



**FORMULA LAND (ALDERBURY) LTD,  
SOUTHAMPTON ROAD  
ALDERBURY**

**FLOOD RISK ASSESSMENT AND  
DRAINAGE STRATEGY**

**APRIL 2026**



**the journey is the reward**

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SOUTHAMPTON ROAD  
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DRAINAGE STRATEGY**

**APRIL 2026**

|                      |                                  |
|----------------------|----------------------------------|
| <b>Project Code:</b> | <b>WDALDERBURYG.23</b>           |
| <b>Prepared by:</b>  | <b>SF</b>                        |
| <b>Approved by:</b>  | <b>SF</b>                        |
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**Formula Land (Alderbury) Ltd,  
Southampton Road  
Alderbury  
Flood Risk Assessment and Drainage Strategy**

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# 1 Introduction

- 1.1 Mayer Brown Ltd has been commissioned by Formula Land to undertake a Flood Risk Assessment (FRA) and Drainage Strategy in support of an **outline** planning application for a proposed residential development for up to 28 new homes (Development) located at land north of Southampton Road, Alderbury.

[Preplanning Advice – Wiltshire County Council](#)

- 1.2 Preplanning advice was obtained from Wiltshire Council in relation to flood risk and drainage and their response is contained in Appendix B. An extract from their response is as follows:

*“A site-specific Flood Risk Assessment (FRA) is required for this application. The site-specific FRA should demonstrate that the site is not adversely affected by flood risk from different sources, and how the flood risk from all sources will be managed without increasing flood risk to the development itself or elsewhere. It should also outline the proposed drainage strategy for the site”*

- 1.3 According to the Environment Agency’s (EA) flood map for planning (Appendix C) the **4.97-hectare** Site is entirely located in a **Flood Zone 1** which has a low probability risk of experiencing flooding from fluvial or tidal sources.
- 1.4 As outlined in NPPF, for development proposals on sites comprising more than one hectare in area, an FRA is a planning requirement and should consider i) the vulnerability of flooding from sources other than river and sea flooding, ii) the potential to increase flood risk elsewhere through the addition of hard surfaces and iii) the effect of the new development on surface water runoff.
- 1.5 This Flood Risk Assessment considers the impact of the proposed development in addition to the common ways in which flooding can occur. The conditions currently existing in the location of the site are described, together with the methods used to identify and assess potential impacts caused from the development proposals. The mitigation measures proposed have been identified in order to avoid and/or reduce the impacts caused by introducing the Development to the area.
- 1.6 This FRA and drainage strategy has been compiled in accordance with “National Planning Policy Framework (NPPF)” published by Communities and Local Government in March 2012 (Ref.1), “Technical Guidance to the National Planning Policy Framework” (Ref.2) and ‘CIRIA C624: Development and Flood Risk Guidance’.

## 2 Site Location and Description

### Site Location

- 2.1 The application Site (Site), covering approximately 4.97 hectares, is located along the western boundary of Alderbury, which is a village approximately three miles southeast of Salisbury.
- 2.2 The Site falls under the administrative boundary of Wiltshire Council. The post code is SP5 9AG and the approximate coordinates at the centre of the site are E418790, N127170. For the site location refer to Appendix A and figure 2.1 below.
- 2.3 The Site is accessed from Southampton Road in the southwest corner, the southeast boundary runs adjacent to Junction Road for approximately 180 metres. The land to the north and southeast is comprised of open fields and Alderbury football Club with the residential properties of Alderbury to the south and northwest.



**Figure 2.1: Site Location**

### Topography

- 2.4 A topographic survey was undertaken in October 2021 and is contained in Appendix D.
- 2.5 The Site is comprised of two open fields, the boundary between which is loosely delineated by a hedgerow running in a north easterly direction. There are no notable features within the fields and vegetation is generally limited to the Site boundaries, which are comprised of hedgerows and trees.

- 2.6 There is a significant level difference across the Site where the recorded ground levels range from 87.5m AOD in the west to 67.5m AOD in the eastern apex. This is a fall of 20 metres over a distance 470 metres, working out at an average gradient of approximately 1 in 23. The land generally falls from west to east.

### Hydrology & Geology

- 2.7 There is an existing ditch within the northern boundary of the Site, which flows/falls with the land in the easterly direction toward the eastern apex adjacent Junction Road.
- 2.8 There is a spring identified within the application boundary at the northeast corner.
- 2.9 A site investigation has not yet been undertaken but according to Defra's "Magic Map Application" it has been determined that the local soils can be described as "*Naturally wet very acid sandy and loamy soils*".

### Existing Catchments

- 2.10 There is a ditch along most of the northern boundary, but the site does not drain entirely into this ditch. An analysis of the contours contained in the topographic survey is below in figure 2.1 that shows the following:
- 2.37 hectares drains into the ditch. Blue shading
  - 2.60 hectares drains onto Junction Road towards the football pitches to the southeast. Orange shading.

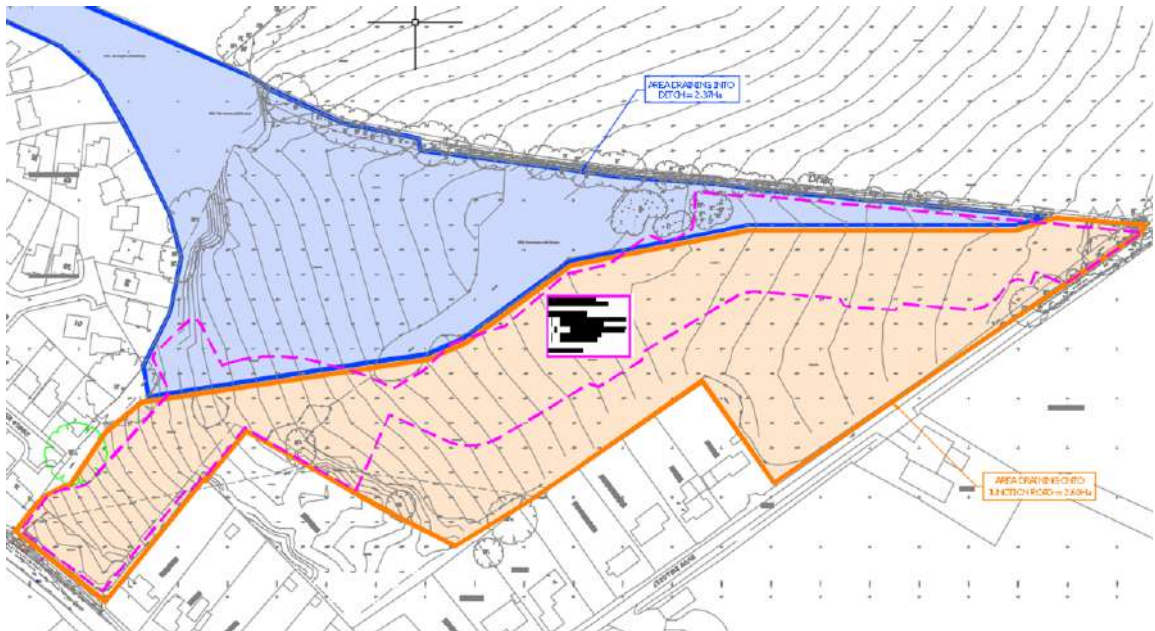


Figure 2.2: Drainage Catchment Areas to Existing Ditch

### Existing Surface Water sewers

- 

### Existing Foul Water Sewers

- Page 4

## 3 The Development

- 3.1 The Development is for 28 new homes with associated open space and infrastructure. The proposed layout plan is contained in Appendix F and can be seen in figure 3.1 below.
- 3.2 This is a relatively large site for 28 new homes because approximately **60% will remain undeveloped** in order to satisfy biodiversity net gain and ecological requirements. An approximate breakdown of the 4.97-hectare boundary is as follows:
- Developed Area (including gardens): 1.70 hectares
  - Public Open Space: 0.27 hectares
  - Undeveloped/Ecological Enhancements: 3.0 hectares



**Figure 3.1: Proposed Development**

- 3.3 Considering the Development is located in a low-risk Flood Zone 1 area the proposed finished road and property levels will be dictated by boundary and engineering constraints as opposed to predicted fluvial or tidal levels. The levels of the proposed roads and properties aim to match existing ground levels where possible in order to minimise the volume of bulk earthworks.
- 3.4 A proposed levels design has been developed primarily to inform the drainage design, which is included in the drainage general arrangement drawing in Appendix G.
- 3.5 The proposed surface and foul water drainage for the development is addressed in sections 5.0 and 6.0 of this report.

## 4 Flood Risk and Mitigation Measures

4.1 In theory there are five principal types/sources of flooding that could affect the Development. These are described below with proposed mitigation measures identified where necessary.

- **Fluvial** – The site is located in a low-risk Flood Zone 1 as can be seen in the flood map in Appendix C. This means that it has an annual probability of <0.1% of experiencing flooding from fluvial sources. There are no mitigation measures required so it will not be addressed further in this FRA.
- **Tidal** – The site is not located in a coastal area so is not at risk of tidal flooding. There are no mitigation measures required so it will not be addressed further in this FRA.
- **Groundwater** – The Groundsure report in Appendix C identifies that the site is at a low risk of ground water flooding. Therefore, flooding from groundwater is considered low risk and there are no mitigation measures required so it will not be addressed further in this FRA.
- **Surface Water Runoff** – The EA Surface Water Flood Map in Appendix C identifies a strip of land within the site that is at a low risk of flooding from surface water. This low-risk flood area is in place because the overland flow drains to the natural low point in the site. This overland flow is generated by the Site only and the naturally low area will be by default be removed by applying good engineering practice when designing the road and drainage infrastructure for the new Development.
- **Infrastructure Failure** – The SFRA does not identify a risk of sewer flooding at the location of the site. Therefore, flooding from infrastructure failure is considered a low risk and there are no mitigation measures required so it will not be addressed further in this FRA.

| Flood Mechanism               | Source                                                      | Flood Risk to the Development | Mitigation Required? |
|-------------------------------|-------------------------------------------------------------|-------------------------------|----------------------|
| Fluvial                       | N/A                                                         | Low                           | No                   |
| Tidal                         | N/A                                                         | Low                           | No                   |
| Groundwater                   | Underlying geology and groundwater levels                   | Low                           | No                   |
| Surface Water / Overland Flow | Runoff from surrounding elevated land and highway corridors | Low                           | No                   |
| Infrastructure Failure        | Surface water systems and Water mains                       | Low                           | No                   |

**Table 4.1: Flood Risk Summary**

## 5 Proposed Surface Water Drainage

### Summary of Proposed Surface Water Drainage

- 5.1 The completed system will manage surface water run-off up to the 1 in 100-year return period including an allowance for climate change.
- 5.2 The surface water system will include traditional positive drainage systems (Gullies, pipes, manholes, etc) that will be used in conjunction with SuDS in the form of permeable paving, a proprietary attenuation tank and proprietary treatment device.
- 5.3 The traditional positive systems will be designed in accordance with Design and Construction Guidance (DCG). This guide is for use by developers undertaking new development when planning, designing and constructing conventional foul and surface water sewers, lateral drains, pumping stations and rising mains intended for adoption by the sewerage undertaker.
- 5.4 The SuDS design is based upon guidance provided in the CIRIA Report C753 - The SuDS Manual. This document provides current best practice national guidance on the planning, design, construction, operation and maintenance of SuDS.

### Consultation with Wiltshire Council

- 5.5 Consultation with Wiltshire County Council, as Lead Local Flood Authority (LLFA), has been undertaken and their response is contained in Appendix B. The LLFA expect to receive a differing level of detail that is dictated by the stage of the planning process. Refer to figure 5.1 below that provides a useful summary of what is required to accompany an outline application. This report provides the required/expected level of detail as stipulated by Wiltshire Council.

| Pre-app | Outline | Full | Reserved matters | Discharge of conditions | Document to be submitted                                                                             |
|---------|---------|------|------------------|-------------------------|------------------------------------------------------------------------------------------------------|
| ✓       | ✓       | ✓    |                  |                         | Flood Risk Assessment / Statement                                                                    |
| ✓       | ✓       | ✓    |                  |                         | Drainage Strategy / Statement & sketch layout plan                                                   |
|         | ✓       |      |                  |                         | Preliminary layout drawings                                                                          |
|         | ✓       |      |                  |                         | Preliminary "Outline" hydraulic calculations                                                         |
|         | ✓       |      |                  |                         | Preliminary landscape proposals                                                                      |
|         | ✓       |      |                  |                         | Ground investigation report (for infiltration)                                                       |
|         | ✓       | ✓    |                  |                         | Evidence of third party agreement for discharge to their system (in principle/ consent to discharge) |

**Table 5.1: Information Required by Wiltshire Council for Outline Application**

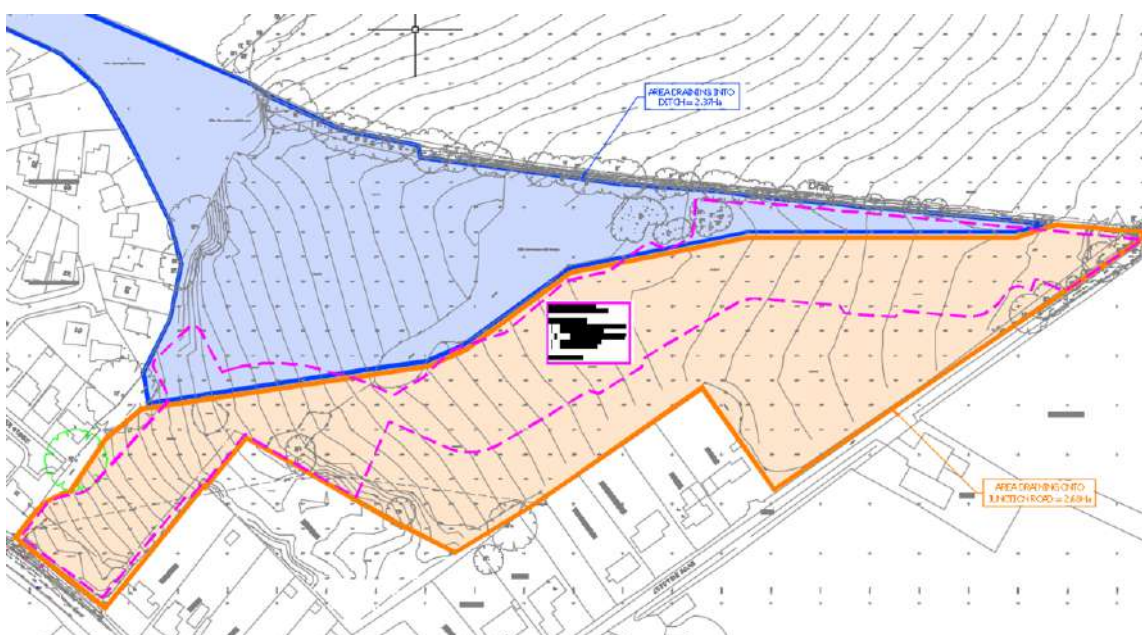
## Existing Drainage

### Existing Sewers

- 5.6 The Site is entirely greenfield and there are no recorded surface water sewers within the boundary.

### Existing Ditch & Drained Catchments

- 5.7 There is an existing ditch along the northern boundary of the Site, which flows/falls with the land in the easterly direction toward the eastern apex adjacent Junction Road.
- 5.8 The site does not drain entirely into this ditch. An analysis of the contours contained in the topographic survey is below in figure 2.1 that shows the following:
- Catchment A: 2.37 hectares drains into the ditch. Blue shading
  - Catchment B: 2.60 hectares drains onto Junction Road towards the football pitches to the southeast. Orange shading.



**Figure 5.1: Drainage Catchment Areas to Existing Ditch**

- 5.9 Most of the proposed developed area (including gardens) covering approximately 1.70 hectares falls within orange shaded area that does not drain into the existing ditch.
- 5.10 The total impermeable area (roads, path, buildings, driveways, etc) draining into the positive drainage system is **0.81 hectares**. A breakdown of the areas, including 10% uplift for **urban creep** on the proposed houses is on the drainage general arrangement drawing in Appendix G.

### Surface Water run-off Disposal Hierarchy

- 5.11 As stated in the PPG, the aim should be to discharge surface water run-off as high up the following drainage hierarchy as reasonably practicable:
- Infiltration Drainage – A BGS Infiltration SuDS Report (Appendix H) has identified opportunities for bespoke infiltration SuDS. According to this report subsurface is potentially suitable although the design will be influenced by the ground conditions. The report also identified that the ground water is likely to be less than 3.0 metres below the surface. There is a rising spring at the north of the site (discussed in flood risk) that suggests a high groundwater level will hinder the use of infiltration drainage.
  - A Watercourse – There is an existing ditch on the northern boundary of the Site, which flows/falls with the land in the easterly direction toward the eastern apex adjacent Junction Road. Based upon the crossfall of the land the site currently drains into this ditch
  - A Sewer – There are no surface water sewers within close proximity.
- 5.12 Based upon the uncertainty on the ground conditions the use of infiltration drainage will not be used as the primary source of surface water disposal.
- 5.13 The surface water run-off from the Development will discharge at a restricted rate via a single outfall into the ditch running along the northern boundary. Refer to the proposed drainage general arrangement plan in Appendix G.
- 5.14 The proposed discharge and associated calculations are discussed in the following section.

### Proposed Discharge Rates and Calculations

#### Greenfield Run-off

- 5.15 The greenfield rates from the 0.81 hectares of proposed impermeable have been calculated using microdrainage, see below (for full calculations refer to Appendix I):
- Q1 years: 1.5 litres/sec
  - Q30 years: 4.0 litres/sec
  - Q100 years: 5.6 litres/sec
  - **QBAR: 1.8 litres/sec**

#### Proposed Discharge Rate

- 5.16 The proposed peak discharge will be **1.8 litres/second**, which is the same as the Qbar greenfield as listed above.

### Network Modelling

- 5.17 The proposed surface drainage system has been modelled in Micro Drainage and the network details and simulation results are contained in Appendix M. A Cv value of 1.0 has been applied and FEH rainfall has been modelled in the simulations.
- 5.18 In order to restrict the run-off to 1.8 litres / second a volume of approximately **855m<sup>3</sup>** will be required for the critical 1in100yr+45% climate change event.
- 5.19 The drainage design ensures that all flows are safely contained within the Development for up to and including the 1in100year event +45% climate change. All the attenuation volume will be in the below ground network and attenuation tank.

### **Exceedance Flows**

- 5.20 Surface water drainage systems could potentially become blocked or overloaded resulting from extreme rainfall events. Careful consideration will be given to the proposed road levels and building floor levels at the detailed design stage to ensure overland flow resulting from sewer or infrastructure failure is safely routed around individual properties within the Development. Exceedance flow routes have been identified in on the proposed drainage plan in Appendix G.

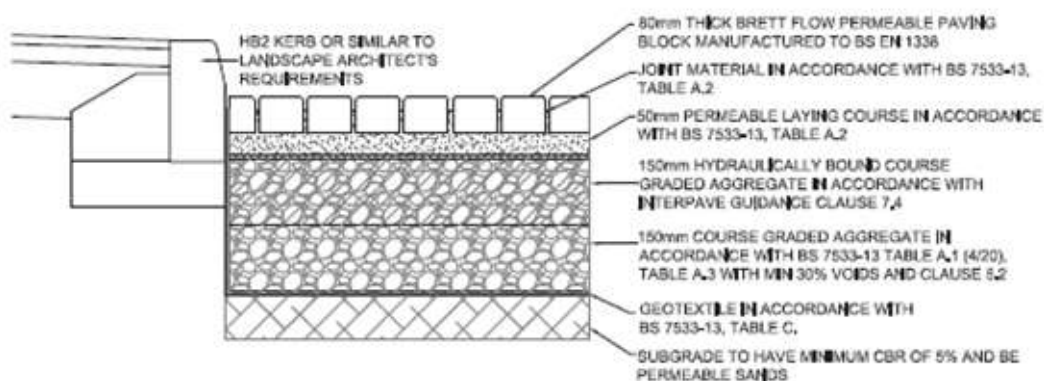
### **Surface Water Quality & Treatment**

- 5.21 Table 26.2 of the Ciria SuDS Manual 2015 identifies the pollution hazard level associated with the land uses within the Proposed Development as being 'Low'. On a scale from 0-1 a 'Low' pollution hazard level relates to the pollution hazard indices below (see Table 26.2 of the SuDS Manual). This is applicable to run-off from residential roofs, driveways, paths, residential parking areas and low traffic roads:
- Total Suspended Solids = 0.5
  - Metals = 0.4
  - Hydrocarbons = 0.4
- 5.22 Table 26.3 of the SuDS Manual sets out the indicative mitigation indices provided by different SuDS features for discharges to surface water.

### Permeable Paving

- 5.23 Communal parking and private parking will be constructed using permeable paving. The rainwater falling onto permeable paved areas of will be treated by the microorganisms as it passes through drainage medium. The system will be Marshals "Piora" proprietary system designed to encourage the growth of these microorganisms in the sub-base, as shown in Figure 5.4 below.

- 5.24 Permeable paving provides sufficient pollution mitigation for run-off from low hazard land uses and provides mitigation indices of 0.7, 0.6 and 0.7, which are in excess of the requirement set out in paragraph 5.24.



**Figure 5.2: Typical Permeable Block Paving Construction**

#### Hydro Dynamic Vortex Separator

- 5.25 An “Aqua Swirl” hydrodynamic vortex separator has been added just upstream of the final outfall into the existing ditch. This is a custom engineered, flow-through water quality device that utilises hydrodynamic separation technology to maximise the removal of coarse sediment, debris and free-floating oil from surface water run-off. According to the product data sheet (Appendix M) the treatment flow rate of the Aqua Swirl system is engineered to meet or exceed the local water quality treatment criteria and form an intrinsic part of a SuDS solution.

#### Traditional Gullies

- 5.26 Full size precast concrete gully pots draining the asphalt roads that will act as the first line of defence to trap silt and sediments in the drainage network.

#### **Adoption and Maintenance**

- 5.27 The proposed surface water sewers within the adopted and private road network will be adopted by Wessex Water under a Section 104 agreement (A Section 104 agreement, under the Water Industry Act 1991, is an agreement between a developer and sewerage undertaker for the adoption of sewers serving a development). These adopted sewers will be maintained in perpetuity in accordance with the Wessex Water maintenance schedule. (Wessex Water’s maintenance schedule is not available but they have a statutory obligation to maintain their sewer networks)
- 5.28 An operation, maintenance and management plan (O&M Plan) for the SuDS systems will be secured by planning condition. The proposed SuDS elements will be maintained

by a Management Company, organised by the Applicant, in accordance with the planning approved O&M Plan.

- 5.29 Taking this approach will ensure surface water systems are adequately maintained and they will continue to operate as designed/intended, which is to capture, convey, treat and dispose of all surface water run-off within the Development boundary.

### Design Criteria

- 5.30 The positive drainage will be designed in accordance with Sewers for Adoption, and BS EN 752 – Drain and sewer systems outside buildings and the Building Regulations - part H (2010).
- 5.31 The surface water network design and rate of surface water runoff would be based on the Modified Rational method and designed in accordance with the Wallingford Procedure. In order to carry out the design of the networks, a number of Global Variables are used. These Global Variables/parameters are related to the location of the site in the UK and have been obtained from Maps for “design and analysis of urban storm drainage – Wallingford procedure”. These are as follows;
- Region = England & Wales
  - $M(5-60) = 20.00\text{mm}$
  - Ration ( $r$ ) = 0.40
- 5.32 The positive surface water system would be designed such that:
- The pipes remain unsurcharged during the 1 in 2 year design storm;
  - The system should not flood during the worst case 1 in 30 year storm with a free outfall;
  - The surface water run-off from the proposed development will be contained on site for up to and including the worst case 1 in 100 year storm event, plus an additional 45% for climate change;
  - The pipe velocities are such that self-cleansing is achieved at lesser more moderate storm intensities :-
    - Pipe roughness ( $k_s$ ) = 0.6
    - Minimum pipe velocity at full flow = 0.75m/s
    - Percentage Impermeable areas:
      - Buildings = 100%
      - Carriageways, footpaths and parking = 100%
      - Private and Communal Parking = 100%
      - Soft Landscaping = 0%

## 6 Proposed Foul Drainage

### Existing Foul Sewers

- 6.1 According to the Wessex Water sewer records in Appendix E there two foul water sewers within the Site:
- Ex Foul Sewer 01: 150mm diameter sewer that runs along the northern boundary, south of the ditch, for a length of approximately 330 metres.
  - Ex Foul Sewer 02: 150mm diameter sewer that runs within the main access area to the southeast for approximately 90 metres.
- 6.2 Both of these sewers eventually run into Junction Road to the south of the Site and discharge into an existing Wessex Water foul water pump station on the opposite side of the A36. The pump station pumps effluent via a rising main back up Junction Road to a gravity sewer in Southampton Road

### Proposed on-site Layout

- 6.3 A number of these existing sewers that pass through the site will need to be diverted to make way for the Development as can be seen in the proposed drainage strategy in Appendix G. The Development will connect into these existing sewers on a gravity basis.
- 6.4 Statutory Authorities have their own methods of calculating peak foul flows from residential developments. It is therefore considered that Wessex Water will calculate foul flows from the Development.

### Design Criteria

- 6.5 The proposed new main foul sewers be designed in accordance with Design and Construction Guidance (DCG). This guide is for use by developers undertaking new development when planning, designing and constructing conventional foul and surface water sewers, lateral drains, pumping stations and rising mains intended for adoption by the sewerage undertaker.

### Adoption & Maintenance

- 6.6 The foul sewers will be adopted by Anglian Water under a Section 104 agreement (A Section 104 agreement, under the Water Industry Act 1991, is an agreement between a developer and sewerage undertaker for the adoption of sewers serving a development). These adopted sewers will be maintained in perpetuity in accordance with the Anglian Water maintenance schedule.

