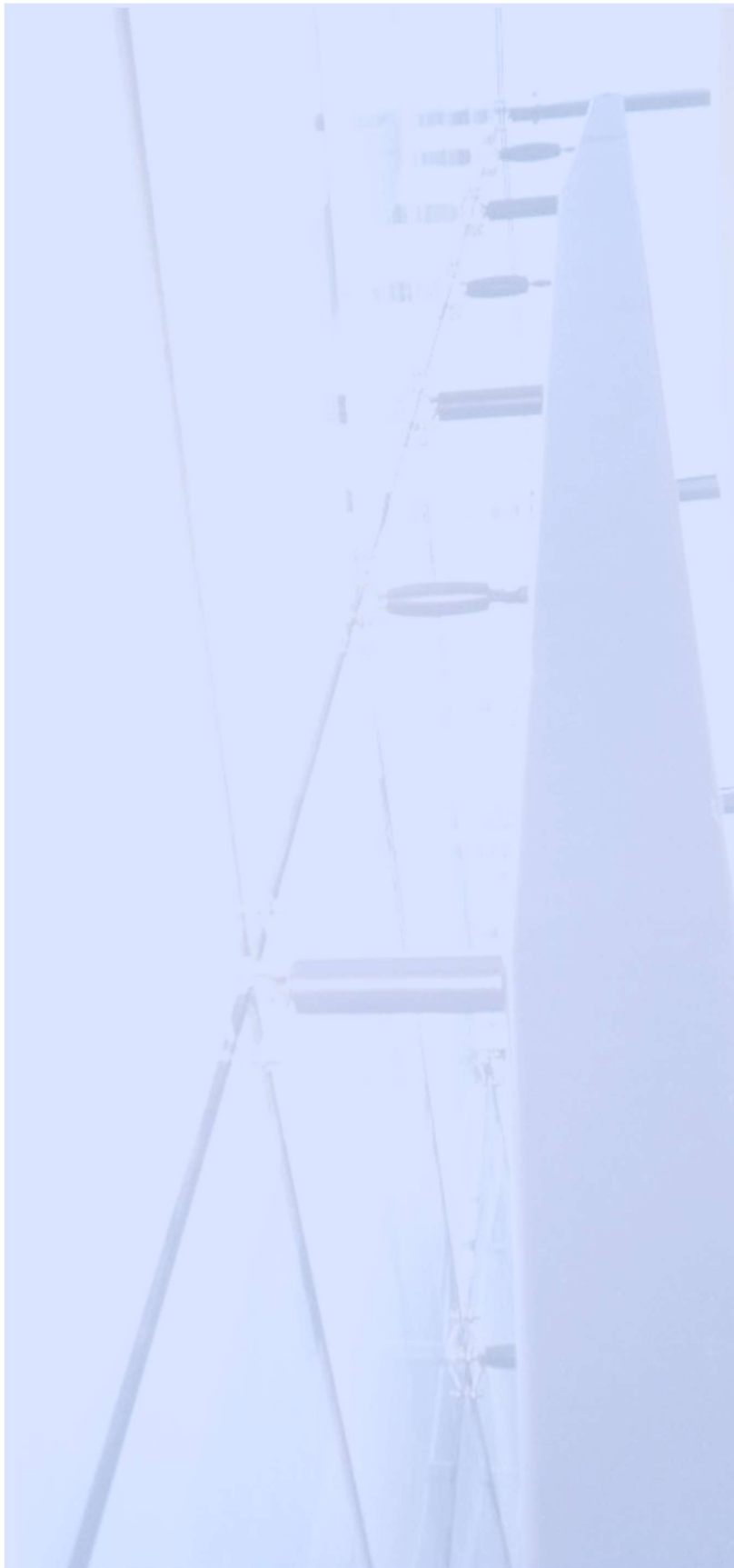




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A DESIMONE Company

1983

Charles Street

Manchester

**Flood Risk Assessment
And Drainage strategy**

**1983-CS-DP2-A180-RP-XX-9041
Rev P06**

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Flood Risk Assessment and drainage strategy
Charles Street, Manchester

For

Jadebricks (Charles street) Ltd

October 2023

Ref : 1983-CS-DP2-A180-RP-XX-9041

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Executive Summary

D.P Squared Ltd have been appointed by Jadebricks (Charles street) Ltd to provide a Flood Risk Assessment in support of a planning application for the redevelopment of the car park located at the junction of Charles Street and York Street in Central Manchester.

