



RIDGE

SILK STREET, NEWTON HEATH
FLOOD RISK ASSESSMENT &
DRAINAGE STRATEGY REPORT

MAY 2021

**SILK STREET, NEWTON HEATH
FLOOD RISK ASSESSMENT & DRAINAGE STRATEGY REPORT
ROWLINSON CONSTRUCTION LIMITED**

Prepared for
ROWLINSON CONSTRUCTION LIMITED

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1. EXECUTIVE SUMMARY

This report details the drainage strategy for a proposed residential development off Silk Street, Newton Heath with associated car parking and landscaping. Table 1 below provides a summary of the SuDS and drainage strategy for the scheme.

Table 1 – Drainage / SuDS Summary

Item	Brief Description
Geology	British Geological Survey (BGS) mapping and borehole information states that the site is underlain by Glacial Till and the Collyhurst Sandstone Formation.
Infiltration Rate	Phase 2 Geo-Environmental Investigation found clay to depths of approximately 8.6mbgl and shallow groundwater was present at depths of between 0.5-2.0mbgl.
Nearest Watercourses	Rochdale Canal to the north is classified as a site of biological importance, as such the Council Ecology Department have requested that no drainage be discharged into the Canal.
Nearest Adopted Sewers	A number of adopted sewers pass within the site or adjacent to the boundary. All surface water sewers in the area ultimately discharge into a combined sewer rather than a watercourse.
Surface Water Outfall and SuDS Hierarchal Approach	Based on the above, surface water from the development will outfall into the surrounding sewers at three outfall points as agreed with United Utilities.
Existing Discharge Rate	Site is fully hardstanding and classed as brownfield.
Proposed Discharge Rate	Runoff will be restricted to 5l/s at three connection points – this equates to a greater than 50% reduction on existing brownfield rates.
Allowance for Climate Change	40% - based on a residential >50-year design life to 'the 2080's'.
Proposed Attenuation Method and Volume	Geo-cellular Storage & Oversized Pipes. 127 m³ to contain the 100year + 40% event.
SuDS features	Water Butts, Geocellular Storage
Maintenance Responsibility	Management Company / Site owner
Foul Drainage Outfall	Existing combined sewer passing through the site.

There is no residual flood risk from the development site to the surrounding district due to the reduction of existing storm water flow rates. Therefore, the development does not increase the risk of flooding to the other adjacent properties and roads. Out of chamber or gully flooding for the extreme 100-year plus climate change event may occur within the development site and is classed as exceedance flows. Flood water from this event will be contained within the development site and directed away from the buildings to the external hard and soft landscaped areas.

2. INTRODUCTION

- 2.1 Ridge & Partners LLP have been appointed by Rowlinson Construction Ltd to prepare this Flood Risk Assessment and Drainage Strategy Report to support the planning application for a proposed residential development with associated parking and landscaping off Silk Street, Gorton, Newton Heath. The assessment has been undertaken in line with the 'National Planning Policy Framework 2019' (NPPF), plus the accompanying 'Flood Risk and Coastal Change' chapter of the National Planning Practice Guidance.
- 2.2 This report has been commissioned by Rowlinson Construction Ltd and is specific to their interests in the development proposals as described by the Architectural plan in Appendix A.
- 2.3 The report has been commissioned to identify any drainage-related issues associated with the proposed development and which are subsequently addressed within this report;
- Identify available data relating to flood risk at the site.
 - Determine whether the site is at risk from flooding from all sources, including from breach or overtopping of any existing flood defences, surface water flooding and/or groundwater flooding.
 - Consider the flood risk from all other sources.
 - Determine the current surface water drainage regime and assess any potential increase in surface water runoff as a result of the proposed development.
 - Discuss Sustainable Drainage Systems (SuDS) as an option for reducing surface water flood risk.
 - Devise an appropriate outline surface water drainage strategy (including calculation where appropriate) to deal with any potential increase in surface water runoff and include for climate change.
 - Devise an appropriate outline foul water drainage strategy.
 - Consider the recommendations of Manchester City Council Strategic Flood Risk Assessment (SFRA).
 - Assess mitigation measures & off-site impacts and define any residual risks.

3. PLANNING POLICY AND CONSULTATION

3.1. Planning Policy Framework

3.1.1 The flood maps provided by the Environment Agency (EA) locate the site within Flood Zone 1, i.e. land defined as having an annual probability of fluvial flooding of less than 1 in 1000 in any year (<0.1%). As a requirement of the NPPF (2019) and accompanying National Planning Practice Guidance (NPPG), the proposed development has to satisfy the requirements of the Sequential Test and where applicable the Exception Test.

3.1.2 Sequential Test:

Under the NPPF (2019), Zone 1 is defined as low probability flood risk. The proposal is for a new residential development, which in line with Table 2 is classified as 'More Vulnerable'.

Placing both these criteria into Table 3 (Flood Risk Vulnerability and Flood Zone 'Compatibility'), More Vulnerable development in Flood Zone 1 determines that 'Development is Appropriate'.

3.1.3 Exception Test:

As the Sequential test is passed, the Exception test is not required.

3.2. Strategic Flood Risk Assessment (SFRA)

3.2.1 SFRA's assess the risk associated with all types of flooding and provide the information required to identify the amount of development permitted in an area; how drainage systems in the area should function and also how risks in vulnerable areas can be reduced and/or mitigated. The NPPF states that Regional Planning Bodies (RPB's) or Local Planning Authorities (LPA's) should prepare SFRA's in consultation with the EA.

3.2.2 In May 2009, JBA Consulting was commissioned by Manchester City, Salford City and Trafford (MST) Councils to update a Level 2 Hybrid Strategic Flood Risk Assessment (SFRA) for the area, following on from the Greater Manchester Sub-Regional SFRA completed in August 2008. The purpose of the SFRA is to assess and map all known sources of flood risk including fluvial, surface water, sewer, groundwater and all impounded water bodies, taking into account future climate change predictions.

3.2.3 A summary of the main elements from the SFRA associated with the development site is detailed below. The full report can be found on the Manchester City Council Website.

- SFRA provides a detailed understanding of flood risks across the borough from all sources.
- According to SFRA maps the site is at low risk of fluvial flooding.
- According to Greater Manchester sub-regional SFRA there are no known reports of groundwater flooding in Manchester, Trafford and Salford Authorities.

- Development should aim to deliver greenfield runoff rates on greenfield sites up to a 1 in 100-year storm event, considering climate change. A 50% reduction on existing rates will apply to all brownfield sites.
- Development should be designed so that there is no flooding to the development in a 1 in 30-year event and so that there is no property flooding in a 1 in 100 year plus climate change event. Where possible SUDS should be implemented.

3.3. Statutory Authority Correspondence

- 3.3.1.** Graham Perry, Developer Engineer at United Utilities, as confirmed that the site will be allowed to discharge at three separate points to achieve a gravity connection for each. The northern portion can discharge by gravity into the 300mm diameter combined sewer in Silk Street on site, at a maximum rate of 5l/s. The eastern parcel can discharge into the 300mm diameter combined sewer within Cowley Street to the west at a maximum rate of 5l/s. The western portion of the development can discharge into the 300mm diameter surface water sewer within Old Church Street at a maximum rate of 5l/s.
- 3.3.2.** David Dutton, Ecologist at Tameside MBC, confirmed that the Rochdale Canal is designated as a site of biological importance due to its aquatic plants. Therefore no surface water drainage should outfall into the Canal.

4. THE SITE

4.1. Site Details

4.1.1 The site details are summarised in Table 2 below:

Table 2: Site Referencing Information

Item	Brief Description
Site name	Silk Street, Newton Heath
Site address and location	Land off Silk Street, Newton Heath, Manchester, M40 1GX
Planning Authority	Manchester City Council
Lead Local Flood Authority	Manchester City Council
Drainage Statutory Undertaker	United Utilities
Site Area	0.72 ha
Flood Risk for Planning	Flood Zone 1
Approximate Grid Reference	OS: 388197, 400538
General Locality	The site is located approximately 6km to the northeast of Manchester City Centre and 1.2km to the northwest of Newton Heath Town Centre.

4.2. Site Description

- 4.2.1. The site is comprised of a series of hardstanding areas currently used for car parking, with access roads linking these together.
- 4.2.2. The Rochdale Canal borders the site to the north, beyond which lies commercial developments. Droylsden Road borders the site to the east, Smallwood Street to the west and Great Newton Street to the south. The general area is comprised of a mixture of residential and commercial properties.
- 4.2.3. An aerial photograph of the existing site (with proposed red line boundary) is shown in Figure 1 below.

Figure 1: Aerial Photograph of Existing Site (Google, 2021)



4.3. Proposed Development

- 4.3.1. As discussed in the earlier sections, the report is prepared to support a planning application for a proposed residential development with associated car parking and landscaping.
- 4.3.2. The current outline Architectural Master Plan in Appendix A provides an indication of the proposals of the site.

5. DEFINITION OF FLOOD HAZARD

5.1. Sources of information

The NPPF (2019) requires the developer to consider the impact of runoff generated by the proposed development onto the downstream catchment, and to assess the risk of runoff from the surrounding district impacting on the development footprint. Further, the report is to consider flood risk from all other sources. The following section defines the flood risk receptors and anticipated flood risk. Section 5 then discusses in further detail the probability of flooding and the likely impacts.

Table 2: Sources of information used in the identification of flood risk

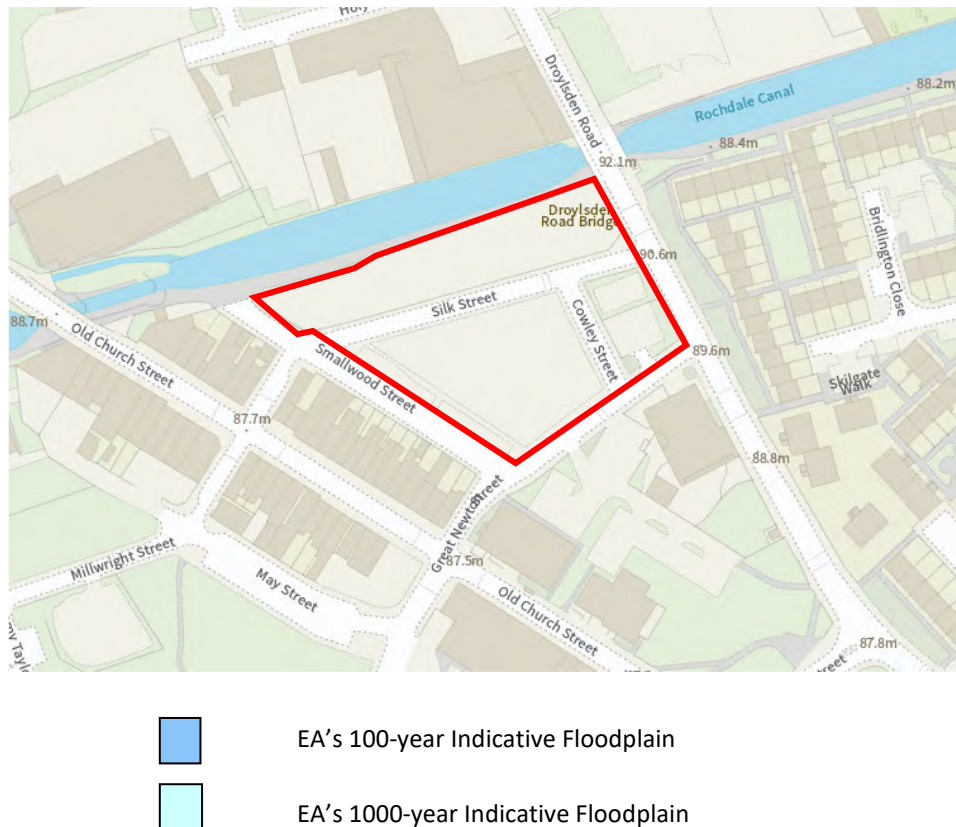
Source of Information	Details
Environment Agency Flood Map	Indicative Flood Maps
United Utilities	Sewer Records
Historic Maps	From various websites
Manchester City Council	Report & Various Maps from SFRA

5.2. Flooding from Rivers (Fluvial)

5.2.1 There are no EA Main Rivers or Ordinary Watercourses in close proximity to the site. The closest is Moston Brook, located approximately 550m to the north.

