

**Project Title**

**Land at Ashby Road, Markfield**

**Report Title**

Drainage Technical Note

**Document Reference:**

5964-003-001

**Prepared For**

Alison Homes East Midlands Ltd

**Date**

December 2025



| Status       | Details of Amendments | Date       | Checked | Approved |
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## EXECUTIVE SUMMARY

- I. This Drainage Technical Note has been produced in accordance with National and Local Planning Policy on behalf of Alison Homes East Midlands Limited to support the Reserved matters application for the construction of 93 residential dwellings, site access and onsite highways, SuDS system and landscaping on Land at Ashby Road, Markfield.
- II. The proposed development necessitates the construction of site-specific surface water drainage infrastructure. This infrastructure must comply with the requirements set forth by the National Planning Policy Framework (NPPF), which mandates the use of Sustainable Drainage Systems (SuDS) in all major developments where feasible.
- III. The Lead Local Flood Authority strongly advocates for the integration of SuDS within new developments. All new drainage systems will be designed in accordance with the following guidelines and standards:
  - Planning Practice Guidance (PPG)
  - Non-Statutory Technical Standards for Sustainable Drainage Systems
  - Building Regulations – Approved Document H (Drainage and Waste Disposal)
  - Local authority sustainable drainage guidance
  - Latest version of Design Construction Guidance
- IV. This report is to be read in conjunction with all planning, architectural and other reports that will accompany the planning application.
- V. From the information available this report confirms that a sustainable drainage system design can be achieved which will discharge surface water in accordance with National Planning Practice Guidance (NPPG) and the CIRIA SuDS hierarchy while providing storage for all storm return periods up to and including the 1:100-year rainfall event with an allowance for climate change.
- VI. This report concludes that the site is not at risk of flooding from tidal or fluvial sources, overland flows, or groundwater.
- VII. In terms of foul and surface water drainage the proposed development is suitable at this location.



## **1.0 PLANNING POLICY CONTEXT**

- 1.1 Leicestershire County Council (LCC) has published an Interim LLFA Guidance Note on Sustainable Drainage Systems (SuDS). This document outlines the key requirements for surface water management and flood-risk considerations for new developments.
- 1.2 The LCC guidance stipulates the following criteria for onsite storage and restricted discharge.
- The existing discharge rate should be clearly identified and expressed in litres per second (l/s) and litres per second per hectare (l/s/ha).
  - The proposed discharge rate should be clearly identified and expressed in litres per second (l/s) and litres per second per hectare (l/s/ha).
  - Evidence should be provided to substantiate existing and proposed flow rates. Section 24 of CIRIA C753 'The SuDS Manual' provides guidance regarding the selection and calculation of run-off estimation methods, including a useful summary in Table 24.1.
  - To minimise the risk of system blockage the council would allow 5 l/s as the minimum discharge rate from a site.
  - Brownfield sites must achieve greenfield run-off rates unless it is adequately demonstrated to not be reasonably practicable or technically viable. In such instances, the applicant should seek to reduce discharge rate as much as reasonably practicable or technically viable. The proposed brownfield discharge rate should never represent an increase over the calculated existing discharge rate.
- 1.3 The following surface water strategy has been developed in accordance with local policy and SuDS requirements, ensuring compliance and effective management of surface water.
- 1.4 Adhering to these guidelines will ensure that the proposed development meets the necessary standards for sustainable drainage, promoting environmental sustainability and regulatory compliance.

## 2.0 EXISTING SITE

### Site Location

- 2.1 The development site is located on Land to the north of Ashby Road, Markfield. There nearest postcode is LE67 9UB at Ordnance Survey grid reference SK 48886 10653.
- 2.2 The site is surrounded by Ashby Road to the south and east while agricultural land lies to the east and A50 Road to the north. At site location plan can be found below in Figure 1.0



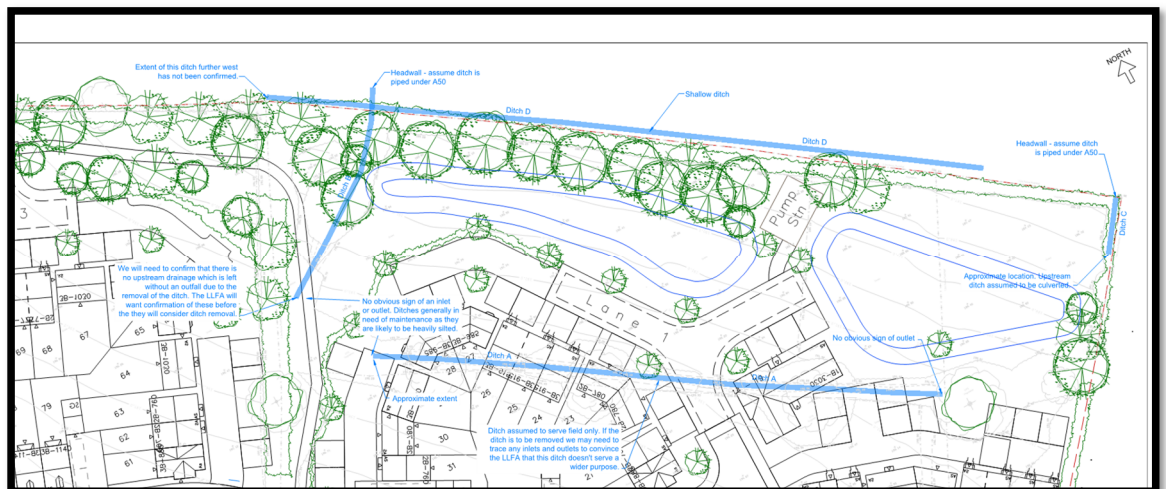
**Figure 1.0: Site Location plan**

## Site Description

- 2.3 The development site is approximately 3.45ha in area and comprises agricultural fields/undeveloped land. It is therefore classified as greenfield
- 2.4 A topographical survey indicates that the site generally falls from south to north. Ground levels fall from approximately 206m AOD to 195.5m AOD along the eastern site boundary.
- 2.5 A copy of the topographical survey is in **Appendix A** at the rear of this report.

## Existing Drainage

- 2.6 Ordnance Survey (OS) mapping indicates the presence of three unnamed watercourses. Two ditches are orientated south / north to the sites- boundary with one ditch orientated east to west. As stated in the FRA report and Technical Note – Surface Water Outfall both prepared by Martin Andrews Consulting Ltd (MAC) indicate ditches flows under A50 to the north. Extract from MAC can be bound below in Figure 2.0.



**Figure 2.0: MAC Technical Note Extract**

- 2.7 The site currently has no positive surface or foul water drainage systems serving the site.
- 2.8 There are no recorded public surface water sewers within the vicinity of the site.
- 2.9 The nearest public foul sewer is situated to the south of the site at Ashby Road.
- 2.10 Details of the public foul sewer and an extract from the MAC Technical Note indicating the locations of existing ditches can be found in **Appendix B**.
- 2.11 Rainfall currently discharges partly through infiltration into the ground and partly as overland greenfield runoff, flowing north towards the existing onsite ditches and headwall outlet.
- 2.12 Pre-developed greenfield runoff rates have been established using the HR Wallingford tool and the updated FEH methodology.
- 2.13 The pre-developed greenfield runoff rates have been calculated using the hard-paved contributing area (positively drained areas). The total contributing area includes the proposed roads, car parking, roof areas, and part of the open-space land from which runoff will be cut off by the proposed drainage system. Altogether, this totals 1.696 ha.
- 2.14 The proposed garden areas has been excluded from Greenfield runoff calculations.
- 2.15 The Greenfield runoff calculation results are listed below:
- QMed 5 l/s/Ha
  - Qbar (FEH) 5.6 l/s/Ha
  - 1:1 year 4.7 l/s/Ha
  - 1:10 year 8.4 l/s/Ha
  - 1:30 year 11.3 l/s/Ha
  - 1:100 year 14.5 l/s/Ha
- 2.16 A copy of the HR Wallingford Greenfield Runoff Calculation can be found in **Appendix C** at the rear of this report.

## Geology and Groundwater

2.17 The British Geological Survey (BGS) identifies the proposed development site as being underlain by Superficial Head Deposits across the western half of the site and Oadby Member deposits across the eastern half. The bedrock geology is indicated to comprise the Gunthorpe Member (mudstone).

2.18 An intrusive ground investigation was undertaken by GRM Development Solutions Ltd, which included the installation of six gas and water monitoring standpipes and the excavation of three soakaway pits. Three soakaway tests were carried out in accordance with the BRE 365 method, all of which indicated insufficient infiltration at the test locations. The results confirmed that the strata of the Oadby Member and the Head Deposits are not suitable for the disposal of surface water via infiltration.

2.19 One infiltration pit has been excavated in the north-west (SA03) of the site, a second in the north-east (SA01), and the third in the south-east (SA02). All infiltration pits revealed gravelly clay and silty clay soils to a total depth of 1.2 m BGL with very poor infiltration potential. Deeper borehole logs indicate that the Oadby Member consists of silty clay down to 7.7 m BGL. Therefore, infiltration methods for surface water runoff disposal have been ruled out.

2.20 A table of all infiltration testing is summarised as follows:

| Trial Pit No. | Depth (m) | Test 1      | Test 2 | Test 3 |
|---------------|-----------|-------------|--------|--------|
| SA01          | 1.4       | Test Failed |        |        |
| SA02          | 1.3       | Test Failed |        |        |
| SA03          | 1.2       | Test Failed |        |        |

2.21 A copy of the site investigation report is located in **Appendix D** at the rear of this report.

## Hydrogeology

2.22 The only identified local surface water feature comprise the existing onsite ditches. There are no recorded surface water abstraction licenses within 500m.

2.23 EA mapping shows site is not located in a groundwater Source Protection Zone (SPZ)

### 3.0 PROPOSED DEVELOPMENT

#### Description

- 3.1 The development proposals are for the erection of 93 residential dwellings, site access and onsite highways, SuDS system and landscaping on Land at Ashby Road, Markfield.
- 3.2 A copy of the site layout plan is in **Appendix E** at the rear of this report.

#### Impermeable Areas

- 3.3 The anticipated impermeable areas of the various elements of the development are summarised as follows. An allowance for 10% Urban Creep has been included within the impermeable areas stated:

|                                     |                                                |
|-------------------------------------|------------------------------------------------|
| • Roof Areas                        | 4,820m <sup>2</sup>                            |
| • Roof Area with 10% Urban Creep    | 5,302m <sup>2</sup>                            |
| • Hardstanding                      | 9,301m <sup>2</sup>                            |
| • Attenuation Basin                 | 1,195m <sup>2</sup>                            |
| • Proposed Landscape Areas (Cv-0.3) | 3,885m <sup>2</sup> (1,166m <sup>2</sup> -30%) |
| <b>Total</b>                        | <b>16,964m<sup>2</sup> – 1.696ha</b>           |

- 3.4 A copy of the impermeable areas plan is in **Appendix F** at the rear of this report.

#### Rainfall Climate Change Allowance

- 3.5 The latest climate change allowances (available online <https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances>), which supports the NPPF in making an allowance for climate change within drainage design. The allowances provide predictions of anticipated change for peak river flow by river basin district and peak rainfall intensity.
- 3.6 The table below shows the anticipated changes in extreme rainfall intensity. The anticipated increases in peak rainfall across the London Management Catchment for the 1% annual exceedance rainfall event are as follows:

| Epoch | Central Allowance | Upper End Allowance |
|-------|-------------------|---------------------|
| 2050s | 20%               | 40%                 |
| 2070s | 25%               | 40%                 |

**Table 5.1: Climate Change Allowances**

\*Use '2050s' for development with a lifetime up to 2060 and use the 2070s epoch for development with a lifetime between 2061 and 2125.

- 3.7 Based on the latest allowances and a life span of the development of 70 to 100 years, an increase of 40% has been applied to peak rainfall to this development.



### **Surface Water Drainage**

- 3.8 CIRIA report C753 The SuDS Manual provides guidance on surface water drainage. The aim for surface water runoff is to match greenfield runoff rates and volumes, where reasonably achievable.
- 3.9 For surface water discharge, the drainage hierarchy notes the following list of drainage options in order of preference:
1. Infiltration to ground
  2. Discharge to a watercourse
  3. Discharge to a surface water sewer
  4. Discharge to a foul water sewer
- 3.10 Based on the findings above, and following confirmation of low infiltration rates during on-site testing, the proposed surface water drainage strategy involves discharging surface water into the existing watercourse via an on-site attenuation basin.
- 3.11 The proposed SuDS system will provide sufficient storage to accommodate a 1:100 year storm event including an additional 40% to account for the predicted effects of future climate change.
- 3.12 Surface water runoff is to be discharged at a restricted rate. The proposed runoff restriction has been calculated as outlined in Paragraph 2.14 above, and the proposed runoff is to be restricted to the median annual flood flow rate, calculated as 5l/s/Ha – 8.5l/s (QMed).
- 3.13 The proposed site levels have been designed with consideration for the implementation of Sustainable Drainage Systems (SuDS), where feasible, to manage and convey surface water runoff into the main on-site drainage network.
- 3.14 The proposed storage basin has been designed with a 2m wide maintenance strip and side slopes graded at a 1:3 gradient. As the proposed storage basin exceeds 2m in depth, protective fencing is proposed to prevent unauthorised access and to address health and safety considerations, in accordance with CIRIA SuDS guidance.
- 3.15 Due to the site's topography surface water runoff is to be collected and discharged into the proposed onsite attenuation basin located along the north-easter boundary of the site. Surface water runoff is to be attenuated prior to being discharged into the existing watercourse.
- 3.16 This restriction ensures that the attenuation basin is fully utilised to manage surface water runoff before release into the existing watercourse, thereby strengthening the overall drainage strategy by minimising the risk of flooding downstream.

- 3.17 The surface water drainage strategy for the development has been carefully designed to ensure compliance with best practice standards and local policy requirements. All surface water runoff generated across the site is proposed to be collected and conveyed to a strategically located main detention basin situated in the north-eastern corner of the site. This basin has been sized appropriately to accommodate runoff from the entire site, including during extreme storm events, and to attenuate flows effectively prior to final discharge. Following attenuation, the runoff is to be discharged into the existing onsite watercourse, which forms part of the natural drainage system.



### **Foul Water Drainage**

- 3.18 Foul Water from the site is proposed to drain via gravity into the onsite pumping station. Foul runoff is then to be pumped into the existing Public Foul Sewer controlled by Severn Trent within North Street.
- 3.19 The design of the foul drainage network has been based on Design and Construction Guidance. Based which states a foul flow of 4000 litres per dwelling per day. For 93 dwellings a peak flow of 4.3l/s has been calculated.
- 3.20 Due to the natural topography of the site, foul water runoff is to be discharged into the onsite pumping station and pumped into the existing public foul sewer located in Ashby Rad. An adoptable foul water pumping station is proposed to be strategically located to the east of the site. The proposed pumping station is to be designed to meet the adoptable standards with suitable hardstanding for tanker access.
- 3.21 The required 24-hour emergency foul water storage has been calculated in accordance with SSG App C Design Guidance with a standard design criterion of 160 litres per dwelling. For a total of 93 dwellings, the required emergency storage volume is:  $93 \text{ dwellings} \times 160 \text{ litres/dwelling} = 14,880 \text{ litres (14.88 m}^3\text{)}$
- 3.22 This volume provides the necessary 24-hour emergency storage capacity in the event of a pump failure, ensuring the system can safely contain foul flows without surcharge or risk to property or the environment.
- 3.23 A copy of the proposed drainage strategy plan, drainage calculations and typical construction details is located in **Appendix G** at the rear of this report.

### Water Quality

- 3.24 The proposed development is residential. In accordance with CIRIA SuDS Manual 2015 (Report C753), the pollution hazard level for this type of development is very low to medium.
- 3.25 The surface water scheme has been designed to include mitigation to ensure that surface water is suitably treated, and any pollution risk adequately managed prior to discharge.
- 3.26 Surface water runoff from the main access road, classified as medium risk, is proposed to be routed through the proposed dry swale before being discharged into the attenuation basin. Runoff will be treated through the dry swale and permeable sediment forebay berm, preventing the discharge of total suspended solids (TSS), metals, and hydrocarbons into the existing watercourse downstream.
- 3.27 Table 26.2 in Chapter 26 of CIRIA report C753 The SuDS Manual provides Pollution Hazard Indices for varying land types. Those of relevance to the development proposals are as follows:

|                                                                                                                                                    | <b>Pollution Hazard Level</b> | <b>Total Suspended Solids (TSS)</b> | <b>Metals</b> | <b>Hydrocarbons</b> |
|----------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------|-------------------------------------|---------------|---------------------|
| Residential roofs                                                                                                                                  | Very Low                      | 0.2                                 | 0.2           | 0.05                |
| Individual property driveways, residential car park, low-traffic roads (below 300 movements)                                                       | Low                           | 0.5                                 | 0.4           | 0.4                 |
| Commercial yard and delivery areas, non-residential car parking with frequent change, all roads except low traffic roads and trunk roads/motorways | Medium                        | 0.7                                 | 0.6           | 0.7                 |

**Table 5.2: Pollution Hazard Indices**

3.28 Pollution Mitigation Indices for each SuDS component within the proposal are as follows:

| Type of Mitigation                         | Total Suspended Solids (TSS) | Metals    | Hydrocarbons |
|--------------------------------------------|------------------------------|-----------|--------------|
| Reno mattress (Basin Inlet - filter drain) | 0.4                          | 0.4       | 0.4          |
| Sediment Forebay                           | 0.5 x 0.4                    | 0.5 x 0.4 | 0.5 x 0.4    |
| Detention Basin                            | 0.5 x 0.5                    | 0.5 x 0.5 | 0.5 x 0.6    |
| Total:                                     | 0.85                         | 0.85      | 0.9          |

**Table 5.3: Pollution Mitigation Indices**

3.29 A factor of 0.5 has been used to account for the reduced performance of secondary component associated with already reduced inflow concentrations.

3.30 The surface water drainage design combines the use of reno mattress, filtration forebay and attenuation basin. The proposed drainage meets the target treatment level required for a site with Pollution Hazard Level of 'Very Low to Medium Risk'.

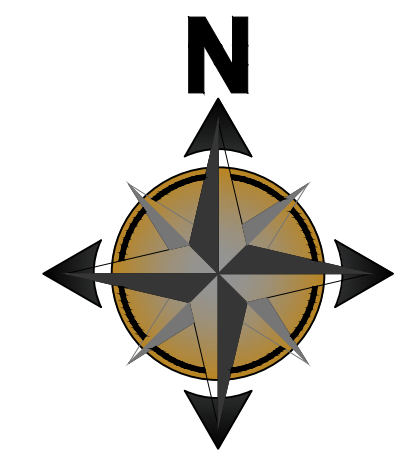
3.31 For further information on the water quality proposals please see the site-specific water quality provision table located on the drainage strategy plan provided.

#### **4.0 CONCLUSIONS**

- 4.1 The development proposals are for the erection of 93 residential dwellings, site access and onsite highways, SuDS system and landscaping on Land at Ashby Road, Markfield.
- 4.2 A suitable SuDS drainage system is proposed which accords with the requirements of national and local policy.
- 4.3 Surface water will be discharged into the existing onsite watercourse at a restricted rate.
- 4.4 Preliminary calculations confirm that surface water runoff generated by the proposed development can be attenuated on site for all rainfall events up to the 1:100 year event including an allowance for climate change.
- 4.5 Foul drainage will be lifted by the use of onsite pumping station into the existing Severn Trent Public sewer located in Ashby Road.
- 4.6 Water quality improvement will be provided as part of the SuDS system proposed.

## Appendix A – Topographical Survey





LEGEND

- Building Line
- Bottom of Bank
- Edge Of Concrete
- Canopy
- Fence
- Gate
- Edge Of Hedge
- Overhead Cable
- Top of Bank
- Wall
- INV
- Invert level
- Tree
- Peg
- Set Out Point

Background Data

All "grey coloured" background data belongs to Castle Surveys, not JW Geomatics and is only used as a visualisation tool to contrast between both companies' Topographical Survey Datasets.

Survey Details:

**Survey Grid:** This survey has been orientated to the Ordnance Survey (O.S.) National Grid (OSGB36) via a Global Position System (GPS) and the O.S. Active Network (OS Net).

All JW Geomatics' survey data is GNSS data, i.e. true OS coordinates and is related to OS National Grid North using a point of origin central to the survey.

**Coordinate System:** This was calculated using the OSTN15 transformation model on the 09.06.25 using Leica Smartnet.

**Survey Level Datum:** Calculated from GPS derived heights using the OSBM15 Transformation Geoid Model in relation to Ordnance Survey Newlyn using Leica Smartnet.

General Notes:

- Physical features present in the vicinity of boundaries may not represent legally conveyed ownership.
- Some features may have been obscured at the time of survey (Parked cars, Dense Vegetation, etc.)
- The background OS Tile & The Existing Topo By Castle Surveys may be inaccurate and incomplete - JW Geomatics are not responsible for this data.
- The plan should only be used for its original intentions - JW Geomatics are not responsible for any mistakes arising from the supply of this plan to third parties.
- All critical dimensions should be checked on site prior to construction.
- Unless otherwise specified, features such as road line markings & hedge centrelines are indicative only.
- Unless specified in the preliminary deliverables, level heights, trunk diameters, fence heights and wall heights are not measured.
- Canopy spread is measured at ground level where possible - The "Tree" legend detail denotes an approximate spread.
- Only trees over 3m in height are surveyed with a "trunk" however large hedges may also have multiple trunks - canopy spread surveyed instead.
- The "Top Of Kerb" is not shown as a poly-line observations taken on all differently sized kerbs, please use the 3D DXF for level data.



status: For Information  
project: Markfield, Leicester  
site: Topographical Survey & Setting Out Locations  
drawn: JW date: 09.06.25  
checked: JW scale: @ A1: 1:500  
job no: JWG-AH6 dsg no: JWG-AH6-001



## Appendix B – Severn Trent Sewer Records and MAC Technical Note

## 1.0 Introduction

- 1.1 This note sets out a response to the Lead Local Flood Authority (LLFA) comments dated 5<sup>th</sup> August 2021 in relation to the planning application detailed below as supported by MAC Pre-planning Engineering Flood Risk Assessment (454-FRA-01-A):

*“21/00787/OUT - Residential development of up to 93 dwellings, public open space, landscaping and SuDS”*

## 2.0 Surface Water Outfall

- 2.1 As set out in the Flood Risk Assessment surface water from the proposed development is to outfall to a ditch located in the north eastern corner of the site, as described in paragraph 3.3.5 of the FRA.
- 2.2 Infiltration techniques are not thought to be viable, subject to further testing at detailed design stage.
- 2.3 An onsite inspection of the existing drainage arrangements was undertaken which identified a number of existing ditches on the site with particular interest on those located on the northern boundary. The plan showing these is included in **Appendix A** of this note and within the FRA.
- 2.4 A single point of discharge has been proposed with surface water discharging into ‘ditch C’. Ditch C runs parallel to the eastern boundary flowing from north to south. A headwall was observed, image below (Inset 2.1). This suggests that the pipe is ditched under the A50.

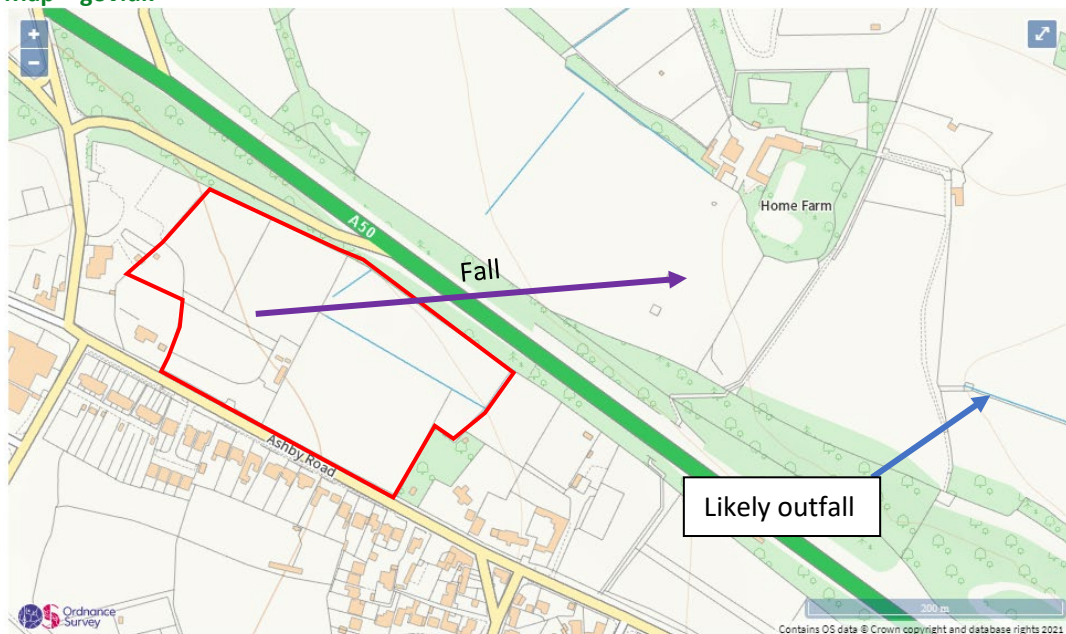
**Inset 2.1: Ditch C Headwall**





- 2.5 We do not know the exact route of the watercourse beyond the headwall but the ditches marked on the plan shown in **Appendix A** currently drain the existing site and appear to have been constructed specifically for this purpose when the A50 was constructed. With flows attenuated to greenfield equivalent rates the proposed development will continue to drain in a similar manner to the existing fields.
- 2.6 The watercourse on highway land would be a highway structure. As such the Local Highway Authority have been contacted with regard to any details they may have of the watercourse, however, they do not have any details of the watercourse as demonstrated by a copy of the correspondence enclosed in **Appendix B**.
- 2.7 Any survey of the piped watercourse would only be able to identify a length of pipe from the headwall to any manhole or ditch. Due to the A50 and surrounding third party land it would not be possible to survey the route with any accuracy.
- 2.8 The Environment Agency's Flood Risk Map (Inset 2.2) indicates the topography of the surrounding land and maps some watercourses. This indicates that land in this area broadly falls from southwest to northeast, as indicated by the fall arrow. We would therefore expect the watercourse to ultimately drain into the mapped watercourse which is marked on Inset 2.2 below.

**Inset 2.2: Direction of Fall and Outfall Watercourse based on Environment Agency Flood Risk Map – gov.uk**



### Summary

We have demonstrated that the site is already drained to the existing ditch(es) located on the northern boundary. The proposed development will broadly replicate the same method of outfall. As such the development will not significantly alter the existing drainage arrangement and will not have a significant adverse impact on the existing drainage network.

**Appendix A**

Existing Drainage  
MAC drawing no. 454-FRA05





Notes:

1. Based on Castles Surveys Ltd 'Topographical Survey', drawing number 20324-20-01 dated 17-09-20.
2. Based on RJ Surveys 'Tree Survey & Layout Plan 01', dated October 2020.

Key:

Existing Ditch



T: 01604 340544 Northampton Office  
E: info@mac-ltd.co.uk W: mac-ltd.co.uk  
Martin Andrews Consulting Ltd

- Transport Assessments
- Flood Risk Assessments
- Highway Advice
- Access Design
- Drainage Strategies
- Vehicle tracking

Client: Pendimo Development Land and Property

Project: Land north of Ashby Road, Markfield

Title: Existing Drainage

Date: 09/05/21

Drw: MJA

Chk: MJA

Drawing No: 454-FRA05

Revision: A

Scale: 1:500

Size: A2





## Martin Andrews

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**From:** Andy D Hunt <Andy.Hunt@leics.gov.uk>  
**Sent:** 25 August 2021 14:40  
**To:** Martin Andrews  
**Subject:** RE: A50 - Markfield, Highways Drainage  
**Attachments:** 454-FRA-01-A-Flood Risk Assessment.pdf; LLFA Drainage.pdf

**Follow Up Flag:** Follow up  
**Flag Status:** Flagged

Afternoon Martin, Thank you for providing all the information for this application.

Unfortunately I do not have the drainage asset information which you have requested for this location, I am therefore unable to help with this request.

Any works which take place within the Highway or that effect LCC Highway users will be classed as notifiable works – The following link <https://www.leicestershire.gov.uk/roads-and-travel/road-maintenance/highways-permits-and-licences> shows the various permits for working within the Highway.

I hope that the above albeit limited information is useful.

Kind regards Andy

Mr Andrew Hunt  
Drainage Engineer  
Highways Delivery  
Leicestershire County Council  
Leics County Council  
Arbor Road, Croft  
Leicestershire, LE9 3GE  
[www.leicestershire.gov.uk](http://www.leicestershire.gov.uk)  
0116 3052312  
[andy.d.hunt@leics.gov.uk](mailto:andy.d.hunt@leics.gov.uk)

---

**From:** Martin Andrews <martin.andrews@mac-ltd.co.uk>  
**Sent:** 25 August 2021 12:36  
**To:** Andy D Hunt <Andy.Hunt@leics.gov.uk>  
**Subject:** A50 - Markfield, Highways Drainage

**CAUTION:** This email originated from outside of the organisation. Do not click links or open attachments unless you recognise the sender and know the content is safe.

Andy,

I have been passed your details by David Hunt as possibly being the correct contact. If not can you let me know or pass this on to the relevant person.

We are working on a live application which is located on land to the south of the A50, Markfield, see FRA attached.

The land falls towards the North / A50 and has ditches internally which drain towards a ditch located at the top of the embankment. In two locations this ditch becomes piped and I believe drains northwards across the A50 and into the watercourse network on the other side.



The LLFA have requested details of the outfall and tracing, we either need to survey the pipe which would be difficult due to its location and the A50 and presumably require permission from the LHA. Alternatively I'm trying to find out if you hold records of this drainage which could be utilised in lieu of undertaking a survey.

Is this something that you can help with. Please call anytime to discuss if that is easier.

