

MONSON

Structural Engineering
Roads & Car Parks
Traffic & Flood Risk Assessments
Water & Drainage Engineering
Technical Audits & Assessments

**26A Kennedy Avenue,
East Grinstead,
RH19 2DG**

Residential development

Drainage Strategy

Issue	A
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Job No	26278



Registered No. FS 37624

Contents

1.00 Introduction2

2.00 Existing Site2

3.00 Site Geology4

4.00 Drainage Strategy6

5.00 Maintenance13

6.00 Conclusions15

Appendices16

Appendix A – Site Location Plan and Development Proposals.....17

Appendix B – UK SuDS Greenfield Estimation18

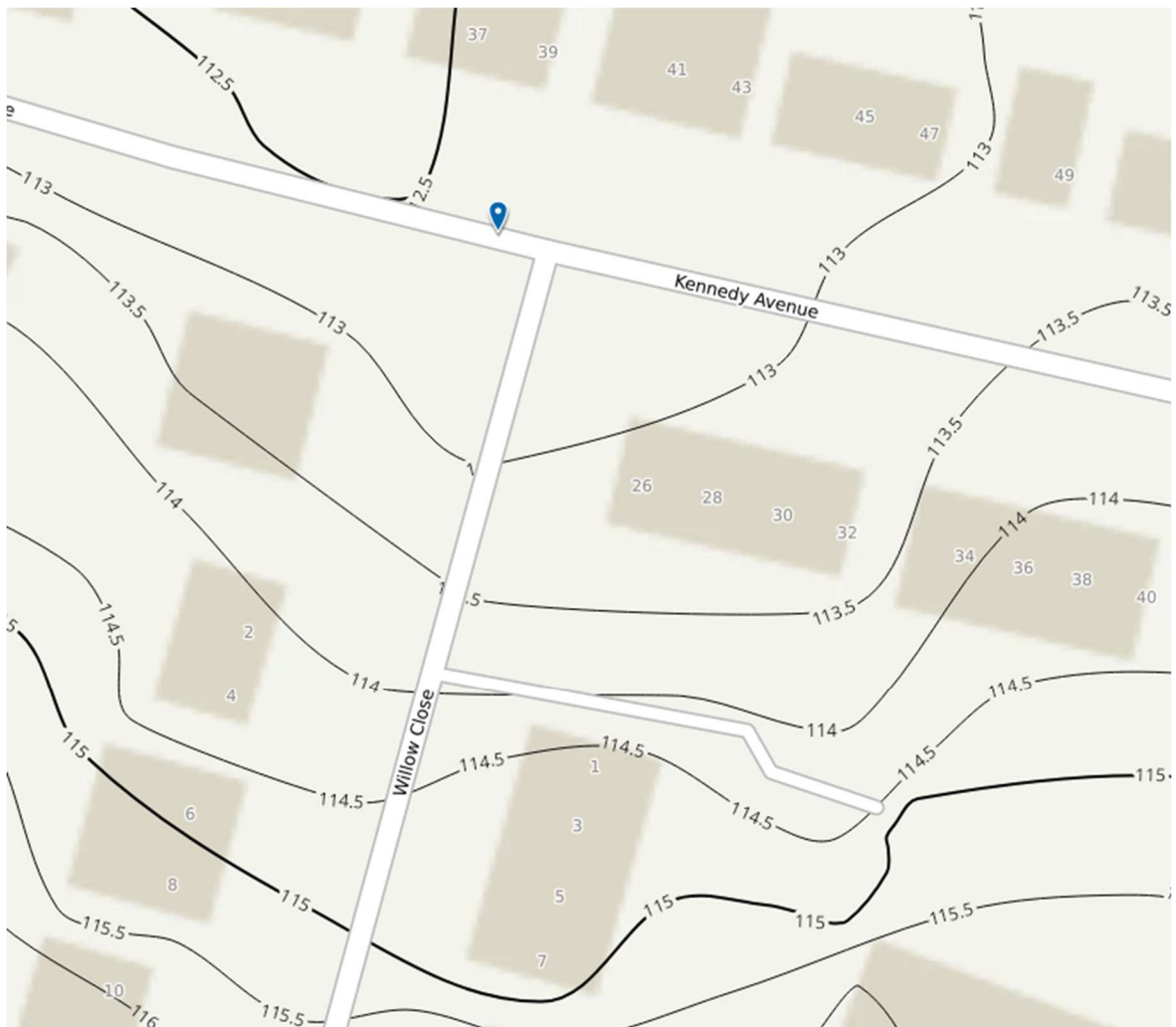
Appendix C – Drainage Strategy Layout19

1.00 Introduction

- 1.01 Monson Engineering have been instructed to prepare a Surface Water Drainage Strategy and sustainable drainage management and maintenance plan to support a planning application for the construction of a single semi-detached residential property at Kennedy Avenue, East Grinstead, RH19 2DG.
- 1.02 The site of the proposal is a portion of land currently associated with the existing no. 26.
- 1.03 The total site area, comprising majority undeveloped green space with minor landscaping features, totals 0.02ha.
- 1.04 The approximate National Grid Reference of the site is TQ 38987 39238 (538987 Easting, 139238 Northing).
- 1.05 The location of the site, as well as development proposals, can be found in **Appendix A**.

2.00 Existing Site

- 2.01 Topographical information taken from Scalgo mapping software indicates that the majority of the site sits at approximately 113m A.O.D with a slope towards to the south up to 114m A.O.D. The Scalgo mapping is included below:



Topographical information – scalgo.com

- 2.02 The site is bounded by Kennedy Avenue to the north, Willow Close to the west and a garage access road to the south. The proposed property is to share a wall with the existing plot 26 to the east.
- 2.03 The site sits within a wider residential estate populated by terraced and semi-detached housing with the exception of an industrial estate found to the south. The estate itself is just north of central East Grinstead.
- 2.04 There is both surface and foul water drainage associated with the adjacent plot 26 found on the site.

3.00 Site Geology

- 3.01 A desktop review of the British Geological Survey maps has shown that the site is underlain by bedrock described as Grinstead Clay Member-Mudstone. An excerpt is included below:



Geology results excerpt – geologyviewer.bgs.ac.uk

Bedrock geology

Grinstead Clay Member-Mudstone. These sedimentary rocks are fluvial, palustrine and shallow-marine in origin. They are detrital, forming deposits reflecting the channels, floodplains and deltas of a river in a coastal setting (with periodic inundation from the sea).

Minimum Age (Years):	133,900,000
Minimum Period:	Cretaceous
Maximum Age (Years):	139,400,000
Maximum Period:	Cretaceous
BGS Maps Portal Link:	View

Geology results key – geologyviewer.bgs.ac.uk

3.02 Infiltration testing to BRE 365 is ruled out due to the lack of spatial requirements stipulated within the Building Regulations Part H.