5.2.2 Figure 2 below locates the site on the Environment Agency's indicative floodplain map. It is clear from this that the red line boundary sits outside of a fluvial generator of flood water from any identified water body or river. It is considered therefore that the site lays outside of the active 100-year and extreme event floodplains, thus lying within 'Flood Zone 1 Classification' in accordance with NPPF Guidance, i.e. probability of annual fluvial flooding significantly less than 1 in 1000 in any one year (<0.1%). The risk from fluvial flood water is diminished to acceptable levels, removing the requirement for further investigation and assessment of the fluvial flood regime.

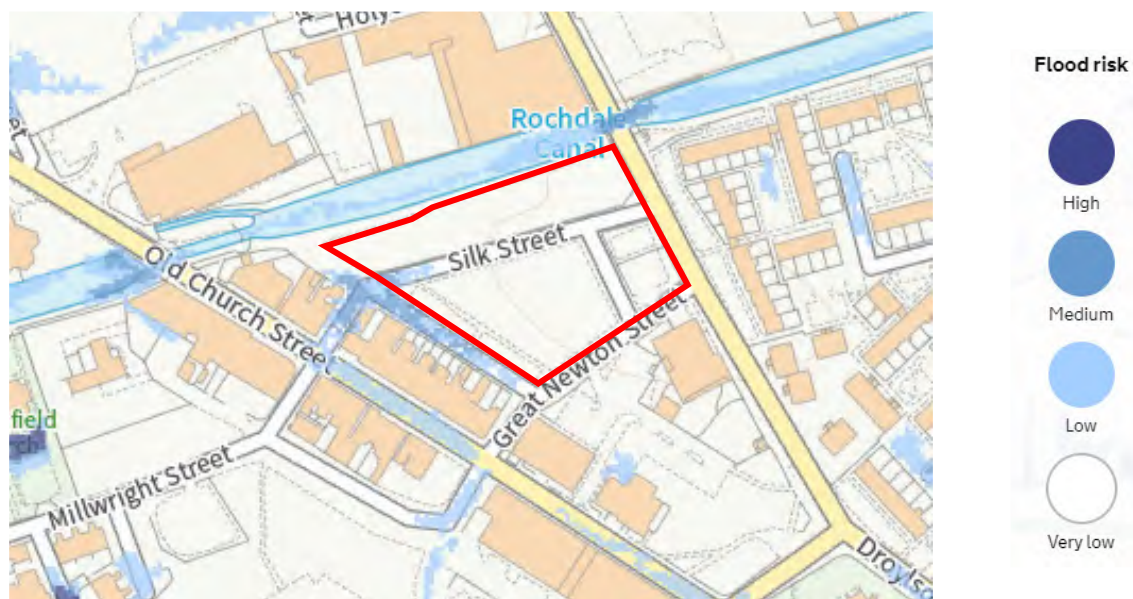
Figure 2 – The EA's 100-year Fluvial Floodplain Map



5.3. Flooding From Land (Overland Flow)

- 5.3.1 Any surface water runoff from the site is currently intercepted by the existing private car park drainage or highway drainage and conveyed away from the site.
- 5.3.2 A review of the EA Indicative Surface Water Flood Risk maps indicates that the site is predominantly at very low risk of surface water flooding as illustrated in figure 3 below. There is some evidence of the highways being at medium risk, however these areas are at a lower level than the development site and will not impact properties.
- 5.3.3 There are no existing surface water flow routes through the site that would need to be maintained. As part of the proposed development the levels across the area of the new housing in the western corner will change to ensure that all falls are away from properties and all low points are located away from the properties, thus maintaining low risk surface water flooding.

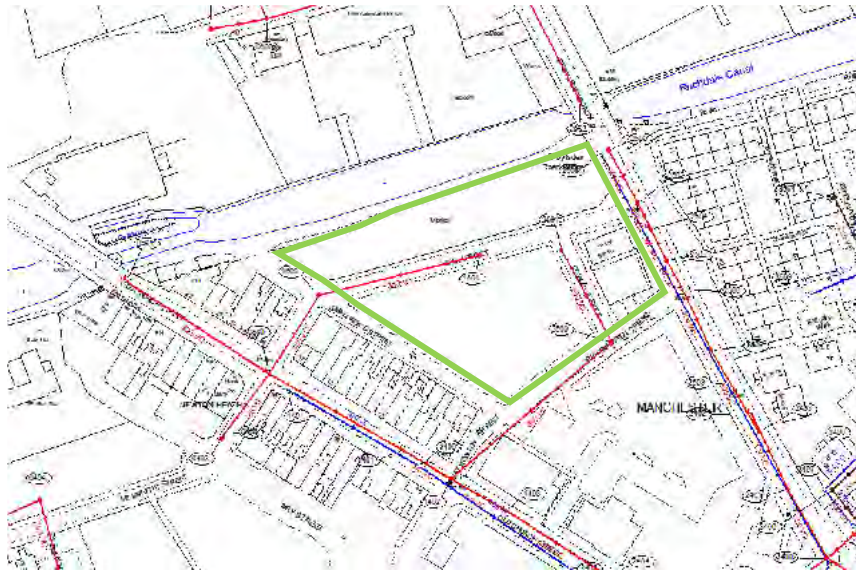
Figure 3 – The EA's Indicative Surface Water Flood Map



5.4. Flooding from Sewers and Private Drainage

- 5.4.1 The United Utilities (UU) sewer records have been reviewed and confirm that there is a 300mm diameter combined sewer within Silk Street and another within Cowley Street on site; the required UU development easement will be adhered to for these sewers.
- 5.4.2 There is a 300mm diameter Surface Water Sewer and 300mm diameter combined sewer within Old Church Street. There are also 300mm diameter combined sewers within Droylsden Road and Great Newton Street. Figure 4 shows the existing sewer records from 2006.
- 5.4.3 The extensive UU adopted drainage network serving the surrounding urban district ensures that the development footprint is protected from the impact of both upstream and downstream runoff. It is speculated that complete protection may well exist beyond a storm event equivalent to the 30-year statistical event. Beyond this projection, there may be a small degree of peripheral 'Exceedance' flooding within the areas above the sewers. However, this is expected to be localised and restricted to the location of specific manhole covers located outside the development footprint. Thus, flood risk to the site from sewers is diminished to acceptable levels.

Figure 4 – Extract of United Utilities Sewer Records



5.5. Flooding from Groundwater

- 5.5.1 The Bedrock Geology of the site is classified as a Principal Aquifer. These are layers of rocks or drift deposits that have high intergranular and/or fracture permeability. They may support water supply and/or river base flow on a strategic scale.
- 4.5.2 According to information contained within the SFRA there are no documented records of groundwater flooding within Manchester and the risk of groundwater flooding within the District is low. Therefore, the site is deemed to have a low susceptibility to groundwater flooding.

5.6. Flooding from Artificial Sources

- 5.6.1 The Rochdale Canal is situated on the northern boundary of the site. According to the SFRA the Rochdale Canal is a broad canal and does not pose a direct flood risk as they are controlled waterbodies with regulated flows. The residual risk of flooding is also limited due to continued maintenance by British Waterways.
- 5.6.2 Therefore the risk of flooding from artificial sources is considered to be diminished to acceptable levels, removing the requirement for further investigation and assessment.

6. ASSESSMENT OF FLOOD RISK ON DEVELOPMENT SITE (PROBABILITY)

6.1. Summary

Section 4 has defined the anticipated flood risks from all sources. Table 3 below considers each of the sources and defines in tabular format the Probability of Flood Risk associated to each and the likely impacts. Below is a table summary of the flood risks associated with the development site.

Table 3 – Flood Risk Summary

Source	Flood Risk	Likely Impacts	Remarks
Tidal	Low	Low	Site not tidally influenced.
Fluvial (Watercourse)	Low	Low	Site located in Flood Zone 1 (low risk).
Surface (Overland Flood Flow)	Low	Low	Indicative EA mapping shows majority of site is at low risk.
Sewers	Low	Low	Combined sewers on site will have the required development easement.
Groundwater	Low	Low	No indication through SFRA or local borehole records that site at risk of groundwater flooding.
Artificial Sources	Low	Low	Rochdale Canal is a controlled waterbody with regulated flows.

7. OUTLINE DRAINAGE STRATEGY

7.1. Existing Surface Water Runoff

- 7.1.1. The site has positive drainage system and it is classified as brownfield. Table 3 below details the brownfield runoff rates for the site.

Table 3: Existing Runoff Rates

	Impermeable Area (m ²)	Existing Discharge Rate - (Imp Area x 50mm/hr) ÷ 3600	Allowable Discharge Rate (50% Reduction from Existing)
Parcel A	1415	15.7 l/s	7.8 l/s
Parcel B	774	10.8 l/s	5.4l/s
Parcel C	2565	35.6 l/s	17.8l/s

7.2. Geology

- 7.2.1 According to Phase 2 Geo-Environmental Investigations undertaken, the site is underlain by a variable thickness of Made Ground. Beneath this lies sandy clay/silty, sandy gravelly clay to depths of approximately 8mbgl. Shallow groundwater was also present at depths of between 0.5-2.0mbgl.
- 7.2.2 Based on the presence of cohesive underlying clay and shallow groundwater, soakaways

7.3. Hydrology

- 7.3.1. The Rochdale Canal is to the north of the site. However, it is classified as a site of biological importance, as such the Council Ecology Department have requested that no drainage be discharged into the Canal.

7.4. Existing Drainage

- 7.4.1. There are existing sewers both on site and in the surrounding highways. United Utilities have confirmed that surface water from the development can outfall into the surrounding sewers at three outfall points.

7.5. Sustainable Drainage Systems

7.5.1. SuDS Objectives

Sustainable drainage developed in line with the ideals of sustainable development is collectively referred to as Sustainable Drainage Systems (SuDS). At a particular site, these systems are designed both to manage the environmental risks resulting from the urban runoff and to contribute wherever possible to environmental enhancement. SuDS objectives are therefore to minimise the impacts

from the development on the quantity and quality of the runoff and maximise amenity and biodiversity opportunities (CIRIA C753, 2015).

7.5.2. SuDS's Design Themes

A strong design theme is essential if the maximum aesthetic benefits are to be gained from the SuDS approach. At a more local scale the SuDS should link with the individual's plot structure, planting, public open space requirements and amenity areas, gaining multiple benefits from a limited area of land.

