Cotefield Business Park

REVISION: V1

DATE: 30 OCTOBER 2020

# Drainage Strategy Report

SOLID.

Structures & Infrastructure

# Drainage Strategy Report
# Cotefield Business Park

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| | |
|---|---|
| **Job Number** | 1831S |
| **Document Reference** | CFD-SOLID-XX-XX-RP-C-001 |
| **Date** | 30/10/2020 |

## PROJECT DETAILS

| | |
|---|---|
| **Title:** Drainage Strategy | |
| **SOLID Job No:** 1831M | **SOLID Doc Ref:** CFD-SOLID-XX-XX-RP-C-001 |
| **Date:** 30/10/2020 | **Status:** Planning |
| **Rev:** P01 | **Issued by:** Argemiro Rivera |

**Status Key:** S0 – Preliminary | S1 – Co-ordination | S2 – Information | S3 – Comment S4 – Approval RIBA Stage 2, 3, 4, Client, Planning, Building Regulations

## APPROVAL

| Prepared by: | Reviewed by: | Approved by: |
|---|---|---|
| [redacted] | | |
| Arge Rivera – Associate Director | Arge Rivera – Associate Director | Arge Rivera – Associate Director |

## REVISION HISTORY

| Rev: | Comment: | Approved by: |
|---|---|---|
| Rev: | Comment: | Approved by: |
| Rev: | Comment: | Approved by: |

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## Table of Contents

# Drainage Strategy Report

## 1. INTRODUCTION

### 1.1. Objective of this report

The objective of this document is to determine the strategy for the disposal of surface water produced as a result of the development of the site located to the west of the A4260 Oxford Road, Bodicote, Banbury OX15 4AQ.

### 1.2 Constraints and limitations

The information presented in this report is based on a review of site visits and site investigations supplied by third parties. No warranty can be given on its accuracy and validity. This report excludes consideration of potential hazards arising from any activities at the Site other than normal use and occupancy for the intended land use. Hazards associated with any other activities have not been assessed and must be subject to a specific risk assessment by the responsible parties.

### 1.3 Purpose of this report

As part of this study a number of records and third party consultations have been undertaken. The main documents reviewed were:

**Third Party**

- Thames Water
- Ground Investigation

**Key Documents:**

- EA desktop information
- Desktop ground information

# 2. SITE INFORMATION

## 2.1 Existing Site

The site is located to the west of the A4260 Oxford Road, Bodicote, Banbury OX15 4AQ at Ordnance Survey National Grid Reference SP 468 374. The site currently is an overflow parking area for the Business Park and as a construction compound for the adjacent housing development. The car park finish is well compacted Type 1 as such this surface is considered to be semi impermeable.

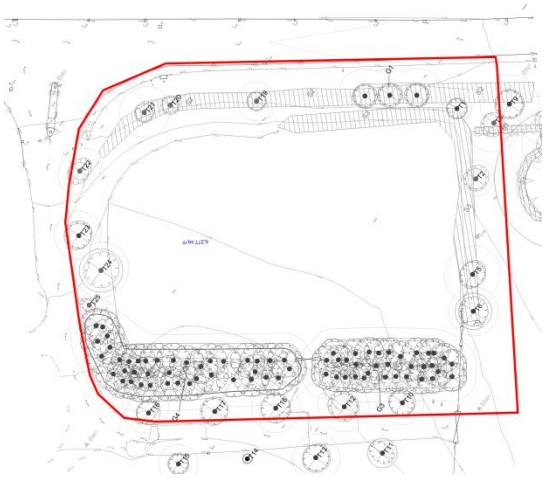

Figure 1: Existing site

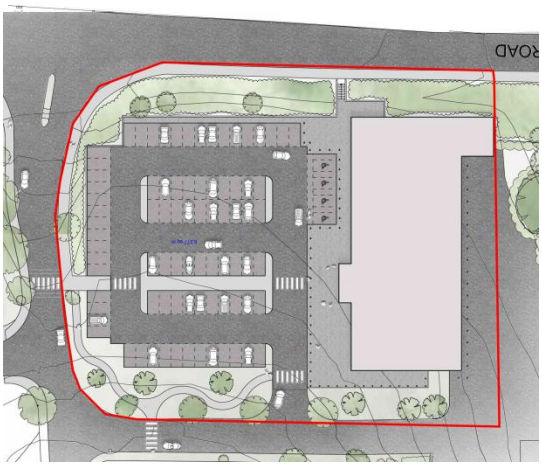

Figure 2: Proposed site

## 2.1 Proposed Development

It is proposed a new building to be used as a food retail store and supermarket. The external areas are the access road and parking areas.

Please refer to **Appendix A** for details of the existing and proposed site layout.

Table1: Existing and Proposed distribution of permeable and impermeable areas. The total site area does not correspond to the planning area.

| Areas Description | Existing Site (Ha) | Redeveloped Site (Ha) |
|---|---|---|
| Total Site Area | 0.628 | 0.628 |
| Impermeable Surface | 0.320 | 0.193 |

Total Permeable area of the redeveloped site: 0.23 Ha

# 3. ASSESSMENT AND MITIGATION OF FLOOD RISKS TO THE SITE

The sources of flooding and specific mitigation are described in table 3 below.