4.00 Drainage Strategy

4.01 The contributing areas for this application have been identified as the roof and surrounding access pavement.

4.02 The National Standards for Sustainable Drainage Systems (SuDS) require that drainage systems mimic natural runoff as closely as possible or manage runoff as close to the source as possible while optimising concurrent provision of amenable space and biodiversity. Considerations for water quality must also be made and implemented so that hazard mitigation is commensurate with the identified sources as per the CIRIA hazard mitigation indices outlined in the SuDS Manual.

4.03 To this end, the following hierarchy for surface water runoff destinations is advised:

- Priority 1: Collection for non-potable use.
- Priority 2: Infiltration to ground.
- Priority 3: Discharge to an above ground surface water body.
- Priority 4: Discharge to a surface water sewer, or another piped surface water drainage system.
- Priority 5: Discharge to a combined sewer.

4.04 The above priorities have been used as pivots to determine the most appropriate outfall. The section below will elaborate further on the decision process.

4.04.1. Priority 1: Collection for non-potable use

There appears to be some space available for the use of a water butt, though this will need to be confirmed at the detail design stage.

4.04.2. Priority 2: Infiltration to ground

Because of spatial constraints owing to the offset requirement of 5m from both buildings and roads stipulated in the Building Regulations Part H, infiltration to the ground has been deemed inappropriate for this site.

4.04.3. Priority 3: Discharge to an above ground surface water body.

Because the site is located within a well-developed residential area, discharge to an above ground water body is not deemed to be practical.

4.04.4. Priority 4: Discharge to a surface water sewer, or another piped surface water drainage system.

There is a private drainage network found to the south of the application site boundary. The current proposal is to discharge both surface and foul water to these existing drains.

4.04.5. Priority 5: Discharge to a combined sewer

Because there has been a more favourable outfall identified in discharging to the existing drains, discharge to a combined sewer has been ruled out.

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#### 4.05 Considering the above review of the SuDS hierarchy, discharging to the existing drains has been found to be the ideal option.

## Surface water

- 4.06 The catchment of the SuDS proposal will consist exclusively of the semi-detached property and the associated surrounding hardstanding.
- 4.07 The strategy will collect rainwater via a series of rainwater pipes for the building. The surrounding pedestrian areas are small enough that they can discharge to adjacent softscape in line with the LABC/NHBC.
- 4.08 The chosen outfall location is a storm water pipe found in the south of the application site boundary. It is understood that existing pipe then discharges to a Southern Water sewer found in Willow Close to the west.
- 4.09 The National Standards for SuDS require discharge to be limited to the 50% AEP greenfield runoff rate. The greenfield rate has been calculated using the UK SuDS Greenfield Estimation Tool. The calculated discharge rate was 0.1l/s. The minimum possible discharge rate for a Hydro-Brake is 0.7l/s, therefore this discharge rate will be used. A copy of the UK SuDS report can be found in **Appendix B**, while supporting calculations are included in **Appendix C**.
- 4.10 Connection to this outfall is subject to a capacity check and an S106 agreement with Southern Water. The drainage strategy layout is included in **Appendix D**.

## Exceedance

- 4.11 Exceedance in this instance would occur because of blockages in the piped system.
- 4.12 The topography of the site and proposed layout do not allow for sequestering exceedance on site. Therefore, exceedance will be directed away from the property to the west, where it is intended to be intercepted by a french drain at the boundary
- 4.13 Maintenance requirements for the SuDS system will be included to provide the end users with a strategy to prevent any such exceedance events.

## Water Quality

- 4.15 The National Standards for SuDS also require consideration for pollution mitigation in line with the CIRIA SuDS Manual.
- 4.16 Tables are given for the land uses and their associated pollutant indices, as well as the accompanying mitigation index table which describes the various SuDS devices and their mitigative properties. The tables are shown below:

**TABLE 26.14** Impermeability and pollution indices for different land use types<sup>1</sup>

| Land use surface type (LUST)                  | Impermeability (IMP <sub>RF</sub> ) | Total suspended solids pollution index (PI <sub>TSS</sub> ) | Organic pollution index (PI <sub>Org</sub> ) | Hydrocarbon pollution index (PI <sub>PAH</sub> ) | Metals pollution index (PI <sub>HM</sub> ) |
|-----------------------------------------------|-------------------------------------|-------------------------------------------------------------|----------------------------------------------|--------------------------------------------------|--------------------------------------------|
| Roofs                                         |                                     |                                                             |                                              |                                                  |                                            |
| ▪ industrial/commercial                       | 1.0                                 | 0.3                                                         | 0.3–0.4                                      | 0.2                                              | 0.4–0.8                                    |
| ▪ residential                                 | 0.9                                 | 0.4–0.5                                                     | 0.6–0.7                                      | 0.1                                              | 0.2–0.5                                    |
| Highways                                      |                                     |                                                             |                                              |                                                  |                                            |
| ▪ motorways                                   | 0.8–0.9                             | 0.9                                                         | 0.7                                          | 0.9                                              | 0.8                                        |
| ▪ major arterial highways                     | 0.7–0.8                             | 0.8                                                         | 0.7                                          | 0.8                                              | 0.8                                        |
| ▪ urban distributor roads                     | 0.6–0.7                             | 0.7–0.8                                                     | 0.5                                          | 0.8                                              | 0.7                                        |
| ▪ residential streets                         | 0.4–0.6                             | 0.4                                                         | 0.6                                          | 0.6                                              | 0.6                                        |
| ▪ pavements                                   | 0.5–0.6                             | 0.4                                                         | 0.6                                          | 0.3                                              | 0.3                                        |
| Car parks/hardstanding                        |                                     |                                                             |                                              |                                                  |                                            |
| ▪ industrial/commercial                       | 0.6–0.8                             | 0.6–0.7                                                     | 0.6–0.7                                      | 0.7                                              | 0.4–0.5                                    |
| ▪ driveways (residential)                     | 0.5                                 | 0.5                                                         | 0.6                                          | 0.4                                              | 0.3                                        |
| Open areas                                    |                                     |                                                             |                                              |                                                  |                                            |
| ▪ gardens (all types)                         | 0.1                                 | 0.3                                                         | 0.2–0.3                                      | 0                                                | 0.01                                       |
| ▪ parks/golf courses                          | 0.2                                 | 0.2–0.3                                                     | 0.2                                          | 0                                                | 0.02                                       |
| ▪ grassed areas (including verges, all types) | 0.1                                 | 0.2–0.3                                                     | 0.2–0.3                                      | 0.05                                             | 0.05                                       |

**Note**

- <sup>1</sup> Pollution index values are based on reported land use type EMC distributions and impact potential thresholds from House *et al* (1993), Luker and Montague (1994), Butler and Clark (1995), D'Arcy *et al* (2000), Mitchell (2005) and Moy *et al* (2003).

