



Vine Street,

Gorton,

Flood Risk Assessment &

Drainage Strategy

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Executive Summary

The proposal is for the construction of a new residential development with associated highways and hard & soft landscaping off Vine Street, Gorton. The overall site is approximately 0.605ha with an area potentially at risk of reservoir flooding. Therefore, to address the requirements of the 'National Planning Policy Framework (NPPF) 2019' plus the accompanying 'Flood Risk and Coastal Change' chapter of the National Planning Practice Guidance, a Flood Risk Assessment is appropriate.

The assessment has determined that the proposed residential development holds a Flood Zone 1 classification, i.e. land defined as having less than a 1 in 1000-year annual probability of flooding in any one year (<0.1%). The site is also at low risk of flooding from all sources. The development has been assessed against the NPPF 'Sequential Test'. Taking into consideration that the application is for a residential development in Flood Zone 1, NPPF confirms that the development is 'Appropriate'. The 'Exception Test' is consequently not required.

The site can be classed as greenfield, as such greenfield runoff rates will apply. The British Geological Survey mapping and borehole information has found that the site is underlain by superficial deposits of Glacial Till consisting of silty clay. The Manchester Marls Formation also underlies the site, comprised of mudstone. Given the cohesive nature of the underlying geology, infiltration is not an option.

Information from the hidden Manchester map shows a historic watercourse potentially running beneath the site; the presence of this is not shown on any other records and no evidence of its existence has been found on site. It is likely that the culvert actually flows beneath the railway line to the north of the site and set in a cutting with approximately 10m lower ground levels. There are no other watercourses in close proximity.

There is a 300mm diameter surface water sewer in Vine Street to the east which flows south, as well as a 225mm diameter combined sewer in Wycombe Avenue to the east.

Based on the above assessment and in accordance with the hierarchal approach, the site will drain to the surface water sewer in Vine Street at greenfield runoff rates with a maximum discharge of 6.9/s to comply with United Utilities adoption guidance. Surface water will be contained within adopted oversized pipes prior to controlled release.

There is no residual flood risk from the development site to the surrounding district due to the restriction in storm water flow rates to the surface water sewer. The development does not therefore, increase the risk of flooding to other adjacent neighbourhoods. 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 where possible contained within the development site and directed away from the building to the external roads, parking areas and hard and soft landscaped areas.

Foul water generated by the development will be discharged to the United Utilities Combined Water Sewer within Wycombe Avenue. The foul discharge does not present an increased flood risk to the surrounding district.

1.0 Introduction

- 1.1 Scott Hughes Design (SHD) has been appointed by Kirkland Developments to prepare this Flood Risk Assessment and Drainage Strategy to support a planning submission for the construction of a new residential development with associated highway access and hard & soft landscaping. The assessment has been undertaken in line with Section 14 of the 'National Planning Policy Framework 2019' plus the accompanying 'Flood Risk and Coastal Change' chapter of the National Planning Practice Guidance.
- 1.2 This Flood Risk Assessment (FRA) has been commissioned by Kirkland Developments and is specific to their interests in the development proposals as described by the Architectural plan in Appendix A. This report may not be assigned.
- 1.3 The report has been commissioned to identify any flood related issues associated with the proposed development and any likely constraints that could be imposed plus to consider the drainage strategy for it. The following issues have been suggested by the Environment Agency (EA) & Manchester City Council (MCC) as Lead Local Flood Authority (LLFA) and 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.
 - Consider the recommendations of the Manchester City Council Strategic Flood Risk Assessment (SFRA).
 - Assess mitigation measures & off site impacts and define any residual risks.

2.0 Development Description and Location

2.1 Site Location

The site is referenced in Table 1, and a site location map is provided in Appendix A.

Table 1: Site Referencing Information

Item	Brief Description
Site name	Vine Street, Gorton
Site address and location	Land off Vine Street, Gorton, Abbey Hey, Manchester, M18 8SR
Council Area	Manchester City Council
Approximate Grid Reference	OS: 389284, 396965
General Locality	The site is located in the Gorton area of Manchester approximately 6.4km to the east of Manchester City Centre.

2.2 Existing site Description

- 2.2.1 The site is currently comprised of an area of rough grassland, with mature trees and shrubs both on site and around the perimeter.
- 2.2.2 The site is bound by Vine Street to the east beyond which there are residential properties, with further residential properties bordering the site to the south. A railway line borders the site to the north within a cutting. A steep embankment drops down from the site to the tracks. Commercial properties border the site to the west.
- 2.2.3 Figure 1 below identifies the overall site location details. Further details of the existing layout can be seen on the Topographical survey in Appendix B. Topographical information indicates that the site has a high point in the centre slopes to the east and west. The highest level of 82.000m AOD is found in the centre of the site and the lowest level of 79.000m AOD is found in the west.

Figure 1: Site Location



2.3 Development Proposals

- 2.3.1 The proposal is for the construction of a new residential development with associated highway access and hard & soft landscaping on land off Vine Street, Gorton. The proposed development will increase the impermeable area.
- 2.3.2 The Site Layout as indicated in Appendix A provides details of the proposed development intent.

3.0 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 therefore 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 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 sites are detailed below. The full report can be obtained from the Manchester City Council website.

- SFRA provides a detailed understanding of flood risks from all sources.
- The main source of flood risk in Manchester is from the Grey Irwell, the Rivers Irk, Medlock and Mersey and Corn Brook.
- 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.