## 7 Conclusion

### Flood Risk

- 7.1 The development is located in a Flood Zone 1 area which has a low probability risk of experiencing flooding from fluvial/tidal sources.
- 7.2 The development is also at low risk of flooding from the following sources: Groundwater and Infrastructure Failure (see Table 9.1):

| Flood Mechanism               | Source                                                      | Flood Risk to the Development | Mitigation Required? |
|-------------------------------|-------------------------------------------------------------|-------------------------------|----------------------|
| Fluvial                       | N/A                                                         | Low                           | No                   |
| Tidal                         | N/A                                                         | Low                           | No                   |
| Groundwater                   | Underlying geology and groundwater levels                   | Low                           | No                   |
| Surface Water / Overland Flow | Runoff from surrounding elevated land and highway corridors | Low                           | No,                  |
| Infrastructure Failure        | Surface water systems and Water mains                       | Low                           | No                   |

**Table 9.1: Flood Risk Summary**

### Surface Water Drainage

- 7.3 The design satisfies the SuDS hierarchy by assessing the potential means of surface water disposal and determining that the existing ditch on the eastern boundary of the site is the most appropriate discharge location.
- 7.4 The peak rate of surface water run-off from the completed development will be 1.8 litres/second, which the greenfield rate (Qbar) of run-off from the developed area only
- 7.5 The completed system will manage surface water run-off up to the 1 in 100-year return period including a 45% allowance for climate change.
- 7.6 The surface water systems will include traditional positive drainage systems (Gullies, pipes, manholes, etc) that will be used in conjunction with SuDS systems in the form of an attenuation tank and permeable paving.

### Foul Drainage

- 7.7 The foul sewers serving the Development will discharge on a gravity basis into the existing Wessex Water foul sewer on Junction Road.

### Adoption & Maintenance

- 7.8 The traditional positive systems will be designed in accordance with Design and Construction Guidance (DCG). The SuDS design is based upon guidance provided in the CIRIA Report C753 - The SuDS Manual.
- 7.9 The proposed surface and foul water sewers within the adopted and private road network will be adopted by Wessex under a Section 104 agreement.
- 7.10 An operation, maintenance and management plan (O&M Plan) for the SuDS systems will be secured by planning condition. The proposed SuDS elements will be maintained by a Management Company, organised by the Applicant, in accordance with the planning approved O&M Plan.

### Conclusion

- 7.11 Having completed this FRA and drainage strategy, the conclusion is that the proposed development at Southampton Road, Alderbury, is not at risk of flooding and can be safely carried out without increasing the risk of flooding to downstream/surrounding properties.

## **APPENDIX A: Site Location**

Notes

To be read in conjunction topographical and arboricultural survey and associated drawings/reports.

KEY

Development boundary

Other land owned by applicant

|     |            |                  |       |      |
|-----|------------|------------------|-------|------|
| P5  | 23-09-2024 | Planning issue   | SL    | SH   |
| P4  | 16-08-2024 | Planning issue   | SL    | SR   |
| P3  | 04-07-2024 | Red line updated | SL    | SH   |
| P2  | 30-01-2024 | Re-issue         | SR    | SH   |
| P1  | 08-01-2024 | First issue      | SL    | SH   |
| Rev | Date       | notes            | Drawn | Chkd |

**r h partnership architects**  
28 Foundry Street Brighton BN1 4AT  
T 01273 645220  
www.rhpartnership.co.uk  
brighton@rhpartnership.co.uk

Project  
Land off Southampton Road  
Alderbury

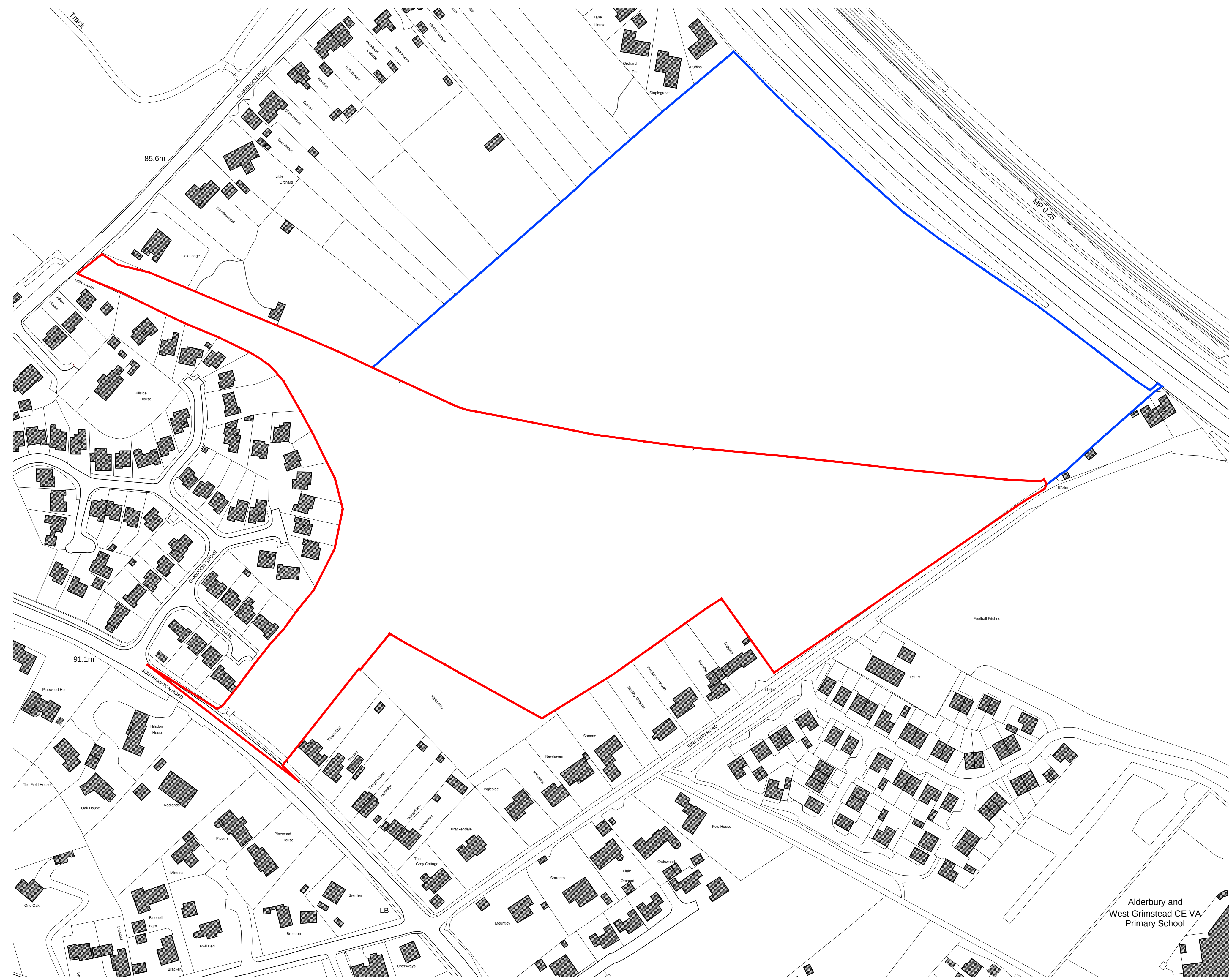
Drawing  
Site Location Plan

| Project                   | originator  | volume | level | type | role | number | revision |
|---------------------------|-------------|--------|-------|------|------|--------|----------|
| P1365-RHP-ZZ-00-DR-A-1015 | P5          |        |       |      |      |        |          |
| Scale(s) @ A1             | RHP Project | Drawn  | Chkd  |      |      |        |          |
| 1:1250                    | P1365       | SR     | SH    |      |      |        |          |

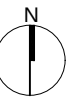
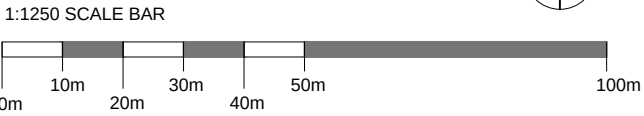
Status  
Planning

Suitability  
S0

File location: R:\Projects\P1365-P1365 Southampton Road Alderbury\BMA01-WP\Sheet\_Plan\1000-1999 Site\deg\P1365-RHP-ZZ-00-DR-A-1015-03 Site Location Plan.dwg Last Plotted: 23/9/2024 12:19PM



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## **APPENDIX B: Wiltshire Council Pre-App Advice**

# Wiltshire Council Planning Consultation Response

12 January 2023

Wiltshire Council Drainage Engineer  
Technical Services Drainage Engineer  
Wiltshire Council

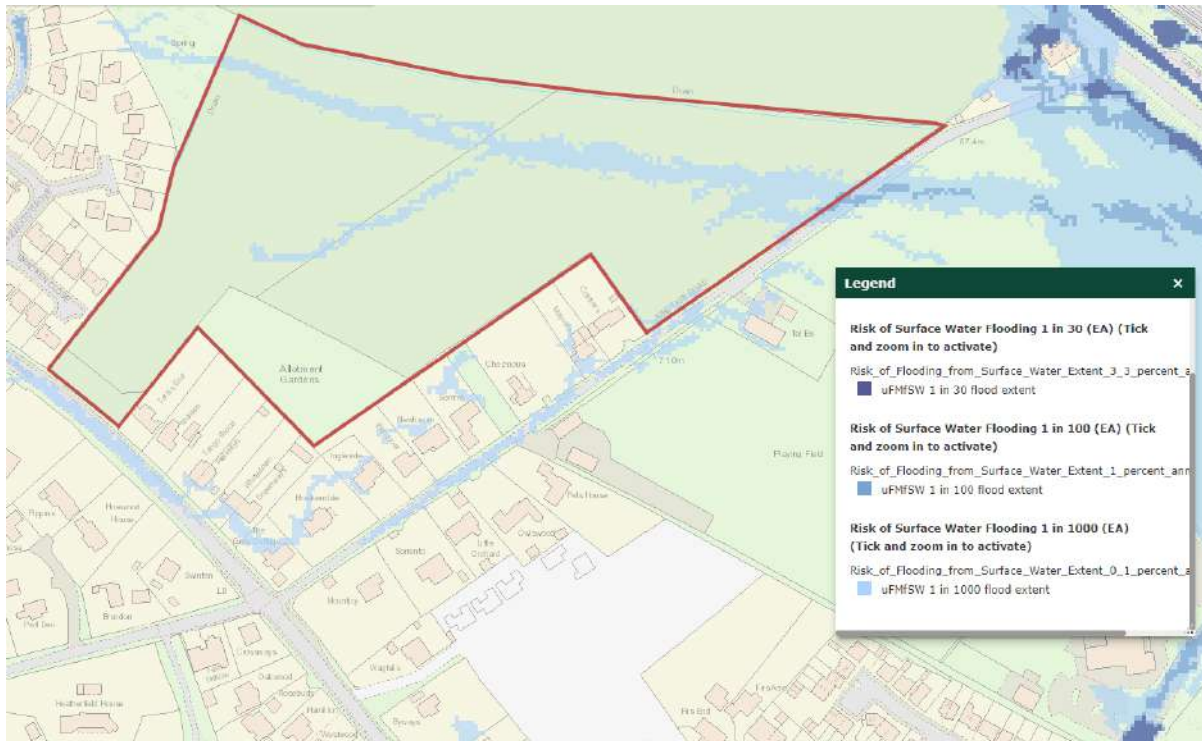
**Application No:** ENQ/2023/00006

**Residential development comprising 77no. Dwellings.**

**LAND AT SOUTHAMPTON ROAD & JUNCTION ROAD, ALDERBURY, SALISBURY,  
SP5 3AG**

## **Pre-Application Advice: Flood Risk**

The Wiltshire Council Strategic Flood Risk Assessment, [SFRA Data Explorer](#), has indicated that the site is located within Flood Zone 1. A surface water flow path has been identified running through the site, resulting in parts of the site being at low surface water flood risk; this shall be investigated further as part of the FRA.



Overall, the site is shown to be at moderate cumulative risk of flooding in the future from all sources.

A site-specific Flood Risk Assessment (FRA) is required for this application. The site-specific FRA should demonstrate that the site is not adversely affected by flood risk from different sources, and how the flood risk from **all sources** will be managed without increasing flood risk to the development itself or elsewhere. It should also outline the proposed drainage strategy for the site. The applicant is referred to the Environment Agency's [advice](#) on how to prepare an FRA, as well as their standing [advice](#) for vulnerable developments.

## **Pre-Application Advice: Drainage Strategy / Drainage Design**

The applicant should note that in all instances the preference should be to utilise blue-green SuDS which provide multi-faceted benefits to the site (in terms of water quantity, quality, amenity and biodiversity); for example, for attenuation features preference should be given to use of swales / ponds / detention basins (if technically feasible) instead of attenuation tanks. The applicant should adopt a holistic approach to planning the site, and sufficient space for SuDS features should be provided at an early stage in order to fulfil the requirements of NPPF Paragraph 169; the LLFA will not accept statements that there is insufficient space for SuDS or that SuDS have not been utilised due to cost.

Any proposals should be designed in accordance with the Non-statutory Technical Standards for Sustainable Drainage Systems and the latest SuDS Manual (C753).

The applicant should note the EA's updated climate change guidance (dated [27 May 2022](#)) when preparing the Flood Risk Assessment / Drainage Strategy. For clarity, the LLFA would expect to see the following climate change allowances applied to rainfall:

- 1 in 30 yr = +40% Climate Change
- 1 in 100 yr = +45% Climate Change

The developer should provide the following information as part of future planning applications:

### **Drainage Strategy**

- Evidence that SuDS have been selected, wherever possible, to provide a wide range of benefits including amenity, biodiversity and maintaining water quality.
- Evidence that SuDS source control measures to manage water quantity and maintain water quality have been implemented wherever possible and throughout the management train so the development is not reliant upon large attenuation features close to the points of discharge.
- Existing greenfield runoff rates for the site.
- Post development runoff rates in accordance with Wiltshire Council's betterment policy:
  - *With regards the control of surface water discharges from new development, Wiltshire Council requires post development discharges from greenfield sites to provide 20% betterment over pre-development discharges for all storm events between the 1 in 1year and 1 in 100year return period events.*
  - *For greenfield development, the runoff volume from the development to any highway drain, sewer or surface water body in the 1 in 100 year, 6 hour rainfall event should never exceed the greenfield runoff volume for the same event.*
- Evidence demonstrating how the surface water disposal hierarchy has been applied and how all other options have been exhausted. The hierarchy is set out below (as per the Sewerage Sector Guidance, paragraph C.3.12):
  - Surface water runoff is collected for use.
  - Discharge into the ground via infiltration.
  - Discharge to a watercourse or other surface water body.
  - Discharge to surface water sewer or other drainage system, discharging to a watercourse or other surface water body.
  - Discharge to a combined sewer.
- The drainage strategy does not increase flood risk, as a result of catchment transfer.
- A detailed plan showing the existing drainage features on the site and how the proposed drainage strategy will be implemented.
- If infiltration is proposed, it is implemented in manner that does not create an offsite impact, particularly if there are reports of groundwater flooding in the area.
- Surface water can be safely managed within the proposed development, up to and including a 1 in 100 year plus climate change event.
- Existing flood flow routes through the site have been maintained or where they will be affected, adequate measures to intercept and safely control flows through the site have been provided to ensure flood risk is not increased elsewhere.

- All proposed drainage features are outside flood zones 2 and 3 and where they are adjacent to an ordinary watercourse, they are not located within the EA surface water flood maps. Where drainage features are located adjacent to flood zones 2 and 3, they must be above the 1 in 100 year plus climate change flood level. This information can be provided by the EA.
- The strategy mimics the existing drainage characteristics of the site by retaining and utilising any existing drainage features.
- Measures to prevent pollution of the receiving groundwater and/or surface waters.
- A clearly labelled drainage layout plan showing the pipe networks and any attenuation ponds. The plan should show any pipe node numbers referred to within the drainage calculations.

## Ground Investigations

- Geotechnical factual and interpretive reports, including infiltration tests in accordance with British Research Establishment (BRE) Digest 365 – Soakaway Design.
- Groundwater level monitoring (taking into account seasonal variations).
- The applicant is referred to Wiltshire Council's [Surface Water Soakaway Guidance](#) for the standards that must be met for planning approval and adoption of infiltration drainage features.

## Detailed Drainage calculations

- Calculations and drawings for the drainage system design showing designated holding areas and conveyance routes based on no flooding on site for a 1 in 30 year plus climate change rainfall event.
- Calculations and drawings for the drainage system design showing designated holding areas and conveyance routes based on no flooding on site for a 1 in 100 year plus climate change rainfall event in respect to a building (including basement) or utility plant susceptible to water within the development.
- Calculations should include an allowance for increased surface water runoff, as a result of urban creep, in accordance with LASOO guidance.
- Hydraulic Models should set the MADD factor / additional storage volume factor to 0m<sup>3</sup> / ha in order to prevent an overestimation of storage capacity in the proposed drainage network.

## Design Drawings

- A plan showing the cross sections and design of any attenuation pond and its components.
- Drawings showing conveyance routes for flows exceeding the 1 in 100 year plus climate change rainfall event that minimise the risk to people and property.

## Third party consent

- Consent for any outfalls from the proposed drainage systems into a public sewer or other drainage system not owned by the applicant.

## Ownership and Management

- Details of how the proposed and existing drainage features on the site will be maintained and managed after completion with confirmation from the relevant authority that they will adopt any systems that are being offered for adoption.

## Construction

- Adequate measures during construction to control pollution to existing watercourses and groundwater.
- A construction management plan.

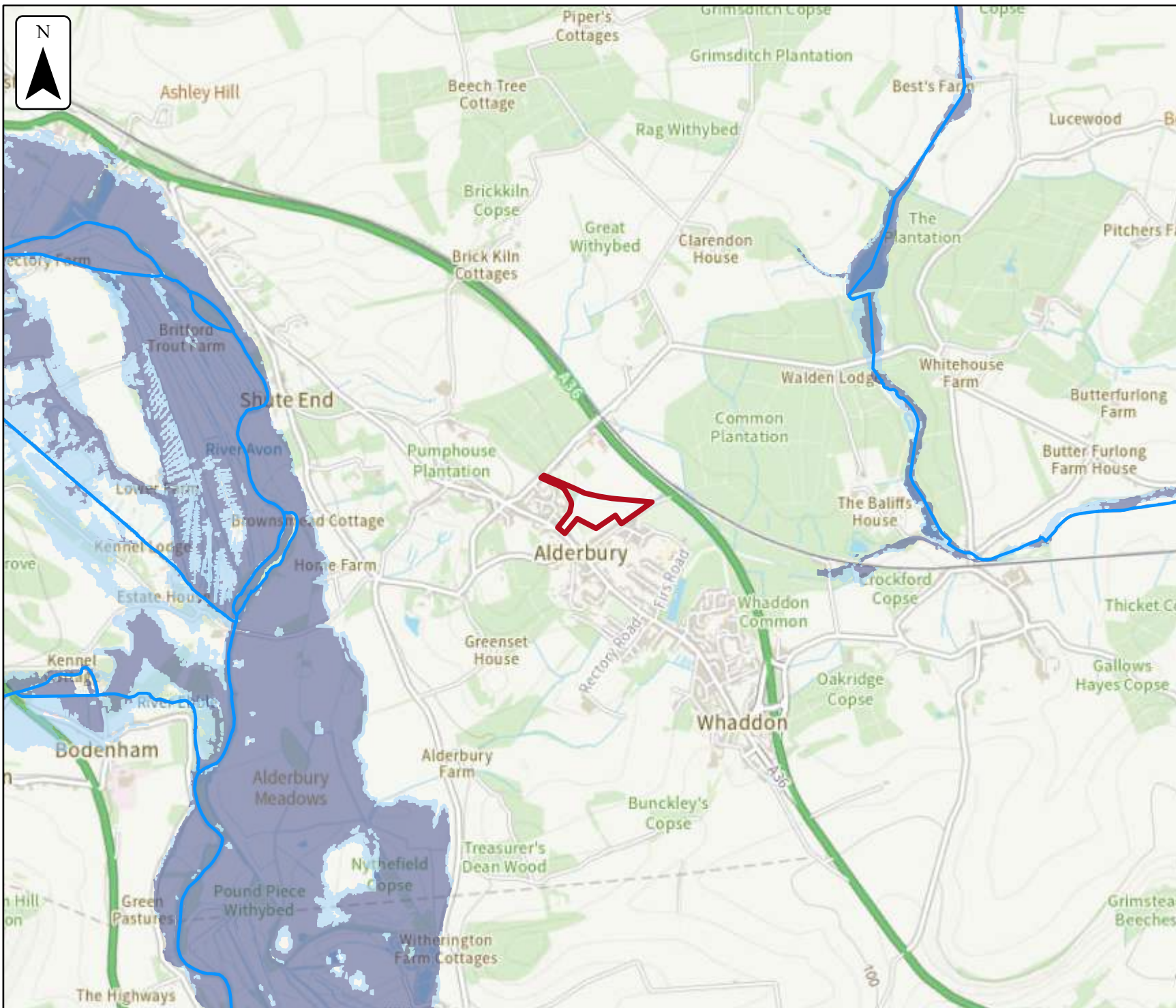
## Informatives:

The table below stipulates the information typically required at each application stage. Provision of the correct information will expedite the processing of applications by the drainage team.

| Pre-app | Outline | Full | Reserved matters | Discharge of conditions | Document to be submitted                                                                             |
|---------|---------|------|------------------|-------------------------|------------------------------------------------------------------------------------------------------|
| ✓       | ✓       | ✓    |                  |                         | Flood Risk Assessment / Statement                                                                    |
| ✓       | ✓       | ✓    |                  |                         | Drainage Strategy / Statement & sketch layout plan                                                   |
|         | ✓       |      |                  |                         | Preliminary layout drawings                                                                          |
|         | ✓       |      |                  |                         | Preliminary "Outline" hydraulic calculations                                                         |
|         | ✓       |      |                  |                         | Preliminary landscape proposals                                                                      |
|         | ✓       |      |                  |                         | Ground investigation report (for infiltration)                                                       |
|         | ✓       | ✓    |                  |                         | Evidence of third party agreement for discharge to their system (in principle/ consent to discharge) |
|         |         | ✓    |                  | ✓                       | Maintenance program and on-going maintenance responsibilities                                        |
|         |         | ✓    | ✓                |                         | Detailed development layout                                                                          |
|         |         | ✓    | ✓                | ✓                       | Detailed flood & drainage design drawings                                                            |
|         |         | ✓    | ✓                | ✓                       | Full Structural, hydraulic & ground investigations                                                   |
|         |         | ✓    | ✓                | ✓                       | Geotechnical factual and interpretive reports, including infiltration results                        |
|         |         | ✓    | ✓                | ✓                       | Evidence of measures to prevent pollution of the receiving groundwater and/or surface waters         |
|         |         | ✓    | ✓                | ✓                       | Drawings showing conveyance routes for flows exceeding the 1 in 100 year plus climate change         |
|         |         | ✓    | ✓                | ✓                       | Detailed landscaping details                                                                         |
|         |         | ✓    | ✓                | ✓                       | Discharge agreements (temporary and permanent)                                                       |
|         |         | ✓    | ✓                | ✓                       | Development Management & Construction Phasing Plan                                                   |

*Ben Wilding (Atkins working on behalf of Wiltshire Council Drainage).*

## **APPENDIX C: Flood Risk Plans**



## Flood map for planning

Your reference  
**South'pton Rd, Alderbury**

Location (easting/northing)  
**418979/127282**

Scale  
**1:25,000**

Created  
**29 Apr 2026 07:52**

-  Selected area
-  Flood zone 3
-  Flood zone 2
-  Flood zone 1
-  Flood defence
-  Main river
-  Water storage area

  
0 200 400 600m

**RISK OF FLOODING FROM SURFACE WATER (RoFSW)**  
(April 2026)  
**Southampton Road, Alderbury**

Wiltshire Council, Post code: SP5 3AG Co-ords: E418790, N127170

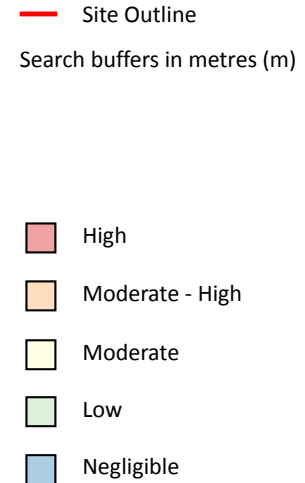
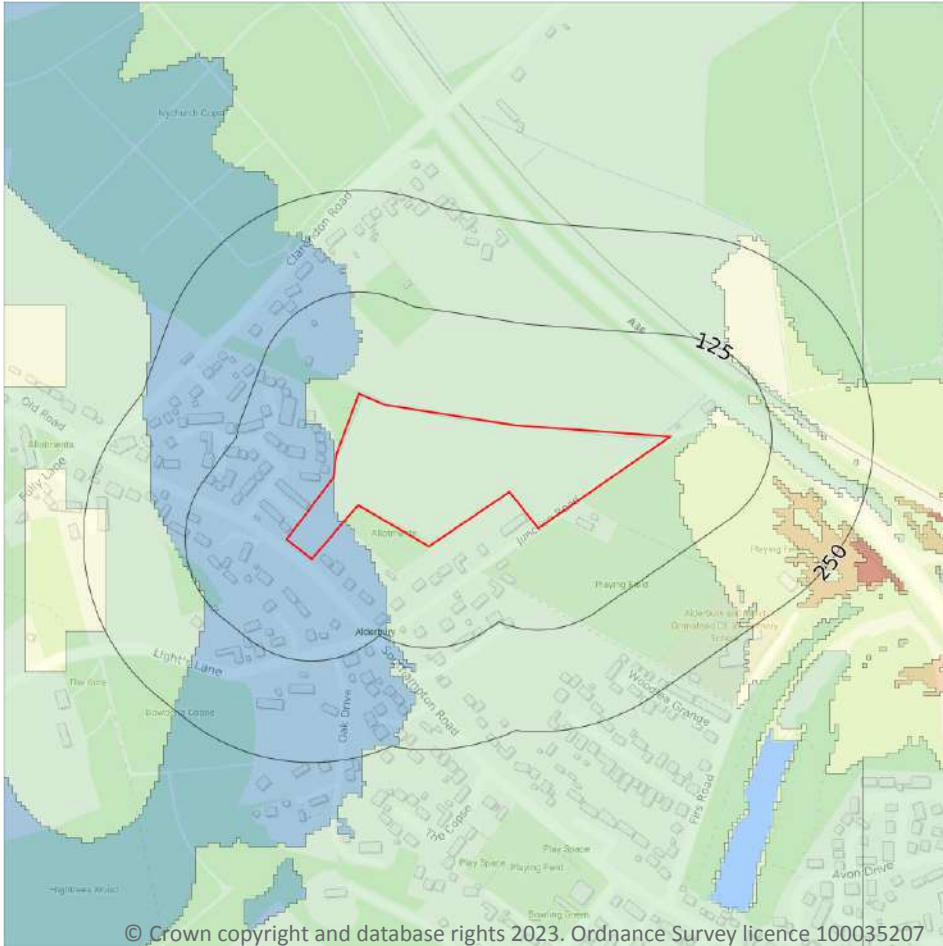
***Risk of Flooding from Surface Water***

Surface water flooding happens when rainwater does not drain away through the normal drainage systems or soak into the ground but lies on or flows over the ground instead.