Table 2: Source of flooding assessment and mitigation

| Source of Flooding | Assessment | Mitigation |
|---|---|---|
| Flooding from water courses onto site (Fluvial) | The EA flood maps show that the site is located within Flood Zone 1.<br>For this site the probability of flooding is likely to be low. | No mitigation is required |
| Flooding from groundwater | The SFRA flood map shows that the site is not susceptible to groundwater flooding. | No mitigation is required |
| Tidal/coastal | Site is not near coast | Not applicable |
| Surface water (overland flows) | The EA flood map shows that the site is at LOW risk of flooding from surface water.<br>The likelihood of overland flows in minimal as the flows are intercepted by the public road before they come onto the site. | No mitigation is required |
| Canals | Site is not near to a canal | Not applicable |
| Reservoirs | The development is outside of the area that could be flooded if a large reservoir were to fail. | No mitigation is required |

## 4. SUSTAINABLE DRAINAGE SYSTEM HIERARCHY AND DISCHARGE POINT

The SuDS techniques were evaluated in relation to the available site information and site visits. The aim is to provide a sustainable design that could accommodate the proposed attenuation volume and replicated the existing drainage regime. The SuDS hierarchy is shown in Figure 2 below.

Figure 2: The SuDS Hierarchy (Source:EA Thames region, 21006, SuDS a practical guide)

| | SUDS technique | Flood Reduction | Pollution Reduction | Landscape & Wildlife Benefit |
|---|---|---|---|---|
| Most Sustainable | **Living roofs** | ✔ | ✔ | ✔ |
| | **Basins and ponds**<br>- Constructed wetlands<br>- Balancing ponds<br>- Detention basins<br>- Retention ponds | ✔ | ✔ | ✔ |
| | **Filter strips and swales** | ✔ | ✔ | ✔ |
| | **Infiltration devices**<br>- soakaways<br>- infiltration trenches and basins | ✔ | ✔ | ✔ |
| | **Permeable surfaces and filter drains**<br>- gravelled areas<br>- solid paving blocks<br>- porous paviors | ✔ | ✔ | |
| Least Sustainable | **Tanked systems**<br>- over-sized pipes/tanks<br>- storms cells | ✔ | | |

Permeable surfacing will be provided on the driveway and parking areas.

Infiltration testing has been carried out. The soakaway tests were over excavated by 1.5m below the based and left open. No ground water was found.

Based on the results of the soakaway tests the permeability rate is 5.836 x10-5 m/s (0.21009m/hr) at a depth of 1.5m bgl. The infiltration rate at shallow depth (0.65m bgl) is 5.086 x10-6m/s (0.18309m/hr).

See **Appendix C** for details.

# 5. SURFACE WATER DRAINAGE SYSTEM

## 5.1 Proposed Surface Water System

A pipe system will convey the surface water from the roof and hard surfaces to the shallow infiltration systems. Please refer to **Appendix D** for the drainage strategy which shows the pipe networks (pipe sizes and gradients), inspection chambers and the proposed soakaway locations. Microdrainage calculations are attached in **Appendix D**.

| | **Existing Site Discharge Rate l/s** | **Proposed Site Discharge Rate m/hr** |
|---|---|---|
| **1 in 2 (Qbar)** | 1.4 | 0.18309 |
| **1 in 30** | 3.2 | 0.18309 |
| **1 in 100** | 4.5 | 0.18309 |
| **1 in 100 +40%** | N/A | 0.18309 |

Treatment will be provided by the permeable surfacing.

## 5.2 Designing For Exceedence

The model results confirmed that the site will maintain all the flows produced by the 1:100+CC events. Should a storm greater that this magnitude occurs or the system fails, the soft and hard landscaping areas are designed to route flows away from the properties and maintain emergency access/egress routes clear.

All flood water will be directed towards the Open field and away from the new development.

The drainage strategy drawing **in Appendix D** shows the intended routes of surface water during exceedance events.

## 6. MAINTENANCE

Maintenance and Management Plan Guidance from SuDS, CIRIA C753 (2015)is to be followed for the effective maintenance of the proposed SuDS techniques.

**TABLE 20.15 Operation and maintenance requirements for pervious pavements**

| Maintenance schedule | Required action | Typical frequency |
|---|---|---|
| Regular maintenance | Brushing and vacuuming (standard cosmetic sweep over whole surface) | Once a year, after autumn leaf fall, or reduced frequency as required, based on site-specific observations of clogging or manufacturer's recommendations – pay particular attention to areas where water runs onto pervious surface from adjacent impermeable areas as this area is most likely to collect the most sediment |
| Occasional maintenance | Stabilise and mow contributing and adjacent areas | As required |
| | Removal of weeds or management using glyphospate applied directly into the weeds by an applicator rather than spraying | As required – once per year on less frequently used pavements |
| Remedial Actions | Remediate any landscaping which, through vegetation maintenance or soil slip, has been raised to within 50 mm of the level of the paving | As required |
| | Remedial work to any depressions, rutting and cracked or broken blocks considered detrimental to the structural performance or a hazard to users, and replace lost jointing material | As required |
| | Rehabilitation of surface and upper substructure by remedial sweeping | Every 10 to 15 years or as required (if infiltration performance is reduced due to significant clogging) |
| Monitoring | Initial inspection | Monthly for three months after installation |
| | Inspect for evidence of poor operation and/or weed growth – if required, take remedial action | Three-monthly, 48 h after large storms in first six months |
| | Inspect silt accumulation rates and establish appropriate brushing frequencies | Annually |
| | Monitor inspection chambers | Annually |

