# Causey Drive, Middleton

# Drainage Strategy

# April 2022

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EnviroSolution Ltd is a multidisciplinary consultancy focused on public and private sector clients, predominantly in the land and property management and development field.

EnviroSolution offers a broad set of services that allow the land or property owner or manager to access a suite of services that are not normally available from a single, high quality and professional source.

EnviroSolution has expertise and experience in all aspects of environmental enforcement, regulation and assessment, working in conjunction with the HSE, Local Authorities and Environment Agency. With specific capability in environmental protection and planning policy and control, EnviroSolution has a core knowledge base to assist clients in dealing with Flood Risk and Drainage issues.

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Abbreviations:

LLFA Lead Local Flood Authority

EA Environment Agency

| | |
|---|---|
| UU | United Utilities |
| SuDS | Sustainable Drainage Systems |

# Introduction

EnviroSolution Ltd have been appointed to undertake a Drainage Strategy in relation to a proposed residential development at 1-5 Causey Drive, Middleton, Manchester, M24 5PN.

Rochdale Metropolitan Borough Council as the districts Lead Local Flood Authority (LLFA) require that all planning applications are accompanied by a Sustainable Drainage Strategy. The aim of a drainage strategy is to identify surface water drainage measures such as Sustainable Drainage Systems (SuDS) in order to provide surface water management measures and treatment. The overall goal is to reduce the impact of a development on the surrounding area.

# Existing conditions

The proposed development site measures approximately 450m$^2$ square meters and is located at a National Grid Reference of 385823, 407159. A site location plan is included in Appendix A .

The site is currently a vacant plot of green space with a single small tree located in the south-eastern corner of the site. The site is bounded by existing residential properties to the north and west, Causey Drive to the south and Windermere Road to the east. Access to the site is provided from all sides except for the northern side which is bounded by a 2m tall wooden panel fence.

An existing site plan is included in Appendix A.

## Site Topography

The topography of the site is generally flat with little change in elevation from 122m aOD to the east and 121m aOD to the west.

# Development Proposals

It is understood that the development proposal includes the construction of a three-storey residential apartment building containing 6 no. flats. The final plans include a car park, bin store and cycle storage areas. A proposed development plan is included in Appendix B.

The proposed development will introduce approximately 325m$^2$ of hardstanding areas in the form of roofs and car parking. Hardstanding areas have been measured from the proposed development plan and are approximate only.

# Ground Conditions

Geological maps of the area indicate the site is directly underlain by superficial diamicton deposits which are of Quaternary age. Diamicton generally consists of over-consolidated and unsorted clays, silts, sands and gravels. The underlying bedrock consists of the Pennine Lower Coal Measures Formation which is of carboniferous age. The coal measures generally consist of interbedded grey mudstone, siltstone and pale grey sandstone with thick coals in the upper part.

A single BGS borehole log (Ref: SD80NE297) has been obtained from BGS online records 120m south of the site. The log shows 1.40m of Made Ground overlying interbedded glaciofluvial deposits (silts, sands and gravels) and glacial till (clay).

A copy of the geological maps is included in Appendix C. A copy of the BGS borehole records is included in Appendix D.

## Infiltration Testing

Infiltration tests were commissioned to investigate the ground conditions and to assess their suitability for soakaways. The tests were completed in accordance with the methodology set out in BRE 365.

A total of 2no. infiltration tests were completed on site. The results show that all infiltration tests failed as it was not possible to determine the infiltration rate using the standard methodology set out in BRE 365. The water failed to drain and remained at a stable level after about 10 - 30 minutes of the testing. Given that the infiltration tests conducted at the site failed, it is therefore not recommended that soakaway drainage systems are installed at this site. Infiltration test results are shown in the Phase 2 report (ref: CL102) written by EnviroSolution in April 2022) and in Appendix E. The location of the infiltration test are identified at IF1 and IF2 on the Exploratory Hole Location Plan included in Appendix E.

## Local Drainage

The local drainage layout has been investigated using United Utilities sewer records (Appendix F). A manhole is located within the south western extent of the site. Cover and invert levels are unknown. Previous drainage investigations have identified an existing sewer running south from this Manhole, connecting with a public combined sewer flowing east within residential gardens adjacent to Causey Drive. This combined sewer joins a 900mm sewer flowing south within residential gardens adjacent to Windermere Road.

There is also a public combined sewer shown to serve the residential developments to the north of the site.

## Policy

### Local Policy

Rochdale Metropolitan Borough Council Local Plan contains the following advice / guidance related to surface water drainage.

**Policy G1 - Tackling and adapting to climate change**

New developments will be expected to:…

…d. Address the impacts of climate change by incorporating comprehensive adaptation measures, including:…

…iii. the incorporation of appropriate water conservation and management measures, such as Sustainable Drainage Systems (SuDS), including ensuring that the rate of run-off on 'greenfield' sites is not increased and on 'brownfield' sites is significantly reduced, and avoiding the use of impermeable surfaces;…

**Policy G8 - Managing water resources and flood risk**

…d. Incorporation of appropriate measures for the management of surface and flood water, including flood storage areas…'

## Correspondence

*United Utilities*

A developer enquiry has been submitted to United Utilities in June 2020 with a response included in Appendix G. A summary is included below:

*'Foul Water*

*Foul flows from this site will be allowed to drain into the public foul water/combined sewer system at an unrestricted rate. United Utilities have no objection to the proposed connection point.*

*Surface Water*

*Surface water from this development will be allowed to drain into the public combined sewer system at a maximum pass-forward flow rate to be agreed with the Lead Local Flood Authority. United Utilities request that this rate does not exceed 5 l/s.*

*Levels*

*For low-lying sites, (where the ground level of the site or the level of a basement is below the ground level at the point where the drainage connects to the public sewer), care should be taken to ensure that the property is not at increased risk of flooding. If these circumstances exist, we recommend that you contact us to discuss further. It could affect the detailed design of your site and result in the need to incorporate appropriate mitigating measures in your drainage scheme.*

*Existing Wastewater Assets Crossing the Site*

*According to our public sewer records there are public sewers located within your site boundary. We will require unrestricted access to the sewer for maintenance purposes, we would ask that you maintain a minimum clearance of 6m which is measured 3m from the centre line of the pipe unless there happens to be a formal easement agreement in place, in which case the specified easement width would apply. If you cannot achieve this then you may wish to consider diverting and or abandoning the public sewer.'*

*Lead Local Flood Authority*

A pre planning opinion has been requested from Rochdale Metropolitan Borough Council as the district's Lead Local Flood Authority with regards to surface water drainage from the site and is included in Appendix H. A summary is included below:

*'Since you have agreed in principal (SIC) with UU for a discharge to public sewer at 5l/s and you have demonstrated that Infiltration is not feasible, if UU accept the discharge of surface water to the public sewer, as LLFA we would agree.*

*Re. Climate Change Allowance - Surface Water Runoff Calculations*

*The UK's National Planning Policy Framework (NPPF) requires new developments to take account of the effects of climate change. Table 5 of the NPPF indicates increases in peak rainfall intensity of up to 30% by 2085.*

*Following the flooding events experienced nationally in 2015, new climate change allowances and criteria were introduced by the Environment Agency in February 2016. This recommends that a 40% upper end climate change allowance should be used to assess the potential flood*

*risk implications arising from the critical duration design rainfall event. New development drainage and attenuation features will take account of this potential 40% increase in order to mitigate surface water flooding within the proposed development.'*

# Managing Surface Water

The site currently comprises undeveloped land and is not formally drained. The proposed development will introduce approximately 325m$^2$ of hardstanding areas in the form of roofs and car parking.

Surface water discharge rates from the site will be increased through the introduction of these hardstanding areas. Surface water discharge from the site will have to be controlled in order to ensure the proposed development does not increase the risk of flooding elsewhere.

## Greenfield runoff rate

The existing greenfield runoff rate for the development site has been calculated using the IH124 methodology from the HR Wallingford Greenfield runoff tool available online. Results are included in Appendix I. A minimum catchment area of 0.1ha is permissible with the tool. The 1 in 1 year event greenfield runoff rate for the development site is 0.67 l/s.

A discharge rate of 5 l/s is proposed, in line with UU and LLFA agreements.

## Attenuation Storage of Surface Water

In order to achieve a proposed discharge rate of 5 l/s, surface water runoff will need to be attenuated on site.