The shading on the map shows the risk of flooding from surface water in this area and associated return period.

|                                                                                      |                                                                                                                                                       |
|--------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------|
|   | <p><b>High Risk Area</b><br/>Each year this area has a greater than 1in30 (3.3%) chance of flooding from surface water</p>                            |
|  | <p><b>Medium Risk Area</b><br/>Each year this area has between a 1in100 and a 1in30 (1%-3.3%) chance of experiencing flooding from Surface Water:</p> |
|  | <p><b>Low Risk Area</b><br/>Each year this area has a between a 1in1000 and 1in100 (0.1%-1%) chance of experiencing flooding from Surface Water</p>   |

## 9 Groundwater flooding



### 9.1 Groundwater flooding

Highest risk on site

Low

Highest risk within 50m

Moderate

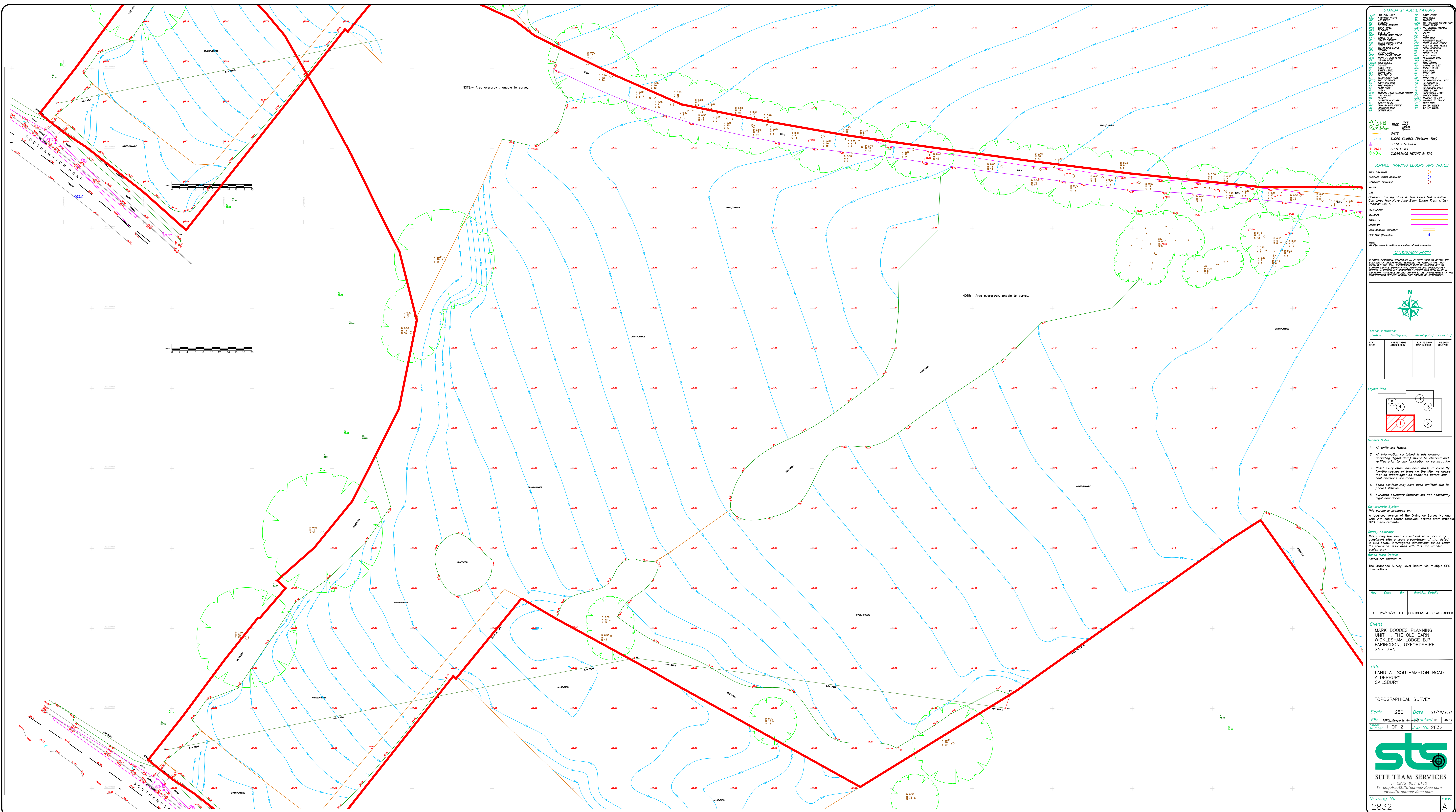
Groundwater flooding is caused by unusually high groundwater levels. It occurs when the water table rises above the ground surface or within underground structures such as basements or cellars. Groundwater flooding tends to exhibit a longer duration than surface water flooding, possibly lasting for weeks or months, and as a result it can cause significant damage to property. This risk assessment is based on a 1 in 100 year return period and a 5m Digital Terrain Model (DTM).

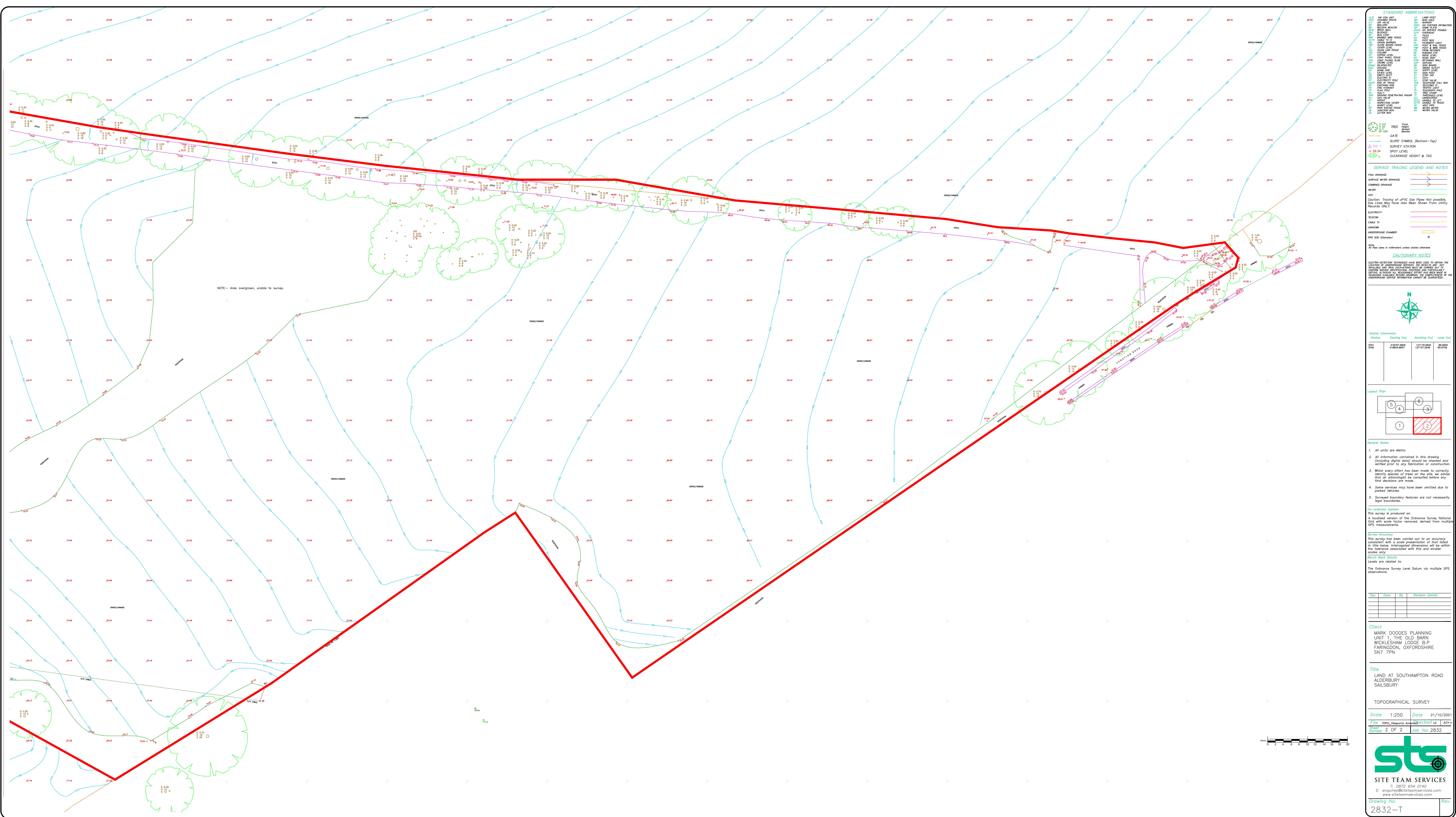
Features are displayed on the Groundwater flooding map on [page 51](#) >

*This data is sourced from Ambiantal Risk Analytics.*

## **APPENDIX D: Topographic Survey**

A0 ++



[illegible]

TREE Trunk  
 Height  
 Survival  
 Species  
 GATE  
 SLOPE SYMBOL (Bottom=Top)  
 SURVEY STATION  
 SPOT LEVEL  
 CLEARANCE HEIGHT & TAG

### SERVICE TRACING LEGEND AND NOTES

|                        |                                                                                     |
|------------------------|-------------------------------------------------------------------------------------|
| FOUL DRAINAGE          |  |
| SURFACE WATER DRAINAGE |  |
| COMBINED DRAINAGE      |  |
| WATER                  |  |
| GAS                    |  |

**Caution:** Tracing of uPVC Gas Pipes Not possible,  
Gas Lines May Have Also Been Shown From Utility  
Records ONLY.

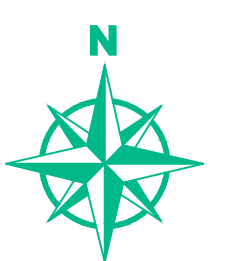
|             |                                                                                     |
|-------------|-------------------------------------------------------------------------------------|
| ELECTRICITY |  |
| TELECOM     |  |
| CABLE TV    |  |
| UNKNOWN     |  |

**UNDERGROUND CHAMBER** 

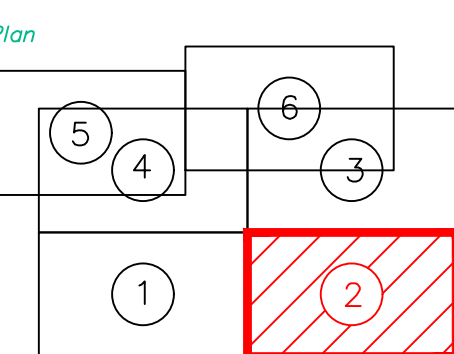
**PIPE SIZE (Diameter)** 

CAUTIONARY NOTES

ELECTRO-DETECTION TECHNIQUES HAVE BEEN USED TO OBTAIN THE LOCATION OF UNDERGROUND SERVICES. THE RESULTS ARE NOT INFALLIBLE AND TRIAL EXCAVATIONS MUST BE CARRIED OUT TO CONFIRM SERVICE EXISTENCE, LOCATIONS AND PARTICULARS. DEPTHS, ALTHOUGH ALL REASONABLE EFFORT HAS BEEN MADE IN SEARCHING AVAILABLE RECORD DRAWINGS, THE COMPLETENESS OF THE UNDERGROUND SERVICE INFORMATION CANNOT BE GUARANTEED.



| Station Information |             |              |           |
|---------------------|-------------|--------------|-----------|
| Station             | Easting (m) | Northing (m) | Level (m) |
| SDH1                | 418797.8806 | 127179.5845  | 86.8650   |
| SDH2                | 418824.8667 | 127157.2948  | 85.9709   |



**General Notes**

1. All units are Metric.
2. All information contained in this drawing (including capital cost) should be checked and verified prior to any fabrication or construction.
3. Whilst every effort has been made to correctly identify species of trees on the site, we advise that an arborologist be consulted before any final decisions are made.
4. Some services may have been omitted due to parked Vehicles.
5. Surveyed boundary features are not necessarily legal boundaries.

**Co-ordinate System**  
This survey is produced on:  
A localised version of the Ordnance Survey National Grid with scale factor removed, derived from multiple GPS measurements.

**Survey Accuracy**  
This survey has been carried out to an accuracy consistent with a scale presentation of that listed in title below. Interrogated dimensions will be within the tolerance associated with this and smaller scales only.

**Bench Mark Details**  
Levels are related to:  
The Ordnance Survey Level Datum via multiple GPS observations.

| Rev | Date | By | Revision Details |
|-----|------|----|------------------|
|     |      |    |                  |
|     |      |    |                  |
|     |      |    |                  |
|     |      |    |                  |
|     |      |    |                  |

**Client**  
MARK DOODES PLANNING  
UNIT 1, THE OLD BARN  
WICKLESHAM LODGE B.P  
FARINGDON, OXFORDSHIRE  
SN7 7PN

**Title**  
LAND AT SOUTHAMPTON ROAD  
ALDERBURY  
SAILSBURY

TOPOGRAPHICAL SURVEY

|       |       |      |            |
|-------|-------|------|------------|
| Scale | 1:250 | Date | 21/10/2021 |
|-------|-------|------|------------|

|              |                       |         |            |
|--------------|-----------------------|---------|------------|
| Scale        | 1:250                 | Date    | 21/10/2021 |
| File         | TOPD_Veaports_Amended | Checked | LD         |
| Sheet Number | 2 OF 2                | Job No. | 2832       |



**SITE TEAM SERVICES**  
T: 0872 654 0140  
E: [enquires@siteteamservices.com](mailto:enquires@siteteamservices.com)  
[www.siteteamservices.com](http://www.siteteamservices.com)

|             |      |
|-------------|------|
| Drawing No. | Rev. |
| 2832-T      |      |

## **APPENDIX E: Wessex Water Sewer Records**

|                    |               |               |                |                    |                           |                             |
|--------------------|---------------|---------------|----------------|--------------------|---------------------------|-----------------------------|
| <b>WATER MAINS</b> | <b>SEWERS</b> | <b>PUBLIC</b> | <b>PRIVATE</b> | <b>SECTION 104</b> | <b>OTHER WESSEX PIPES</b> | <b>NON-WESSEX / UNKNOWN</b> |
| Distribution Main  | Foul          |               |                |                    | Rising Mains              | Private Rising Mains        |
| Washout Main       | Surface       |               |                |                    | Standby Rising Mains      | Culverted Watercourse       |
| Raw Water Main     | Combined      |               |                |                    | Effluent Disposal         | Highway Drain               |
| Abandoned Main     | Abandoned     |               |                |                    | Overflow                  | Use Unknown                 |
| Private Main       |               |               |                |                    | Syphon                    | Status Unknown              |

Colours generally indicate the use of the sewer/drain (i.e Red - Foul, Dark Blue - Surface, Magenta - Combined/Dual Use, Light Green - Highway Drain, Mid Green - Overflow) styles of line are shown on the key in sample/typical colours.

|                 |                          |                         |
|-----------------|--------------------------|-------------------------|
| <b>SITES</b>    | <b>STRUCTURES</b>        | <b>OTHER STRUCTURES</b> |
| Source          | Manhole - Foul           | Attenuation Tank        |
| Reservoir       | Manhole - Surface        | Tunnel                  |
| Pump            | Manhole - Combined       | Interceptor             |
| Treatment Works | Outfall                  |                         |
|                 | Inlet                    |                         |
|                 | Lamphole                 |                         |
|                 | Bifurcation - Foul       |                         |
|                 | Bifurcation - Surface    |                         |
|                 | Bifurcation - Combined   |                         |
|                 | Combined Sewage Overflow |                         |
|                 | Lamphole                 |                         |
|                 | Rodding Eye              |                         |
|                 | Catchpit                 |                         |
|                 | Flushing Chamber         |                         |
|                 | Soakaway                 |                         |
|                 | Non Return Valve         |                         |
|                 | Washout                  |                         |
|                 | Air Valve                |                         |
|                 | Hatch Box                |                         |

Information in this plan is provided for identification purposes only. No warranty as to accuracy is given or implied. The precise route of pipe work may not exactly match that shown. Wessex Water does not accept liability for inaccuracies. Sewers and lateral drains adopted by Wessex Water under the Water Industry (Schemes for Adoption of Private Sewers) Regulations 2011 are to be plotted over time and may not yet be shown. In carrying out any works, you accept liability for the cost of any repairs to Wessex Water apparatus damaged as a result of your works. You are advised to commence excavations using hand tools only. Mechanical digging equipment should not be used until pipe work has been precisely located. If you are considering any form of building works and pipe work is shown within the boundary of your property or a property to be purchased (or very close by) a surveyor should plot its exact position prior to commencing works or purchase. Building over or near Wessex Water's apparatus is not normally permitted.

**Date:** 30/10/2023, 15:56:06

**Scale:** 1:2,500

**Centre:** 419,004, 127,314

## **APPENDIX F: Proposed Layout**



**ACOUSTIC LEGEND:**

|                                                                                       |                 |
|---------------------------------------------------------------------------------------|-----------------|
|  | 2.1m solid bank |
|  | 2.4m solid bank |

For further information refer to Jameson Acoustics Noise Assessment Report 22049-RP-1.84

| Proposed Dwellings     |           |
|------------------------|-----------|
| 102P Flats             | 2         |
| 2B4P Detached Bungalow | 2         |
| 2B4P Dwelling Houses   | 4         |
| 3B5P Dwelling Houses   | 18        |
| 4B6P Dwelling Houses   | 2         |
| <b>Total Units</b>     | <b>28</b> |

| P#               | SL                                                                                                                                                                                                                                                                                | SH      |
|------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------|
| P0               | Planning Issue - Layout amended                                                                                                                                                                                                                                                   | SL SH   |
| P5               | 12/03/2025<br>Unit 39-40 house type amended to 2no.<br>1029 units, site entrance amended in<br>accordance with Mayor Brown Proposed<br>Priority Access Junction drawing 01D,<br>acoustic barriers added in accordance with<br>Janssens Acoustics Technical Note<br>22049-TN-1+R2. | SL SH   |
| P4               | 24/09/2024<br>Planning Issue                                                                                                                                                                                                                                                      | SL SH   |
| P3               | 23/09/2024<br>Planning Issue                                                                                                                                                                                                                                                      | SL SH   |
| P2               | 16/08/2024<br>Planning Issue                                                                                                                                                                                                                                                      | SL SR   |
| P1               | 08/01/2024<br>First Issue                                                                                                                                                                                                                                                         | SL SR   |
| Rev Date + notes | Drawn                                                                                                                                                                                                                                                                             | Checked |

**r h partnership architects**  
28 Foundry Street Brighton BN1 4AT  
T 01273 645220  
[www.rhpartnership.co.uk](http://www.rhpartnership.co.uk)  
[brighton@rhpartnership.co.uk](mailto:brighton@rhpartnership.co.uk)

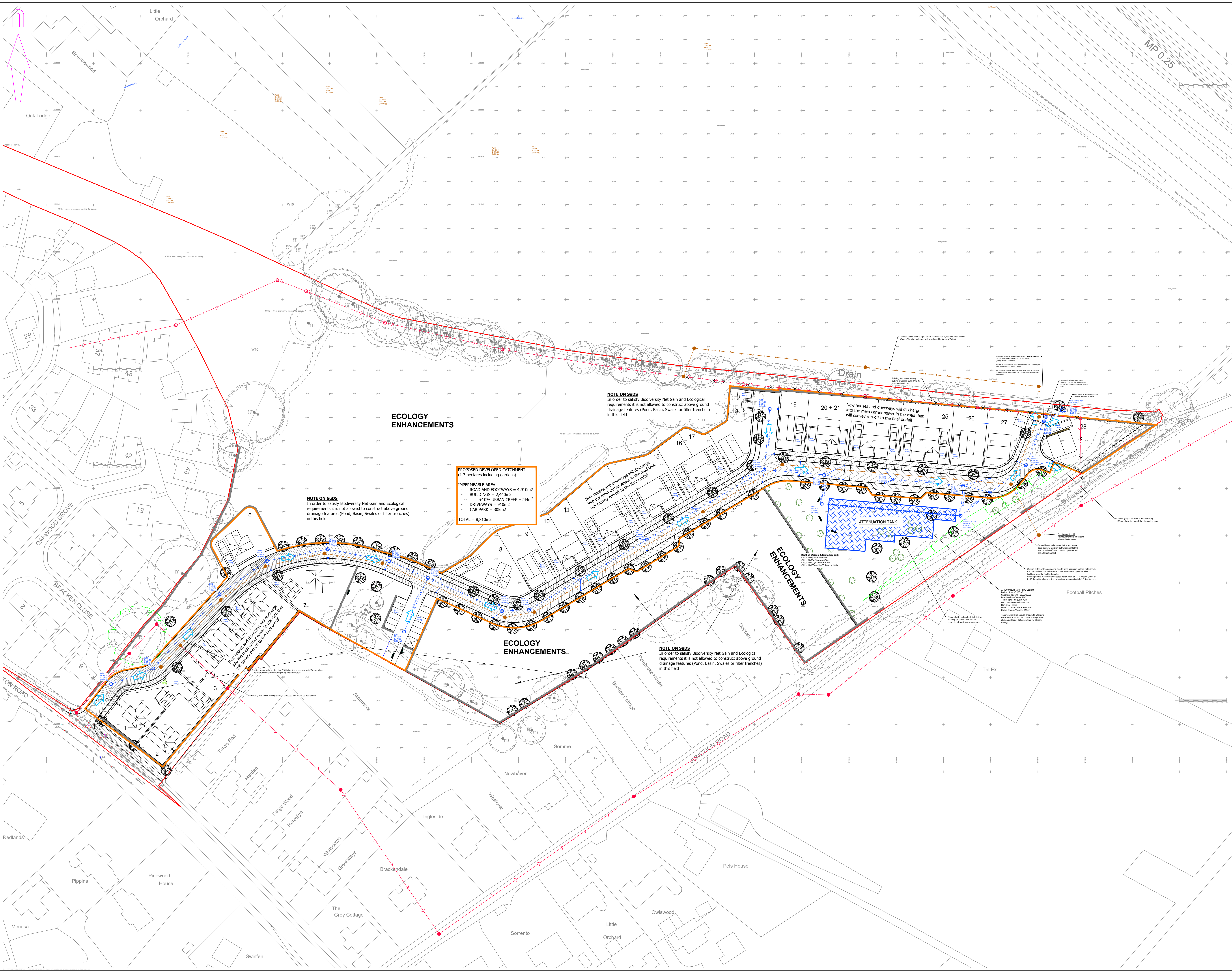
and off Southampton Road  
derbury

## Indicative Proposed Site Plan

| Project                   | originator  | volume | level | type | size | number | rev     |
|---------------------------|-------------|--------|-------|------|------|--------|---------|
| P1365-RHP-ZZ-00-DR-A-1200 |             |        |       |      |      |        |         |
| Scale(s) @ AD             | RHP Project |        |       |      |      | Drawn  | Checked |
| 1:600                     | P1365       |        |       |      |      | SL     | SH      |
| Status                    |             |        |       |      |      |        | Suite   |

## Planning

## **APPENDIX G: Proposed Drainage Strategy**



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**A0 ORIGINAL**

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**KEY:**

- PROPOSED SURFACE WATER SEWER AND MANHOLE
- PROPOSED HYDROBRAKE
- PROPOSED FOUL WATER SEWER AND MANHOLE
- PROPOSED SURFACE WATER SEWER AND INSPECTION CHAMBER
- EXISTING FOUL WATER SEWER AND MANHOLE
- PROPOSED SURFACE WATER ATTENUATION TANK
- PROPOSED ATTENUATION BASIN
- PROPOSED SURFACE WATER HEADWALL
- PROPOSED CATCHMENT
- PROPOSED INDICATIVE OVERLAND FLOW ROUTE

- NOTES:**
- This drawing is not to be scaled.
  - Drawing based on RH Partnership Architect's "Proposed Indicative Site Plan" drawing reference P1365-RHP-ZZ-00-DR-A-1200 revision P4, received on 25/09/2024.
  - This drawing is to be read in conjunction with all relevant engineering and landscaping drawings. Any discrepancies are to be reported to the engineer immediately for clarification.

| FOR INFORMATION      |                                                                                                                              |    |            |
|----------------------|------------------------------------------------------------------------------------------------------------------------------|----|------------|
| NOT FOR CONSTRUCTION |                                                                                                                              |    |            |
| P5                   | Drawing updated following revised Architect's layout received on 13/03/2024. (TC)                                            | SF | 30/04/2026 |
| P4                   | Out of drain along North Western boundary moved outside perimeter of fence. Notes updated. (TC)                              | SF | 22/01/2025 |
| P3                   | Latest proposed site layout used. Adjustments made to drainage and levels design accordingly. Key and notes added. (TC)      | SF | 07/10/2024 |
| P2                   | Latest proposed site layout used, landscape strategy added. Adjustments made to drainage and levels design accordingly. (SF) | SF | 05/01/2024 |
| P1                   | Initial Issue (SF)                                                                                                           | SF | 04/01/2024 |

| rev. | amendment | checked | date |
|------|-----------|---------|------|
|------|-----------|---------|------|

