summer	99.552	0.157	0.9	1.8	O K
7200 min Summer	99.528	0.133	0.8	1.3	O K
8640 min Summer	99.510	0.115	0.7	1.0	O K
10080 min Summer	99.497	0.102	0.6	0.7	O K
15 min Winter	99.809	0.414	2.5	12.4	Flood Risk
30 min Winter	99.880	0.485	2.9	16.9	Flood Risk
60 min Winter	99.930	0.535	3.2	20.4	Flood Risk
120 min Winter	99.955	0.560	3.4	22.2	Flood Risk
180 min Winter	99.953	0.558	3.3	22.0	Flood Risk

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
15 min Summer	115.660	0.0	17
30 min Summer	78.386	0.0	31
60 min Summer	50.812	0.0	54
120 min Summer	31.860	0.0	86
180 min Summer	23.904	0.0	120
240 min Summer	19.362	0.0	154
360 min Summer	14.282	0.0	222
480 min Summer	11.513	0.0	288
600 min Summer	9.732	0.0	352
720 min Summer	8.478	0.0	414
960 min Summer	6.814	0.0	538
1440 min Summer	4.997	0.0	780
2160 min Summer	3.657	0.0	1144
2880 min Summer	2.926	0.0	1500
4320 min Summer	2.133	0.0	2204
5760 min Summer	1.702	0.0	2936
7200 min Summer	1.427	0.0	3672
8640 min Summer	1.237	0.0	4400
10080 min Summer	1.097	0.0	5136
15 min Winter	115.660	0.0	17
30 min Winter	78.386	0.0	31
60 min Winter	50.812	0.0	58
120 min Winter	31.860	0.0	92
180 min Winter	23.904	0.0	130

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Micro Drainage	Source Control 2018.1	

Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
240 min Winter	99.941	0.546	3.3	21.2	Flood Risk
360 min Winter	99.908	0.513	3.1	18.8	Flood Risk
480 min Winter	99.876	0.481	2.9	16.6	Flood Risk
600 min Winter	99.846	0.451	2.7	14.7	Flood Risk
720 min Winter	99.819	0.424	2.5	13.0	Flood Risk
960 min Winter	99.772	0.377	2.3	10.3	Flood Risk
1440 min Winter	99.702	0.307	1.8	6.8	Flood Risk
2160 min Winter	99.634	0.239	1.4	4.1	O K
2880 min Winter	99.590	0.195	1.2	2.7	O K
4320 min Winter	99.539	0.144	0.9	1.5	O K
5760 min Winter	99.510	0.115	0.7	0.9	O K
7200 min Winter	99.491	0.096	0.6	0.7	O K
8640 min Winter	99.477	0.082	0.5	0.5	O K
10080 min Winter	99.468	0.073	0.4	0.4	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
240 min Winter	19.362	0.0	166
360 min Winter	14.282	0.0	238
480 min Winter	11.513	0.0	304
600 min Winter	9.732	0.0	370
720 min Winter	8.478	0.0	434
960 min Winter	6.814	0.0	558
1440 min Winter	4.997	0.0	796
2160 min Winter	3.657	0.0	1148
2880 min Winter	2.926	0.0	1500
4320 min Winter	2.133	0.0	2204
5760 min Winter	1.702	0.0	2928
7200 min Winter	1.427	0.0	3640
8640 min Winter	1.237	0.0	4400
10080 min Winter	1.097	0.0	5064

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Micro Drainage	Source Control 2018.1	

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)	18.000	Shortest Storm (mins)	15
Ratio R	0.335	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.071

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

0	4 0.071
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Micro Drainage		Source Control 2018.1

Model Details

Storage is Online Cover Level (m) 100.000

Porous Car Park Structure

Infiltration Coefficient Base (m/hr)	0.09000	Width (m)	4.8
Membrane Percolation (mm/hr)	1000	Length (m)	147.0
Max Percolation (l/s)	196.0	Slope (1:X)	100.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	99.395	Cap Volume Depth (m)	0.475

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Micro Drainage	Source Control 2018.1	

Summary of Results for 100 year Return Period (+40%)

Half Drain Time : 72 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
15 min Summer	99.816	0.421	1.3	6.4	Flood Risk
30 min Summer	99.881	0.486	1.5	8.5	Flood Risk
60 min Summer	99.924	0.529	1.6	10.0	Flood Risk
120 min Summer	99.950	0.555	1.7	10.9	Flood Risk
180 min Summer	99.952	0.557	1.7	11.0	Flood Risk
240 min Summer	99.945	0.550	1.6	10.7	Flood Risk
360 min Summer	99.921	0.526	1.6	9.9	Flood Risk
480 min Summer	99.898	0.503	1.5	9.1	Flood Risk
600 min Summer	99.876	0.481	1.4	8.3	Flood Risk
720 min Summer	99.857	0.462	1.4	7.7	Flood Risk
960 min Summer	99.821	0.426	1.3	6.5	Flood Risk
1440 min Summer	99.764	0.369	1.1	4.9	Flood Risk
2160 min Summer	99.702	0.307	0.9	3.4	Flood Risk
2880 min Summer	99.659	0.264	0.8	2.5	O K
4320 min Summer	99.601	0.206	0.6	1.5	O K
5760 min Summer	99.564	0.169	0.5	1.0	O K
7200 min Summer	99.539	0.144	0.4	0.7	O K
8640 min Summer	99.520	0.125	0.4	0.6	O K
10080 min Summer	99.506	0.111	0.3	0.4	O K
15 min Winter	99.846	0.451	1.4	7.3	Flood Risk
30 min Winter	99.916	0.521	1.6	9.7	Flood Risk
60 min Winter	99.967	0.572	1.7	11.5	Flood Risk
120 min Winter	99.991	0.596	1.8	12.4	Flood Risk
180 min Winter	99.987	0.592	1.8	12.2	Flood Risk

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
15 min Summer	115.660	0.0	17
30 min Summer	78.386	0.0	31
60 min Summer	50.812	0.0	54
120 min Summer	31.860	0.0	86
180 min Summer	23.904	0.0	120
240 min Summer	19.362	0.0	154
360 min Summer	14.282	0.0	222
480 min Summer	11.513	0.0	288
600 min Summer	9.732	0.0	352
720 min Summer	8.478	0.0	416
960 min Summer	6.814	0.0	540
1440 min Summer	4.997	0.0	780
2160 min Summer	3.657	0.0	1144
2880 min Summer	2.926	0.0	1500
4320 min Summer	2.133	0.0	2208
5760 min Summer	1.702	0.0	2936
7200 min Summer	1.427	0.0	3672
8640 min Summer	1.237	0.0	4400
10080 min Summer	1.097	0.0	5136
15 min Winter	115.660	0.0	17
30 min Winter	78.386	0.0	31
60 min Winter	50.812	0.0	58
120 min Winter	31.860	0.0	92
180 min Winter	23.904	0.0	130

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Micro Drainage	Source Control 2018.1	

Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
240 min Winter	99.972	0.577	1.7	11.7	Flood Risk
360 min Winter	99.936	0.541	1.6	10.4	Flood Risk
480 min Winter	99.902	0.507	1.5	9.2	Flood Risk
600 min Winter	99.871	0.476	1.4	8.2	Flood Risk
720 min Winter	99.843	0.448	1.3	7.2	Flood Risk
960 min Winter	99.795	0.400	1.2	5.8	Flood Risk
1440 min Winter	99.722	0.327	1.0	3.9	Flood Risk
2160 min Winter	99.651	0.256	0.8	2.4	O K
2880 min Winter	99.605	0.210	0.6	1.6	O K
4320 min Winter	99.550	0.155	0.5	0.9	O K
5760 min Winter	99.519	0.124	0.4	0.6	O K
7200 min Winter	99.499	0.104	0.3	0.4	O K
8640 min Winter	99.485	0.090	0.3	0.3	O K
10080 min Winter	99.475	0.080	0.2	0.2	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
240 min Winter	19.362	0.0	168
360 min Winter	14.282	0.0	238
480 min Winter	11.513	0.0	306
600 min Winter	9.732	0.0	372
720 min Winter	8.478	0.0	436
960 min Winter	6.814	0.0	560
1440 min Winter	4.997	0.0	806
2160 min Winter	3.657	0.0	1152
2880 min Winter	2.926	0.0	1500
4320 min Winter	2.133	0.0	2208
5760 min Winter	1.702	0.0	2936
7200 min Winter	1.427	0.0	3648
8640 min Winter	1.237	0.0	4408
10080 min Winter	1.097	0.0	5120

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Micro Drainage	Source Control 2018.1	

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)	18.000	Shortest Storm (mins)	15
Ratio R	0.335	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.038

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

0	4	0.038
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Micro Drainage	Source Control 2018.1	

Model Details

Storage is Online Cover Level (m) 100.000

Porous Car Park Structure

Infiltration Coefficient Base (m/hr)	0.09000	Width (m)	6.0
Membrane Percolation (mm/hr)	1000	Length (m)	37.5
Max Percolation (l/s)	62.5	Slope (1:X)	40.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	99.395	Cap Volume Depth (m)	0.475

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Micro Drainage	Source Control 2018.1	

Summary of Results for 100 year Return Period (+40%)

Half Drain Time : 60 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
15 min Summer	99.727	0.332	2.0	7.9	Flood Risk
30 min Summer	99.783	0.388	2.3	10.8	Flood Risk
60 min Summer	99.819	0.424	2.5	13.0	Flood Risk
120 min Summer	99.840	0.445	2.7	14.3	Flood Risk
180 min Summer	99.841	0.446	2.7	14.3	Flood Risk
240 min Summer	99.834	0.439	2.6	13.9	Flood Risk
360 min Summer	99.814	0.419	2.5	12.6	Flood Risk
480 min Summer	99.793	0.398	2.4	11.4	Flood Risk
600 min Summer	99.773	0.378	2.3	10.3	Flood Risk
720 min Summer	99.755	0.360	2.2	9.3	Flood Risk
960 min Summer	99.724	0.329	2.0	7.8	Flood Risk
1440 min Summer	99.674	0.279	1.7	5.6	O K
2160 min Summer	99.623	0.228	1.4	3.8	O K
2880 min Summer	99.588	0.193	1.2	2.7	O K
4320 min Summer	99.544	0.149	0.9	1.6	O K
5760 min Summer	99.516	0.121	0.7	1.0	O K
7200 min Summer	99.496	0.101	0.6	0.7	O K
8640 min Summer	99.483	0.088	0.5	0.6	O K
10080 min Summer	99.473	0.078	0.5	0.4	O K
15 min Winter	99.753	0.358	2.1	9.2	Flood Risk
30 min Winter	99.813	0.418	2.5	12.6	Flood Risk
60 min Winter	99.850	0.455	2.7	14.9	Flood Risk
120 min Winter	99.868	0.473	2.8	16.1	Flood Risk
180 min Winter	99.863	0.468	2.8	15.7	Flood Risk

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
15 min Summer	115.660	0.0	17
30 min Summer	78.386	0.0	31
60 min Summer	50.812	0.0	50
120 min Summer	31.860	0.0	84
180 min Summer	23.904	0.0	118
240 min Summer	19.362	0.0	152
360 min Summer	14.282	0.0	218
480 min Summer	11.513	0.0	284
600 min Summer	9.732	0.0	346
720 min Summer	8.478	0.0	408
960 min Summer	6.814	0.0	530
1440 min Summer	4.997	0.0	768
2160 min Summer	3.657	0.0	1128
2880 min Summer	2.926	0.0	1496
4320 min Summer	2.133	0.0	2204
5760 min Summer	1.702	0.0	2936
7200 min Summer	1.427	0.0	3672
8640 min Summer	1.237	0.0	4400
10080 min Summer	1.097	0.0	5088
15 min Winter	115.660	0.0	17
30 min Winter	78.386	0.0	31
60 min Winter	50.812	0.0	56
120 min Winter	31.860	0.0	90
180 min Winter	23.904	0.0	128

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Micro Drainage	Source Control 2018.1	

Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
240 min Winter	99.850	0.455	2.7	14.9	Flood Risk
360 min Winter	99.819	0.424	2.5	12.9	Flood Risk
480 min Winter	99.789	0.394	2.4	11.2	Flood Risk
600 min Winter	99.762	0.367	2.2	9.7	Flood Risk
720 min Winter	99.737	0.342	2.1	8.4	Flood Risk
960 min Winter	99.696	0.301	1.8	6.5	O K
1440 min Winter	99.635	0.240	1.4	4.2	O K
2160 min Winter	99.579	0.184	1.1	2.4	O K
2880 min Winter	99.545	0.150	0.9	1.6	O K
4320 min Winter	99.505	0.110	0.7	0.9	O K
5760 min Winter	99.482	0.087	0.5	0.5	O K
7200 min Winter	99.468	0.073	0.4	0.4	O K
8640 min Winter	99.458	0.063	0.4	0.3	O K
10080 min Winter	99.450	0.055	0.3	0.2	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
240 min Winter	19.362	0.0	164
360 min Winter	14.282	0.0	232
480 min Winter	11.513	0.0	300
600 min Winter	9.732	0.0	362
720 min Winter	8.478	0.0	426
960 min Winter	6.814	0.0	548
1440 min Winter	4.997	0.0	782
2160 min Winter	3.657	0.0	1144
2880 min Winter	2.926	0.0	1496
4320 min Winter	2.133	0.0	2204
5760 min Winter	1.702	0.0	2896
7200 min Winter	1.427	0.0	3608
8640 min Winter	1.237	0.0	4312
10080 min Winter	1.097	0.0	5112

