

# Surface Water strategy report

For the proposed development on land R/O  
95-99 North Bersted Street,  
Bersted, PO22 9AF.

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# 1 Executive Summary

- A All surface water arising can be managed on site.
- B All surface water arising from roofed areas is controlled by direct infiltration through soakaways.
- C All planted areas will be adapted to include bio-retention planting.
- D All areas of hard standing on the site will be constructed using a permeable medium.
- E The project team have detailed “off line” rainwater butt(s) to collect water for external use.
- F There is no design outfall away from the site.
- G All SuDS on site will be installed with full consideration to long term maintenance.
- H Exceedence flows and flows arising from system failure can be accommodated on site.
- I The use of SuDS techniques on site will mitigate and treat the run-off volumes.

## 2 Introduction

## 2.1 Site location

The development is Land to the rear of 95-99 North Bersted Street, Bersted PO22 9AF (see Figure 1).

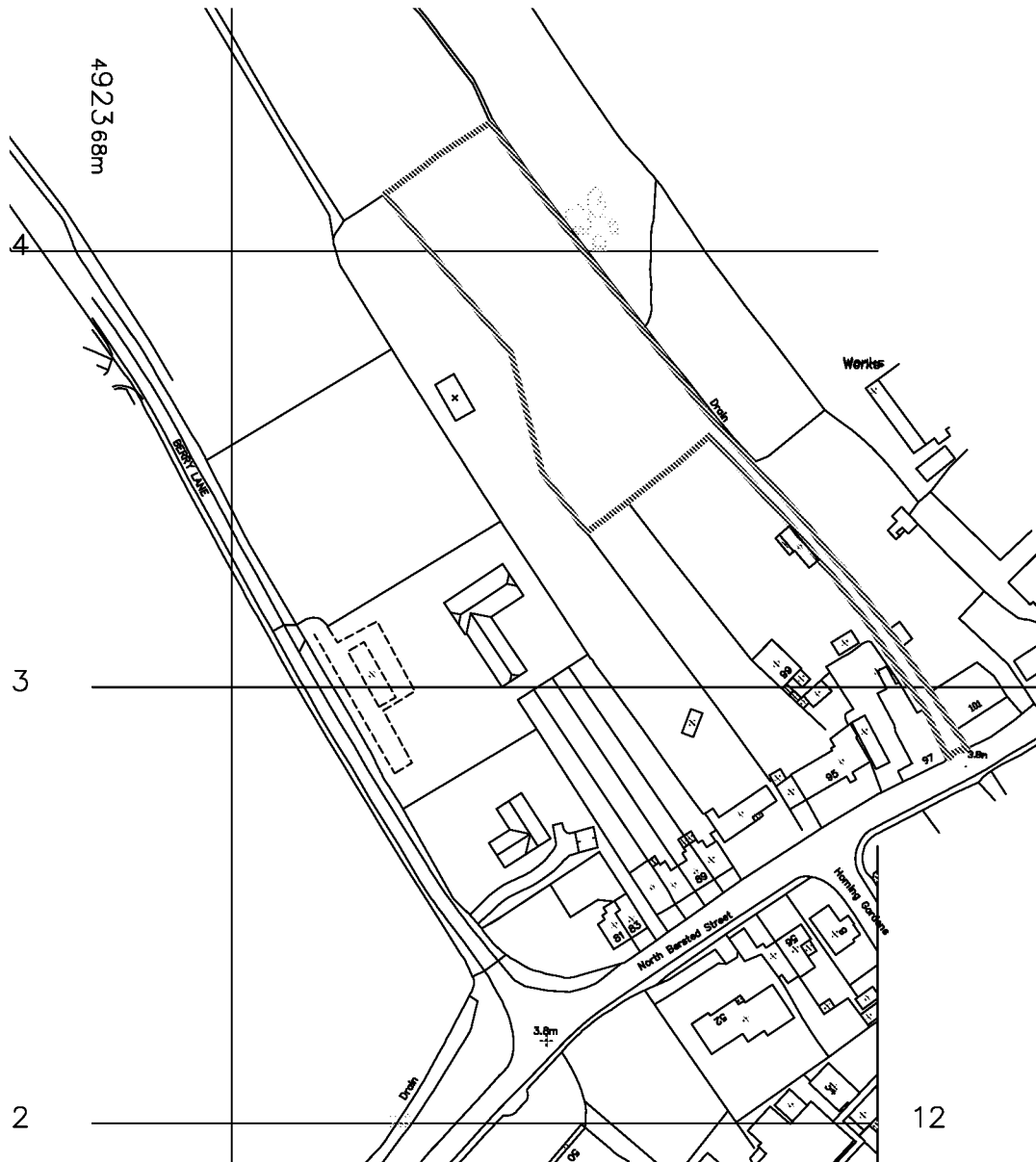


Figure 1: Site location plan, in red (source: As provided by Architect)

## **2.2 Proposed development description**

The proposal is for a 2 bed detached dwelling (proposal plans at Appendix A).

