



GONDOLIN
Land & Water
Civil Engineering & Environmental Solutions

Shaw Lane, Markfield

Proposed Residential Development

Drainage Impact Assessment Report

Client: Mr. Moore
Project/Proposal No: GON.0257.0158
Version: 1
Date: 28/11/2023





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1	28/11/2023	James MacIntosh	Zak Ritchie	For Issue

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1. Introduction

1.1 Preamble

Gondolin Land and Water Ltd (Gondolin) has been appointed by Andrew Large Surveyors Ltd (the agent) on behalf of Mr. Moore (the client) to prepare a Drainage Impact Assessment (DIA) report for a proposed residential development at Shaw Lane, Markfield.

This report provides the relevant design information for the proposed site surface water drainage / SuDS scheme and wastewater drainage, taking due cognisance of local and national drainage design guidance and British Water Flows and Loads 4.

The site was visited in August 2023 by an experienced Hydrologist / Civil Engineer to inform the drainage design.

This report assesses the potential increase in surface water runoff attributed to the development and proposes a surface water management strategy to manage this. The strategy is in accordance with sustainable drainage principles and allows the site to remain free of flooding during design storm events, whilst ensuring no increase of flood risk to offsite receptors and ensures no deterioration of the local water environment.

This report also includes details of the proposed wastewater drainage strategy for the proposed development.

1.2 Site Context

The site is located off Shaw Lane, Markfield, approximately 3.65km southeast of Coalville, at the approximate National Grid Reference (NGR): SK 46279 11719 and is accessed via Shaw Lane to the north of the site boundary.

The site comprises brownfield land. At present, there are buildings associated with the site's previous use as a haulage yard. The north and east boundary is bound by gardens of nearby residential properties. The south is bound by agricultural land, and to the west the site is bound by an allotment.

A site location plan is included as Drawing DIA-001.

1.3 Flood Risk Statement

Review of the Environment Agency (EA) Flood Map for Planning indicates the site is wholly located within Flood Zone 1. In accordance with EA guidance, as the site is located within Flood Zone 1 and is under 1 ha in size (approximately 0.3ha), a flood risk assessment is not required. The site is also not at risk of flood from any other flood risk sources from review of EA long term flood risk service mapping.

1.4 Development Details

The proposed development is for the siting of 4no. dwelling units with associated driveway / parking areas. Access to the site shall utilise the existing access from the north, stemming from Shaw Lane. The proposed development plan and details are included as Appendix A.

1.5 Topography

Detailed topographic data (LiDAR) was obtained from the DEFRA Survey Data Download and has been used to inform this assessment and is included within the relevant drawings.

Review of the LiDAR data indicates that the site is generally flat with a gentle slope to the west. Levels within the site range from an approximate maximum elevation of 191.5mAOD at the east boundary, falling to approximately 188.2mAOD in the southwestern corner.



1.6 Geology and Hydrogeology

1.6.1 Geology

1.6.1.1 Superficial

Review of the British Geological Survey (BGS) online geology maps¹ indicates that superficial deposits underlying the site are apart of the Oadby Member which comprises Diamicton. However, it should be noted that deposits of Head (comprising clay, silt, sand and gravel) are immediately adjacent to the east.

There are no freely available BGS borehole logs within close proximity to the site.

1.6.1.2 Bedrock

Review of the BGS online geology maps shows that the site overlies the Gunthorpe Member comprising mudstone. However, it should be noted that a thin band of the Cotgrave Sandstone Member comprising sandstone is located immediately south of the site. South of the Cotgrave Sandstone Member (and still within close proximity of the site) is the Edwalton Member comprising mudstone.

1.6.1.3 Preliminary Site Investigation Information

A Preliminary Site Investigation (PSI) was undertaken on 22nd and 23rd August 2023 supervised by an experienced Hydrologist / Civil Engineer.

The PSI comprised 1no. deep trial pit and 4no. shallow trial pits (5no. total), named TPA-TPE inclusive, located throughout the site and were targeted at depths between 0.5m and 1.0m below ground level (bgl) and a summary of the ground conditions encountered (with rounded average depths) is provided below:

- 0-0.4m bgl – dark brown, slightly clayey TOPSOIL with grass roots.
- 0.4-0.8m bgl – brown sandy gravelly CLAY with low cobble content.
- 0.8-1.0m bgl – Orangey brown occasionally mottled grey sandy gravelly CLAY with occasional angular cobbles of sandstone.

Most of the ground conditions were very similar across the site, however, the TOPSOIL thickness varied between trial pits (0.3-0.45m bgl). Groundwater was not recorded down to a maximum depth of 1.0m bgl.

A series of soil infiltration tests (4no. in total) were conducted as part of the PSI in accordance with BS 6297 and BRE Digest 365 Methodology. TPD was dug prior to Gondolin arriving to site and had filled with surface runoff, therefore, no formal infiltration tests were performed within it. However, depth changes of the pooling surface water were noted while Gondolin were on site to infer an approximate percolation value (Vp) within the trial pit. The infiltration rates of each trial pit are outlined in Table 1 below.

Table 1 Trial Pit Percolation Values

TP ID	Maximum Depth of TP (mbgl)	Vp (s/mm)	Soil Infiltration Rate (m/s) ²
TPA	0.5	139	7.18x10 ⁻⁶
TPB	0.5	74	1.35x10 ⁻⁵
TPC	0.5	210	4.76x10 ⁻⁶
TPD	1.0	1901 ¹	5.26x10 ⁻⁷
TPE	0.75	1101 ¹	7.18x10 ⁻⁷

¹ British Geological Survey (2023) Natural Environment Research Council – GeoIndex (onshore) online BGS Map Viewers, available at: <https://www.bgs.ac.uk/map-viewers/geoindex-onshore/> (accessed on 28th November 2023)



Notes: ¹Vp not calculated from time for water to drop 75%-25% as per BS 6297 due to water depth not reaching 25% water depth as drainage was unfavourable. ²Estimated from Vp results via following equation - $(1/Vp)/1000$

A selection of photographs from the PSI and full Trial Pit Logs are included as Appendix B.

1.6.2 Hydrogeology

Review of the BGS GeoIndex Hydrogeological map (1:625,000 scale) indicates the site is underlain by a low productivity Secondary B aquifer described as "Largely argillaceous sequence with occasional sandstones yielding less than 0.5l/s of water that can be highly mineralised which confines the underlying Sherwood Sandstone aquifer."

No groundwater was encountered during the PSI to a depth of 1.0m bgl.

1.7 Hydrology and Existing Drainage Regime

Review of the Flood Estimation Handbook (FEH) Web Service² and other available mapping shows there are two minor unnamed watercourses nearby the site, approximately 300m south and 150m west of the site, respectively. The watercourses both ultimately drain to the River Sence, with their confluence approximately 1.5km northwest of the site. A series of small ponds are located along the southern watercourse approximately 450m southwest of the site.

The existing buildings (planned on being demolished) have conventional surface water drainage in the form of rainwater pipes which discharge to the surrounding ground. A Severn Trent Water combined sewer crosses the site access route and runs east to west through the rear gardens of the properties along Shaw Lane.

Drawing DIA-002 provides a hydrological overview of the site and local area.

2. Proposed Surface Water Drainage Design

2.1 Design Overview

The management of surface water drainage from the development has been considered taking due cognisance of the following guidance:

- CIRIA, Report C753 – the SuDS Manual, 2015
- CIRIA, Report C635 – Designing for Exceedance in Urban Drainage, Good Practice (2006)
- Leicestershire County Council – Interim LLFA Guidance Note: Planning and Development in Leicestershire, 2018

The proposed drainage / SuDS scheme for the proposed development is for Permeable Paving (Type C) to be installed within the development driveway and parking areas with a proportion underlain by a sub-surface geocellular storage system. The proposed system shall manage, treat and attenuate runoff from the dwellings and associated driveways / parking areas.

Roof drainage shall be collected via conventional methods and piped into the sub-surface geocellular storage system. Driveway / parking areas shall be constructed of permeable paving allowing surface water to infiltrate into the subbase and drain to the geocellular storage system. Driveway / parking areas shall also be designed with a gentle grading to direct exceedance surface runoff towards the geocellular storage system and away from the dwellings.

An illustration of Type C Permeable Paving and an example with geocellular storage beneath are shown below (as taken from CIRIA Report C753):

² UK Centre for Ecology and Hydrology (2023) Flood Estimation handbook Web Service, available at: <https://fehweb.ceh.ac.uk/> (accessed on 28th November 2023)

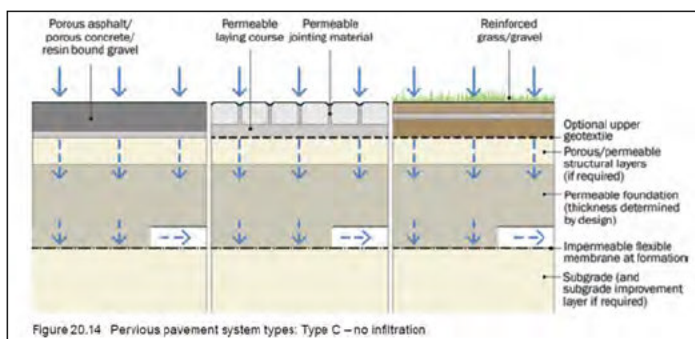


Figure 20.16 Concrete block permeable paving with geocellular sub-base replacement system (from Interpave, 2013)

The proposed method of discharge shall be to discharge to the nearby existing Severn Trent Water (STW) combined sewer running to the north of the main site area. A hydrobrake chamber shall be installed to the outflow pipe of the SuDS system to ensure discharge rates do not exceed the pre-development scenario. STW have been consulted and have confirmed the combined sewer has enough capacity to accommodate the proposed discharge rate from the development. STW's full response is attached as Appendix C.

The Proposed Drainage Layout and Typical Drainage Details for the development are provided as Drawing DIA-003 and DIA-004.

2.2 Design Criteria

2.2.1 Drainage Discharge Locations

In accordance with the aforementioned guidance documents, the hierarchy for favoured disposal options of surface water runoff from development sites is as follows:

1. Infiltration to Ground;
2. Discharge to Surface Waters; or
3. Discharge to Sewer.

Table 2 below discusses the disposal method suitability in the context of the site and proposed development.

Table 2 Suitability of Surface Water Disposal Methods

Surface Water Disposal Method	Suitability Description	Method Suitable? (Y/N)
Infiltration to Ground	The Preliminary Site Investigation confirms that surface water drainage discharge to ground is not viable (refer to Section 1.6.1.3 for relevant details). The results indicate that infiltration rates across the site are variable and range from marginally suitable infiltration rates ($> 1 \times 10^{-4}$) to unsuitable infiltration rates ($< 1 \times 10^{-4}$)	N
Surface Water Discharge	The closest watercourse to the site is approximately 150m to the west. It is noted that any discharge to the watercourse would require third party consent. The watercourse was visited during the site visit and was noted to be small in nature and approximately 0.5m deep. Given the local area is predominantly flat and the shallow nature of the watercourse, a gravity discharge is not considered feasible. As such, discharge to watercourse is not considered to be viable.	N
Sewer Discharge	There is a Severn Trent Water (STW) combined sewer within the vicinity of the site and crosses the proposed site access route and would allow for a surface water discharge via gravity. It is noted that there are no surface water sewers within the local area.	Y

Review of Table 2 above confirms that discharge to sewer is the only viable means to dispose of surface water drainage and is the method proposed within this report.



2.2.2 Water Quantity Review

As the proposed discharge strategy for the proposed developments is to discharge to sewer, a limiting discharge rate is applicable. Therefore, Greenfield runoff rates have been estimated through application of methodology outlined in IH R124³ as set out within the Interim Code of Practice for SuDS (ICP).

The IH R124 method can be used to estimate Greenfield runoff release rates for a range of AEP events, or return periods, by applying regional growth curve factors to the mean annual peak runoff (i.e. QBAR).

The UK hydrological region for the local area is Region 4, therefore, the appropriate growth curve factors for this region have been incorporated into the analysis undertaken in the MicroDrainage (2020) software suite⁴.

The following hydrological characteristics have been incorporated into the runoff modelling and results are presented in Table 3 below for a range of AEP storm events.

- Average Annual Rainfall (SAAR): 700mm/year
- Soil Index: 0.450
- UK Hydrological Region No. 4

Table 3 Estimation of the Greenfield (Pre-Development) Rate of Runoff

AEP (%)	Return Period (1 in X Years)	Unit Greenfield Runoff Rate (l/s/Ha)
50	2	3.9
QBAR		4.4
3.3	30	8.6
1	100	11.3
0.5	200	13.3
0.1	1000	18.3

In accordance with CIRIA Report C753 (the SuDS Manual) it is proposed to limit surface water discharge from each proposed development zone to QBAR greenfield rates for all design events up to and including the 1% AEP plus 40% climate change uplift.

The total impermeable area for the proposed development is **0.10 ha**. Accordingly, a discharge rate of **0.4 l/s** has been applied to the proposed discharge strategy. This is based on a runoff coefficient (CV) of 1 being applied for the development roofs and driveway / parking areas for the proposed development.

In accordance with Leicestershire County Council guidance, a 10% allowance for urban creep has been factored into the assessment.

2.2.3 Water Quality Review (Simple Index Approach)

In accordance with CIRIA Report C753, it is necessary to undertake a 'Water Quality Risk Management' assessment to determine the suitability of SuDS methods from a water quality perspective. The approach outlined below is based on the 'Simple Index Approach' for discharge to surface water as detailed in the SuDS Manual (Section 26.7, Tables 26.2 and 26.3).

Table 4 below compares the SuDS Mitigation Indices (MI) against the maximum Pollution Hazard Index (PI) for the proposed development. This is based on the application of a Permeable Pavement discharging to surface water.

