



LIND STREET CAR PARK MANCHESTER



BOOHOO DRAINAGE STRATEGY

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1 Introduction

1.1 Project Background

Westlakes Engineering have been appointed by Boohoo to prepare a Drainage Strategy for a proposed development at Lind Street, Manchester, M40 7FP. The Drainage Strategy provides information on the existing drainage within and surrounding the site and a proposal, including discharge rates, for drainage of the new development whilst considering the potential for the use of sustainable urban drainage systems.

The Drainage Strategy has been based on the proposed layouts produced by Architecture M on behalf of Boohoo (see Appendix A) which show that the site would be redeveloped as a carpark.

The existing buildings that used to stand on the site have been demolished. Whilst it is assumed that the previous site use would have required connections to the public sewer network for both surface and foul water drainage, no CCTV surveys to prove the existence and condition of such connections have been undertaken to date.

Proposals contained or forming part of this report represent the design intent at this current time and may be subject to alteration or adjustment through the detailed design for this project. Where such adjustments as are deemed necessary as part of the detailed design process represent a material deviation from the intent contained in this document, prior approval shall be obtained from the relevant authority in advance of commencing such works.

1.2 Scope of the Drainage Strategy

The strategy has been prepared in accordance with requirements set by the Local Authority (Manchester City Council (MCC)) and United Utilities (UU). The assessment will:

- Investigate the existing drainage within and surrounding the site.
- Investigate the potential for using SUDS techniques to reduce water run off to the public sewer network.

The Drainage Strategy is also based on the following information:

- United Utilities Public Sewer Records (Appendix B)
- SUDS Manual/NFFP (References 1 & 4).

In accordance with Manchester City Council (MCC) SFRA (Reference 2), proposed “brownfield” redevelopments of more than one property, or of area exceeding 0.1 hectares, are required to reduce post-development runoff rates for events up to and including a 1 in 100-year return period event with allowance for climate change (in line with PPS25 (Reference 5)) to 50% of the pre-development site condition with an aim of reducing runoff to Greenfield rates.

2 Site Description

2.1 Location

The site covers an area of approximately 0.276 hectares (2760m²) and is bordered to the north by Lind Street, to the south by Cyrus Street, to the east by Cambrian Street and to the west by offices and industrial buildings.

The site is located in a mixed commercial, industrial and residential area and is currently unoccupied with overgrown vegetation.

Figure 1 – Aerial Photograph



2.2 Site History

The earliest available OS mapping for the area (1848) shows the site within the overall grounds of 'Medlock Cottage' and its extensive gardens. To the north was a 'brick field' (likely clay extraction for brick manufacture) with the Ashton Canal beyond. To the south and west were buildings which appear to have been terraced housing and mills. To the east was the Holt Town reservoir, a pottery and further 'brick fields'.

By the 1894/95 mapping, Medlock Cottage was no longer present, and the area featured unspecified buildings which may have been terraced housing and mills (given the industrial history of the area). To the south of the site the "Mission Hall" building appears with extensive unspecified area, possibly green space, which includes the proposed development site.

Subsequent maps of the surrounding area show a gradual development over time for residential and industrial uses (mills, foundries, chemical works, coal mining, power station), although on-site land uses appear to remain the same.



By the 1956 mapping, a school appears to occupy the site in its entirety with extensive recreational area to the south.

By the 2014 mapping, the on-site mill buildings appear to have been demolished.

2.3 Topography

A topographical survey is not currently available. From assessment of Ordnance Survey records the site appears to be fairly flat at around 49.5m AOD, with a nominal fall from east to west.

2.4 Geology

As the site has previously been developed, some Made Ground can be expected to be found across the site.

Although no ground investigation (GI) has been undertaken on the site to date, Westlakes Environmental have recently investigated an adjacent site at 20 Pollard Street East (located on the opposite side of Lind Street) which also belongs to Boohoo. From the GI report prepared for that investigation (Reference 7), local ground conditions were found to comprise Made Ground over generally firm to stiff Till Deposits (boulder clay) over sandstone bedrock.

2.5 Hydrogeology

The Environment Agency (EA) designates aquifer types based on geological mapping provided by the British Geological Society (BGS). The EA defines aquifers as 'underground layers of water-bearing rock or drift deposits from which groundwater can be extracted'.

The Glacial Till is classified as a Secondary Aquifer with undifferentiated layers. The bedrock beneath and adjacent to the site is classified as a Secondary (A) Aquifer with permeable layers.

In the GI for 20 Pollard Street, groundwater was recorded on the borehole logs and monitoring recorded the resting level of the groundwater table as being between 1.6m and 2.2m below ground level.

There are no groundwater abstraction licenses within 500m of the site. The site is not located in a Source Protection Zone.

2.6 Hydrology and Watercourses

The Ashton Canal is located 120m to the north of the site with the River Medlock located approximately 200m to the south of the development boundary.

2.7 Existing Sewers

From a review of the United Utilities public sewer records (see Appendix B), it appears that there is a 300mm diameter combined sewer running from south to north along Lind Street which then turns south along Cambrian Street, increasing in size to 375mm diameter.

It is not uncommon for infrastructure in such areas to have not been fully surveyed or accurately recorded, and as such it is recommended that a connectivity survey of drainage in the surrounding area be undertaken to confirm what is present.

3 Flood Risk Guidance

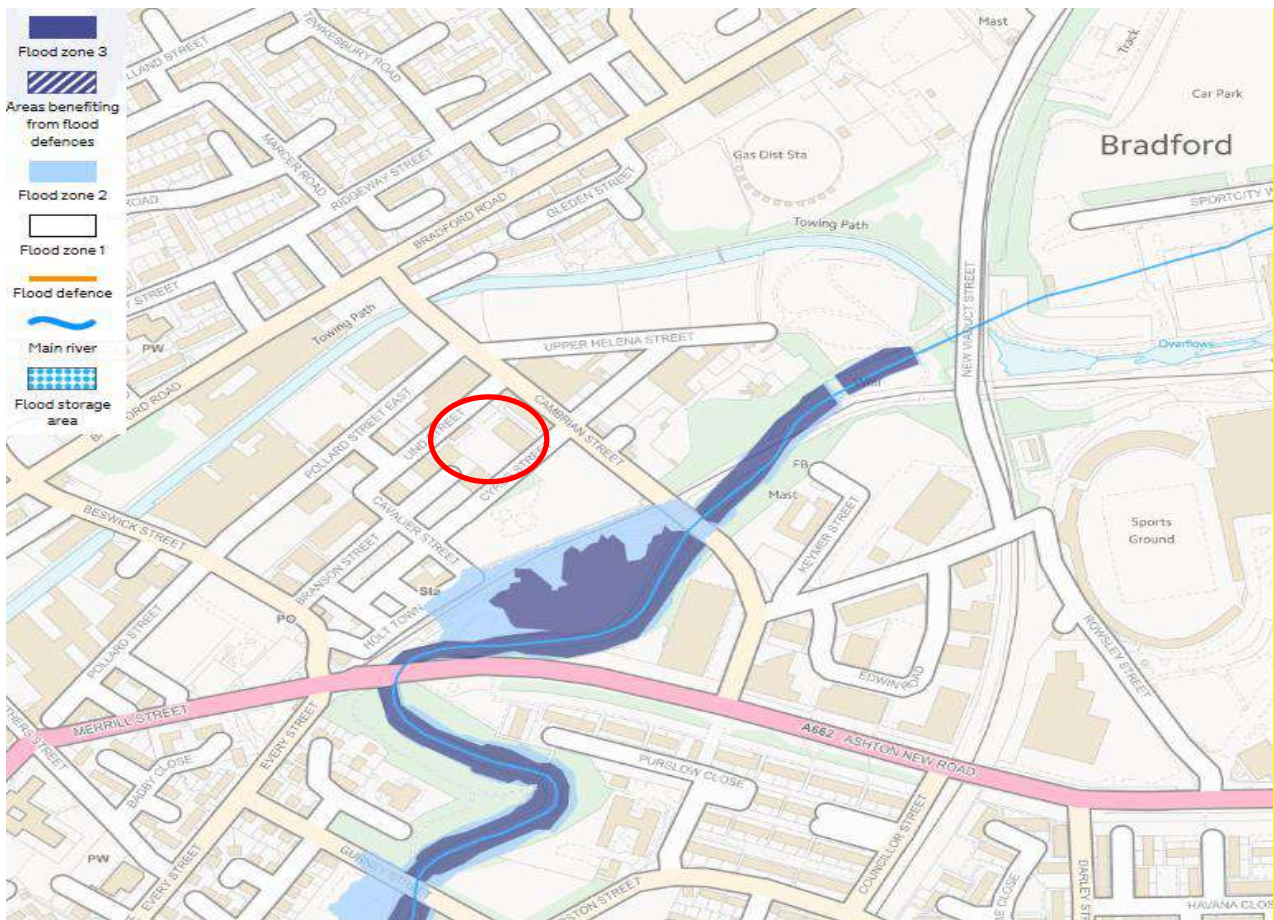
3.1 Flood Risk – Fluvial and Tidal Flooding

Flood maps are produced by the EA for the whole of the UK to highlight areas at particular risk of flooding by categorising them into different Zones. These maps are based on a broad assessment of areas using digital mapping techniques and extracts from the EA flood maps for the site and its surroundings are included in the figures below.

The EA fluvial and tidal flood map (see Figure 2) shows that the site and its surroundings are located entirely within EA Flood Zone 1, which is defined in NPPF Table 1 as “land assessed as having a less than 1 in 1000 annual probability of river or sea flooding (<0.1%)”.

The site is proposed to be used for employment uses which fall within the ‘less vulnerable’ classification within Table 2 of NPPF. All uses of land are considered appropriate in Flood Zone 1 and, as the site is not located in EA Flood Zones 2 or 3, it is not necessary to apply the NPPF Exception Test.

Figure 2 – Environment Agency Fluvial and Tidal Flood Zone Plan



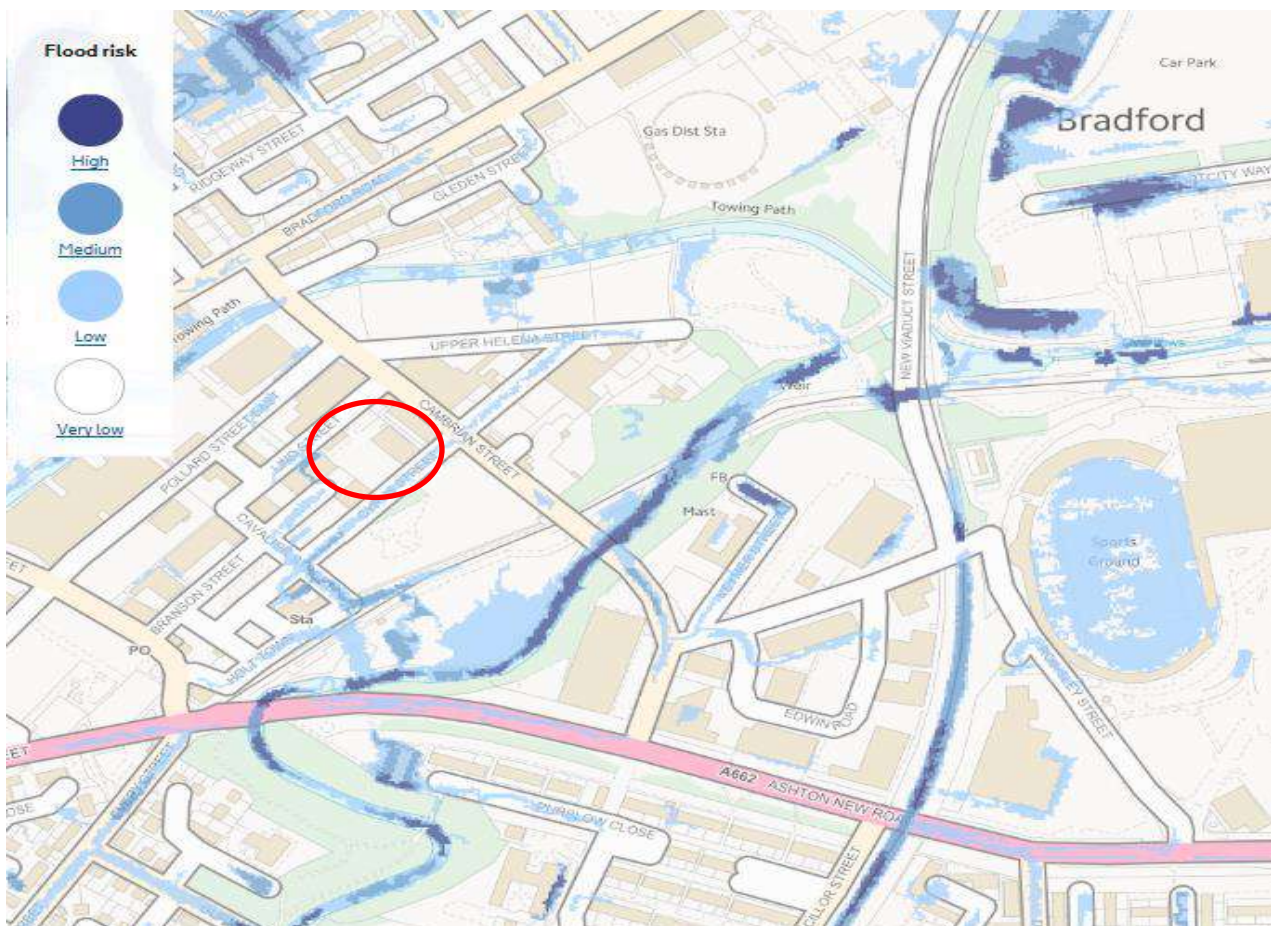
3.2 Flood Risk – Surface Water

Surface water flooding occurs typically as a result from pooling of surface waters and overland flow during heavy rainfall events that cannot readily drain away.

The EA's surface water flood map (see Figure 3) indicates the risk of surface water flooding at the site to be mainly very low. There are minor areas of low to medium flooding shown at the low point on Lind Street and along an old cobbled access road into the adjacent property. These locations are consistent with low points in the local topography and the flooding can be attributed to ponding of overland flows from higher ground.

Post-development, the construction of a new car park on the site will result in interception and positive drainage of rainfall. Management of surface water is being considered as part of the development proposals and a preliminary drainage strategy is outlined within Section 4 of this Report. As a result of this, any effect from the site on local surface water flooding will have been addressed and removed.

Figure 3 – Environment Agency Surface Water Flood Zone Plan



3.3 SFRA and the Ashton Canal

The site lies within the Strategic Development Site reference M0024 (Holt Town Area) as described in the Manchester City, Salford City and Trafford Councils Level 2 Hybrid Strategic Flood Risk Assessment (SFRA) dated March 2011 (Reference 2)

Flooding along the Ashton Canal is described in paragraph 3.2.5 of the SFRA which states:

“There is a limited likelihood of canal overtopping in Manchester. If it does occur, it is unlikely to affect areas beyond the canal towpath. The risk of canal flooding from breach is summarised below:

- *in a breach scenario, flooding could spread to areas a significant distance away from the canal. The areas which are most vulnerable to a breach include aqueducts and where watercourses pass under canals. This coincides with areas of lower topography and a higher probability of breach.*
- *The strategic sites within Canal Breach Zone A are Sport City M0002, Eastern Gateway M0001, Holt Town M0024 and Lower Medlock M0026.*
- *These sites are also within Canal Breach Zone B.*
- *A very small area of Miles Platting M0008 is also within Canal Breach Zone A to the south of the site.”*

Although the Holt Town Area is included in Canal Breach Zone A, the proposed site lies outside the affected area as shown on the drawing in Appendix C.

3.4 Canal and River Interactions

The Strategic Development Site M0024 includes an interaction between the Ashton Canal and the River Medlock referenced as ASH_002 shown on drawing reference HI_5.1 in Appendix D. The following text has been taken directly from the SFRA:

“It is possible that breach of the Ashton Canal at this location would result in additional water flowing into the River Medlock downstream of the culvert exit. It is not considered possible for flow from the Medlock to enter the canal at this location because of the elevation difference between the two.”

This refers to the fact that the canal is higher than the river and that, whilst it is therefore possible for flood water from the canal to reach the river, the reverse is impossible. Nevertheless, as noted already, the development site is not thought to be in an area susceptible to flooding from a potential breach of the Canal.

