Detailed Drainage Strategy
223 Station Road, Earl Shilton

19/02/2024
Version 1.0
RAB: 3253_FRD

Disclaimer

This document has been prepared solely as a Flood Risk Assessment for Colin Burton Builders Ltd. RAB Consultants accepts no responsibility or liability for any use that is made of this document other than by the client for the purposes for which it was originally commissioned and prepared. No person other than the client may copy (in whole or in part) use or rely on the contents of this document, without the prior written permission of the Managing Director of RAB Consultants Ltd. Any advice, opinions, or recommendations within this document should be read and relied upon only in the context of the whole document.

Published by

RAB Consultants Limited
Second Floor
Cathedral House
Beacon Street
Lichfield
Staffordshire
WS13 7AA

Call: 01543 547 303
Email: enquiries@rabconsultants.co.uk
Visit: rabconsultants.co.uk

By viewing and saving this document digitally instead of printing it, you could save 4.6g of carbon emissions from double-sided printing on primary-sourced or 3.7g from 100% recycled A4 paper. Please only print this document if it is necessary.

Quality Control

Action	Name
Prepared	N. Parsons
Checked	A. Tsavdaris
Approved	A. Tsavdaris

Revision History

Version	Date	Amendments	Issued to
1.0	19/02/2024	First Issue	Mark Geraghty – HSSP Architects

Contents

1.0 INTRODUCTION 1
2.0 SITE DETAILS 1
2.1 Site location 1
2.2 Site description 2
2.3 Development proposal 2
3.0 DRAINAGE STRATEGY 2
3.1 SuDS applicable policies 2
3.2 SuDS feasibility 2
3.3 Existing drainage 4
3.4 Proposed drainage 6
4.0 MANAGEMENT & MAINTENANCE PLAN 10
4.1 Maintenance Schedule 11
4.1.1 General requirements 11
4.1.1 Landscape maintenance 11
4.1.2 Geocellular storage 12
4.1.3 Inlets, outlets, flow controls, inspection chambers 12
4.1.4 Drainage network 13
4.1.5 Proprietary treatment device 14
4.2 Proposed Foul water drainage strategy 14
5.0 CONCLUSION 15
6.0 RECOMMENDATIONS 15
APPENDIX A – TOPOGRAPHIC SURVEY 17
APPENDIX B – PROPOSED PLANS 18
APPENDIX C – SEVERN TRENT WATER SEWER MAP 19
APPENDIX D – MICRODRAINAGE SOURCE CONTROL RESULTS 20
APPENDIX E – DETAILED DRAWINGS 21
APPENDIX F – NORTH DEVELOPMENT PLAN 22
APPENDIX G – DESIGN RISK REGISTER 23

1.0 Introduction

RAB Consultants has prepared this Detailed Drainage report to assist with the discharge of Condition 9 associated with the proposed development of 4 detached dwellings at 223 Station Road, Earl Shilton, Leicester – Planning Application Ref: 23/00298/FUL.

2.0 Site details

2.1 Site location

TABLE 1: SITE LOCATION

Site address:	223 Station Road, Earl Shilton, Leicester LE9 7GG
Site area:	0.39ha
Existing land use:	Garden land to rear of 223 Station Road
OS NGR:	SP 46342 96782
Local Planning Authority:	Hinckley and Bosworth Borough Council

2.2 Site description

The proposed site is garden land to the rear of 223 Station Road, Earl Shilton, located to the south of the town.

The site is bounded by an agricultural field to the north, in which a planning application for 9 dwellings has been granted (Application ref: 21/00607/FUL), with development understood to be currently taking place. A small ordinary watercourse lies just south of the site, flowing west and parallel to the A47, which lies just further south.

The site is accessible by vehicle from Breach Lane which bounds the site to the east. A small ditch flows south, parallel to Breach Lane along the site's eastern boundary which discharges into this small watercourse. The ditch flows through a short section of culvert beneath the access to the site.

Freely available LiDAR (1m-DTM-2022) and the topographic survey of the site (Appendix A) show the site is relatively steep, falling from 100mAOD at the west extent down to 97mAOD at the east extent, with a general gradient of 1:40.

2.3 Development proposal

It is proposed to construct 4 detached dwellings on the site, each with associated parking and an access road from Breach Lane to the east.

Proposed plans area included in Appendix B.

3.0 Drainage strategy

3.1 SuDS applicable policies

Leicestershire County Council SuDS guidance has been used to assist with this drainage strategy, along with CIRIA's SUDS Manual and LASOO Non-Statutory Technical Standards for Sustainable Drainage, Practice Guidance.

3.2 SuDS feasibility

The SuDS Manual (2015) discusses the SuDS approach to managing surface water runoff which is intended to mimic the natural catchment process as closely as is possible. The approach sets out the design objectives in respect of SuDS:

- Use of surface water runoff as a resource;
- Manage rainwater close to where it falls (at source);
- Manage runoff on the surface (above ground);
- Allow rainwater to soak into the ground (infiltration);
- Promote evapotranspiration;
- Slow and store runoff to mimic natural runoff rates and volumes;

- Reduce contamination of runoff through pollution prevention and by controlling the runoff at source; and
- Treat runoff to reduce the risk of urban contaminants causing environmental pollution.

Depending on the characteristics of the site and local requirements, these may be used in conjunction and to varying degrees. Table 2 presents the functions of the SuDS components (from which a management train can be created) and their feasibility in respect of the site.

TABLE 2: FEASIBILITY OF SUDS TECHNIQUES AT THE DEVELOPMENT SITE

Technique	Description	Feasibility Y / N / M (Maybe)
Good building design and rainwater harvesting	Components that capture rainwater and facilitate its use within the building or local environment.	Y – Water butts could be included to collect rainwater from building rooftops for re-use on the site.
Porous and pervious surface materials	Structural surfaces that allow water to penetrate, thus reducing the proportion of runoff that is conveyed to the drainage system (green roofs, pervious paving).	Y – Porous surfaces could be used on the proposed parking areas and building surrounds.
Infiltration Systems	Components that facilitate the infiltration of water into the ground. These often include temporary storage zones to accommodate runoff volumes before slow release to the soil.	N – According to Soilscapes, the site is within an area of impeded drainage suggesting that infiltration is not viable at site level. In addition, due to the site layout, there is very limited room to achieve the 5m rule required for infiltration SuDS. As such, infiltration is not viable at site level.
Conveyance Systems	Components that convey flows to downstream storage systems (e.g. swales, watercourses).	N - There is no scope within the proposal for surface conveyance due to the site layout.
Storage Systems	Components that control the flows and, where possible, volumes of runoff being discharged from the site, by storing water and releasing it slowly (attenuation). These systems may also provide further treatment of the runoff (e.g. ponds, wetlands, and detention basins).	Y – There is scope within the development to include on-site storage.

Treatment Systems	Components that remove or facilitate the degradation of contaminants present in the runoff.	Y – There is scope within the development to provide water treatment benefits.

3.3 Existing drainage

Historic maps show the site, and the northern field formed a Brick Works from the late-1800s up until around the start of the First World War. The Brick Works is then shown to have been disused up until the late 1950's, early 1960's when residential development of the area began.

The site in its existing state consists of a small greenhouse in the northwest corner and vegetated garden land.

From the topographic survey, runoff from the site is expected to flow southeast, towards the Breach Lane ditch and the small ordinary watercourse just south of the site, as shown in Figure 1. Just east of the site, the watercourse enters a culvert and is expected to continue to flow east until it joins the River Soar more than 5km from the site.

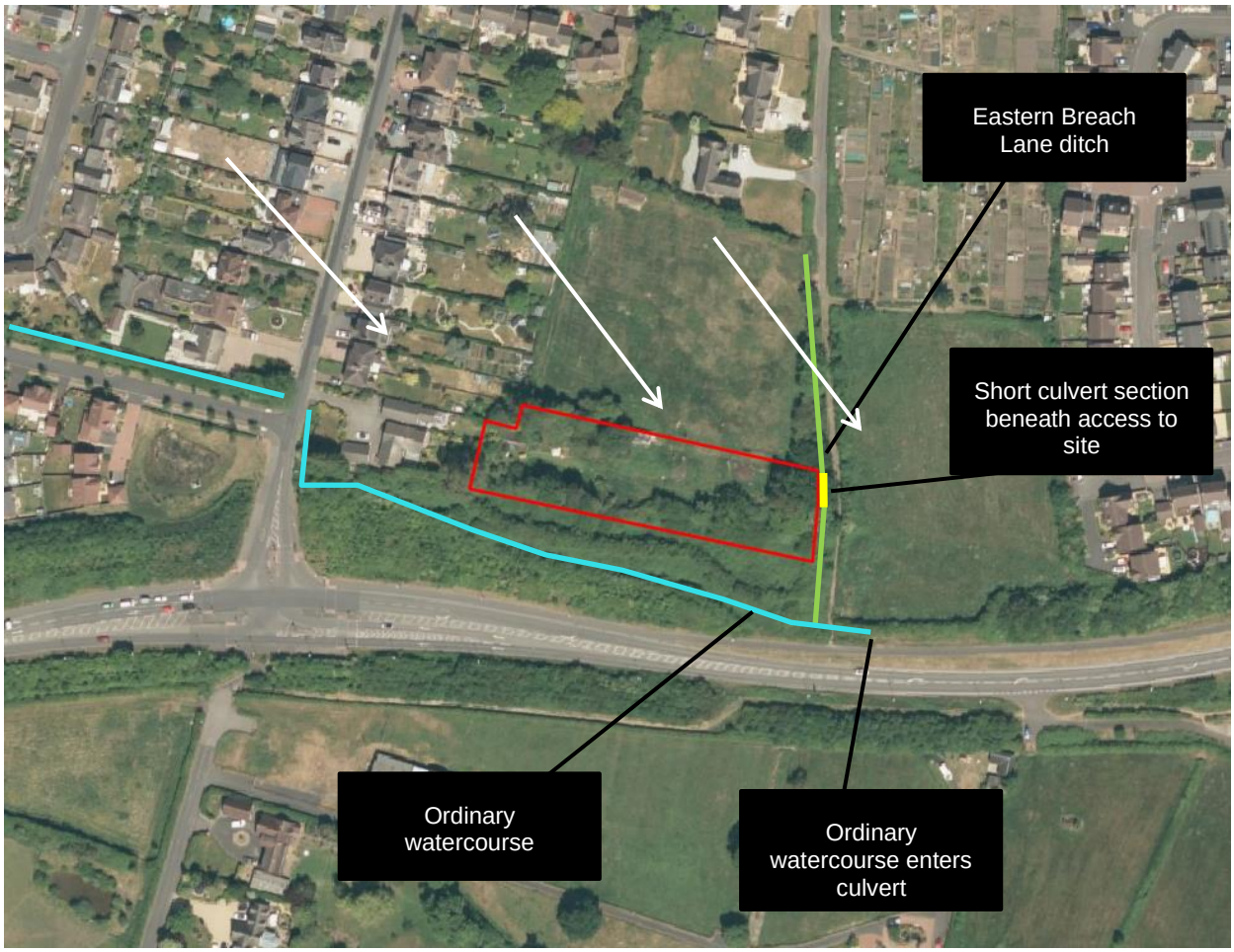


FIGURE 1: NATURAL TOPOGRAPHY AND SURFACE WATER FEATURES

A Severn Trent Water asset map (Appendix C) shows a 225mm diameter surface water drain flowing southeast across the site, with an outlet downstream of the site, towards the Breach Lane ditch. It is understood that within the development of the site to the north, this drain will be diverted to discharge into the ditch, upstream of the site as indicated in Figure 3 below.

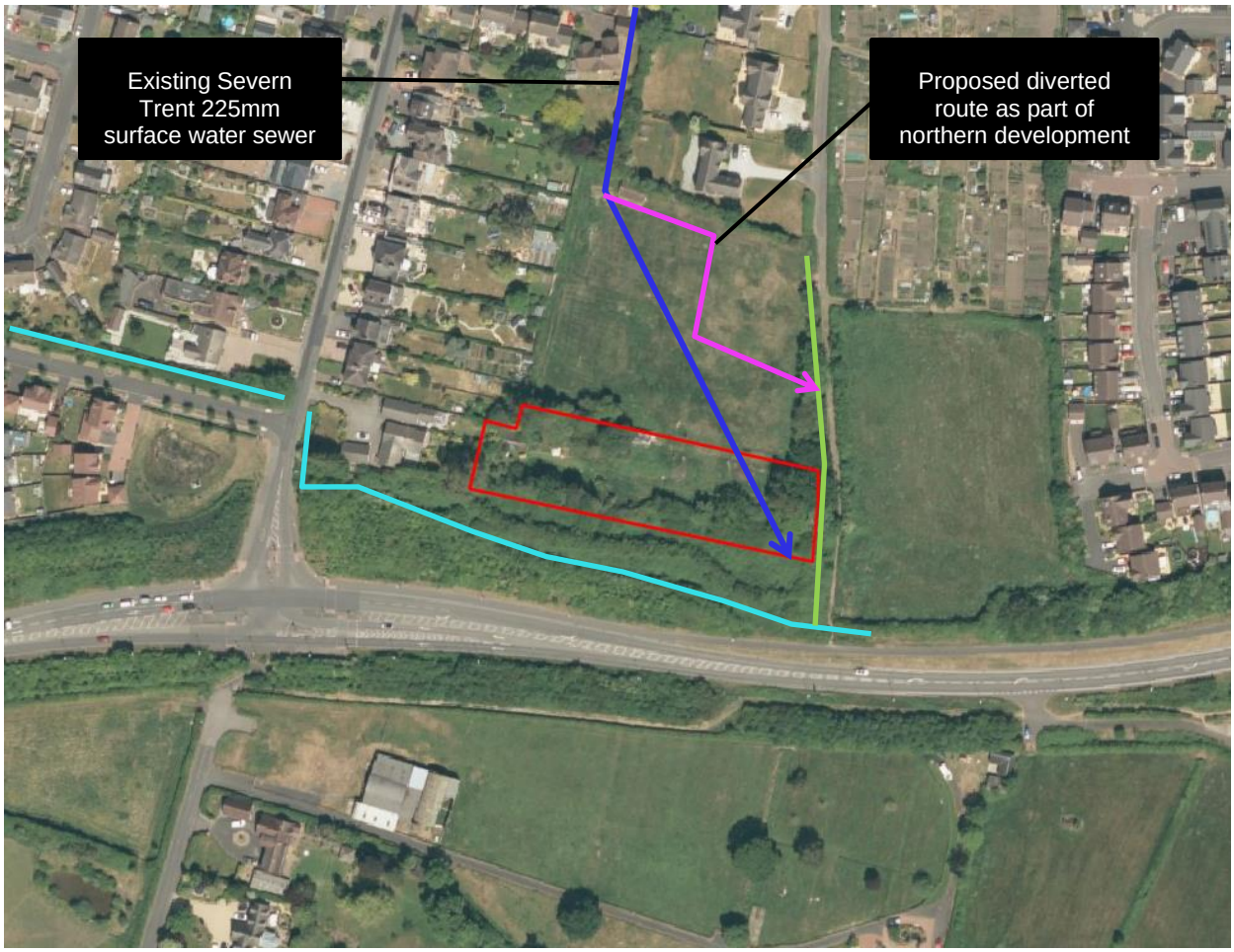


FIGURE 2: NORTHERN DEVELOPMENT PROPOSED PUBLIC SURFACE WATER SEWER DIVERSION

The northern development proposes to discharge surface water and divert the Severn Trent sewer to discharge into the ditch upstream of the site.