³ Institute of Hydrology Report No. 124 (1994) (IH R124), Flood estimation for small catchments, June 1994

⁴ MicroDrainage (2020). WinDes Drainage Design and Modelling Software (Version 2020.1.3)



Table 4 SuDS Water Quality Design Criteria: Index Approach Review

Land Use	Pollution Hazard and SuDS Mitigation Indices Comparison					
	Total Suspended Solids (TSS)		Metals		Hydro-Carbons	
	Pollution Index	Mitigation Index	Pollution Index	Mitigation Index	Pollution Index	Mitigation Index
Residential roofs	0.2	0.7	0.2	0.6	0.05	0.7
Individual Property Driveways	0.5		0.4		0.4	

Notes: Mitigation Index based on a Permeable Pavement

The SuDS Mitigation Index offered by the proposed SuDS is $\geq$ Pollution Hazard Index therefore the water quality assessment criteria is satisfied.

2.3 SuDS Performance Review

2.3.1 Key Design Details

The geocellular storage SuDS has been sized to accommodate the 1:100yr plus 40% climate change event. The key outline design parameters / geometry are summarised in Table 5 below.

Table 5 SuDS Summary Design Details

Parameter	Unit	Value	Notes
Storage Depth	m	0.66	As measured from AutoCAD design (typical storage crate depth)
Storage Area	m ²	228	As measured from AutoCAD design
Storage Volume	m ³	150	Storage Area x Storage Depth
Storage Porosity	-	0.95	Typical porosity value for cellular storage systems
Limiting Discharge Rate	l/s	0.4	To be provided by Hydrobrake Optimum (or similar)

2.3.2 Hydraulic Analysis

The geocellular storage system has been modelled using the industry standard MicroDrainage software suite and a summary of the modelling results is included as Table 6 below.

Table 6 Geocellular Storage System - Hydraulic Modelling Summary

Return Period Event (1 in X)	Max. Water Depth (m)	Freeboard Allowance (mm)	Max Outflow Rate (l/s)	Storage Volume (m ³)	Critical Storm Duration (hours)
2	0.101	559	0.3	21.9	16
10	0.153	507	0.3	33.0	12
30	0.201	459	0.3	43.5	16
100	0.272	388	0.3	58.8	16
100 + 40% CC	0.406	254	0.3	87.8	24

The results above confirm that the increased runoff from the proposed development can be adequately contained within the sub-surface geocellular storage system for up to the design 100yr + 40% climate change event while limiting the discharge to 0.4 l/s. As additional contingency and in accordance with CIRIA Report C753, a suitable freeboard depth from the maximum water level to the geocellular storage crest level has been factored into the design. It is noted that additional



freeboard / storage would be provided within the permeable paving and associated laying course and subbase.

Full copies of the hydraulic modelling and model details are enclosed as Appendix D.

2.4 Outline Maintenance Schedule

2.4.1 Overview

To ensure efficient operation of the proposed surface water management / SuDS scheme, drainage components should be inspected and maintained throughout the life of the development. Regular inspection / maintenance will ensure efficient operation and prevent potential failure / blockage of drainage components.

The following draft maintenance plan has been developed from best practice guidance, professional experience, and information provided in CIRIA Report C753 (The SuDS Manual).

All drainage components will be retained under private ownership, with a private maintenance agreement being in place with a management company to undertake the ongoing maintenance on behalf of the residents of the development. This maintenance schedule will be integrated into the overall site operating and maintenance strategy and tailored / refined over time as required.

2.4.2 Maintenance Program

2.4.2.1 SuDS Permeable Paving

Table 7 below provides the inspection and maintenance recommendations set out in Table 16.1 of the CIRIA Report C753.

Table 7 SuDS Permeable Paving Area – Outline Maintenance Requirements

Maintenance Schedule	Required Action	Typical Frequency
Regular Maintenance	Brushing and vacuuming (standard cosmetic sweep over whole surface)	Once a year, after autumn leaf fall, or reduced frequency as required, based on site-specific observations of clogging or manufacturer's recommendations
Occasional Maintenance	Removal of weeds or management using glyphosate applied directly into the weeds by an applicator rather than spraying	As required – once per year on less frequently used areas
Remedial Actions	Remediate any landscaping which, through vegetation maintenance or soil slip, has been raised to within 50mm of the level of the paving	As required
	Remedial work to any depressions, rutting and cracked or broken blocks considered detrimental to the structural performance or a hazard to users, and replace lost jointing material	As required
	Rehabilitation of surface and upper substructure	Every 10 to 15 years or as required (if infiltration performance is reduced due to significant clogging)
Monitoring	Initial inspection	Monthly for three months after installation



Maintenance Schedule	Required Action	Typical Frequency
	Inspect for evidence of poor operation and/or weed growth – if required, take remedial action	Three-monthly, 48 h after large storms in first six months
	Inspect silt accumulation rates and establish appropriate brushing frequencies	Annually
	Monitor inspection chambers	Annually

2.4.3 Geocellular Storage System

The geocellular storage system should be inspected and maintained in accordance with manufacturer guidelines. This should include but not be limited to:

- Visual inspection noting condition of the system, connecting pipes and any leakages
- Jetting (as required) to remove any silt build up

2.4.4 Inspection Chambers and Manholes

It is recommended that inspection chamber and manhole covers are lifted at least yearly to check for debris / silt accumulations and check the drainage runs are flowing freely.

Any silt / debris accumulations should be manually removed and jet washed where required.

3. Proposed Wastewater Drainage

3.1 Overview

The proposed development will generate wastewater loadings from standard residential use, as per British Water Flows and Loads 4.

In accordance with national guidance, the favoured hierarchy for wastewater disposal is as follows:

1. Discharge to Public Sewer;
2. Discharge via Infiltration to Ground; or
3. Discharge to Surface Waters.

Table 8 below discusses the disposal method suitability in the context of the site and proposed development.

Table 8 Suitability of Wastewater Disposal Methods

Wastewater Disposal Method	Suitability Description	Method Suitable? (Y/N)
Discharge to Sewer	There is a Severn Trent Water (STW) combined sewer within the vicinity of the site and crosses the proposed site access route and would allow for wastewater discharge via gravity.	Y
Discharge to Ground	The Preliminary Site Investigation confirms that wastewater drainage discharge to ground is not viable (refer to Section 1.6.1.3 for relevant details). Percolation rates were shown to be varied across the site with the majority of rates considered unsuitable (too slow).	N
Discharge to Surface Waters	The closest watercourse to the site is approximately 150m to the west. It is noted that any discharge to the watercourse would require third party consent. The watercourse was visited during the site visit and was noted to be small in nature and approximately 0.5m deep. Given the local area is predominantly flat and the shallow nature of the watercourse, a gravity discharge is not considered feasible. As such, discharge to watercourse is not considered to be viable.	N



Table 8 indicates the most favoured option; discharge to sewers is possible for the site, therefore, the proposed wastewater disposal method is discharge to sewer.

The proposed wastewater drainage scheme is for wastewater to be collected from each dwelling unit via conventional sealed pipework, which will discharge to the Severn Trent Water (STW) combined sewer via a new connection point beneath the site access. STW have been consulted and have confirmed the combined sewer has enough capacity to accommodate the proposed discharge rate from the development. STW's full response is attached as Appendix C.

The Proposed Drainage Layout and Typical Drainage Details for the development are provided as Drawing DIA-003 and DIA-004.

3.2 Wastewater Loading Calculations

With reference to British Water Flows and Loads 4, a summary of the wastewater loading calculations for each development zone are outlined in Table 9 below.

Table 9 Wastewater Loading Calculations

Parameter	Unit	Value	Notes
No. of dwelling units	-	4	As per proposed development plans
Occupancy per unit	-	6	Based on each unit housing 4 bedrooms
Total Population Equivalent (p.e.)	-	24	No. units multiplied by maximum occupancy
Total maximum daily flow	l/day	3600	2 units multiplied by daily flow per unit
Instantaneous Average Flow	l/s	0.04	Over 24-hour period

4. Closure

Gondolin Land and Water Ltd (Gondolin) has been appointed by Andrew Large Surveyors Ltd (the agent) on behalf of Mr. Moore (the client) to prepare a Drainage Impact Assessment (DIA) for a proposed residential development at Shaw Lane, Markfield.

The site was visited in August 2023 by an experienced Hydrologist / Civil Engineer to inform the drainage design.

A Preliminary Site Investigation was undertaken during these site visits to establish the site specific ground conditions and determined it was unviable for a surface and wastewater drainage discharge to ground.

This report assesses the potential increase in surface water runoff attributed to the development and proposes a surface water management strategy to manage this. The strategy is in accordance with sustainable drainage principles and allows the site to remain free of flooding during design storm events, whilst ensuring no increase of flood risk to offsite receptors and ensures no deterioration of the water environment. It also assesses the management of wastewater loading based on the industry standard guidance (British Water Flows and Loads 4).

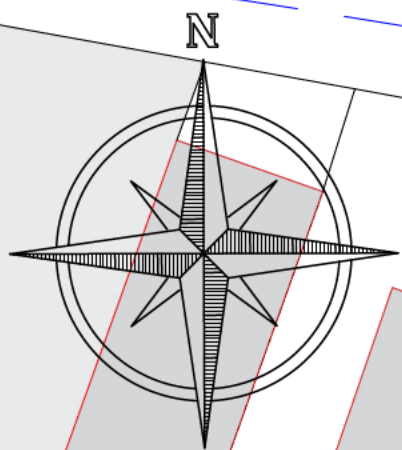
The surface water and wastewater drainage and SuDS design presented herein should be considered provisional outline designs which would be refined and further detailed at the post-planning stages.

Taking all of the above into account it is considered there is no impediment to the development being granted planning permission on the grounds of surface water and wastewater drainage provision.



Appendix A

Proposed Development Plan



ALL DRAWINGS PREPARED BY ANDREW
LARGE SURVEYORS LTD ARE TO BE
UTILISED FOR PLANNING PURPOSES
ONLY

PROPOSED SITE:

OUTLINE OF EXISTING BUILDINGS
SHOWN OVER THE TOP OF THE
PROPOSED LAYOUT IN A DASHED LINE.

NO OVERLOOKING ISSUES WITH ANY
EXISTING NEIGHBOURS OF THE SITE.

EXISTING AND PROPOSED PLANTING TO
SCREEN THE DEVELOPMENT FROM
NEIGHBOURS WITH SCOPE TO INCLUDE
MORE THAN SUFFICIENT BIODIVERSITY
ENHANCEMENT.

4 PROPOSED DWELLINGS SHOWN:

GROSS EXTERNAL AREAS -

1. 197.62m2
2. 54.12m2
3. 54.12m2
4. 147.12m2

TOTAL - 452.98m2

DEVELOPMENT TO UTILISE THE SAME
ACCESS ONTO SHAW LANE AS THE
HAULAGE YARD.

5. PROPOSED SPECIES RICH NATIVE
HEDGEROW

6. PROPOSED BUFFER PLANTING

AndrewLarge
surveyors LTD

LAND TO THE REAR OF
193 SHAW LANE
MARKFIELD
LE67 9PW

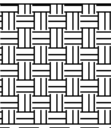
PROPOSED SITE
SCALE: 1:200@A1

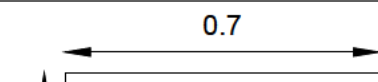


Appendix B

Preliminary Site Investigation Information

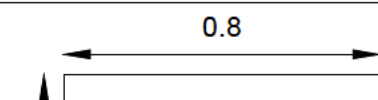


Samples and In-situ Tests				Water	Backfill	Description of Strata	Depth (m)	(Thickness)	Legend
Depth	No.	Type	Results						
				Dry		Dark brown slightly clayey TOPSOIL (damp) with thick vegetative roots.	0.3	(0.3)	
						Orangey brown sandy gravelly CLAY (damp) with occasional angular cobbles of SANDSTONE. Sand is medium and gravel is of mixed sizes (fine to coarse), both sub-rounded to sub-angular with poor sorting. Grey CLAY is noted at base of pit. (OADBY MEMBER)	0.5	(0.2)	
						 Trial pit terminated			

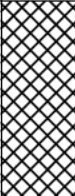
General Notes and Observations			Dimensions	
1. No groundwater ingress to pits throughout works 2. Trial pit logged in accordance with BS 5930:2015 3. Trial pit remained stable throughout (no slumping or sidewall failure) 4. Trial pit backfilled and compacted within suitable layers, tufts and topsoil placed last to restore ground profile			 Final Depth: 0.5m	
Weather: Sunny with some cloud cover and moderate temperatures			All dimensions in metres	
Method Used:	Plant Used:	Logged by:	Checked by:	
Hand dug	N/A	J.MacIntosh	Z.Ritchie	

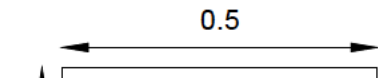


Samples and In-situ Tests				Water	Backfill	Description of Strata	Depth (m)	(Thickness)	Legend
Depth	No.	Type	Results						
				Dry		Some grass over dark brown TOPSOIL (damp) with vegetative roots. Clay content increases with depth. Localised pocket of orange sandy CLAY noted at 0.15m bgl.	0.45	(0.45)	
						Orangey brown occasionally mottled grey sandy gravelly CLAY (damp) with occasional angular cobbles of SANDSTONE. Sand is medium and gravel is of mixed sizes (fine to coarse), both sub-rounded to sub-angular with poor sorting. Grey CLAY is noted at base of pit. (OADBY MEMBER)	0.5	(0.05)	
						 Trial pit terminated			

General Notes and Observations			Dimensions	
1. No groundwater ingress to pits throughout works 2. Trial pit logged in accordance with BS 5930:2015 3. Trial pit remained stable throughout (no slumping or sidewall failure) 4. Trial pit backfilled and compacted within suitable layers, tufts and topsoil placed last to restore ground profile			 Final Depth: 0.5m	
Weather: Sunny with some cloud cover and moderate temperatures			All dimensions in metres	
Method Used:	Plant Used:	Logged by:	Checked by:	
Hand dug	N/A	J.MacIntosh	Z.Ritchie	