## **2.3 Site geology**

An on-site trial hole investigation (Appendix C) indicates Topsoil over River Terrace Deposits (undifferentiated) - Sand, Silt And Clay

### **2.3.1 Ground water**

Ground water was not encountered in the on-site survey.

### **2.3.2 Infiltration rates**

Infiltration rate for the site has been calculated as  $1.04 \times 10^{-5} \text{ ms}^{-1}$  following infiltration testing to BRE 365 methodology, Appendix C.

## **3 Surface water disposal strategy**

### **3.1 Design Criteria**

In line with the SuDS management train, the following hierarchy will be considered in applying the use of SuDS into the proposed development scheme.

- Source control

### **3.2 Indicative scheme**

The indicative layout of the SuDS on site is shown at Appendix B.

### **3.3 Infiltration devices**

Due to the reasonable infiltration rates associated with the local geology, Section 2.3, infiltration devices appear ideally suited for this site. Therefore, they can be designed to accommodate design rainfall events (i.e. designed in line with BRE365 and Part H of the Building Regulations and at least 5m away from any structure). Any water

delivered from trafficked areas will require oil/silt interception via either commercial units or soft SuDS devices such as perimeter filter strips or bio retention around areas of hard standing.

### 3.3.1 Design

All surface water arising from roofed areas and driveway area is controlled by direct infiltration through a soakaway.

All surface water arising from roofed areas is controlled by direct infiltration through a soakaway. Notes:

- For this report the drained area to the soakaway(s) arises from the area of roof plus a 1 allowance for urban creep.
- The soakaway is designed for all events up to and including the M100 6hr event.
- An allowance of x1.3 is made for climate change in line with current best practice.

Designed to BRE365, and to accommodate all surface water arising from a drained area of 195m<sup>2</sup> requires 1 , concrete ring soakaway(s) of 3.66m internal diameter in a minimum 4.2m by 4.2m excavation (allows a minimum 100mm stone surround) with a 1.2m effective depth. See Table 1 and Figure 2.

|                       |          |                  |
|-----------------------|----------|------------------|
| Permeability          | 1.00E-05 | ms <sup>-1</sup> |
| Urban Creep           | 1        |                  |
| Drained area          | 195      | m <sup>2</sup>   |
| Designed drained area | 195      | m <sup>2</sup>   |
| Return Period         | 100      | yr               |
| Climate change        | 1.3      |                  |

|                                 |      |
|---------------------------------|------|
| Design diameter, m              | 3.66 |
| Design Depth <sub>eff</sub> , m | 1.2  |
| Design Qty                      | 1    |

|                                   |      |      |      |      |      |      |      |      |      |       |
|-----------------------------------|------|------|------|------|------|------|------|------|------|-------|
| Duration, mins                    | 5    | 10   | 15   | 30   | 60   | 120  | 240  | 360  | 600  | 1440  |
| Rainfall, mm                      | 17.8 | 26.5 | 32.1 | 42.1 | 52.7 | 63.6 | 74.6 | 81.3 | 90.4 | 107.8 |
| Volume in, m <sup>3</sup>         | 3.5  | 5.2  | 6.3  | 8.2  | 10.3 | 12.4 | 14.5 | 15.9 | 17.6 | 21    |
| Volume out, m <sup>3</sup>        | 0    | 0.1  | 0.1  | 0.2  | 0.4  | 0.7  | 1.5  | 2.2  | 3.6  | 8.7   |
| Balance vol req'd, m <sup>3</sup> | 3.5  | 5.1  | 6.2  | 8    | 9.9  | 11.7 | 13   | 13.7 | 14   | 12.3  |

|                                        |       |
|----------------------------------------|-------|
| Crit balance vol req'd, m <sup>3</sup> | 14.0  |
| Vol in core, m <sup>3</sup>            | 12.6  |
| Vol in stone surround, m <sup>3</sup>  | 1.7   |
| Balance vol provided, m <sup>3</sup>   | 14.4  |
| Crit Duration, mins                    | 600   |
| Empty to 50%, hrs                      | 19.29 |