*Table 26.14 – CIRIA SuDS Manual*

**TABLE 26.15 Pollution mitigation indices for different SuDS components and conventional pipe drainage**

| SuDS type                            | Total suspended solids pollution mitigation index (PMI <sub>TSS</sub> ) | Hydrocarbon pollution mitigation index (PMI <sub>PAH</sub> ) | Organic pollution mitigation index (PMI <sub>Org</sub> ) | Heavy metal pollution mitigation index (PMI <sub>HM</sub> ) |
|--------------------------------------|-------------------------------------------------------------------------|--------------------------------------------------------------|----------------------------------------------------------|-------------------------------------------------------------|
| Filter drains                        | 0.6                                                                     | 0.8                                                          | 0.7                                                      | 0.7                                                         |
| Porous asphalt                       | 0.7                                                                     | 0.9                                                          | 0.9                                                      | 0.9                                                         |
| Porous paving                        | 0.2                                                                     | 0.3                                                          | 0.2                                                      | 0.3                                                         |
| Sedimentation tank                   | 0.95                                                                    | 0.95                                                         | 0.95                                                     | 0.95                                                        |
| Green roof                           | 0.8–0.9                                                                 | 0.9                                                          | 0.5                                                      | 0.7–0.9                                                     |
| Filter strip                         | 0.9                                                                     | 0.8                                                          | 0.8                                                      | 0.7                                                         |
| Swales                               | 0.7                                                                     | 0.6                                                          | 0.4                                                      | 0.4                                                         |
| Soakaways                            | 0.3                                                                     | 0.6                                                          | 0.5                                                      | 0.5                                                         |
| Infiltration trench                  | 0.3                                                                     | 0.6                                                          | 0.5                                                      | 0.5                                                         |
| Infiltration basin                   | 0.05                                                                    | 0.05                                                         | 0.01                                                     | 0.05                                                        |
| Retention pond                       | 0.6                                                                     | 0.5                                                          | 0.6                                                      | 0.5                                                         |
| Detention basin                      | 0.7                                                                     | 0.7                                                          | 0.8                                                      | 0.6                                                         |
| Extended detention basins            | 0.4                                                                     | 0.4                                                          | 0.4                                                      | 0.4                                                         |
| Lagoons                              | 0.9                                                                     | 0.9                                                          | 0.9                                                      | 0.8                                                         |
| Constructed wetlands                 |                                                                         |                                                              |                                                          |                                                             |
| ▪ subsurface flow                    | 0.2                                                                     | 0.1                                                          | 0.1                                                      | 0.1                                                         |
| ▪ surface flow                       | 0.4                                                                     | 0.2                                                          | 0.2                                                      | 0.2                                                         |
| Conventional gully and pipe drainage | 1.0                                                                     | 1.0                                                          | 1.0                                                      | 1.0                                                         |

*Table 26.15 – CIRIA SuDS Manual*

4.17 The land use identified is the residential roof, which has the following hazard indices:

| Land use            | TSS pollution index | Organic pollution index | Hydrocarbon pollution index | Metals pollution index |
|---------------------|---------------------|-------------------------|-----------------------------|------------------------|
| Roofs (Residential) | 0.5                 | 0.7                     | 0.1                         | 0.5                    |

- 4.18 The SuDS devices used in this proposal and their associated mitigation indices are given as follows:

| SuDS type                            | TSS pollution index | Organic pollution index | Hydrocarbon pollution index | Metals pollution index |
|--------------------------------------|---------------------|-------------------------|-----------------------------|------------------------|
| Conventional gully and pipe drainage | 1.0                 | 1.0                     | 1.0                         | 1.0                    |

- 4.19 The tables above show that the sum of the mitigation indices surpasses that of the hazard indices, therefore the water quality goals for the scheme have been achieved.

## Foul water

- 4.20 The foul water generated by the site is limited to the domestic discharge from the single detached properties.
- 4.21 The system is proposed to discharge via gravity to the private network found in the south of the application boundary. It is understood that this network eventually discharges to a Southern Water sewer found in Willow Close.
- 4.22 The foul discharge rate associated with the development has been calculated based on occupancy in line with Flows and Loads 4 as published by British Water. The property is a 3-bed house, and therefore an occupancy of 5 has been derived. On this basis, a daily flow of 750l/d has been calculated. Therefore, the peak flow per second is **0.009l/s**.
- 4.23 Connection to this outfall is subject to a capacity check and an S106 agreement with Southern Water. The drainage strategy layout is included in **Appendix C**.

## 5.00 Maintenance

- 5.01 Maintenance of drainage features is usually carried out when necessary, such as when there is a blockage resulting in flooding. Accompanying this should be a maintenance routine that serves to prevent such scenarios or identify developing problems within the system.
- 5.02 The drainage strategy will only make use of a conventional drainage system with the following maintenance requirements:

|                                                                                                                                                                                                                                                                                |                        |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------|
| Inlets, outlets, controls and inspection chambers                                                                                                                                                                                                                              |                        |
| <b>Regular Maintenance</b>                                                                                                                                                                                                                                                     | <b>Frequency</b>       |
| <b>Inlets, outlets and surface control structures</b><br><br>Inspect surface structures removing obstructions and silt as necessary. Check there is no physical damage.<br><br>Strim vegetation 1m min. surround to structures and keep hard aprons free from silt and debris. | Monthly<br><br>Monthly |
| Inspection chambers and below ground control chambers                                                                                                                                                                                                                          |                        |
| Remove cover and inspect ensuring water is flowing freely and that the exit route for water is unobstructed. Remove debris and silt.<br><br>Undertake inspection after leaf fall in autumn                                                                                     | Annually               |