4.0 Definition of Flood Hazard

4.1 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.

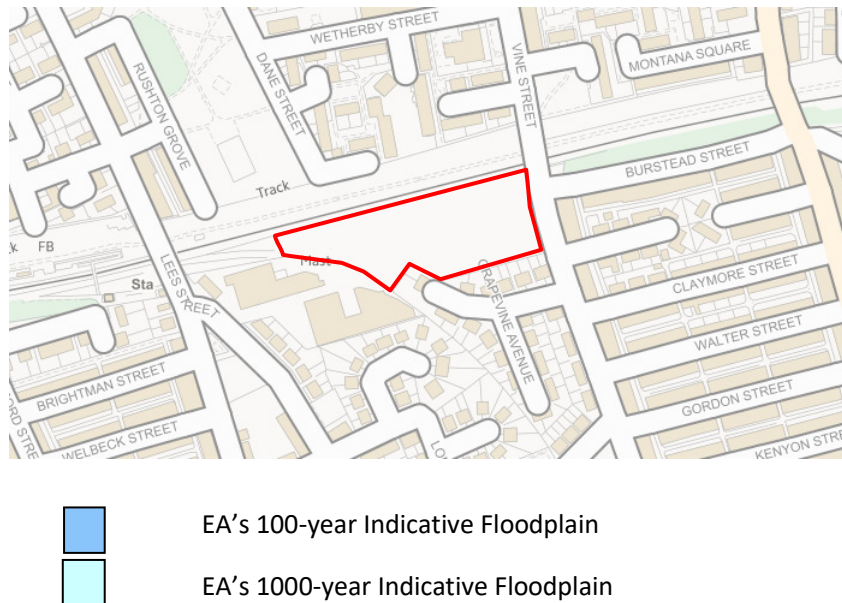
Table 2: Sources of information used in the identification of flood risk

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

4.2 Flooding from Rivers (Fluvial)

- 4.2.1 Information from the hidden Manchester map shows a historic watercourse potentially running beneath the site; the presence of this is not shown on any other records and no evidence of its existence has been found on site. It is likely that the culvert actually flows beneath the railway line to the north of the site and set in a cutting with approximately 10m lower ground levels. There are no other watercourses in close proximity, with Gore Brook located 900m to the south.
- 4.2.2 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.

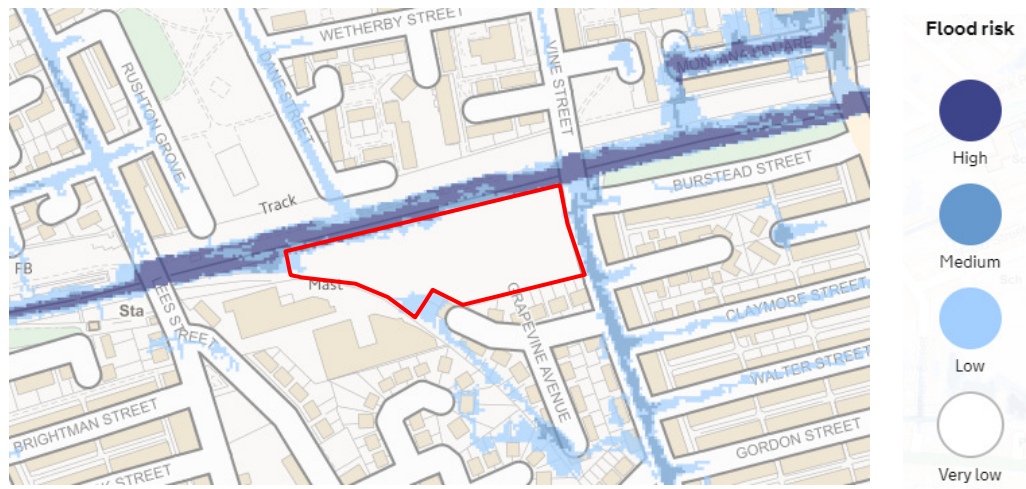
Figure 2 – The EA's 100-year Fluvial Floodplain Map



4.3 Flooding From Land (Overland Flow)

- 4.3.1 The site has a high point in the centre, with slopes down towards the east and west predominantly. Any surface water runoff from the surrounding area will be intercepted by the existing drainage within the surrounding highways and conveyed away from the site. Any surface water runoff from the north will be unable to flow onto the development site due to its much lower level.
- 4.3.2 A review of the EA Indicative Surface Water Flood Risk maps indicates that the site is at low risk of flooding (see Figure 3) and there are no flow routes through the site. The railway line to the north is shown as being at high risk, this is due to it being at a significantly lower level than the surrounding area; the sites elevated position ensures this surface water will not pose a risk. As part of the proposed development the levels across the site will change to ensure that all falls are away from all properties, thus posing a low risk.