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Micro Drainage		Source Control 2018.1

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)	18.000	Shortest Storm (mins)	15
Ratio R	0.335	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.054

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

0	4 0.054
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Micro Drainage	Source Control 2018.1	

Model Details

Storage is Online Cover Level (m) 100.000

Porous Car Park Structure

Infiltration Coefficient Base (m/hr)	0.09000	Width (m)	4.8
Membrane Percolation (mm/hr)	1000	Length (m)	113.0
Max Percolation (l/s)	150.7	Slope (1:X)	100.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	99.395	Cap Volume Depth (m)	0.475

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Micro Drainage		Source Control 2018.1

Summary of Results for 100 year Return Period (+40%)

Half Drain Time : 110 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m ³)	Status
15 min Summer	98.359	0.559	0.4	3.2	O K
30 min Summer	98.522	0.722	0.4	4.1	O K
60 min Summer	98.652	0.852	0.5	4.9	O K
120 min Summer	98.717	0.917	0.5	5.2	O K
180 min Summer	98.724	0.924	0.5	5.3	O K
240 min Summer	98.709	0.909	0.5	5.2	O K
360 min Summer	98.658	0.858	0.5	4.9	O K
480 min Summer	98.608	0.808	0.5	4.6	O K
600 min Summer	98.561	0.761	0.5	4.3	O K
720 min Summer	98.516	0.716	0.4	4.1	O K
960 min Summer	98.434	0.634	0.4	3.6	O K
1440 min Summer	98.300	0.500	0.4	2.8	O K
2160 min Summer	98.152	0.352	0.3	2.0	O K
2880 min Summer	98.047	0.247	0.3	1.4	O K
4320 min Summer	97.913	0.113	0.2	0.6	O K
5760 min Summer	97.851	0.051	0.2	0.3	O K
7200 min Summer	97.842	0.042	0.2	0.2	O K
8640 min Summer	97.837	0.037	0.2	0.2	O K
10080 min Summer	97.833	0.033	0.1	0.2	O K
15 min Winter	98.430	0.630	0.4	3.6	O K
30 min Winter	98.617	0.817	0.5	4.7	O K
60 min Winter	98.773	0.973	0.5	5.5	O K
120 min Winter	98.848	1.048	0.6	6.0	O K
180 min Winter	98.853	1.053	0.6	6.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m ³)	Time-Peak (mins)
15 min Summer	115.660	0.0	18
30 min Summer	78.386	0.0	32
60 min Summer	50.812	0.0	60
120 min Summer	31.860	0.0	96
180 min Summer	23.904	0.0	128
240 min Summer	19.362	0.0	164
360 min Summer	14.282	0.0	232
480 min Summer	11.513	0.0	302
600 min Summer	9.732	0.0	368
720 min Summer	8.478	0.0	434
960 min Summer	6.814	0.0	566
1440 min Summer	4.997	0.0	822
2160 min Summer	3.657	0.0	1188
2880 min Summer	2.926	0.0	1556
4320 min Summer	2.133	0.0	2248
5760 min Summer	1.702	0.0	2936
7200 min Summer	1.427	0.0	3640
8640 min Summer	1.237	0.0	4320
10080 min Summer	1.097	0.0	5064
15 min Winter	115.660	0.0	18
30 min Winter	78.386	0.0	32
60 min Winter	50.812	0.0	60
120 min Winter	31.860	0.0	98
180 min Winter	23.904	0.0	136

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20 East Sands	19146 Gresford, Wrexham	
Burbage Marlborough	Prelim Soakaway Design	
Wiltshire SN8 3AN	19146-SA-01-B	
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File 19169-SA-01-B.SRCX	Checked by	
Micro Drainage	Source Control 2018.1	

Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
240 min Winter	98.828	1.028	0.6	5.9	O K
360 min Winter	98.750	0.950	0.5	5.4	O K
480 min Winter	98.674	0.874	0.5	5.0	O K
600 min Winter	98.602	0.802	0.5	4.6	O K
720 min Winter	98.537	0.737	0.5	4.2	O K
960 min Winter	98.421	0.621	0.4	3.5	O K
1440 min Winter	98.242	0.442	0.4	2.5	O K
2160 min Winter	98.059	0.259	0.3	1.5	O K
2880 min Winter	97.939	0.139	0.3	0.8	O K
4320 min Winter	97.846	0.046	0.2	0.3	O K
5760 min Winter	97.836	0.036	0.2	0.2	O K
7200 min Winter	97.831	0.031	0.1	0.2	O K
8640 min Winter	97.827	0.027	0.1	0.2	O K
10080 min Winter	97.824	0.024	0.1	0.1	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
240 min Winter	19.362	0.0	176
360 min Winter	14.282	0.0	250
480 min Winter	11.513	0.0	324
600 min Winter	9.732	0.0	394
720 min Winter	8.478	0.0	462
960 min Winter	6.814	0.0	598
1440 min Winter	4.997	0.0	852
2160 min Winter	3.657	0.0	1232
2880 min Winter	2.926	0.0	1584
4320 min Winter	2.133	0.0	2200
5760 min Winter	1.702	0.0	2936
7200 min Winter	1.427	0.0	3584
8640 min Winter	1.237	0.0	4368
10080 min Winter	1.097	0.0	5040

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20 East Sands Burbage Marlborough Wiltshire SN8 3AN	19146 Gresford, Wrexham Prelim Soakaway Design 19146-SA-01-B	
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Micro Drainage		Source Control 2018.1

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)	18.000	Shortest Storm (mins)	15
Ratio R	0.335	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.016

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

0	4	0.016
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20 East Sands Burbage Marlborough Wiltshire SN8 3AN	19146 Gresford, Wrexham Prelim Soakaway Design 19146-SA-01-B	
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Micro Drainage	Source Control 2018.1	

Model Details

Storage is Online Cover Level (m) 100.000

Cellular Storage Structure

Invert Level (m) 97.800 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.24480 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.24480

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	6.0	6.0	1.200	6.0	18.0	1.201	0.0	18.0

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20 East Sands Burbage Marlborough Wiltshire SN8 3AN	19146 Gresford, Wrexham Prelim Soakaway Design 19146-SA-02-B	
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Micro Drainage		Source Control 2018.1

Summary of Results for 100 year Return Period (+40%)

Half Drain Time : 30 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m ³)	Status
15 min Summer	98.461	0.661	1.5	3.8	O K
30 min Summer	98.585	0.785	1.6	4.5	O K
60 min Summer	98.644	0.844	1.7	4.8	O K
120 min Summer	98.615	0.815	1.7	4.6	O K
180 min Summer	98.552	0.752	1.6	4.3	O K
240 min Summer	98.483	0.683	1.5	3.9	O K
360 min Summer	98.360	0.560	1.4	3.2	O K
480 min Summer	98.262	0.462	1.3	2.6	O K
600 min Summer	98.182	0.382	1.2	2.2	O K
720 min Summer	98.115	0.315	1.1	1.8	O K
960 min Summer	98.012	0.212	1.0	1.2	O K
1440 min Summer	97.887	0.087	0.8	0.5	O K
2160 min Summer	97.843	0.043	0.7	0.2	O K
2880 min Summer	97.834	0.034	0.5	0.2	O K
4320 min Summer	97.825	0.025	0.4	0.1	O K
5760 min Summer	97.820	0.020	0.3	0.1	O K
7200 min Summer	97.817	0.017	0.3	0.1	O K
8640 min Summer	97.815	0.015	0.2	0.1	O K
10080 min Summer	97.813	0.013	0.2	0.1	O K
15 min Winter	98.553	0.753	1.6	4.3	O K
30 min Winter	98.699	0.899	1.8	5.1	O K
60 min Winter	98.760	0.960	1.8	5.5	O K
120 min Winter	98.693	0.893	1.8	5.1	O K
180 min Winter	98.588	0.788	1.6	4.5	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m ³)	Time-Peak (mins)
15 min Summer	115.660	0.0	16
30 min Summer	78.386	0.0	26
60 min Summer	50.812	0.0	44
120 min Summer	31.860	0.0	78
180 min Summer	23.904	0.0	112
240 min Summer	19.362	0.0	144
360 min Summer	14.282	0.0	208
480 min Summer	11.513	0.0	270
600 min Summer	9.732	0.0	332
720 min Summer	8.478	0.0	392
960 min Summer	6.814	0.0	512
1440 min Summer	4.997	0.0	748
2160 min Summer	3.657	0.0	1092
2880 min Summer	2.926	0.0	1448
4320 min Summer	2.133	0.0	2156
5760 min Summer	1.702	0.0	2880
7200 min Summer	1.427	0.0	3552
8640 min Summer	1.237	0.0	4256
10080 min Summer	1.097	0.0	5104
15 min Winter	115.660	0.0	16
30 min Winter	78.386	0.0	28
60 min Winter	50.812	0.0	46
120 min Winter	31.860	0.0	84
180 min Winter	23.904	0.0	118

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20 East Sands Burbage Marlborough Wiltshire SN8 3AN	19146 Gresford, Wrexham Prelim Soakaway Design 19146-SA-02-B	
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Micro Drainage Source Control 2018.1		

Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m ³)	Status
240 min Winter	98.488	0.688	1.5	3.9	O K
360 min Winter	98.317	0.517	1.3	2.9	O K
480 min Winter	98.190	0.390	1.2	2.2	O K
600 min Winter	98.091	0.291	1.1	1.7	O K
720 min Winter	98.012	0.212	1.0	1.2	O K
960 min Winter	97.899	0.099	0.8	0.6	O K
1440 min Winter	97.842	0.042	0.7	0.2	O K
2160 min Winter	97.831	0.031	0.5	0.2	O K
2880 min Winter	97.825	0.025	0.4	0.1	O K
4320 min Winter	97.818	0.018	0.3	0.1	O K
5760 min Winter	97.815	0.015	0.2	0.1	O K
7200 min Winter	97.812	0.012	0.2	0.1	O K
8640 min Winter	97.811	0.011	0.2	0.1	O K
10080 min Winter	97.809	0.009	0.1	0.1	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m ³)	Time-Peak (mins)
240 min Winter	19.362	0.0	154
360 min Winter	14.282	0.0	218
480 min Winter	11.513	0.0	282
600 min Winter	9.732	0.0	344
720 min Winter	8.478	0.0	404
960 min Winter	6.814	0.0	520
1440 min Winter	4.997	0.0	724
2160 min Winter	3.657	0.0	1100
2880 min Winter	2.926	0.0	1436
4320 min Winter	2.133	0.0	2140
5760 min Winter	1.702	0.0	2888
7200 min Winter	1.427	0.0	3624
8640 min Winter	1.237	0.0	4264
10080 min Winter	1.097	0.0	4944

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20 East Sands Burbage Marlborough Wiltshire SN8 3AN	19146 Gresford, Wrexham Prelim Soakaway Design 19146-SA-02-B	
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Micro Drainage		Source Control 2018.1

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)	18.000	Shortest Storm (mins)	15
Ratio R	0.335	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.022

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

0	4 0.022
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20 East Sands Burbage Marlborough Wiltshire SN8 3AN	19146 Gresford, Wrexham Prelim Soakaway Design 19146-SA-02-B	
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Micro Drainage	Source Control 2018.1	

Model Details

Storage is Online Cover Level (m) 100.000

Cellular Storage Structure

Invert Level (m) 97.800 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.85320 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.85320

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	6.0	6.0	1.200	6.0	18.0	1.201	0.0	18.0

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Burbage Marlborough	Prelim Soakaway Design	
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Micro Drainage	Source Control 2018.1	

Summary of Results for 100 year Return Period (+40%)

Half Drain Time : 119 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m ³)	Status
15 min Summer	98.389	0.589	0.5	4.2	O K
30 min Summer	98.563	0.763	0.6	5.4	O K
60 min Summer	98.705	0.905	0.6	6.4	O K
120 min Summer	98.777	0.977	0.6	7.0	O K
180 min Summer	98.787	0.987	0.6	7.0	O K
240 min Summer	98.773	0.973	0.6	6.9	O K
360 min Summer	98.722	0.922	0.6	6.6	O K
480 min Summer	98.672	0.872	0.6	6.2	O K
600 min Summer	98.623	0.823	0.6	5.9	O K
720 min Summer	98.577	0.777	0.6	5.5	O K
960 min Summer	98.493	0.693	0.5	4.9	O K
1440 min Summer	98.351	0.551	0.5	3.9	O K
2160 min Summer	98.192	0.392	0.4	2.8	O K
2880 min Summer	98.078	0.278	0.4	2.0	O K
4320 min Summer	97.930	0.130	0.3	0.9	O K
5760 min Summer	97.857	0.057	0.3	0.4	O K
7200 min Summer	97.844	0.044	0.2	0.3	O K
8640 min Summer	97.838	0.038	0.2	0.3	O K
10080 min Summer	97.834	0.034	0.2	0.2	O K
15 min Winter	98.463	0.663	0.5	4.7	O K
30 min Winter	98.663	0.863	0.6	6.2	O K
60 min Winter	98.833	1.033	0.7	7.4	O K
120 min Winter	98.918	1.118	0.7	8.0	O K
180 min Winter	98.928	1.128	0.7	8.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m ³)	Time-Peak (mins)
15 min Summer	115.660	0.0	18
30 min Summer	78.386	0.0	32
60 min Summer	50.812	0.0	60
120 min Summer	31.860	0.0	98
180 min Summer	23.904	0.0	130
240 min Summer	19.362	0.0	166
360 min Summer	14.282	0.0	234
480 min Summer	11.513	0.0	304
600 min Summer	9.732	0.0	370
720 min Summer	8.478	0.0	438
960 min Summer	6.814	0.0	568
1440 min Summer	4.997	0.0	822
2160 min Summer	3.657	0.0	1192
2880 min Summer	2.926	0.0	1556
4320 min Summer	2.133	0.0	2252
5760 min Summer	1.702	0.0	2936
7200 min Summer	1.427	0.0	3664
8640 min Summer	1.237	0.0	4304
10080 min Summer	1.097	0.0	5112
15 min Winter	115.660	0.0	18
30 min Winter	78.386	0.0	32
60 min Winter	50.812	0.0	60
120 min Winter	31.860	0.0	108
180 min Winter	23.904	0.0	138