Table 1: BRE 365 Calculation results

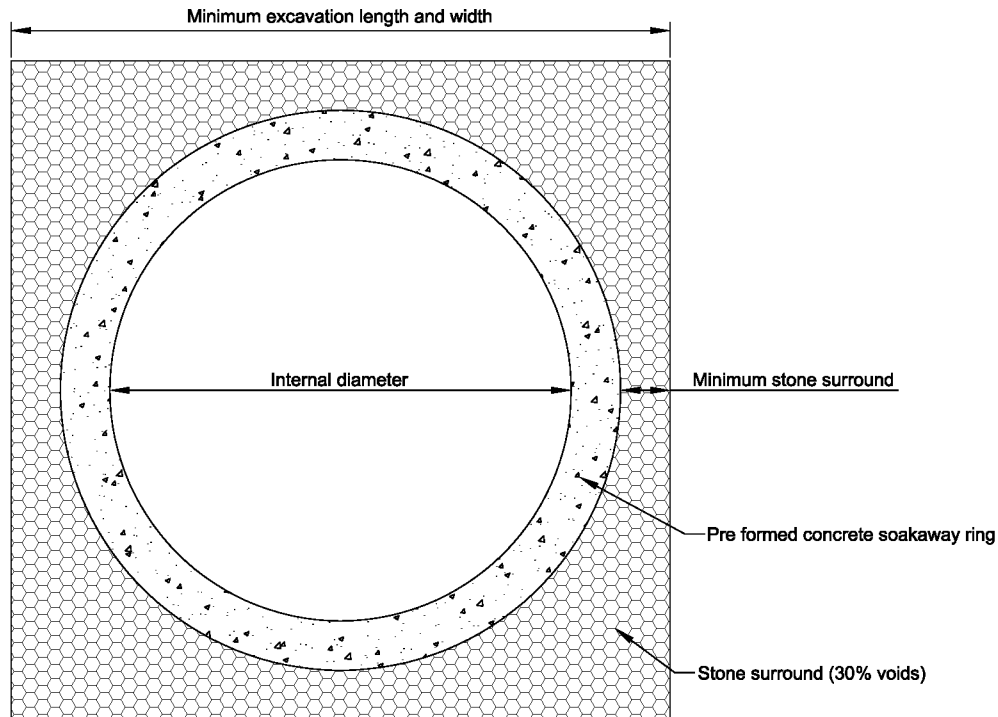


Figure 2: Preformed concrete soakaway setting out

### 3.3.2 Sedimentation risk

Domestic roofing carries a very low sediment loading. Worst case  $216 \text{ kg} \cdot \text{ha}^{-1} \cdot \text{yr}^{-1}$  - so for this site that equates to circa  $4.2 \text{ kg} \cdot \text{yr}^{-1}$  in the worst case. Generally this would reduce the attenuation capacity by circa 2% over 50yrs (all data from the SuDS manual). The design allows for this amount with extra capacity provided to a 100yr design life. The BRE 365 method acknowledges this sedimentation and hence the base area is not considered in the sizing calculations.

### 3.3.3 Minimising sedimentation risk

However, the developer will fit accessible sumped rainwater gulleys at the base of all RWP's so as to reduce the amount of any sediment entering the soakaway.

The developer will also fit downpipe leaf guards to all outfalls from the roof (or "hedgehog" gutter guards).

All soakaways offer sufficient volume to accommodate the 5mm event.

### 3.3.4 Alternative crate style soakaway

If access is restricted such that concrete rings cannot be used, a plastic crate alternative is provided:

All surface water arising from roofed areas is controlled by direct infiltration through a soakaway. Notes:

- For this report the drained area to the soakaway(s) arises from the area of roof plus a 1 allowance for urban creep.
- The soakaway is designed for all events up to and including the M100 6hr event.
- An allowance of x1.3 is made for climate change in line with current best practice.

Designed to BRE365, and to accommodate all surface water arising from a drained area of 195m<sup>2</sup> requires 1 , open void (i.e. 95%), soakaway(s) of 3.6m wide x 3.5m long with a 1.2m effective depth. See Table 2.