## 6.00 Conclusions

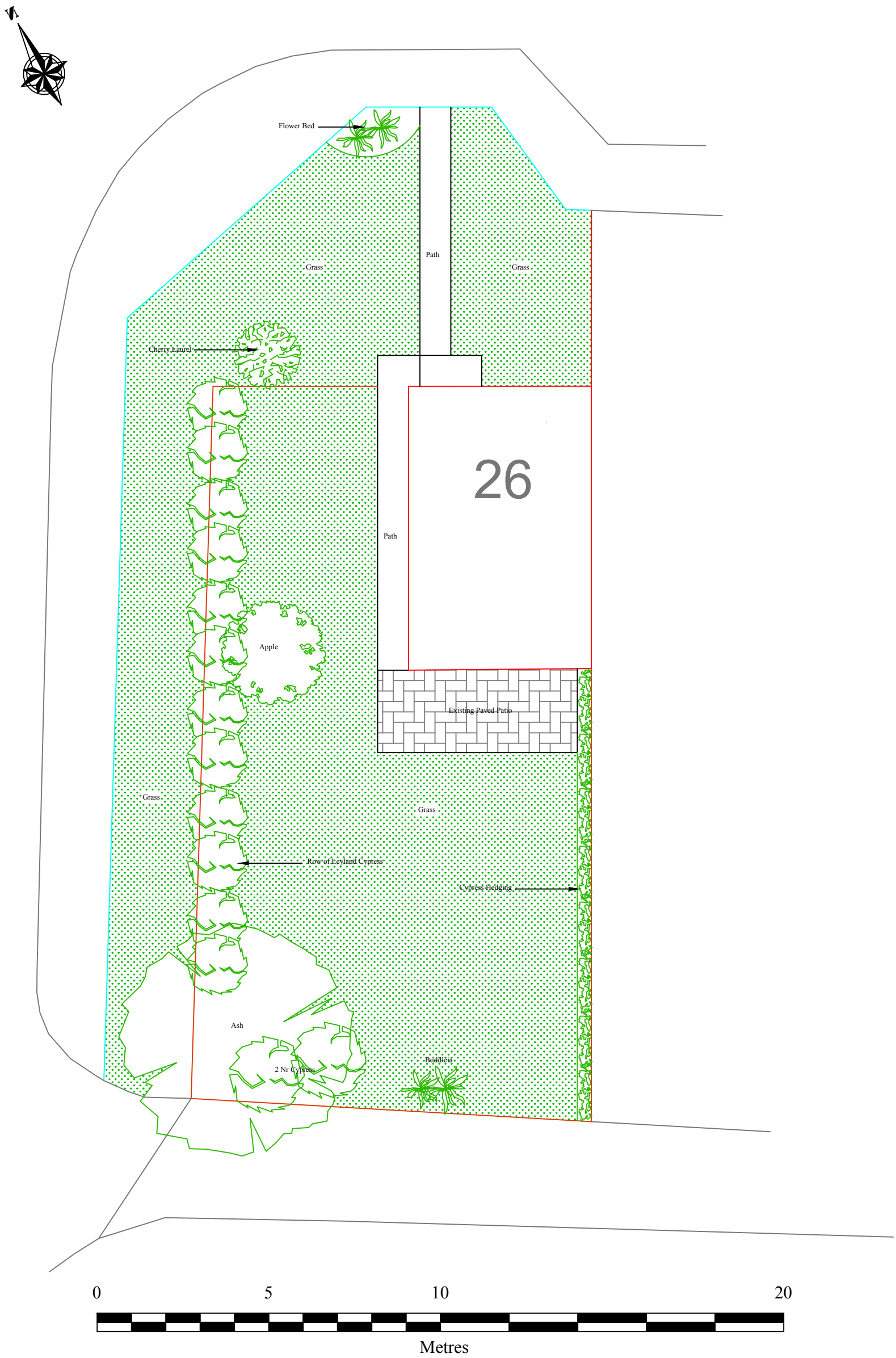
- 6.01 The preceding drainage strategy was for the construction of a single semi-detached residential dwelling.
- 6.02 The site of the proposal is a parcel of land associated with no. 26 Kennedy avenue.
- 6.03 The drainage strategy will make use of conventional piped drainage system. The discharge will be limited to **0.7l/s** as the 50% AEP greenfield rate.
- 6.04 The foul water generated by the site will discharge to the private foul network at a peak flow of **0.009l/s**.
- 6.05 The site's outfall destinations for both surface and foul water are both within a private network that eventually discharges to a southern water network.
- 6.06 Infiltration has been ruled out owing to the site constraints within the application boundary.
- 6.07 A French drain is to be constructed at the perimeter of the area to serve as a contingency for overtopping runoff in the event of a failure of the SuDS system.
- 6.08 A maintenance schedule has been provided to ensure that an exceedance event does not occur.