The LLFA have stated:

*Following the flooding events experienced nationally in 2015, new climate change allowances and criteria were introduced by the Environment Agency in February 2016. This recommends*

*that a 40% upper end climate change allowance should be used to assess the potential flood risk implications arising from the critical duration design rainfall event. New development drainage and attenuation features will take account of this potential 40% increase in order to mitigate surface water flooding within the proposed development.'*

An estimate storage volume of 6m$^3$ will be required in order to accommodate the 1 in 100 year plus 40% climate change event. The storage estimates were produced on CausewayFlow and are based on a discharge flow rate of 5 l/s, storage within an area structure, an impermeable drainage area of 0.33ha, a design head of 1.5 m and hydro-brake flow control. CausewayFlow results are shown in Appendix J.

The attenuation volumes provided in this report are indicative purposes only and should be verified at the detailed design stage.

## Method of Discharge

Paragraph 080 of the NPPG: Flood Risk and Coastal Change states:

*'Generally, the aim should be to discharge surface run off as high up the following hierarchy of drainage options as reasonably practicable:*

- *into the ground (infiltration);*
- *to a surface water body;*
- *to a surface water sewer, highway drain, or another drainage system;*
- *to a combined sewer..'*

The following section of this report will determine the most practical method of surface water discharge, in line with the hierarchy mentioned above, taking into account the specific characteristic of the proposed development site.

### *Infiltration*

The first method of surface water discharge to consider is the infiltration of surface water into the ground.

The site is underlain by superficial deposits of Diamicton, generally comprising over-consolidated and unsorted clays, silts, sands and gravels.

A total of 2no. infiltration tests were completed on site. The results show that all infiltration tests failed as it was not possible to determine the infiltration rate using the standard methodology set out in BRE 365. The water failed to drain and remained at a stable level after about 10 - 30 minutes of the testing. Given that the infiltration tests conducted at the site failed, it is therefore not recommended that soakaway drainage systems are installed at this site.

*Watercourse*

As the discharge of surface water via infiltration is not feasible, the next method of surface water disposal is discharge into a surface water body such as a watercourse.

The nearest watercourse is an unnamed land drain located approximately 220m north west from site. The discharge of surface water into this land drain would require crossing third party land. The discharge of surface water into a watercourse is therefore not considered feasible.

*Sewer*

As a connection to a watercourse is not possible, the final method of surface water discharge to consider is through connection to the public sewer system.

There is an existing sewer running south from the Manhole located in the south-western extent of the site. The sewer connects with a 150mm public combined sewer flowing east within residential gardens adjacent to Causey Drive.

UU have stated *'Surface water from this development will be allowed to drain into the public combined sewer system at a maximum pass-forward flow rate to be agreed with the Lead Local Flood Authority. United Utilities request that this rate does not exceed 5 l/s.'*

The LLFA have stated *'Since you have agreed in principal with UU for a discharge to public sewer at 5 l/s and you have demonstrated that Infiltration is not feasible, if UU accept the discharge of surface water to the public sewer, as LLFA we would agree.'*

Surface water should be discharged to the UU public combined system at a maximum discharge rate of 5 l/s. A formal sewer connection should be agreed with UU.

## Sustainable Drainage Systems

Where practical surface water should be stored on site in the form of Sustainable Drainage Systems (SuDS). The SuDS options discussed in this report include; soakaways; swales, detention basins and ponds; rainwater harvesting; green roofs; porous / permeable paving; underground attenuation devices.

### *Soakaways*

As stated above, given that the infiltration tests conducted at the site failed, it is not recommended that soakaway drainage systems are installed at this site

### *Swales, detention basins and ponds*

Limited space is available on site to place open water attenuation features such as ponds and basins.

### *Rainwater Harvesting*

Rainwater harvesting will collect surface water runoff for use. Attenuation benefits of rainwater harvesting techniques can be limited as they require storage tanks to be empty in order to be effective. Rainwater harvesting techniques, however, could be used within the final development design.

### *Green Roofs*

Green roofs have not been identified on development plans. Considering the significant cost involved in the installation and maintenance of green roofs, as well as the significant costs involved with the incorporation of green roofs onto the development design, green roofs are not considered a practical option.

### *Porous / Permeable Paving*

Porous permeable paving could be installed in the car parking area in the northern extent of the site. Storage would be provided within the subgrade material. The amount of storage available is dependant upon site gradients and subgrade depth. Stored water would then be discharged at a controlled rate to the receiving UU sewer system. The use of permeable paving should be considered at the detailed design stage.

### *Underground Attenuation*

Underground attenuation could be installed through the use of tanks / oversized pipes. Sufficient space for an attenuation tank is provided in the north of the site below the car parking area.

## Exceedance Event

Storage will be provided on site to accommodate the 1 in 100 year + 40% CC event. A storm events greater than the 1 in 100 year + 40% CC event should be allowed to produce minor flooding on site, within the car parking area. The finished floor levels of the proposed residential building will be set 150mm above ground floor levels. This will ensure flooding derived from an exceedance event will not affect the property.

## Maintenance of SuDS

Maintenance of in site drainage features should be the responsibility of the site owner. Maintenance of drainage features should be maintained in line with manufacturers recommendations. The SuDS Manual (CIRA, 2015) provides maintenance schedules for SuDS, detailing the necessary required actions. Figure1 demonstrates the maintenance schedules necessary for permeable paving.

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

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

Figure 1 – Maintenance Schedule for permeable paving (SuDS Manual (CIRA, 2015).

## Surface Water Drainage Scheme

Surface water runoff will be discharged to the United Utilities public combined sewer system at a maximum discharge rate of 5 l/s. Surface water runoff up to the 1 in 100 year plus 40% climate change allowance event will be attenuated on site. A total attenuation

storage volume of 6m$^3$ will be required to achieve the discharge rate of 5 l/s and can be provided in the form of permeable paving subgrade storage. The proposed surface water drainage scheme will ensure no increase in runoff over the lifetime of the development. A Conceptual Drainage Sketch is included in Appendix K.

## Water Quality

The CIRIA C753 publication 'The SuDS Manual' (2015), details the pollution hazard indices by land use. Table 1 shows the level of hazard from each land use:

*Table 1 – Pollution Hazard Indices*

| Hazard | Land Use | Total Suspended Soils (TSS) | Metals | Hydrocarbons |
|---|---|---|---|---|
| Very Low | Residential roofs | 0.2 | 0.2 | 0.05 |
| Low | Other Roofs (commercial / industrial roofs) | 0.3 | 0.2 | 0.05 |
| Low | Individual property driveways, residential car parks, low traffic roads. | 0.5 | 0.4 | 0.4 |
| Medium | Commercial, industrial uses including car parking and roads. | 0.7 | 0.6 | 0.7 |
| High | Areas used for handling and storage of chemicals and fuels, handling and storage of waste (incl. scrap yards). | 0.8[2] | 0.8[2] | 0.9[2] |

*Table 1 is an extract from CIRIA C753 publication 'The SuDS Manual' (2015). Coloured rows highlight the proposed development land uses*

Table 1 shows the proposed development includes residential roofs and residential car parking. These land uses are within the 'very low' and 'low' categories.

The CIRIA C753 publication 'The SuDS Manual' (2015), details the level of pollution mitigation offered by each SuDS device recommended in this report. Pollution mitigation levels are shown within Table 2.

Table 2 - Pollution mitigation

| Hazard | Total Suspended Soils (TSS) | Metals | Hydrocarbons |
|---|---|---|---|
| Permeable Paving | 0.7 | 0.6 | 0.7 |

*Table 2 is an extract from CIRIA C753 publication 'The SuDS Manual' (2015).*

As shown in Table 2, the use of permeable paving would provide suitable treatment. If attenuation would be provided by a below ground device such as a tank or oversized piping, treatment could be provided by a separator.

## Foul Water

Foul water should be discharged to the public combined sewer system either at the southern extent of the site.

UU have stated *'Foul flows from this site will be allowed to drain into the public foul water/combined sewer system at an unrestricted rate. United Utilities have no objection to the proposed connection point.'*

# Conclusion

It is understood that the development proposal includes the construction of a three-storey residential apartment building containing 6 no. flats. The final plans include a car park, bin store and cycle store areas.

The proposed development will introduce hardstanding areas in the form of roofs and car parking. In order to ensure the proposed development does not increase the risk of flooding elsewhere, surface water discharge from the site must be controlled. In order to achieve this, surface water will be stored on site to accommodate the 1 in 100 year plus 40% climate change event. Flow control devices will be used to limit the rate of discharge from site.

