



LAND OFF BROMLEY STREET MANCHESTER

FLOOD RISK ASSESSMENT AND DRAINAGE MANAGEMENT STRATEGY



For

Meanwhile Creative
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Bristol
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JUNE 2023

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**LAND OFF BROMLEY STREET
MANCHESTER**

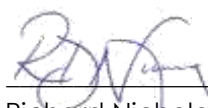
**FLOOD RISK ASSESSMENT AND
DRAINAGE MANAGEMENT STRATEGY**

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EXECUTIVE SUMMARY

This Flood Risk Assessment and Drainage Management Strategy was commissioned by Eden Planning on behalf of Meanwhile Creative, referred to hereafter as 'the client'. This report has been prepared to support a planning application for the creation of a commercial 'box park'. This will comprise of 285no. containers (to be used for commercial nature), 63no. car parking spaces, a central yard area, an urban park. The proposals are confirmed to be 'less vulnerable' within the National Planning Policy Framework; the supporting Planning Practice Guidance confirms that this type of development is appropriate when located within Flood Zone 1, providing there is no increase in flood risk as a result.

Flood Risk

This report has reviewed all sources of flood risk both to and resulting from the proposed development. Consultation with the Environment Agency, United Utilities, and Manchester City Council has not identified any historical flooding at the site or within the wider area. To summarise, the proposals are at 'low' flood risk from the sources reviewed as part of this assessment. Any residual flood risk associated with surface water will be sustainably managed post-development, following the implementation of a sustainable surface water management regime, any residual risks can be managed by appropriate levels design.

Drainage Strategy

Given the low flood risks identified, the key focus of this assessment is on the sustainable management of surface water run-off to ensure no increased flood risk results from the development proposals. The surface water run-off management options have been assessed in accordance with the sustainable drainage hierarchy, which is to discharge to ground, followed by a waterbody or finally the public sewer.

Based on the ground conditions identified by the published online datasets and the soil classification, the use of an infiltration-based solution at the site does not appear to be favourable. It is understood that the site currently drains to the public sewer, however, the existing drainage system utilises permeable surfacing and oversized surface water pipes to minimise surface water run-off generated at present. It should however be noted that no existing drainage investigations have been undertaken, and these assumptions are based on the Preliminary Drainage Strategy provided to accompany the previous planning approval on the site.

Should infiltration not offer a full practical solution at the site, then the alternative proposals are to continue to discharge surface water run-off into the public combined sewer located to the north-west of site within Bromley Street. The existing systems are to be reused where practical, however, should further investigation identify that there is insufficient stormwater storage provision, then additional stormwater storage should be retrofit as required.

In accordance with the SuDS Manual (CIRIA) and the Non-Technical Standards for SuDS (March 2015) all sites should endeavour to achieve as close to pre-development greenfield rates as is viable. Based on the site area, the pre-development greenfield rate (QBar) is calculated to be 9.0l/s (6.5l/s/ha).

It is however understood that the rate of discharge is currently restricted to a rate of 5.0l/s by a flow control device, prior to outfall into the public combined sewer network within Bromley Street. It is assumed that the rate was restricted to this lower rate due to capacity constraints,

at the request of United Utilities. Further consultation has been undertaken with United Utilities, who have confirmed that should a full infiltration solution not be feasible, a rate of 5.0l/s communicating with the existing connection would be acceptable.

Early discussion will be needed to identify any additional capacity constraints. Any offsite works are to be discussed with other relevant parties (Highways Authority) during the detailed design stage. Restricting the rate of discharge will generate a requirement to provide onsite stormwater storage for the extreme rainfall events. The surface water scheme for the development will be designed to cater for the surface water run-off generated in the events up to and including the 1 in 100yr return period event with 30% allowance for climate change.

This Flood Risk Assessment and Drainage Management Strategy has been prepared in consultation with the relevant interested parties and incorporates their comments where possible. The report is commensurate with the scale and nature of the development proposals and in summary, the development can be considered appropriate in accordance with the Planning Practice Guidance and Non-Statutory Standards.

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Specialist Software

-  MicroDrainage WinDES (v.2020.1.3) – Calculation of Greenfield run-off volumes, rates of rainfall and stormwater storage estimates.

Abbreviations & Acronyms

BGS	British Geological Survey
CC	Climate Change
CSAI	Cranfield Soil and Agrifood Institute
EA	Environment Agency
FEH	Flood Estimation Handbook
FRA	Flood Risk Assessment
LLFA	Lead Local Flood Authority
LPA	Local Planning Authority
mAOD	Metres Above Ordnance Datum
MCC	Manchester City Council
NGR	National Grid Reference
NPPF	National Planning Policy Framework
OS	Ordnance Survey
PFRA	Preliminary Flood Risk Assessment
PPG	Planning Practice Guidance
QSE	Quick Storage Estimate
QBAR	Mean Annual Flood
SfA	Sewers for Adoption
SFRA	Strategic Flood Risk Assessment
SuDS	Sustainable Drainage Systems
TWL	Top Water Level
UU	United Utilities

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1.0 INTRODUCTION

1.1 Planning Policy Context

- 1.1.1 All forms of flooding and their impact on the natural and built environment are material planning considerations. The revised National Planning Policy Framework (NPPF) sets out the Government's objectives for the planning system, and how planning should facilitate and promote sustainable patterns of development, avoiding flood risk and accommodating the impacts of climate change. Government policy with respect to development in flood risk areas is contained within the revised NPPF and the supporting Planning Practice Guidance (PPG) (refer to extracts in **Appendix A**).
- 1.1.2 A Flood Risk Assessment and Drainage Management Strategy (FRA&DMS) has been completed in accordance with the revised NPPF and the PPG to review all sources of flood risk both to and from the proposed development. The report also considers the most appropriate drainage management options including the implementation of Sustainable Drainage Systems (SuDS) in line with national policy.
- 1.1.3 The proposals are commercial in nature, which is identified to be 'less vulnerable' in Annex 3: Flood Risk Vulnerability Classification, within the National Planning Policy Framework. The Planning Practice Guidance (PPG) confirms that this type of land-use is appropriate for Flood Zone 1, providing there is no increase in flood risk elsewhere due to the proposals.

1.2 Site Context

- 1.2.1 This FRA&DMS has been prepared to support a planning application for the creation of a commercial 'box park'. This will comprise of 285no. containers (to be used for commercial nature), 63no. car parking spaces, a central yard area, an urban park. The proposals will be complete with access, car parking, external works, boundary fencing, external services, and drainage.

1.3 Consultation

- 1.3.1 The NPPF advises that Manchester City Council as the Local Planning Authority (LPA) should consult with the EA who will provide advice and guidance on flood issues at a strategic level and in relation to planning applications. The preparation of this report has been undertaken in consultation with the Environment Agency (EA), United Utilities (UU), and Manchester City Council (MCC). Consultation responses can be seen in **Appendix B, C, and D** respectively.

2.0 EXISTING SITE LOCATION

2.1 Location

- 2.1.1 The development site is located on land off Bromley Street in Manchester. The Ordnance Survey National Grid Reference for the site is E: 384856, N: 399353 and the nearest postcode is M4 4HZ (see Location Plan in **Appendix E**). The total site covers 1.379ha and is edged in red within **Figure 1**.
- 2.1.2 In terms of the surrounding land-use, the site is surrounded by a mixture of industrial and commercial development. The site is bound to the north and east by Bromley Street, to the south by Rochdale Road, and to the west by Peary Street, as illustrated in **Figure 1**.



2.2 Existing and Historical Land Use

- 2.2.1 The site is currently developed and comprises of permeable surfacing associated with the previous use (Peary Street Parking). Historically, the site was developed to form part

of the Rochdale Road Gas Works (built in 1824). The site was later redeveloped to form an office building with associated carparking. Most recently in 2018, temporary approval was granted for the construction of a 487no. space carpark onsite as part of a wider development (planning ref.: 118699/FO/2017). No other historical uses have been identified as part of this assessment.

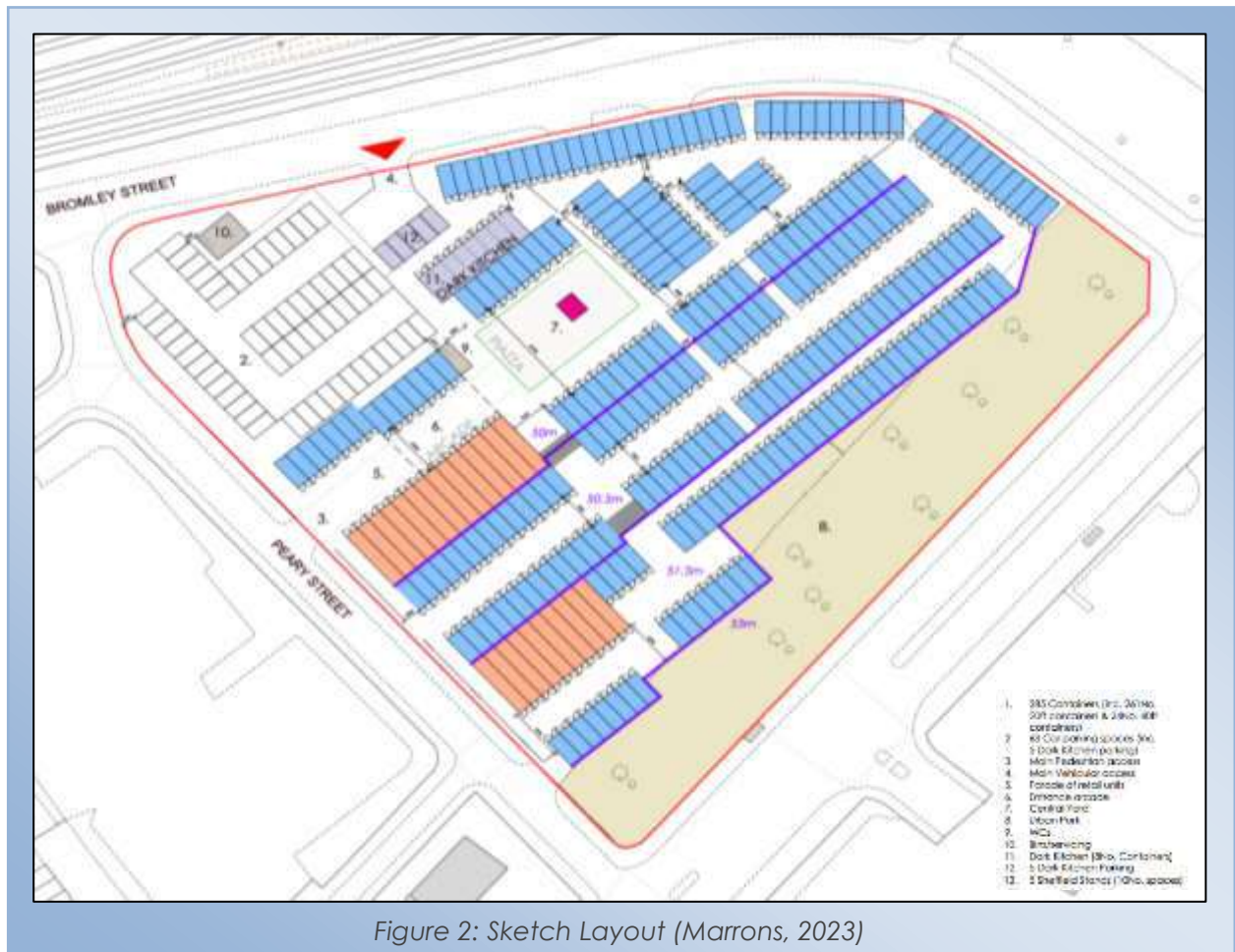
2.3 Topography

- 2.3.1 A topographical survey has been undertaken and is included within **Appendix F**. The survey has identified that the site falls generally in a north-westerly direction from a level of 53.59mAOD in the eastern corner, down to a level of 47.13mAOD in the north-western corner of site. The arrows shown in **Figure 1** indicate the general fall across the site.

3.0 DEVELOPMENT PROPOSALS

3.1 Nature of the development

- 3.1.1 This assessment is to support a planning application for the creation of a commercial 'box park'. This will comprise of 285no. containers (to be used for commercial nature), 63no. car parking spaces, a central yard area, an urban park. The proposals will be complete with access, car parking, external works, boundary fencing, external services, and drainage. A sketch layout is included in **Appendix G**, a snippet of the proposals can be seen in **Figure 2** below.



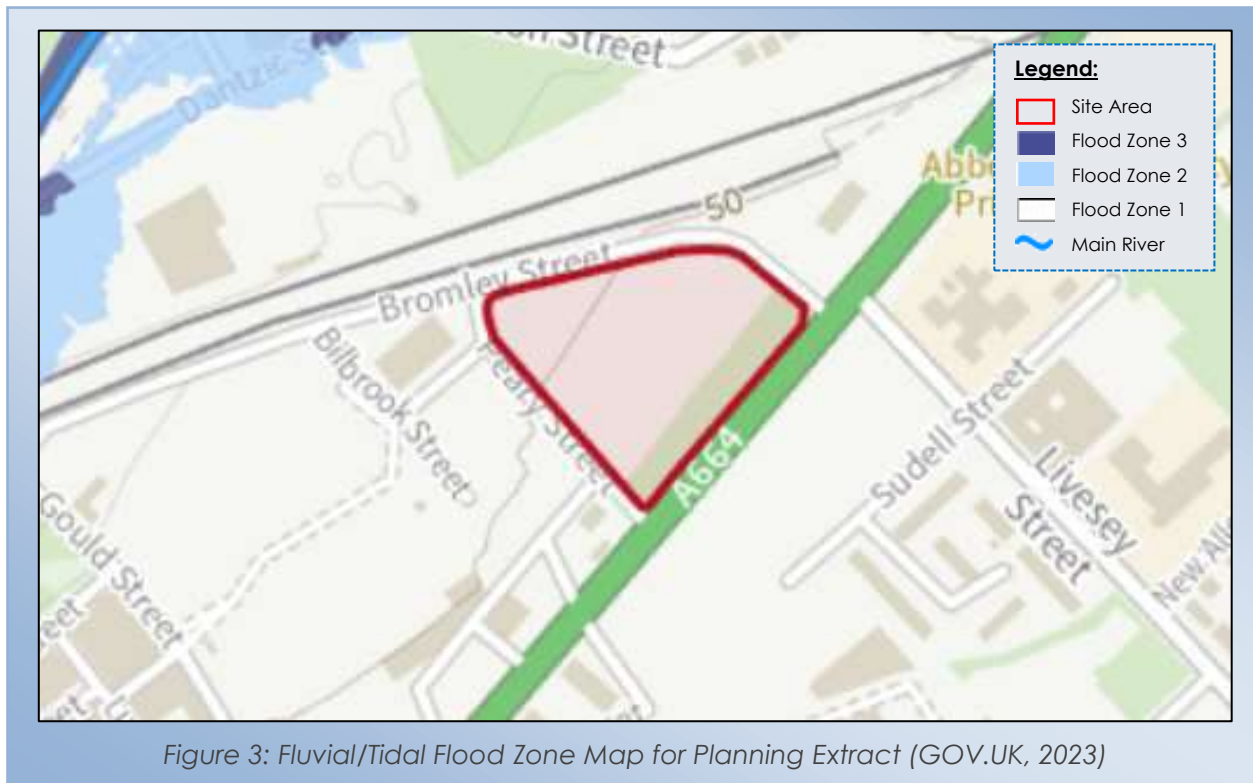
- 3.1.2 The total site covers 1.379ha and is 100% permeable at present, as type 3 permeable surfacing was used for the site's former use as a temporary car park (Peary Street Parking). Due to the scale and nature of the development, it is understood that the impermeable areas onsite will increase. Based on the sketch layout plan above, we have assumed that the site will be 33% impermeable post-development, which equates to 0.460ha.
- 3.1.3 To minimise the flood risk to the neighbouring properties it is recommended that the surface water run-off generated by the proposals be managed effectively with the peak rates of run-off being restricted to the equivalent of the pre-development situation (with betterment where required). National and local policy identifies that SUDS should be incorporated into new development where feasible. Opportunities to

provide soft landscaping on the site would provide added benefits to water quality and ecology. Furthermore, betterment in the form of permeable surfaces should also be considered during detailed design to reduce the surface water run-off generated. Refer to Section 5.0 for the outline drainage strategy.

4.0 SOURCES OF FLOOD RISK

4.1 Fluvial Flood Risk

- 4.1.1 Information relating to flood risk at the site has been obtained from the Environment Agency and from the Gov.uk website. An extract of the EA's Flood Zone Map for Planning is shown in **Figure 3**, which illustrates that the site is located within Flood Zone 1. Flood Zone 1 is an area considered to be at little or no flood risk from rivers and/or the sea (as defined by the EA).



Main Rivers

- 4.1.2 The nearest Main River is the River Irk, which is located 185m north of the development proposals. It is understood based on the proximity to site and the surrounding topography that the risk from this Main River is very low. This is reflected in the national flood mapping datasets (see full mapping in **Appendix B**).
- 4.1.3 Initial consultation with the EA, UU, and MCC also failed to highlight any historical flooding directly to the site and surrounding area due to fluvial sources (see correspondence in **Appendix B, C, and D**). This is further supported by the review of Manchester City Council's Strategic Flood Risk Assessment, which does not identify the site to be at risk from fluvial sources.

4.2 Tidal Flood Risk

- 4.2.1 The coastline is located over 35km west of the development site. Due to the distance from site, the tidal flood risk from these sources is 'low'. This is supported by the EA's Flood Zone Map for Planning also for the site being in Flood Zone 1.

4.3 Flood Risk Vulnerability Classification and Flood Zone Compatibility

- 4.3.1 The proposals are residential in nature and therefore considered to be 'less vulnerable' development in Annex 3: Flood Risk Vulnerability Classification, within the NPPF. The PPG confirms that this type of land-use is appropriate for Flood Zone 1, providing there is no increase in flood risk elsewhere due to the proposals.

4.4 Surface Water Flood Risk

- 4.4.1 Surface water flooding occurs when rainwater is unable to drain away through the normal drainage systems or soak into the ground but lies on or flows over the ground instead. The risk associated with surface water flooding is indicated by the long-term flood mapping (extract shown in **Figure 4**).
- 4.4.2 As indicated in **Figure 4**, the site is predominantly at 'very low' risk from surface water flooding. Generally, areas at higher risk correspond with existing watercourses, conveyance features, existing ponds, or low-lying depressions. In this case, the areas onsite at 'low' risk correspond with a conveyance route (in the north-eastern corner) and a relatively flat area of the site (south-eastern corner).



- 4.4.3 Any residual flood risks associated with surface water will be reduced through appropriate onsite levels design and the implementation of formal surface water drainage infrastructure. Any potential exceedance of the post-development flows from the proposed surface water drainage network, will be considered and contained onsite to ensure no increased risk to others.
- 4.4.4 It is recommended that the Finished Floor Level of the proposed containers are raised above the external levels where feasible (following any regrade of site), this will help

protect the development from excess surface water run-off. Furthermore, the external levels design should provide safe overland flow routes within the site, steering surface water overland flow away from residential development and towards open space areas where necessary.

Pluvial (Overland run-off) Flood Risk

- 4.4.5 Intense rainfall that is unable to soak into the ground or enter drainage systems can run-off land and result in flooding. Local topography and the land-use can have a strong influence on the direction and depth of flow. The topography of the site and surrounding developed areas means it is unlikely the site will be impacted by overland pluvial flows, as these are typically generated in undeveloped/undrained areas.
- 4.4.6 The volume and rate of overland flow from land can be exacerbated, if development increases the percentage of impermeable area. Any overland flows generated by the development must be carefully controlled with safe avenues directing overland flow away from adjacent development being advised.

Sewer Flood Risk

- 4.4.7 In urban areas, rainwater is frequently drained into surface water sewers or sewers containing both surface and wastewater known as 'combined sewers'. Foul water flooding often occurs in areas prone to overland flow and can result when the sewer is overwhelmed by heavy rainfall and will continue until the water drains away.
- 4.4.8 United Utilities sewer records have identified public combined sewers within Bromley Street to the north and north-east, within Rochdale Road to the south, and Peary Street to the west. Consultation with United Utilities has been undertaken which confirmed no current record of sewer flooding within the vicinity of the proposed development (see **Appendix C** for correspondence and sewer records).

4.5 Groundwater Flood Risk

- 4.5.1 High groundwater levels are usually the key source of groundwater flooding, which occurs when excess water emerges at the grounds surface (or within manmade underground structures such as basements). Groundwater flooding is often more insistent than surface water flooding and would typically last for weeks/months rather than days meaning the result to property is often more severe.
- 4.5.2 In general terms groundwater flooding can occur from three main sources:
-  If groundwater levels are naturally close to the surface, then this can present a flood risk during times of intense rainfall.
 -  Seepage and percolation occur where embankments above ground level hold water. In these cases, water travels through the embankment material and emerges on the opposite side of the embankment.
 -  Groundwater recovery / rebound occurs where the water table has been artificially depressed by abstraction. When the abstraction stops the water, table makes a recovery to its original level. There is the potential for groundwater flooding in low lying areas where groundwater levels have been depressed below their pre-pumping conditions, where these were at or close to ground level.

- 4.5.3 The mapping data for groundwater shows that the site is underlain by a Secondary B bedrock aquifer, with Secondary (undifferentiated) superficial deposits. The site is also located within a Medium - Low Groundwater Vulnerability Zone. No historical flooding at or within proximity of the site due to groundwater related sources has however been identified as part of this assessment, including during a review of the Manchester City Council Strategic Flood Risk Assessment (see mapping extracts within **Appendix H**).
- 4.5.4 Irrespective, it is advised that the containers are raised sufficiently above the external levels where possible to safeguard the proposed container units (this is typically 150mm). It is understood that these are naturally slightly elevated as constructed. The external levels should fall away from the containers where practical to provide safe avenues for overland flows around/away from both existing and proposed development.

4.6 Artificial Sources of Flood Risk

- 4.6.1 National policy states that an FRA should consider the potential risks from a variety of other flood sources including artificial sources (such as risks from reservoirs and canals).

Reservoirs

- 4.6.2 The EA recognises reservoirs as bodies of water over 25,000cu.m and the long-term flood mapping is included in **Appendix B** which shows the extents of flooding associated with reservoirs does not impact on or near to the development site.

Canals

- 4.6.3 The nearest canal to the site is the Rochdale Canal, which is located 705m south-east of the site. It is understood based on the proximity to the site, and the surrounding topography that the risk of flooding associated with canals is 'low'.
- 4.6.4 Irrespective, it is advised that external levels fall away from the proposed containers, to minimise the flood risk from a variety of sources. By keeping the Finished Floor Level elevated relative to the externals, this should help create overland flood flow routes in the event of a breach or any other source of flooding that could lead to overland flows including reservoir or canal flooding.

4.7 Historical and Anecdotal Flooding Information

- 4.7.1 No historical flooding on or near to the development site has been identified during our review of online sources, including review of MCC's Strategic Flood Risk Assessment (see general mapping extracts in **Appendix H**).
- 4.7.2 Consultation with the Environment Agency, United Utilities, and Manchester City Council has also failed to identify any historic flooding directly to the site from the variety of sources reviewed (see **Appendix B, C, and D** for correspondence).

4.8 Flood Risk Mitigation Measures & Residual Risks

- 4.8.1 The site is located wholly within Flood Zone 1 and are at little risk of fluvial/tidal flooding. To observe a conservative approach however, mitigation measures have been

proposed below to safeguard against other potential residual sources of flood risk. The mitigation measures also consider the uncertainties of climate change in accordance with the revised NPPF and PPG.

Mitigation Measures

- 4.8.2 For 'less vulnerable' development located within Flood Zone 1, it is typical to set the Finished Floor Level (FFL) of any proposed buildings a minimum of 150mm above the existing ground levels. Ensuring that the FFL of the container units are raised sufficiently above the external levels where feasible (following any re-grade) should mitigate any risk of flooding from a variety of sources, including groundwater and surface water risks. It is understood that the proposed container units are naturally slightly elevated as constructed.
- 4.8.3 Any overland flows generated by the development must be carefully controlled. Safe avenues directing overland flow way from any existing and proposed buildings are advised.
- 4.8.4 To minimise the flood risk to the neighbouring properties it is recommended that the surface water run-off generated by the proposals be managed effectively with the peak rates of run-off being restricted to the equivalent of the pre-development situation (with betterment where required).
- 4.8.5 The proposed onsite surface water drainage system will need to be sized to contain exceedance from storm events up to and including the 1 in 100yr return period storm event with a 30% allowance for climate change being onsite.
- 4.8.6 As with any drainage system blockages within either the foul or surface water system have the potential to cause flooding or disruption. It is important that should any drainage systems not be offered for adoption to either UU or MCC then an appropriate maintenance regime should be scheduled with a suitably qualified management company for these private drainage systems.

Residual Risks

- 4.8.7 If an extreme rainfall event exceeds the design criteria for the drainage system it is likely that there will be some overland flows that are unable to enter the system, it is important that these potential overland flows are catered for within the development site if the capacity of the drainage system is exceeded.

5.0 SURFACE WATER MANAGEMENT

- 5.0.1 The total site covers 1.379ha and is understood to be 100% permeable at present, as the former car park (planning ref.: 118699/FO/2017) used type 3 permeable surfacing. It is understood that surface water generated by the site is formally drained at present.
- 5.0.2 It is understood that the site currently drains to the public sewer, however, the existing drainage system utilises permeable surfacing and oversized surface water pipes to minimise surface water run-off generated at present. It is understood that the rate of discharge is restricted to a rate of 5.0l/s by a flow control device, prior to outfall into the public combined sewer network within Bromley Street. It should however be noted that no existing drainage investigations have been undertaken, and these assumptions are based on the Preliminary Drainage Strategy provided to accompany the previous application for the site (planning ref.: 118699/FO/2017), which is included in **Appendix J** for completeness.
- 5.0.3 It is recommended that further investigations into the existing drainage systems are undertaken at an early stage to confirm their scale and nature, and whether any existing assets are suitably sized and in sufficient condition for re-use as part of the new development. As our assumptions are currently based on anecdotal drawings, we have considered to site to be 100% permeable to calculate existing run-off.

5.1 Pre-Development Surface Water Run-off

- 5.1.1 The peak rates and volumes of run-off generated by the site area have been calculated for the events shown in **Table 1** (full details **Appendix I**). The surface water run-off rates have been calculated using the IH124 Statistical Method. The full calculations in **Appendix I** are based on an area of 1ha and those in **Table 1** are calculated pro-rata for the proposed site area of 1.379ha.

Site Area	Run-Off Rates				Run-Off Volumes	
	1 In 1 Yr	1 In 30 Yr	1 In 100 Yr	QBar	1 In 1 Yr	1 In 100 Yr
1.379ha	7.8l/s	15.2l/s	18.6l/s	9.0l/s	165.3cu.m	497.5cu.m

Table 1: Pre-Development Surface Water Run-Off Rates (Betts Hydro, 2023)

5.2 Post Development Surface Water Run-Off

- 5.2.1 As previously discussed, based on the sketch layout, it is understood that the impermeable areas post-development will increase to 33% of the site (equating to 0.460ha). The unrestricted post-development run-off rates have been detailed in **Table 2**.

Proposed Imp. Area	Run-Off Rates		
	1 In 1 Yr	1 In 30 Yr	1 In 100 Yr + 30% CC
0.460ha	21.6l/s	43.3l/s	76.4l/s

Table 2: Post-Development Un-Restricted Run-Off Rates (Betts Hydro, 2023)

- 5.2.2 In accordance with national and local planning policies it is necessary to restrict surface water run-off rates where at all practical to mimic a pre-development greenfield situation. The proposals will therefore be to discharge surface water run-off from site mimicking the pre-development greenfield situation (**Table 1**).

5.3 Sustainable Drainage Systems (SuDS)

- 5.3.1 In accordance with national and local planning policy, peak surface water discharge rates from new development should be appropriately managed and where possible reduced. To manage surface water run-off policy shows that preference should always be given to Sustainable Drainage Systems (SuDS) over the traditional methods of buried sewers wherever possible and practical.
- 5.3.2 SuDS can (if designed and situated appropriately) address the four key sustainability objectives embedded in planning policy including providing space for water (water quantity), improving water quality and biodiversity, along with providing valuable amenity/recreational space within new development sites. These benefits depend on the type of SuDS features being proposed, some examples suitable for this nature of development are illustrated in **Figure 5**.



- 5.3.3 Opportunities should also be taken to provide soft landscaping where at all possible on site to assist in minimising surface water run-off. It would be recommended that permeable surfacing and bio-filtration be considered where at all feasible. By including measures such as these the surface water run-off is being dealt with at source and this will assist locally with surface water management (subject to ground conditions).
- 5.3.4 If infiltration is not feasible then a connection into the main drainage systems is needed, but the presence of the permeable surfaces will still allow the first 5mm of rainfall to be dealt with at source as identified in the SuDS Manual (CIRIA 753). Detailed design should confirm whether this site would be suitable for incorporation of SuDS following more detailed analysis of levels, ground conditions and attenuation requirements.

5.4 Methods of Surface Water Management

5.4.1 There are three methods that have been reviewed for the management and discharge of surface water. These may be applied individually or collectively to form a complete strategy and should be applied in the order of priority listed subsequently:

-  Discharge via infiltration
-  Discharge to watercourse
-  Discharge to the public sewerage system

5.5 Discharge via Infiltration

5.5.1 Any impermeable areas that can drain to soakaway or an alternative method of infiltration would significantly improve the sustainability of any surface water system onsite. At this time there has been no onsite infiltration testing to support this assessment, therefore the ground conditions have been identified based on the online datasets.