# Appendix A

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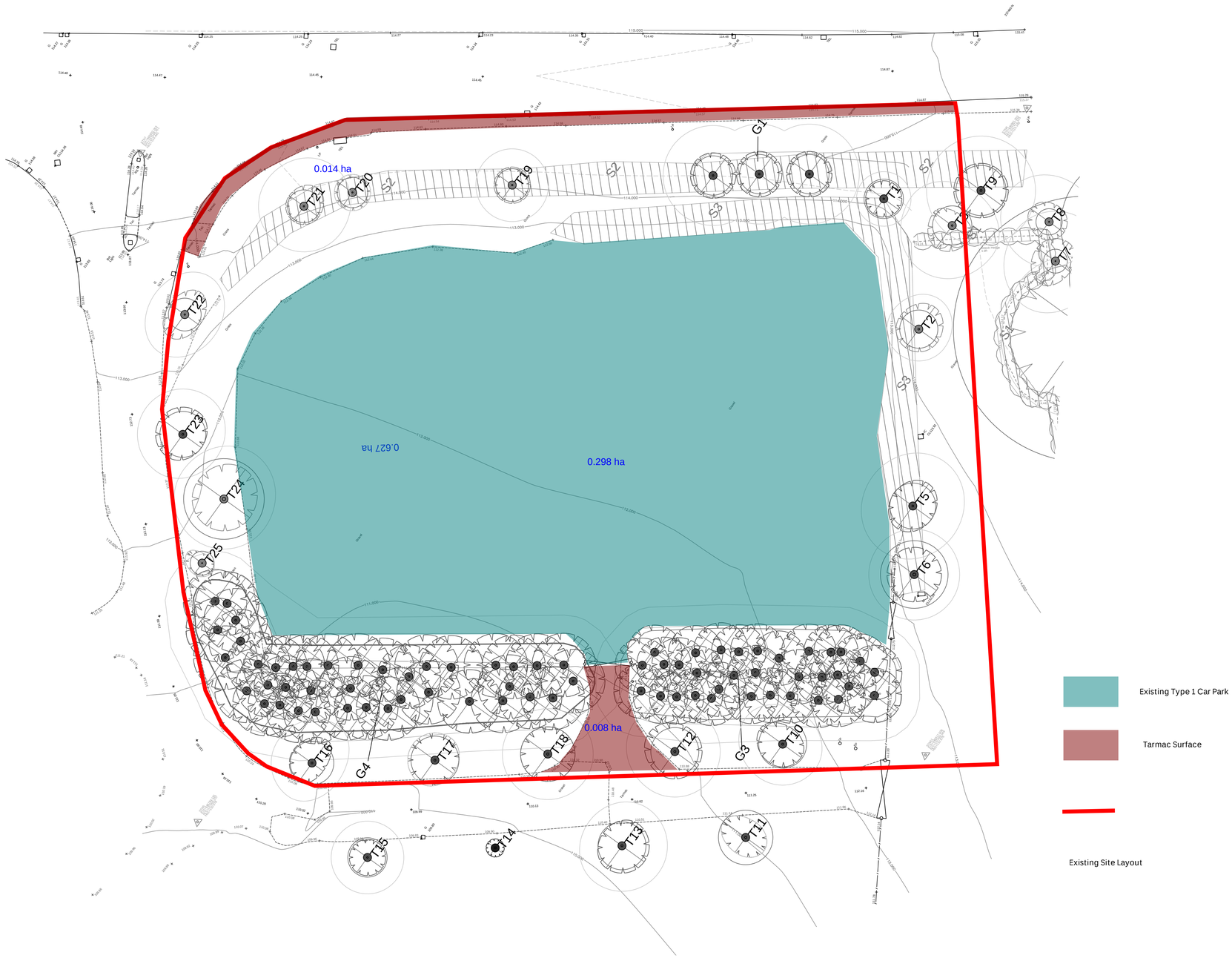
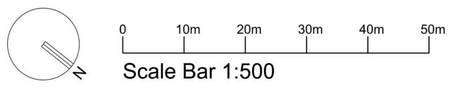

0.014 ha
0.627 ha
0.298 ha
0.008 ha
G1
G2
G3
G4
T1
T2
T3
T4
T5
T6
T7
T8
T9
T10
T11
T12
T13
T14
T15
T16
T17
T18
T19
T20
T21
T22
T23
T24
T25
S1
S2
S3
Existing Type 1 Car Park
Tarmac Surface
Existing Site Layout

DO NOT SCALE FROM THIS DRAWING - Figured dimensions only to be used for setting out.
Any dimensional discrepancies found on site are to be brought to the attention of the architect or contract adminstrator immediately. IF IN DOUBT ASK!