The discharge of surface water via infiltration has been demonstrated to be unfeasible. Surface water should be discharged to the united utilities public combined system at a maximum discharge rate of 5 l/s. This has been agreed in principle with United Utilities.

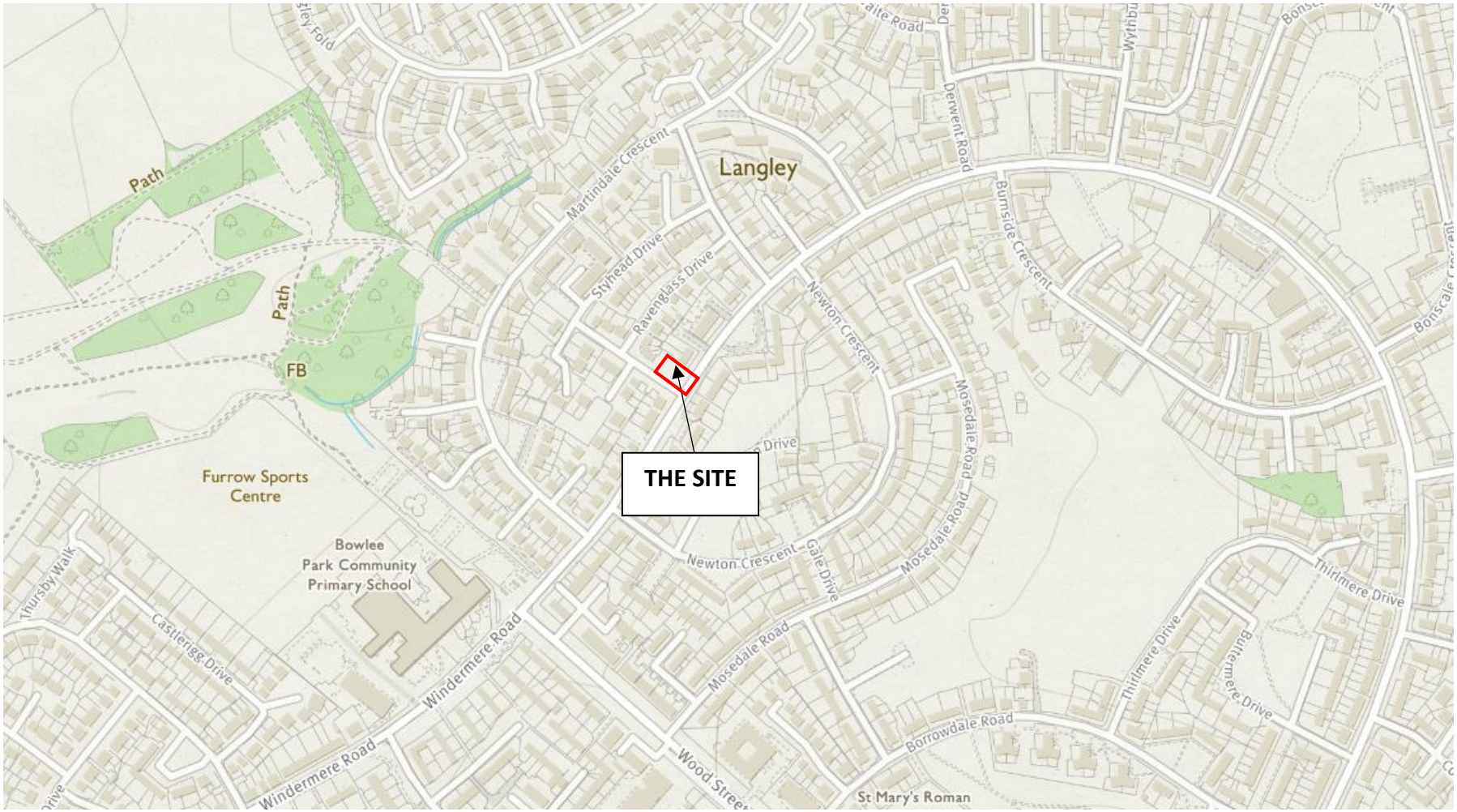
Attenuation can be provided in the form of permeable paving.

Foul flows should be discharged to the united utilities public combined system. This has been agreed in principle with United Utilities.

# Recommendations

- Verify the attenuation calculations in this report before undertaking any detailed drainage design.
- Contact United Utilities for a formal sewerage connection.