5.5.2 The online Cranfield Soil and AgriFood Institute (CSAI) Soilscape viewer identifies slowly permeable, seasonally wet acid loamy and clayey soils. The British Geology Survey (BGS) mapping data indicates that the bedrock geology consists of Manchester Marls Member (Mudstone) to the east of site, and Chester Formation (sandstone) to the west, with superficial deposits of Devensian Till. The underlying strata appears to suggest that permeability is medium, however the FEH soil factor of 0.47 suggests a low permeability (based on a scale of 0.1 being very high permeability and 0.5 being very low).

5.5.3 Based on the ground conditions identified by the published online datasets and the soil classification, the use of an infiltration-based solution at the site does not appear to be favourable. To confirm whether infiltration rates at the site would promote the use of permeable surfacing and other infiltration solutions, it is recommended that Soakaway Testing (to BRE365) is undertaken at an early stage. Testing will need to confirm the specific onsite underlying ground conditions and suitability of such to achieve a full infiltration-based drainage solution at the site.

5.5.4 Where the rates are not suitable for a full infiltration-based drainage solution; or the underlying stability is of concern, there would still be scope to utilise shallow infiltration-based solutions (designed appropriately) such as permeable surfacing with a formal outfall from such being to the main drainage system proposed to serve the site. The following sections will consider these alternative fall-back options for managing run-off generated should a full infiltration-based solution not be feasible.

5.6 Discharge to Watercourse/Waterbody

5.6.1 The next discharge option in the sustainable drainage hierarchy should be to discharge to the watercourse, there are however no watercourses suitable for outfall within proximity of the site. The alternative drainage method should be to discharge surface water run-off into a nearby public surface water compatible sewer network.

5.7 Discharge to Public Sewer Network

5.7.1 As infiltration may not offer a full practical solution at the site, the alternative method would be a connection into the public sewer network. United Utilities have identified a

public combined sewer (375mm dia.) located within Bromley Street to the north-west of the site (see sewer records in **Appendix C**).

- 5.7.2 It is understood that the site currently drains to the public sewer, however, the existing drainage system utilises permeable surfacing and oversized surface water pipes to minimise surface water run-off generated at present. It is understood that the rate of discharge is restricted to a rate of 5.0l/s by a flow control device, prior to outfall into the public combined sewer network within Bromley Street.
- 5.7.3 It should however be noted that no existing drainage investigations have been undertaken, and these assumptions are based on the Preliminary Drainage Strategy provided to accompany the previous application for the site (planning ref.: 118699/FO/2017). It is recommended that further investigations into the existing drainage systems are undertaken at an early stage to confirm their scale and nature, and whether any existing assets are suitably sized and in sufficient condition for re-use as part of the new development.
- 5.7.4 Should infiltration not offer a full practical solution at the site, then the alternative proposals are to continue to discharge surface water run-off into the public combined sewer (manhole ref.: 7302) located to the north-west of site within Bromley Street, as illustrated in **Figure 6** (see full plan in **Appendix K**). The existing systems are to be reused where practical, however, should further investigation identify that there is insufficient stormwater storage provision, then additional stormwater storage should be retrofit as required.



Figure 6: Preliminary Drainage Strategy (Betts Hydro, 2023)

* This drawing is not a drainage 'design' it is a preliminary drainage strategy.

- 5.7.5 The proposals are still to utilise permeable surfaces across external areas even if a full infiltration solution is not viable; the permeable surfaces will be lined with a connection to the proposed main drainage serving the new development. The presence of the permeable surfaces will still allow the first 5mm of rainfall to be dealt with at source as identified in the SuDS Manual (CIRIA 753).
- 5.7.6 Detailed design will be required to confirm the feasibility of the strategy and consents for works to the public sewer network will be required from United Utilities. Early discussion will be needed to identify any additional capacity constraints. Any offsite works are to be discussed with other relevant parties (Highways Authority) during the detailed design stage.

Proposed Discharge Rates

- 5.7.7 In accordance with the SuDS Manual (CIRIA) and the Non-Technical Standards for SuDS (March 2015) all sites should endeavour to achieve as close to pre-development greenfield rates as is viable. Based on the site area, the pre-development greenfield rate (QBar) is calculated to be 9.0l/s (6.5l/s/ha).
- 5.7.8 As previously noted, it is understood that the rate of discharge is restricted to a rate of 5.0l/s by a flow control device, prior to outfall into the public combined sewer network within Bromley Street. It is assumed that the rate was restricted to this lower rate due to capacity constraints, at the request of United Utilities. Further consultation has been undertaken with United Utilities, who have confirmed that should a full infiltration solution not be feasible, a rate of 5.0l/s communicating with the existing connection would be acceptable (see correspondence in **Appendix C**).
- 5.7.9 Restricting the rate of discharge will generate a requirement to provide onsite stormwater storage for the extreme rainfall events. The stormwater storage figures quoted in **Table 3 (Appendix L)** are estimates only. Detailed design will determine with accuracy the attenuation requirements and confirm whether there is sufficient capacity within the existing drainage system to cater for the additional volumes generated by the development proposals.

Prop. Imp. Area (1.094ha)	1 In 1 Year	1 In 30 Year	1 In 100 Year + 30% CC
Restricted Run-Off Rate	5.0l/s	5.0l/s	5.0l/s
Estimated Stormwater Storage Volume	37cu.m-69cu.m	115cu.m-174cu.m	251cu.m-349cu.m

Table 3: Estimated Stormwater Storage Requirements (Betts Hydro, 2023)

- 5.7.10 Given the scale and nature of the development this will be provided via underground storage; the specific means are to be determined during the detailed design stage. The surface water scheme for the development will be designed to cater for the surface water run-off generated in the events up to and including the 1 in 100yr return period event with 30% allowance for climate change.

5.8 Climate Change

5.8.1 There are indications that the climate in the UK is changing significantly, and it is widely believed that the nature of climate change will vary greatly by region. Current opinion indicates the likelihood that future climate change would produce more frequent short duration and high intensity rainfall events with the addition of more frequent periods of long duration rainfall. It is believed that the impact of climate change means there is likely to be a long-term increase in the average sea levels, with an expectation that sea levels will rise gradually. An increase in flood water levels means that future flooding events will occur more frequently and will have a greater impact.

5.8.2 In accordance with the Irwell Management Catchment peak rainfall allowances, the central allowance (**Table 4**) for the 2070's has been utilised (based on development with a lifetime between 2061 and 2100).

PROJECTIONS	TOTAL POTENTIAL CHANGE ANTICIPATED FOR THE 2070'S
Upper End Allowance	45%
Central Allowance	30%

Table 4: Change to Peak Rainfall Compared to 1981-2000 Baseline (Environment Agency, 2022)

6.0 FOUL WATER MANAGEMENT

- 6.1 Review of the UU sewer records identify there to be public sewer infrastructure to the north and west of the site. The nearest foul water compatible public sewer is a public combined sewer located within Bromley Street adjacent to the northern boundary of the site (refer to sewer records within **Appendix C**).
- 6.2 The site is developed at present; however, it is understood that there are no foul water flows generated by the site currently. Based on the site area of 1.379ha, the approximate peak foul water flows generated by the site have been calculated at 0.83l/s (based on a domestic flow of 0.6l/s/ha) as per the guidance contained within Sewers for Adoption. No trade effluent flows from the development proposals are anticipated.
- 6.3 The proposals are therefore to discharge foul water flows from the site into the public combined sewer located within Bromley Street (manhole ref.: 7302), as illustrated in **Figure 6** (see previously). A new formal connection will be required, subject to formal consent and agreement from United Utilities. Detailed design will also be required to confirm feasibility of the strategy and to confirm whether a full gravity connection can be achieved.
- 6.4 A pre-development enquiry has been undertaken with UU to identify their preferred point(s) of connection and constraints. United Utilities have confirmed a connection to the combined public sewer at the most convenient point is acceptable, as foul flows are minimal (see correspondence within **Appendix C**).

7.0 SUMMARY AND CONCLUSIONS

- 7.1 This report has been prepared to support a planning application for the for the creation of a commercial 'box park'. This will comprise of 285no. containers (to be used for commercial nature), 63no. car parking spaces, a central yard area, an urban park. The proposals are confirmed to be 'less vulnerable' within NPPF; the supporting PPG confirms that this type of development is appropriate when located within Flood Zone 1, providing there is no increase in flood risk as a result.

Flood Risk

- 7.2 This report has reviewed all sources of flood risk both to and resulting from the proposed development. Consultation with the Environment Agency, United Utilities, and Manchester City Council has not identified any historical flooding at the site or within the wider area. To summarise, the proposals are at 'low' flood risk from the sources reviewed as part of this assessment. Any residual flood risk associated with surface water will be sustainably managed post-development, following the implementation of a sustainable surface water management regime, any residual risks can be managed by appropriate levels design.

Drainage Strategy

- 7.3 Given the low flood risks identified, the key focus of this assessment is on the sustainable management of surface water run-off to ensure no increased flood risk results from the development proposals. The surface water run-off management options have been assessed in accordance with the sustainable drainage hierarchy, which is to discharge to ground, followed by a waterbody or finally the public sewer. Based on the ground conditions identified by the published online datasets and the soil classification, the use of an infiltration-based solution at the site does not appear to be favourable.
- 7.4 It is understood that the site currently drains to the public sewer, however, the existing drainage system utilises permeable surfacing and oversized surface water pipes to minimise surface water run-off generated at present. It is understood that the rate of discharge is restricted to a rate of 5.0l/s by a flow control device, prior to outfall into the public combined sewer network within Bromley Street. It should however be noted that no existing drainage investigations have been undertaken, and these assumptions are based on the Preliminary Drainage Strategy provided to accompany the previous application for the site (planning ref.: 118699/FO/2017).
- 7.5 It is recommended that further investigations into the existing drainage systems are undertaken at an early stage to confirm their scale and nature, and whether any existing assets are suitably sized and in sufficient condition for re-use as part of the new development. As our assumptions are currently based on anecdotal drawings, we have considered to site to be 100% permeable to calculate existing run-off.
- 7.6 Should infiltration not offer a full practical solution at the site, then the alternative proposals are to continue to discharge surface water run-off into the public combined sewer (manhole ref.: 7302) located to the north-west of site within Bromley Street. The existing systems are to be reused where practical, however, should further investigation identify that there is insufficient stormwater storage provision, then additional stormwater storage should be retrofit as required.

- 7.7 In accordance with the SuDS Manual (CIRIA) and the Non-Technical Standards for SuDS (March 2015) all sites should endeavour to achieve as close to pre-development greenfield rates as is viable. Based on the site area, the pre-development greenfield rate (QBar) is calculated to be 9.0l/s (6.5l/s/ha).
- 7.8 It is however understood that the rate of discharge is currently restricted to a rate of 5.0l/s by a flow control device, prior to outfall into the public combined sewer network within Bromley Street. It is assumed that the rate was restricted to this lower rate due to capacity constraints, at the request of United Utilities. Further discussion is currently being undertaken to confirm any capacity constraints within this location.
- 7.9 Early discussion will be needed to identify any additional capacity constraints. Any offsite works are to be discussed with other relevant parties (Highways Authority) during the detailed design stage. Restricting the rate of discharge will generate a requirement to provide onsite stormwater storage for the extreme rainfall events. The surface water scheme for the development will be designed to cater for the surface water run-off generated in the events up to and including the 1 in 100yr return period event with 30% allowance for climate change.
- 7.10 This Flood Risk Assessment and Drainage Management Strategy has been prepared in consultation with the relevant interested parties and incorporates their comments where possible. The report is commensurate with the scale and nature of the development proposals and in summary, the development can be considered appropriate in accordance with the Planning Practice Guidance and Non-Statutory Standards.

8.0 RECOMMENDATIONS

- 8.1 For 'less vulnerable' development located within Flood Zone 1, it is typical to set the Finished Floor Level (FFL) a minimum of 150mm above the existing ground levels. Ensuring that the FFL of the container units are raised sufficiently above the external levels where feasible (following any re-grade) should mitigate any risk of flooding from a variety of sources, including groundwater and surface water risks. It is understood that the proposed container units are naturally slightly elevated as constructed.
- 8.2 Any overland flows generated by the development must be carefully controlled. Safe avenues directing overland flow way from any existing and proposed buildings are advised.
- 8.3 To minimise the flood risk to the neighbouring properties it is recommended that the surface water run-off generated by the proposals be managed effectively with the peak rates of run-off being restricted to the equivalent of the pre-development situation (with betterment where required).
- 8.4 The proposed onsite surface water drainage system will need to be sized to contain exceedance from storm events up to and including the 1 in 100yr return period storm event with a 30% allowance for climate change being onsite.
- 8.5 It should however be noted that no existing drainage investigations have been undertaken, and these assumptions are based on the Preliminary Drainage Strategy provided to accompany the previous application for the site (planning ref.: 118699/FO/2017). It is recommended that further investigations into the existing drainage systems are undertaken at an early stage to confirm their scale and nature, and whether any existing assets are suitably sized and in sufficient condition for re-use as part of the new development.
- 8.6 As with any drainage system blockages within either the foul or surface water system have the potential to cause flooding or disruption. It is important that should any drainage systems not be offered for adoption to either UU or MCC then an appropriate maintenance regime should be scheduled with a suitably qualified management company for these private drainage systems.
- 8.7 If an extreme rainfall event exceeds the design criteria for the drainage system it is likely that there will be some overland flows that are unable to enter the system, it is important that these potential overland flows are catered for within the development site if the capacity of the drainage system is exceeded.

BIBLIOGRAPHY & REFERENCES

Adapting to Climate Change: Advice for Flood and Coastal Erosion Risk Management Authorities – Environment Agency/DEFRA 2016

CIRIA 522: Sustainable urban drainage systems – design manual for England and Wales (2000).

CIRIA 523: Sustainable urban drainage systems – best practice manual (2001).

CIRIA 609: Sustainable drainage systems. Hydraulic, structural and water quality advice (2004).

CIRIA 624: Development and flood risk – guidance for the construction industry (2004).

CIRIA 635: Designing for Exceedance in urban drainage: Good practice (2006).

CIRIA 644: Building Greener (2007).

CIRIA 753: The SUDS manual (2015).

Flood Risk to People – Phase 2 (FD2321/TR2), DEFRA and the Environment Agency (2006).

Flood estimation for small catchments: Institute of Hydrology Report No.124, NERC (1994).

Flood Estimation Handbook, Centre for Ecology and Hydrology (1999).

Planning Practice Guidance (2022).

Sewers for Adoption 7th Edition, WRc (2012).

National Planning Policy Framework, Ministry of Housing, Communities and Local Government (2018).

Web-based References

Bingmaps – <http://www.bing.com/Maps/>

British Geological Survey – <http://www.bgs.ac.uk/opengeoscience/home.html>

Chronology of British Hydrological Events – www.dundee.ac.uk/

CIRIA – <http://www.ciria.org/>

Cranfield University – <http://www.landis.org.uk/soilscales/>

Environment Agency – www.environment-agency.gov.uk/

FloodProBE – <http://www.floodprobe.eu/>

Flood Forum – <http://www.floodforum.org.uk/>

Flood London – <http://www.floodlondon.com/>

Flood Map for Planning - <https://flood-map-for-planning.service.gov.uk/>

Google Maps – <http://maps.google.co.uk/>

Risk of Flooding Maps - <https://flood-warning-information.service.gov.uk/long-term-flood-risk/map>

Streetmap – <http://www.streetmap.co.uk/>

United Utilities – <https://www.unitedutilities.com/>

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APPENDIX A: NPPF & PPG EXTRACTS

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14. Meeting the challenge of climate change, flooding and coastal change

152. The planning system should support the transition to a low carbon future in a changing climate, taking full account of flood risk and coastal change. It should help to: shape places in ways that contribute to radical reductions in greenhouse gas emissions, minimise vulnerability and improve resilience; encourage the reuse of existing resources, including the conversion of existing buildings; and support renewable and low carbon energy and associated infrastructure.

Planning for climate change

153. Plans should take a proactive approach to mitigating and adapting to climate change, taking into account the long-term implications for flood risk, coastal change, water supply, biodiversity and landscapes, and the risk of overheating from rising temperatures⁵³. Policies should support appropriate measures to ensure the future resilience of communities and infrastructure to climate change impacts, such as providing space for physical protection measures, or making provision for the possible future relocation of vulnerable development and infrastructure.
154. New development should be planned for in ways that:
- a) avoid increased vulnerability to the range of impacts arising from climate change. When new development is brought forward in areas which are vulnerable, care should be taken to ensure that risks can be managed through suitable adaptation measures, including through the planning of green infrastructure; and
 - b) can help to reduce greenhouse gas emissions, such as through its location, orientation and design. Any local requirements for the sustainability of buildings should reflect the Government's policy for national technical standards.
155. To help increase the use and supply of renewable and low carbon energy and heat, plans should:
- a) provide a positive strategy for energy from these sources, that maximises the potential for suitable development, while ensuring that adverse impacts are addressed satisfactorily (including cumulative landscape and visual impacts);
 - b) consider identifying suitable areas for renewable and low carbon energy sources, and supporting infrastructure, where this would help secure their development; and

⁵³ In line with the objectives and provisions of the Climate Change Act 2008.

- c) identify opportunities for development to draw its energy supply from decentralised, renewable or low carbon energy supply systems and for co-locating potential heat customers and suppliers.
156. Local planning authorities should support community-led initiatives for renewable and low carbon energy, including developments outside areas identified in local plans or other strategic policies that are being taken forward through neighbourhood planning.
157. In determining planning applications, local planning authorities should expect new development to:
- a) comply with any development plan policies on local requirements for decentralised energy supply unless it can be demonstrated by the applicant, having regard to the type of development involved and its design, that this is not feasible or viable; and
 - b) take account of landform, layout, building orientation, massing and landscaping to minimise energy consumption.
158. When determining planning applications for renewable and low carbon development, local planning authorities should:
- a) not require applicants to demonstrate the overall need for renewable or low carbon energy, and recognise that even small-scale projects provide a valuable contribution to cutting greenhouse gas emissions; and
 - b) approve the application if its impacts are (or can be made) acceptable⁵⁴. Once suitable areas for renewable and low carbon energy have been identified in plans, local planning authorities should expect subsequent applications for commercial scale projects outside these areas to demonstrate that the proposed location meets the criteria used in identifying suitable areas.

Planning and flood risk

159. Inappropriate development in areas at risk of flooding should be avoided by directing development away from areas at highest risk (whether existing or future). Where development is necessary in such areas, the development should be made safe for its lifetime without increasing flood risk elsewhere.
160. Strategic policies should be informed by a strategic flood risk assessment, and should manage flood risk from all sources. They should consider cumulative impacts in, or affecting, local areas susceptible to flooding, and take account of advice from the Environment Agency and other relevant flood risk management authorities, such as lead local flood authorities and internal drainage boards.

⁵⁴ Except for applications for the repowering of existing wind turbines, a proposed wind energy development involving one or more turbines should not be considered acceptable unless it is in an area identified as suitable for wind energy development in the development plan; and, following consultation, it can be demonstrated that the planning impacts identified by the affected local community have been fully addressed and the proposal has their backing.

161. All plans should apply a sequential, risk-based approach to the location of development – taking into account all sources of flood risk and the current and future impacts of climate change – so as to avoid, where possible, flood risk to people and property. They should do this, and manage any residual risk, by:
- a) applying the sequential test and then, if necessary, the exception test as set out below;
 - b) safeguarding land from development that is required, or likely to be required, for current or future flood management;
 - c) using opportunities provided by new development and improvements in green and other infrastructure to reduce the causes and impacts of flooding, (making as much use as possible of natural flood management techniques as part of an integrated approach to flood risk management); and
 - d) where climate change is expected to increase flood risk so that some existing development may not be sustainable in the long-term, seeking opportunities to relocate development, including housing, to more sustainable locations.
162. The aim of the sequential test is to steer new development to areas with the lowest risk of flooding from any source. Development should not be allocated or permitted if there are reasonably available sites appropriate for the proposed development in areas with a lower risk of flooding. The strategic flood risk assessment will provide the basis for applying this test. The sequential approach should be used in areas known to be at risk now or in the future from any form of flooding.
163. If it is not possible for development to be located in areas with a lower risk of flooding (taking into account wider sustainable development objectives), the exception test may have to be applied. The need for the exception test will depend on the potential vulnerability of the site and of the development proposed, in line with the Flood Risk Vulnerability Classification set out in Annex 3.
164. The application of the exception test should be informed by a strategic or site-specific flood risk assessment, depending on whether it is being applied during plan production or at the application stage. To pass the exception test it should be demonstrated that:
- a) the development would provide wider sustainability benefits to the community that outweigh the flood risk; and
 - b) the development will be safe for its lifetime taking account of the vulnerability of its users, without increasing flood risk elsewhere, and, where possible, will reduce flood risk overall.
165. Both elements of the exception test should be satisfied for development to be allocated or permitted.
166. Where planning applications come forward on sites allocated in the development plan through the sequential test, applicants need not apply the sequential test again. However, the exception test may need to be reapplied if relevant aspects of the proposal had not been considered when the test was applied at the plan-

making stage, or if more recent information about existing or potential flood risk should be taken into account.

167. When determining any planning applications, local planning authorities should ensure that flood risk is not increased elsewhere. Where appropriate, applications should be supported by a site-specific flood-risk assessment⁵⁵. Development should only be allowed in areas at risk of flooding where, in the light of this assessment (and the sequential and exception tests, as applicable) it can be demonstrated that:
- a) within the site, the most vulnerable development is located in areas of lowest flood risk, unless there are overriding reasons to prefer a different location;
 - b) the development is appropriately flood resistant and resilient such that, in the event of a flood, it could be quickly brought back into use without significant refurbishment;
 - c) it incorporates sustainable drainage systems, unless there is clear evidence that this would be inappropriate;
 - d) any residual risk can be safely managed; and
 - e) safe access and escape routes are included where appropriate, as part of an agreed emergency plan.
168. Applications for some minor development and changes of use⁵⁶ should not be subject to the sequential or exception tests but should still meet the requirements for site-specific flood risk assessments set out in footnote 55.
169. Major developments should incorporate sustainable drainage systems unless there is clear evidence that this would be inappropriate. The systems used should:
- a) take account of advice from the lead local flood authority;
 - b) have appropriate proposed minimum operational standards;
 - c) have maintenance arrangements in place to ensure an acceptable standard of operation for the lifetime of the development; and
 - d) where possible, provide multifunctional benefits.

Coastal change

⁵⁵ A site-specific flood risk assessment should be provided for all development in Flood Zones 2 and 3. In Flood Zone 1, an assessment should accompany all proposals involving: sites of 1 hectare or more; land which has been identified by the Environment Agency as having critical drainage problems; land identified in a strategic flood risk assessment as being at increased flood risk in future; or land that may be subject to other sources of flooding, where its development would introduce a more vulnerable use.

⁵⁶ This includes householder development, small non-residential extensions (with a footprint of less than 250m²) and changes of use; except for changes of use to a caravan, camping or chalet site, or to a mobile home or park home site, where the sequential and exception tests should be applied as appropriate.

170. In coastal areas, planning policies and decisions should take account of the UK Marine Policy Statement and marine plans. Integrated Coastal Zone Management should be pursued across local authority and land/sea boundaries, to ensure effective alignment of the terrestrial and marine planning regimes.
171. Plans should reduce risk from coastal change by avoiding inappropriate development in vulnerable areas and not exacerbating the impacts of physical changes to the coast. They should identify as a Coastal Change Management Area any area likely to be affected by physical changes to the coast, and:
- a) be clear as to what development will be appropriate in such areas and in what circumstances; and
 - b) make provision for development and infrastructure that needs to be relocated away from Coastal Change Management Areas.
172. Development in a Coastal Change Management Area will be appropriate only where it is demonstrated that:
- a) it will be safe over its planned lifetime and not have an unacceptable impact on coastal change;
 - b) the character of the coast including designations is not compromised;
 - c) the development provides wider sustainability benefits; and
 - d) the development does not hinder the creation and maintenance of a continuous signed and managed route around the coast⁵⁷.
173. Local planning authorities should limit the planned lifetime of development in a Coastal Change Management Area through temporary permission and restoration conditions, where this is necessary to reduce a potentially unacceptable level of future risk to people and the development.

⁵⁷ As required by the Marine and Coastal Access Act 2009.

(<http://www.legislation.gov.uk/ukxi/2015/596/article/4/made>) to require planning permission to be sought in each case.

Paragraph: 075 Reference ID: 7-075-20220825

Revision date: 25 08 2022

How can neighbourhood plans and neighbourhood development/community right to build orders take account of coastal change?

In any instance where a Neighbourhood Area is proposed in a Coastal Change Management Area, careful attention should be paid to the guidance on [what development would be appropriate in such an area](#), including whether [time-limiting planning permissions](#) are needed. The local planning authority will need to be consulted about existing and anticipated levels of risk, and the types of development that may or may not be appropriate.

See related policy in [paragraphs 170 to 173 of the National Planning Policy Framework](#) (<https://www.gov.uk/guidance/national-planning-policy-framework/14-meeting-the-challenge-of-climate-change-flooding-and-coastal-change>).

Paragraph: 076 Reference ID: 7-076-20220825

Revision date: 25 08 2022

Flood Zone and flood risk tables

- Table 1: Flood Zones
- [National Planning Policy Framework Annex 3 - Flood risk vulnerability classification](#) (<https://www.gov.uk/guidance/national-planning-policy-framework/annex-3-flood-risk-vulnerability-classification>)
- [Table 2: Flood risk vulnerability and flood zone 'incompatibility'](#)

Paragraph: 077 Reference ID: 7-077-20220825

Revision date: 25 08 2022

Table 1: Flood Zones

Flood Zone	Definition
Zone 1 Low Probability	Land having a less than 0.1% annual probability of river or sea flooding. (Shown as 'clear' on the Flood Map for Planning – all land outside Zones 2, 3a and 3b)
Zone 2 Medium Probability	Land having between a 1% and 0.1% annual probability of river flooding; or land having between a 0.5% and 0.1% annual

Flood Zone	Definition
	probability of sea flooding. (Land shown in light blue on the Flood Map)
Zone 3a High Probability	Land having a 1% or greater annual probability of river flooding; or Land having a 0.5% or greater annual probability of sea. (Land shown in dark blue on the Flood Map)
Zone 3b The Functional Floodplain	This zone comprises land where water from rivers or the sea has to flow or be stored in times of flood. The identification of functional floodplain should take account of local circumstances and not be defined solely on rigid probability parameters. Functional floodplain will normally comprise: • land having a 3.3% or greater annual probability of flooding, with any existing flood risk management infrastructure operating effectively; or • land that is designed to flood (such as a flood attenuation scheme), even if it would only flood in more extreme events (such as 0.1% annual probability of flooding). Local planning authorities should identify in their Strategic Flood Risk Assessments areas of functional floodplain and its boundaries accordingly, in agreement with the Environment Agency. (Not separately distinguished from Zone 3a on the Flood Map)

Note: The Flood Zones shown on the Environment Agency's Flood Map for Planning (Rivers and Sea) do not take account of the possible impacts of climate change and consequent changes in the future probability of flooding. Reference should therefore also be made to the [Strategic Flood Risk Assessment](https://www.gov.uk/guidance/local-planning-authorities-strategic-flood-risk-assessment) (<https://www.gov.uk/guidance/local-planning-authorities-strategic-flood-risk-assessment>) when considering location and potential future flood risks to developments and land uses.

Paragraph: 078 Reference ID: 7-078-20220825

Revision date: 25 08 2022

Table 2: Flood risk vulnerability and flood zone 'incompatibility'

Flood Zones	Flood Risk Vulnerability Classification				
	Essential infrastructure	Highly vulnerable	More vulnerable	Less vulnerable	Water compatible
Zone 1	✓	✓	✓	✓	✓
Zone 2	✓	Exception Test required	✓	✓	✓
Zone 3a †	Exception Test required †	X	Exception Test required	✓	✓
Zone 3b *	Exception Test required *	X	X	X	✓ *

Key:

✓ Exception test is not required

X Development should not be permitted

Notes to table 2:

- This table does not show the application of the [Sequential Test](#) which should be applied first to guide development to the lowest flood risk areas; nor does it reflect the need to avoid flood risk from sources other than rivers and the sea;
- The Sequential and [Exception Tests](#) do not need to be applied to those developments set out in [National Planning Policy Framework footnote 56](#) (<https://www.gov.uk/guidance/national-planning-policy-framework/14-meeting-the-challenge-of-climate-change-flooding-and-coastal-change>). The Sequential and Exception Tests should be applied to 'major' and 'non major' development;
- Some developments may contain different elements of vulnerability and the highest vulnerability category should be used, unless the development is considered in its component parts.

“†” In Flood Zone 3a essential infrastructure should be designed and constructed to remain operational and safe in times of flood.

“*” In Flood Zone 3b (functional floodplain) essential infrastructure that has passed the Exception Test, and water-compatible uses, should be designed and constructed to:

- remain operational and safe for users in times of flood;

- result in no net loss of floodplain storage;
- not impede water flows and not increase flood risk elsewhere.

Paragraph: 079 Reference ID: 7-079-20220825

Revision date: 25 08 2022

Site-specific flood risk assessment: Checklist

1 - Development site and location

You can use this section to describe the site you are proposing to develop. It would be helpful to include, or make reference to, a location map which clearly indicates the development site.