3.5 Critical Drainage Area – Conurbation Core

The site lies within the Conurbation Core critical drainage area as defined within the SFRA and shown in Appendix E. As such it is subject to restrictions on surface water discharge. The required reduction in flow is stated within paragraph 5.46 of the Local Flood Risk Management Strategy document which states:

“Within Critical Drainage Areas, and consistent with SFRA Core Strategy policy EN14 (Flood Risk), developers should aim to minimise surface water runoff from developments, and achieve at least the following runoff rates:

- *Greenfield runoff on greenfield sites up to a 1 in 100-year storm event, including consideration of climate change*
- *A 50% runoff rate reduction for brownfield sites, with an aim of reducing runoff to greenfield rates up to a 1 in 100-year storm event, including consideration of climate change”.*

4 Proposed Drainage Strategy

4.1 Surface Water Drainage

Any new development site drainage should be designed in accordance with current best practice to provide adequate capacity not to flood for the critical 1 in 30-year storm event. In addition, flood waters arising from a 1 in 100 year storm event, inclusive of a percentage uplift to allow for climate change (currently anticipated to be 40%), must be constrained within the site area so as not to cause damage to buildings and essential services or to adjoining developments and services.

In following the standard hierarchy of drainage solutions, consideration should firstly be given to the discharge of surface water runoff by sustainable methods such as infiltration. Review of currently available geological information for the surrounding area would suggest that ground conditions within the site (Made Ground over Clay) may not support infiltration. However, this may still need to be confirmed by in situ testing as part of the process of agreeing the proposed drainage strategy with the Lead Local Flood Authority.

Given the presence of an existing network of combined sewers in the surrounding streets, which may well have served the previous site use, it would be the intention to discharge all surface water flows at an attenuated rate to the existing United Utilities combined sewer within Lind Street.

At this time, it has not been possible to prove an existing connection from the proposed site to the adopted sewer. However, given the historical development that had previously existed across the site, the presence of a connection should be anticipated.

In order to define a proposed flow rate from the site, the existing brownfield flows have been estimated by forming a 2-pipe network in line with the guidance contained within Microdrainage modelling software, assuming the pre-development impermeable area to be 100% of the site and simulating the 1 in 100-year storm 360-minute duration.

On this basis the brownfield run off rate for the critical storm has been calculated as 94.2 l/s (see Figure 4).

As part of the preparation of this Drainage Strategy, initial enquiries were made to both United Utilities and the LLFA. In their response (see Appendix F), the LLFA stated:

"From the information you have provided, we can advise that your site is in the Conurbation Core Critical Drainage Area (CDA). Therefore, the LLFA would require your strategy to adhere to the following criteria from our Local Flood Risk Management Strategy:

- *Greenfield runoff for Greenfield areas.*
- *A 50% runoff rate reduction for Brownfield areas, with an aim of reducing runoff to Greenfield rates."*

Although the proposed development site was categorised by the LLFA as containing both brownfield and greenfield areas, in order to further reduce the impact of the development on the existing drainage infrastructure it is proposed to limit the surface water discharge to as close as possible to greenfield run off rates.

There are two methods for calculating the greenfield run-off rate: the IH124 method and the ICP method. The IH124 method calculates the peak Greenfield run-off flow rates by correlation of the Soil Index Value, the Average Annual Rainfall and the Site Area (SOIL, SAAR and AREA). The IH124 Method should be used for sites in excess of 50 hectares and the resulting discharge is linearly interpolated for the required area. The ICP method uses the IH124 method and automatically interpolates the discharge for sites less than 50 hectares and therefore this is the method that has been used and an extract is shown in Figure 5.

Figure 4 – Brownfield Discharge Rate Calculations – 2 pipe system

Westlakes Engineering Ltd

Page 1

20 Dale Street

Manchester

M1 1EZ

Date: 07/03/2022 12:51

Designed by Eleni Zachara

File: BROWNFIELD DISCHARGE RAT...

Checked by

Innovyze

Network 2020.1.3

Micro Drainage

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

Simulation Criteria

Areal Reduction Factor: 1.000

Additional Flow - % of Total Flow: 0.000

Hot Start (mins): 0

MADD Factor * 10m³/ha Storage: 2.000

Hot Start Level (mm): 0

Inlet Coefficient: 0.800

Manhole Resilience Coeff (Global): 0.500

Flow per Person per Day (l/per/day): 0.000

Foul Sewage per hectare (l/s): 0.000

Number of Input Hydrographs: 0

Number of Offline Controls: 0

Number of Time/Area Diagrams: 0

Number of Online Controls: 0

Number of Storage Structures: 0

Number of Real Time Controls: 0

Synthetic Rainfall Details

Rainfall Model: FSR

Ratio R: 0.360

Region: England and Wales Cv (Summer): 0.750

M5-60 (mm): 18.000 Cv (Winter): 0.840

Margin for Flood Risk Warning (mm): 300.0

DVD Status: OFF

Analysis Timestep: Fine

Inertia Status: OFF

DTS Status: ON

Profile(s)

Summer and Winter

Duration(s) (mins): 15, 30, 60, 120, 240, 360

Return Period(s) (years): 1, 30, 100

Climate Change (%): 0, 0, 0

Water Level

PN

US/MH

Storm

Return Period

Climate Change

First (X) Surcharge

First (Y) Flood

First (Z) Overflow

Overflow Act.

Level (m)

1.000

MH1

15 Winter

100

+0%

30/15 Summer

48.749

1.001

MH2

15 Winter

100

+0%

30/15 Summer

48.440

Surcharged Flooded

Half Drain

Pipe

PN

US/MH

Depth (m)

Volume (m³)

Flow / Overflow Cap.

Time (mins)

Flow (l/s)

Status

Level Exceeded

1.000

MH1

0.449

0.000

2.07

95.3

SURCHARGED

1.001

MH2

0.213

0.000

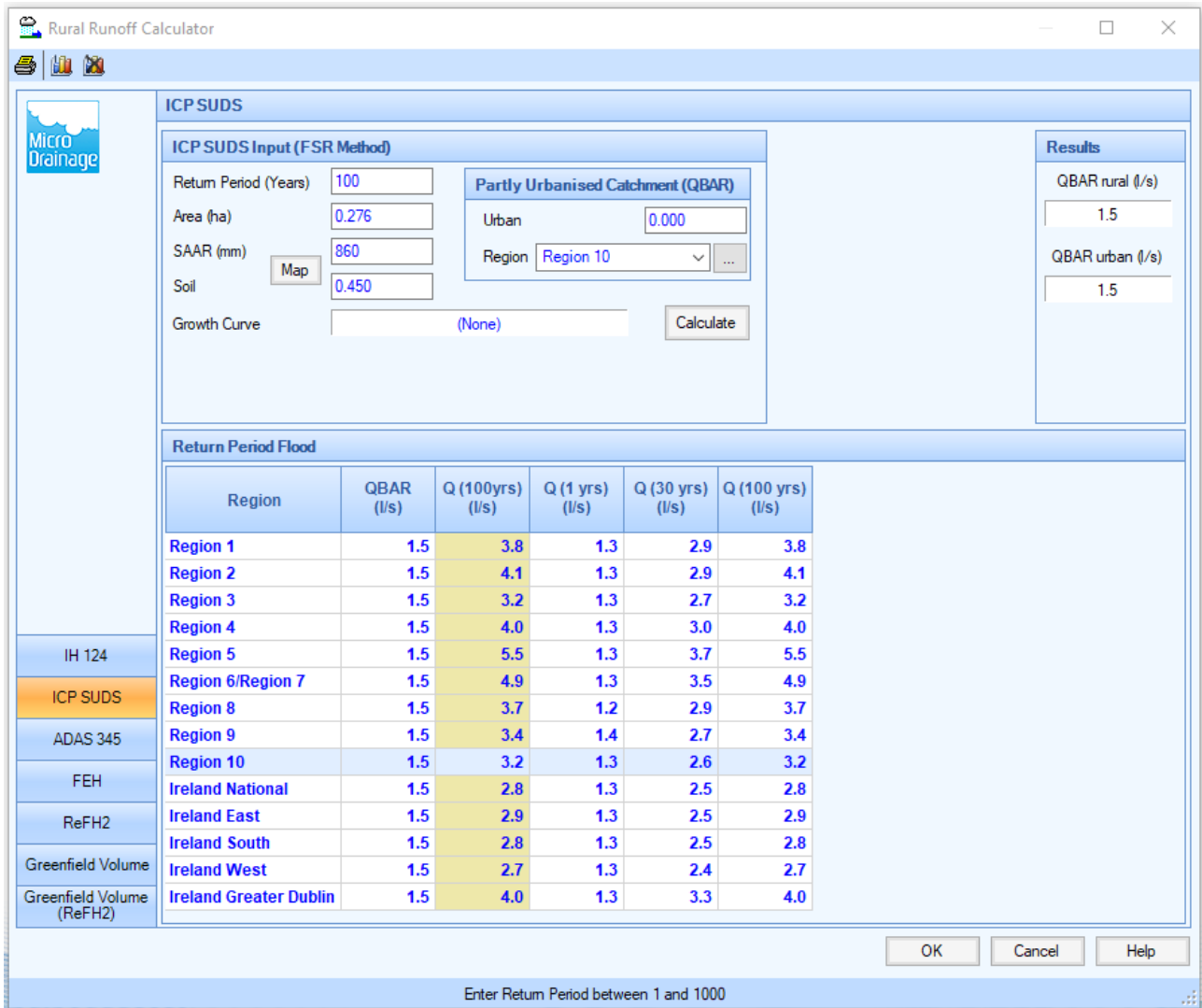
2.05

94.2

SURCHARGED

©1982-2020 Innovyze

Figure 5 – Greenfield Discharge Rate using ICP method.



Rural Runoff Calculator

ICP SUDS

ICP SUDS Input (FSR Method)

Return Period (Years)

Area (ha)

SAAR (mm)

Soil

Growth Curve

Partly Urbanised Catchment (QBAR)

Urban

Region

Results

QBAR rural (l/s)

QBAR urban (l/s)

Return Period Flood

Region	QBAR (l/s)	Q (100yrs) (l/s)	Q (1 yrs) (l/s)	Q (30 yrs) (l/s)	Q (100 yrs) (l/s)
Region 1	1.5	3.8	1.3	2.9	3.8
Region 2	1.5	4.1	1.3	2.9	4.1
Region 3	1.5	3.2	1.3	2.7	3.2
Region 4	1.5	4.0	1.3	3.0	4.0
Region 5	1.5	5.5	1.3	3.7	5.5
Region 6/Region 7	1.5	4.9	1.3	3.5	4.9
Region 8	1.5	3.7	1.2	2.9	3.7
Region 9	1.5	3.4	1.4	2.7	3.4
Region 10	1.5	3.2	1.3	2.6	3.2
Ireland National	1.5	2.8	1.3	2.5	2.8
Ireland East	1.5	2.9	1.3	2.5	2.9
Ireland South	1.5	2.8	1.3	2.5	2.8
Ireland West	1.5	2.7	1.3	2.4	2.7
Ireland Greater Dublin	1.5	4.0	1.3	3.3	4.0

OK Cancel Help

Enter Return Period between 1 and 1000

From figure 5 it can be seen that the greenfield discharge rate was calculated as 3.2l/s.

The proposed discharge rates should therefore be restricted to 3.2 l/s in accordance with the guidance contained within the SFRA.

The new car park will have an area of approximately 0.276ha comprising both impermeable and porous asphalt construction. The roadways will be surfaced in impermeable asphalt and will be laid to fall towards the parking bays which will be surfaced in porous asphalt on a sub-base of single size stone to provide attenuation storage. A series of porous pipes and inspection chambers will drain the underground build-up and lead to a final hydrobrake chamber, located within the site boundary, from which discharge to the public sewer will be restricted to 3.2l/s.

The proposed arrangement is shown on drawing reference WL_2018_002_P1_Proposed Drainage Strategy shown in Appendix G.

Surface water run off calculations have been undertaken using the Microdrainage programme, based on the above (see Appendix H).

A CCTV drainage survey is recommended and will be required to establish existing connections.

5 Conclusions and Recommendations

5.1 Conclusions

- 5.1.1 The likely ground conditions are expected to be as are typical for this part of Manchester, i.e. Made Ground over Glacial Till (clay).
- 5.1.2 The EA Flood Map shows the development to be contained within an area designated as Flood Zone 1 where all classes of land use are considered acceptable.
- 5.1.3 Although a potential for local surface water flooding is identified on EA Surface Water Flood Maps, it is expected that this risk would be reduced by the development itself, i.e. the introduction of new hard standing areas and drainage will mean that all surface water from the site will be controlled on site.
- 5.1.4 The potential use of SUDS has been investigated. Although it is considered unlikely that the ground conditions will be suitable for the use of soakaways for bulk drainage of surface water, the use of permeable paving and high voids stone sub-base for paved and parking areas is considered beneficial as a method of filtration to improve water run-off quality.
- 5.1.5 With discharge to the canal unlikely to be accepted by the Canal and River Trust it is proposed that discharge of surface water will be to the existing United Utilities combined system at a greenfield rate of 3.2/s.
- 5.1.6 Attenuation storage volumes will be achieved via a combination of SuDS techniques including high-voids sub-base and percolation pipes under paved and parking/ block paved areas.

5.2 Recommendations

- 5.2.1 Intrusive ground investigation should be undertaken to confirm site-specific ground conditions, further understand any development constraints, inform any geotechnical design and to quantify contamination risks.
- 5.2.2 A CCTV survey should be carried out along the existing drainage system within Lind Street, Cambrian Street and Cyrus Street to determine the condition of the existing system and identify and existing points of connection.



References

1. C753. The SuDS Manual. CIRIA. 2015
2. Manchester City, Salford City and Trafford Councils Level 2 Hybrid SFRA. Level 1 SFRA. Final March 2010
3. Technical Guidance to the National Planning Policy Framework. March 2012.
4. Planning Policy Statement 25: Development and Flood Risk Practice Guide. December 2009
5. Manchester City, Salford City and Trafford Councils Level 2 Hybrid SFRA. Level 1 SFRA. Final March 2011
6. Local Flood Risk Management Strategy. March 2014
7. 1884-002-001_GI Report 20 Pollard Street East, prepared by Westlakes Environmental issued November 2021.



Appendix A - Architect's Layout

Pollard Street East

Lind Street

Cyrus Street

Upper Helena

Cambrian Street



architecture:m

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Revision Notes

Project Title

Lind Street Car Park

Date

01.03.22

Drawn By

MDW

Scale @ A3

1:500

Drawing Title

Proposed Site Plan

Job Number

536

Status

• P

Drawing Number

• 200

Revision

• A



Appendix B - United Utilities Record Plan

Westlakes Engineering Ltd

**2.1 Unit 20
Dale Street,
Manchester,
M1 1EZ**

FAO:

How to contact us:

**United Utilities Water Limited
Property Searches
Haweswater House
Lingley Mere Business Park
Great Sankey
Warrington
WA5 3LP**

Telephone: 0370 7510101

E-mail: propertysearches@uuplc.co.uk

**Your Ref: Boohoo Man
Our Ref: UUPS-ORD-327762
Date: 22/09/2021**

Dear Sirs

Location: 20 POLLARD STREET EAST, MANCHESTER, M40 7FS

I acknowledge with thanks your request dated 20/09/2021 for information on the location of our services.

Please find enclosed plans showing the approximate position of United Utilities' apparatus known to be in the vicinity of this site.

The enclosed plans are being provided to you subject to the United Utilities terms and conditions for both the wastewater and water distribution plans which are shown attached.

If you are planning works anywhere in the North West, please read United Utilities' access statement before you start work to check how it will affect our network. <http://www.unitedutilities.com/work-near-asset.aspx>.

I trust the above meets with your requirements and look forward to hearing from you should you need anything further.

If you have any queries regarding this matter please [contact us](#).

Yours Faithfully,



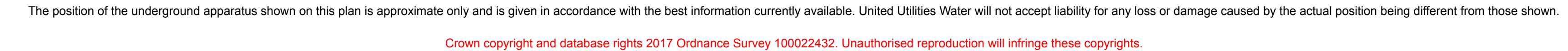
Karen McCormack
Property Searches Manager

TERMS AND CONDITIONS - WASTEWATER AND WATER DISTRIBUTION PLANS

These provisions apply to the public sewerage, water distribution and telemetry systems (including sewers which are the subject of an agreement under Section 104 of the Water Industry Act 1991 and mains installed in accordance with the agreement for the self construction of water mains) (UUWL apparatus) of United Utilities Water Limited "(UUWL)".