**Appendix A – Site Location and Site Plan**




| | |
|---|---|
| enviro \| solution | **Site Location Map** |

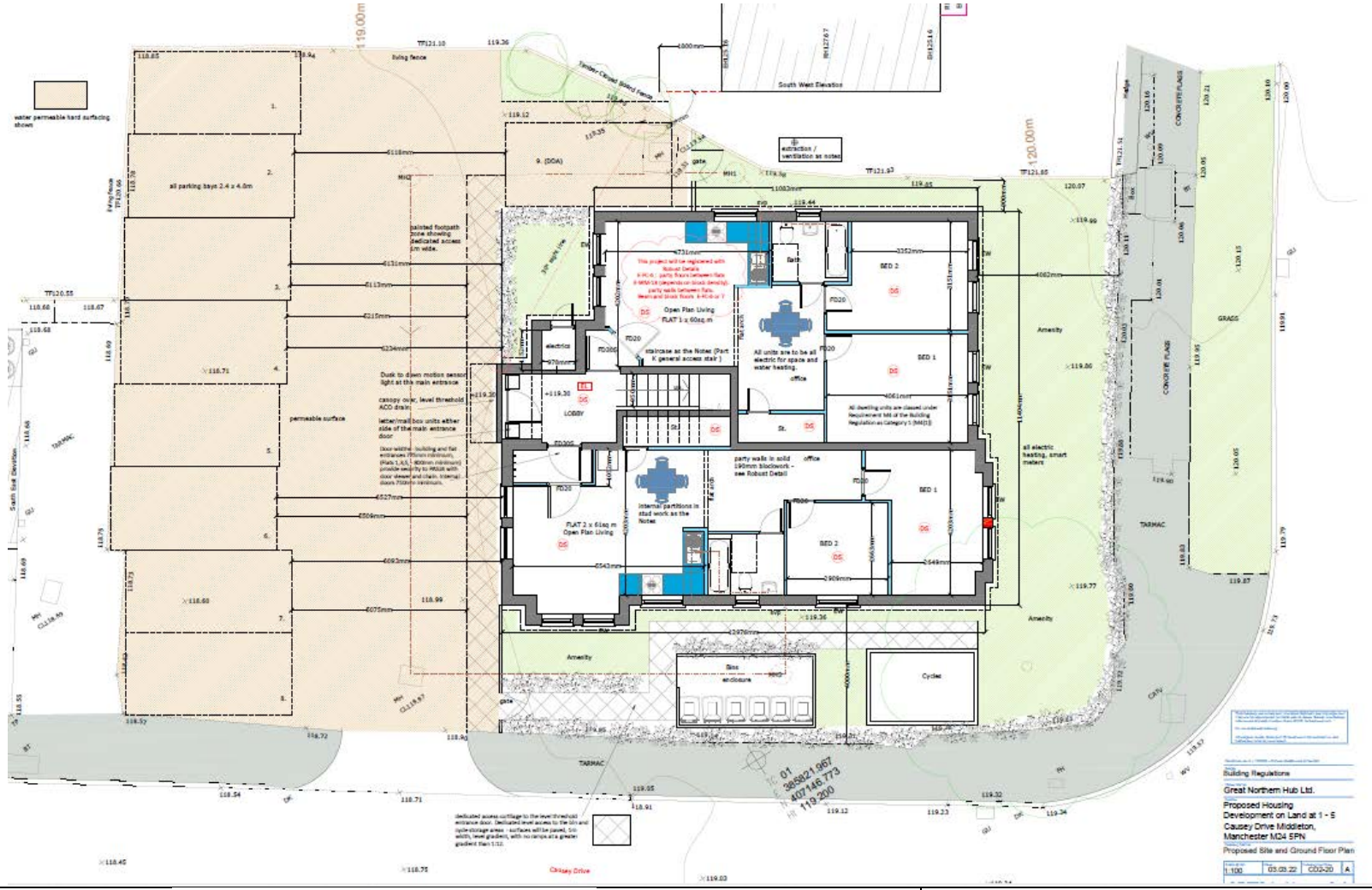
**Figure 1**




| | |
|---|---|
| enviro \| solution | **Existing Site Plan** |

**Figure 2**

## Appendix B – Proposed Development Plan



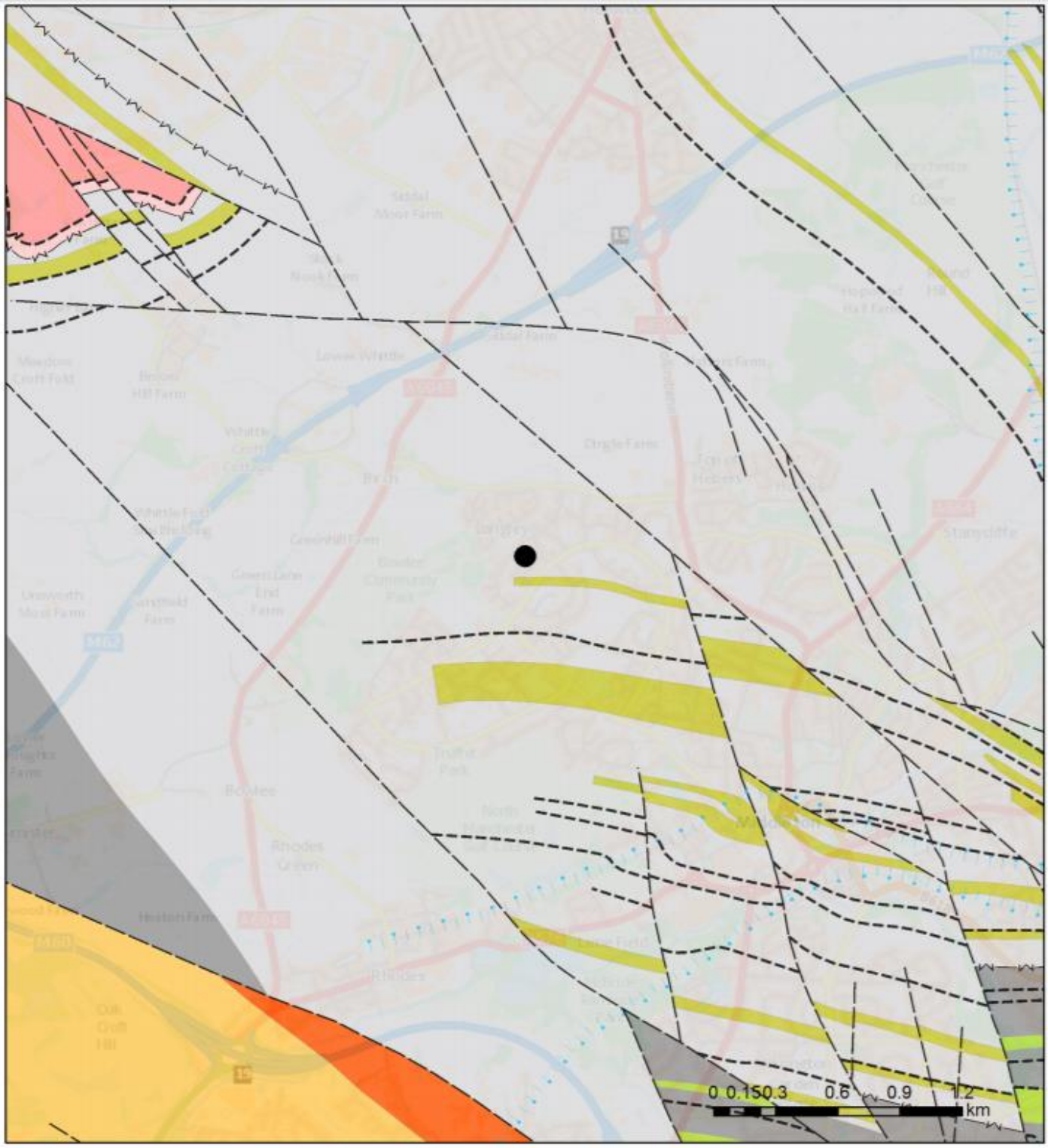

enviro | solution

**Proposed Development Plan**

**Figure 3**

**Appendix C – Geological Maps**

**Bedrock Geology**



**Bedrock geology 1:50,000 scale**

- PENNINE LOWER COAL MEASURES FORMATION - MUDSTONE, SILTSTONE AND SANDSTONE
- ROSSENDALE FORMATION - MUDSTONE AND SILTSTONE
- ROUGH ROCK - SANDSTONE
- PENNINE MIDDLE COAL MEASURES FORMATION - MUDSTONE, SILTSTONE AND SANDSTONE
- CHESTER FORMATION - SANDSTONE
- COLLYHURST SANDSTONE FORMATION - SANDSTONE
- BLENFIRE ROCK - SANDSTONE
- NOB END ROCK - SANDSTONE
- MANCHESTER MARLS FORMATION - MUDSTONE

## Superficial Geology



**Superficial deposits 1:50,000 scale**

- GLACIOFLUVIAL DEPOSITS, DEVENSIAN - SAND AND GRAVEL
- TILL, DEVENSIAN - DIAMICTON
- GLACIOLACUSTRINE DEPOSITS, DEVENSIAN - CLAY AND SILT
- HUMMOCKY (MOUNDY) GLACIAL DEPOSITS, DEVENSIAN - DIAMICTON
- ALLUVIUM - CLAY, SILT, SAND AND GRAVEL
- HEAD - CLAY, SILT, SAND AND GRAVEL
- LACUSTRINE DEPOSITS - CLAY
- PEAT - PEAT

**Appendix D – BGS Borehole Logs**

**SD80NE297**

**Manchester Smart Motorway M60 BH21362AZ CP**

X: 385835.23 Y: 407014.99 Level: 97.11

Start: 2014-09-18 End: 2014-09-18

Client: Manchester Smart Motorways

Contractor:

Engineer: Hyder

Page 1

| DEPTH METRES | Depth | Level | Log | Description |
|---|---|---|---|---|
| | | | | Loose dark brown silty fine and medium SAND TOPSOIL |
| | 0.60 | 96.51 | | MADE GROUND Medium dense light grey angular medium and coarse GRAVEL of limestone |
| 1.0 | 1.00 | 96.11 | | |
| | 1.40 | 95.71 | | MADE GROUND Medium dense light orangish brown gravelly fine and medium SAND Gravel is angular fine to coarse of sandstone and limestone |
| 2.0 | | | | |
| | | | | Medium dense light brown silty fine SAND with orangish brown thinly laminated fine to coarse sand bands GLACIOFLUVIAL DEPOSITS |
| | 2.90 | 94.21 | | |
| 3.0 | 3.20 | 93.91 | | Firm light brown sandy SILT Sand is fine GLACIOFLUVIAL DEPOSITS |
| 4.0 | | | | Firm brown slightly sandy slightly gravelly CLAY Sand is fine and medium Gravel is subangular to rounded fine and medium of mudstone sandstone and coal GLACIAL TILL |

IMPORTANT: This is a basic log auto-generated from AGS data held by the National Geoscience Data Centre (NGDC) and does not necessarily include all of the information supplied in the original AGS file. If you wish to deposit AGS files to the NGDC please see www.bgs.ac.uk/services/ngdc. Generated 19-05-2020 at 11:41 by BGS Groundhog (BETA). BGS Reference 20200203120349441688

**Manchester Smart Motorway M60 BH21362AZ CP**

X: 385835.23 Y: 407014.99 Level: 97.11

Start: 2014-09-18 End: 2014-09-18

Client: Manchester Smart Motorways

Contractor:

Engineer: Hyder

Page 2

| DEPTH METRES | Depth | Level | Log | Description |
|---|---|---|---|---|
| | 5.40 | 91.71 | | Firm brown slightly sandy slightly gravelly CLAY Sand is fine and medium Gravel is subangular to rounded fine and medium of mudstone sandstone and coal GLACIAL TILL |
| 6.0 | 6.10 | 91.01 | | Soft light brown sandy SILT Sand is fine GLACIOFLUVIAL DEPOSITS |
| 7.0 | | | | Firm brown slightly sandy becoming sandy slightly gravelly CLAY Sand is fine to coarse Gravel is subangular to rounded fine and medium of mudstone siltstone sandstone and coal GLACIAL TILL |
| 8.0 | | | | Soft light brown sandy SILT Sand is fine GLACIOFLUVIAL DEPOSITS |
| | 8.80 | 88.31 | | Firm brown slightly sandy slightly gravelly CLAY with silty fine sand partings Sand is fine and medium Gravel is subangular to rounded fine of mudstone siltstone sandstone and coal GLACIAL TILL |
| 9.0 | 9.30 | 87.81 | | Medium dense brown silty fine and medium SAND GLACIOFLUVIAL DEPOSITS |
| | 9.80 | 87.31 | | |