7.5.3. The SuDS Management Train

The 'Management Train Approach' should be central to the surface water drainage strategy of the proposed site. The main objective is treatment and control of runoff as near to the source as possible protecting downstream habitats and further enhancing the amenity value of the site. This concept uses a hierarchy of drainage techniques to incrementally reduce pollution, flow rates and volumes of storm water discharge from the site, and is as follows:

- 1. Prevention** – The use of good site design and housekeeping measures to prevent runoff and pollution and includes the use of rainwater reuse / harvesting.
- 2. Source Controls** – Control of runoff at source or as close to source as possible (e.g. soakaways, green roofs, pervious pavements).
- 3. Site Control** – Management of water in a local area and can include below ground storage / attenuation, detention basins, large infiltration devices.
- 4. Regional Control** – Management of water from a site or various sites and can include wetlands and balancing ponds.

7.5.4. SuDS Site Constraints

SuDS techniques are suitable for all sites; therefore, an assessment of the existing site is required so that SuDS limitations can be determined.

- **Land Use Characteristics:** The size and type of the development plot restricts the range of source control and site control SuDS devices to be considered both above and below ground.
- **Site Characteristics:** Cohesive underlying geology and shallow groundwater found on site means infiltration is not a viable option.
- **Catchment Characteristics:** The site is currently classed as brownfield.
- **Environmental and Amenity Performance:** The inclusion of SuDS within the overall development is a key driver in providing both amenity and habitat creation. Safety to all future occupiers is paramount and so best practice guidance will be incorporated so that these devices blend into the surrounding without the need for significant safety precautions. Maintenance plans will be prepared for all SuDS devices that are included.

7.5.5. SuDS Methods

Tables 4 and 5, below, provide an assessment of various above and below ground SuDS methods that can provide water quality treatment and management of flows to reduce runoff rates and

volumes and whether they can be suitably incorporated at this development site. The purpose of this assessment is to set out options to be considered at the planning stage with consideration to time constraints, viability and lifetime maintenance of the development.

Table 4: Surface SuDS Methods

Method	Comment	Suitability for Development
Green Roofs	- Can be used on suitable low-rise buildings to provide retention, attenuation and treatment of rainwater - Promotes evaporation and local biodiversity.	<u>Not suitable:</u> Architectural proposals for the development and maintenance issues deem this unsuitable.
Water Butts	Plastic tanks placed at the base of rainwater down pipes to collect rainwater runoff from the roof areas.	<u>Suitable:</u> Can be located at base of rainwater downpipes. Subject to Client approval.
Rainwater Harvesting	Rainwater harvesting reduces the total runoff volume from the developed site and reduces treated water consumption.	<u>Not Suitable:</u> - Additional costs of installation would have severe effect on viability of development. - Running and maintenance costs would not be acceptable to client and future occupiers.
Infiltration Options	Reduces total run off volume from the development.	<u>Not Suitable:</u> Cohesive underlying geology and shallow groundwater found during SI confirmed infiltration is not viable.
Permeable Surfacing (Infiltration)	- Reduces total run off volume from the development. - Can be used to enhance water quality.	<u>Not Suitable:</u> Cohesive underlying geology and shallow groundwater found during SI confirmed infiltration is not viable.
Permeable Surfacing (Standard)	- Can be used to enhance quality of runoff water. - Sub-base provides 'source' storage and reduces the volume of storage downstream. - The storage can be created with selection of the stone fill or use of plastic box stems. - Impermeable membrane at base of construction to prevent impact on pavement stability.	<u>May be Suitable:</u> Private driveways have the potential to attenuate and filter surface water flows through the use of permeable surfacing (subject to confirmation from architect on surface finishes).
Swales, basins and ponds	- Provide areas for above ground surface runoff storage. - Swales also improve water quality through filtration.	<u>Not suitable:</u> Space constraints on site do not permit large above ground areas for surface water storage.

Table 5: Sub-Surface SuDS Methods

Method	Comment	Suitability for Development
Geocellular Storage	- Suitable for sites with insufficient space for basins etc. - Suitable for sites where topography prevents the use of open basins etc. - Can be very effective infiltration devices subject to ground conditions.	<u>Suitable:</u> The use of geocellular attenuation may be possible to retain excess storm water.
Large Diameter Pipes, Culverts or Tanks	- Suitable for sites with insufficient space for basins etc. - Provide a volume of below ground storage with a high void ratio and good man entry provision to allow for future maintenance and cleaning. - Generally suitable for adoption by the statutory water company.	<u>Suitable:</u> The use of oversized pipes may be possible to retain excess storm water.

7.5.6. SuDS Hierarchal Approach

Based on the SuDS assessment in Tables 4 and 5, plus an assessment of the local site conditions, the SuDS hierarchal approach for discharge of surface water at the development site is considered in greater detail below:

Table 6: SuDS Hierarchal Approach

Method	Suitability	Suitability for Development
Infiltration to Ground	No	Cohesive underlying geology and shallow groundwater mean soakaways are not viable.
Connection to Watercourse	No	Rochdale Canal to the north is classified as a site of biological importance, as such the Council Ecology Department have requested that no drainage be discharged into the Canal.
Connection to Surface Water Sewer	Yes	A surface water sewer is located within Droylsden Road.
Connection to a Combined Sewer	Yes	Combined sewers are situated within the existing highways on site. United Utilities have confirmed that two connections to these would be acceptable, each limited to 5l/s.

7.5.7. SuDS Design Philosophy

The SuDS assessment and hierarchal approach discussed in Tables 4, 5 and 6 above has defined the overall SuDS strategy. Thus, the SuDS philosophy for the development site is the promotion of Prevention, Source Control and Site Control techniques with discharge rates to be restricted to greenfield rates, to reduce the risk of both site and downstream flooding.

The following design philosophy is proposed:

- Surface water treatment using the 'Management Train' approach to remove and isolate contamination at all SuDS facilities prior to conveyance to the ground.
- Discharge to the surrounding sewers, both surface water and combined, at a maximum outfall rate of 5l/s as agreed with United Utilities.
- Site control in the form of attenuation pipes with restricted outflow.
- Aim to limit where possible the impermeable fraction of development.

7.6. Surface Water Drainage Strategy

- 7.6.1.** The outline strategy is to collect runoff from the roof and other site areas and direct it to new below-ground surface water drainage pipework that will discharge into the surrounding adopted sewer network at three connection points, as agreed with United Utilities.
- 7.6.2.** The discharge rate will be restricted to a maximum of 5l/s as requested by United Utilities; this rate also equates to a greater than 50% reduction on existing brownfield rates. In turn this will generate surface water attenuation volumes which will be contained in oversized pipes.
- 7.6.3.** The proposed drainage layout for the new development site will be designed in accordance with Design & Construction Guidance (DCG), BS EN 752: 2008 and Building Regulations Part H guidance, i.e. up to the 30-year storm return period criterion and tested for the 1 in 100 year return period including a 40% increase to account for climate change to confirm that there is no flood risk to the properties.
- 7.6.4.** Flooding can occur on a local scale beyond the 30-year criterion due to runoff exceeding the capacity of the minor system during extreme events and it can only be addressed on a site-specific basis. Design & Construction Guidance states that developments should be protected against flooding from extreme events (1 in 30 year) and that flood pathways are identified when the drainage system is exceeded.
- 7.6.5.** In the case of this development, exceedance flows will be all those over and above the 30-year design criterion set by Sewers for Adoption guidance. Using storage within the external areas would be achievable and would direct flood water away from the proposed properties, with flows directed back into the surface water drainage network as water levels in the drainage network receded. The exceedance flows and volumes can be calculated for the new development drainage layout. In the case of this development and due to the fall across the site, consideration will be given to make sure all water is controlled so that it does not impact on any adjoining properties.
- 7.6.6.** Table 7 below defines the outline post-development attenuation volumes. The volumes identified below are preliminary for this outline assessment and are likely to alter at detailed design stage.
- 7.6.7.** Any future drainage calculations carried out as part of a site-wide drainage strategy or for the development layouts themselves must include the appropriate increase in rainfall to satisfy the future Climate Change allowances.

Table 7: Outline Attenuation Volumes

	Impermeable Area (ha)	Proposed Discharge Rate (l/s)	1 in 30 year attenuation (m ³)	1 in 100 year attenuation + 40% Climate Change Allowance (m ³)
Parcel A	0.196	5.0	35.0	80.0
Parcel B	0.120	5.0	15.0	38.0
Parcel C	0.045	5.0	3.0	9.0

7.7. Pollution Control

- 7.7.1.** Silt is to be prevented from entering the drainage system by the use of trapped gullies, channels with silt traps or Sustainable Drainage Systems.

7.8. Foul Water Strategy

- 7.8.1.** The outline foul water drainage strategy is to connect to the existing combined water sewer network at three connection points.

8. MANAGEMENT MEASURES, OFF SITE IMPACTS AND RESIDUAL RISK

8.1. Flood Risk Management Measures

- 8.1.1.** The report has found the site to be at low risk of flooding from all sources.
- 8.1.2.** The surface water drainage strategy will restrict runoff to 5l/s at three connection points, prior to discharge into the United Utilities Sewer Network. Attenuation has been proposed in the form of oversized pipes. The new surface water networks will be designed in line with current British Standard and Design & Construction Guidance up to the 100-year storm return period including an allowance for climate change.
- 8.1.3.** The use of SuDS in the form of Site Control measures, with controlled (restricted) outflow, will help to minimise the flood risk impact to the surrounding sewer network.
- 8.1.4.** There will be a site management health and safety document prepared in respect of the final development. This will include the required maintenance regime for the on-site drains and drainage facilities such as the channels, gullies, pipes, manholes and all SuDS facilities.
- 8.1.5.** Both United Utilities and Manchester City Council Highway Authority will be responsible for site cleanliness, gully emptying and drain cleansing to ensure that the surface water drainage system will always operate at its maximum efficiency.
- 8.1.6.** Should any flooding occur from the new sewers and drains it will be directed away from the buildings to the external areas.

8.2. Off Site Impacts

- 8.2.1.** Up to and including the 100-year plus increase in rainfall allowance due to climate change (CC) event, the report has justified that there is no risk of flooding.
- 8.2.2.** Surface water runoff does not increase from the pre-development regime and utilises SuDS solutions to satisfy the site constraints, the proposed development will therefore not increase flood risk onto its locality.

8.3. Residual Risk

- 8.3.1.** With careful design of the drainage elements as described above there will be no residual flood-related risks that will remain after the development has been completed.