|                       |          |                  |
|-----------------------|----------|------------------|
| Permeability          | 1.00E-05 | ms <sup>-1</sup> |
| Urban Creep           | 1        |                  |
| Drained area          | 195      | m <sup>2</sup>   |
| Designed drained area | 195      | m <sup>2</sup>   |
| Return Period         | 100      | yr               |
| % voids               | 95       | %                |
| Climate change        | 1.3      |                  |

|                                 |     |
|---------------------------------|-----|
| Design Width, m                 | 3.6 |
| Design Depth <sub>eff</sub> , m | 1.2 |
| Design Qty                      | 1   |

|                           |      |      |      |      |      |      |      |      |      |       |
|---------------------------|------|------|------|------|------|------|------|------|------|-------|
| Duration, mins            | 5    | 10   | 15   | 30   | 60   | 120  | 240  | 360  | 600  | 1440  |
| Rainfall, mm              | 17.8 | 26.5 | 32.1 | 42.1 | 52.7 | 63.6 | 74.6 | 81.3 | 90.4 | 107.8 |
| Volume in, m <sup>3</sup> | 3.5  | 5.2  | 6.3  | 8.2  | 10.3 | 12.4 | 14.5 | 15.9 | 17.6 | 21    |
| Length req'd, m           | 0.8  | 1.3  | 1.5  | 2    | 2.4  | 2.9  | 3.2  | 3.4  | 3.5  | 3.4   |

|                     |       |
|---------------------|-------|
| Crit Length, m      | 3.5   |
| Crit Duration, mins | 600   |
| Empty to 50%, hrs   | 23.54 |

Table 2: BRE 365 Calculation results

### 3.3.5 Sedimentation risk

Domestic roofing carries a very low sediment loading. Worst case 216 kg.ha<sup>-1</sup>yr<sup>-1</sup> - so for this site that equates to circa 4.2kg.yr<sup>-1</sup> in the worst case. Generally this would reduce the attenuation capacity by circa 2% over 50yrs (all data from the SuDS manual). The design allows for this amount with extra capacity provided to a 100yr design life. The BRE 365 method acknowledges this sedimentation and hence the base area is not considered in the sizing calculations.

### **3.3.6 Minimising sedimentation risk**

However, the developer will fit accessible sumped rainwater gulleys at the base of all RWP's so as to reduce the amount of any sediment entering the soakaway.

The developer will also fit downpipe leaf guards to all outfalls from the roof (or "hedgehog" gutter guards).

## **3.4 Permeable hard standing**

### **3.4.1 Permeable paving**

So as to reduce overall soakaway size, where practicable, all areas of hard standing on the site will be constructed using a permeable medium.

A 30% void ratio is assumed through a 350mm sub-base. This is appropriate for a DOT Type 3 Sub-base hence the storage capacity equates to circa 105mm per 1m<sup>2</sup> therefore based on a M6 100hr + cc storm of 87mm rainfall the paving offers, without any allowance for infiltration, a circa 1:1.2 drained volume:storage volume capacity. Hence there is no anticipated exceedence flow from the areas of permeable paving.

TSS 0.7, Metals 0.6, Hydrocarbons 0.7 = suitable for trafficked areas

All permeable paving offers sufficient storage volume to accommodate the 5mm event.

## **3.5 Rainwater harvesting**

### **3.5.1 For external use**

Rain water harvesting / water butts: These provide additional, "off line" SuDS, and are deemed a suitable SuDS component for small plots<sup>[1]</sup>. The collection and re-use of water can reduce run off volumes arising from roofs. The collected water, via readily available diverters, being used for external uses. The project team have detailed "off line" rainwater butt(s) to collect water for external use.

## **3.6 Landscaped areas**

There is no anticipated exceedence flow from the areas of garden planting or perimeter Bio retention.

### 3.7 Building Regulations

All drainage on site, both foul and SW will be subject to compliance with Part H of the Building Regulations. Hence all SW runs, pipe diameters etc. will comply in full with the requirements of Part H, be designed following the guidance of Approved Document H, and be inspected and approved by the Building Control body at the time of construction.

#### 3.7.1 SW pipes

SW drain 100mm diameter laid at no less than 1:100 - provides 6 ls<sup>-1</sup> max flow capacity.

#### 3.7.2 Foul pipes

Single dwelling - peak flow 2.5ls<sup>-1</sup>(Part H; Table 6)

At least 1 WC.

FW drain 100mm diameter **laid to a laser level** to falls no less than 1:80 (1:40 if no laser level used).

### 3.8 Maintenance of SuDS

Ultimate responsibility for the long term maintenance with SuDS in this environment lay with the land owner/management company.