TERMS AND CONDITIONS:

- This Map and any information supplied with it is issued subject to the provisions contained below, to the exclusion of all others and no party relies upon any representation, warranty, collateral contract or other assurance of any person (whether party to this agreement or not) that is not set out in this agreement or the documents referred to in it.
- This Map and any information supplied with it is provided for general guidance only and no representation, undertaking or warranty as to its accuracy, completeness or being up to date is given or implied.
- In particular, the position and depth of any UUWL apparatus shown on the Map are approximate only. UUWL strongly recommends that a comprehensive survey is undertaken in addition to reviewing this Map to determine and ensure the precise location of any UUWL apparatus. The exact location, positions and depths should be obtained by excavation trial holes.
- The location and position of private drains, private sewers and service pipes to properties are not normally shown on this Map but their presence must be anticipated and accounted for and you are strongly advised to carry out your own further enquiries and investigations in order to locate the same.
- The position and depth of UUWL apparatus is subject to change and therefore this Map is issued subject to any removal or change in location of the same. The onus is entirely upon you to confirm whether any changes to the Map have been made subsequent to issue and prior to any works being carried out.
- This Map and any information shown on it or provided with it must not be relied upon in the event of any development, construction or other works (including but not limited to any excavations) in the vicinity of UUWL apparatus or for the purpose of determining the suitability of a point of connection to the sewerage or other distribution systems.
- No person or legal entity, including any company shall be relieved from any liability howsoever and whensoever arising for any damage caused to UUWL apparatus by reason of the actual position and/or depths of UUWL apparatus being different from those shown on the Map and any information supplied with it.
- If any provision contained herein is or becomes legally invalid or unenforceable, it will be taken to be severed from the remaining provisions which shall be unaffected and continue in full force and affect.
- This agreement shall be governed by English law and all parties submit to the exclusive jurisdiction of the English courts, save that nothing will prevent UUWL from bringing proceedings in any other competent jurisdiction, whether concurrently or otherwise.

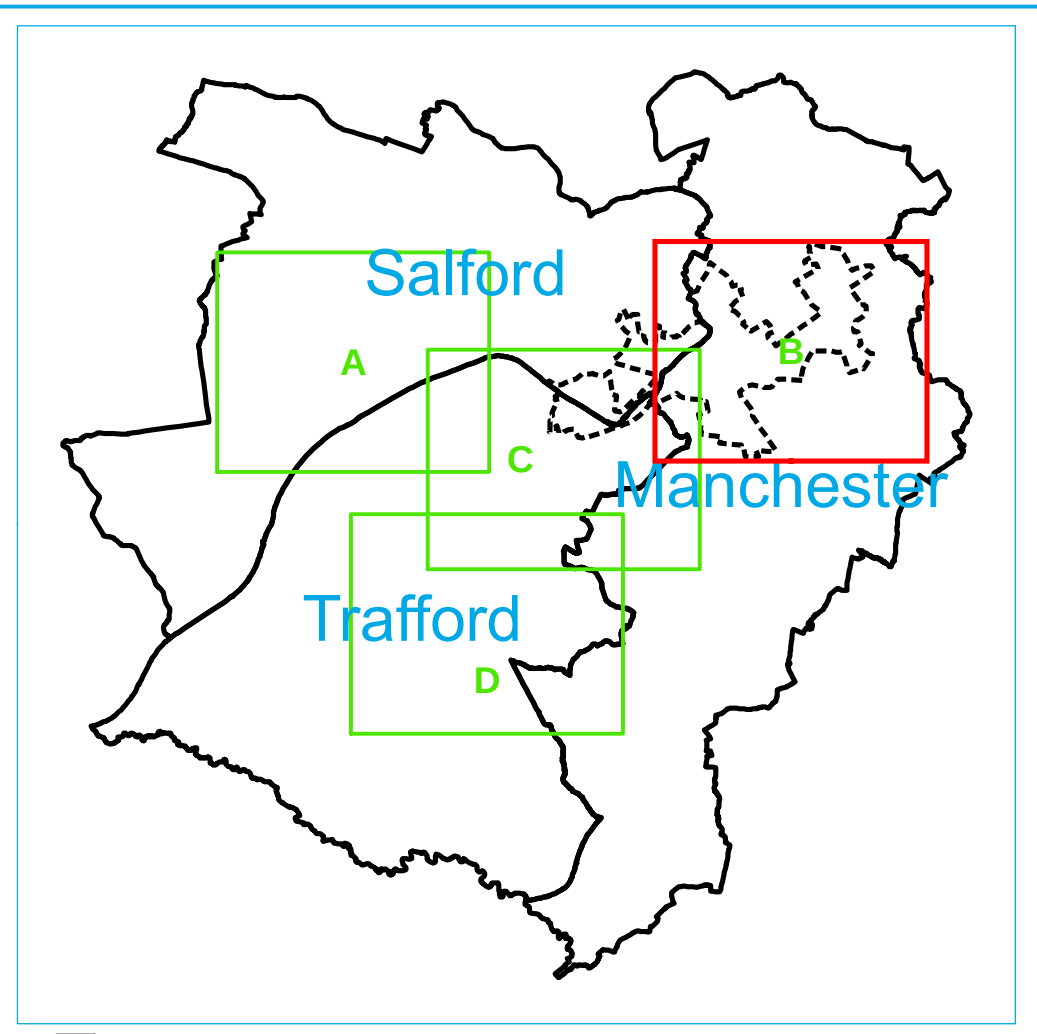
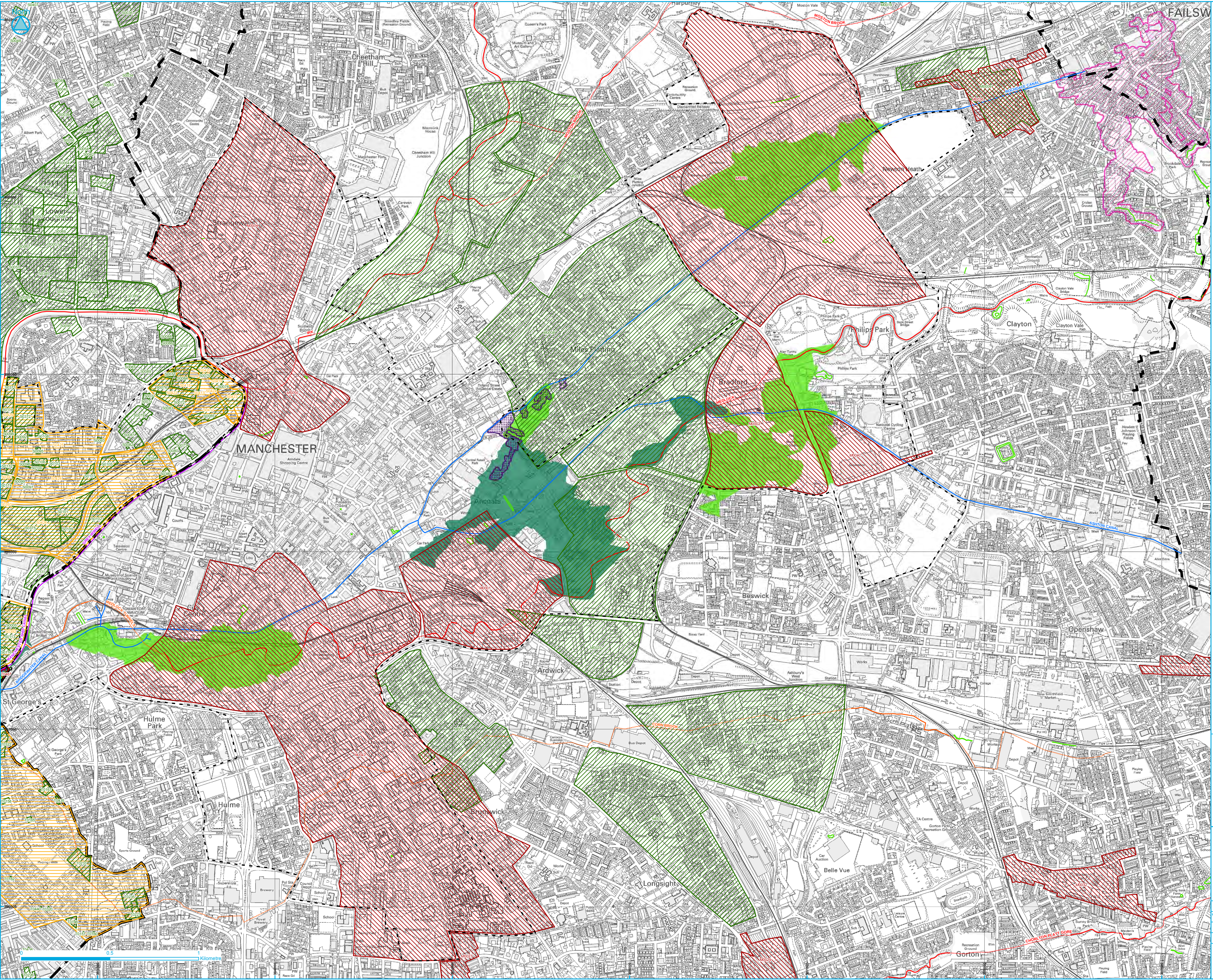


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**SEWER
RECORDS**



Appendix C - Canal Hazard Zone A map – SFRA



- Council Boundary**
- Canal Overtop Hazard Zone**
- Canal Breach Hazard Zone**
- Potential Development Sites / Locations**
- Main Rivers (V8.0)**
- Digitised River Lines**
- Other Waterbodies**
- Ashton, Bridgewater and Rochdale Canals**
- Manchester Ship Canal / Grey Inwell**
- Other Waterbodies**
- Canal Overtop Hazard Zone**
- Canal Breach Zone A**
- Canal Breach Zone B**
- Oldham SFRA Canal Hazard Zone**
- Employment**
- Housing**
- Mixed Use**
- Other**
- Regional Centre Boundary**
- Cultivated**
- Open**
- Cultivated**
- Open**

This map has been produced in accordance with PPS25: Development and Flood Risk.

Two indicative "Canal Hazard Zones" have been created for the Bridgewater, Ashton and Rochdale Canals. These have been generated using broadscale 2D modelling to show areas that could potentially be affected by flooding in the event of:

- *Canal Overtop Hazard Zone
- *Canal Breach Hazard Zone

The potential breach locations / areas were sub-divided into two Canal Breach Zones:

- *Canal Breach Zone A - A walkover survey of the canal was undertaken to identify the embankments more likely to breach, based on their height and width. This zone shows those areas that would be affected by a breach of one of these embankments. In this zone a detailed examination of canal breach flood risks is required in a site specific FRA.
- *Canal Breach Zone B - Less likely breach locations, such as at wide, low or very low embankments, were identified by a walkover survey of the canal. At such locations it is more likely that this source of risk could be scoped out within any site specific FRA.

It should be noted that these outlines are based on broadscale modelling techniques and should only be taken as an indication of areas that might be at risk and inform Flood Risk Assessments. There are a number of uncertainties associated with the simulation of flooding from canals in either overtopping or breach conditions. The assumptions behind the modelling should be considered when using and reviewing the hazard zones that have been produced. Full details of the methodology used to derive Canal Hazard Zones is provided in Chapter 3 of the Level 2 SFRA and guidance on the use of the Canal Hazard Zones is provided in Chapter 3 of the SFRA User Guide.

The Canal Hazard Zone resulting in a breach from the Rochdale Canal in Oldham has also been included on the map and has been taken from the Oldham SFRA (2010). This was based on a similar broadscale methodology.

Interactions between the Bridgewater Canal and the River Medlock in Castlefield may result in overtopping of the Canal during severe weather events, as shown elsewhere in the SFRA.

For further information please see the Level 2 SFRA Chapter 3.

The Main River information shown in the SFRA is provided by the Environment Agency; the centreline data may deviate from that shown on basemapping due to inherent differences in data resolution. Further information on Main Rivers is provided on the Environment Agency's website. The mapping of culverted sections of watercourse is a strategic screening only based upon Ordnance Survey 1:10,000 mapping and should be confirmed for more detailed studies such as site specific Flood Risk Assessment. The canals layer does not necessarily cover all the canal arms, but the modelled overtopping/breaching and hydraulic interactions with rivers and other waterbodies is complete and accurate as appropriate for a Strategic Flood Risk Assessment.

The River Inwell between Victoria Station and Pomona Island is not shown as a Main River on the Environment Agency's Flood Map although Flood Zones related to the river are. The same approach has been taken in this SFRA.

The map should be considered when applying the Sequential Test and used to scope the inclusion of canal flood risk within a site specific FRA.



Other offices at Altherstone, Doncaster, Edinburgh, Haywards Heath, Limerick, Newcastle upon Tyne, Newport, Northallerton, Saltburn, Skipton, Tadcaster & Wellingford

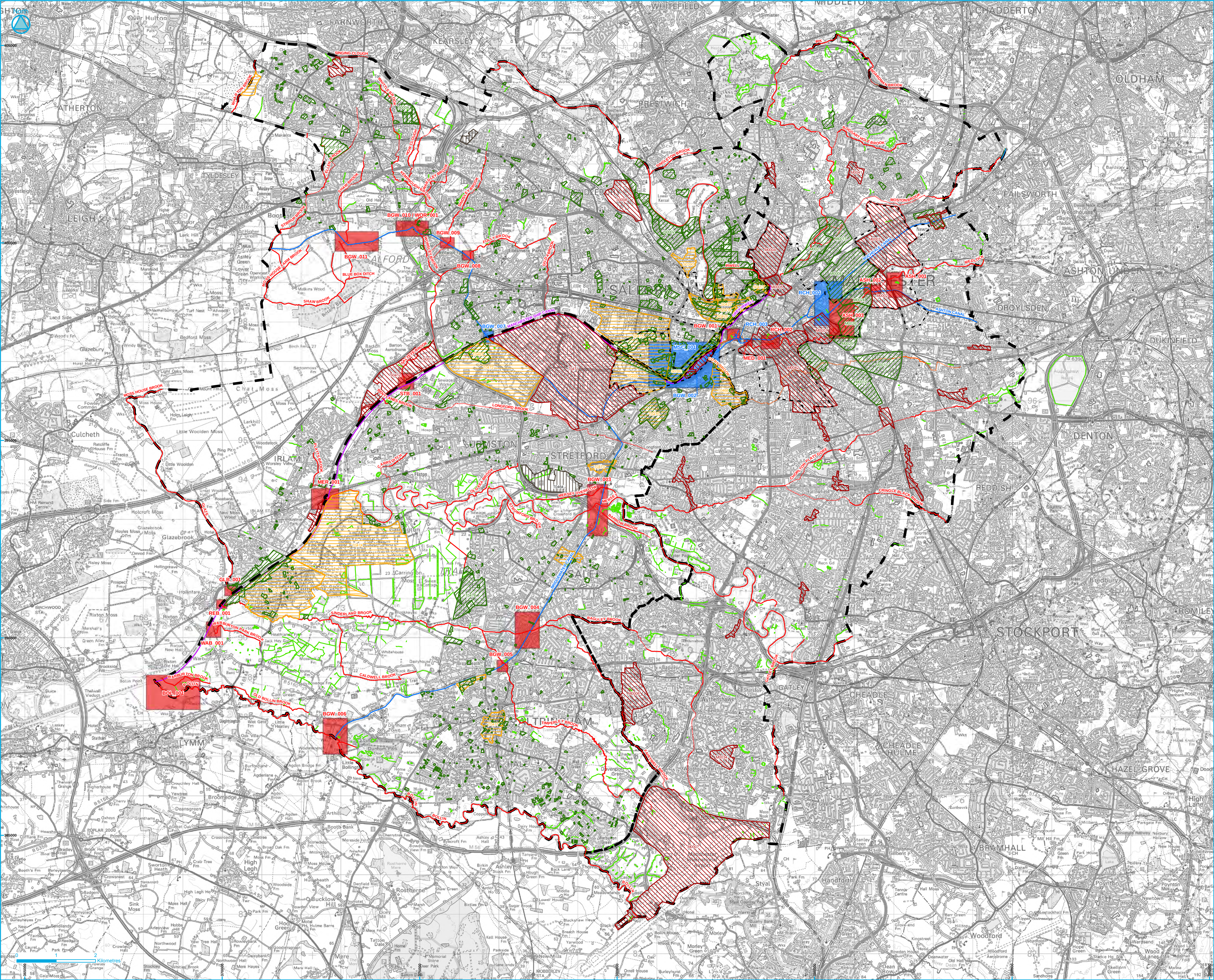


United Kingdom

Manchester City, Salford City and Trafford Councils Level 2 Hybrid SFRA		
Canal Hazard Zones		
Drawn by: J Cheetham	Date: 15/03/2011	This map is based upon Ordnance Survey material with the permission of Ordnance Survey on behalf of the Controller of Her Majesty's Stationery Office. © Crown copyright. Unauthorised reproduction infringes Crown copyright and may lead to prosecution or civil proceedings. Licence number: 100019558-2011
Checked by: J Dimelow	Date: 01/02/2011	
Approved by: J Cooper	Date: 01/02/2011	
File Name: ...ArcViewMapping\Level2MST_Canal_Hazard_V1.3.mxd		
Drawing Number: MM_3.2B	Status: FINAL	Scale: 1:10,000
Original © A1		



Appendix D - Watercourse interaction drawing Ref HI_5.1 – SFRA



- Council Boundary**
- Hydraulic Interactions**
- Potential Development Sites / Locations**
- Main Rivers (V8.0)**
- Digitised River Lines**

This map has been produced in accordance with PPS25: Development and Flood Risk.