## **Appendices**

## Appendix A – Site Location Plan and Development Proposals

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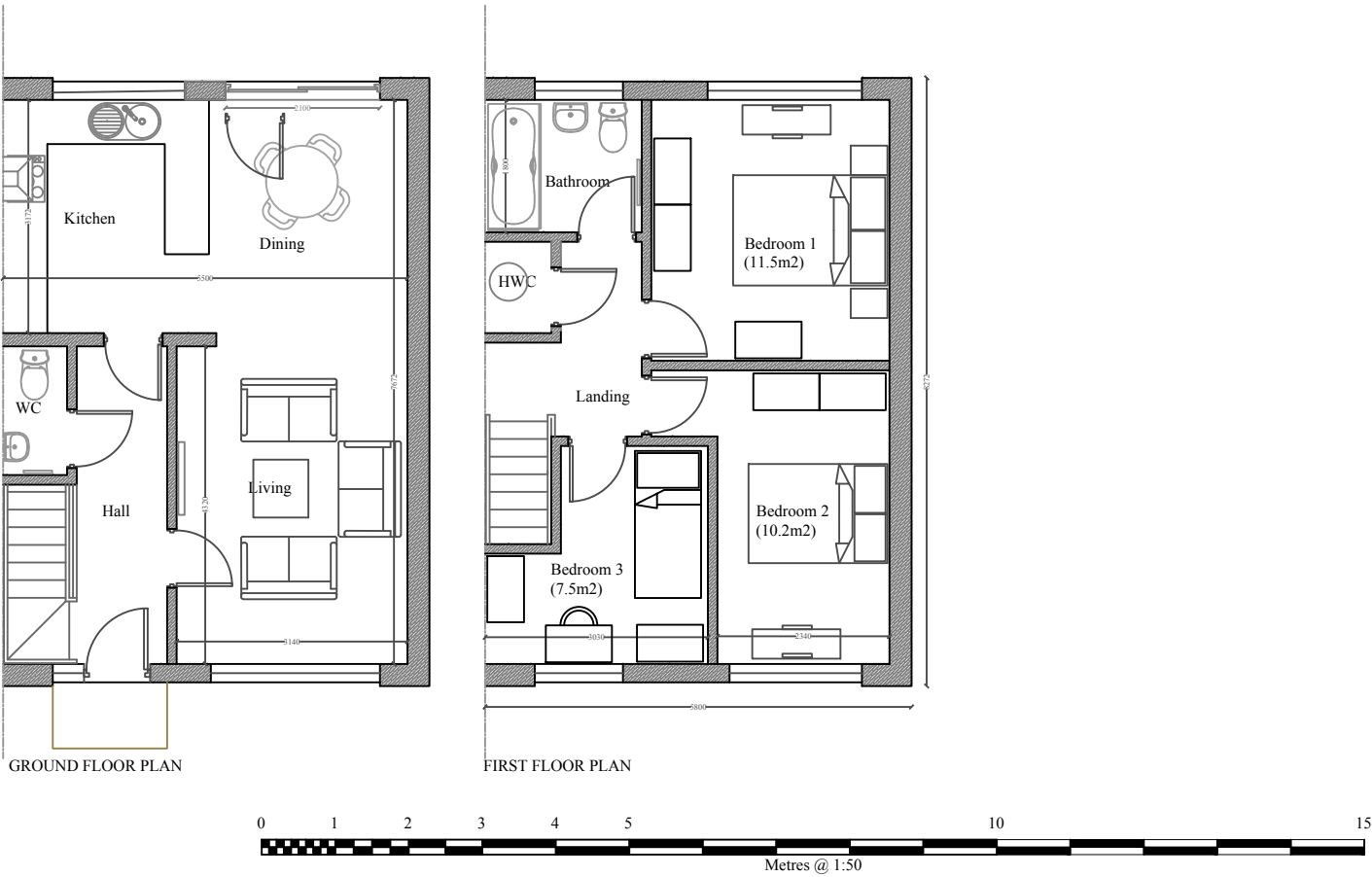
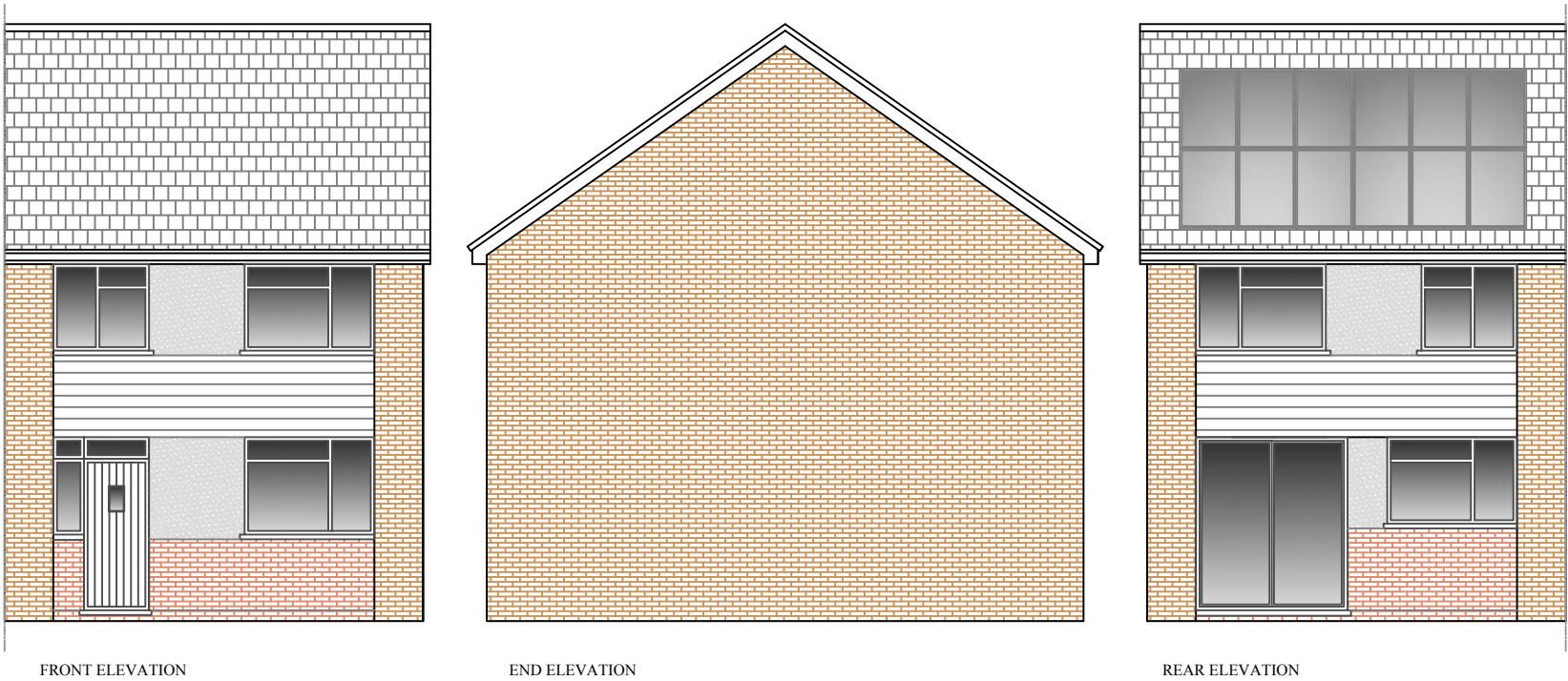






Notes:

Stated scale(s) applicable only when printed at A3.



7 LINNET DRIVE, ATTLEBOROUGH, NORFOLK NR17 2FY - T: 01953 529476 M: 07775 663888

Project: **NEW DWELLING ATTACHED TO 26 KENNEDY AVENUE  
EAST GRINSTEAD, WEST SUSSEX RH19 2DG**

Client: **J. SPENCER Esq.**

Title: **PROPOSED PLANS & ELEVATIONS**

Dwg Nr: **26011/A3/102** Rev: ~ Date: **Jan 2026** Drawn: **GWB** Scale: **1:100**