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Micro Drainage	Source Control 2018.1	

Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
240 min Winter	98.906	1.106	0.7	7.9	O K
360 min Winter	98.828	1.028	0.7	7.3	O K
480 min Winter	98.750	0.950	0.6	6.8	O K
600 min Winter	98.677	0.877	0.6	6.2	O K
720 min Winter	98.609	0.809	0.6	5.8	O K
960 min Winter	98.487	0.687	0.5	4.9	O K
1440 min Winter	98.296	0.496	0.5	3.5	O K
2160 min Winter	98.096	0.296	0.4	2.1	O K
2880 min Winter	97.963	0.163	0.3	1.2	O K
4320 min Winter	97.847	0.047	0.3	0.3	O K
5760 min Winter	97.838	0.038	0.2	0.3	O K
7200 min Winter	97.832	0.032	0.2	0.2	O K
8640 min Winter	97.827	0.027	0.2	0.2	O K
10080 min Winter	97.824	0.024	0.1	0.2	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
240 min Winter	19.362	0.0	178
360 min Winter	14.282	0.0	252
480 min Winter	11.513	0.0	326
600 min Winter	9.732	0.0	398
720 min Winter	8.478	0.0	468
960 min Winter	6.814	0.0	604
1440 min Winter	4.997	0.0	866
2160 min Winter	3.657	0.0	1236
2880 min Winter	2.926	0.0	1588
4320 min Winter	2.133	0.0	2204
5760 min Winter	1.702	0.0	2928
7200 min Winter	1.427	0.0	3632
8640 min Winter	1.237	0.0	4296
10080 min Winter	1.097	0.0	5016

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20 East Sands Burbage Marlborough Wiltshire SN8 3AN	19146 Gresford, Wrexham Prelim Soakaway Design 19146-SA-03-B	
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Micro Drainage		Source Control 2018.1

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)	18.000	Shortest Storm (mins)	15
Ratio R	0.335	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.021

Time (mins)		Area
From:	To:	(ha)
0	4	0.021

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20 East Sands	19146 Gresford, Wrexham	
Burbage Marlborough	Prelim Soakaway Design	
Wiltshire SN8 3AN	19146-SA-03-B	
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Micro Drainage	Source Control 2018.1	

Model Details

Storage is Online Cover Level (m) 100.000

Cellular Storage Structure

Invert Level (m) 97.800 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.25200 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.25200

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	7.5	7.5	1.200	7.5	20.7	1.201	0.0	20.7

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20 East Sands Burbage Marlborough Wiltshire SN8 3AN	19146 Gresford, Wrexham Prelim Soakaway Design 19146-SA-04-B	
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Micro Drainage		Source Control 2018.1

Summary of Results for 100 year Return Period (+40%)

Half Drain Time : 700 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m ³)	Status
15 min Summer	98.348	0.548	0.1	4.7	O K
30 min Summer	98.536	0.736	0.1	6.3	O K
60 min Summer	98.737	0.937	0.1	8.0	O K
120 min Summer	98.937	1.137	0.2	9.7	O K
180 min Summer	99.040	1.240	0.2	10.6	O K
240 min Summer	99.098	1.298	0.2	11.1	O K
360 min Summer	99.151	1.351	0.2	11.6	O K
480 min Summer	99.169	1.369	0.2	11.7	O K
600 min Summer	99.174	1.374	0.2	11.8	O K
720 min Summer	99.175	1.375	0.2	11.8	O K
960 min Summer	99.167	1.367	0.2	11.7	O K
1440 min Summer	99.128	1.328	0.2	11.4	O K
2160 min Summer	99.048	1.248	0.2	10.7	O K
2880 min Summer	98.970	1.170	0.2	10.0	O K
4320 min Summer	98.833	1.033	0.1	8.8	O K
5760 min Summer	98.715	0.915	0.1	7.8	O K
7200 min Summer	98.613	0.813	0.1	6.9	O K
8640 min Summer	98.526	0.726	0.1	6.2	O K
10080 min Summer	98.449	0.649	0.1	5.6	O K
15 min Winter	98.415	0.615	0.1	5.3	O K
30 min Winter	98.626	0.826	0.1	7.1	O K
60 min Winter	98.854	1.054	0.2	9.0	O K
120 min Winter	99.082	1.282	0.2	11.0	O K
180 min Winter	99.201	1.401	0.2	12.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m ³)	Time-Peak (mins)
15 min Summer	115.660	0.0	19
30 min Summer	78.386	0.0	34
60 min Summer	50.812	0.0	64
120 min Summer	31.860	0.0	122
180 min Summer	23.904	0.0	182
240 min Summer	19.362	0.0	242
360 min Summer	14.282	0.0	360
480 min Summer	11.513	0.0	466
600 min Summer	9.732	0.0	514
720 min Summer	8.478	0.0	576
960 min Summer	6.814	0.0	702
1440 min Summer	4.997	0.0	980
2160 min Summer	3.657	0.0	1388
2880 min Summer	2.926	0.0	1816
4320 min Summer	2.133	0.0	2596
5760 min Summer	1.702	0.0	3400
7200 min Summer	1.427	0.0	4176
8640 min Summer	1.237	0.0	4928
10080 min Summer	1.097	0.0	5656
15 min Winter	115.660	0.0	19
30 min Winter	78.386	0.0	33
60 min Winter	50.812	0.0	62
120 min Winter	31.860	0.0	120
180 min Winter	23.904	0.0	178

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20 East Sands Burbage Marlborough Wiltshire SN8 3AN	19146 Gresford, Wrexham Prelim Soakaway Design 19146-SA-04-B	
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Micro Drainage Source Control 2018.1		

Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
240 min Winter	99.270	1.470	0.2	12.6	O K
360 min Winter	99.339	1.539	0.2	13.2	O K
480 min Winter	99.369	1.569	0.2	13.4	O K
600 min Winter	99.376	1.576	0.2	13.5	O K
720 min Winter	99.370	1.570	0.2	13.4	O K
960 min Winter	99.361	1.561	0.2	13.3	O K
1440 min Winter	99.306	1.506	0.2	12.9	O K
2160 min Winter	99.190	1.390	0.2	11.9	O K
2880 min Winter	99.073	1.273	0.2	10.9	O K
4320 min Winter	98.874	1.074	0.2	9.2	O K
5760 min Winter	98.710	0.910	0.1	7.8	O K
7200 min Winter	98.573	0.773	0.1	6.6	O K
8640 min Winter	98.459	0.659	0.1	5.6	O K
10080 min Winter	98.362	0.562	0.1	4.8	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
240 min Winter	19.362	0.0	236
360 min Winter	14.282	0.0	350
480 min Winter	11.513	0.0	460
600 min Winter	9.732	0.0	564
720 min Winter	8.478	0.0	602
960 min Winter	6.814	0.0	740
1440 min Winter	4.997	0.0	1052
2160 min Winter	3.657	0.0	1496
2880 min Winter	2.926	0.0	1936
4320 min Winter	2.133	0.0	2768
5760 min Winter	1.702	0.0	3584
7200 min Winter	1.427	0.0	4392
8640 min Winter	1.237	0.0	5184
10080 min Winter	1.097	0.0	5944

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Date 18/06/2020 15:06 File 19169-SA-04-B.SRCX	Designed by jason Checked by	
Micro Drainage		Source Control 2018.1

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)	18.000	Shortest Storm (mins)	15
Ratio R	0.335	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.022

Time (mins)		Area
From:	To:	(ha)
0	4	0.022

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File 19169-SA-04-B.SRCX	Checked by	
Micro Drainage	Source Control 2018.1	

Model Details

Storage is Online Cover Level (m) 100.000

Cellular Storage Structure

Invert Level (m) 97.800 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.05040 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.05040

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	9.0	9.0	1.600	9.0	28.2	1.601	0.0	28.2

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Date 18/06/2020 15:33 File 19169-SA-05-B.SRCX	Designed by jason Checked by	
Micro Drainage		Source Control 2018.1

Summary of Results for 100 year Return Period (+40%)

Half Drain Time : 366 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m ³)	Status
15 min Summer	98.315	0.515	0.2	4.4	O K
30 min Summer	98.487	0.687	0.2	5.9	O K
60 min Summer	98.662	0.862	0.2	7.4	O K
120 min Summer	98.817	1.017	0.3	8.7	O K
180 min Summer	98.879	1.079	0.3	9.2	O K
240 min Summer	98.900	1.100	0.3	9.4	O K
360 min Summer	98.906	1.106	0.3	9.5	O K
480 min Summer	98.902	1.102	0.3	9.4	O K
600 min Summer	98.890	1.090	0.3	9.3	O K
720 min Summer	98.874	1.074	0.3	9.2	O K
960 min Summer	98.834	1.034	0.3	8.8	O K
1440 min Summer	98.754	0.954	0.3	8.2	O K
2160 min Summer	98.645	0.845	0.2	7.2	O K
2880 min Summer	98.549	0.749	0.2	6.4	O K
4320 min Summer	98.390	0.590	0.2	5.0	O K
5760 min Summer	98.266	0.466	0.2	4.0	O K
7200 min Summer	98.168	0.368	0.2	3.1	O K
8640 min Summer	98.090	0.290	0.2	2.5	O K
10080 min Summer	98.026	0.226	0.1	1.9	O K
15 min Winter	98.379	0.579	0.2	4.9	O K
30 min Winter	98.573	0.773	0.2	6.6	O K
60 min Winter	98.772	0.972	0.3	8.3	O K
120 min Winter	98.954	1.154	0.3	9.9	O K
180 min Winter	99.031	1.231	0.3	10.5	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m ³)	Time-Peak (mins)
15 min Summer	115.660	0.0	19
30 min Summer	78.386	0.0	33
60 min Summer	50.812	0.0	62
120 min Summer	31.860	0.0	122
180 min Summer	23.904	0.0	180
240 min Summer	19.362	0.0	238
360 min Summer	14.282	0.0	294
480 min Summer	11.513	0.0	356
600 min Summer	9.732	0.0	424
720 min Summer	8.478	0.0	492
960 min Summer	6.814	0.0	634
1440 min Summer	4.997	0.0	910
2160 min Summer	3.657	0.0	1316
2880 min Summer	2.926	0.0	1704
4320 min Summer	2.133	0.0	2464
5760 min Summer	1.702	0.0	3224
7200 min Summer	1.427	0.0	3960
8640 min Summer	1.237	0.0	4672
10080 min Summer	1.097	0.0	5352
15 min Winter	115.660	0.0	18
30 min Winter	78.386	0.0	33
60 min Winter	50.812	0.0	62
120 min Winter	31.860	0.0	120
180 min Winter	23.904	0.0	176

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Micro Drainage Source Control 2018.1		

Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
240 min Winter	99.063	1.263	0.3	10.8	O K
360 min Winter	99.067	1.267	0.3	10.8	O K
480 min Winter	99.061	1.261	0.3	10.8	O K
600 min Winter	99.045	1.245	0.3	10.6	O K
720 min Winter	99.022	1.222	0.3	10.4	O K
960 min Winter	98.964	1.164	0.3	10.0	O K
1440 min Winter	98.842	1.042	0.3	8.9	O K
2160 min Winter	98.681	0.881	0.2	7.5	O K
2880 min Winter	98.545	0.745	0.2	6.4	O K
4320 min Winter	98.332	0.532	0.2	4.5	O K
5760 min Winter	98.175	0.375	0.2	3.2	O K
7200 min Winter	98.056	0.256	0.2	2.2	O K
8640 min Winter	97.966	0.166	0.1	1.4	O K
10080 min Winter	97.898	0.098	0.1	0.8	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
240 min Winter	19.362	0.0	232
360 min Winter	14.282	0.0	330
480 min Winter	11.513	0.0	374
600 min Winter	9.732	0.0	452
720 min Winter	8.478	0.0	528
960 min Winter	6.814	0.0	682
1440 min Winter	4.997	0.0	980
2160 min Winter	3.657	0.0	1404
2880 min Winter	2.926	0.0	1812
4320 min Winter	2.133	0.0	2592
5760 min Winter	1.702	0.0	3344
7200 min Winter	1.427	0.0	4040
8640 min Winter	1.237	0.0	4760
10080 min Winter	1.097	0.0	5440

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Rainfall Model	FSR	Winter Storms	Yes
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Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	18.000	Shortest Storm (mins)	15
Ratio R	0.335	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.021

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

0	4 0.021
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20 East Sands	19146 Gresford, Wrexham	
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File 19169-SA-05-B.SRCX	Checked by	
Micro Drainage	Source Control 2018.1	

Model Details

Storage is Online Cover Level (m) 100.000

Cellular Storage Structure

Invert Level (m) 97.800 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.09000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.09000

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	9.0	9.0	1.600	9.0	28.2	1.601	0.0	28.2

Appendix C

Regulated Drainage and Water Search

Regulated Drainage & Water Search



Search Details

Prepared for: GeoSmart

Matter: 72009

Client address: Suite 9-11 Old Bank Buildings, Bellstone, Shrewsbury, SY1 1HU

Property:

Residential Development at, Gresford, Hillock Lane, Marford, Wreccsam, LL12 8YG

Water Company:

Dwr Cymru Welsh Water

PO Box 690, Cardiff, CF3 5WL

Date Returned:
16/09/2019

Property type:
Residential

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Summary for Conveyancers

This summary identifies matters revealed which you may wish to highlight to your client or investigate further. It is intended as a snapshot of the information contained in the search, should in no way be considered legal advice, and should be taken in context with the full search information and with your client's planned use and enjoyment of the property.