- a. Where is the development site located? (e.g. postal address or national grid reference)
- b. What is the current use of the site? (e.g. undeveloped land, housing, shops, offices)
- c. Which Flood Zone (for river or sea flooding) is the site within? (i.e. Flood Zone 1, Flood Zone 2, Flood Zone 3). As a first step, you should check the [Flood Map for Planning \(https://flood-map-for-planning.service.gov.uk/\)](https://flood-map-for-planning.service.gov.uk/). Check the Strategic Flood Risk Assessment for the area available from the local planning authority to identify if the site is within Flood Zone 1 but at increased risk of flooding in future due to climate change
- d. Also check the Strategic Flood Risk Assessment to identify if there are any other sources of flooding that may affect the site now or in the future.

2 - Development proposals

You can use this section to provide a general summary of the development proposals. It would be helpful to include, or make reference to, an existing block plan and a proposed block plan, where appropriate.

- a. What are the development proposal(s) for this site? Will this involve a change of use of the site and, if so, what will that change be?
- b. In terms of vulnerability to flooding, what is the vulnerability classification of the proposed development? See [National Planning Policy Framework Annex 3 \(https://www.gov.uk/guidance/national-planning-policy-framework/annex-3-flood-risk-vulnerability-classification\)](https://www.gov.uk/guidance/national-planning-policy-framework/annex-3-flood-risk-vulnerability-classification) for an explanation of the vulnerability classifications.
- c. What is the expected or estimated lifetime of the proposed development likely to be (e.g. 100 years or 75 years)? See [paragraph 006](#) of this guidance for further advice on how to assess the lifetime of developments for flood risk and coastal

APPENDIX B: EA INFORMATION & CORRESPONDENCE

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Hannah Buchanan

From: GMMC Info Requests <InfoRequests.GMMC@environment-agency.gov.uk>
Sent: 26 April 2023 11:37
To: Hannah Buchanan
Subject: GMMC307283SW Response attached from the Environment Agency
Attachments: GMMC307283SW DFM.pdf; GMMC307283SW RFO.pdf; GMMC307283SW Table.pdf

Follow Up Flag: Follow up
Flag Status: Completed

Dear Hannah,

Thank you for your enquiry which was received on 19/04/23.

We respond to requests under the Freedom of Information Act 2000 and Environmental Information Regulations 2004.

Please see the data requested attached and in the links below, followed by my colleague's supporting comments;

There are no flood defences in the vicinity of the site.

There are no 2D levels available for this site.

Manchester Council is responsible for issues relating to surface water and hold information on surface water flooding.

Here are some useful links below:

<https://ea.sharefile.com/d-sc5a19e54a2e841978e0ec5530d5c0b04>

The ShareFile links contains the following data:

Manchester Ship Canal 2016
Model (P7)
Mapedit & Outputs (P6)
Report (P5)

Please can you advise that the link will expire in 30 days from DATE. It is therefore advisable that the client saves this data to their own system.

Please be aware you can check your risk of flooding on our external website <https://flood-warning-information.service.gov.uk/long-term-flood-risk/>

Here are some useful links below:

<https://www.gov.uk/guidance/flood-risk-assessment-local-planning-authorities>
<https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances>

Please refer to the [Open Government Licence](#) which explains the permitted use of this information.

Product 5/6/7

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3. We have restricted use of the Information as a result of legal restrictions placed upon us to protect the rights or confidentiality of others. In this instance it is because of third party data. If you contact us in writing (this includes email) we will, as far as confidentiality rules allow, provide you with details including, if available, how you might seek permission from a third party to extend your use rights.
- 4.1 The Information may contain some data that we believe is within the definition of "personal data" under the Data Protection Act 1998 but we consider that we will not be in breach of the Act if we disclose it to you with conditions set out in this condition and the conditions above. This personal data comprises names of individuals or commentary relating to property that may be owned by an individual or commentary relating to the activities of an individual.
- 4.2 Under the Act a person who holds and uses or passes to others personal data is responsible for any compliance with the Act and so we have no option but to warn you that this means you have responsibility to check that you are compliant with the Act in respect of this personal data.
- 5 The location of public water supply abstraction sources must not be published to a resolution more detailed than 1km². Information about the operation of flood assets should not be published.
- 6 .1 Where we have supplied model data which may include model inputs or outputs you agree to supply to the Environment Agency copies of any assessments/studies and related outputs, modifications or derivatives created pursuant to the supply to you of the Information, all of which are hereinafter referred to as "the Data".
- 6.2 You agree, in the public interest to grant to the Environment Agency a perpetual royalty free non-exclusive licence to use the Data or any part thereof for its internal purposes or to use it in any way as part of Environment Agency derivative products which it supplies free of charge to others such as incorporation into the Environment Agency's Open Data mapping products.

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Please get in touch if you have any further queries or contact us within two months if you'd like us to review the information we have sent.

Kind regards,

Sarah

Sarah Walters | Customer and Engagement Officer
Greater Manchester, Merseyside and Cheshire

Direct email: Inforequests.GMMC@environment-agency.gov.uk

Office address: Richard Fairclough House, Knutsford Road, Latchford, Warrington, WA4 1HT

Please consider this a "thanks" in advance.

Every email has a carbon footprint. So if you don't hear back from me,
it's not because of you, it's because of the planet.

#WhatWeCanDo

From: Hannah Buchanan <hannahbuchanan@betts-associates.co.uk>
Sent: 19 April 2023 11:16
To: GMMC Info Requests <InfoRequests.GMMC@environment-agency.gov.uk>
Subject: GMMC307283SW Flood Risk Information Request - Products 4, 5, 6, & 7

To whom it may concern,

Bromley Street, Manchester

Please could you confirm whether you have any information (Products 4, 5, 6, & 7) that you feel would be valuable to a Flood Risk Assessment and Drainage Management Strategy for the above site (location plan attached), including details of historical flooding and any predicted flood water levels; this would be greatly appreciated. If there are any specific requirements that you require in a scope of works for this site, please can you advise at this stage so that it can be fully incorporated into the proposals at an early stage.

Please do not hesitate to contact me on the details below to discuss further should you require additional information or clarification.

Kind Regards,

Hannah Buchanan BSc (Hons) MSc GradCIWEM
Graduate Flood Risk Analyst

BETTS HYDRO

Consulting Engineers

Old Marsh Farm Barns, Welsh Road, Sealand, Flintshire, CH5 2LY
Chester +44 (0)1244 289041

hannahbuchanan@betts-associates.co.uk
www.betts-associates.co.uk

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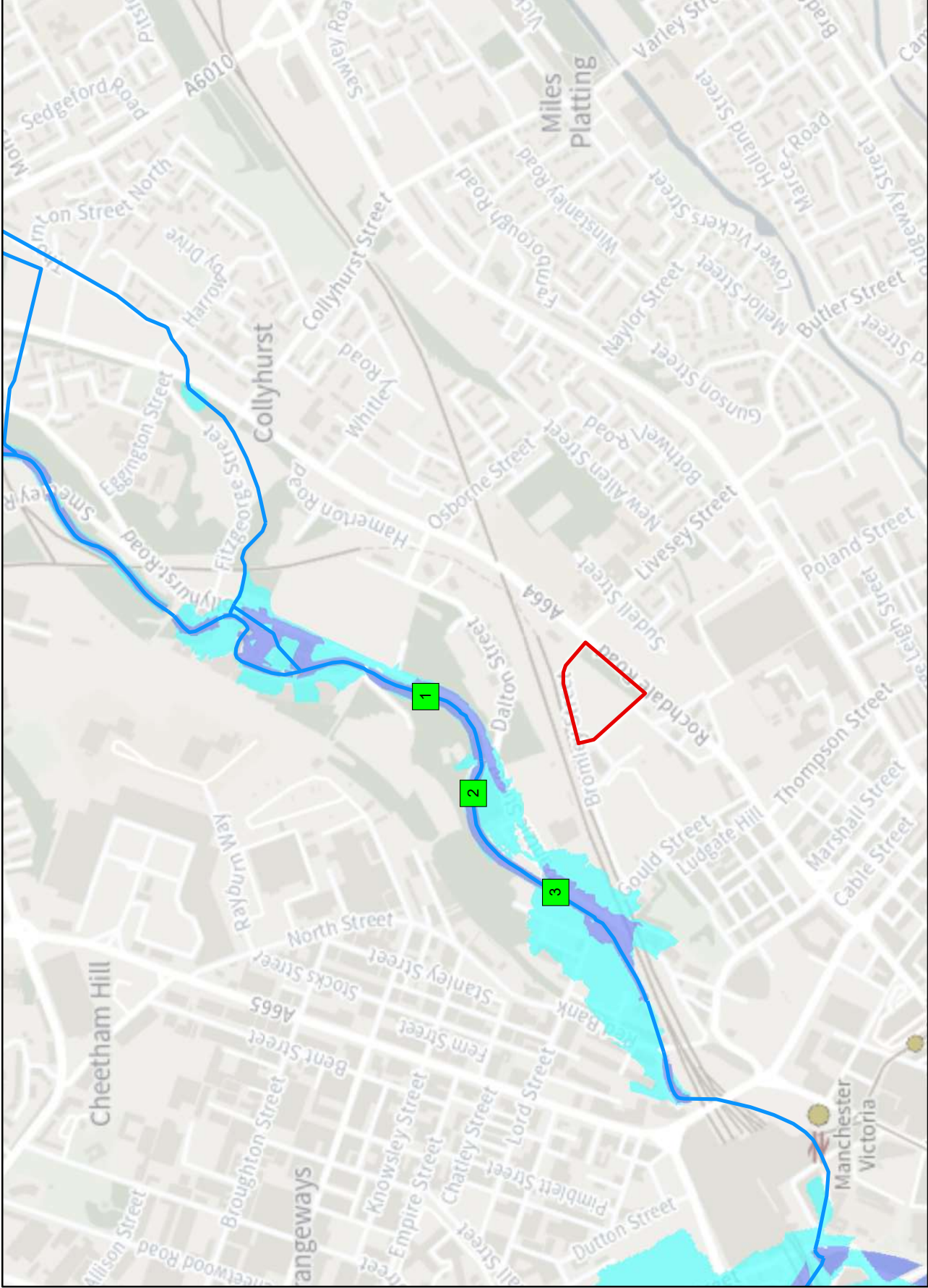
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Detailed Flood Map Centred on Bromley Street, Manchester, M4 4HZ.
Created 21/04/2023 [GMMMC307283SW]



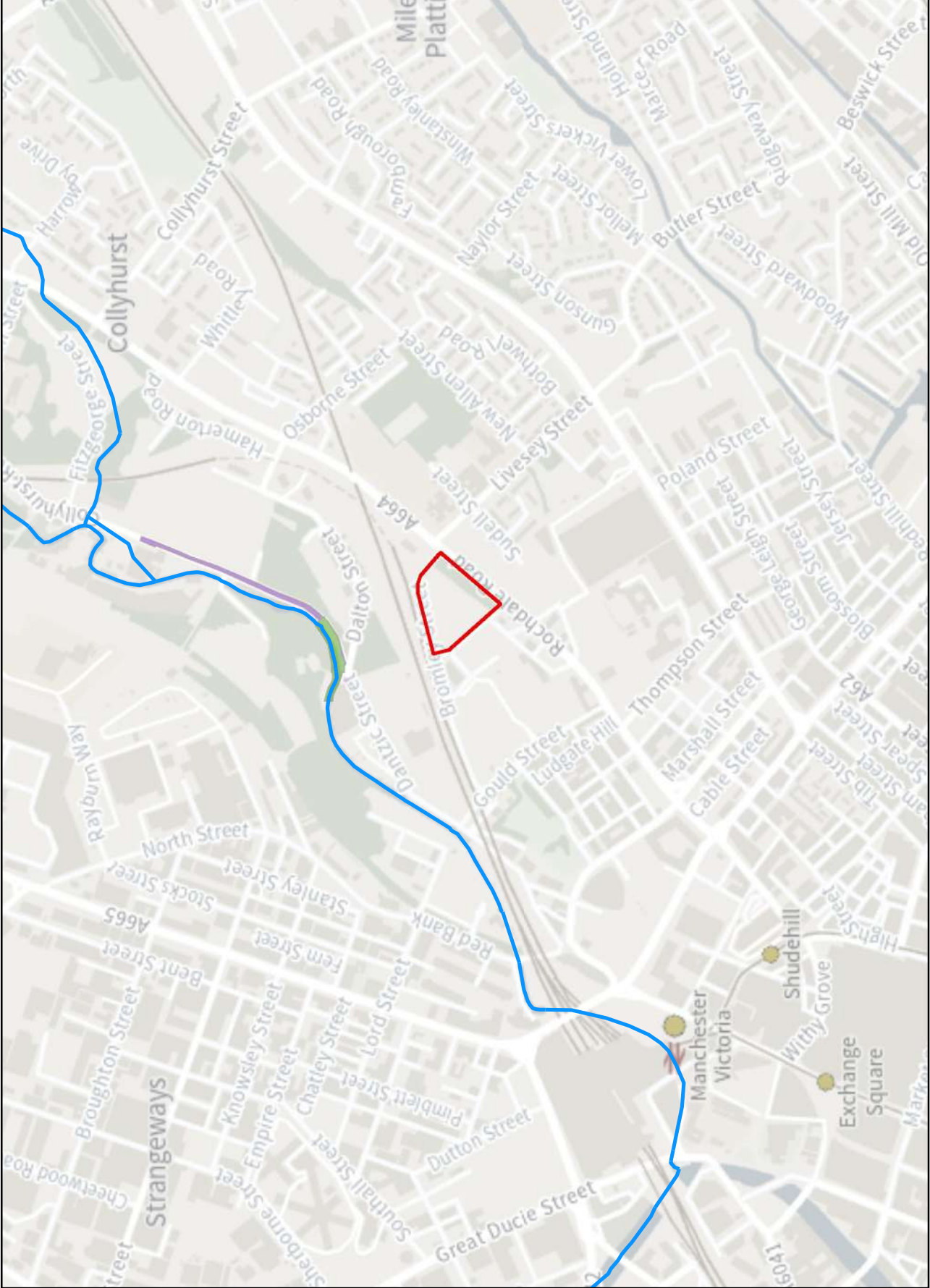
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N

Legend

-  Site Location
-  Model Measurements
-  Main River
-  Flood Zone 3
-  Flood Zone 2

Recorded Flood Outline Map Centred on Bromley Street, Manchester, M4 4HZ.
Created 20/04/2023 [GMMMC307283SW]



1:10,001

N

Legend



Site Location



Main River

Recorded Flood Outlines

Start Date



16/03/2019



26/12/2015

Map Reference	Model Node Reference	Existing	Notching	Data	20 % AEP (1 in 5 year)	10 % AEP (1 in 10 year)	4 % AEP (1 in 25 year)	2 % AEP (1 in 50 year)	1.33 % AEP (1 in 75 year)	1 % AEP (1 in 100 year)	1 % AEP (1 in 100 year) + 35% increase in flow	1 % AEP (1 in 100 year) + 50% increase in flow	0.5 % AEP (1 in 200 year)	0.1 % AEP (1 in 1000 year)	1 % AEP (1 in 100 year)	0.1 % AEP (1 in 1000 year)	Letchford 3 Gates Closed Scenario	Letchford 1 Gate Closed Scenario
1	ea013_0251_LR001_1500	384659	399657	Modelled Water Level (m asdH) Modelled Flow (cumecs)	28.83 23.79	29.14 28.58	29.41 34.72	29.71 41.20	29.96 45.81	30.18 49.66	30.86 64.55	30.93 67.04	30.73 60.50	31.68 102.17	31.68 102.17	31.68 102.17	30.18 49.66	30.18 49.66
2	ea013_0251_LR001_1293	384682	399657	Modelled Water Level (m asdH) Modelled Flow (cumecs)	28.63 23.91	28.82 28.73	29.06 34.91	29.32 41.41	29.52 46.05	29.69 49.90	30.36 64.87	30.44 67.37	30.21 60.80	31.33 102.67	31.33 102.67	31.33 102.67	29.69 49.90	29.69 49.90
3	ea013_0251_LR001_1042	384499	399419	Modelled Water Level (m asdH) Modelled Flow (cumecs)	28.02 24.00	28.24 28.83	28.54 35.03	28.86 41.55	29.11 48.20	29.31 50.08	30.09 65.10	30.16 67.61	29.89 61.02	31.06 103.02	31.06 103.02	31.06 103.02	29.31 50.08	29.31 50.08

Model data taken from Manchester Ship Canal 2016
AEP - Annual Exceedence Probability
in asdH - metres above ordance datum Newlyn
cumecs - cubic metres per second

Notes: "Climate Change Scenario - 35% and 70% increases in flow calculated for the 2002s (2010 - 2115). Please see <https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances> for more information regarding the new climate change guidance. The location of the site and the type (vulnerability) of development determine the climate change allowances to consider in any flood risk assessment.

For the Manchester Ship Canal Model, we provide the following three scenarios:

1. Normal Operation: All sluice gates operate automatically to maintain a navigable ponded water level upstream of each set of sluice gates. During times of high flow the gates are opened automatically to allow excess water pass downstream. During extreme conditions the sluice gates can be manually overridden to extend the opening heights.
2. Letchford 1 Gate Closed Scenario: The scenario represents a single operational movement from 2 active sluice gates. The model setup removes the gate from PHD controller setup and an IED file is used to define the sluice gate as fixed in the closed position.
3. Letchford 3 Gates Closed Scenario: This scenario has been defined as the removal of operational rules at all three sluice gates at Letchford Locks. Thus, all gates are fixed in the closed position resulting in no regulation of upstream water levels. The model setup removes each of the gates from PHD controller setup and an IED file is used to define sluice gates fixed in the closed position.

Map Reference	Model Node Reference	Existing	Notching	Data	4 % AEP (1 in 25 year)	1 % AEP (1 in 100 year)	1 % AEP (1 in 100 year) + Climate Change*	0.1 % AEP (1 in 1000 year)
1	ea013_Model_JK_00024	384658	399657	Modelled Water Level (m asdH) Modelled Flow (cumecs)	30.72 55.42	31.16 63.10	31.42 67.62	32.09 97.43
2	ea013_Model_JK_00028	384682	399657	Modelled Water Level (m asdH) Modelled Flow (cumecs)	30.16 55.22	30.54 73.64	30.79 76.07	31.43 113.00
3	ea013_Model_JK_00030	384499	399419	Modelled Water Level (m asdH) Modelled Flow (cumecs)	29.80 55.51	30.21 63.66	30.37 70.92	30.93 134.74

Model data taken from River Itk SFRA 2011
AEP - Annual Exceedence Probability
in asdH - metres above ordance datum Newlyn
cumecs - cubic metres per second

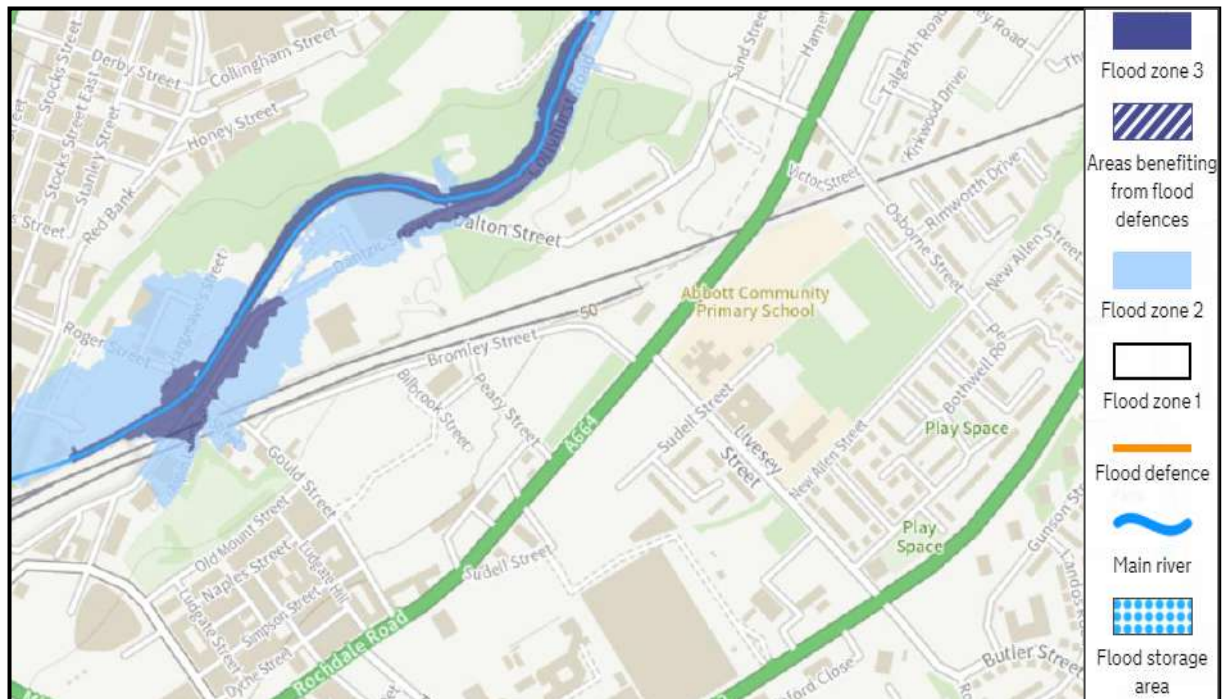
Notes: "Climate Change Scenario - We only had climate change measurements based on the previous climate change guidance (20% increase in flow). The new climate change guidance is available at <https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances>. The location of the site and the type (vulnerability) of development determine the climate change allowances to consider in any flood risk assessment.

Recorded Flood Outlines

Flood Event Code	Name	Start Date	End Date	Source of Flooding	Cause of Flooding
59700	Cheffem H#	26/12/2015	26/12/2015	Main River	Unknown
69610	Calhurst Road	10/02/2019	10/02/2019		channel capacity exceeded (no raised defences)

NATIONAL FLOOD MAPPING

Flood Map for Planning

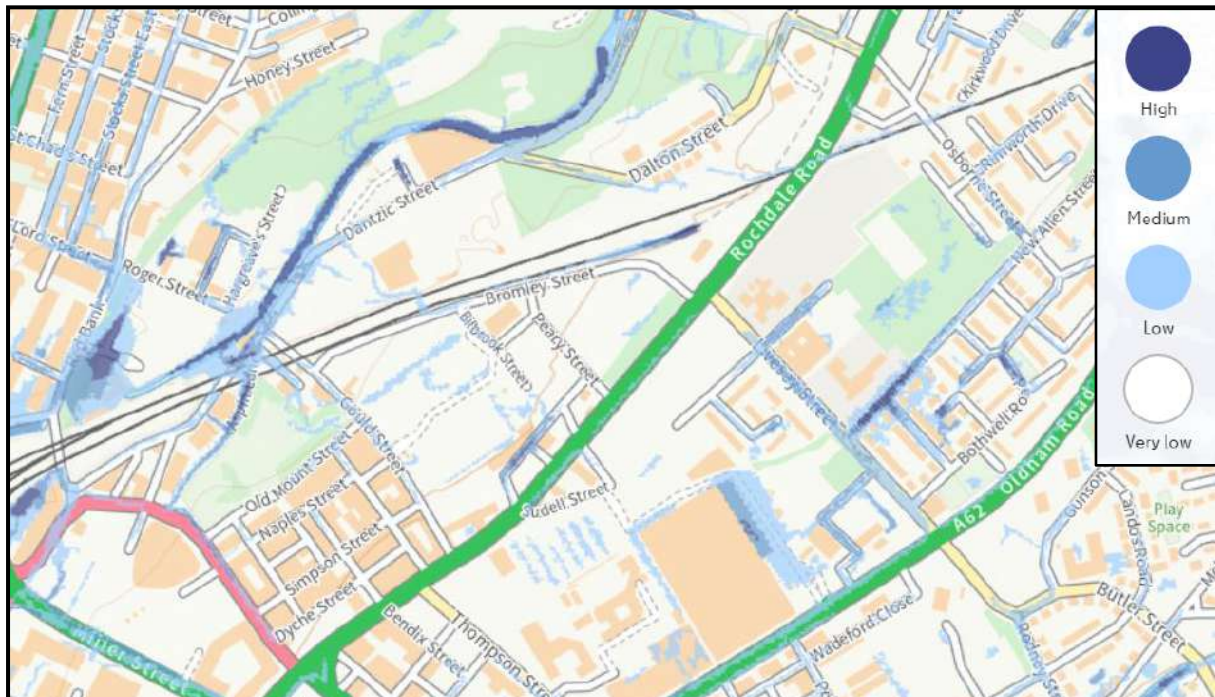


Long Term Flood Risk – Rivers or Sea



NATIONAL FLOOD MAPPING

Long Term Flood Risk – Surface Water



Long Term Flood Risk - Reservoirs



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APPENDIX C: UU CORRESPONDENCE

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Hannah Buchanan

From: seweradoptions@uuplc.co.uk
Sent: 09 June 2023 11:07
To: Hannah Buchanan
Subject: RE: 04147237 - Horton Close, Chadderton

Hi Hannah,

Thank you for the additional information, as foul flows are minimal I have no objection to a connection to the combined public sewer at the most convent point.

Regards

Anthony



Anthony Laithwaite
Ww Lead - ICS / Portal Project
Ww Engineer
Developer Services & Metering
Customer Services

M: 07880 298897
unitedutilities.com

----- Original Message -----

From: seweradoptions@uuplc.co.uk [seweradoptions@uuplc.co.uk]
Sent: 09/06/2023 07:44
To: hannahbuchanan@betts-associates.co.uk
Subject: RE: 04147237 - Horton Close, Chadderton

Good Morning,

Thank you for your email this has been logged to the engineer Anthony their number is 07880298897. They have a service level agreement to respond on or before 21/06/2023.

Kind Regards,



Tonicha Wilde
Customer Advisor Advanced
Developer Services & Metering
Customer Services
Direct Tel: N/A
Tel: 0345 026 8989 (option 4)
unitedutilities.com

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Did you know we now have a live chat facility available to you Mon to Friday 8 -5pm. You just click on the orange live chat box on our webpage and one of our advisors will be ready to chat to you and help you

with your enquiry <https://www.unitedutilities.com/builders-developers/> or you can email us at WastewaterDeveloperServices@uuplc.co.uk

----- Original Message -----

From: Hannah Buchanan [hannahbuchanan@betts-associates.co.uk]

Sent: 07/06/2023 16:53

To: seweradoptions@uuplc.co.uk

Subject: RE: 04147237 - Horton Close, Chadderton

Good afternoon Anthony,

Thank you for your prompt response, I have asked the client, and they have confirmed that only the toilet block onsite will have a water connection. It is my understanding that there will be no toilets within the units themselves.

Kind Regards,

Hannah Buchanan *BSc (Hons) MSc GradCIWEM*

Graduate Flood Risk Analyst

BETTS HYDRO

Consulting Engineers

Old Marsh Farm Barns, Welsh Road, Sealand, Flintshire, CH5 2LY

Chester +44 (0)1244 289041

hannahbuchanan@betts-associates.co.uk

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From: seweradoptions@uuplc.co.uk <seweradoptions@uuplc.co.uk>
Sent: Wednesday, June 7, 2023 4:16 PM
To: Hannah Buchanan <hannahbuchanan@betts-associates.co.uk>
Subject: RE: 04147237 - Horton Close, Chadderton

Good Afternoon Hannah,

Thank you for your Pre Development Enquiry, please see our response below:

Bromley Street, Manchester – UU REF 04147237

I can see you're looking for connection advice, I can confirm as per your email that the site should drain to ground, should this not be possible we would have no objections to 5l/s communicating with the existing connection.

In regards to foul I note this would be a new connection, can you confirm how many units / offices would have toilet and sink facilities please....

I look forward to hearing from you

Regards

Anthony



Anthony Laithwaite
Ww Lead - ICS / Portal Project
Ww Engineer
Developer Services & Metering
Customer Services

M: 07880 298897
unitedutilities.com



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<http://www.unitedutilities.com/subsidiaries>



Hannah Buchanan

From: wastewaterdeveloperservices@uuplc.co.uk
Sent: 21 April 2023 11:00
To: Hannah Buchanan
Subject: 03915393 Sewer Flood Risk Information Request

Hi Hannah

'I can confirm that we have no current record of sewer flooding within the vicinity of the proposed development.

Please note that United Utilities Water Limited (Uuw) can only record and check flooding events which are reported to us and we have to comply with our Regulators instructions on the qualification of flooding events to place on the register.

Our response does not include:

- any sewer flooding events caused by blockages or collapses which are the result of third party actions, natural events or other actions over which Uuw has no control and not a facet of sewer capacity; or*
- any historical sewer flooding events that have been removed from the register as a result of investment in our infrastructure.*

As with all development sites, we recommend you liaise with our water and wastewater engineers by contacting our Developer Services team so the details of your development proposal can be considered further. Details can be found at the following link.

<https://www.unitedutilities.com/services/builders-developers/>

Should you require any further information please do not hesitate to contact me.'