Samples and In-situ Tests				Water	Backfill	Description of Strata	Depth (m)	(Thickness)	Legend
Depth	No.	Type	Results						
				Dry		Grass over dark brown TOPSOIL (damp) with vegetative roots. Clay content increases with depth.	0.45	(0.45)	
						Orangey brown occasionally mottled grey sandy gravelly CLAY (damp) with occasional angular cobbles of SANDSTONE. Sand is medium and gravel is of mixed sizes (fine to coarse), both sub-rounded to sub-angular with poor sorting. (OADBY MEMBER)	0.5	(0.05)	
						Trial pit terminated			

General Notes and Observations			Dimensions	
1. No groundwater ingress to pits throughout works 2. Trial pit logged in accordance with BS 5930:2015 3. Trial pit remained stable throughout (no slumping or sidewall failure) 4. Trial pit backfilled and compacted within suitable layers, tufts and topsoil placed last to restore ground profile			 Final Depth: 0.5m	
Weather: Sunny with some cloud cover and moderate temperatures			All dimensions in metres	
Method Used:	Plant Used:	Logged by:	Checked by:	
Hand dug	N/A	J.MacIntosh	Z.Ritchie	



GONDOLIN

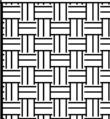
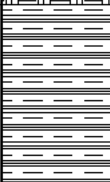
Land & Water

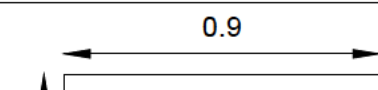
Project: Shaw Lane, Markfield		Client: Andrew Large Surveyors		Trial Pit ID: TPD
Project No. GON.0257.0158	Date: 22/08/2023	Ground Level: 191.0m AOD	Co-ordinates: X: 446277 Y: 311702	Sheet: 1 of 1

Samples and In-situ Tests				Water	Backfill	Description of Strata	Depth (m)	Thick-ness	Legend
Depth	No.	Type	Results						
				Dry		Dark brown slightly clayey TOPSOIL (damp) with vegetative roots. CLAY content increases with depth.	0.4	(0.4)	
						Brown sandy gravelly CLAY (damp) with low cobble content. Sand is medium and gravel is of mixed sizes (fine to coarse), both sub-rounded to sub-angular with poor sorting.	0.8	(0.4)	
						(OADBY MEMBER) Orangey brown occasionally mottled grey sandy gravelly CLAY (damp) with occasional angular cobbles of SANDSTONE. Sand is medium and gravel is of mixed sizes (fine to coarse), both sub-rounded to sub-angular with poor sorting.	1.0	(0.2)	
						(OADBY MEMBER)			
						Trial pit terminated			

General Notes and Observations				Dimensions	
- No groundwater ingress to pits throughout works - Trial pit logged in accordance with BS 5930:2015 - Trial pit remained stable throughout (no slumping or sidewall failure) - Trial pit backfilled and compacted within suitable layers, tufts and topsoil placed last to restore ground profile					
Weather: Sunny with some cloud cover and moderate temperatures				All dimensions in metres	
Method Used: Hand dug	Plant Used: N/A	Logged by: J.MacIntosh	Checked by: Z.Ritchie		



Samples and In-situ Tests				Water	Backfill	Description of Strata	Depth (m)	(Thick-ness)	Legend
Depth	No.	Type	Results						
				Dry		Some grass over dark brown clayey TOPSOIL (damp) with vegetative roots.	0.3	(0.3)	
						Orangey brown occasionally mottled grey sandy gravelly CLAY (damp) with occasional angular cobbles of SANDSTONE. Sand is medium and gravel is of mixed sizes (fine to coarse), both sub-rounded to sub-angular with poor sorting.	0.75	(0.45)	
						(OADBY MEMBER)			
						 Trial pit terminated			

General Notes and Observations			Dimensions	
1. No groundwater ingress to pits throughout works 2. Trial pit logged in accordance with BS 5930:2015 3. Trial pit remained stable throughout (no slumping or sidewall failure) 4. Trial pit backfilled and compacted within suitable layers, tufts and topsoil placed last to restore ground profile			 Final Depth: 0.75m	
Weather: Sunny with some cloud cover and moderate temperatures			All dimensions in metres	
Method Used:	Plant Used:	Logged by:	Checked by:	
Hand dug	N/A	J.MacIntosh	Z.Ritchie	





Appendix C

Severn Trent Water PDE

Stephen Donnan

From: James MacIntosh
Sent: 04 October 2023 09:11
To: Stephen Donnan
Subject: FW: Developer enquiry - 1094153 Shaw Lane

Morning Stephen,

STW have confirmed that the sewer can accept our estimated SW discharge if limited to 0.4l/s.

Cheers,

James

James MacIntosh | Graduate Environmental Engineer | Gondolin Land & Water Ltd
BSc(hons), MSc, GradCIWEM



GONDOLIN
Land & Water
Civil Engineering & Environmental Solutions

Our new Office Address: 15 Quayside Street, Leith, Edinburgh, EH6 6EJ

Registered Company No. SC706920

Mobile: [REDACTED]

Office: [REDACTED]
[REDACTED]

Website: www.gondolinltd.co.uk



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Please consider the environment before printing this e-mail

From: Network Solutions [REDACTED]
Sent: Tuesday, October 3, 2023 8:47 AM
To: James MacIntosh [REDACTED]
Subject: RE: Developer enquiry - 1094153 Shaw Lane

ST Classification: OFFICIAL PERSONAL

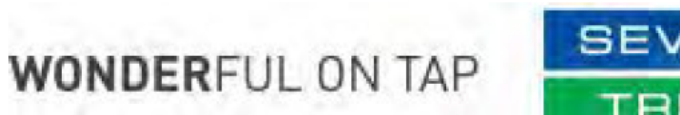
Good morning,

Thank you for contacting me and providing the below information.

I can confirm connection to the combined network is granted if flows are restricted with accordance to greenfield conditions 0.4 l/s (as per your proposal) and would be subject to formal 106 approval.

Many thanks

Page Barot
Network Solutions
Leicester Water Centre
[REDACTED]



Did you know? You can now make full applications online for a variety of our Developer Service offerings including Development Enquiries. Take a look here for more details: <https://www.stwater.co.uk/building-and-developing/regulations-and-forms/application-forms-and-guidance/>

We have listened to our customers and local communities and Severn Trent have made a pledge to transform and protect the health of our Rivers, for more information please follow the link below:
<https://www.stwater.co.uk/get-river-positive/our-river-pledges/>

From: James MacIntosh [REDACTED]
Sent: 21 September 2023 17:08
To: Network Solutions [REDACTED]
Subject: RE: Developer enquiry - 1094153 Shaw Lane

Caution: This is an external email originating outside Severn Trent. Think before you click on links or open attachments.

Good afternoon,

Thank you for the Developer Enquiry response letter.

RE surface water discharge:

We have already investigated the viability of discharging to the watercourse local to the site as we appreciate a surface water discharge to a combined sewer is the least favourable option. The watercourse in question is located 160m west of the site and any connection to this would be through third party land and thus would require consent from the respective landowner or landowners. This watercourse was visited during our site works and was noted to be small in nature and approximately 0.5 deep. The local area is predominantly flat and given the shallow nature of the watercourse, a gravity connection from the site to the watercourse would not be possible and a pumped solution would be required. Given the above it is therefore considered that a discharge to surface waters is not viable for the site and based on the information already provided as part of our application, the only viable option for surface water discharge is via the existing combined sewer.

Many thanks,

James

James MacIntosh | Graduate Environmental Engineer | Gondolin Land & Water Ltd
BSc(hons), MSc, GradCIWEM



GONDOLIN
Land & Water
Civil Engineering & Environmental Solutions

Our new Office Address: 15 Quayside Street, Leith, Edinburgh, EH6 6EJ

Registered Company No. SC706920

Mobile: [REDACTED]

Office: [REDACTED]

Email: [REDACTED]

Website: www.gondolinltd.co.uk



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Please consider the environment before printing this e-mail

From: Network Solutions [REDACTED]
Sent: Friday, September 15, 2023 10:54 AM
To: James MacIntosh [REDACTED]
Subject: Developer enquiry - 1094153 Shaw Lane

ST Classification: OFFICIAL PERSONAL

Good morning,

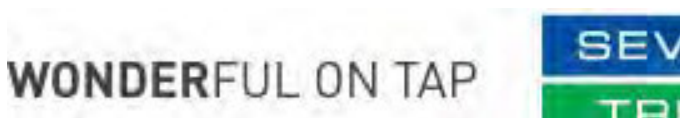
Please find attached below our Developer Enquiry response letter, along with a sewer record extract and supplementary guidance notes with regard to the above site.

If you have any further queries with regard to our response, please do not hesitate to contact us on the number / email address mentioned below. Please refrain from sending responses to a certain individual directly. Our email address below will ensure that your response is logged and tracked for a response. When responding, please quote our reference number above in all return correspondence.

Kind regards,

Network Solutions

(reply to network.solutions@severntrent.co.uk)



Did you know? You can now make full applications online for a variety of our Developer Service offerings including Development Enquiries. Take a look here for more details: <https://www.stwater.co.uk/building-and-developing/regulations-and-forms/application-forms-and-guidance/>

We have listened to our customers and local communities and Severn Trent have made a pledge to transform and protect the health of our Rivers, for more information please follow the link below: <https://www.stwater.co.uk/get-river-positive/our-river-pledges/>

Severn Trent Plc (registered number 2366619) and Severn Trent Water Limited (registered number 2366686) (together the "Companies") are both limited companies registered in England & Wales with their registered office at Severn Trent Centre, 2 St John's Street, Coventry, CV1 2LZ This email (which includes any files attached to it) is not contractually binding on its own, is intended solely for the named recipient and may contain CONFIDENTIAL, legally privileged or trade secret information protected by law. If you have received this message in error please delete it and notify us immediately by telephoning +44 2477715000. If you are not the intended recipient you must not use, disclose, distribute, reproduce, retransmit, retain or rely on any information contained in this email. Please note the Companies reserve the right to monitor email communications in accordance with applicable law and regulations. To the extent permitted by law, neither the Companies or any of their subsidiaries, nor any employee, director or officer thereof, accepts any liability whatsoever in relation to this email including liability arising from any external breach of security or confidentiality or for virus infection or for statements made by the sender as these are not necessarily made on behalf of the Companies. Reduce waste! Please consider the environment before printing this email

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WONDERFUL ON TAP



Gondolin Land & Water Office.
Quayside Street,
Leith,
Edinburgh,
EH6 6EJ

F.A.O: James Macintosh

14/09/2023

Severn Trent Water Ltd
Leicester Water Centre
Gorse Hill
Anstey
Leicester
LE7 7GU

www.stwater.co.uk

Email:
Network.Solutions@SevernTrent.co.uk
Page Barot
Tel:
Our ref: 1094153

Dear Sir/Madam,

**Proposed Development: (4 Dwellings) Shaw Lane, Markfield,
Stanton Under Bardon, LE67 9PW, 446289, 311724**

I refer to your 'Development Enquiry Request' in respect of the above named site. Please find enclosed the sewer records that are included in the fee together with the Supplementary Guidance Notes (SGN) which refer to surface water disposal from development sites.

Protective Strip

Sewer Records show a public 150mm combined sewer and associated manhole within the site's northern boundary. This sewer will require a 6m clearance about the pipe's centreline (3m each side) where no planting of trees or construction shall be permitted.

Due to a change in legislation on 1 October 2011 there may be former private sewers on the site which have transferred to the responsibility of Severn Trent Water Ltd, which are not shown on the statutory sewer records, but are located in your client's land. These sewers would require protective strips of 3 metres either side of the sewer's centreline that we will not allow to be built over. If such sewers are identified to be present on the site, please contact us for further guidance.

Please note: there is no guarantee that you will be able to build over or close to any Severn Trent sewers, and where a diversion is required there is no guarantee that you will be able to undertake those works on a self-lay basis. Every approach to build near to or

divert our assets has to be assessed on its own merit and the decision of what is or isn't permissible is taken based on the risk to the asset and the wider catchment it serves. It is vital therefore that you contact us at the earliest opportunity to discuss the implications of our assets crossing your site. Failure to do so could significantly affect the costs and timescales of your project if it transpires diversionary works need to be carried out by Severn Trent.

Foul Water Drainage

The combined sewer, MH SK46112702 and SK46113701 throughout the north of the site would be the most suitable connection point for your development. An option to create your own MH chamber should be investigated. This will prevent having to gain 3rd party access. The network can accommodate flows for 4 Dwellings. Therefore, a connection is acceptable to the company subject to a S106 submission.

Surface Water Drainage

Sewer records show a watercourse that runs west of the site. I suggest further investigation is carried out. It is advised to pursue a connection to this if feasible, with flow rates to be agreed by the LLFA.

As a last resort, a connection to the combined sewer 150mm running across the north of the site can be considered with flows restricted with accordance to greenfield conditions 0.4 l/s and would be subject to formal 106 approval.

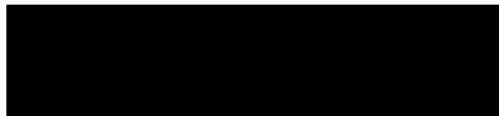
Connections

For any new connections (including the re-use of existing connections) to the public sewerage system, the developer will need to submit a Section 106 application form. Our Developer Services department are responsible for handling all new connections enquiries and applications. To contact them for an application form and associated guidance notes please call 0800 7076600 or download from www.stwater.co.uk.

Please quote the above reference in any future correspondence (including e-mails) with STW Limited. Please note that Developer

Enquiry responses are only valid for 6 months from the date of this letter.