Maps

1.1	Where relevant, please include a copy of an extract from the public sewer map	Map Provided
1.2	Where relevant, please include a copy of an extract from the map of waterworks	Map Provided



Drainage

2.1	Does foul water from the property drain to the public sewer?	Yes
2.2	Does surface water from the property drain to the public sewer?	No
2.3	Is a surface water drainage charge payable?	Refer to Vendor
2.4	Does the public sewer map indicate any public sewer, disposal main or lateral drain within the boundaries of the property?	Yes
2.4.1	Does the public sewer map indicate any public sewage pumping station within the boundaries of the property?	No
2.5	Does the public sewer map indicate any public sewer within 30.48 metres (100 feet) of any buildings within the property?	Yes
2.5.1	Does the public sewer map indicate any public pumping station within 50 metres (164.04 feet) of any buildings within the property?	Insured
2.6	Are any sewers or lateral drains serving, or which are proposed to serve the property, the subject of an existing adoption agreement or an application for such an agreement?	No
2.7	Has any Sewerage Undertaker approved or been consulted about any plans to erect a building or extension on the property over or in the vicinity of a public sewer, disposal main or drain?	No
2.8	Is any building which is, or forms part of the property, at risk of internal flooding due to overloaded public sewers?	Insured
2.9	Please state the distance from the property to the nearest boundary of the nearest sewage treatment works	Insured



Water

3.1	Is the property connected to mains water supply?	Yes
3.2	Are there any water mains, resource mains or discharge pipes within the boundaries of the property?	Yes
3.3	Is any water main or service pipe serving, or which is proposed to serve the property, the subject of an existing adoption agreement or an application for such an agreement?	No
3.4	Is this property at risk of receiving low water pressure or flow?	Insured
3.5	What is the classification of the water supply for the property?	See report
3.6	Please include details of the location of any water meter serving the property	See report



Charging

4.1.1	Who is responsible for providing the sewerage services for the property?	Welsh Water
4.1.2	Who is responsible for providing the water services for the property?	Hafren Dyfrdwy
4.2	Who bills the property for sewerage services?	Welsh Water
4.3	Who bills the property for water services?	Hafren Dyfrdwy
4.4	What is the current basis for charging for sewerage and/or water services at the property?	See report
4.5	Will the basis for charging for sewerage and water services at the property change as a consequence of a change of occupation?	Insured



Question 1.1

Where relevant, please include a copy of an extract from the public sewer map

A copy of an extract from the public sewer map is included in which the location of the property is identified



Guidance Notes:

Pipes that are shown on the public sewer map as sewers, disposal mains or lateral drains are defined as those for which a Sewerage Undertaker holds statutory responsibility under the Water Industry Act 1991. A Sewerage Undertaker is not generally responsible for rivers, water courses, ponds, culverts or highway drains. If any of these are shown on the copy extract they are shown for information only. Sewers or lateral drains indicated on the extract of the public sewer map as being subject to an agreement under Section 104 of the Water Industry Act 1991 are not an 'as constructed' record. It is recommended that these details are checked with the developer, if any. Please note that following the private sewer transfer on 1 October 2011 there may be additional public assets other than those shown on the public sewer map.

Question 1.2

Where relevant, please include a copy of an extract from the map of waterworks

A copy of an extract from the map of waterworks is included in which the location of the property is identified



Guidance Notes:

Pipes that are shown on the map of waterworks as water mains, resource mains or discharge pipes are defined as those for which a Water Undertaker holds statutory responsibility under the Water Industry Act 1991. Water Undertakers are not responsible for private water mains or private service pipes connecting the property to the public water main and do not hold details of these. These may pass through land outside of the control of the seller, or may be shared with adjacent properties. The buyer may wish to investigate whether separate rights or easements are needed for their inspection, repair or renewal. The extract of the map of waterworks shows water mains in the vicinity of the property. It should be possible to estimate the likely length and route of any private water supply pipe connecting the property to the public water network.



Public Sewer & Water Map



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	Public Combined Sewer		Public Foul Sewer
	Public Surface Water Sewer		Abandoned Public Sewer
	Water Pipes		Sewer Publicly Maintained under Section 24 Public Health Act 1936
	Section 104 Surface Water Sewer		Section 104 Foul Sewer
	Decommissioned Water		Public Sewage Pumping Station

This map is provided by InfoTrack Ltd and must be used in conjunction with the search results attached. Please note, the boundary may have been adjusted from the plan provided so that it reflects the National Polygon dataset provided by the Land Registry. This dataset covers all registered titles (freehold and leasehold) in England and Wales and shows the indicative shape and position of each boundary. The information shown on the map is based on data obtained from various sources but the position of any water company apparatus must should be regarded as approximate. Service pipes, private sewers and drains are generally not shown. This map should not be used for detailed design of any proposed works and users of this map are strongly advised to commission their own survey of the area before carrying out any works to establish the actual position of all apparatus.



Question 2.1

Does foul water from the property drain to the public sewer?

Records indicate that foul water from the property does drain to a public sewer.



Guidance Notes:

The above answer is inferred from the proximity of a public sewer as indicated on the enclosed map. If the inference is wrong, the attached Information Accuracy Indemnity covers an adverse entry.

For confirmation, please refer to billing information, form TA6 or the Property Details Questionnaire which confirms connection to mains drainage. Sewerage Undertakers are not responsible for private drains and private sewers that connect the property to the public sewerage system, and do not hold details of these. The property owner will normally have sole responsibility for private drains serving the property and may have shared responsibility with other users if the property is served by a private sewer which also serves other properties if not connected to the public sewerage system. These may pass through land outside of the control of the seller and the buyer may wish to investigate whether separate rights or easements are needed for their inspection, repair or renewal. An extract from the public sewer map is enclosed. This will show known public sewers and lateral drains in the vicinity of the property and it should be possible to estimate the likely length and route of any private drains and/or private sewers connecting the property to the public sewerage system. If foul water does not drain to the public sewerage system the property may have private facilities in the form of a septic tank, cesspit or other type of treatment plant.



Question 2.2

Does surface water from the property drain to the public sewer?

Records indicate that surface water from the property does not drain to a public sewer. There are no public surface water sewers within the vicinity of the property. We recommend that drainage connections are confirmed with the vendor.



Guidance Notes:

The above answer is inferred from the proximity of a public sewer as indicated on the enclosed map. If the inference is wrong, the attached Information Accuracy Indemnity covers an adverse entry.

For confirmation, please refer to billing information, form TA6 or the Property Details Questionnaire which confirms connection to mains drainage. Sewerage Undertakers are not responsible for private drains and private sewers that connect the property to the public sewerage system, and do not hold details of these. The property owner will normally have sole responsibility for private drains serving the property and may have shared responsibility with other users if the property is served by a private sewer which also serves other properties. These may pass through land outside of the control of the seller and the buyer may wish to investigate whether separate rights or easements are needed for their inspection, repair or renewal. In some cases, Sewerage Undertaker records do not distinguish between foul and surface water connections to the public sewerage system. If on inspection the buyer finds that the property is not connected for surface water drainage, the property may be eligible for a rebate of the surface water drainage charge. Details can be obtained from the Water Company. An extract from the public sewer map is enclosed. This will show known public sewers and lateral drains in the vicinity of the property and it should be possible to estimate the likely length and route of any private drains and/or private sewers connecting the property to the public sewerage system. If surface water does not drain to a public sewer the property may have private facilities in the form of a soakaway or private connection to a watercourse. Please note, the property may drain to a Sustainable Urban Drainage System (SuDs), please refer to the Local Authority Search for further information.

Question 2.3

Is a surface water drainage charge payable?

Please refer to vendor or pre-contract documents and/or your own survey of the property



Guidance Notes:

Where surface water charges are payable but upon inspection the property owner believes that surface water does not drain to the public sewerage system, an application can be made to the Water Company to end surface water charges.



Question 2.4

Does the public sewer map indicate any public sewer, disposal main or lateral drain within the boundaries of the property?

The public sewer map indicates that there are public sewers, disposal mains or lateral drains within the boundaries of the property. Please note, it has not always been a requirement for such public sewers, disposal mains or lateral drains to be recorded on the public sewer map. It is therefore possible for unidentified sewers, disposal mains or lateral drains to exist within the boundaries of the property. However on 1 October 2011 private sewers were transferred into public ownership. There may therefore be additional public sewers, disposal mains or lateral drains which are not recorded on the public sewer map but which may prevent or restrict development of the property.



Guidance Notes:

The approximate boundary of the property has been determined by reference to the plan provided. The presence of a public sewer, disposal main or lateral drain running within the boundary of the property may restrict further development. The Sewerage Undertaker has a statutory right of access to carry out work on its assets, subject to notice. This may result in employees of the Company or its contractors needing to enter the property to carry out work. Any private sewers or lateral drains which are indicated on the extract of the public sewer map as being subject to an agreement under Section 104 of the Water Industry Act 1991 are considered to be not an 'as constructed' record. It is recommended these details are checked with the developer.

Question 2.4.1

Does the public sewer map indicate any public sewage pumping station within the boundaries of the property?

The public sewer map included indicates that there is no public sewage pumping station within the boundaries of the property.



Guidance Notes:

The presence of a public sewage pumping station running within the boundary of the property may restrict further development. The company has a statutory right of access to carry out work on its assets subject to notice. Please note that private pumping stations built prior to 1 July 2011 which serve more than one property and pump to the existing public sewer are eligible for transfer into public ownership as of 1 October 2016. Pumping stations installed after 1 July 2011 remain the responsibility of the homeowner unless they are the subject of an adoption agreement. Please note that the Water Company may not have been made aware of all the pumping stations which meet the adoption obligation criteria and therefore there may be pumping stations not recorded on the public sewer map.



Question 2.5

Does the public sewer map indicate any public sewer within 30.48 metres (100 feet) of any buildings within the property?

The public sewer map indicates that there is a public sewer within 30.48 metres (100 feet) of a building within the property. On 1 October 2011 private sewers were transferred into public ownership, there may therefore be additional lateral drains and/or public sewers which are not recorded on the public sewer map but are within 30.48 metres (100 feet) of a building within the property.



Guidance Notes:

Any private sewers or lateral drains which are indicated on the extract of the public sewer map as being subject to an agreement under Section 104 of the Water Industry Act 1991 are not an 'as constructed' record. It is recommended these details be checked with the developer. The presence of a public sewer within 30.48 metres (100 feet) of any buildings within the property can result in the Local Authority requiring a property to be connected to the public sewer. The measure is estimated using the map provided and the water company records, between the building(s) within the boundary of the property and the nearest public sewer.

Question 2.5.1

Does the public sewer map indicate any public pumping station within 50 metres (164.04 feet) of any buildings within the property?

Not answered - This information is not available, if an answer had been available which was adverse at the date of this report the Information Accuracy Indemnity attached would apply.



Guidance Notes:

The presence of a public sewage pumping station running within the boundary of the property may restrict further development. The company has a statutory right of access to carry out work on its assets subject to notice. Please note that private pumping stations built prior to 1 July 2011 which serve more than one property and pump to the existing public sewer are eligible for transfer into public ownership as of 1 October 2016. Pumping stations installed after 1 July 2011 will remain the responsibility of the homeowner unless they are the subject of an adoption agreement. Please note that the Water Company may not have been made aware of all the pumping stations which meet the adoption obligation criteria and therefore there may be pumping stations not recorded on the public sewer map.



Question 2.6

Are any sewers or lateral drains serving, or which are proposed to serve the property, the subject of an existing adoption agreement or an application for such an agreement?

Records indicate that sewers serving the property are not the subject of an existing adoption agreement or an application for such an agreement.



Guidance Notes:

On 1 October 2011 all foul Section 104 sewers laid before 1 July 2011 were transferred into public ownership, excluding those that discharge to a privately owned sewage treatment or collection facility. All surface Section 104 sewers that do not discharge to a public watercourse were also transferred. Water Companies' mapping records are currently being reviewed and updated and may not yet reflect this change, therefore there may be additional public sewers, disposal mains or lateral drains which are not yet recorded on the public sewer map or public sewers that still show as Section 104 sewers.

Question 2.7

Has any Sewerage Undertaker approved or been consulted about any plans to erect a building or extension on the property over or in the vicinity of a public sewer, disposal main or drain?

There are no records in relation to any approval or consultation about plans to erect a building or extension on the property over or in the vicinity of a public sewer, disposal main or drain. However please note the sewerage undertaker might not be aware of a building or extension on the property over or in the vicinity of a public sewer, disposal main or drain. The attached Information Accuracy Indemnity covers adverse entries at the date of this report where data is not available.