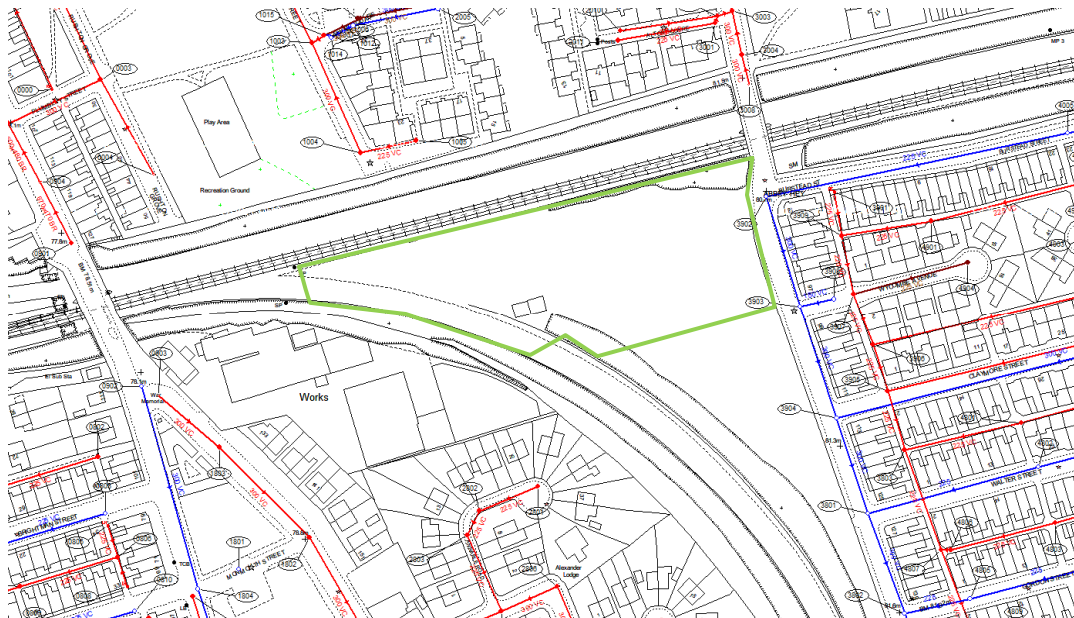
Figure 3 – The EA's Indicative Surface Water Flood Map



4.4 Flooding from Sewers and Private Drainage

4.4.1 The United Utilities (UU) sewer records have been reviewed and confirm that there are no adopted sewers running through the site. There is a 300mm diameter surface water sewer in Vine Street to the east which flows south. There is also a 300mm diameter combined sewer in Vine Street to the northeast of the site flowing north. Another 225mm diameter combined sewer is found in Wycombe Avenue to the east. An extract of the sewer records is shown in Figure 4 below.

Figure 4 – Extract of United Utilities Sewer Records



4.5 Flooding from Groundwater

- 4.5.1 The site is underlain by a variable thickness of Made Ground. The majority of the site is underlain by Glacial Till which is classified as a Secondary Undifferentiated Aquifer. Beneath this layer there are the Manchester Marls Formation classified as a Secondary B Aquifer. These are predominantly lower permeability layers which may store and yield limited amounts of groundwater due to localised features such as fissures, thin permeable horizons and weathering.
- 4.5.3 The Manchester City Council SFRA stated that there are relatively few reported incidents of groundwater flooding in the Borough. Therefore, the site is deemed to have a low susceptibility to groundwater flooding.

4.6 Flooding from Artificial Sources

- 4.6.1 Gorton Upper and Lower reservoirs are located approximately 800m to the southeast. The EA flood maps indicate that the north and northwest of the site are within an area that could be affected by reservoir flooding. These maps represent a worst-case scenario. Therefore, the risk of flooding from artificial sources is deemed to be low.

5.0 Assessment of Flood Risk on Development Site (Probability)

5.1 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 maps show the site to be at low risk of surface water flooding. Area to the north show as at high risk is at a significantly lower level than the site.
Sewers	Low	Low	There are no public sewers within the site boundary.
Groundwater	Low	Low	No indication through SFRA or local borehole records that site at risk of groundwater flooding.
Artificial Sources	Low	Low	North of site may be impacted by reservoir flooding according to mapping but this is a worst case scenario.

6.0 Drainage Strategy

6.1 Existing Surface Water Runoff

- 6.1.1 The site is currently comprised of an area of rough grassland, with mature trees and shrubs and as such can be classified as greenfield. Table 4 below details the greenfield runoff rates for the site.

Table 4 – Existing Runoff Rates

	Permeable Area (m ²)	1 Year (l/s)	Qbar (l/s)	30 Year (l/s)	100 year (l/s)
Area of grassland	6050	2.9	3.3	5.6	6.9

6.2 Geology

- 6.2.1 The British Geological Survey mapping and borehole information has found that the site is underlain by superficial deposits of Glacial Till consisting of silty clay. The Manchester Marls Formation also underlies the site, comprised of mudstone.
- 6.2.2 The cohesive nature of the underlying geology confirms that infiltration techniques are not viable for use on the site.

6.3 Watercourses

- 6.3.1 As discussed previously, there are no watercourses in close proximity to the site.

6.4 Public Sewers

- 6.4.1 There is a 300mm diameter surface water sewer in Vine Street to the east.
- 6.4.2 There is a 225mm diameter combined sewer in Wycombe Avenue to the east.

6.5 Sustainable Drainage Systems

6.5.1 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).

6.5.2 SuDS's Design Themes

A strong design theme is essential if the maximum aesthetic benefits are to be gained from the SuDS approach.

6.5.3 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.

6.5.4 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 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 ground mean infiltration is not a viable option.
- Catchment Characteristics: Greenfield runoff rates will apply.
- Environmental and Amenity Performance: Safety to all future users is paramount when including SuDS within the overall development 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.