Yours sincerely



Page Barot
Network Solutions
Developer Services



Appendix D

MicroDrainage Modelling Extracts

Gondolin Land & Water Ltd		Page 1
35/1 Balfour Street Edinburgh EH6 5DL	Shaw Lane, Markfield SuDS Design	
Date 29/11/2023 17:23 File Shaw Lane SuDS Design.SRCX	Designed by JM Checked by SD	
Innovyze	Source Control 2020.1.3	

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	20.500	Shortest Storm (mins)	15
Ratio R	0.400	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.110

Time (mins)	Area
From:	To: (ha)
0	4 0.110

Gondolin Land & Water Ltd		Page 2
35/1 Balfour Street Edinburgh EH6 5DL	Shaw Lane, Markfield SuDS Design	
Date 29/11/2023 17:23 File Shaw Lane SuDS Design.SRCX	Designed by JM Checked by SD	
Innovyze	Source Control 2020.1.3	

Model Details

Storage is Online Cover Level (m) 0.660

Cellular Storage Structure

Invert Level (m) 0.000 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m) Area (m²) Inf. Area (m²)

0.000 227.7 0.0

Hydro-Brake® Optimum Outflow Control

Unit Reference MD-SHE-0031-4000-0660-4000
Design Head (m) 0.660
Design Flow (l/s) 0.4
Flush-Flo™ Calculated
Objective Minimise upstream storage
Application Surface
Sump Available Yes
Diameter (mm) 31
Invert Level (m) 0.000
Minimum Outlet Pipe Diameter (mm) 75
Suggested Manhole Diameter (mm) 1200

Control Points Head (m) Flow (l/s)

Design Point (Calculated) 0.660 0.4
Flush-Flo™ 0.139 0.3
Kick-Flo® 0.280 0.3
Mean Flow over Head Range - 0.3

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	0.3	1.200	0.5	3.000	0.8	7.000	1.1
0.200	0.3	1.400	0.6	3.500	0.8	7.500	1.2
0.300	0.3	1.600	0.6	4.000	0.9	8.000	1.2
0.400	0.3	1.800	0.6	4.500	0.9	8.500	1.3
0.500	0.4	2.000	0.6	5.000	1.0	9.000	1.3
0.600	0.4	2.200	0.7	5.500	1.0	9.500	1.3
0.800	0.4	2.400	0.7	6.000	1.1		
1.000	0.5	2.600	0.7	6.500	1.1		

Gondolin Land & Water Ltd		Page 5																																																																																																																																																																																																																																																																																		
35/1 Balfour Street Edinburgh EH6 5DL		Shaw Lane, Markfield SuDS Design																																																																																																																																																																																																																																																																																		
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Innovyze		Source Control 2020.1.3																																																																																																																																																																																																																																																																																		
Summary of Results for 10 year Return Period Half Drain Time : 872 minutes. <table><thead><tr><th>Storm Event</th><th>Max Level (m)</th><th>Max Depth (m)</th><th>Max Infiltration (l/s)</th><th>Max Control E (l/s)</th><th>Max Outflow (l/s)</th><th>Max Volume (m³)</th><th>Status</th></tr></thead><tbody><tr><td>15 min Summer</td><td>0.058</td><td>0.058</td><td>0.0</td><td>0.3</td><td>0.3</td><td>12.5</td><td>O K</td></tr><tr><td>30 min Summer</td><td>0.074</td><td>0.074</td><td>0.0</td><td>0.3</td><td>0.3</td><td>16.0</td><td>O K</td></tr><tr><td>60 min Summer</td><td>0.091</td><td>0.091</td><td>0.0</td><td>0.3</td><td>0.3</td><td>19.6</td><td>O K</td></tr><tr><td>120 min Summer</td><td>0.107</td><td>0.107</td><td>0.0</td><td>0.3</td><td>0.3</td><td>23.1</td><td>O K</td></tr><tr><td>180 min Summer</td><td>0.116</td><td>0.116</td><td>0.0</td><td>0.3</td><td>0.3</td><td>25.0</td><td>O K</td></tr><tr><td>240 min Summer</td><td>0.121</td><td>0.121</td><td>0.0</td><td>0.3</td><td>0.3</td><td>26.2</td><td>O K</td></tr><tr><td>360 min Summer</td><td>0.128</td><td>0.128</td><td>0.0</td><td>0.3</td><td>0.3</td><td>27.6</td><td>O K</td></tr><tr><td>480 min Summer</td><td>0.131</td><td>0.131</td><td>0.0</td><td>0.3</td><td>0.3</td><td>28.4</td><td>O K</td></tr><tr><td>600 min Summer</td><td>0.132</td><td>0.132</td><td>0.0</td><td>0.3</td><td>0.3</td><td>28.6</td><td>O K</td></tr><tr><td>720 min Summer</td><td>0.133</td><td>0.133</td><td>0.0</td><td>0.3</td><td>0.3</td><td>28.7</td><td>O K</td></tr><tr><td>960 min Summer</td><td>0.133</td><td>0.133</td><td>0.0</td><td>0.3</td><td>0.3</td><td>28.8</td><td>O K</td></tr><tr><td>1440 min Summer</td><td>0.131</td><td>0.131</td><td>0.0</td><td>0.3</td><td>0.3</td><td>28.4</td><td>O K</td></tr><tr><td>2160 min Summer</td><td>0.126</td><td>0.126</td><td>0.0</td><td>0.3</td><td>0.3</td><td>27.3</td><td>O K</td></tr><tr><td>2880 min Summer</td><td>0.120</td><td>0.120</td><td>0.0</td><td>0.3</td><td>0.3</td><td>25.9</td><td>O K</td></tr><tr><td>4320 min Summer</td><td>0.106</td><td>0.106</td><td>0.0</td><td>0.3</td><td>0.3</td><td>22.9</td><td>O K</td></tr><tr><td>5760 min Summer</td><td>0.093</td><td>0.093</td><td>0.0</td><td>0.3</td><td>0.3</td><td>20.1</td><td>O K</td></tr><tr><td>7200 min Summer</td><td>0.082</td><td>0.082</td><td>0.0</td><td>0.3</td><td>0.3</td><td>17.8</td><td>O K</td></tr><tr><td>8640 min Summer</td><td>0.073</td><td>0.073</td><td>0.0</td><td>0.3</td><td>0.3</td><td>15.8</td><td>O K</td></tr><tr><td>10080 min Summer</td><td>0.066</td><td>0.066</td><td>0.0</td><td>0.3</td><td>0.3</td><td>14.2</td><td>O K</td></tr><tr><td>15 min Winter</td><td>0.065</td><td>0.065</td><td>0.0</td><td>0.3</td><td>0.3</td><td>14.0</td><td>O K</td></tr></tbody></table> <table><thead><tr><th>Storm Event</th><th>Rain (mm/hr)</th><th>Flooded Volume (m³)</th><th>Discharge Volume (m³)</th><th>Time-Peak (mins)</th></tr></thead><tbody><tr><td>15 min Summer</td><td>61.473</td><td>0.0</td><td>10.6</td><td>19</td></tr><tr><td>30 min Summer</td><td>39.705</td><td>0.0</td><td>13.9</td><td>34</td></tr><tr><td>60 min Summer</td><td>24.606</td><td>0.0</td><td>19.1</td><td>64</td></tr><tr><td>120 min Summer</td><td>14.865</td><td>0.0</td><td>23.2</td><td>122</td></tr><tr><td>180 min Summer</td><td>10.981</td><td>0.0</td><td>25.8</td><td>182</td></tr><tr><td>240 min Summer</td><td>8.832</td><td>0.0</td><td>27.6</td><td>242</td></tr><tr><td>360 min Summer</td><td>6.491</td><td>0.0</td><td>30.4</td><td>362</td></tr><tr><td>480 min Summer</td><td>5.212</td><td>0.0</td><td>32.5</td><td>480</td></tr><tr><td>600 min Summer</td><td>4.394</td><td>0.0</td><td>34.2</td><td>596</td></tr><tr><td>720 min Summer</td><td>3.821</td><td>0.0</td><td>35.5</td><td>646</td></tr><tr><td>960 min Summer</td><td>3.064</td><td>0.0</td><td>37.7</td><td>762</td></tr><tr><td>1440 min Summer</td><td>2.243</td><td>0.0</td><td>40.2</td><td>1024</td></tr><tr><td>2160 min Summer</td><td>1.641</td><td>0.0</td><td>47.8</td><td>1428</td></tr><tr><td>2880 min Summer</td><td>1.314</td><td>0.0</td><td>51.0</td><td>1844</td></tr><tr><td>4320 min Summer</td><td>0.960</td><td>0.0</td><td>55.5</td><td>2636</td></tr><tr><td>5760 min Summer</td><td>0.768</td><td>0.0</td><td>60.4</td><td>3400</td></tr><tr><td>7200 min Summer</td><td>0.646</td><td>0.0</td><td>63.5</td><td>4112</td></tr><tr><td>8640 min Summer</td><td>0.561</td><td>0.0</td><td>65.9</td><td>4840</td></tr><tr><td>10080 min Summer</td><td>0.498</td><td>0.0</td><td>67.9</td><td>5552</td></tr><tr><td>15 min Winter</td><td>61.473</td><td>0.0</td><td>12.0</td><td>19</td></tr></tbody></table>				Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control E (l/s)	Max Outflow (l/s)	Max Volume (m³)	Status	15 min Summer	0.058	0.058	0.0	0.3	0.3	12.5	O K	30 min Summer	0.074	0.074	0.0	0.3	0.3	16.0	O K	60 min Summer	0.091	0.091	0.0	0.3	0.3	19.6	O K	120 min Summer	0.107	0.107	0.0	0.3	0.3	23.1	O K	180 min Summer	0.116	0.116	0.0	0.3	0.3	25.0	O K	240 min Summer	0.121	0.121	0.0	0.3	0.3	26.2	O K	360 min Summer	0.128	0.128	0.0	0.3	0.3	27.6	O K	480 min Summer	0.131	0.131	0.0	0.3	0.3	28.4	O K	600 min Summer	0.132	0.132	0.0	0.3	0.3	28.6	O K	720 min Summer	0.133	0.133	0.0	0.3	0.3	28.7	O K	960 min Summer	0.133	0.133	0.0	0.3	0.3	28.8	O K	1440 min Summer	0.131	0.131	0.0	0.3	0.3	28.4	O K	2160 min Summer	0.126	0.126	0.0	0.3	0.3	27.3	O K	2880 min Summer	0.120	0.120	0.0	0.3	0.3	25.9	O K	4320 min Summer	0.106	0.106	0.0	0.3	0.3	22.9	O K	5760 min Summer	0.093	0.093	0.0	0.3	0.3	20.1	O K	7200 min Summer	0.082	0.082	0.0	0.3	0.3	17.8	O K	8640 min Summer	0.073	0.073	0.0	0.3	0.3	15.8	O K	10080 min Summer	0.066	0.066	0.0	0.3	0.3	14.2	O K	15 min Winter	0.065	0.065	0.0	0.3	0.3	14.0	O K	Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)	15 min Summer	61.473	0.0	10.6	19	30 min Summer	39.705	0.0	13.9	34	60 min Summer	24.606	0.0	19.1	64	120 min Summer	14.865	0.0	23.2	122	180 min Summer	10.981	0.0	25.8	182	240 min Summer	8.832	0.0	27.6	242	360 min Summer	6.491	0.0	30.4	362	480 min Summer	5.212	0.0	32.5	480	600 min Summer	4.394	0.0	34.2	596	720 min Summer	3.821	0.0	35.5	646	960 min Summer	3.064	0.0	37.7	762	1440 min Summer	2.243	0.0	40.2	1024	2160 min Summer	1.641	0.0	47.8	1428	2880 min Summer	1.314	0.0	51.0	1844	4320 min Summer	0.960	0.0	55.5	2636	5760 min Summer	0.768	0.0	60.4	3400	7200 min Summer	0.646	0.0	63.5	4112	8640 min Summer	0.561	0.0	65.9	4840	10080 min Summer	0.498	0.0	67.9	5552	15 min Winter	61.473	0.0	12.0	19
Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control E (l/s)	Max Outflow (l/s)	Max Volume (m³)	Status																																																																																																																																																																																																																																																																													
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2160 min Summer	1.641	0.0	47.8	1428																																																																																																																																																																																																																																																																																
2880 min Summer	1.314	0.0	51.0	1844																																																																																																																																																																																																																																																																																
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Summary of Results for 30 year Return Period

Half Drain Time : 1137 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	0.074	0.074	0.0	0.3	0.3	15.9	O K
30 min Summer	0.095	0.095	0.0	0.3	0.3	20.6	O K
60 min Summer	0.117	0.117	0.0	0.3	0.3	25.3	O K
120 min Summer	0.138	0.138	0.0	0.3	0.3	29.9	O K
180 min Summer	0.150	0.150	0.0	0.3	0.3	32.4	O K
240 min Summer	0.157	0.157	0.0	0.3	0.3	34.0	O K
360 min Summer	0.166	0.166	0.0	0.3	0.3	35.9	O K
480 min Summer	0.171	0.171	0.0	0.3	0.3	37.0	O K
600 min Summer	0.174	0.174	0.0	0.3	0.3	37.6	O K
720 min Summer	0.175	0.175	0.0	0.3	0.3	37.8	O K
960 min Summer	0.174	0.174	0.0	0.3	0.3	37.7	O K
1440 min Summer	0.171	0.171	0.0	0.3	0.3	37.0	O K
2160 min Summer	0.165	0.165	0.0	0.3	0.3	35.6	O K
2880 min Summer	0.157	0.157	0.0	0.3	0.3	33.9	O K
4320 min Summer	0.140	0.140	0.0	0.3	0.3	30.2	O K
5760 min Summer	0.124	0.124	0.0	0.3	0.3	26.7	O K
7200 min Summer	0.109	0.109	0.0	0.3	0.3	23.7	O K
8640 min Summer	0.097	0.097	0.0	0.3	0.3	21.0	O K
10080 min Summer	0.087	0.087	0.0	0.3	0.3	18.7	O K
15 min Winter	0.082	0.082	0.0	0.3	0.3	17.8	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	78.048	0.0	13.7	19
30 min Summer	50.792	0.0	17.8	34
60 min Summer	31.593	0.0	24.7	64
120 min Summer	19.064	0.0	29.9	124
180 min Summer	14.032	0.0	33.0	182
240 min Summer	11.238	0.0	35.1	242
360 min Summer	8.217	0.0	38.4	362
480 min Summer	6.574	0.0	40.7	482
600 min Summer	5.525	0.0	42.4	600
720 min Summer	4.793	0.0	43.8	720
960 min Summer	3.827	0.0	45.5	874
1440 min Summer	2.783	0.0	46.2	1110
2160 min Summer	2.022	0.0	59.0	1492
2880 min Summer	1.611	0.0	62.5	1904
4320 min Summer	1.168	0.0	67.3	2720
5760 min Summer	0.929	0.0	73.2	3464
7200 min Summer	0.778	0.0	76.5	4248
8640 min Summer	0.673	0.0	79.2	5008
10080 min Summer	0.595	0.0	81.3	5656
15 min Winter	78.048	0.0	15.4	19