# Planning

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Project: Cotefield Farm

Drawing Title: Proposed Site Plan

Client: Will Bratt

Job No: 39042

Drawing No: 05 rev. -

Date: Mar 2019

Drawn: BM Checked: -

Scale: 1:500@A1

# Appendix C

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# BRE365 Soil Infiltration Rate Calculations
# Cotefield Business Park

| | |
|---|---|
| Solid Job No: | 1831S |
| Solid Doc Ref: | 1831S-BBC-SOLID-XX-UD-CA-C-001 |
| Date: | 30/10/2020 |


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| PROJECT DETAILS | |
|---|---|
| **Title:** Soil Infiltration Rate calculations report | |
| **Solid Job No:** 1831S | **Solid Doc Ref:** 1831S-BBC-SOLID-XX-UD-CA-C-001 |
| **Date:** 30/10/2020 | **Status:** S4 - Building Regs |
| **Rev:** P01 | **Issued by:** ARD |

## CONTENTS

| APPROVAL | | |
|---|---|---|
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| [redacted] | | |

| REVISION HISTORY | | |
|---|---|---|
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| Rev: | Comment: | Approved by: |
| Rev: | Comment: | Approved by: |

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# SOAKAWAY TRIAL PIT 1

**Pit Dimensions:**

| | | |
|---|---|---|
| L: | 950 | mm |
| W: | 850 | mm |
| D: | 1200 | mm |

Key

| | |
|---|---|
| | Input |
| | Calculation |

## Test 1

| Time Since Start | Water Level from ground level | Depth of water |
|---|---|---|
| min | mm | mm |
| 0 | 223 | 977 |
| 15 | 481 | 719 |
| 30 | 696 | 504 |
| 45 | 878 | 322 |
| 60 | 1054 | 146 |
| 75 | 1200 | 0 |
| | | |
| | | |
| | | |
| | | |
| | | |

Mean Surface Area: 2.57 m2
Depth of water at start of test: 977 mm
Time at 25% or at: 244.3 mm of water

Interpolating Values

| Time | Water Depth |
|---|---|
| 45 | 322 |
| 60 | 146 |

t: 51.63 min. From interpolating values

Time at 75% or at: 732.8 mm of water

Interpolating Values

| Time | Water Depth |
|---|---|
| 0 | 977 |
| 15 | 719 |

t: 14.2 min. From interpolating values

Volume of test Pit between 25% and 75% of water depth: 0.394 m3
Time Taken to drain between 25% and 75% of water depth: 37.43 min or 0.624 hr

**Test 1 - Soil Infiltration rate:** 6.85E-05 m/s = 0.246441 m/hr

## Test 2

| Time Since Start | Water Level from GL | Depth of water |
|---|---|---|
| min | mm | mm |
| 0 | 223 | 977 |
| 15 | 453 | 747 |
| 30 | 658 | 542 |
| 45 | 835 | 365 |
| 60 | 982 | 218 |
| 75 | 1125 | 75 |
| 90 | 1200 | 0 |
| | | |
| | | |
| | | |

Mean Surface Area: 2.57 m2
Depth of water: 977 mm
Time at 25% or at: 244.3 mm of water

Interpolating Values

| Time | Water Depth |
|---|---|
| 45 | 365 |
| 60 | 218 |

t: 57.32 min. From interpolating values

Time at 75% or at: 732.8 mm of water

Interpolating Values

| Time | Water Depth |
|---|---|
| 15 | 747 |
| 30 | 542 |

t: 16.04 min. From interpolating values

Volume of test Pit between 25% and 75% of water depth: 0.394 m3
Time Taken to drain between 25% and 75% of water depth: 41.28 min or 0.688 hr

**Test 2 - Soil Infiltration rate:** 6.21E-05 m/s = 0.223439 m/hr

## Test 3

| Time Since Start | Water Level from GL | Depth of water |
|---|---|---|
| min | mm | mm |
| 0 | 223 | 977 |
| 15 | 444 | 756 |
| 30 | 651 | 549 |
| 45 | 827 | 373 |
| 60 | 950 | 250 |
| 75 | 1097 | 103 |
| 90 | 1200 | 0 |
| | | |
| | | |
| | | |

Mean Surface Area: 2.566 m2
Depth of water: 977 mm
Time at 25% or at: 244.3 mm of water

Interpolating Values

| Time | Water Depth |
|---|---|
| 60 | 250 |
| 75 | 103 |

t: 60.59 min. From interpolating values

Time at 75% or at: 732.8 mm of water

Interpolating Values

| Time | Water Depth |
|---|---|
| 15 | 756 |
| 30 | 549 |

t: 16.68 min. From interpolating values

Volume of test Pit between 25% and 75% of water depth: 0.394 m3
Time Taken to drain between 25% and 75% of water depth: 43.9 min or 0.732 hr