The map shows the interactions between different sources of flooding. This identifies where further consideration of hydraulic interactions is required in site specific FRAs.

The Main River information shown in the SFRA is provided by the Environment Agency; the centreline data may deviate from that shown on basemapping due to inherent differences in data resolution. Further information on Main Rivers is provided on the Environment Agency's website. The mapping of culverted sections of watercourse is a strategic screening only based upon Ordnance Survey 1:10,000 mapping and should be confirmed for more detailed studies such as site specific Flood Risk Assessment. The canals layer does not necessarily cover all the canal arms, but the modelled overtopping/breaching and hydraulic interactions with rivers and other waterbodies is complete and accurate as appropriate for a Strategic Flood Risk Assessment. The River Irwell downstream from Victoria Station and the Manchester Ship Canal function as a single (hydraulically linked) watercourse. The rectangles represented on this map show an indicative area over which hydraulic interactions are considered possible.

The River Irwell between Victoria Station and Pomona Island is not shown as a Main River on the Environment Agency's Flood Map although Flood Zones related to the river are. The same approach has been taken in this SFRA.

Other offices at Atherstone, Doncaster, Edinburgh, Haywards Heath, Limerick, Newcastle upon Tyne, Newport, Northampton, Saltire, Skipton, Tadcaster & Wellingford

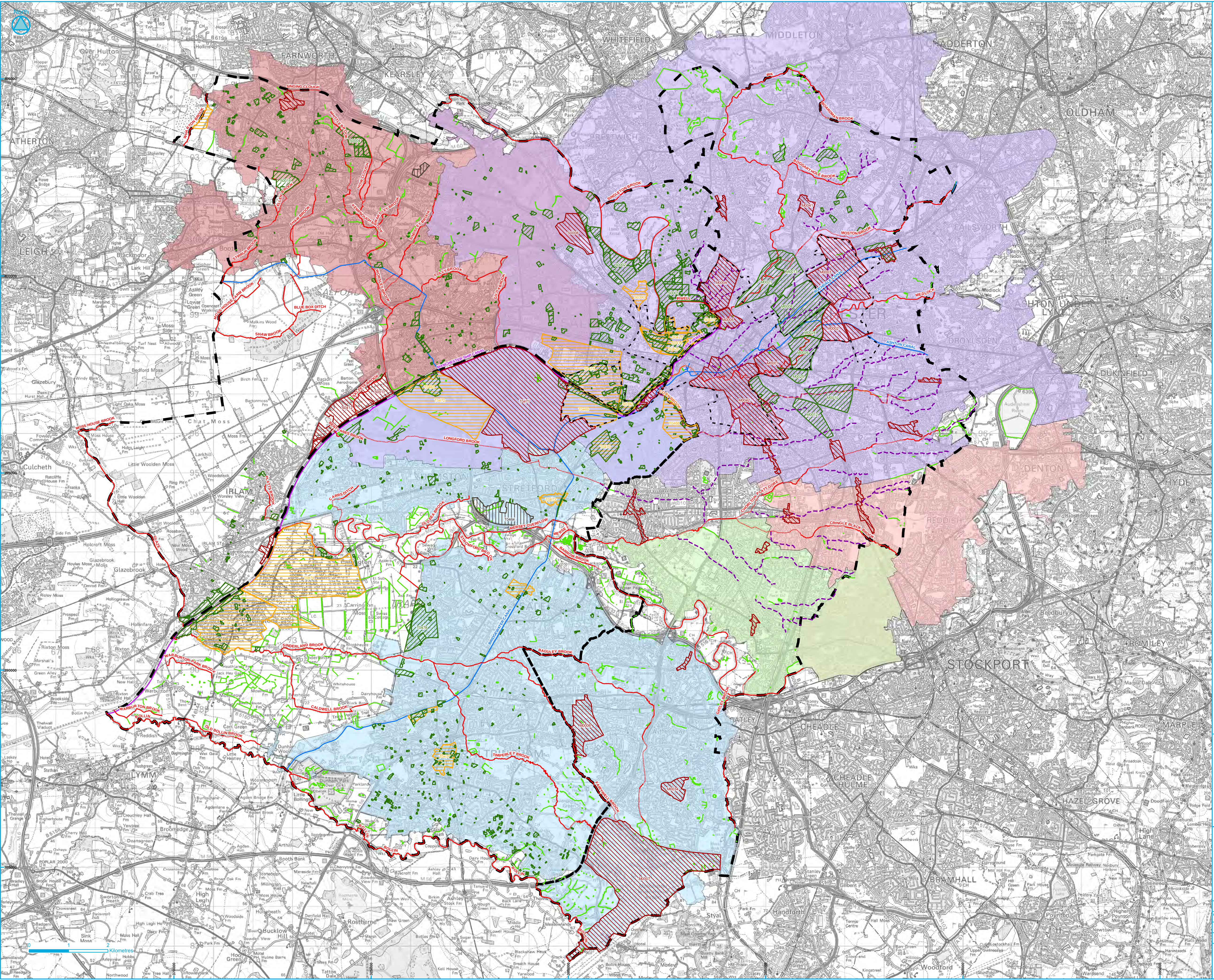
Manchester City, Salford City and Trafford Councils Level 2 Hybrid SFRA

Hydraulic Interactions

Drawn by: J Cheetham	Date: 08/03/2011	This map is based upon Ordnance Survey material with the permission of Ordnance Survey on behalf of the Controller of Her Majesty's Stationery Office © Crown copyright. Unauthorised reproduction infringes Crown copyright and may lead to prosecution or civil proceedings. Licence number: 10001658 2011.
Checked by: J Dimelow	Date: 01/02/2011	
Approved by: J Cooper	Date: 01/02/2011	
File Name: ...ArcViewMapping\Level2\MS2_Hydraulic_Interactions_V1.1.mxd	Status: DRAFT	Scale: 1:45,000
Drawing Number: HI_5.1	FINAL	



Appendix E - Conurbation Core critical drainage area – SFRA



- Council Boundary
- Lost Watercourses
- Critical Drainage Areas**
 - Conurbation Core
 - Didsbury
 - Levenshulme and Fallowfield
 - Manchester and Trafford South
 - Salford North West
- Main Rivers (V8.0)**
 - Ashton, Bridgewater and Rochdale Canals
 - Manchester Ship Canal / Grey Inwell
 - Other Waterbodies
 - Culverted
 - Open
- Digitised River Lines**
 - Culverted
 - Open
- Potential Development Sites / Locations**
 - Employment
 - Housing
 - Mixed Use
 - Other
- Regional Centre Boundary

This map has been produced in accordance with PPS25: Development and Flood Risk.

Certain locations are particularly sensitive to an increase in the rate of surface water runoff and/or volume from new development. There are generally known local flooding problems associated with these areas. These areas have been defined as Critical Drainage Areas in the SFRA. Specific drainage requirements are required in these areas to help reduce local flood risk.

Chapter 5 of the Level 2 SFRA covers the flooding from surface water and sewers and how Critical Drainage Areas have been defined.

The Main River information shown in the SFRA is provided by the Environment Agency; the centreline data may deviate from that shown on basemapping due to inherent differences in data resolution. Further information on Main Rivers is provided on the Environment Agency's website. The mapping of culverted sections of watercourse is a strategic screening only based upon Ordnance Survey 1:10,000 mapping and should be confirmed for more detailed studies such as site specific Flood Risk Assessment. The canals layer does not necessarily cover all the canal arms, but the modelled overtopping/breaching and hydraulic interactions with rivers and other waterbodies is complete and accurate as appropriate for a Strategic Flood Risk Assessment.

The River Irwell between Victoria Station and Pomona Island is not shown as a Main River on the Environment Agency's Flood Map although Flood Zones related to the river are. The same approach has been taken in this SFRA.

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Other offices at Atherstone, Doncaster, Edinburgh, Haywards Heath, Limerick, Newcastle upon Tyne, Newport, Northampton, Saltburn, Skipton, Tadcaster & Wellingford

Manchester City, Salford City and Trafford Councils Level 2 Hybrid SFRA

Critical Drainage Areas

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Checked by:	J Dimelow	Date:	01/02/2011		
Approved by:	J Cooper	Date:	01/02/2011		
File Name: ...ArcView\Mapping\Level2\MST_CDA_Current_V1.2.mxd					
Drawing Number:	SS_4.5	Status:	FINAL	Scale:	1:45,000

Original @ A



Appendix F - Correspondence

Eleni Zachara

From: Flood Risk Management <floodriskmanagement@manchester.gov.uk>
Sent: 18 February 2022 14:13
To: Eleni Zachara
Subject: RE: Pre - development enquiry - Lind Street Car Park - M40 7ES
Attachments: Manchester City Council - SuDS Requirement for Developers 2019.pdf

CAUTION:EXTERNAL EMAIL!

Good afternoon Eleni,

Thank you for your email.

From the information you have provided, we can advise that your site is in the Conurbation Core Critical Drainage Area (CDA). Therefore, the LLFA would require your strategy to adhere to the following criteria from our Local Flood Risk Management Strategy:

- Greenfield runoff for Greenfield areas.
- A 50% runoff rate reduction for Brownfield areas, with an aim of reducing runoff to Greenfield rates.

Please note that if both greenfield and brownfield areas are onsite, we would want to see the strategy account for that.

It is also important that you consult with the relevant asset owner on the discharge rate and connection. As part of your submission to us, you should present evidence of their acceptance of the proposed discharge rate & connection.

Additional observations based on the information you have provided:

- Your application should demonstrate evidence-based adherence to the Drainage Hierarchy, which should include full consideration of infiltration.
- We encourage consideration of green SuDS components in-line with our carbon and climate change objectives.
- **We recommend you review our attached SuDS guidance for developers.**

I hope this is of assistance in guiding your strategy. Should you have any further queries, please do not hesitate to contact us.

Kind Regards,
Laura

Laura Peacock MESci(Geol) MCIWEM
Flood Risk Engineer – LLFA

Highways Service,
Growth and Neighbourhoods Directorate
Manchester City Council
PO Box 532
Town Hall
Manchester
M60 2LA
Web: <http://www.manchester.gov.uk>

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This footnote also confirms that this email message has been swept for the presence of computer viruses.

From: Eleni Zachara <Eleni.Zachara@Westlakes.co.uk>
Sent: 14 February 2022 15:24
To: Flood Risk Management <floodriskmanagement@manchester.gov.uk>
Subject: Pre - development enquiry - Lind Street Car Park - M40 7ES

To whom it might concern

My name is Eleni Zachara for Westlakes Engineering in Manchester.
We have a project in Manchester, Lind Street, closest post code: M40 7ES
I have attached the site location and the architects proposals.
Maybe have a discussion about surface water discharge rates (what would be acceptable for the LLFA)

Please do not hesitate contacting me any further queries and thank you in advance.

Kind Regards

Eleni Zachara
Senior Infrastructure Engineer

Tel: 0161 236 8203
Mob.: 07763116983
Email: eleni.zachara@westlakes.co.uk
Web: www.westlakes.co.uk

Unit 2.1, 20 Dale Street, Manchester, M1 1EZ



The Manchester Office are proud to be supporting Back on Track Manchester as our nominated charity of the year. Back on Track Manchester is a learning Centre in central Manchester that works with adults going through recovery or rehabilitation. Please see their website for more information <http://www.backontrackmanchester.org.uk/#>

'In response to the outbreak of COVID-19, Westlakes Engineering Ltd are taking necessary measures to reduce the risk of their staff contracting/coming into contact with the virus, whilst adhering to the latest Government guidelines.

Westlakes Engineering are therefore adopting a principle of remote working to ensure continuity of our design delivery work to our clients and remain contactable through the company e-mail address enquiries@westlakes.co.uk and the companies main office number: 0161 236-8203.'

Eleni Zachara

From: Perry, Graham <Graham.Perry@uuplc.co.uk>
Sent: 24 February 2022 14:16
To: Eleni Zachara
Cc: Wastewater Developer Services
Subject: Pre Development Enquiry for : Lind Street Manchester M40 7ES UU reference Number : 4200047291

You don't often get email from graham.perry@uuplc.co.uk. [Learn why this is important](#)

CAUTION:EXTERNAL EMAIL!

Pre Development Enquiry for: Lind Street Manchester M40 7ES UU reference Number : 4200047291

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

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

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

Foul Water

We have noted that the enquiry is for a car park without any proposals to discharge domestic foul from the site therefore a discharge point has not been offered. If this changes please let us know and we will amend our response to include one

Surface Water

All surface water flow from the proposed development should drain in-line with the drainage hierarchy, as outlined in Paragraph 80, (Reference ID: 7-080-20150323), of the National Planning Practice Guidance. We also recommend you prioritise the use of multi-functional sustainable drainage systems for the management of surface water in accordance with national planning policy.

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

This is outlined as follows, in order of priority:

- 1. into the ground (infiltration);**
- 2. to a surface waterbody;**
- 3. to a surface water sewer or highway drain;**
- 4. to a combined sewer.**

For guidance, The **North West SuDS Pro-Forma** provides information on the appropriate evidence required at each stage of the hierarchy, to demonstrate how each level has been discounted.

The Lead Local Flood Authority has responsibility for all surface water drainage concerns and their input to your proposal is critical. You should also consider whether it is necessary to discuss your proposal with the Environment Agency, or Internal Drainage Board (if operating in your area).

The Local Planning Authority are the determining authority for any application for planning permission and the appropriate authority for determining cost viability of a proposed drainage scheme, such assessments are outside of the jurisdiction of United Utilities.

Infiltration

Surface water runoff generated from this development should discharge to the ground via infiltration system where feasible.

A detailed evidence based feasibility assessment must be carried out in line with Chapter 25 of the CIRIA SuDS Manual 2015 to determine whether infiltration is a suitable method of surface water disposal.

Particular attention must be paid to Ground Water Source Protection Zones to ensure that the risk of pollution to these valuable resources is not compromised. Details can be obtained from the government website:

<https://www.gov.uk/guidance/groundwater-source-protection-zones-spzs#find-groundwater-spzs>

If your site is in a Groundwater Source Protection Zone, you should have regard to the Environment Agency's approach to Groundwater Protection. Information on this is available via the link below:

<https://www.gov.uk/government/publications/groundwater-protection-position-statements>

Please note that such a location could have implications for the principle of your development and the need for additional mitigating measures to protect the groundwater environment and public water supply in the detailed design of your site.

Waterbody

If an evidence based assessment has been carried out and confirms that infiltration is not feasible, we recommend that you contact the Lead Local Flood Authority and/or Environment Agency to discuss a point of discharge to the Ashton canal located to the north of the site or to the River Medlock to the south

We would encourage you to identify and engage with any third party landowner and riparian owner to agree access and discharge rights to the water body if this is not in your ownership.

Highway Drainage

If an evidence based assessment has been carried out and confirms that infiltration is not feasible, we recommend that you investigate the possibility of draining surface water to the highway drain where this ultimately discharges to a watercourse, by contacting the relevant Highway Authority.

Public Sewer

In accordance with the hierarchy of drainage options within the National Planning Practice Guidance, both discharge to ground via infiltration and discharge to a waterbody should be discounted prior to consideration of discharging surface water to the public sewer system. Evidence should be provided to demonstrate how these have been discounted, as outlined in the North West SuDS pro-forma.

Once evidence is provided as outlined above, United Utilities will consider a connection to the 375mm diameter public combined sewer within Cyrus Street located south of the proposed site at a pass forward flow to be agreed by the Lead Local Flood Authority. United Utilities request that any agreed rate does not exceed 5 l/s.