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Summary of Results for 30 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
30 min Winter	0.107	0.107	0.0	0.3	0.3	23.1	O K
60 min Winter	0.131	0.131	0.0	0.3	0.3	28.4	O K
120 min Winter	0.156	0.156	0.0	0.3	0.3	33.7	O K
180 min Winter	0.169	0.169	0.0	0.3	0.3	36.5	O K
240 min Winter	0.177	0.177	0.0	0.3	0.3	38.3	O K
360 min Winter	0.188	0.188	0.0	0.3	0.3	40.7	O K
480 min Winter	0.194	0.194	0.0	0.3	0.3	42.1	O K
600 min Winter	0.198	0.198	0.0	0.3	0.3	42.9	O K
720 min Winter	0.200	0.200	0.0	0.3	0.3	43.3	O K
960 min Winter	0.201	0.201	0.0	0.3	0.3	43.5	O K
1440 min Winter	0.196	0.196	0.0	0.3	0.3	42.3	O K
2160 min Winter	0.186	0.186	0.0	0.3	0.3	40.3	O K
2880 min Winter	0.174	0.174	0.0	0.3	0.3	37.7	O K
4320 min Winter	0.148	0.148	0.0	0.3	0.3	32.1	O K
5760 min Winter	0.124	0.124	0.0	0.3	0.3	26.9	O K
7200 min Winter	0.104	0.104	0.0	0.3	0.3	22.4	O K
8640 min Winter	0.087	0.087	0.0	0.3	0.3	18.7	O K
10080 min Winter	0.073	0.073	0.0	0.3	0.3	15.8	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
30 min Winter	50.792	0.0	19.8	33
60 min Winter	31.593	0.0	27.7	62
120 min Winter	19.064	0.0	33.5	122
180 min Winter	14.032	0.0	36.8	180
240 min Winter	11.238	0.0	39.2	238
360 min Winter	8.217	0.0	42.7	356
480 min Winter	6.574	0.0	45.0	472
600 min Winter	5.525	0.0	46.7	584
720 min Winter	4.793	0.0	47.8	698
960 min Winter	3.827	0.0	48.8	916
1440 min Winter	2.783	0.0	47.9	1198
2160 min Winter	2.022	0.0	66.0	1624
2880 min Winter	1.611	0.0	69.9	2076
4320 min Winter	1.168	0.0	75.1	2940
5760 min Winter	0.929	0.0	82.0	3744
7200 min Winter	0.778	0.0	85.7	4472
8640 min Winter	0.673	0.0	88.8	5192
10080 min Winter	0.595	0.0	91.2	5856

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Innovyze	Source Control 2020.1.3	

Summary of Results for 100 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
30 min Winter	0.140	0.140	0.0	0.3	0.3	30.3	O K
60 min Winter	0.174	0.174	0.0	0.3	0.3	37.5	O K
120 min Winter	0.206	0.206	0.0	0.3	0.3	44.6	O K
180 min Winter	0.224	0.224	0.0	0.3	0.3	48.4	O K
240 min Winter	0.235	0.235	0.0	0.3	0.3	50.7	O K
360 min Winter	0.249	0.249	0.0	0.3	0.3	53.9	O K
480 min Winter	0.259	0.259	0.0	0.3	0.3	55.9	O K
600 min Winter	0.265	0.265	0.0	0.3	0.3	57.2	O K
720 min Winter	0.268	0.268	0.0	0.3	0.3	58.1	O K
960 min Winter	0.272	0.272	0.0	0.3	0.3	58.8	O K
1440 min Winter	0.269	0.269	0.0	0.3	0.3	58.2	O K
2160 min Winter	0.255	0.255	0.0	0.3	0.3	55.1	O K
2880 min Winter	0.241	0.241	0.0	0.3	0.3	52.0	O K
4320 min Winter	0.210	0.210	0.0	0.3	0.3	45.4	O K
5760 min Winter	0.180	0.180	0.0	0.3	0.3	38.9	O K
7200 min Winter	0.153	0.153	0.0	0.3	0.3	33.0	O K
8640 min Winter	0.129	0.129	0.0	0.3	0.3	27.9	O K
10080 min Winter	0.109	0.109	0.0	0.3	0.3	23.5	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
30 min Winter	66.528	0.0	24.6	33
60 min Winter	41.548	0.0	36.4	64
120 min Winter	25.038	0.0	43.5	122
180 min Winter	18.356	0.0	47.2	180
240 min Winter	14.633	0.0	49.3	240
360 min Winter	10.641	0.0	51.5	358
480 min Winter	8.478	0.0	52.0	474
600 min Winter	7.102	0.0	51.8	590
720 min Winter	6.143	0.0	51.2	706
960 min Winter	4.882	0.0	50.0	934
1440 min Winter	3.526	0.0	47.7	1382
2160 min Winter	2.543	0.0	82.5	1756
2880 min Winter	2.014	0.0	86.4	2188
4320 min Winter	1.448	0.0	88.5	3068
5760 min Winter	1.145	0.0	101.1	3920
7200 min Winter	0.954	0.0	105.2	4688
8640 min Winter	0.821	0.0	108.5	5448
10080 min Winter	0.723	0.0	111.1	6152

Gondolin Land & Water Ltd

Page 11

35/1 Balfour Street
Edinburgh
EH6 5DL

Date 29/11/2023 17:22
File Shaw Lane SuDS Design.SRCX

Shaw Lane, Markfield
SuDS Design

Designed by JM
Checked by SD

Micro Drainage

Innovyze

Source Control 2020.1.3

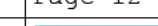
Summary of Results for 100 year Return Period (+40%)

Half Drain Time : 2283 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max E Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	0.134	0.134	0.0	0.3	0.3	29.0	O K
30 min Summer	0.176	0.176	0.0	0.3	0.3	38.0	O K
60 min Summer	0.218	0.218	0.0	0.3	0.3	47.1	O K
120 min Summer	0.259	0.259	0.0	0.3	0.3	56.1	O K
180 min Summer	0.282	0.282	0.0	0.3	0.3	61.1	O K
240 min Summer	0.297	0.297	0.0	0.3	0.3	64.2	O K
360 min Summer	0.317	0.317	0.0	0.3	0.3	68.7	O K
480 min Summer	0.331	0.331	0.0	0.3	0.3	71.5	O K
600 min Summer	0.339	0.339	0.0	0.3	0.3	73.4	O K
720 min Summer	0.346	0.346	0.0	0.3	0.3	74.7	O K
960 min Summer	0.352	0.352	0.0	0.3	0.3	76.2	O K
1440 min Summer	0.354	0.354	0.0	0.3	0.3	76.7	O K
2160 min Summer	0.344	0.344	0.0	0.3	0.3	74.5	O K
2880 min Summer	0.333	0.333	0.0	0.3	0.3	72.1	O K
4320 min Summer	0.311	0.311	0.0	0.3	0.3	67.2	O K
5760 min Summer	0.288	0.288	0.0	0.3	0.3	62.3	O K
7200 min Summer	0.263	0.263	0.0	0.3	0.3	57.0	O K
8640 min Summer	0.241	0.241	0.0	0.3	0.3	52.2	O K
10080 min Summer	0.221	0.221	0.0	0.3	0.3	47.7	O K
15 min Winter	0.150	0.150	0.0	0.3	0.3	32.6	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	141.940	0.0	23.8	19
30 min Summer	93.140	0.0	27.1	34
60 min Summer	58.167	0.0	45.0	64
120 min Summer	35.053	0.0	51.6	124
180 min Summer	25.698	0.0	52.9	184
240 min Summer	20.487	0.0	52.7	244
360 min Summer	14.897	0.0	51.8	362
480 min Summer	11.869	0.0	50.9	482
600 min Summer	9.943	0.0	50.2	602
720 min Summer	8.600	0.0	49.6	722
960 min Summer	6.835	0.0	48.4	962
1440 min Summer	4.937	0.0	46.4	1440
2160 min Summer	3.560	0.0	97.2	1928
2880 min Summer	2.820	0.0	94.9	2280
4320 min Summer	2.028	0.0	86.7	3068
5760 min Summer	1.603	0.0	126.3	3920
7200 min Summer	1.335	0.0	131.3	4680
8640 min Summer	1.149	0.0	135.5	5448
10080 min Summer	1.012	0.0	138.8	6248
15 min Winter	141.940	0.0	25.6	19

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Gondolin Land & Water Ltd		Page 12
35/1 Balfour Street Edinburgh EH6 5DL	Shaw Lane, Markfield SuDS Design	
Date 29/11/2023 17:22 File Shaw Lane SuDS Design.SRCX	Designed by JM Checked by SD	
Innovyze	Source Control 2020.1.3	

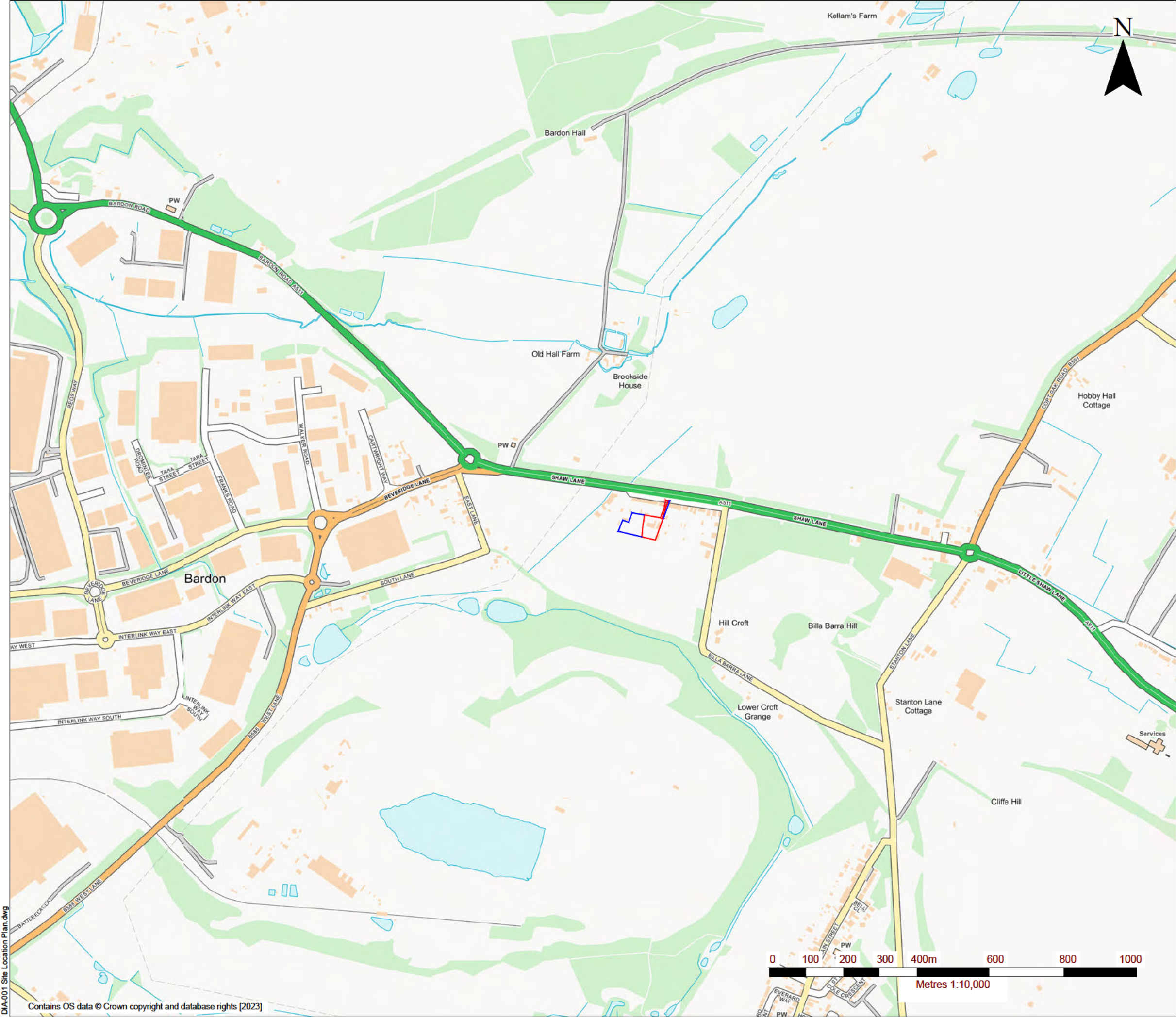
Summary of Results for 100 year Return Period (+40%)