**Martin Andrews** | MEng (Hons) CEng MICE MCIHT | **Director**

On behalf of MAC Pre-planning Engineering

T: 01604 340544 | M: 07719 319973

E: [martin.andrews@mac-ltd.co.uk](mailto:martin.andrews@mac-ltd.co.uk)

W: [www.preplanningengineering.co.uk](http://www.preplanningengineering.co.uk) | Northampton Office

Martin Andrews Consulting Ltd (Registered in England & Wales 11317116)

Registered Office: Regents Pavilion, 4 Summerhouse Road, Northampton, NN3 6BJ

You'll no doubt be aware that the coronavirus pandemic is affecting all public services.

At Leicestershire County Council, we're currently working hard to maintain our critical services. Because of this we're having to prioritise all our work and you may not get a reply as quick as usual.

We're really sorry for any delay - and we hope to reply as soon as we can. Thank you for your support and understanding.

For the latest updates visit: [www.leicestershire.gov.uk/coronavirus-covid-19](http://www.leicestershire.gov.uk/coronavirus-covid-19)

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## Appendix C – Greenfield Runoff Calculation

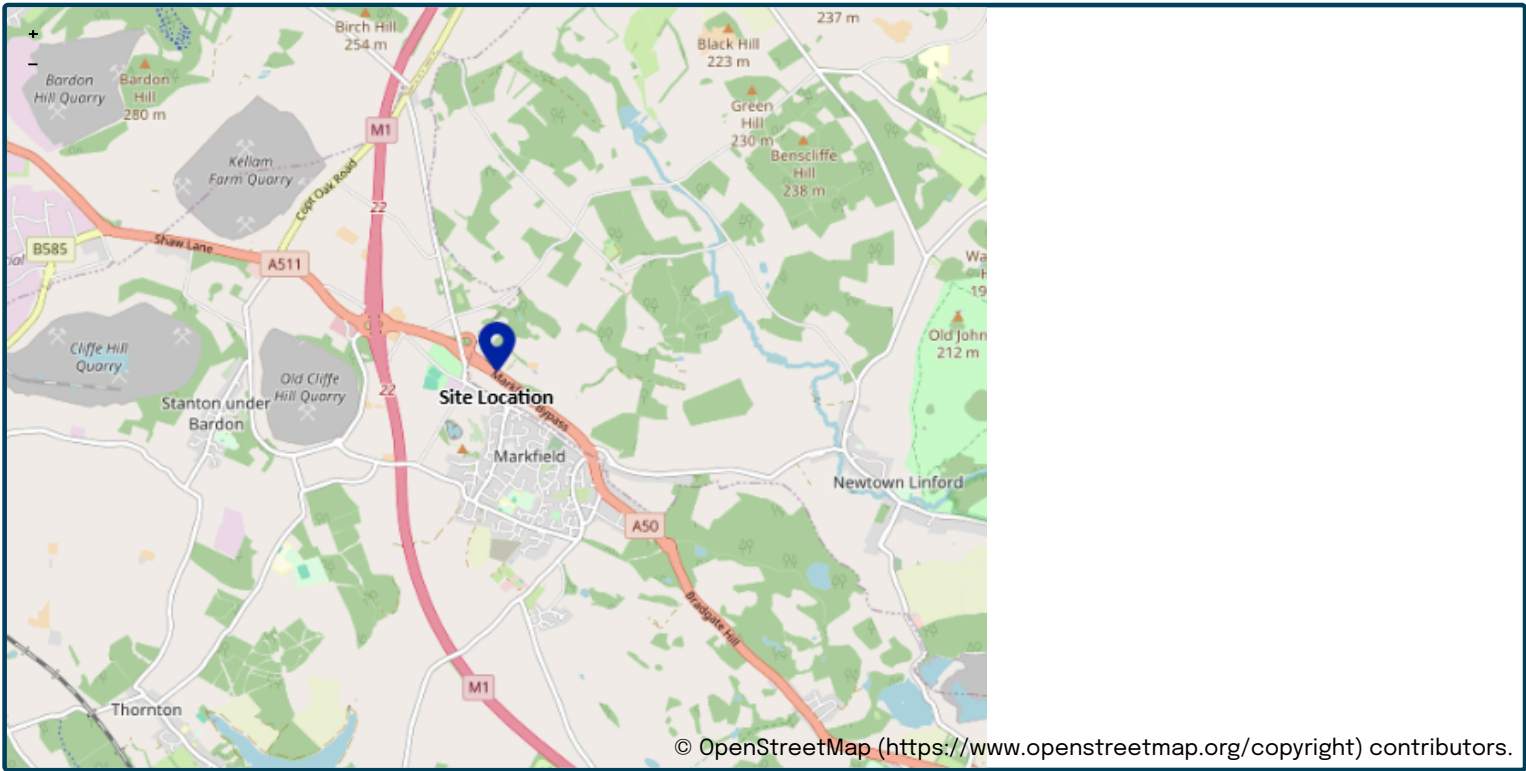
This is an estimation of the greenfield runoff rates that are used to meet normal best practice criteria in line with Environment Agency guidance “Rainfall runoff management for developments”, SC030219 (2013), the SuDS Manual C753 (CIRIA, 2015) and the non-statutory standards for SuDS (Defra, 2015). 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="15/07/2026"/> |
| Calculated by | <input type="text"/>                    |
| Reference     | <input type="text"/>                    |
| Model version | <input type="text" value="2.2.3"/>      |

## Location

|               |                      |
|---------------|----------------------|
| Site name     | <input type="text"/> |
| Site location | <input type="text"/> |



|                                       |                                     |
|---------------------------------------|-------------------------------------|
| Site easting (British National Grid)  | <input type="text" value="448886"/> |
| Site northing (British National Grid) | <input type="text" value="310632"/> |

## Site details

|                      |                                |    |
|----------------------|--------------------------------|----|
| Total site area (ha) | <input type="text" value="1"/> | ha |
|----------------------|--------------------------------|----|

# Greenfield runoff

## Method

|        |                        |
|--------|------------------------|
| Method | FEH statistical (2025) |
|--------|------------------------|

## FEH statistical (2025)

|                                   | <u>My value</u>                    | <u>Map value</u>                                                    |
|-----------------------------------|------------------------------------|---------------------------------------------------------------------|
| SAAR9120 (mm)                     | <input type="text" value="724"/>   | <input type="text" value="mm"/>                                     |
| BFIHOST19scaled                   | <input type="text" value="0.31"/>  | <input type="text"/>                                                |
| QMed-QBar conversion              | <input type="text" value="1.124"/> | <input checked="" type="radio"/> <input type="text" value="1.124"/> |
| QMed (l/s)                        | <input type="text" value="5"/>     | <input type="text" value="l/s"/>                                    |
| QBar (FEH statistical 2025) (l/s) | <input type="text" value="5.6"/>   | <input type="text" value="l/s"/>                                    |

## Growth curve factors

|                        | <u>My value</u>                   | <u>Map value</u>                                                |
|------------------------|-----------------------------------|-----------------------------------------------------------------|
| Hydrological region    | <input type="text" value="4"/>    | <input checked="" type="radio"/> <input type="text" value="4"/> |
| 1 year growth factor   | <input type="text" value="0.83"/> | <input type="text"/>                                            |
| 2 year growth factor   | <input type="text" value="0.89"/> | <input type="text"/>                                            |
| 10 year growth factor  | <input type="text" value="1.49"/> | <input type="text"/>                                            |
| 30 year growth factor  | <input type="text" value="2"/>    | <input type="text"/>                                            |
| 100 year growth factor | <input type="text" value="2.57"/> | <input type="text"/>                                            |
| 200 year growth factor | <input type="text" value="3.04"/> | <input type="text"/>                                            |

## Results

|                           |                                   |                                  |
|---------------------------|-----------------------------------|----------------------------------|
| Method                    | FEH statistical (2025)            |                                  |
| Flow rate 1 year (l/s)    | <input type="text" value="4.7"/>  | <input type="text" value="l/s"/> |
| Flow rate 2 year (l/s)    | <input type="text" value="5.0"/>  | <input type="text" value="l/s"/> |
| Flow rate 10 years (l/s)  | <input type="text" value="8.4"/>  | <input type="text" value="l/s"/> |
| Flow rate 30 years (l/s)  | <input type="text" value="11.3"/> | <input type="text" value="l/s"/> |
| Flow rate 100 years (l/s) | <input type="text" value="14.5"/> | <input type="text" value="l/s"/> |
| Flow rate 200 years (l/s) | <input type="text" value="17.1"/> | <input type="text" value="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/>). 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>). 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 D – Site Investigation Report

## Appendix E – Proposed Site Layout Plan







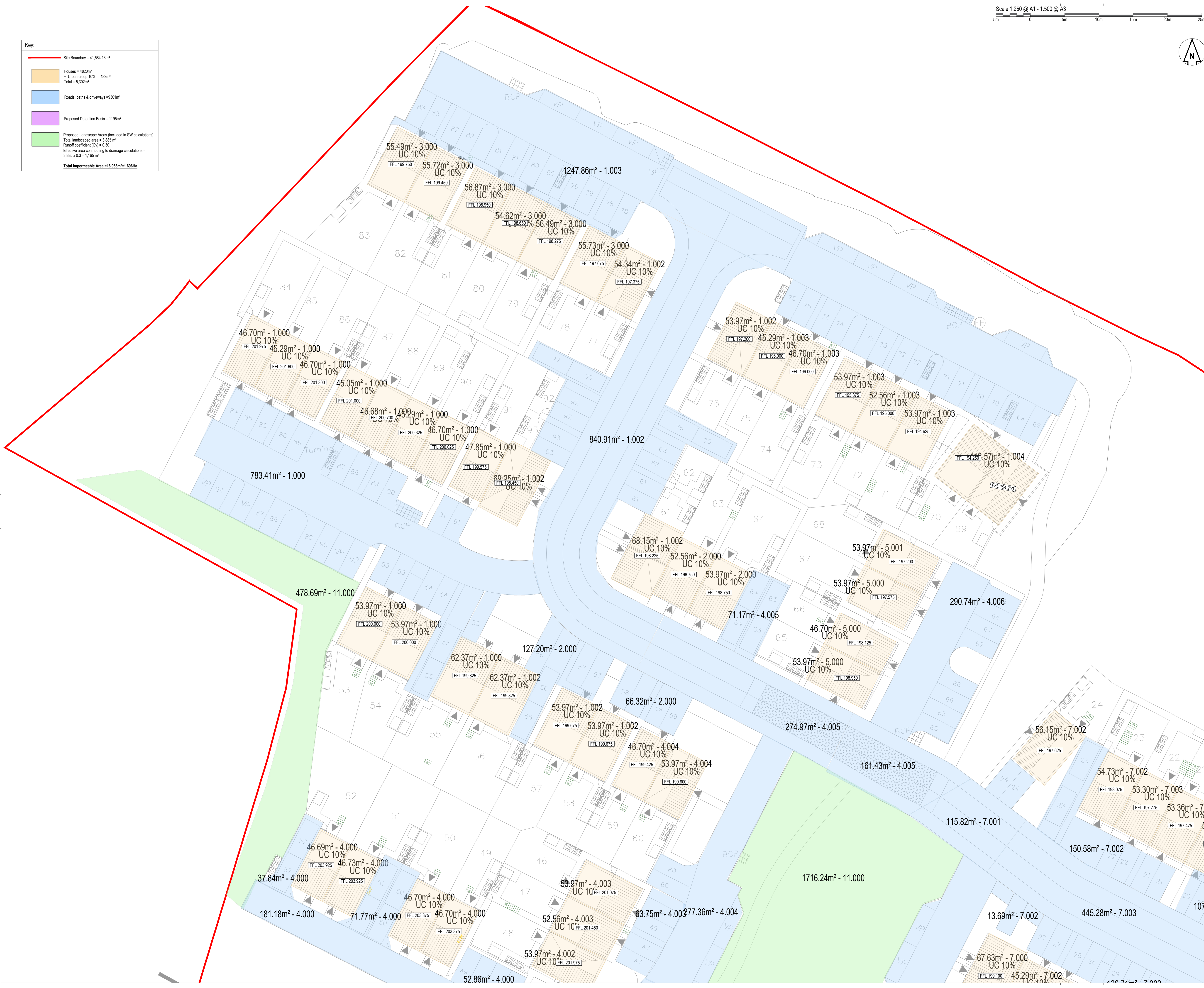
## Appendix F – Proposed Impermeable Areas Plan





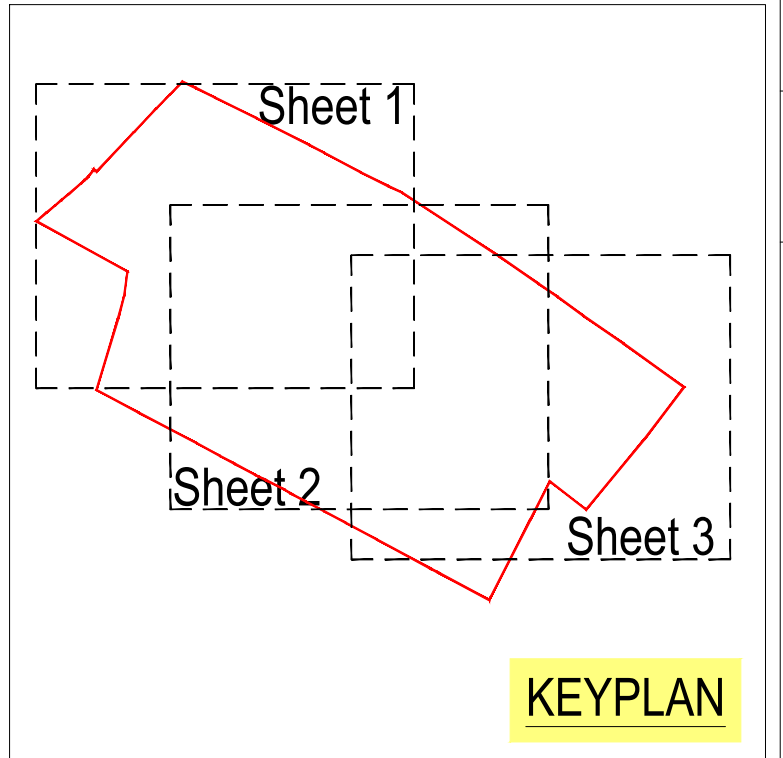
Key:

|                                                                                                                             |                                                                                                                                                                                                                                                                                                      |
|-----------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <span style="color: red;">—</span>                                                                                          | Site Boundary = 41,584.13m <sup>2</sup>                                                                                                                                                                                                                                                              |
| <span style="background-color: #f4a460; border: 1px solid black; display: inline-block; width: 20px; height: 10px;"></span> | Houses = 4820m <sup>2</sup><br>+ Urban creep 10% = 482m <sup>2</sup><br>Total = 5,302m <sup>2</sup>                                                                                                                                                                                                  |
| <span style="background-color: #add8e6; border: 1px solid black; display: inline-block; width: 20px; height: 10px;"></span> | Roads, paths & driveways = 9301m <sup>2</sup>                                                                                                                                                                                                                                                        |
| <span style="background-color: #ff00ff; border: 1px solid black; display: inline-block; width: 20px; height: 10px;"></span> | Proposed Detention Basin = 1195m <sup>2</sup>                                                                                                                                                                                                                                                        |
| <span style="background-color: #90ee90; border: 1px solid black; display: inline-block; width: 20px; height: 10px;"></span> | Proposed Landscape Areas (included in SW calculations):<br>Total landscaped area = 3,885 m <sup>2</sup><br>Runoff coefficient (Cv) = 0.30<br>Effective area contributing to drainage calculations =<br>3,885 x 0.3 = 1,165 m <sup>2</sup><br>Total Impermeable Area = 16,963m <sup>2</sup> = 1.696Ha |



DO NOT SCALE OFF THIS DRAWING

- NOTES**
- The contractor is responsible for verifying all site & setting out dimensions before commencing work.
  - This drawing is to be read in conjunction with all relevant Architectural and M&E drawings.
  - All dimensions in meters unless stated otherwise.
- DRAINAGE NOTES:**
- All drainage works to be constructed in strict accordance with specification of the Local Authority, Building Regulations, Design and Construction Guidance (published by Water UK) BS EN152.
  - Any existing drainage found crossing the site is to be investigated, and if found to be 'live', it should be diverted in consultation with the Client.
  - For location and setting out of building drainage points refer to architects drawings.
  - All pipe runs near buildings to comply with the Building Regulations 2015 part H1. Where a pipe is within 1m of a foundation the trench shall be filled with class GEN3 concrete up to the lowest level of the foundation. Where the trench is further than 1m from the foundation, the trench shall be filled with class GEN3 concrete to a level below the lowest level for the foundation equal to the distance from the foundation less 150mm. In both cases the pipe shall be bedded and surrounded in 150mm thick class GEN3 concrete.
  - Where pipes, external to the structures, have a depth to soffit from ground level of less than 450mm they shall have a class GEN3 concrete encasement (150mm thick).
  - Where a pipe, under a carriageway, has a depth of cover of less than 1.2m the pipe shall be laid in a concrete bed and surround.
  - Where a pipe, under a vehicular area other than a carriageway has a depth of cover if less than 0.9m the pipe shall be protected with a concrete slab set above it.
  - In any circumstances where pipes are bedded and surrounded in concrete flexible joints should be provided, compressible boards (fibreboard or polystyrene) shall be provided at a maximum of 8m centres (coinciding with pipe joints), the boards shall be pre-cut to pipe diameter and to a height and width equal to the concrete cross section. A board thickness of 18mm for pipes up to 450mm nominal diameter and 36mm for pipes over 450mm nominal diameter.
  - All private building drainage shall be constructed in strict accordance with BS EN152. Foul drainage beneath the floor slab shall be laid, shall be laid no flatter than 1:40. Unless otherwise specified below ground building drainage external to the building shall be 100mm diameter and shall be laid at a minimum gradient of (<1% = 1 in 40>1% = 1 in 80) for foul drains and 1 in 80 for surface water drains.
  - All building drains shall be laid in conjunction with 'non adoptive bedding details' (class d, n or b) unless otherwise specified.
  - All pipes, bends and junction for private building drainage shall be UPVC conforming to BS4660, BSEN13598 and BSEN1401 as appropriate and shall be laid in accordance with the manufacturer's specification.
  - All pipes, bends and junction materials for adoptable drainage shall be UPVC compliant with Clause E2.21 of Design and Construction Guidance for Foul and Surface Water Water Sewers, Sector Guidance Appendix C, June 2022. These should conform to BS4660, BSEN13598 and BSEN1401 as appropriate and shall be laid in accordance with the manufacturer's specification.
  - All back inlet gullies to be roddable or connected to inspection chambers.
  - All gully connections other than at manholes to be 'Y' junctions.
  - All road gully connections to be 150mm diameter.
  - All sub stacks to be fitted with air admittance valves where branch drain exceeds 12m except at the head of the run. Soil vent pipes located at the head of a run to terminate to fresh air.
  - No low point shall be without a method of drainage.
  - All connections to be soffit to soffit unless otherwise noted.
  - All concrete and concrete products to be in accordance with BRE 363 for sulphates.
  - The locations of all building drainage points shall be cross referenced against the architects drawings during setting out and any discrepancies reported immediately.
  - Before connections are made to existing public sewers an application under S106 must be made to relevant sewerage undertaker.
  - The precise depth and location and size of existing pipes, watercourses or manholes where connections or diversion are proposed must be confirmed and reported to the engineer before works commence on site.
  - Any existing drains to be abandoned to be decommissioned in accordance with the Building Regulations by either grubbing, infilling or sealing.
  - Should ground water be encountered on site during construction the Client shall be informed to determine if additional measures are required.
  - The drainage system shall be fully cleaned on completion of the project using methods that ensure pollution off site does not occur.
  - Any existing land drains severed during construction shall be reinstated.



| Revision History |                                              |    |      |      |            |
|------------------|----------------------------------------------|----|------|------|------------|
| Rev              | Comment                                      | By | Chkd | Appr | Date       |
|                  |                                              |    |      |      |            |
|                  |                                              |    |      |      |            |
| A05              | FOR APPROVAL - Updated to latest site layout | PJ | TZ   | SB   | 05.06.2026 |
| A04              | FOR APPROVAL - Updated to latest site layout | PJ | TZ   | SB   | 03.06.2026 |
| A03              | FOR APPROVAL - Updated to latest site layout | PJ | TZ   | SB   | 27.05.2026 |
| A02              | FOR APPROVAL                                 | BS | TZ   | SB   | 09.12.2025 |
| A01              | FOR APPROVAL                                 | TZ | TZ   | SB   | 24.11.2025 |
| Current Revision |                                              |    |      |      |            |
| A06              | FOR APPROVAL - Updated to latest site layout | TZ | TZ   | SB   | 16.07.2026 |

**APPROVAL**

**ALLISON HOMES**

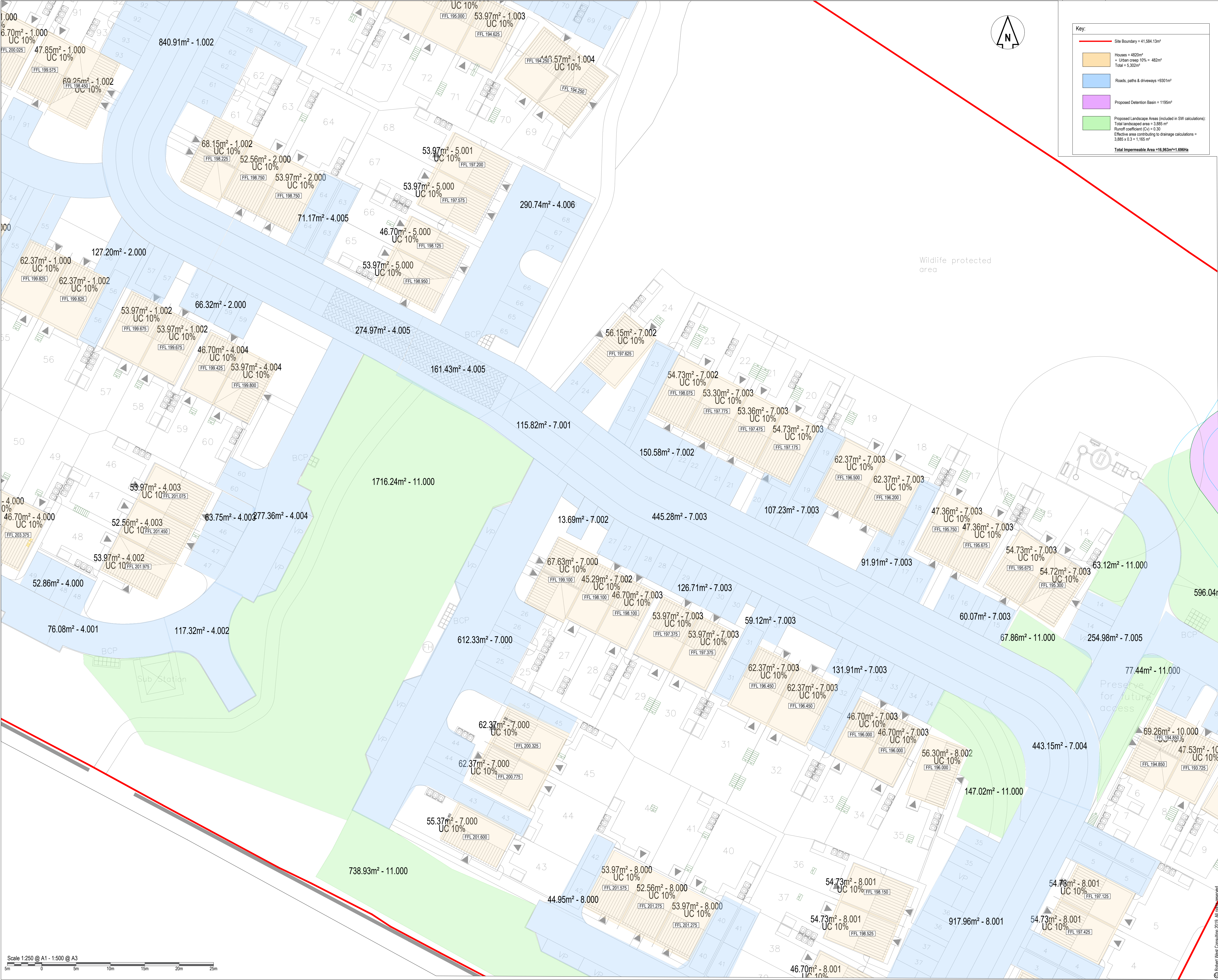
**robert west**  
proesgroup

1 Paris Garden  
London  
SE1 1ND  
t: 0203 773 7880  
www.robertwest.co.uk

Project **MARKFIELD**

Drawing Title **PROPOSED IMPERMEABLE AREA PLAN  
SHEET 1 OF 3**

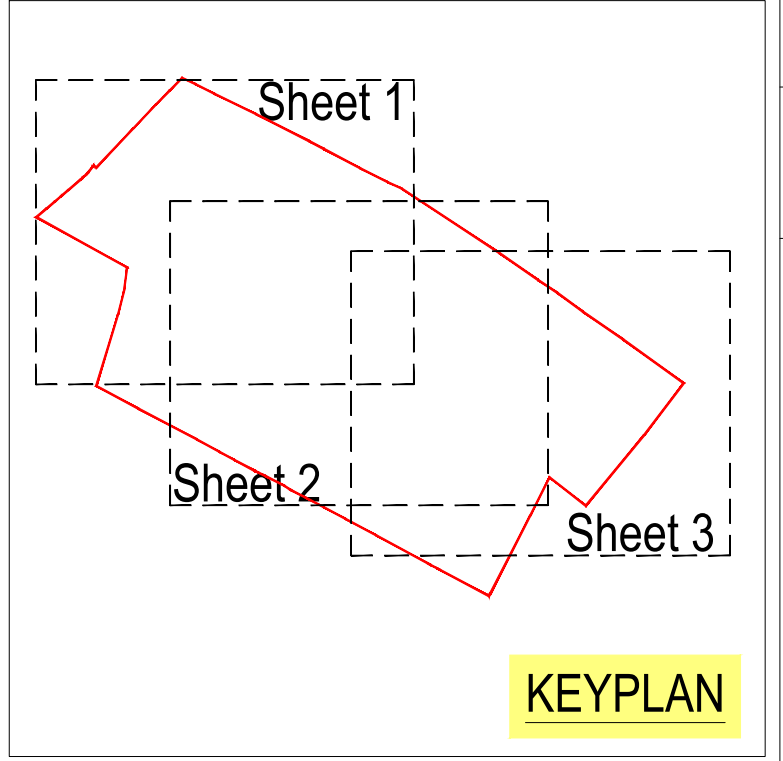




Key:

- Site Boundary = 41,584.13m²
- Houses = 4820m²  
+ Urban creep 10% = 482m²  
Total = 5,302m²
- Roads, paths & driveways = 9301m²
- Proposed Detention Basin = 1195m²
- Proposed Landscape Areas (included in SW calculations):  
Total landscaped area = 3,885 m²  
Runoff coefficient (Cv) = 0.30  
Effective area contributing to drainage calculations = 3,885 x 0.3 = 1,165 m²  
Total Impermeable Area = 16,983m² = 1.698Ha

- DO NOT SCALE OFF THIS DRAWING
- NOTES**
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  - This drawing is to be read in conjunction with all relevant Architectural and M&E drawings.
  - All dimensions in meters unless stated otherwise.
- DRAINAGE NOTES:**
- All drainage works to be constructed in strict accordance with specification of the Local Authority, Building Regulations, Design and Construction Guidance (published by Water UK) & BS EN 752.
  - Any existing drainage found crossing the site is to be investigated, and if found to be 'live', it should be diverted in consultation with the Client.
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| Revision History |                                              |    |      |      |            |
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| Current Revision |                                              |    |      |      |            |
| A06              | FOR APPROVAL - Updated to latest site layout | TZ | TZ   | SB   | 16.07.2026 |