6.5.5 SuDS Methods

Tables 5 and 6, 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 5: 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, and promotes evaporation and local biodiversity.	<u>Not suitable:</u> - Architectural proposals for the development and maintenance issues deem this unsuitable. - Additional costs of installation would have severe effect on viability of the development.
Water Butts	Plastic tanks placed at the base of rainwater down pipes to collect rainwater runoff from the roof areas.	<u>Suitable:</u> Suitable for positioning at the 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 the development. - Running and maintenance costs would not be acceptable. - The ability to restrict peak flow rates and short-term peak volumes is non-existent where a critical storm event occurs.
Infiltration Options	Reduces total run off volume from the development.	<u>Not Suitable:</u> Cohesive underlying geology mean this is not a viable option.

Method	Comment	Suitability for Development
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 mean this is not a viable option.
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> Parking areas have the potential to attenuate and filter surface water flows through the use of permeable paving (subject to confirmation from architect on surface finishes).
Swales, basins and ponds	- Provide areas for above ground surface runoff storage. - Swales also allow filtering of particulate matter, improving water quality	<u>Not suitable:</u> Site layout and size does not permit large above ground areas for surface water storage.
Bio-Retention	Collect and retain run-off to help improve water quality, prior to discharge in piped system on infiltration.	<u>Not suitable:</u> Site layout and size does not permit large above ground areas for surface water storage.

Table 6: 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, be suitable for adoption by the statutory water company (e.g. United Utilities).	<u>Suitable:</u> The use of oversized pipes may be possible to retain excess storm water.

6.5.6 SuDS Hierarchal Approach

Based on the SuDS assessment in Tables 5 and 6, 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 7: SuDS Hierarchal Approach

Method	Suitability	Suitability for Development
Infiltration to Ground	No	Cohesive underlying geology mean infiltration is not viable.
Connection to Watercourse	No	There are no watercourses in close proximity.
Connection to Surface Water Sewer	Yes	300mm diameter surface water sewer in Vine Street to the east.
Connection to a Combined Sewer	No	There are other viable options that would take precedence.

6.5.7 SuDS Design Philosophy

The SuDS assessment and hierarchal approach discussed in Tables 5, 6 and 7 above has defined the overall SuDS strategy. Thus, the SuDS philosophy for the development site is the promotion of Source Control and Site Control techniques with discharge rates to be restricted to greenfield rates, to reduce the risk of both on 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 into the surface water sewer in Vine Street.
- Site control in the form of oversized pipes with restricted outflow.
- Aim to limit where possible the impermeable fraction of development.

6.6 **Surface Water Drainage Strategy**

6.6.1 The drainage strategy for the site is to collect runoff from the roof and external areas and direct it to new below ground surface water drainage networks that will connect to the surface water sewer in Vine Street. The surface water outflow will be restricted to 6.9l/s to suit UU requirements for minimum orifice opening sizes.

6.6.2 The proposed drainage layout for the new development site will be designed in accordance with 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.

6.6.3 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 and Construction Guidance (DCG) 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.

6.6.4 In the case of this development, exceedance flows will be all those over and above the 30-year design criterion set by Design and Construction 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, consideration will be given to make sure all water is controlled so that it does not impact on any adjoining properties.

6.6.5 Full hydraulic calculations have been completed using Microdrainage Design Software with these rates. These calculations confirm that there is no flooding for a 1 in 30 year event. See Appendix D for further details.

6.6.6 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.

6.7 Pollution Control

6.7.1 Silt is to be prevented from entering the drainage system by the use of trapped gullies, channels with silt traps, French drains with silt traps or by the use of Sustainable Drainage techniques. Oil separators in line with Pollution Prevention Guidance 3 (PPG 3) criteria will be provided (it is acknowledged that PPG 3 has been withdrawn, however as no replacement has been released it is still best practice guidance).

6.8 Foul Water Strategy

6.8.1 The foul water drainage strategy is to connect into the combined sewer within Wycombe Avenue to the east. There would be very limited increase in the foul water discharge rates generated by the new development.

7.0 Management Measures, Off Site Impacts and Residual Risk

7.1 Flood Risk Management Measures

- 7.1.1 The report has found the site to be at low risk of flooding from all sources.
- 7.1.2 The surface water drainage strategy is to limit the surface water runoff to a peak of 6.9l/s. Attenuation has been proposed in the form of attenuation pipes. The new surface water networks will be designed in line with current British Standard up to the 100-year storm return period including an allowance for climate change. Beyond the 30yr criterion out of chamber flooding may occur and flood water will be directed away from the residential units to the external highway and parking areas, where it will then be directed back into the drainage network as pipe water levels recede.
- 7.1.3 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. Note UU will be responsible for the adopted sewers and Manchester Council Highway Authority for the highway drainage.
- 7.1.5 Should any flooding occur from the new sewers and drains it will be directed away from the properties to external roads and hard and soft landscaping areas.

7.2 Off Site Impacts

- 7.2.1 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.
- 7.2.2 The development footprint does not cross or cover any existing or declared future catchment flood defences. Consequently, the Applicant does not propose to augment or compromise any existing catchment defences.
- 7.2.3 By restricting the peak runoff at its point of discharge by the inclusion of SuDS, this will reduce surface water flooding impact onto the downstream sewer network and the development will not increase flood risk onto its locality

7.3 Residual Risk

- 7.3.1 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.
- 7.3.2 Flood risk to people and property can be managed but it can never be completely removed; a residual risk remains after flood management or mitigation measures have been put in place. The only known flood related risk that will remain will be the risk of out of manhole flooding within both the existing private and public sewer network beyond the 30-year design criterion. Should exceedance occur, out of chamber flood water will be directed to the external hard standing areas and roads but will not be a flood risk generator.