The culvert which conveys the ditch beneath the access to the site is 225mm diameter. With the additional flow upstream of this culvert (along with other potential inflows), there is an increased potential for its capacity to be exceeded. In such events, water would naturally pass east and travel south down Breach Lane towards the A47. The site naturally lies higher than Breach Lane and falls towards the road as previously indicated in Figure 2.

The development site is therefore not expected to be negatively affected by the Severn Trent surface water sewer diversion; however, this should be confirmed as part of the sewer diversion design.

3.3.1 Greenfield Runoff

It is debateable, therefore, what the relevance of the conventional catchment-based greenfield runoff calculations (IH124) is, given the historic worked nature of the site.

Nevertheless, greenfield runoff rates for the site have been calculated using the IH124 method (based on the interim Code of Practice of Sustainable Drainage Systems given the small site area).

IH124 parameters:

Area = 1ha unit area (to calculate l/s/ha)

SOIL = 0.450

SAAR = 700mm

Region = 4

TABLE 3: ESTIMATE OF PRE-DEVELOPMENT PEAK RUNOFF RATES

Annual Exceedance Probability (AEP)	Peak Runoff Rate (l/s/ha)
QBAR	4.4
100% (1 year)	3.7
3.33% (30 year)	8.7
1% (100 year)	11.3

3.4 Proposed drainage

It is proposed to construct 4 dwellings on the site, each with associated parking and an access road from Breach Lane,

The recommended hierarchy for discharging surface water (ref. The SuDS Manual, CIRIA C753) is:

1. Infiltration to the maximum extent that is practical.
2. Discharge to surface waters.
3. Discharge to surface water sewer.
4. Discharge to combined sewers.

BGS online mapping reports the local bedrock to be Gunthorpe & Edwalton Member, Mudstone, with superficial deposits of Bosworth Clay Member - Clay and silt. Soilscapes describes the soil on the development as ‘Slightly acid loamy and clayey soils with impeded drainage’. MicroDrainage gives a natural SOIL value of 0.450 for the site. Given the available data, and the historic worked nature of the site, infiltration as the primary method of discharging surface water runoff is unlikely to be viable.

Given the above, the optimal strategy is simply to continue draining to the southern ordinary watercourse via the existing Breach Lane drainage ditch. All land up to the edge of the ditch is under the ownership of the applicant. A consent[1] from the Lead Local Flood Authority may be required to construct a formal outlet structure at this ditch.

Given the small, narrow site the use of on-surface SuDS is limited. Therefore, a drainage strategy is proposed which comprises:

[1] Appointed contractor must liaise with the LLFA prior to commencing any works.

- Collecting rainfall from impermeable drained areas and conveying to underground geocellular storage.
- Attenuate and control flow as close as reasonably practicable to greenfield QBAR. In this case, greenfield QBAR for the proposed drained area is very low (Proposed drained area + 10% urban creep = 0.205 ha x 4.4 l/s/ha = 0.9 l/s) – therefore it is proposed to control to 3.0 l/s as a compromise between rate and the risk of blockage of the flow controller, for all rainfall scenarios up to and including the 1% AEP plus 40% climate change event.
- Discharge to the existing eastern boundary ditch, via a formal headwall.

The drainage scheme comprises:

- Convey surface water from proposed impermeable areas via a network of underground pipes into underground geocellular storage located beneath the proposed access road.
- Create a geocellular storage system:
    - Geocellular Storage 1: 102m^2 x 0.50m – Attenuating runoff from 0.090ha of impermeable area.
        - Outlet controlled to 3.0 l/s via a vortex flow controller (HydroBrake or similar), discharging into Geocellular 2.
    - Geocellular Storage 2: 85m^2 x 1.00m – Attenuating runoff from the remaining 0.095ha of impermeable area.
        - Outlet controlled to 3.0 l/s via a vortex flow controller (HydroBrake or similar) into the Breach Lane ditch.
- Given the limited space within the site for on-surface SuDS, in order to ensure water quality of runoff is managed effectively, proprietary treatment systems in the form of SDS Aqua Swirls (or similar) will be installed upstream of both geocellular storage tanks.

Post-development runoff rates for the drained area of the site have been calculated using MicroDrainage 2020.1.3[2] Network for the full range of storm events, with results summarised in Table 4, and with all results included in Appendix D.

A 10% urban creep value has been applied to the total drained area to account for potential future expansion of impermeable area across the site.

---

[2] ***Summary of MicroDrainage Network test parameters:***
Geocellular 1: 102m^2 x 0.5m available storage depth – 0.95 porosity – Draining 0.096ha area (+10% urban creep)
Flow control: Hydrobrake – Qmax = 3.0 l/s
Geocellular 2: 85m^2 x 1.0m available storage depth – 0.95 porosity – Draining 0.09ha area (+10% urban creep)
Flow control: Hydrobrake – Qmax = 3.0 l/s
Total drained area = 0.205 ha (Proposed impermeable area + 10% urban creep).
5 min time of concentration
FSR Rainfall – M5-60 = 19.900mm – Ratio R = 0.400

TABLE 4: SUMMARY OF MICRODRAINAGE RESULTS

Annual Exceedance Probability (AEP)	Geocellular 1		Geocellular 2 (leaving site)	
	Peak level (max=0.50m)	Peak rate	Peak level (max=1.00m)	Peak rate
1 in 1 (100%)	0.088m	2.5 l/s	0.144m	2.7 l/s
1 in 30 (3.33%)	0.228m	3.0 l/s	0.446m	3.0 l/s
1 in 100 +CC (1% +40% CC)	0.494m	3.0 l/s	0.963m	3.0 l/s

An indicative drainage arrangement for the entire site is shown below in Figure 3, with detailed drawings included in Appendix E.

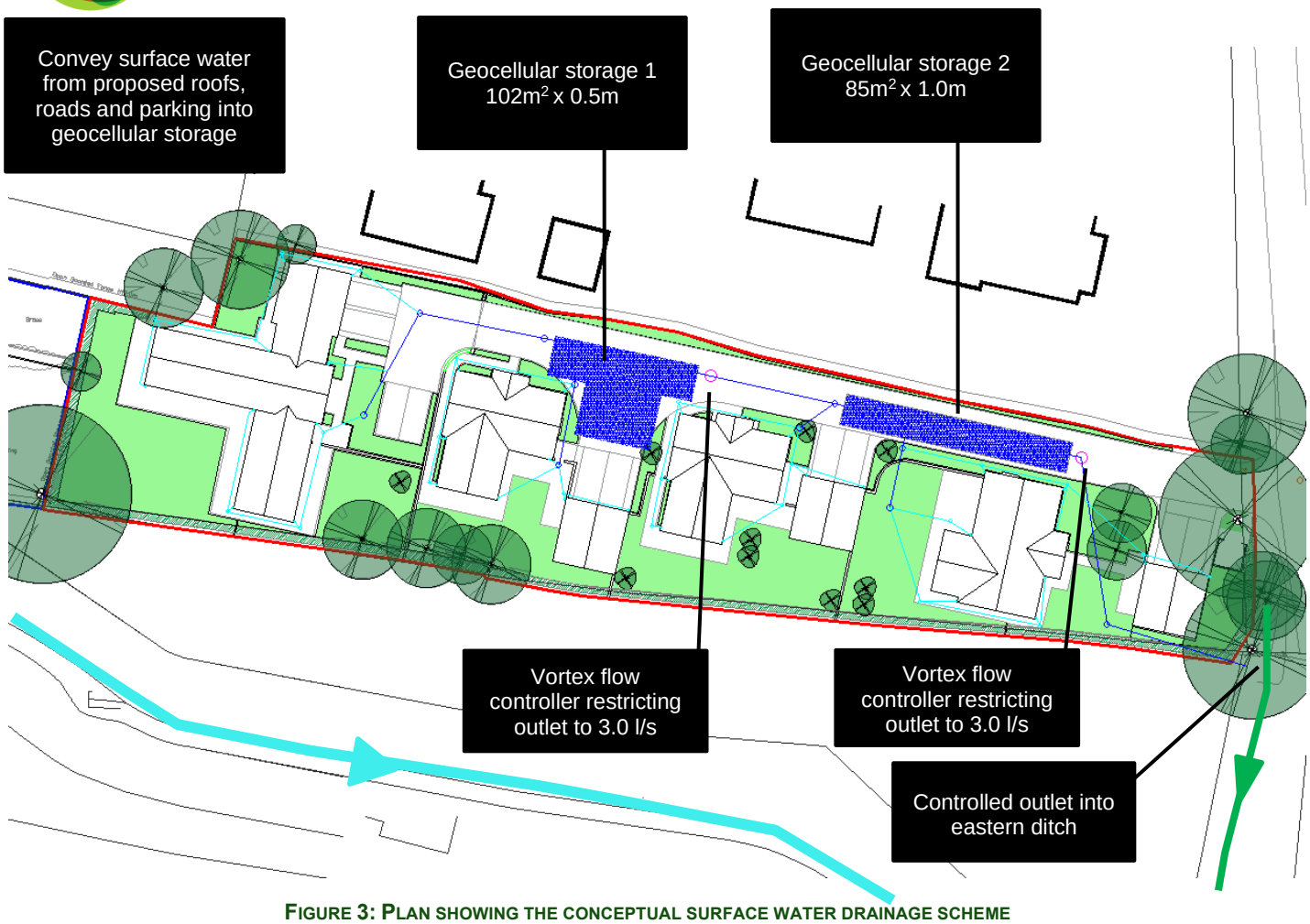


FIGURE 3: PLAN SHOWING THE CONCEPTUAL SURFACE WATER DRAINAGE SCHEME

In summary: For **water quantity**, runoff **rate** and **volume** will be managed by the introduction of a formal drainage scheme with attenuation and controlled final outflow. The scheme will manage **flood risk**, such that no flooding occurs for events up to the 1% AEP +40% CC. The scheme will also safely manage **exceedance** and system failure scenarios as site ground levels will be set such that exceedance of the drainage system will be directed away from proposed buildings into the access road and towards Breach Lane, where no vulnerable receptors are located. In addition, a flap valve should be installed at the outfall to prevent any backflows from the watercourse.

The proposed drainage system (and site) also has potential to provide **amenity** and **biodiversity** enhancement within the local environment, complementing the local habitat.

The drainage scheme will control **water quality**, in line with the SuDS Manual simple index approach (Section 26.7.1) for discharges to surface waters, as rainfall onto the access road and driveways (low pollution hazard), rooftops and paths (very low pollution hazard) will pass through at least 1 SDS Aqua Swirl (A-2), which will provide a high level of treatment.

TABLE 5: SUDS MITIGATION INDICES FOR DISCHARGE TO SURFACE WATERS

Area drained	SuDS Component	Hazard Index / Mitigation Index		
		TSS	Metals	Hydrocarbons
Driveway (low risk) & rooftops	**Proprietary Treatment – SDS Aqua Swirl AD-2**	**0.5 / 0.8**	**0.4 / 0.5**	**0.4 / 0.7**

Due to the proposed arrangement of geocellular storages, two Aqua Swirl AD-2 systems will be used – each upstream to the geocellular storage tanks.

The mitigation indices for the treatment train are greater than the hazard indices, therefore, the scheme is in line with the mitigation index approach of the SuDS Manual.

The system should be maintained in line with recommendations made in the CIRIA SuDS Manual and the maintenance plan, as set out in Section 4.0 below to ensure long-term functionality.

4.0 Management & Maintenance Plan

The following maintenance and management plan has been formed to assist with ensuring the longevity of the surface water scheme to provide multiple benefits throughout its lifetime. The plan will also aim to prevent any blockages or damage occurring to each component of the scheme to minimise the risk of flooding as much as possible.

The level of inspection and maintenance will vary depending on the type of SuDS component and scheme, the land use, and the type of vegetation. It is vital that SuDS construction is supervised and inspected on completion if owners are to avoid taking on liabilities and to ensure the specified materials are being used and placed correctly. Incorrect materials or installation should be rejected as they will adversely affect the performance, maintenance costs and ultimately the design life of the SuDS components.

The site manager must maintain maintenance logs for all elements.

The SuDS features incorporated to this particular design have to be maintained in order to ensure efficient water treatment and water management.

4.1 Maintenance Schedule

4.1.1 General requirements

TABLE 6: GENERAL REQUIREMENTS

Maintenance	Frequency	Owner
Maintenance activities comprise: • Regular maintenance • Occasional tasks • Remedial Work	Will vary depending on activity	(Private or adopted)

Regular maintenance (including inspections and monitoring). Consists of basic tasks done on a frequent and predictable schedule, including vegetation management, litter and debris removal, and inspections.

Occasional maintenance Comprises tasks that are likely to be required periodically, but on a much less frequent and predictable basis than the routine tasks (sediment removal is an example).

Remedial maintenance Comprises intermittent tasks that may be required to rectify faults associated with the system, although the likelihood of faults can be minimised by good design.

Where remedial work is found to be necessary, it is likely to be due to site-specific characteristics or unforeseen events, and as such timings are difficult to predict.

Avoid use of weedkillers and pesticides to prevent chemical pollution.