**m3** mayer brown

Mayer Brown Limited  
Lion House, Oriental Road, Woking, Surrey, GU24 8AR  
Telephone 01483 750 506 Fax 01483 750 437  
wokingoffice@mayerbrown.co.uk www.mayerbrown.co.uk

|                               |            |             |                   |
|-------------------------------|------------|-------------|-------------------|
| client                        |            |             |                   |
| FORMULA LAND (ALDERBURY) Ltd  |            |             |                   |
| project                       |            |             |                   |
| SOUTHAMPTON ROAD<br>ALDERBURY |            |             |                   |
| scale                         | 1:500      | drawn by    | TC                |
|                               |            | checked by  | SF                |
| date                          | APRIL 2026 | cad file    | 20 - DRAINAGE.DWG |
| title                         |            |             |                   |
| PROPOSED DRAINAGE STRATEGY    |            |             |                   |
| Mayer Brown Limited jobcode   |            | suitability | revision          |
| WP/ALDERBURY                  |            |             | P5                |
| drawing number                |            |             |                   |
| WPALDERBURY.23_20             |            |             |                   |

## **APPENDIX H: BGS Infiltration SuDS GeoReport**

TOM CASSIDY  
MAYER BROWN  
BROWN & CO PLANNING LTD  
LION HOUSE  
147 ORIENTAL ROAD  
WOKING  
GU22 8AR

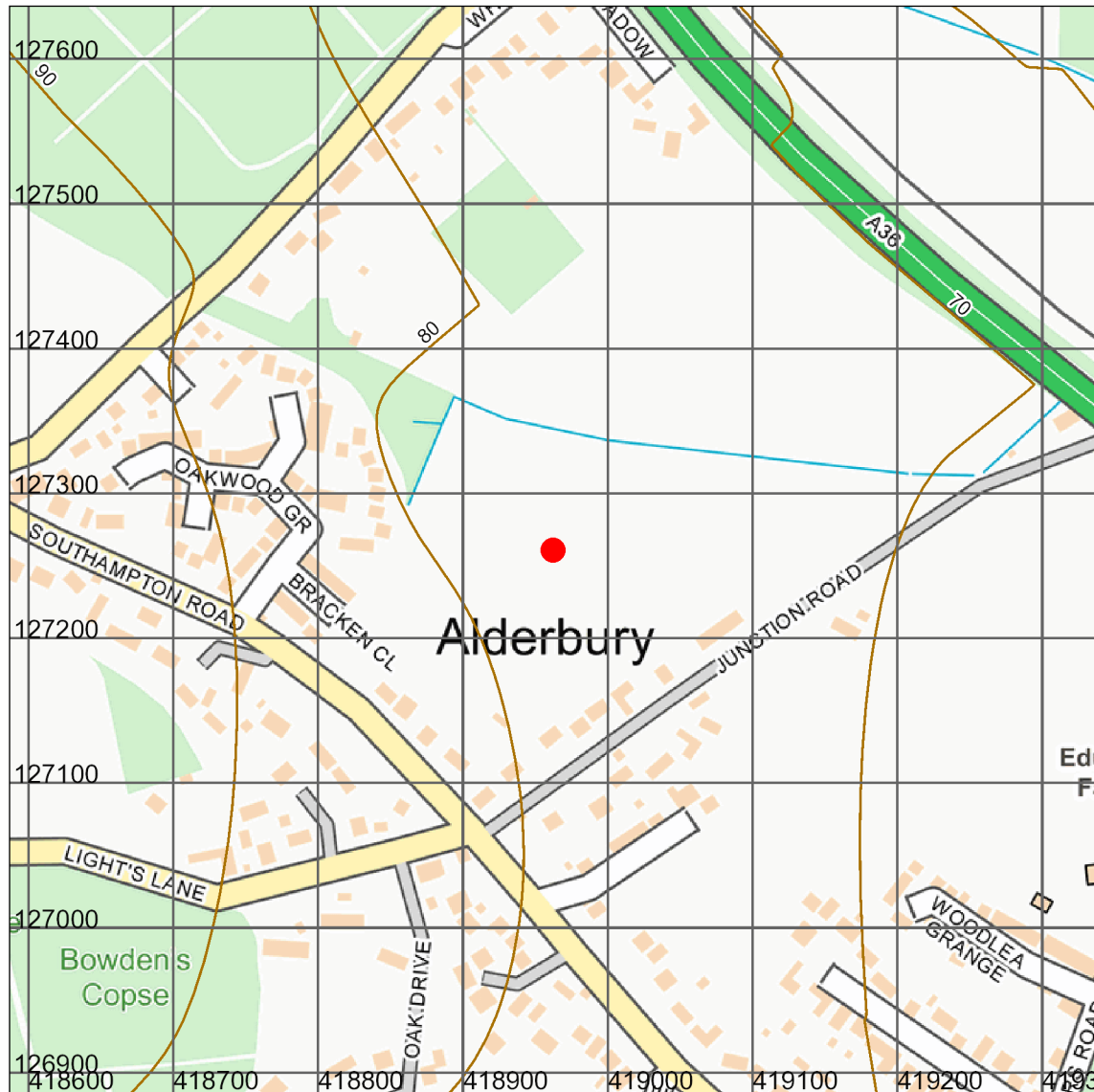
## Infiltration SuDS GeoReport:

This report provides information on the suitability of the subsurface for the installation of infiltration sustainable drainage systems (SuDS). It provides information on the properties of the subsurface with respect to significant constraints, drainage, ground stability and groundwater quality protection.

Report Id: *BGS\_336572/51343*

Client reference: *WPALDBURY.23*

## Search location



Contains OS data © Crown Copyright and database right 2024. OS OpenMap Local: Scale: 1:5 000 (1cm = 50 m)

**Search location indicated in red**

*Point centred at: 418962,127261*

## Assessment for an infiltration sustainable drainage system

### Introduction

Sustainable drainage systems (SuDS) are drainage solutions that manage the volume and quality of surface water close to where it falls as rain. They aim to reduce flow rates to rivers, increase local water storage capacity and reduce the transport of pollutants to the water environment. There are four main types of SuDS, which are often designed to be used in sequence. They comprise:

- **source control:** systems that control the rate of runoff
- **pre-treatment:** systems that remove sediments and pollutants
- **retention:** systems that delay the discharge of water by providing surface storage
- **infiltration:** systems that mimic natural recharge to the ground.

This report focuses on infiltration SuDS. It provides subsurface information on the properties of the ground with respect to drainage, ground stability and groundwater quality protection. It is intended principally for those involved in the preliminary assessment of the suitability of the ground for infiltration SuDS, and those involved in assessing proposals from others for sustainable drainage, but it may also be useful to help house-holders judge whether or not further professional advice should be sought. If in doubt, users should consult a suitably-qualified professional about the results in this report before making any decisions based upon it.

This GeoReport is structured in two parts:

- **Part 1. Summary data.**

Comprises three maps that summarise the data contained within Part 2.

- **Part 2. Detailed data.**

Comprises a further 24 maps in four thematic sections:

- **Very significant constraints.** Maps highlight areas where infiltration may result in adverse impacts due to factors including: ground instability (soluble rocks, non-coal shallow mining and landslide hazards); persistent shallow groundwater, or the presence of made ground, which may represent a ground stability or contamination hazard.
- **Drainage potential.** Maps indicate the drainage potential of the ground, by considering subsurface permeability, depth to groundwater and the presence of floodplain deposits.
- **Ground stability.** Maps indicate the presence of hazards that have the potential to cause ground instability resulting in damage to some buildings and structures, if water is infiltrated to the ground.
- **Groundwater protection.** Maps provide key indicators to help determine whether the groundwater may be susceptible to deterioration in quality as a result of infiltration.

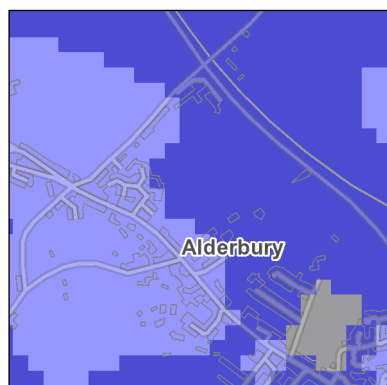
This report considers the suitability of the subsurface for the installation of infiltration SuDS, such as soakaways, infiltration basins or permeable pavements. It provides subsurface data to indicate whether, and which type of infiltration system may be appropriate. It does not state that infiltration SuDS are, or are not, appropriate as this is highly dependent on the design of the individual system. This report therefore describes the subsurface conditions at the site, allowing the reader to determine the suitability of the site for infiltration SuDS.

The map and text data in this report is similar to that provided in the '*Infiltration SuDS Map: Detailed*' national map product. For further information about the data, consult the '*User Guide for the Infiltration SuDS Map: Detailed*', available from <http://nora.nerc.ac.uk/16618/>.

## PART 1: SUMMARY DATA

This section provides a summary of the data.

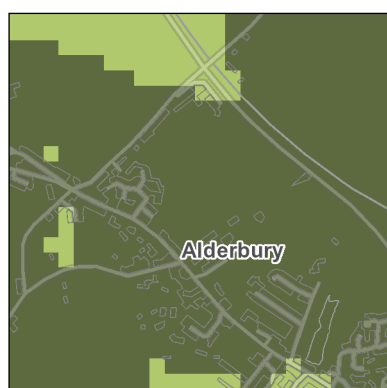
### In terms of the drainage potential, is the ground suitable for infiltration SuDS?



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-  Highly compatible for infiltration SuDS. The subsurface is likely to be suitable for free-draining infiltration SuDS.
-  Probably compatible for infiltration SuDS. The subsurface is probably suitable although the design may be influenced by the ground conditions.
-  Opportunities for bespoke infiltration SuDS. The subsurface is potentially suitable although the design will be influenced by the ground conditions.
-  Very significant constraints are indicated. There is a very significant potential for one or more hazards associated with infiltration.

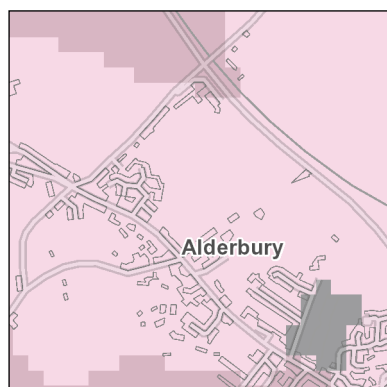
### Is ground instability likely to be a problem?



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-  Increased infiltration is very unlikely to result in ground instability.
-  Ground instability problems may be present or anticipated, but increased infiltration is unlikely to result in ground instability.
-  Ground instability problems are probably present. Increased infiltration may result in ground instability.
-  There is a very significant potential for one or more geohazards associated with infiltration.

### Is the groundwater susceptible to deterioration in quality?



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-  The groundwater is not expected to be especially vulnerable to contamination.
-  The groundwater may be vulnerable to contamination.
-  The groundwater is likely to be vulnerable to contaminants.
-  Made ground is present at the surface. Infiltration may increase the possibility of remobilising pollutants.

## PART 2: DETAILED DATA

This section provides further information about the properties of the ground and will help assess the suitability of the ground for infiltration SuDS.

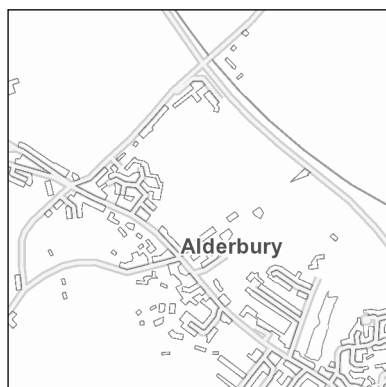
### Section 1. Very significant constraints

Where maps are overlain by grey polygons, geological or hydrogeological hazards may exist that could be made worse by infiltration. The following hazards are considered:

- soluble rocks
- landslides
- shallow mining (not including coal)
- shallow groundwater
- made ground

For more information read 'Explanation of terms' at the end of this report.

#### Soluble rock hazard

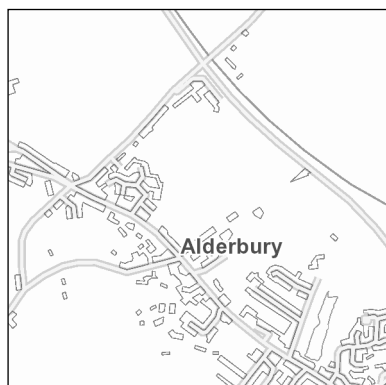


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☒ Very significant soluble rock hazard.  
Soluble rocks are present with a very significant possibility of localised subsidence that could be initiated or made worse by infiltration. The site investigation should consider whether the potential for or the consequences of subsidence as a result of infiltration are significant.

☐ Very significant soluble rock hazards are not present; however this hazard may still need to be considered. See Part 3.

#### Landslide hazard

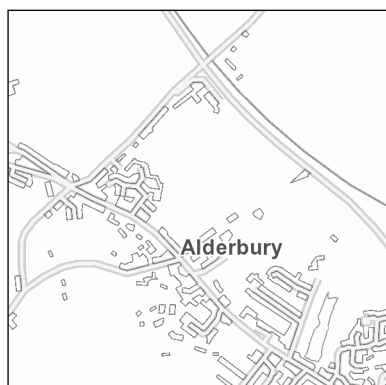


Contains OS data © Crown Copyright and database right 2024

☒ Very significant landslide hazard.  
Slope instability problems are almost certainly present and may be active. An increase in moisture content as a result of infiltration may cause the slope to fail. The site investigation should consider whether the potential for or the consequences of landslide as a result of infiltration are significant.

☐ Very significant landslide hazards are not present; however this hazard may still need to be considered. See Part 3.

## Shallow mining hazard (not including coal)

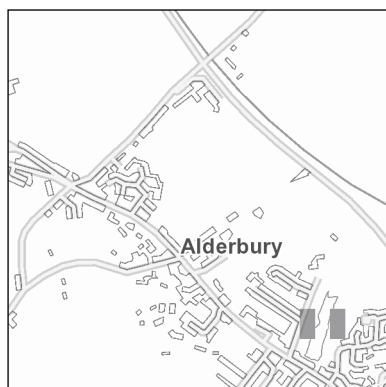


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☒ Very significant mining hazard.  
Shallow mining is likely to be present with a very significant possibility of localised subsidence that could be initiated or made worse by increased infiltration. Also, infiltration may increase the possibility of remobilising pollutants. The site investigation should consider whether the potential for or consequences of subsidence and/or remobilisation of pollutants as a result of infiltration are significant.

☐ Very significant mining hazards are not present; however this hazard may still need to be considered. See Part 3.

## Persistent shallow groundwater



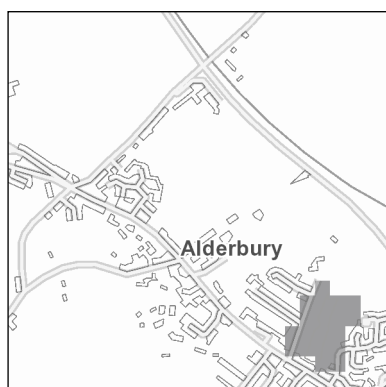
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☒ Very high likelihood of persistent or seasonally shallow groundwater.

Persistent or seasonally shallow groundwater is likely to be present. Infiltration may increase the likelihood of soakaway inundation, or groundwater emergence at the surface. The site investigation should consider whether the potential for or the consequences of groundwater level rise as a result of infiltration are significant.

☐ See Part 2 for the likely depth to water table.

## Made ground



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☒ Made ground present.  
Made ground is present at the surface. Infiltration may affect ground stability or increase the possibility of remobilising pollutants. The site investigation should consider whether the potential for or consequences of ground instability and/or pollutant leaching as a result of infiltration are significant.

☐ None recorded

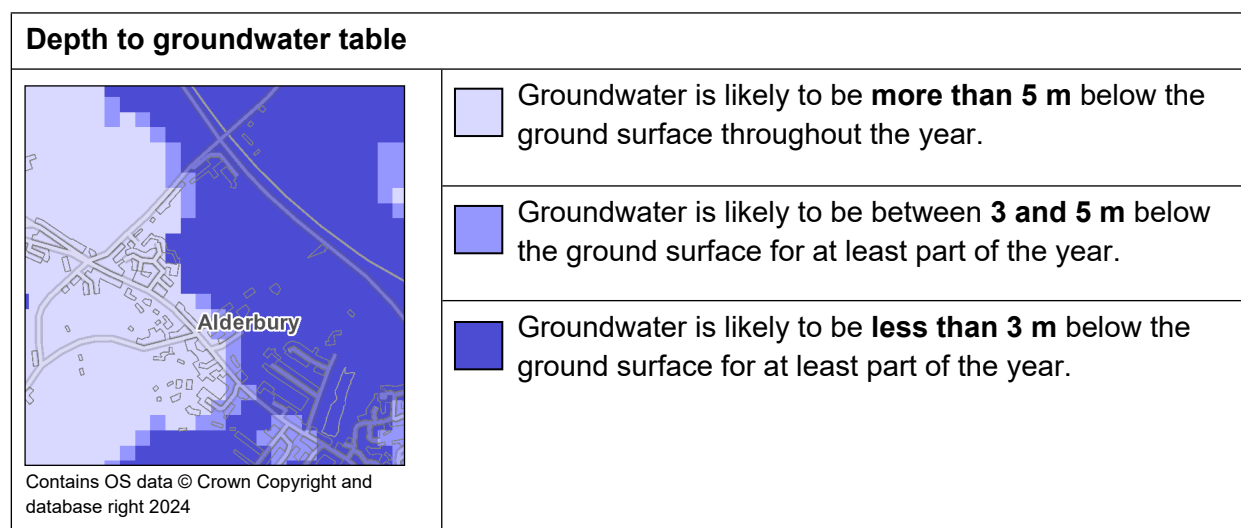
## Section 2. Drainage potential

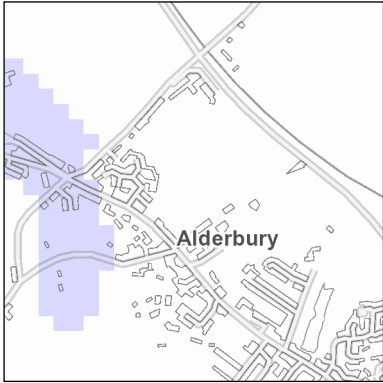
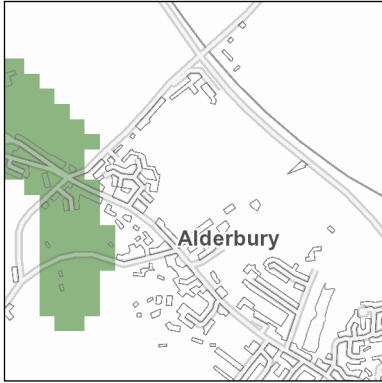
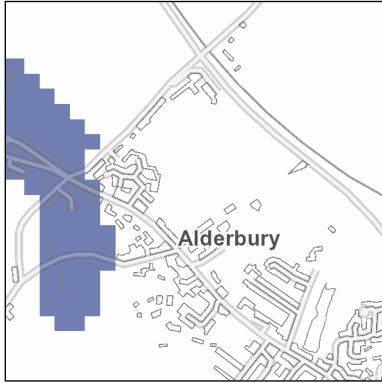
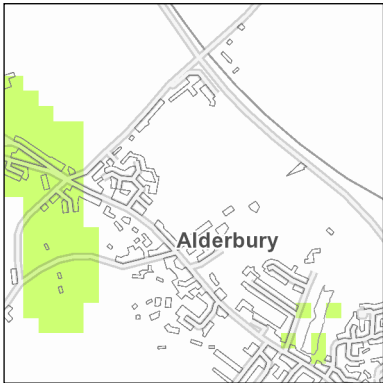
The following pages contain maps that will help you assess the drainage potential of the ground by considering the:

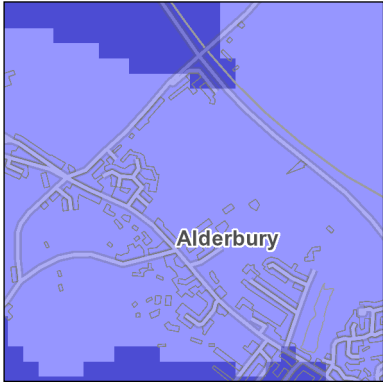
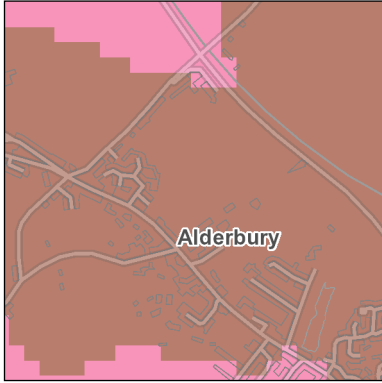
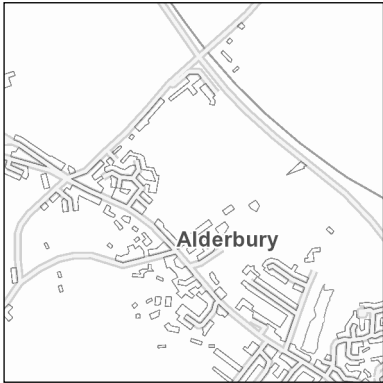
- depth to water table
- permeability of the superficial deposits
- thickness of the superficial deposits
- permeability of the bedrock
- presence of floodplains

Superficial deposits are not present everywhere and therefore some areas of the *superficial deposit permeability* map may not be coloured. Where this is the case, the *bedrock permeability* map shows the likely permeability of the ground. Superficial deposits in some places are very thin and hence in these places you may wish to consider both the permeability of the superficial deposits and the permeability of the bedrock. The *superficial thickness* map will tell you whether the superficial deposits are thin (< 3 m thick) or thick (>3 m). Where they are over 3 m thick, the permeability of the bedrock may not be relevant.

For more information read 'Explanation of terms' at the end of this report.



|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                             |                                                                                                                                                                          |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Superficial deposit permeability</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                             |                                                                                                                                                                          |
|  <p>Contains OS data © Crown Copyright and database right 2024</p>                                                                                                                                                                                                                                                                                                                                                                                                                     |  Superficial deposits are likely to be <b>free-draining</b> .                                                                                                                                              |                                                                                                                                                                          |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |  The superficial deposit permeability is <b>spatially variable</b> , but likely to permit moderate infiltration.                                                                                           |                                                                                                                                                                          |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |  Superficial deposits are likely to be <b>poorly draining</b> .                                                                                                                                            |                                                                                                                                                                          |
| <p>These maps show the permeability range that is summarised above.</p> <p> Very Low<br/> Low<br/> Moderate<br/> High<br/> Very High</p> | <b>Minimum</b><br> <p>Contains OS data © Crown Copyright and database right 2024</p>                                                                                                                     | <b>Maximum</b><br> <p>Contains OS data © Crown Copyright and database right 2024</p> |
| <b>Superficial deposit thickness</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                             |                                                                                                                                                                          |
|  <p>Contains OS data © Crown Copyright and database right 2024</p>                                                                                                                                                                                                                                                                                                                                                                                                                   |  The thickness of superficial deposits is <b>&lt; 3 m</b> and hence the permeability of the ground may be dependent on both the superficial deposits (where present) and underlying bedrock (see below). |                                                                                                                                                                          |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |  The thickness of superficial deposits is <b>&gt; 3 m</b> and hence the permeability of the superficial deposits is likely to determine the permeability of the ground.                                  |                                                                                                                                                                          |

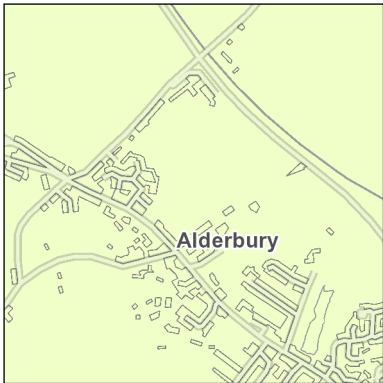
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                            |                                                                                                                                                                          |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Bedrock permeability</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                                                            |                                                                                                                                                                          |
|  <p>Contains OS data © Crown Copyright and database right 2024</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |  Bedrock deposits are likely to be <b>free-draining</b> .                                                                                                                                                                 |                                                                                                                                                                          |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |  The bedrock permeability is <b>spatially variable</b> , but likely to permit moderate infiltration.                                                                                                                      |                                                                                                                                                                          |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |  Bedrock deposits are likely to be <b>poorly draining</b> .                                                                                                                                                               |                                                                                                                                                                          |
| <p>These maps show the permeability range that is summarised above.</p> <p><b>Key</b></p> <ul style="list-style-type: none"><li> Very Low</li><li> Low</li><li> Moderate</li><li> High</li><li> Very High</li></ul> | <b>Minimum</b><br> <p>Contains OS data © Crown Copyright and database right 2024</p>                                                                                                                                    | <b>Maximum</b><br> <p>Contains OS data © Crown Copyright and database right 2024</p> |
| <b>Geological indicators of flooding</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                                                                                                                                                                                                                                            |                                                                                                                                                                          |
|  <p>Contains OS data © Crown Copyright and database right 2024</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |  Superficial floodplain deposits or low-lying coastal areas have been identified. Groundwater levels may rise in response to high river or tide levels, potentially causing inundation of subsurface infiltration SuDS. |                                                                                                                                                                          |

Section 3. Ground stability

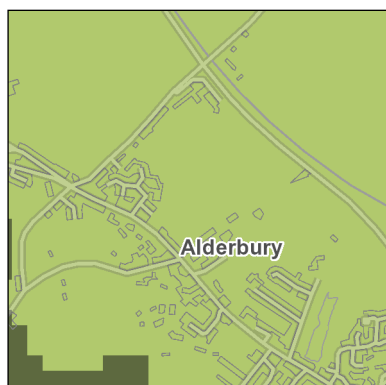
The following pages contain maps that will help you assess whether infiltration may impact the stability of the ground. They consider hazards associated with:

- soluble rocks
- landslides
- shallow mining
- running sands
- swelling clays
- compressible ground, and
- collapsible ground

In the following maps, geohazards that are identified in green are unlikely to prevent infiltration SuDS from being installed, but they should be considered during design. For more information read ‘Explanation of terms’ at the end of this report.

| Soluble rocks                                                                                                                                                    |                                                                                                                                                                                                                                                        |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <br><small>Contains OS data © Crown Copyright and database right 2024</small> |  Increased infiltration is unlikely to result in subsidence.                                                                                                        |
|                                                                                                                                                                  |  Increased infiltration is unlikely to cause localised subsidence, but potential impacts should be considered.                                                      |
|                                                                                                                                                                  |  Increased infiltration may result in localised subsidence. The potential for or the consequences of subsidence associated with soluble rocks should be considered. |
|                                                                                                                                                                  |  Very significant possibility of localised subsidence that could be initiated or made worse by infiltration.                                                        |

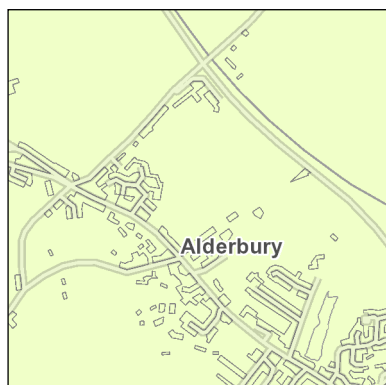
## Landslides



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-  Increased infiltration is unlikely to lead to slope instability.
-  Slope instability problems may be present or anticipated, but increased infiltration is unlikely to cause instability
-  Slope instability problems are probably present or have occurred in the past, and increased infiltration may result in slope instability.
-  Slope instability problems are almost certainly present and may be active. An increase in moisture content as a result of infiltration may cause the slope to fail.