Appendix A – Architectural Site Layout



- External waste and recycling storage
 - Cycle store
 - Drying
 - New trees
 - Individual dwelling waste collection point
 - 2 no dwelling waste collection point
 - New lighting column
 - Electric vehicle charging points
- 1 no 240L wheeled bin for residual waste (refuse).
1 no 240L wheeled bin for food and garden waste.
1 no 140L wheeled bin for paper and cardboard.
1 no 140L wheeled bin for glass, cans and plastics.
- One EV charging point per dwelling located on box section post.
Electricity supply 32 amp 7 kW given a 6-12 hours charging time.
All subject to existing electricity infrastructure.
Lockable chargers will be considered.

- Network Rail Access
- 10m safety zone from boundary
- 80m contour
- Site boundary
- Developable area

schedule of accommodation		gross internal floor area	
(2 storey unless noted otherwise)		sq m	
2 b 3p houses	71	15	
3 b 4p houses	88	6	
3 b 4p houses	88.87	3	
4 b 5p houses	100	1	
total no dwellings		25	
total site area		0.8h	
developable areay		0.6h	
density		42 / h	

car parking	
2 bedroom house	100%
3 bedroom house	100%
4 bedroom house	200%

Appendix B – Topographical Survey



NOTES AND AMENDMENTS

ONLY MANHOLES AND SERVICES VISIBLE AT
TIME OF SURVEY SHOWN

DRAINAGE INFORMATION MUST BE CHECKED AND
VERIFIED WITH LOCAL AUTHORITY RECORDS
BEFORE TO WORK COMMENCING

Levels defining edge of carriageway are observed at
channel (bottom of kerb). Unless otherwise stated.

TREE SPREADS ARE SYMBOLIC ONLY AND ARE
REPRESENTATIVE OF THE AVERAGE SPREAD.

THE DRIP LINE LAYER DENOTES THE TREES EXTREMITY

REVISIONS

DESCRIPTION	SURVEY	DRAWN	DATE
TOPOGRAPHICAL SURVEY UPDATED AS REQUESTED	SG	PSH	26.02.2019
ADDITIONAL INFO ADDED TO TOPO	MG	CH	06.11.2020
SURVEY EMBANKMENT WHERE POSSIBLE AS REQUESTED	FB	PSH	07.12.2020

[illegible]

BENCHMARK INFORMATION

All levels relate to OSBM Newlyn
Datum Generated by VRS GPS

SURVEY STATIONS

tn1	389351.802	396962.521	81.021
tn2	389346.733	396968.778	80.691
tn3	389330.457	397029.430	81.411
tn1a	389335.385	396990.134	80.652
f1	389306.237	396981.447	81.490
f2	389253.766	396966.085	81.702
f3	389320.229	396948.317	81.529

JLP Surveying

P Surveying Consultants Ltd
Suite 25 Rodney House,
King Street,
Finnan
VN1 1BT
Tel - 01942 243313
Fax - 01942 492230
Mobile - 07710 428498
MAIL: peacohouston@jpsurveys.com