As a Water Company, we have no obligation to accept highway drainage into our public sewer network. However, should your proposals include runoff from highways or car parks, we would request that consideration is given to SuDS components that deliver source control are incorporated within the design of the scheme to reduce the volume and frequency of discharges of these flows to the public sewer.

Levels

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

Land drainage / Overland flows / track drainage

United Utilities have no obligation, and furthermore we do not accept land drainage, overland flows or track drainage into the public sewerage network under any circumstances

Existing Wastewater Assets Crossing the Site

We have reviewed our records and can confirm that there does not appear to be any charted public sewers located within the boundary of proposed development. However, due to the accuracy of the records and the public sewer transfer legislation in 2011, not all public sewers are shown on our records so we would ask that you proceed with caution and carry out your own site investigation works. If any uncharted sewers are identified while carrying out your works we would ask that you contact United Utilities at the earliest opportunity so that we can offer guidance and update our records.

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

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

Existing Water Assets Crossing the Site

It is the developer responsibility to identify utilities on-site. Where clean water assets are shown on our records, we recommend that you contact our Water Pre-Development Team, via the following email address:

DeveloperServicesWater@uuplc.co.uk. Further information for this service can be found on our website via the link below:

<https://www.unitedutilities.com/builders-developers/larger-developments/pre-development/water-pre-dev/>

Connection Application

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

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

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

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

Kind regards,

Graham Perry



Graham Perry
Development Engineer
Developer Services
M: 07557 577548
T: 01925 679405
unitedutilities.com

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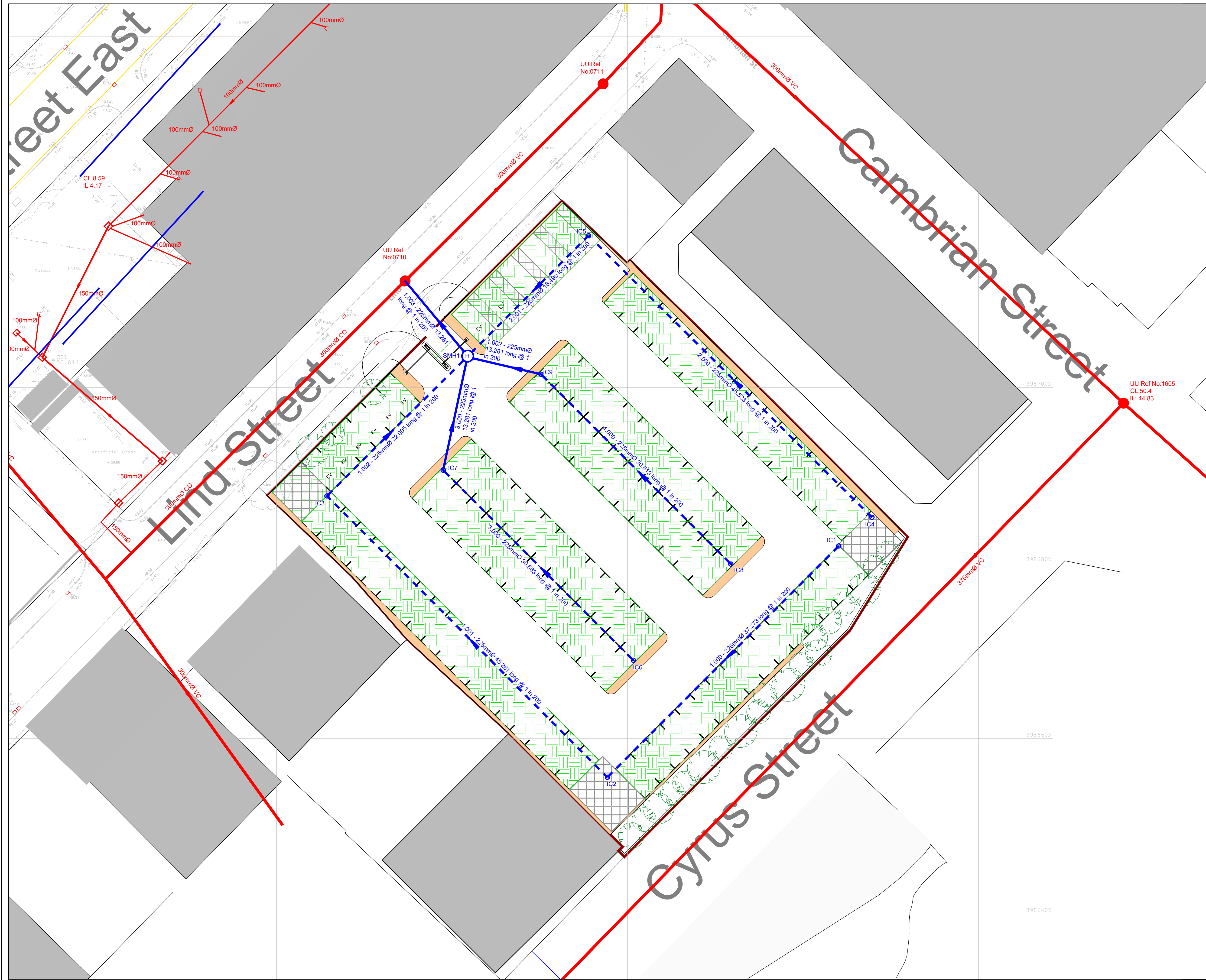
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Appendix G - Proposed Drainage Strategy Plan



DRAINAGE NOTES

1. ALL NON ADOPTABLE DRAINS UP TO 150 Dia. TO BE TWIN WALL PLASTIC PIPE MANUFACTURED IN ACCORDANCE WITH BS EN 1401-1OR EQUAL APPROVED.
2. ALL ADOPTABLE DRAINS UP TO 300 Dia. TO BE 'POLYSEWER' BY 'POLYPIPE' AND MANUFACTURED IN ACCORDANCE WITH THE WATER INDUSTRY SPECIFICATION WIS-4-35-01.
3. DRAINS TO BE INSTALLED IN ACCORDANCE WITH MANUFACTURERS RECOMMENDATIONS. BACKFILL AND BEDDING TO AS PER TYPICAL DETAIL U.N.O.
4. ALL DRAINS TO BE LAID SOFFIT TO SOFFIT. AND THE EXACT POSITIONS OF ALL DRAINS MAY BE DETERMINED ON SITE PRIOR TO COMMENCEMENT OF WORK. ANY REVISIONS ARE TO BE SUBJECT TO THE APPROVAL OF THE LOCAL BUILDING INSPECTOR.
5. WORKS TO ANY ADOPTED SERVICES ARE TO BE IN ACCORDANCE WITH 'THE CODE' AND SHOULD BE APPROVED WITH THAMES WATER PRIOR TO COMMENCEMENT.
6. ANY DRAINS CAST IN & PASSING THROUGH CONCRETE GROUND BEAMS TO HAVE A FLEXIBLE JOINT NOT MORE THAN 150mm FROM THE FACE OF THE GROUND BEAM. (FLEXIBLE JOINT TO MANUFACTURERS DETAILS) AND A MAXIMUM 600mm LONG ROCKER PIPER EITHER SIDE
7. ALL LINES OF DRAINAGE INDICATED ARE PROVISIONAL ONLY. THE EXACT POSITIONS OF ALL DRAINS MAY BE ALTERED TO SUIT AND DETERMINED ON SITE PRIOR TO COMMENCEMENT OF WORK. ANY REVISIONS ARE TO BE SUBJECT TO THE APPROVAL OF THE LOCAL BUILDING INSPECTOR. AN ACCURATE RECORD OF ANY AMENDMENT IS TO BE KEPT BY THE CONTRACTOR.
8. ALL BURIED CONNECTIONS TO POP-UPS TO BE 150mm Dia.

LEGEND

- UU Ref
No: xxxx
- ICx
- SMHx
- PROPOSED POROUS CARPARK
- PROPOSED SURFACE WATER SEWER
- PROPOSED PERFORATED PIPE
- EXISTING COMBINED SEWER
- EXISTING COMBINED SEWER CHAMBER
- PROPOSED SURFACE WATER INSPECTION CHAMBER 450mmØ DIAMETER
- PROPOSED HYDROBRAKE CHAMBER TO RESTRICT FLOW TO 3.2l/s

P2	10.03.22	ISSUED FOR PLANNING	EZ	GE	CP
P1	08.03.22	ISSUED FOR PLANNING	EZ	GE	CP
Rev	Date	Revision Details	By	Chkd	Appd

Westlakes
Engineering

Client

BOOHOO

Project

LIND STREET CAR PARK

Title

PROPOSED DRAINAGE STRATEGY

Drawing No.

WL_2018_002

Revision

P2

Scale

1:200

Date

MAR' 22

Drawn

EZ

Chk

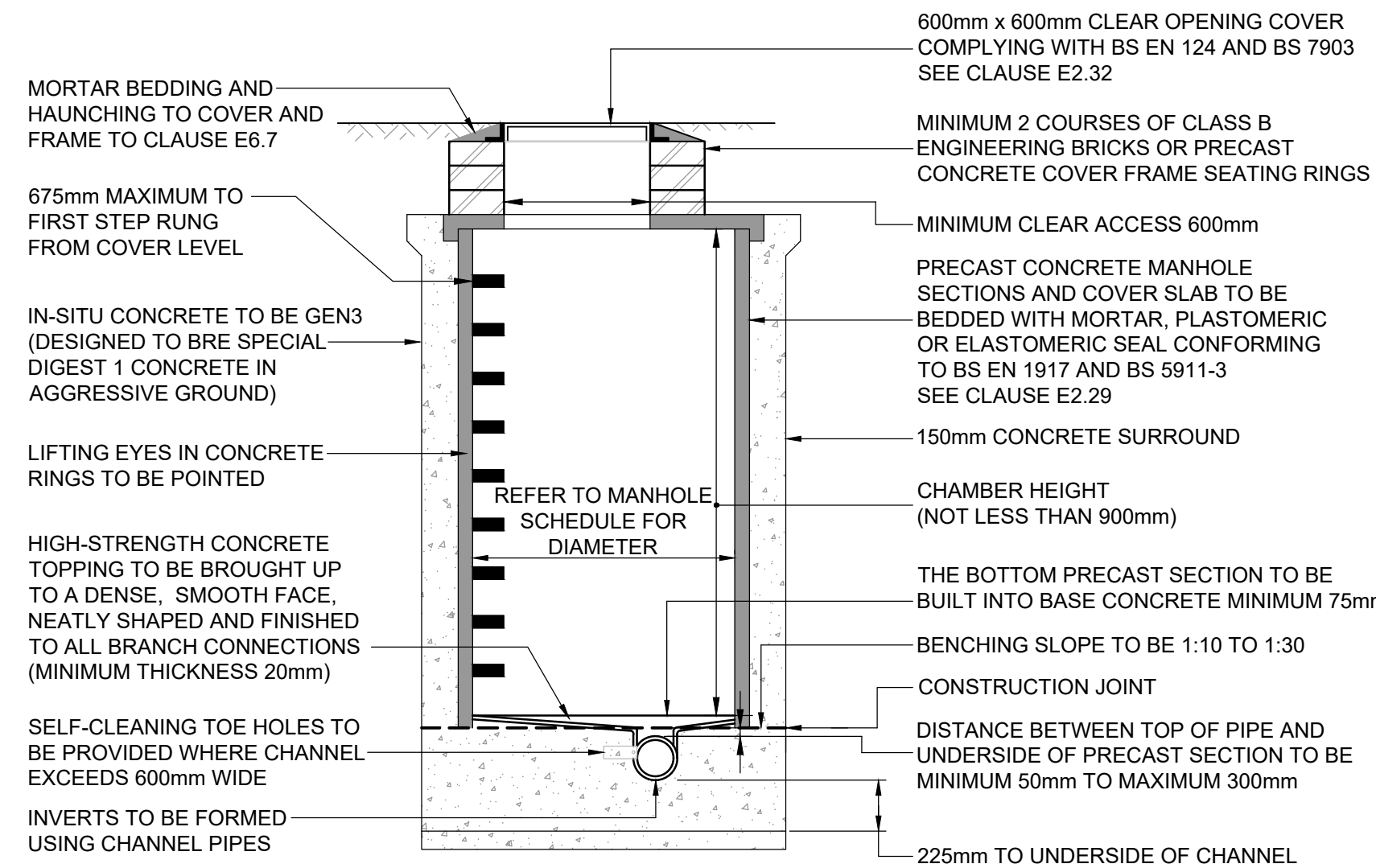
GE

App

CP

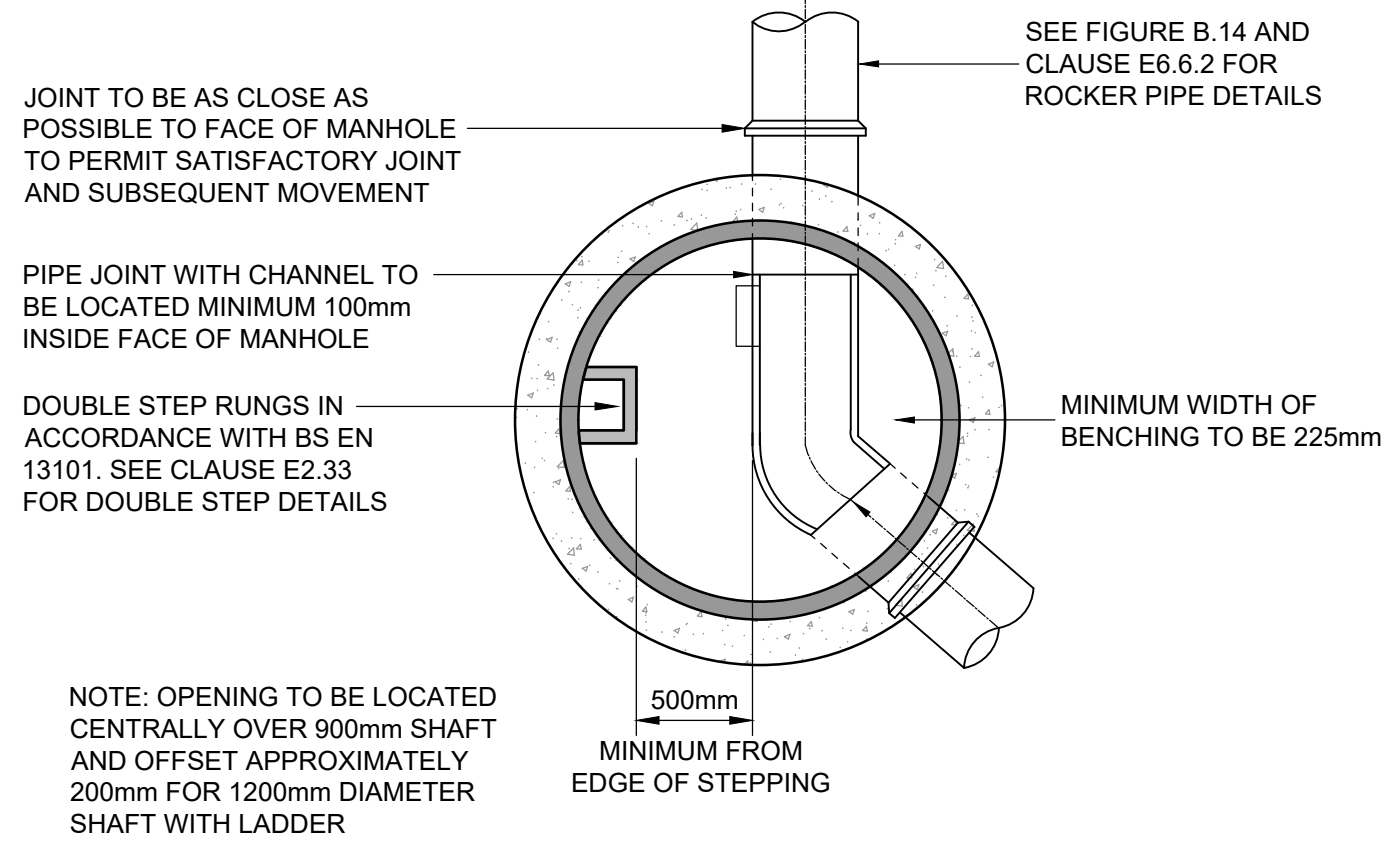
Unit 2.1, 20 Dale Street
Manchester.
M1 1EZ