4.1.1 Landscape maintenance

TABLE 7: MAINTENANCE SCHEDULE FOR SURROUNDING LANDSCAPE

Maintenance	Frequency	Owner
Regular maintenance Litter management: • Pick up all litter in SuDS and Landscape areas and remove from site.	Monthly	Private management / homeowners
Grass Maintenance: • Mow all grass verges, paths and amenity at 35-50mm with 75mm max. Leaving grass *in situ*. • Wildflower areas trimmed to 50mm on 3 year rotation	As required or monthly	
Occasional tasks • Prune (trim) tree branches to allow for sunlight to reach ground level flora.	Annually or as required	

4.1.2 Geocellular storage

TABLE 8: GUIDELINE MAINTENANCE SCHEDULE FOR THE STORAGE UNITS, ADAPTED FROM CIRIA RP992/23 AND C753

Maintenance	Frequency	Owner
Regular maintenance • Inspect and identify any areas that are not operating correctly. If required, take remedial action. • Inspect/check all inlets, outlets and vents to ensure that they are in good condition and operating as designed.	Annually or as required.	Private maintenance / management company
Occasional tasks • Survey inside of tank for sediment build-up and remove if necessary*. • Replace cellular storage tank at the end of design life**	Every 5 years or as required. After 25 years (or as indicated by manufacturer.	

**Silt disposal to be undertaken in line with the Environment Agency Regulatory Position Statement 055 and by a qualified professional.*

***Assuming maintenance schedule is followed, and remedial action is taken when required.*

It is imperative that the management company maintains record logs, including dated images, of the cellular storage access chamber, all inlets, outlet flow control chamber, and silt traps. These records should be shared with the site owner.

Following 20 years from the installation of the proposed cellular storage tank, the tank manufacturer must review the records from the last 5 years and identify whether there is a requirement for replacement of the feature. Should a tank replacement be required, a qualified contractor must be appointed and develop a construction phase plan taking into consideration the utilities, while clearly identifying the required temporary works to enable the tank replacement.

4.1.3 Inlets, outlets, flow controls, inspection chambers

TABLE 9: MAINTENANCE SCHEDULE FOR THE INLETS, OUTLETS, FLOW CONTROL STRUCTURES AND INSPECTION CHAMBERS/MANHOLES

Maintenance	Frequency	Owner
Regular maintenance Inlets, outlets: • Inspect surface structures removing obstructions and silt as necessary. Check there is no physical damage. • Strim vegetation 1m min. surround to structures and keep hard aprons free from silt and debris	Monthly	Private maintenance / management company

Maintenance	Frequency	Owner
Inspection chambers/manholes and below ground flow control chambers / proprietary treatment systems: • Remove cover and inspect ensuring water is flowing freely and that the exit route for water is unobstructed. Remove debris and silt. • Undertake inspection after leaf fall in autumn.	Monthly for 12 months, then annually.	
Occasional tasks • Check topsoil levels are 20mm above edges of baskets and chambers to avoid mower damage.	As necessary	
Remedial Work • Repair physical damage if necessary.	As required	

4.1.4 Drainage network

TABLE 10: MAINTENANCE SCHEDULE FOR PIPED DRAINAGE NETWORK

Drainage Element	Maintenance	Frequency	Owner
Downpipes and gullies	**Regular maintenance** • Open any covers, inspect integrity of gullies and repair as necessary.	Monthly	Private maintenance / management company
	• Remove silt / debris by suction.	Annually or as required	
Pipe network	**Regular maintenance** • Remove any sediment within the network and inspection chambers.	Every 3 years or as required	
	• Open covers inspect integrity of chambers and repair as necessary. • Remove silt / debris by suction.	Annually	

4.1.5 Proprietary treatment device

The proprietary treatment devices maintenance schedule will have to be specified by the manufacturer as different features will have different maintenance requirements.

TABLE 11: MAINTENANCE SCHEDULE FOR THE PROPRIETARY TREATMENT DEVICES

Maintenance	Frequency	Owner
Regular maintenance • Remove litter and debris and inspect sediment, oil and grease accumulation.	As recommended by manufacturer	Private maintenance / management company
Remedial actions • Replace malfunctioning parts or structures	As required	
Monitoring • Inspect for evidence of poor operation.	Six monthly / Or as recommended by manufacturer	
• Inspect sediment accumulation rates and establish appropriate removal frequencies	Monthly during first half year of operation, then every six months / As recommended by manufacturer	

4.2 Proposed Foul water drainage strategy

The National Planning Practice Guidance and Building Regulations Approved Document H give a hierarchy of drainage options that must be considered and discounted in the following order:

1. Connection to the public sewer
2. Package sewage treatment plant (which can be offered to the Sewerage Undertaker for adoption)
3. Septic Tank
4. If none of the above are feasible a cesspool

A Severn Trent Map (Appendix C) was obtained to understand the existing foul water drainage in close proximity to the site. The map shows there is a 525mm gravity foul sewer in Clickers Way (A47) approximately 50m south of the site.

As mentioned previously, the site to the north is currently under construction for the development of 9 dwellings. Appendix F shows the proposed development plan for this northern site, with a proposed foul connection to the 525mm foul sewer at manhole MH4700 in Clickers Way.

The proposed foul network from the northern development will pass south along Breach Lane, adjacent the site. It is expected Severn Trent Water will adopt this foul sewer given it will serve 9 dwellings. Once

constructed and adopted by Severn Trent, the foul sewer serving the northern development will therefore offer a connection point for foul water from this proposed development.

The general slope across the site into Breach Lane is approximately 1:40, which gives ample fall for a foul system to serve the site.

A Section 104 / 106 agreement will be required with Severn Trent Water to make this modification.

Foul pipework to serve the 4 proposed dwellings will be set at 100mm diameter, in line with Design Construction Guidance (Version 2.1), Section B6 - Reliability:

1a. Gravity foul sewer, 100mm nominal internal diameter for ten properties or less.

9b. A sewer or lateral drain with a nominal internal diameter of 100 mm, or a lateral drain serving ten or less properties is laid to a gradient not flatter than 1:80.

The conceptual foul drainage is shown in the detailed drawings within Appendix D.

5.0 Conclusion

RAB Consultants has prepared this Detailed Drainage Strategy to support the proposed development of 4 dwellings at 223 Station Road, Earl Shilton, Leicester.

A drainage design is proposed that comprises collection of rainwater into attenuation units designed to safely manage runoff from the proposed impermeable areas. This will have the effect of managing surface water runoff from all impermeable areas and for all events up to and including the 1% AEP plus climate change storm (40%).

A connection to the foul public sewer system is proposed, subject to Severn Trent Water agreement.

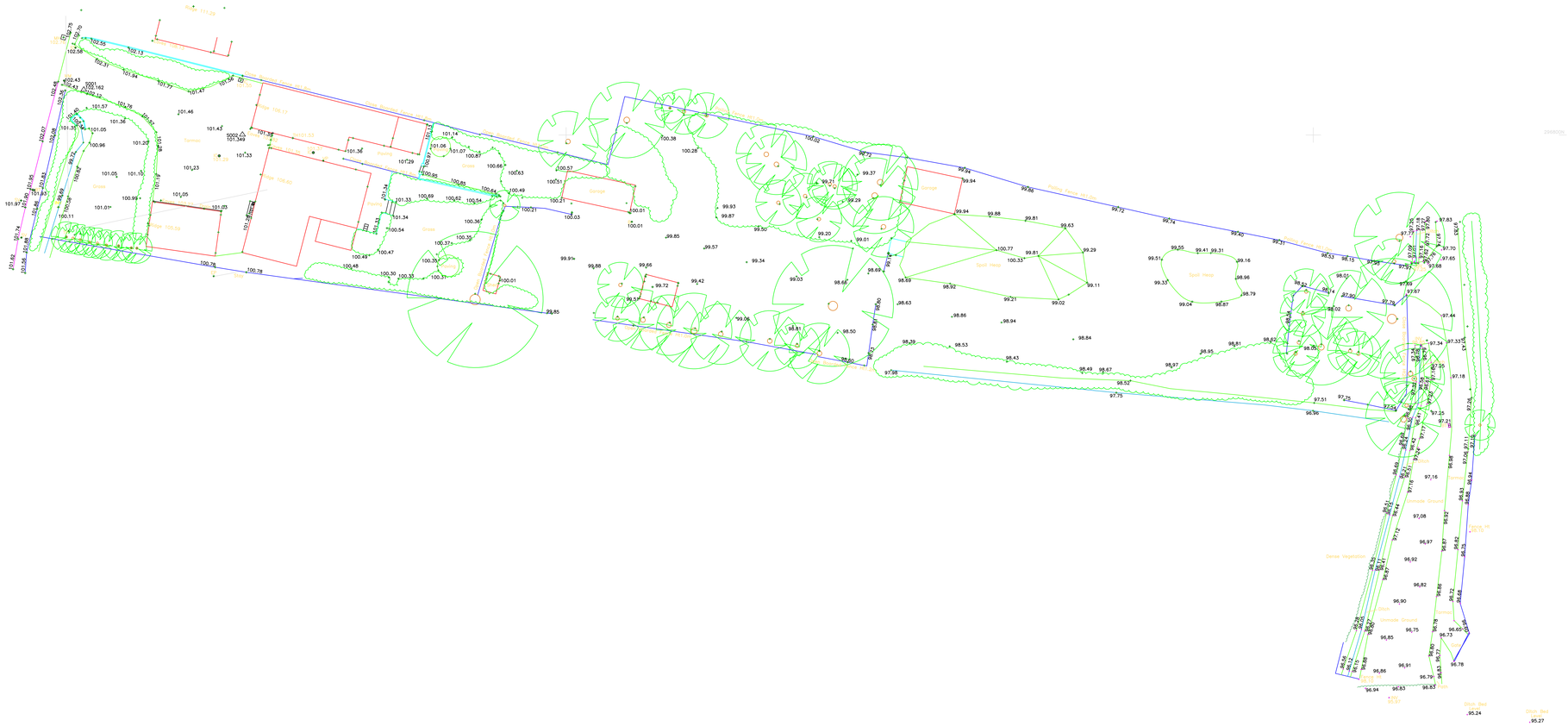
It is concluded that the proposed drainage scheme provides an integrated SuDS treatment train that meets the 4 pillars of SuDS and is in line with the Local Planning Authority's SuDS guidance.

6.0 Recommendations

- Consult with the Lead Local Flood Authority regarding the need for discharge consent due to the proposed outfall at the ditch.
- Contractor to set ground levels across the site that allows exceedance to safely runoff, as described within Section 3.4 and shown within the Appendix D drawings of this report.
- Implement a SuDS drainage scheme, in line with Section 3.4 of this report and relevant drawings, which should integrate surface water risk management measures within the site and provide water quality improvements along with benefits to people and wildlife.
- Implement a regular maintenance schedule of the system, in line with Section 4.0 of this report, paying attention to the proprietary treatment, flow control, debris / silt levels and blockage potential of the outflow.
- All SuDS features must be constructed in line with recommendations made in the Water UK's Design and Construction Guidance (2021) and the CIRIA Guidance on the Construction of SuDS (2017).
- Section 104/106 agreement for the discharge of foul water to be confirmed by others.

- Others to confirm structural configuration of internal (building) drainage pipe runs and road network drainage into the main run.
- Others to confirm structural integrity of the proposed cellular storage tank systems, prior to installation.
- Developer must confirm details of the private management company that is to maintain the proposed drainage system.
- Construction (Design and Management) Regulations 2015:
    - The revised CDM Regulations came into force in April 2015, which defines the duties for all parties involved in a construction project, including those promoting the development. One of the designer's responsibilities is to ensure that the client organisation, in this instance Colin Burton Builders Ltd, is made aware of their duties (please see link for Commercial Client) under the CDM Regulations.
    - A Design Risk Assessment has been undertaken for the design of the surface water drainage system and is included within Appendix G.

Appendix A – Topographic survey



0m 10m 20m

Scale

ABBREVIATIONS

A/C	AIR CONDITIONING
AH	ARCH HEIGHT
BT	BRITISH TELECOMMUNICATIONS
C	WINDOW CILL HEIGHT
Cab	CABINET
CBF	CLOSE BOARDED FENCE
CL	COVER LEVEL
DP	DISCHARGE PIPE
DC	DIAMOND CABLE COVER
DK	DROP KERB
FP	FOOTPATH
G	GULLY
GV	GAS VALVE
IC	INSPECTION CHAMBER
K	KERB
LP	LAMP POST
MH	MANHOLE
PCL	POST & CHAIN LINK FENCE
RWP	RAIN WATER PIPE
SA	SECURITY ALARM
SBM	SITE BENCH MARK
SH	SPRING HEIGHT
TP	TELEGRAPH POLE
WP	WASTE PIPE

LEGEND

DRAWING ISSUE STATUS

Issue	Details	By	Date
A	Original Survey	ATR	23/05/19
B	Ditch Survey	JWB	29/01/24

SHEET LAYOUT

THIS SURVEY HAS BEEN CARRIED OUT TO AN ACCURACY CONSISTENT WITH A PRESENTATION SCALE OF 1:200. INTERROGATED DIMENSIONS WILL BE WITHIN THE TOLERANCE ASSOCIATED WITH THIS AND SMALLER SCALES ONLY.

ALL LEVELS RELATE TO OS DATUM USING GPS (Vrs NOW)

ALL CRITICAL DIMENSIONS SHOULD BE VERIFIED ON SITE PRIOR TO ANY DESIGN OR CONSTRUCTION WORKS.

HSSP Architects

PERA Business Park
Nottingham Road
Melton Mowbray
LE13 0PB

223 Station Road
Earl Shilton
Leicestershire
LE9 7GG

Topographical Survey

SURVEYED AND DRAWN BY

RAMOWSKI CLARKE LIMITED
6 Dovecote Drive
Wollaton
Nottingham
NG8 2NB
Tel: (0115) 9289091
email: mail@ramowski-clarke.com

SCALE 1:250 @ A0

DATE OF ISSUE MAY 2019

RCL JOB No. 3153 | CHECKED ATR

DRAWING No. 3153-01-b | ISSUE B

Appendix B – Proposed Plans

COPYRIGHT NOTICE:
This drawing is the copyright of the Architects and may not be reproduced or used except by written permission.