**FOR APPROVAL**

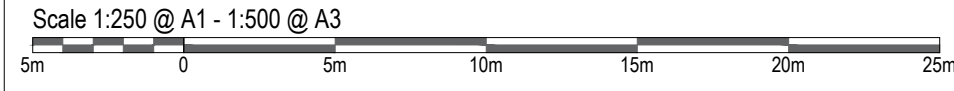
**ALLISON HOMES**

1 Paris Garden  
London  
SE1 1ND  
t: 0203 773 7880  
www.robertwest.co.uk

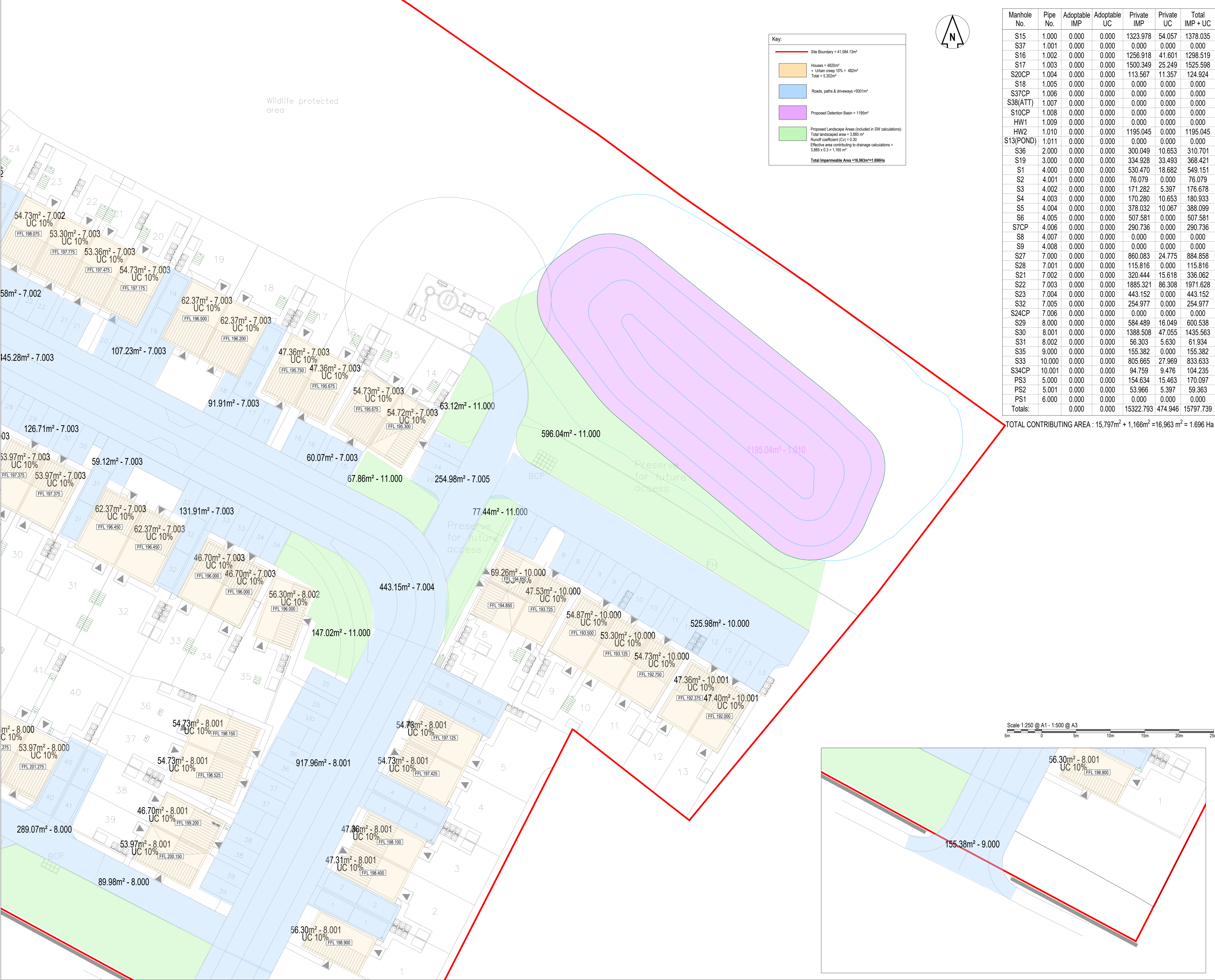
Project: **MARKFIELD**

Drawing Title: **PROPOSED IMPERMEABLE AREA PLAN  
SHEET 2 OF 3**

RWCL Internal Register reference: 5964-003 Scales @ A1  
1061-A06

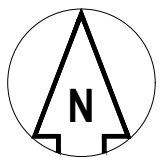






Key:

|                                                                                                                             |                                                                                                                                                                                                                                        |
|-----------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <span style="color: red;">—</span>                                                                                          | Site Boundary = 41,584.13m <sup>2</sup>                                                                                                                                                                                                |
| <span style="background-color: #f4a460; border: 1px solid black; display: inline-block; width: 15px; height: 10px;"></span> | Houses = 4820m <sup>2</sup><br>+ Urban creep 10% = 482m <sup>2</sup><br>Total = 5,302m <sup>2</sup>                                                                                                                                    |
| <span style="background-color: #add8e6; border: 1px solid black; display: inline-block; width: 15px; height: 10px;"></span> | Roads, paths & driveways = 9301m <sup>2</sup>                                                                                                                                                                                          |
| <span style="background-color: #ff69b4; border: 1px solid black; display: inline-block; width: 15px; height: 10px;"></span> | Proposed Detention Basin = 1195m <sup>2</sup>                                                                                                                                                                                          |
| <span style="background-color: #90ee90; border: 1px solid black; display: inline-block; width: 15px; height: 10px;"></span> | Proposed Landscape Areas (included in SW calculations):<br>Total landscaped area = 3,885 m <sup>2</sup><br>Runoff coefficient (Cv) = 0.30<br>Effective area contributing to drainage calculations = 3,885 x 0.3 = 1,165 m <sup>2</sup> |
|                                                                                                                             | <b>Total Impermeable Area =16,963m<sup>2</sup>=1.696Ha</b>                                                                                                                                                                             |



| Manhole No. | Pipe No. | Adoptable IMP | Adoptable UC | Private IMP | Private UC | Total IMP + UC |
|-------------|----------|---------------|--------------|-------------|------------|----------------|
| S15         | 1.000    | 0.000         | 0.000        | 1323.978    | 54.057     | 1378.035       |
| S37         | 1.001    | 0.000         | 0.000        | 0.000       | 0.000      | 0.000          |
| S16         | 1.002    | 0.000         | 0.000        | 1256.918    | 41.601     | 1298.519       |
| S17         | 1.003    | 0.000         | 0.000        | 1500.349    | 25.249     | 1525.598       |
| S20CP       | 1.004    | 0.000         | 0.000        | 113.567     | 11.357     | 124.924        |
| S18         | 1.005    | 0.000         | 0.000        | 0.000       | 0.000      | 0.000          |
| S37CP       | 1.006    | 0.000         | 0.000        | 0.000       | 0.000      | 0.000          |
| S38(ATT)    | 1.007    | 0.000         | 0.000        | 0.000       | 0.000      | 0.000          |
| S10CP       | 1.008    | 0.000         | 0.000        | 0.000       | 0.000      | 0.000          |
| HW1         | 1.009    | 0.000         | 0.000        | 0.000       | 0.000      | 0.000          |
| HW2         | 1.010    | 0.000         | 0.000        | 1195.045    | 0.000      | 1195.045       |
| S13(POND)   | 1.011    | 0.000         | 0.000        | 0.000       | 0.000      | 0.000          |
| S36         | 2.000    | 0.000         | 0.000        | 300.049     | 10.653     | 310.701        |
| S19         | 3.000    | 0.000         | 0.000        | 334.928     | 33.493     | 368.421        |
| S1          | 4.000    | 0.000         | 0.000        | 530.470     | 18.682     | 549.151        |
| S2          | 4.001    | 0.000         | 0.000        | 76.079      | 0.000      | 76.079         |
| S3          | 4.002    | 0.000         | 0.000        | 171.282     | 5.397      | 176.678        |
| S4          | 4.003    | 0.000         | 0.000        | 170.280     | 10.653     | 180.933        |
| S5          | 4.004    | 0.000         | 0.000        | 378.032     | 10.067     | 388.099        |
| S6          | 4.005    | 0.000         | 0.000        | 507.581     | 0.000      | 507.581        |
| S7CP        | 4.006    | 0.000         | 0.000        | 290.736     | 0.000      | 290.736        |
| S8          | 4.007    | 0.000         | 0.000        | 0.000       | 0.000      | 0.000          |
| S9          | 4.008    | 0.000         | 0.000        | 0.000       | 0.000      | 0.000          |
| S27         | 7.000    | 0.000         | 0.000        | 860.083     | 24.775     | 884.858        |
| S28         | 7.001    | 0.000         | 0.000        | 115.816     | 0.000      | 115.816        |
| S21         | 7.002    | 0.000         | 0.000        | 320.444     | 15.618     | 336.062        |
| S22         | 7.003    | 0.000         | 0.000        | 1885.321    | 86.308     | 1971.628       |
| S23         | 7.004    | 0.000         | 0.000        | 443.152     | 0.000      | 443.152        |
| S32         | 7.005    | 0.000         | 0.000        | 254.977     | 0.000      | 254.977        |
| S24CP       | 7.006    | 0.000         | 0.000        | 0.000       | 0.000      | 0.000          |
| S29         | 8.000    | 0.000         | 0.000        | 584.489     | 16.049     | 600.538        |
| S30         | 8.001    | 0.000         | 0.000        | 1388.508    | 47.055     | 1435.563       |
| S31         | 8.002    | 0.000         | 0.000        | 56.303      | 5.630      | 61.934         |
| S35         | 9.000    | 0.000         | 0.000        | 155.382     | 0.000      | 155.382        |
| S33         | 10.000   | 0.000         | 0.000        | 805.665     | 27.969     | 833.633        |
| S34CP       | 10.001   | 0.000         | 0.000        | 94.759      | 9.476      | 104.235        |
| PS3         | 5.000    | 0.000         | 0.000        | 154.634     | 15.463     | 170.097        |
| PS2         | 5.001    | 0.000         | 0.000        | 53.966      | 5.397      | 59.363         |
| PS1         | 6.000    | 0.000         | 0.000        | 0.000       | 0.000      | 0.000          |
| Totals:     |          | 0.000         | 0.000        | 15322.793   | 474.946    | 15797.739      |

TOTAL CONTRIBUTING AREA : 15,797m<sup>2</sup> + 1,166m<sup>2</sup>=16,963 m<sup>2</sup> = 1.696 Ha

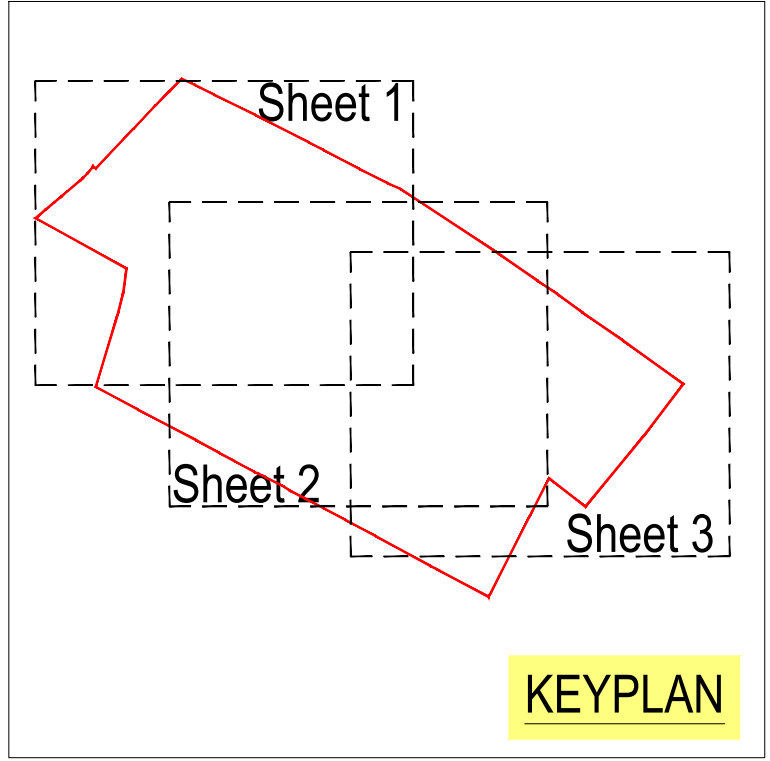
DO NOT SCALE OFF THIS DRAWING

NOTES

1. The contractor is responsible for verifying all site & setting out dimensions before commencing work.
2. This drawing is to be read in conjunction with all relevant Architectural and M&E drawings.
3. All dimensions in meters unless stated otherwise.

DRAINAGE NOTES:

1. All drainage works to be constructed in strict accordance with specification of the Local Authority, Building Regulations, Design and Construction Guidance (published by Water UK) BS EN 752.
2. Any existing drainage found crossing the site is to be investigated, and if found to be 'live', it should be diverted in consultation with the Client.
3. For location and setting out of building drainage points refer to architects drawings.
4. All pipe runs near buildings to comply with the Building Regulations 2015 part H1. Where a pipe is within 1m of a foundation the trench shall be filled with class GEN3 concrete up to the lowest level of the foundation. Where the trench is further than 1m from the foundation, the trench shall be filled with class GEN3 concrete to a level below the lowest level for the foundation equal to the distance from the foundation less 150mm. In both cases the pipe shall be bedded and surrounded in 150mm thick class GEN3 concrete.
5. Where pipes, external to the structures, have a depth to soffit from ground level of less than 450mm they shall have a class GEN3 concrete encasement (150mm thick).
6. Where a pipe, under a carriageway, has a depth of cover of less than 1.2m the pipe shall be laid in a concrete bed and surround.
7. Where a pipe, under a vehicular area other than a carriageway has a depth of cover if less than 0.9m the pipe shall be protected with a concrete slab set above it.
8. In any circumstances where pipes are bedded and surrounded in concrete flexible joints should be provided, compressible boards (fibroboard or polystyrene) shall be provided at a maximum of 8m centres (coinciding with pipe joints), the boards shall be pre-cut to pipe diameter and to a height and width equal to the concrete cross section, a board thickness of 18mm for pipes up to 450mm nominal diameter and 30mm for pipes over 450mm nominal diameter.
9. All private building drainage shall be constructed in strict accordance with BS EN 752. Foul drainage beneath the floor slab shall be laid, shall be laid no flatter than 1:40. Unless otherwise specified below ground building drainage external to the building shall be 100mm diameter and shall be laid at a minimum gradient of (<11s = 1 in 40)>11s = 1 in 80) for foul drains and 1 in 80 for surface water drains.
10. All building drains shall be laid in conjunction with 'iron adoptive bedding details' (class d, n or b) unless otherwise specified.
11. All pipes, bends and junction for private building drainage shall be UPVC conforming to BS4660, BSEN13598 and BSEN1401 as appropriate and shall be laid in accordance with the manufacturer's specification.
12. All pipes, bends and junction materials for adoptable drainage shall be UPVC compliant with Clause E2.21 of Design and Construction Guidance for Foul and Surface Water Water Sewers, Sector Guidance Appendix C, June 2022. These should conform to BS4660, BSEN13598 and BSEN1401 as appropriate and shall be laid in accordance with the manufacturer's specification.
13. All back inlet gullies to be roddable or connected to inspection chambers.
14. All gully connections other than at manholes to be 'Y' junctions.
15. All road gully connections to be 150mm diameter.
16. All stub stacks to be fitted with air admittance valves where branch drain exceeds 12m except at the head of the run. Soil vent pipes located at the head of a run to terminate to fresh air.
17. No low point shall be without a method of drainage.
18. All connections to be soffit to soffit unless otherwise noted.
19. All concrete and concrete products to be in accordance with BRE 363 for sulphates.
20. The locations of all building drainage points shall be cross referenced against the architects drawings during setting out and any discrepancies reported immediately.
21. Before connections are made to existing public sewers an application under S106 must be made to relevant sewerage undertaker.
22. The precise depth and location and size of existing pipes, watercourses or manholes where connections or diversion are proposed must be confirmed and reported to the engineer before works commence on site.
23. Any existing drains to be abandoned to be decommissioned in accordance with the Building Regulations by either grubbing, infilling or sealing.
24. Should ground water be encountered on site during construction the Client shall be informed to determine if additional measures are required.
25. The drainage system shall be fully cleansed on completion of the project using methods that ensure pollution off site does not occur.
26. Any existing land drains severed during construction shall be reinstated.



| Revision History |                                              |    |      |      |            |  |
|------------------|----------------------------------------------|----|------|------|------------|--|
| Rev              | Comment                                      | By | Chkd | Appr | Date       |  |
|                  |                                              |    |      |      |            |  |
|                  |                                              |    |      |      |            |  |
| A05              | FOR APPROVAL - Updated to latest site layout | PJ | TZ   | SB   | 05.06.2026 |  |
| A04              | FOR APPROVAL - Updated to latest site layout | PJ | TZ   | SB   | 03.06.2026 |  |
| A03              | FOR APPROVAL - Updated to latest site layout | PJ | TZ   | SB   | 27.05.2026 |  |
| A02              | FOR APPROVAL                                 | BS | TZ   | SB   | 09.12.2025 |  |
| A01              | FOR APPROVAL                                 | TZ | TZ   | SB   | 24.11.2025 |  |
| Current Revision |                                              |    |      |      |            |  |
| A06              | FOR APPROVAL - Updated to latest site layout | TZ | TZ   | SB   | 16.07.2026 |  |

FOR APPROVAL

ALLISON HOMES

**robert west**  
proesgroup  
1 Paris Garden  
London  
SE1 1ND  
t: 0203 773 7880  
www.robertwest.co.uk

Project  
MARKFIELD

Drawing Title  
PROPOSED IMPERMEABLE AREA PLAN  
SHEET 3 OF 3

RWCL Internal Register reference: 5964-003

Scales @ A1

1062-A06

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## Appendix G – Proposed Drainage Strategy Plan and Calculations

## Network Details

### Manhole Schedule

| Manhole   | Catchment Area (ha) | Size (mm) | Type   | CL (m)  | IL (m)  | Depth To Soffit (m) | Easting (m) | Northing (m) |
|-----------|---------------------|-----------|--------|---------|---------|---------------------|-------------|--------------|
| S15       | 0.186               | 1350      | Type C | 201.156 | 199.615 | 1.316               | 448716.509  | 310747.348   |
| S37       | 0.000               | 1350      | Type C | 198.961 | 197.646 | 1.090               | 448746.885  | 310732.126   |
| S36       | 0.031               | 1350      | Type C | 198.593 | 197.849 | 0.594               | 448764.708  | 310722.891   |
| S16       | 0.130               | 1200      | Type C | 198.332 | 197.135 | 0.897               | 448756.415  | 310732.584   |
| S19       | 0.037               | 1350      | Type C | 199.366 | 197.967 | 1.249               | 448741.711  | 310804.444   |
| S17       | 0.153               | 1350      | Type B | 197.012 | 194.642 | 1.995               | 448783.025  | 310784.556   |
| S20CP     | 0.012               | 1350      | Type B | 193.508 | 191.107 | 2.026               | 448829.297  | 310759.577   |
| S18       | 0.000               | 1350      | Type C | 190.850 | 189.520 | 0.955               | 448839.113  | 310754.777   |
| S1        | 0.055               | 1350      | Type C | 203.961 | 202.526 | 1.285               | 448720.329  | 310681.512   |
| S2        | 0.008               | 1350      | Type B | 202.877 | 200.995 | 1.733               | 448751.878  | 310665.362   |
| S3        | 0.018               | 1350      | Type B | 202.268 | 200.458 | 1.660               | 448761.575  | 310665.669   |
| S4        | 0.018               | 1350      | Type B | 201.645 | 199.540 | 1.880               | 448769.736  | 310671.064   |
| S5        | 0.039               | 1350      | Type B | 200.696 | 198.470 | 1.926               | 448776.803  | 310683.766   |
| S6        | 0.051               | 1200      | Type B | 198.843 | 196.740 | 1.803               | 448789.143  | 310710.318   |
| S7CP      | 0.201               | 1200      | Type B | 198.248 | 196.220 | 1.728               | 448809.962  | 310698.514   |
| PS3       | 0.017               | 450       | Type E | 198.662 | 196.767 | 1.794               | 448802.016  | 310711.418   |
| PS1       | 0.000               | 180       | Type E | 197.034 | 197.011 | -0.077              | 448803.720  | 310738.728   |
| PS2       | 0.006               | 1050      | Type E | 196.950 | 195.250 | 1.600               | 448813.348  | 310733.776   |
| S8        | 0.000               | 1200      | Type B | 194.700 | 192.651 | 1.749               | 448832.272  | 310720.328   |
| S37CP     | 0.000               | 1350      | Type B | 190.242 | 188.050 | 1.742               | 448860.910  | 310740.086   |
| S38(ATT)  | 0.000               | 1500      | Type C | 189.817 | 187.890 | 1.402               | 448887.652  | 310722.671   |
| S10CP     | 0.000               | 1500      | Type B | 190.150 | 187.580 | 2.045               | 448923.417  | 310699.099   |
| S27       | 0.088               | 1350      | Type C | 200.855 | 199.428 | 1.202               | 448799.657  | 310651.430   |
| S28       | 0.012               | 1350      | Type C | 198.330 | 196.630 | 1.475               | 448818.135  | 310687.560   |
| S21       | 0.034               | 1200      | Type B | 197.978 | 196.000 | 1.753               | 448824.937  | 310690.871   |
| S22       | 0.212               | 1200      | Type B | 197.723 | 195.570 | 1.853               | 448833.917  | 310685.092   |
| S23       | 0.051               | 1350      | Type B | 195.551 | 193.020 | 2.156               | 448889.795  | 310656.523   |
| S29       | 0.134               | 1350      | Type C | 201.363 | 200.013 | 1.125               | 448828.136  | 310618.885   |
| S35       | 0.016               | 1350      | Type C | 199.282 | 197.907 | 1.150               | 448866.013  | 310587.600   |
| S30       | 0.144               | 1350      | Type C | 199.073 | 197.530 | 1.243               | 448871.083  | 310597.007   |
| S31       | 0.006               | 1350      | Type C | 196.238 | 194.700 | 1.238               | 448893.500  | 310641.355   |
| S32       | 0.040               | 1350      | Type B | 195.764 | 192.500 | 2.889               | 448897.938  | 310653.963   |
| S24CP     | 0.000               | 1350      | Type B | 194.379 | 191.130 | 2.874               | 448906.740  | 310672.611   |
| HW1       | 0.060               | 1500      | Type B | 190.150 | 187.520 | 2.105               | 448923.908  | 310688.268   |
| S33       | 0.083               | 1350      | Type B | 193.671 | 192.010 | 1.511               | 448921.242  | 310658.285   |
| S34CP     | 0.010               | 1350      | Type B | 192.293 | 190.549 | 1.594               | 448939.829  | 310646.660   |
| HW2       | 0.120               | 1500      | Type B | 190.150 | 187.500 | 2.200               | 448949.936  | 310665.049   |
| S13(POND) | 0.000               | 1500      | Type B | 190.150 | 187.400 | 2.450               | 448958.777  | 310670.668   |
| S14       | 0.000               | 1350      | Type C | 185.971 | 184.621 | 1.050               | 448974.063  | 310673.395   |

### Pipe Schedule

| Pipe Number | US Manhole | US IL (m) | DS Manhole | DS IL (m) | Shape | Dimension (mm) | Length (m) | Gradient (1:x) | Roughness (mm) | US Depth To Soffit (m) | DS Depth To Soffit (m) |
|-------------|------------|-----------|------------|-----------|-------|----------------|------------|----------------|----------------|------------------------|------------------------|
| 1.000       | S15        | 199.615   | S37        | 197.646   | Circ  | 225            | 33.977     | 17             | 0.600          | 1.316                  | 1.090                  |
| 1.001       | S37        | 197.646   | S16        | 197.210   | Circ  | 225            | 9.540      | 22             | 0.600          | 1.090                  | 0.897                  |
| 2.000       | S36        | 197.849   | S16        | 197.285   | Circ  | 150            | 12.757     | 23             | 0.600          | 0.594                  | 0.897                  |
| 1.002       | S16        | 197.135   | S17        | 194.717   | Circ  | 300            | 58.389     | 24             | 0.600          | 0.897                  | 1.995                  |
| 3.000       | S19        | 197.967   | S17        | 194.867   | Circ  | 150            | 45.852     | 15             | 0.600          | 1.249                  | 1.995                  |
| 1.003       | S17        | 194.642   | S20CP      | 191.932   | Circ  | 375            | 52.584     | 19             | 0.600          | 1.995                  | 1.201                  |
| 1.004       | S20CP      | 191.107   | S18        | 189.520   | Circ  | 375            | 10.926     | 7              | 0.600          | 2.026                  | 0.955                  |
| 1.005       | S18        | 189.520   | S37CP      | 188.125   | Circ  | 375            | 26.286     | 19             | 0.600          | 0.955                  | 1.742                  |
| 4.000       | S1         | 202.526   | S2         | 200.995   | Circ  | 150            | 35.443     | 23             | 0.600          | 1.285                  | 1.733                  |
| 4.001       | S2         | 200.995   | S3         | 200.458   | Circ  | 150            | 9.702      | 18             | 0.600          | 1.733                  | 1.660                  |
| 4.002       | S3         | 200.458   | S4         | 199.615   | Circ  | 150            | 9.782      | 12             | 0.600          | 1.660                  | 1.880                  |
| 4.003       | S4         | 199.540   | S5         | 198.545   | Circ  | 225            | 14.536     | 15             | 0.600          | 1.880                  | 1.926                  |
| 4.004       | S5         | 198.470   | S6         | 196.740   | Circ  | 300            | 29.280     | 17             | 0.600          | 1.926                  | 1.803                  |
| 4.005       | S6         | 196.740   | S7CP       | 196.220   | Circ  | 300            | 23.933     | 46             | 0.600          | 1.803                  | 1.728                  |
| 4.006       | S7CP       | 196.220   | S8         | 192.651   | Circ  | 300            | 31.202     | 9              | 0.600          | 1.728                  | 1.749                  |
| 5.000       | PS3        | 196.767   | PS2        | 195.250   | Circ  | 100            | 25.065     | 17             | 0.600          | 1.794                  | 1.600                  |
| 6.000       | PS1        | 197.011   | PS2        | 195.250   | Circ  | 100            | 10.827     | 6              | 0.600          | -0.077                 | 1.600                  |
| 5.001       | PS2        | 195.250   | S8         | 192.852   | Circ  | 100            | 23.216     | 10             | 0.600          | 1.600                  | 1.749                  |



## Pipe Schedule

| Pipe Number | US Manhole | US IL (m) | DS Manhole | DS IL (m) | Shape | Dimension (mm) | Length (m) | Gradient (1:x) | Roughness (mm) | US Depth To Soffit (m) | DS Depth To Soffit (m) |
|-------------|------------|-----------|------------|-----------|-------|----------------|------------|----------------|----------------|------------------------|------------------------|
| 4.007       | S8         | 192.651   | S37CP      | 188.200   | Circ  | 300            | 34.792     | 8              | 0.600          | 1.749                  | 1.742                  |
| 1.006       | S37CP      | 188.050   | S38(ATT)   | 187.965   | Circ  | 450            | 31.913     | 375            | 0.600          | 1.742                  | 1.402                  |
| 1.007       | S38(ATT)   | 187.890   | S10CP      | 187.580   | Circ  | 525            | 42.835     | 138            | 0.600          | 1.402                  | 2.045                  |
| 1.008       | S10CP      | 187.580   | HW1        | 187.520   | Circ  | 525            | 10.842     | 181            | 0.600          | 2.045                  | 2.105                  |
| 7.000       | S27        | 199.428   | S28        | 196.640   | Circ  | 225            | 40.581     | 15             | 0.600          | 1.202                  | 1.465                  |
| 7.001       | S28        | 196.630   | S21        | 196.000   | Circ  | 225            | 7.565      | 12             | 0.600          | 1.475                  | 1.753                  |
| 7.002       | S21        | 196.000   | S22        | 195.645   | Circ  | 225            | 10.679     | 30             | 0.600          | 1.753                  | 1.853                  |
| 7.003       | S22        | 195.570   | S23        | 193.095   | Circ  | 300            | 62.758     | 25             | 0.600          | 1.853                  | 2.156                  |
| 7.004       | S23        | 193.020   | S32        | 192.500   | Circ  | 375            | 8.537      | 16             | 0.600          | 2.156                  | 2.889                  |
| 8.000       | S29        | 200.013   | S30        | 197.605   | Circ  | 225            | 48.198     | 20             | 0.600          | 1.125                  | 1.243                  |
| 9.000       | S35        | 197.907   | S30        | 197.605   | Circ  | 225            | 10.686     | 35             | 0.600          | 1.150                  | 1.243                  |
| 8.001       | S30        | 197.530   | S31        | 194.700   | Circ  | 300            | 49.691     | 18             | 0.600          | 1.243                  | 1.238                  |
| 8.002       | S31        | 194.700   | S32        | 192.575   | Circ  | 300            | 13.366     | 6              | 0.600          | 1.238                  | 2.889                  |
| 7.005       | S32        | 192.500   | S24CP      | 191.130   | Circ  | 375            | 20.621     | 15             | 0.600          | 2.889                  | 2.874                  |
| 7.006       | S24CP      | 191.130   | HW1        | 187.670   | Circ  | 375            | 23.235     | 7              | 0.600          | 2.874                  | 2.105                  |
| 1.009       | HW1        | 187.520   | HW2        | 187.500   | Circ  | 525            | 34.880     | 1744           | 0.600          | 2.105                  | 2.125                  |
| 10.000      | S33        | 192.010   | S34CP      | 190.549   | Circ  | 150            | 21.923     | 15             | 0.600          | 1.511                  | 1.594                  |
| 10.001      | S34CP      | 190.549   | HW2        | 187.800   | Circ  | 150            | 20.983     | 8              | 0.600          | 1.594                  | 2.200                  |
| 1.010       | HW2        | 187.500   | S13(POND)  | 187.400   | Circ  | 450            | 10.476     | 105            | 0.600          | 2.200                  | 2.300                  |
| 1.011       | S13(POND)  | 187.400   | S14        | 184.621   | Circ  | 300            | 15.528     | 6              | 0.600          | 2.450                  | 1.050                  |