9. APPENDICES

- Appendix A – Architectural Site Layout
- Appendix B – Site Topographical Survey
- Appendix C – Ridge Design Drawings
- Appendix D – Outline Surface Water Attenuation Calculations

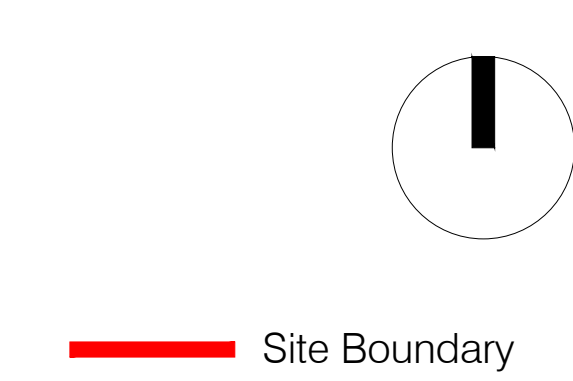
APPENDIX A – ARCHITECTURAL SITE LAYOUT

Contractors are not to scale dimensions from this drawing

Rev	Description	By	Date
P01	For comment	MM	08/04/21
P02	For comment	MM	20/04/21



3 Bed house	17
● 4 Bed house	4
1 Bed Apt	36
2 Bed Apt	12
TOTAL	69



MC

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Eastgate, 2 Castle Street
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Manchester
M3 4LZ

0161 974 7203
info@mcau.co.uk
www.mcau.co.uk

Client

Rowlinson

Project

Silk Street, Manchester

Description

GA Proposed Site Layout

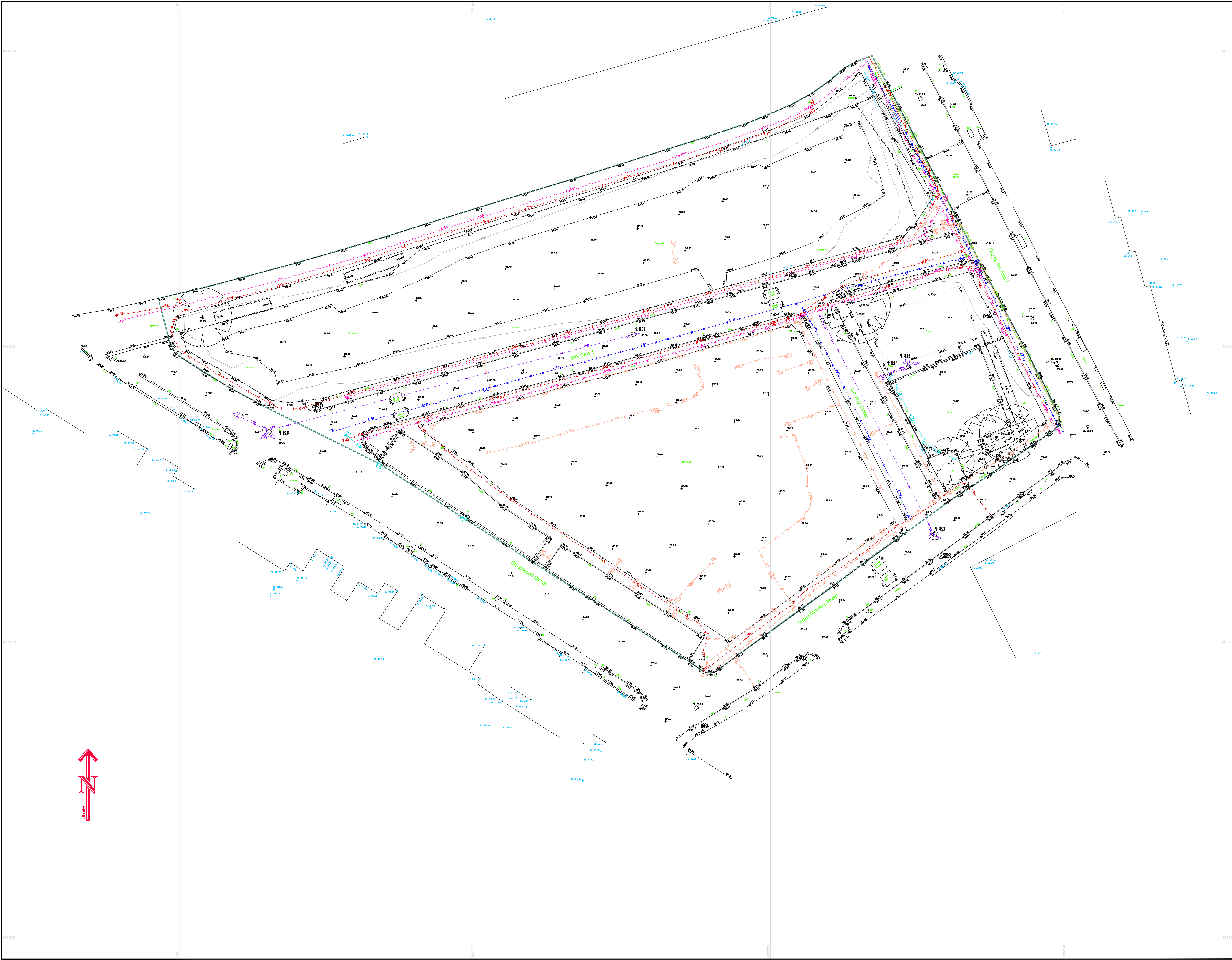
Information			
Scale	Drawn	Date	
1:250 @ A1	MM	Apr 21	
Job number	Drawing number	Revision	
1184	02-001	P02	

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Note: Design/Layouts/Areas are indicative only at this stage and subject to detailed design. Refer to separate Landscape Architects drawings for detailed landscape information.

Site Layout

APPENDIX B – SITE TOPOGRAPHICAL SURVEY



Topographical Survey Legend			
1	Subst	h	Height
11	Subst	h	Height
12	Subst	h	Height
13	Subst	h	Height
14	Subst	h	Height
15	Subst	h	Height
16	Subst	h	Height
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100	Subst	h	Height

Drainage/Services Legend			
1	Subst	h	Height
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12	Subst	h	Height
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17	Subst	h	Height
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94	Subst	h	Height
95	Subst	h	Height
96	Subst	h	Height
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98	Subst	h	Height
99	Subst	h	Height
100	Subst	h	Height

Survey Station Coordinates			
Stn	Eastings	Northings	Level
0001	388022.73	400562.40	89.20
0002	388122.75	400540.28	87.74
0003	388222.87	400514.80	88.71
0004	388188.56	400485.36	88.12
0005	388128.08	400451.75	87.70
0006	388080.23	400413.50	86.66
000A	388237.91	400556.11	90.48

PAS128 Quality Levels
Please refer to PAS128:2014 Table 1 - "Quality level of survey outputs (normative)"
For anticipated accuracy of quality levels.
All utilities are located to PAS128 QL 62 unless otherwise stated.

The following table identifies the PAS128 quality level based on the notes shown on the drawing:

Annotation found on drawing	PAS128 Quality Level
Added from records	PAS128 QL-D
French scar, street furniture	PAS128 QL-C
Visual correspondence to utility	PAS128 QL-B4
Assumed route	PAS128 QL-B3
Unable to obtain depth	PAS128 QL-B1
QL-B1	PAS128 QL-B1
QL-B2P	PAS128 QL-B2P
QL-B2P	PAS128 QL-B2P
QL-B1P	PAS128 QL-B1P

Quality levels ending with a "P" refer to a utility that has been located with post processed Ground Penetrating Radar (GPR).

Drawing caveats, please note:
SSL Ltd carry out surveys in accordance with site procedures using approved detectors.
Depth data is limited by the accuracy of the detection equipment. Average accuracy is +/- 10% of depth with GPR and +/- 5% of the depth with electromagnetic technologies.

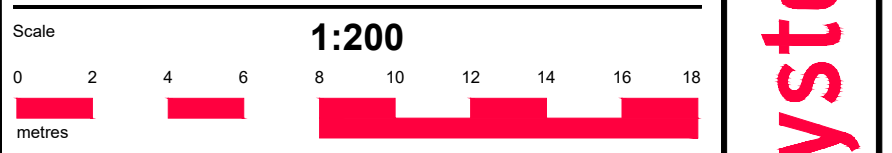
It is SSL's procedure to use statutory underpinning plans prior to and during the survey as a guide for the survey team.

In accordance with British Telecom's national policy survey companies are not permitted to issue BT inspection chamber covers.
Drainage routes between manholes, if not able to be traced by SSL's survey methodologies, are assumed to be direct lines between manholes.
SSL advise that excavations in the vicinity of services are carried out with due diligence, please refer to HSG47.

Please note:
Any discrepancy found between an Ordnance Survey benchmark and an OSGB15 computed orthometric height is likely to be due to bench mark subsidence or uplift and, assuming precise GPS survey has been carefully carried out, the orthometric height given by OSGB15 should be considered correct in preference to archive benchmark heights. OSGB15 converts GPS ellipsoid heights to orthometric heights above mean sea level.

Levels are related to OSGB15
Value m/a

Coordinates are related to National Grid (GPS)



The accuracy of this survey is commensurate with the drawing scale specified within the title block. Copyright in this drawing remains with Survey Systems Ltd. Do not scale from this drawing, work to figured dimensions. Check all dimensions on-site. In the event of any discrepancy, please refer open to Survey Systems Ltd.

Client: Wilde Consulting Engineers

Title: Topographical & Utility Survey

Location: AL AF NB DM

Date: January 2019

Drawn by: AG MT

File name: 19250.TOP001B

Sheet size: A0

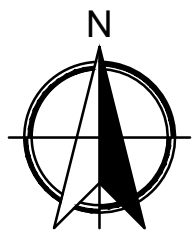
Drawing No: SSL:19250:200:1:1

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Fax: 01425 538816
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SURVEY systems

APPENDIX C – RIDGE DESIGN DRAWINGS



GENERAL NOTES

1. DRAWINGS ARE TO BE READ IN CONJUNCTION WITH ALL RELEVANT SPECIFICATIONS, ENGINEERS, ARCHITECTS & SERVICES DRAWINGS, INCLUDING APPROVED BUILDERS WORK DRAWINGS. CONTRACTOR TO NOTIFY ENGINEER OF DISCREPANCIES BETWEEN STRUCTURAL DRAWINGS AND SPECIFICATIONS OR OTHER DRAWINGS.
2. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS NOTED OTHERWISE.
3. DO NOT SCALE FROM THIS DRAWING, WORK TO DIMENSIONS OR CO-ORDINATES PROVIDED. ALL LEVELS ARE IN METRES AND ALL DIMENSIONS ARE IN MILLIMETRES, UNLESS OTHERWISE NOTED. ANY AMBIGUITIES, OMISSIONS AND ERRORS ON DRAWINGS, SHALL BE BROUGHT TO THE ENGINEERS ATTENTION IMMEDIATELY.