**Test 3 - Soil Infiltration rate:** 5.84E-05 m/s
0.210088 m/hr

**Lowest Soil Infiltration Rate:** 5.836E-05 m/s
0.21009 m/hr

SOLID STRUCTURES

# SOAKAWAY TRIAL PIT 2

**Pit Dimensions:**

| | | |
|---|---|---|
| L: | 950 | mm |
| W: | 750 | mm |
| D: | 625 | mm |

**Key**

| | |
|---|---|
| | Input |
| | Calculation |

## Test 1

| Time Since Start | Water Level from ground level | Depth of water |
|---|---|---|
| min | mm | mm |
| 0 | 124 | 501 |
| 15 | 247 | 378 |
| 30 | 367 | 258 |
| 45 | 471 | 154 |
| 60 | 574 | 51 |
| 75 | 600 | 25 |
| | | |
| | | |
| | | |
| | | |
| | | |

Mean Surface Area: 1.56 m2
Depth of water at start of test: 501 mm
Time at 25% or at: 125.3 mm of water

Interpolating Values

| Time | Water Depth |
|---|---|
| 45 | 154 |
| 60 | 51 |

t: 49.19 min. From interpolating values

Time at 75% or at: 375.8 mm of water

Interpolating Values

| Time | Water Depth |
|---|---|
| 15 | 378 |
| 30 | 258 |

t: 15.28 min. From interpolating values

Volume of test Pit between 25% and 75% of water depth: 0.178 m3
Time Taken to drain between 25% and 75% of water depth: 33.91 min or 0.565 hr
**Test 1 - Soil Infiltration rate:** 5.61E-05 m/s
0.201920 m/hr

## Test 2

| Time Since Start | Water Level from GL | Depth of water |
|---|---|---|
| min | mm | mm |
| 0 | 118 | 507 |
| 15 | 238 | 387 |
| 30 | 355 | 270 |
| 45 | 452 | 173 |
| 60 | 534 | 91 |
| 75 | 600 | 25 |
| | | |
| | | |
| | | |
| | | |

Mean Surface Area: 1.57 m2
Depth of water: 507 mm
Time at 25% or at: 126.8 mm of water

Interpolating Values

| Time | Water Depth |
|---|---|
| 45 | 173 |
| 60 | 91 |

t: 53.46 min. From interpolating values

Time at 75% or at: 380.3 mm of water

Interpolating Values

| Time | Water Depth |
|---|---|
| 15 | 387 |
| 30 | 270 |

t: 15.87 min. From interpolating values

Volume of test Pit between 25% and 75% of water depth: 0.181 m3
Time Taken to drain between 25% and 75% of water depth: 37.59 min or 0.627 hr
**Test 2 - Soil Infiltration rate:** 5.09E-05 m/s
0.183092 m/hr

**Lowest Soil Infiltration Rate:** 5.086E-05 m/s
0.18309 m/hr

# Appendix D

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## ICP SUDS Mean Annual Flood

Input

| | | | | | |
|---|---|---|---|---|---|
| Return Period (years) | 2 | SAAR (mm) | 700 | Urban | 0.000 |
| Area (ha) | 0.320 | Soil | 0.450 | Region Number | Region 6 |

| Results | l/s |
|---|---|
| QBAR Rural | 1.4 |
| QBAR Urban | 1.4 |
| Q2 years | 1.2 |
| Q1 year | 1.2 |
| Q30 years | 3.2 |
| Q100 years | 4.5 |

## STORM SEWER DESIGN by the Modified Rational Method

### Design Criteria for Storm

Pipe Sizes STANDARD Manhole Sizes STANDARD

FSR Rainfall Model - England and Wales

| | | | |
|---|---|---|---|
| Return Period (years) | 2 | PIMP (%) | 100 |
| M5-60 (mm) | 19.700 | Add Flow / Climate Change (%) | 0 |
| Ratio R | 0.408 | Minimum Backdrop Height (m) | 0.200 |
| Maximum Rainfall (mm/hr) | 50 | Maximum Backdrop Height (m) | 1.500 |
| Maximum Time of Concentration (mins) | 30 | Min Design Depth for Optimisation (m) | 0.400 |
| Foul Sewage (l/s/ha) | 0.000 | Min Vel for Auto Design only (m/s) | 1.00 |
| Volumetric Runoff Coeff. | 0.750 | Min Slope for Optimisation (1:X) | 500 |

Designed with Level Soffits

### Time Area Diagram for Storm

| Time (mins) | Area (ha) | Time (mins) | Area (ha) |
|---|---|---|---|
| 0-4 | 0.112 | 4-8 | 0.052 |

Total Area Contributing (ha) = 0.164

Total Pipe Volume (m³) = 0.773

### Network Design Table for Storm

| PN | Length (m) | Fall (m) | Slope (1:X) | I.Area (ha) | T.E. (mins) | Base Flow (l/s) | k (mm) | HYD SECT | DIA (mm) | Section Type | Auto Design |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1.000 | 10.000 | 0.099 | 100.9 | 0.123 | 6.00 | 0.0 | 0.600 | o | 150 | Pipe/Conduit | |
| 1.001 | 10.000 | 0.059 | 168.2 | 0.041 | 0.00 | 0.0 | 0.600 | o | 225 | Pipe/Conduit | |
| 1.002 | 5.000 | 0.030 | 168.2 | 0.000 | 0.00 | 0.0 | 0.600 | o | 225 | Pipe/Conduit | |