## Outfall Details

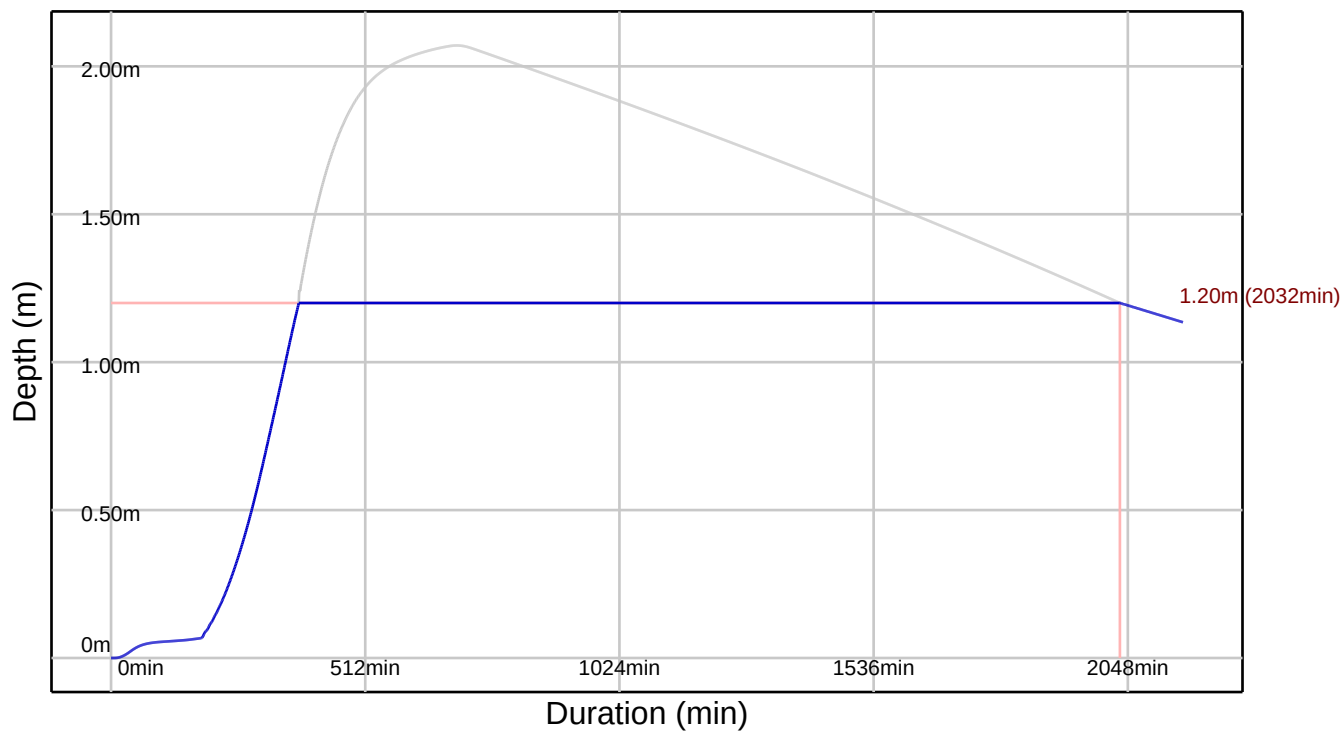
Outfall Manhole S14 : Free Discharge

## Flow Control Details

### Tank Structure at Manhole S38(ATT)

| Tank Invert (m) | Tank Height (m) | Porosity Ratio (%) | Area (m2) | Effective Area (m2)<br>Area x Porosity Ratio | Max Storage (m3)<br>Effective Area x Height | Infil Base (m/hr) | Infil Side (m/hr) | Safety Factor |
|-----------------|-----------------|--------------------|-----------|----------------------------------------------|---------------------------------------------|-------------------|-------------------|---------------|
| 187.882         | 1.200           | 95.00              | 270.000   | 256.500                                      | 307.800                                     | 0.00000000        | 0.00000000        | 2.00          |

## Tank 1 at S38(ATT) (100Yr+40% 720Min Winter)

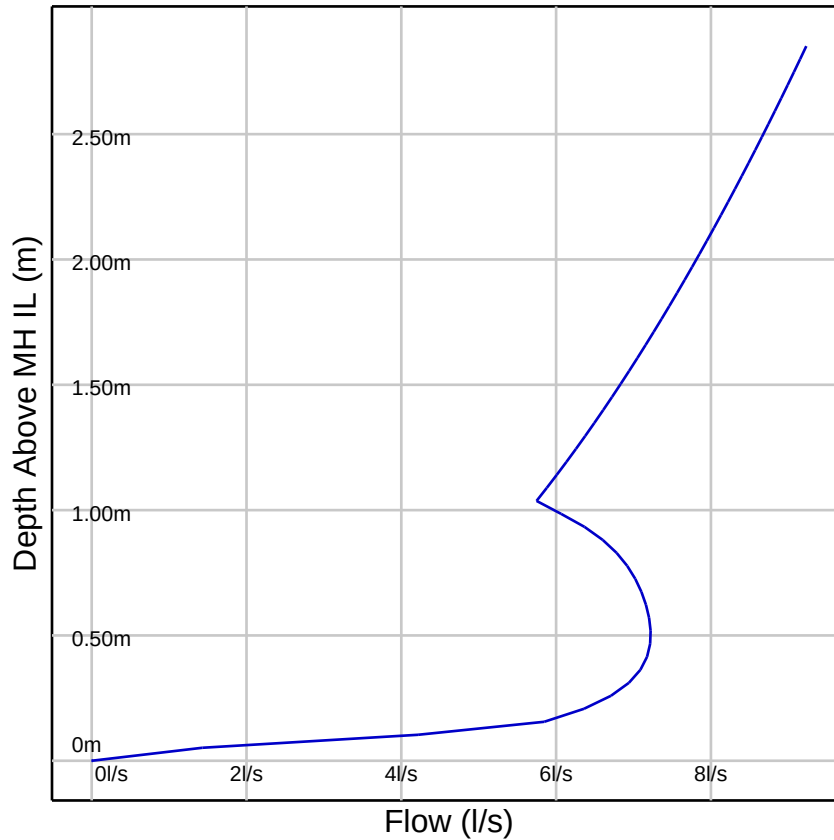


## Controls within Manhole S13(POND)

### Hydro-Brake® Optimum Control

| Model Ref               | Design Depth (m) | Design Flow (l/s) | Invert Offset (m) | FF Head (m) | FF Flow (l/s) | KF Head (m) | KF Flow (l/s) |
|-------------------------|------------------|-------------------|-------------------|-------------|---------------|-------------|---------------|
| SHE-0115-8500-2400-8500 | 2.400            | 8.500             | 0.000             | 0.502       | 7.222         | 1.030       | 5.729         |

## Hydro-Brake® Optimum Control from S13(POND) to S14

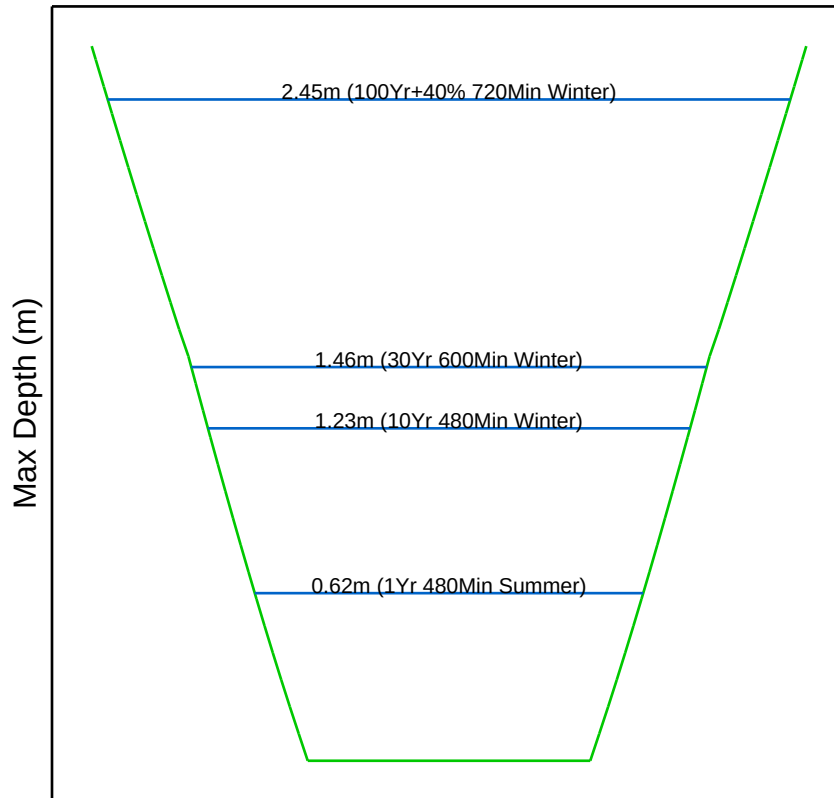


## Pond Structure at Manhole S13(POND)

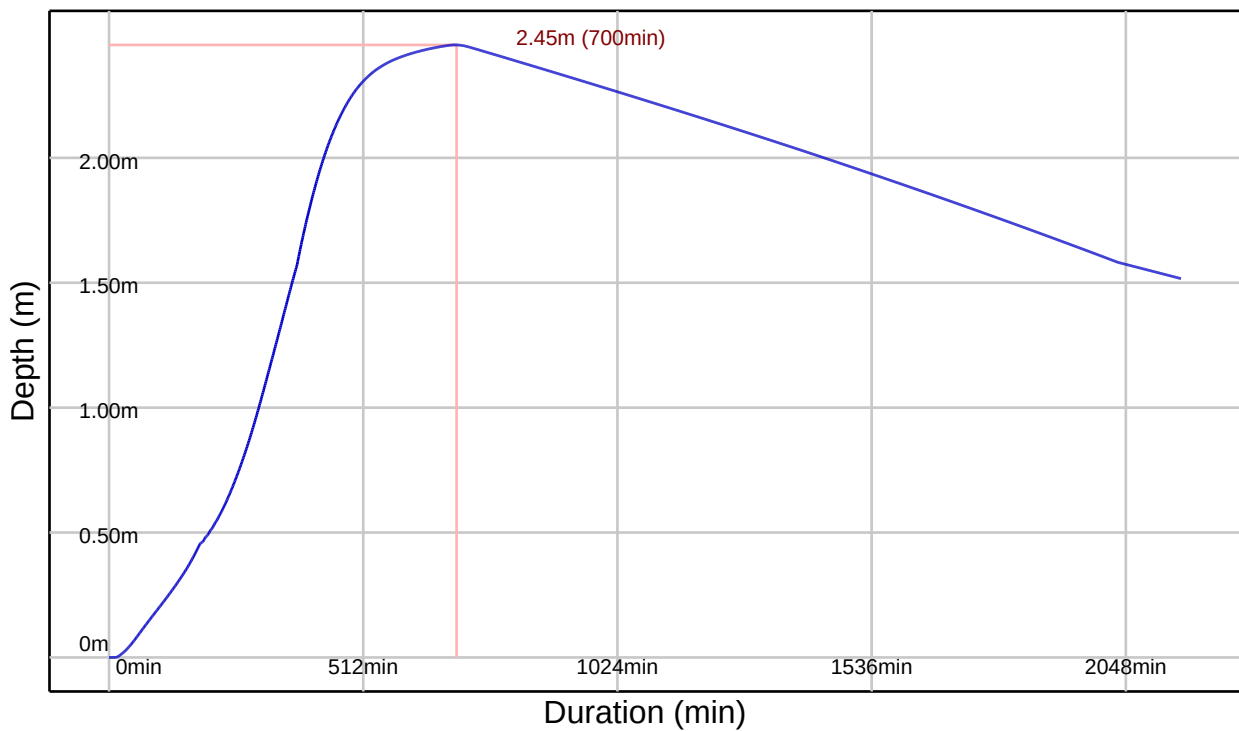
| Pond Invert (m) | Max Depth (m) | Volume To Water Level (m3) | Water Level (m) | Freeboard (m) | Infil Base (m/hr) | Infil Side (m/hr) | Safety Factor |
|-----------------|---------------|----------------------------|-----------------|---------------|-------------------|-------------------|---------------|
| 187.500         | 2.650         | 1002.536                   | 189.850         | 0.300         | 0.00000000        | 0.00000000        | 2.00          |



## Pond Depth/Area Diagram at S13(POND)



## Pond 2 at S13(POND) (100Yr+40% 720Min Winter)



## Simulation Settings

FEH2022 (point): Filename=FEH\_Point\_Descriptors\_448889\_310666\_v5\_1\_0.xml

Summer (Cv min: 0.30, max: 1.00), Winter (Cv min: 0.30, max: 1.00)

Global Time of Entry: 5.0 mins

Durations (mins): 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 10080

Return Periods (yrs) + Climate Change: (1, +0%), (10, +0%), (30, +0%), (100, +40%)

Manhole Flood Risk Freeboard: 0.300m

## Simulated Rainfall Events

| Storm                | Average Intensity<br>(mm/hr) | Runoff<br>Continuity % | Flow<br>Continuity % | Storm                     | Average Intensity<br>(mm/hr) | Runoff<br>Continuity % | Flow<br>Continuity % |
|----------------------|------------------------------|------------------------|----------------------|---------------------------|------------------------------|------------------------|----------------------|
| 1Yr 15Min Winter     | 17.384                       | 0.00                   | -0.08                | 30Yr 15Min Summer         | 78.807                       | 0.00                   | 1.25                 |
| 1Yr 15Min Summer     | 17.384                       | 0.00                   | 0.00                 | 30Yr 15Min Winter         | 78.807                       | 0.00                   | 1.18                 |
| 1Yr 30Min Winter     | 11.343                       | 0.00                   | -0.27                | 30Yr 30Min Summer         | 51.149                       | 0.00                   | 1.65                 |
| 1Yr 30Min Summer     | 11.343                       | 0.00                   | -0.21                | 30Yr 30Min Winter         | 51.149                       | 0.00                   | 1.59                 |
| 1Yr 60Min Winter     | 7.043                        | 0.00                   | -0.25                | 30Yr 60Min Summer         | 31.723                       | 0.00                   | 1.97                 |
| 1Yr 60Min Summer     | 7.043                        | 0.00                   | -0.23                | 30Yr 60Min Winter         | 31.723                       | 0.00                   | 1.92                 |
| 1Yr 120Min Winter    | 5.594                        | 0.00                   | -0.17                | 30Yr 120Min Summer        | 19.617                       | 0.00                   | 2.04                 |
| 1Yr 120Min Summer    | 5.594                        | 0.00                   | -0.20                | 30Yr 120Min Winter        | 19.617                       | 0.00                   | 2.04                 |
| 1Yr 180Min Winter    | 4.752                        | 0.00                   | -0.08                | 30Yr 180Min Summer        | 14.708                       | 0.00                   | 1.93                 |
| 1Yr 180Min Summer    | 4.752                        | 0.00                   | -0.10                | 30Yr 180Min Winter        | 14.708                       | 0.00                   | 1.95                 |
| 1Yr 240Min Winter    | 3.979                        | 0.00                   | -0.04                | 30Yr 240Min Summer        | 11.859                       | 0.00                   | 1.74                 |
| 1Yr 240Min Summer    | 3.979                        | 0.00                   | -0.05                | 30Yr 240Min Winter        | 11.859                       | 0.00                   | 1.75                 |
| 1Yr 360Min Winter    | 3.089                        | 0.00                   | -0.02                | 30Yr 360Min Summer        | 8.709                        | 0.00                   | 1.30                 |
| 1Yr 360Min Summer    | 3.089                        | 0.00                   | -0.03                | 30Yr 360Min Winter        | 8.709                        | 0.00                   | 1.32                 |
| 1Yr 480Min Winter    | 2.558                        | 0.00                   | -0.02                | 30Yr 480Min Summer        | 6.961                        | 0.00                   | 0.85                 |
| 1Yr 480Min Summer    | 2.558                        | 0.00                   | -0.02                | 30Yr 480Min Winter        | 6.961                        | 0.00                   | 0.86                 |
| 1Yr 600Min Winter    | 2.183                        | 0.00                   | -0.01                | 30Yr 600Min Summer        | 5.818                        | 0.00                   | 0.50                 |
| 1Yr 600Min Summer    | 2.183                        | 0.00                   | -0.02                | 30Yr 600Min Winter        | 5.818                        | 0.00                   | 0.51                 |
| 1Yr 720Min Summer    | 1.905                        | 0.00                   | -0.01                | 30Yr 720Min Summer        | 5.008                        | 0.00                   | 0.13                 |
| 1Yr 720Min Winter    | 1.905                        | 0.00                   | -0.01                | 30Yr 720Min Winter        | 5.008                        | 0.00                   | 0.15                 |
| 1Yr 960Min Winter    | 1.536                        | 0.00                   | -0.01                | 30Yr 960Min Summer        | 3.953                        | 0.00                   | -0.02                |
| 1Yr 960Min Summer    | 1.536                        | 0.00                   | -0.01                | 30Yr 960Min Winter        | 3.953                        | 0.00                   | -0.02                |
| 1Yr 1440Min Summer   | 1.118                        | 0.00                   | -0.01                | 30Yr 1440Min Summer       | 2.826                        | 0.00                   | -0.02                |
| 1Yr 1440Min Winter   | 1.118                        | 0.00                   | -0.01                | 30Yr 1440Min Winter       | 2.826                        | 0.00                   | -0.01                |
| 1Yr 10080Min Winter  | 0.295                        | 0.00                   | 0.00                 | 30Yr 10080Min Summer      | 0.681                        | 0.00                   | -0.00                |
| 1Yr 10080Min Summer  | 0.295                        | 0.00                   | 0.00                 | 30Yr 10080Min Winter      | 0.681                        | 0.00                   | 0.00                 |
| 10Yr 15Min Summer    | 61.352                       | 0.00                   | 0.68                 | 100Yr+40% 15Min Summer    | 139.493                      | 0.00                   | 2.91                 |
| 10Yr 15Min Winter    | 61.352                       | 0.00                   | 0.65                 | 100Yr+40% 15Min Winter    | 139.493                      | 0.00                   | 2.89                 |
| 10Yr 30Min Summer    | 39.400                       | 0.00                   | 1.15                 | 100Yr+40% 30Min Summer    | 91.347                       | 0.00                   | 3.18                 |
| 10Yr 30Min Winter    | 39.400                       | 0.00                   | 1.18                 | 100Yr+40% 30Min Winter    | 91.347                       | 0.00                   | 3.09                 |
| 10Yr 60Min Summer    | 24.338                       | 0.00                   | 1.28                 | 100Yr+40% 60Min Summer    | 57.013                       | 0.00                   | 3.13                 |
| 10Yr 60Min Winter    | 24.338                       | 0.00                   | 1.28                 | 100Yr+40% 60Min Winter    | 57.013                       | 0.00                   | 3.10                 |
| 10Yr 120Min Summer   | 15.485                       | 0.00                   | 1.33                 | 100Yr+40% 120Min Summer   | 34.742                       | 0.00                   | 3.02                 |
| 10Yr 120Min Winter   | 15.485                       | 0.00                   | 1.33                 | 100Yr+40% 120Min Winter   | 34.742                       | 0.00                   | 3.05                 |
| 10Yr 180Min Winter   | 11.793                       | 0.00                   | 1.28                 | 100Yr+40% 180Min Summer   | 25.904                       | 0.00                   | 2.90                 |
| 10Yr 180Min Summer   | 11.793                       | 0.00                   | 1.27                 | 100Yr+40% 180Min Winter   | 25.904                       | 0.00                   | 2.92                 |
| 10Yr 240Min Summer   | 9.525                        | 0.00                   | 1.07                 | 100Yr+40% 240Min Summer   | 20.901                       | 0.00                   | 2.76                 |
| 10Yr 240Min Winter   | 9.525                        | 0.00                   | 1.08                 | 100Yr+40% 240Min Winter   | 20.901                       | 0.00                   | 2.77                 |
| 10Yr 360Min Summer   | 7.041                        | 0.00                   | 0.71                 | 100Yr+40% 360Min Summer   | 15.349                       | 0.00                   | 2.44                 |
| 10Yr 360Min Winter   | 7.041                        | 0.00                   | 0.73                 | 100Yr+40% 360Min Winter   | 15.349                       | 0.00                   | 2.46                 |
| 10Yr 480Min Summer   | 5.655                        | 0.00                   | 0.31                 | 100Yr+40% 480Min Summer   | 12.263                       | 0.00                   | 2.13                 |
| 10Yr 480Min Winter   | 5.655                        | 0.00                   | 0.32                 | 100Yr+40% 480Min Winter   | 12.263                       | 0.00                   | 2.14                 |
| 10Yr 600Min Summer   | 4.736                        | 0.00                   | -0.04                | 100Yr+40% 600Min Summer   | 10.248                       | 0.00                   | 1.81                 |
| 10Yr 600Min Winter   | 4.736                        | 0.00                   | -0.03                | 100Yr+40% 600Min Winter   | 10.248                       | 0.00                   | 1.82                 |
| 10Yr 720Min Winter   | 4.081                        | 0.00                   | -0.03                | 100Yr+40% 720Min Summer   | 8.820                        | 0.00                   | 1.50                 |
| 10Yr 720Min Summer   | 4.081                        | 0.00                   | -0.03                | 100Yr+40% 720Min Winter   | 8.820                        | 0.00                   | 1.51                 |
| 10Yr 960Min Summer   | 3.229                        | 0.00                   | -0.03                | 100Yr+40% 960Min Summer   | 6.945                        | 0.00                   | 0.95                 |
| 10Yr 960Min Winter   | 3.229                        | 0.00                   | -0.02                | 100Yr+40% 960Min Winter   | 6.945                        | 0.00                   | 0.97                 |
| 10Yr 1440Min Winter  | 2.319                        | 0.00                   | -0.01                | 100Yr+40% 1440Min Summer  | 4.932                        | 0.00                   | 0.03                 |
| 10Yr 1440Min Summer  | 2.319                        | 0.00                   | -0.02                | 100Yr+40% 1440Min Winter  | 4.932                        | 0.00                   | 0.04                 |
| 10Yr 10080Min Summer | 0.578                        | 0.00                   | 0.00                 | 100Yr+40% 10080Min Winter | 1.111                        | 0.00                   | -0.00                |
| 10Yr 10080Min Winter | 0.578                        | 0.00                   | 0.00                 | 100Yr+40% 10080Min Summer | 1.111                        | 0.00                   | 0.00                 |

## Simulation Results

Return Period (yrs) + Climate Change (%):

1yr+0%

### Manholes

| Manhole   | Critical Storm | Peak (mins) | Level (m) | Depth (m) | Inflow (l/s) | Flood (m3) | Status     |
|-----------|----------------|-------------|-----------|-----------|--------------|------------|------------|
| S15       | 15 min Summer  | 8           | 199.668   | 0.053     | 15.641       |            | OK         |
| S37       | 15 min Summer  | 8           | 197.703   | 0.057     | 15.556       |            | OK         |
| S36       | 15 min Summer  | 8           | 197.878   | 0.029     | 3.194        |            | OK         |
| S16       | 15 min Summer  | 8           | 197.210   | 0.075     | 31.929       |            | OK         |
| S19       | 15 min Summer  | 8           | 197.995   | 0.028     | 3.787        |            | OK         |
| S17       | 15 min Summer  | 9           | 194.725   | 0.084     | 50.237       |            | OK         |
| S20CP     | 15 min Summer  | 9           | 191.170   | 0.063     | 51.861       |            | OK         |
| S18       | 15 min Summer  | 9           | 189.603   | 0.083     | 51.907       |            | OK         |
| S1        | 15 min Summer  | 8           | 202.565   | 0.039     | 5.645        |            | OK         |
| S2        | 15 min Summer  | 8           | 201.033   | 0.038     | 6.327        |            | OK         |
| S3        | 15 min Summer  | 8           | 200.498   | 0.039     | 8.109        |            | OK         |
| S4        | 15 min Summer  | 9           | 199.581   | 0.041     | 9.835        |            | OK         |
| S5        | 15 min Summer  | 9           | 198.515   | 0.045     | 13.706       |            | OK         |
| S6        | 15 min Summer  | 9           | 196.811   | 0.071     | 18.766       |            | OK         |
| S7CP      | 15 min Summer  | 9           | 196.274   | 0.054     | 26.840       |            | OK         |
| PS3       | 15 min Summer  | 8           | 196.790   | 0.023     | 1.749        |            | OK         |
| PS1       | 15 min Winter  | 0           | 197.011   | 0.000     | 0.000        |            | OK         |
| PS2       | 15 min Summer  | 8           | 195.273   | 0.023     | 2.350        |            | OK         |
| S8        | 15 min Summer  | 9           | 192.705   | 0.054     | 29.243       |            | OK         |
| S37CP     | 15 min Summer  | 9           | 188.278   | 0.228     | 81.353       |            | OK         |
| S38(ATT)  | 480 min Summer | 348         | 188.122   | 0.240     | 3.421        |            | OK         |
| S10CP     | 480 min Summer | 348         | 188.122   | 0.542     | 3.403        |            | Surcharged |
| S27       | 15 min Summer  | 8           | 199.467   | 0.039     | 9.095        |            | OK         |
| S28       | 15 min Summer  | 8           | 196.668   | 0.038     | 10.166       |            | OK         |
| S21       | 15 min Summer  | 8           | 196.057   | 0.057     | 13.593       |            | OK         |
| S22       | 15 min Summer  | 8           | 195.649   | 0.079     | 34.225       |            | OK         |
| S23       | 15 min Summer  | 8           | 193.088   | 0.068     | 38.320       |            | OK         |
| S29       | 15 min Summer  | 8           | 200.053   | 0.040     | 8.451        |            | OK         |
| S35       | 15 min Summer  | 8           | 197.928   | 0.020     | 1.597        |            | OK         |
| S30       | 15 min Summer  | 8           | 197.594   | 0.064     | 24.618       |            | OK         |
| S31       | 15 min Summer  | 8           | 194.748   | 0.048     | 25.073       |            | OK         |
| S32       | 15 min Summer  | 9           | 192.594   | 0.094     | 66.090       |            | OK         |
| S24CP     | 15 min Summer  | 9           | 191.202   | 0.072     | 66.257       |            | OK         |
| HW1       | 480 min Summer | 348         | 188.122   | 0.602     | 6.261        |            | Surcharged |
| S33       | 15 min Summer  | 8           | 192.054   | 0.044     | 8.569        |            | OK         |
| S34CP     | 15 min Summer  | 8           | 190.587   | 0.039     | 9.594        |            | OK         |
| HW2       | 480 min Summer | 346         | 188.122   | 0.622     | 7.157        |            | Surcharged |
| S13(POND) | 480 min Summer | 346         | 188.121   | 0.621     | 7.157        |            | Surcharged |
| S14       | 360 min Winter | 434         | 184.646   | 0.025     | 7.221        |            | Outfall    |

### Conduits

| Pipe No. | Critical Storm | Peak (mins) | US Manhole | DS Manhole | Flow Depth (m) | Max Velocity (m/s) | Max Flow (l/s) | Flow / Capacity | Status |
|----------|----------------|-------------|------------|------------|----------------|--------------------|----------------|-----------------|--------|
| 1.000    | 15 min Summer  | 8           | S15        | S37        | 0.055          | 2.090              | 15.556         | 0.124           | OK     |
| 1.001    | 15 min Summer  | 8           | S37        | S16        | 0.055          | 2.031              | 15.417         | 0.138           | OK     |
| 2.000    | 15 min Summer  | 8           | S36        | S16        | 0.029          | 1.333              | 3.164          | 0.084           | OK     |
| 1.002    | 15 min Summer  | 9           | S16        | S17        | 0.075          | 2.297              | 31.507         | 0.139           | OK     |
| 3.000    | 15 min Summer  | 8           | S19        | S17        | 0.028          | 1.590              | 3.697          | 0.079           | OK     |
| 1.003    | 15 min Summer  | 9           | S17        | S20CP      | 0.083          | 2.779              | 50.629         | 0.111           | OK     |
| 1.004    | 15 min Summer  | 9           | S20CP      | S18        | 0.073          | 3.436              | 51.907         | 0.068           | OK     |
| 1.005    | 15 min Summer  | 9           | S18        | S37CP      | 0.118          | 2.237              | 52.020         | 0.112           | OK     |
| 4.000    | 15 min Summer  | 8           | S1         | S2         | 0.039          | 1.527              | 5.545          | 0.149           | OK     |
| 4.001    | 15 min Summer  | 8           | S2         | S3         | 0.039          | 1.729              | 6.293          | 0.150           | OK     |
| 4.002    | 15 min Summer  | 9           | S3         | S4         | 0.039          | 2.229              | 8.051          | 0.153           | OK     |
| 4.003    | 15 min Summer  | 9           | S4         | S5         | 0.040          | 2.059              | 9.880          | 0.072           | OK     |
| 4.004    | 15 min Summer  | 9           | S5         | S6         | 0.058          | 1.444              | 13.761         | 0.051           | OK     |
| 4.005    | 15 min Summer  | 9           | S6         | S7CP       | 0.062          | 1.782              | 18.897         | 0.115           | OK     |
| 4.006    | 15 min Summer  | 9           | S7CP       | S8         | 0.054          | 3.125              | 26.939         | 0.071           | OK     |



## Conduits

| Pipe No. | Critical Storm | Peak (mins) | US Manhole | DS Manhole | Flow Depth (m) | Max Velocity (m/s) | Max Flow (l/s) | Flow / Capacity | Status |
|----------|----------------|-------------|------------|------------|----------------|--------------------|----------------|-----------------|--------|
| 5.000    | 15 min Summer  | 8           | PS3        | PS2        | 0.023          | 1.275              | 1.740          | 0.116           | OK     |
| 6.000    | 15 min Summer  | 8           | PS1        | PS2        | 0.012          | 0.000              | 0.000          | 0.000           | OK     |
| 5.001    | 15 min Summer  | 8           | PS2        | S8         | 0.023          | 1.693              | 2.307          | 0.118           | OK     |
| 4.007    | 15 min Summer  | 9           | S8         | S37CP      | 0.066          | 3.159              | 29.333         | 0.073           | OK     |
| 1.006    | 15 min Summer  | 9           | S37CP      | S38(ATT)   | 0.212          | 1.100              | 81.141         | 0.490           | OK     |
| 1.007    | 480 min Summer | 348         | S38(ATT)   | S10CP      | 0.378          | 0.537              | 19.905         | 0.048           | OK     |
| 1.008    | 360 min Summer | 238         | S10CP      | HW1        | 0.525          | 0.199              | 21.715         | 0.060           | OK     |
| 7.000    | 15 min Summer  | 8           | S27        | S28        | 0.039          | 1.977              | 8.975          | 0.065           | OK     |
| 7.001    | 15 min Summer  | 8           | S28        | S21        | 0.047          | 1.659              | 10.138         | 0.067           | OK     |
| 7.002    | 15 min Summer  | 8           | S21        | S22        | 0.056          | 1.736              | 13.505         | 0.142           | OK     |
| 7.003    | 15 min Summer  | 9           | S22        | S23        | 0.078          | 2.300              | 33.687         | 0.152           | OK     |
| 7.004    | 15 min Summer  | 9           | S23        | S32        | 0.081          | 2.185              | 38.311         | 0.077           | OK     |
| 8.000    | 15 min Summer  | 8           | S29        | S30        | 0.040          | 1.723              | 8.285          | 0.071           | OK     |
| 9.000    | 15 min Summer  | 8           | S35        | S30        | 0.020          | 0.890              | 1.577          | 0.018           | OK     |
| 8.001    | 15 min Summer  | 8           | S30        | S31        | 0.056          | 2.696              | 24.436         | 0.092           | OK     |
| 8.002    | 15 min Summer  | 8           | S31        | S32        | 0.047          | 3.499              | 24.872         | 0.056           | OK     |
| 7.005    | 15 min Summer  | 9           | S32        | S24CP      | 0.083          | 3.650              | 66.257         | 0.128           | OK     |
| 7.006    | 360 min Summer | 202         | S24CP      | HW1        | 0.204          | 2.390              | 22.053         | 0.028           | OK     |
| 1.009    | 180 min Summer | 116         | HW1        | HW2        | 0.525          | 0.359              | 57.929         | 0.509           | OK     |
| 10.000   | 15 min Summer  | 8           | S33        | S34CP      | 0.042          | 2.138              | 8.522          | 0.185           | OK     |
| 10.001   | 180 min Summer | 97          | S34CP      | HW2        | 0.087          | 2.133              | 4.723          | 0.073           | OK     |
| 1.010    | 120 min Summer | 73          | HW2        | S13(POND)  | 0.450          | 0.916              | 70.634         | 0.224           | OK     |
| 1.011    | 360 min Winter | 434         | S13(POND)  | S14        | 0.025          | 2.563              | 7.221          | 0.015           | OK     |