The site is shown to be situated within Flood Zones 3 of the Environment Agency Flood Map and therefore has a high risk of fluvial flooding.

An initial assessment indicates that the primary flood risk at the proposed development is from fluvial flooding resulting from the River Medlock and an increase in surface water run off following the application of climate change.

The proposed development site is located directly west of Bracken House and currently comprises of a car parking facility, accessed from the west via York Street.

The topographical survey provided identified that the site falls from south to north with levels ranging from 31.600m AOD (pavement of Charles Street) down to 30.620m AOD (adjacent to the bridge).

The nearest watercourse is the River Medlock located approximately 50m north west of the site, which meanders through Central Manchester in a westerly direction.

Development proposals comprise of erection of a new multi-storey purpose built student accommodation (PBSA) medium rise building.

It is proposed that the ground floor level of the building will be set at 31.900m AOD, which is 300mm above the pavement on Charles Street, to allow for internal ramped disabled access.

Underneath the ground floor slab will be a void (under croft) with cladding around the envelope of the building designed with flood vents to allow flood waters to pass through the under croft unimpeded in the event of a flood. The soffit of the ground floor slab for ground floor slab will be set no less than 31.400m AOD (higher than 1 in 100 year on-site flood level).

The ground floor of the building will also be designed to allow flood waters to enter via flood vents, however a small area of approximately 10m x 8m will require flood proofing which will not be able to flood, in which the lift shafts and M&E services will be located.

The ground floor level will only be used for less vulnerable uses, the student accommodation will be located at first floor level and above. The first floor level of the building will be set at 35.000m AOD.

Fluvial Flooding: River Medlock

Information on modelled water levels was obtained from the Environment Agency and have been taken from the Manchester Ship Canal Model.

The Environment Agency have provided 2D Modelled flood levels for the north and south extents of the application site. Node Ref 6 is located at the south of the site and Node Ref 7 is located at the north. These flood levels have been used to determine flood depths on-site for various return periods.

A review of the flood depths determined that the footprint of the proposed building will flood during all events up to and including the 1 in 1000-year event.

Providing that mitigation measures outlined within Section 7 are incorporated into the development the risk of fluvial flooding can be suitably managed.

Surface Water & Foul Drainage

Following development, it is recommended that surface water flows resulting from the building's roof area discharges into the public surface water sewer located at the north of York Street.

Flows should be restricted to 50% of the existing discharge rate i.e., 2.5l/s for all return periods up to and including the 1 in 100 year + 50% climate change event.

Flows in excess of this will be attenuated within a blue roof on the roof at level 09, full details to be finalised during the detailed design phase.

CIRIA proposal 3084 April 2019 Guidance on the delivery of blue roofs has been provided as an attachment which should be used for reference during the detailed design phase.

Foul from the proposed development will connect into the public combined sewer networks either within York Street or Charles Street, following consent from United Utilities.

Please see the indicative Drainage strategy drawing in Appendix H.

Mitigation Measures

Finished Floor Levels

In order to allow disabled ramped access internally, it is proposed that the ground floor finished floor level will be elevated 300mm above the pavement level on Charles Street.

- Proposed Ground Floor Level = 31.600m AOD + 0.300 = 31.900m AOD

It is proposed that most of the ground floor level of the building will be allowed to flood via perforated panels or another venting system. This will allow water to penetrate the building during a flood event and allow it to drain back out again once the flood had subsided. Details are to be developed during detailed design phase,

It is highlighted that there will be a proportion of the ground floor level which will not be allowed to flood, this area will comprise of lift shafts and M&E service area. The total footprint of the flood exclusion area is approximately 10m x 8m.