All SuDS on site will be installed with full consideration to long term maintenance. The following guidance applies:

#### 3.8.1 Soakaways

Figure 3<sup>[1]</sup> provides details maintenance operations required for a soakaway system.

| Maintenance schedule   | Required action                                                                                                                          | Typical frequency                              |
|------------------------|------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------|
| Regular maintenance    | Inspect for sediment and debris in pre-treatment components and floor of inspection tube or chamber and inside of concrete manhole rings | Annually                                       |
|                        | Cleaning of gutters and any filters on downpipes                                                                                         | Annually (or as required based on inspections) |
|                        | Trimming any roots that may be causing blockages                                                                                         | Annually (or as required)                      |
| Occasional maintenance | Remove sediment and debris from pre-treatment components and floor of inspection tube or chamber and inside of concrete manhole rings    | As required, based on inspections              |
| Remedial actions       | Reconstruct soakaway and/or replace or clean void fill, if performance deteriorates or failure occurs                                    | As required                                    |
|                        | Replacement of clogged geotextile (will require reconstruction of soakaway)                                                              | As required                                    |
| Monitoring             | Inspect silt traps and note rate of sediment accumulation                                                                                | Monthly in the first year and then annually    |
|                        | Check soakaway to ensure emptying is occurring                                                                                           | Annually                                       |

Figure 3: Maintenance operations for soakaway

### 3.8.2 Permeable pavements

The maintenance plan for rainwater harvesting devices will include:

- Monthly litter removal;
- Bi-Annual suction sweeping.
- Annual inspection and repairs as/if required.

### 3.8.3 Oil and silt interceptors

The maintenance plan for any oil/silt interceptors will include:

- Regular inspection (initially monthly) and cleaning to assess sediment and oil levels
- Vehicular access required.

## 3.9 Summary

All surface water arising can be managed on site using SuDS. There is no design exceedence outfall away from the site. Exceedence flows and flows arising from system

failure can be accommodated on site within areas of bgarden planting, attenuation crates and the sub-base to the hard standing.

The use of SuDS techniques on site, as detailed above and when installed in line with best practice (I.e. CIRIA 753 & CIRIA 768), will mitigate and treat the run-off volumes in line with the core policies.

Signed



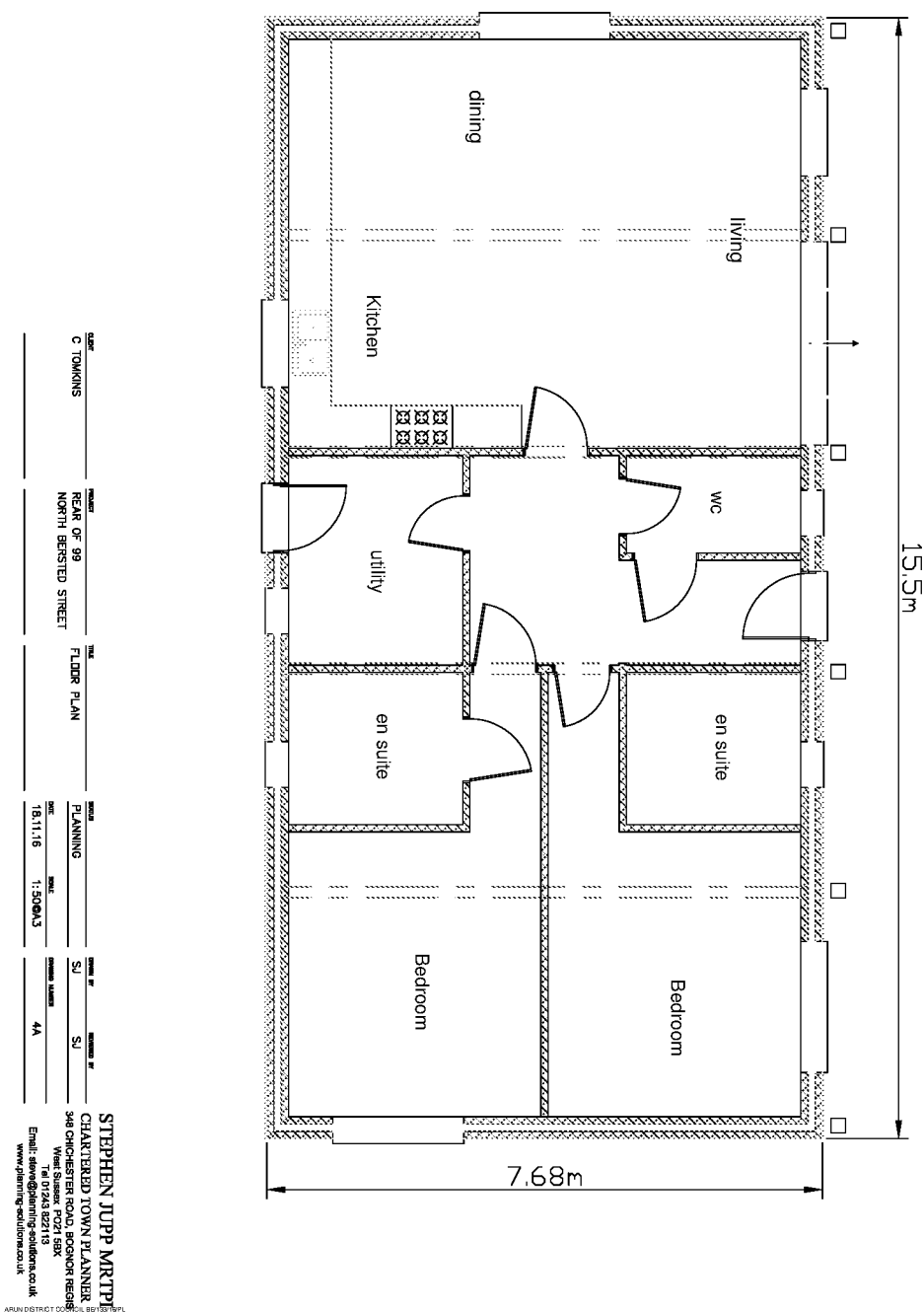
Dr Robin Saunders C. Build E, MCABE, BEng(Hons), PhD