## Appendix B – UK SuDS Greenfield Estimation

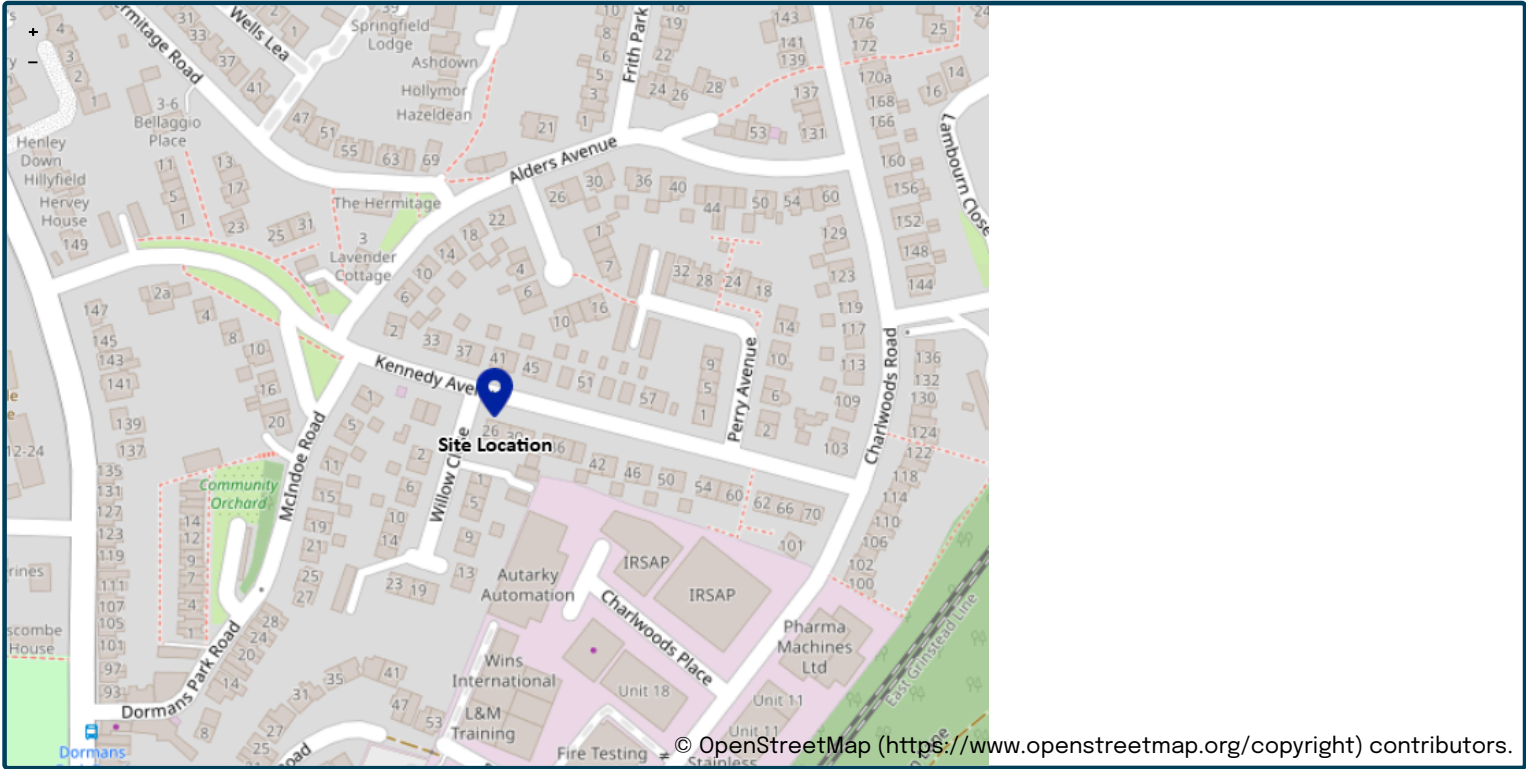
This is an estimation of the greenfield runoff rates that are used to meet normal best practice criteria in line with Environment Agency guidance “Rainfall runoff management for developments”, SC030219 (2013), the SuDS Manual C753 (CIRIA, 2015) and the non-statutory standards for SuDS (Defra, 2015). This information on greenfield runoff rates may be the basis for setting consents for the drainage of surface water runoff from sites.

## Project details

|               |                                         |
|---------------|-----------------------------------------|
| Date          | <input type="text" value="07/08/2026"/> |
| Calculated by | <input type="text"/>                    |
| Reference     | <input type="text"/>                    |
| Model version | <input type="text" value="2.2.3"/>      |

## Location

|               |                                                 |
|---------------|-------------------------------------------------|
| Site name     | <input type="text" value="26A Kennedy Avenue"/> |
| Site location | <input type="text" value="East Grinstead"/>     |



|                                       |                                     |
|---------------------------------------|-------------------------------------|
| Site easting (British National Grid)  | <input type="text" value="538992"/> |
| Site northing (British National Grid) | <input type="text" value="139233"/> |

## Site details

|                      |                                  |    |
|----------------------|----------------------------------|----|
| Total site area (ha) | <input type="text" value=".02"/> | ha |
|----------------------|----------------------------------|----|

# Greenfield runoff

## Method

|        |       |
|--------|-------|
| Method | IH124 |
|--------|-------|

## IH124

|                            |                                             |     |                                  |
|----------------------------|---------------------------------------------|-----|----------------------------------|
|                            | <u>My value</u>                             |     | <u>Map value</u>                 |
| SAAR (mm)                  | <input type="text" value="800"/>            | mm  | <input type="text" value="800"/> |
| How should SPR be derived? | <input type="text" value="WRAP soil type"/> |     |                                  |
| WRAP soil type             | <input type="text" value="4"/>              |     | <input type="text" value="4"/>   |
| SPR                        | <input type="text" value="0.47"/>           |     |                                  |
| QBar (IH124) (l/s)         | <input type="text" value="0.1"/>            | l/s |                                  |

## Growth curve factors

|                        |                                   |  |                                |
|------------------------|-----------------------------------|--|--------------------------------|
|                        | <u>My value</u>                   |  | <u>Map value</u>               |
| Hydrological region    | <input type="text" value="7"/>    |  | <input type="text" value="7"/> |
| 1 year growth factor   | <input type="text" value="0.85"/> |  |                                |
| 2 year growth factor   | <input type="text" value="0.88"/> |  |                                |
| 10 year growth factor  | <input type="text" value="1.62"/> |  |                                |
| 30 year growth factor  | <input type="text" value="2.3"/>  |  |                                |
| 100 year growth factor | <input type="text" value="3.19"/> |  |                                |
| 200 year growth factor | <input type="text" value="3.74"/> |  |                                |

## Results

|                           |                                  |     |
|---------------------------|----------------------------------|-----|
| Method                    | IH124                            |     |
| Flow rate 1 year (l/s)    | <input type="text" value="0.1"/> | l/s |
| Flow rate 2 year (l/s)    | <input type="text" value="0.1"/> | l/s |
| Flow rate 10 years (l/s)  | <input type="text" value="0.2"/> | l/s |
| Flow rate 30 years (l/s)  | <input type="text" value="0.3"/> | l/s |
| Flow rate 100 years (l/s) | <input type="text" value="0.4"/> | l/s |
| Flow rate 200 years (l/s) | <input type="text" value="0.4"/> | l/s |

Please note runoff estimation is subject to significant uncertainty. Results are therefore normally reported to only 1 decimal place. Where 2 decimal places are provided, this does not indicate accuracy to this level, it has been adopted to prevent ‘zero’ figures from being reported. Outputs less than 0.01 l/s are reported as 0.01 l/s.