Storm Event	Max	Max	Max	Max	Max	Max	Status
	Level (m)	Depth (m)	Infiltration (l/s)	Control (l/s)	Σ Outflow (l/s)	Volume (m³)	
30 min Winter	0.197	0.197	0.0	0.3	0.3	42.6	O K
60 min Winter	0.244	0.244	0.0	0.3	0.3	52.9	O K
120 min Winter	0.292	0.292	0.0	0.3	0.3	63.1	O K
180 min Winter	0.318	0.318	0.0	0.3	0.3	68.7	O K
240 min Winter	0.334	0.334	0.0	0.3	0.3	72.3	O K
360 min Winter	0.358	0.358	0.0	0.3	0.3	77.4	O K
480 min Winter	0.373	0.373	0.0	0.3	0.3	80.7	O K
600 min Winter	0.384	0.384	0.0	0.3	0.3	83.0	O K
720 min Winter	0.391	0.391	0.0	0.3	0.3	84.6	O K
960 min Winter	0.400	0.400	0.0	0.3	0.3	86.6	O K
1440 min Winter	0.406	0.406	0.0	0.3	0.3	87.8	O K
2160 min Winter	0.398	0.398	0.0	0.3	0.3	86.1	O K
2880 min Winter	0.383	0.383	0.0	0.3	0.3	82.9	O K
4320 min Winter	0.355	0.355	0.0	0.3	0.3	76.8	O K
5760 min Winter	0.325	0.325	0.0	0.3	0.3	70.2	O K
7200 min Winter	0.293	0.293	0.0	0.3	0.3	63.4	O K
8640 min Winter	0.258	0.258	0.0	0.3	0.3	55.7	O K
10080 min Winter	0.226	0.226	0.0	0.3	0.3	48.8	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m ³)	Discharge Volume (m ³)	Time-Peak (mins)
30 min Winter	93.140	0.0	27.5	34
60 min Winter	58.167	0.0	49.4	64
120 min Winter	35.053	0.0	53.2	122
180 min Winter	25.698	0.0	52.7	182
240 min Winter	20.487	0.0	52.2	240
360 min Winter	14.897	0.0	51.3	358
480 min Winter	11.869	0.0	50.7	476
600 min Winter	9.943	0.0	50.2	594
720 min Winter	8.600	0.0	49.7	708
960 min Winter	6.835	0.0	49.0	942
1440 min Winter	4.937	0.0	48.2	1398
2160 min Winter	3.560	0.0	99.9	2052
2880 min Winter	2.820	0.0	96.8	2620
4320 min Winter	2.028	0.0	89.6	3284
5760 min Winter	1.603	0.0	141.3	4208
7200 min Winter	1.335	0.0	146.9	5120
8640 min Winter	1.149	0.0	151.5	5960
10080 min Winter	1.012	0.0	155.1	6664



Drawings



LEGEND

SITE BOUNDARY

LAND OWNERSHIP BOUNDARY

00	11/23	INITIAL ISSUE	GD	SD
REV	DATE	DESCRIPTION	BY	CHK

CLIENT:
MR. MOORE

PROJECT:
SHAW LANE RESIDENTIAL DEVELOPMENT

DRAWING TITLE:
SITE LOCATION PLAN

SCALE:
1: 10,000 @ A3

DATE:
NOVEMBER 2023

DRAWING NUMBER:
DIA-001

REV:
00

DRAWING STATUS:
FOR PLANNING

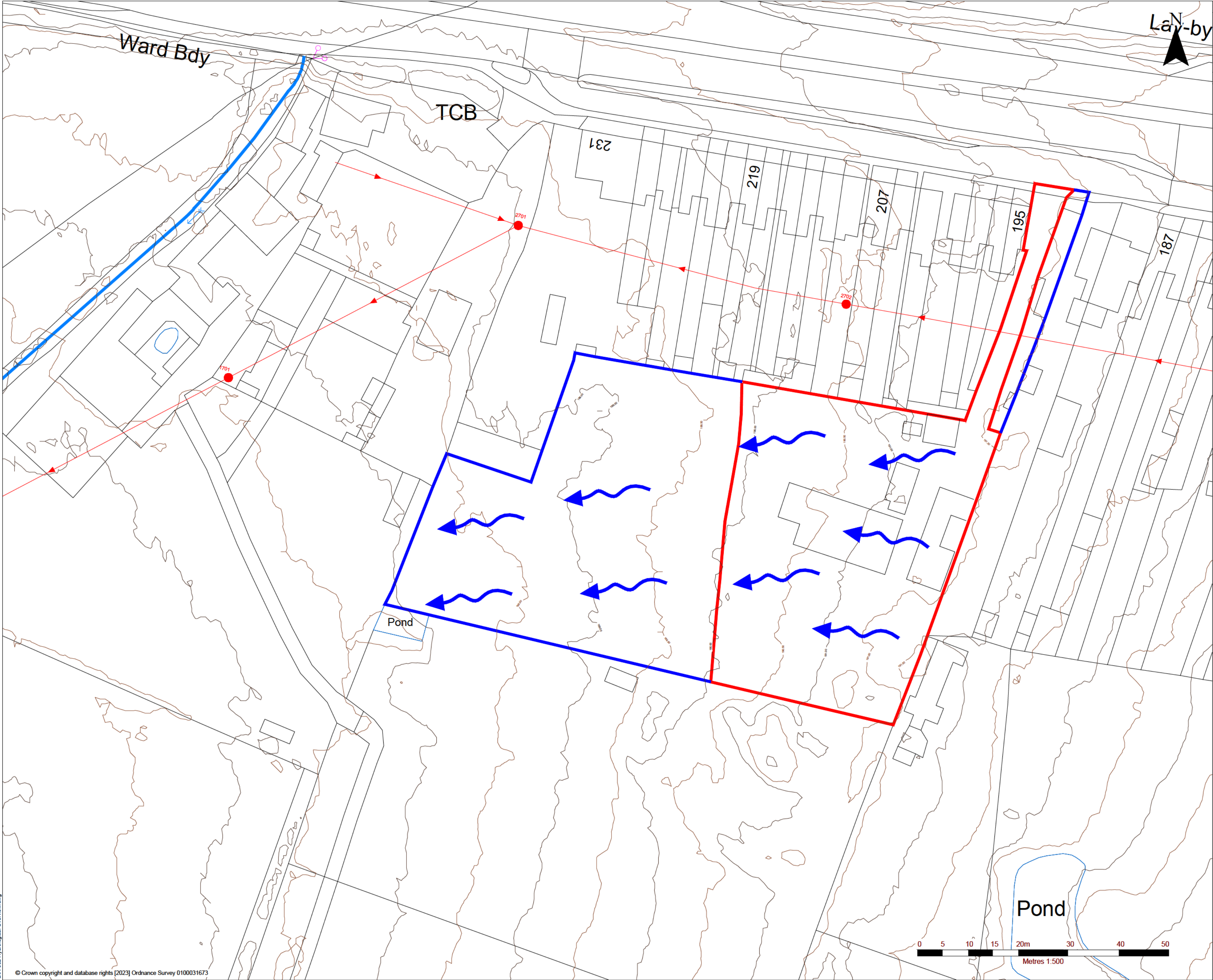
GONDOLIN LAND & WATER LTD
15 Quayside Street
Edinburgh
EH6 6EJ
Registered Company No. SC706920



GONDOLIN
Land & Water

DIA-001 Site Location Plan.dwg

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NOTES

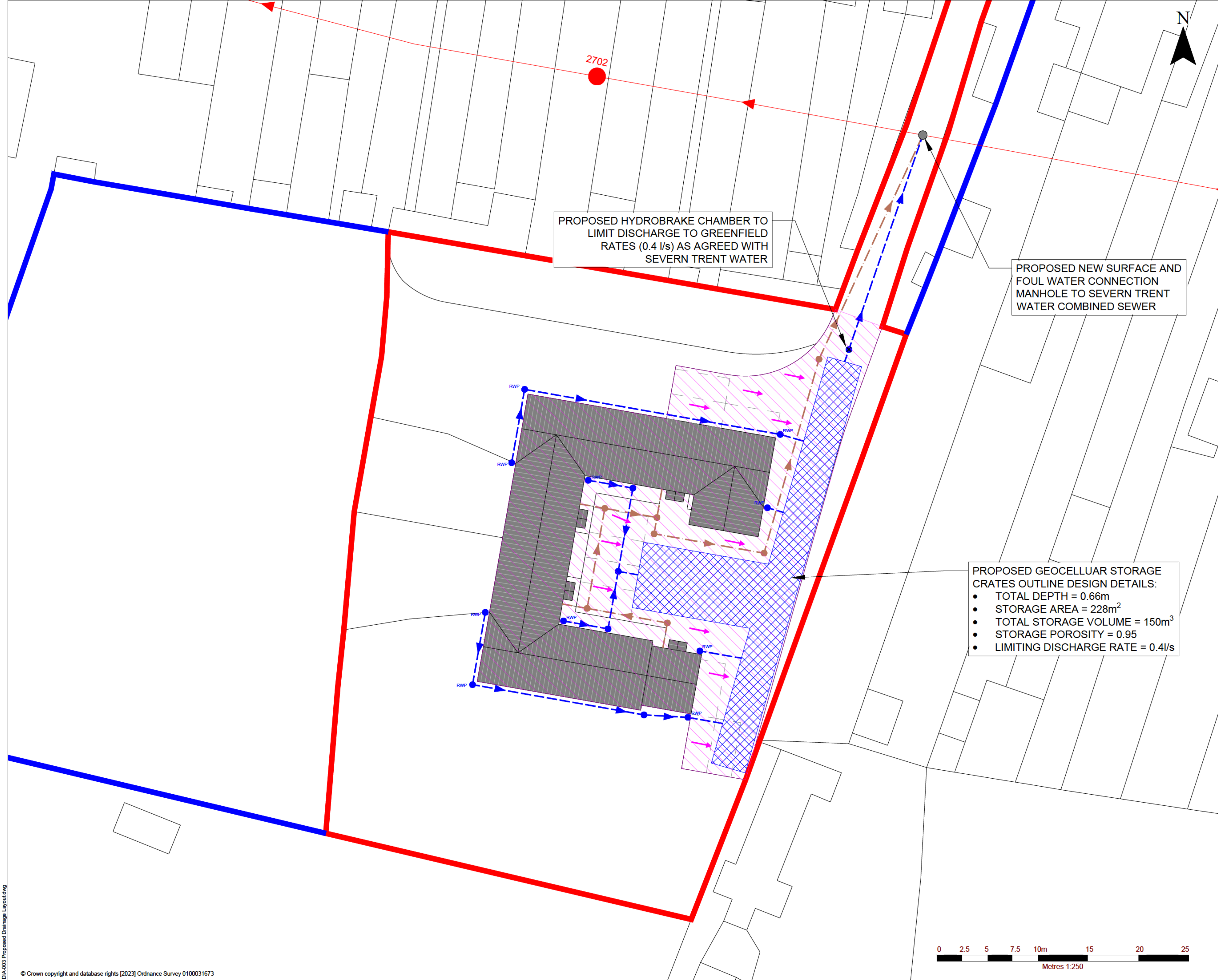
1. CONTOURS DERIVED FROM DATA OBTAINED FROM DEFRA SURVEY DATA.

LEGEND

- SITE BOUNDARY
- SITE OWNERSHIP BOUNDARY
- EXISTING MINOR WATERCOURSE
- EXISTING MAJOR CONTOUR (1m INTERVALS)
- EXISTING MINOR CONTOURS (0.5m INTERVALS)
- SEVERN TRENT WATER COMBINED SEWER
- SEVERN TRENT WATER COMBINED SEWER MANHOLE CHAMBER
- OVERLAND FLOWPATH

00	11/23	INITIAL ISSUE	GD	SD
REV	DATE	DESCRIPTION	BY	CHK
CLIENT: MR. MOORE				
PROJECT: SHAW LANE RESIDENTIAL DEVELOPMENT				
DRAWING TITLE: HYDROLOGICAL OVERVIEW				
SCALE: 1: 500 @ A2		DATE: NOVEMBER 2023		
DRAWING NUMBER: DIA-002		REV: 00		
DRAWING STATUS: FOR PLANNING				
GONDOLIN LAND & WATER LTD 15 Quayside Street Edinburgh EH6 6EJ Registered Company No. SC706920				

GONDOLIN
Land & Water



NOTES

1. DEVELOPMENT LAYOUT PROPOSAL PREPARED BY ANDREW LARGE SURVEYORS LTD.
2. DRAINAGE DESIGN SHOULD BE CONSIDERED PROVISIONAL OUTLINE DETAIL AND NOT FOR CONSTRUCTION.
3. EXISTING COMBINED SEWER ESTIMATED TO BE AT A DEPTH OF AT LEAST 1.2m (BASED ON LOCAL MANHOLE DEPTH DATA PROVIDED BY SEVERN TRENT WATER). DETAILED DESIGN TO CONFIRM DEPTH OF SEWER TO ENSURE GRAVITY DISCHARGE OF SURFACE AND WASTEWATER IS ACHIEVED.