Kind regards Jill



Jill Ellis
Customer Advisor Advanced
Developer Services & Metering
Customer Services
Direct Tel: 01925 233 064
Tel: 0345 072 6067
unitedutilities.com

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

----- Original Message -----

From: Hannah Buchanan [hannahbuchanan@betts-associates.co.uk]

Sent: 19/04/2023 11:16

To: wastewaterdeveloperservices@uuplc.co.uk

Subject: Sewer Flood Risk Information Request

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To whom it may concern,

Bromley Street, Manchester

Please could you confirm whether you have any information that you feel would be valuable to a Flood Risk Assessment and Drainage Management Strategy for the above site (location plan attached), including details of historical flooding and any predicted flood water levels; this would be greatly appreciated. If there are any specific requirements that you require in a scope of works for this site, please can you advise at this stage so that it can be fully incorporated into the proposals at an early stage.

Please do not hesitate to contact me on the details below to discuss further should you require additional information or clarification.

Kind Regards,

Hannah Buchanan *BSc (Hons) MSc GradCIWEM*

Graduate Flood Risk Analyst

BETTS HYDRO

Consulting Engineers

Old Marsh Farm Barns, Welsh Road, Sealand, Flintshire, CH5 2LY

Chester +44 (0)1244 289041

hannahbuchanan@betts-associates.co.uk

www.betts-associates.co.uk

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Betts-Associates

**Old Marsh Farm Barns
Old Marsh Farm Barns,
Flintshire,
CH5 2LY**

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: HYD844
Our Ref: UUPS-ORD-489893
Date: 23/05/2023**

Dear Sirs

Location: Bromley Street Manchester

I acknowledge with thanks your request dated 22/05/2023 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.

APPENDIX D: LPA/LLFA CORRESPONDENCE

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Hannah Buchanan

From: Hannah Buchanan
Sent: 19 April 2023 11:16
To: floodriskmanagement@manchester.gov.uk
Subject: Historic Flood Risk and Drainage Information Request
Attachments: Location Plan.pdf

To whom it may concern,

Bromley Street, Manchester

Please could you confirm whether you have any information that you feel would be valuable to a Flood Risk Assessment and Drainage Management Strategy for the above site (location plan attached), including details of historical flooding and any predicted flood water levels; this would be greatly appreciated. If there are any specific requirements that you require in a scope of works for this site, please can you advise at this stage so that it can be fully incorporated into the proposals at an early stage.

Please do not hesitate to contact me on the details below to discuss further should you require additional information or clarification.

Kind Regards,

Hannah Buchanan BSc (Hons) MSc GradCIWEM
Graduate Flood Risk Analyst

BETTS HYDRO

Consulting Engineers

Old Marsh Farm Barns, Welsh Road, Sealand, Flintshire, CH5 2LY
Chester +44 (0)1244 289041

hannahbuchanan@betts-associates.co.uk
www.betts-associates.co.uk

CIVIL | STRUCTURAL | GEO-ENVIRONMENTAL | HYDROLOGY | FLOOD RISK MANAGEMENT
SUDS | STRUCTURAL SURVEYS | PARTY WALL DUTIES | INFILTRATION | GEOTECHNICAL

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APPENDIX E: LOCATION PLAN

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LOCATION PLAN

Bromley Street, Manchester



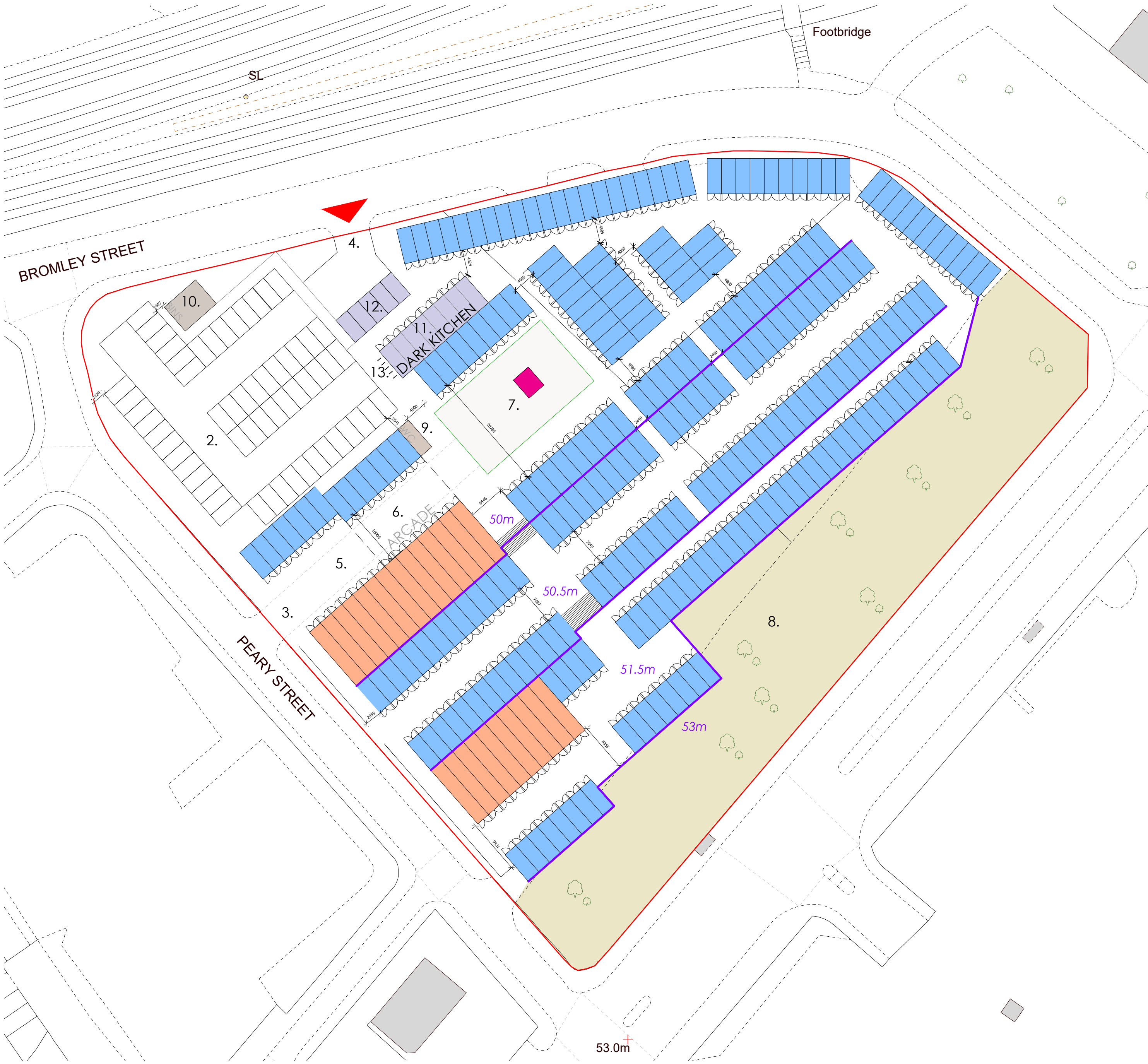
OS X (Eastings)	384856
OS Y (Northings)	399353
Nat Grid	SJ848993 / SJ8485699353
Nearest Post Code	M4 4HZ
Lat (WGS84)	N53:29:26 (53.49066500873191)
Long (WGS84)	W2:13:47 (-2.2297162073747927)
Lat, Long (WGS84)	53.49066500873191, -2.2297162073747927
Lat (OSGB36)	N53:29:26 (53.49041781060557)
Long (OSGB36)	W2:13:42 (-2.228275058902222)
Lat, Long (OSGB36)	53.49041781060557, -2.22827505890222

APPENDIX F: TOPOGRAPHIC SURVEY

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APPENDIX G: PROPOSED PLANNING LAYOUT

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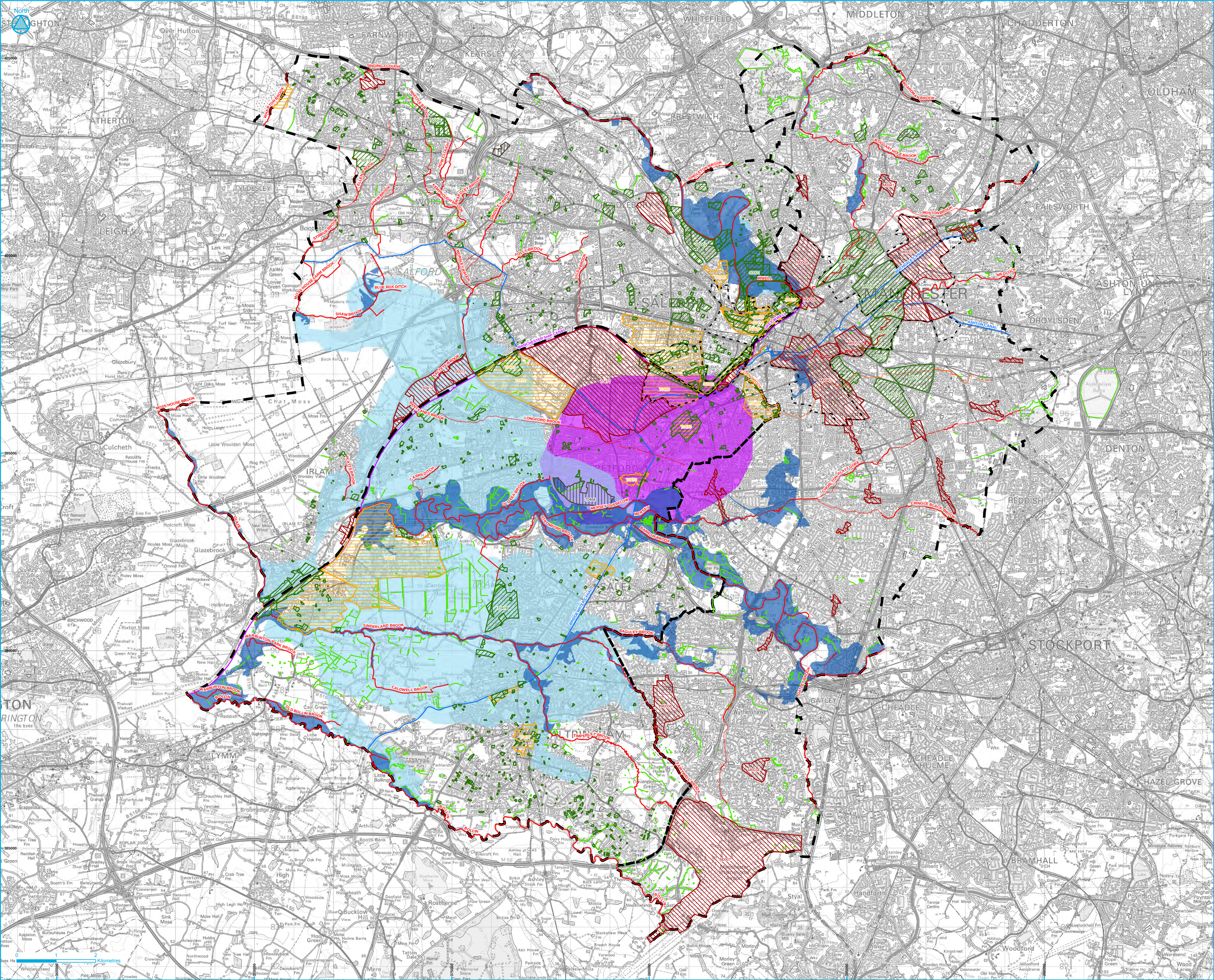


1. 285 Containers (inc. 261No. 20ft containers & 24No. 40ft containers)
2. 63 Car parking spaces (inc. 5 Dark Kitchen parking)
3. Main Pedestrian access
4. Main Vehicular access
5. Parade of retail units
6. Entrance arcade
7. Central Yard
8. Urban Park
9. WCs
10. Bins/servicing
11. Dark Kitchen (8No. Containers)
12. 5 Dark Kitchen Parking
13. 5 Sheffield Stands (10No. spaces)

SKETCH LAYOUT

APPENDIX H: PFRA/SFRA PLANNING EXTRACTS

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- Council Boundary
- Ashton, Bridgewater and Rochdale Canals
- Manchester Ship Canal / Grey Inwell
- Other Waterbodies
- Main Rivers (V8.0)**
 - Culverted
 - Open
- Digitised River Lines**
 - Culverted
 - Open
- Groundwater Issue**
 - Areas at risk of GW Flooding
 - Areas of shallow GW
 - Areas at risk of GW rebound
- Potential Development Sites / Locations**
 - Employment
 - Housing
 - Mixed Use
 - Other
- Regional Centre Boundary

The map has been produced in accordance with PPS25: Development and Flood Risk and its Practice Guide. This map shows areas that are potentially at risk from groundwater flooding and should be used to scope suitable mitigation measures in a site specific Flood Risk Assessment.

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 information on the map is based on Environment Agency potential groundwater rebound areas, data from the Coal Authority, BGS drift geology mapping and Defra Groundwater Emergence Maps.

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.

www.jeremybenn.co.uk
t 01925 570876
f 0845 882772
e info@jbaconsulting.co.uk

Bank Quay House
Sankey Street
Warrington
WA1 1NN
United Kingdom

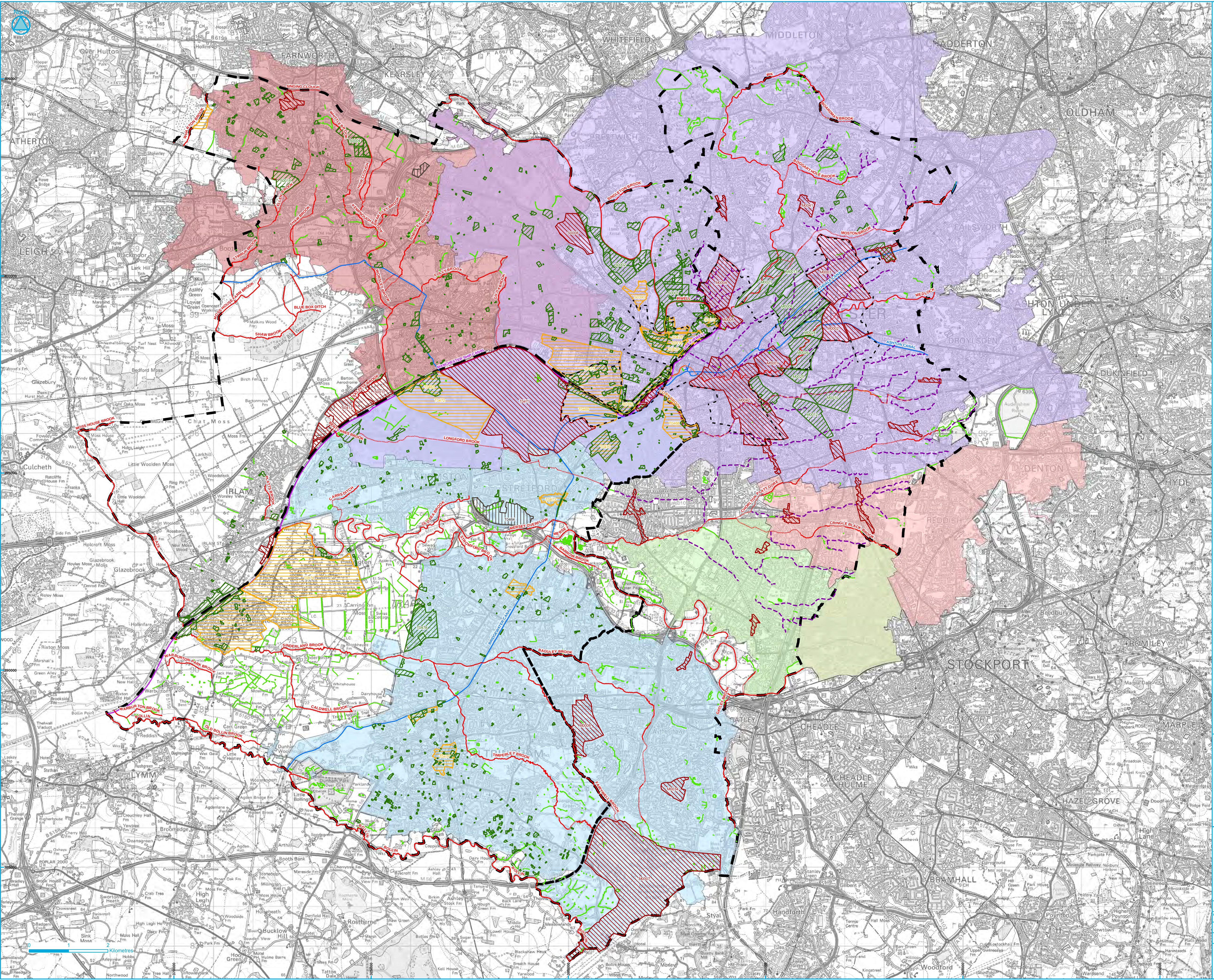
Other offices at Atherstone, Doncaster, Edinburgh, Haywards Heath, Limerick, Newcastle upon Tyne, Newport, Northallerton, Salford, Skipton, Tadcaster & Wellingford

for

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

Groundwater Flooding

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: 100019068 2011.
Checked by: J Dimelow	Date: 01/02/2011	
Approved by: J Cooper	Date: 01/02/2011	
File Name: ..\ArcViewMapping\Level1\MS2_GroundwaterFlooding_V1.3.mxd		
Drawing Number:	Status:	Scale:
GW_2.1	FINAL	1:45,000
Original @ A1		



- Council Boundary**
- Lost Watercourses**
- Critical Drainage Areas**
- Main Rivers (V8.0)**
- Digitised River Lines**
- Potential Development Sites / Locations**
- 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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United Kingdom

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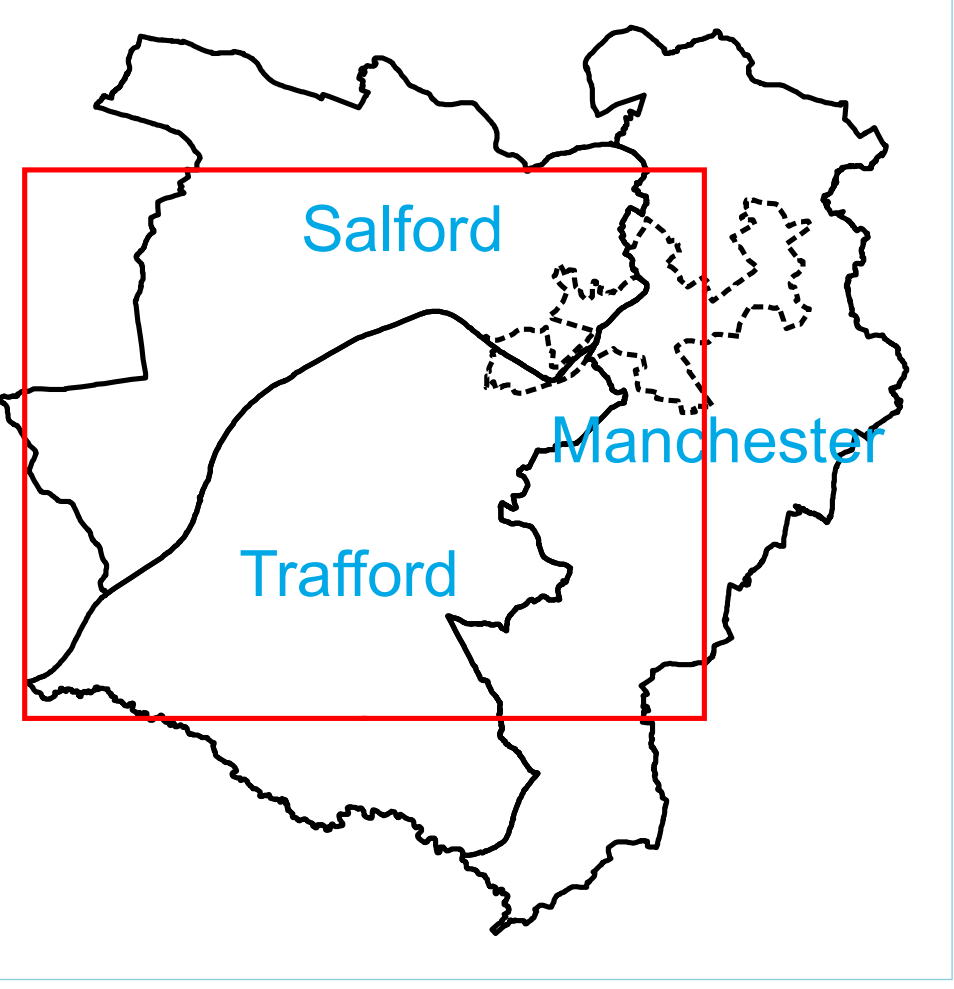
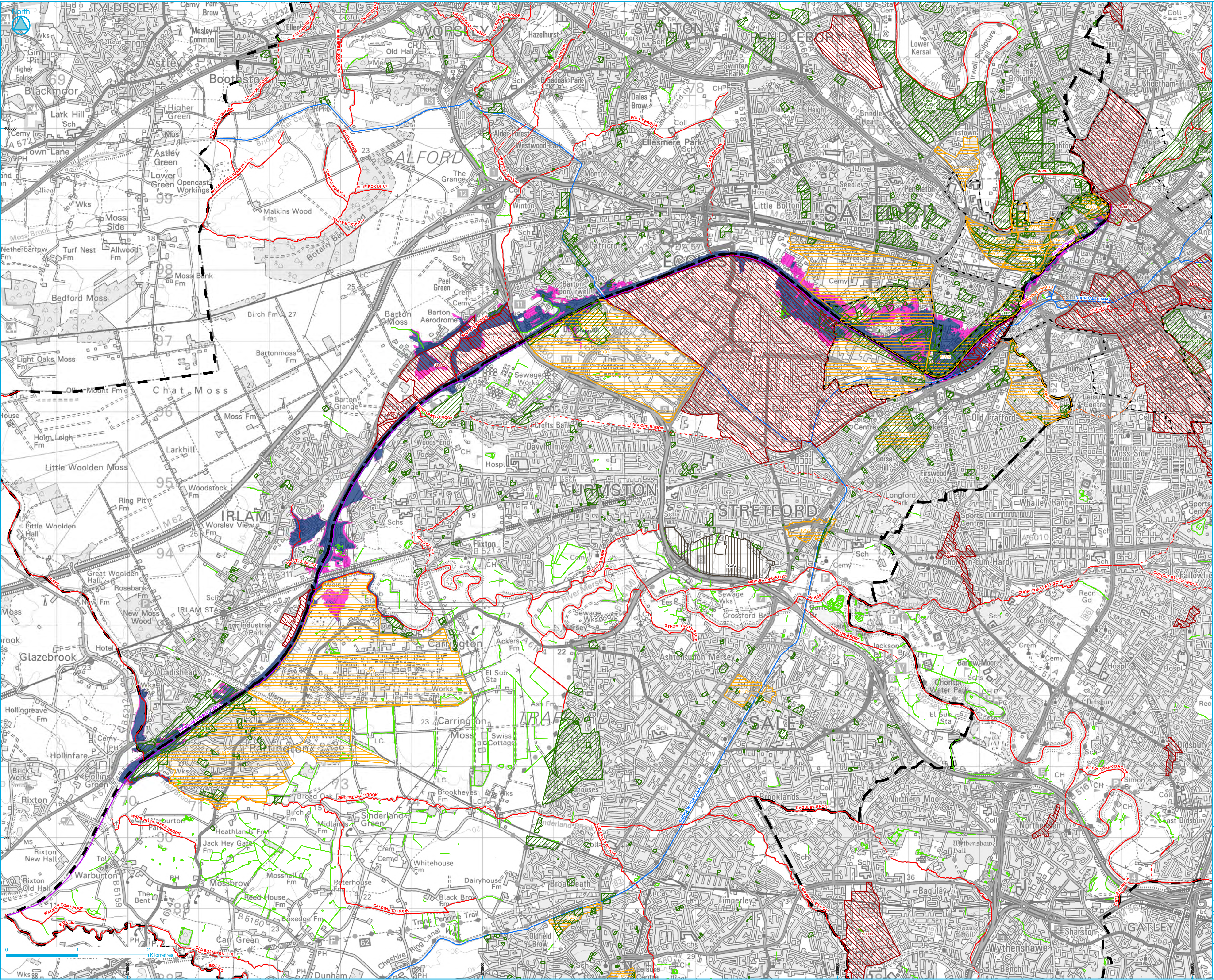


Manchester City, Salford City and Trafford Councils Level 2 Hybrid SFRA

Critical Drainage Areas

Drawn by:	J Chestham	Date:	16/03/2011	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: 100016568/2011.	
Checked by:	J Dimelow	Date:	01/02/2011		
Approved by:	J Cooper	Date:	01/02/2011		
File Name: ...ArcViewMappingLevel2MST_CDA_Current_V1.2.mxd					
Drawing Number:	SS_4.5	Status:	FINAL	Scale:	1:45,000

Original © A



- Council Boundary
- Urban Design Thresholds For Resistance & Resilience
 - <0.6 m
 - >0.6 m
- Potential Development Sites / Locations
 - Employment
 - Housing
 - Mixed Use
 - Other
- Regional Centre Boundary
- Ashton, Bridgewater and Rochdale Canals
- Manchester Ship Canal / Grey Inwell
- Other Waterbodies
- Main Rivers (V8.0)
 - Culverted
 - Open
- Digitised River Lines
 - Culverted
 - Open

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

Areas at risk from the Manchester Ship Canal and Grey Inwell are currently subject to a wide variation in model results resulting from model uncertainties. Hence urban design response needs to adopt a mix of non-structural resilience measures and/or floor level raising to account for the high degree of uncertainty associated with a residual risk.

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.

This map shows typical urban design approaches that would be applicable to areas of residual flood risk. The design thresholds used to identify where resistance and resilience are potentially applicable are based on flood depths expected in a 1 in 100 yr event with an allowance for climate change and the adopted flood risk scenario for operation of the Manchester Ship Canal. This map should be used in conjunction with the advice given in Chapter 9 of the Level 2 SFRA.

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.

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

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

Urban Design Zoning for the Manchester Ship Canal and Grey Inwell

Drawn by: J Cheetham	Date: 16/03/2011	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: 100016688 2011.
Checked by: J Dimelew	Date: 01/02/2011	
Approved by: J Cooper	Date: 01/02/2011	
File Name: ...ArcView/Mapping/Level2MST_MSC_UrbanDesignZoning_V1.3.mxd		
Drawing Number: FL_1.15	Status: FINAL	Scale: 1:25,000

APPENDIX I: SURFACE WATER RUN-OFF CALCULATIONS

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Calculated by:	Hannah Buchanan
Site name:	Bromley Street
Site location:	Manchester

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

Site Details

Latitude:	53.49063° N
Longitude:	2.22958° W
Reference:	2686012586
Date:	May 22 2023 15:49

Runoff estimation approach

IH124

Site characteristics

Total site area (ha):	1
-----------------------	---

Methodology

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

Notes

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

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

Soil characteristics

	Default	Edited
SOIL type:	4	4
HOST class:	N/A	N/A
SPR/SPRHOST:	0.47	0.47

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

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

Hydrological characteristics

	Default	Edited
SAAR (mm):	902	902
Hydrological region:	10	10
Growth curve factor 1 year:	0.87	0.87
Growth curve factor 30 years:	1.7	1.7
Growth curve factor 100 years:	2.08	2.08
Growth curve factor 200 years:	2.37	2.37

(3) Is $SPR/SPRHOST \leq 0.3$?