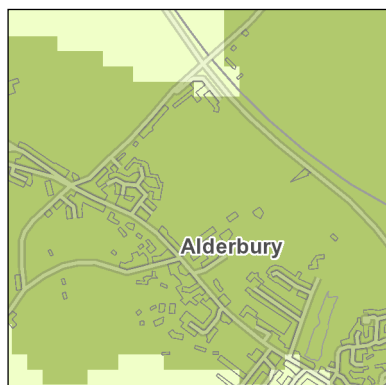
## Shallow mining



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-  Increased infiltration is unlikely to lead to subsidence.
-  Shallow mining is possibly present. Increased infiltration is unlikely to cause a geohazard, but potential impacts should be considered.
-  Shallow mining could be present with a significant possibility that localised subsidence could be initiated or made worse by increased infiltration.
-  Shallow mining is likely to be present, with a very significant possibility that localised subsidence may be initiated or made worse by increased infiltration.

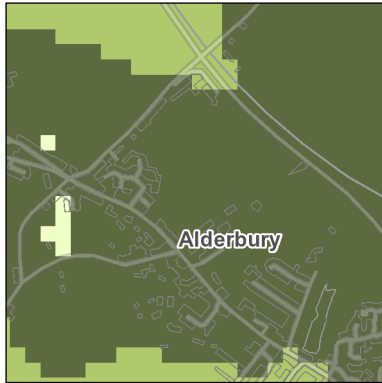
## Running sand



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-  Increased infiltration is unlikely to cause ground collapse associated with running sands.
-  Running sand is possibly present. Increased infiltration is unlikely to cause a geohazard, but potential impacts should be considered.
-  Significant possibility for running sand problems. Increased infiltration may result in a geohazard.

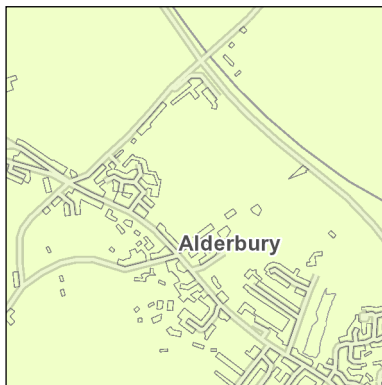
## Swelling clays



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-  Increased infiltration is unlikely to cause shrink-swell ground movement.
-  Ground is susceptible to shrink-swell ground movement. Increased infiltration is unlikely to cause a geohazard, but potential impacts should be considered.
-  Ground is susceptible to shrink-swell ground movement. Increased infiltration may result in a geohazard.

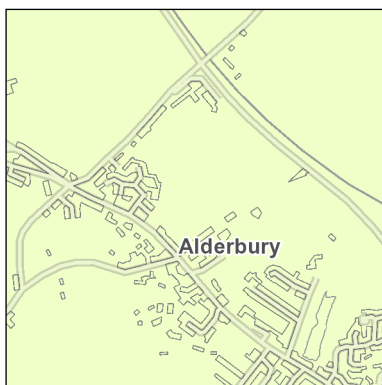
## Compressible ground



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-  Increased infiltration is unlikely to lead to ground compression.
-  Compressibility and uneven settlement hazards are probably present. Increased infiltration may result in a geohazard.

## Collapsible ground



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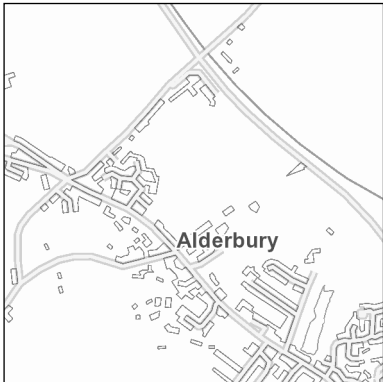
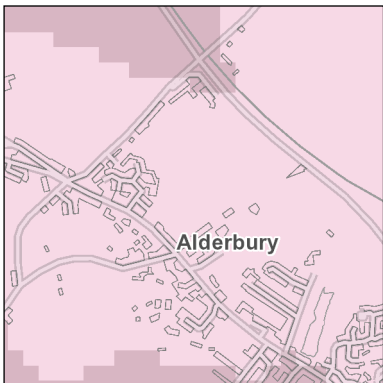
-  Increased infiltration is unlikely to result in subsidence.
-  Deposits with potential to collapse when loaded and saturated are possibly present in places. Increased infiltration is unlikely to cause a geohazard, but potential impacts should be considered.
-  Deposits with potential to collapse when loaded and saturated are probably present in places. Increased infiltration may result in a geohazard.

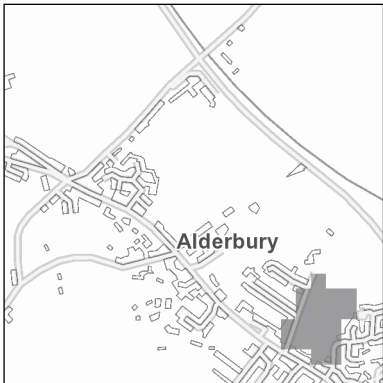
Section 4. Groundwater quality protection

The following pages contain maps showing some of the information required to ensure the protection of groundwater quality. Data presented includes:

- groundwater source protection zones (Environment Agency data)
- predominant flow mechanism
- made ground

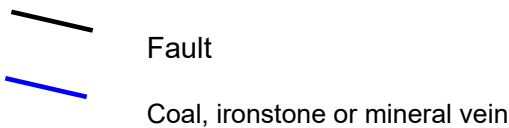
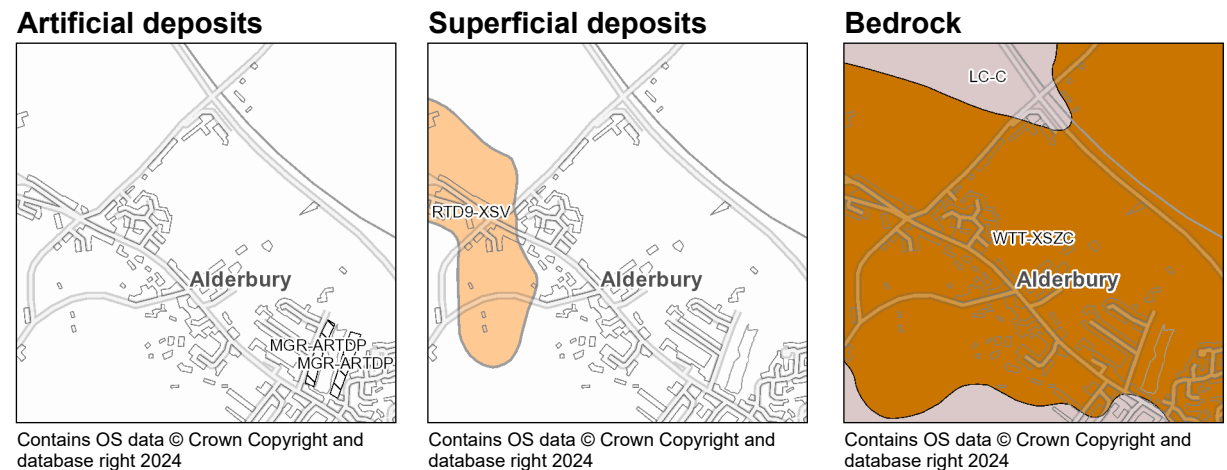
For more information read ‘Explanation of terms’ at the end of this report.

| Groundwater source protection zones                                                                                                                                                                                                                                                                           |                                                                                                                                                                                                                                                                   |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <div></div> <div>Contains OS data © Crown Copyright and database right 2024</div> <div>Derived in part from Source Protection Zone data provided under licence from the Environment Agency © Environment Agency 2024.</div> | <div><div></div>Groundwater is not within a source protection zone.</div>                                                                                                                                                                                         |
|                                                                                                                                                                                                                                                                                                               | <div><div></div>Source protection zone IV</div>                                                                                                                                                                                                                   |
|                                                                                                                                                                                                                                                                                                               | <div><div></div>Source protection zone III</div>                                                                                                                                                                                                                  |
|                                                                                                                                                                                                                                                                                                               | <div><div></div>Source protection zone II</div>                                                                                                                                                                                                                   |
|                                                                                                                                                                                                                                                                                                               | <div><div></div>Source protection zone I</div>                                                                                                                                                                                                                    |
| Predominant flow mechanism                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                   |
| <div></div> <div>Contains OS data © Crown Copyright and database right 2024</div>                                                                                                                                          | <div><div></div>Water is likely to percolate through the unsaturated zone to the groundwater through either the pore space in granular media or through porespace and fractures; these processes have some potential for contaminant removal and breakdown.</div> |
|                                                                                                                                                                                                                                                                                                               | <div><div></div>Water is likely to percolate through the unsaturated zone to the groundwater through fractures, a process which has little potential for contaminant removal and breakdown.</div>                                                                 |

| Made ground                                                                                                                                                   |                                                                                                                                                                                                                                |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <div><p>Contains OS data © Crown Copyright and database right 2024</p></div> | <div><div></div><div>Made ground is present at the surface. Infiltration may increase the possibility of remobilising pollutants.</div></div> |

Section 5. Geological Maps

The following maps show the artificial, superficial and bedrock geology within the area of interest.



Note: Faults and Coals, ironstone & mineral veins are shown for illustration and to aid interpretation of the map. Not all such features are shown and their absence on the map face does not necessarily mean that none are present

Key to Artificial deposits:

| Map colour                                                                          | Computer Code | Rock name               | Rock type          |
|-------------------------------------------------------------------------------------|---------------|-------------------------|--------------------|
|  | MGR-ARTDP     | MADE GROUND (UNDIVIDED) | ARTIFICIAL DEPOSIT |

Key to Superficial deposits:

| Map colour                                                                          | Computer Code | Rock name                 | Rock type       |
|-------------------------------------------------------------------------------------|---------------|---------------------------|-----------------|
|  | RTD9-XSV      | RIVER TERRACE DEPOSITS, 9 | SAND AND GRAVEL |

Key to Bedrock geology:

| Map colour                                                                        | Computer Code | Rock name             | Rock type           |
|-----------------------------------------------------------------------------------|---------------|-----------------------|---------------------|
|  | LC-C          | LONDON CLAY FORMATION | CLAY                |
|  | WTT-XSZC      | WITTERING FORMATION   | SAND, SILT AND CLAY |

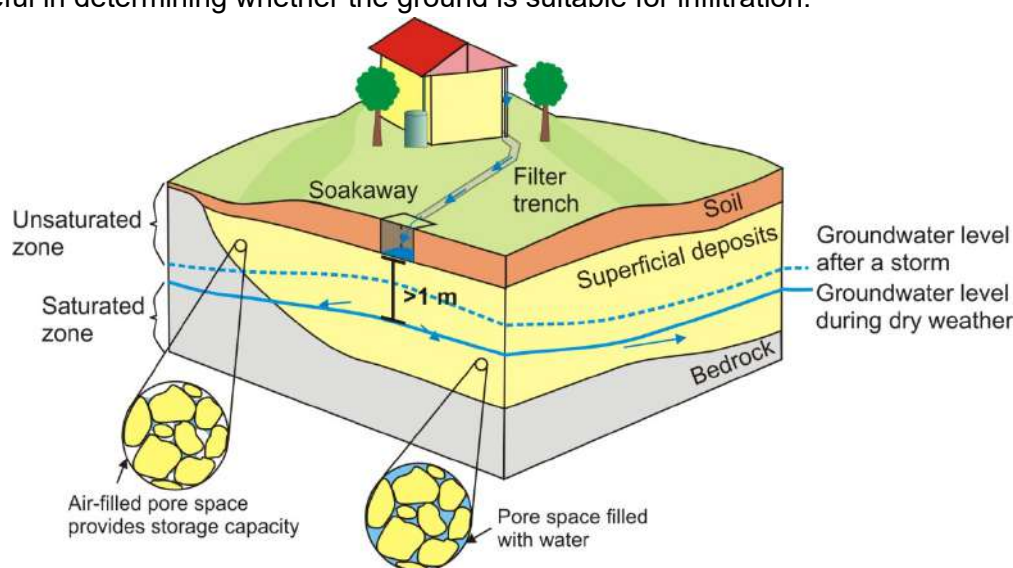
## Limitations of this report:

- This report is concerned with the potential for infiltration-to-the-ground to be used as a SuDS technique at the site described. It only considers the subsurface beneath the search area and does NOT consider potential surface or subsurface impacts outside of that area.
- This report is NOT an alternative for an on-site investigation or soakaway test, which might reach a different conclusion.
- This report must NOT be used to justify disposal of foul waste or grey water.
- This report is based on and limited to an interpretation of the records held by the British Geological Survey (BGS) at the time the search is performed. The datasets used (with the exception of that showing depth to water table) are based on 1:50 000 digital geological maps and not site-specific data.
- Other more specific and detailed ground instability information for the site may be held by BGS, and an assessment of this could result in a modified assessment.
- To interpret the maps correctly, the report must be viewed and printed in colour.
- The search does NOT consider the suitability of sites with regard to:
  - previous land use,
  - potential for, or presence of contaminated land
  - presence of perched water tables
  - shallow mining hazards relating to coal mining. Searches of coal mining should be carried out via The Coal Authority Mine Reports Service: [www.coalminingreports.co.uk](http://www.coalminingreports.co.uk).
  - made ground, where not recorded
  - proximity to landfill sites (searches for landfill sites or contaminated land should be carried out through consultation with local authorities/Environment Agency)
  - zones around private water supply boreholes that are susceptible to groundwater contamination.
- This report is supplied in accordance with the GeoReports Terms & Conditions available separately, and the copyright restrictions described at the end of this report

## Explanation of terms

### Depth to groundwater

In the shallow subsurface, the ground is commonly unsaturated with respect to water. Air fills the spaces within the soil and the underlying superficial deposits and bedrock. At some depth below the ground surface, there is a level below which these spaces are full of water. This level is known as the groundwater level, and the water below it is termed the groundwater. When water is infiltrated, the groundwater level may rise temporarily. To ensure that there is space in the unsaturated zone to accommodate this, there should be a minimum thickness of 1 m between the base of the infiltration system and the water table. An estimate of the *depth to groundwater* is therefore useful in determining whether the ground is suitable for infiltration.



### Groundwater flooding

Groundwater flooding occurs when a rise in groundwater level results in very shallow groundwater or the emergence of groundwater at the surface. If infiltration systems are installed in areas that are susceptible to groundwater flooding, it is possible that the system could become inundated. The susceptibility map seeks to identify areas where the geological conditions and water tables indicate that groundwater level rise could occur under certain circumstances. A high susceptibility to groundwater flooding classification does not mean that groundwater flooding has ever occurred in the past, or will do so in the future as the susceptibility maps do not contain information on how often flooding may occur. The susceptibility maps are designed for planning; identifying areas where groundwater flooding might be an issue that needs to be taken into account.

## Geological indicators of flooding

In floodplain deposits, groundwater level can be influenced by the water level in the adjacent river. Groundwater level may increase during periods of fluvial flood and therefore this should be taken into account when designing infiltration systems on such deposits. The *geological indicators of flooding* dataset shows where there is geological evidence (floodplain deposits) that flooding has occurred in the past.

For further information on flood-risk, the likely frequency of its recurrence in relation to any proposed development of the site, and the status of any flood prevention measures in place, you are advised to contact the local office of the Environment Agency (England and Wales) at [www.environment-agency.gov.uk/](http://www.environment-agency.gov.uk/) or the Scottish Environment Protection Agency (Scotland) at [www.sepa.org.uk](http://www.sepa.org.uk).

## Artificial ground

Artificial ground comprises deposits and excavations that have been created or modified by human activity. It includes ground that is worked (quarries and road cuttings), infilled (back-filled quarries), landscaped (surface re-shaping), disturbed (near surface mineral workings) or classified as made ground (embankments and spoil heaps). The composition and properties of artificial ground are often unknown. In particular, the permeability and chemical composition of the artificial ground should be determined to ensure that the ground will drain and that any contaminants present will not be remobilised.

## Superficial permeability

Superficial deposits are those geological deposits that were formed during the most recent period of geological time (as old as 2.6 million years before present). They generally comprise relatively thin deposits of gravel, sand, silt and clay and are present beneath the pedological soil in patches or larger spreads over much of Britain. The ease with which water can percolate through these deposits is controlled by their permeability and varies widely depending on their composition. Those deposits comprising clays and silts are less permeable and thus infiltration is likely to be slow, such that water may pool on the surface. In comparison, deposits comprising sands and gravels are more permeable allowing water to percolate freely.

## Bedrock permeability

Bedrock forms the main mass of rock forming the Earth. It is present everywhere, commonly beneath superficial deposits. Where the superficial deposits are thin or absent, the ease with which water will percolate into the ground depends on the permeability of the bedrock.

## **Natural ground instability**

Natural ground instability refers to the propensity for upward, lateral or downward movement of the ground that can be caused by a number of natural geological hazards (e.g. ground dissolution/compressible ground). Some movements associated with particular hazards may be gradual and of millimetre or centimetre scale, whilst others may be sudden and of metre or tens of metres scale. Significant natural ground instability has the potential to cause damage to buildings and structures, especially when the drainage characteristics of a site are altered. It should be noted, however, that many buildings, particularly more modern ones, are built to such a standard that they can remain unaffected in areas of significant ground movement.

## **Shrink-swell**

A shrinking and swelling clay changes volume significantly according to how much water it contains. All clay deposits change volume as their water content varies, typically swelling in winter and shrinking in summer, but some do so to a greater extent than others. Contributory circumstances could include drought, leaking service pipes, tree roots drying-out the ground or changes to local drainage patterns, such as the creation of soakaways. Shrinkage may remove support from the foundations of buildings and structures, whereas clay expansion may lead to uplift (heave) or lateral stress on part or all of a structure; any such movements may cause cracking and distortion.

## **Landslides (slope stability)**

A landslide is a relatively rapid outward and downward movement of a mass of ground on a slope, due to the force of gravity. A slope is under stress from gravity but will not move if its strength is greater than this stress. If the balance is altered so that the stress exceeds the strength, then movement will occur. The stability of a slope can be reduced by removing ground at the base of the slope, by placing material on the slope, especially at the top, or by increasing the water content of the materials forming the slope. Increase in subsurface water content beneath a soakaway could increase susceptibility to landslide hazards. The assessment of landslide hazard refers to the stability of the present land surface. It does not encompass a consideration of the stability of excavations.

## **Soluble rocks (dissolution)**

Some rocks are soluble in water and can be progressively removed by the flow of water through the ground. This process tends to create cavities, potentially leading to the collapse of overlying materials and possibly subsidence at the surface. The release of water into the subsurface from infiltration systems may increase the dissolution of rock or destabilise material above or within a cavity. Dissolution cavities may create a pathway for rapid transport of contaminated water to an aquifer or water course.

## **Compressible ground**

Many ground materials contain water-filled pores (the spaces between solid particles). Ground is compressible if a building (or other load) can cause the water in the pore space to be squeezed out, causing the ground to decrease in thickness. If ground is extremely compressible the building may sink. If the ground is not uniformly compressible, different parts of the building may sink by different amounts, possibly causing tilting, cracking or distortion. The compressibility of the ground may alter as a result of changes in subsurface water content caused by the release of water from soakaways.

## **Collapsible deposits**

Collapsible ground comprises certain fine-grained materials with large pore spaces (the spaces between solid particles). It can collapse when it becomes saturated by water and/or a building (or other structure) places too great a load on it. If the material below a building collapses it may cause the building to sink. If the collapsible ground is variable in thickness or distribution, different parts of the building may sink by different amounts, possibly causing tilting, cracking or distortion. The subsurface underlying a soakaway will experience an increase in water content that may affect the stability of the ground. This hazard is most likely to be encountered only in parts of southern England.

## **Running sand**

Running sand conditions occur when loosely-packed sand, saturated with water, flows into an excavation, borehole or other type of void. The pressure of the water filling the spaces between the sand grains reduces the contact between the grains and they are carried along by the flow. This can lead to subsidence of the surrounding ground. Running sand is potentially hazardous during the drainage system installation. During installation, excavation of the ground may create a space into which sand can flow, potentially causing subsidence of surrounding ground.

## **Shallow mining hazards (non coal)**

Current or past underground mining for coal or for other commodities can give rise to cavities at shallow or intermediate depths, which may cause fracturing, general settlement, or the formation of crown-holes in the ground above. Spoil from mineral workings may also present a pollution hazard. The release of water into the subsurface from soakaways may destabilise material above or within a cavity. Cavities arising as a consequence of mining may also create a pathway for rapid transport of contaminated water to an aquifer or watercourse. The mining hazards map is derived from the geological map and considers the potential for subsidence associated with mining on the basis of geology type. Therefore if mining is known to occur within a certain rock, the map will highlight the potential for a hazard within the area covered by that geology.

For more information regarding underground and opencast **coal mining**, the location of mine entries (shafts and adits) and matters relating to subsidence or other ground movement induced by **coal mining** please contact the Coal Authority, Mining Reports, 200 Lichfield Lane, Mansfield, Nottinghamshire, NG18 4RG; telephone 0845 762 6848 or at [www.coal.gov.uk](http://www.coal.gov.uk). For more information regarding other types of mining (i.e. non-coal), please contact the British Geological Survey.

### **Groundwater source protection zones**

In England and Wales, the Environment Agency has defined areas around wells, boreholes and springs that are used for the abstraction of public drinking water as source protection zones. In conjunction with Groundwater Protection Policy the zones are used to restrict activities that may impact groundwater quality, thereby preventing pollution of underlying aquifers, such that drinking water quality is upheld. The Environment Agency can provide advice on the location and implications of source protection zones in your area ([www.environment-agency.gov.uk/](http://www.environment-agency.gov.uk/))

## Contact Details

### ***Keyworth Office***

British Geological Survey  
Environmental Science Centre  
Nicker Hill  
Keyworth  
Nottingham  
NG12 5GG  
Tel: 0115 9363100  
Email: [enquiries@bgs.ac.uk](mailto:enquiries@bgs.ac.uk)

### ***Wallingford Office***

British Geological Survey  
Maclean Building  
Wallingford  
Oxford  
OX10 8BB  
Email: [enquiries@bgs.ac.uk](mailto:enquiries@bgs.ac.uk)

### ***Edinburgh Office***

British Geological Survey  
Lyell Centre  
Research Avenue South  
Edinburgh  
EH14 4AP  
Tel: 0131 6671000  
Email: [enquiry@bgs.ac.uk](mailto:enquiry@bgs.ac.uk)

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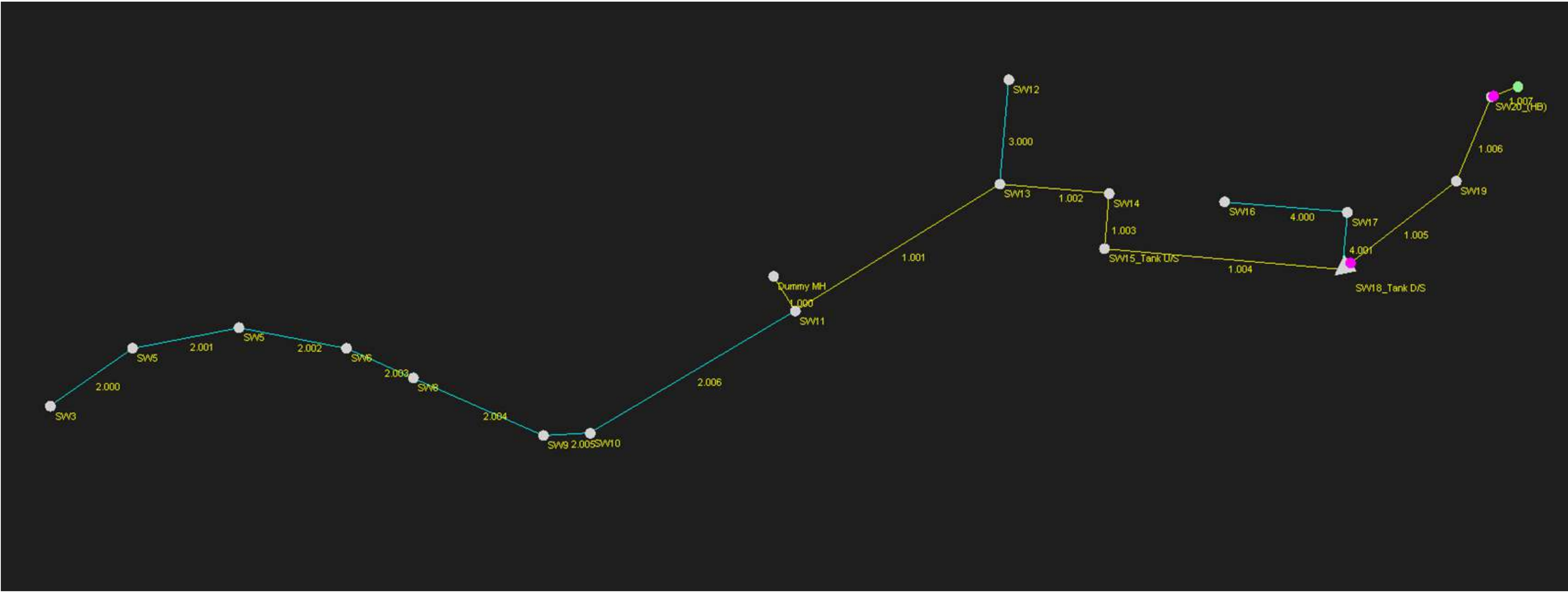
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## **APPENDIX I: Greenfield Run-off Rates**