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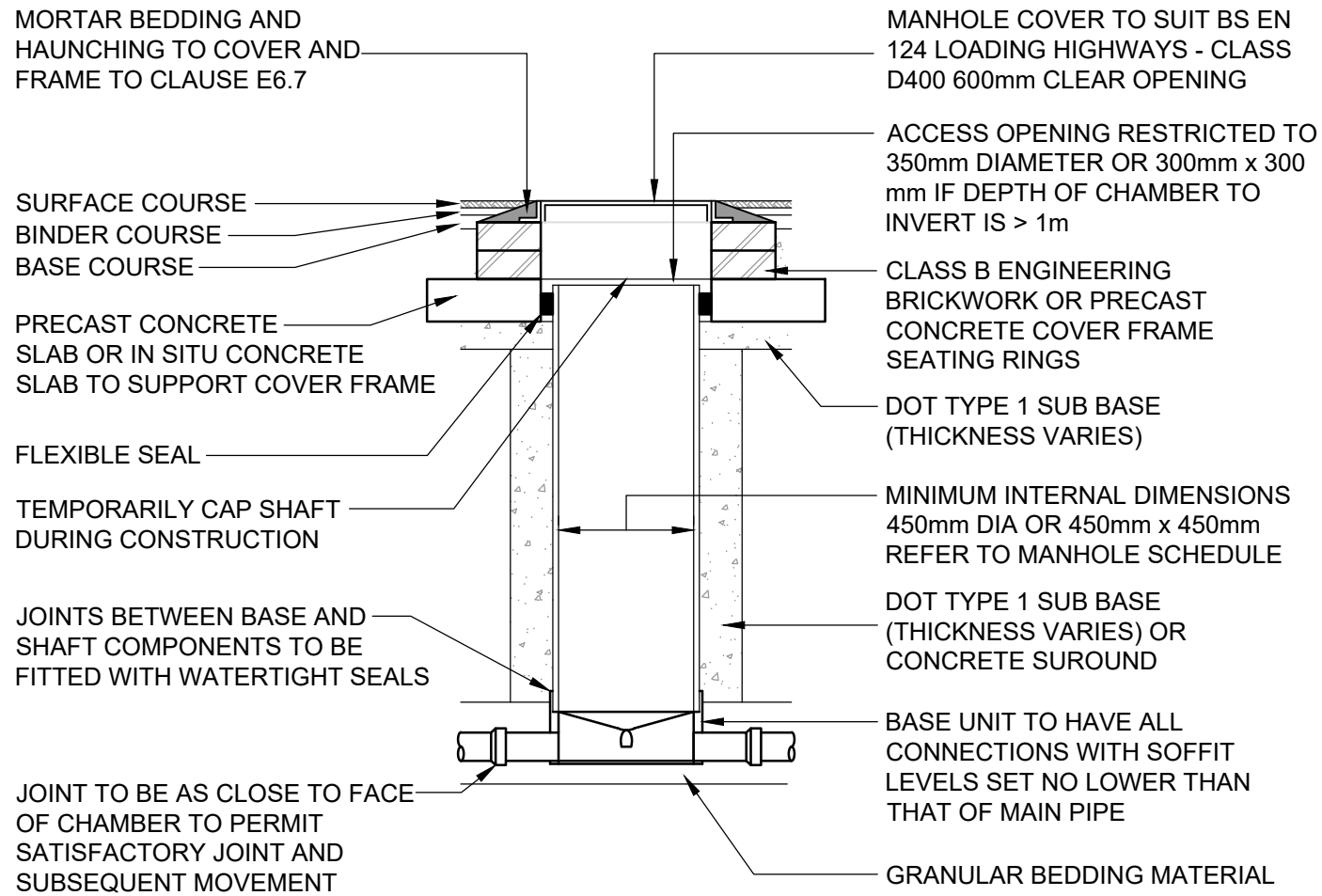


TYPICAL MANHOLE DETAIL - TYPE 2
MAXIMUM DEPTH FROM COVER LEVEL TO SOFFIT OF PIPE 3.0m

SCALE 1:25



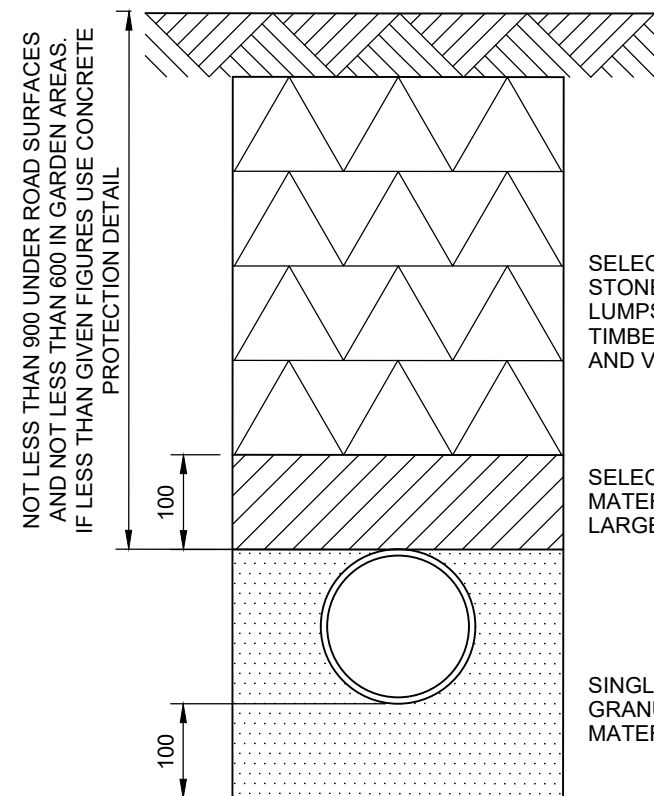
PLAN
SCALE 1:25



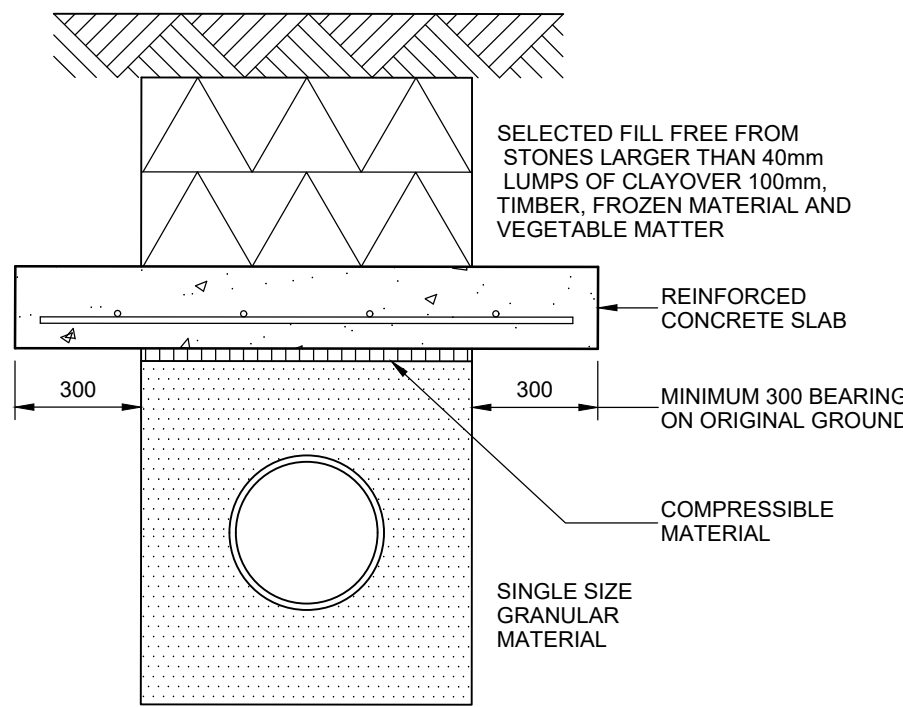
INSPECTION CHAMBER TYPE 3 (FLEXIBLE MATERIAL)

MAXIMUM DEPTH FROM COVER LEVEL TO SOFFIT OF PIPE 3m NON ENTRY

SCALE 1:25



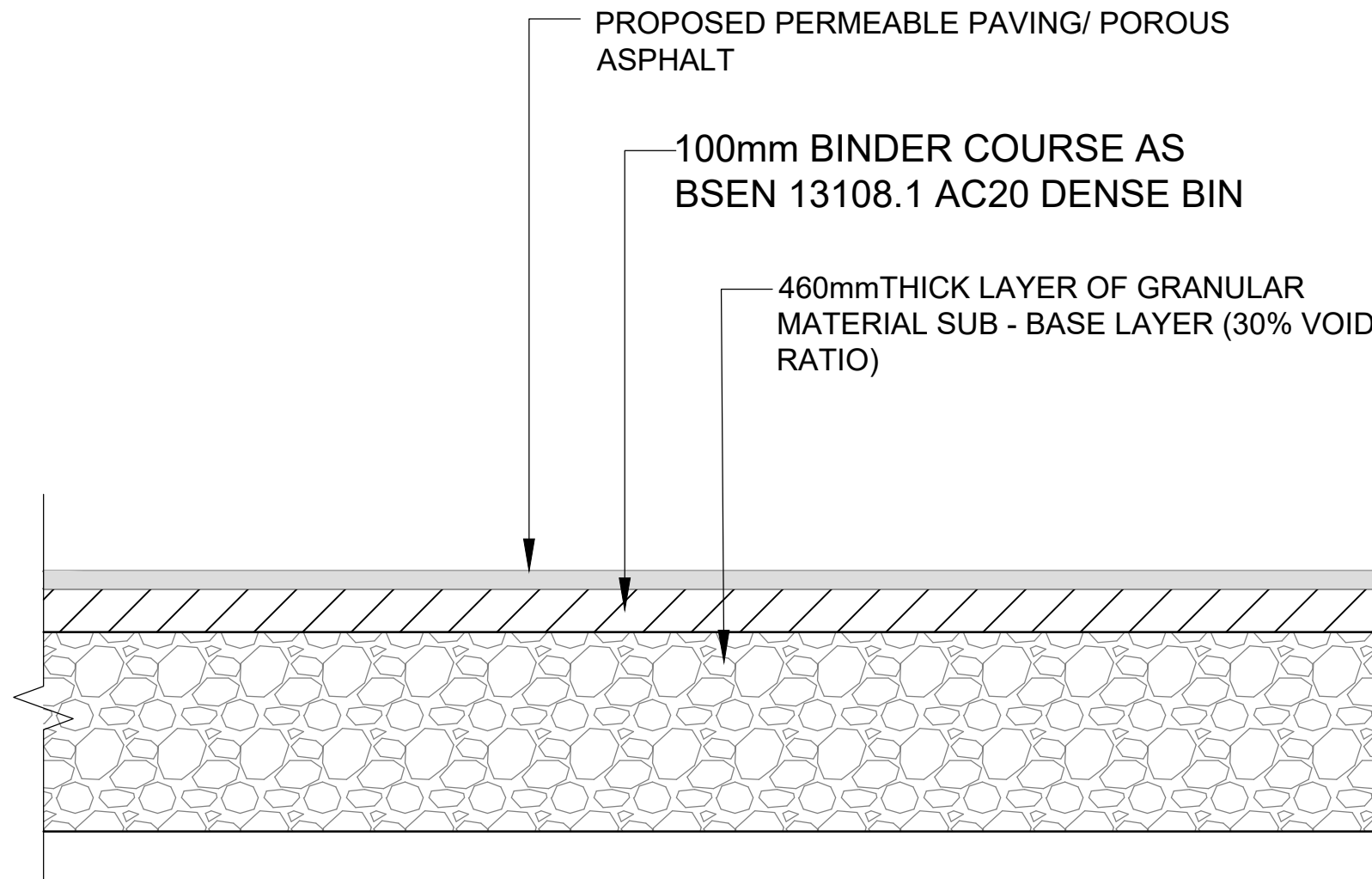
TYPICAL FLEXIBLE PIPE STANDARD BACKFILL
SCALE N.T.S.



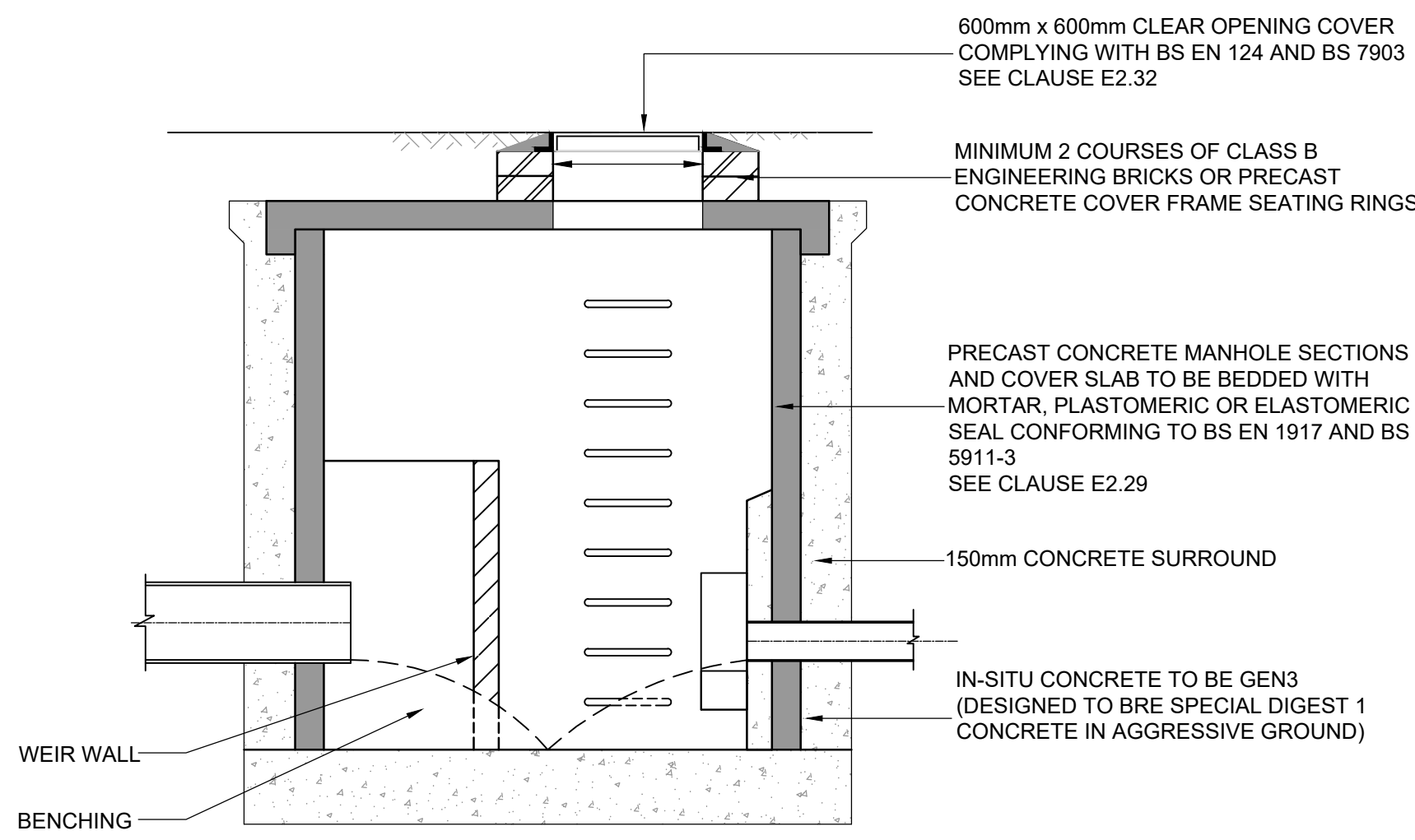
TYPICAL FLEXIBLE PIPE WITH CONCRETE PROTECTION
SCALE N.T.S.

PIPE Ø (DN)	IMPORTED GRANULAR MATERIALS
100mm Ø	USE 10mm SINGLE SIZE MATERIAL
150mm Ø	USE 10 or 14mm SINGLE SIZE MATERIAL or 14 to 5mm GRADED
225mm Ø & 300mm Ø	USE 10, 14 or 20mm SINGLE SIZE MATERIAL or 14 to 5mm GRADED or 20 to 5mm GRADED
NOTE FOR GRANULAR BEDDING DETAILS FOR FLEXIBLE PIPES WITH A DIAMETER GREATER THAN 300mm REFER TO MANUFACTURERS DETAILS.	