IMPORTANT: This is a basic log auto-generated from AGS data held by the National Geoscience Data Centre (NGDC) and does not necessarily include all of the information supplied in the original AGS file. If you wish to deposit AGS files to the NGDC please see www.bgs.ac.uk/services/ngdc. Generated 19-05-2020 at 11:41 by BGS Groundhog (BETA). BGS Reference 20200203120349441688

**Manchester Smart Motorway M60 BH21362AZ CP**

X: 385835.23 Y: 407014.99 Level: 97.11

Start: 2014-09-18 End: 2014-09-18

Client: Manchester Smart Motorways

Contractor:

Engineer: Hyder

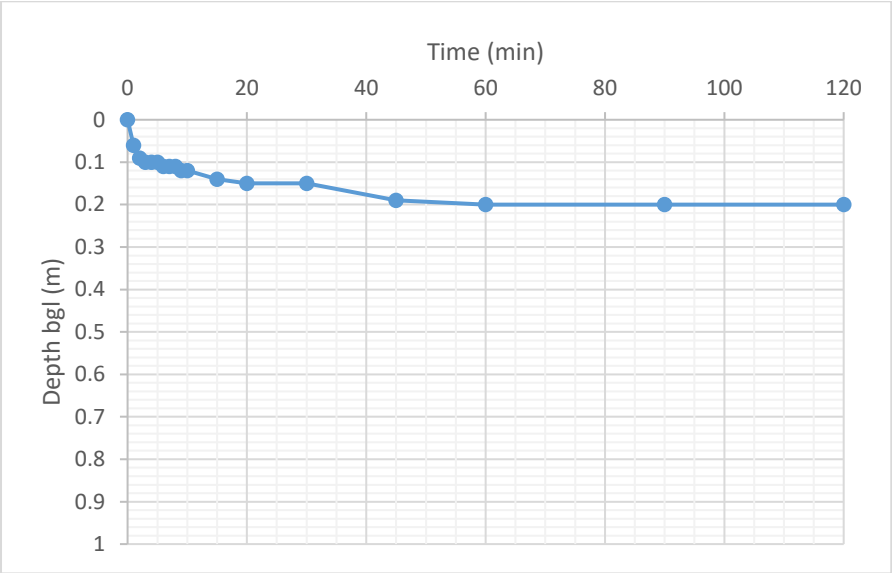


| DEPTH METRES | Depth | Level | Log | Description |
|---|---|---|---|---|
| | 10.50 | 86.61 | | Medium dense brown silty fine and medium SAND GLACIOFLUVIAL DEPOSITS |
| 11.0 | | | | |
| 12.0 | | | | |
| 13.0 | | | | |
| 14.0 | | | | |

IMPORTANT: This is a basic log auto-generated from AGS data held by the National Geoscience Data Centre (NGDC) and does not necessarily include all of the information supplied in the original AGS file. If you wish to deposit AGS files to the NGDC please see www.bgs.ac.uk/services/ngdc. Generated 19-05-2020 at 11:41 by BGS Groundhog (BETA). BGS Reference 20200203120349441688

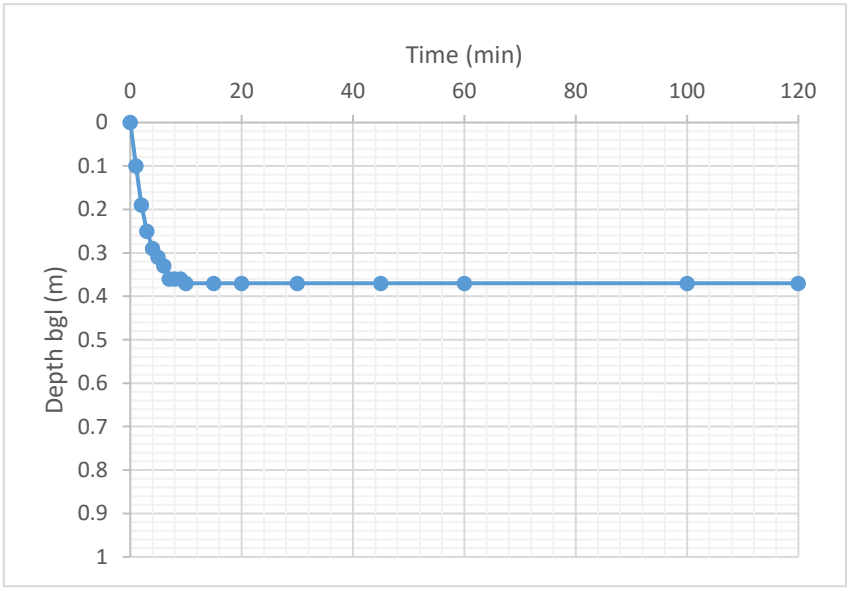
# Appendix E – Infiltration Testing Results

## IF 1 – Test 1



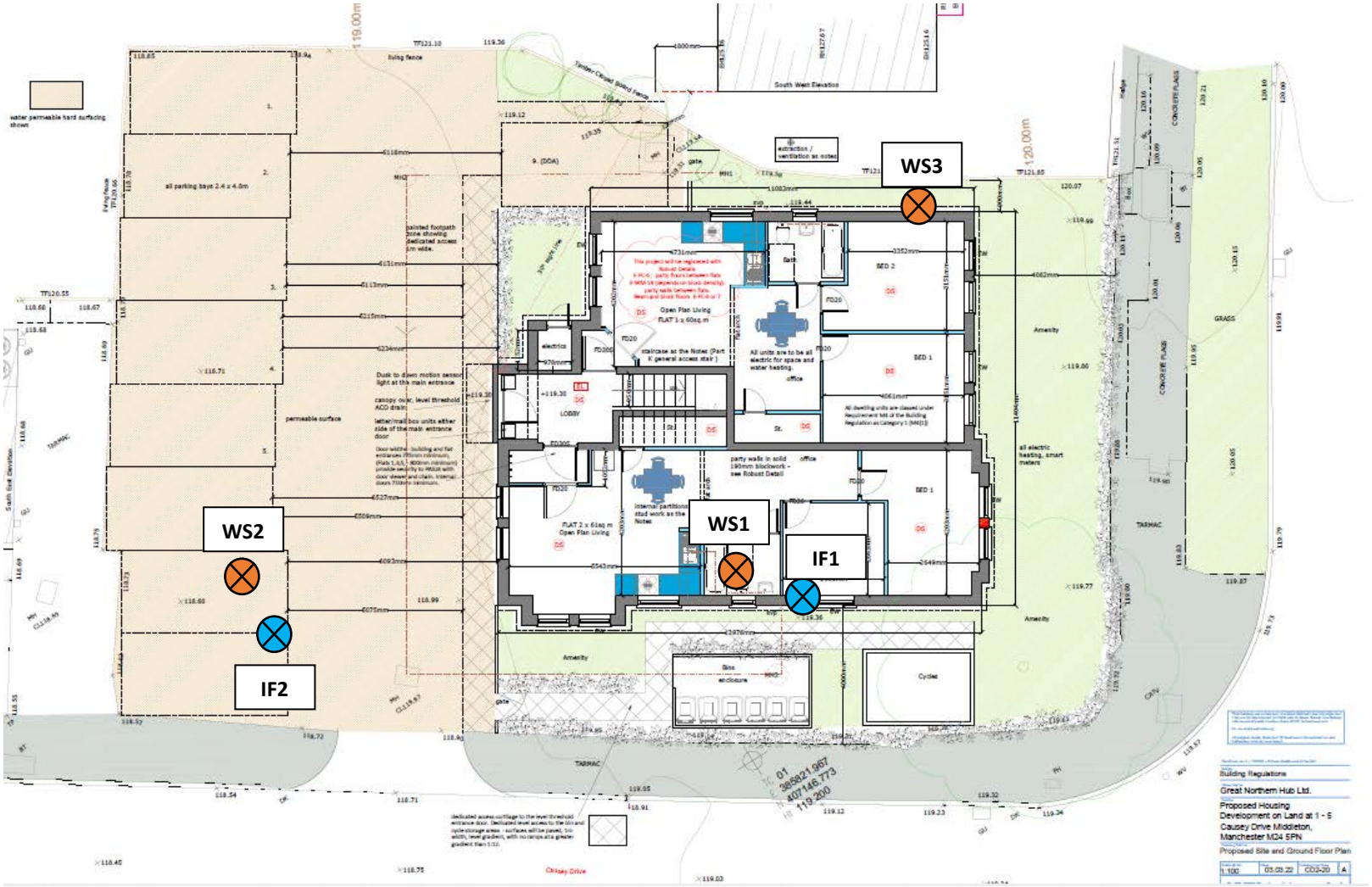

| Time Elapsed | Depth of water bgl |
|---|---|
| 0 | 0 |
| 1 | 0.06 |
| 2 | 0.09 |
| 3 | 0.1 |
| 4 | 0.1 |
| 5 | 0.1 |
| 6 | 0.11 |
| 7 | 0.11 |
| 8 | 0.11 |
| 9 | 0.12 |
| 10 | 0.12 |
| 15 | 0.14 |
| 20 | 0.15 |
| 30 | 0.15 |
| 45 | 0.19 |
| 60 | 0.2 |
| 90 | 0.2 |
| 120 | 0.2 |