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

Greenfield runoff rates

	Default	Edited
Q_{BAR} (l/s):	6.5	6.5
1 in 1 year (l/s):	5.65	5.65
1 in 30 years (l/s):	11.04	11.04
1 in 100 year (l/s):	13.51	13.51
1 in 200 years (l/s):	15.39	15.39

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

SURFACE WATER RUN-OFF CALCULATION SHEET

Development	Bromley Street, Manchester
Project No.	HYD844

Revision	B	Completed by	HB
Date	19/05/2023	Checked by	KH

Areas			
Total Site	1.379	ha	
Development Area ¹	1.379	ha	
Existing Impermeable		ha	
Existing Impermeable ²		ha	
Existing Pervious	1.379	ha	
Existing Pervious ²	0.000	ha	
Proposed total impermeable	0.460	ha	33%

Catchment Characteristics			
SAAR	905	mm	
SPR	0.47		
BFI	0.333		
i_1	16.9	mm/hr	d_1 21.6 mm
i_{30}	33.9	mm/hr	d_{30} 48.7 mm
i_{100}	46.0	mm/hr	d_{100} 61.3 mm

Run-off Rates			
Pre-development			
Impermeable -----	1yr	0.0	l/s
	30yr	0.0	l/s
	100yr	0.0	l/s
	50mm/hr ³	0.0	l/s
Pervious ⁴ -----	1yr	7.8	l/s
	30yr	15.2	l/s
	100yr	18.6	l/s
	QBar ⁵	9.0	l/s
Total -----	1yr	7.8	l/s
	30yr	15.2	l/s
	100yr	18.6	l/s
Post-development (without control)			
Impermeable ⁶ -----	1yr	21.6	l/s
	30yr	43.3	l/s
	100yr+30%CC	76.4	l/s

Volumes			
Pre-development			
Impermeable -----	1yr	0.0	cu.m
	30yr	0.0	cu.m
	100yr	0.0	cu.m
Pervious ⁴ -----	1yr	165.3	cu.m
	30yr	349.2	cu.m
	100yr	497.5	cu.m
Total -----	1yr	165.3	cu.m
	30yr	349.2	cu.m
	100yr	497.5	cu.m
Post-development			
Impermeable ⁶ -----	1yr	99.1	cu.m
	30yr	223.8	cu.m
	100yr	281.9	cu.m

Stormwater Storage Estimates			
Restricted to 5.0l/s as requested by United Utilities			
Microdrainage Quick Storage Estimates (using FEH catchment data)			
Return Period	Rate	lower	upper
1yr	5.0 l/s	37	69
30yr	5.0 l/s	115	174
100yr+30%CC	5.0 l/s	251	349
			mean
			53 cu.m
			144.5 cu.m
			300 cu.m

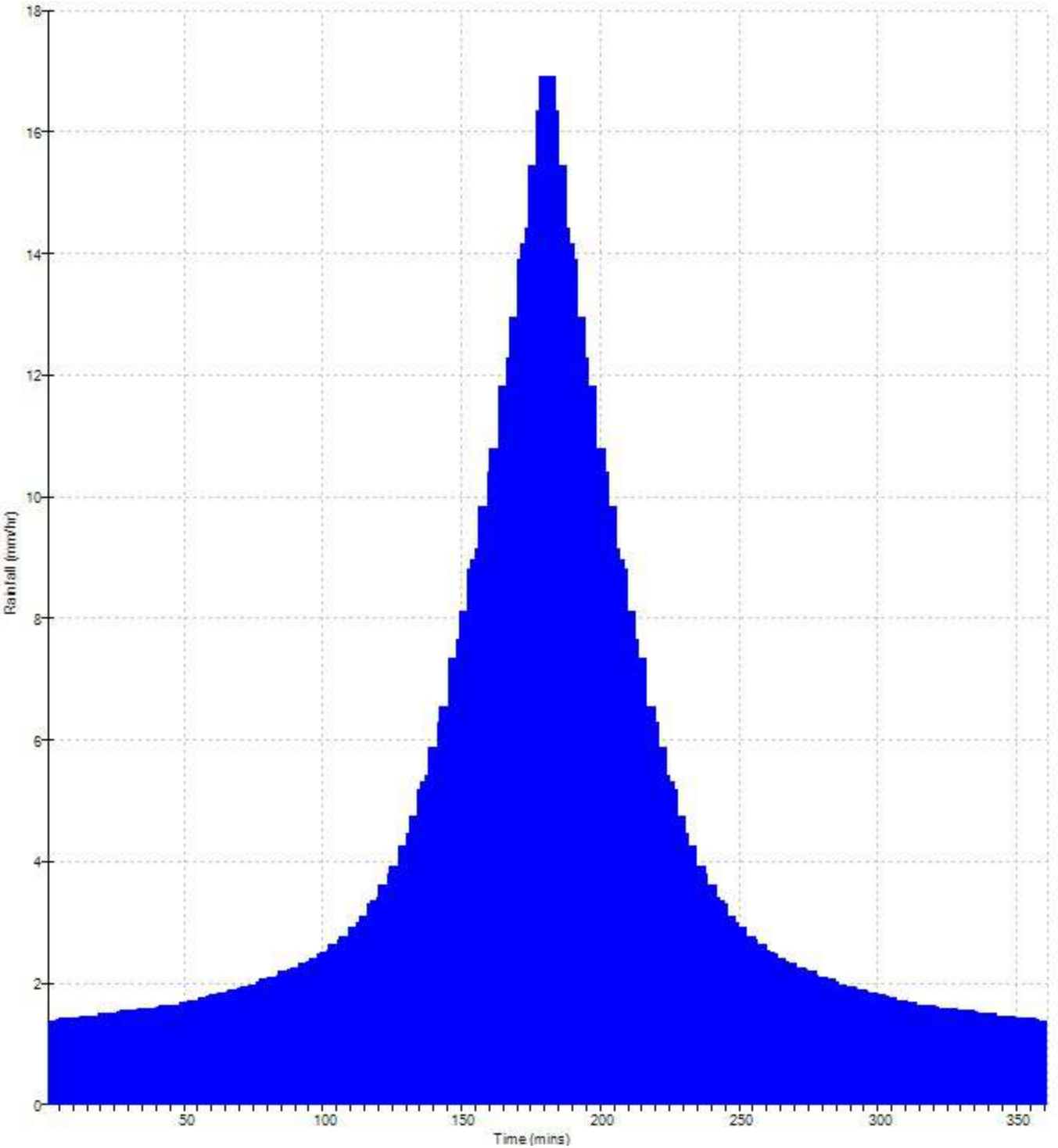
1/ The 'development area' removes areas of POS and/or landscaped areas of the wider site that are to remain as existing.
 2/ On occasion the existing impermeable area cannot be evidenced to connect and a reduction is applied.
 3/ 50mm/hr is used for BRegs calculations and often used by Water Companies when considering allowable post-development rates of discharge. (Rational Method)
 4/ The Greenfield rates and of run-off have been calculated using the UK SUDS Calculator
 5/ QBar is the estimated flood flow for the 2.33yr return period event and is often used as a post-development rate restriction.
 6/ Post-development run-off is only considered from the impermeable area when the proposed post-development impermeable area >50% in accordance with the EA Guidance Preliminary rainfall runoff management for developments (W5-074/A/TR1/1 rev E (2012)).

NB. The catchment characteristics are from the FEH catchment, the UK SUDS Calculator and Microdrainage.
 NB. The rainfall intensities and depths are calculated for the 6hr duration rainfall event (peak summer intensity)

Rainfall profile

Storm duration (mins) 360

FEH Data	
FEH Rainfall Version	2013
Site Location	GB 384872 399338 SJ 84872 99338
Data Type	Point
Peak Intensity (mm/hr)	16.928
Ave. Intensity (mm/hr)	4.318
Return Period (years)	2.0



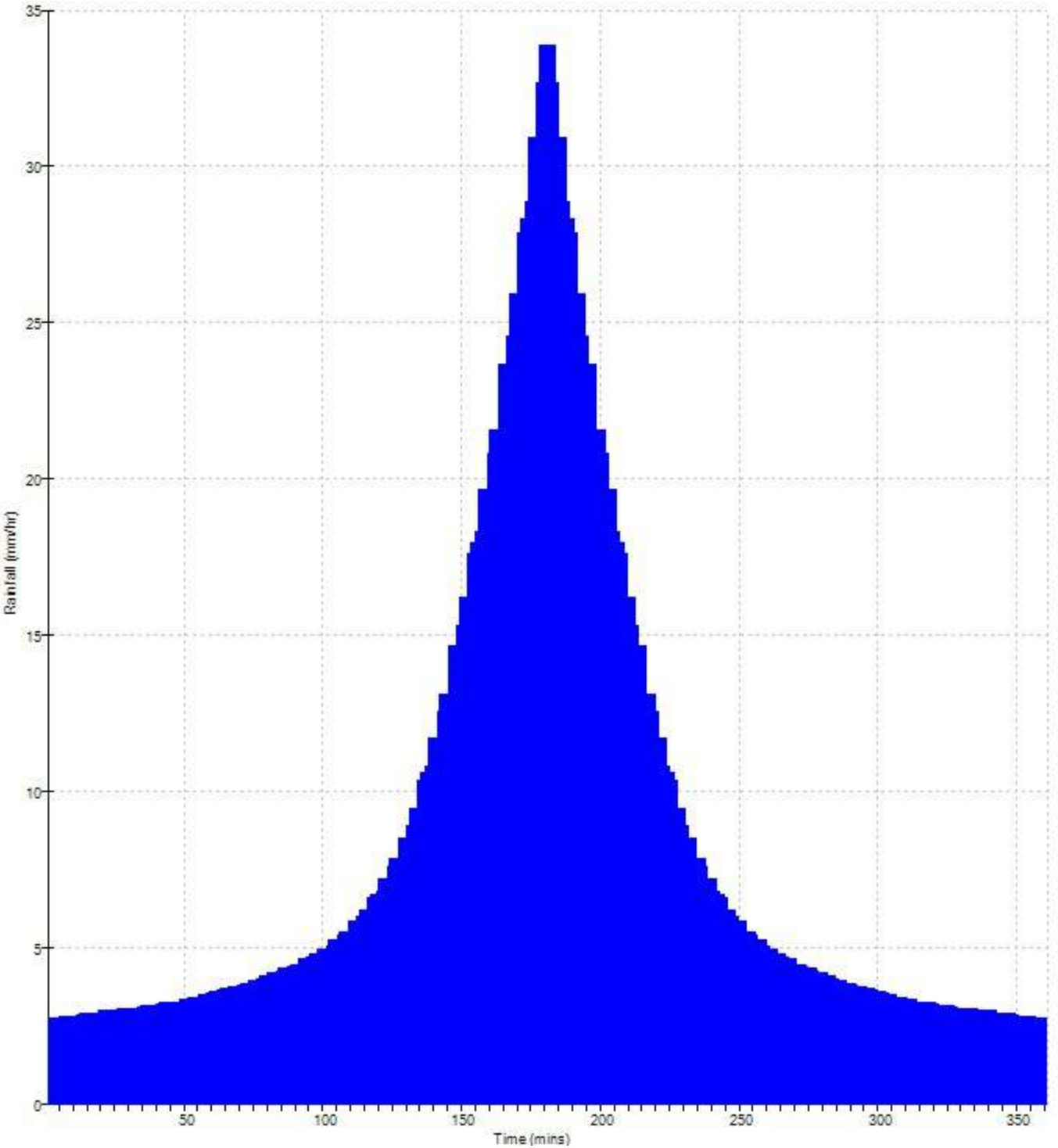
Betts Associates Ltd		Page 1
Old Marsh Farm Barns	Bromley Street	
Welsh Road	Manchester	
Sealand Flintshire CH5 2LY		
Date 22/05/2023	Designed by HB	
File	Checked by KH	
Micro Drainage	Network 2020.1.3	

Rainfall profile

Storm duration (mins) 360

FEH Data

FEH Rainfall Version	2013
Site Location	GB 384872 399338 SJ 84872 99338
Data Type	Point
Peak Intensity (mm/hr)	33.896
Ave. Intensity (mm/hr)	8.647
Return Period (years)	30.0



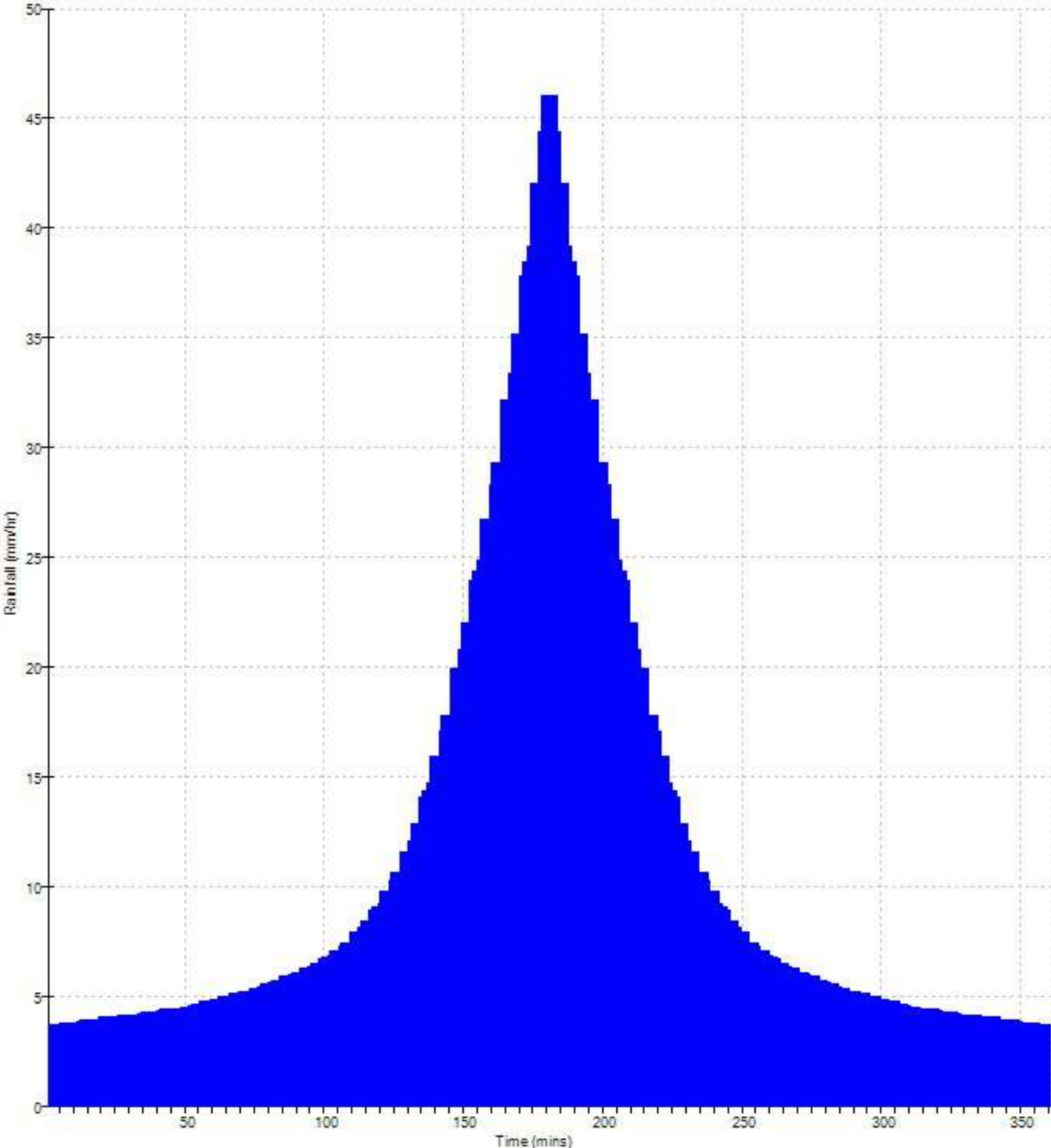
Betts Associates Ltd		Page 1
Old Marsh Farm Barns	Bromley Street	
Welsh Road	Manchester	
Sealand Flintshire CH5 2LY		
Date 22/05/2023	Designed by HB	
File	Checked by KH	
Micro Drainage	Network 2020.1.3	

Rainfall profile

Storm duration (mins) 360

FEH Data

FEH Rainfall Version	2013
Site Location	GB 384872 399338 SJ 84872 99338
Data Type	Point
Peak Intensity (mm/hr)	46.048
Ave. Intensity (mm/hr)	11.747
Return Period (years)	100.0



Betts Associates Ltd		Page 1
Old Marsh Farm Barns Welsh Road Sealand Flintshire CH5 2LY	Bromley Street Manchester	
Date 22/05/2023	Designed by HB	
File	Checked by KH	
Micro Drainage		Source Control 2020.1.3

Greenfield Runoff Volume

FEH Data

Return Period (years)	30
Storm Duration (mins)	360
FEH Rainfall Version	2013
Site Location	GB 384872 399338 SJ 84872 99338
Data Type	Point
Areal Reduction Factor	1.00
Area (ha)	1.379
SAAR (mm)	905
CWI	122.047
SPR Host	47.000
URBEXT (1990)	0.0000

Results

Percentage Runoff (%)	48.81
Greenfield Runoff Volume (m³)	349.185

Betts Associates Ltd		Page 1
Old Marsh Farm Barns Welsh Road Sealand Flintshire CH5 2LY	Bromley Street Manchester	
Date 22/05/2023	Designed by HB	
File	Checked by KH	
Micro Drainage	Source Control 2020.1.3	

Greenfield Runoff Volume

FEH Data

Return Period (years)	100
Storm Duration (mins)	360
FEH Rainfall Version	2013
Site Location	GB 384872 399338 SJ 84872 99338
Data Type	Point
Areal Reduction Factor	1.00
Area (ha)	1.379
SAAR (mm)	905
CWI	122.047
SPR Host	47.000
URBEXT (1990)	0.0000

Results

Percentage Runoff (%)	51.18
Greenfield Runoff Volume (m³)	497.464

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Old Marsh Farm Barns Welsh Road Sealand Flintshire CH5 2LY	Bromley Street Manchester	
Date 22/05/2023	Designed by HB	
File	Checked by KH	
Micro Drainage		Source Control 2020.1.3

Greenfield Runoff Volume

FEH Data

Return Period (years)	2
Storm Duration (mins)	360
FEH Rainfall Version	2013
Site Location	GB 384872 399338 SJ 84872 99338
Data Type	Point
Areal Reduction Factor	1.00
Area (ha)	1.379
SAAR (mm)	905
CWI	122.047
SPR Host	47.000
URBEXT (1990)	0.0000

Results

Percentage Runoff (%)	46.26
Greenfield Runoff Volume (m³)	165.290

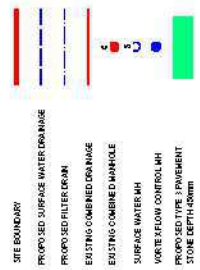
APPENDIX J: EXISTING DRAINAGE SITUATION

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GENERAL NOTES:

1. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL RELEVANT ARCHITECT'S AND ENGINEER'S DRAWINGS AND SPECIFICATIONS.
2. POINTS ON THIS DRAWING, ANY AMBIGUITIES, CONFLICTS AND ERRORS OR OMISSIONS SHALL BE BROUGHT TO THE ENGINEER'S ATTENTION IMMEDIATELY. ALL DIMENSIONS MUST BE CHECKED/VERIFIED ON SITE.
3. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS NOTED OTHERWISE.
4. FOR GENERAL NOTE REFER TO DRAWING.
5. ALL LEVELS IN MM UNLESS SPECIFIED OTHERWISE.
6. EXISTING STUDIES INFORMATION TO BE SUPPLIED BY OTHERS.
7. THE CONTRACTOR IS RESPONSIBLE FOR VERIFYING THE ACCURACY OF ALL INFORMATION PROVIDED AND FOR OBTAINING ADDITIONAL SURVEY FOR VALIDATION WHERE NECESSARY.
8. ALL WORKS TO BE CARRIED OUT AND APPROVED BY THE LOCAL AUTHORITY PRIOR TO COMMENCEMENT ON SITE.

KEY



PREPARED TO SUBMIT LAYOUT	11/01/19	AMG	RMZ
ISSUED FOR PLANNING	05/11/17	AMG	RMZ
DATE	05/11/17	AMG	RMZ
BY	AMG	RMZ	
CHECKED	AMG	RMZ	

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PRELIMINARY \$0

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MANCHESTER

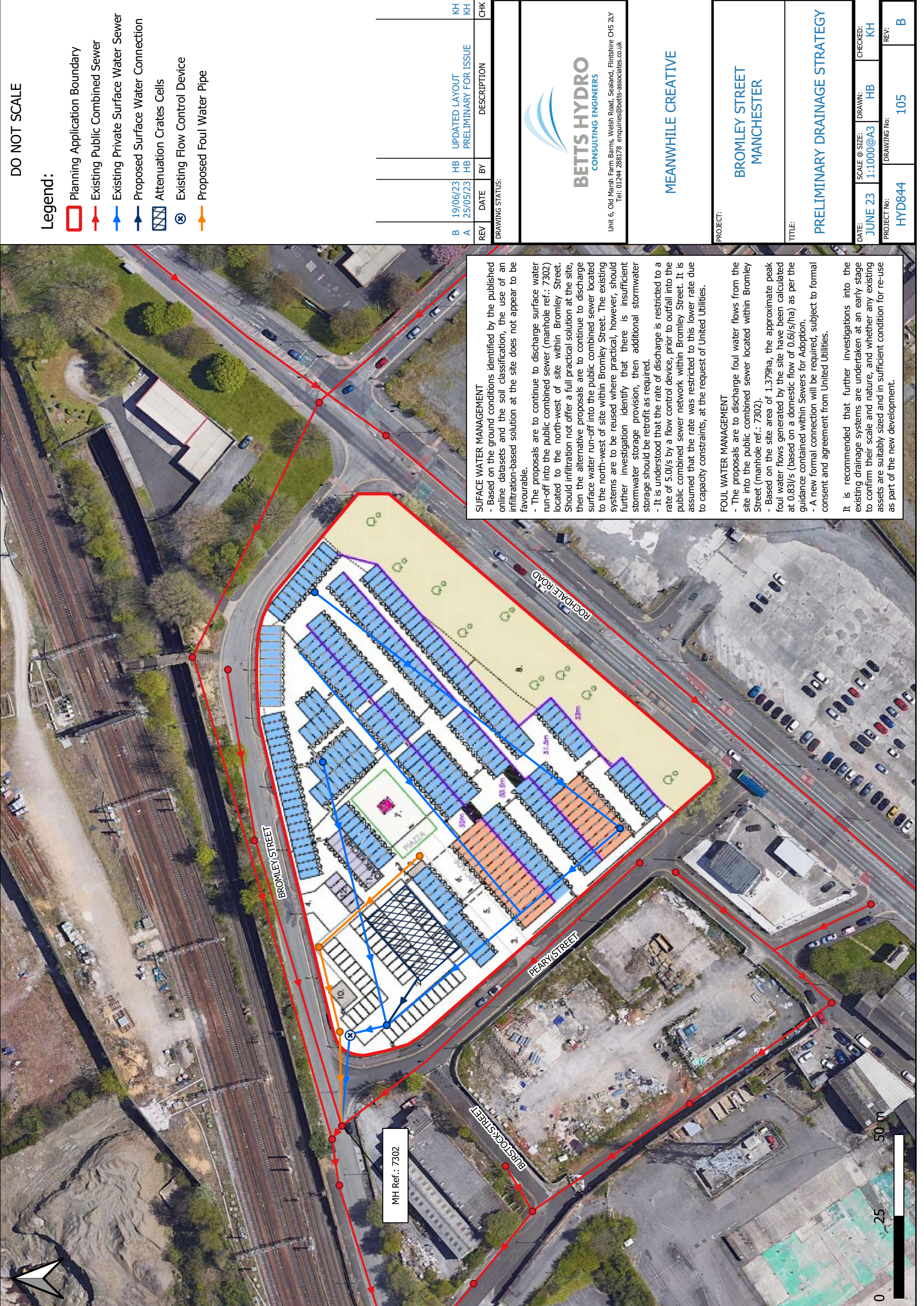
DRAINAGE STRATEGY
GENERAL ARRANGEMENT

DATE	10/01/19	DATE	10/01/19	DATE	10/01/19
BY	AMG	BY	AMG	BY	AMG
CHECKED	AMG	CHECKED	AMG	CHECKED	AMG
DATE	10/01/19	DATE	10/01/19	DATE	10/01/19



APPENDIX K: PRELIMINARY DRAINAGE STRATEGY

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DO NOT SCALE

Legend:

- Planning Application Boundary
- Existing Public Combined Sewer
- Existing Private Surface Water Sewer
- Proposed Surface Water Connection
- Attenuation Crates Cells
- Existing Flow Control Device
- Proposed Foul Water Pipe

REV	DATE	BY	DESCRIPTION	CHK
B	19/06/23	HB	UPDATED LAYOUT	KH
A	25/05/23	HB	PRELIMINARY FOR ISSUE	KH
DRAWING STATUS:				CHK



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CONSULTING ENGINEERS

Unit 6, Old Marsh Farm Barns, Welsh Road, Sealand, Flintshire CH15 2LY
Tel: 01244 288178 enquiries@betts-associates.co.uk

MEANWHILE CREATIVE

PROJECT:				BROMLEY STREET MANCHESTER	
TITLE:				PRELIMINARY DRAINAGE STRATEGY	
DATE:	JUNE 23	SCALE @ SIZE:	1:1000@A3	DRAWN:	HB
PROJECT No:	HYD844	DRAWING No:	105	CHECKED:	KH
				REV:	B

SURFACE WATER MANAGEMENT

- Based on the ground conditions identified by the published online datasets and the soil classification, the use of an infiltration-based solution at the site does not appear to be favourable.

- The proposals are to continue to discharge surface water run-off into the public combined sewer (manhole ref.: 7302) located to the north-west of site within Bromley Street. Should infiltration not offer a full practical solution at the site, then the alternative proposals are to continue to discharge surface water run-off into the public combined sewer located to the north-west of site within Bromley Street. The existing systems are to be reused where practical, however, should further investigation identify that there is insufficient stormwater storage provision, then additional stormwater storage should be retrofit as required.

- It is understood that the rate of discharge is restricted to a rate of 5.0l/s by a flow control device, prior to outfall into the public combined sewer network within Bromley Street. It is assumed that the rate was restricted to this lower rate due to capacity constraints, at the request of United Utilities.

FOUL WATER MANAGEMENT

- The proposals are to discharge foul water flows from the site into the public combined sewer located within Bromley Street (manhole ref.: 7302).

- Based on the site area of 1.379ha, the approximate peak foul water flows generated by the site have been calculated at 0.83l/s (based on a domestic flow of 0.6l/s/ha) as per the guidance contained within Sewers for Adoption.

- A new formal connection will be required, subject to formal consent and agreement from United Utilities.

It is recommended that further investigations into the existing drainage systems are undertaken at an early stage to confirm their scale and nature, and whether any existing assets are suitably sized and in sufficient condition for re-use as part of the new development.

APPENDIX L: STORMWATER STORAGE ESTIMATES

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QUICK STORAGE ESTIMATES

BROMLEY STREET, MANCHESTER

1 YEAR RETURN PERIOD STORM EVENT

Micro Drainage		Variables		
Variables Results Design Overview 2D Overview 3D Vt	FEH Rainfall	Cv (Summer)	0.750	
	Return Period (years)	2	Cv (Winter)	0.840
	Version	2013	Point	...
	Site	GB 384872 399338 SJ 84872 99338	Impervious Area (ha)	0.460
			Maximum Allowable Discharge (l/s)	5.0
			Infiltration Coefficient (m/hr)	0.00000
			Safety Factor	2.0
		Climate Change (%)	0	

Micro Drainage		Results
Variables	Global Variables require approximate storage of between 37 m³ and 69 m³. These values are estimates only and should not be used for design purposes.	

30 YEAR RETURN PERIOD STORM EVENT

Micro Drainage		Variables		
Variables Results Design Overview 2D Overview 3D Vt	FEH Rainfall	Cv (Summer)	0.750	
	Return Period (years)	30	Cv (Winter)	0.840
	Version	2013	Point	...
	Site	GB 384872 399338 SJ 84872 99338	Impervious Area (ha)	0.460
			Maximum Allowable Discharge (l/s)	5.0
			Infiltration Coefficient (m/hr)	0.00000
			Safety Factor	2.0
		Climate Change (%)	0	

Micro Drainage		Results
Variables	Global Variables require approximate storage of between 115 m³ and 174 m³. These values are estimates only and should not be used for design purposes.	

100 YEAR RETURN PERIOD STORM EVENT + 30% CLIMATE CHANGE

 Variables Results Design Overview 2D Overview 3D Vt	Variables	
	FEH Rainfall	
	Return Period (years)	100
	Version	2013
	Point	
	Site	GB 384872 399338 SJ 84872 99338
	Cv (Summer)	0.750
	Cv (Winter)	0.840
	Impermeable Area (ha)	0.460
	Maximum Allowable Discharge (l/s)	5.0
	Infiltration Coefficient (m/hr)	0.00000
	Safety Factor	2.0
	Climate Change (%)	30

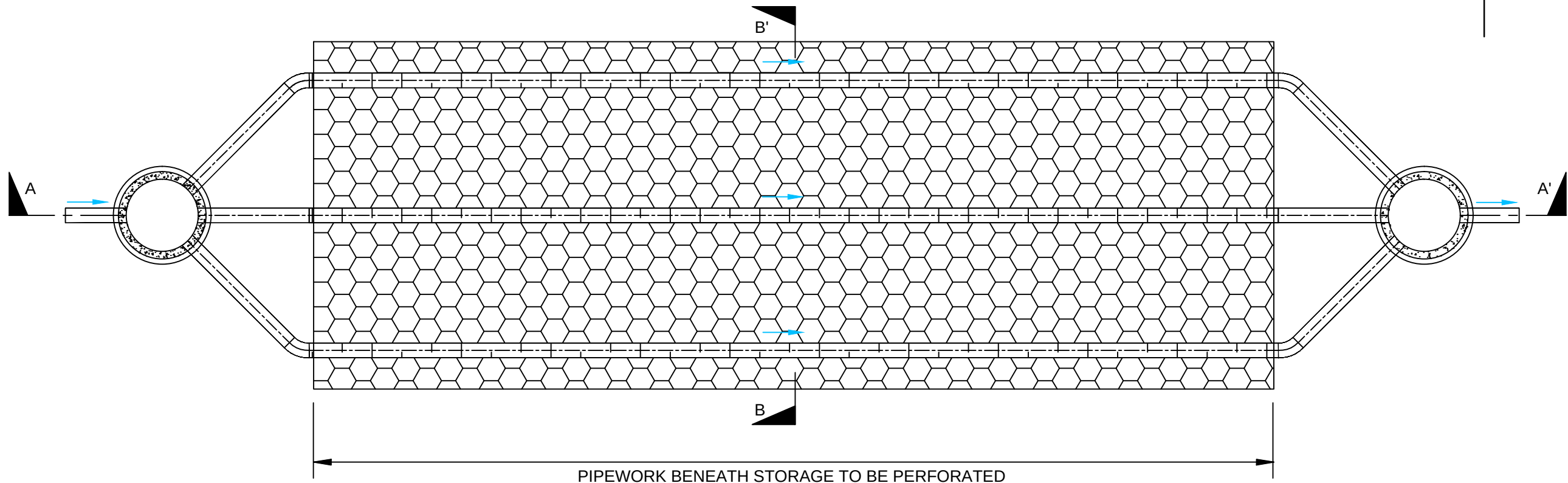
 Variables	Results
	Global Variables require approximate storage of between 251 m³ and 349 m³. These values are estimates only and should not be used for design purposes.