Return Period (yrs) + Climate Change (%):

10yr+0%

## Manholes

| Manhole   | Critical Storm   | Peak (mins) | Level (m) | Depth (m) | Inflow (l/s) | Flood (m3) | Status     |
|-----------|------------------|-------------|-----------|-----------|--------------|------------|------------|
| S15       | 15 min Summer    | 8           | 199.718   | 0.102     | 55.220       |            | OK         |
| S37       | 15 min Summer    | 8           | 197.762   | 0.116     | 55.006       |            | OK         |
| S36       | 15 min Summer    | 8           | 197.906   | 0.056     | 11.275       |            | OK         |
| S16       | 15 min Summer    | 8           | 197.285   | 0.150     | 112.955      |            | OK         |
| S19       | 15 min Summer    | 8           | 198.021   | 0.055     | 13.370       |            | OK         |
| S17       | 15 min Summer    | 8           | 194.806   | 0.165     | 180.343      |            | OK         |
| S20CP     | 15 min Summer    | 8           | 191.234   | 0.127     | 183.428      |            | OK         |
| S18       | 15 min Summer    | 9           | 189.679   | 0.159     | 182.749      |            | OK         |
| S1        | 15 min Summer    | 8           | 202.604   | 0.078     | 19.929       |            | OK         |
| S2        | 15 min Summer    | 8           | 201.073   | 0.078     | 22.553       |            | OK         |
| S3        | 15 min Summer    | 8           | 200.539   | 0.081     | 28.805       |            | OK         |
| S4        | 15 min Summer    | 8           | 199.619   | 0.079     | 35.252       |            | OK         |
| S5        | 15 min Summer    | 8           | 198.554   | 0.084     | 49.205       |            | OK         |
| S6        | 15 min Summer    | 8           | 196.879   | 0.139     | 67.459       |            | OK         |
| S7CP      | 15 min Summer    | 8           | 196.324   | 0.104     | 96.157       |            | OK         |
| PS3       | 15 min Summer    | 8           | 196.812   | 0.045     | 6.172        |            | OK         |
| PS1       | 15 min Summer    | 0           | 197.011   | 0.000     | 0.000        |            | OK         |
| PS2       | 15 min Summer    | 8           | 195.295   | 0.045     | 8.302        |            | OK         |
| S8        | 15 min Summer    | 8           | 192.754   | 0.102     | 103.971      |            | OK         |
| S37CP     | 480 min Winter   | 463         | 188.733   | 0.683     | 3.108        |            | Surcharged |
| S38(ATT)  | 480 min Winter   | 464         | 188.733   | 0.851     | 2.958        |            | Surcharged |
| S10CP     | 480 min Winter   | 464         | 188.733   | 1.153     | 2.990        |            | Surcharged |
| S27       | 15 min Summer    | 8           | 199.502   | 0.074     | 32.111       |            | OK         |
| S28       | 15 min Summer    | 8           | 196.702   | 0.072     | 36.037       |            | OK         |
| S21       | 15 min Summer    | 8           | 196.118   | 0.118     | 48.169       |            | OK         |
| S22       | 15 min Summer    | 8           | 195.728   | 0.158     | 121.103      |            | OK         |
| S23       | 15 min Summer    | 8           | 193.162   | 0.142     | 136.513      |            | OK         |
| S29       | 15 min Summer    | 8           | 200.090   | 0.077     | 29.838       |            | OK         |
| S35       | 15 min Summer    | 8           | 197.944   | 0.037     | 5.639        |            | OK         |
| S30       | 15 min Summer    | 8           | 197.654   | 0.124     | 87.192       |            | OK         |
| S31       | 15 min Summer    | 8           | 194.788   | 0.088     | 88.978       |            | OK         |
| S32       | 15 min Summer    | 8           | 192.691   | 0.191     | 235.789      |            | OK         |
| S24CP     | 15 min Summer    | 8           | 191.267   | 0.137     | 235.086      |            | OK         |
| HW1       | 480 min Winter   | 464         | 188.733   | 1.213     | 5.425        |            | Surcharged |
| S33       | 15 min Summer    | 8           | 192.102   | 0.092     | 30.252       |            | OK         |
| S34CP     | 15 min Summer    | 8           | 190.624   | 0.075     | 33.902       |            | OK         |
| HW2       | 480 min Winter   | 464         | 188.733   | 1.233     | 6.141        |            | Surcharged |
| S13(POND) | 480 min Winter   | 464         | 188.733   | 1.233     | 6.142        |            | Surcharged |
| S14       | 10080 min Summer | 5562        | 184.646   | 0.025     | 7.221        |            | Outfall    |

## Conduits

| Pipe No. | Critical Storm | Peak (mins) | US Manhole | DS Manhole | Flow Depth (m) | Max Velocity (m/s) | Max Flow (l/s) | Flow / Capacity | Status |
|----------|----------------|-------------|------------|------------|----------------|--------------------|----------------|-----------------|--------|
| 1.000    | 15 min Summer  | 8           | S15        | S37        | 0.109          | 2.875              | 55.006         | 0.437           | OK     |
| 1.001    | 15 min Summer  | 8           | S37        | S16        | 0.111          | 2.802              | 54.628         | 0.489           | OK     |
| 2.000    | 15 min Summer  | 8           | S36        | S16        | 0.055          | 1.893              | 11.205         | 0.298           | OK     |
| 1.002    | 15 min Summer  | 8           | S16        | S17        | 0.148          | 3.227              | 111.790        | 0.492           | OK     |
| 3.000    | 15 min Summer  | 8           | S19        | S17        | 0.054          | 2.281              | 13.189         | 0.284           | OK     |
| 1.003    | 15 min Summer  | 8           | S17        | S20CP      | 0.162          | 3.922              | 178.894        | 0.392           | OK     |
| 1.004    | 15 min Summer  | 8           | S20CP      | S18        | 0.143          | 4.749              | 183.253        | 0.239           | OK     |
| 1.005    | 15 min Summer  | 9           | S18        | S37CP      | 0.267          | 2.178              | 183.197        | 0.396           | OK     |
| 4.000    | 15 min Summer  | 8           | S1         | S2         | 0.078          | 2.130              | 19.793         | 0.533           | OK     |
| 4.001    | 15 min Summer  | 8           | S2         | S3         | 0.079          | 2.360              | 22.394         | 0.533           | OK     |
| 4.002    | 15 min Summer  | 8           | S3         | S4         | 0.078          | 3.091              | 28.686         | 0.546           | OK     |
| 4.003    | 15 min Summer  | 8           | S4         | S5         | 0.077          | 2.923              | 35.121         | 0.257           | OK     |
| 4.004    | 15 min Summer  | 8           | S5         | S6         | 0.112          | 2.041              | 49.039         | 0.181           | OK     |
| 4.005    | 15 min Summer  | 8           | S6         | S7CP       | 0.121          | 2.504              | 66.921         | 0.408           | OK     |
| 4.006    | 15 min Summer  | 8           | S7CP       | S8         | 0.103          | 4.464              | 95.762         | 0.253           | OK     |
| 5.000    | 15 min Summer  | 8           | PS3        | PS2        | 0.045          | 1.798              | 6.148          | 0.410           | OK     |
| 6.000    | 15 min Summer  | 8           | PS1        | PS2        | 0.023          | 0.000              | 0.000          | 0.000           | OK     |
| 5.001    | 15 min Summer  | 8           | PS2        | S8         | 0.045          | 2.403              | 8.209          | 0.418           | OK     |
| 4.007    | 15 min Summer  | 8           | S8         | S37CP      | 0.201          | 3.178              | 103.483        | 0.259           | OK     |

## Conduits

| Pipe No. | Critical Storm   | Peak (mins) | US Manhole | DS Manhole | Flow Depth (m) | Max Velocity (m/s) | Max Flow (l/s) | Flow / Capacity | Status |
|----------|------------------|-------------|------------|------------|----------------|--------------------|----------------|-----------------|--------|
| 1.006    | 180 min Summer   | 114         | S37CP      | S38(ATT)   | 0.450          | 1.132              | 99.165         | 0.599           | OK     |
| 1.007    | 120 min Winter   | 79          | S38(ATT)   | S10CP      | 0.525          | 0.481              | 51.508         | 0.125           | OK     |
| 1.008    | 15 min Winter    | 13          | S10CP      | HW1        | 0.525          | 0.475              | 102.793        | 0.286           | OK     |
| 7.000    | 15 min Summer    | 8           | S27        | S28        | 0.073          | 2.835              | 31.834         | 0.232           | OK     |
| 7.001    | 15 min Summer    | 8           | S28        | S21        | 0.095          | 2.267              | 35.973         | 0.238           | OK     |
| 7.002    | 15 min Summer    | 8           | S21        | S22        | 0.113          | 2.401              | 47.953         | 0.504           | OK     |
| 7.003    | 15 min Summer    | 8           | S22        | S23        | 0.156          | 3.221              | 119.692        | 0.540           | OK     |
| 7.004    | 15 min Summer    | 8           | S23        | S32        | 0.166          | 2.890              | 136.327        | 0.275           | OK     |
| 8.000    | 15 min Summer    | 8           | S29        | S30        | 0.077          | 2.473              | 29.486         | 0.253           | OK     |
| 9.000    | 15 min Summer    | 8           | S35        | S30        | 0.043          | 1.168              | 5.610          | 0.064           | OK     |
| 8.001    | 15 min Summer    | 8           | S30        | S31        | 0.106          | 3.875              | 86.730         | 0.326           | OK     |
| 8.002    | 15 min Summer    | 8           | S31        | S32        | 0.102          | 4.335              | 88.678         | 0.199           | OK     |
| 7.005    | 15 min Summer    | 8           | S32        | S24CP      | 0.164          | 5.072              | 235.086        | 0.454           | OK     |
| 7.006    | 15 min Summer    | 9           | S24CP      | HW1        | 0.256          | 3.794              | 234.595        | 0.302           | OK     |
| 1.009    | 15 min Winter    | 10          | HW1        | HW2        | 0.525          | 1.082              | 225.037        | 1.977           | OK     |
| 10.000   | 15 min Summer    | 8           | S33        | S34CP      | 0.083          | 2.984              | 30.120         | 0.652           | OK     |
| 10.001   | 15 min Summer    | 8           | S34CP      | HW2        | 0.113          | 3.418              | 33.764         | 0.521           | OK     |
| 1.010    | 15 min Winter    | 11          | HW2        | S13(POND)  | 0.450          | 2.570              | 284.118        | 0.900           | OK     |
| 1.011    | 10080 min Summer | 5562        | S13(POND)  | S14        | 0.025          | 2.563              | 7.221          | 0.015           | OK     |



Return Period (yrs) + Climate Change (%):  
30yr+0%

## Manholes

| Manhole   | Critical Storm  | Peak (mins) | Level (m) | Depth (m) | Inflow (l/s) | Flood (m3) | Status     |
|-----------|-----------------|-------------|-----------|-----------|--------------|------------|------------|
| S15       | 15 min Summer   | 8           | 199.734   | 0.119     | 70.931       |            | OK         |
| S37       | 15 min Summer   | 8           | 197.783   | 0.137     | 70.675       |            | OK         |
| S36       | 15 min Summer   | 8           | 197.914   | 0.065     | 14.483       |            | OK         |
| S16       | 15 min Summer   | 8           | 197.310   | 0.175     | 145.120      |            | OK         |
| S19       | 15 min Summer   | 8           | 198.029   | 0.063     | 17.174       |            | OK         |
| S17       | 15 min Summer   | 8           | 194.833   | 0.191     | 231.733      |            | OK         |
| S20CP     | 15 min Summer   | 8           | 191.252   | 0.145     | 235.843      |            | OK         |
| S18       | 15 min Summer   | 9           | 189.727   | 0.207     | 234.698      |            | OK         |
| S1        | 15 min Summer   | 8           | 202.617   | 0.091     | 25.599       |            | OK         |
| S2        | 15 min Summer   | 8           | 201.087   | 0.092     | 28.974       |            | OK         |
| S3        | 15 min Summer   | 8           | 200.553   | 0.095     | 37.007       |            | OK         |
| S4        | 15 min Summer   | 8           | 199.630   | 0.090     | 45.287       |            | OK         |
| S5        | 15 min Summer   | 8           | 198.566   | 0.096     | 63.219       |            | OK         |
| S6        | 15 min Summer   | 8           | 196.902   | 0.162     | 86.687       |            | OK         |
| S7CP      | 15 min Summer   | 8           | 196.339   | 0.119     | 123.608      |            | OK         |
| PS3       | 15 min Summer   | 8           | 196.819   | 0.052     | 7.929        |            | OK         |
| PS1       | 15 min Summer   | 0           | 197.011   | 0.000     | 0.000        |            | OK         |
| PS2       | 15 min Summer   | 8           | 195.302   | 0.052     | 10.667       |            | OK         |
| S8        | 15 min Summer   | 8           | 192.768   | 0.117     | 133.698      |            | OK         |
| S37CP     | 600 min Winter  | 578         | 188.960   | 0.910     | 3.210        |            | Surcharged |
| S38(ATT)  | 600 min Winter  | 578         | 188.960   | 1.078     | 3.212        |            | Surcharged |
| S10CP     | 600 min Winter  | 578         | 188.960   | 1.380     | 3.229        |            | Surcharged |
| S27       | 15 min Summer   | 8           | 199.512   | 0.084     | 41.248       |            | OK         |
| S28       | 15 min Summer   | 8           | 196.714   | 0.083     | 46.315       |            | OK         |
| S21       | 15 min Summer   | 8           | 196.139   | 0.139     | 61.904       |            | OK         |
| S22       | 15 min Summer   | 8           | 195.756   | 0.186     | 155.592      |            | OK         |
| S23       | 15 min Summer   | 8           | 193.187   | 0.167     | 175.430      |            | OK         |
| S29       | 15 min Summer   | 8           | 200.101   | 0.088     | 38.328       |            | OK         |
| S35       | 15 min Summer   | 8           | 197.949   | 0.042     | 7.243        |            | OK         |
| S30       | 15 min Summer   | 8           | 197.673   | 0.143     | 112.040      |            | OK         |
| S31       | 15 min Summer   | 8           | 194.800   | 0.100     | 114.402      |            | OK         |
| S32       | 15 min Summer   | 8           | 192.724   | 0.224     | 303.091      |            | OK         |
| S24CP     | 15 min Summer   | 8           | 191.287   | 0.157     | 302.238      |            | OK         |
| HW1       | 600 min Winter  | 578         | 188.960   | 1.440     | 5.885        |            | Surcharged |
| S33       | 15 min Summer   | 8           | 192.120   | 0.110     | 38.860       |            | OK         |
| S34CP     | 15 min Summer   | 8           | 190.636   | 0.088     | 43.537       |            | OK         |
| HW2       | 600 min Winter  | 578         | 188.960   | 1.460     | 6.680        |            | Surcharged |
| S13(POND) | 600 min Winter  | 578         | 188.960   | 1.460     | 6.681        |            | Surcharged |
| S14       | 1440 min Winter | 582         | 184.646   | 0.025     | 7.221        |            | Outfall    |

## Conduits

| Pipe No. | Critical Storm | Peak (mins) | US Manhole | DS Manhole | Flow Depth (m) | Max Velocity (m/s) | Max Flow (l/s) | Flow / Capacity | Status |
|----------|----------------|-------------|------------|------------|----------------|--------------------|----------------|-----------------|--------|
| 1.000    | 15 min Summer  | 8           | S15        | S37        | 0.128          | 3.032              | 70.675         | 0.562           | OK     |
| 1.001    | 15 min Summer  | 8           | S37        | S16        | 0.130          | 2.958              | 70.191         | 0.628           | OK     |
| 2.000    | 15 min Summer  | 8           | S36        | S16        | 0.064          | 2.019              | 14.399         | 0.383           | OK     |
| 1.002    | 15 min Summer  | 8           | S16        | S17        | 0.172          | 3.422              | 143.655        | 0.633           | OK     |
| 3.000    | 15 min Summer  | 8           | S19        | S17        | 0.062          | 2.439              | 16.963         | 0.365           | OK     |
| 1.003    | 15 min Summer  | 8           | S17        | S20CP      | 0.187          | 4.174              | 230.019        | 0.504           | OK     |
| 1.004    | 15 min Summer  | 9           | S20CP      | S18        | 0.176          | 4.834              | 235.688        | 0.307           | OK     |
| 1.005    | 15 min Summer  | 9           | S18        | S37CP      | 0.291          | 2.561              | 235.458        | 0.509           | OK     |
| 4.000    | 15 min Summer  | 8           | S1         | S2         | 0.092          | 2.246              | 25.427         | 0.685           | OK     |
| 4.001    | 15 min Summer  | 8           | S2         | S3         | 0.094          | 2.477              | 28.772         | 0.684           | OK     |
| 4.002    | 15 min Summer  | 8           | S3         | S4         | 0.092          | 3.260              | 36.852         | 0.701           | OK     |
| 4.003    | 15 min Summer  | 8           | S4         | S5         | 0.088          | 3.118              | 45.129         | 0.330           | OK     |
| 4.004    | 15 min Summer  | 8           | S5         | S6         | 0.129          | 2.170              | 63.027         | 0.232           | OK     |
| 4.005    | 15 min Summer  | 8           | S6         | S7CP       | 0.140          | 2.662              | 86.055         | 0.524           | OK     |
| 4.006    | 15 min Summer  | 8           | S7CP       | S8         | 0.118          | 4.769              | 123.146        | 0.326           | OK     |
| 5.000    | 15 min Summer  | 8           | PS3        | PS2        | 0.052          | 1.911              | 7.899          | 0.527           | OK     |
| 6.000    | 15 min Summer  | 8           | PS1        | PS2        | 0.026          | 0.000              | 0.000          | 0.000           | OK     |
| 5.001    | 15 min Summer  | 8           | PS2        | S8         | 0.052          | 2.557              | 10.552         | 0.538           | OK     |
| 4.007    | 15 min Summer  | 8           | S8         | S37CP      | 0.208          | 3.099              | 133.133        | 0.333           | OK     |

## Conduits

| Pipe No. | Critical Storm  | Peak (mins) | US Manhole | DS Manhole | Flow Depth (m) | Max Velocity (m/s) | Max Flow (l/s) | Flow / Capacity | Status |
|----------|-----------------|-------------|------------|------------|----------------|--------------------|----------------|-----------------|--------|
| 1.006    | 60 min Summer   | 35          | S37CP      | S38(ATT)   | 0.450          | 1.613              | 239.660        | 1.447           | OK     |
| 1.007    | 30 min Winter   | 23          | S38(ATT)   | S10CP      | 0.525          | 0.563              | 75.421         | 0.183           | OK     |
| 1.008    | 15 min Winter   | 14          | S10CP      | HW1        | 0.525          | 0.570              | 123.338        | 0.343           | OK     |
| 7.000    | 15 min Summer   | 8           | S27        | S28        | 0.084          | 3.035              | 40.915         | 0.299           | OK     |
| 7.001    | 15 min Summer   | 8           | S28        | S21        | 0.111          | 2.369              | 46.238         | 0.306           | OK     |
| 7.002    | 15 min Summer   | 8           | S21        | S22        | 0.132          | 2.536              | 61.629         | 0.648           | OK     |
| 7.003    | 15 min Summer   | 8           | S22        | S23        | 0.183          | 3.408              | 153.823        | 0.694           | OK     |
| 7.004    | 15 min Summer   | 8           | S23        | S32        | 0.195          | 3.016              | 175.200        | 0.353           | OK     |
| 8.000    | 15 min Summer   | 8           | S29        | S30        | 0.088          | 2.646              | 37.911         | 0.325           | OK     |
| 9.000    | 15 min Summer   | 8           | S35        | S30        | 0.055          | 1.158              | 7.210          | 0.082           | OK     |
| 8.001    | 15 min Summer   | 8           | S30        | S31        | 0.121          | 4.154              | 111.514        | 0.419           | OK     |
| 8.002    | 15 min Summer   | 8           | S31        | S32        | 0.124          | 4.256              | 114.039        | 0.256           | OK     |
| 7.005    | 15 min Summer   | 8           | S32        | S24CP      | 0.190          | 5.365              | 302.238        | 0.584           | OK     |
| 7.006    | 15 min Summer   | 8           | S24CP      | HW1        | 0.266          | 3.650              | 301.673        | 0.389           | OK     |
| 1.009    | 15 min Winter   | 11          | HW1        | HW2        | 0.525          | 1.104              | 239.002        | 2.100           | OK     |
| 10.000   | 15 min Summer   | 8           | S33        | S34CP      | 0.099          | 3.129              | 38.678         | 0.838           | OK     |
| 10.001   | 15 min Summer   | 8           | S34CP      | HW2        | 0.119          | 3.645              | 43.364         | 0.669           | OK     |
| 1.010    | 15 min Winter   | 10          | HW2        | S13(POND)  | 0.450          | 2.572              | 315.301        | 0.999           | OK     |
| 1.011    | 1440 min Winter | 582         | S13(POND)  | S14        | 0.025          | 2.563              | 7.221          | 0.015           | OK     |

Return Period (yrs) + Climate Change (%):  
100yr+40%

## Manholes

| Manhole   | Critical Storm | Peak (mins) | Level (m) | Depth (m) | Inflow (l/s) | Flood (m3) | Status     |
|-----------|----------------|-------------|-----------|-----------|--------------|------------|------------|
| S15       | 15 min Summer  | 8           | 199.803   | 0.188     | 125.561      |            | OK         |
| S37       | 15 min Summer  | 9           | 198.071   | 0.425     | 120.741      |            | Surcharged |
| S36       | 15 min Summer  | 9           | 197.941   | 0.091     | 24.568       |            | OK         |
| S16       | 15 min Summer  | 10          | 197.554   | 0.419     | 218.159      |            | Surcharged |
| S19       | 15 min Summer  | 8           | 198.055   | 0.088     | 30.401       |            | OK         |
| S17       | 15 min Summer  | 8           | 194.921   | 0.279     | 398.185      |            | OK         |
| S20CP     | 15 min Summer  | 10          | 191.396   | 0.289     | 368.324      |            | OK         |
| S18       | 15 min Summer  | 10          | 190.843   | 1.323     | 369.487      |            | Flood Risk |
| S1        | 15 min Summer  | 10          | 202.993   | 0.468     | 36.121       |            | Surcharged |
| S2        | 15 min Summer  | 10          | 201.321   | 0.326     | 43.908       |            | Surcharged |
| S3        | 15 min Summer  | 10          | 200.738   | 0.279     | 55.086       |            | Surcharged |
| S4        | 15 min Summer  | 9           | 199.657   | 0.117     | 69.459       |            | OK         |
| S5        | 15 min Summer  | 8           | 198.593   | 0.123     | 100.734      |            | OK         |
| S6        | 15 min Summer  | 8           | 196.967   | 0.227     | 142.402      |            | OK         |
| S7CP      | 15 min Summer  | 8           | 196.382   | 0.162     | 207.930      |            | OK         |
| PS3       | 15 min Summer  | 8           | 196.844   | 0.077     | 14.035       |            | OK         |
| PS1       | 15 min Summer  | 0           | 197.011   | 0.000     | 0.000        |            | OK         |
| PS2       | 15 min Summer  | 8           | 195.329   | 0.079     | 18.879       |            | OK         |
| S8        | 15 min Summer  | 9           | 192.816   | 0.165     | 223.388      |            | OK         |
| S37CP     | 720 min Winter | 697         | 189.952   | 1.902     | 4.157        |            | Flood Risk |
| S38(ATT)  | 720 min Winter | 697         | 189.952   | 2.071     | 4.155        |            | Surcharged |
| S10CP     | 720 min Winter | 697         | 189.952   | 2.372     | 4.155        |            | Flood Risk |
| S27       | 15 min Summer  | 8           | 199.543   | 0.115     | 73.016       |            | OK         |
| S28       | 15 min Summer  | 10          | 196.856   | 0.225     | 66.871       |            | Surcharged |
| S21       | 15 min Summer  | 10          | 196.687   | 0.687     | 94.470       |            | Surcharged |
| S22       | 15 min Summer  | 10          | 196.282   | 0.712     | 229.173      |            | Surcharged |
| S23       | 15 min Summer  | 9           | 193.255   | 0.235     | 274.548      |            | OK         |
| S29       | 15 min Summer  | 8           | 200.134   | 0.122     | 67.847       |            | OK         |
| S35       | 15 min Summer  | 8           | 197.963   | 0.056     | 12.821       |            | OK         |
| S30       | 15 min Summer  | 8           | 197.737   | 0.207     | 198.796      |            | OK         |
| S31       | 15 min Summer  | 8           | 194.836   | 0.136     | 202.264      |            | OK         |
| S32       | 15 min Summer  | 9           | 192.841   | 0.341     | 496.204      |            | OK         |
| S24CP     | 15 min Summer  | 9           | 191.357   | 0.227     | 496.971      |            | OK         |
| HW1       | 720 min Winter | 697         | 189.952   | 2.432     | 7.620        |            | Flood Risk |
| S33       | 15 min Summer  | 10          | 193.233   | 1.223     | 54.833       |            | Surcharged |
| S34CP     | 15 min Summer  | 11          | 190.953   | 0.405     | 57.111       |            | Surcharged |
| HW2       | 720 min Winter | 697         | 189.952   | 2.452     | 8.663        |            | Flood Risk |
| S13(POND) | 720 min Winter | 697         | 189.952   | 2.452     | 8.664        |            | Flood Risk |
| S14       | 720 min Winter | 697         | 184.648   | 0.027     | 8.553        |            | Outfall    |

## Conduits

| Pipe No. | Critical Storm | Peak (mins) | US Manhole | DS Manhole | Flow Depth (m) | Max Velocity (m/s) | Max Flow (l/s) | Flow / Capacity | Status     |
|----------|----------------|-------------|------------|------------|----------------|--------------------|----------------|-----------------|------------|
| 1.000    | 15 min Summer  | 8           | S15        | S37        | 0.206          | 3.255              | 124.330        | 0.988           | OK         |
| 1.001    | 15 min Summer  | 9           | S37        | S16        | 0.225          | 3.060              | 118.996        | 1.066           | OK         |
| 2.000    | 15 min Summer  | 9           | S36        | S16        | 0.121          | 2.149              | 25.653         | 0.683           | OK         |
| 1.002    | 15 min Summer  | 8           | S16        | S17        | 0.295          | 3.836              | 242.240        | 1.067           | OK         |
| 3.000    | 15 min Summer  | 8           | S19        | S17        | 0.088          | 2.809              | 30.058         | 0.646           | OK         |
| 1.003    | 15 min Summer  | 8           | S17        | S20CP      | 0.271          | 4.660              | 397.813        | 0.872           | OK         |
| 1.004    | 15 min Summer  | 10          | S20CP      | S18        | 0.332          | 4.820              | 404.901        | 0.528           | OK         |
| 1.005    | 15 min Winter  | 9           | S18        | S37CP      | 0.375          | 3.337              | 368.617        | 0.797           | Surcharged |
| 4.000    | 15 min Winter  | 8           | S1         | S2         | 0.150          | 2.359              | 38.043         | 1.025           | Surcharged |
| 4.001    | 30 min Summer  | 16          | S2         | S3         | 0.150          | 2.567              | 43.700         | 1.040           | Surcharged |
| 4.002    | 15 min Summer  | 10          | S3         | S4         | 0.135          | 3.363              | 55.467         | 1.056           | OK         |
| 4.003    | 15 min Summer  | 9           | S4         | S5         | 0.113          | 3.465              | 69.433         | 0.508           | OK         |
| 4.004    | 15 min Summer  | 8           | S5         | S6         | 0.175          | 2.360              | 100.518        | 0.370           | OK         |
| 4.005    | 15 min Summer  | 8           | S6         | S7CP       | 0.194          | 2.942              | 141.454        | 0.862           | OK         |
| 4.006    | 15 min Summer  | 9           | S7CP       | S8         | 0.162          | 5.352              | 207.518        | 0.549           | OK         |
| 5.000    | 15 min Summer  | 8           | PS3        | PS2        | 0.078          | 2.130              | 13.980         | 0.933           | OK         |
| 6.000    | 15 min Summer  | 8           | PS1        | PS2        | 0.039          | 0.000              | 0.000          | 0.000           | OK         |
| 5.001    | 15 min Summer  | 8           | PS2        | S8         | 0.078          | 2.853              | 18.636         | 0.950           | OK         |
| 4.007    | 15 min Summer  | 9           | S8         | S37CP      | 0.232          | 3.844              | 224.305        | 0.561           | OK         |



## Conduits

| Pipe No. | Critical Storm | Peak (mins) | US Manhole | DS Manhole | Flow Depth (m) | Max Velocity (m/s) | Max Flow (l/s) | Flow / Capacity | Status     |
|----------|----------------|-------------|------------|------------|----------------|--------------------|----------------|-----------------|------------|
| 1.006    | 15 min Winter  | 9           | S37CP      | S38(ATT)   | 0.450          | 3.475              | 552.676        | 3.336           | OK         |
| 1.007    | 60 min Summer  | 36          | S38(ATT)   | S10CP      | 0.525          | 0.973              | 210.556        | 0.511           | OK         |
| 1.008    | 15 min Winter  | 15          | S10CP      | HW1        | 0.525          | 0.961              | 208.003        | 0.578           | OK         |
| 7.000    | 15 min Summer  | 9           | S27        | S28        | 0.159          | 3.446              | 72.758         | 0.531           | OK         |
| 7.001    | 15 min Summer  | 10          | S28        | S21        | 0.225          | 2.433              | 78.243         | 0.518           | OK         |
| 7.002    | 15 min Winter  | 8           | S21        | S22        | 0.225          | 2.612              | 95.056         | 0.999           | OK         |
| 7.003    | 15 min Summer  | 10          | S22        | S23        | 0.300          | 3.461              | 239.528        | 1.081           | Surcharged |
| 7.004    | 15 min Summer  | 9           | S23        | S32        | 0.288          | 3.414              | 274.482        | 0.554           | OK         |
| 8.000    | 15 min Summer  | 8           | S29        | S30        | 0.127          | 2.932              | 67.563         | 0.579           | OK         |
| 9.000    | 15 min Summer  | 8           | S35        | S30        | 0.094          | 1.177              | 12.775         | 0.146           | OK         |
| 8.001    | 15 min Summer  | 8           | S30        | S31        | 0.172          | 4.719              | 197.153        | 0.740           | OK         |
| 8.002    | 15 min Summer  | 9           | S31        | S32        | 0.200          | 4.320              | 201.760        | 0.453           | OK         |
| 7.005    | 15 min Summer  | 9           | S32        | S24CP      | 0.284          | 5.618              | 496.971        | 0.959           | OK         |
| 7.006    | 15 min Summer  | 9           | S24CP      | HW1        | 0.301          | 5.227              | 496.475        | 0.640           | OK         |
| 1.009    | 60 min Summer  | 37          | HW1        | HW2        | 0.525          | 1.738              | 376.137        | 3.305           | OK         |
| 10.000   | 15 min Winter  | 10          | S33        | S34CP      | 0.150          | 3.253              | 56.196         | 1.217           | Surcharged |
| 10.001   | 15 min Winter  | 10          | S34CP      | HW2        | 0.150          | 3.634              | 62.776         | 0.968           | Surcharged |
| 1.010    | 15 min Winter  | 10          | HW2        | S13(POND)  | 0.450          | 2.686              | 427.196        | 1.353           | OK         |
| 1.011    | 720 min Winter | 697         | S13(POND)  | S14        | 0.027          | 2.702              | 8.553          | 0.018           | OK         |



**DRAINAGE KEY**

- Site Boundary
- Existing Foul Water Sewer
- Adoptable S104 Foul Water Manhole & Pipe Refer to schedule for size/ types and cover details
- Adoptable S104 Foul Water Rising Main
- Adoptable S104 Surface Water Manhole & Pipe Refer to schedule for size/ types and cover details
- HB Hydrobrake Manhole (see plan for restricted rate)
- CP Catch Pit Manhole - 500mm Sump
- RG Surface Water Road Gully
- Private Foul Water Inspection Chamber & Pipe
- Private Surface Water Inspection Chamber & Pipe
- DC Private Drainage Channel
- YG Private Surface Water Yard Gully
- RG Private Surface Water Road Gully
- FD Fin Collection Drain
- Crate Soakaway / Crate Attenuation Tank ###
- Proposed filter drain/land drainage with 1500 perforated pipe
- Precast Concrete Headwall
- PD Patio Drain
- Tree Root Protection Area

**Greenfield Runoff Calculation Notes**

Greenfield runoff rates have been calculated using the positively drained hard-paved areas only, applying the updated HR Wallingford FEH Statistical method.