LEGEND

	SITE BOUNDARY
	LAND OWNERSHIP BOUNDARY
	SEVERN TRENT WATER COMBINED SEWER
	SEVERN TRENT WATER COMBINED SEWER MANHOLE CHAMBER
	PROPOSED SURFACE WATER DRAINAGE PIPEWORK
	PROPOSED RAIN WATER PIPE
	PROPOSED SURFACE WATER INSPECTION CHAMBER
	PROPOSED HYDROBRAKE
	PROPOSED STORAGE CRATES
	INDICATIVE SURFACE GRADING
	PROPOSED WASTEWATER DRAINAGE PIPEWORK
	PROPOSED WASTEWATER MANHOLE / INSPECTION CHAMBER
	PROPOSED COMBINED SEWER MANHOLE CHAMBER
	IMPERMEABLE AREA TO BE DRAINED (0.1ha)

00	11/23	INITIAL ISSUE	JM	SD
REV	DATE	DESCRIPTION	BY	CHK

CLIENT:
MR. MOORE

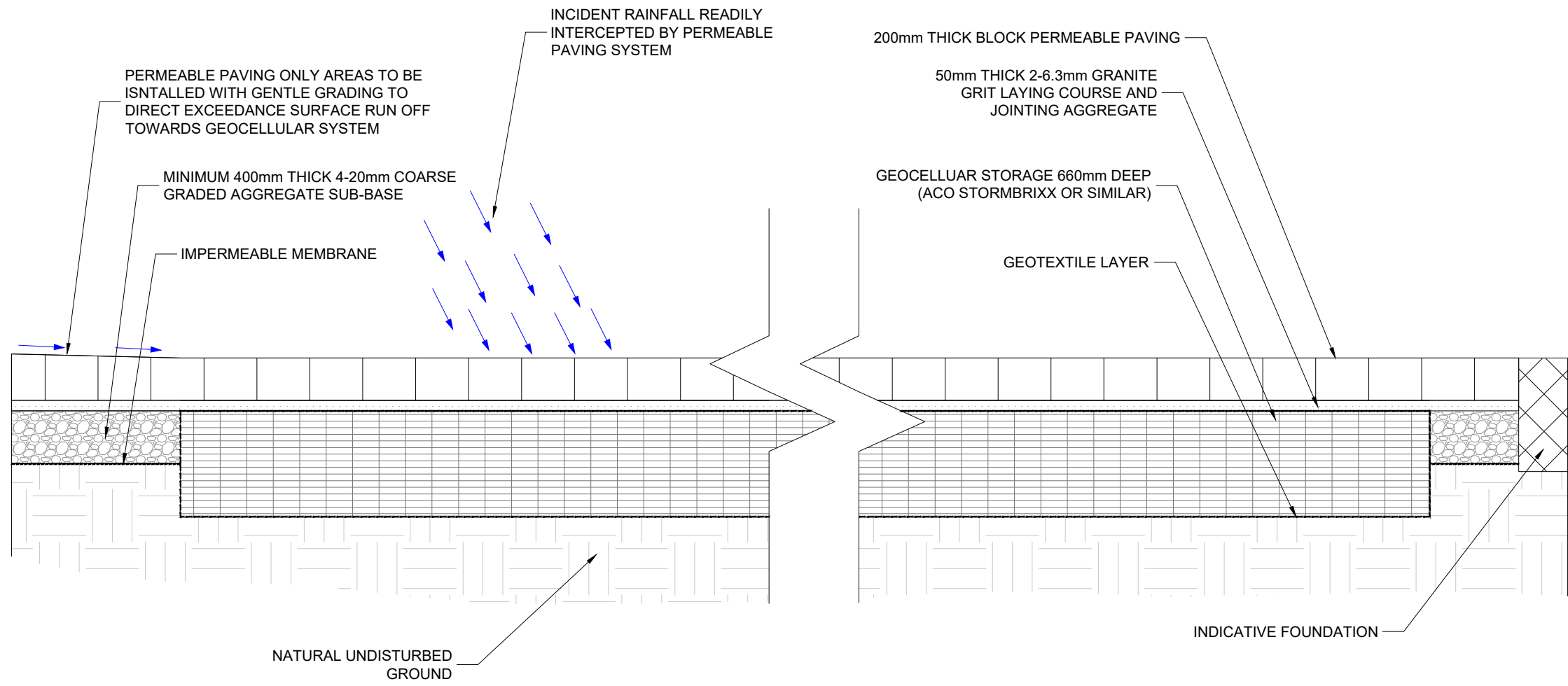
PROJECT:
SHAW LANE RESIDENTIAL DEVELOPMENT

DRAWING TITLE:
PROPOSED DRAINAGE LAYOUT

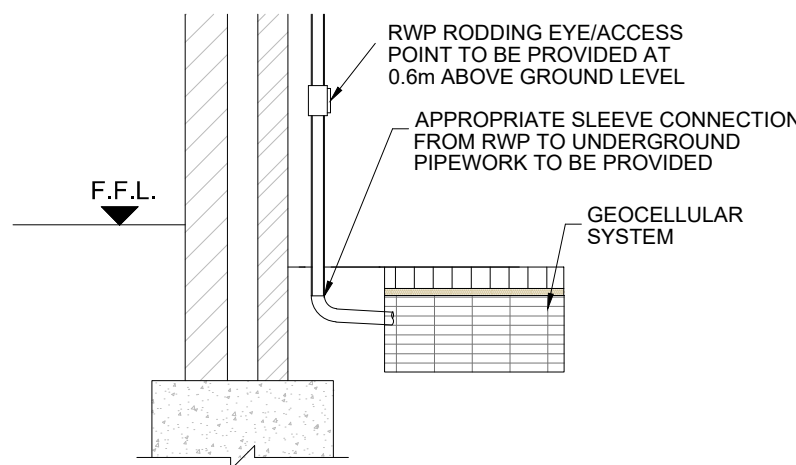
SCALE: 1: 250 @ A2	DATE: NOVEMBER 2023
DRAWING NUMBER: DIA-003	REV: 00
DRAWING STATUS: FOR PLANNING	

GONDOLIN LAND & WATER LTD
15 Quayside Street
Edinburgh
EH6 6EJ
Registered Company No. SC706920

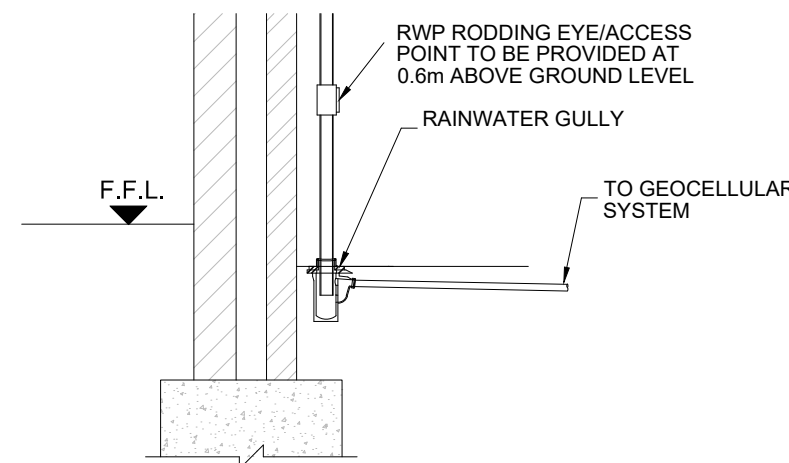
DIA-004_Typical Drainage Details.dwg



TYPICAL PERMEABLE PAVING SYSTEM WITH
GEOCELLULAR SUB-BASE REPLACEMENT SYSTEM



RWP CONNECTION DETAIL
(TO GEOCELLULAR SYSTEM)



RWP CONNECTION DETAIL
(TO PIPEWORK)

NOTE: RIGID PIPES BUILT INTO MANHOLES SHALL HAVE A FLEXIBLE JOINT AS CLOSE AS FEASIBLE TO THE EXTERNAL FACE OF THE STRUCTURE AND THE LENGTH OF THE NEXT ROCKER PIPE SHALL BE AS IN THE TABLE BELOW

MIN ROCKER PIPE LENGTH	
NOMINAL DIAMETER(mm)	L(mm)
150 to 600	600
over 600 to 750	1000
over 750	1250

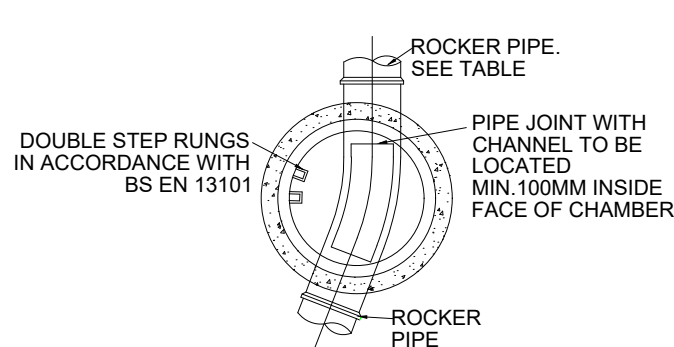
INTERNAL DIAMETER OF CONCRETE MANHOLES	
DIAMETER OF LARGEST PIPE IN MANHOLE (MM)	INTERNAL DIAMETER OF MANHOLE (MM)
LESS THAN 375	1200
375 to 450	1350
450 to 700	1500
750 to 1050	1800
1125 to 1500	2100
>1500	CONSULT SEVERN TRENT

INTERNAL DIAMETER OF INSPECTION CHAMBERS	
DIAMETER OF LARGEST PIPE IN MANHOLE (MM)	DIAMETER OF INSPECTION CHAMBER (MM)
LESS THAN 160	450
160 to 300	600
300 to 450	750

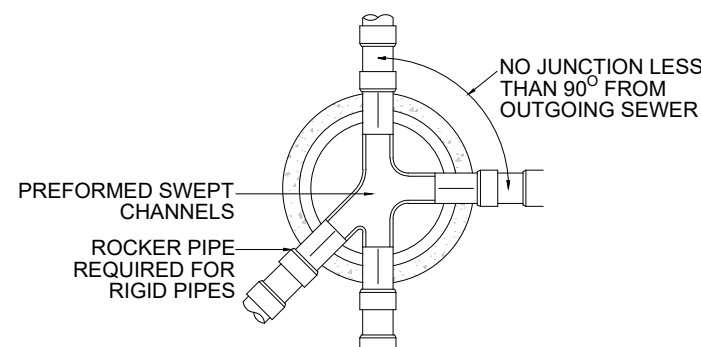


LEGEND

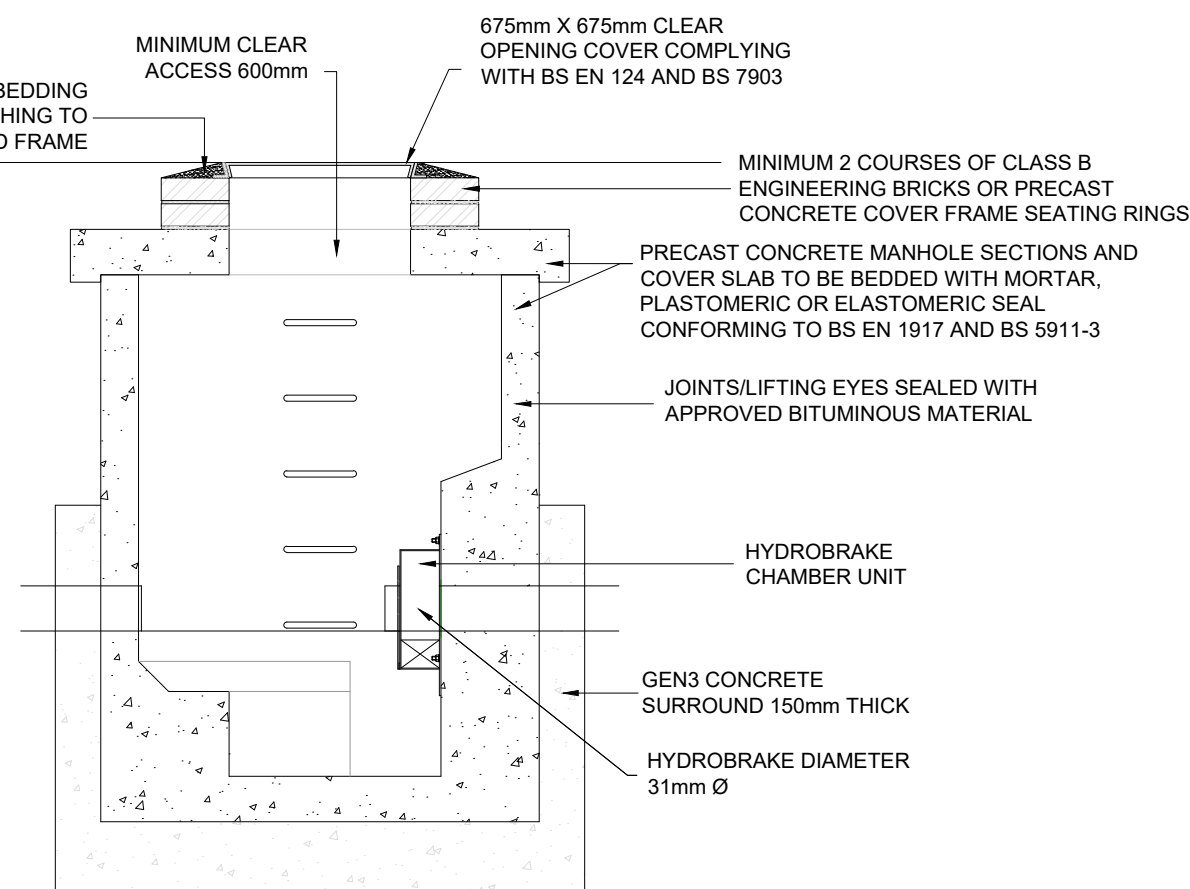
- DRAWING TO BE READ IN CONJUNCTION WITH ALL OTHER DRAWINGS.
- REFER TO DRAWING DIA-003 FOR DRAINAGE LAYOUT.
- ALL DRAINAGE TO BE CONSTRUCTED IN ACCORDANCE WITH SEWERS FOR ADOPTION LATEST EDITION AND / OR MANUFACTURER'S SPECIFICATIONS.
- ALL PIPEWORK TO BE UPVC TO BS 4660 AND BS EN 1401-1, CLASS SN4 WITH FLEXIBLE JOINTS AND KITEMARK CERTIFIED OR SIMILAR APPROVED.
- THE CONTRACTOR IS TO REMAIN RESPONSIBLE FOR THE TEMPORARY STABILITY OF THE SURROUNDING GROUND THROUGHOUT THE CONSTRUCTION.
- BEDDING CLASSES REFER TO THOSE GIVEN IN DMRB VOLUME 4, SECTION 2, PART 5, HA40/01, APPENDIX B.
- DESIGN SHOULD BE CONSIDERED PROVISIONAL. EXACT ALIGNMENTS AND DETAILS TO BE CONFIRMED AT LATER DESIGN STAGES.