## IF2 – Test 1




| Time Elapsed | Depth of water Bgl |
|---|---|
| 0 | 0 |
| 1 | 0.1 |
| 2 | 0.19 |
| 3 | 0.25 |
| 4 | 0.29 |
| 5 | 0.31 |
| 6 | 0.33 |
| 7 | 0.36 |
| 8 | 0.36 |
| 9 | 0.36 |
| 10 | 0.37 |
| 15 | 0.37 |
| 20 | 0.37 |
| 30 | 0.37 |
| 45 | 0.37 |
| 60 | 0.37 |
| 100 | 0.37 |
| 120 | 0.37 |

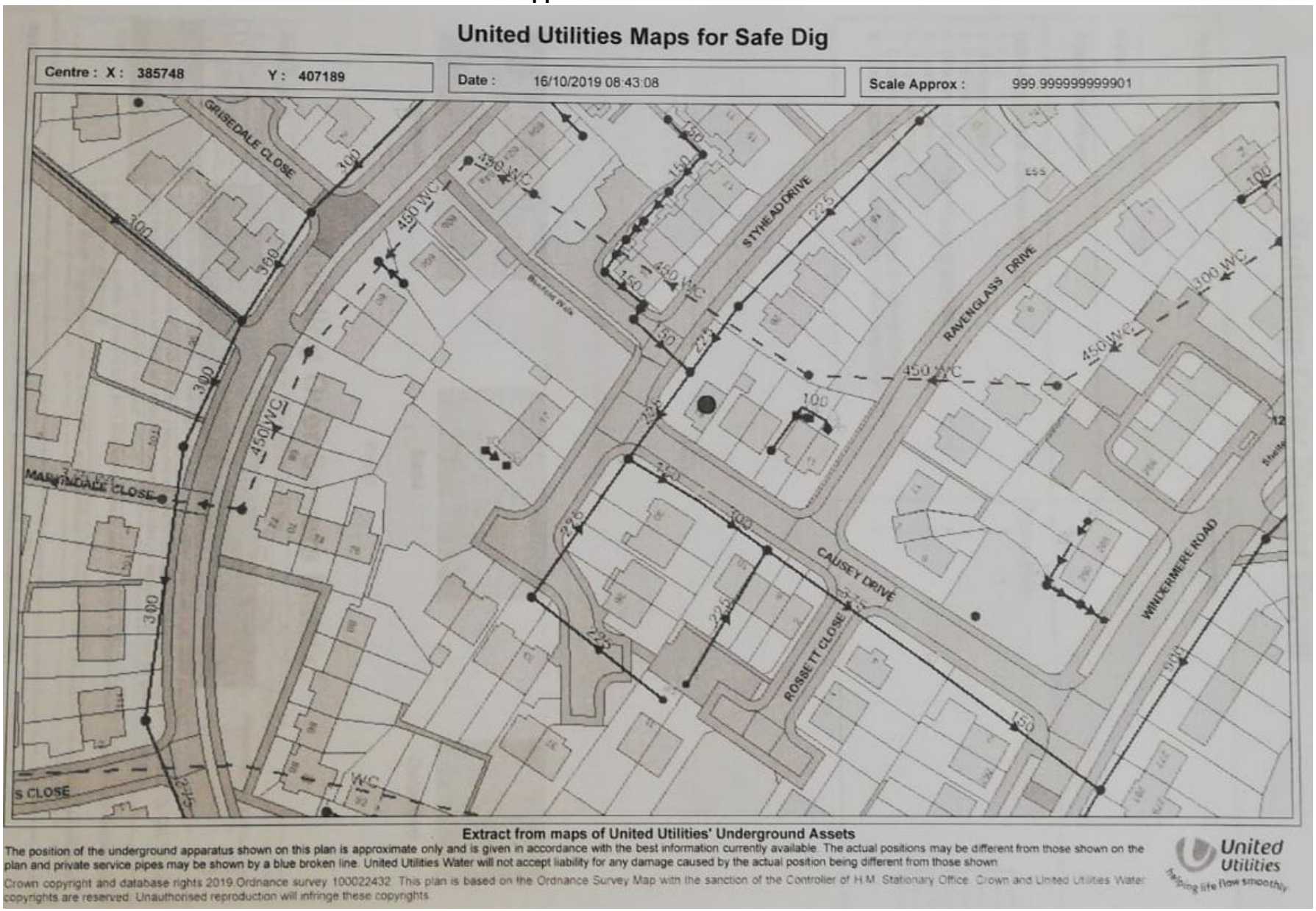
## Appendix - Infiltration Test Locations




enviro | solution

**Exploratory Hole Location Plan**

**Appendix F UU Sewer Plan –**




**Extract from maps of United Utilities' Underground Assets**

The position of the underground apparatus shown on this plan is approximate only and is given in accordance with the best information currently available. The actual positions may be different from those shown on the plan and private service pipes may be shown by a blue broken line. United Utilities Water will not accept liability for any damage caused by the actual position being different from those shown.

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United Utilities
Helping life flow smoothly

**Appendix G - United Utilities Correspondance**

# FW: Pre Development Enquiry - Land on corner of Causey Lane and Windermere Road, Middleton, M24 5PZ - UU reference Number 4200031978

William Chambers <will@envirosolution.co.uk>

Mon 21/03/2022 09:58

To: Harri Williams <harri@envirosolution.co.uk>

Cc: Tom Craig <tom@envirosolution.co.uk>

1 attachments (4 MB)

FW: PDE 4200031978 due 25/6 - CAUSEY LANE MIDDLETON;

---

**From:** chris.lynch@siteinfrastructureservices.co.uk <chris.lynch@siteinfrastructureservices.co.uk>
**Sent:** 24 June 2020 12:09
**To:** Tom Craig <tom@envirosolution.co.uk>
**Cc:** William Chambers <will@envirosolution.co.uk>
**Subject:** FW: Pre Development Enquiry - Land on corner of Causey Lane and Windermere Road, Middleton, M24 5PZ - UU reference Number 4200031978

Tom,

Please find attached the pre development enquiry response from UU.

Regards,

Chris Lynch
Managing Director
07437016072
chris.lynch@SISLIMITED.info

Site Infrastructure Services Limited

---

**From:** Wastewater Developer Services <WastewaterDeveloperServices@uuplc.co.uk>
**Sent:** 24 June 2020 10:56
**To:** 'chris.lynch@siteinfrastructureservices.co.uk' <chris.lynch@siteinfrastructureservices.co.uk>
**Cc:** Wastewater Developer Services <WastewaterDeveloperServices@uuplc.co.uk>
**Subject:** Pre Development Enquiry - Land on corner of Causey Lane and Windermere Road, Middleton, M24 5PZ - UU reference Number 4200031978

Good Morning Chris,

**Pre Development Enquiry - Land on corner of Causey Lane and Windermere Road, Middleton, M24 5PZ - UU reference Number 4200031978**

We have carried out an assessment of your application which is based on the information provided. This pre-development advice on your drainage strategy will be valid for 12 months. Your drainage strategy will need to be reviewed by other competent authorities as part of the planning process, and we advise that you carry out the necessary site investigations to confirm the viability of your proposals.

If your investigations require access to our public sewer network, we ask that you contact our network engineers with a request for an access certificate via our main contact telephone number 0345 3723223 or refer to the link below:

https://www.unitedutilities.com/builders-developers/working-near-our-assets/

**Foul Water**

Foul flows from this site will be allowed to drain into the public foul water/combined sewer system at an unrestricted rate. United Utilities have no objection to the proposed connection point.