Below the ground floor level will be an undercroft with the full 350m² area available to flood at all times via flood venting system. The soffit of the ground floor level will be set at a level no less than 31.400m AOD, which is higher than the 1 in 100 year flood level associated with the River Medlock

Flood Resilience/Resistance

In order to provide an extra element of safety it is recommended that flood resilience/resistance measures outlined within Table 6 are incorporated into the buildings design, set 0.600m above the 1 in 100 year + 35% Climate Change flood level

- Flood Resilience/Resistance Measures (no less than) = 32.620 + 0.600 = 33.220m AOD

Environment Agency Flood Warnings

The application site is situated within an area covered the Environment Agency's Flood Warning's Direct Service; it is recommended that staff sign up to receive flood warnings to enable flood evacuation prior to the onset of flooding.

Safe Place of Refuge

All of the student accommodation will be at second floor level and above, therefore there will be a safe place of temporary refuge available at all times in the event of an extreme flood event. The plan is that the majority of residents, staff and visitors will evacuate due to early warnings of a flood event.

Emergency Evacuation Plan

It is recommended that persons on site are prepared to evacuate away from the property, if advised to do so by the EA Flood Alert Service, the emergency services and/or local authority, in the advance of the onset of any flooding. Routes in 1983-XX-DP2-A180-CA-XX-9010 Rev P02 Proposed flood emergency plan.

Signage

It is recommended that the building includes internal signage outlining flood protocols and evacuation routes to be adhered to in event of flood.

Business Flood Plan

See 1983-XX-DP2-A180-CA-XX-9010 Rev P02 Proposed flood emergency plan.

1. Introduction

1.1. Terms of Reference

D.P Squared Ltd have been appointed by Jade Bricks to provide a Flood Risk Assessment in support of a planning application for the redevelopment of the car park located at the junction of Charles Street and York Street in Central Manchester.

The site is shown to be situated within Flood Zone 3 of the Environment Agency Flood Map and therefore has a high risk of fluvial flooding.

It is usual for the Environment Agency to raise an objection to development applications within the floodplain, or Zones 2 and 3 of the flood map, until the issue of flood risk has been properly evaluated. The Agency will also object to developments where the total site area is in excess of 1 Hectare until suitable consideration has been given to the management of surface water runoff.

1.2. Objectives

The objective of this assessment is to evaluate the following issues in regard to flood risk at the application site.

- Suitability of the proposed development in accordance with current planning policy.
- Identify the risk to both the proposed development and people from all forms of flooding.
- Provide a preliminary assessment of foul and surface water management.
- Increasing the risk of flooding elsewhere e.g. surface water flows and flood routing.
- Recommendation of appropriate measures to mitigate against flooding both within the proposed development, and neighbouring land and property.

1.3. Data Sources

This assessment is based on desk-top study of information from the following sources:

- National Planning Policy Framework (2023)
- Planning Practice Guidance at www.gov.uk
- Building Regulations Approved Document H
- Environment Agency Flood Mapping
- Manchester, Salford and Trafford Strategic Flood Risk Assessment Level 1 (2010)
- Manchester, Salford and Trafford Strategic Flood Risk Assessment Level 2 (2011)
- MST and Environment Agency Strategic Flood Risk Assessment Joint Statement (2011)
- British Geological Society – Historic Borehole Logs
- Cranfield University's Soilscape Viewer
- CIRIA C697 The SUDS Manual
- Chronology of British Hydrological Events (Dundee University)

2. Planning Policy Context

2.1. Approach to the Assessment

An initial assessment indicates that the primary flood risk at the proposed development is from the fluvial flooding resulting from the River Medlock and an increase in surface water run off following the application of climate change.

Consideration has also been given to the site flooding from secondary sources such as pluvial, groundwater; artificial water bodies; infrastructure failure and ponding.

The requirements for flood risk assessments are generally as set out in the 'Technical Guidance to the National Planning Policy Framework', updated in September 2023; and in more detail from the Environment Agency's 'Standing Advice on Flood Risk' available from www.gov.uk.