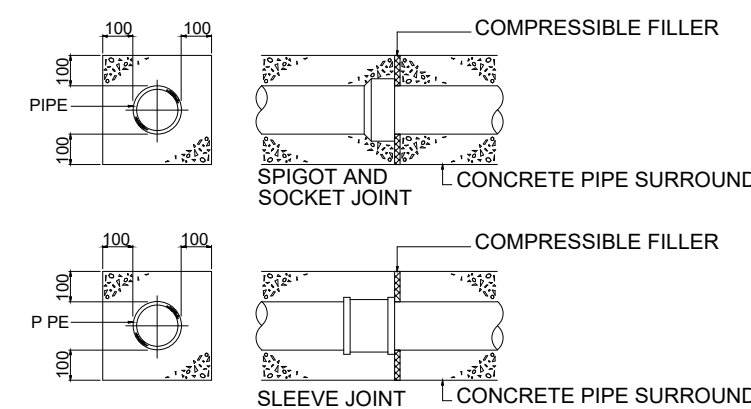
PLAN ON MANHOLE
N.T.S.



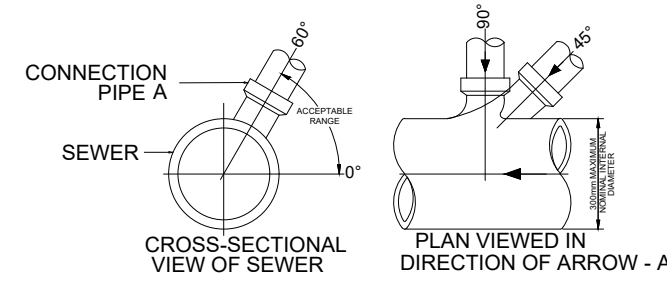
TYPICAL MANHOLE ARRANGEMENT
OF PIPE JUNCTIONS
N.T.S.



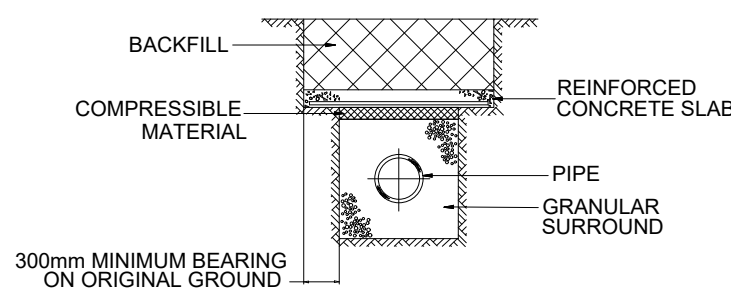
HYDROBRAKE OPTIMUM™ CHAMBER
N.T.S.



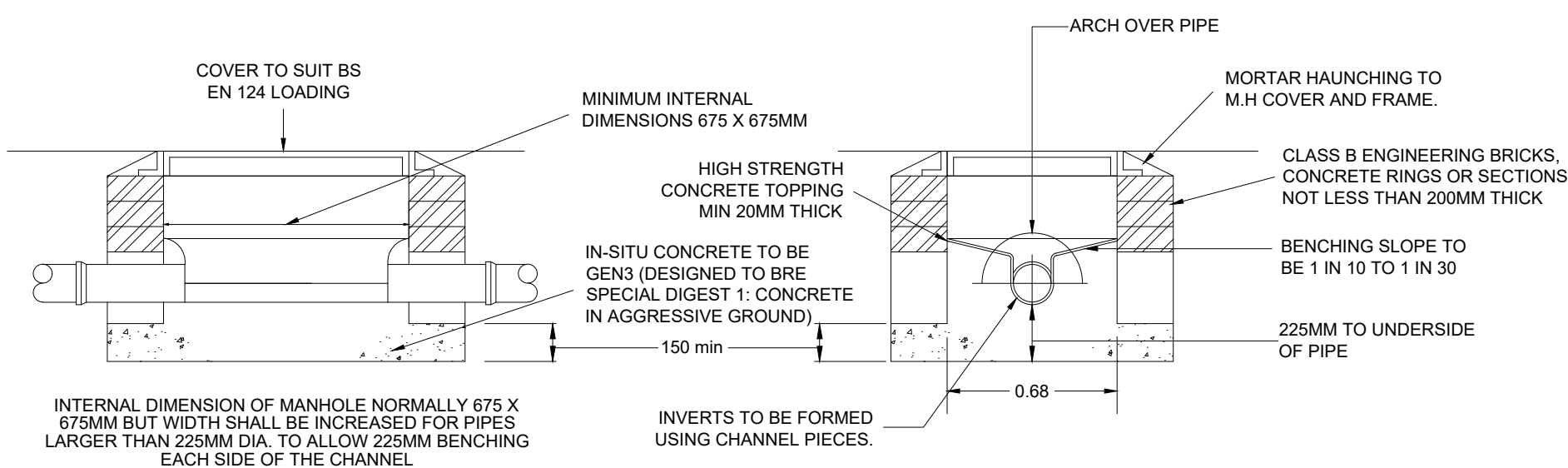
JOINTS FOR CONCRETE ENCASED
PIPES
N.T.S.



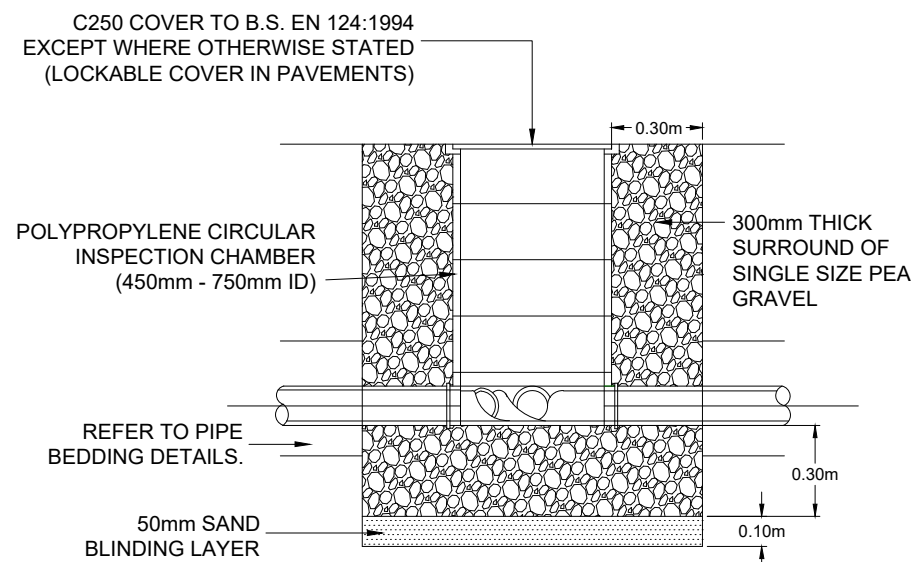
BRANCH SEWER CONNECTION
DETAIL
N.T.S.



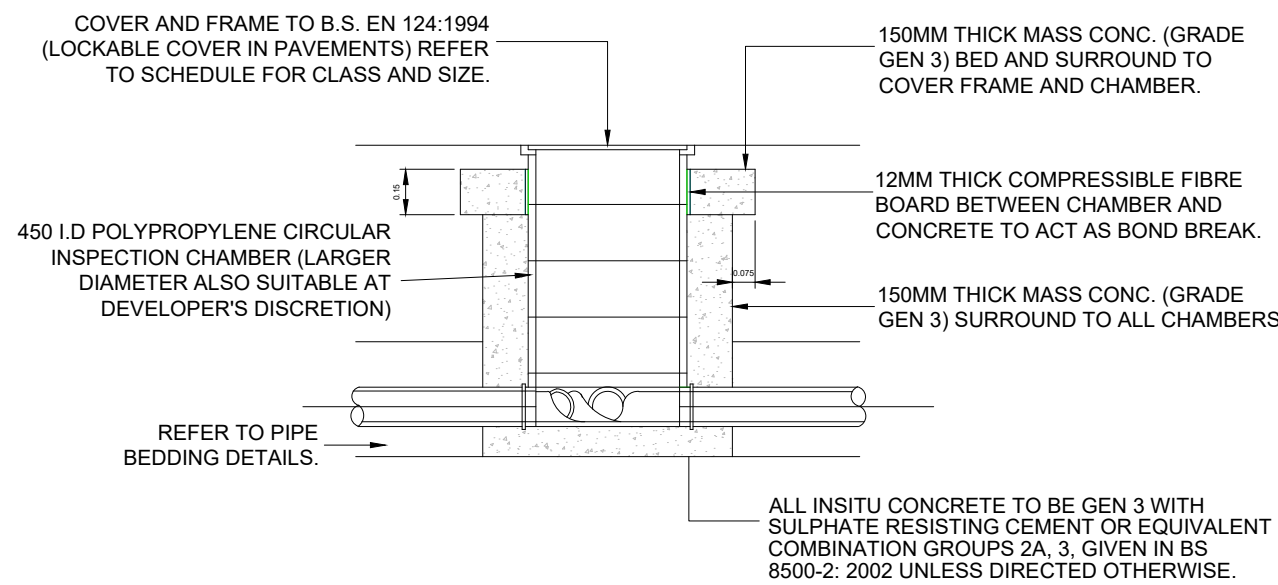
ALTERNATIVE PIPE PROTECTION DETAIL
N.T.S.



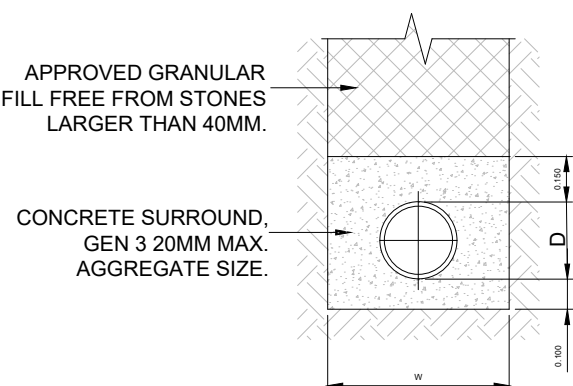
TYPICAL MANHOLE DETAIL - TYPE 4
MAXIMUM DEPTH FROM COVER LEVEL TO SOFFIT OF PIPE 1.5m
N.T.S.



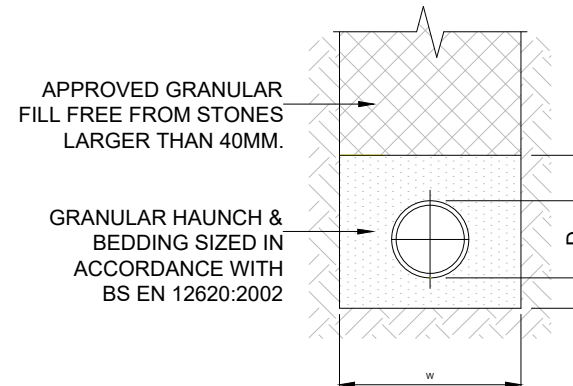
TYPICAL INSPECTION CHAMBER DETAIL
(GRAVEL SURROUND - NON-TRAFFICKED AREAS)
N.T.S.



TYPICAL INSPECTION CHAMBER DETAIL



CLASS 'Z' PIPE BEDDING &
BACKFILLING DETAIL
PIPES WHERE COVER TO CROWN IS LESS THAN 1200MM
UNDER ROADS AND FOOTPATHS



CLASS 'S' PIPE BEDDING &
BACKFILLING DETAIL
PIPES WHERE COVER TO CROWN IS GREATER THAN
1200MM UNDER ROADS AND FOOTPATHS

TRENCH DIMENSIONS					
D	100	150	225	300	375
W	450	600	700	850	1050

TRENCH BEDDING AND FILL MATERIALS	
GRANULAR BEDDING TYPE 'A'	
TYPE	% PASSING BY MASS B.S. 410 SIEVE SIZES (mm)
USE FOR NOMINAL PIPE (DIA.)	63 37.5 20 14 10 5 2.36
A10 <300	- - - 100 85.1 0.25 2.36

NOTE: TYPE 'B' NOT TO BE USED UNDER CARRIAGEWAYS AND PARKING AREAS ON CLAY SITES INDICATED ON SECTIONS. IT IS TO BE SUBSTITUTED BY DOT TYPE 2.

00	11/23	INITIAL ISSUE	GD	SD
REV	DATE	DESCRIPTION	BY	CHK

CLIENT:
MR. MOORE

PROJECT:
SHAW LANE RESIDENTIAL DEVELOPMENT

DRAWING TITLE:
TYPICAL DRAINAGE DETAILS

SCALE:
NOT TO SCALE @ A1

DATE:
NOVEMBER 2023

DRAWING NUMBER:
DIA-004

REV:
00

DRAWING STATUS:
FOR PLANNING

GONDOLIN LAND & WATER LTD
15 Quayside Street
Edinburgh
EH6 6EL
Registered Company No. SC706920





GONDOLIN
Land & Water

Civil Engineering and Environmental Solutions

Gondolin Land and Water Ltd is a small, client friendly environmental and engineering consultancy business based in Scotland with coverage throughout the UK.

Edinburgh Office Address:

15 Quayside Street, Leith, Edinburgh, EH6 6EJ

Website:

gondolinltd.co.uk

Registered Company No:

SC706920

Sectors:

Onshore Renewables & Storage | Infrastructure | Mining and Minerals | Rural Tourism & Recreation |
Property & Urban Regeneration | Corporate, Industrial & Manufacturing | Waste Management