TABLE A
GRANULAR BEDDING AND SIDEFILL MATERIALS FOR FLEXIBLE PIPES

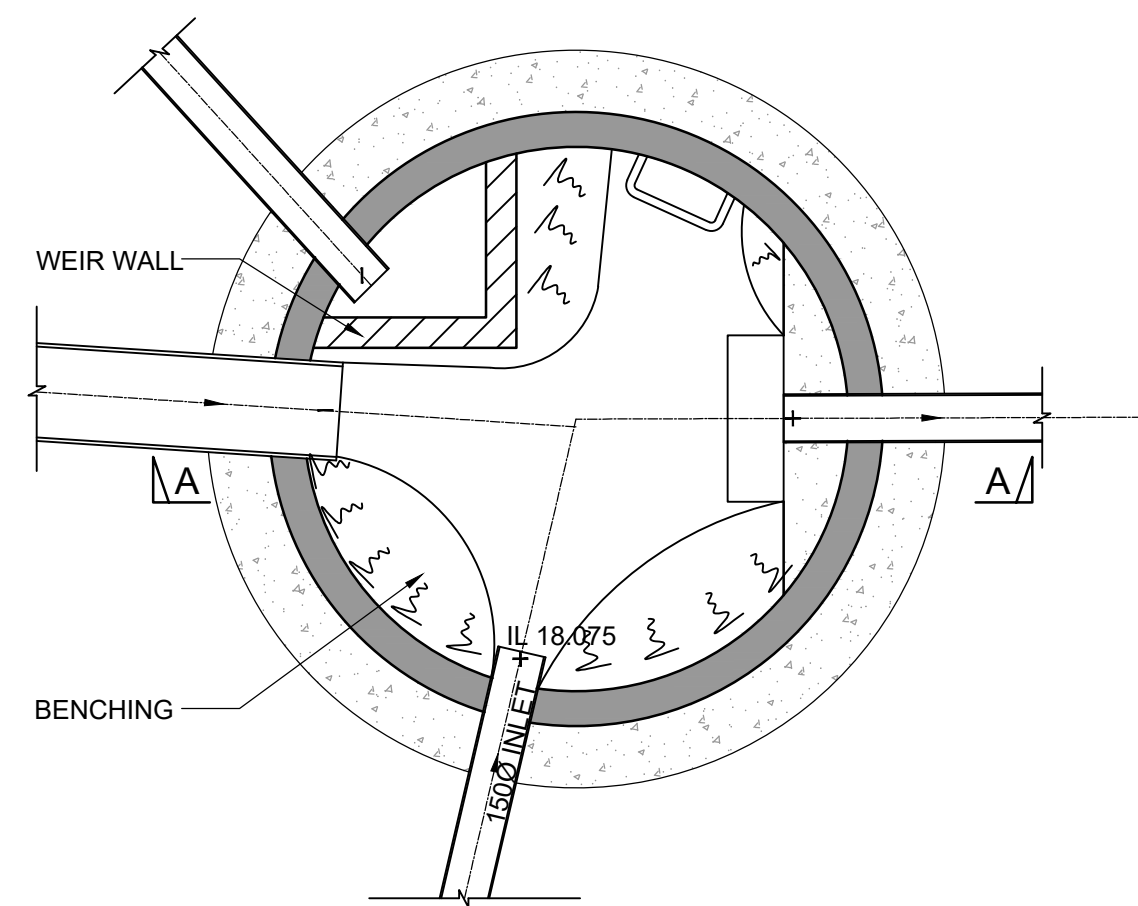


DETAIL 1
CAR PARK BUILD UP
DETAIL
NOT IN SCALE



HYDROBRAKE MANHOLE SECTION A-A

SCALE 1:25



HYDROBRAKE MANHOLE PLAN

SCALE 1:25

DRAINAGE NOTES

- ALL NON ADOPTABLE DRAINS UP TO 150 Dia. TO BE TWIN WALL PLASTIC PIPE MANUFACTURED IN ACCORDANCE WITH BS EN 1401-10R EQUAL APPROVED.
- ALL ADOPTABLE DRAINS UP TO 300 Dia. TO BE 'POLYSEWER' BY 'POLYPIPE' AND MANUFACTURED IN ACCORDANCE WITH THE WATER INDUSTRY SPECIFICATION WIS-4-35-01.
- DRAINS TO BE INSTALLED IN ACCORDANCE WITH MANUFACTURERS RECOMMENDATIONS. BACKFILL AND BEDDING TO AS PER TYPICAL DETAIL U.N.O.
- ALL DRAINS TO BE LAID SOFFIT TO SOFFIT.
- WORKS TO ANY ADOPTED SERVICES ARE TO BE IN ACCORDANCE WITH 'SEWERS FOR ADOPTION' 7th EDITION AND SHOULD BE APPROVED WITH YORKSHIRE WATER PRIOR TO COMMENCEMENT.
- NEW INSPECTION CHAMBERS (IC) TO BE A MINIMUM OF 450mm DIA. ALL MANHOLES (MH) TO BE A MINIMUM OF 1200mm DIA. REFER TO M.H. SCHEDULE FOR ACTUAL SIZES.
- REFER TO ARCHITECTS DRAWINGS FOR INTERNAL DRAINAGE 'POP UP' POSITIONS.
- ANY DRAINS PASSING THROUGH SUBSTRUCTURE WALLS TO HAVE A MINIMUM 50mm CLEAR SPACE, RC LINTEL SUPPORT ABOVE & CEMENT FIBRE COLLARS EITHER SIDE TO PREVENT VERMIN ENTRY
- ANY DRAINS CAST IN & PASSING THROUGH CONCRETE GROUND BEAMS TO HAVE A FLEXIBLE JOINT NOT MORE THAN 150mm FROM THE FACE OF THE GROUND BEAM. (FLEXIBLE JOINT TO MANUFACTURERS DETAILS) AND A MAXIMUM 600mm LONG ROCKER PIPER EITHER SIDE
- ALL LINES OF DRAINAGE INDICATED ARE PROVISIONAL ONLY. THE EXACT POSITIONS OF ALL DRAINS MAY BE ALTERED TO SUIT AND DETERMINED ON SITE PRIOR TO COMMENCEMENT OF WORK. ANY REVISIONS ARE TO BE SUBJECT TO THE APPROVAL OF THE ENGINEER. AN ACCURATE RECORD OF ANY AMENDMENT IS TO BE KEPT BY THE CONTRACTOR.
- COVER LEVELS SHOWN ARE APPROXIMATE ONLY AND SHOULD BE ALTERED TO SUIT FINISHED SURFACE LEVELS. READ IN CONJUNCTION WITH THE MANHOLE SCHEDULE
- ALL SOIL AND VENT PIPES TO HAVE LOW LEVEL ACCESS PLATES.
- ALL BURIED CONNECTIONS TO POP-UPS TO BE 150mm Dia.

TYPICAL DRAINAGE NOTES - MANHOLES

- ALL PRECAST CONCRETE MANHOLE COMPONENTS SHALL BE IN ACCORDANCE WITH BS5911 Pt3 & BSEN 1917:2002.
- INSITU CONCRETE TO BE GEN3 AND BE IN ACCORDANCE WITH BS EN 206-1 AND BS 8500.1
- CONSTRUCTION JOINTS IN CONCRETE SURROUNDS MUST NOT BE WITHIN 150 OF CHAMBER SHAFT RING JOINTS.
- ALL MANHOLE COVERS AND FRAMES SHALL COMPLY WITH BS. EN 124.
- THE CONSTRUCTION SHOWN IS FOR NORMAL GROUND CONDITIONS.
- WORKMANSHIP TO COMPLY TO BS 8000 PART 14 CODE OF PRACTISE FOR BELOW GROUND DRAINAGE AND SUPPLEMENTARY SPECIFICATIONS.
- ANY CHANGE OF PIPE DIAMETER OR PIPE DIRECTION TO BE WITHIN THE MANHOLE CHAMBER
- MANHOLE LEVEL TO BE FLUSH WITH SURFACING AND 150mm ABOVE GL IN LANDSCAPED AREA.
- SAFETY CHAINS ARE REQUIRED IN MANHOLES WITH OUTLETS 600Ø OR LARGER. CHAINS TO BE FITTED IN DOWNSTREAM SIDE OF MANHOLE. ALL COMPONENTS FABRICATED IN STAINLESS STEEL GRADE 316 S16 TO BS EN 10088-3 .

P1	08.03.22	ISSUED FOR PLANNING	EZ	GE	CP
Rev	Date	Revision Details	By	Chkd	Appd



Client	BOOHOO				
Project	LIND STREET CAR PARK				
Title	TYPICAL DRAINAGE DETAILS				
Drawing No.	WL_2018_003				Revision P1
Scale	1:200	Date	MAR' 22		
Drawn	EZ	Chk	GE	App	CP
Unit 2.1, 20 Dale Street Manchester. M1 1EZ			Copyright reserved Tel: 0161 236 8203		

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Online Controls for Storm

Hydro-Brake® Optimum Manhole: SMH10, DS/PN: 1.003, Volume (m³): 36.5

Unit Reference	MD-SHE-0096-3500-0500-3500
Design Head (m)	0.500
Design Flow (l/s)	3.5
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	96
Invert Level (m)	48.782
Minimum Outlet Pipe Diameter (mm)	150
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	0.500	3.5
Flush-Flo™	0.162	3.5
Kick-Flo®	0.359	3.0
Mean Flow over Head Range	-	2.9

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	5.2	3.000	8.1	7.000	12.1
0.200	3.5	1.400	5.6	3.500	8.7	7.500	12.6
0.300	3.3	1.600	6.0	4.000	9.2	8.000	13.0
0.400	3.2	1.800	6.3	4.500	9.8	8.500	13.4
0.500	3.5	2.000	6.7	5.000	10.3	9.000	13.8
0.600	3.8	2.200	7.0	5.500	10.7	9.500	14.1
0.800	4.3	2.400	7.3	6.000	11.2		
1.000	4.8	2.600	7.5	6.500	11.7		

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<u>Storage Structures for Storm</u>		
<u>Porous Car Park Pipe: 1.000</u>		
Manning's N	0.030	Width (m) 4.8
Infiltration Coefficient Base (m/hr)	0.00000	Length (m) 37.3
Membrane Percolation (mm/hr)	1000	Slope (1:X) 200.0
Max Percolation (l/s)	49.7	Depression Storage (mm) 5
Safety Factor	2.0	Evaporation (mm/day) 3
Porosity	0.30	Membrane Depth (mm) 0
Invert Level (m)	48.900	
<u>Porous Car Park Pipe: 1.001</u>		
Manning's N	0.030	Width (m) 4.8
Infiltration Coefficient Base (m/hr)	0.00000	Length (m) 45.3
Membrane Percolation (mm/hr)	1000	Slope (1:X) 200.0
Max Percolation (l/s)	60.3	Depression Storage (mm) 5
Safety Factor	2.0	Evaporation (mm/day) 3
Porosity	0.30	Membrane Depth (mm) 0
Invert Level (m)	48.900	
<u>Porous Car Park Pipe: 1.002</u>		
Manning's N	0.030	Width (m) 4.8
Infiltration Coefficient Base (m/hr)	0.00000	Length (m) 22.6
Membrane Percolation (mm/hr)	1000	Slope (1:X) 191.0
Max Percolation (l/s)	30.1	Depression Storage (mm) 5
Safety Factor	2.0	Evaporation (mm/day) 3
Porosity	0.30	Membrane Depth (mm) 0
Invert Level (m)	48.900	
<u>Porous Car Park Pipe: 2.000</u>		
Manning's N	0.030	Width (m) 4.8
Infiltration Coefficient Base (m/hr)	0.00000	Length (m) 45.5
Membrane Percolation (mm/hr)	1000	Slope (1:X) 200.0
Max Percolation (l/s)	60.7	Depression Storage (mm) 5
Safety Factor	2.0	Evaporation (mm/day) 3
Porosity	0.30	Membrane Depth (mm) 0
Invert Level (m)	48.900	
<u>Porous Car Park Pipe: 2.001</u>		
Manning's N	0.030	Width (m) 4.8
Infiltration Coefficient Base (m/hr)	0.00000	Length (m) 19.4
Membrane Percolation (mm/hr)	1000	Slope (1:X) 210.4
Max Percolation (l/s)	25.9	Depression Storage (mm) 5
Safety Factor	2.0	Evaporation (mm/day) 3
Porosity	0.30	Membrane Depth (mm) 0
Invert Level (m)	48.900	
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Date 10/03/2022 11:12 File PROPOSED DRAINAGE STRAT...	Designed by Eleni.Zachara Checked by																																																									
Innovyze	Network 2020.1.3																																																									
<u>Porous Car Park Pipe: 3.000</u> <table><tr><td>Manning's N</td><td>0.030</td><td>Width (m)</td><td>9.6</td></tr><tr><td>Infiltration Coefficient Base (m/hr)</td><td>0.00000</td><td>Length (m)</td><td>30.7</td></tr><tr><td>Membrane Percolation (mm/hr)</td><td>1000</td><td>Slope (1:X)</td><td>200.0</td></tr><tr><td>Max Percolation (l/s)</td><td>81.8</td><td>Depression Storage (mm)</td><td>5</td></tr><tr><td>Safety Factor</td><td>2.0</td><td>Evaporation (mm/day)</td><td>3</td></tr><tr><td>Porosity</td><td>0.30</td><td>Membrane Depth (mm)</td><td>0</td></tr><tr><td>Invert Level (m)</td><td>48.900</td><td></td><td></td></tr></table> <u>Porous Car Park Pipe: 4.000</u> <table><tr><td>Manning's N</td><td>0.030</td><td>Width (m)</td><td>9.6</td></tr><tr><td>Infiltration Coefficient Base (m/hr)</td><td>0.00000</td><td>Length (m)</td><td>30.6</td></tr><tr><td>Membrane Percolation (mm/hr)</td><td>1000</td><td>Slope (1:X)</td><td>200.0</td></tr><tr><td>Max Percolation (l/s)</td><td>81.6</td><td>Depression Storage (mm)</td><td>5</td></tr><tr><td>Safety Factor</td><td>2.0</td><td>Evaporation (mm/day)</td><td>3</td></tr><tr><td>Porosity</td><td>0.30</td><td>Membrane Depth (mm)</td><td>0</td></tr><tr><td>Invert Level (m)</td><td>48.900</td><td></td><td></td></tr></table>			Manning's N	0.030	Width (m)	9.6	Infiltration Coefficient Base (m/hr)	0.00000	Length (m)	30.7	Membrane Percolation (mm/hr)	1000	Slope (1:X)	200.0	Max Percolation (l/s)	81.8	Depression Storage (mm)	5	Safety Factor	2.0	Evaporation (mm/day)	3	Porosity	0.30	Membrane Depth (mm)	0	Invert Level (m)	48.900			Manning's N	0.030	Width (m)	9.6	Infiltration Coefficient Base (m/hr)	0.00000	Length (m)	30.6	Membrane Percolation (mm/hr)	1000	Slope (1:X)	200.0	Max Percolation (l/s)	81.6	Depression Storage (mm)	5	Safety Factor	2.0	Evaporation (mm/day)	3	Porosity	0.30	Membrane Depth (mm)	0	Invert Level (m)	48.900		
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Online Controls for Storm

Hydro-Brake® Optimum Manhole: SMH1, DS/PN: 1.003, Volume (m³): 36.5

Unit Reference	MD-SHE-0096-3500-0500-3500
Design Head (m)	0.500
Design Flow (l/s)	3.5
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	96
Invert Level (m)	48.782
Minimum Outlet Pipe Diameter (mm)	150
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	0.500	3.5	Kick-Flo®	0.359	3.0
Flush-Flo™	0.162	3.5	Mean Flow over Head Range	-	2.9

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	5.2	3.000	8.1	7.000	12.1
0.200	3.5	1.400	5.6	3.500	8.7	7.500	12.6
0.300	3.3	1.600	6.0	4.000	9.2	8.000	13.0
0.400	3.2	1.800	6.3	4.500	9.8	8.500	13.4
0.500	3.5	2.000	6.7	5.000	10.3	9.000	13.8
0.600	3.8	2.200	7.0	5.500	10.7	9.500	14.1
0.800	4.3	2.400	7.3	6.000	11.2		
1.000	4.8	2.600	7.5	6.500	11.7		

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Storage Structures for Storm