2.2. National Planning Policy Framework (NPPF)

The information provided in the flood risk assessment should be credible and fit for purpose.

Site-specific flood risk assessments should always be proportionate to the degree of flood risk and make optimum use of information already available, including information in a Strategic Flood Risk Assessment for the area, and the interactive flood risk maps available on the www.gov.uk website.

A flood risk assessment should also be appropriate to the scale, nature and location of the development.

2.2.1. Site Specific Flood Risk Assessment Checklist

The following checklist has been extracted from Flood Risk & Coastal Change Section of the Planning practice guidance available from www.gov.uk, updated in August 2022.

1. Development site and location

Provide a description of the site you are proposing to develop, including, or making 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).

Check the Flood Map for Planning (Rivers and Sea) and the Strategic Flood Risk Assessment for the area available from the local planning authority.

2. Development proposals

Provide a general summary of the development proposals, including, or making 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?
- C. What is the expected or estimated lifetime of the proposed development likely to be? (E.g., less than 20 years, 20-50 years, 50-100 years?).

3. Sequential test

For developments in flood zones 2 or 3 only.

(If the development site is wholly within flood zone 1, this section can be skipped - go to section 4).

Describe how the sequential test has been applied to the development (if required, and as set out in paragraphs 101-104 of the National Planning Policy Framework); and provide the evidence to demonstrate how the requirements of the test have been met.

See paragraph 033 of the NPPF guidance for further information. (It is recommended that the Developer or Agent contacts the LPA to confirm whether the sequential test should be applied and to ensure the appropriate level of information is provided).

- A. What other locations with a lower risk of flooding have you considered for the proposed development?
- B. If you have not considered any other locations, what are the reasons for this?
- C. Explain why you consider the development cannot reasonably be located within an area with the lowest probability of flooding (flood zone 1); and, if your chosen site is within flood zone 3, explain why you consider the development cannot reasonably be located in flood zone 2.
- D. As well as flood risk from rivers or the sea, have you taken account of the risk from any other sources of flooding in selecting the location for the development?

4. Exception test

Provide the evidence to support certain development proposals in flood zones 2 or 3 if, following application of the sequential test, it is appropriate to apply the exception test, as set out in paragraphs 102-104 of the National Planning Policy Framework.

It is advisable to contact the local planning authority to confirm whether the exception test needs to be applied and to ensure the appropriate level of information is provided.

- A. Would the proposed development provide wider sustainability benefits to the community? If so, could these benefits be considered to outweigh the flood risk to and from the proposed development?

- B. How can it be demonstrated that the proposed development will remain safe over its lifetime without increasing flood risk elsewhere?
- C. Will it be possible for the development to reduce flood risk overall (e.g., through the provision of improved drainage)?

5. Climate Change

How is flood risk at the site likely to be affected by climate change? (The local planning authority's Strategic Flood Risk Assessment should have taken this into account). Further advice on how to take account of the impacts of climate change in flood risk assessments is available from the Environment Agency.

6. Site specific flood risk

Describe the risk of flooding to and from the proposed development over its expected lifetime, including appropriate allowances for the impacts of climate change. It would be helpful to include any evidence, such as maps and level surveys of the site, flood datasets (e.g., flood levels, depths and/or velocities) and any other relevant data, which can be acquired through consultation with the Environment Agency, the lead local flood authority for the area, or any other relevant flood risk management authority. Alternatively, you may consider undertaking or commissioning your own assessment of flood risk, using methods such as computer flood modelling.