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                   |                                                                                     |                       |     |      |       |           |       |       |       |           |     |               |          |            |     |            |     |            |     |         |     |           |     |            |     |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------|-------------------------------------------------------------------------------------|-----------------------|-----|------|-------|-----------|-------|-------|-------|-----------|-----|---------------|----------|------------|-----|------------|-----|------------|-----|---------|-----|-----------|-----|------------|-----|
| Mayer Brown Limited                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                   | Page 1                                                                              |                       |     |      |       |           |       |       |       |           |     |               |          |            |     |            |     |            |     |         |     |           |     |            |     |
| Lion House<br>Oriental Road<br>Woking, GU22 8AR                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Southampton Rd<br>Alderbury<br>Greenfield Run-off |  |                       |     |      |       |           |       |       |       |           |     |               |          |            |     |            |     |            |     |         |     |           |     |            |     |
| Date 30/04/2026 09:17<br>File                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Designed by SF<br>Checked by SF                   |                                                                                     |                       |     |      |       |           |       |       |       |           |     |               |          |            |     |            |     |            |     |         |     |           |     |            |     |
| Innovyze                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Source Control 2020.1                             |                                                                                     |                       |     |      |       |           |       |       |       |           |     |               |          |            |     |            |     |            |     |         |     |           |     |            |     |
| <p style="text-align: center;"><u>ICP SUDS Mean Annual Flood</u></p> <p style="text-align: center;">Input</p> <table><tr><td>Return Period (years)</td><td>100</td><td>Soil</td><td>0.300</td></tr><tr><td>Area (ha)</td><td>0.810</td><td>Urban</td><td>0.000</td></tr><tr><td>SAAR (mm)</td><td>811</td><td>Region Number</td><td>Region 7</td></tr></table> <p style="text-align: center;"><b>Results l/s</b></p> <table><tr><td>QBAR Rural</td><td>1.8</td></tr><tr><td>QBAR Urban</td><td>1.8</td></tr><tr><td>Q100 years</td><td>5.6</td></tr><tr><td>Q1 year</td><td>1.5</td></tr><tr><td>Q30 years</td><td>4.0</td></tr><tr><td>Q100 years</td><td>5.6</td></tr></table> |                                                   |                                                                                     | Return Period (years) | 100 | Soil | 0.300 | Area (ha) | 0.810 | Urban | 0.000 | SAAR (mm) | 811 | Region Number | Region 7 | QBAR Rural | 1.8 | QBAR Urban | 1.8 | Q100 years | 5.6 | Q1 year | 1.5 | Q30 years | 4.0 | Q100 years | 5.6 |
| Return Period (years)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 100                                               | Soil                                                                                | 0.300                 |     |      |       |           |       |       |       |           |     |               |          |            |     |            |     |            |     |         |     |           |     |            |     |
| Area (ha)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 0.810                                             | Urban                                                                               | 0.000                 |     |      |       |           |       |       |       |           |     |               |          |            |     |            |     |            |     |         |     |           |     |            |     |
| SAAR (mm)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 811                                               | Region Number                                                                       | Region 7              |     |      |       |           |       |       |       |           |     |               |          |            |     |            |     |            |     |         |     |           |     |            |     |
| QBAR Rural                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 1.8                                               |                                                                                     |                       |     |      |       |           |       |       |       |           |     |               |          |            |     |            |     |            |     |         |     |           |     |            |     |
| QBAR Urban                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 1.8                                               |                                                                                     |                       |     |      |       |           |       |       |       |           |     |               |          |            |     |            |     |            |     |         |     |           |     |            |     |
| Q100 years                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 5.6                                               |                                                                                     |                       |     |      |       |           |       |       |       |           |     |               |          |            |     |            |     |            |     |         |     |           |     |            |     |
| Q1 year                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | 1.5                                               |                                                                                     |                       |     |      |       |           |       |       |       |           |     |               |          |            |     |            |     |            |     |         |     |           |     |            |     |
| Q30 years                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 4.0                                               |                                                                                     |                       |     |      |       |           |       |       |       |           |     |               |          |            |     |            |     |            |     |         |     |           |     |            |     |
| Q100 years                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 5.6                                               |                                                                                     |                       |     |      |       |           |       |       |       |           |     |               |          |            |     |            |     |            |     |         |     |           |     |            |     |
| ©1982-2020 Innovyze                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                   |                                                                                     |                       |     |      |       |           |       |       |       |           |     |               |          |            |     |            |     |            |     |         |     |           |     |            |     |

## **APPENDIX J: Windes Calculations**

MICRODRAINAGE PLAN



|                                                 |                                                      |                                                                                     |
|-------------------------------------------------|------------------------------------------------------|-------------------------------------------------------------------------------------|
| Mayer Brown Limited                             |                                                      | Page 1                                                                              |
| Lion House<br>Oriental Road<br>Woking, GU22 8AR | Southampton Road<br>Alderbury<br>Windes Calculations |  |
| Date 30/04/2026 13:00<br>File Aldbury_2026.MDX  | Designed by SF<br>Checked by SF                      |                                                                                     |
| Innovyze                                        | Network 2020.1                                       |                                                                                     |

#### Existing Network Details for Storm

| PN    | Length<br>(m) | Fall<br>(m) | Slope<br>(1:X) | I.Area<br>(ha) | T.E.<br>(mins) | Base<br>Flow (l/s) | k<br>(mm) | HYD<br>SECT | DIA<br>(mm) | Section Type |
|-------|---------------|-------------|----------------|----------------|----------------|--------------------|-----------|-------------|-------------|--------------|
| 1.000 | 9.928         | 0.200       | 49.6           | 0.000          | 5.00           | 0.0                | 0.600     | o           | 225         | Pipe/Conduit |
| 2.000 | 24.429        | 1.960       | 12.5           | 0.050          | 5.00           | 0.0                | 0.600     | o           | 225         | Pipe/Conduit |
| 2.001 | 26.316        | 1.560       | 16.9           | 0.050          | 5.00           | 0.0                | 0.600     | o           | 225         | Pipe/Conduit |
| 2.002 | 26.582        | 0.980       | 27.1           | 0.050          | 5.00           | 0.0                | 0.600     | o           | 225         | Pipe/Conduit |
| 2.003 | 17.783        | 0.660       | 26.9           | 0.050          | 5.00           | 0.0                | 0.600     | o           | 225         | Pipe/Conduit |
| 2.004 | 34.535        | 1.205       | 28.7           | 0.050          | 5.00           | 0.0                | 0.600     | o           | 300         | Pipe/Conduit |
| 2.005 | 11.384        | 0.460       | 24.7           | 0.080          | 0.00           | 0.0                | 0.600     | o           | 300         | Pipe/Conduit |
| 2.006 | 57.994        | 2.040       | 28.4           | 0.080          | 0.00           | 0.0                | 0.600     | o           | 300         | Pipe/Conduit |
| 1.001 | 58.452        | 1.400       | 41.8           | 0.080          | 0.00           | 0.0                | 0.600     | o           | 300         | Pipe/Conduit |
| 3.000 | 25.426        | 0.450       | 56.5           | 0.040          | 5.00           | 0.0                | 0.600     | o           | 225         | Pipe/Conduit |
| 1.002 | 26.666        | 0.325       | 82.0           | 0.075          | 0.00           | 0.0                | 0.600     | o           | 375         | Pipe/Conduit |
| 1.003 | 13.432        | 0.164       | 81.9           | 0.030          | 0.00           | 0.0                | 0.600     | o           | 375         | Pipe/Conduit |
| 1.004 | 58.000        | 0.000       | 0.0            | 0.000          | 0.00           | 0.0                | 0.600     | o           | 450         | Pipe/Conduit |
| 4.000 | 29.946        | 0.550       | 54.4           | 0.045          | 5.00           | 0.0                | 0.600     | o           | 225         | Pipe/Conduit |
| 4.001 | 13.863        | 0.335       | 41.4           | 0.045          | 0.00           | 0.0                | 0.600     | o           | 225         | Pipe/Conduit |
| 1.005 | 34.962        | 0.117       | 300.0          | 0.045          | 0.00           | 0.0                | 0.600     | o           | 450         | Pipe/Conduit |

#### Network Results Table

| PN    | US/IL<br>(m) | Σ I.Area<br>(ha) | Σ Base<br>Flow (l/s) | Vel<br>(m/s) | Cap<br>(l/s) |
|-------|--------------|------------------|----------------------|--------------|--------------|
| 1.000 | 71.000       | 0.000            | 0.0                  | 1.86         | 74.0         |
| 2.000 | 79.740       | 0.050            | 0.0                  | 3.73         | 148.2        |
| 2.001 | 77.780       | 0.100            | 0.0                  | 3.20         | 127.3        |
| 2.002 | 76.220       | 0.150            | 0.0                  | 2.52         | 100.3        |
| 2.003 | 75.240       | 0.200            | 0.0                  | 2.53         | 100.6        |
| 2.004 | 74.505       | 0.250            | 0.0                  | 2.95         | 208.4        |
| 2.005 | 73.300       | 0.330            | 0.0                  | 3.17         | 224.3        |
| 2.006 | 72.840       | 0.410            | 0.0                  | 2.96         | 209.2        |
| 1.001 | 70.800       | 0.490            | 0.0                  | 2.44         | 172.5        |
| 3.000 | 70.000       | 0.040            | 0.0                  | 1.74         | 69.3         |
| 1.002 | 69.325       | 0.605            | 0.0                  | 2.00         | 221.1        |
| 1.003 | 69.000       | 0.635            | 0.0                  | 2.00         | 221.3        |
| 1.004 | 67.400       | 0.635            | 0.0                  | 0.00         | 0.0          |
| 4.000 | 68.510       | 0.045            | 0.0                  | 1.78         | 70.6         |
| 4.001 | 67.960       | 0.090            | 0.0                  | 2.04         | 81.1         |
| 1.005 | 67.400       | 0.770            | 0.0                  | 1.17         | 185.8        |

|                                                 |                                                      |                                                                                     |
|-------------------------------------------------|------------------------------------------------------|-------------------------------------------------------------------------------------|
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| Innovyze                                        | Network 2020.1                                       |                                                                                     |

#### Existing Network Details for Storm

| PN    | Length<br>(m) | Fall<br>(m) | Slope<br>(1:X) | I.Area<br>(ha) | T.E.<br>(mins) | Base<br>Flow (l/s) | k<br>(mm) | HYD<br>SECT | DIA<br>(mm) | Section Type |
|-------|---------------|-------------|----------------|----------------|----------------|--------------------|-----------|-------------|-------------|--------------|
| 1.006 | 22.148        | 0.074       | 300.0          | 0.040          | 0.00           | 0.0                | 0.600     | o           | 450         | Pipe/Conduit |
| 1.007 | 6.995         | 0.056       | 124.9          | 0.000          | 0.00           | 0.0                | 0.600     | o           | 150         | Pipe/Conduit |

#### Network Results Table

| PN    | US/IL<br>(m) | Σ I.Area<br>(ha) | Σ Base<br>Flow (l/s) | Vel<br>(m/s) | Cap<br>(l/s) |
|-------|--------------|------------------|----------------------|--------------|--------------|
| 1.006 | 67.280       | 0.810            | 0.0                  | 1.17         | 185.8        |
| 1.007 | 67.206       | 0.810            | 0.0                  | 0.90         | 15.9         |

|                                                 |                                                      |                                                                                     |
|-------------------------------------------------|------------------------------------------------------|-------------------------------------------------------------------------------------|
| Mayer Brown Limited                             |                                                      | Page 3                                                                              |
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| Date 30/04/2026 13:00<br>File Aldbury_2026.MDX  | Designed by SF<br>Checked by SF                      |                                                                                     |
| Innovyze                                        | Network 2020.1                                       |                                                                                     |

### Online Controls for Storm

**Orifice Manhole: SW18\_Tank D/S, DS/PN: 1.005, Volume (m<sup>3</sup>): 11.9**

Diameter (m) 0.075 Discharge Coefficient 0.600 Invert Level (m) 67.400

**Hydro-Brake® Optimum Manhole: SW20\_(HB), DS/PN: 1.007, Volume (m<sup>3</sup>): 4.9**

|                                   |                            |
|-----------------------------------|----------------------------|
| Unit Reference                    | MD-SHE-0061-1800-1200-1800 |
| Design Head (m)                   | 1.200                      |
| Design Flow (l/s)                 | 1.8                        |
| Flush-Flo™                        | Calculated                 |
| Objective                         | Minimise upstream storage  |
| Application                       | Surface                    |
| Sump Available                    | Yes                        |
| Diameter (mm)                     | 61                         |
| Invert Level (m)                  | 67.206                     |
| Minimum Outlet Pipe Diameter (mm) | 75                         |
| Suggested Manhole Diameter (mm)   | 1200                       |

| Control Points            | Head (m) | Flow (l/s) |
|---------------------------|----------|------------|
| Design Point (Calculated) | 1.200    | 1.8        |
| Flush-Flo™                | 0.265    | 1.5        |
| Kick-Flo®                 | 0.542    | 1.3        |
| Mean Flow over Head Range | -        | 1.4        |

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

| Depth (m) | Flow (l/s) | Depth (m) | Flow (l/s) | Depth (m) | Flow (l/s) | Depth (m) | Flow (l/s) |
|-----------|------------|-----------|------------|-----------|------------|-----------|------------|
| 0.100     | 1.3        | 1.200     | 1.8        | 3.000     | 2.7        | 7.000     | 4.1        |
| 0.200     | 1.5        | 1.400     | 1.9        | 3.500     | 2.9        | 7.500     | 4.2        |
| 0.300     | 1.5        | 1.600     | 2.0        | 4.000     | 3.1        | 8.000     | 4.3        |
| 0.400     | 1.5        | 1.800     | 2.2        | 4.500     | 3.3        | 8.500     | 4.4        |
| 0.500     | 1.4        | 2.000     | 2.3        | 5.000     | 3.5        | 9.000     | 4.6        |
| 0.600     | 1.3        | 2.200     | 2.4        | 5.500     | 3.6        | 9.500     | 4.7        |
| 0.800     | 1.5        | 2.400     | 2.5        | 6.000     | 3.8        |           |            |
| 1.000     | 1.7        | 2.600     | 2.6        | 6.500     | 3.9        |           |            |

| Mayer Brown Limited                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                      | Page 4                                                                              |           |           |                |           |           |                |       |       |       |       |     |       |       |       |       |  |  |  |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------|-------------------------------------------------------------------------------------|-----------|-----------|----------------|-----------|-----------|----------------|-------|-------|-------|-------|-----|-------|-------|-------|-------|--|--|--|
| Lion House<br>Oriental Road<br>Woking, GU22 8AR                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Southampton Road<br>Alderbury<br>Windes Calculations |  |           |           |                |           |           |                |       |       |       |       |     |       |       |       |       |  |  |  |
| Date 30/04/2026 13:00<br>File Aldbury_2026.MDX                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Designed by SF<br>Checked by SF                      |                                                                                     |           |           |                |           |           |                |       |       |       |       |     |       |       |       |       |  |  |  |
| Innovyze                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Network 2020.1                                       |                                                                                     |           |           |                |           |           |                |       |       |       |       |     |       |       |       |       |  |  |  |
| <div>Storage Structures for Storm</div> <div>Cellular Storage Manhole: SW18_Tank D/S, DS/PN: 1.005</div> <div>Invert Level (m) 67.400 Safety Factor 2.0<br/>Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95<br/>Infiltration Coefficient Side (m/hr) 0.00000</div> <table><thead><tr><th>Depth (m)</th><th>Area (m²)</th><th>Inf. Area (m²)</th><th>Depth (m)</th><th>Area (m²)</th><th>Inf. Area (m²)</th></tr></thead><tbody><tr><td>0.000</td><td>800.0</td><td>800.0</td><td>1.126</td><td>0.0</td><td>945.2</td></tr><tr><td>1.125</td><td>800.0</td><td>945.2</td><td></td><td></td><td></td></tr></tbody></table> |                                                      |                                                                                     | Depth (m) | Area (m²) | Inf. Area (m²) | Depth (m) | Area (m²) | Inf. Area (m²) | 0.000 | 800.0 | 800.0 | 1.126 | 0.0 | 945.2 | 1.125 | 800.0 | 945.2 |  |  |  |
| Depth (m)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Area (m²)                                            | Inf. Area (m²)                                                                      | Depth (m) | Area (m²) | Inf. Area (m²) |           |           |                |       |       |       |       |     |       |       |       |       |  |  |  |
| 0.000                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 800.0                                                | 800.0                                                                               | 1.126     | 0.0       | 945.2          |           |           |                |       |       |       |       |     |       |       |       |       |  |  |  |
| 1.125                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 800.0                                                | 945.2                                                                               |           |           |                |           |           |                |       |       |       |       |     |       |       |       |       |  |  |  |
| ©1982-2020 Innovyze                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                      |                                                                                     |           |           |                |           |           |                |       |       |       |       |     |       |       |       |       |  |  |  |

|                                                 |                                                      |                                                                                     |
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| Lion House<br>Oriental Road<br>Woking, GU22 8AR | Southampton Road<br>Alderbury<br>Windes Calculations |  |
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| Innovyze                                        | Network 2020.1                                       |                                                                                     |

### Summary of Critical Results by Maximum Level (Rank 1) for Storm

#### Simulation Criteria

Areal Reduction Factor 1.000      Additional Flow - % of Total Flow 0.000  
 Hot Start (mins) 0      MADD Factor \* 10m<sup>3</sup>/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 Storage Structures 1  
 Number of Online Controls 2      Number of Time/Area Diagrams 0  
 Number of Offline Controls 0      Number of Real Time Controls 0

#### Synthetic Rainfall Details

Rainfall Model FEH  
 FEH Rainfall Version 2013  
 Site Location GB 418952 127196 SU 18952 27196  
 Data Type Point  
 Cv (Summer) 0.750  
 Cv (Winter) 1.000

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

Profile(s) Winter  
 Duration(s) (mins) 15, 30, 60, 120, 240, 360, 480, 960, 1440, 2880  
 Return Period(s) (years) 2  
 Climate Change (%) 0

| PN    | US/MH Name    | Event                          | US/CL (m) | Water Level (m) | Surcharged Depth (m) | Flooded Volume (m <sup>3</sup> ) |
|-------|---------------|--------------------------------|-----------|-----------------|----------------------|----------------------------------|
| 1.000 | Dummy MH      | 15 minute 2 year Winter I+0%   | 72.300    | 71.000          | -0.225               | 0.000                            |
| 2.000 | SW3           | 15 minute 2 year Winter I+0%   | 81.240    | 79.779          | -0.186               | 0.000                            |
| 2.001 | SW5           | 15 minute 2 year Winter I+0%   | 79.280    | 77.840          | -0.165               | 0.000                            |
| 2.002 | SW5           | 15 minute 2 year Winter I+0%   | 77.720    | 76.305          | -0.140               | 0.000                            |
| 2.003 | SW6           | 15 minute 2 year Winter I+0%   | 76.740    | 75.342          | -0.123               | 0.000                            |
| 2.004 | SW8           | 15 minute 2 year Winter I+0%   | 76.080    | 74.606          | -0.199               | 0.000                            |
| 2.005 | SW9           | 15 minute 2 year Winter I+0%   | 74.800    | 73.423          | -0.177               | 0.000                            |
| 2.006 | SW10          | 15 minute 2 year Winter I+0%   | 74.340    | 72.965          | -0.175               | 0.000                            |
| 1.001 | SW11          | 15 minute 2 year Winter I+0%   | 72.300    | 70.952          | -0.148               | 0.000                            |
| 3.000 | SW12          | 15 minute 2 year Winter I+0%   | 71.300    | 70.051          | -0.174               | 0.000                            |
| 1.002 | SW13          | 15 minute 2 year Winter I+0%   | 71.000    | 69.520          | -0.180               | 0.000                            |
| 1.003 | SW14          | 15 minute 2 year Winter I+0%   | 70.500    | 69.226          | -0.149               | 0.000                            |
| 1.004 | SW15_Tank U/S | 15 minute 2 year Winter I+0%   | 70.500    | 67.904          | 0.054                | 0.000                            |
| 4.000 | SW16          | 15 minute 2 year Winter I+0%   | 70.000    | 68.563          | -0.172               | 0.000                            |
| 4.001 | SW17          | 15 minute 2 year Winter I+0%   | 69.450    | 68.032          | -0.153               | 0.000                            |
| 1.005 | SW18_Tank D/S | 1440 minute 2 year Winter I+0% | 69.450    | 67.701          | -0.149               | 0.000                            |

|                                                 |                                                      |                                                                                     |
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| Innovyze                                        | Network 2020.1                                       |                                                                                     |

Summary of Critical Results by Maximum Level (Rank 1) for Storm

| PN    | US/MH<br>Name | Maximum<br>Vol (m³) | Pipe<br>Flow<br>(l/s) | Status     |
|-------|---------------|---------------------|-----------------------|------------|
| 1.000 | Dummy MH      | 0.000               | 0.0                   | OK         |
| 2.000 | SW3           | 0.038               | 9.3                   | OK         |
| 2.001 | SW5           | 0.067               | 18.6                  | OK         |
| 2.002 | SW5           | 0.100               | 27.7                  | OK         |
| 2.003 | SW6           | 0.127               | 36.8                  | OK         |
| 2.004 | SW8           | 0.109               | 46.2                  | OK         |
| 2.005 | SW9           | 0.174               | 59.0                  | OK         |
| 2.006 | SW10          | 0.170               | 71.6                  | OK         |
| 1.001 | SW11          | 0.325               | 82.8                  | OK         |
| 3.000 | SW12          | 0.052               | 7.5                   | OK         |
| 1.002 | SW13          | 0.268               | 101.1                 | OK         |
| 1.003 | SW14          | 0.780               | 105.8                 | OK         |
| 1.004 | SW15_Tank U/S | 0.564               | 104.8                 | SURCHARGED |
| 4.000 | SW16          | 0.055               | 8.3                   | OK         |
| 4.001 | SW17          | 0.101               | 15.4                  | OK         |
| 1.005 | SW18_Tank D/S | 233.945             | 1.9                   | OK         |





|                                                 |                                                      |                                                                                     |
|-------------------------------------------------|------------------------------------------------------|-------------------------------------------------------------------------------------|
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| Innovyze                                        | Network 2020.1                                       |                                                                                     |

Summary of Critical Results by Maximum Level (Rank 1) for Storm

| PN    | US/MH<br>Name | Maximum<br>Vol (m³) | Pipe<br>Flow<br>(l/s) | Status     |
|-------|---------------|---------------------|-----------------------|------------|
| 1.000 | Dummy MH      | 0.685               | 6.5                   | SURCHARGED |
| 2.000 | SW3           | 0.060               | 20.2                  | OK         |
| 2.001 | SW5           | 0.105               | 40.2                  | OK         |
| 2.002 | SW5           | 0.170               | 59.9                  | OK         |
| 2.003 | SW6           | 0.248               | 79.4                  | OK         |
| 2.004 | SW8           | 0.187               | 99.5                  | OK         |
| 2.005 | SW9           | 0.345               | 131.3                 | OK         |
| 2.006 | SW10          | 0.344               | 163.6                 | OK         |
| 1.001 | SW11          | 2.564               | 178.7                 | SURCHARGED |
| 3.000 | SW12          | 0.081               | 16.1                  | OK         |
| 1.002 | SW13          | 2.307               | 214.5                 | SURCHARGED |
| 1.003 | SW14          | 3.043               | 223.1                 | SURCHARGED |
| 1.004 | SW15_Tank U/S | 0.855               | 217.0                 | SURCHARGED |
| 4.000 | SW16          | 0.085               | 18.0                  | OK         |
| 4.001 | SW17          | 0.182               | 37.2                  | OK         |
| 1.005 | SW18_Tank D/S | 432.394             | 2.0                   | SURCHARGED |



|                                                 |                                                      |                                                                                     |
|-------------------------------------------------|------------------------------------------------------|-------------------------------------------------------------------------------------|
| Mayer Brown Limited                             |                                                      | Page 1                                                                              |
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| Innovyze                                        | Network 2020.1                                       |                                                                                     |

### Summary of Critical Results by Maximum Level (Rank 1) for Storm

#### Simulation Criteria

Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 0.000  
 Hot Start (mins) 0 MADD Factor \* 10m<sup>3</sup>/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 Storage Structures 1  
 Number of Online Controls 2 Number of Time/Area Diagrams 0  
 Number of Offline Controls 0 Number of Real Time Controls 0

#### Synthetic Rainfall Details

Rainfall Model FEH  
 FEH Rainfall Version 2013  
 Site Location GB 418952 127196 SU 18952 27196  
 Data Type Point  
 Cv (Summer) 0.750  
 Cv (Winter) 1.000