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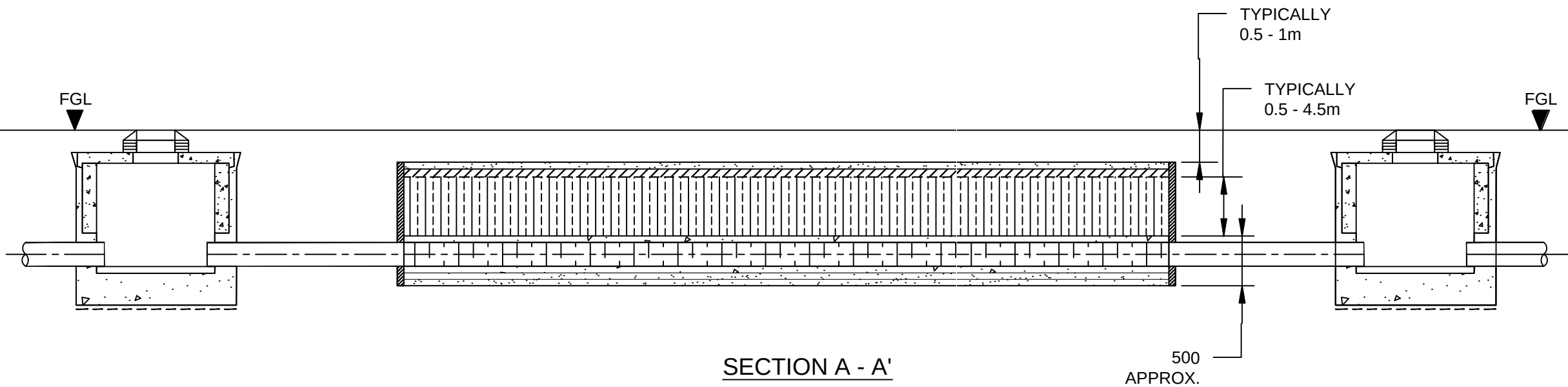
APPENDIX M: TYPICAL SUDS DETAILS

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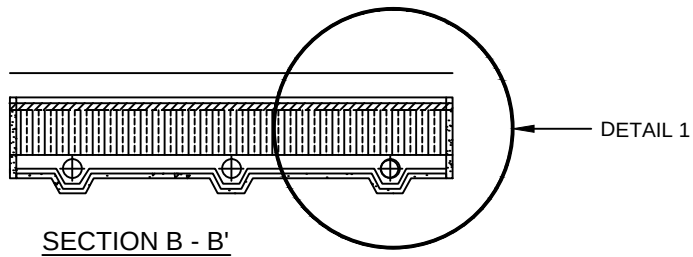


PLAN

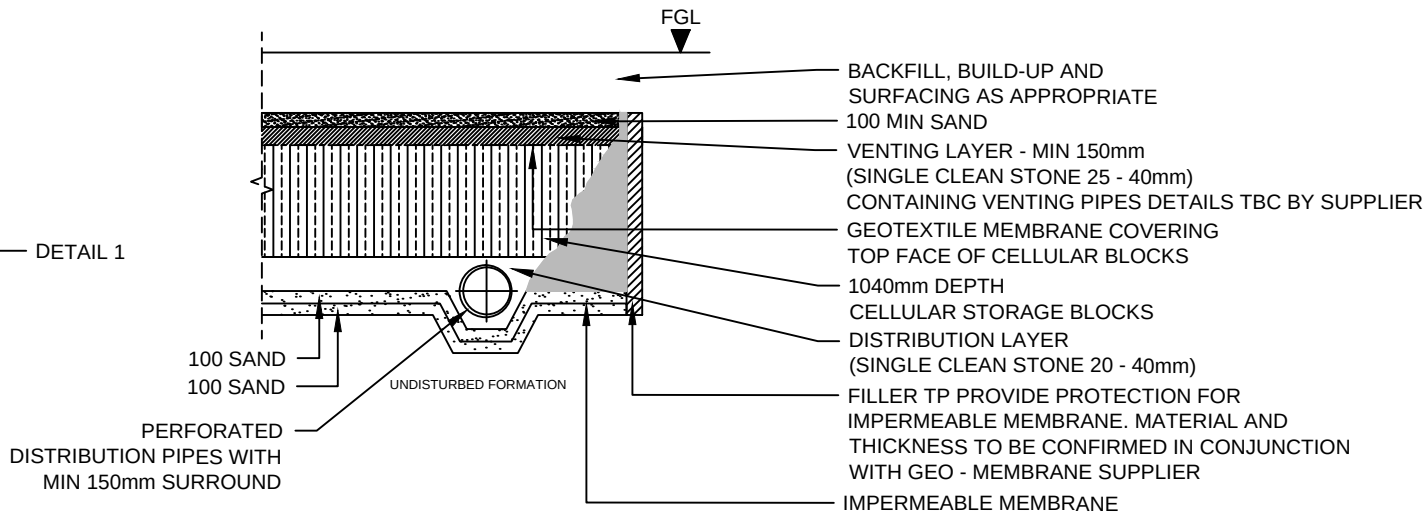


SECTION A - A'

ALL DIMENSIONS AND DEPTHS DEPENDENT ON REQUIRED VOLUME AND LOCAL GROUND CONDITIONS

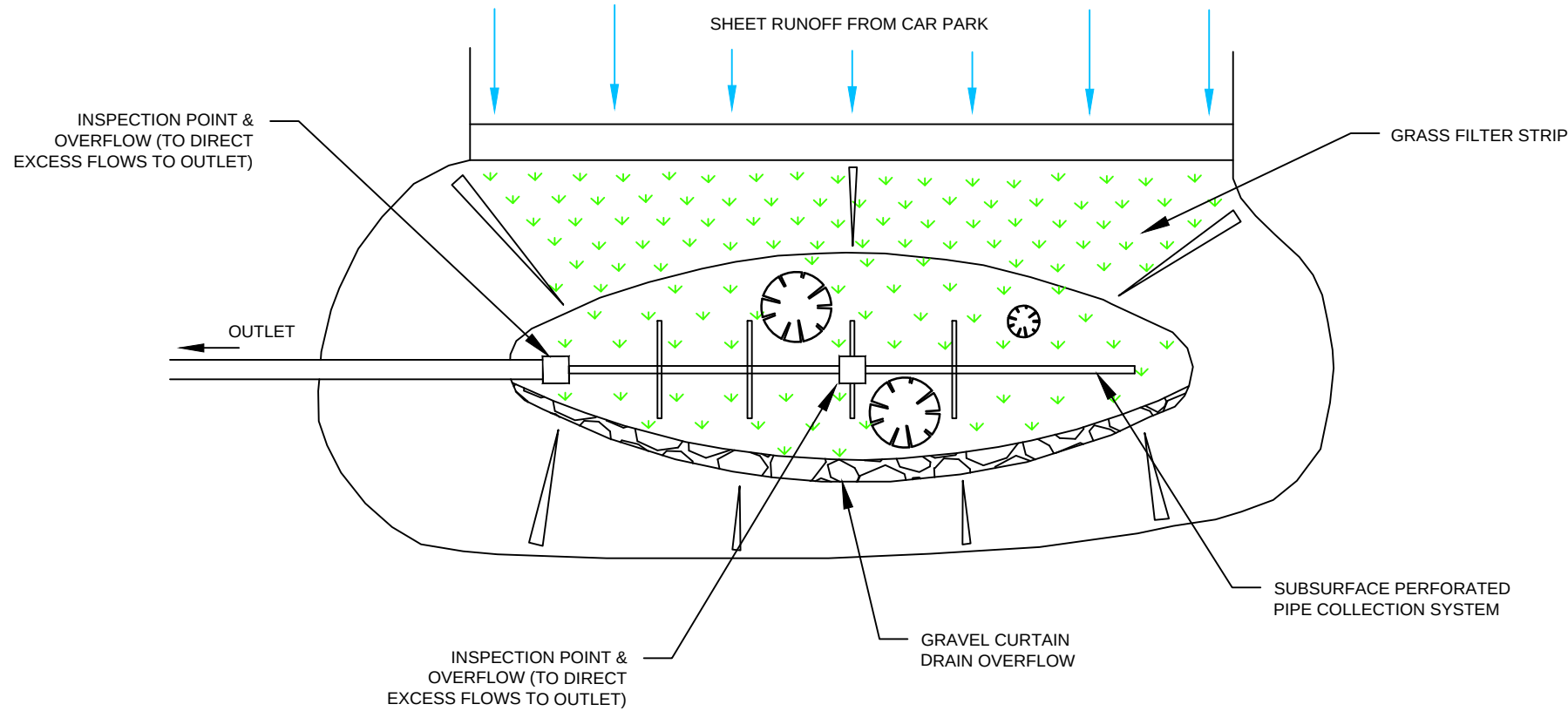


SECTION B - B'

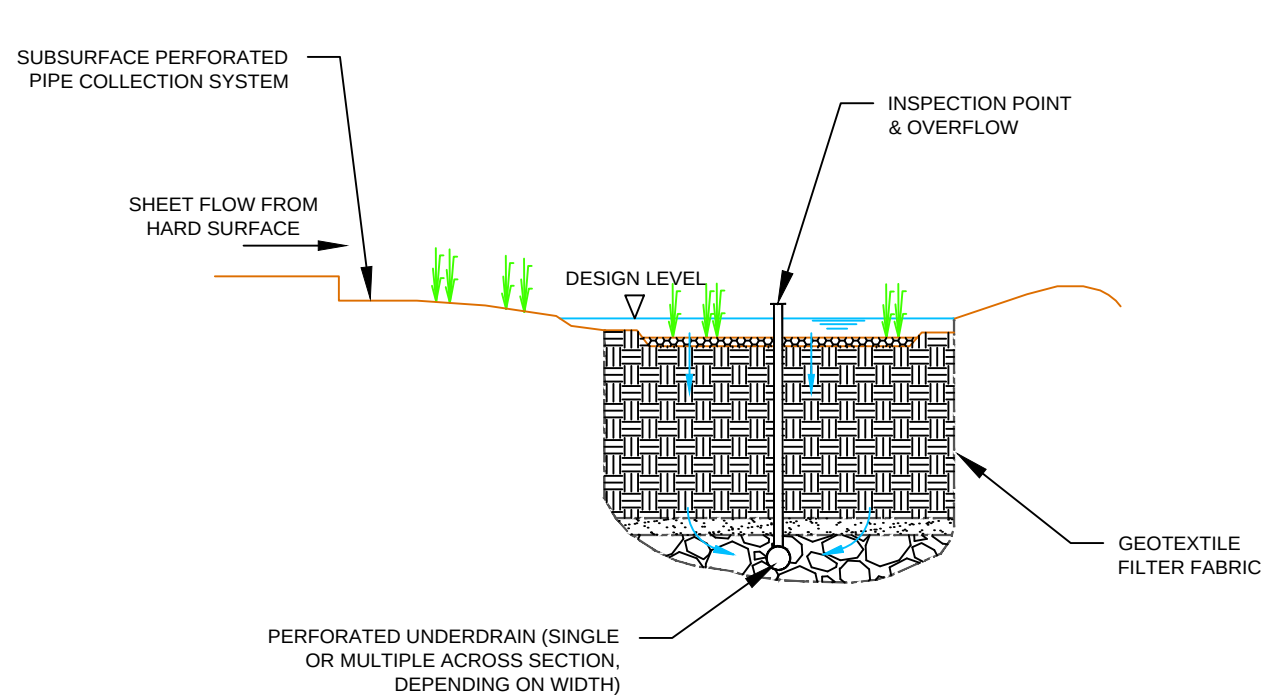


DETAIL 1

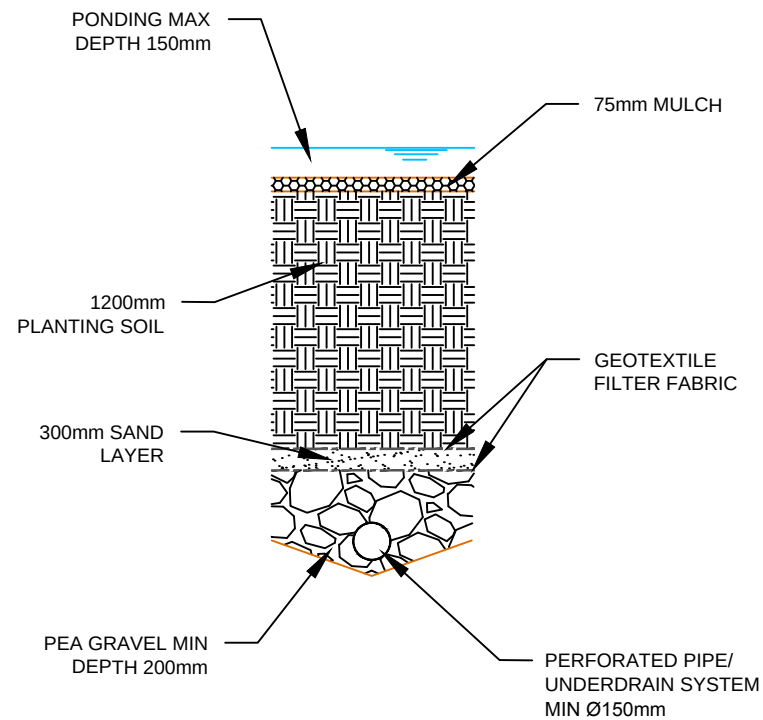
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DRAWING STATUS: PRELIMINARY				
				
PROJECT: TYPICAL SUDS DETAIL				
TITLE: CELLULAR STORAGE				
DATE: SEP 2014	SCALE @ SIZE: @ A3	DRAWN: CP	CHECKED: RDN	
PROJECT No: BETTS	DRAWING No: 113	REV: A		



PLAN VIEW



PROFILE



TYPICAL SECTION

REV	DATE	BY	DESCRIPTION	CHK

DRAWING STATUS: PRELIMINARY



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PROJECT:

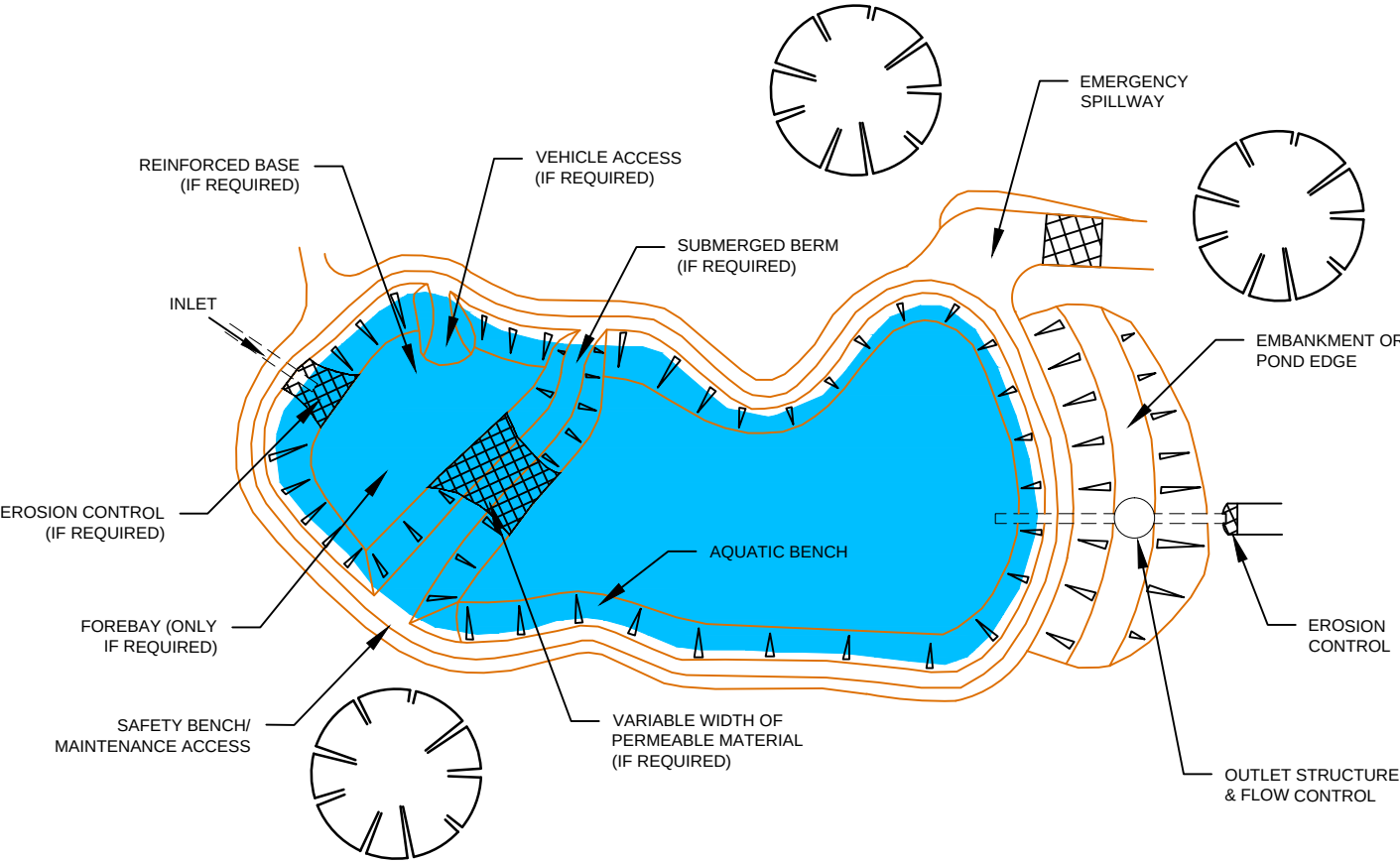
TYPICAL SUDS DETAIL

TITLE:

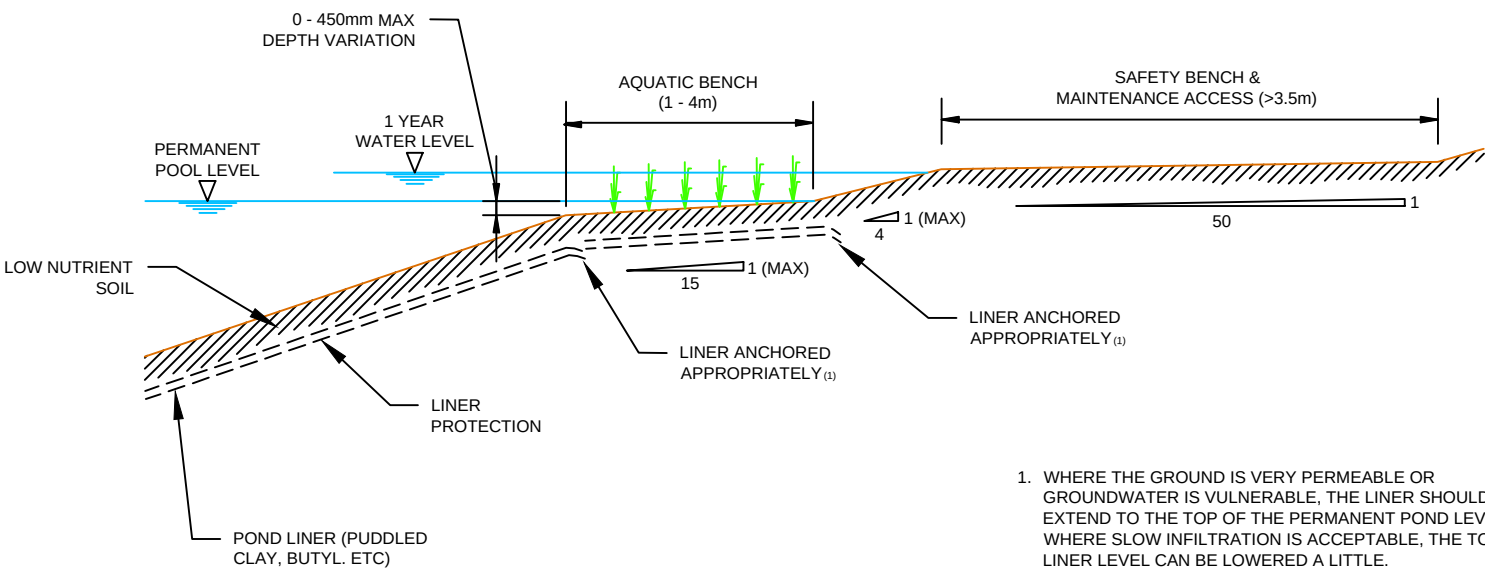
BIORETENTION APPLICATIONS

DATE: SEP 2014	SCALE @ SIZE: @ A3	DRAWN: CP	CHECKED: RDN
PROJECT No: BETTS	DRAWING No: 112	REV: A	

DO NOT SCALE

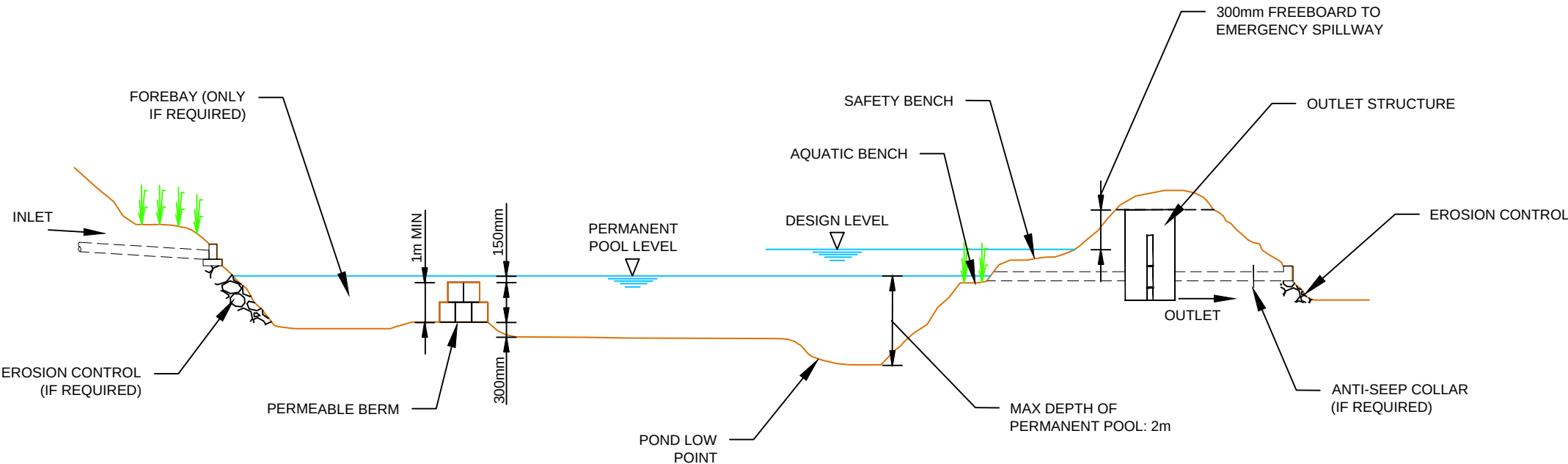


PLAN VIEW



TYPICAL POND EDGE GEOMETRY

1. WHERE THE GROUND IS VERY PERMEABLE OR GROUNDWATER IS VULNERABLE, THE LINER SHOULD EXTEND TO THE TOP OF THE PERMANENT POND LEVEL. WHERE SLOW INFILTRATION IS ACCEPTABLE, THE TOP LINER LEVEL CAN BE LOWERED A LITTLE.



PROFILE

REV	DATE	BY	DESCRIPTION	CHK

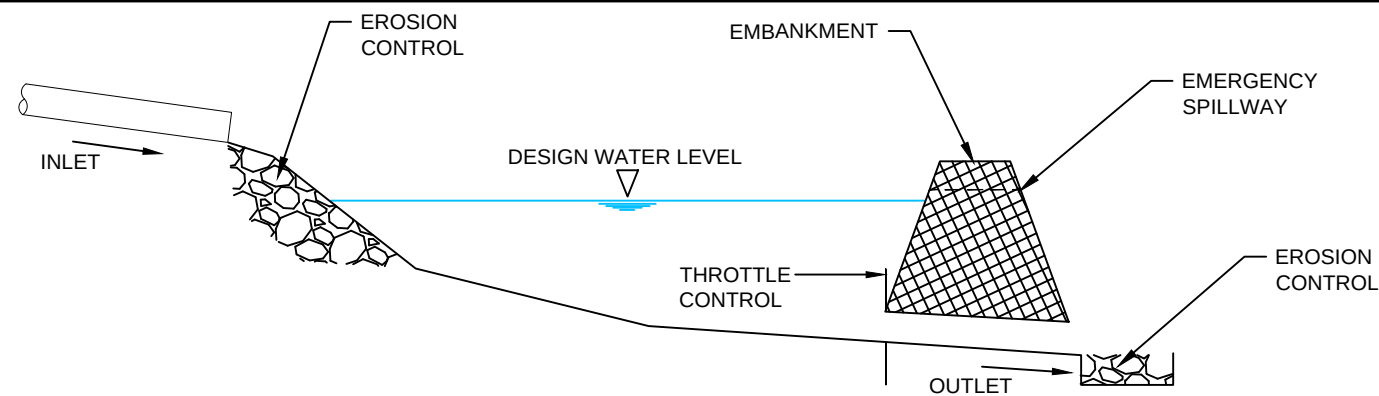
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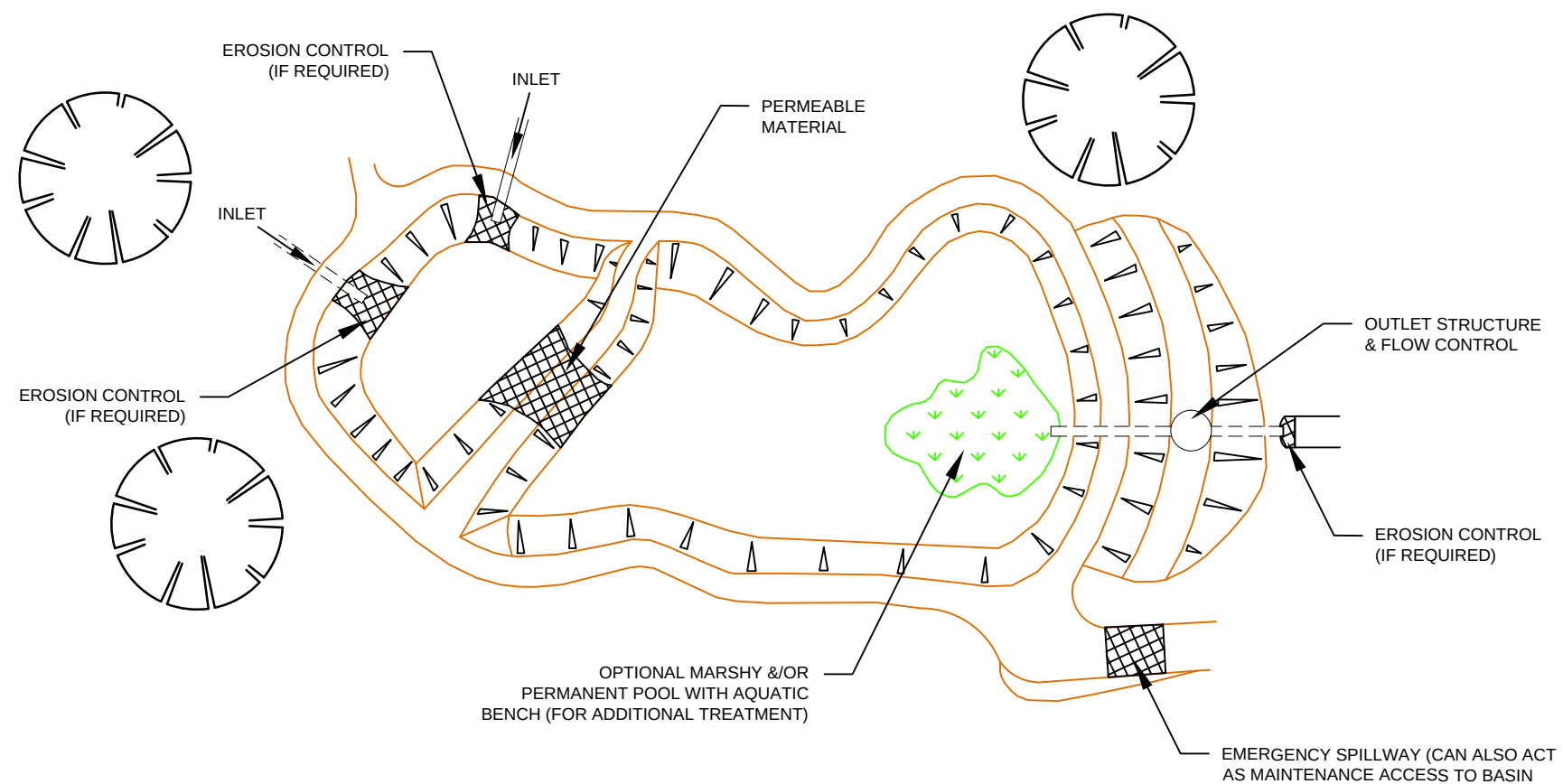
PROJECT:
TYPICAL SUDS DETAIL