Guidance Notes:

Buildings or extensions erected over a public sewer, disposal main or lateral drain in contravention of building controls or which conflict with the provisions of the Water Industry Act 1991 may have to be removed or altered. On 1 October 2011 the majority of private sewers, disposal mains and lateral drains, connected to the public network as of 1 July 2011, transferred to public ownership. Therefore there may be formerly private sewers and lateral drains that have been built over, however the sewerage undertaker may not have approved or been consulted about any plans to erect a building or extension on the property or in the vicinity of these. Please also refer to vendor or pre-contract documents and/or your own survey of the property.



Question 2.8

Is any building which is, or forms part of the property, at risk of internal flooding due to overloaded public sewers?

Not answered - If an answer had been available which was adverse at the date of this report the Information Accuracy Indemnity attached would apply.



Guidance Notes:

A sewer is 'overloaded' when the flow from a storm is unable to pass through it due to a permanent problem (eg. flat gradient, small diameter). Flooding as a result of temporary problems such as blockage, siltation, collapses and equipment or operational failures are excluded. 'Internal flooding' from public sewers is defined as flooding which enters a building or passes below a suspended floor. For reporting purposes, buildings are restricted to those normally occupied and used for residential, public, commercial, business or industrial purposes. 'At Risk' properties are those that the Water Company is required to include in the Regulatory Register that is reported annually to the Director General of Water Services. These are defined as properties that have suffered, or are likely to suffer, internal flooding from public foul, combined or surface water sewers due to overloading of the sewerage system more frequently than the relevant reference period (either once or twice in ten years) as determined by the Company's reporting procedure. Flooding as a result of storm events proven to be exceptional and beyond the reference period of one in ten years are not included on the At Risk register. Properties may be at risk of flooding but not included on the Register where flooding incidents have not been reported to the Company. Public sewers are defined as those for which the company holds statutory responsibility under the Water Industry Act 1991. It should be noted that flooding can occur from private sewers and drains which are not the responsibility of the Company and therefore would be excluded from the report.

Question 2.9

Please state the distance from the property to the nearest boundary of the nearest sewage treatment works

Not answered - If an answer had been available which was adverse at the date of this report the Information Accuracy Indemnity attached would apply.



Guidance Notes:

The nearest sewage treatment works will not always be the sewage treatment works serving the catchment within which the property is situated.



Question 3.1

Is the property connected to mains water supply?

Records indicate that the property is connected to the mains water supply.



Guidance Notes:

The above answer is inferred from the proximity of a public water main as indicated on the enclosed map. If the inference is wrong, the attached Information Accuracy Indemnity covers an adverse entry.

For confirmation, please refer to billing information, form TA6 or the Property Details Questionnaire which confirms connection to mains water, and information regarding whether a water meter is installed. Details of private supplies are not kept by the Water Undertaker. We recommend the situation is checked with the current owner of the property.

Question 3.2

Are there any water mains, resource mains or discharge pipes within the boundaries of the property?

The map of waterworks does indicate water mains, resource mains or discharge pipes within the boundaries of the property.



Guidance Notes:

The approximate boundary of the property has been determined by reference to the plan provided. The presence of public water main, resource main or discharge pipe within the boundary of the property may restrict further development within it. Water Undertakers have a statutory right of access to carry out work on their assets, subject to notice. This may result in employees of the Company or its contractors needing to enter the property to carry out work.

Question 3.3

Is any water main or service pipe serving, or which is proposed to serve the property, the subject of an existing adoption agreement or an application for such an agreement?

Records indicate that water mains or service pipes serving the property are not the subject of an existing adoption agreement or an application for such an agreement.



Guidance Notes:

Where the property is part of a very recent or ongoing development and the water mains and service pipes are not the subject of an adoption application, buyers should consult with the developer to confirm that the Water Undertaker will be asked to provide a water supply to the development or to ascertain the extent of any private water supply system for which they will hold maintenance and renewal liabilities.



Question 3.4

Is this property at risk of receiving low water pressure or flow?

Not answered - If an answer had been available which was adverse at the date of this report the Information Accuracy Indemnity attached would apply.



Guidance Notes:

'Low water pressure' means water pressure below the regulatory reference level which is the minimum pressure when demand on the system is not abnormal.

Question 3.5

What is the classification of the water supply for the property?

To check the average water hardness of water supplied to the property please visit <https://www.hdcymru.co.uk/>



Guidance Notes:

The hardness of water depends on the amount of calcium in it - the more it contains the harder the water is. There is no UK or European standard set for the hardness of drinking water. More information on water hardness can be found on the Drinking Water Inspectorates' website: <http://www.dwi.gov.uk>

If the property is in a hard water area, you may wish to refer to the vendor or pre-contract documents and/or your own survey of the property to establish if a water softener has been installed.

Question 3.6

Please include details of the location of any water meter serving the property

Please refer to vendor or pre-contract documents and / or your own survey of the property. For further information regarding the water meter serving this property please contact:

Hafren Dyfrdwy
Packsaddle
Wrexham Road
Rhostyllen
Wrexham
LL14 4EH
Tel: 0330 678 0646
www.hdcymru.co.uk



Question 4.1.1

Who is responsible for providing the sewerage services for the property?

Please refer to vendor or pre-contract documents and / or your own survey of the property. The Sewerage Undertakers for the area are:

Dwr Cymru Welsh Water
PO Box 690
St. Mellons
Cardiff
CF3 5WL
Tel: 0800 052 0145
www.dwrcymru.com

Question 4.1.2

Who is responsible for providing the water services for the property?

Please refer to vendor or pre-contract documents and / or your own survey of the property. The Water Undertakers for the area are:

Hafren Dyfrdwy
Packsaddle
Wrexham Road
Rhostyllen
Wrexham
LL14 4EH
Tel: 0330 678 0646
www.hdcymru.co.uk

Question 4.2

Who bills the property for sewerage services?

Dwr Cymru Welsh Water
PO Box 690
St. Mellons
Cardiff
CF3 5WL
Tel: 0800 052 0145
www.dwrcymru.com



Question 4.3

Who bills the property for water services?

Hafren Dyfrdwy
Packsaddle
Wrexham Road
Rhostyllen
Wrexham
LL14 4EH
Tel: 0330 678 0646
www.hdcymru.co.uk

Question 4.4

What is the current basis for charging for sewerage and/or water services at the property?

Water and sewerage companies' full charges are set out in their charges schemes which are available from the company free of charge upon request.



Guidance Notes:

The Water Industry Act 1991 Section 150, The Water Resale Order 2001 provides protection for people who buy their water or sewerage services from a person or company instead of directly from a water or sewerage company.

The average household bill is, by definition, an average across all customers. Readings taken from a water meter are used to calculate metered sewerage charges, the volume charge for sewerage services is usually based on a percentage of total water supplied. To view the above information in full please visit the Office of Water Services (OFWAT) Website: <http://www.ofwat.gov.uk> Water and Sewerage Companies full charges are set out in their charges schemes which are available from the Company free of charge upon request.

Question 4.5

Will the basis for charging for sewerage and water services at the property change as a consequence of a change of occupation?

Not answered - If an answer had been available which was adverse at the date of this report the Information Accuracy Indemnity attached would apply.



Guidance Notes:

The Company may install a meter at the premises where a buyer makes a change of use of the property or where the occupier uses water for watering the garden, other than by hand (this includes the use of sprinklers) or automatically replenishing a pond or swimming pool with a capacity greater than 10,000 litres.

Glossary

‘the 1991 Act’ means the Water Industry Act 1991[61]

‘the 2000 Regulations’ means the Water Supply (Water Quality) Regulations 2000[62]

‘adoption agreement’ means an agreement made or to be made under Section 51A(1) or 104(1) of the 1991 Act[64]

‘discharge pipe’ means a pipe which discharges are made or are to be made under Section 165(1) of the 1991 Act

‘disposal main’ means (subject to section 219(2) of the 1991 Act) any outfall pipe or other pipe which - (a) is a pipe for the conveyance of effluent to or from any sewage disposal works, whether of a Sewerage Undertaker or of any other person; and (b) is not a public sewer

‘drain’ means (subject to Section 219(2) of the 1991 Act) a drain used for the drainage of one building or of any buildings or yards appurtenant to buildings within the same curtilage

‘lateral drain’ means - (a) that part of a drain which runs from the curtilage of a building (or buildings or yards within the same curtilage) to the sewer with which the drain communicates or is to communicate; or (b) (if different and the context so requires) the part of a drain identified in a declaration of vesting made under Section 102 of the 1991 Act or in an agreement made under Section 104 of that Act[65]

‘map of waterworks’ means the map made available under Section 198(3) of the 1991 Act[67] in relation to the information specified in subsection (1A)

‘private sewer’ means a pipe or pipes which drain foul or surface water, or both, from premises, and are not vested in a Sewerage Undertaker

‘public sewer’ means, subject to Section 106(1A) of the 1991 Act[68], a sewer for the time being vested in a Sewerage Undertaker in its capacity as such, whether vested in that Undertaker - (a) by virtue of a scheme under Schedule 2 to the Water Act 1989[69]; (b) by virtue of a scheme under Schedule 2 to the 1991 Act[70]; (c) under Section 179 of the 1991 Act[71]; or (d) otherwise; ‘public sewer map’ means the map made available under Section 199(5) of the 1991 Act[72]

‘resource main’ means (subject to Section 219(2) of the 1991 Act) any pipe, not being a trunk main, which is or is to be used for the purpose of - (a) conveying water from one source of supply to another, from a source of supply to a regulating reservoir or from a regulating reservoir to a source of supply; or (b) giving or taking a supply of water in bulk

‘sewerage services’ includes the collection and disposal of foul and surface water and any other services which are required to be provided by a Sewerage Undertaker for the purpose of carrying out its functions

‘Sewerage Undertaker’ means the company appointed to be the Sewerage Undertaker under Section 6(1) of the 1991 Act for the area in which the property is or will be situated

‘surface water’ includes water from roofs and other impermeable surfaces within the curtilage of the property

‘water main’ means (subject to Section 219(2) of the 1991 Act) any pipe, not being a pipe for the time being vested in a person other than the Water Undertaker, which is used or to be used by a Water Undertaker or licensed water supplier for the purpose of making a general supply of water available to customers or potential customers of the Undertaker or supplier, as distinct from for the purpose of providing a supply to particular customers

‘water meter’ means any apparatus for measuring or showing the volume of water supplied to, or of effluent discharged from any premises

‘water supplier’ means the company supplying water in the water supply zone, whether a Water Undertaker or licensed water supplier

‘water supply zone’ in relation to a calendar year, means the names and areas designated by a Water Undertaker within its area of supply that are to be its water supply zones for that year

‘Water Undertaker’ means the company appointed to be the Water Undertaker under Section 6(1) of the 1991 Act for the area in which the property is or will be situated. In this Report, references to a pipe, including references to a main, a drain or a sewer, shall include references to a tunnel or conduit which serves or is to serve as the pipe in question and to any accessories for the pipe.



Information for Buyers

This section is a guide to the content of the regulated drainage and water search result. It should be read in association with the main report. This information should not be considered as legal advice and you should check with your conveyancer if you have any concerns about the search results.

Map of Public Sewers/Waterworks

i	What is a Map of Public Sewers or Map of Waterworks?	Water companies maintain maps of sewers and water pipes for which they are responsible. Most but not all sewer and water pipes within an individual property boundary are the property owner's responsibility.
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Sewer & Water Maintenance

i	Are all Sewer & Water Pipes publicly maintained?	Sewer & Water Pipes can be either publicly or privately maintained. If they are publicly maintained, the local Sewerage or Water undertaker is responsible for repairs and maintenance. As from 1 October 2011 most lateral drains (see glossary) are now owned and maintained by the sewerage undertaker. Sewerage Undertakers are not responsible for any private drains and private sewers that connect the property to the public sewerage system, and do not hold details of these. The property owner will normally have sole responsibility for private drains and water pipes serving the property.
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Sewers

i	What is a Foul Water Sewer?	Foul sewers/drains take foul sewage (waste from toilets, bathrooms and kitchens etc) away from your property.
i	What is a Surface Water Sewer?	Surface water sewers/drains take surface water (rainwater) away from your property (includes water from roofs and other impermeable surfaces within the curtilage of the property). In some cases, Sewerage Undertaker records do not distinguish between foul and surface water connections to the public sewerage system. If on inspection the buyer finds that the property is not connected for surface water drainage, the property may be eligible for a rebate of the surface water drainage charge. Details can be obtained from the Water Company.
i	What is a Combined Sewer?	Combined sewers carry both foul sewage and surface water away from your property.

Adoption Agreement

- i** What does it mean if a sewer is subject to a Section 104 adoption agreement?
- With new developments, the developer will typically lay new sewers which are 'subject to adoption'. Purchasers of new homes will want to know whether or not the property will eventually be connected to a public sewer. The adoption of private sewers and drains by the Sewerage Undertaker is subject to the developer complying with the terms of the adoption agreement made under the provisions of Section 104 of the Water Industry Act 1991. For newly built properties, where the property is part of a very recent or on-going development and the sewers are not the subject of an adoption application, buyers should consult with the developers to ascertain the extent of private drains & sewers for which they will hold maintenance & renewal liabilities.
- i** Why do I need to know if there is a public foul sewer within 30.48 metres (100 feet) of any buildings within the property?
- If foul water from the property does not drain to a public sewer, the presence of a public foul sewer within 30.48 metres (100 feet) of any buildings within the property can result in the local authority requiring the property to be connected to a public sewer if the existing arrangements are unsatisfactory.