### Disclaimer

This report was produced using the Greenfield runoff rate estimation tool (2.2.3) developed by HR Wallingford and available at [uksuds.com](https://www.uksuds.com/) (<https://www.uksuds.com/>). The use of this tool is subject to the UK SuDS terms and conditions and licence agreement, which can both be found at [uksuds.com/terms-conditions](https://www.uksuds.com/terms-conditions) (<https://www.uksuds.com/terms-conditions>). The outputs from this tool have been used to estimate Greenfield runoff rates. The use of these results is the responsibility of the users of this tool. No liability will be accepted by HR Wallingford, the Environment Agency, Centre for Ecology and Hydrology, Wallingford Hydrosolutions or any other organisation for the use of these data in the design or operational characteristics of any drainage scheme.

## Appendix C – Surface water calculations

### Design Settings

|                       |                   |                                      |               |
|-----------------------|-------------------|--------------------------------------|---------------|
| Rainfall Methodology  | FSR               | Maximum Time of Concentration (mins) | 30.00         |
| Return Period (years) | 1                 | Maximum Rainfall (mm/hr)             | 50.0          |
| Additional Flow (%)   | 0                 | Minimum Velocity (m/s)               | 1.00          |
| FSR Region            | England and Wales | Connection Type                      | Level Soffits |
| M5-60 (mm)            | 20.000            | Minimum Backdrop Height (m)          | 0.200         |
| Ratio-R               | 0.450             | Preferred Cover Depth (m)            | 1.200         |
| CV                    | 0.750             | Include Intermediate Ground          | ✓             |
| Time of Entry (mins)  | 5.00              | Enforce best practice design rules   | ✓             |

### Nodes

| Name   | Area (ha) | T of E (mins) | Cover Level (m) | Diameter (mm) | Easting (m) | Northing (m) | Depth (m) | Invert Level (m) |
|--------|-----------|---------------|-----------------|---------------|-------------|--------------|-----------|------------------|
| RE 1   | 0.003     | 5.00          | 113.000         | 100           | 538983.972  | 139244.707   | 0.600     | 112.400          |
| SWIC 1 | 0.003     | 5.00          | 113.250         | 450           | 538985.530  | 139232.388   | 0.800     | 112.450          |
| SWIC 2 |           |               | 113.250         | 1200          | 538980.457  | 139233.606   | 1.050     | 112.200          |
| SWIC 3 |           |               | 113.000         | 600           | 538980.465  | 139235.562   | 0.833     | 112.167          |

### Links

| Name  | US Node | DS Node | Length (m) | ks (mm) / n | US IL (m) | DS IL (m) | Fall (m) | Slope (1:X) | Dia (mm) | T of C (mins) | Rain (mm/hr) |
|-------|---------|---------|------------|-------------|-----------|-----------|----------|-------------|----------|---------------|--------------|
| 1.000 | RE 1    | SWIC 2  | 11.644     | 0.600       | 112.400   | 112.200   | 0.200    | 58.2        | 100      | 5.19          | 50.0         |
| 2.000 | SWIC 1  | SWIC 2  | 5.217      | 0.600       | 112.450   | 112.200   | 0.250    | 20.9        | 100      | 5.05          | 50.0         |
| 1.001 | SWIC 2  | SWIC 3  | 1.956      | 0.600       | 112.200   | 112.167   | 0.033    | 59.3        | 100      | 5.22          | 50.0         |

| Name  | Vel (m/s) | Cap (l/s) | Flow (l/s) | US Depth (m) | DS Depth (m) | Σ Area (ha) | Σ Add Inflow (l/s) | Pro Depth (mm) | Pro Velocity (m/s) |
|-------|-----------|-----------|------------|--------------|--------------|-------------|--------------------|----------------|--------------------|
| 1.000 | 1.011     | 7.9       | 0.4        | 0.500        | 0.950        | 0.003       | 0.0                | 15             | 0.521              |
| 2.000 | 1.698     | 13.3      | 0.4        | 0.700        | 0.950        | 0.003       | 0.0                | 12             | 0.756              |
| 1.001 | 1.002     | 7.9       | 0.8        | 0.950        | 0.733        | 0.006       | 0.0                | 21             | 0.640              |

### Simulation Settings

|                      |                   |                            |        |
|----------------------|-------------------|----------------------------|--------|
| Rainfall Methodology | FSR               | Analysis Speed             | Normal |
| Rainfall Events      | Singular          | Skip Steady State          | x      |
| FSR Region           | England and Wales | Drain Down Time (mins)     | 240    |
| M5-60 (mm)           | 20.000            | Additional Storage (m³/ha) | 20.0   |
| Ratio-R              | 0.450             | Starting Level (m)         |        |
| Summer CV            | 0.750             | Check Discharge Rate(s)    | x      |
| Winter CV            | 0.840             | Check Discharge Volume     | x      |

### Storm Durations

|    |    |    |     |     |     |     |     |     |     |     |      |
|----|----|----|-----|-----|-----|-----|-----|-----|-----|-----|------|
| 15 | 30 | 60 | 120 | 180 | 240 | 360 | 480 | 600 | 720 | 960 | 1440 |
|----|----|----|-----|-----|-----|-----|-----|-----|-----|-----|------|

| Return Period<br>(years) | Climate Change<br>(CC %) | Additional Area<br>(A %) | Additional Flow<br>(Q %) |
|--------------------------|--------------------------|--------------------------|--------------------------|
| 1                        | 0                        | 0                        | 0                        |
| 30                       | 0                        | 0                        | 0                        |
| 100                      | 0                        | 0                        | 0                        |
| 100                      | 45                       | 10                       | 0                        |

**Node SWIC 2 Online Hydro-Brake® Control**

|                          |         |                         |                             |
|--------------------------|---------|-------------------------|-----------------------------|
| Flap Valve               | x       | Objective               | (CL) Minimise blockage risk |
| Replaces Downstream Link | x       | Sump Available          | ✓                           |
| Invert Level (m)         | 112.200 | Product Number          | CTL-SCL-0038-5000-0300-5000 |
| Design Depth (m)         | 0.300   | Min Outlet Diameter (m) | 0.075                       |
| Design Flow (l/s)        | 0.5     | Min Node Diameter (mm)  | 1200                        |