Based on a contributing area of 1.696 hectares, the calculated Greenfield runoff rates are as follows:

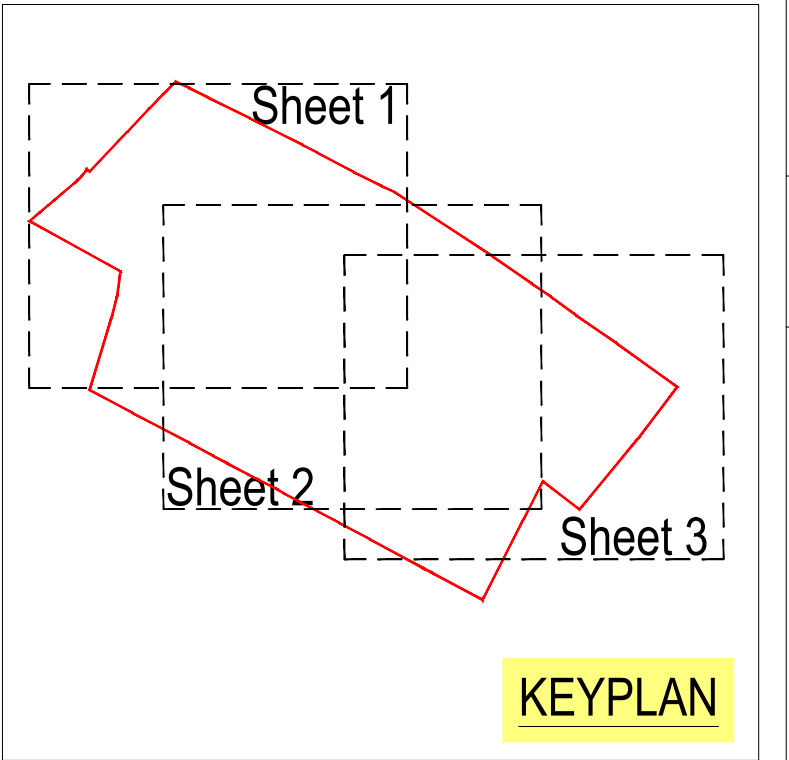
| Return Period | Runoff Rate (l/s) |
|---------------|-------------------|
| Omred         | 5.9 l/s           |
| Char (FEH)    | 5.6 l/s           |
| 1 in 1 year   | 4.7 l/s           |
| 1 in 10 year  | 8.4 l/s           |
| 1 in 30 year  | 11.3 l/s          |
| 1 in 100 year | 14.5 l/s          |

The proposed discharge rate of 8.5 l/s has been applied.

Scale 1:250 @ A1 - 1:500 @ A3



- NOTES**
- The contractor is responsible for verifying all site & setting out dimensions before commencing work.
  - This drawing is to be read in conjunction with all relevant Architectural and M&E drawings.
  - All dimensions in meters unless stated otherwise.
- DRAINAGE NOTES:**
- All drainage works to be constructed in strict accordance with specification of the Local Authority, Building Regulations, Design and Construction Guidance (published by Water UK) BS EN 752.
  - Any existing drainage found crossing the site is to be investigated, and if found to be 'live', it should be diverted in consultation with the Client.
  - For location and setting out of building drainage points refer to architects drawings.
  - All pipe runs near buildings to comply with the Building Regulations 2015 part H11. Where a pipe is within 1m of a foundation the trench shall be filled with class GEN3 concrete up to the lowest level of the foundation. Where the trench is further than 1m from the foundation, the trench shall be filled with class GEN3 concrete to a level below the lowest level for the foundation equal to the distance from the foundation less 150mm. In both cases the pipe shall be bedded and surrounded in 150mm thick class GEN3 concrete.
  - Where pipes, external to the structures, have a depth to soffit from ground level of less than 450mm they shall have a class GEN3 concrete encasement (150mm thick).
  - Where a pipe, under a carriageway, has a depth of cover of less than 1.2m the pipe shall be laid in a concrete bed and surround.
  - Where a pipe, under a vehicular area other than a carriageway has a depth of cover if less than 0.9m the pipe shall be protected with a concrete slab set above it.
  - In any circumstances where pipes are bedded and surrounded in concrete flexible joints should be provided, compressible boards (fibreglass or polystyrene) shall be provided at a maximum of 8m centres (coinciding with pipe joints), the boards shall be pre-cut to pipe diameter and to a height and width equal to the concrete cross section. A board thickness of 15mm for pipes up to 450mm nominal diameter and 30mm for pipes over 450mm nominal diameter.
  - All private building drainage shall be constructed in strict accordance with BS EN 752. Foul drainage beneath the floor slab shall be laid, shall be laid no flatter than 1:40. Unless otherwise specified below ground building drainage external to the building shall be 100mm diameter and shall be laid at a minimum gradient of  $\leq 1/10$  = 1 in 40/1/10 = 1 in 80 for foul drains and 1 in 80 for surface water drains.
  - All building drains shall be laid in conjunction with 'non adoptive bedding details' (class d, n or b) unless otherwise specified.
  - All pipes, bends and junction for private building drainage shall be UPVC conforming to BS4660, BSEN13598 and BSEN1401 as appropriate and shall be laid in accordance with the manufacturer's specification.
  - All pipes, bends and junction materials for adoptable drainage shall be UPVC compliant with Clause E2.21 of Design and Construction Guidance for Foul and Surface Water Water Sewers, Sector Guidance Appendix C, June 2022. These should conform to BS4660, BSEN13598 and BSEN1401 as appropriate and shall be laid in accordance with the manufacturer's specification.
  - All back inlet gullies to be roddable or connected to inspection chambers.
  - All gully connections other than at manholes to be 'Y' junctions.
  - All road gully connections to be 150mm diameter.
  - All slab stacks to be fitted with air admittance valves where branch drain exceeds 12m except at the head of the run. Soil vent pipes located at the head of a run to terminate to fresh air.
  - No low point shall be without a method of drainage.
  - All connections to be soffit to soffit unless otherwise noted.
  - All concrete and concrete products to be in accordance with BRE 363 for sulphates.
  - The locations of all building drainage points shall be cross referenced against the architects drawings during setting out and any discrepancies reported immediately.
  - Before connections are made to existing public sewers an application under S106 must be made to relevant sewerage undertaker.
  - The precise depth and location and size of existing pipes, watercourses or manholes where connections or diversion are proposed must be confirmed and reported to the engineer before works commence on site.
  - Any existing drains to be abandoned to be decommissioned in accordance with the Building Regulations by either grubbing, infilling or sealing.
  - Should ground water be encountered on site during construction the Client shall be informed to determine if additional measures are required.
  - The drainage system shall be fully cleaned on completion of the project using methods that ensure pollution off site does not occur.
  - Any existing land drains severed during construction shall be reinstated.



| Revision History |                                              |    |      |      |
|------------------|----------------------------------------------|----|------|------|
| Rev              | Comment                                      | By | Chkd | Appr |
| A05              | FOR APPROVAL - Updated to latest site layout | PJ | TZ   | SB   |
| A04              | FOR APPROVAL - Updated to latest site layout | PJ | TZ   | SB   |
| A03              | FOR APPROVAL - Updated to latest site layout | PJ | TZ   | SB   |
| A02              | FOR APPROVAL                                 | BS | TZ   | SB   |
| A01              | FOR APPROVAL                                 | TZ | TZ   | SB   |

**APPROVAL**

**ALLISON HOMES**

**robert west**  
proesgroup

1 Paris Garden  
London  
SE1 1ND  
t: 0203 773 7880  
www.robertwest.co.uk

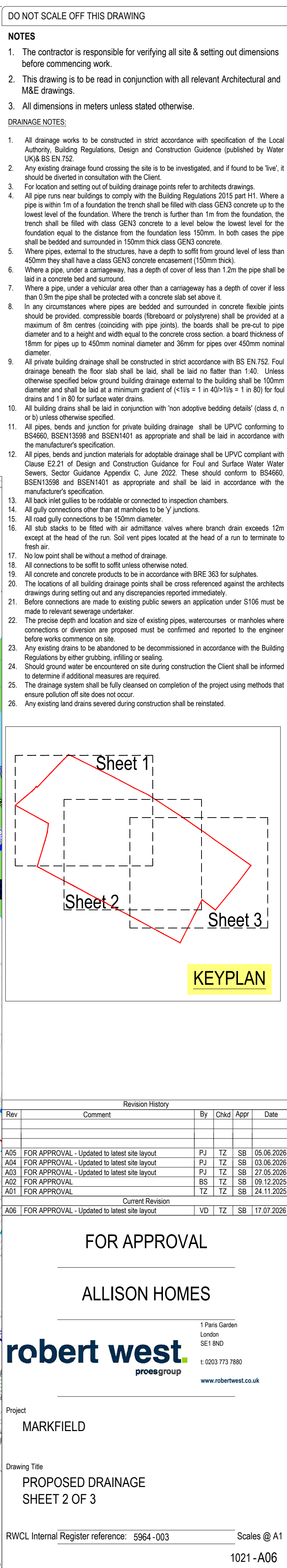
Project **MARKFIELD**

Drawing Title **PROPOSED DRAINAGE PLAN  
SHEET 1 OF 3**

RWCL Internal Register reference: 5964-003

Scales @ A1  
1020-A06





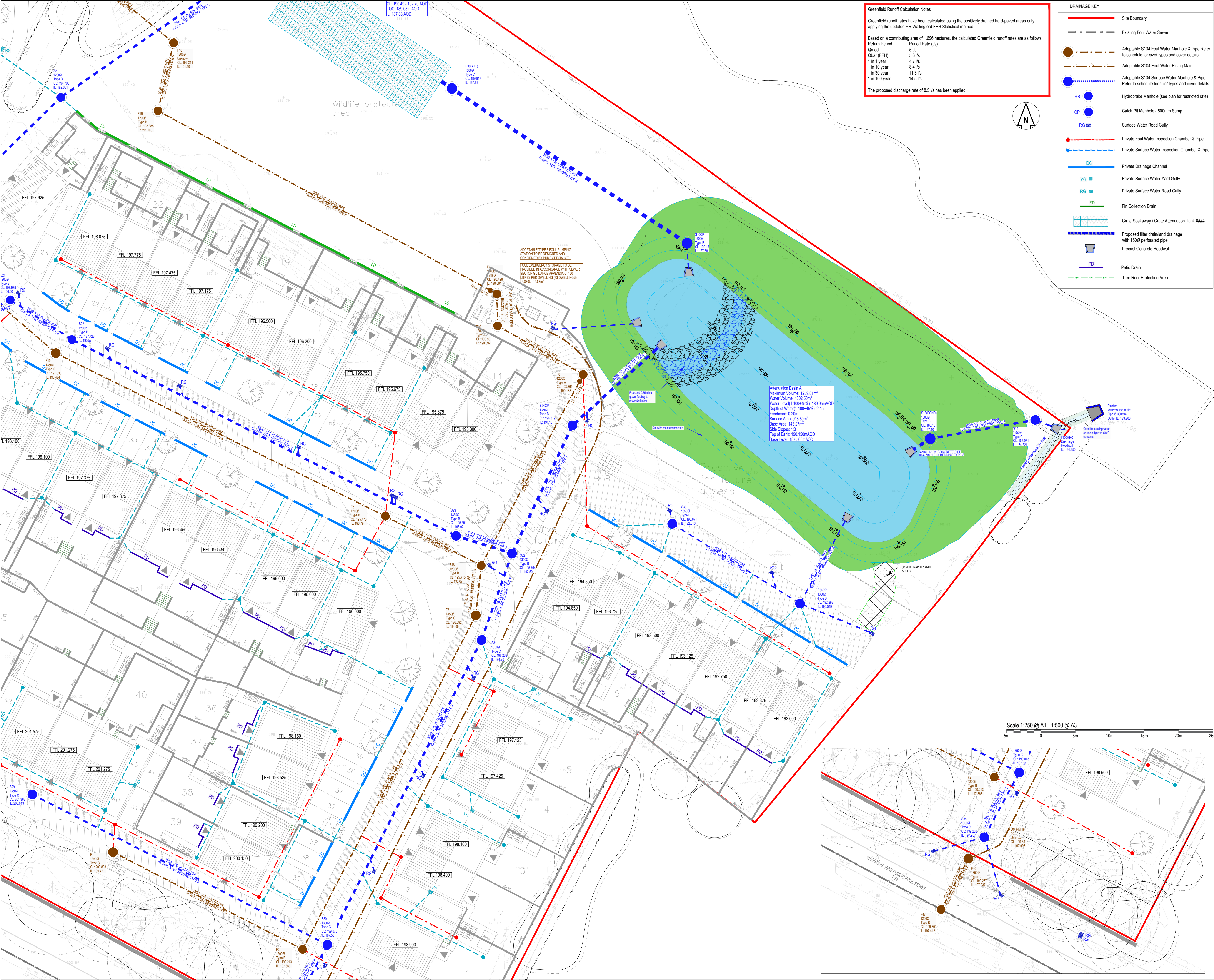
Project  
**MARKFIELD**

Drawing Title  
**PROPOSED DRAINAGE  
SHEET 2 OF 3**

RWCL Internal Register reference: 5964-003 Scales @ A1

1021-A06





**Greenfield Runoff Calculation Notes**

Greenfield runoff rates have been calculated using the positively drained hard-paved areas only, applying the updated HR Wallingford FEH Statistical method.

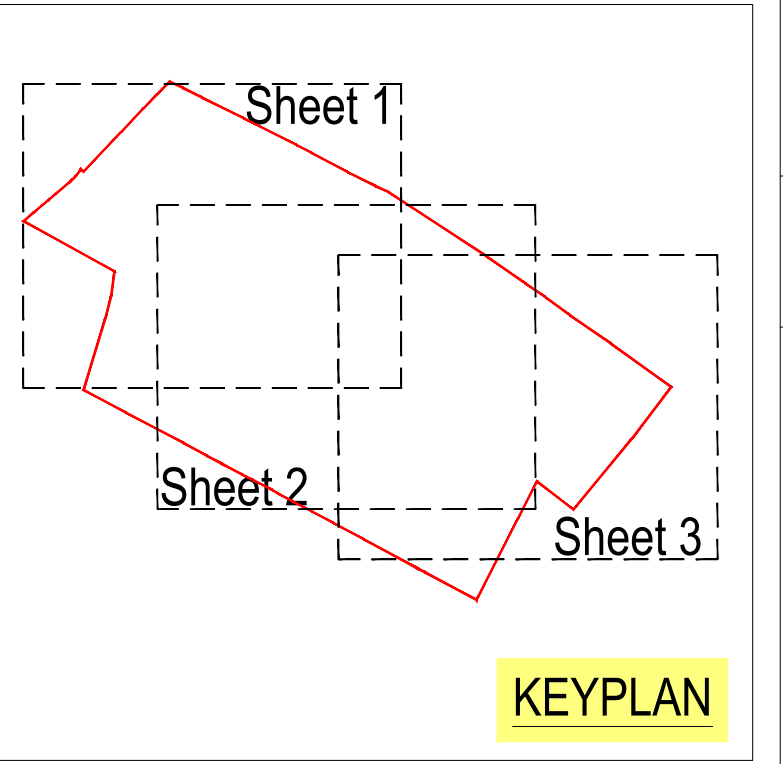
Based on a contributing area of 1.696 hectares, the calculated Greenfield runoff rates are as follows:

| Return Period | Runoff Rate (l/s) |
|---------------|-------------------|
| Omied         | 5.1/s             |
| Qbar (FEH)    | 5.6 l/s           |
| 1 in 1 year   | 4.7 l/s           |
| 1 in 10 year  | 8.4 l/s           |
| 1 in 50 year  | 11.3 l/s          |
| 1 in 100 year | 14.5 l/s          |

The proposed discharge rate of 8.5 l/s has been applied.

- DRAINAGE KEY**
- Site Boundary
  - Existing Foul Water Sewer
  - Adoptable S104 Foul Water Manhole & Pipe Refer to schedule for size/ types and cover details
  - Adoptable S104 Foul Water Rising Main
  - Adoptable S104 Surface Water Manhole & Pipe Refer to schedule for size/ types and cover details
  - HB Hydrobrake Manhole (see plan for restricted rate)
  - CP Catch Pit Manhole - 500mm Sump
  - RG Surface Water Road Gully
  - Private Foul Water Inspection Chamber & Pipe
  - Private Surface Water Inspection Chamber & Pipe
  - DC Private Drainage Channel
  - YG Private Surface Water Yard Gully
  - RG Private Surface Water Road Gully
  - FD Fin Collection Drain
  - Crate Soakaway / Crate Attenuation Tank ###
  - Proposed filter drain/land drainage with 1500 perforated pipe
  - Precast Concrete Headwall
  - PD Patio Drain
  - Tree Root Protection Area

- DO NOT SCALE OFF THIS DRAWING**
- NOTES**
- The contractor is responsible for verifying all site & setting out dimensions before commencing work.
  - This drawing is to be read in conjunction with all relevant Architectural and M&E drawings.
  - All dimensions in meters unless stated otherwise.
- DRAINAGE NOTES:**
- All drainage works to be constructed in strict accordance with specification of the Local Authority, Building Regulations, Design and Construction Guidance (published by Water UK) BS EN 1252.
  - Any existing drainage found crossing the site is to be investigated, and if found to be 'live', it should be diverted in consultation with the Client.
  - For location and setting out of building drainage points refer to architects drawings.
  - All pipe runs near buildings to comply with the Building Regulations 2015 part H11. Where a pipe is within 1m of a foundation the trench shall be filled with class GEN3 concrete up to the lowest level of the foundation. Where the trench is further than 1m from the foundation, the trench shall be filled with class GEN3 concrete to a level below the lowest level for the foundation equal to the distance from the foundation less 150mm. In both cases the pipe shall be bedded and surrounded in 150mm thick class GEN3 concrete.
  - Where pipes, external to the structures, have a depth to soffit from ground level of less than 450mm they shall have a class GEN3 concrete encasement (150mm thick).
  - Where a pipe, under a carriageway, has a depth of cover of less than 1.2m the pipe shall be laid in a concrete bed and surround.
  - Where a pipe, under a vehicular area other than a carriageway has a depth of cover if less than 0.9m the pipe shall be protected with a concrete slab set above it.
  - In any circumstances where pipes are bedded and surrounded in concrete flexible joints should be provided, compressible boards (fibreglass or polystyrene) shall be provided at a maximum of 8m centres (coinciding with pipe joints), the boards shall be pre-cut to pipe diameter and to a height and width equal to the concrete cross section, a board thickness of 15mm for pipes up to 450mm nominal diameter and 30mm for pipes over 450mm nominal diameter.
  - All private building drainage shall be constructed in strict accordance with BS EN 1252. Foul drainage beneath the floor slab shall be laid, shall be laid no flatter than 1:40. Unless otherwise specified below ground building drainage external to the building shall be 100mm diameter and shall be laid at a minimum gradient of (<1% = 1 in 40>1% = 1 in 80) for foul drains and 1 in 80 for surface water drains.
  - All building drains shall be laid in conjunction with 'non adoptive bedding details' (class d, n or b) unless otherwise specified.
  - All pipes, bends and junction for private building drainage shall be UPVC conforming to BS4660, BSEN13598 and BSEN1401 as appropriate and shall be laid in accordance with the manufacturer's specification.
  - All pipes, bends and junction materials for adoptable drainage shall be UPVC compliant with Clause E2.21 of Design and Construction Guidance for Foul and Surface Water Water Sewers, Sector Guidance Appendix C, June 2022. These should conform to BS4660, BSEN13598 and BSEN1401 as appropriate and shall be laid in accordance with the manufacturer's specification.
  - All back inlet gullies to be roddable or connected to inspection chambers.
  - All gully connections other than at manholes to be 'Y' junctions.
  - All road gully connections to be 150mm diameter.
  - All stub stacks to be fitted with air admittance valves where branch drain exceeds 12m except at the head of the run. Soil vent pipes located at the head of a run to terminate to fresh air.
  - No low point shall be without a method of drainage.
  - All connections to be soffit to soffit unless otherwise noted.
  - All concrete and concrete products to be in accordance with BRE 363 for sulphates.
  - The locations of all building drainage points shall be cross referenced against the architects drawings during setting out and any discrepancies reported immediately.
  - Before connections are made to existing public sewers an application under S106 must be made to relevant sewerage undertaker.
  - The precise depth and location and size of existing pipes, watercourses or manholes where connections or diversion are proposed must be confirmed and reported to the engineer before works commence on site.
  - Any existing drains to be abandoned to be decommissioned in accordance with the Building Regulations by either grouting, infilling or sealing.
  - Should ground water be encountered on site during construction the Client shall be informed to determine if additional measures are required.
  - The drainage system shall be fully cleaned on completion of the project using methods that ensure pollution off site does not occur.
  - Any existing land drains severed during construction shall be reinstated.



| Revision History |                                              |    |      |      |            |
|------------------|----------------------------------------------|----|------|------|------------|
| Rev              | Comment                                      | By | Chkd | Appr | Date       |
| A06              | FOR APPROVAL - Rising Main Information Added | PJ | TZ   | SB   | 22.06.2026 |
| A05              | FOR APPROVAL - Updated to latest site layout | PJ | TZ   | SB   | 05.06.2026 |
| A04              | FOR APPROVAL - Updated to latest site layout | PJ | TZ   | SB   | 03.06.2026 |
| A03              | FOR APPROVAL - Updated to latest site layout | PJ | TZ   | SB   | 27.05.2026 |
| A02              | FOR APPROVAL                                 | BS | TZ   | SB   | 09.12.2025 |
| A01              | FOR APPROVAL                                 | TZ | TZ   | SB   | 24.11.2025 |