©Crown copyright and database rights(2014) Ordnance Survey licence number100047314

Notes:
This drawing is to be read in conjunction with all relevant drawings and specifications.
Do not scale from this drawing. Use figured dimensions only. All levels and dimensions to be checked on site. All level and dimensional discrepancies are to be bought to the immediate attention of HSSP Architects ltd.
Responsibility cannot be accepted for alteration and/or deviation from this design without prior acknowledgement of HSSP Architects ltd.
Copyright reserved. This drawing may only be used for the client and location specified in the title block. It may not be copied or disclosed to any other third party without prior written consent from HSSP Architects ltd.
Prior to any works commencing on site, the engineer is to be contacted regarding the current status, revision or regulatory approval of this drawing.
All work to be to the entire satisfaction of the NHBC or Local Authority not withstanding anything shown or implied in this drawing. All materials and workmanship to be in accordance with British Standards or the current equivalent of the appropriate British Standard Code of Practice. All relevant dimensions and levels to be ascertained or checked and verified on site before specific areas of work are commenced.
This drawing is to be read in conjunction with clients specification/employers requirements and structural engineers design.

E 230420 MG Bin collection area added to site entrance
D 230117 MG Plans & elevs revised following client review
C 221207 MG Additional dwellings added
B 210827 MG Levels added
A 210705 MG Garage updated following client comments

Revision Notes.

Drawing Status.

PLANNING

hssp architects

Pera Business Park,Nottingham Road
Melton Mowbray, LE13 0PB
Telephone: 01664 563 288 Fax: 01664 563 360
E-Mail: info@hssparchitects.co.uk Web: www.hssparchitects.co.uk

Project.
Proposed houseing on land at rear of 223 Station Road, Earl Shilton, Leicestershire.
-

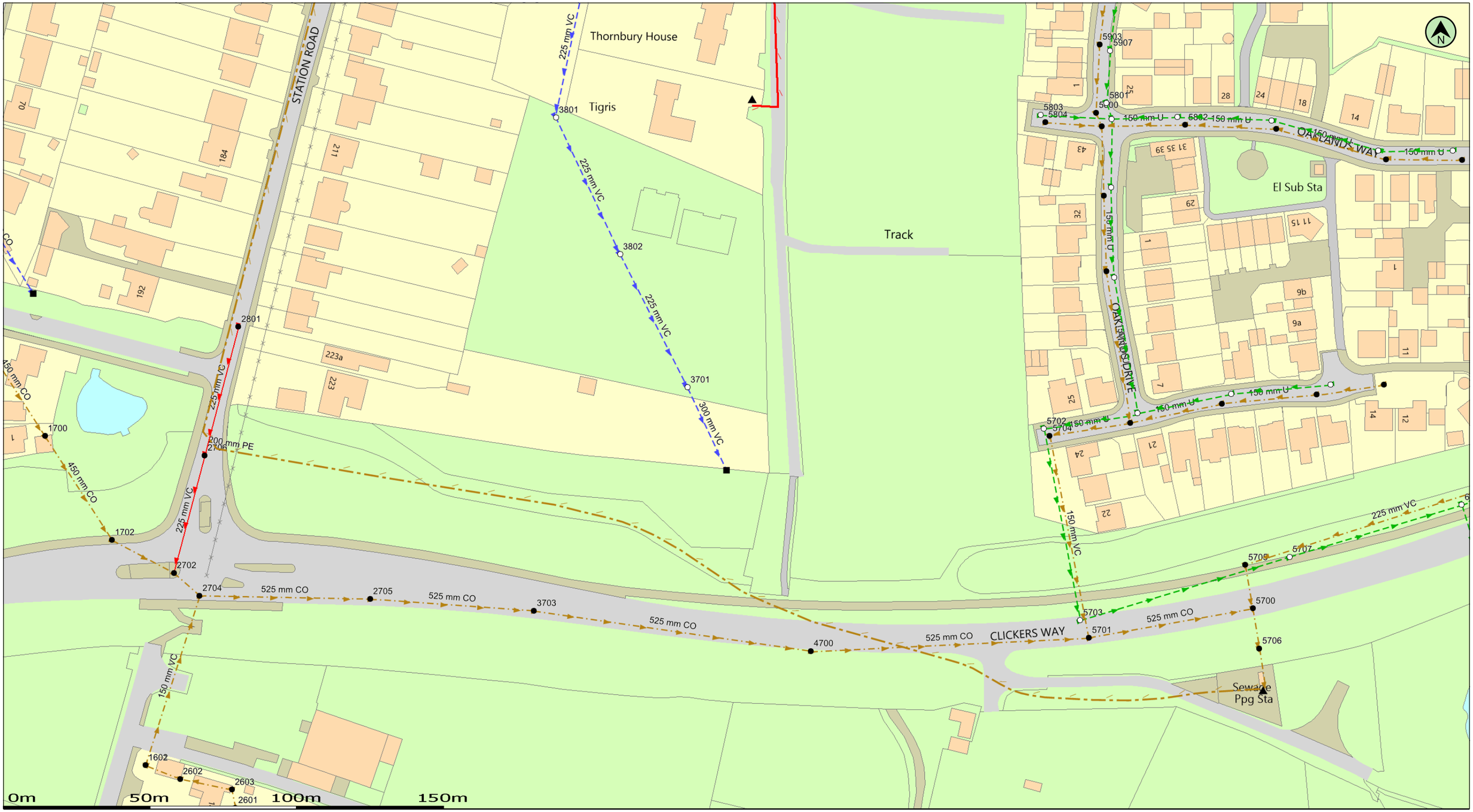
Title.
Proposed site plan

Scale.	Drawn.	Checked.	Date.
1:200 & 1:50	MG	JB	June '21

Drawing No.	Revision.
7637-03-01	E

HSSP A1

Appendix C – Severn Trent Water Sewer Map



(c) Crown copyright and database rights 2024 Ordnance Survey 100031673 | Date: 09/01/24 | Scale: 1:1250 | Map Centre: 446401,296786 | Data updated: 14/12/23 | Our Ref: 1362361 - 1 | Wastewater Plan A3

Do not scale off this map. The plan and any information supplied with it is furnished as a general guide, is only valid at the date of issue and no warranty as to its correctness is given or implied. In particular this plan and any information shown on it must not be relied upon in the event of any development or works (including but not limited to excavations) in the vicinity of SEVERN TRENT WATER assets or for the purposes of determining the suitability of a point of connection to the sewerage or distribution systems. Reproduction by permission of Ordnance Survey on behalf of HMSO. ©Crown Copyright and database rights 2023 All rights reserved. Ordnance Survey licence number 100031673. Document users other than SEVERN TRENT WATER business users are advised that this document is provided for reference purpose only and is subject to copyright, therefore, no further copies should be made from it.

- Public Foul Gravity/Lateral Drain
- Public Combined Gravity/Lateral Drain
- Public Surface Water Gravity/Lateral Drain
- Pressure Foul
- Pressure Combined
- Pressure Surface Water
- Highway Drain
- Overflow Pipe
- Disposal Pipe
- Culverted Water Course
- Pumping Station
- Fitting
- Manhole Foul
- Manhole Surface
- Abandoned Pipe
- Chamber

Section 104 sewers are shown in green

Private sewers are shown in magenta

nathan.parsons@rabconsultants.co.uk

Station Road

SEVERN TRENT

GENERAL CONDITIONS AND PRECAUTIONS TO BE TAKEN WHEN CARRYING OUT WORK ADJACENT TO SEVERN TRENT WATER'S APPARATUS

Please ensure that a copy of these conditions is passed to your representative and/or your contractor on site. If any damage is caused to Severn Trent Water Limited (STW) apparatus (defined below), the person, contractor or subcontractor responsible must inform STW immediately on:
0800 783 4444 (24 hours)

a) These general conditions and precautions apply to the public sewerage, water distribution and cables in ducts including (but not limited to) sewers which are the subject of an Agreement under Section 104 of the Water Industry Act 1991(a legal agreement between a developer and STW, where a developer agrees to build sewers to an agreed standard, which STW will then adopt); mains installed in accordance with an agreement for the self-construction of water mains entered into with STW and the assets described at condition b) of these general conditions and precautions. Such apparatus is referred to as “STW Apparatus” in these general conditions and precautions.

b) Please be aware that due to The Private Sewers Transfer Regulations June 2011, the number of public sewers has increased, but many of these are not shown on the public sewer record. However, some idea of their positions may be obtained from the position of inspection covers and their existence must be anticipated.

c) On request, STW will issue a copy of the plan showing the approximate locations of STW Apparatus although in certain instances a charge will be made. The position of private drains, private sewers and water service pipes to properties are not normally shown but their presence must be anticipated. This plan and the information supplied with it is furnished as a general guide only and STW does not guarantee its accuracy.

d) STW does not update these plans on a regular basis. Therefore the position and depth of STW Apparatus may change and this plan is issued subject to any such change. Before any works are carried out, you should confirm whether any changes to the plan have been made since it was issued.

e) The plan must not be relied upon in the event of excavations or other works in the vicinity of STW Apparatus. It is your responsibility to ascertain the precise location of any STW Apparatus prior to undertaking any development or other works (including but not limited to excavations).

f) No person or company shall be relieved from liability for loss and/or damage caused to STW Apparatus by reason of the actual position and/or depths of STW Apparatus being different from those shown on the plan.

In order to achieve safe working conditions adjacent to any STW Apparatus the following should be observed:

1. All STW Apparatus should be located by hand digging prior to the use of mechanical excavators.

2. All information set out in any plans received from us, or given by our staff at the site of the works, about the position and depth of the mains, is approximate. Every possible precaution should be taken to avoid damage to STW Apparatus. You or your contractor must ensure the safety of STW Apparatus and will be responsible for the cost of repairing any loss and/or damage caused (including without limitation replacement parts).

3. Water mains are normally laid at a depth of 900mm. No records are kept of customer service pipes which are normally laid at a depth of 750mm; but some idea of their positions may be obtained from the position of stop tap covers and their existence must be anticipated.

4. During construction work, where heavy plant will cross the line of STW Apparatus, specific crossing points must be agreed with STW and suitably reinforced where required. These crossing points should be clearly marked and crossing of the line of STW Apparatus at other locations must be prevented.

5. Where it is proposed to carry out piling or boring within 20 metres of any STW Apparatus, STW should be consulted to enable any affected STW Apparatus to be surveyed prior to the works commencing.

6. Where excavation of trenches adjacent to any STW Apparatus affects its support, the STW Apparatus must be supported to the satisfaction of STW. Water mains and some sewers are pressurised and can fail if excavation removes support to thrust blocks to bends and other fittings.

7. Where a trench is excavated crossing or parallel to the line of any STW Apparatus, the backfill should be adequately compacted to prevent any settlement which could subsequently cause damage to the STW Apparatus. In special cases, it may be necessary to provide permanent support to STW Apparatus which has been exposed over a length of the excavation before backfilling and reinstatement is carried out. There should be no concrete backfill in contact with the STW Apparatus.

8. No other apparatus should be laid along the line of STW Apparatus irrespective of clearance. Above ground apparatus must not be located within a minimum of 3 metres either side of the centre line of STW Apparatus for smaller sized pipes and 6 metres either side for larger sized pipes without prior approval. No manhole or chamber shall be built over or around any STW Apparatus.

9. A minimum radial clearance of 300 millimetres should be allowed between any plant or equipment being installed and existing STW Apparatus. We reserve the right to increase this distance where strategic assets are affected.

10. Where any STW Apparatus coated with a special wrapping is damaged, even to a minor extent, STW must be notified and the trench left open until the damage has been inspected and the necessary repairs have been carried out. In the case of any material damage to any STW Apparatus causing leakage, weakening of the mechanical strength of the pipe or corrosion-protection damage, the necessary remedial work will be recharged to you.

11. It may be necessary to adjust the finished level of any surface boxes which may fall within your proposed construction. Please ensure that these are not damaged, buried or otherwise rendered inaccessible as a result of the works and that all stop taps, valves, hydrants, etc. remain accessible and operable. Minor reduction in existing levels may result in conflict with STW Apparatus such as valve spindles or tops of hydrants housed under the surface boxes. Checks should be made during site investigations to ascertain the level of such STW Apparatus in order to determine any necessary alterations in advance of the works.

12. With regard to any proposed resurfacing works, you are required to contact STW on the number given above to arrange a site inspection to establish the condition of any STW Apparatus in the nature of surface boxes or manhole covers and frames affected by the works. STW will then advise on any measures to be taken, in the event of this a proportionate charge will be made.

13. You are advised that STW will not agree to either the erection of posts, directly over or within 1.0 metre of valves and hydrants,

14. No explosives are to be used in the vicinity of any STW Apparatus without prior consultation with STW.

TREE PLANTING RESTRICTIONS

There are many problems with the location of trees adjacent to sewers, water mains and other STW Apparatus and these can lead to the loss of trees and hence amenity to the area which many people may have become used to. It is best if the problem is not created in the first place. Set out below are the recommendations for tree planting in close proximity to public sewers, water mains and other STW Apparatus.

15. Please ensure that, in relation to STW Apparatus, the mature root systems and canopies of any tree planted do not and will not encroach within the recommended distances specified in the notes below.

16. Both Poplar and Willow trees have extensive root systems and should not be planted within 12 metres of a sewer, water main or other STW Apparatus.

17. The following trees and those of similar size, be they deciduous or evergreen, should not be planted within 6 metres of a sewer, water main or other STW Apparatus. E.g. Ash, Beech, Birch, most Conifers, Elm, Horse Chestnut, Lime, Oak, Sycamore, Apple and Pear. Asset Protection Statements Updated May 2014

18. STW personnel require a clear path to conduct surveys etc. No shrubs or bushes should be planted within 2 metre of the centre line of a sewer, water main or other STW Apparatus.

19. In certain circumstances, both STW and landowners may wish to plant shrubs/bushes in close proximity to a sewer, water main of other STW Apparatus for screening purposes. The following are shallow rooting and are suitable for this purpose: Blackthorn, Broom, Cotoneaster, Elder, Hazel, Laurel, Privet, Quickthorn, Snowberry, and most ornamental flowering shrubs.