PROJECT
VINE STREET,
ABBHEY HEY,
MANCHESTER

DRAWING TITLE

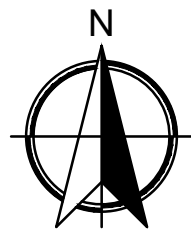
Topographical Land Survey

SCALE	SHEET SIZE	No. of SHEETS	DATE
1:200	A0	1	29.05.18

S18-442

S18-442

Appendix C – Scott Hughes Design Drawings

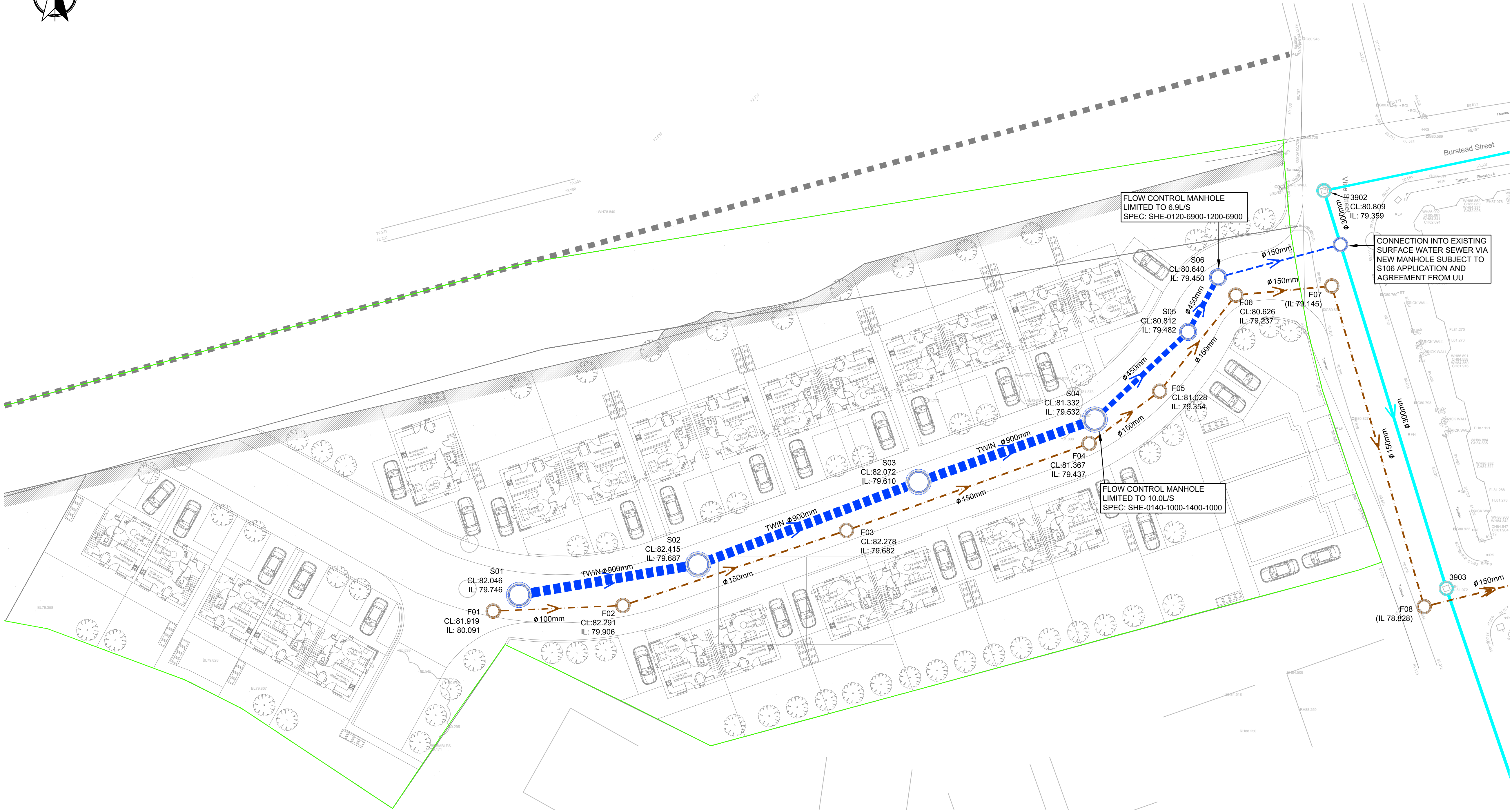


GENERAL NOTES

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.
4. INFORMATION CONTAINED ON THIS DRAWING IS SCHEME DESIGN ONLY AND REQUIRES FURTHER DETAILED DESIGN AND CO-ORDINATION WITH THE CONTRACTOR, DESIGN TEAM AND APPROPRIATE SUB-CONTRACTORS.

DRAINAGE KEY

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



P1	10.12.20	EJD	PG	ISSUED FOR COMMENT
No	DATE	DRAWN	REV'D ENG.	AMENDMENT

STATUS	PURPOSE OF ISSUE
S2	FOR INFORMATION

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		Scott Hughes Design Ltd. The Flint Glass Works, 64 Jersey Street, Manchester M4 6JW t. 0161 605 0831 f. 0161 605 0832 e.mail@scotthughesdesign.co.uk Reg No. 4899745	
CLIENT KIRKLAND DEVELOPMENT LTD			
PROJECT VINE STREET, GORTON			
DRAFTER AS		ENGINEER PG	
TITLE PROPOSED DRAINAGE GA		PROJECT REFERENCE: 3763	
SCALE 1:250	SHEET A1	DRAWING No VSG-SHD-00-ZZ-DR-C-0101	REV P1

Appendix D – Hydraulic Calculations

Scott Hughes Design Ltd		Page 1
The Flint Glass Works 64 Jersey Street Manchester M4 6JW	Vine Street	
Date 18/11/2020 File	Designed by EJD Checked by PG	
Micro Drainage Source Control 2018.1		

ICP SUDS Mean Annual Flood

Input

Return Period (years)	1	Soil	0.450
Area (ha)	0.605	Urban	0.000
SAAR (mm)	846	Region Number	Region 10

Results 1/s

QBAR Rural	3.3
QBAR Urban	3.3
Q1 year	2.9
Q1 year	2.9
Q30 years	5.6
Q100 years	6.9

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Scott Hughes Design Ltd		Page 3
The Flint Glass Works 64 Jersey Street Manchester M4 6JW	Vine Street Gorton	
Date 10/12/2020 File VSG Surface Water Calcs 03.12.20.MDX	Designed by EJD Checked by PG	
Micro Drainage		Network 2018.1
<u>Simulation Criteria for Storm</u> Volumetric Runoff Coeff 0.750 Manhole Headloss Coeff (Global) 0.500 Inlet Coeffiecient 0.800 Areal Reduction Factor 1.000 Foul Sewage per hectare (l/s) 0.000 Flow per Person per Day (l/per/day) 0.000 Hot Start (mins) 0 Additional Flow - % of Total Flow 0.000 Run Time (mins) 60 Hot Start Level (mm) 0 MADD Factor * 10m³/ha Storage 2.000 Output Interval (mins) 1 Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 0 Number of Online Controls 2 Number of Storage Structures 0 Number of Real Time Controls 0 <u>Synthetic Rainfall Details</u> Rainfall Model FSR M5-60 (mm) 18.000 Cv (Summer) 0.750 Return Period (years) 2 Ratio R 0.367 Cv (Winter) 0.840 Region England and Wales Profile Type Summer Storm Duration (mins) 30		
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The Flint Glass Works 64 Jersey Street Manchester M4 6JW	Vine Street Gorton	
Date 10/12/2020 File VSG Surface Water Calcs 03.12.20.MDX	Designed by EJD Checked by PG	
Micro Drainage Network 2018.1		