Water Pipes

- i** What are Water Pipes?
- Water pipes (water mains, resource mains or discharge pipes) supply clean water to a property. The pipework can be either publicly or privately maintained. Water Undertakers are not responsible for private water mains or private service pipes connecting the property to the public water main and do not hold details of these. These may pass through land outside of the control of the seller, or may be shared with adjacent properties. The buyer may wish to investigate whether separate rights or easements are needed for their inspection, repair or renewal. If the property is not connected to mains water supply we recommend the situation is checked with the current owner of the property. Details of private supplies are not kept by the Water Undertaker.
- i** What does it mean if there are public water pipes or public sewers within the boundary of the property?
- The presence of public water pipes or public sewers within the boundary of the property may restrict further development. The Water and/or Sewerage Undertaker also has a statutory right of access to carry out work on its assets, subject to notice. This may result in employees of the Water Company or Sewer Undertaker or its contractors needing to enter the property to carry out work. The approximate boundary of the property has been determined by reference to the plan provided.

Information

- i** What is meant by the Private Sewer Transfer?
- On 1 October 2011, the responsibility for many private sewers and lateral drains, which drain to a public sewer and may be located both within and beyond the property boundary, transferred to the water and sewerage companies.
- The water and sewerage companies are currently undertaking an exercise to map these new public sewers and lateral drains. In the meantime however there may be additional public assets not shown on the public sewer map enclosed herein.
- For further information visit:

<http://www.ofwat.gov.uk/households/supply-and-standards/supply-pipes/>

The following diagram illustrate an example of the impact of the new drainage arrangements:



Sustainable Urban Drainage System (SuDS)

- i** What are Sustainable Urban Drainage Systems (SuDS)?
- Sustainable Urban Drainage System (SuDS) are designed to drain surface water from a property or site in a natural more sustainable way, than through conventional networks of pipes and sewers, to local watercourses. SuDS slow down surface water run-off and reduce the risk of flooding, particularly during heavy rain. They also improve water quality and reduce the risk of pollution that can happen when foul sewers are overwhelmed by surface water, leading to dirty water being released into rivers.

Unanswered Questions

- i** Why are certain questions not answered within this report?
- This report is compiled using publicly available information (as defined by the Water Industry Act 1991). Where data is not publicly available, we provide an insurance policy (see attached). Where we infer certain answers (Q2.1, 2.2 and 3.1) we refer you to alternative sources of information, including billing information, form TA6 or the Property Details Questionnaire which confirms connection to mains drainage, if a septic tank is installed, and information regarding whether a water meter is installed. If both our inference and the form TA6, the Property Details Questionnaire or billing information are incorrect, then our insurance policy would apply.

REGULATED DRAINAGE AND WATER SEARCH INFORMATION ACCURACY POLICY INSURANCE PRODUCT INFORMATION DOCUMENT

Company: Stewart Title Limited

Stewart Title Limited is a title insurance company authorised by the Prudential Regulation Authority and regulated by the Financial Conduct Authority and the Prudential Regulation Authority. Registered in England and Wales No 270166. Registered office address: 11 Haymarket, London SW1V 4BP

Complete pre-contractual and contractual information on this policy is provided in other documents

WHAT IS THIS TYPE OF INSURANCE?

Regulated Drainage and Water Search Information Accuracy Policy



WHAT IS INSURED?

- ✓ The defect as described in the Defects section of the Policy Schedule and which arises from your use and ownership of the property as described in the Policy Schedule.
- ✓ In the event of a Regulated Drainage and Water Search provided by the Organisation containing an Adverse Entry which materially affects the market value of the Property then we will, subject to your compliance with the terms and conditions of this policy, pay under this policy for those losses and costs which are set out in the Cover section of the Policy Schedule.



WHAT IS NOT INSURED?

- ✗ Any amount higher than the Limit of Indemnity under the Policy Schedule.
- ✗ All matters set out under the Exclusions section of the Policy Schedule.
- ✗ Any claim made either by you and/or a third party against you which is not set out in the Cover section of the Policy Schedule.



ARE THERE ANY RESTRICTIONS ON COVER?

- ! In deciding to accept this policy in exchange for the premium and in setting the terms and premium, we have relied on the information given by you (or anyone acting on your behalf). You must ensure that, when answering any questions asked by us, any information provided is accurate and complete.
- ! If you deliberately or recklessly provide us with false or misleading information, we may treat this policy as if it never existed and decline all claims. If you provide us with false or misleading information carelessly, we may:
 - treat this Policy as if it had never existed, and refuse to pay all claims and return the premium paid. However, we may only do so if we would not otherwise have provided you with insurance cover at all;
 - amend the terms of this policy, and apply the amended terms as if they were already in place, if a Claim has been adversely affected by your carelessness;
 - reduce the amount we will pay on a Claim in the proportion the premium you paid bears to the premium we would have charged for this policy; or
 - take a similar proportionate action.
- ! We, or anyone acting on our behalf, will write to you if we intend to treat this policy as if it had never existed, or amend the terms of this policy.
- ! If you become aware that the information given to us is inaccurate, you must inform us as soon as practicable.



WHERE AM I COVERED?

This policy covers you for the UK property specified in the Policy Schedule.



WHAT ARE MY OBLIGATIONS?

- You, or anyone acting on your behalf, must not:
 - disclose the existence of this policy to any third party other than prospective purchasers, lenders, lessees and their legal advisers without our prior written consent
 - take or fail to take action which results in a Claim as this may prejudice your position and void this policy
 - take any steps to settle a Claim without our prior written consent.
- On becoming aware of any potential or actual Claim, you will:
 - provide written notice and details to us at our registered office address immediately of all known facts including all communications, correspondence and all court documents.
 - not admit any liability whatsoever or take steps to compromise or settle the Claim, without our written consent.
 - provide all information and assistance that we and/or any party professional or otherwise acting on our behalf requires at your own expense doing everything reasonably practicable with our prior written consent to minimise any loss.
- You will not make any
 - admission, promise of payment or indemnity
 - application to a court, Upper Tribunal (Land Chamber) or the Land Registry without our written consent



WHEN AND HOW DO I PAY?

You do not make any payments to us directly. Your professional advisors who arranged and recommended the cover to you will tell you how and when to pay.



WHEN DOES THE COVER START AND END?

Your cover will begin on the Policy Date which is set out in the Policy Schedule. The dates of cover are specified on the Policy Schedule.



HOW DO I CANCEL THE CONTRACT?

This policy can be cancelled by contacting us within 14 days of the Policy Date, provided all interested parties (such as lenders holding a mortgage or charge on the Property) consent to cancellation. If you wish to cancel this policy, please write (quoting your policy number) to 'The Underwriting Manager' at our registered address or email to STLEnquiry@stewart.com.

We may at our discretion charge you for the time that you have been on cover including Insurance Premium Tax.

Any refund of premium will be made to the party who paid the premium.

BASIS OF COVER

The Insured has paid or agreed to pay the Premium for this indemnity cover.

The Insured agrees to comply with the terms and conditions of the policy. Failure by the Insured to comply can lead to invalidation of the policy in whole or in part or reduce the amount of any Claim subsequently made.

Signed for and on behalf of Stewart Title Limited

A handwritten signature in black ink, appearing to read 'Steven Lessack', is written over a faint, light grey circular watermark that contains the text 'STEWART TITLE LIMITED'.

Steven Lessack
CEO, Stewart Title Limited

Authorised Signatory

POLICY SCHEDULE

POLICY NUMBER 155853	PROPERTY Each property which is noted on the bordereau
POLICY DATE As referred to on the bordereau per Property	LIMIT OF INDEMNITY See Additional Policy Clause(s) section below
POLICY TERM In Perpetuity from the Policy Date	PREMIUM See Additional Policy Clause(s) section below

THE INSURED

The party purchasing the Property at the Policy Date and any bank, building society or other similar lending institution holding a mortgage or charge on the Property('the Lender') whether as a result of the purchase or as the result of the owner of the Property remortgaging it to the Lender

THE INSURER

STEWART TITLE LIMITED - (Company Reg 2770166), 11 Haymarket, London SW1Y 4BP

THE DEFECT

The Insured has been provided with a Regulated Drainage and Water Search ('the Search') by the Organisation which may contain an Adverse Entry which materially affects the market value of the Property.

INSURED USE

Continued use of the Property for residential or commercial uses as in existence at the Policy Date

EXCLUSION(S)

Any Claim arising from or relating to:

- (i) any matter revealed in any other searches made available to the Insured or anyone acting on the Insured's behalf prior to the Policy Date
- (ii) any matter otherwise known to the Insured or anyone acting on the Insured's behalf prior to the Policy Date
- (iii) consequential loss
- (iv) environmental or contamination matters (including but not limited to the Environmental Protection Act 1990
- (v) any matter where the Insured or their legal advisors have not followed or acted upon the guidance notes provided in the Search

ADDITIONAL POLICY CLAUSE(S)

Definitions:-

Adverse Entry - Any matter or matters which would have been disclosed in the Search and which were in existence on or before the Policy Date which adversely affect the market value of the Property but which were not disclosed in the Search due to:-

- (i) the absence in the Search of answers to questions 2.5.1,2.7,2.8,2.9,3.3,3.4 and 4.5 and/or
- (ii) incorrect information being given to the Organisation by the statutory authority or authorities responsible for maintaining the registers forming the subject matter of the Search and/or
- (iii) incorrect information being given by the Organisation to the Insured in respect of Questions 2.1,2.2,2.4.1 and 3.1.where the Organisation has interpreted data obtained from the statutory authority or authorities responsible for maintaining the registers but that interpretation is incorrect due to the negligence of, or an error by, the Organisation.

Organisation - STL Group PLC

Regulated Search - A search requested by or on behalf of the Insured in the course of a purchase or remortgage transaction relating to the Property in response to which the Organisation in accordance with the Council of Property Search Organisations' search code has undertaken enquiries and provided a report upon which the Insured relies.

LIMIT OF INDEMNITY	PREMIUM
(Up to £ per Property)	(£ inclusive of I.P.T)
£ 2,000,000.00	£ 0.75

MEMORANDUM OF ENDORSEMENT For Seller Cover

Definitions

The definitions referred to below shall be read as being in addition to those given or where repeated for the purpose of the cover provided to the seller under this Policy as an alternative to those in the Policy

Seller: the Seller of the Property who has requested and paid for the Regulated Search in order to enable the sale of the Property to the Buyer

Buyer: The person(s), corporate or incorporate body, named as Buyer in the exchanged contract for the purchase of the

Property on whose behalf a Regulated Search has been undertaken or who relies upon a Regulated Search carried out on behalf of the seller of the Property by the Organisation and who has subsequently purchased the Property following receipt of the Regulated Search.

Completion Date: the date upon which the sale of the Property to the Buyer completed

Offer Price: the lower of (i) the price agreed between the Seller and the Buyer for the sale of the Property prior to the Completion Date (ii) the highest valuation of the Property obtained by the Seller from an estate agent prior to marketing the property with the estate agent.

Sale Price: the price actually paid by the Buyer to the Seller for the Property on the Completion Date as detailed in the exchanged contract.

Seller Cover

The cover under this Policy will be extended to provide the following additional cover:-

The Seller shall have cover starting on the Completion Date for the matters referred to in sub paragraph (ii) under the definition of Adverse Entry in this policy by revealing an Adverse Entry which should not have been revealed ('the Error') and which is the sole and direct cause of the Buyer renegotiating the Offer Price of the Property to the Sale Price and as a result of which renegotiation the Seller has suffered loss.

Exclusions

The Company shall be not liable to indemnify the Seller for any Error :

- (i) not disclosed in the Search
- (ii) in respect of any matter of which the Seller or his legal representative had Knowledge as at the date that contracts are exchanged with the Buyer for the purchase of the Property.
- (iii) Any Adverse Entry which arises after the Effective Date
- (iv) The cover for the Seller shall not apply where the transaction is a remortgage or the Property is used for commercial purposes

Conditions

All conditions referred to in the Policy shall apply

GENERAL PROVISIONS

- a. Any act or omission by the Insured, or anyone acting on the Insured's behalf, which in whole or in part induces a Claim under the policy may prejudice the Insured's position and could invalidate the policy in whole or in part or reduce the amount of any Claim.
- b. The Insurers liability under this policy will not exceed the Limit of Indemnity (as increased by the Inflation Provision if applicable).
- c. This policy shall be governed by and construed in accordance with the law of England and Wales and is subject to the jurisdiction of the courts of England and Wales.
- d. The policy and any endorsement issued in respect of it are one contract and shall be read together.
- e. The insured will not be entitled to abandon the Property to the Insurer.
- f. Your information may be used for the purposes of insurance administration by the Insurer, its associated companies, by reinsurers and your intermediary. It may be disclosed to regulatory bodies for the purposes of monitoring and/or enforcing the Insurer's compliance with any regulatory rules/codes.
- g. Your information may also be used for offering renewal, research and statistical purposes and crime prevention. It may be transferred to any country, including countries outside the European Economic Area for any of these purposes and for systems administration. Where this happens, we will ensure that anyone to whom we pass your information agrees to treat your information with the same level of protection as if we were dealing with it.
- h. If you give us information about another person, in doing so you confirm that they have given you permission to provide it to us to be able to process their personal data (including any sensitive personal data) and also that you have told them who we are and what we will use their data for, as set out in this notice.
- i. In the case of personal data, with limited exceptions, and on payment of the appropriate fee, you have the right to access and if necessary rectify information held about you.
- j. The Insurer and the Organisation agree that this version of this Policy will be effective for all Properties entered on a bordereau on or after 1 December 2018.