Manhole Reference	Liquid Type	Cover Level	Invert Level	Depth to Invert
2702	C	100.3	98.52	1.78
2704	C	-	97.89	0
2801	C	102.68	100.79	1.89
	F			
	F			
	F			
	F			
	F			
	F			
	F			
	F			
	F			
	F			
1601	F	103.06	101.45	1.61
1602	F	103.06	0	0
1700	F	-	0	0
1702	F	-	0	0
2601	F	102.43	101.81	0.62
2602	F	102.77	101.54	1.23
2603	F	102.71	101.73	0.98
2705	F	98.64	96.13	2.52
2706	F	101.45	100.17	1.28
3703	F	97.88	94.36	3.52
4700	F	96.88	93.73	3.15
5700	F	97.54	93.01	4.53
5701	F	96.96	93.14	3.82
5704	F	96.89	94.15	2.73
5705	F	96.94	93.13	3.81
5706	F	0	92.54	0
5800	F	101.43	99.38	2.05
5802	F	101.42	99.06	2.36
5804	F	101.91	99.4	2.51
5903	F	103.02	100.45	2.57
	S			
	S			
	S			
	S			
	S			
	S			
	S			
	S			
	S			
	S			
3701	S	99.78	97.75	2.03
3801	S	104.64	102.1	2.54
3802	S	101.29	99.96	1.33
5702	S	96.89	94.99	1.91
5703	S	96.83	94.83	2

Manhole Reference	Liquid Type	Cover Level	Invert Level	Depth to Invert
5803	S	101.92	99.9	2.02
5907	S	102.88	100.89	1.99
6700	S	98.17	93.56	4.62

Manhole Reference	Liquid Type	Cover Level	Invert Level	Depth to Invert

5707	S	97.39	93.74	3.65
5801	S	101.82	99.78	2.04

Appendix D – MicroDrainage Source Control Results

Time Area Diagram for Existing

Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.101	4-8	0.104

Total Area Contributing (ha) = 0.205

Total Pipe Volume (m^3) = 131.740

©1982-2020 Innovyze

Existing Network Details for Existing

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	n	HYD SECT	DIA (mm)	Section Type
E1.000	11.922	0.119	100.2	0.047	5.00	0.0	0.600		o	150	Pipe/Conduit
E1.001	15.208	0.152	100.1	0.007	5.00	0.0	0.600		o	150	Pipe/Conduit
E2.000	15.394	0.154	100.0	0.028	5.00	0.0	0.600		o	150	Pipe/Conduit
E1.002	15.386	0.000	0.0	0.025	0.00	0.0		0.050	→[↓]		Cellular Storage
E1.003	20.460	0.500	40.9	0.000	0.00	0.0		0.050	o	150	Pipe/Conduit
E3.000	6.983	0.100	70.0	0.032	5.00	0.0	0.600		o	150	Pipe/Conduit
E4.000	10.056	0.101	99.8	0.037	5.00	0.0	0.600		o	150	Pipe/Conduit
E3.001	3.994	0.040	100.0	0.000	0.00	0.0	0.600		o	150	Pipe/Conduit
E1.004	18.441	0.000	0.0	0.028	0.00	0.0		0.050	→[↓]		Cellular Storage
E1.005	17.976	0.120	150.0	0.000	0.00	0.0	0.600		o	150	Pipe/Conduit
E1.006	16.160	0.323	50.0	0.000	0.00	0.0	0.600		o	150	Pipe/Conduit

Network Results Table

PN	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Vel (m/s)	Cap (l/s)
E1.000	98.763	0.047	0.0	1.00	17.7
E1.001	98.644	0.055	0.0	1.00	17.8
E2.000	98.700	0.028	0.0	1.01	17.8
E1.002	98.100	0.108	0.0	0.00	0.0
E1.003	98.100	0.108	0.0	0.35	6.2
E3.000	98.140	0.032	0.0	1.20	21.3
E4.000	98.200	0.037	0.0	1.01	17.8
E3.001	98.040	0.069	0.0	1.00	17.8
E1.004	96.800	0.205	0.0	0.00	0.0
E1.005	96.800	0.205	0.0	0.82	14.5
E1.006	96.680	0.205	0.0	1.43	25.2

©1982-2020 Innovyze

Manhole Schedules for Existing

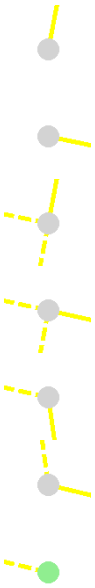
MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam.,L*W (mm)	PN	Pipe Out Invert Level (m)	Diameter (mm)	PN	Pipes In Invert Level (m)	Diameter (mm)	Backdrop (mm)
E1	99.589	0.826	Open Manhole	450	E1.000	98.763	150				
E2	100.025	1.381	Open Manhole	450	E1.001	98.644	150	E1.000	98.644	150	
E3a	99.400	0.700	Open Manhole	450	E2.000	98.700	150				
E3 GC1U	99.434	1.334	Open Manhole	450	E1.002	98.100		E1.001	98.492	150	41
								E2.000	98.546	150	95
E4 GC1D	99.200	1.100	Open Manhole	1200	E1.003	98.100	150	E1.002	98.100		
E8	99.058	0.918	Open Manhole	450	E3.000	98.140	150				
E9A	99.100	0.900	Open Manhole	450	E4.000	98.200	150				
E9	99.000	0.960	Open Manhole	1200	E3.001	98.040	150	E3.000	98.040	150	
								E4.000	98.099	150	59
E5 GC2U	99.000	2.200	Open Manhole	450	E1.004	96.800		E1.003	97.600	150	
								E3.001	98.000	150	340
E6 GC2D	98.848	2.048	Open Manhole	1200	E1.005	96.800	150	E1.004	96.800		
E7	97.263	0.583	Open Manhole	450	E1.006	96.680	150	E1.005	96.680	150	
E	97.200	0.843	Open Manhole	0		OUTFALL		E1.006	96.357	150	

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
E1	446320.826	296786.074	446320.826	296786.074	Required	
E2	446326.567	296796.523	446326.567	296796.523	Required	
E3a	446344.526	296778.406	446344.526	296778.406	Required	
E3 GC1U	446341.470	296793.494	446341.470	296793.494	Required	
E4 GC1D	446356.477	296790.102	446356.477	296790.102	Required	

©1982-2020 Innovyze

Manhole Schedules for Existing

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
E8	446374.411	296774.959	446374.411	296774.959	Required	
E9A	446365.880	296783.868	446365.880	296783.868	Required	
E9	446375.725	296781.817	446375.725	296781.817	Required	
E5 GC2U	446376.468	296785.741	446376.468	296785.741	Required	
E6 GC2D	446394.462	296781.707	446394.462	296781.707	Required	
E7	446396.996	296763.910	446396.996	296763.910	Required	
E	446412.712	296760.148			No Entry	



©1982-2020 Innovyze

PIPELINE SCHEDULES for Existing

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
E1.000	o	150	E1	99.589	98.763	0.676	Open Manhole	450
E1.001	o	150	E2	100.025	98.644	1.231	Open Manhole	450
E2.000	o	150	E3a	99.400	98.700	0.550	Open Manhole	450
E1.002	→[↓]		E3 GC1U	99.434	98.100	0.833	Open Manhole	450
E1.003	o	150	E4 GC1D	99.200	98.100	0.950	Open Manhole	1200
E3.000	o	150	E8	99.058	98.140	0.768	Open Manhole	450
E4.000	o		E9A	99.100	98.200	0.750	Open Manhole	450
E3.001	o	150	E9	99.000	98.040	0.810	Open Manhole	1200
E1.004	→[↓]		E5 GC2U	99.000	96.800	1.190	Open Manhole	450
E1.005	o	150	E6 GC2D	98.848	96.800	1.898	Open Manhole	1200
E1.006	o	150	E7	97.263	96.680	0.433	Open Manhole	450

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
E1.000	11.922	100.2	E2	100.025	98.644	1.231	Open Manhole	450
E1.001	15.208	100.1	E3 GC1U	99.434	98.492	0.792	Open Manhole	450
E2.000	15.394	100.0	E3 GC1U	99.434	98.546	0.738	Open Manhole	450
E1.002	15.386	0.0	E4 GC1D	99.200	98.100	0.599	Open Manhole	1200
E1.003	20.460	40.9	E5 GC2U	99.000	97.600	1.250	Open Manhole	450
E3.000	6.983	70.0	E9	99.000	98.040	0.810	Open Manhole	1200
E4.000	10.056	99.8	E9	99.000	98.099	0.751	Open Manhole	1200
E3.001	3.994	100.0	E5 GC2U	99.000	98.000	0.850	Open Manhole	450
E1.004	18.441	0.0	E6 GC2D	98.848	96.800	1.038	Open Manhole	1200
E1.005	17.976	150.0	E7	97.263	96.680	0.432	Open Manhole	450
E1.006	16.160	50.0	E	97.200	96.357	0.693	Open Manhole	0

©1982-2020 Innovyze

Area Summary for Existing

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
1.000	User	-	100	0.047	0.047	0.047
1.001	User	-	100	0.007	0.007	0.007
2.000	User	-	100	0.028	0.028	0.028
1.002	User	-	100	0.015	0.015	0.015
	User	-	100	0.010	0.010	0.025
1.003	-	-	100	0.000	0.000	0.000
3.000	User	-	100	0.032	0.032	0.032
4.000	User	-	100	0.025	0.025	0.025
	User	-	100	0.012	0.012	0.037
3.001	-	-	100	0.000	0.000	0.000
1.004	User	-	100	0.019	0.019	0.019
	User	-	100	0.009	0.009	0.028
1.005	-	-	100	0.000	0.000	0.000
1.006	-	-	100	0.000	0.000	0.000
				Total	Total	Total
				0.205	0.205	0.205

Free Flowing Outfall Details for Existing

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
E1.006	E	97.200	96.357	0.000	0	0

Simulation Criteria for Existing

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

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

Synthetic Rainfall Details

Rainfall Model	FSR	Ratio R	0.400
Return Period (years)	10	Profile Type	Summer
Region	England and Wales	Cv (Summer)	0.750
M5-60 (mm)	19.800	Cv (Winter)	0.840

©1982-2020 Innovyze

Synthetic Rainfall Details

Storm Duration (mins) 30

©1982-2020 Innovyze

Online Controls for Existing

Hydro-Brake® Optimum Manhole: E4 GC1D, DS/PN: E1.003, Volume (m³): 47.1

Unit Reference	MD-SHE-0090-3000-0500-3000
Design Head (m)	0.500
Design Flow (l/s)	3.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	90
Invert Level (m)	98.100
Minimum Outlet Pipe Diameter (mm)	150
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	0.500	3.0	Kick-Flo®	0.355	2.6
Flush-Flo™	0.157	3.0	Mean Flow over Head Range	-	2.5

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

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	2.8	1.200	4.5	3.000	6.9	7.000	10.4
0.200	3.0	1.400	4.8	3.500	7.4	7.500	10.7
0.300	2.8	1.600	5.1	4.000	7.9	8.000	11.1
0.400	2.7	1.800	5.4	4.500	8.4	8.500	11.4
0.500	3.0	2.000	5.7	5.000	8.8	9.000	11.8
0.600	3.3	2.200	6.0	5.500	9.2	9.500	12.1
0.800	3.7	2.400	6.2	6.000	9.6		
1.000	4.1	2.600	6.4	6.500	10.0		

Hydro-Brake® Optimum Manhole: E6 GC2D, DS/PN: E1.005, Volume (m³): 79.8

Unit Reference	MD-SHE-0082-3000-1000-3000
Design Head (m)	1.000
Design Flow (l/s)	3.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	82

©1982-2020 Innovyze

Hydro-Brake® Optimum Manhole: E6 GC2D, DS/PN: E1.005, Volume (m³): 79.8

Invert Level (m)	96.800
Minimum Outlet Pipe Diameter (mm)	100
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.000	3.0	Kick-Flo®	0.623	2.4
Flush-Flo™	0.297	3.0	Mean Flow over Head Range	-	2.6

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

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	2.4	1.200	3.3	3.000	5.0	7.000	7.4
0.200	2.9	1.400	3.5	3.500	5.4	7.500	7.7
0.300	3.0	1.600	3.7	4.000	5.7	8.000	7.9
0.400	2.9	1.800	3.9	4.500	6.0	8.500	8.2
0.500	2.8	2.000	4.1	5.000	6.3	9.000	8.4
0.600	2.5	2.200	4.3	5.500	6.6	9.500	8.6
0.800	2.7	2.400	4.5	6.000	6.9		
1.000	3.0	2.600	4.7	6.500	7.2		

©1982-2020 Innovyze

Storage Structures for Existing

Cellular Storage Pipe: E1.002

Manning's N	0.050	Infiltration Coefficient Side (m/hr)	0.00000
Invert Level (m)	98.100	Safety Factor	2.0
Infiltration Coefficient Base (m/hr)	0.00000	Porosity	0.95

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	102.0	0.0	0.501	0.0	0.0
0.500	102.0	0.0			

Cellular Storage Pipe: E1.004

Manning's N	0.050	Infiltration Coefficient Side (m/hr)	0.00000
Invert Level (m)	96.800	Safety Factor	2.0
Infiltration Coefficient Base (m/hr)	0.00000	Porosity	0.95

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	85.0	0.0	1.010	0.0	0.0
1.000	85.0	0.0			

©1982-2020 Innovyze

1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Existing

Simulation Criteria

Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 0.000
Hot Start (mins) 0 MADD Factor * 10m³/ha Storage 0.000
Hot Start Level (mm) 0 Inlet Coeffiecient 0.800
Manhole Headloss Coeff (Global) 0.500 Flow per Person per Day (l/per/day) 0.000
Foul Sewage per hectare (l/s) 0.000

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

Synthetic Rainfall Details

Rainfall Model FSR Ratio R 0.400
Region England and Wales Cv (Summer) 0.750
M5-60 (mm) 19.800 Cv (Winter) 0.840

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

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
Return Period(s) (years) 1, 30, 100
Climate Change (%) 0, 0, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
E1.000	E1	15 Winter	1	+0%	30/15 Summer				98.830
E1.001	E2	15 Winter	1	+0%	30/15 Summer				98.716
E2.000	E3a	15 Winter	1	+0%	100/15 Winter				98.749
E1.002	E3 GC1U	60 Winter	1	+0%					98.188
E1.003	E4 GC1D	60 Winter	1	+0%	30/15 Winter				98.188
E3.000	E8	15 Winter	1	+0%	30/15 Summer				98.190
E4.000	E9A	15 Winter	1	+0%	30/15 Winter				98.259
E3.001	E9	15 Winter	1	+0%	30/15 Summer				98.140
E1.004	E5 GC2U	180 Winter	1	+0%					96.944
E1.005	E6 GC2D	180 Winter	1	+0%	30/15 Summer				96.944
E1.006	E7	180 Winter	1	+0%					96.714