Online Controls for Storm

Hydro-Brake® Optimum Manhole: S04, DS/PN: 1.003, Volume (m³): 32.2

Unit Reference	MD-SHE-0140-1000-1400-1000	Sump Available	Yes
Design Head (m)	1.400	Diameter (mm)	140
Design Flow (l/s)	10.0	Invert Level (m)	79.532
Flush-Flo™	Calculated	Minimum Outlet Pipe Diameter (mm)	225
Objective	Minimise upstream storage	Suggested Manhole Diameter (mm)	1200
Application	Surface		

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.400	10.0	Kick-Flo®	0.879	8.0
Flush-Flo™	0.410	10.0	Mean Flow over Head Range	-	8.7

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)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	5.0	0.600	9.8	1.600	10.6	2.600	13.4	5.000	18.3	7.500	22.2
0.200	9.2	0.800	8.9	1.800	11.3	3.000	14.3	5.500	19.2	8.000	22.9
0.300	9.8	1.000	8.5	2.000	11.8	3.500	15.4	6.000	20.0	8.500	23.6
0.400	10.0	1.200	9.3	2.200	12.4	4.000	16.5	6.500	20.8	9.000	24.3
0.500	9.9	1.400	10.0	2.400	12.9	4.500	17.4	7.000	21.5	9.500	24.9

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Scott Hughes Design Ltd		Page 5
The Flint Glass Works 64 Jersey Street Manchester M4 6JW	Vine Street Gorton	
Date 10/12/2020 File VSG Surface Water Calcs 03.12.20.MDX	Designed by EJD Checked by PG	
Micro Drainage Network 2018.1		

Hydro-Brake® Optimum Manhole: FLOW CONTROL, DS/PN: 1.005, Volume (m³): 3.0

Unit Reference	MD-SHE-0120-6900-1200-6900	Sump Available	Yes
Design Head (m)	1.200	Diameter (mm)	120
Design Flow (l/s)	6.9	Invert Level (m)	79.450
Flush-Flo™	Calculated	Minimum Outlet Pipe Diameter (mm)	150
Objective	Minimise upstream storage	Suggested Manhole Diameter (mm)	1200
Application	Surface		

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.200	6.9	Kick-Flo®	0.760	5.6
Flush-Flo™	0.356	6.9	Mean Flow over Head Range	-	6.0

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)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	4.2	0.600	6.5	1.600	7.9	2.600	9.9	5.000	13.5	7.500	16.4
0.200	6.5	0.800	5.7	1.800	8.3	3.000	10.6	5.500	14.2	8.000	16.9
0.300	6.9	1.000	6.3	2.000	8.8	3.500	11.4	6.000	14.8	8.500	17.4
0.400	6.9	1.200	6.9	2.200	9.2	4.000	12.2	6.500	15.3	9.000	17.9
0.500	6.8	1.400	7.4	2.400	9.5	4.500	12.9	7.000	15.9	9.500	18.4

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The Flint Glass Works 64 Jersey Street Manchester M4 6JW					Vine Street Gorton									
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Micro Drainage					Network 2018.1									

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

Simulation Criteria

Areal Reduction Factor 1.000 Manhole Headloss Coeff (Global) 0.500 MADD Factor * 10m³/ha Storage 2.000
 Hot Start (mins) 0 Foul Sewage per hectare (l/s) 0.000 Inlet Coefficient 0.800
 Hot Start Level (mm) 0 Additional Flow - % of Total Flow 0.000 Flow per Person per Day (l/per/day) 0.000

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

Synthetic Rainfall Details

Rainfall Model FSR M5-60 (mm) 18.000 Cv (Summer) 0.750
 Region England and Wales Ratio R 0.366 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0 DVD Status ON
 Analysis Timestep 2.5 Second Increment (Extended) Inertia Status ON
 DTS Status OFF

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

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water	Surcharged	Flooded	Pipe		Status	
									Level (m)	Depth (m)	Volume (m³)	Flow / Cap.	Overflow (l/s)		Flow (l/s)
1.000	S01	30 Winter	1	+0%					79.812	-0.834	0.000	0.00		7.0	OK
1.001	S02	30 Winter	1	+0%	100/120 Winter				79.812	-0.775	0.000	0.01		9.8	OK

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The Flint Glass Works 64 Jersey Street Manchester M4 6JW	Vine Street Gorton													
Date 10/12/2020 File VSG Surface Water Calcs 03.12.20.MDX	Designed by EJD Checked by PG													
Micro Drainage		Network 2018.1												
<u>1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm</u>														
<table> <thead> <tr> <th></th><th>US/MH</th><th>Level</th></tr> <tr> <th>PN</th><th>Name</th><th>Exceeded</th></tr> </thead> <tbody> <tr> <td>1.000</td><td>S01</td><td></td></tr> <tr> <td>1.001</td><td>S02</td><td></td></tr> </tbody> </table>				US/MH	Level	PN	Name	Exceeded	1.000	S01		1.001	S02	
	US/MH	Level												
PN	Name	Exceeded												
1.000	S01													
1.001	S02													
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1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water	Surcharged	Flooded			Pipe
									Level (m)	Depth (m)	Volume (m³)	Flow / Cap.	Overflow (l/s)	Flow (l/s)
1.002	S03	30 Winter	1	+0%	100/60 Winter				79.812	-0.698	0.000	0.00		7.7
1.003	S04	30 Winter	1	+0%	30/15 Winter				79.812	-0.170	0.000	0.04		5.7
1.004	S05	30 Winter	1	+0%	30/30 Winter				79.694	-0.238	0.000	0.06		6.7
1.005	FLOW CONTROL	30 Winter	1	+0%	1/15 Summer				79.692	0.092	0.000	0.45		6.7