NON INVALIDATION

The interest in this policy of any Insured will not be invalidated by a breach of the policy terms or conditions by any other party, unless

- a. Such party acted on the Insured's behalf or with the Insured's knowledge and consent
- b. Where the Insured is a successor in title, they had knowledge of a breach of the policy terms or conditions or of previous non-disclosure or misrepresentation to the Insurer.

IMPORTANT CONDITIONS

In respect of each Property:-

- a. In deciding to accept this policy in exchange for the Premium and in setting the terms and premium, the Insurer has relied on the assumptions made being correct and any information given by the Insured (or anyone acting on the Insured's behalf). The Insured must ensure that, when answering any questions asked by the Insurer, any information provided is accurate and complete and the Insurer is informed of any assumptions which cannot be met.
- b. If the Insured deliberately or recklessly provides the Insurer with false or misleading information, the Insurer may treat this policy as if it never existed and decline all claims.
- c. If the Insured provides the Insurer with false or misleading information carelessly, the Insurer may:
 - a. treat this policy as if it had never existed, and refuse to pay all claims and return the premium paid. However, the Insurer may only do so if it would not otherwise have provided the Insured with insurance cover at all;
 - b. amend the terms of this insurance, and apply the amended terms as if they were already in place, if a claim has been adversely affected by the Insured's carelessness;
 - c. reduce the amount the Insurer will pay on a claim in the proportion the premium the Insured has paid bears to the premium the Insurer would have charged for the policy; or
 - d. take a similar proportionate action.The Insurer, or anyone acting on the Insurer's behalf, will write to the Insured if the Insurer intends to treat this policy as if it had never existed, or amend the terms of the policy.
- d. If the Insured becomes aware that the information given to the Insurer is inaccurate, the Insured must inform the Insurer as soon as practicable.
- e. The Insured (or anyone acting on the Insured's behalf) shall not at any time disclose the existence of this policy to any third party other than bona fide prospective purchasers, their lenders, lessees and respective legal advisers without the Insurers written consent
- f. The Insured shall not discuss the Defect with any party without the Insurer's written consent, who, it is reasonable to believe can as a result of the discussion make a Claim.
- g. A bordereau is provided to the Insurer by the Policyholder in Excel format setting out the address of the Property, the Limit of Indemnity (being the purchase price of the Property) and the Policy Date (being the date of exchange of contracts for the purchase of the Property by the Insured) and that the bordereau is sent to the Insurer at the Insurer's Address within 14 days of the month end following the Policy Date and payment for all properties listed on the bordereau paid either by cheque payable to Stewart Title Limited or by BACS to HSBC Bank Plc, 60 Queen Victoria Street, London EC4N 4TR Account Name: Stewart Title Premium Collection Account, Sort Code 40-05-30, Account Number: 94573269 Reference: «PolicyNumber»

In respect of Conditions e, f and g above where the Insured fails to comply with these conditions the Insurer's liability under this policy may be limited to the extent the Insurer is compromised by any breach of these conditions

COMPLAINTS PROCEDURE

Any complaint should be raised in the first instance with our General Counsel by

- Writing to the General Counsel at the Insurer's Address
- Telephoning 0207 010 7820

Details of our complaints handling procedure are available by contacting our General Counsel.

If we are unable to resolve your complaint to your satisfaction, you may have the right to refer your complaint to the Financial Ombudsman Service at Exchange Tower, London E14 9SR. The Financial Ombudsman Service website is <http://www.financial-ombudsman.org.uk/>.

The existence, and your use of, this complaints process is without prejudice to your other rights under this policy and your rights in law.

RIGHT TO CANCEL POLICY

This Policy can be cancelled by contacting us within 14 days of the policy date, provided all interested parties (such as lenders holding a mortgage or charge on the Property) consent to cancellation. If you wish to cancel this policy, please write (quoting your policy number) to 'The Underwriting Manager' at the Insurer's Address.

We may at our discretion charge you for the time that you have been on cover including Insurance Premium Tax.

Any refund of premium will be made to the party who paid the premium.

CLAIMS CONDITIONS

On becoming aware of any potential or actual Claim, the Insured will:

- provide written notice and details to the Insurer at the Insurer's Address immediately of all known facts including all communications, correspondence and all court documents.
- not admit any liability whatsoever or take steps to compromise or settle the Claim, without the written consent of the Insurer.
- provide all information and assistance that the Insurer and/or any party professional or otherwise acting on the Insurer's behalf require at the Insured's own expense doing everything reasonably practicable with the Insurer's prior written consent to minimise any loss.

The Insured will not make any

- admission, promise of payment or indemnity
- application to a court, Upper Tribunal (Land Chamber) or the Land Registry without the written consent of the Insurer

DEALING WITH THE CLAIM

- In dealing with the Claim the Insurer will at its discretion and cost be entitled to (whether or not the Insurer is liable under this policy):-
 - take or defend proceedings in any court or tribunal in the name of the Insured in any proceedings including the right to abandon or submit to judgment
 - exercise, in the name of the Insured, any rights or remedies available to the Insured in any proceedings including the right to abandon or submit to judgment
 - compromise, settle or compound the Claim and deal in such manner as it thinks fit
 - pay at any time to the Insured the amount of the Limit of Indemnity (as increased by the Inflation Provision if applicable) or any lesser amount for which the Claim can be settled and then relinquish control of and have no further involvement with the Claim.
 - The Insurer shall be under no obligation to pay the proceeds of any Claim paid under this Policy to any party other than the Insured and that the proceeds of any Claim shall be incapable of assignment.
 - If, at the time of the Claim, there is other insurance (whether incepted by the Insured or any other party) under which the Insured may be entitled to make a Claim, either wholly or partly in respect of the same interest or risk covered by this policy, the Insurer will not be liable to pay or contribute more than their rateable proportion of the Claim.
 - If the Insured shall make any Claim knowing the same to be false or fraudulent, as regards amount or otherwise, this policy shall become void and the Claim shall be forfeited.
 - The Insurer will be entitled to all rights and defences it may have in respect of a Claim notified by any Insured against any successor to that Insured.
 - Where the Insurer and the Insured cannot agree to the amount to be paid under this policy the matter shall be referred to an arbitrator to be appointed by the parties (or in default of agreement, in accordance with the law in force at the time). The making of an award by the arbitrator shall be a condition precedent to any right of action against the Insurer. The Insured will afford to the Insurer every reasonable assistance in this respect.
 - If the Insurer agrees or is obliged to make any payment to or on behalf of an Insured because of the risk insured by this policy the Insurer will immediately be subrogated to any rights which the Insured may have in relation to that risk.
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THE FINANCIAL SERVICES COMPENSATION SCHEME (FSCS)

We are covered by the FSCS. You may be entitled to compensation from the scheme if we cannot meet our obligations. This will depend on the type of business and the circumstances of the Claim.

Further information about the compensation scheme arrangements is available from the FSCS who can be contacted at Financial Services Compensation Scheme, 10th Floor, Beaufort House, 15 St Botolph Street, EC3A 7QU. The FSCS website may be viewed at www.fscs.org.uk.

Stewart Title Limited is authorised by the Prudential Regulation Authority and regulated by the Financial Conduct Authority and the Prudential Regulation Authority. Registered in England and Wales No: 2770166. Registered office address: 11 Haymarket, London SW1Y 4BP.

Important Consumer Protection Information

This search has been produced by InfoTrack Ltd, Level 11, 91 Waterloo Road, London, SE1 8RT (Tel: 0207 186 8090, Email: helpdesk@infotrack.co.uk or visit www.infotrack.co.uk) which is registered with the Property Codes Compliance Board (PCCB) as a subscriber to the Search Code. The PCCB independently monitors how registered search firms maintain compliance with the Code.

The Search Code

- provides protection for homebuyers, sellers, estate agents, conveyancers and mortgage lenders who rely on the information included in property search reports undertaken by subscribers on residential and commercial property within the UK
- sets out minimum standards which firms compiling and selling search reports have to meet
- promotes the best practice and quality standards within the industry for the benefit of consumers and property professionals
- enables consumers and property professionals to have confidence in firms which subscribe to the code, their products and services. By giving you this information, the search firm is confirming that they keep to the principles of the Code. This provides important protection for you

The Code's core principles

Firms which subscribe to the Search Code will:

- display the Code logo prominently on their search reports
- act with integrity and carry out work with due skill, care and diligence
- at all times maintain adequate and appropriate insurance to protect consumers
- conduct business in an honest, fair and professional manner
- handle complaints speedily and fairly
- ensure that all search services comply with the law, registration rules and standards
- monitor their compliance with the Code

Complaints

If you have a query or complaint about your search, you should raise it directly with the search firm, and if appropriate ask for any complaint to be considered under their formal internal complaints procedure. If you remain dissatisfied with the firm's final response, after your complaint has been formally considered, or if the firm has exceeded the response timescales, you may refer your complaint for consideration under The Property Ombudsman scheme (TPOs). The Ombudsman can award compensation of up to £5,000 to you if he finds that you have suffered actual financial loss and/or aggravation, distress or inconvenience as a result of your search provider failing to keep to the Code.

Please note that all queries or complaints regarding your search should be directed to your search provider in the first instance, not to TPOs or to the PCCB.

TPOs Contact Details:

The Property Ombudsman scheme
Milford House
43-55 Milford Street
Salisbury
Wiltshire
SP1 2BP

Tel: 01722 333306 / Fax: 01722 332296
Web: www.tpos.co.uk / Email: admin@tpos.co.uk

You can get more information about the PCCB from www.propertycodes.org.uk

Please ask your search provider if you would like a copy of the Search Code.



Internal Complaints Procedure

InfoTrack Ltd has a formal internal complaints procedure for handling complaints speedily and fairly. If you wish to make a complaint, we will:

1. acknowledge your complaint within 5 working days of receipt
2. normally deal with it fully and provide a final response, in writing, within 20 working days of receipt
3. keep you informed by letter, telephone or email, as you prefer, if we need more time
4. provide a final response, in writing, at the latest within 40 working days of receipt
5. liaise, at your request, with anyone acting formally on your behalf

Complaints should be sent to: InfoTrack Ltd, Level 11, 91 Waterloo Road, London, SE1 8RT (Tel: 0207 186 8090, Email: helpdesk@infotrack.co.uk, www.infotrack.co.uk)

If you are not satisfied with our final response, or if we exceed the above timescales, you may refer the complaint to The Property Ombudsman scheme (TPOs) - Tel: 01722 333306 / Email : admin@tpos.co.uk. We will co-operate with TPOs during an investigation and comply with any decision the Ombudsman makes.

Revised 29 January 2019

Terms and Conditions

1 Definitions

In these Terms the following words shall have the following meanings:

- 1.1 "Client" means the seller, buyer, lender or lessee (or potential seller, buyer, lender or lessee) in respect of the Property who is the intended recipient of the Report.
- 1.2 "Code" means the Code of Practice for Search Compilers and Retailers as updated from time to time.
- 1.3 "Company" means a company registered at Companies House in respect of which InfoTrack Ltd has been instructed to provide a Service.
- 1.4 "Consumer" means any person acting for purposes other than their trade, business or profession.
- 1.5 "Intellectual Property Rights" means copyright, patent, design right (registered or unregistered), service or trade mark (registered or unregistered), database right, or other data right, moral right or know how or any other intellectual property right.
- 1.6 "Literature" means InfoTrack Ltd's brochures, price lists and advertisements in any type of media, including the content of the Website.
- 1.7 "Order" means the request for Services by You.
- 1.8 "Property" means an address or location for which InfoTrack Ltd is engaged to provide a Service.
- 1.9 "Report" means the report prepared by InfoTrack Ltd in respect of the Property or the Order.
- 1.10 "Service(s)" means the supply of services by InfoTrack Ltd to You including but not limited to property searches, reports and photographs, company searches, trade marks and domain name searches and other services from time to time and includes our instructions to a Supplier, on your behalf and the dissemination of the information subsequently provided by the Suppliers.
- 1.11 "Supplier" means any organisation or third party who provides data or information of any form to InfoTrack Ltd for the purposes of providing the Services.
- 1.12 "Terms" means these terms and conditions of business.
- 1.13 "VAT" means value added tax under the Value Added Tax Act 1994 and any similar replacement or additional tax.
- 1.14 "Website" means our website located at www.infotrack.co.uk
- 1.15 "We", "Us", "Our", "STL", "InfoTrack" and "InfoTrack Ltd" are references to InfoTrack Limited, a company incorporated in England and Wales with registered number 09474590 and whose registered office is situated at 10 John Street, London, United Kingdom, WC1N 2EB. VAT number GB 228530612.
- 1.16 "You" and "Your" are references to the individual, company, partnership or organisation who accesses the Website or places an Order.

2 Agreement

- 2.1 The agreement between You and InfoTrack Ltd shall come into existence when InfoTrack Ltd accepts your completed Order by either sending you written confirmation or starting to provide you with the relevant Services ("Agreement"). Please read and check your Order before it is submitted so that any errors can be identified and corrected.
- 2.2 These Terms may be varied from time to time. The Terms in force at the time of the Agreement, in conjunction with any relevant Supplier terms and conditions (where InfoTrack Ltd is placing orders for searches as Your agent), shall govern the Agreement to the exclusion of all other terms and conditions. You should print a copy of these Terms for future reference.