**Results for 1 year Critical Storm Duration. Lowest mass balance: 100.00%**

| Node Event       | US<br>Node | Peak<br>(mins) | Level<br>(m) | Depth<br>(m) | Inflow<br>(l/s) | Node<br>Vol (m³) | Flood<br>(m³) | Status |
|------------------|------------|----------------|--------------|--------------|-----------------|------------------|---------------|--------|
| 15 minute winter | RE 1       | 11             | 112.415      | 0.015        | 0.4             | 0.0017           | 0.0000        | OK     |
| 15 minute summer | SWIC 1     | 11             | 112.462      | 0.012        | 0.4             | 0.0028           | 0.0000        | OK     |
| 15 minute winter | SWIC 2     | 14             | 112.290      | 0.090        | 0.8             | 0.1014           | 0.0000        | OK     |
| 15 minute winter | SWIC 3     | 14             | 112.184      | 0.017        | 0.5             | 0.0000           | 0.0000        | OK     |

| Link Event<br>(Upstream Depth) | US<br>Node | Link  | DS<br>Node | Outflow<br>(l/s) | Velocity<br>(m/s) | Flow/Cap | Link<br>Vol (m³) | Discharge<br>Vol (m³) |
|--------------------------------|------------|-------|------------|------------------|-------------------|----------|------------------|-----------------------|
| 15 minute winter               | RE 1       | 1.000 | SWIC 2     | 0.4              | 0.407             | 0.050    | 0.0461           |                       |
| 15 minute summer               | SWIC 1     | 2.000 | SWIC 2     | 0.4              | 0.621             | 0.030    | 0.0185           |                       |
| 15 minute winter               | SWIC 2     | 1.001 | SWIC 3     | 0.5              | 0.538             | 0.064    | 0.0018           | 0.4                   |

**Results for 30 year Critical Storm Duration. Lowest mass balance: 100.00%**

| Node Event       | US<br>Node | Peak<br>(mins) | Level<br>(m) | Depth<br>(m) | Inflow<br>(l/s) | Node<br>Vol (m³) | Flood<br>(m³) | Status     |
|------------------|------------|----------------|--------------|--------------|-----------------|------------------|---------------|------------|
| 30 minute winter | RE 1       | 24             | 112.521      | 0.121        | 0.8             | 0.0131           | 0.0000        | SURCHARGED |
| 30 minute winter | SWIC 1     | 25             | 112.520      | 0.070        | 0.8             | 0.0165           | 0.0000        | OK         |
| 30 minute winter | SWIC 2     | 25             | 112.520      | 0.320        | 1.6             | 0.3624           | 0.0000        | SURCHARGED |
| 30 minute winter | SWIC 3     | 25             | 112.184      | 0.017        | 0.5             | 0.0000           | 0.0000        | OK         |

| Link Event<br>(Upstream Depth) | US<br>Node | Link  | DS<br>Node | Outflow<br>(l/s) | Velocity<br>(m/s) | Flow/Cap | Link<br>Vol (m³) | Discharge<br>Vol (m³) |
|--------------------------------|------------|-------|------------|------------------|-------------------|----------|------------------|-----------------------|
| 30 minute winter               | RE 1       | 1.000 | SWIC 2     | 0.8              | 0.407             | 0.101    | 0.0911           |                       |
| 30 minute winter               | SWIC 1     | 2.000 | SWIC 2     | 0.8              | 0.621             | 0.060    | 0.0358           |                       |
| 30 minute winter               | SWIC 2     | 1.001 | SWIC 3     | 0.5              | 0.540             | 0.064    | 0.0018           | 1.3                   |

**Results for 100 year Critical Storm Duration. Lowest mass balance: 100.00%**

| Node Event       | US<br>Node | Peak<br>(mins) | Level<br>(m) | Depth<br>(m) | Inflow<br>(l/s) | Node<br>Vol (m³) | Flood<br>(m³) | Status     |
|------------------|------------|----------------|--------------|--------------|-----------------|------------------|---------------|------------|
| 30 minute winter | RE 1       | 26             | 112.613      | 0.213        | 1.1             | 0.0230           | 0.0000        | SURCHARGED |
| 30 minute winter | SWIC 1     | 26             | 112.613      | 0.163        | 1.1             | 0.0380           | 0.0000        | SURCHARGED |
| 30 minute winter | SWIC 2     | 26             | 112.612      | 0.412        | 1.9             | 0.4664           | 0.0000        | SURCHARGED |
| 30 minute winter | SWIC 3     | 26             | 112.185      | 0.018        | 0.6             | 0.0000           | 0.0000        | OK         |

| Link Event<br>(Upstream Depth) | US<br>Node | Link  | DS<br>Node | Outflow<br>(l/s) | Velocity<br>(m/s) | Flow/Cap | Link<br>Vol (m³) | Discharge<br>Vol (m³) |
|--------------------------------|------------|-------|------------|------------------|-------------------|----------|------------------|-----------------------|
| 30 minute winter               | RE 1       | 1.000 | SWIC 2     | 0.9              | 0.407             | 0.117    | 0.0911           |                       |
| 30 minute winter               | SWIC 1     | 2.000 | SWIC 2     | 1.1              | 0.621             | 0.081    | 0.0408           |                       |
| 30 minute winter               | SWIC 2     | 1.001 | SWIC 3     | 0.6              | 0.556             | 0.072    | 0.0020           | 1.7                   |

**Results for 100 year +45% CC +10% A Critical Storm Duration. Lowest mass balance: 100.00%**

| Node Event       | US<br>Node | Peak<br>(mins) | Level<br>(m) | Depth<br>(m) | Inflow<br>(l/s) | Node<br>Vol (m³) | Flood<br>(m³) | Status     |
|------------------|------------|----------------|--------------|--------------|-----------------|------------------|---------------|------------|
| 30 minute winter | RE 1       | 28             | 112.854      | 0.454        | 1.7             | 0.0536           | 0.0000        | FLOOD RISK |
| 30 minute winter | SWIC 1     | 28             | 112.854      | 0.404        | 1.7             | 0.0977           | 0.0000        | SURCHARGED |
| 30 minute winter | SWIC 2     | 28             | 112.854      | 0.654        | 1.9             | 0.7394           | 0.0000        | SURCHARGED |
| 30 minute winter | SWIC 3     | 28             | 112.187      | 0.020        | 0.7             | 0.0000           | 0.0000        | OK         |

| Link Event<br>(Upstream Depth) | US<br>Node | Link  | DS<br>Node | Outflow<br>(l/s) | Velocity<br>(m/s) | Flow/Cap | Link<br>Vol (m³) | Discharge<br>Vol (m³) |
|--------------------------------|------------|-------|------------|------------------|-------------------|----------|------------------|-----------------------|
| 30 minute winter               | RE 1       | 1.000 | SWIC 2     | 1.0              | 0.407             | 0.120    | 0.0911           |                       |
| 30 minute winter               | SWIC 1     | 2.000 | SWIC 2     | 1.2              | 0.621             | 0.088    | 0.0408           |                       |
| 30 minute winter               | SWIC 2     | 1.001 | SWIC 3     | 0.7              | 0.588             | 0.088    | 0.0023           | 2.6                   |

## Appendix D – Drainage Strategy Layout