PN	US/MH Name	Status	Level Exceeded
1.002	S03	OK	
1.003	S04	OK	
1.004	S05	OK	
1.005	FLOW CONTROL	SURCHARGED	

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The Flint Glass Works 64 Jersey Street Manchester M4 6JW					Vine Street Gorton									
Date 10/12/2020 File VSG Surface Water Calcs 03.12.20.MDX					Designed by EJD Checked by PG									
Micro Drainage					Network 2018.1									

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

Simulation Criteria

Areal Reduction Factor 1.000 Manhole Headloss Coeff (Global) 0.500 MADD Factor * 10m³/ha Storage 2.000
 Hot Start (mins) 0 Foul Sewage per hectare (l/s) 0.000 Inlet Coefficient 0.800
 Hot Start Level (mm) 0 Additional Flow - % of Total Flow 0.000 Flow per Person per Day (l/per/day) 0.000

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

Synthetic Rainfall Details

Rainfall Model FSR M5-60 (mm) 18.000 Cv (Summer) 0.750
 Region England and Wales Ratio R 0.366 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0 DVD Status ON
 Analysis Timestep 2.5 Second Increment (Extended) Inertia Status ON
 DTS Status OFF

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

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status
1.000	S01	60 Winter	30	+0%					80.073	-0.573	0.000	0.01		10.6	OK
1.001	S02	60 Winter	30	+0%	100/120 Winter				80.072	-0.515	0.000	0.01		11.1	OK

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Date 10/12/2020 File VSG Surface Water Calcs 03.12.20.MDX	Designed by EJD Checked by PG													
Micro Drainage														
Network 2018.1														
<u>30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm</u>														
<table><thead><tr><th></th><th>US/MH</th><th>Level</th></tr><tr><th>PN</th><th>Name</th><th>Exceeded</th></tr></thead><tbody><tr><td>1.000</td><td>S01</td><td></td></tr><tr><td>1.001</td><td>S02</td><td></td></tr></tbody></table>				US/MH	Level	PN	Name	Exceeded	1.000	S01		1.001	S02	
	US/MH	Level												
PN	Name	Exceeded												
1.000	S01													
1.001	S02													
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The Flint Glass Works 64 Jersey Street Manchester M4 6JW	Vine Street Gorton	
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Micro Drainage Network 2018.1		

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

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)
1.002	S03	60 Winter	30	+0%	100/60 Winter				80.072	-0.438	0.000	0.00		7.6
1.003	S04	60 Winter	30	+0%	30/15 Winter				80.072	0.090	0.000	0.04		6.4
1.004	S05	60 Winter	30	+0%	30/30 Winter				79.961	0.029	0.000	0.06		7.1
1.005	FLOW CONTROL	60 Winter	30	+0%	1/15 Summer				79.960	0.360	0.000	0.46		6.9

PN	US/MH Name	Status	Level Exceeded
1.002	S03	OK	
1.003	S04	SURCHARGED	
1.004	S05	SURCHARGED	
1.005	FLOW CONTROL	SURCHARGED	

Scott Hughes Design Ltd			Page 13																
The Flint Glass Works 64 Jersey Street Manchester M4 6JW		Vine Street Gorton																	
Date 10/12/2020 File VSG Surface Water Calcs 03.12.20.MDX		Designed by EJD Checked by PG																	
Micro Drainage		Network 2018.1																	
<u>100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm</u>																			
<table><thead><tr><th></th><th>US/MH</th><th></th><th>Level</th></tr><tr><th>PN</th><th>Name</th><th>Status</th><th>Exceeded</th></tr></thead><tbody><tr><td>1.000</td><td>S01</td><td>OK</td><td></td></tr><tr><td>1.001</td><td>S02</td><td>SURCHARGED</td><td></td></tr></tbody></table>					US/MH		Level	PN	Name	Status	Exceeded	1.000	S01	OK		1.001	S02	SURCHARGED	
	US/MH		Level																
PN	Name	Status	Exceeded																
1.000	S01	OK																	
1.001	S02	SURCHARGED																	
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100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water	Surcharged	Flooded	Pipe		
									Level (m)	Depth (m)	Volume (m³)	Flow / Cap.	Overflow (1/s)	Flow (1/s)
1.002	S03	120 Winter	100	+40%	100/60 Winter				80.628	0.118	0.000	0.00		6.0
1.003	S04	120 Winter	100	+40%	30/15 Winter				80.628	0.646	0.000	0.04		6.0
1.004	S05	120 Winter	100	+40%	30/30 Winter				80.508	0.576	0.000	0.06		7.0
1.005	FLOW CONTROL	120 Winter	100	+40%	1/15 Summer				80.507	0.907	0.000	0.46		6.9

PN	US/MH Name	Status	Level Exceeded
1.002	S03	SURCHARGED	
1.003	S04	SURCHARGED	
1.004	S05	SURCHARGED	
1.005	FLOW CONTROL	FLOOD RISK	