**FOR APPROVAL**

**ALLISON HOMES**

**robert west**  
proesgroup

1 Paris Garden  
London  
SE1 1ND  
t: 0203 773 7880  
www.robertwest.co.uk

Project **MARKFIELD**

Drawing Title **PROPOSED DRAINAGE SHEET 3 OF 3**

RWCL Internal Register reference: 5964-003 Scales @ A1 1022-A07



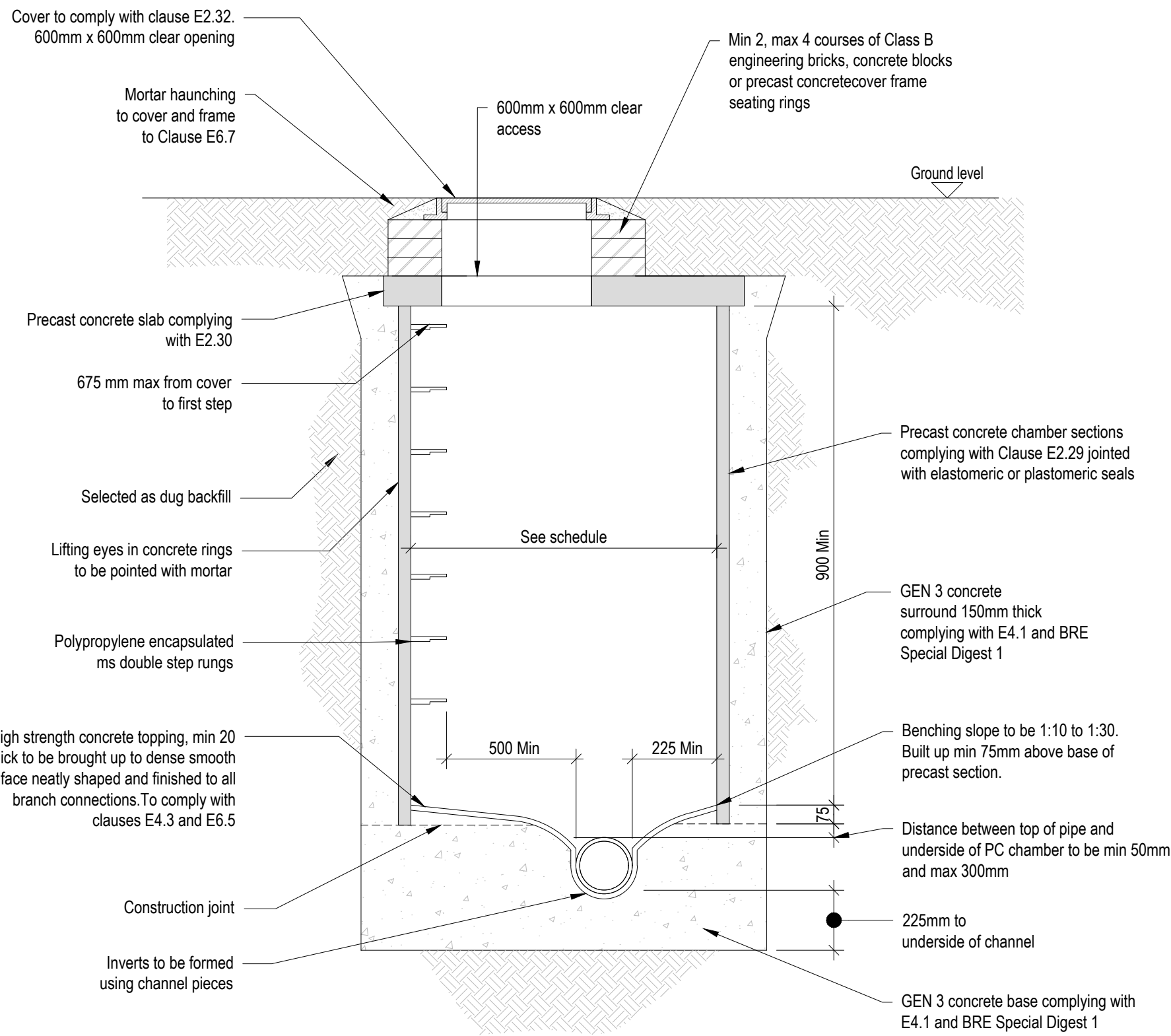


FIG B10 - TYPE B MANHOLE - SECTION

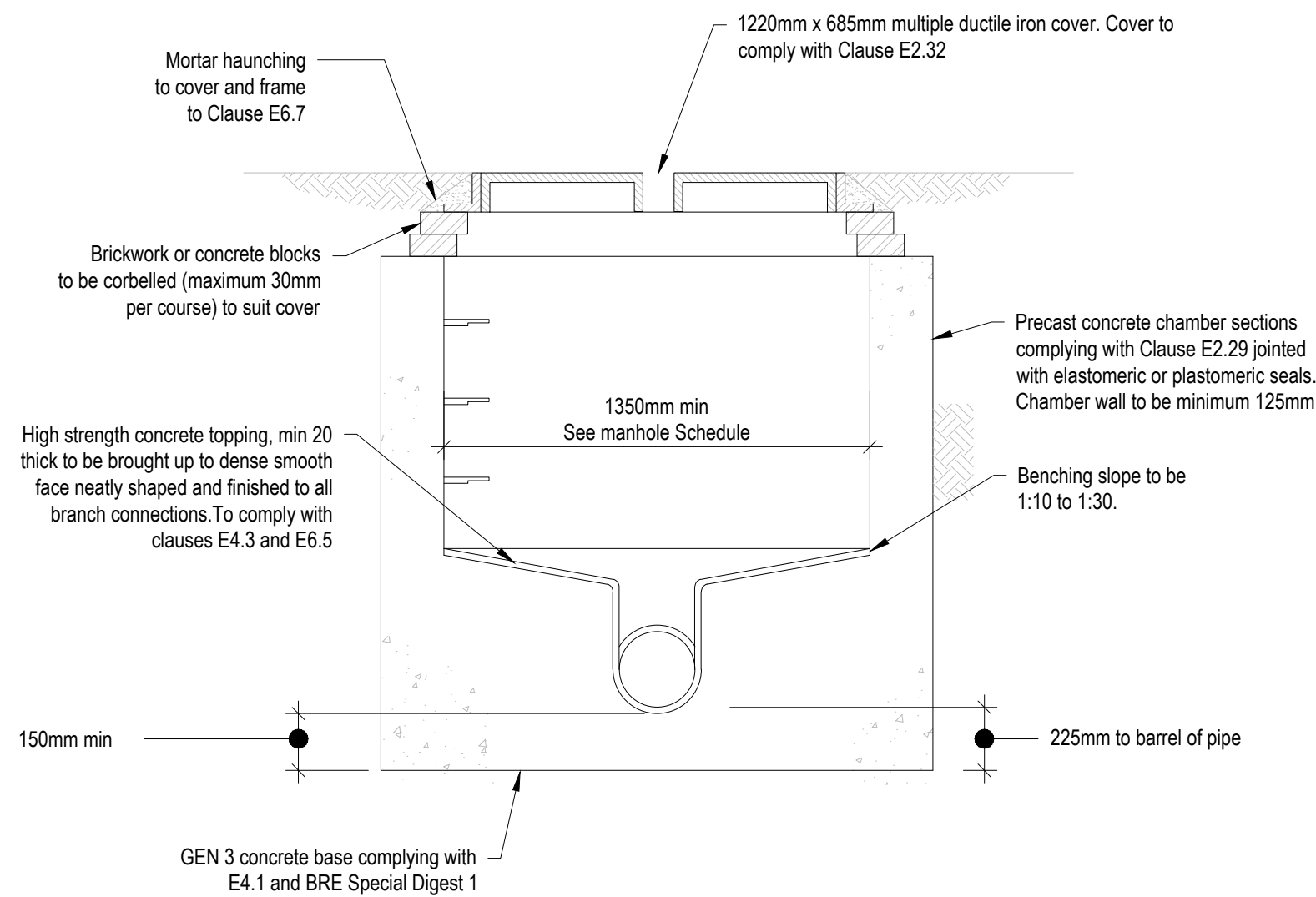
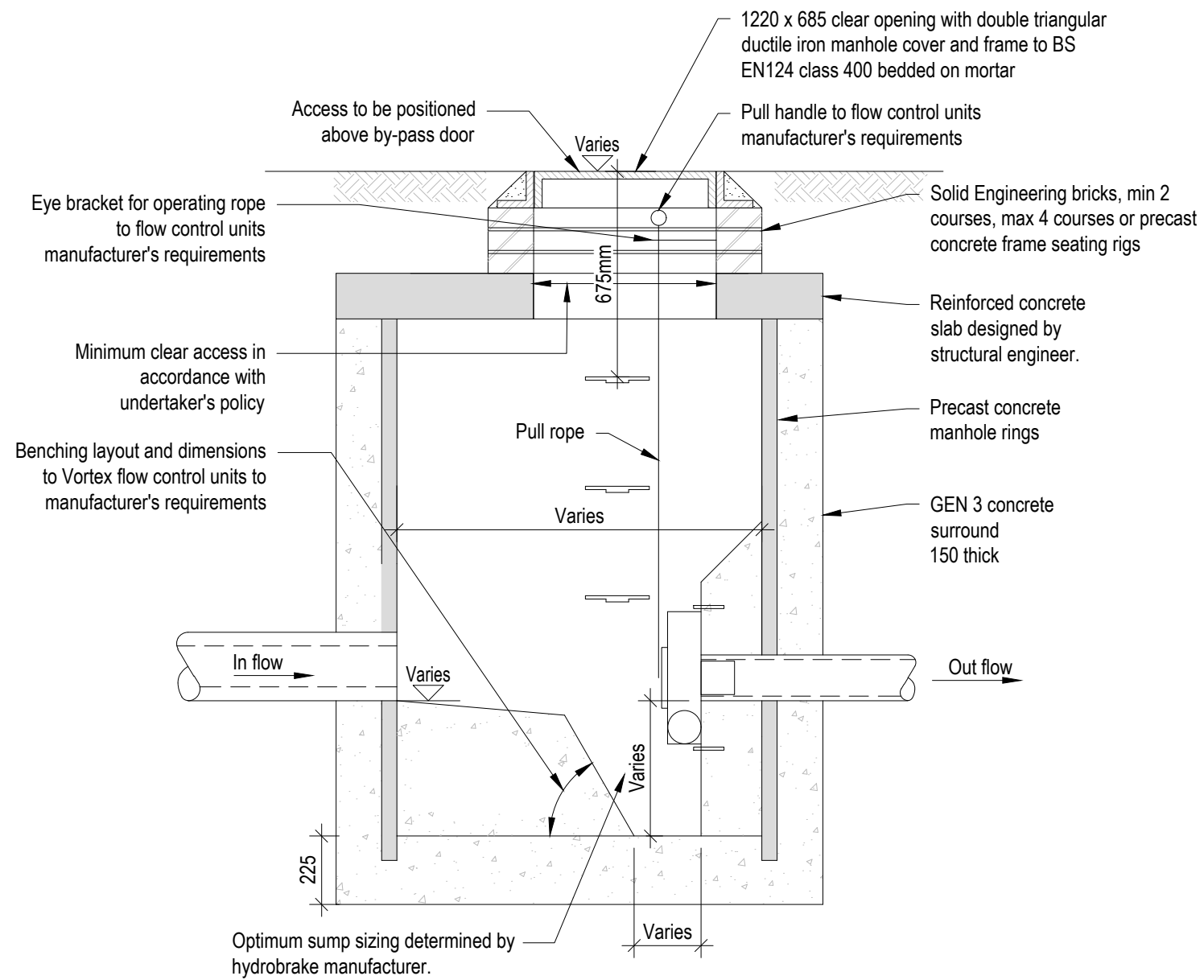


FIG B15 - TYPE C MANHOLE - SECTION



FLOW CONTROL CHAMBER - SECTION A-A  
TO manufacturer's requirements

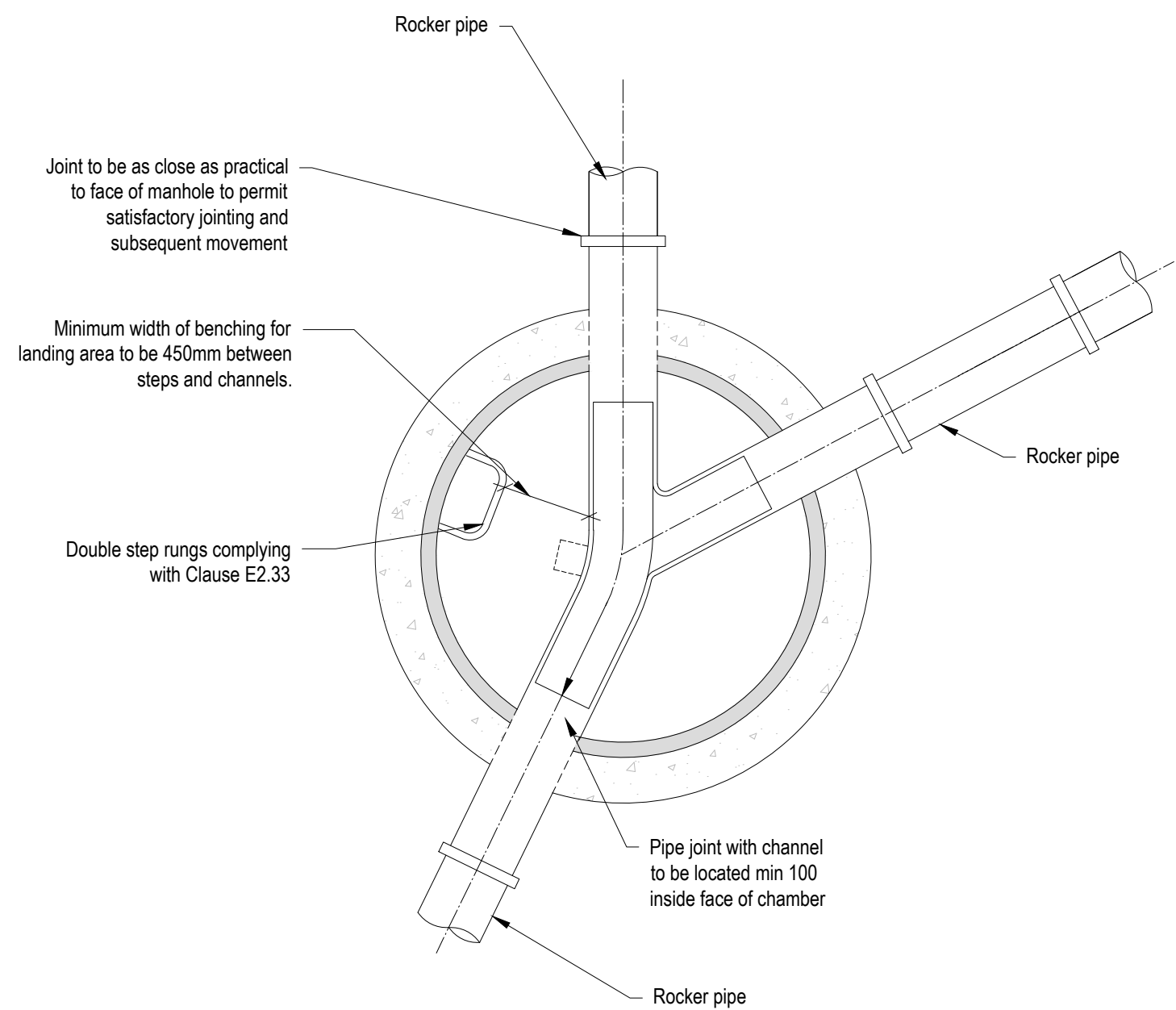


FIG B10 - TYPE B MANHOLE - PLAN  
DEPTH TO SOFFIT: 1.5m to 3.0m  
SEE SCHEDULE FOR DIMENSIONS AND GA FOR CONNECTIONS

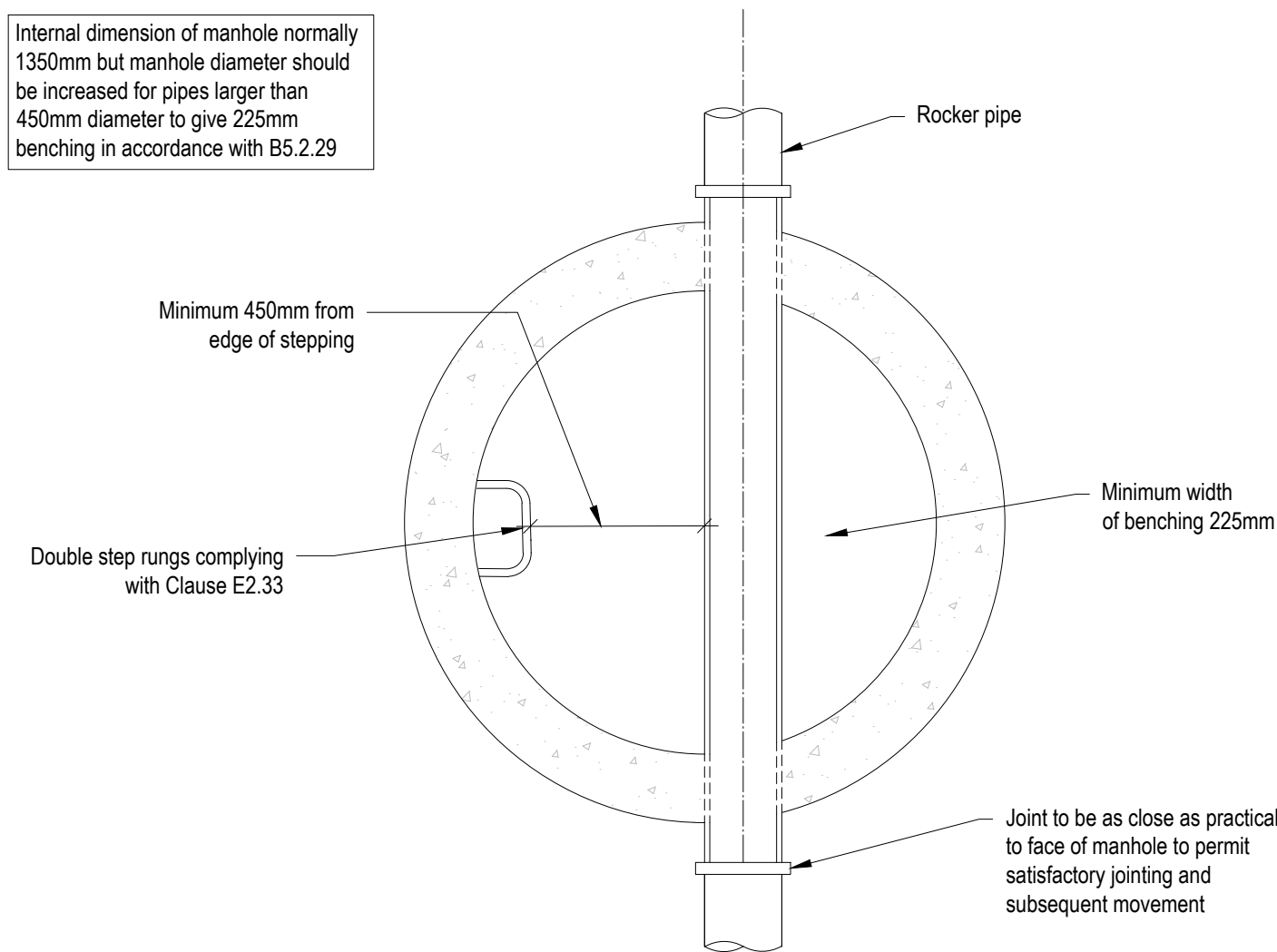
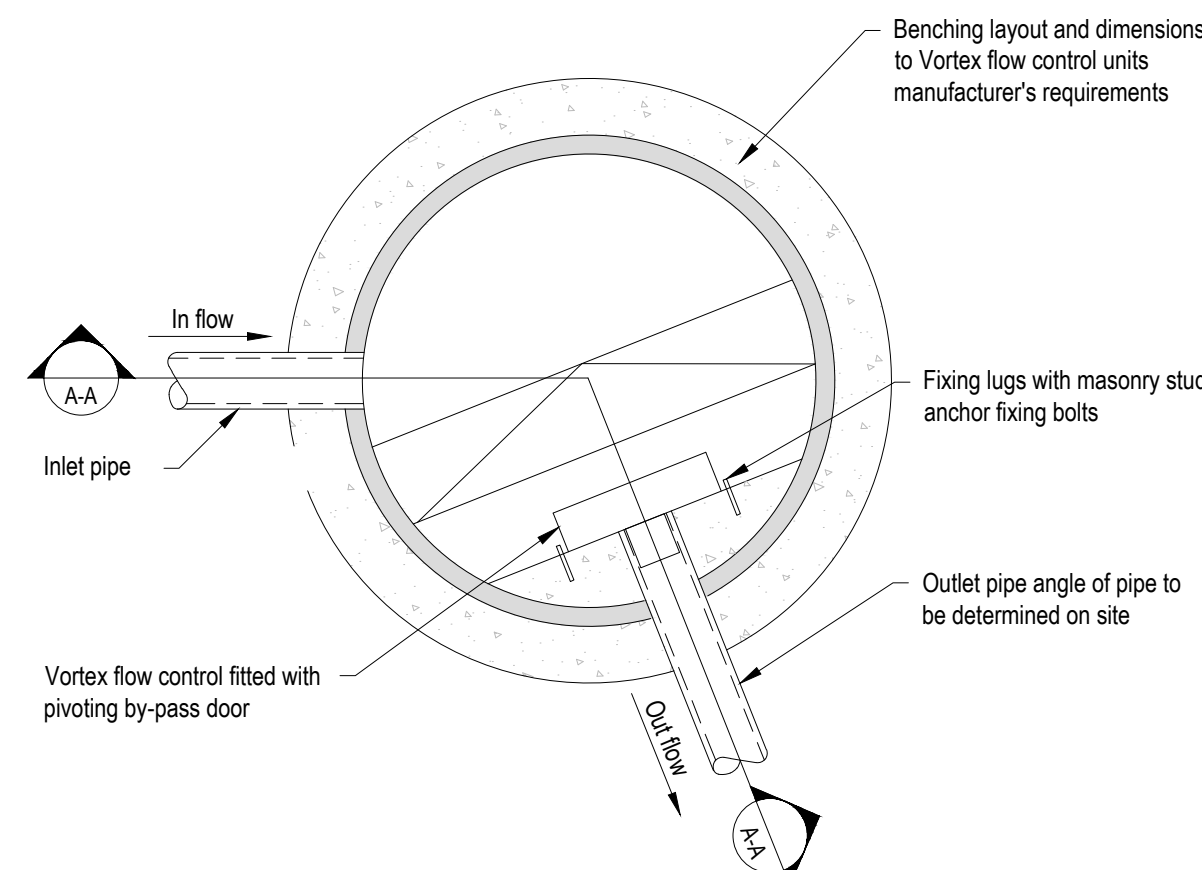


FIG B15 - TYPE C MANHOLE - PLAN  
DEPTH TO SOFFIT: LESS THAN 1.5m  
SEE SCHEDULE FOR DIMENSIONS AND GA FOR CONNECTIONS



FLOW CONTROL CHAMBER - PLAN VIEW  
Scale: 1:20

DO NOT SCALE OFF THIS DRAWING

NOTES

1. The contractor is responsible for verifying all site & setting out dimensions before commencing work.
2. This drawing is to be read in conjunction with all relevant Architectural and M&E drawings.
3. All dimensions in meters unless stated otherwise.

| Revision History |              |    |      |      |            |
|------------------|--------------|----|------|------|------------|
| Rev              | Comment      | By | Chkd | Appr | Date       |
|                  |              |    |      |      |            |
|                  |              |    |      |      |            |
|                  |              |    |      |      |            |
|                  |              |    |      |      |            |
| Current Revision |              |    |      |      |            |
| A01              | FOR APPROVAL | TZ | TZ   | SB   | 24.11.2025 |

APPROVAL

ALLISON HOMES

**robert west**  
proesgroup  
1 Paris Garden  
London  
SE1 1ND  
t: 0203 773 7880  
www.robertwest.co.uk

Project  
MARKFIELD

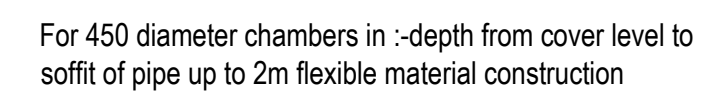
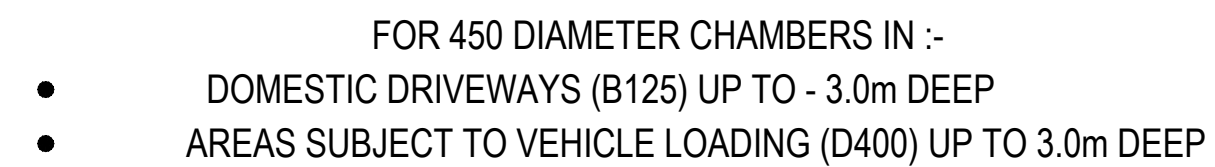
Drawing Title  
PROPOSED CONSTRUCTION DETAILS  
SHEET 1

RWCL Internal Register reference: 5964-003

Scales @ A1

1100 - A01



Scales @ A1



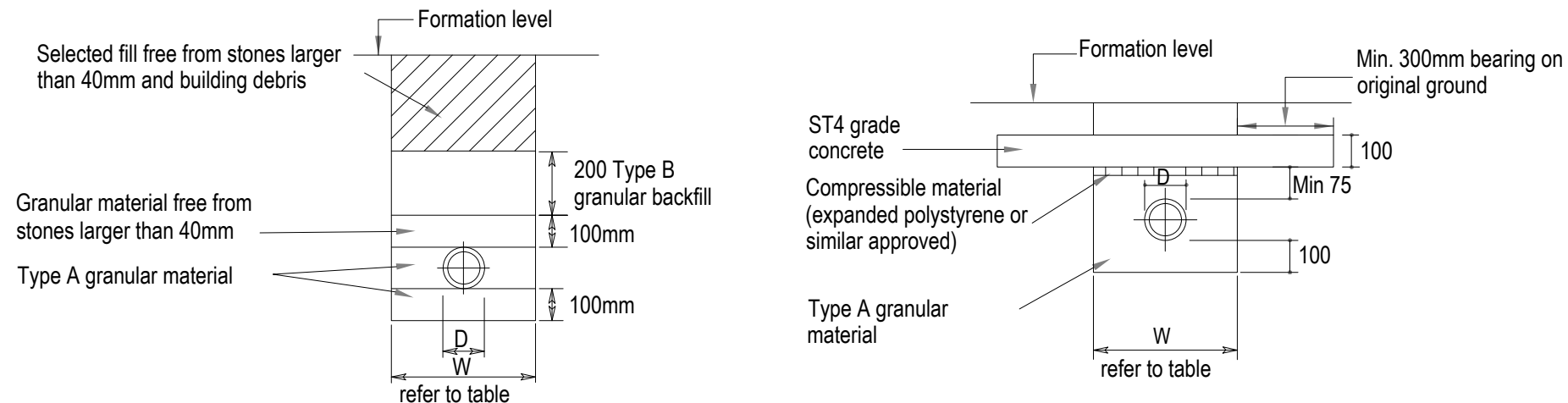


- 

Location: Pedestrian areas up to 5.0m depth, Vehicle areas 0.6m - 5.0m

Location: Vehicle areas - up to 0.6m

(SCALE 1:20)



Location: Pedestrian areas, 0.6m  
- 7.0m Vehicle areas,  
0.9m - 7.0m Under  
buildings

Location: Pedestrian areas up to 0.6m, private vehicle parking and areas subject to construction traffic up to 0.9m.

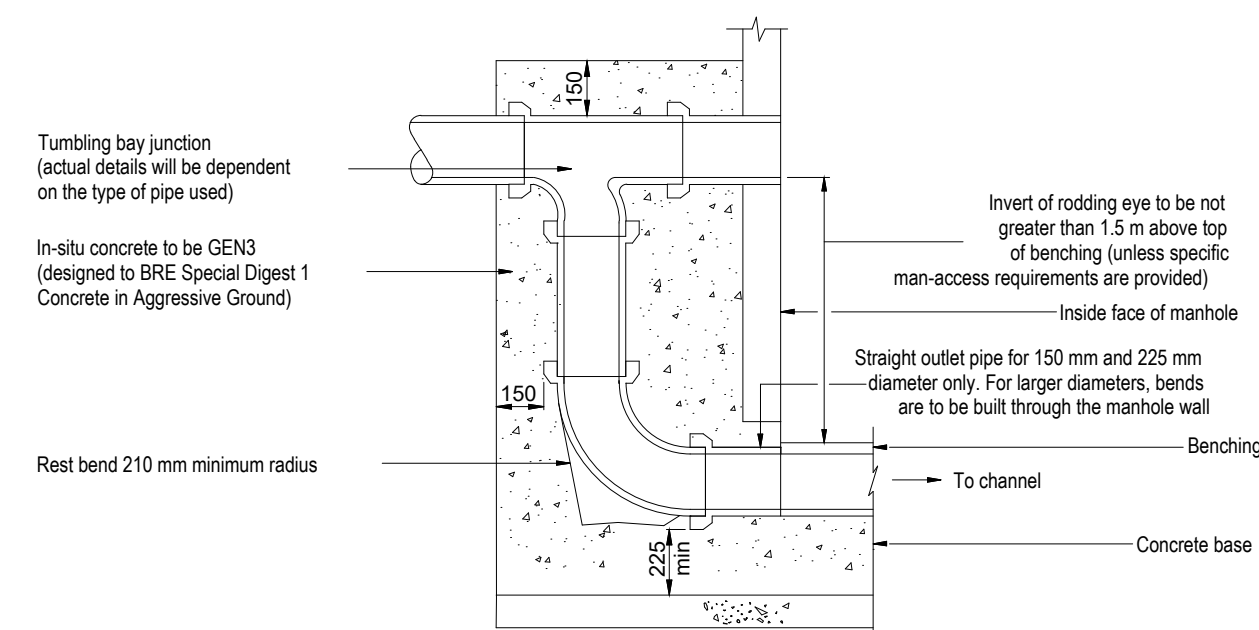
When laid in landscape areas subject to no loading (incl. construction traffic) ST4 concrete can be omitted.



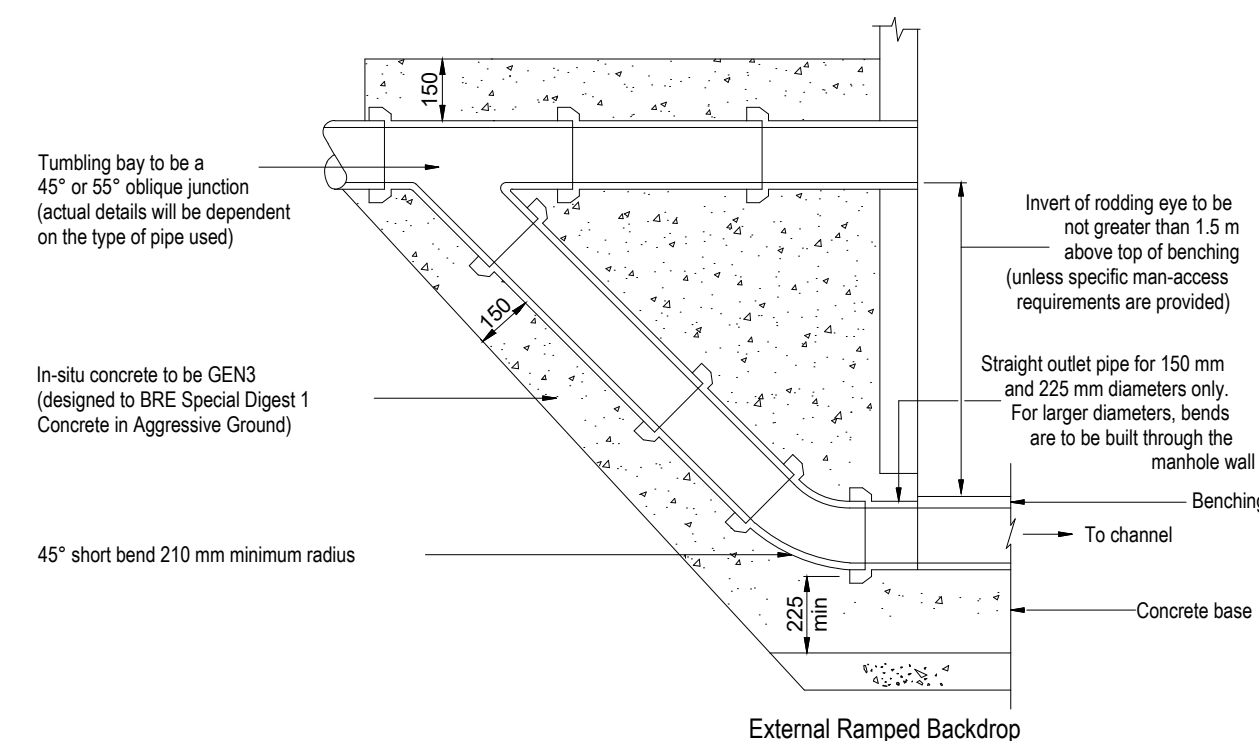
Scale: 1:20



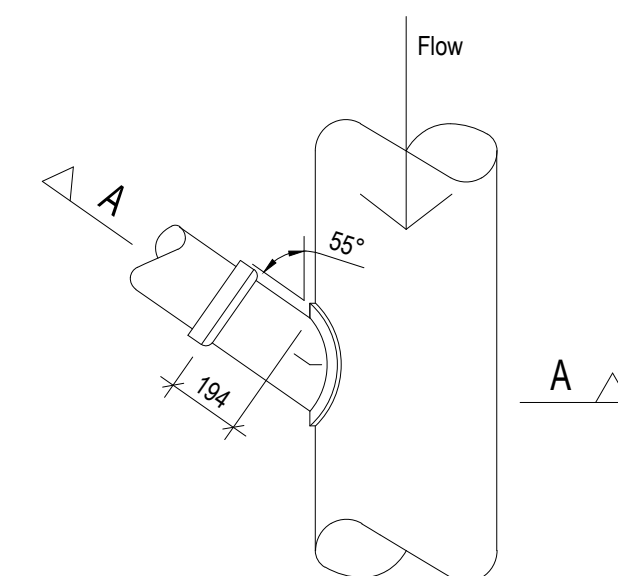
Ø150 MAIN CHANNEL, MAX 2 NO. (Ø100 & Ø150)  
SIDE CONNECTIONS ON EACH SIDE  
(50mm step height for all branch connections)



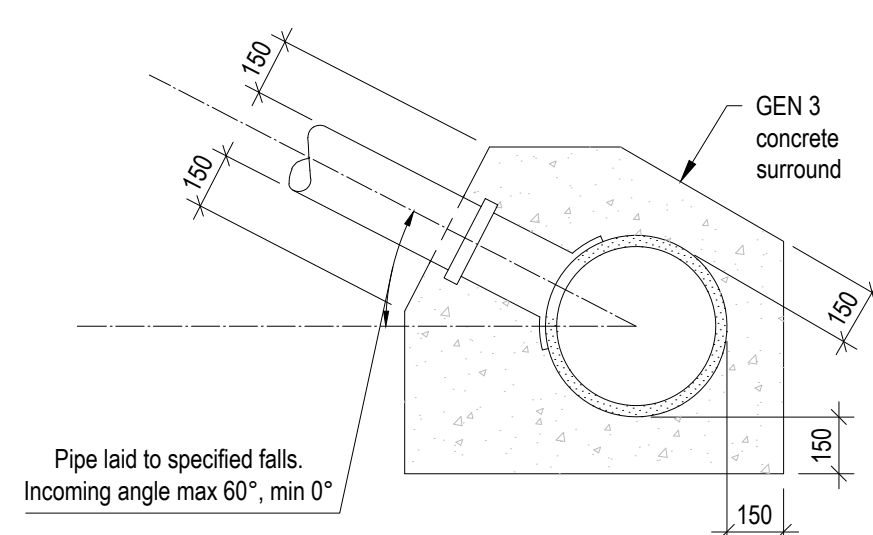
## EXTERNAL VERTICAL BACKDROP



## EXTERNAL RAMPED BACKDROP

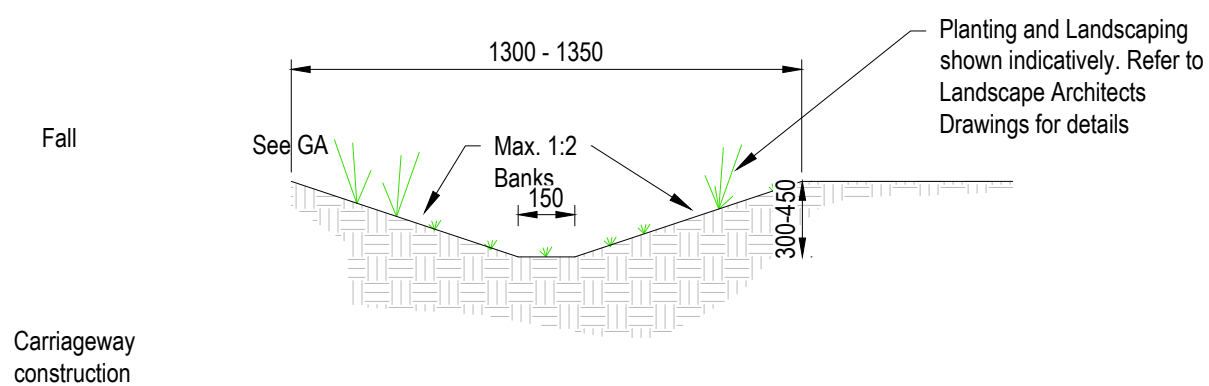


SADDLE CONNECTION - PLAN  
VIEW



SADDLE CONNECTION SECTION A-A

SCALE 1:20



### PROPOSED DRAINAGE (DRY) SWALE

DO NOT SCALE OFF THIS DRAWING

## NOTES

1. The contractor is responsible for verifying all site & setting out dimensions before commencing work.
2. This drawing is to be read in conjunction with all relevant Architectural and M&E drawings.
3. All dimensions in meters unless stated otherwise.