**Surface Water**

Surface water from this development will be allowed to drain into the public combined sewer system at a maximum pass-forward flow rate to be agreed with the Lead Local Flood Authority. United Utilities request that this rate does not exceed 5 l/s.

**Levels**

For low-lying sites, (where the ground level of the site or the level of a basement is below the ground level at the point where the drainage connects to the public sewer), care should be taken to ensure that the property is not at increased risk of flooding. If these circumstances exist, we recommend that you contact us to discuss further. It could affect the detailed design of your site and result in the need to incorporate appropriate mitigating measures in your drainage scheme.

**Existing Wastewater Assets Crossing the Site**

According to our public sewer records there are public sewers located within your site boundary. We will require unrestricted access to the sewer for maintenance purposes, we would ask that you maintain a minimum clearance of 6m which is measured 3m from the centre line of the pipe unless there happens to be a formal easement agreement in place, in which case the specified easement width would apply. If you cannot achieve this then you may wish to consider diverting and or abandoning the public sewer.

Please refer to the link below to obtain full details of the processes involved with sewer diversions:

https://www.unitedutilities.com/builders-developers/larger-developments/wastewater/sewer-diversions/

**Existing Water Assets Crossing the Site**

It is the developer responsibility to identify utilities on-site. Where clean water assets are shown on our records, we recommend that you contact our Water Pre-Development Team, via the following email address: DeveloperServicesWater@uuplc.co.uk. Further information for this service can be found on our website via the link below:
https://www.unitedutilities.com/builders-developers/larger-developments/pre-development/water-pre-dev/

**Connection Application**

Although we may discuss and agree discharge points and rates in principle, please be aware that you will have to apply for a formal sewer connection. This is so that we can assess the method of construction, Health & Safety requirements and to ultimately inspect the connection when it is made. Details of the application process and the form itself can be obtained from our website by following the link below:

https://www.unitedutilities.com/builders-developers/larger-developments/wastewater/sewer-connections/

We recommend that the detailed design should confirm the locations of all utilities in the area and ensure that any proposed drainage solution considers routing and clash checks where required.

If we can be of any further assistance please don't hesitate to contact us further.

Many thanks and kind regards,

Tom

Did you know we now have a live chat facility available to you Mon to Friday 8 -5pm. You just click on the orange live chat box on our webpage and one of our advisors will be ready to chat to you and help you with your enquiry https://www.unitedutilities.com/builders-developers/ or you can email us at WastewaterDeveloperServices@uuplc.co.uk

United Utilities
Water for the North West

**Thomas Bethell**
Assistant Engineer
Developer Services & Metering
Customer Services
**M:** 07880 339 195
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**Appendix H - Lead Local Flood Authority Correspondance**

# RE: Causey Drive LLFA pre development enquiry

Stephen McCann <Stephen.McCann@Rochdale.Gov.UK>
Fri 01/04/2022 13:29
To: Harri Williams <harri@envirosolution.co.uk>
Cc: Francis Comyn <Francis.Comyn@Rochdale.Gov.UK>

Good Afternoon Harri,

Since you have agreed in principal with UU for a discharge to public sewer at 5l/s and you have demonstrated that Infiltration is not feasible, if UU accept the discharge of surface water to the public sewer, as LLFA we would agree.

Re. CLIMATE CHANGE ALLOWANCE - SURFACE WATER RUNOFF CALCULATIONS

The UK's National Planning Policy Framework (NPPF) requires new developments to take account of the effects of climate change. Table 5 of the NPPF indicates increases in peak rainfall intensity of up to 30% by 2085.

Following the flooding events experienced nationally in 2015, new climate change allowances and criteria were introduced by the Environment Agency in February 2016. This recommends that a 40% upper end climate change allowance should be used to assess the potential flood risk implications arising from the critical duration design rainfall event. New development drainage and attenuation features will take account of this potential 40% increase in order to mitigate surface water flooding within the proposed development.

**Stephen McCann**
Drainage & Flooding Engineer
Highways, Property & Strategic Housing

ROCHDALE BOROUGH COUNCIL

01706 924606
07552 570262
stephen.mccann@rochdale.gov.uk

Rochdale Borough Council
Floor 2, Number One Riverside
Smith Street, Rochdale, OL16 1XU

To access our services go to www.rochdale.gov.uk

---

**From:** Harri Williams <harri@envirosolution.co.uk>
**Sent:** 28 March 2022 15:55
**To:** Strategic Planning <Strategic.Planning@Rochdale.Gov.UK>
**Subject:** Causey Drive LLFA pre development enquiry

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

**Proposed residential development at Causey Drive and Windermere Road, Middleton, M24 5PZ**

Dear Sir / Madam,

I am writing in order to ensure the proposed surface water drainage scheme of the site at the above address is in line with LLFA policies.

The site is comprised of 33no residential apartments. A development plan and location plan is attached.

We propose to discharge surface water to the UU public sewer system at a maximum discharge rate of 5 l/s. This has been agreed in principle with United Utilities. Infiltration test have been conducted and demonstrate that infiltration is not feasible. Please advise if this rate of discharge is acceptable.

Please advise if the LLFA have any specific drainage policies for attenuation e.g climate change allowances.

If you require any further information please do not hesitate to reply,

Kind Regards,
Harri

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# Appendix I – Surface Water Runoff

Print | Close Report

# Greenfield runoff rate estimation for sites

www.uksuds.com | Greenfield runoff tool

| | |
|---|---|
| Calculated by: | Harri Williams |
| Site name: | Causey Drive |
| Site location: | Middleton |

This is an estimation of the greenfield runoff rates that are used to meet normal best practice criteria in line with Environment Agency guidance "Rainfall runoff management for developments", SC030219 (2013) , the SuDS Manual C753 (Ciria, 2015) and the non-statutory standards for SuDS (Defra, 2015). This information on greenfield runoff rates may be the basis for setting consents for the drainage of surface water runoff from sites.

**Site Details**

| | |
|---|---|
| Latitude: | 53.56080° N |
| Longitude: | 2.21547° W |
| Reference: | 4008044694 |
| Date: | Apr 11 2022 09:58 |

**Runoff estimation approach** IH124

**Site characteristics**

Total site area (ha): 0.1

**Methodology**

| | |
|---|---|
| $Q_{BAR}$ estimation method: | Calculate from SPR and SAAR |
| SPR estimation method: | Calculate from SOIL type |

| Soil characteristics | Default | Edited |
|---|---|---|
| SOIL type: | 4 | 4 |
| HOST class: | N/A | N/A |
| SPR/SPRHOST: | 0.47 | 0.47 |

| Hydrological characteristics | Default | Edited |
|---|---|---|
| SAAR (mm): | 1038 | 1038 |
| Hydrological region: | 10 | 10 |
| Growth curve factor 1 year: | 0.87 | 0.87 |
| Growth curve factor 30 years: | 1.7 | 1.7 |
| Growth curve factor 100 years: | 2.08 | 2.08 |
| Growth curve factor 200 years: | 2.37 | 2.37 |

**Notes**

**(1) Is $Q_{BAR}$ < 2.0 l/s/ha?**

When $Q_{BAR}$ is < 2.0 l/s/ha then limiting discharge rates are set at 2.0 l/s/ha.

**(2) Are flow rates < 5.0 l/s?**

Where flow rates are less than 5.0 l/s consent for discharge is usually set at 5.0 l/s if blockage from vegetation and other materials is possible. Lower consent flow rates may be set where the blockage risk is addressed by using appropriate drainage elements.

**(3) Is SPR/SPRHOST ≤ 0.3?**

Where groundwater levels are low enough the use of soakaways to avoid discharge offsite would normally be preferred for disposal of surface water runoff.

| Greenfield runoff rates | Default | Edited |
|---|---|---|
| $Q_{BAR}$ (l/s): | 0.77 | 0.77 |
| 1 in 1 year (l/s): | 0.67 | 0.67 |
| 1 in 30 years (l/s): | 1.3 | 1.3 |
| 1 in 100 year (l/s): | 1.59 | 1.59 |
| 1 in 200 years (l/s): | 1.81 | 1.81 |

This report was produced using the greenfield runoff tool developed by HR Wallingford and available at www.uksuds.com. The use of this tool is subject to the UK SuDS terms and conditions and licence agreement , which can both be found at www.uksuds.com/terms-and-conditions.htm. The outputs from this tool are estimates of greenfield runoff rates. The use of these results is the responsibility of the users of this tool. No liability will be accepted by HR Wallingford, the Environment Agency, CEH, Hydrosolutions or any other organisation for the use of this data in the design or operational characteristics of any drainage scheme.