DRAINAGE KEY

- EXISTING SW SEWER
- EXISTING CW SEWER
- PROPOSED SW DRAIN
- PROPOSED FW DRAIN
- PROPOSED CW DRAIN
- SITE BOUNDARY

P1	25.05.21	EJD	PB	PRELIMINARY ISSUE
No	DATE	DRAWN	REV'D ENG.	AMENDMENT

STATUS	PURPOSE OF ISSUE
S2	FOR INFORMATION

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RIDGE

CLIENT	ROWLINSON CONSTRUCTION		
PROJECT	SILK STREET, GORTON		
DRAFTER	EJD	ENGINEER	PB
TITLE	PROPOSED DRAINAGE		
SCALE	SHEET	DRAWING No	REV
1-250	A1	SSG-RDG-00-ZZ-DR-C-0100	P1

APPENDIX D – OUTLINE SURFACE WATER ATTENUATION CALCULATIONS

Scott Hughes Design Ltd						Page 1	
The Flint Glass Works 64 Jersey Street Manchester M4 6JW				Parcel A Silk Street			
Date 25/05/2021 File Parcel A - 30YR.SRCX				Designed by EJD Checked by PB			
Micro Drainage				Source Control 2018.1			
<u>Summary of Results for 30 year Return Period</u>							
Half Drain Time : 64 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	87.737	0.309	0.0	4.6	4.6	20.6	O K
30 min Summer	87.819	0.391	0.0	4.7	4.7	26.0	O K
60 min Summer	87.871	0.443	0.0	4.7	4.7	29.5	O K
120 min Summer	87.889	0.461	0.0	4.7	4.7	30.7	O K
180 min Summer	87.876	0.448	0.0	4.7	4.7	29.8	O K
240 min Summer	87.853	0.425	0.0	4.7	4.7	28.3	O K
360 min Summer	87.802	0.374	0.0	4.7	4.7	24.9	O K
480 min Summer	87.755	0.327	0.0	4.6	4.6	21.7	O K
600 min Summer	87.713	0.285	0.0	4.6	4.6	19.0	O K
720 min Summer	87.678	0.250	0.0	4.5	4.5	16.6	O K
960 min Summer	87.624	0.196	0.0	4.3	4.3	13.0	O K
1440 min Summer	87.561	0.133	0.0	3.8	3.8	8.8	O K
2160 min Summer	87.527	0.099	0.0	3.1	3.1	6.6	O K
2880 min Summer	87.511	0.083	0.0	2.6	2.6	5.5	O K
4320 min Summer	87.495	0.067	0.0	1.9	1.9	4.5	O K
5760 min Summer	87.487	0.059	0.0	1.5	1.5	3.9	O K
7200 min Summer	87.481	0.053	0.0	1.3	1.3	3.5	O K
8640 min Summer	87.477	0.049	0.0	1.1	1.1	3.3	O K
10080 min Summer	87.474	0.046	0.0	1.0	1.0	3.0	O K
15 min Winter	87.779	0.351	0.0	4.7	4.7	23.3	O K
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)			
15 min Summer	65.258	0.0	23.9	19			
30 min Summer	43.502	0.0	31.9	32			
60 min Summer	27.812	0.0	40.9	54			
120 min Summer	17.284	0.0	50.8	88			
180 min Summer	12.947	0.0	57.1	122			
240 min Summer	10.499	0.0	61.7	156			
360 min Summer	7.772	0.0	68.5	222			
480 min Summer	6.279	0.0	73.8	286			
600 min Summer	5.318	0.0	78.1	348			
720 min Summer	4.641	0.0	81.8	408			
960 min Summer	3.741	0.0	87.9	524			
1440 min Summer	2.757	0.0	97.2	754			
2160 min Summer	2.030	0.0	107.4	1104			
2880 min Summer	1.632	0.0	115.1	1468			
4320 min Summer	1.198	0.0	126.7	2204			
5760 min Summer	0.961	0.0	135.6	2936			
7200 min Summer	0.810	0.0	142.9	3664			
8640 min Summer	0.704	0.0	149.1	4376			
10080 min Summer	0.626	0.0	154.6	5080			
15 min Winter	65.258	0.0	26.8	20			
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Scott Hughes Design Ltd							Page 2
The Flint Glass Works 64 Jersey Street Manchester M4 6JW			Parcel A Silk Street				
Date 25/05/2021 File Parcel A - 30YR.SRCX			Designed by EJD Checked by PB				
Micro Drainage			Source Control 2018.1				
<u>Summary of Results for 30 year Return Period</u>							
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	87.873	0.445		0.0	4.7	4.7	29.6 O K
60 min Winter	87.938	0.510		0.0	4.7	4.7	33.9 O K
120 min Winter	87.951	0.523		0.0	4.7	4.7	34.8 O K
180 min Winter	87.927	0.499		0.0	4.7	4.7	33.2 O K
240 min Winter	87.889	0.461		0.0	4.7	4.7	30.7 O K
360 min Winter	87.807	0.379		0.0	4.7	4.7	25.2 O K
480 min Winter	87.736	0.308		0.0	4.6	4.6	20.5 O K
600 min Winter	87.678	0.250		0.0	4.5	4.5	16.6 O K
720 min Winter	87.632	0.204		0.0	4.3	4.3	13.6 O K
960 min Winter	87.571	0.143		0.0	3.9	3.9	9.5 O K
1440 min Winter	87.528	0.100		0.0	3.1	3.1	6.6 O K
2160 min Winter	87.505	0.077		0.0	2.3	2.3	5.1 O K
2880 min Winter	87.495	0.067		0.0	1.9	1.9	4.4 O K
4320 min Winter	87.483	0.055		0.0	1.4	1.4	3.7 O K
5760 min Winter	87.477	0.049		0.0	1.1	1.1	3.2 O K
7200 min Winter	87.472	0.044		0.0	0.9	0.9	2.9 O K
8640 min Winter	87.469	0.041		0.0	0.8	0.8	2.7 O K
10080 min Winter	87.466	0.038		0.0	0.7	0.7	2.5 O K
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)			
30 min Winter	43.502	0.0	35.7	33			
60 min Winter	27.812	0.0	45.8	60			
120 min Winter	17.284	0.0	56.9	96			
180 min Winter	12.947	0.0	63.9	134			
240 min Winter	10.499	0.0	69.1	170			
360 min Winter	7.772	0.0	76.7	238			
480 min Winter	6.279	0.0	82.7	302			
600 min Winter	5.318	0.0	87.5	362			
720 min Winter	4.641	0.0	91.6	422			
960 min Winter	3.741	0.0	98.5	532			
1440 min Winter	2.757	0.0	108.9	752			
2160 min Winter	2.030	0.0	120.3	1104			
2880 min Winter	1.632	0.0	128.9	1468			
4320 min Winter	1.198	0.0	141.9	2176			
5760 min Winter	0.961	0.0	151.9	2880			
7200 min Winter	0.810	0.0	160.1	3664			
8640 min Winter	0.704	0.0	167.0	4272			
10080 min Winter	0.626	0.0	173.1	5096			
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The Flint Glass Works 64 Jersey Street Manchester M4 6JW	Parcel A Silk Street	
Date 25/05/2021 File Parcel A - 30YR.SRCX	Designed by EJD Checked by PB	
Micro Drainage Source Control 2018.1		

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	30	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	18.100	Shortest Storm (mins)	15
Ratio R	0.348	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+0

Time Area Diagram

Total Area (ha) 0.196

Time (mins) Area			Time (mins) Area		
From:	To:	(ha)	From:	To:	(ha)
0	4	0.098	4	8	0.098

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The Flint Glass Works 64 Jersey Street Manchester M4 6JW	Parcel A Silk Street	
Date 25/05/2021 File Parcel A - 30YR.SRCX	Designed by EJD Checked by PB	
Micro Drainage Source Control 2018.1		

Model Details

Storage is Online Cover Level (m) 89.428

Cellular Storage Structure

Invert Level (m) 87.428 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m ²)	Inf. Area (m ²)	Depth (m)	Area (m ²)	Inf. Area (m ²)
0.000	70.0	70.0	1.201	0.0	110.2
1.200	70.0	110.2			

Hydro-Brake® Optimum Outflow Control

Unit Reference MD-SHE-0097-5000-1600-5000
Design Head (m) 1.600
Design Flow (l/s) 5.0
Flush-Flo™ Calculated
Objective Minimise upstream storage
Application Surface
Sump Available Yes
Diameter (mm) 97
Invert Level (m) 87.428
Minimum Outlet Pipe Diameter (mm) 150
Suggested Manhole Diameter (mm) 1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.600	5.0
Flush-Flo™	0.425	4.7
Kick-Flo®	0.865	3.8
Mean Flow over Head Range	-	4.2

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	3.1	1.200	4.4	3.000	6.7	7.000	10.0
0.200	4.3	1.400	4.7	3.500	7.2	7.500	10.3
0.300	4.6	1.600	5.0	4.000	7.7	8.000	10.7
0.400	4.7	1.800	5.3	4.500	8.1	8.500	11.0
0.500	4.7	2.000	5.5	5.000	8.5	9.000	11.3
0.600	4.6	2.200	5.8	5.500	8.9	9.500	11.6
0.800	4.1	2.400	6.0	6.000	9.3		
1.000	4.0	2.600	6.3	6.500	9.7		

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Scott Hughes Design Ltd		Page 3
The Flint Glass Works 64 Jersey Street Manchester M4 6JW	Parcel A Silk Street	
Date 25/05/2021 File Parcel A - 100yr + CC.SRCX	Designed by EJD Checked by PB	
Micro Drainage		Source Control 2018.1

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)	18.100	Shortest Storm (mins)	15
Ratio R	0.348	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.196

Time (mins) Area			Time (mins) Area		
From:	To:	(ha)	From:	To:	(ha)
0	4	0.098	4	8	0.098