### Network Results Table

| PN | Rain (mm/hr) | T.C. (mins) | US/IL (m) | Σ I.Area (ha) | Σ Base Flow (l/s) | Foul (l/s) | Add Flow (l/s) | Vel (m/s) | Cap (l/s) | Flow (l/s) |
|---|---|---|---|---|---|---|---|---|---|---|
| 1.000 | 50.00 | 6.17 | 112.450 | 0.123 | 0.0 | 0.0 | 0.0 | 1.00 | 17.7 | 16.7 |
| 1.001 | 50.00 | 6.33 | 112.276 | 0.164 | 0.0 | 0.0 | 0.0 | 1.01 | 40.0 | 22.2 |
| 1.002 | 50.00 | 6.42 | 112.216 | 0.164 | 0.0 | 0.0 | 0.0 | 1.01 | 40.0 | 22.2 |

### Free Flowing Outfall Details for Storm

| Outfall Pipe Number | Outfall Name | C. Level (m) | I. Level (m) | Min I. Level (m) | D,L (mm) | W (mm) |
|---|---|---|---|---|---|---|
| 1.002 | | 113.000 | 112.187 | 0.000 | 0 | 0 |

## Simulation Criteria for Storm

| | | | |
|---|---|---|---|
| Volumetric Runoff Coeff | 0.750 | Additional Flow - % of Total Flow | 0.000 |
| Areal Reduction Factor | 1.000 | MADD Factor * 10m³/ha Storage | 2.000 |
| Hot Start (mins) | 0 | Inlet Coeffiecient | 0.800 |
| Hot Start Level (mm) | 0 | Flow per Person per Day (l/per/day) | 0.000 |
| Manhole Headloss Coeff (Global) | 0.500 | Run Time (mins) | 60 |
| Foul Sewage per hectare (l/s) | 0.000 | Output Interval (mins) | 1 |

| | | | | | |
|---|---|---|---|---|---|
| Number of Input Hydrographs | 0 | Number of Offline Controls | 0 | Number of Time/Area Diagrams | 0 |
| Number of Online Controls | 1 | Number of Storage Structures | 2 | Number of Real Time Controls | 0 |

## Synthetic Rainfall Details

| | | | |
|---|---|---|---|
| Rainfall Model | FSR | Profile Type | Summer |
| Return Period (years) | 2 | Cv (Summer) | 0.750 |
| Region | England and Wales | Cv (Winter) | 0.840 |
| M5-60 (mm) | 19.700 | Storm Duration (mins) | 30 |
| Ratio R | 0.408 | | |

## Online Controls for Storm

### Pump Manhole: S03-Car Park, DS/PN: 1.002, Volume ($m^3$): 1.2

**Invert Level (m)** 112.216

| Depth (m) | Flow (l/s) |
|---|---|
| 1.000 | 0.0000 |

## Storage Structures for Storm

### Porous Car Park Manhole: S01-Main Building, DS/PN: 1.000

| | | | |
|---|---|---|---|
| Infiltration Coefficient Base (m/hr) | 0.18309 | Width (m) | 61.0 |
| Membrane Percolation (mm/hr) | 1000 | Length (m) | 10.0 |
| Max Percolation (l/s) | 169.4 | Slope (1:X) | 0.0 |
| Safety Factor | 2.0 | Depression Storage (mm) | 5 |
| Porosity | 0.30 | Evaporation (mm/day) | 3 |
| Invert Level (m) | 112.450 | Cap Volume Depth (m) | 0.450 |

### Porous Car Park Manhole: S03-Car Park, DS/PN: 1.002

| | | | |
|---|---|---|---|
| Infiltration Coefficient Base (m/hr) | 0.18309 | Width (m) | 168.0 |
| Membrane Percolation (mm/hr) | 1000 | Length (m) | 100.0 |
| Max Percolation (l/s) | 4666.7 | Slope (1:X) | 0.0 |
| Safety Factor | 2.0 | Depression Storage (mm) | 5 |
| Porosity | 0.30 | Evaporation (mm/day) | 3 |
| Invert Level (m) | 112.500 | Cap Volume Depth (m) | 0.350 |

### Volume Summary (Static)

Length Calculations based on Centre-Centre

| Pipe Number | USMH Name | Storage Structure Volume (m³) | Total Volume (m³) |
|---|---|---|---|
| 1.000 | S01-Main Building | 82.350 | 82.350 |
| 1.001 | S02-Access Road | 0.000 | 0.000 |
| 1.002 | S03-Car Park | 1764.000 | 1764.000 |
| Total | | 1846.350 | 1846.350 |

## 1 year Return Period 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 * 10m³/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 Offline Controls | 0 | Number of Time/Area Diagrams | 0 |
| Number of Online Controls | 1 | Number of Storage Structures | 2 | Number of Real Time Controls | 0 |