# Appendix J – Causeway Flow Storage Estimate

## Design Settings

| | | | |
|---|---|---|---|
| Rainfall Methodology | FSR | Maximum Time of Concentration (mins) | 30.00 |
| Return Period (years) | | Maximum Rainfall (mm/hr) | 50.0 |
| Additional Flow (%) | 0 | Minimum Velocity (m/s) | 1.00 |
| FSR Region | England and Wales | Connection Type | Level Soffits |
| M5-60 (mm) | | Minimum Backdrop Height (m) | 0.200 |
| Ratio-R | | Preferred Cover Depth (m) | 1.200 |
| CV | 0.750 | Include Intermediate Ground | ✓ |
| Time of Entry (mins) | | Enforce best practice design rules | ✓ |

## Nodes

| Name | Area (ha) | T of E (mins) | Cover Level (m) | Node Type | Diameter (mm) | Depth (m) |
|---|---|---|---|---|---|---|
| Storage | 0.033 | 5.00 | 100.000 | Junction | 1200 | 2.000 |

## Simulation Settings

| | | | |
|---|---|---|---|
| Rainfall Methodology | FSR | Skip Steady State | x |
| FSR Region | England and Wales | Drain Down Time (mins) | 240 |
| M5-60 (mm) | 20.000 | Additional Storage (m³/ha) | 20.0 |
| Ratio-R | 0.300 | Check Discharge Rate(s) | x |
| Summer CV | 0.750 | Check Discharge Volume | ✓ |
| Winter CV | 0.840 | 100 year 360 minute (m³) | |
| Analysis Speed | Normal | | |

### Storm Durations

| 15 | 30 | 60 | 120 | 180 | 240 | 360 | 480 | 600 | 720 | 960 | 1440 |
|---|---|---|---|---|---|---|---|---|---|---|---|

| Return Period (years) | Climate Change (CC %) | Additional Area (A %) | Additional Flow (Q %) |
|---|---|---|---|
| 100 | 40 | 0 | 0 |

## Pre-development Discharge Volume

| | | | |
|---|---|---|---|
| Site Makeup | Greenfield | Return Period (years) | 100 |
| Greenfield Method | FSR/FEH | Climate Change (%) | 0 |
| Positively Drained Area (ha) | | Storm Duration (mins) | 360 |
| Soil Index | 1 | Betterment (%) | 0 |
| SPR | 0.10 | PR | |
| CWI | | Runoff Volume (m³) | |

## Node Storage Online Hydro-Brake® Control

| | | | |
|---|---|---|---|
| Flap Valve | x | Objective | (HE) Minimise upstream storage |
| Replaces Downstream Link | ✓ | Sump Available | ✓ |
| Invert Level (m) | 97.500 | Product Number | CTL-SHE-0098-5000-1500-5000 |
| Design Depth (m) | 1.500 | Min Outlet Diameter (m) | 0.150 |
| Design Flow (l/s) | 5.0 | Min Node Diameter (mm) | 1200 |

## Node Storage Depth/Area Storage Structure

| | | | | | |
|---|---|---|---|---|---|
| Base Inf Coefficient (m/hr) | 0.00000 | Safety Factor | 2.0 | Invert Level (m) | 98.000 |
| Side Inf Coefficient (m/hr) | 0.00000 | Porosity | 0.95 | Time to half empty (mins) | 12 |

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| Depth (m) | Area (m²) | Inf Area (m²) | Depth (m) | Area (m²) | Inf Area (m²) | Depth (m) | Area (m²) | Inf Area (m²) |
|---|---|---|---|---|---|---|---|---|
| 0.000 | 5.8 | 0.0 | 1.000 | 5.8 | 0.0 | 1.001 | 0.0 | 0.0 |

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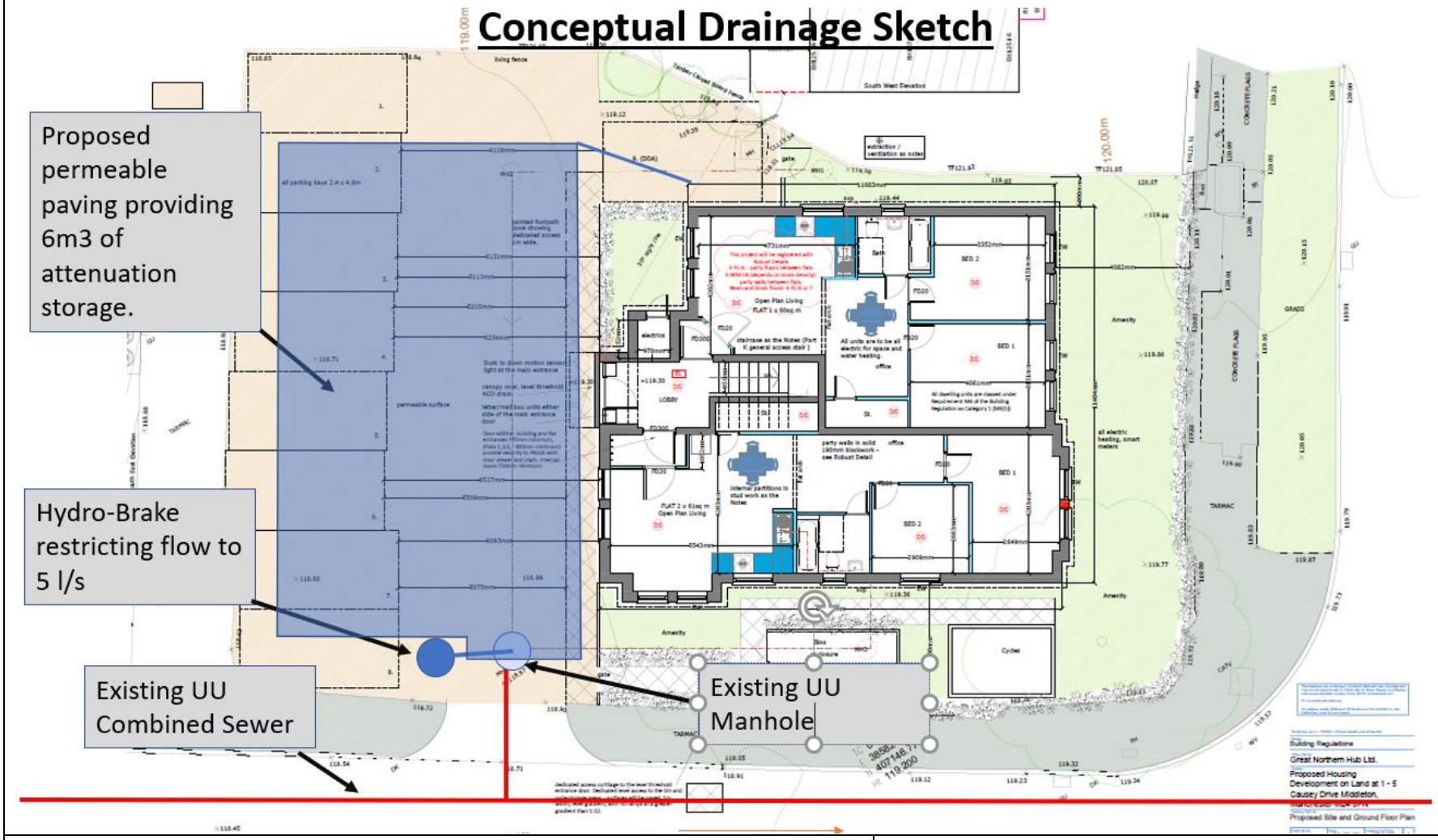
**Results for 100 year +40% CC Critical Storm Duration. Lowest mass balance: 99.79%**

| Node Event | US Node | Peak (mins) | Level (m) | Depth (m) | Inflow (l/s) | Node Vol (m³) | Flood (m³) | Status |
|---|---|---|---|---|---|---|---|---|
| 30 minute winter | Storage | 25 | 98.840 | 0.840 | 15.3 | 4.9061 | 0.0000 | OK |

| Link Event (Outflow) | US Node | Link | Outflow (l/s) | Discharge Vol (m³) |
|---|---|---|---|---|
| 240 minute summer | Storage | Hydro-Brake® | 4.9 | 21.5 |

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**Appendix K – Conceptual Drainage Sketch**




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**Conceptual Drainage Sketch**