Date: 6<sup>th</sup> June, 2018

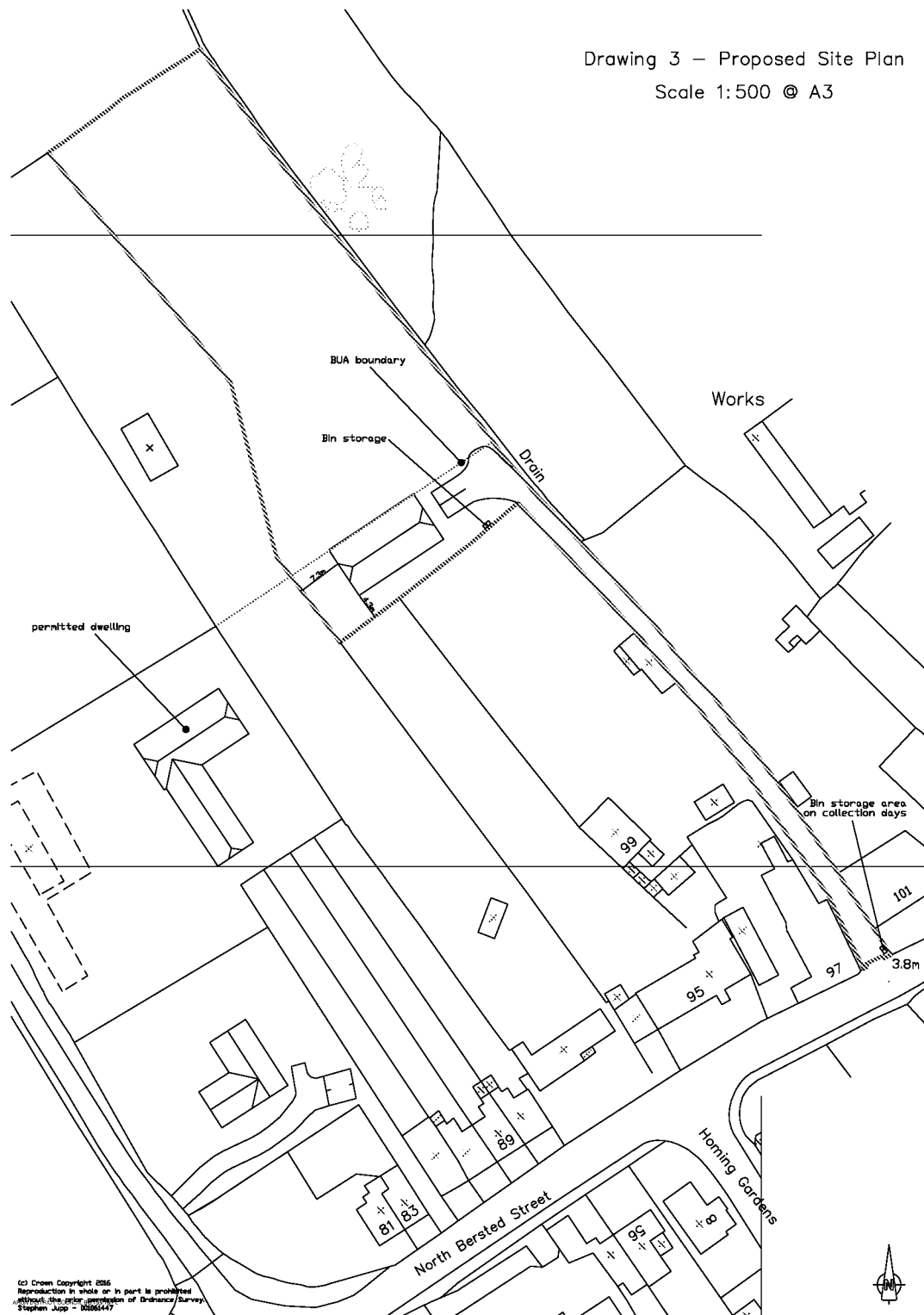
## References

[1] CIRIA. The SUDS manual. Technical report, CIRIA, 2015.