### Synthetic Rainfall Details

| | | | | | |
|---|---|---|---|---|---|
| Rainfall Model | FSR | M5-60 (mm) | 19.700 | Cv (Summer) | 0.750 |
| Region | England and Wales | Ratio R | 0.408 | Cv (Winter) | 0.840 |

| | | | |
|---|---|---|---|
| Margin for Flood Risk Warning (mm) | 300.0 | DVD Status | OFF |
| Analysis Timestep | Fine | Inertia Status | OFF |
| DTS Status | ON | | |

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

| PN | US/MH Name | Storm | Return Period | Climate Change | First (X) Surcharge | First (Y) Flood | First (Z) Overflow | Overflow Act. | Water Level (m) |
|---|---|---|---|---|---|---|---|---|---|
| 1.000 | S01-Main Building | 30 Winter | 1 | +0% | | | | | 112.469 |
| 1.001 | S02-Access Road | 15 Summer | 1 | +0% | 1/15 Summer | | | | 112.506 |
| 1.002 | S03-Car Park | 30 Winter | 1 | +0% | 1/15 Summer | | | | 112.500 |

| PN | US/MH Name | Surcharged Depth (m) | Flooded Volume (m³) | Flow / Cap. | Overflow (l/s) | Pipe Flow (l/s) | Status | Level Exceeded |
|---|---|---|---|---|---|---|---|---|
| 1.000 | S01-Main Building | -0.131 | 0.000 | -0.03 | | -0.5 | OK | |
| 1.001 | S02-Access Road | 0.005 | 0.000 | 0.10 | | 3.3 | SURCHARGED | |
| 1.002 | S03-Car Park | 0.059 | 0.000 | 0.00 | | 0.0 | SURCHARGED | |

## 30 year Return Period 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 * 10m³/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 Offline Controls | 0 | Number of Time/Area Diagrams | 0 |
| Number of Online Controls | 1 | Number of Storage Structures | 2 | Number of Real Time Controls | 0 |

### Synthetic Rainfall Details

| | | | | | |
|---|---|---|---|---|---|
| Rainfall Model | FSR | M5-60 (mm) | 19.700 | Cv (Summer) | 0.750 |
| Region | England and Wales | Ratio R | 0.408 | Cv (Winter) | 0.840 |

| | | | |
|---|---|---|---|
| Margin for Flood Risk Warning (mm) | 300.0 | DVD Status | OFF |
| Analysis Timestep | Fine | Inertia Status | OFF |
| DTS Status | ON | | |

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

| PN | US/MH Name | Storm | Return Period | Climate Change | First (X) Surcharge | First (Y) Flood | First (Z) Overflow | Overflow Act. | Water Level (m) |
|---|---|---|---|---|---|---|---|---|---|
| 1.000 | S01-Main Building | 30 Winter | 30 | +0% | | | | | 112.508 |
| 1.001 | S02-Access Road | 15 Winter | 30 | +0% | 1/15 Summer | | | | 112.519 |
| 1.002 | S03-Car Park | 30 Winter | 30 | +0% | 1/15 Summer | | | | 112.501 |

| PN | US/MH Name | Surcharged Depth (m) | Flooded Volume (m³) | Flow / Cap. | Overflow (l/s) | Pipe Flow (l/s) | Status | Level Exceeded |
|---|---|---|---|---|---|---|---|---|
| 1.000 | S01-Main Building | -0.092 | 0.000 | -0.04 | | -0.6 | OK | |
| 1.001 | S02-Access Road | 0.018 | 0.000 | 0.42 | | 14.1 | SURCHARGED | |
| 1.002 | S03-Car Park | 0.059 | 0.000 | 0.00 | | 0.0 | SURCHARGED | |

## 100 year Return Period 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 * 10m³/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 Offline Controls | 0 | Number of Time/Area Diagrams | 0 |
| Number of Online Controls | 1 | Number of Storage Structures | 2 | Number of Real Time Controls | 0 |