TITLE:
WET PONDS

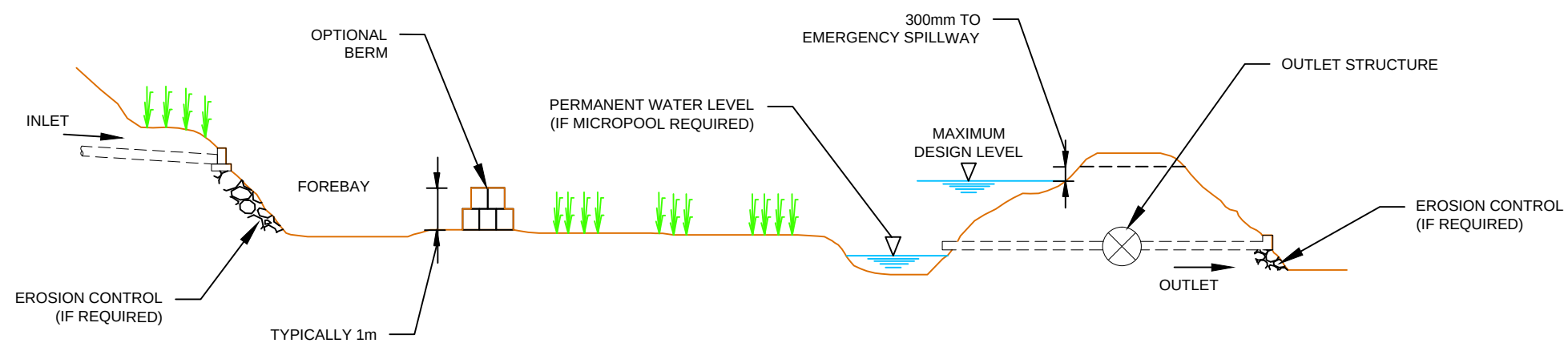
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PROJECT No: BETTS	DRAWING No: 111	REV: A	



**SCHEMATIC OF DETENTION
BASIN PROFILE**



PLAN VIEW



ELEVATION

DO NOT SCALE

REV	DATE	BY	DESCRIPTION	CHK

DRAWING STATUS: **PRELIMINARY**

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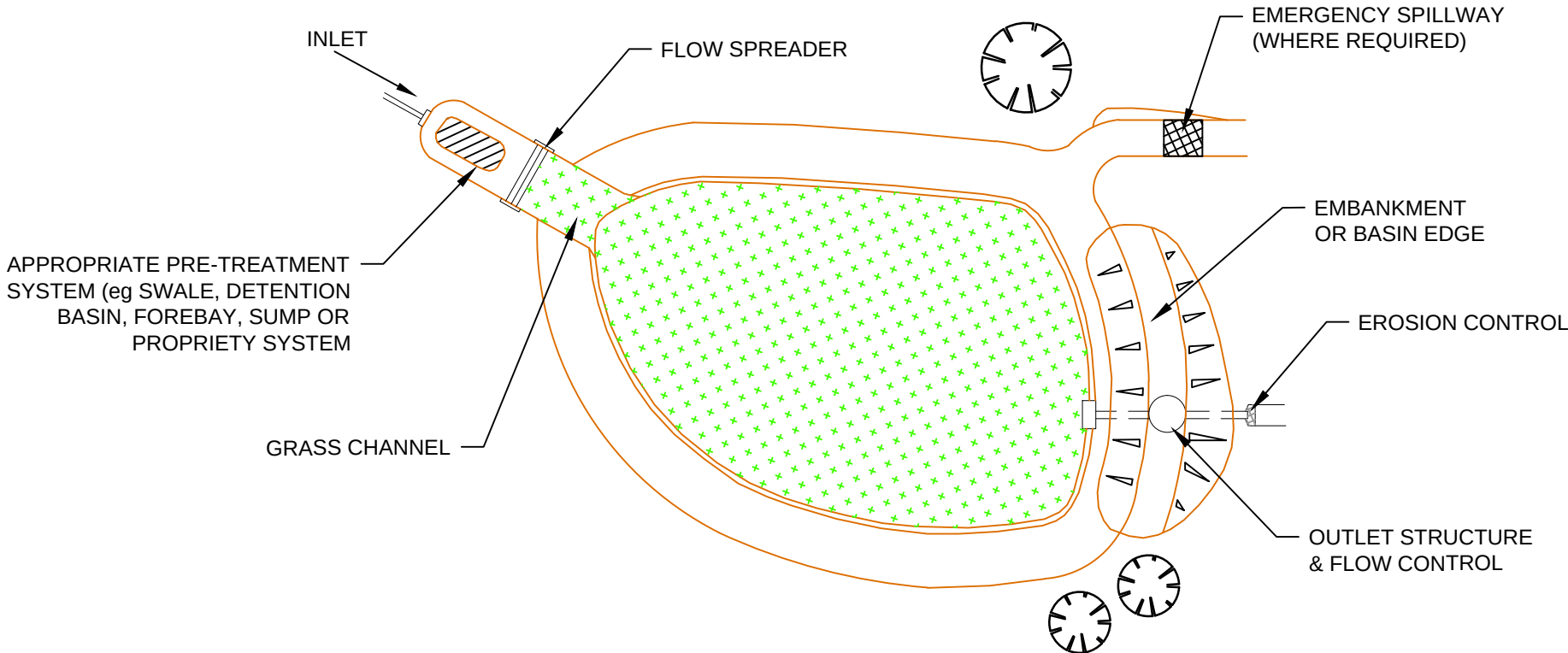
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TYPICAL SUDS DETAIL

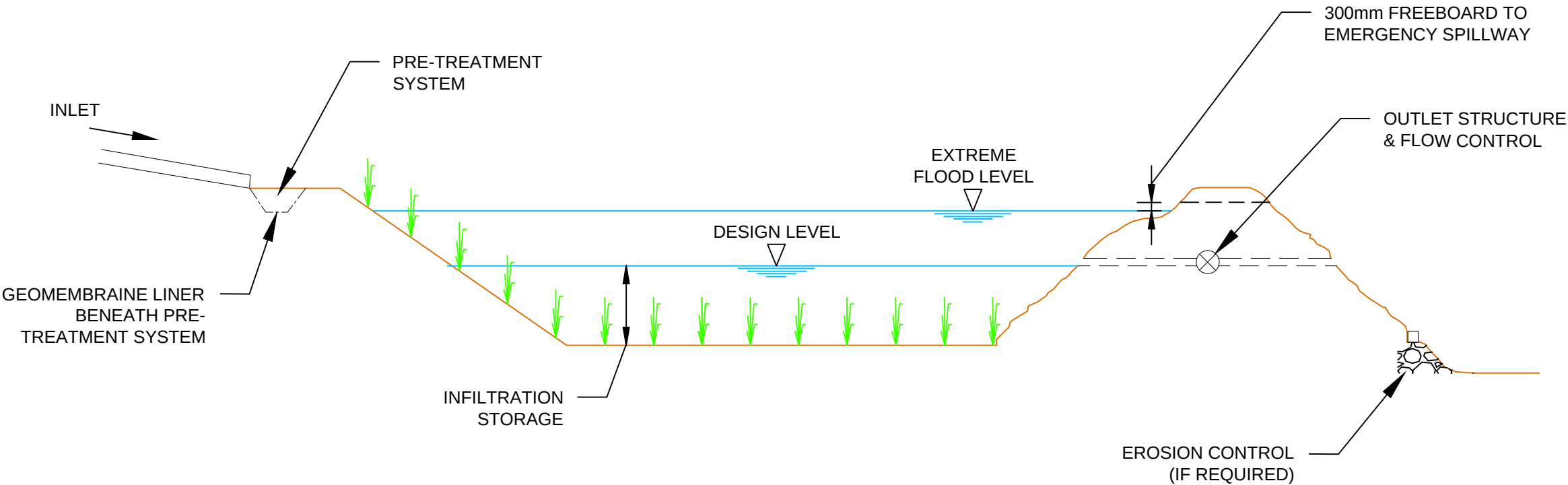
TITLE:

DETENTION BASINS

DATE: SEP 2014	SCALE @ SIZE: @ A3	DRAWN: CP	CHECKED: RDN
PROJECT No: BETTS	DRAWING No: 110	REV: A	



PLAN VIEW



ELEVATION

REV	DATE	BY	DESCRIPTION	CHK

DRAWING STATUS: PRELIMINARY

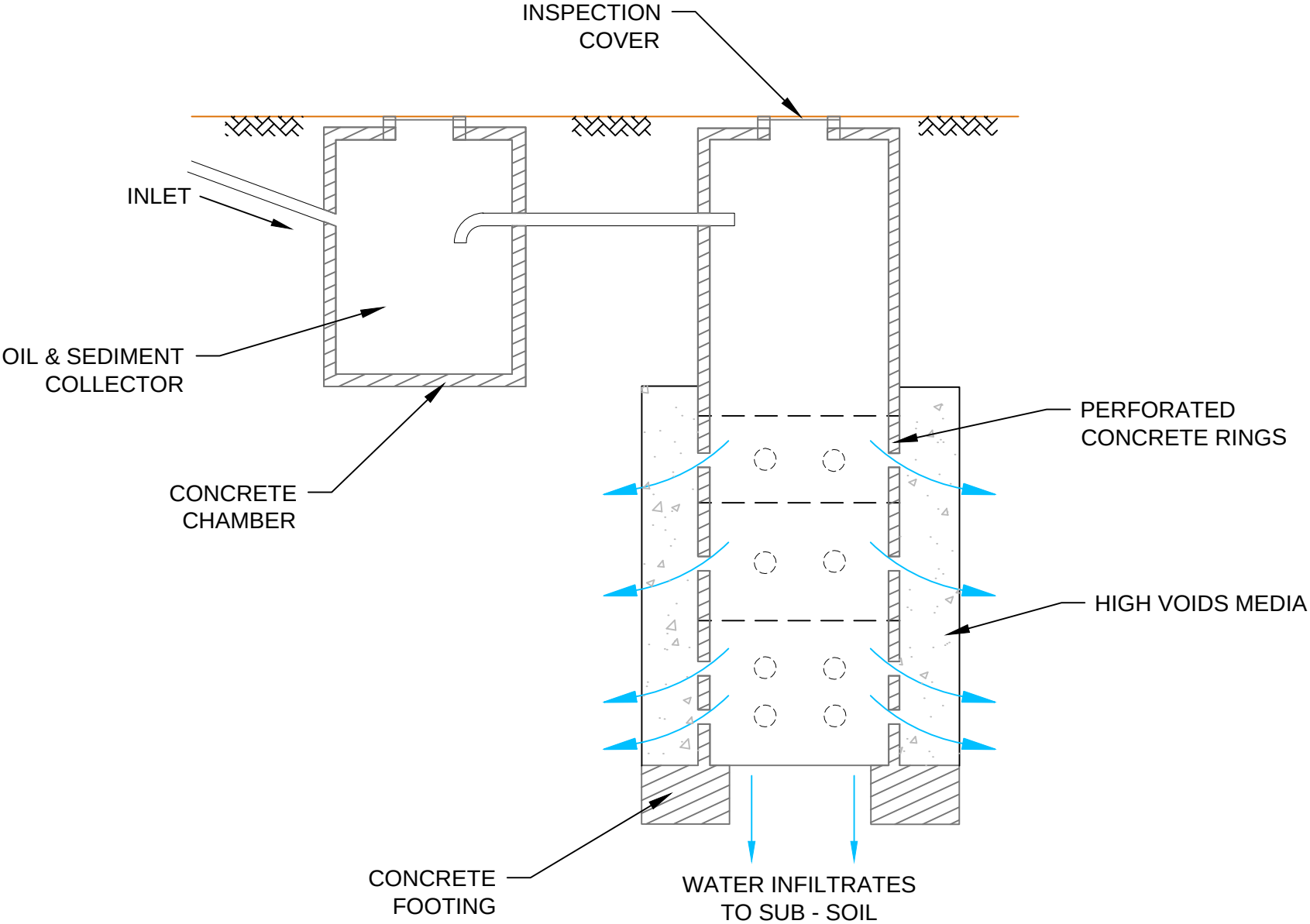


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PROJECT:
TYPICAL SUDS DETAIL

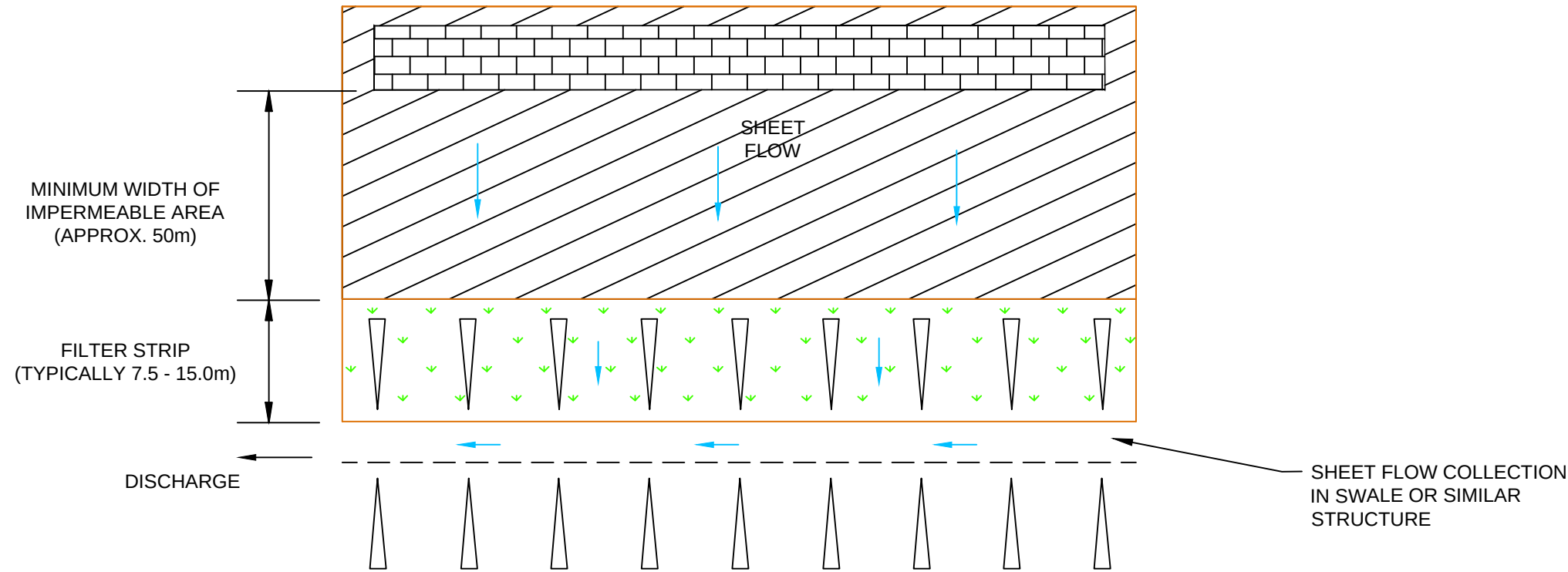
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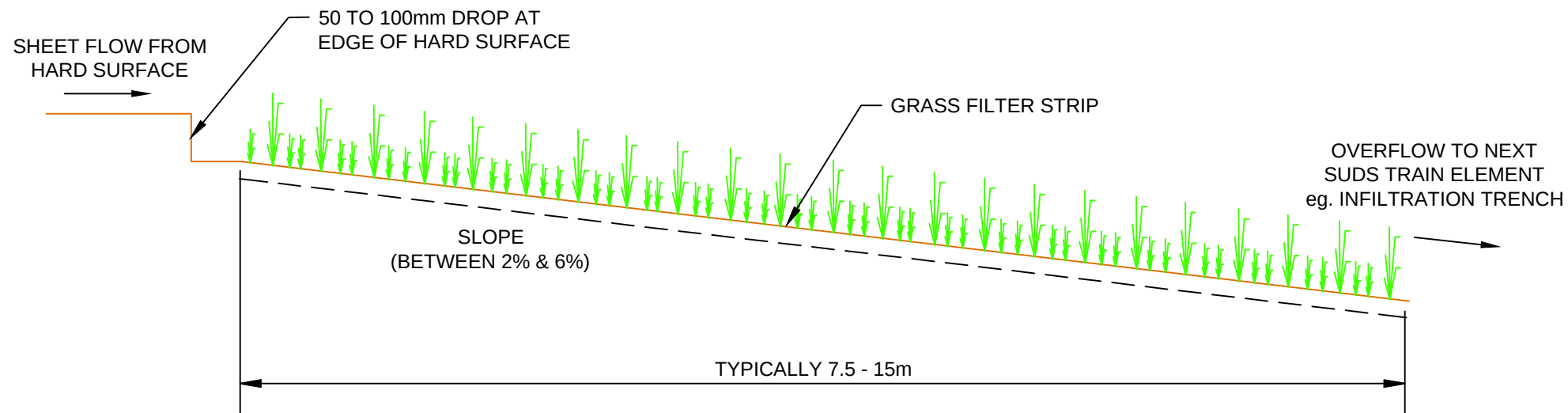


SOAKAWAY DETAILS
(INCLUDING PRE-TREATMENT DEVICE)

REV	DATE	BY	DESCRIPTION	CHK
DRAWING STATUS: PRELIMINARY				
 BETTS ASSOCIATES CIVIL AND STRUCTURAL ENGINEERS Unit 6, Old Marsh Farm Barns, Welsh Road, Sealand, Flintshire CH5 2LY Tel: 01244 288178 Fax: 01244 288516 enquiries@betts-associates.co.uk				
PROJECT:				
TYPICAL SUDS DETAIL				
TITLE:				
SOAKAWAYS				
DATE: SEP 2014	SCALE @ SIZE: @ A3	DRAWN: CP	CHECKED: RDN	
PROJECT No: BETTS	DRAWING No: 108	REV: A		



PLAN



ELEVATION

REV	DATE	BY	DESCRIPTION	CHK

DRAWING STATUS: PRELIMINARY



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PROJECT:

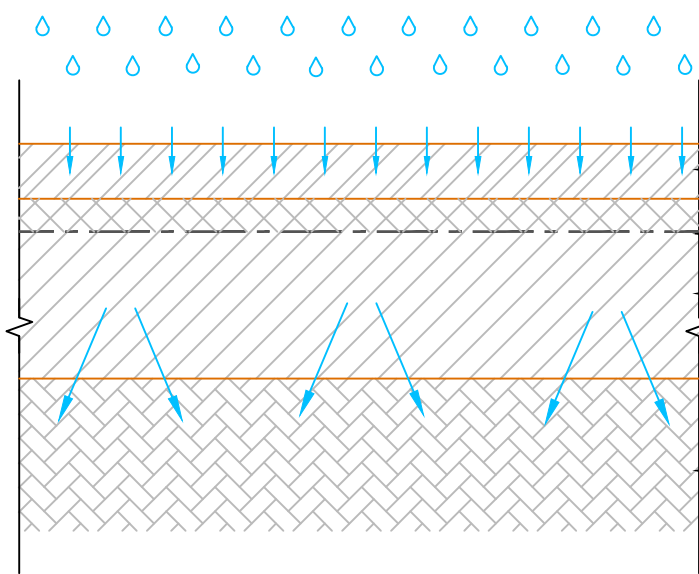
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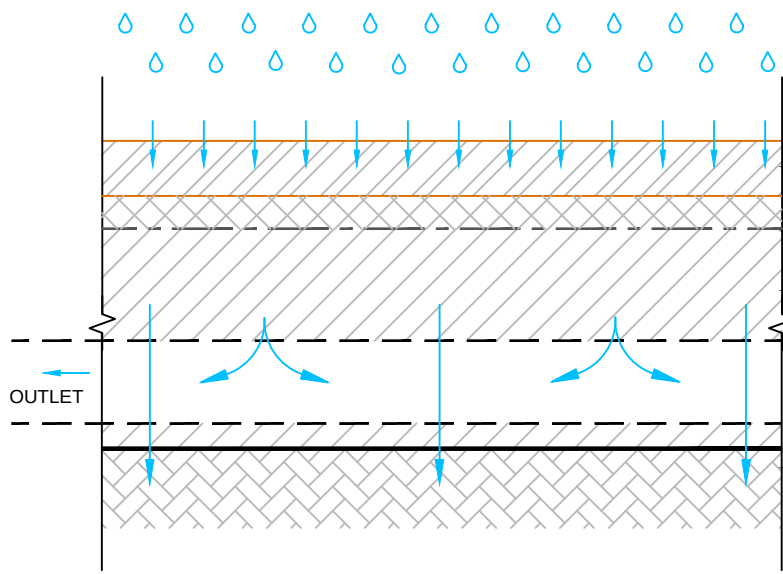
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PROJECT No: BETTS	DRAWING No: 107	REV: A	

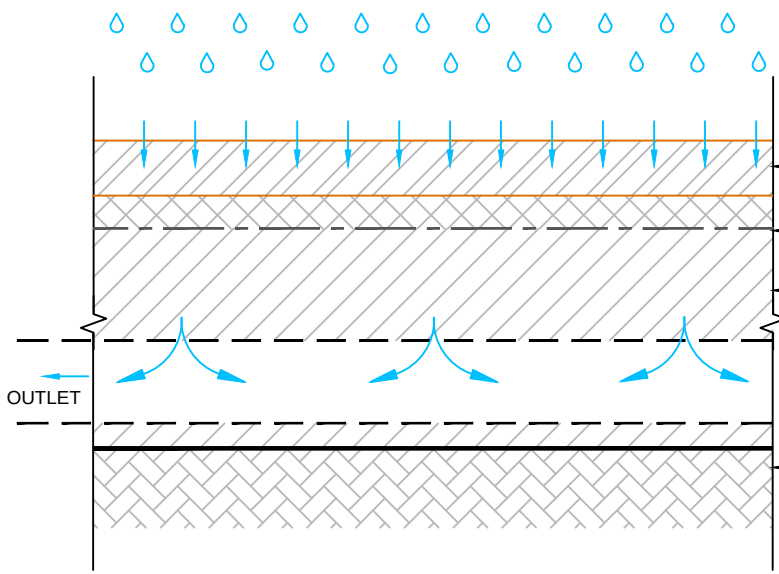
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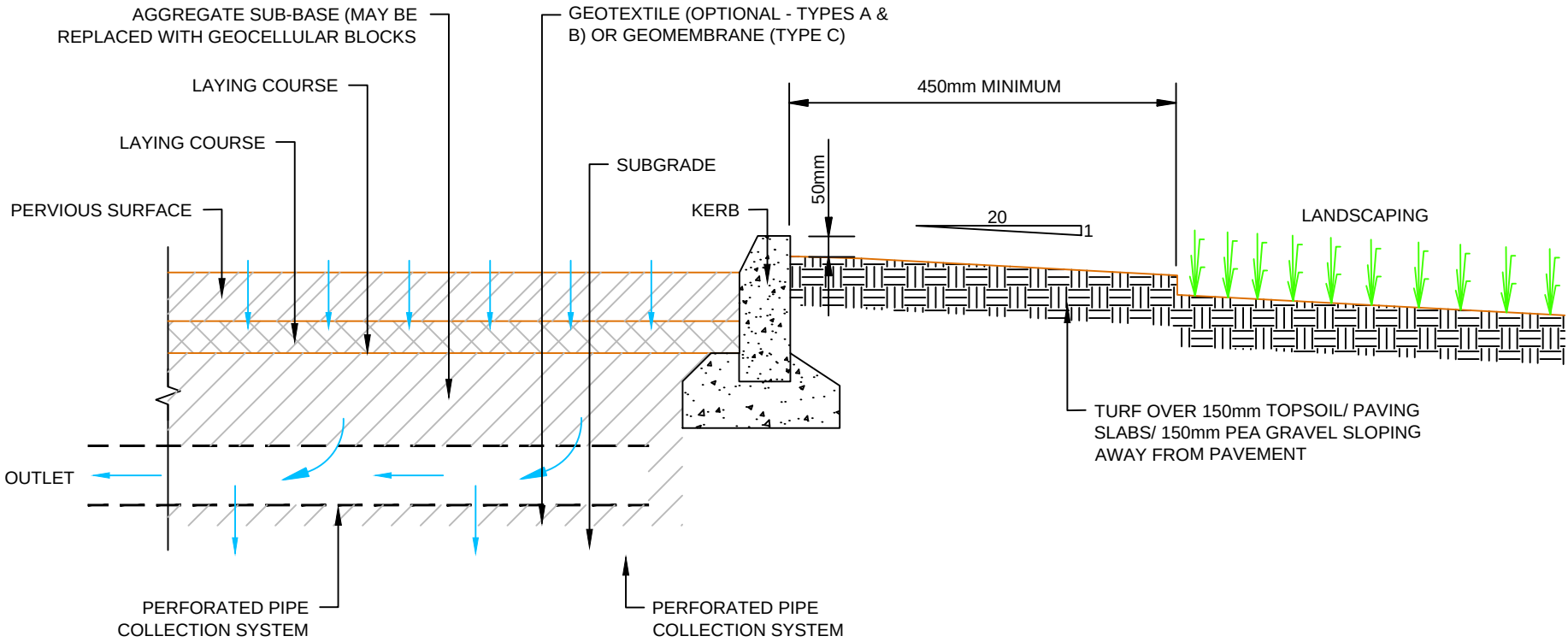
TYPE A: TOTAL INFILTRATION



TYPE B: PARTIAL INFILTRATION



TYPE C: NO INFILTRATION



LANDSCAPING DETAIL

REV	DATE	BY	DESCRIPTION	CHK

DRAWING STATUS: PRELIMINARY

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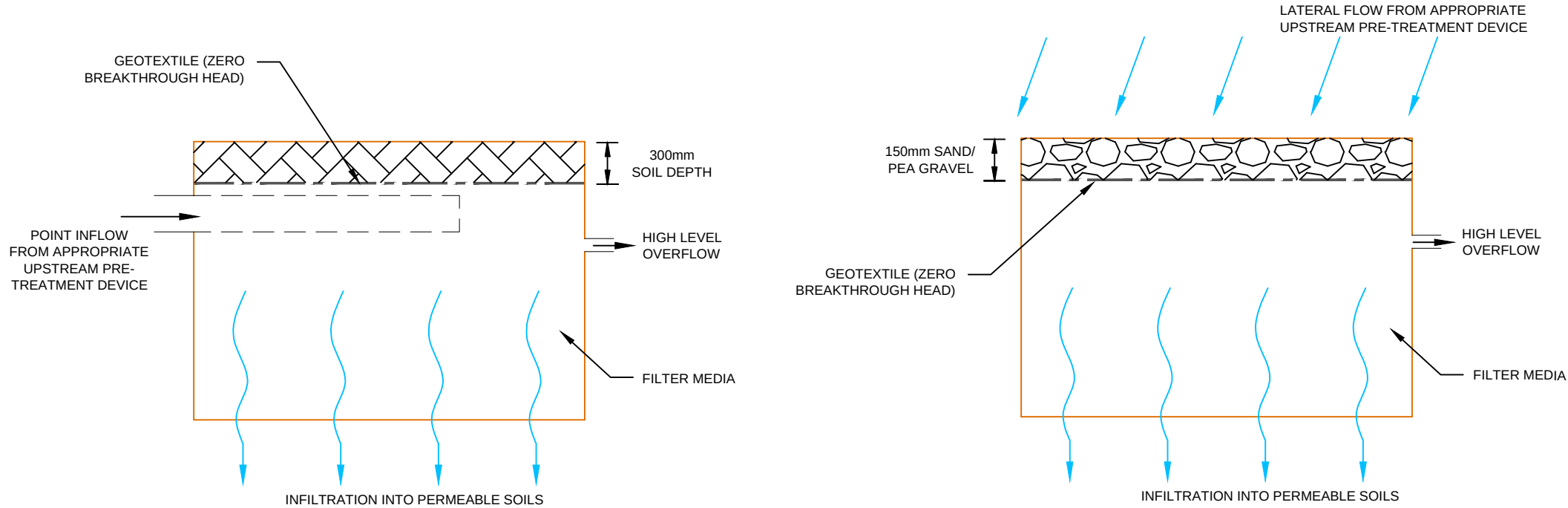
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TYPICAL SUDS DETAIL

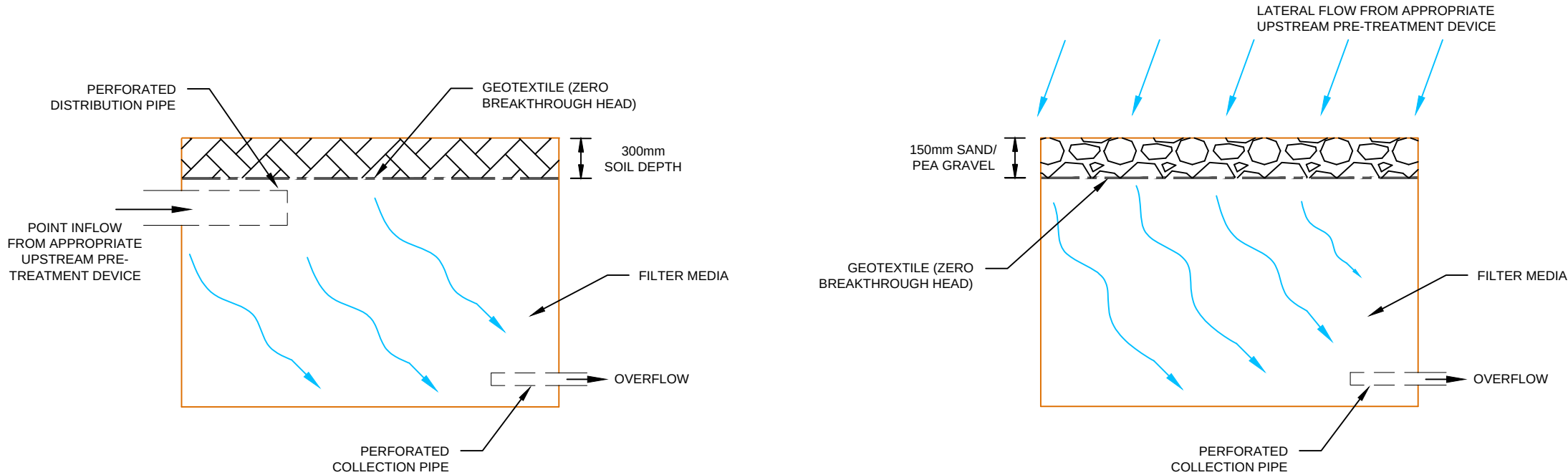
TITLE:

PERVIOUS PAVEMENTS

DATE: SEP 2014	SCALE @ SIZE: @ A3	DRAWN: CP	CHECKED: RDN
PROJECT No: BETTS	DRAWING No: 105	REV: A	



INFILTRATION TRENCH SCHEMATICS



FILTER TRENCH SCHEMATICS

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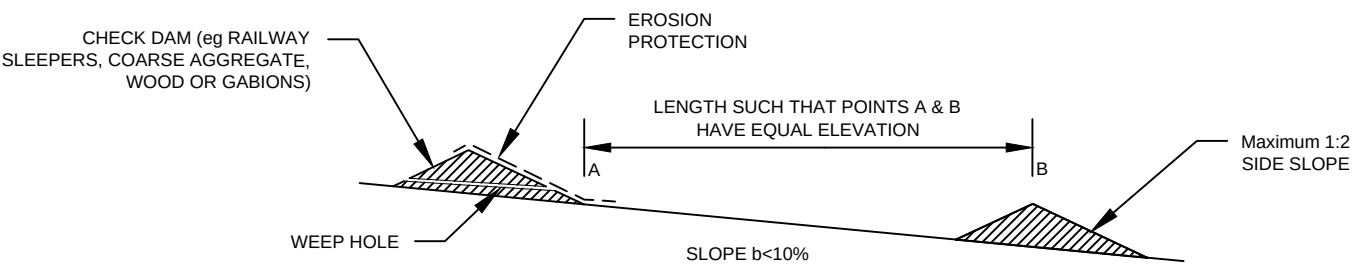
DRAWING STATUS: PRELIMINARY

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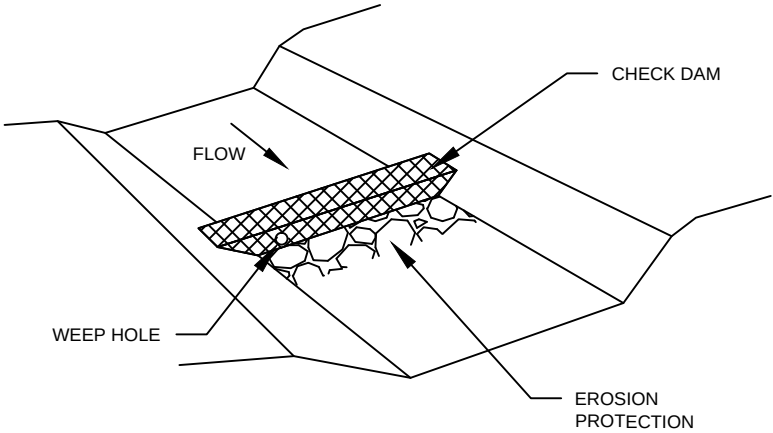
PROJECT:
TYPICAL SUDS DETAIL

TITLE:
TRENCHES

DATE: SEP 2014	SCALE @ SIZE: @ A3	DRAWN: CP	CHECKED: RDN
PROJECT No: BETTS	DRAWING No: 105	REV: A	

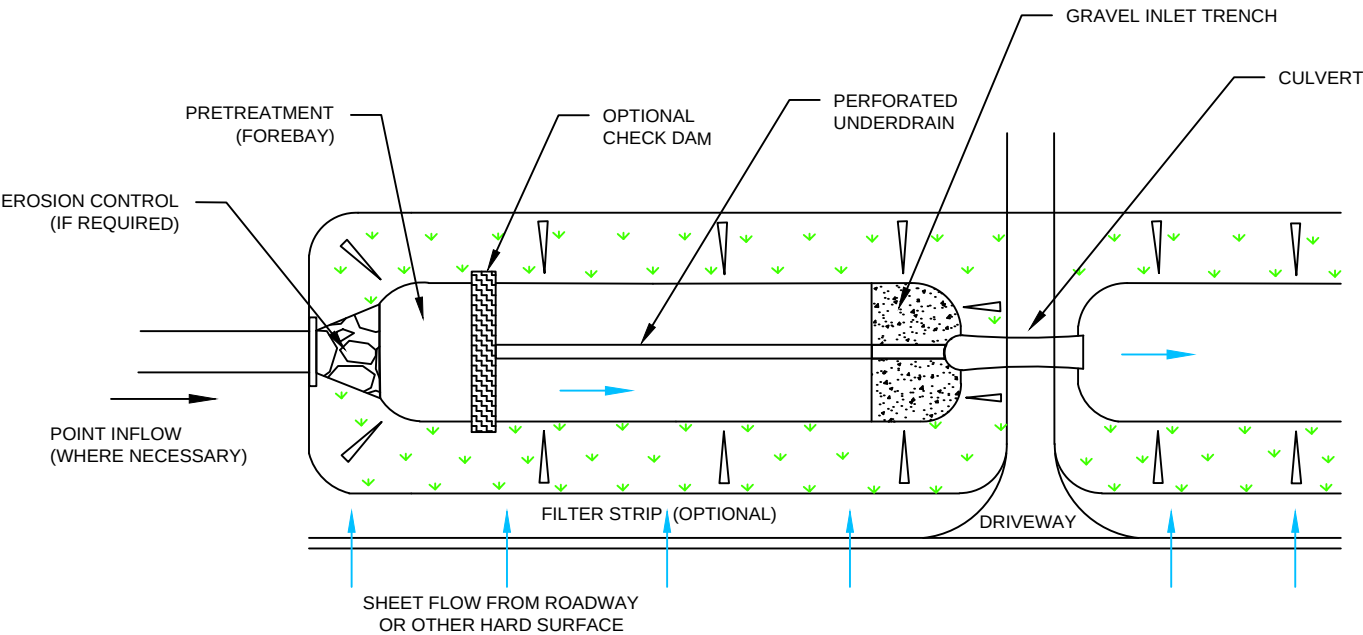


ELEVATION



SCHEMATIC

CHECK DAM



ENHANCED DRY SWALE

REV	DATE	BY	DESCRIPTION	CHK

DRAWING STATUS: PRELIMINARY



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PROJECT:

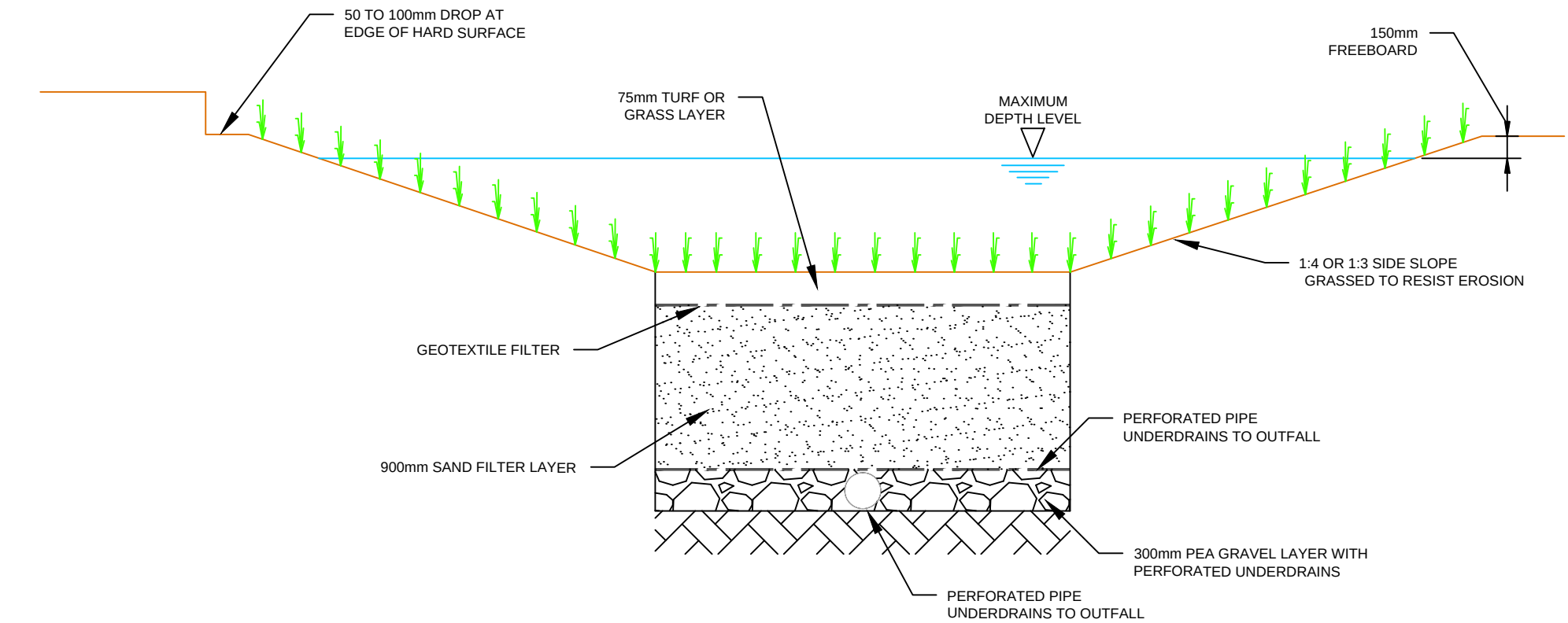
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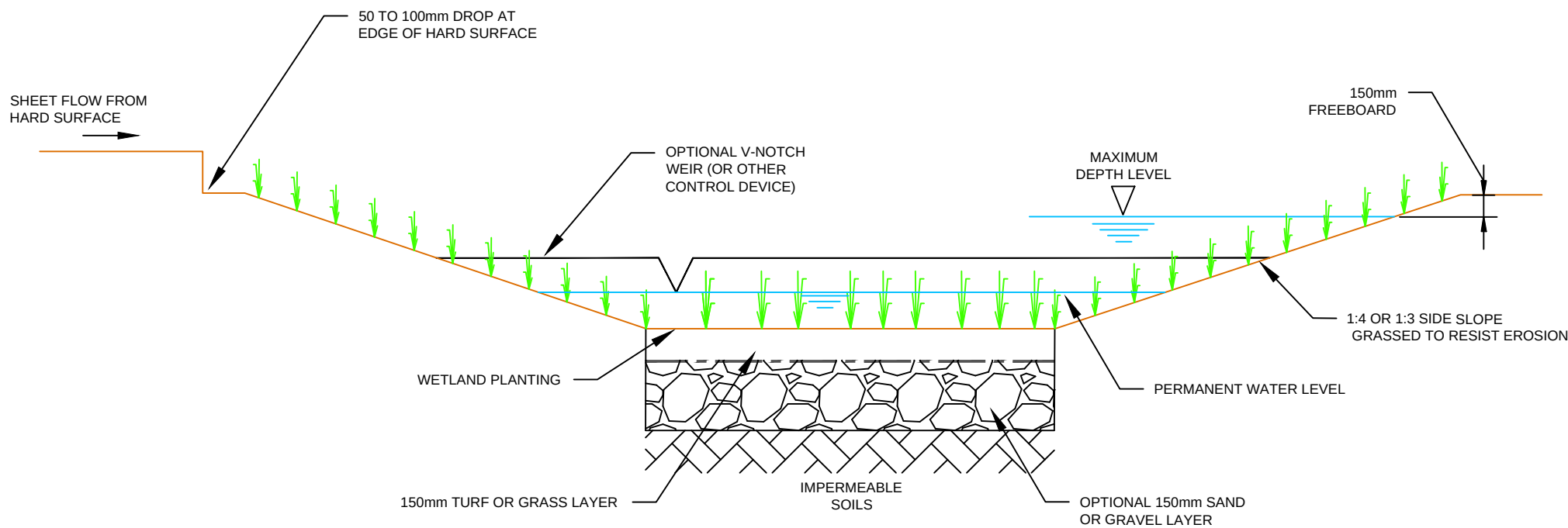
SWALES
(2 of 2)

DATE: SEP 2014	SCALE @ SIZE: @ A3	DRAWN: CP	CHECKED: RDN
PROJECT No: BETTS	DRAWING No: 104	REV: A	

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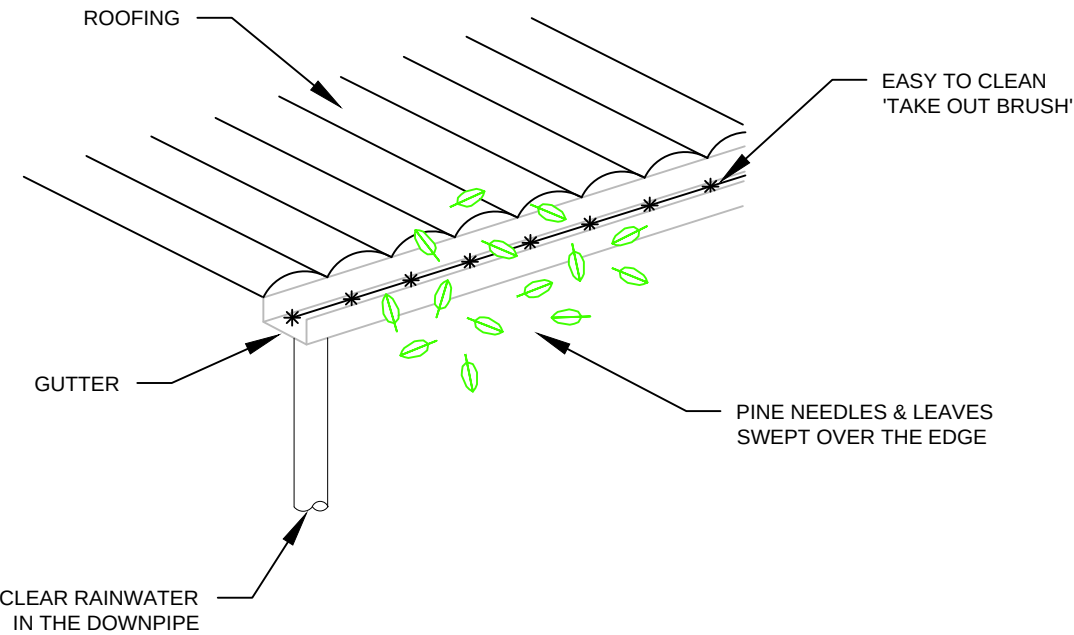


DRY SWALE

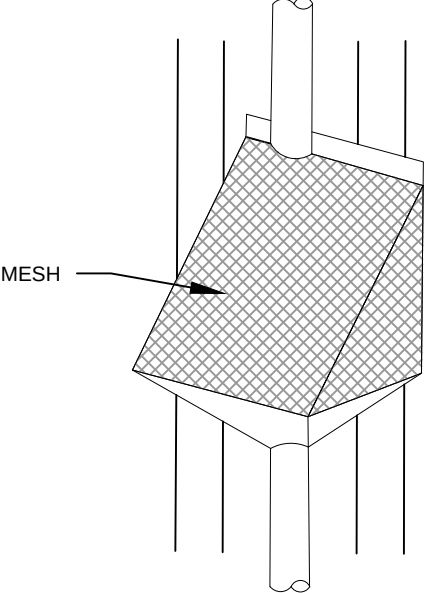


WET SWALE

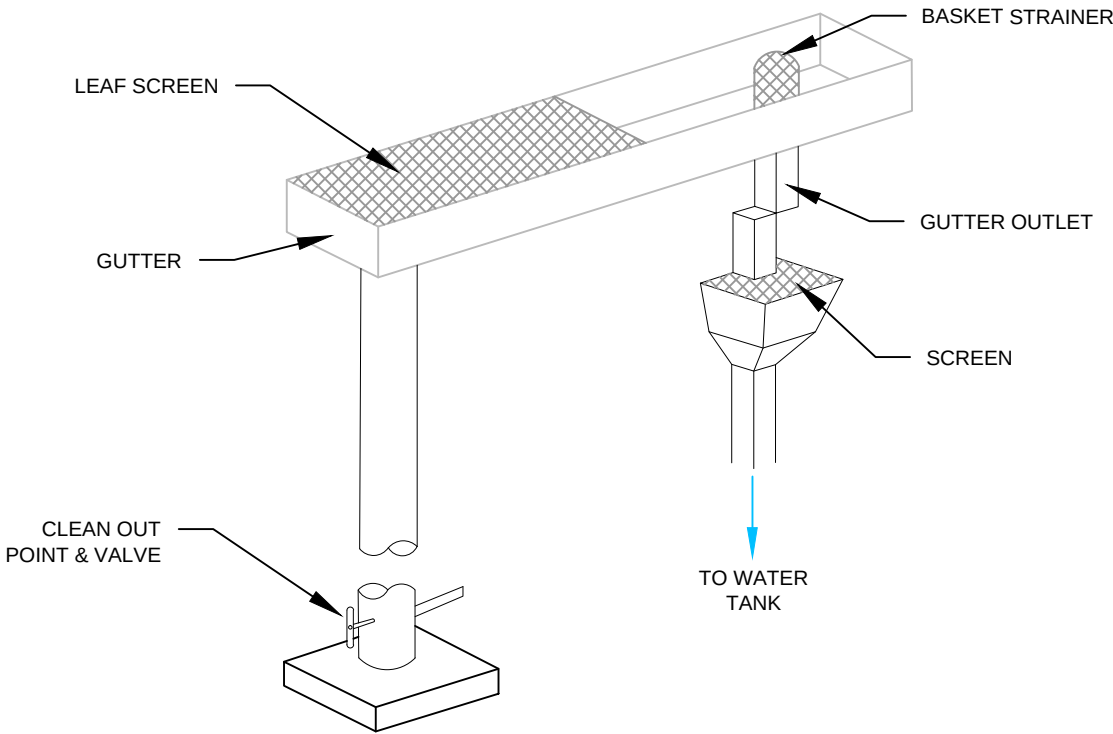
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 BETTS ASSOCIATES CIVIL AND STRUCTURAL ENGINEERS Unit 6, Old Marsh Farm Barns, Welsh Road, Sealand, Flintshire CH5 2LY Tel: 01244 288178 Fax: 01244 288516 enquiries@betts-associates.co.uk				
PROJECT:				
TYPICAL SUDS DETAIL				
TITLE:				
SWALES (1 of 2)				
DATE: SEP 2014	SCALE @ SIZE: @ A3	DRAWN: CP	CHECKED: RDN	
PROJECT No: BETTS	DRAWING No: 103	REV: A		



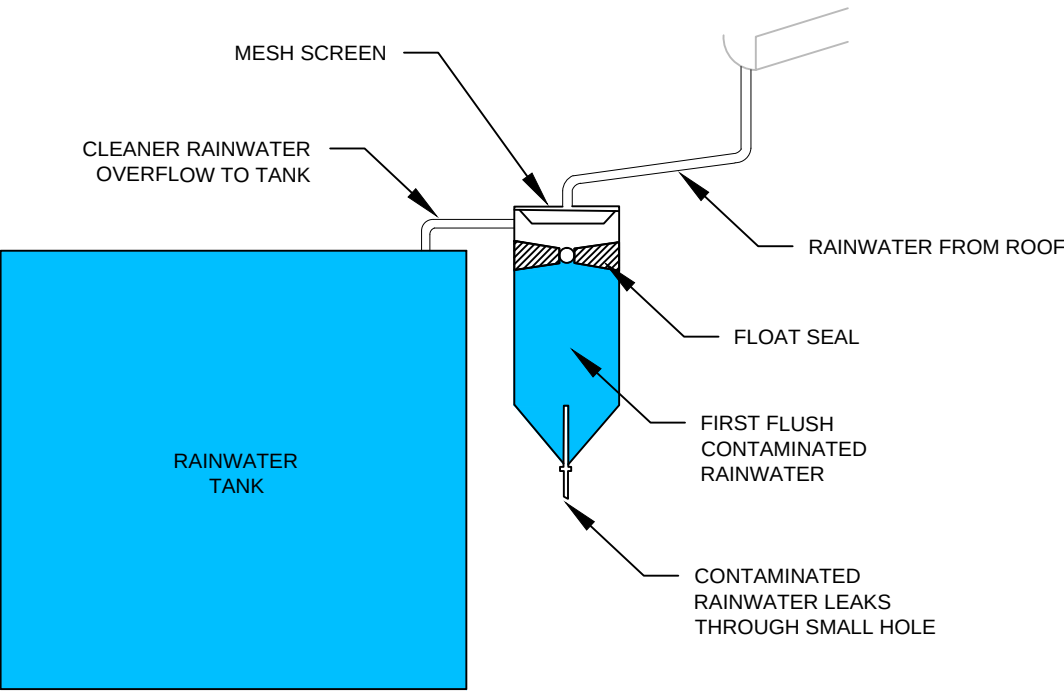
RAINWATER HARVESTING



RAINWATER HARVESTING

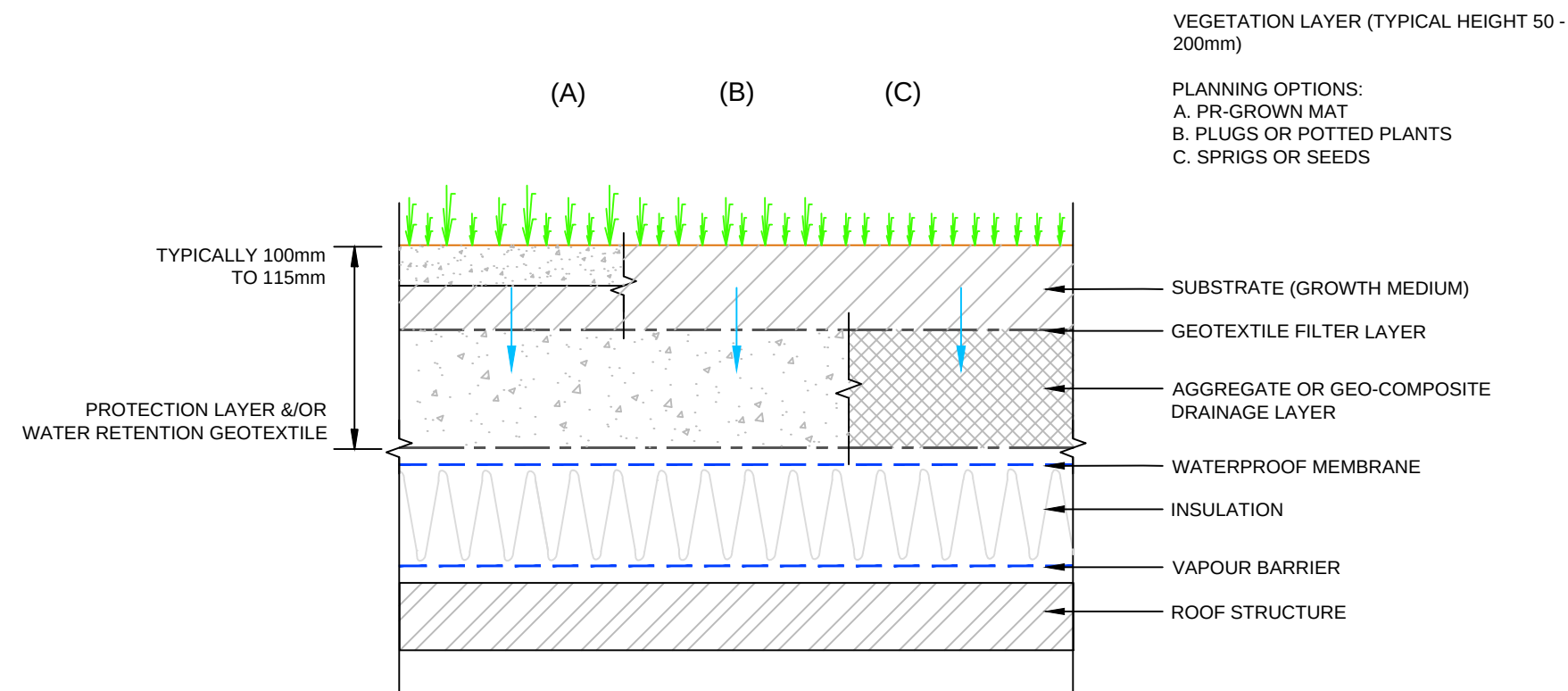


RAINWATER HARVESTING

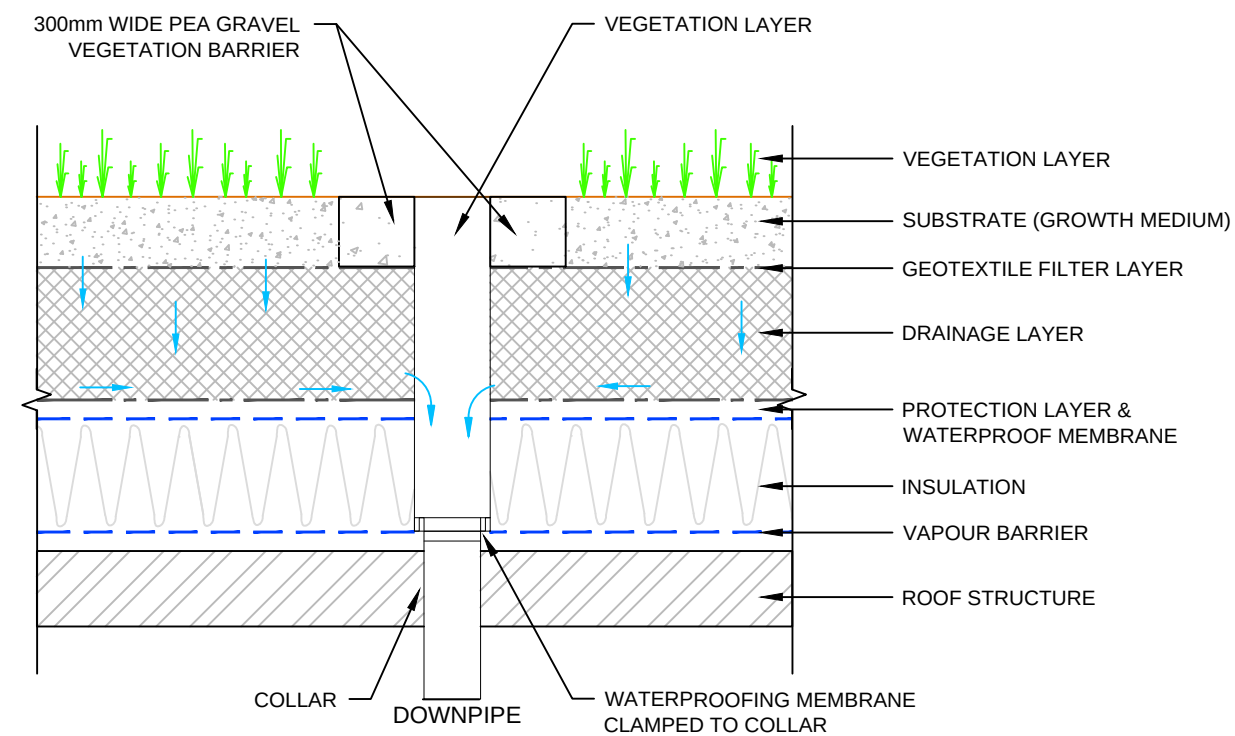


RAINWATER HARVESTING

REV	DATE	BY	DESCRIPTION	CHK
DRAWING STATUS: PRELIMINARY				
BETTS ASSOCIATES CIVIL AND STRUCTURAL ENGINEERS Unit 6, Old Marsh Farm Barns, Welsh Road, Sealand, Flintshire CH5 2LY Tel: 01244 288178 Fax: 01244 288516 enquiries@betts-associates.co.uk				
PROJECT:				
TYPICAL SUDS DETAIL				
TITLE:				
RAINWATER HARVESTING				
DATE: SEP 2014	SCALE @ SIZE: @ A3	DRAWN: CP	CHECKED: RDN	
PROJECT No: BETTS	DRAWING No: 102	REV: A		



GREEN ROOF



OUTLET FROM GREEN ROOF

DO NOT SCALE

REV	DATE	BY	DESCRIPTION	CHK

DRAWING STATUS: **PRELIMINARY**

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PROJECT:

TYPICAL SUDS DETAIL

TITLE:

GREEN ROOFS

DATE: SEP 2014	SCALE @ SIZE: @ A3	DRAWN: CP	CHECKED: RDN
PROJECT No: BETTS	DRAWING No: 101	REV: A	

APPENDIX N: NOTES OF LIMITATIONS

The data essentially comprised a study of available documented information from various sources together with discussions with relevant authorities and other interested parties. There may also be circumstances at the site that are not documented. The information reviewed is not exhaustive and has been accepted in good faith as providing representative and true data pertaining to site conditions. If additional information becomes available which might impact our conclusions, we request the opportunity to review the information, reassess the potential concerns and modify our opinion if warranted.

It should be noted that any risks identified in this report are perceived risks based on the available information.

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