Scott Hughes Design Ltd		Page 4																																																																																																																															
The Flint Glass Works 64 Jersey Street Manchester M4 6JW	Parcel A Silk Street																																																																																																																																
Date 25/05/2021 File Parcel A - 100yr + CC.SRCX	Designed by EJD Checked by PB																																																																																																																																
Micro Drainage Source Control 2018.1																																																																																																																																	
<u>Model Details</u> Storage is Online Cover Level (m) 89.428 <u>Cellular Storage Structure</u> Invert Level (m) 87.428 Safety Factor 2.0 Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95 Infiltration Coefficient Side (m/hr) 0.00000 <table><tr><th>Depth (m)</th><th>Area (m²)</th><th>Inf. Area (m²)</th><th>Depth (m)</th><th>Area (m²)</th><th>Inf. Area (m²)</th></tr><tr><td>0.000</td><td>70.0</td><td>70.0</td><td>1.201</td><td>0.0</td><td>110.2</td></tr><tr><td>1.200</td><td>70.0</td><td>110.2</td><td></td><td></td><td></td></tr></table> <u>Hydro-Brake® Optimum Outflow Control</u> <table><tr><td>Unit Reference</td><td>MD-SHE-0097-5000-1600-5000</td></tr><tr><td>Design Head (m)</td><td>1.600</td></tr><tr><td>Design Flow (l/s)</td><td>5.0</td></tr><tr><td>Flush-Flo™</td><td>Calculated</td></tr><tr><td>Objective</td><td>Minimise upstream storage</td></tr><tr><td>Application</td><td>Surface</td></tr><tr><td>Sump Available</td><td>Yes</td></tr><tr><td>Diameter (mm)</td><td>97</td></tr><tr><td>Invert Level (m)</td><td>87.428</td></tr><tr><td>Minimum Outlet Pipe Diameter (mm)</td><td>150</td></tr><tr><td>Suggested Manhole Diameter (mm)</td><td>1200</td></tr></table> <table><tr><th>Control Points</th><th>Head (m)</th><th>Flow (l/s)</th></tr><tr><td>Design Point (Calculated)</td><td>1.600</td><td>5.0</td></tr><tr><td>Flush-Flo™</td><td>0.425</td><td>4.7</td></tr><tr><td>Kick-Flo®</td><td>0.865</td><td>3.8</td></tr><tr><td>Mean Flow over Head Range</td><td>-</td><td>4.2</td></tr></table> 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 <table><tr><th>Depth (m)</th><th>Flow (l/s)</th><th>Depth (m)</th><th>Flow (l/s)</th><th>Depth (m)</th><th>Flow (l/s)</th><th>Depth (m)</th><th>Flow (l/s)</th></tr><tr><td>0.100</td><td>3.1</td><td>1.200</td><td>4.4</td><td>3.000</td><td>6.7</td><td>7.000</td><td>10.0</td></tr><tr><td>0.200</td><td>4.3</td><td>1.400</td><td>4.7</td><td>3.500</td><td>7.2</td><td>7.500</td><td>10.3</td></tr><tr><td>0.300</td><td>4.6</td><td>1.600</td><td>5.0</td><td>4.000</td><td>7.7</td><td>8.000</td><td>10.7</td></tr><tr><td>0.400</td><td>4.7</td><td>1.800</td><td>5.3</td><td>4.500</td><td>8.1</td><td>8.500</td><td>11.0</td></tr><tr><td>0.500</td><td>4.7</td><td>2.000</td><td>5.5</td><td>5.000</td><td>8.5</td><td>9.000</td><td>11.3</td></tr><tr><td>0.600</td><td>4.6</td><td>2.200</td><td>5.8</td><td>5.500</td><td>8.9</td><td>9.500</td><td>11.6</td></tr><tr><td>0.800</td><td>4.1</td><td>2.400</td><td>6.0</td><td>6.000</td><td>9.3</td><td></td><td></td></tr><tr><td>1.000</td><td>4.0</td><td>2.600</td><td>6.3</td><td>6.500</td><td>9.7</td><td></td><td></td></tr></table>			Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)	0.000	70.0	70.0	1.201	0.0	110.2	1.200	70.0	110.2				Unit Reference	MD-SHE-0097-5000-1600-5000	Design Head (m)	1.600	Design Flow (l/s)	5.0	Flush-Flo™	Calculated	Objective	Minimise upstream storage	Application	Surface	Sump Available	Yes	Diameter (mm)	97	Invert Level (m)	87.428	Minimum Outlet Pipe Diameter (mm)	150	Suggested Manhole Diameter (mm)	1200	Control Points	Head (m)	Flow (l/s)	Design Point (Calculated)	1.600	5.0	Flush-Flo™	0.425	4.7	Kick-Flo®	0.865	3.8	Mean Flow over Head Range	-	4.2	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	0.100	3.1	1.200	4.4	3.000	6.7	7.000	10.0	0.200	4.3	1.400	4.7	3.500	7.2	7.500	10.3	0.300	4.6	1.600	5.0	4.000	7.7	8.000	10.7	0.400	4.7	1.800	5.3	4.500	8.1	8.500	11.0	0.500	4.7	2.000	5.5	5.000	8.5	9.000	11.3	0.600	4.6	2.200	5.8	5.500	8.9	9.500	11.6	0.800	4.1	2.400	6.0	6.000	9.3			1.000	4.0	2.600	6.3	6.500	9.7		
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The Flint Glass Works 64 Jersey Street Manchester M4 6JW			Parcel B Silk Street			
Date 25/05/2021 File Parcel B - 30yr.SRCX			Designed by EJD Checked by PB			
Micro Drainage			Source Control 2018.1			
Summary of Results for 30 year Return Period						
Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status	
15 min Summer	86.396	0.356	4.7	10.6	O K	
30 min Summer	86.434	0.394	4.7	12.5	O K	
60 min Summer	86.442	0.402	4.7	13.0	O K	
120 min Summer	86.421	0.381	4.7	11.9	O K	
180 min Summer	86.391	0.351	4.7	10.3	O K	
240 min Summer	86.359	0.319	4.6	8.8	O K	
360 min Summer	86.301	0.261	4.5	6.0	O K	
480 min Summer	86.254	0.214	4.3	4.1	O K	
600 min Summer	86.218	0.178	4.2	2.7	O K	
720 min Summer	86.190	0.150	4.0	1.8	O K	
960 min Summer	86.155	0.115	3.6	1.0	O K	
1440 min Summer	86.127	0.087	2.7	0.5	O K	
2160 min Summer	86.109	0.069	2.0	0.3	O K	
2880 min Summer	86.100	0.060	1.6	0.2	O K	
4320 min Summer	86.090	0.050	1.2	0.2	O K	
5760 min Summer	86.084	0.044	0.9	0.1	O K	
7200 min Summer	86.080	0.040	0.8	0.1	O K	
8640 min Summer	86.077	0.037	0.7	0.1	O K	
10080 min Summer	86.075	0.035	0.6	0.1	O K	
15 min Winter	86.427	0.387	4.7	12.2	O K	
30 min Winter	86.474	0.434	4.7	14.7	O K	
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)		
15 min Summer	65.258	0.0	14.7	18		
30 min Summer	43.502	0.0	19.6	29		
60 min Summer	27.812	0.0	25.0	46		
120 min Summer	17.284	0.0	31.1	80		
180 min Summer	12.947	0.0	35.0	114		
240 min Summer	10.499	0.0	37.8	146		
360 min Summer	7.772	0.0	42.0	206		
480 min Summer	6.279	0.0	45.2	266		
600 min Summer	5.318	0.0	47.9	322		
720 min Summer	4.641	0.0	50.1	378		
960 min Summer	3.741	0.0	53.9	492		
1440 min Summer	2.757	0.0	59.6	734		
2160 min Summer	2.030	0.0	65.8	1084		
2880 min Summer	1.632	0.0	70.5	1464		
4320 min Summer	1.198	0.0	77.6	2140		
5760 min Summer	0.961	0.0	83.1	2872		
7200 min Summer	0.810	0.0	87.5	3672		
8640 min Summer	0.704	0.0	91.3	4272		
10080 min Summer	0.626	0.0	94.7	5000		
15 min Winter	65.258	0.0	16.4	19		
30 min Winter	43.502	0.0	21.9	30		
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The Flint Glass Works 64 Jersey Street Manchester M4 6JW		Parcel B Silk Street			
Date 25/05/2021 File Parcel B - 30yr.SRCX		Designed by EJD Checked by PB			
Micro Drainage		Source Control 2018.1			
<u>Summary of Results for 30 year Return Period</u>					
Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
60 min Winter	86.482	0.442	4.7	15.1	O K
120 min Winter	86.445	0.405	4.7	13.1	O K
180 min Winter	86.395	0.355	4.7	10.5	O K
240 min Winter	86.346	0.306	4.6	8.1	O K
360 min Winter	86.260	0.220	4.4	4.3	O K
480 min Winter	86.199	0.159	4.0	2.1	O K
600 min Winter	86.160	0.120	3.7	1.1	O K
720 min Winter	86.144	0.104	3.3	0.8	O K
960 min Winter	86.125	0.085	2.6	0.5	O K
1440 min Winter	86.108	0.068	2.0	0.3	O K
2160 min Winter	86.097	0.057	1.5	0.2	O K
2880 min Winter	86.090	0.050	1.2	0.2	O K
4320 min Winter	86.082	0.042	0.9	0.1	O K
5760 min Winter	86.077	0.037	0.7	0.1	O K
7200 min Winter	86.074	0.034	0.6	0.1	O K
8640 min Winter	86.072	0.032	0.5	0.1	O K
10080 min Winter	86.069	0.029	0.4	0.1	O K
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)	
60 min Winter	27.812	0.0	28.0	50	
120 min Winter	17.284	0.0	34.8	88	
180 min Winter	12.947	0.0	39.2	122	
240 min Winter	10.499	0.0	42.3	154	
360 min Winter	7.772	0.0	47.0	214	
480 min Winter	6.279	0.0	50.6	266	
600 min Winter	5.318	0.0	53.6	314	
720 min Winter	4.641	0.0	56.1	372	
960 min Winter	3.741	0.0	60.3	490	
1440 min Winter	2.757	0.0	66.7	734	
2160 min Winter	2.030	0.0	73.6	1072	
2880 min Winter	1.632	0.0	78.9	1468	
4320 min Winter	1.198	0.0	86.9	2132	
5760 min Winter	0.961	0.0	93.0	2912	
7200 min Winter	0.810	0.0	98.0	3640	
8640 min Winter	0.704	0.0	102.2	4272	
10080 min Winter	0.626	0.0	106.0	5200	
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Parcel B
Silk Street



Designed by EJD

Checked by PB

Source Control 2018.1

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	30	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	18.100	Shortest Storm (mins)	15
Ratio R	0.348	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+0

Time Area Diagram

Total Area (ha) 0.120

Time (mins)	Area	Time (mins)	Area
From: To:	(ha)	From: To:	(ha)
0 4	0.060	4 8	0.060

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The Flint Glass Works 64 Jersey Street Manchester M4 6JW	Parcel B Silk Street	
Date 25/05/2021 File Parcel B - 30yr.SRCX	Designed by EJD Checked by PB	
Micro Drainage Source Control 2018.1		

Model Details

Storage is Online Cover Level (m) 88.040

Pipe Structure

Diameter (m) 0.900 Length (m) 60.000
Slope (1:X) 400.000 Invert Level (m) 86.040

Hydro-Brake® Optimum Outflow Control

Unit Reference MD-SHE-0097-5000-1600-5000
Design Head (m) 1.600
Design Flow (l/s) 5.0
Flush-Flo™ Calculated
Objective Minimise upstream storage
Application Surface
Sump Available Yes
Diameter (mm) 97
Invert Level (m) 86.040
Minimum Outlet Pipe Diameter (mm) 150
Suggested Manhole Diameter (mm) 1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.600	5.0
Flush-Flo™	0.425	4.7
Kick-Flo®	0.865	3.8
Mean Flow over Head Range	-	4.2

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	3.1	1.200	4.4	3.000	6.7	7.000	10.0
0.200	4.3	1.400	4.7	3.500	7.2	7.500	10.3
0.300	4.6	1.600	5.0	4.000	7.7	8.000	10.7
0.400	4.7	1.800	5.3	4.500	8.1	8.500	11.0
0.500	4.7	2.000	5.5	5.000	8.5	9.000	11.3
0.600	4.6	2.200	5.8	5.500	8.9	9.500	11.6
0.800	4.1	2.400	6.0	6.000	9.3		
1.000	4.0	2.600	6.3	6.500	9.7		