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

Profile(s) Winter  
 Duration(s) (mins) 15, 30, 60, 120, 240, 360, 480, 960, 1440, 2880  
 Return Period(s) (years) 100  
 Climate Change (%) 0

| PN    | US/MH Name    | Event                            | US/CL (m) | Water Level (m) | Surcharged Depth (m) | Flooded Volume (m <sup>3</sup> ) |
|-------|---------------|----------------------------------|-----------|-----------------|----------------------|----------------------------------|
| 1.000 | Dummy MH      | 15 minute 100 year Winter I+0%   | 72.300    | 72.154          | 0.929                | 0.000                            |
| 2.000 | SW3           | 15 minute 100 year Winter I+0%   | 81.240    | 79.806          | -0.159               | 0.000                            |
| 2.001 | SW5           | 15 minute 100 year Winter I+0%   | 79.280    | 77.884          | -0.121               | 0.000                            |
| 2.002 | SW5           | 15 minute 100 year Winter I+0%   | 77.720    | 76.377          | -0.068               | 0.000                            |
| 2.003 | SW6           | 15 minute 100 year Winter I+0%   | 76.740    | 75.602          | 0.137                | 0.000                            |
| 2.004 | SW8           | 15 minute 100 year Winter I+0%   | 76.080    | 74.681          | -0.124               | 0.000                            |
| 2.005 | SW9           | 15 minute 100 year Winter I+0%   | 74.800    | 74.023          | 0.423                | 0.000                            |
| 2.006 | SW10          | 15 minute 100 year Winter I+0%   | 74.340    | 73.692          | 0.552                | 0.000                            |
| 1.001 | SW11          | 15 minute 100 year Winter I+0%   | 72.300    | 72.154          | 1.054                | 0.000                            |
| 3.000 | SW12          | 15 minute 100 year Winter I+0%   | 71.300    | 70.163          | -0.062               | 0.000                            |
| 1.002 | SW13          | 15 minute 100 year Winter I+0%   | 71.000    | 70.122          | 0.422                | 0.000                            |
| 1.003 | SW14          | 15 minute 100 year Winter I+0%   | 70.500    | 69.611          | 0.236                | 0.000                            |
| 1.004 | SW15_Tank U/S | 15 minute 100 year Winter I+0%   | 70.500    | 68.252          | 0.402                | 0.000                            |
| 4.000 | SW16          | 15 minute 100 year Winter I+0%   | 70.000    | 68.602          | -0.133               | 0.000                            |
| 4.001 | SW17          | 2880 minute 100 year Winter I+0% | 69.450    | 68.103          | -0.082               | 0.000                            |
| 1.005 | SW18_Tank D/S | 2880 minute 100 year Winter I+0% | 69.450    | 68.103          | 0.253                | 0.000                            |

|                                                 |                                                      |                                                                                     |
|-------------------------------------------------|------------------------------------------------------|-------------------------------------------------------------------------------------|
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| Innovyze                                        | Network 2020.1                                       |                                                                                     |

Summary of Critical Results by Maximum Level (Rank 1) for Storm

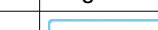
| PN    | US/MH<br>Name | Maximum<br>Vol (m³) | Pipe<br>Flow<br>(l/s) | Status     |
|-------|---------------|---------------------|-----------------------|------------|
| 1.000 | Dummy MH      | 1.299               | 13.7                  | FLOOD RISK |
| 2.000 | SW3           | 0.069               | 25.5                  | OK         |
| 2.001 | SW5           | 0.120               | 50.7                  | OK         |
| 2.002 | SW5           | 0.208               | 75.5                  | OK         |
| 2.003 | SW6           | 0.656               | 99.5                  | SURCHARGED |
| 2.004 | SW8           | 0.216               | 123.7                 | OK         |
| 2.005 | SW9           | 1.921               | 146.0                 | SURCHARGED |
| 2.006 | SW10          | 1.678               | 174.0                 | SURCHARGED |
| 1.001 | SW11          | 4.232               | 197.7                 | FLOOD RISK |
| 3.000 | SW12          | 0.178               | 20.0                  | OK         |
| 1.002 | SW13          | 3.445               | 240.5                 | SURCHARGED |
| 1.003 | SW14          | 3.428               | 251.5                 | SURCHARGED |
| 1.004 | SW15_Tank U/S | 0.958               | 244.8                 | SURCHARGED |
| 4.000 | SW16          | 0.098               | 22.7                  | OK         |
| 4.001 | SW17          | 0.249               | 1.3                   | OK         |
| 1.005 | SW18_Tank D/S | 544.493             | 2.0                   | SURCHARGED |

|                                                 |                                                      |                                                                                     |
|-------------------------------------------------|------------------------------------------------------|-------------------------------------------------------------------------------------|
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Summary of Critical Results by Maximum Level (Rank 1) for Storm

| PN    | US/MH<br>Name | Event                            | US/CL<br>(m) | Water<br>Level<br>(m) | Surcharged<br>Depth<br>(m) | Flooded<br>Volume<br>(m <sup>3</sup> ) |
|-------|---------------|----------------------------------|--------------|-----------------------|----------------------------|----------------------------------------|
| 1.006 | SW19          | 2880 minute 100 year Winter I+0% | 68.920       | 68.061                | 0.331                      | 0.000                                  |
| 1.007 | SW20_(HB)     | 2880 minute 100 year Winter I+0% | 68.600       | 68.061                | 0.705                      | 0.000                                  |

| PN    | US/MH<br>Name | Maximum<br>Vol (m <sup>3</sup> ) | Pipe<br>Flow<br>(l/s) | Status     |
|-------|---------------|----------------------------------|-----------------------|------------|
| 1.006 | SW19          | 6.248                            | 3.2                   | SURCHARGED |
| 1.007 | SW20_(HB)     | 4.293                            | 1.5                   | SURCHARGED |

|                                                 |                                                      |                                                                                     |
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| Innovyze                                        | Network 2020.1                                       |                                                                                     |

### Summary of Critical Results by Maximum Level (Rank 1) for Storm

### Simulation Criteria

|                  |   |                                            |       |
|------------------|---|--------------------------------------------|-------|
| Hot Start (mins) | 0 | MADD Factor * 10m <sup>3</sup> /ha Storage | 2.000 |
|------------------|---|--------------------------------------------|-------|

|                      |   |                    |       |
|----------------------|---|--------------------|-------|
| Hot Start Level (mm) | 0 | Inlet Coeffiecient | 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 Storage Structures 1

Number of Online Controls 2 Number of Time/Area Diagrams 0

Number of Offline Controls @ Number of Real Time Controls @

### Synthetic Rainfall Details

|                                    |       |
|------------------------------------|-------|
| Margin for Flood Risk Warning (mm) | 300.0 |
|------------------------------------|-------|

Analysis Timestep 2.5 Second Increment (Extended)

DTS Status ON

DVD Status ON

Inertia Status OFF

|            |        |
|------------|--------|
| Profile(s) | Winter |
|------------|--------|

Duration(s) (mins) 60, 120, 240, 360, 480, 960, 1440, 2880

|                          |     |
|--------------------------|-----|
| Return Period(s) (years) | 100 |
|--------------------------|-----|

|                    |    |
|--------------------|----|
| Climate Change (%) | 45 |
|--------------------|----|

|       |           |                 |          |        |       |              | Water  | Surcharged | Flooded |
|-------|-----------|-----------------|----------|--------|-------|--------------|--------|------------|---------|
|       | US/MH     |                 |          |        |       |              | Level  | Depth      | Volume  |
| PN    | Name      |                 | Event    |        |       | US/CL<br>(m) | (m)    | (m)        | (m³)    |
| 1.000 | Dummy MH  | 60 minute       | 100 year | Winter | I+45% | 72.300       | 71.898 | 0.673      | 0.000   |
| 2.000 | SW3       | 60 minute       | 100 year | Winter | I+45% | 81.240       | 79.797 | -0.168     | 0.000   |
| 2.001 | SW5       | 60 minute       | 100 year | Winter | I+45% | 79.280       | 77.871 | -0.134     | 0.000   |
| 2.002 | SW5       | 60 minute       | 100 year | Winter | I+45% | 77.720       | 76.353 | -0.092     | 0.000   |
| 2.003 | SW6       | 60 minute       | 100 year | Winter | I+45% | 76.740       | 75.407 | -0.058     | 0.000   |
| 2.004 | SW8       | 60 minute       | 100 year | Winter | I+45% | 76.080       | 74.660 | -0.145     | 0.000   |
| 2.005 | SW9       | 60 minute       | 100 year | Winter | I+45% | 74.800       | 73.502 | -0.098     | 0.000   |
| 2.006 | SW10      | 60 minute       | 100 year | Winter | I+45% | 74.340       | 73.210 | 0.070      | 0.000   |
| 1.001 | SW11      | 60 minute       | 100 year | Winter | I+45% | 72.300       | 71.898 | 0.798      | 0.000   |
| 3.000 | SW12      | 60 minute       | 100 year | Winter | I+45% | 71.300       | 70.080 | -0.145     | 0.000   |
| 1.002 | SW13      | 60 minute       | 100 year | Winter | I+45% | 71.000       | 70.043 | 0.343      | 0.000   |
| 1.003 | SW14      | 60 minute       | 100 year | Winter | I+45% | 70.500       | 69.575 | 0.200      | 0.000   |
| 1.004 | SW15_Tank | U/S 2880 minute | 100 year | Winter | I+45% | 70.500       | 68.510 | 0.660      | 0.000   |
| 4.000 | SW16      | 60 minute       | 100 year | Winter | I+45% | 70.000       | 68.590 | -0.145     | 0.000   |
| 4.001 | SW17      | 2880 minute     | 100 year | Winter | I+45% | 69.450       | 68.510 | 0.325      | 0.000   |
| 1.005 | SW18_Tank | D/S 2880 minute | 100 year | Winter | I+45% | 69.450       | 68.510 | 0.660      | 0.000   |
| 1.006 | SW19      | 60 minute       | 100 year | Winter | I+45% | 68.920       | 68.459 | 0.729      | 0.000   |

|                                                 |                                                      |                                                                                     |
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| Innovyze                                        | Network 2020.1                                       |                                                                                     |

Summary of Critical Results by Maximum Level (Rank 1) for Storm

| PN    | US/MH<br>Name | Maximum<br>Vol (m³) | Pipe<br>Flow<br>(l/s) | Status     |
|-------|---------------|---------------------|-----------------------|------------|
| 1.000 | Dummy MH      | 1.010               | 4.9                   | SURCHARGED |
| 2.000 | SW3           | 0.059               | 20.3                  | OK         |
| 2.001 | SW5           | 0.105               | 40.6                  | OK         |
| 2.002 | SW5           | 0.169               | 60.9                  | OK         |
| 2.003 | SW6           | 0.246               | 81.1                  | OK         |
| 2.004 | SW8           | 0.186               | 101.4                 | OK         |
| 2.005 | SW9           | 0.341               | 133.9                 | OK         |
| 2.006 | SW10          | 0.751               | 163.4                 | SURCHARGED |
| 1.001 | SW11          | 3.441               | 188.4                 | SURCHARGED |
| 3.000 | SW12          | 0.085               | 16.2                  | OK         |
| 1.002 | SW13          | 3.011               | 230.7                 | SURCHARGED |
| 1.003 | SW14          | 3.285               | 241.8                 | SURCHARGED |
| 1.004 | SW15_Tank U/S | 1.250               | 12.8                  | SURCHARGED |
| 4.000 | SW16          | 0.085               | 18.3                  | OK         |
| 4.001 | SW17          | 1.514               | 1.8                   | SURCHARGED |
| 1.005 | SW18_Tank D/S | 854.385             | 2.0                   | SURCHARGED |
| 1.006 | SW19          | 6.698               | 6.2                   | SURCHARGED |



## **APPENDIX K: Vortex Flow Control Chamber**

# RIDGISTORMCheck Vortex Flow Control Chambers

Data Sheet

Where flows within a drainage system are required to be limited (i.e. prior to discharge from site), with improved hydraulic performance and reduced maintenance, we are able to offer our RIDGISTORMCheck Vortex Flow Control Chamber.

Pre-fabricated under factory controlled conditions, the RIDGISTORMCheck Chamber is available in a range of diameters from 1050-3000mm and incorporates a vortex flow control unit, fitted onto a preformed headwall. Each vortex flow control unit is manufactured to suit the unique hydraulic characteristics of the site's drainage system design. RIDGISTORMCheck Vortex Flow Control Chambers are typically supplied as a single unit, allowing simple installation and eliminating a number of construction risks associated with in-situ construction. When installed in conjunction with our range of pipe systems, they offer a fully integrated drainage system.



### Applications

Site specific RIDGISTORMCheck Vortex Flow Control Chambers are engineered to suit a range of stormwater systems, providing a hydraulically efficient means of flow regulation that does not use moving parts or require power to operate.

### Key Features and Benefits

- Self-activating vortex flow controller which controls forward flow of water
- No moving parts - virtually maintenance free
- Manufactured with an integral sump for silt catchment/removal
- Can be manufactured to adoptable standards
- Multiple inlet and outlet options, allowing quick and seamless connection to pipelines
- Depths can be tailored to suit project requirements
- Optional integral benching
- Optional step rungs to BS EN 13101 and ladders to BS EN 14396
- Optional riser section and riser location ring
- Integral lifting points available on request to improve Health and Safety during handling and installation
- Stub connections and rocker pipes are available
- Manufactured in a factory controlled environment for improved quality of finish
- Eliminates wastage associated with in-situ construction

### Other fabrications in our RIDGISTORMCheck range:

- Orifice Plate Flow Control Chambers

### Performance

RIDGISTORMCheck Vortex Flow Control Chambers are fabricated from Ridgistorm-XL pipework, which is manufactured to meet the material requirements of BS EN 13476.

| RIDGISTORMCHECK VORTEX FLOW CONTROL CHAMBER |                                                                                           |
|---------------------------------------------|-------------------------------------------------------------------------------------------|
| PHYSICAL PROPERTIES                         |                                                                                           |
| Diameter                                    | 1050-3000mm                                                                               |
| Depth                                       | To suit requirements                                                                      |
| Material                                    | HDPE                                                                                      |
| Colour                                      | Black with Blue Interior                                                                  |
| Flow control units                          | Grade 304 Stainless Steel                                                                 |
| Chemical resistance                         | HDPE is naturally resistant to most chemicals associated with stormwater drainage systems |
| Inlets/outlets                              | 100-3000mm                                                                                |
| Hydraulic performance                       | Unit manufactured to suit site specific conditions                                        |

### Our Ridgistorm-XL Fabrications range

All of our Ridgistorm-XL fabrications are tailor-made, fully-welded, watertight structured wall chambers to suit project-specific requirements. Health and Safety benefits become apparent during handling and installation, due to our fabrications' strong but light in weight nature. In addition, off-site construction ensures uncompromised, high quality products being delivered to site ready-to-install, reducing installation time and costs.



# RIDGISTORMCheck Vortex Flow Control Chambers

Data Sheet

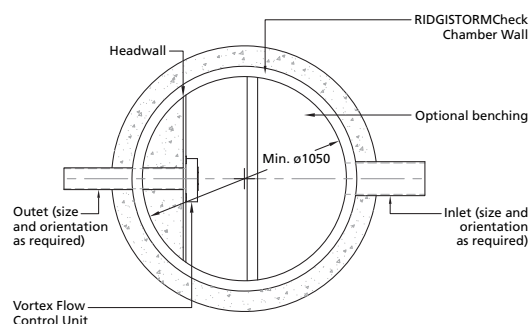
## PRODUCT INFORMATION

P2

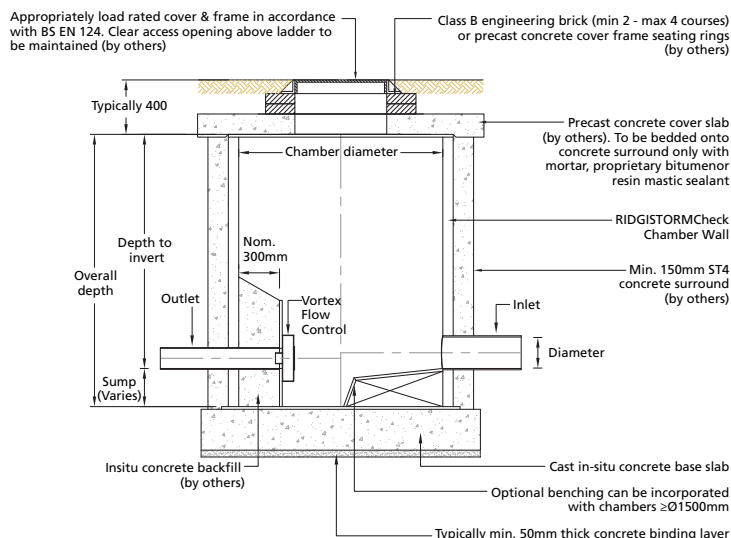
ISSUE 2 - MAR 2019

### Non-Bypass Chamber

For sites where discharge rates must be guaranteed to not exceed a prescribed limit(s).

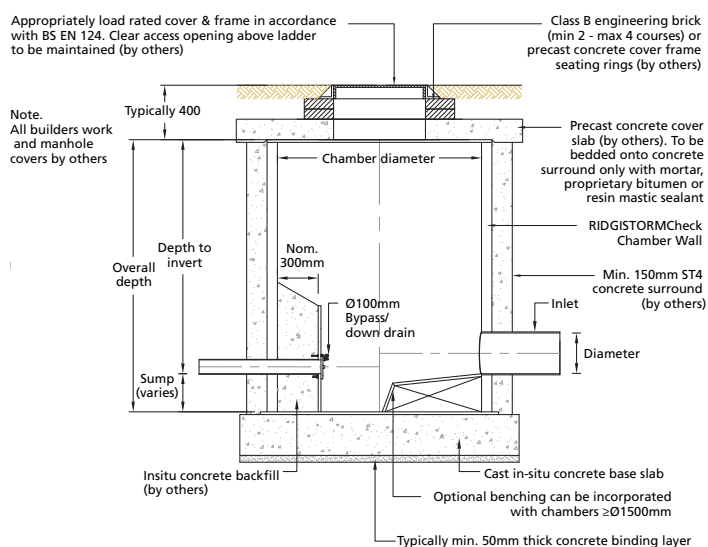
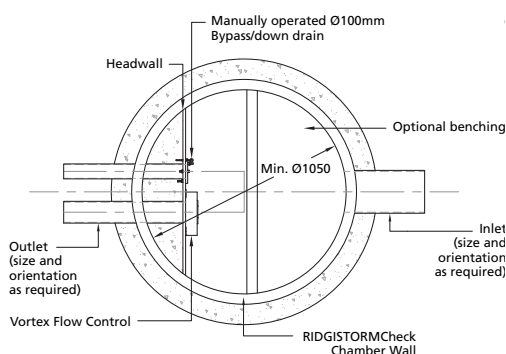


Note.  
All builders work and  
manhole covers by others



### Manual Bypass Design

The manual bypass design offers a bypass the ability to flow control device to facilitate maintenance. Manually operated from the surface, the activation of the bypass system opens a door in the head wall allowing water in the chamber to drain down via the bypass pipe.



For further information please contact our Technical Team on +44 (0) 1509 615100 or download our CAD Standard Details from our website [www.polypipe.com/civils-technical-hub](http://www.polypipe.com/civils-technical-hub)

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Polypipe Civils

Charnwood Business Park, Loughborough, Leicestershire LE11 1LE

Tel: +44 (0) 1509 615100 Fax: +44 (0) 1509 610215 Email: [civils@polypipe.com](mailto:civils@polypipe.com)

[www.polypipe.com/civils](http://www.polypipe.com/civils)



## **APPENDIX L: Gaslight Proprietary Soakaway Tank**

**SDS**

Water  
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WATER TECHNOLOGY

## SDS GEOLight®

Stormwater Management System



**SDS**  
Water  
Infrastructure  
Systems

SDS GEOLight® is an ultra lightweight honeycombed modular structure, made from recycled PVC, that provides an underground storage facility for the application of stormwater attenuation or infiltration.

## Stormwater Management

The Environment Agency is keen to promote the wider use of sustainable drainage systems, which reduce the impact of surface water runoff. There are two main ways of storing surface water for stormwater management:

- Stormwater attenuation tanks
- Soakaway infiltration systems

### Stormwater Attenuation Systems

This consists of underground water storage facilities that hold excess water during periods of peak rainfall.

The stored water is gradually released in a controlled manner into the surface water drainage system or directly into watercourses, reducing the risk of upstream and downstream flooding.

### Soakaway Infiltration Systems

Soakaways are designed to store surface water runoff until it can be gradually absorbed by the surrounding ground.

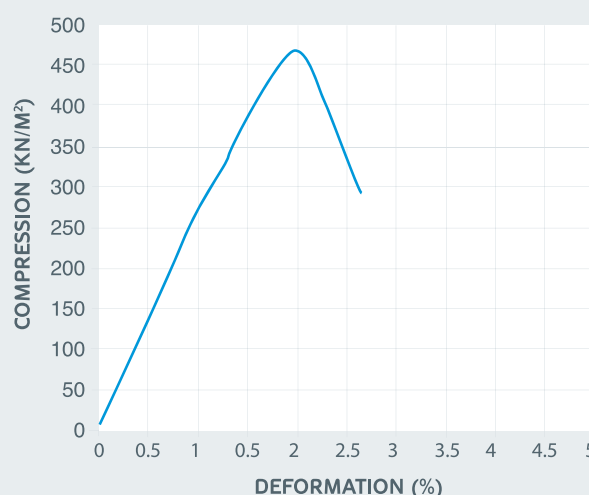
**SDS GEOLight® – an efficient and economic solution for stormwater management.**

## SDS GEOLight® Attenuation

**SDS GEOLight® has been specifically designed to form underground water storage reservoirs in stormwater management schemes. Its honeycombed structure gives it certain unique characteristics that make it ideal for this purpose:**

- The high void rate (95%) of GEOLight® means that the maximum volume of water is stored in the minimum volume of storage unit.
- High compressive strength. GEOLight® is available in two strengths as standard: 200 and 400kN/m<sup>2</sup>. Note: Higher compressive strengths available from 600 to 1000 kN/m<sup>2</sup>. The graph on the right shows the results of a compression test, where samples of GEOLight® 400 were compressed at the rate of 1mm per minute. The deformation at 400kN/m<sup>2</sup> is about 1.6%.

RESULTS OF COMPRESSION TEST ON SDS GEOLIGHT® 400



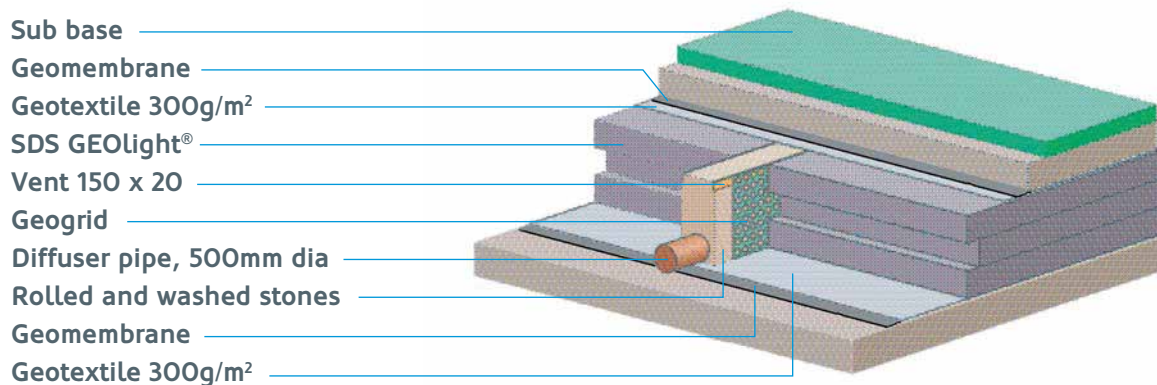
The GEOLight® Stormwater Attenuation System consists of two manholes (inspection chambers) connected by a length of perforated distribution pipe which feeds the stormwater storage reservoirs on either side formed from GEOLight®.

The distribution pipe is normally from 225mm up to 500mm diameter, generally covered in a trench that is filled with draining material such as 15/25 clean graded stone, free from fines.

The reservoirs and distribution pipe are wrapped in a waterproof membrane, such as butyl, to prevent seepage of water into the surrounding ground. The top of each GEOLight® reservoir has a vent which is connected back to the upstream manhole.

A geotextile or 10mm mesh geogrid is laid between the distribution pipe and GEOLight® to prevent the GEOLight® units being clogged by the draining materials.

## SDS GEOLight® Attenuation



### How does it work?

- 1. In normal conditions, water enters a back drop manhole. This is the upstream manhole and any silt or sediment will collect in the bottom of the chamber. The water then flows along the distribution pipe into the downstream manhole. The upstream pipework is sized to cope with normal flow conditions. The distribution pipe and attenuation tank are sized to cope with storm conditions. The outflow pipe is sized to cope with the permissible discharge.
- 2. In storm conditions the flow restrictor (vortex flow control or orifice plate) in the downstream manhole limits the amount of water flowing out of the manhole. This causes the water level in the distribution pipe to rise and water to spill into the GEOLight® reservoirs on either side. As the water level rises in the reservoirs, air is forced out of the high level vents into the upstream manhole.

- 3. Once the storm has passed, the water level in the GEOLight® reservoirs gradually falls as water passes through the flow restrictor in the downstream manhole. The vents now allow air to return into the GEOLight® reservoirs. Gradually the reservoirs empty. The flow restrictor prevents excess surges of flood water to pass downstream and uses the storage reservoirs to store the water for the period of the storm.

### Calculating the storage capacity

The storage capacity of the GEOLight® reservoirs is determined by the maximum outflow permitted, (set by the water company or Environment Agency), the impermeable area of the site and the rainfall return period – normally 1 in 30 years, but again can be dictated by the water company. A full design service, including calculations, can be supplied via a third party consultant.

**Please contact SDS for details.**

### Other uses

**The water storage ability of SDS GEOLight® lends itself to a number of other uses:**

- Water recycling combines with irrigation systems – this is increasingly popular: GEOLight® is used to retain stormwater which is then pumped as required to a network of standpipes for irrigation.
- Drainage channels – the natural permeability of GEOLight® lends itself for use as an underground drainage channel that collects and drains away groundwater.
- Pollution control – improved water runoff quality. When used in combination with oil / petrol separators, GEOLight® can replenish groundwater without the risk of contamination from oil, chemicals or suspended solids.
- To form lightweight embankments (slope stabilisation) – GEOLight® can be used to quickly form the base of embankments that only weigh a fraction of earth embankments.