TABLE 1

| DN           | Minimum trench width (OD + x) |                    |          |
|--------------|-------------------------------|--------------------|----------|
|              | Supported trench              | Unsupported trench |          |
|              |                               | # > 60°            | # < 60°  |
| less 225     | 600                           | 600                | 600      |
| 225 to 350   | 800                           | 800                | 800      |
| 350 to 700   | OD + 700                      | OD + 700           | OD + 400 |
| 700 to 1200  | OD + 850                      | OD + 850           |          |
| greater 1200 | OD + 1000                     | OD + 1000          | OD + 400 |

In the values  $OD + x$ ,  $x/2$  equals the minimum working space between the pipe and the trench wall or support, where:  
 $OD$  is external diameter.  
 $\theta$  is angle of unsupported trench side measured to the horizontal.

### MINIMUM TRENCH WIDTH IN RELATION TO NORMAL SIZE DN

TABLE 2

| Trench depth | Minimum trench width |
|--------------|----------------------|
| less 1000    | As Table 1           |
| 1000 to 1750 | 800                  |
| 1750 to 4000 | 900                  |
| greater 4000 | 1000                 |

The minimum trench width shall be the greater of the values taken from tables 1 & 2.

### MINIMUM TRENCH WIDTH IN RELATION TO TRENCH DEPTH

[illegible]

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ALLISON HOMES

**robert west.**  
proesgroup

1 Paris Garden  
London  
SE1 8ND  
t: 0203 773 7880  
[www.robertwest.co.uk](http://www.robertwest.co.uk)

Project  
MARKFIELD

Drawing Title

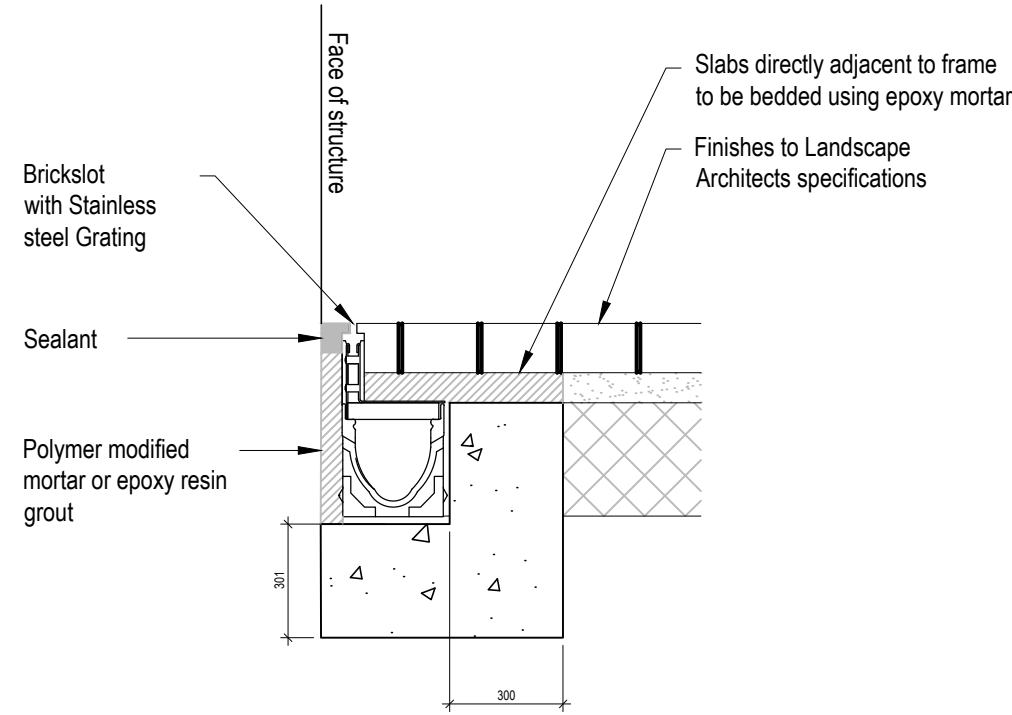
PROPOSED CONSTRUCTION DETAILS  
SHEET 3

RWCL Internal Register reference: 5964 -003

Scales @ A+

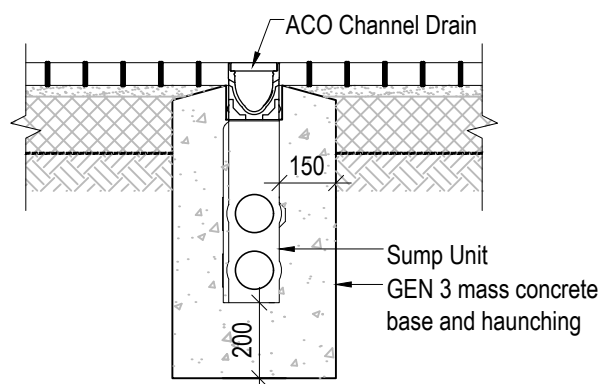
1102-A01



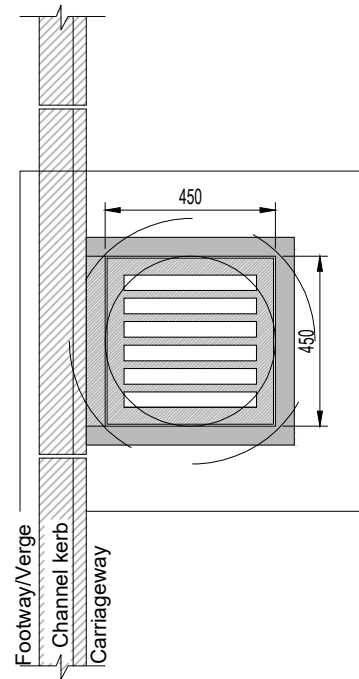


LINEAR SLOT DRAIN AT THRESHOLD DETAIL

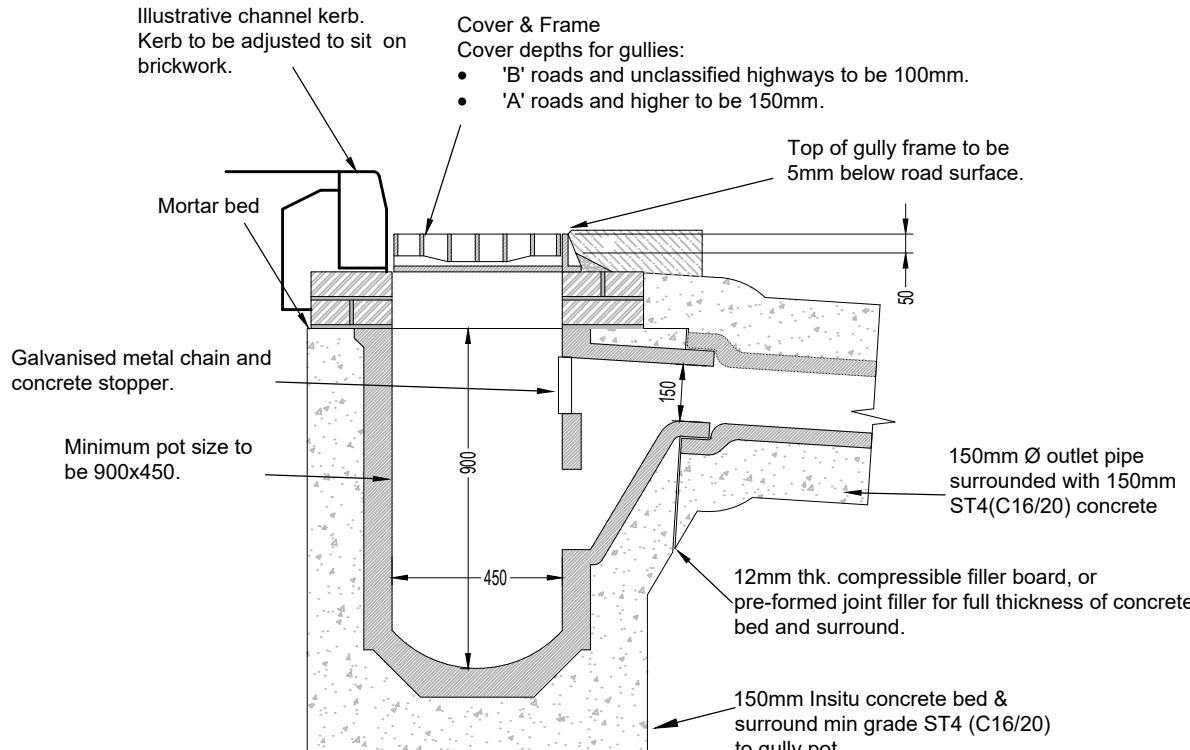
SCALE 1:20



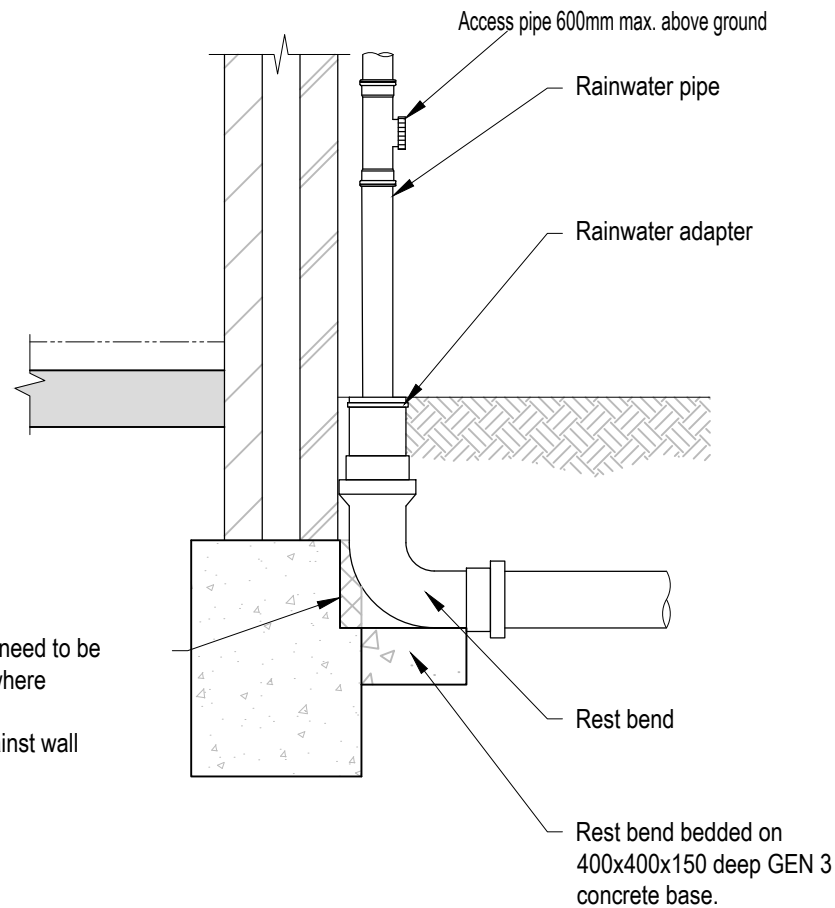
SUMP UNIT CHANNEL/SLOT DRAIN DETAIL (ACO M100D UNIVERSAL SUMP)



ROAD GULLY AT KERB Type:Precast Concrete Plan

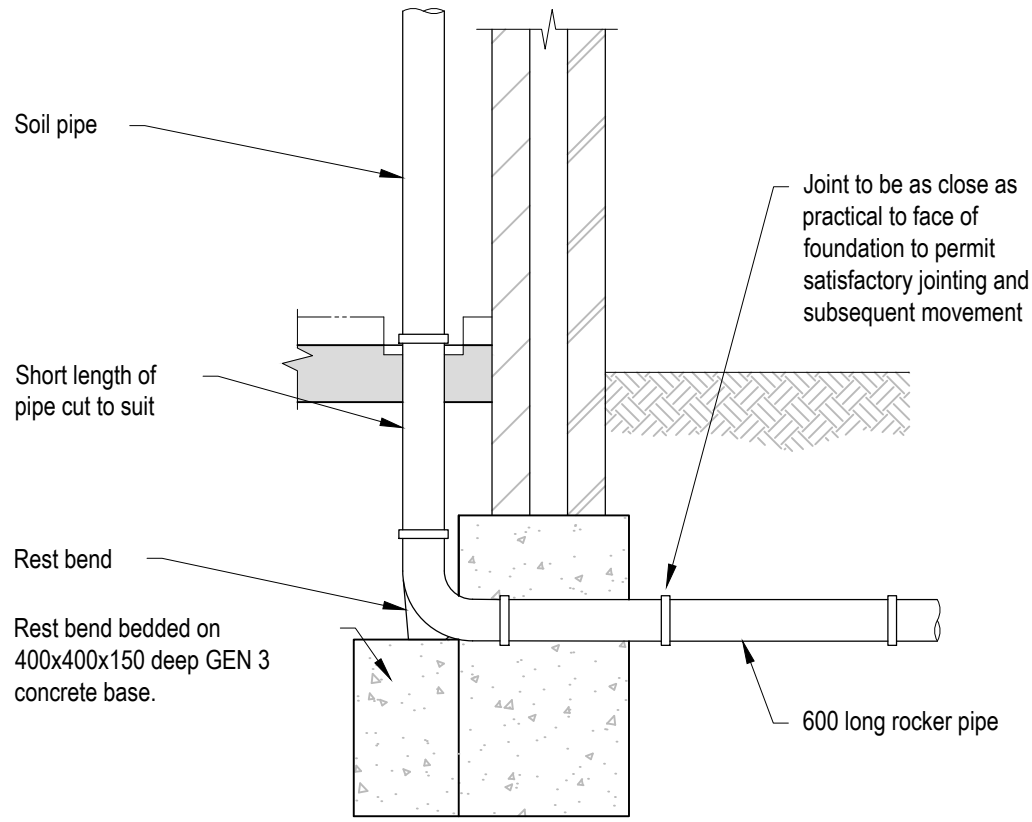


ROAD GULLY AT KERB Type:Precast Concrete Section



RAINWATER DOWN PIPE TO DRAIN (SURFACE WATER SYSTEM)

SCALE 1:20



TYPICAL SOIL VENT PIPE/STUB STACK/WC DETAIL

SCALE 1:20

DO NOT SCALE OFF THIS DRAWING

NOTES

1. The contractor is responsible for verifying all site & setting out dimensions before commencing work.
2. This drawing is to be read in conjunction with all relevant Architectural and M&E drawings.
3. All dimensions in meters unless stated otherwise.

| Revision History |              |    |      |      |          |  |
|------------------|--------------|----|------|------|----------|--|
| Rev              | Comment      | By | Chkd | Appr | Date     |  |
|                  |              |    |      |      |          |  |
|                  |              |    |      |      |          |  |
|                  |              |    |      |      |          |  |
|                  |              |    |      |      |          |  |
|                  |              |    |      |      |          |  |
| Current Revision |              |    |      |      |          |  |
| A01              | FOR APPROVAL | TZ | TZ   | SB   | 24.11.20 |  |

APPROVAL

ALLISON HOMES

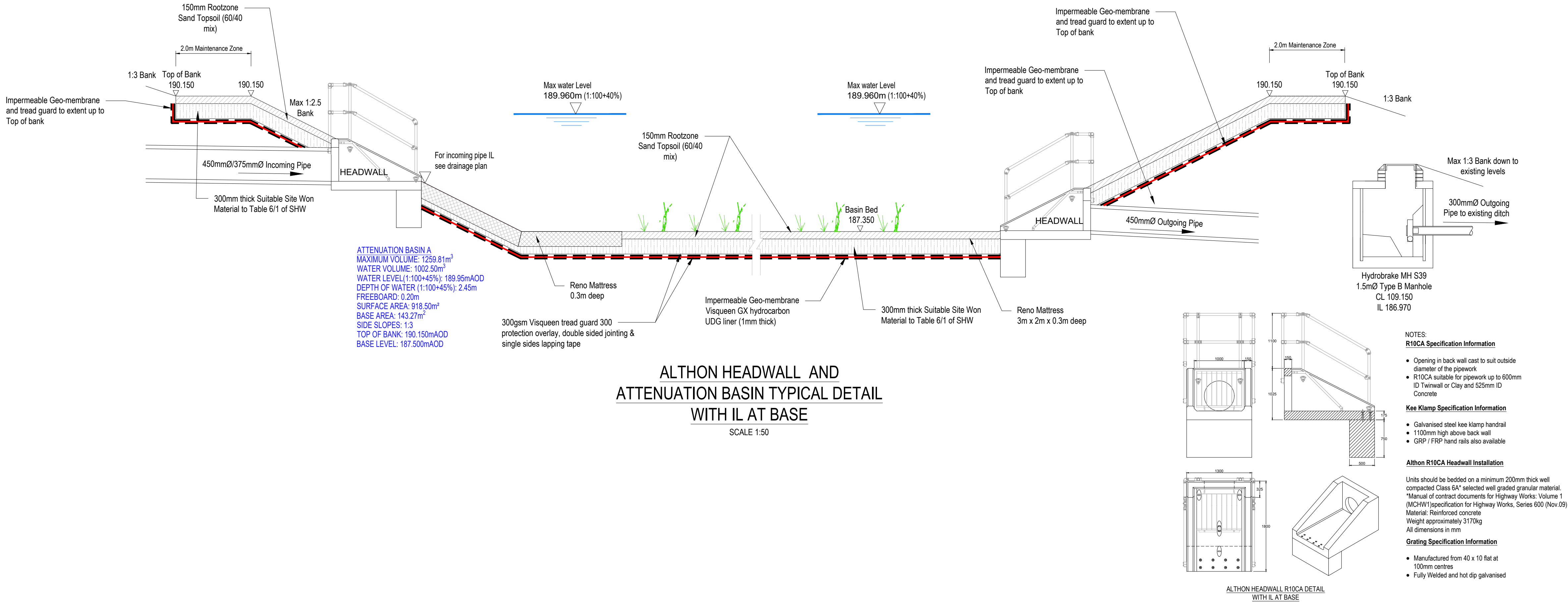
**robert west**  
proesgroup  
1 Paris Garden  
London  
SE1 1ND  
t: 0203 773 7880  
www.robertwest.co.uk

Project  
MARKFIELD

Drawing Title  
PROPOSED CONSTRUCTION DETAILS  
SHEET 4

RWCL Internal Register reference: 5964-003 Scales @ A1





DO NOT SCALE OFF THIS DRAWING

- NOTES**
1. The contractor is responsible for verifying all site & setting out dimensions before commencing work.
  2. This drawing is to be read in conjunction with all relevant Architectural and M&E drawings.
  3. All dimensions in meters unless stated otherwise.

Revision History

| Rev              | Comment                                      | By | Chkd | Appr | Date       |
|------------------|----------------------------------------------|----|------|------|------------|
|                  |                                              |    |      |      |            |
|                  |                                              |    |      |      |            |
|                  |                                              |    |      |      |            |
| A02              | FOR APPROVAL - Updated to latest site layout | PJ | TZ   | SB   | 27.05.2026 |
| A01              | FOR APPROVAL                                 | TZ | TZ   | SB   | 24.11.2025 |
| Current Revision |                                              |    |      |      |            |
| A03              | FOR APPROVAL - Updated to latest site layout | TZ | SB   | SB   | 16.07.2026 |

APPROVAL

ALLISON HOMES

1 Paris Garden  
London  
SE1 8ND  
t: 0203 773 7880  
www.robertwest.co.uk

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Project

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Drawing Title

PROPOSED CONSTRUCTION DETAILS  
SHEET 5

RWCL Internal Register reference: 5964-003

Scales @ A1

1104 -A03

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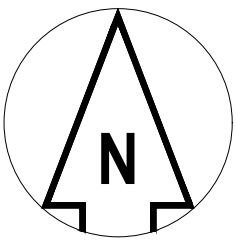


Key:

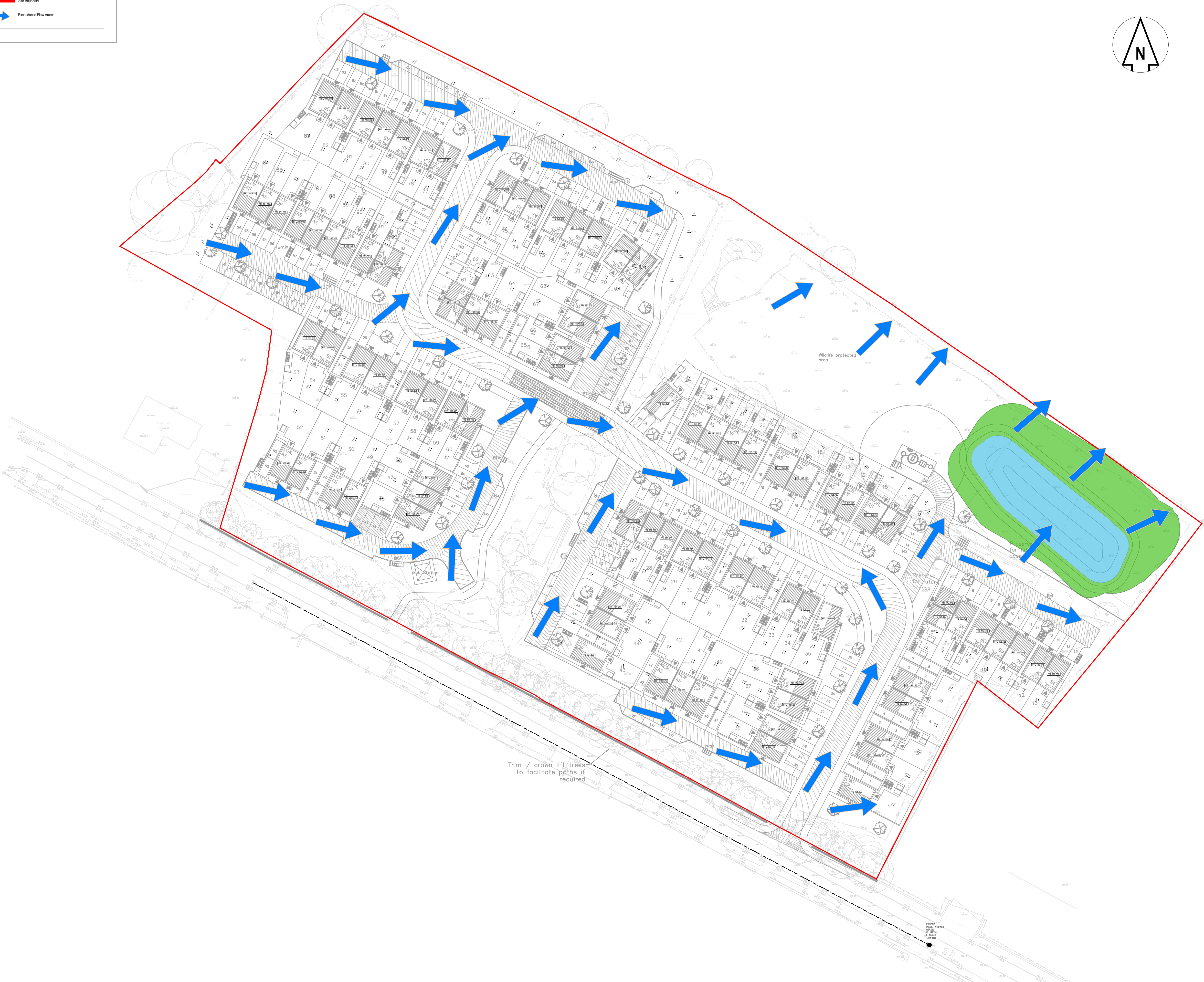
Site Boundary

Exceedance Flow Arrow

Scale 1:500 @ A1 - 1:1000 @ A3



- DO NOT SCALE OFF THIS DRAWING
- NOTES
- The contractor is responsible for verifying all site & setting out dimensions before commencing work.
  - This drawing is to be read in conjunction with all relevant Architectural and M&E drawings.
  - All dimensions in meters unless stated otherwise.



| Revision History |                                              |    |      |      |            |
|------------------|----------------------------------------------|----|------|------|------------|
| Rev              | Comment                                      | By | Chkd | Appr | Date       |
|                  |                                              |    |      |      |            |
|                  |                                              |    |      |      |            |
| A04              | FOR APPROVAL - Updated to latest site layout | PJ | TZ   | SB   | 05/06/2026 |
| A03              | FOR APPROVAL - Updated to latest site layout | PJ | TZ   | SB   | 03/06/2026 |
| A02              | UPDATED AS PER SITE LAYOUT DATED 06.05.26    | NS | TZ   | SB   | 27/05/2026 |
| A01              | ISSUED FOR APPROVAL                          | TZ | TZ   | SB   | 24/11/2025 |
| Current Revision |                                              |    |      |      |            |
| A05              | FOR APPROVAL - Updated to latest site layout | SK | TZ   | SB   | 17/07/2026 |

APPROVAL

ALLISON HOMES

1 Paris Garden  
London  
SE1 8ND

**robert west**  
prosgroup

t: 0203 773 7880  
www.robertwest.co.uk

Project  
MARKFIELD

Drawing Title  
PROPOSED SITE  
EXCEEDANCE FLOW PLAN

RWCL Internal Register reference: 5964-003 Scales @ A1

1150-A05



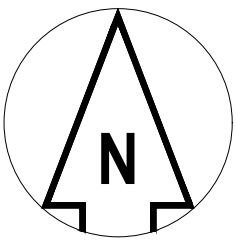
Key:

Site Boundary

Exceedance Flow Arrow

Scale 1:500 @ A1 - 1:1000 @ A3

10m 0 10m 20m 30m 40m 50m



- DO NOT SCALE OFF THIS DRAWING
- NOTES
1. The contractor is responsible for verifying all site & setting out dimensions before commencing work.
  2. This drawing is to be read in conjunction with all relevant Architectural and M&E drawings.
  3. All dimensions in meters unless stated otherwise.



| Revision History |                     |    |      |      |            |  |
|------------------|---------------------|----|------|------|------------|--|
| Rev              | Comment             | By | Chkd | Appr | Date       |  |
|                  |                     |    |      |      |            |  |
|                  |                     |    |      |      |            |  |
|                  |                     |    |      |      |            |  |
| A01              | ISSUED FOR APPROVAL | TZ | TZ   | SB   | 24/11/2025 |  |
| Current Revision |                     |    |      |      |            |  |
| A02              | UPDATED FLOW ARROWS | NS | PJ   | SB   | 27/05/2026 |  |

APPROVAL

ALLISON HOMES

robert west

prosgroup

1 Paris Garden  
London  
SE1 8ND

t: 0203 773 7880  
www.robertwest.co.uk

Project  
MARKFIELD

Drawing Title  
EXISTING SITE  
EXCEEDANCE FLOW PLAN