©1982-2020 Innovyze

1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Existing

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
E1.000	E1	-0.083	0.000	0.41			6.5	OK	
E1.001	E2	-0.078	0.000	0.45			7.4	OK	
E2.000	E3a	-0.101	0.000	0.23			3.8	OK	
E1.002	E3 GC1U	-0.413	0.000	0.02		52	7.6	OK	
E1.003	E4 GC1D	-0.062	0.000	0.40			2.5	OK	
E3.000	E8	-0.100	0.000	0.24			4.4	OK	
E4.000	E9A	-0.091	0.000	0.33			5.2	OK	
E3.001	E9	-0.050	0.000	0.75			9.4	OK	
E1.004	E5 GC2U	-0.866	0.000	0.01		87	5.1	OK	
E1.005	E6 GC2D	-0.006	0.000	0.20			2.7	OK	
E1.006	E7	-0.116	0.000	0.12			2.7	OK	

©1982-2020 Innovyze

30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Existing

Simulation Criteria

Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 0.000
Hot Start (mins) 0 MADD Factor * 10m³/ha Storage 0.000
Hot Start Level (mm) 0 Inlet Coeffiecient 0.800
Manhole Headloss Coeff (Global) 0.500 Flow per Person per Day (l/per/day) 0.000
Foul Sewage per hectare (l/s) 0.000

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

Synthetic Rainfall Details

Rainfall Model FSR Ratio R 0.400
Region England and Wales Cv (Summer) 0.750
M5-60 (mm) 19.800 Cv (Winter) 0.840

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

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
Return Period(s) (years) 1, 30, 100
Climate Change (%) 0, 0, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
E1.000	E1	15 Winter	30	+0%	30/15 Summer				98.947
E1.001	E2	15 Winter	30	+0%	30/15 Summer				98.828
E2.000	E3a	15 Winter	30	+0%	100/15 Winter				98.782
E1.002	E3 GC1U	60 Winter	30	+0%					98.328
E1.003	E4 GC1D	60 Winter	30	+0%	30/15 Winter				98.328
E3.000	E8	15 Winter	30	+0%	30/15 Summer				98.321
E4.000	E9A	15 Winter	30	+0%	30/15 Winter				98.351
E3.001	E9	15 Winter	30	+0%	30/15 Summer				98.285
E1.004	E5 GC2U	240 Winter	30	+0%					97.246
E1.005	E6 GC2D	240 Winter	30	+0%	30/15 Summer				97.246
E1.006	E7	600 Winter	30	+0%					96.715

©1982-2020 Innovyze

30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Existing

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
E1.000	E1	0.034	0.000	0.98			15.7	SURCHARGED	
E1.001	E2	0.034	0.000	1.11			18.2	SURCHARGED	
E2.000	E3a	-0.068	0.000	0.56			9.3	OK	
E1.002	E3 GC1U	-0.273	0.000	0.04		66	18.3	OK	
E1.003	E4 GC1D	0.078	0.000	0.49			3.0	SURCHARGED	
E3.000	E8	0.031	0.000	0.59			10.7	SURCHARGED	
E4.000	E9A	0.001	0.000	0.79			12.6	SURCHARGED	
E3.001	E9	0.095	0.000	1.86			23.2	SURCHARGED	
E1.004	E5 GC2U	-0.564	0.000	0.01		148	9.2	OK	
E1.005	E6 GC2D	0.296	0.000	0.22			3.0	SURCHARGED	
E1.006	E7	-0.115	0.000	0.13			3.0	OK	

©1982-2020 Innovyze

100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Existing

Simulation Criteria

Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 0.000
Hot Start (mins) 0 MADD Factor * 10m³/ha Storage 0.000
Hot Start Level (mm) 0 Inlet Coeffiecient 0.800
Manhole Headloss Coeff (Global) 0.500 Flow per Person per Day (l/per/day) 0.000
Foul Sewage per hectare (l/s) 0.000

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

Synthetic Rainfall Details

Rainfall Model FSR Ratio R 0.400
Region England and Wales Cv (Summer) 0.750
M5-60 (mm) 19.800 Cv (Winter) 0.840

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

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
Return Period(s) (years) 1, 30, 100
Climate Change (%) 0, 0, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
E1.000	E1	15 Winter	100	+40%	30/15 Summer				99.583
E1.001	E2	15 Winter	100	+40%	30/15 Summer				99.226
E2.000	E3a	15 Winter	100	+40%	100/15 Winter				98.856
E1.002	E3 GC1U	120 Winter	100	+40%					98.595
E1.003	E4 GC1D	120 Winter	100	+40%	30/15 Winter				98.594
E3.000	E8	15 Winter	100	+40%	30/15 Summer				98.716
E4.000	E9A	15 Winter	100	+40%	30/15 Winter				98.814
E3.001	E9	15 Winter	100	+40%	30/15 Summer				98.599
E1.004	E5 GC2U	600 Winter	100	+40%					97.763
E1.005	E6 GC2D	600 Winter	100	+40%	30/15 Summer				97.763
E1.006	E7	2160 Winter	100	+40%					96.715

©1982-2020 Innovyze

100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Existing

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
E1.000	E1	0.670	0.000	1.74			27.9	FLOOD RISK	
E1.001	E2	0.432	0.000	1.97			32.2	SURCHARGED	
E2.000	E3a	0.006	0.000	1.01			16.6	SURCHARGED	
E1.002	E3 GC1U	-0.006	0.000	0.04		52	20.9	OK	
E1.003	E4 GC1D	0.344	0.000	0.49			3.0	SURCHARGED	
E3.000	E8	0.426	0.000	1.05			19.1	SURCHARGED	
E4.000	E9A	0.464	0.000	1.42			22.5	FLOOD RISK	
E3.001	E9	0.409	0.000	3.35			41.9	SURCHARGED	
E1.004	E5 GC2U	-0.047	0.000	0.01		210	8.5	OK	
E1.005	E6 GC2D	0.813	0.000	0.22			3.0	SURCHARGED	
E1.006	E7	-0.115	0.000	0.13			3.0	OK	

©1982-2020 Innovyze

Appendix E – Detailed Drawings

LEGEND

- Geocellular storage
- Proposed indicative private surface water drains and inspection chambers
- Proposed surface water pipes
- Proposed surface water inspection chamber
- Proposed Flow control chamber
- Proposed foul water pipes
- Proposed foul chamber
- Northern development - indicative foul pipes
- Northern development - indicative foul chamber
- Pipe flow direction
- Exceedance

Notes:

1. All setting out to be in accordance with the Architects drawings. Any discrepancies between the Engineers and the Architects drawings to be referred to the Architect before proceeding. Dimensions must not be scaled.
2. This drawing must be read in conjunction with all relevant drawings and with the drainage report (RAB3253FRD).
3. A construction phase plan, in line with CDM 2015, must be prepared by the principal contractor prior to any work taking place. The Contractor must comply with all current legislation relating to health and safety.
4. Connections to open channels to be agreed and inspected by Local Authority.
5. Until technical approval has been obtained from the relevant Authority, it should be understood that all drawings issued are Preliminary and not for construction. Should the contractor commence the work prior to such approval being given, it is entirely at his own risk.
6. Drainage to be in accordance with BS 7533-13:2009, Building Regulations Part H: Drainage and Waste Disposal, *Design and Construction Guidance for foul and surface water sewers offered for adoption under the Code for adoption agreements for water and sewerage companies operating wholly or mainly in England*, CIRIA Guidance on the Construction of (C768) SuDS and CIRIA SuDS Manual (C735).
7. The minimum depth of cover to the crown of gravity pipes without protection should be 0.35m for domestic gardens and pathways without any possibility of vehicular access; 0.5m in domestic driveways, parking areas and yards with height restrictions to prevent entry by vehicles weighing >7.5 tonnes; 0.9m in domestic driveways, parking areas and narrow streets without footways with limited access for vehicles with a gross vehicle weight in excess of 7.5 tonnes; 1.2m in highways and parking areas with unrestricted access to vehicles with a gross vehicle weight in excess of 7.5 tonnes.
8. All pipes not meeting the criteria 7 MUST include a minimum 150mm thick Class GEN3 Concrete surround in line with the 2020 Design And Construction Guidance document.
9. 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.
10. The Contractor shall make allowance for raising / lowering all access covers & frames to suit finished levels.
11. Cover Class to manholes/inspection chambers are to suit anticipated vehicular loadings in accordance with BSEN 124:2015 (D400 where potential for HGV loading, C250/B125/A15 in footway trafficked areas not accessible by vehicles.
12. All soft / hard paved areas affected by the works shall be fully reinstated upon completion of the works. all surface markings damaged by the works shall be fully reinstated.
13. Before handover, all manholes shall be inspected, all rubble removed, and the whole system shall be thoroughly flushed and cleaned.
14. All levels are in Ordnance datum unless otherwise specified.
15. All pipe runs near buildings to comply with the Building Regulations 2002 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.
16. Backfill material to drainage trenches under carriageways to be DOT Type 1 sub-base material, elsewhere backfill to be free draining readily compacted material, free from rubbish and organic matter, frozen soil clay lumps and large stones. To be compacted in layers of not exceeding 150mm thick.
17. Joints, pipe couplers, pipe bends, etc., specification to be provided by manufacturers.
18. All materials delivered to the site associated to the sub-base storage of the permeable pavement must be tested to obtain their porosity and permeability; in line with BS 1377-2:1990 and BS 1377-4:1990.
19. Typical pipe bedding to drainage for pipes up to D=525mm is to be Class S (i.e. 10-14mm).
20. Trench temporary formwork is required to all excavations exceeding 1.2m depth to provide adequate support and stability at all times.
21. Sewers are to be constructed in single sections between manholes only. Trenches to be backfilled prior to excavating the succeeding sewer run.
22. The drainage pipes are to be coordinated with the foundation levels from the structural engineer, subject to detailed design.
23. Structural integrity of pipes running internally through the proposed dwellings must be confirmed by the structural engineer.
24. All foul and RWP shall be 100mm diameter unless otherwise noted.
25. For setting out dimensions of SVPs, RWPs, etc., refer to the Architect's or Mechanical Engineer's drawing. Positions shown are indicative only.
26. Cover levels shown are approximate only and are to be adjusted to suit finished ground levels.
27. At least one soil pipe at the head of each foul run shall vent to the atmosphere.
28. All gradients on drainage runs are indicative. Runs to be laid soffit to soffit.
29. All drain runs from SVPs, stub stacks, or FW gullies to be laid at 1:40 gradient. All RWPs to be laid at minimum 1:60 gradient.
30. Rodding eyes to be laid strictly to manufacturer's instructions.
31. All concrete products to be in accordance with BRE 363 for sulphates.
32. No SuDS features should receive construction-related runoff. Alternative methods of surface water disposal must be employed.
33. Where sewer or drains are to be abandoned they shall be removed or infilled by grouting in accordance with the Civil Engineer Specification for the Water Industry 7th edition, Clause S.23.
34. All manholes shall be watertight.
35. Cover levels shown are approximate only and are to be adjusted to suit finished ground levels.
36. This drawing is for planning purposes only, not construction.
37. No utility survey was provided prior to the production of this drainage design. Therefore the location of **any** existing utilities within the site is unknown. The Contractor must therefore undertake their own investigation where the presence of any existing sewers, services, plant or apparatus may affect the design installation and/or their operations, prior to the commencement of any works. RAB Consultants accepts no liability should existing (unknown) utilities clash with the proposed design. Should the contractor commence the work prior to such investigation, it is entirely at his own risk.
38. RAB Consultants accepts no liability should the proposed drainage not be installed in line with these notes and report RAB3253, and structural/functional failure occurs.

RAB RESILIENCE & FLOOD RISK

Cathedral House,
Beacon Street,
Lichfield,
WS13 7AA

Client

Colin Burton Builders Ltd

Project

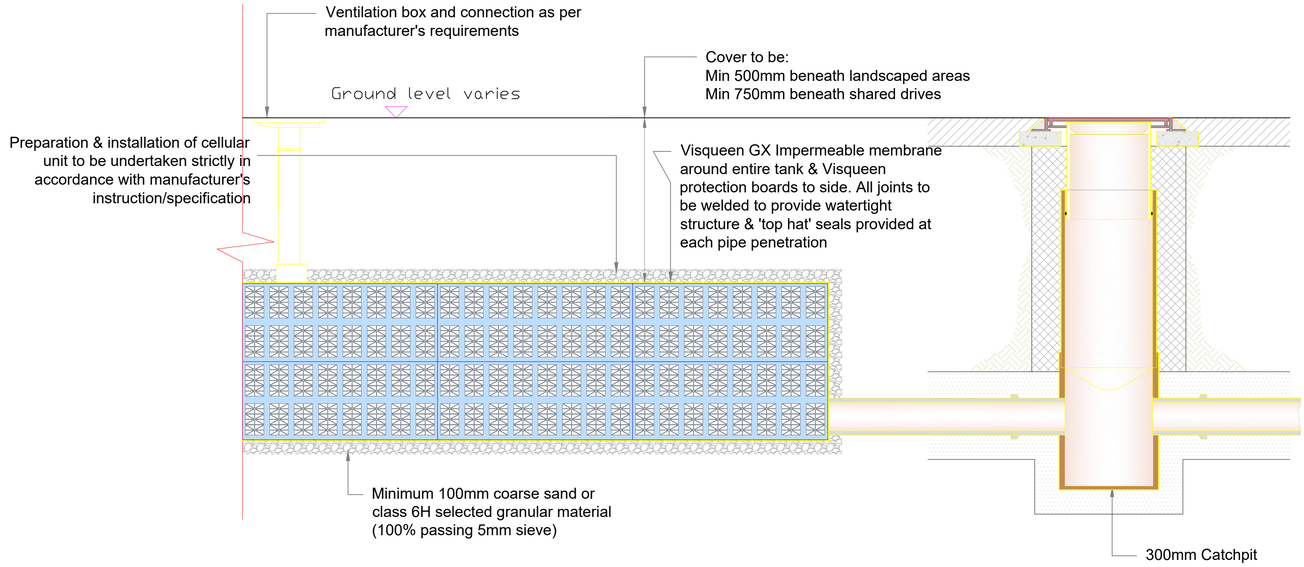
RAB3253 Station Road, Earl Shilton

Drawing

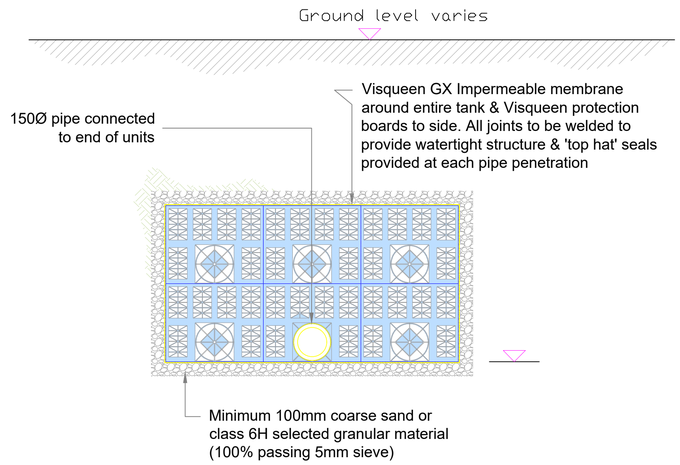
Drainage Design
Plan view

Checked by AT	Approved by AT	
Drawn by NP	Date: 15/02/2024	Scale: 1:200@ A1

Drawing No.	Revision
RAB3253FRD/001	v1



Modular Storage Detail with Catchpit Chamber



Modular Storage Section

Notes:

1. Same notes as drawing RAB3253_001 apply.

RAB RESILIENCE & FLOOD RISK
Cathedral House,
Beacon Street,
Lichfield,
WS13 7AA

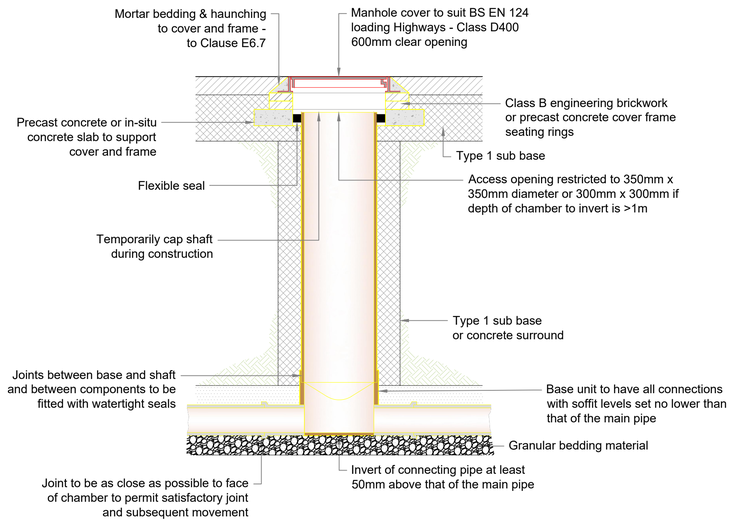
Client
Colin Burton Builders Ltd

Project
RAB3253 Station Road, Earl Shilton

Drawing
Typical Details

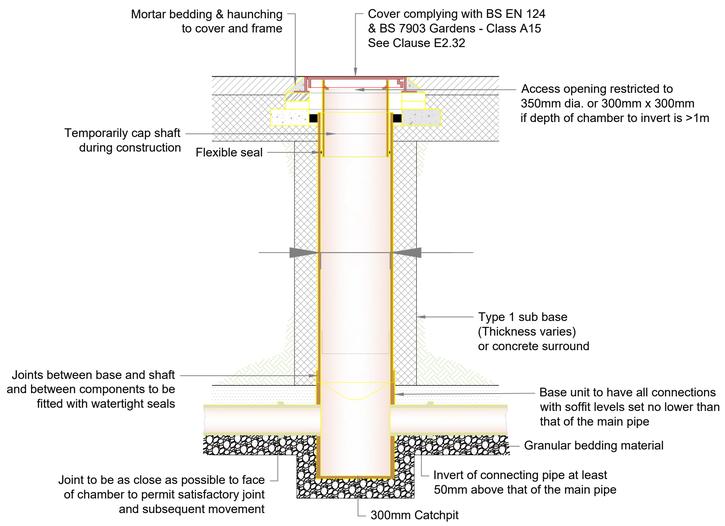
Checked by AT	Approved by AT	
Drawn by NP	Date: 15/02/2024	Scale: NOT TO SCALE

Drawing No.	Revision
RAB3253FRD/002	v1



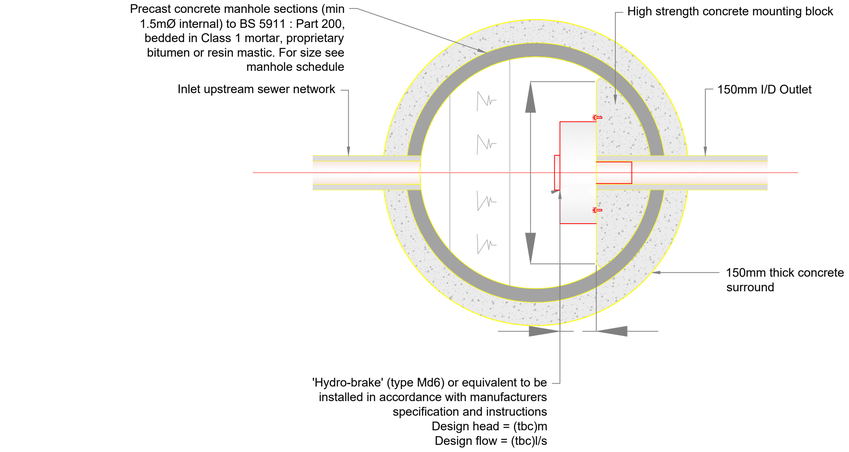
Typical Inspection Chamber Detail - Type D

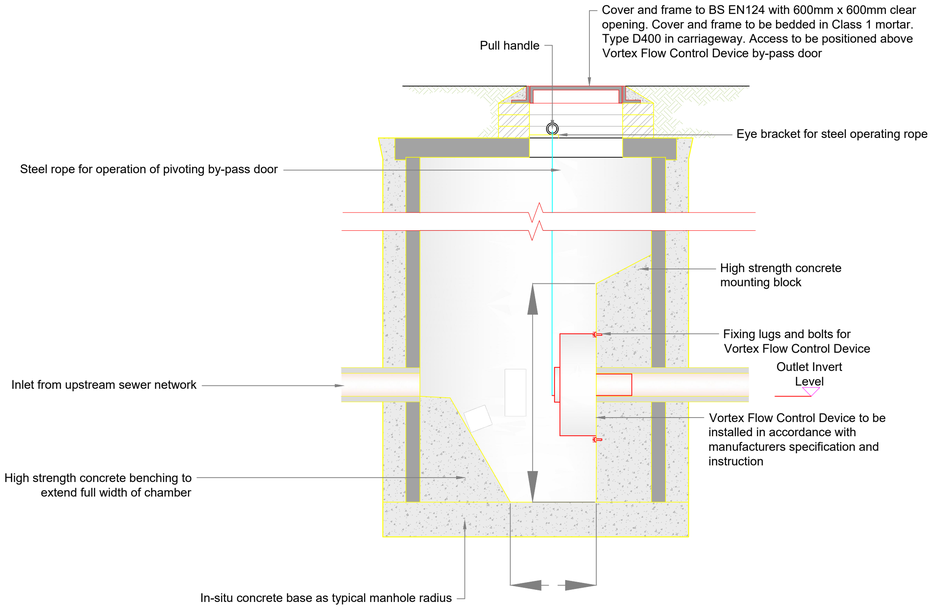
Max depth from cover level to soffit of pipe in areas subject to vehicle loading 3.0m, non-entry

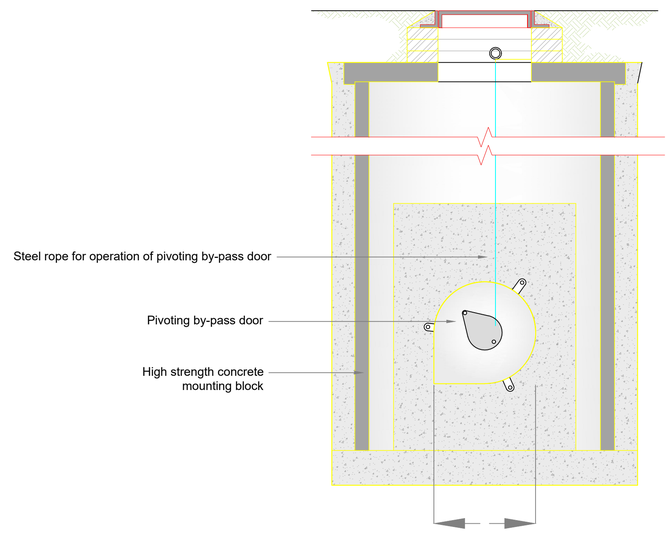


Typical Inspection Chamber Detail with Catchpit - Type D

Max depth from cover level to soffit of pipe in areas subject to vehicle loading 3.0m, non-entry







Typical Vortex Flow Control Manhole

Notes:

1. Same notes as drawing RAB3253_001 apply.

RAB RESILIENCE & FLOOD RISK
Cathedral House,
Beacon Street,
Lichfield,
WS13 7AA

Client

Colin Burton Builders Ltd

Project

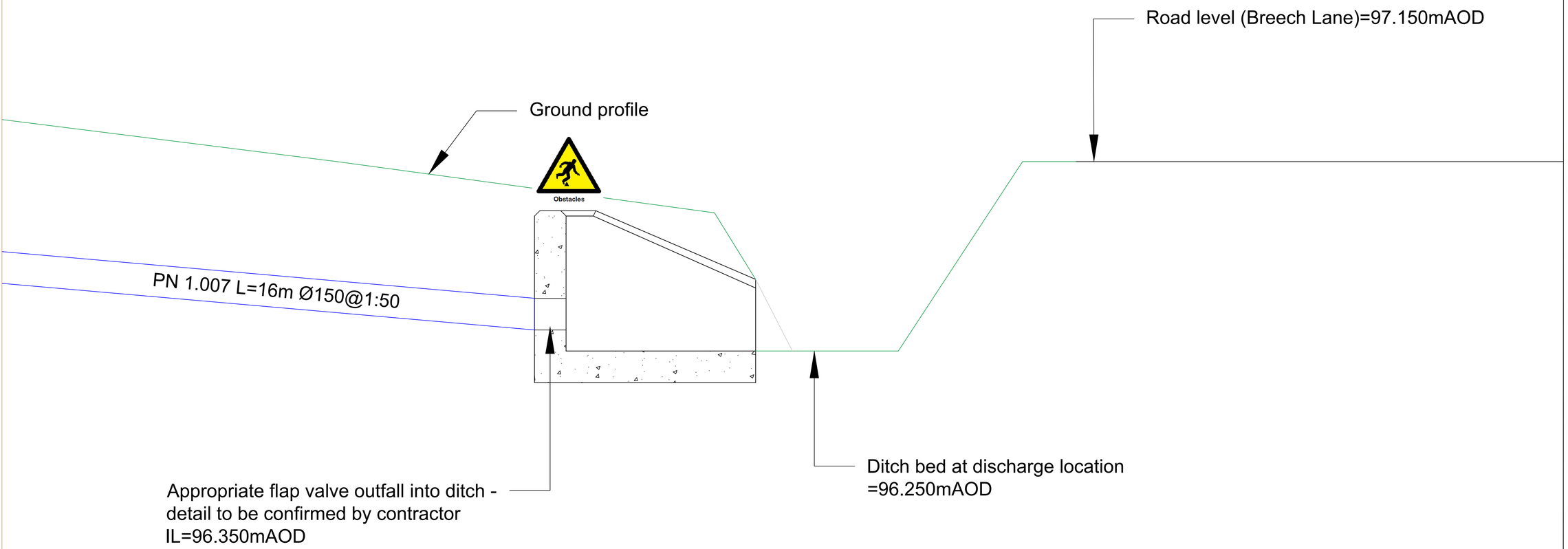
RAB3253 Station Road, Earl Shilton

Drawing

Typical Details

Checked by AT	Approved by AT	
Drawn by NP	Date: 15/02/2024	Scale: NOT TO SCALE

Drawing No.	Revision
RAB3253FRD/003	v1



Typical cross-section at discharge into ditch - view upstream

Notes:

1. Same notes as drawing RAB3253_001 apply.

H&S

Obstacles

The principal contractor and maintenance contractor are advised to follow HSE protocol during construction and maintenance, respectively, to manage the risk of trips and falls and adopt appropriate H & S mitigation measures. The installation of Kee Klamp should be considered at the headwall.

RAB RESILIENCE & FLOOD RISK
Cathedral House,
Beacon Street,
Lichfield,
WS13 7AA

Client
Colin Burton Builders Ltd

Project
RAB3253 Station Road, Earl Shilton

Drawing
Typical Details

Checked by AT	Approved by AT	
Drawn by NP	Date: 15/02/2024	Scale: NOT TO SCALE

Drawing No.	Revision
RAB3253FRD/004	v1

STORMWATER TREATMENT

SDS

Water Infrastructure Systems

SDS Aqua-Swirl®

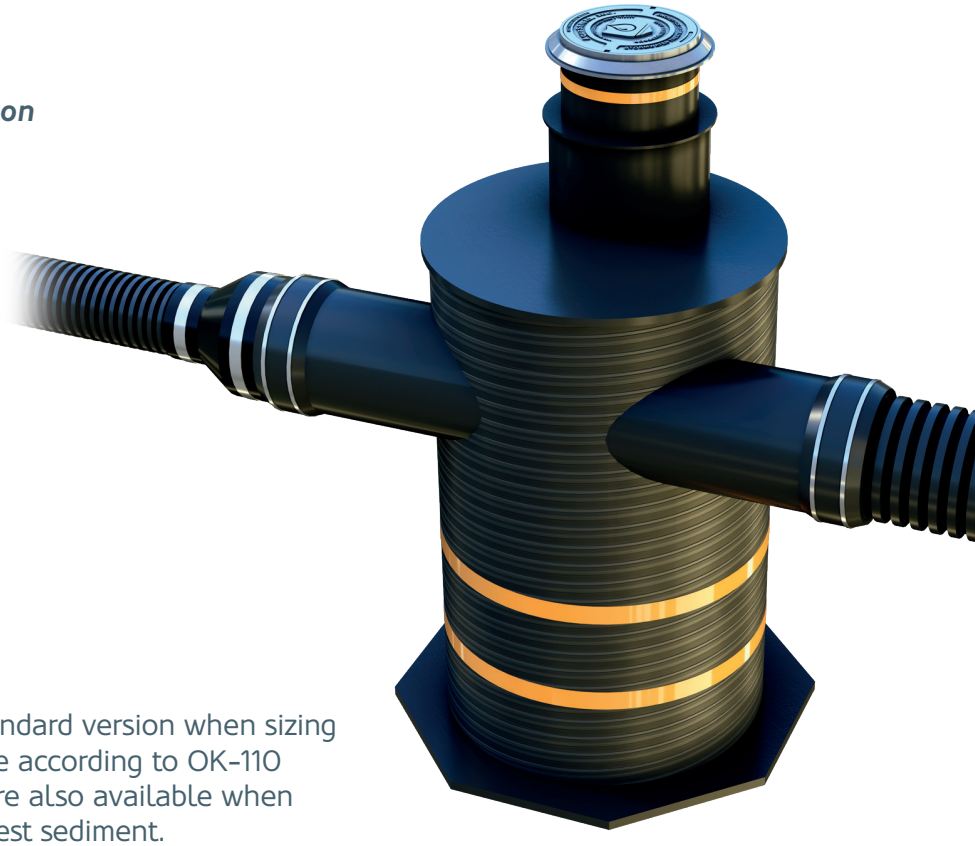
Hydrodynamic Vortex Separator

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

SYMBiotIC™

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

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



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

SDS Aqua-Swirl® is sized according to water quality treatment flow rates which are based on the initial movement of pollutants into the storm drainage system. This flow rate typically represents approximately 90% to 95% of the total pollutants in the runoff volume.