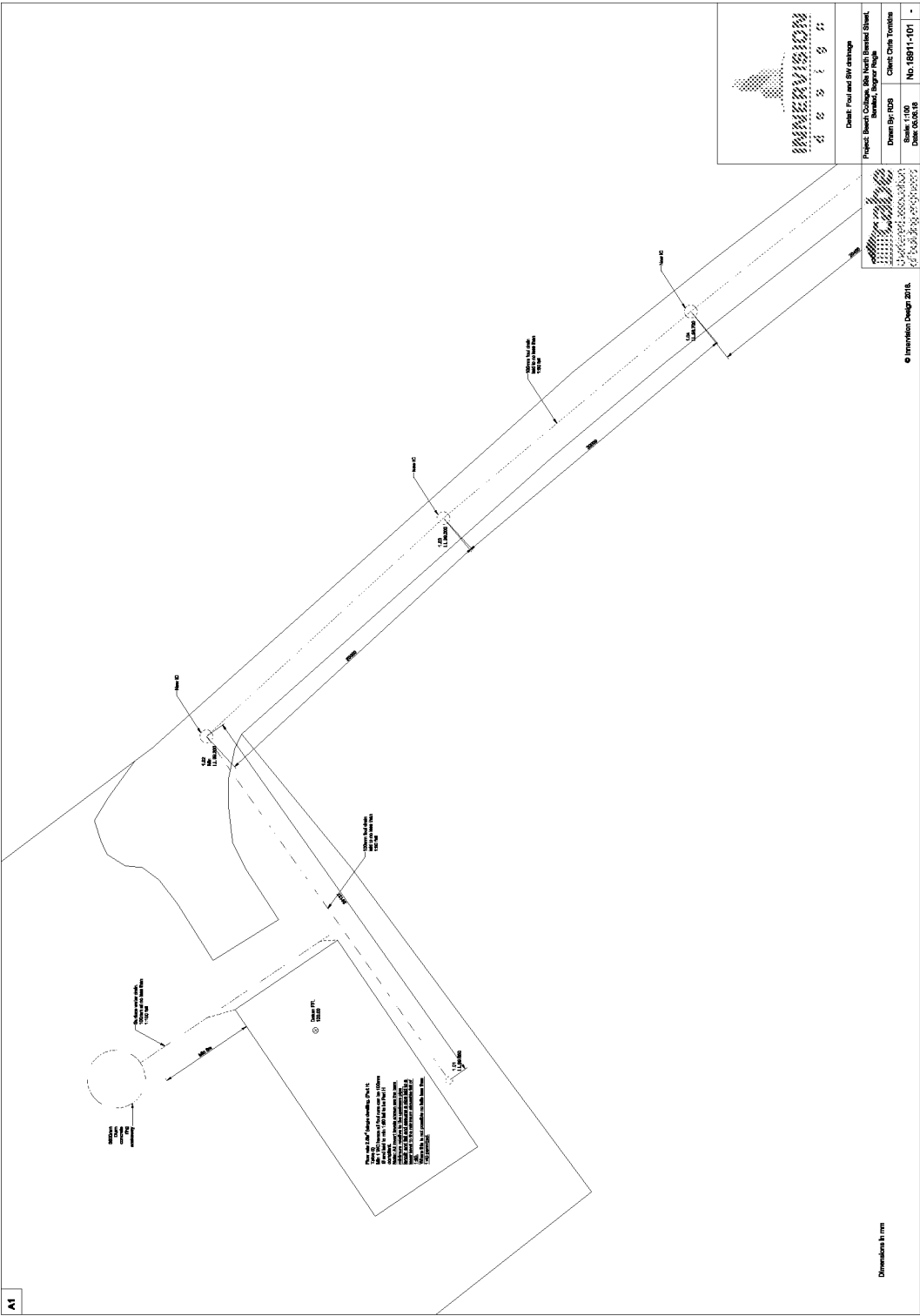
A Proposal plans

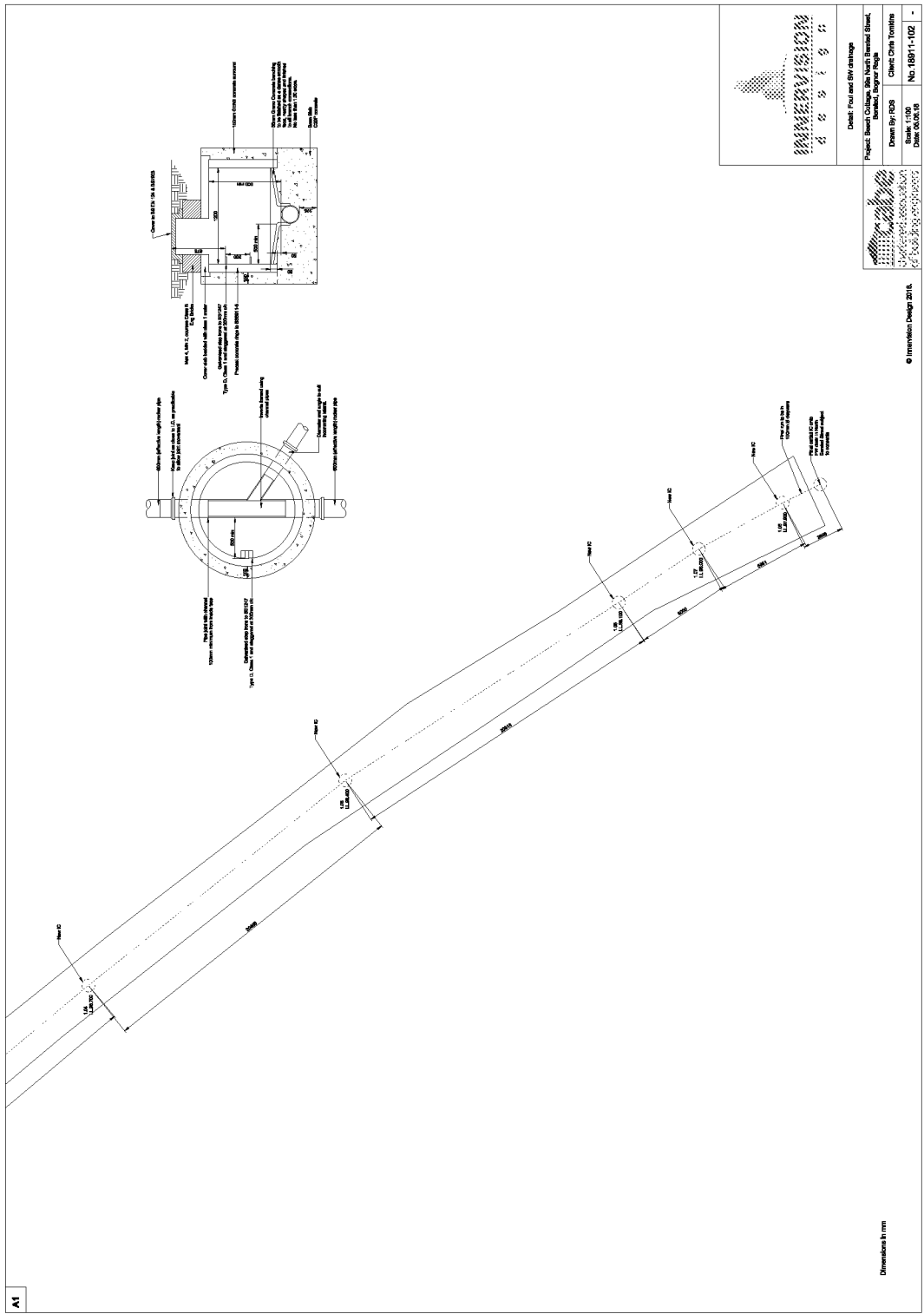


Drawing 3 – Proposed Site Plan  
Scale 1:500 @ A3



# B Indicative drainage (SuDS) plan





## C Infiltration test results

“We have dug a trial pit measuring 1.5m deep x .7m long x 0.5m wide . Filled the pit to the top let it totally drain out to check that it had all gone in 24 hours it did, it was completely empty in under 6 hours easily . On 3.3.2018 filled the pit full let the water drain to 75% full so water was 1.125m deep and timed it until it was 25% full with a depth of 0.375m left in it . Time taken 75% to 25% was 230 minutes. On 28.5.2018 repeated the test as above , time taken 75% to 25% was 195 minutes”

From this an infiltration rate of  $1.04 \times 10^{-5} \text{ ms}^{-1}$  can be calculated in the worst case (first test - 230 mins).