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The Flint Glass Works 64 Jersey Street Manchester M4 6JW			Parcel B Silk Street			
Date 25/05/2021 File Parcel B - 100yr + CC.SRCX			Designed by EJD Checked by PB			
Micro Drainage			Source Control 2018.1			
<u>Summary of Results for 100 year Return Period (+40%)</u>						
	Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
	15 min Summer	86.605	0.565	4.7	21.8	O K
	30 min Summer	86.715	0.675	4.7	27.6	O K
	60 min Summer	86.787	0.747	4.7	31.2	O K
	120 min Summer	86.786	0.746	4.7	31.2	O K
	180 min Summer	86.755	0.715	4.7	29.7	O K
	240 min Summer	86.716	0.676	4.7	27.7	O K
	360 min Summer	86.634	0.594	4.7	23.4	O K
	480 min Summer	86.561	0.521	4.7	19.4	O K
	600 min Summer	86.495	0.455	4.7	15.8	O K
	720 min Summer	86.437	0.397	4.7	12.7	O K
	960 min Summer	86.344	0.304	4.6	8.0	O K
	1440 min Summer	86.227	0.187	4.2	3.1	O K
	2160 min Summer	86.152	0.112	3.5	0.9	O K
	2880 min Summer	86.130	0.090	2.8	0.6	O K
	4320 min Summer	86.110	0.070	2.0	0.3	O K
	5760 min Summer	86.101	0.061	1.6	0.2	O K
	7200 min Summer	86.095	0.055	1.4	0.2	O K
	8640 min Summer	86.090	0.050	1.2	0.2	O K
	10080 min Summer	86.087	0.047	1.0	0.1	O K
	15 min Winter	86.663	0.623	4.7	24.9	O K
	30 min Winter	86.803	0.763	4.7	32.0	O K
	Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)	
	15 min Summer	117.928	0.0	26.5	20	
	30 min Summer	79.405	0.0	35.7	33	
	60 min Summer	51.110	0.0	46.0	60	
	120 min Summer	31.826	0.0	57.3	94	
	180 min Summer	23.794	0.0	64.2	128	
	240 min Summer	19.231	0.0	69.2	160	
	360 min Summer	14.137	0.0	76.3	228	
	480 min Summer	11.370	0.0	81.9	292	
	600 min Summer	9.594	0.0	86.3	352	
	720 min Summer	8.346	0.0	90.1	412	
	960 min Summer	6.693	0.0	96.4	526	
	1440 min Summer	4.895	0.0	105.7	752	
	2160 min Summer	3.572	0.0	115.7	1100	
	2880 min Summer	2.853	0.0	123.2	1452	
	4320 min Summer	2.074	0.0	134.4	2192	
	5760 min Summer	1.652	0.0	142.7	2840	
	7200 min Summer	1.384	0.0	149.5	3624	
	8640 min Summer	1.197	0.0	155.1	4392	
	10080 min Summer	1.060	0.0	160.2	5112	
	15 min Winter	117.928	0.0	29.7	20	
	30 min Winter	79.405	0.0	40.0	34	
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The Flint Glass Works 64 Jersey Street Manchester M4 6JW		Parcel B Silk Street			
Date 25/05/2021		Designed by EJD			
File Parcel B - 100yr + CC.SRCX		Checked by PB			
Micro Drainage		Source Control 2018.1			
<u>Summary of Results for 100 year Return Period (+40%)</u>					
Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
60 min Winter	86.936	0.896	4.7	37.2	O K
120 min Winter	86.943	0.903	4.7	37.4	O K
180 min Winter	86.868	0.828	4.7	34.8	O K
240 min Winter	86.791	0.751	4.7	31.4	O K
360 min Winter	86.652	0.612	4.7	24.3	O K
480 min Winter	86.537	0.497	4.7	18.1	O K
600 min Winter	86.441	0.401	4.7	12.9	O K
720 min Winter	86.361	0.321	4.6	8.8	O K
960 min Winter	86.247	0.207	4.3	3.8	O K
1440 min Winter	86.151	0.111	3.5	0.9	O K
2160 min Winter	86.122	0.082	2.5	0.5	O K
2880 min Winter	86.110	0.070	2.0	0.3	O K
4320 min Winter	86.097	0.057	1.5	0.2	O K
5760 min Winter	86.090	0.050	1.2	0.2	O K
7200 min Winter	86.085	0.045	1.0	0.1	O K
8640 min Winter	86.082	0.042	0.9	0.1	O K
10080 min Winter	86.079	0.039	0.8	0.1	O K
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)	
60 min Winter	51.110	0.0	51.5	62	
120 min Winter	31.826	0.0	64.2	112	
180 min Winter	23.794	0.0	72.0	140	
240 min Winter	19.231	0.0	77.5	176	
360 min Winter	14.137	0.0	85.5	246	
480 min Winter	11.370	0.0	91.7	310	
600 min Winter	9.594	0.0	96.7	368	
720 min Winter	8.346	0.0	101.0	424	
960 min Winter	6.693	0.0	108.0	530	
1440 min Winter	4.895	0.0	118.4	736	
2160 min Winter	3.572	0.0	129.6	1100	
2880 min Winter	2.853	0.0	138.0	1440	
4320 min Winter	2.074	0.0	150.5	2168	
5760 min Winter	1.652	0.0	159.9	2864	
7200 min Winter	1.384	0.0	167.4	3664	
8640 min Winter	1.197	0.0	173.7	4288	
10080 min Winter	1.060	0.0	179.5	4952	
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The Flint Glass Works 64 Jersey Street Manchester M4 6JW	Parcel B Silk Street	
Date 25/05/2021	Designed by EJD	
File Parcel B - 100yr + CC.SRCX	Checked by PB	
Micro Drainage		Source Control 2018.1

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)	18.100	Shortest Storm (mins)	15
Ratio R	0.348	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.120

Time (mins) Area			Time (mins) Area		
From:	To:	(ha)	From:	To:	(ha)
0	4	0.060	4	8	0.060

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The Flint Glass Works 64 Jersey Street Manchester M4 6JW	Parcel B Silk Street	
Date 25/05/2021 File Parcel B - 100yr + CC.SRCX	Designed by EJD Checked by PB	
Micro Drainage Source Control 2018.1		

Model Details

Storage is Online Cover Level (m) 88.040

Pipe Structure

Diameter (m) 0.900 Length (m) 60.000
Slope (1:X) 400.000 Invert Level (m) 86.040

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0097-5000-1600-5000
Design Head (m)	1.600
Design Flow (l/s)	5.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	97
Invert Level (m)	86.040
Minimum Outlet Pipe Diameter (mm)	150
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.600	5.0
Flush-Flo™	0.425	4.7
Kick-Flo®	0.865	3.8
Mean Flow over Head Range	-	4.2

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	3.1	1.200	4.4	3.000	6.7	7.000	10.0
0.200	4.3	1.400	4.7	3.500	7.2	7.500	10.3
0.300	4.6	1.600	5.0	4.000	7.7	8.000	10.7
0.400	4.7	1.800	5.3	4.500	8.1	8.500	11.0
0.500	4.7	2.000	5.5	5.000	8.5	9.000	11.3
0.600	4.6	2.200	5.8	5.500	8.9	9.500	11.6
0.800	4.1	2.400	6.0	6.000	9.3		
1.000	4.0	2.600	6.3	6.500	9.7		