- 2.3 By submitting an Order, you shall be deemed to have accepted these Terms and You agree to be bound by these Terms when You place any Order.
- 2.4 These Terms together with the Literature and Order comprise the whole agreement relating to the supply of the Services to You by InfoTrack Ltd.
- 2.5 If You are not a Consumer You acknowledge that You have not relied upon any representations save insofar as the same have been expressly incorporated in these Terms and You agree that you shall have no remedy in respect of any misrepresentation (other than fraudulent misrepresentation) which has not become a term of these Terms.
- 2.6 If You are a Consumer then, while We accept responsibility for statements and representations made by Our duly authorised agents, please ensure You ask for any variations from these Terms to be confirmed in writing.

3 Services

- 3.1 InfoTrack Ltd shall use reasonable care and skill in providing the Services to You and shall use only established and trusted suppliers where obtaining information or data from third parties in accordance with the Code.
- 3.2 We reserve the right to make any changes to the Services described in our Literature to conform with any applicable statutory requirements or any non-material changes which we reasonably deem appropriate in our sole discretion.
- 3.3 Our Services are provided solely for Your use, or the use of Your Clients on whose behalf You have commissioned the Services, and shall not be used or relied upon by any other party, without Our written consent.
- 3.4 You hereby agree that We will start performing the Services as soon as possible, following the formation of the Agreement, which is likely to be before the end of the fourteen working day period set out in clause 5.3.

4 Price and Payment

- 4.1 The price payable for the Services shall be in pounds sterling inclusive of VAT as set out in the Literature or Order, as applicable.
- 4.2 Payment is due in full from You within 30 days of the date of Our invoice (or as otherwise contracted). We will invoice You following the provision of the Service(s) or as otherwise notified to You at the point of order or as set out in the Literature.
- 4.3 InfoTrack Ltd reserves the right to amend its prices from time to time and the Services will be charged at the price applicable at the date on which an Order is submitted.
- 4.4 If You fail to pay Our invoice on or before the due date, InfoTrack Ltd may charge You interest on the late payment at the prevailing statutory rate pursuant to the Late Payment of Commercial Debts (Interest) Act 1998 until the outstanding payment is made in full.

5 Cancellation of Services

This Term 5 only applies if you are a Consumer.

- 5.1 If you are a Consumer, you have a legal right to cancel the Agreement under the Consumer Contracts (Information, Cancellation and Additional Charges) Regulations 2013, during the period set out in Term 5.3.
- 5.2 This cancellation right does not apply:
 - 5.2.1 in the case of goods made to Your specifications, where these are personalised goods or by reason of their nature cannot be returned; or
 - 5.2.2 where We have started work on the Services with Your agreement (given in Term 3.4).

- 5.3 As a Consumer Your right to cancel the Agreement starts on the date the Agreement is formed. You have fourteen working days to cancel the Agreement. If you cancel the Agreement within this period, and the exceptions set out in Term 5.2 do not apply, then You will receive a full refund of any price paid by You. The refund will be processed as soon as possible, and in any case within 30 days of the day on which you gave us notice of cancellation. You will not be liable for any further payment to us in respect of the Agreement.
- 5.4 To cancel the Agreement You must contact Us in writing at our registered office address by sending an email to helpdesk@infotrack.co.uk
- 5.5 Following cancellation of the Agreement (save for cancellation in accordance with Term 5.3) You will remain liable for any costs, expenses and disbursements incurred by Us prior to receiving written notice of cancellation. Such costs, expenses and disbursements shall be invoiced and payable in accordance with Term 4.2.
- ## 6 Termination
- 6.1 InfoTrack Ltd may suspend or terminate any agreement with You without any liability to You with immediate effect if at any time:
- 6.1.1 You fail to make any payment due in accordance with Term 4;
- 6.1.2 If You repeatedly breach or commit or cause to be committed a material breach of these Terms; or
- 6.1.3 You commit a breach and You fail to remedy the breach within 7 days of receipt of a written notice to do so.
- 6.2 If an Agreement is terminated under this Term 6 and You have made an advance payment We will refund You a reasonable proportion of the balance as determined exclusively by Us having regard to the value of Services already provided to You.
- ## 7 Events Beyond Our Control
- 7.1 We reserve the right without notice or liability to You, to defer the date of performance (by a period equivalent to the period during which the Services could not be performed) or to cancel the provision of the Services or reduce the volume of the Services ordered by You if we are prevented from or delayed in the carrying on of Our business due to circumstances beyond Our reasonable control provided that, if the event in question continues for a continuous period in excess of 60 days, You shall be entitled to give notice in writing to us to terminate the Order.
- ## 8 Warranties and Limitation of Liability
- 8.1 Subject to Term 9 and Term 10 (as applicable), We provide warranties and accept liability only to the extent stated in this Term 8.
- 8.2 We do not exclude or restrict our liability for death or personal injury caused by our own negligence or any other liability the exclusion of which is expressly prohibited by law.
- 8.3 Unless otherwise indicated on the front page of the Report, We confirm that any individuals within Our business who conducted any searches has not knowingly had any personal or business relationship with any individual involved in the sale of or dealings with the Property.
- 8.4 In providing the Services You acknowledge and accept that:-
- 8.4.1 InfoTrack Ltd's only obligation is to exercise reasonable care and skill in providing the Services in accordance with the Code.
- 8.4.2 The Services do not include any information relating to the value or worth of the Property or the Company.
- 8.4.3 InfoTrack Ltd cannot warrant or guarantee that the Website or any website linked to or from the Website will be uninterrupted or error free or free of viruses or other harmful components and furthermore InfoTrack Ltd cannot warrant the performance of any linked internet service not operated by InfoTrack Ltd. Accordingly InfoTrack Ltd shall not be liable for any damage or loss whatsoever caused: by any virus, including damage to Your computer equipment, software, data or other property resulting from Your access to, use of or browsing of the Website; or as a result of downloading any material, data, text, images, video or audio from the Website; or by the contents of or Your access to, any website linked to the Website; or for inaccuracies or typographical errors of information or on the Website.
- 8.4.4 InfoTrack Ltd shall use reasonable endeavours to provide the Services within the timescale set out in the Literature.
- 8.4.5 Any services other than our Services, which are advertised in the Literature are for information only, and We are not responsible for any such services which You may use as a result of our recommendation or otherwise. Any such third party services may be subject to the terms and conditions of the relevant third party service provider.
- 8.5 In connection with the Report You undertake to make a reasonable inspection of any results set out therein to satisfy Yourself that there are no defects or failures. In the event that there is a material defect You will notify Us in writing of such defect as soon as possible after its discovery.
- 8.6 Any claim relating to data or information obtained from a Supplier shall in the first instance be made against the Supplier (with such assistance from InfoTrack Ltd as may reasonably be required) and only if such a claim cannot be made against the Supplier will You make a claim against InfoTrack Ltd.
- ## 9 Our Liability if you are a Business
- This Term 9 only applies if you are not contracting as a Consumer**
- 9.1 We only supply the Reports for use by You and Your Clients, and You agree not to use the Reports for any resale purposes unless You have obtained Our prior written consent.
- 9.2 Nothing in these Terms limits or excludes Our liability for:
- 9.2.1 Death or personal injury caused by Our negligence;
- 9.2.2 Fraud or fraudulent misrepresentation;
- 9.2.3 Any loss or damage sustained as a direct consequence of Our negligence;
- 9.2.4 Breach of the terms implied by section 12 of the Sale of Goods Act 1979 (title and quiet possession); or
- 9.2.5 Defective products under the Consumer Protection Act 1987.
- 9.3 Subject to Term 9.2, We will under no circumstances whatever be liable to You (or any other party entitled to rely on the Report(s)), whether in contract, tort (including negligence), breach of statutory duty, or otherwise, arising under or in connection with the Agreement for:
- 9.3.1 Any loss of profits, sales, business or revenue;
- 9.3.2 Loss or corruption of data, information or software;
- 9.3.3 Loss of business opportunity;
- 9.3.4 Loss of anticipated savings;
- 9.3.5 Loss of goodwill; or
- 9.3.6 Any indirect or consequential loss.

- 9.4 Subject to Term 9.2 and Term 9.3, Our total liability to You in respect of all other losses arising under or in connection with the Contract, whether in contract, tort (including negligence), breach of statutory duty, or otherwise, shall in no circumstances exceed £10 million.
- 9.5 Except as expressly stated in these Terms, We do not give any representation, warranties or undertakings in relation to the Reports. Any representation, condition or warranty which might be implied or incorporated into these Terms by statute, common law or otherwise is excluded to the fullest extent permitted by law. In particular, We will not be responsible for ensuring that the Reports are suitable for Your purposes.
- 10 Our liability if you are a Consumer**
This Term 10 only applies if you are a Consumer.
- 10.1 If We fail to comply with these Terms, We are responsible for loss or damage You suffer that is a foreseeable result of Our breach of these Terms or Our negligence, but We are not responsible for any loss or damage that is not foreseeable. Loss or damage is foreseeable if they were an obvious consequence of Our breach or if they were contemplated by You and us at the time We entered into the Agreement.
- 10.2 We only supply the Reports for private use. You agree not to use the Reports for any commercial, business or re-sale purposes, and We have no liability to You for any loss of profit, loss of business, business interruption, or loss of business opportunity.
- 10.3 We do not in any way exclude or limit Our liability for:
- 10.3.1 Death or personal injury caused by Our negligence;
- 10.3.2 Fraud and fraudulent misrepresentation;
- 10.3.3 Any breach of the terms implied by section 12 of the Sale of Goods Act 1979 (title and quiet possession);
- 10.3.4 Any breach of the terms implied by sections 13 to 15 of the Sale of Goods Act 1979 (description, satisfactory quality, fitness for purpose and samples); and
- 10.3.5 Defective products under the Consumer Protection Act 1987.
- 10.4 We have obtained insurance cover in respect of Our own liability for individual claims not exceeding £10 million per claim. Our liability is therefore limited to £10 million in respect of any single claim, event, or series of related claims or events and You are responsible for making your own arrangements for the insurance of any excess loss.
- 11 Intellectual Property Rights**
- 11.1 You acknowledge that all Intellectual Property Rights in the Services are and shall remain owned by either InfoTrack Ltd or our Suppliers and nothing in these Terms purports to transfer, assign or grant any rights to You in respect of the Intellectual Property Rights.
- 11.2 You agree to indemnify Us against all liabilities, costs, expenses, damages and losses (including but not limited to any direct, indirect or consequential losses and all interest, penalties and legal costs (calculated on a full indemnity basis) and all other professional costs and expenses) arising out of or in connection with any claim for actual or alleged infringement of a third party's Intellectual Property Rights as a result of You including an Ordnance Survey plan within the Order.
- 12 Insurance**
- 12.1 Our insurers are QBE Insurance (Europe) Ltd whose address is Plantation Place, 30 Fenchurch Street, London, EC3M 3BD. The level of cover provided by them for our Professional Indemnity Insurance is £10 million.
- 12.2 Our Professional Indemnity Insurance includes cover for errors and omissions in local authority and water company data and records used to compile our search reports.
- 12.3 Should we cease to trade for any reason, prior to that event, we shall execute run-off insurance cover under our Professional Indemnity Insurance for our past search products and services.
- 13 Complaints**
- 13.1 Full details of Our Complaints Procedure are set out on Our Website. We will deal with any complaints made by You in accordance with the Complaints Procedure.
- 13.2 As per Our Complaints Procedure, should you not be satisfied with our final response or we have exceeded the response timescales pursuant to Our Complaints Procedure, you may refer your complaint to The Property Ombudsman Scheme. The Property Ombudsman Scheme's website is www.tpos.co.uk and email address is admin@tpos.co.uk.
- 13.3 We will co-operate fully with The Property Ombudsman Scheme during an investigation and comply with his final decision.
- 14 General**
- 14.1 You shall not be entitled to assign the Agreement or any part of it without Our prior written consent.
- 14.2 We may assign the Agreement or any part of it to any person, firm or company provided that such assignment shall not materially affect Your rights under the Agreement.
- 14.3 The parties to these Terms do not intend that any term of Our Agreement shall be enforceable by virtue of the Contracts (Rights of Third Parties) Act 1999 by any person that is not a party to these Terms or a permitted assignee.
- 14.4 Failure or delay by Us in enforcing or partially enforcing any provision of the Agreement will not be construed as a waiver of any of Our rights under the Agreement.
- 14.5 Any waiver by Us of any breach of, or any default under, any provision of the Agreement by You will not be deemed a waiver of any subsequent breach or default and will in no way affect the other terms of the Agreement.
- 14.6 If any provision or part of a provision is held to be invalid or unenforceable by any court or other body of competent jurisdiction, that provision or part of that provision shall be deemed severable and the other provisions or the remainder of the relevant provision will continue in full force and effect.
- 14.7 Unless otherwise stated in these Terms, all notices from You to InfoTrack Ltd or vice versa must be in writing and sent to InfoTrack Ltd's registered office address as stipulated in Term 1.15 (or as updated from time to time) or Your address as stipulated in the Order.
- 14.8 In providing the Services and Reports We will comply with the Code.
- 14.9 Any personal information which you provide to us will be held in accordance with the Data Protection Act 1998 and other applicable regulations and only used in accordance with Our Privacy Policy (details of which are set out on Our Website).
- 14.10 The Agreement shall be governed by and construed in accordance with English law and shall be subject to the non-exclusive jurisdiction of the Courts of England and Wales. However, if You are a resident of Northern Ireland you may also bring proceedings in Northern Ireland, and if you are a resident of Scotland you may also bring proceedings in Scotland.

Revised 29 January 2019