Porous Car Park Pipe: 1.000

Manning's N	0.030	Width (m)	4.8
Infiltration Coefficient Base (m/hr)	0.00000	Length (m)	37.3
Membrane Percolation (mm/hr)	1000	Slope (1:X)	200.0
Max Percolation (l/s)	49.7	Depression Storage (mm)	5
Safety Factor	2.0	Evaporation (mm/day)	3
Porosity	0.30	Membrane Depth (mm)	0
Invert Level (m)	48.900		

Porous Car Park Pipe: 1.001

Manning's N	0.030	Width (m)	4.8
Infiltration Coefficient Base (m/hr)	0.00000	Length (m)	45.3
Membrane Percolation (mm/hr)	1000	Slope (1:X)	200.0
Max Percolation (l/s)	60.3	Depression Storage (mm)	5
Safety Factor	2.0	Evaporation (mm/day)	3
Porosity	0.30	Membrane Depth (mm)	0
Invert Level (m)	48.900		

Porous Car Park Pipe: 1.002

Manning's N	0.030	Width (m)	4.8
Infiltration Coefficient Base (m/hr)	0.00000	Length (m)	22.6
Membrane Percolation (mm/hr)	1000	Slope (1:X)	191.0
Max Percolation (l/s)	30.1	Depression Storage (mm)	5
Safety Factor	2.0	Evaporation (mm/day)	3
Porosity	0.30	Membrane Depth (mm)	0
Invert Level (m)	48.900		

Porous Car Park Pipe: 2.000

Manning's N	0.030	Width (m)	4.8
Infiltration Coefficient Base (m/hr)	0.00000	Length (m)	45.5
Membrane Percolation (mm/hr)	1000	Slope (1:X)	200.0
Max Percolation (l/s)	60.7	Depression Storage (mm)	5
Safety Factor	2.0	Evaporation (mm/day)	3
Porosity	0.30	Membrane Depth (mm)	0
Invert Level (m)	48.900		

Porous Car Park Pipe: 2.001

Manning's N	0.030	Max Percolation (l/s)	25.9
Infiltration Coefficient Base (m/hr)	0.00000	Safety Factor	2.0
Membrane Percolation (mm/hr)	1000	Porosity	0.30

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<u>Porous Car Park Pipe: 2.001</u> <table><tr><td>Invert Level (m)</td><td>48.900</td><td>Depression Storage (mm)</td><td>5</td></tr><tr><td>Width (m)</td><td>4.8</td><td>Evaporation (mm/day)</td><td>3</td></tr><tr><td>Length (m)</td><td>19.4</td><td>Membrane Depth (mm)</td><td>0</td></tr><tr><td>Slope (1:X)</td><td>210.4</td><td></td><td></td></tr></table>			Invert Level (m)	48.900	Depression Storage (mm)	5	Width (m)	4.8	Evaporation (mm/day)	3	Length (m)	19.4	Membrane Depth (mm)	0	Slope (1:X)	210.4														
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Invert Level (m)	48.900																													
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Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria

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

Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 0
 Number of Online Controls 1 Number of Storage Structures 7 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR Ratio R 0.355
 Region England and Wales Cv (Summer) 0.750
 M5-60 (mm) 18.000 Cv (Winter) 0.840

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

Profile(s) Summer and Winter

Duration(s) (mins) 15, 30, 60, 120, 180, 360
 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)
1.000	IC1	360 Winter	100	+40%					49.042
1.001	IC2	360 Winter	100	+40%					49.042
1.002	IC3	360 Winter	100	+40%					49.042
2.000	IC4	360 Winter	100	+40%					49.042
2.001	IC5	360 Winter	100	+40%					49.042
3.000	IC6	360 Winter	100	+40%					49.046
3.001	IC7	360 Winter	100	+40%					49.047
4.000	IC8	60 Winter	100	+40%					49.051
4.001	IC9	60 Winter	100	+40%					49.051
1.003	SMH1	360 Winter	100	+40%	100/120 Winter				49.042

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Summary Wizard of 15 minute 1 year Summer I+0% for Storm

Simulation Criteria

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

Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 0
 Number of Online Controls 1 Number of Storage Structures 7 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR Ratio R 0.355
 Region England and Wales Cv (Summer) 0.750
 M5-60 (mm) 18.000 Cv (Winter) 0.840

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

Profile(s) Summer and Winter

Duration(s) (mins) 15, 30, 60, 120, 180, 360
 Return Period(s) (years) 1, 30, 100
 Climate Change (%) 0, 0, 40

PN	US/MH Name	Storm Rank	Water		Surcharged		Flooded		Half Drain		Pipe	Status
			Level (m)	Depth (m)	Volume (m³)	Flow / Cap.	Overflow (l/s)	Time (mins)	Flow (l/s)			
1.000	IC1	36	48.900	-0.600	0.000	0.00				0.0		OK
1.001	IC2	36	48.812	-0.688	0.000	0.00				0.0		OK
1.002	IC3	36	48.774	-0.726	0.000	0.00				0.0		OK
2.000	IC4	36	48.900	-0.600	0.000	0.00				0.0		OK
2.001	IC5	36	48.672	-0.828	0.000	0.00				0.0		OK
3.000	IC6	36	48.900	-0.600	0.000	0.00				0.0		OK
3.001	IC7	36	48.843	-0.282	0.000	0.00				0.0		OK
4.000	IC8	36	48.900	-0.600	0.000	0.00				0.0		OK
4.001	IC9	36	48.855	-0.270	0.000	0.00				0.0		OK
1.003	SMH1	35	48.783	-0.224	0.000	0.00				0.0		OK

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Summary Wizard of 15 minute 30 year Summer I+0% for Storm

Simulation Criteria

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

Number of Input Hydrographs	0	Number of Offline Controls	0	Number of Time/Area Diagrams	0
Number of Online Controls	1	Number of Storage Structures	7	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	Ratio R	0.355
Region	England and Wales	Cv (Summer)	0.750
M5-60 (mm)	18.000	Cv (Winter)	0.840

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

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

WARNING: Half Drain Time has not been calculated as the structure is too full.

PN	US/MH Name	Storm Rank	Water			Surcharged		Flooded		Half Drain Time (mins)	Pipe Flow (l/s)	Status
			Level (m)	Depth (m)	Volume (m³)	Flow / Cap.	Overflow (l/s)					
1.000	IC1	33	48.900	-0.600	0.000	0.00			0.0	OK		
1.001	IC2	27	48.882	-0.618	0.000	0.00			0.1	OK		
1.002	IC3	27	48.845	-0.655	0.000	0.00			0.0	OK		
2.000	IC4	33	48.900	-0.600	0.000	0.00			0.0	OK		
2.001	IC5	33	48.672	-0.828	0.000	0.00			0.0	OK		
3.000	IC6	28	48.901	-0.599	0.000	0.00			0.0	OK		
3.001	IC7	27	48.904	-0.221	0.000	0.00			0.0	OK		
4.000	IC8	27	48.920	-0.580	0.000	0.00			0.2	OK		
4.001	IC9	27	48.923	-0.202	0.000	0.02			0.2	OK		
1.003	SMH1	28	48.800	-0.207	0.000	0.00			0.2	OK		

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Summary Wizard of 360 minute 1 year Winter I+0% for Storm

Simulation Criteria

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

Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 0
 Number of Online Controls 1 Number of Storage Structures 7 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR Ratio R 0.355
 Region England and Wales Cv (Summer) 0.750
 M5-60 (mm) 18.000 Cv (Winter) 0.840

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

Profile(s) Summer and Winter

Duration(s) (mins) 15, 30, 60, 120, 180, 360
 Return Period(s) (years) 1, 30, 100
 Climate Change (%) 0, 0, 40

PN	US/MH Name	Storm Rank	Water		Surcharged		Flooded		Half Drain		Pipe	Status
			Level (m)	Depth (m)	Volume (m³)	Flow / Overflow Cap. (l/s)	Time (mins)	Flow (l/s)				
1.000	IC1	23	48.904	-0.596	0.000	0.00			7	0.2	OK	
1.001	IC2	23	48.902	-0.598	0.000	0.00				0.2	OK	
1.002	IC3	22	48.882	-0.618	0.000	0.00				0.0	OK	
2.000	IC4	10	48.900	-0.600	0.000	0.00				0.0	OK	
2.001	IC5	23	48.672	-0.828	0.000	0.00				0.0	OK	
3.000	IC6	23	48.918	-0.582	0.000	0.00			108	0.1	OK	
3.001	IC7	23	48.918	-0.207	0.000	0.02				0.2	OK	
4.000	IC8	23	48.931	-0.569	0.000	0.00			135	0.2	OK	
4.001	IC9	24	48.931	-0.194	0.000	0.05				0.5	OK	
1.003	SMH1	23	48.820	-0.187	0.000	0.02				0.7	OK	

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Summary Wizard of 120 minute 30 year Winter I+0% for Storm

Simulation Criteria

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

Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 0
 Number of Online Controls 1 Number of Storage Structures 7 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR Ratio R 0.355
 Region England and Wales Cv (Summer) 0.750
 M5-60 (mm) 18.000 Cv (Winter) 0.840

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

Profile(s) Summer and Winter

Duration(s) (mins) 15, 30, 60, 120, 180, 360
 Return Period(s) (years) 1, 30, 100
 Climate Change (%) 0, 0, 40

PN	US/MH Name	Storm Rank	Water		Surcharged		Flooded		Half Drain		Pipe	Status
			Level (m)	Depth (m)	Volume (m³)	Flow / Overflow Cap. (l/s)	Time (mins)	Flow (l/s)				
1.000	IC1	13	48.932	-0.568	0.000	0.00			33	0.4		OK
1.001	IC2	15	48.933	-0.567	0.000	0.00				1.0		OK
1.002	IC3	13	48.933	-0.567	0.000	0.00				1.4		OK
2.000	IC4	14	48.900	-0.600	0.000	0.00				0.0		OK
2.001	IC5	14	48.794	-0.706	0.000	0.00				0.5		OK
3.000	IC6	13	48.960	-0.540	0.000	0.00			71	0.7		OK
3.001	IC7	14	48.961	-0.164	0.000	0.16				2.2		OK
4.000	IC8	13	48.982	-0.518	0.000	0.00			57	1.1		OK
4.001	IC9	13	48.982	-0.143	0.000	0.29				3.2		OK
1.003	SMH1	13	48.932	-0.075	0.000	0.10				3.4		OK

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Summary Wizard of 180 minute 30 year Winter I+0% for Storm

Simulation Criteria

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

Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 0
 Number of Online Controls 1 Number of Storage Structures 7 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR Ratio R 0.355
 Region England and Wales Cv (Summer) 0.750
 M5-60 (mm) 18.000 Cv (Winter) 0.840

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

Profile(s) Summer and Winter

Duration(s) (mins) 15, 30, 60, 120, 180, 360
 Return Period(s) (years) 1, 30, 100
 Climate Change (%) 0, 0, 40

PN	US/MH Name	Storm Rank	Water		Surcharged		Flooded		Half Drain		Pipe	Status
			Level (m)	Depth (m)	Volume (m³)	Flow / Overflow Cap. (l/s)	Time (mins)	Flow (l/s)				
1.000	IC1	12	48.939	-0.561	0.000	0.00			51	0.4		OK
1.001	IC2	12	48.939	-0.561	0.000	0.00				1.1		OK
1.002	IC3	12	48.939	-0.561	0.000	0.00				1.6		OK
2.000	IC4	15	48.900	-0.600	0.000	0.00				0.1		OK
2.001	IC5	11	48.840	-0.660	0.000	0.00				0.5		OK
3.000	IC6	12	48.962	-0.538	0.000	0.00			85	0.6		OK
3.001	IC7	12	48.962	-0.163	0.000	0.17				2.2		OK
4.000	IC8	14	48.981	-0.519	0.000	0.00			74	0.8		OK
4.001	IC9	14	48.982	-0.143	0.000	0.29				3.1		OK
1.003	SMH1	12	48.939	-0.068	0.000	0.10				3.5		OK

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Summary Wizard of 360 minute 30 year Winter I+0% for Storm

Simulation Criteria

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

Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 0
 Number of Online Controls 1 Number of Storage Structures 7 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR Ratio R 0.355
 Region England and Wales Cv (Summer) 0.750
 M5-60 (mm) 18.000 Cv (Winter) 0.840

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

Profile(s) Summer and Winter

Duration(s) (mins) 15, 30, 60, 120, 180, 360
 Return Period(s) (years) 1, 30, 100
 Climate Change (%) 0, 0, 40

PN	US/MH Name	Storm Rank	Water		Surcharged		Flooded		Half Drain		Pipe	Status
			Level (m)	Depth (m)	Volume (m³)	Flow / Overflow Cap. (l/s)	Time (mins)	Flow (l/s)				
1.000	IC1	11	48.940	-0.560	0.000	0.00			60	0.3		OK
1.001	IC2	11	48.940	-0.560	0.000	0.00				1.0		OK
1.002	IC3	11	48.940	-0.560	0.000	0.00				1.6		OK
2.000	IC4	16	48.900	-0.600	0.000	0.00				0.1		OK
2.001	IC5	10	48.864	-0.636	0.000	0.00				0.3		OK
3.000	IC6	14	48.960	-0.540	0.000	0.00			115	0.4		OK
3.001	IC7	15	48.960	-0.165	0.000	0.14				1.9		OK
4.000	IC8	18	48.973	-0.527	0.000	0.00			118	0.4		OK
4.001	IC9	18	48.973	-0.152	0.000	0.23				2.6		OK
1.003	SMH1	11	48.939	-0.068	0.000	0.10				3.5		OK

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Summary Wizard of 60 minute 100 year Winter I+40% for Storm

Simulation Criteria

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

Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 0
 Number of Online Controls 1 Number of Storage Structures 7 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR Ratio R 0.355
 Region England and Wales Cv (Summer) 0.750
 M5-60 (mm) 18.000 Cv (Winter) 0.840

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

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

PN	US/MH Name	Storm Rank	Water		Surcharged		Flooded		Half Drain		Pipe	Status
			Level (m)	Depth (m)	Volume (m³)	Flow / Overflow Cap. (l/s)	Time (mins)	Flow (l/s)				
1.000	IC1	6	49.005	-0.495	0.000	0.00				0.9	OK	
1.001	IC2	6	49.006	-0.494	0.000	0.01				2.3	OK	
1.002	IC3	6	49.006	-0.494	0.000	0.01				3.1	OK	
2.000	IC4	7	48.986	-0.514	0.000	0.00				0.5	OK	
2.001	IC5	7	48.987	-0.513	0.000	0.00				0.7	OK	
3.000	IC6	6	49.017	-0.483	0.000	0.00				1.8	OK	
3.001	IC7	6	49.017	-0.108	0.000	0.47				6.2	OK	
4.000	IC8	1	49.051	-0.449	0.000	0.00			61	2.6	OK	
4.001	IC9	1	49.051	-0.074	0.000	0.79				8.6	OK	
1.003	SMH1	6	49.005	-0.002	0.000	0.10				3.5	OK	

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Summary Wizard of 360 minute 100 year Winter I+40% for Storm

Simulation Criteria

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

Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 0
 Number of Online Controls 1 Number of Storage Structures 7 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR Ratio R 0.355
 Region England and Wales Cv (Summer) 0.750
 M5-60 (mm) 18.000 Cv (Winter) 0.840

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

Profile(s) Summer and Winter

Duration(s) (mins) 15, 30, 60, 120, 180, 360
 Return Period(s) (years) 1, 30, 100
 Climate Change (%) 0, 0, 40

PN	US/MH Name	Storm Rank	Water		Surcharged		Flooded		Half Drain		Pipe	Status
			Level (m)	Depth (m)	Volume (m³)	Flow / Cap.	Overflow (l/s)	Time (mins)	Flow (l/s)			
1.000	IC1	1	49.042	-0.458	0.000	0.00			206	0.5		OK
1.001	IC2	1	49.042	-0.458	0.000	0.00			289	1.0		OK
1.002	IC3	1	49.042	-0.458	0.000	0.01			311	2.8		OK
2.000	IC4	1	49.042	-0.458	0.000	0.00			199	0.6		OK
2.001	IC5	1	49.042	-0.458	0.000	0.00			305	0.9		OK
3.000	IC6	1	49.046	-0.454	0.000	0.00			212	0.6		OK
3.001	IC7	1	49.047	-0.078	0.000	0.23				3.1		OK
4.000	IC8	3	49.046	-0.454	0.000	0.00			207	0.6		OK
4.001	IC9	3	49.046	-0.079	0.000	0.46				5.0		OK
1.003	SMH1	1	49.042	0.035	0.000	0.10				3.5	SURCHARGED	

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Appendix H - Microdrainage Calculations