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The Flint Glass Works 64 Jersey Street Manchester M4 6JW			Parcel C Silk Street			
Date 25/05/2021 File Parcel C - 30yr.SRCX			Designed by EJD Checked by PB			
Micro Drainage			Source Control 2018.1			
Summary of Results for 30 year Return Period						
Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status	
15 min Summer	88.090	0.276	4.6	2.9	O K	
30 min Summer	88.097	0.283	4.6	3.0	O K	
60 min Summer	88.067	0.253	4.5	2.5	O K	
120 min Summer	88.000	0.186	4.2	1.6	O K	
180 min Summer	87.953	0.139	3.9	1.0	O K	
240 min Summer	87.927	0.113	3.5	0.7	O K	
360 min Summer	87.902	0.088	2.7	0.5	O K	
480 min Summer	87.890	0.076	2.3	0.3	O K	
600 min Summer	87.882	0.068	2.0	0.3	O K	
720 min Summer	87.877	0.063	1.7	0.2	O K	
960 min Summer	87.869	0.055	1.4	0.2	O K	
1440 min Summer	87.860	0.046	1.0	0.1	O K	
2160 min Summer	87.853	0.039	0.7	0.1	O K	
2880 min Summer	87.849	0.035	0.6	0.1	O K	
4320 min Summer	87.843	0.029	0.4	0.1	O K	
5760 min Summer	87.840	0.026	0.4	0.0	O K	
7200 min Summer	87.838	0.024	0.3	0.0	O K	
8640 min Summer	87.836	0.022	0.3	0.0	O K	
10080 min Summer	87.835	0.021	0.2	0.0	O K	
15 min Winter	88.117	0.303	4.6	3.3	O K	
30 min Winter	88.117	0.303	4.6	3.3	O K	
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)		
15 min Summer	65.258	0.0	5.5	13		
30 min Summer	43.502	0.0	7.3	21		
60 min Summer	27.812	0.0	9.4	38		
120 min Summer	17.284	0.0	11.7	68		
180 min Summer	12.947	0.0	13.1	98		
240 min Summer	10.499	0.0	14.2	126		
360 min Summer	7.772	0.0	15.7	186		
480 min Summer	6.279	0.0	17.0	246		
600 min Summer	5.318	0.0	17.9	306		
720 min Summer	4.641	0.0	18.8	366		
960 min Summer	3.741	0.0	20.2	484		
1440 min Summer	2.757	0.0	22.3	716		
2160 min Summer	2.030	0.0	24.7	1100		
2880 min Summer	1.632	0.0	26.4	1428		
4320 min Summer	1.198	0.0	29.1	2152		
5760 min Summer	0.961	0.0	31.2	2928		
7200 min Summer	0.810	0.0	32.8	3544		
8640 min Summer	0.704	0.0	34.2	4248		
10080 min Summer	0.626	0.0	35.5	4976		
15 min Winter	65.258	0.0	6.2	14		
30 min Winter	43.502	0.0	8.2	23		
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The Flint Glass Works 64 Jersey Street Manchester M4 6JW		Parcel C Silk Street			
Date 25/05/2021 File Parcel C - 30yr.SRCX		Designed by EJD Checked by PB			
Micro Drainage		Source Control 2018.1			
<u>Summary of Results for 30 year Return Period</u>					
Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
60 min Winter	88.062	0.248	4.5	2.4	O K
120 min Winter	87.963	0.149	4.0	1.1	O K
180 min Winter	87.920	0.106	3.3	0.6	O K
240 min Winter	87.902	0.088	2.7	0.5	O K
360 min Winter	87.885	0.071	2.1	0.3	O K
480 min Winter	87.876	0.062	1.7	0.2	O K
600 min Winter	87.870	0.056	1.4	0.2	O K
720 min Winter	87.866	0.052	1.2	0.2	O K
960 min Winter	87.860	0.046	1.0	0.1	O K
1440 min Winter	87.853	0.039	0.7	0.1	O K
2160 min Winter	87.847	0.033	0.5	0.1	O K
2880 min Winter	87.843	0.029	0.4	0.1	O K
4320 min Winter	87.839	0.025	0.3	0.0	O K
5760 min Winter	87.836	0.022	0.3	0.0	O K
7200 min Winter	87.834	0.020	0.2	0.0	O K
8640 min Winter	87.833	0.019	0.2	0.0	O K
10080 min Winter	87.832	0.018	0.2	0.0	O K
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)	
60 min Winter	27.812	0.0	10.5	40	
120 min Winter	17.284	0.0	13.1	70	
180 min Winter	12.947	0.0	14.7	96	
240 min Winter	10.499	0.0	15.9	126	
360 min Winter	7.772	0.0	17.6	184	
480 min Winter	6.279	0.0	19.0	242	
600 min Winter	5.318	0.0	20.1	306	
720 min Winter	4.641	0.0	21.0	360	
960 min Winter	3.741	0.0	22.6	486	
1440 min Winter	2.757	0.0	25.0	716	
2160 min Winter	2.030	0.0	27.6	1080	
2880 min Winter	1.632	0.0	29.6	1452	
4320 min Winter	1.198	0.0	32.6	2140	
5760 min Winter	0.961	0.0	34.9	2920	
7200 min Winter	0.810	0.0	36.8	3656	
8640 min Winter	0.704	0.0	38.3	4328	
10080 min Winter	0.626	0.0	39.8	5208	
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The Flint Glass Works 64 Jersey Street Manchester M4 6JW	Parcel C Silk Street																																																																																																														
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Micro Drainage																																																																																																															
Source Control 2018.1																																																																																																															
<u>Model Details</u> Storage is Online Cover Level (m) 89.814 <u>Pipe Structure</u> Diameter (m) 0.750 Length (m) 20.000 Slope (1:X) 400.000 Invert Level (m) 87.814 <u>Hydro-Brake® Optimum Outflow Control</u> <table><tr><td>Unit Reference</td><td>MD-SHE-0097-5000-1600-5000</td></tr><tr><td>Design Head (m)</td><td>1.600</td></tr><tr><td>Design Flow (l/s)</td><td>5.0</td></tr><tr><td>Flush-Flo™</td><td>Calculated</td></tr><tr><td>Objective</td><td>Minimise upstream storage</td></tr><tr><td>Application</td><td>Surface</td></tr><tr><td>Sump Available</td><td>Yes</td></tr><tr><td>Diameter (mm)</td><td>97</td></tr><tr><td>Invert Level (m)</td><td>87.814</td></tr><tr><td>Minimum Outlet Pipe Diameter (mm)</td><td>150</td></tr><tr><td>Suggested Manhole Diameter (mm)</td><td>1200</td></tr></table> <table><tr><th>Control Points</th><th>Head (m)</th><th>Flow (l/s)</th></tr><tr><td>Design Point (Calculated)</td><td>1.600</td><td>5.0</td></tr><tr><td>Flush-Flo™</td><td>0.425</td><td>4.7</td></tr><tr><td>Kick-Flo®</td><td>0.865</td><td>3.8</td></tr><tr><td>Mean Flow over Head Range</td><td>-</td><td>4.2</td></tr></table> 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 <table><tr><th>Depth (m)</th><th>Flow (l/s)</th><th>Depth (m)</th><th>Flow (l/s)</th><th>Depth (m)</th><th>Flow (l/s)</th><th>Depth (m)</th><th>Flow (l/s)</th></tr><tr><td>0.100</td><td>3.1</td><td>1.200</td><td>4.4</td><td>3.000</td><td>6.7</td><td>7.000</td><td>10.0</td></tr><tr><td>0.200</td><td>4.3</td><td>1.400</td><td>4.7</td><td>3.500</td><td>7.2</td><td>7.500</td><td>10.3</td></tr><tr><td>0.300</td><td>4.6</td><td>1.600</td><td>5.0</td><td>4.000</td><td>7.7</td><td>8.000</td><td>10.7</td></tr><tr><td>0.400</td><td>4.7</td><td>1.800</td><td>5.3</td><td>4.500</td><td>8.1</td><td>8.500</td><td>11.0</td></tr><tr><td>0.500</td><td>4.7</td><td>2.000</td><td>5.5</td><td>5.000</td><td>8.5</td><td>9.000</td><td>11.3</td></tr><tr><td>0.600</td><td>4.6</td><td>2.200</td><td>5.8</td><td>5.500</td><td>8.9</td><td>9.500</td><td>11.6</td></tr><tr><td>0.800</td><td>4.1</td><td>2.400</td><td>6.0</td><td>6.000</td><td>9.3</td><td></td><td></td></tr><tr><td>1.000</td><td>4.0</td><td>2.600</td><td>6.3</td><td>6.500</td><td>9.7</td><td></td><td></td></tr></table>			Unit Reference	MD-SHE-0097-5000-1600-5000	Design Head (m)	1.600	Design Flow (l/s)	5.0	Flush-Flo™	Calculated	Objective	Minimise upstream storage	Application	Surface	Sump Available	Yes	Diameter (mm)	97	Invert Level (m)	87.814	Minimum Outlet Pipe Diameter (mm)	150	Suggested Manhole Diameter (mm)	1200	Control Points	Head (m)	Flow (l/s)	Design Point (Calculated)	1.600	5.0	Flush-Flo™	0.425	4.7	Kick-Flo®	0.865	3.8	Mean Flow over Head Range	-	4.2	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	0.100	3.1	1.200	4.4	3.000	6.7	7.000	10.0	0.200	4.3	1.400	4.7	3.500	7.2	7.500	10.3	0.300	4.6	1.600	5.0	4.000	7.7	8.000	10.7	0.400	4.7	1.800	5.3	4.500	8.1	8.500	11.0	0.500	4.7	2.000	5.5	5.000	8.5	9.000	11.3	0.600	4.6	2.200	5.8	5.500	8.9	9.500	11.6	0.800	4.1	2.400	6.0	6.000	9.3			1.000	4.0	2.600	6.3	6.500	9.7		
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Date 25/05/2021 File Parcel C - 100yr + CC.SRCX			Designed by EJD Checked by PB			
Micro Drainage			Source Control 2018.1			
<u>Summary of Results for 100 year Return Period (+40%)</u>						
Storm Event		Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer		88.322	0.508	4.7	6.5	O K
30 min Summer		88.376	0.562	4.7	7.3	O K
60 min Summer		88.367	0.553	4.7	7.2	O K
120 min Summer		88.278	0.464	4.7	5.8	O K
180 min Summer		88.186	0.372	4.7	4.4	O K
240 min Summer		88.110	0.296	4.6	3.2	O K
360 min Summer		88.007	0.193	4.2	1.7	O K
480 min Summer		87.950	0.136	3.9	1.0	O K
600 min Summer		87.925	0.111	3.4	0.7	O K
720 min Summer		87.911	0.097	3.0	0.5	O K
960 min Summer		87.894	0.080	2.5	0.4	O K
1440 min Summer		87.879	0.065	1.8	0.3	O K
2160 min Summer		87.868	0.054	1.3	0.2	O K
2880 min Summer		87.861	0.047	1.1	0.1	O K
4320 min Summer		87.853	0.039	0.8	0.1	O K
5760 min Summer		87.849	0.035	0.6	0.1	O K
7200 min Summer		87.846	0.032	0.5	0.1	O K
8640 min Summer		87.843	0.029	0.4	0.1	O K
10080 min Summer		87.842	0.028	0.4	0.1	O K
15 min Winter		88.395	0.581	4.7	7.6	O K
30 min Winter		88.467	0.653	4.7	8.6	O K
Storm Event		Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)	
15 min Summer		117.928	0.0	9.9	15	
30 min Summer		79.405	0.0	13.4	24	
60 min Summer		51.110	0.0	17.2	42	
120 min Summer		31.826	0.0	21.5	74	
180 min Summer		23.794	0.0	24.1	106	
240 min Summer		19.231	0.0	26.0	134	
360 min Summer		14.137	0.0	28.6	192	
480 min Summer		11.370	0.0	30.7	248	
600 min Summer		9.594	0.0	32.4	308	
720 min Summer		8.346	0.0	33.8	368	
960 min Summer		6.693	0.0	36.1	488	
1440 min Summer		4.895	0.0	39.6	716	
2160 min Summer		3.572	0.0	43.4	1068	
2880 min Summer		2.853	0.0	46.2	1456	
4320 min Summer		2.074	0.0	50.4	2196	
5760 min Summer		1.652	0.0	53.5	2864	
7200 min Summer		1.384	0.0	56.0	3544	
8640 min Summer		1.197	0.0	58.2	4336	
10080 min Summer		1.060	0.0	60.1	5104	
15 min Winter		117.928	0.0	11.1	15	
30 min Winter		79.405	0.0	15.0	26	
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The Flint Glass Works 64 Jersey Street Manchester M4 6JW		Parcel C Silk Street			
Date 25/05/2021 File Parcel C - 100yr + CC.SRCX		Designed by EJD Checked by PB			
Micro Drainage		Source Control 2018.1			
<u>Summary of Results for 100 year Return Period (+40%)</u>					
Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
60 min Winter	88.431	0.617	4.7	8.1	O K
120 min Winter	88.269	0.455	4.7	5.7	O K
180 min Winter	88.132	0.318	4.6	3.5	O K
240 min Winter	88.035	0.221	4.4	2.1	O K
360 min Winter	87.934	0.120	3.7	0.8	O K
480 min Winter	87.910	0.096	3.0	0.5	O K
600 min Winter	87.897	0.083	2.6	0.4	O K
720 min Winter	87.888	0.074	2.2	0.3	O K
960 min Winter	87.878	0.064	1.8	0.2	O K
1440 min Winter	87.867	0.053	1.3	0.2	O K
2160 min Winter	87.859	0.045	1.0	0.1	O K
2880 min Winter	87.853	0.039	0.8	0.1	O K
4320 min Winter	87.847	0.033	0.6	0.1	O K
5760 min Winter	87.843	0.029	0.4	0.1	O K
7200 min Winter	87.841	0.027	0.4	0.0	O K
8640 min Winter	87.839	0.025	0.3	0.0	O K
10080 min Winter	87.837	0.023	0.3	0.0	O K
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)	
60 min Winter	51.110	0.0	19.3	44	
120 min Winter	31.826	0.0	24.1	80	
180 min Winter	23.794	0.0	27.0	110	
240 min Winter	19.231	0.0	29.1	138	
360 min Winter	14.137	0.0	32.1	188	
480 min Winter	11.370	0.0	34.4	246	
600 min Winter	9.594	0.0	36.3	304	
720 min Winter	8.346	0.0	37.9	368	
960 min Winter	6.693	0.0	40.5	476	
1440 min Winter	4.895	0.0	44.4	732	
2160 min Winter	3.572	0.0	48.6	1084	
2880 min Winter	2.853	0.0	51.8	1436	
4320 min Winter	2.074	0.0	56.4	2188	
5760 min Winter	1.652	0.0	60.0	2888	
7200 min Winter	1.384	0.0	62.8	3536	
8640 min Winter	1.197	0.0	65.2	4360	
10080 min Winter	1.060	0.0	67.3	5072	
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Scott Hughes Design Ltd		Page 4
The Flint Glass Works 64 Jersey Street Manchester M4 6JW	Parcel C Silk Street	
Date 25/05/2021 File Parcel C - 100yr + CC.SRCX	Designed by EJD Checked by PB	
Micro Drainage Source Control 2018.1		

Model Details

Storage is Online Cover Level (m) 89.814

Pipe Structure

Diameter (m) 0.750 Length (m) 20.000
Slope (1:X) 400.000 Invert Level (m) 87.814

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0097-5000-1600-5000
Design Head (m)	1.600
Design Flow (l/s)	5.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	97
Invert Level (m)	87.814
Minimum Outlet Pipe Diameter (mm)	150
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.600	5.0
Flush-Flo™	0.425	4.7
Kick-Flo®	0.865	3.8
Mean Flow over Head Range	-	4.2

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	3.1	1.200	4.4	3.000	6.7	7.000	10.0
0.200	4.3	1.400	4.7	3.500	7.2	7.500	10.3
0.300	4.6	1.600	5.0	4.000	7.7	8.000	10.7
0.400	4.7	1.800	5.3	4.500	8.1	8.500	11.0
0.500	4.7	2.000	5.5	5.000	8.5	9.000	11.3
0.600	4.6	2.200	5.8	5.500	8.9	9.500	11.6
0.800	4.1	2.400	6.0	6.000	9.3		
1.000	4.0	2.600	6.3	6.500	9.7		

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