### Synthetic Rainfall Details

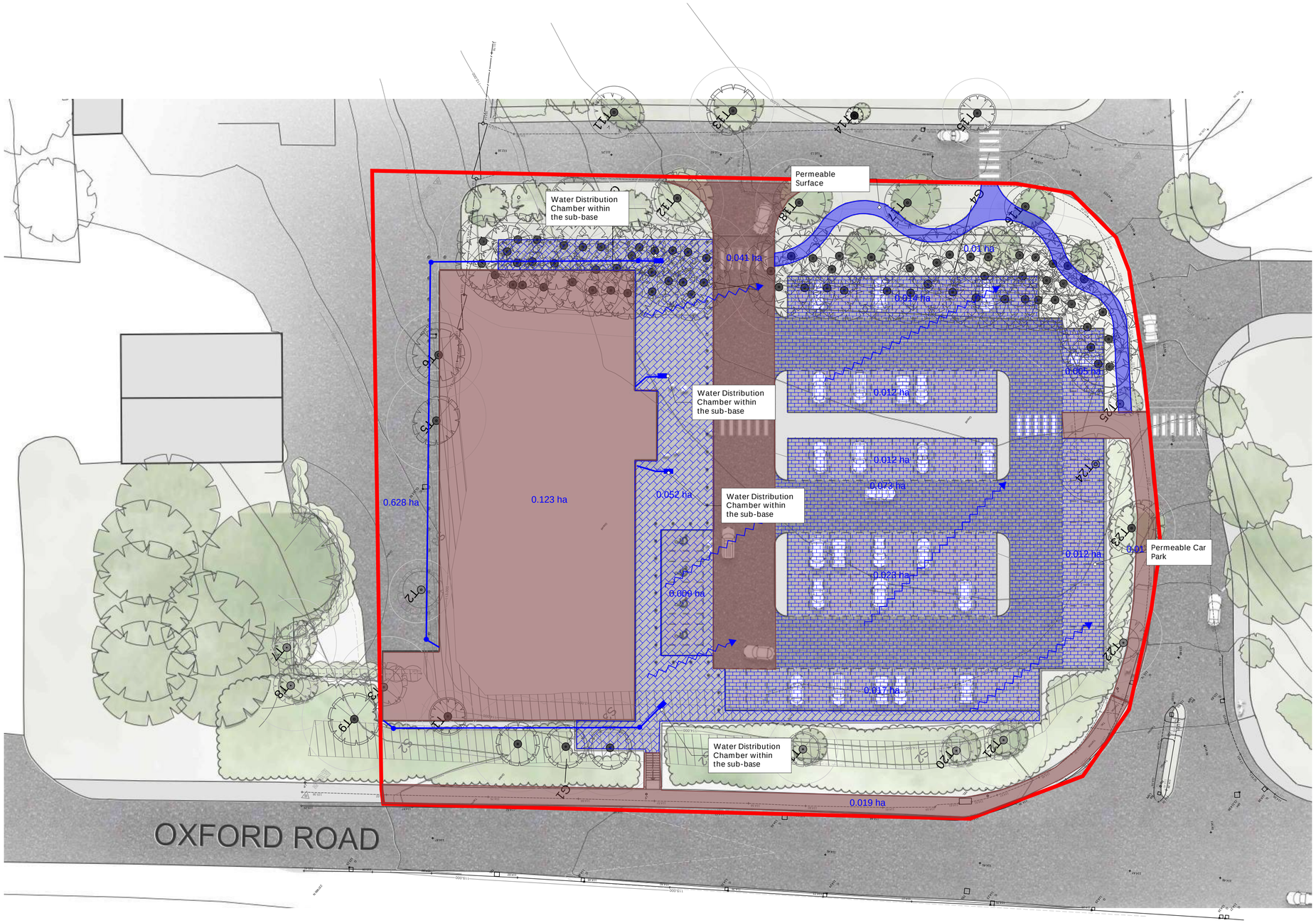
| | | | | | |
|---|---|---|---|---|---|
| Rainfall Model | FSR | M5-60 (mm) | 19.700 | Cv (Summer) | 0.750 |
| Region | England and Wales | Ratio R | 0.408 | Cv (Winter) | 0.840 |

| | | | |
|---|---|---|---|
| Margin for Flood Risk Warning (mm) | 300.0 | DVD Status | OFF |
| Analysis Timestep | Fine | Inertia Status | OFF |
| DTS Status | ON | | |

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

| PN | US/MH Name | Storm | Return Period | Climate Change | First (X) Surcharge | First (Y) Flood | First (Z) Overflow | Overflow Act. | Water Level (m) |
|---|---|---|---|---|---|---|---|---|---|
| 1.000 | S01-Main Building | 30 Winter | 100 | +40% | | | | | 112.573 |
| 1.001 | S02-Access Road | 15 Winter | 100 | +40% | 1/15 Summer | | | | 112.538 |
| 1.002 | S03-Car Park | 30 Winter | 100 | +40% | 1/15 Summer | | | | 112.502 |

| PN | US/MH Name | Surcharged Depth (m) | Flooded Volume (m³) | Flow / Cap. | Overflow (l/s) | Pipe Flow (l/s) | Status | Level Exceeded |
|---|---|---|---|---|---|---|---|---|
| 1.000 | S01-Main Building | -0.027 | 0.000 | 0.70 | | 10.9 | OK | |
| 1.001 | S02-Access Road | 0.037 | 0.000 | 0.79 | | 26.2 | SURCHARGED | |
| 1.002 | S03-Car Park | 0.060 | 0.000 | 0.00 | | 0.0 | SURCHARGED | |




NOTES

1. All Structural Engineer's drawings are to be read in conjunction with all relevant Architect's & Services Engineer's drawings and specifications.

Overland Flows

Impermeable Surface

Permeable Surface
100mm Permeable Paving Block
50mm Sharp Sand
350mm Type 3 Foundations

Permeable Surface
100mm Permeable Paving Block
50mm Sharp Sand
450mm Type 3 Foundations

| Rev | Description | Date | By | Chk |
|---|---|---|---|---|
| P01 | First Issue | 30.10.20 | ARD | ARD |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Project

Cotefield Business Park

Drawing Title

SURFACE WATER
DRAINAGE STRATEGY

Scale
1:250 @ A1

Role
Civil

Status / Stage
S4 - For Planning Approval

Job No
1831S

| Ref | Org | Zone | Level | Type | Role | Number | Rev |
|---|---|---|---|---|---|---|---|
| CBP | SOLID | XX | XX | DR | C | 0001 | P01 |