The treatment flow rate of the SDS Aqua-Swirl® system is engineered to meet or exceed the local water quality treatment criteria and form an intrinsic part of the SuDS solution.

SDS Ltd, Clearwater House, Castlemills, Biddisham, Somerset, BS26 2RE

T: +44 (0)1934 751303
E: info@sdslimited.com

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

SPECIFICATIONS

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

[1] BYP (Internal Bypass) provides full treatment of the first flush of water while the peak design storm is diverted and channelled through the main conveyance pipe.
[2] Based on the Tennessee Tech University 'Laboratory Evaluation of TSS Removal Efficiency for the Aqua-Swirl® Concentrator Stormwater Treatment System'.

Notes:
Details of pollution mitigation indices, head loss and CAD details, standard drawings and Installation Guides available upon request.
The sediment storage capacity has been calculated in accordance with the relevant test protocol and is not a physical maximum; any additional sediment capacity required is achieved with bespoke deeper units.
For assistance in design and specific sizing using historical rainfall data, please contact SDS.

A-S DS/0822

SDS Ltd, Clearwater House, Castlemills, Biddisham, Somerset, BS26 2RE
T: +44 (0)1934 751303
E: info@sdslimited.com

Appendix F – North Development Plan

Drainage Legend:

- Site Boundary
- MH — Public Surface Water Sewer
- MH D — Newly Diverted Public Surface Water Sewer
- Abandoned Route
- RE — Rodding Eye
- S — Surface Water Drainage
- FCC — Flow Control Chamber
- F — Foul Water Drainage
- Cellular Attenuation
- Type C Permeable Paving
- Permeable Resin Bound Gravel
- Perforated Pipe
- ACO — ACO Channel Drain
- TD — Threshold Drain

SAFETY,HEALTH & ENVIRONMENTAL HAZARD INFORMATION BOX.

The hazards noted below are in addition to the normal hazards and risks faced by a competent contractor when dealing with the types of works detailed on this drawing.

CONSTRUCTION RISKS:
- Deep Trenches
- Unforeseen Services
- Leptospirosis

DEMOLITION RISKS:
- Leptospirosis

Notes:

1. DO NOT SCALE FROM THIS DRAWING.
2. All dimensions are in millimetres Unless Noted Otherwise (u.n.o.)
3. Drawing is to be read in conjunction with all relevant architect's drawings. Any inconsistencies should be reported to PRP immediately.
4. All levels and dimensions are to be checked on site before any work commences.
5. The Health and Safety at Work act is to be complied with at all times. Attention is drawn to the wearing of hard hats, reflectorised clothing, and the use of any other required safety equipment.

Drainage:

1. Invert levels of existing manholes to be checked on site prior to commencing any drainage works.
2. For positions of all rainwater pipes & foul outlets refer to Architect's drawings.
3. All joints between precast manhole components shall have a minimum uncompressed thickness of 10mm of proprietary bitumen or resin mastic sealant.
4. Storm & foul branch connections are to be laid at gradients of between 1:10 & 1:80
5. All in-situ concrete shall be minimum grade GEN3.
6. Precast concrete cover & reducing slabs to be heavy duty reinforced concrete to BS 5911.
7. Rising mains shall be black MDPE SDR11 as WI 4-32-03 & joints & fittings to be in accordance with WI 4-32-04. Other approved pipe materials to be in accordance with their relevant BS.
8. Manhole covers & frames shall be manufactured in cast iron or ductile iron & shall comply with requirements of BS EN 124 & shall be kite marked or equivalent.
9. Where there is no intermediate manhole between the start of a surface water pipe run and the soakaway the gradient of the run shall be not less than 1 : 60.
10. All completed work shall be suitably protected from damage by construction work. Damaged drainage will not be accepted. It is recommended that no heavy loading or underground work is permitted above or near unprotected drainage, and that dumpers, trucks, fork lifts or other heavy vehicles are not driven along or near pipe runs.

Rev	Date	Description	By / Chk
P2	20/04/2023	Second tank and discharge location added	NN / FW
P1	04/04/2023	Issued for comments	NN / FW

PRP
consulting engineers & surveyors

Catherine House
Old Harborough Road
Brixworth, NN6 9BX

Telephone: 01604 889 870
northampton@prp.uk.com
www.prp.uk.com

Leicester
Northampton
London

engineering excellence | creating advantage

Client:
Stronghold Homes

Architect:
Hayward Architects

Project:
Proposed Development
Breach Lane, Earl Shilton
LE9 7FB

Title:
Proposed Drainage Layout

Status:
PRELIMINARY

Engineer:	NN	Date:	April 2023
Drawn:	NN	Scales @ A1:	1:250
Checked:	FW		
Project No:	82639	Drg No: 101	Rev: P2

● copyright all rights reserved PRP.UK Ltd 2010

Appendix G – Design Risk Register

Design Risk Register

Updated: Monday 19 February 2024

RESILIENCE & FLOOD RISK

Project Name: Station Road, Earl Shilton
Project Number: 3253_FRD

Notes:

Risk Rating - Likelihood
5 = Almost Certain
4 = Probable
3 = Possible
2 = Possible (under unfortunate circumstances)
1 = Rare

Risk Rating - Consequences
5 = Fatality
4 = Major Injury, resulting in disability
3 = Injury requires GP's or Hospital attendance
2 = Minor Injury, 1st Aid required
1 = Minor Injury, 1st Aid required

Risk	RAG
Low	C
Medium	A
High	R

Likelihood	Consequences				
5	5	10	15	20	25
4	4	8	12	16	20
3	3	6	9	12	15
2	2	4	6	8	10
1	1	2	3	4	5

Risk ID	Risk Description & Impact	Risk Owner	Persons at risk	Risk Category	Risk Rating: Likelihood	Risk Rating: Severity	Risk Rating: RAG	Mitigation	Mitigation Risk Rating: Likelihood	Mitigation Risk Rating: Severity	Mitigation Risk Rating: RAG	Residual Risk	Comments	GENERAL ADVICE	CONTRACTOR AND CLIENT TO COMPLY WITH THE RELEVANT LEGISLATION (WHERE APPLICABLE) BELOW (NOT LIMITED TO)
1	**Design** Cellular storage collapse under high loading capacity from vehicle movement.	Designer (RAB)	Gen. Public	Safety	4	4	16	High load resistant product to be used with sign-off from manufacturer. Suitable minimum cover depth has been used in design based on product technical data.	2	4	8	Incorrect product specification by contractor may cause failure.		PPE to be worn at all times during construction where necessary and informed by risk assessments and method statements.	CDM 2015
2	**Constuction** Contractor may use heavy plant in construction phase causing structural failure of the drainage network.	Lead Contractor	Construction	Safety	4	4	16	Construction Phase Plan must include suitable mitigation measures and should be developed by qualified contractor.	2	4	8			Site should be cleared and remain tidy during construction process.	Confined Spaces Regulations 1997
3	**Site Conditions** Poor soil stability.	Client	Construction	Safety	3	4	12	A CBR value of 5% has been assumed. Client must instruct a detailed soil investigation and inform designer ASAP should there be any discrepancies.	2	4	8	Lack of communication between parties on CBR value.			Control of Vibration at Work Regulations 2005
4	**Maintenance** Drainage system becomes blocked causing flooding to occur across the site**.**	Asset owner	Gen. Public	Safety	4	4	16	Flow control devices have been designed with *minimise blockage risk* preference. Maintenance schedule has been included in the report. Client to consult manufacturer for further maintenance input.	1	4	4	Asset owner does not follow maintenance schedule and system becomes blocked.			The Health and Safety at Work Act 1974
5	**Site Conditions** High groundwater level on-site causing drainage system to lose capacity or cellular storage hydrostatic uplift.	Designer (RAB)	Gen. Public	Safety	3	4	12	Soil investigation and online sources do not indicate high groundwater levels on site. Contractor to inform designer & tank manufacturer of any change to groundwater level occurance at the site.	2	4	8	Long term groundwater level could change post construction due to future development and climate change.			Working at Height Regulations 2005
6	**Maintenance** Build up of solids due to flat gradients causing the system to discharge water of low quality and block.	Asset owner	Gen. Public	Safety	4	3	12	Pipework with minimum gradient of 1:150. Maintenance schedule of proposed drainage system has been provided in report RAB:3253_FRD and should be followed by asset owner.	2	3	6	Maintenance schedule is not followed resulting in blockages in system.			The Noise at Work Regulations 2005
7	**Trees** Tree roots grow into and affect performance of drainage system**.**	Designer (RAB)	Gen. Public	Safety	4	3	12	Discharge of foul and surface water requires pipes to be constructed close to mature trees. Arboriculture consultant must provide detailed installation method for infrastructure close to trees. Designer to be informed ASAP should there be any proposed design changes.	1	3	3	Future landscaping work could alter plant and tree locations within the site, which may directly impact the drainage system.			The Management of Health and Safety at Work Regulations 1999
8	**Design** Pollutants entering drainage system and discharge to public sewer.	Designer (RAB)	Gen. Public	Environmental	4	3	12	Proprietary treatment devices have been specified to provide cleansing benefits to site runoff prior to discharge.	2	2	4	Poor maintenance would cause a reduction in treatment potential of SuDS features.			
9	**Excavations** Deep excavations during construction causing collapse of trench.	Lead Contractor	Construction	Safety	4	4	16	Trench boxes or preferable side slopes should also be used. Contractor to follow HSE protocol regarding deep excavations. Construction Phase Plan must include suitable mitigation measures.	2	4	8	Risk of workers falling in excavations remains despite signage and barriers.			
10	***In-situ* work** Constructing manholes on site causing delays, poor quality work and risk to health and safety.	Designer (RAB)	Construction	Safety	4	3	12	The use of pre-fabricated manholes is advised and should be explored by client and contractor.	2	3	6	Pre-fabricated manholes require the use and operation of a mobile crane which may introduce additional risks. CPP shpuld address such risks.			
11	**Services** Underground services (gas,water main, electric etc.) are struck during excavation.	Lead Contractor	Construction	Safety	4	5	20	Contractor to map out exisitng utilities prior to excavation work using utilities surveys and their own investigative work after site clearance commences. Inform designer ASAP if there are any potential clashes	2	4	8	Deep utilities will be difficult to locate - additional checks should be made in stages for deep excavation points.			
12	**Overhead services** Collision with overhead services (telephone lines etc.) during construction or maintenance.	Lead Contractor	Construction & Maintenance	Safety	4	5	20	Contractor to assess utilities surveys and provide risk assessments of working near overhead services. Maintenance contractor must undertake own risk assessments prior to commencing maintenance work.	2	4	8				
13	**Decomission** Surface water features including cellular storage and permeable paving fail due to exceeding design life.	Asset owner	Gen. Public	Safety	5	4	20	Ensure there is a replacement strategy in place, at least 5 years prior to the end of the design life of the system. Most storage features and oil interceptors have 25-50 years design life.	1	4	4	Production line error and inadequate maintenance may cause failure before design life is reached.			
14	**Design** Failure of products used including geotextiles, liners, cellular storage crates etc.	Lead Contractor	Construction	Physical	3	4	12	Contractor must liaise with manufacturers to confirm spec of products is in line with site constraints.	1	4	4				
15	**Design** Tank, pipe and chamber failure due to close proximity to building foundations.	Designer (RAB)	Construction	Safety	4	5	20	Designer has adopted methods used within DCG for design of lateral surface water sewers. Contractor to inform Designer if there are discrepancies/concerns on site.	2	5	10	Contractor fails to comply with DCG design guidance for pipes close to foundations and fails to inform the designer of potential issues prior to installation.			
16	**Maintenance Access** Access to undertake maintenance activities presents health and safety hazards.	Designer (RAB)	Maintenance	Safety	3	4	12	SuDS and drainage system maintenance access has been designed to be easily accesible. Maintenance contractor must undertake own assessment prior to undertaking any works.	1	4	4				
17	**Construction Site Access** Transport of materials and machinery into the site - causing disruption to local area	Lead Contractor	Gen. Public	Safety	4	3	12	Construction Phase Plan must include suitable mitigation measures and should be developed by qualified contractor.	2	3	6				
18	**Design** Risk of falling and trip due to the introduction of a drainage design element (for example, open manhole cover in a public space, outfall into a watercourse, ditches, etc.)	Designer (RAB)	Gen. Public	Safety	4	4	16	Contractor to ensure manholes are installed in line with best practice where new inspection chambers are to be installed along pedestrinas paths. No access to site from the public during construction should be allowed. Proposed outfall headwall must include Kee Klamp (or similar method) for managing risk of falling.	2	4	8	Failure to install such control measures.			
19	**Construction** Construction process enables the spreading of invasive species throught the site and surrounding ecosystem.	Lead Contractor	Gen. Public	Environmental	4	3	12	Client must provide a site-specific ecological survey of planting species and provide to contractor. Contractor must adopt site-specific methods of work to reduce the risk of invasive species spreading across the local ecosystem.	2	3	6	Client fails to provide relevant survey and contractor fails to adopt suitable method of work relevant to protecting the local environment from invasive species.			

CONTRACTOR MUST PROVIDE A CONSTRUCTION PHASE PLAN (CPP), IN LINE WITH CDM 2015, PRIOR TO ANY WORKS TAKING PLACE. CPP SHOULD BE REVIEWED BY PRINCIPAL DESIGNER AND CLIENT.