# Stormwater Attenuation System

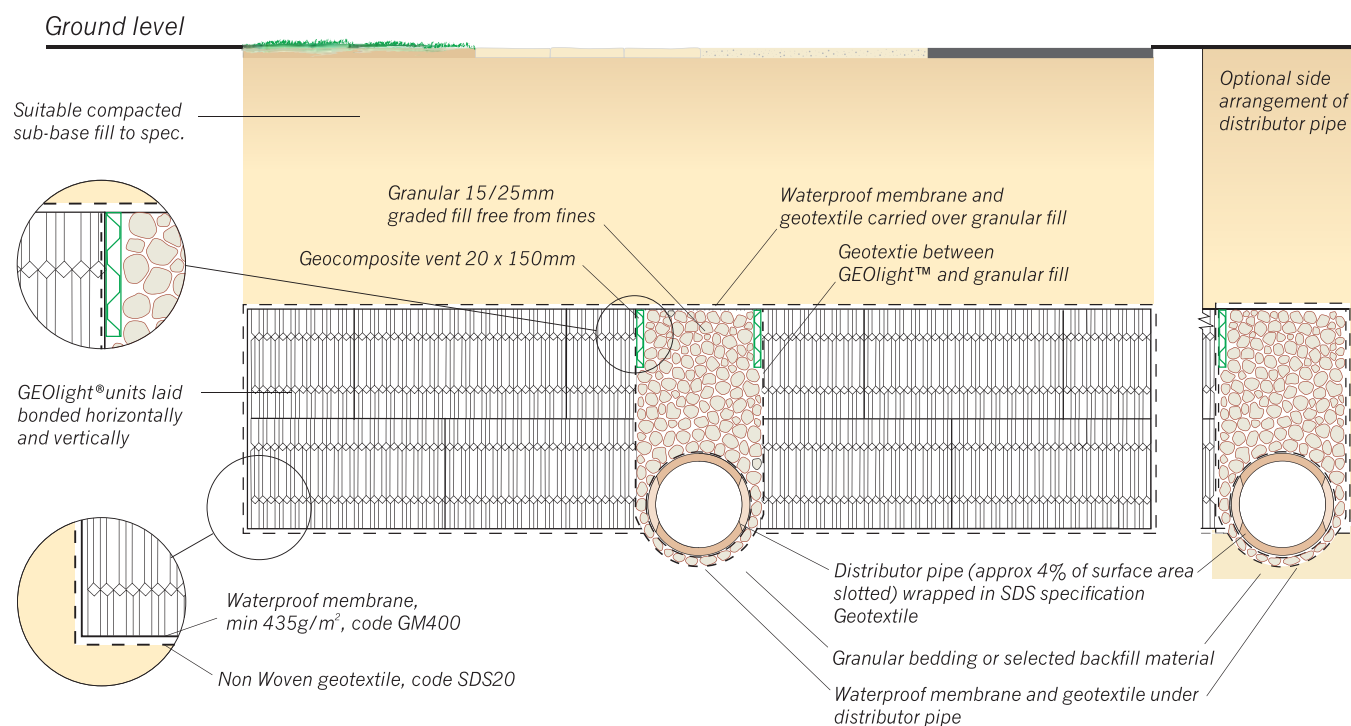
## Design Details

The details on these two pages illustrate the construction of a typical SDS GEOLight® Stormwater Attenuation System. The length and height of the GEOLight® reservoirs is determined by the quantity of water to be stored.

The layout of each scheme is specifically designed to suit the characteristics and limitation of the site. Typically the distributor pipe would be arranged in the centre of the reservoir, but can alternatively be placed at the side where topographical constraints dictate.

The high performance waterproof membrane should be sealed continuously to encapsulate the GEOLight® reservoirs, distributor pipe and granular fill. It is protected by a heavyweight needle punched, non woven geotextile. To help with maintenance a high flow geotextile is placed between the granular fill and GEOLight® attenuation units to prevent silt and particles being washed into the reservoir. GEOLight® can be used under a range of surfaces e.g. grass, porous paving, standard paving block, tarmac and concrete.

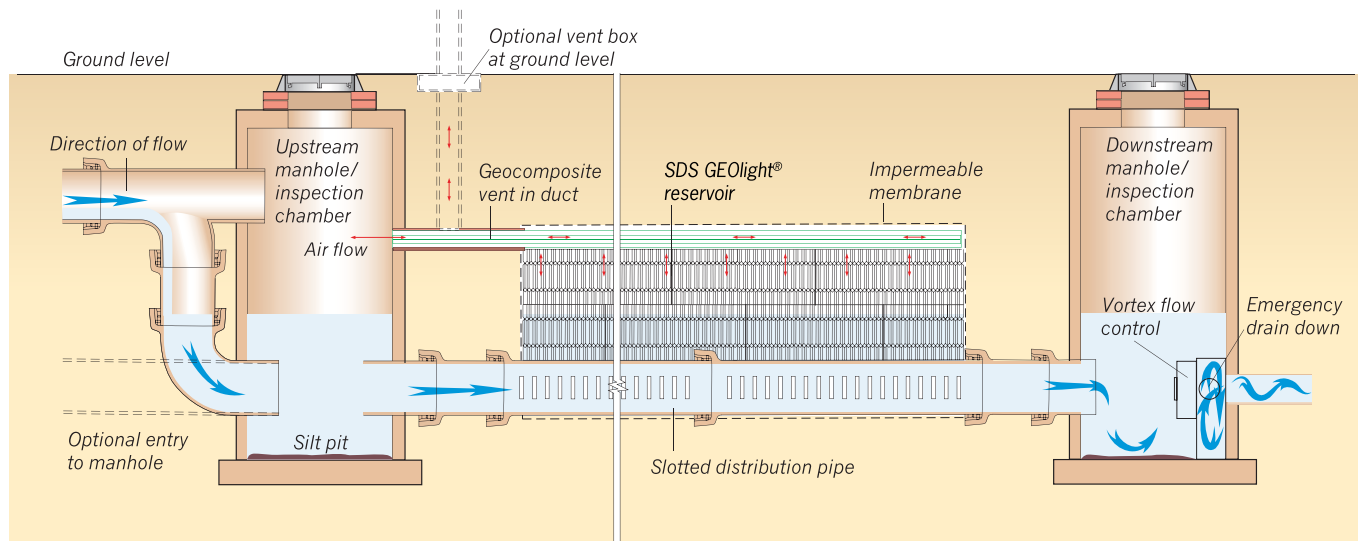
## Cross Section



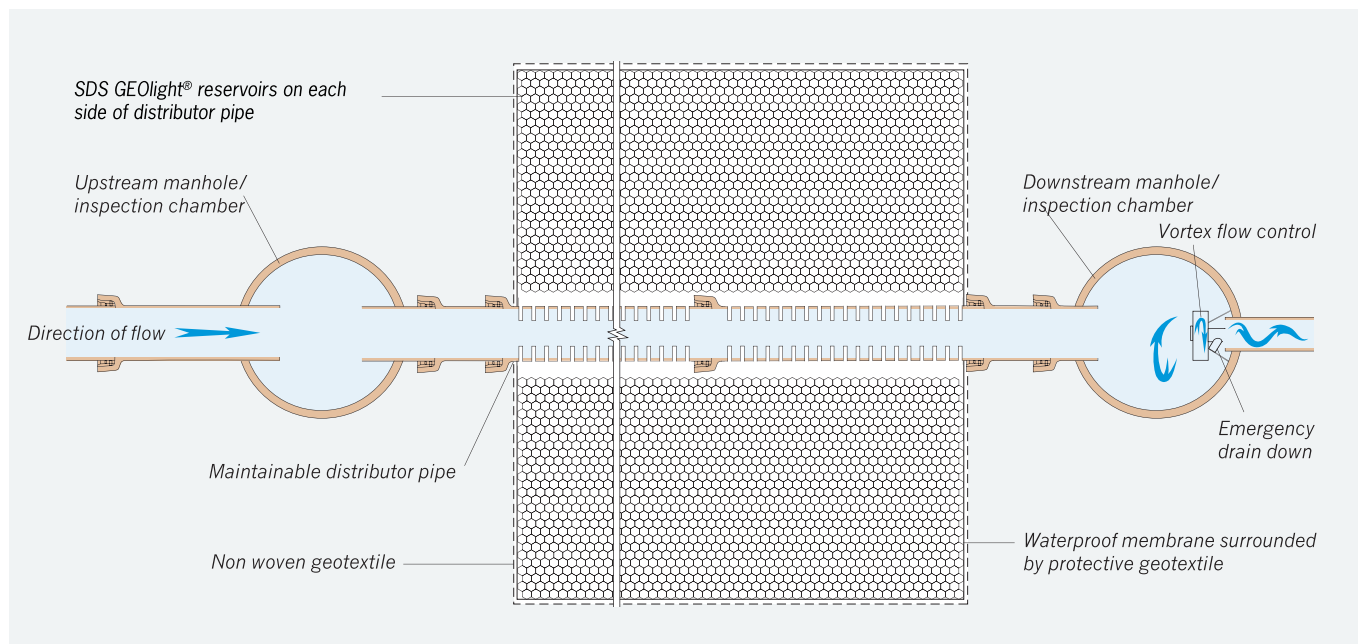
# Stormwater Attenuation System

## Design Details

### Long Section



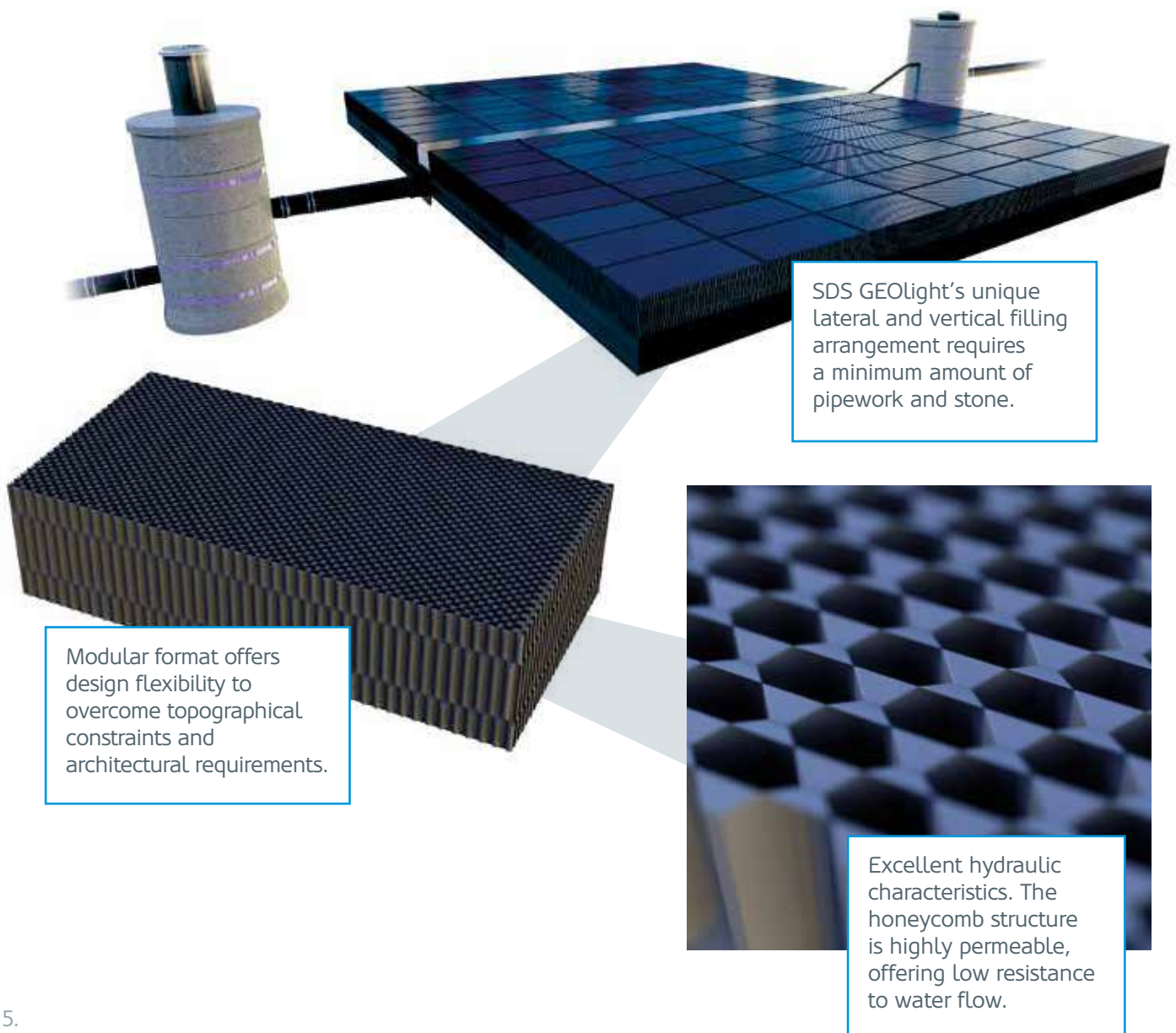
### Plan



## Benefits

- High compressive strength – can be located under all roads, car parks and amenity area surfaces.
- Reduced excavation costs – the very high void rate (95%) minimises the required volume of earthworks.
- Speed of installation – 1000m<sup>3</sup> reservoir, completed in one week.
- Light and easy to handle.
- Depth of tank invert reduced by using patented lateral supply.
- Simplified distribution pipe network, easy maintenance – dispensing with costly and complicated pipework configurations.
- Greatly reduces the risk of flooding when used as stormwater storage.
- Can also be used for water recycling and combining with irrigation systems.
- Can virtually eliminate pollution when used in combination with specialist petrol / oil separators.
- Design service available, including calculations.

## GEOLight® block



# COSHH and Handling Information

## 1. COMPOSITION/INFORMATION ON INGREDIENTS:

### Hazardous ingredients:

None as finished goods or products.

### Types of materials:

Polyvinyl chloride (PVC)  
MEK

## 2. HAZARDS IDENTIFICATION

### Nature of hazard:

There are no health risks from the products during normal use. The products may contain various pigment colours and stabilisers that may be toxic. The chemicals are, however, bound within the product material and not easily extracted.

## 3. FIRST-AID MEASURES

### Eye contact:

Plastic materials may cause physical irritation in the eyes. Wash out with large amounts of water. If irritation persists, seek medical advice.

### Skin contact:

Not applicable.

### Inhalation:

Not applicable.

### Ingestion:

Not expected to have any toxic effects.

## 4. FIRE-FIGHTING MEASURES

### Extinguishing media:

On small fires use any hand-held extinguisher type.  
On large fires use water.

### Fire and explosion hazards:

Melting plastics may flow and spread in a large fire.  
Products of fire will be thick black toxic smoke.

### Material characteristics:

PVC products will burn in the presence of a flame but are classed as self-extinguishing.

### Protective equipment:

Wear self-contained breathing apparatus and protective clothing.

## 5. HANDLING AND STORAGE

### Handling:

There are no hazards associated with the finished products. However, when cutting SDS GEOLight®, we recommend that the correct tools are used e.g. Handsaw or Alligator saw. When cutting, dust may be created; avoid inhaling these dusts. Take care of heat build-up within materials during cutting etc. The pallets of SDS GEOLight® units should be placed on level ground and should not be stacked on site. The maximum weight of the pallet of SDS GEOLight® units as delivered to site is 650kg (700kg on one copy), including packaging. Machines used to lift the pallet should be able to lift this weight safely. Loose individual units should not be stored more than three units high. SDS GEOLight® units are lightweight ranging from 23kg to 55kg and can be easily handled – one or two person lift.

### Storage:

SDS GEOLight® units will resist the effects of UV light for up to six months; however, prolonged storage in direct sunlight should be avoided. SDS GEOLight® units should not be stored near to any fuel storage areas or any other solvents. SDS GEOLight® units are very robust and resistant to damage during normal handling; however, they should be secured in areas where impacts from vehicles or construction plant will be avoided.

### Material characteristics:

PVC products will burn in the presence of a flame but are classed as self-extinguishing.

### Protective equipment:

Wear self-contained breathing apparatus and protective clothing.

## 6. EXPOSURE CONTROLS / PERSONAL PROTECTION

### Respiratory protection:

Not required under normal conditions of use. Where cutting etc. creates dust, wear a disposable half-mask to the standard FFP2S.

### Hand protection:

Wear impervious strong gloves to prevent cuts to the hands while handling, cutting etc.

### Eye protection:

Wear safety glasses when cutting etc.

### Skin protection:

Wear overalls.

## 7. SITE HAZARDS

### Other hazards for consideration:

Working in excavations and trenches – SDS GEOLight® may be designed with a shallow invert for infiltration (soakaway) or attenuation (storage) system. This negates the need for deep excavations or trenches, excavation near services e.g. gas, electricity or contaminated soil areas. N.B. All risk assessments should be undertaken by the main contractor for forklift, access to and working in excavations and trench support.

## 8. STABILITY AND REACTIVITY

### Decomposition products:

Major thermal decomposition products are oxides of carbon. Relevant differences are (in addition): PVC may produce amounts of Hydrogen Chloride.

### Stability:

These materials are stable at temperatures up to normal operating limits (moulding parameters).

## 9. ECOLOGICAL INFORMATION

### Biodegradability:

Plastic products are not readily biodegradable but are not detrimental to terrestrial wildlife.

### Aquatic toxicity:

Non-toxic to marine life.

## 10. DISPOSAL CONSIDERATIONS

### Method:

The preferred method of disposal is collection and recycling. Plastics can safely be placed with regular industrial or household wastes where recycling is not available.

## 11. OTHER INFORMATION

As the handling, storage, use and disposal of the product are beyond our control SDS disclaims all liability for loss, damage, injury or expense in any way connected with such activities and further makes no warranties, expressed or implied, as to the suitability of the product for any particular use.

The preferred method of disposal is collection and recycling. Plastics can safely be placed with regular industrial or household wastes where recycling is not available.

# SDS

Water  
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## INNOVATORS IN WATER TECHNOLOGY



**SDS Limited**  
Clearwater House  
Castlemills  
Biddisham  
Somerset  
BS26 2RE

**T** +44 (0)1934 751303  
**E** [info@sdslimited.com](mailto:info@sdslimited.com)



**sdslimited.com**

## **APPENDIX M: Hydrodynamic Vortex Separator**

## STORMWATER TREATMENT

### SDS Aqua-Swirl®

Hydrodynamic Vortex Separator

**SDS Aqua-Swirl® is a custom engineered, flow-through water quality device that utilises hydrodynamic separation technology to maximise the removal of coarse sediment, debris and free-floating oil from surface water runoff.**

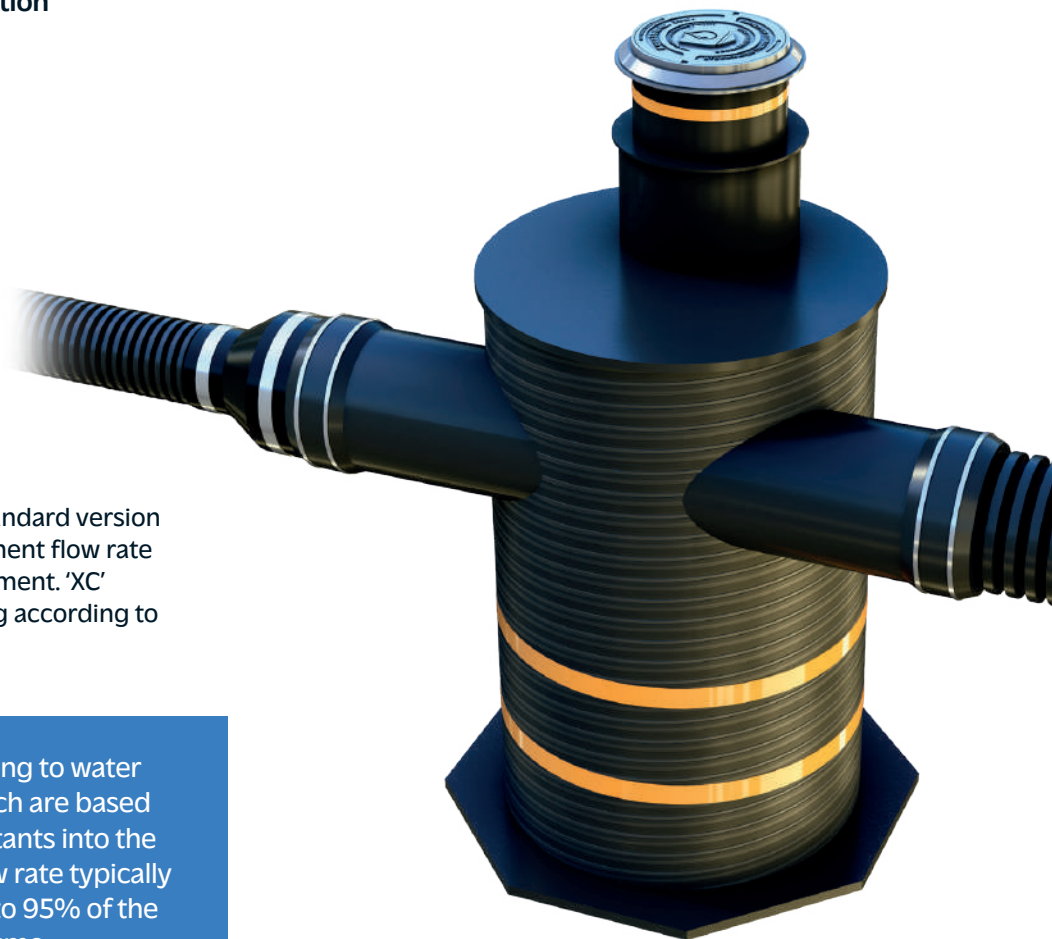
When connected to a SDS SYMBiotIC™ system, SDS Aqua-Swirl® provides real time data on a broad range of key operating factors such as pollutant loads and silt capture level.

SYMBiotIC™

- BBA HAPAS approved
- HDPE plastic modular construction
- No moving parts
- Sealed baffle
- Large debris storage chamber
- Lifting supports
- Compact dimensions
- Available in 9 different sizes
- Bespoke sizing available

SDS Aqua-Swirl® is supplied in the standard version when sizing to its water quality treatment flow rate according to OK-110 (coarse) test sediment. 'XC' versions are also available when sizing according to the NJDEP (finer) test sediment.

SDS Aqua-Swirl® is sized according to water quality treatment flow rates which are based on the initial movement of pollutants into the storm drainage system. This flow rate typically represents approximately 90% to 95% of the total pollutants in the runoff volume. The treatment flow rate of the SDS Aqua-Swirl® system is engineered to meet or exceed the local water quality treatment criteria and form an intrinsic part of the SuDS solution.



| Features                                                             | Benefits                                                                                                                                                             |
|----------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Performance monitoring available via SDS SYMBiotIC™.                 | Provides bespoke suite of operating data, such as silt levels and pollutants, viewable via a secure web portal dashboard with live notifications via email and text. |
| BBA HAPAS certified.                                                 | Approved for installation under roads and pavements; adoptable by National Highways.                                                                                 |
| NJCAT/NJDEP-verified performance for sediment removal and retention. | Verification accepted by the Environment Agency (as cited in the CIRIA C753 SuDS Manual).                                                                            |
| 'XC' models meet NJDEP testing protocol.                             | Ensures that particulates and adhered pollutants are not mobilised during major storm events, maximising the capture of floating debris, oil and hydrocarbons.       |
| Manufactured from HDPE high strength plastic Weholite.               | Offers a durable, light weight and low-cost alternative to concrete. Easy and quick to install resulting in substantial cost savings.                                |
| Bespoke construction.                                                | No on-site assembly required.                                                                                                                                        |
| Specialised sealed baffle.                                           | Prevents captured floatables from escaping.                                                                                                                          |
| Internal bypass with pollution retention.                            | Able to treat localised rain and larger storm events while retaining captured pollutants.                                                                            |
| Single easy-access chamber for pollutant removal and storage.        | Simplifies inspection and maintenance facilities with no special equipment required.                                                                                 |
| Compact dimensions.                                                  | Reduces ground excavation and product installation costs.                                                                                                            |
| Small footprint design.                                              | Can be retro-fitted with minimal disruption to existing infrastructure utilities or surface features, extending the ability to meet new regulations.                 |
| Certified installation lifting supports.                             | Easy installation without the need for large, expensive cranes.                                                                                                      |
| Suitable for use during site construction programme.                 | Can be put into operation prior to completion of the site build, with the inclusion of a planned maintenance schedule.                                               |
| Available in 9 different standard sizes and also bespoke.            | Provides greater design flexibility and assists the removal of sediments at a greater rate than comparable systems.                                                  |

## Specifications

| Aqua-Swirl® Model No. | Maximum ID Pipe Connection (mm) BYP <sup>1</sup> | Chamber Internal Diameter (mm) | Water Quality Treatment Flow Rate OK-110 Coarse (l/s) Model AS- <sup>2</sup> | Water Quality Treatment Flow Rate NJDEP Fine (l/s) Model XC- | Oil/ Debris Storage Capacity (litres) | Sediment Storage Capacity (m³) | Aqua-Swirl® Weight (kg) |
|-----------------------|--------------------------------------------------|--------------------------------|------------------------------------------------------------------------------|--------------------------------------------------------------|---------------------------------------|--------------------------------|-------------------------|
| AS-2/XC-2             | 375                                              | 750                            | 30                                                                           | 16                                                           | 136                                   | 0.3                            | 300                     |
| AS-3/XC-3             | 500                                              | 1050                           | 53                                                                           | 31                                                           | 416                                   | 0.6                            | 700                     |
| AS-4/XC-4             | 600                                              | 1200                           | 77                                                                           | 40                                                           | 644                                   | 0.8                            | 1000                    |
| AS-5/XC-5             | 750                                              | 1500                           | 120                                                                          | 63                                                           | 1382                                  | 1.3                            | 1100                    |
| AS-6/XC-6             | 900                                              | 1800                           | 173                                                                          | 91                                                           | 1439                                  | 1.8                            | 1400                    |
| AS-7/XC-7             | 1050                                             | 2100                           | 235                                                                          | 123                                                          | 1987                                  | 2.5                            | 1700                    |
| AS-8/XC-8             | 1200                                             | 2400                           | 307                                                                          | 161                                                          | 2612                                  | 3.3                            | 2200                    |
| AS-9/XC-9             | 1350                                             | 2800                           | 418                                                                          | 220                                                          | 3596                                  | 4.4                            | 2600                    |
| AS-10/XC-10           | 1500                                             | 3000                           | 480                                                                          | 252                                                          | 4164                                  | 5.1                            | 3100                    |

<sup>1</sup> BYP (Internal Bypass) provides full treatment of the first flush of water while the peak design storm is diverted and channelled through the main conveyance pipe.

<sup>2</sup> Based on the Tennessee Tech University 'Laboratory Evaluation of TSS Removal Efficiency for the Aqua-Swirl® Concentrator Stormwater Treatment System'.

Notes: **Details of pollution mitigation indices, head loss and CAD details, standard drawings and Installation Guides available upon request.**

The sediment storage capacity has been calculated in accordance with the relevant test protocol and is not a physical maximum; any additional sediment capacity required is achieved with bespoke deeper units.

For assistance in design and specific sizing using historical rainfall data, please contact SDS.

A-S DS/0125