- A. What is/ are the main source(s) of flood risk to the site? (E.g., tidal/sea, fluvial or rivers, surface water, groundwater, other?). You should consider the flood mapping available from the Environment Agency, the Strategic Flood Risk Assessment for the area, historic flooding records and any other relevant and available information.
- B. What is the probability of the site flooding, taking account of the maps of flood risk available from the Environment Agency, the local planning authority's Strategic Flood Risk Assessment and any further flood risk information?
- C. Are you aware of any other sources of flooding that may affect the site?
- D. What is the expected depth and level for the design flood? See paragraph 055 of the NPPF guidance for information on what is meant by a "design flood". If possible, flood levels should be presented in metres above Ordnance Datum (i.e., the height above average sea level).
- E. Are properties expected to flood internally in the design flood and to what depth? Internal flood depths should be provided in metres.
- F. How will the development be made safe from flooding and the impacts of climate change, for its lifetime? Further information can be found in paragraphs 054 and 059 (including on the use of flood resilience and resistance measures) of the NPPF guidance.
- G. How will you ensure that the development and any measures to protect the site from flooding will not cause any increase in flood risk off-site and elsewhere? Have you taken into account the impacts of climate change, over the expected lifetime of the development? (e.g., providing compensatory flood storage which has been agreed with the Environment Agency).
- H. Are there any opportunities offered by the development to reduce the causes and impacts of flooding?

7. Surface water management*

Describe the existing and proposed surface water management arrangements at the site using sustainable drainage systems wherever appropriate, to ensure there is no increase in flood risk to others off-site.

- A. What are the existing surface water drainage arrangements for the site?
- B. If known, what (approximately) are the existing rates and volumes of surface water run-off generated by the site?
- C. What are the proposals for managing and discharging surface water from the site, including any measures for restricting discharge rates? For major developments (e.g., of ten or more homes or major commercial developments), and for all developments in areas at risk of flooding, sustainable drainage systems should be used, unless demonstrated to be inappropriate.
- D. How will you prevent run-off from the completed development causing an impact elsewhere?
- E. Where applicable, what are the plans for the ongoing operation and/or maintenance of the surface water drainage systems?

8. Occupants and users of the development

Provide a summary of the numbers of future occupants and users of the new development; the likely future pattern of occupancy and use; and proposed measures for protecting more vulnerable people from flooding.

- A. Will the development proposals increase the overall number of occupants and/or people using the building or land, compared with the current use? If this is the case, by approximately how many will the number(s) increase?
- B. Will the proposals change the nature or times of occupation or use, such that it may affect the degree of flood risk to these people? If this is the case, describe the extent of the change.
- C. Where appropriate, are you able to demonstrate how the occupants and users that may be more vulnerable to the impact of flooding (e.g., residents who will sleep in the building; people with health or mobility issues; etc..) will be located primarily in the parts of the building and site that are at lowest risk of flooding? If not, are there any overriding reasons why this approach is not being followed?

9. Residual risk

Describe any residual risks that remain after the flood risk management and mitigation measures are implemented, and to explain how these risks can be managed to keep the users of the development safe over its lifetime.

- A. What flood related risks will remain after the flood risk management and mitigation measures have been implemented?
- B. How, and by whom, will these risks be managed over the lifetime of the development? (e.g., putting in place flood warning and evacuation plans).

10. Flood risk assessment credentials

Provide details of the author and date of the flood risk assessment.

- A. Who has undertaken the flood risk assessment?
- B. When was the flood risk assessment completed?

Other considerations

* Managing surface water

The site-specific flood risk assessment will need to show how surface water runoff generated by the developed site will be managed. In some cases, it may be advisable to detail the surface water management for the proposed development in a separate drainage strategy or plan. You may like to discuss this approach with the lead local flood authority.

Surface water drainage elements of major planning applications (e.g., of ten or more homes) are reviewed by the lead local flood authority for the area. As a result, there may be specific issues or local policies, for example the Local Flood Risk Management Strategy or Surface Water Management Plan, that will need to be considered when assessing and managing surface water matters.

It is advisable to contact the appropriate lead local flood authority prior to completing the surface water drainage section of the flood risk assessment, to ensure that the relevant matters are covered in sufficient detail.

Proximity to Main Rivers

If the development of the site involves any activity within specified distances of main rivers, a flood risk activity permit may be required in addition to planning permission.

For non-tidal main rivers, a flood risk activity permit may be required if the development of the site is within 8 metres of a river, flood defence structure or culvert.

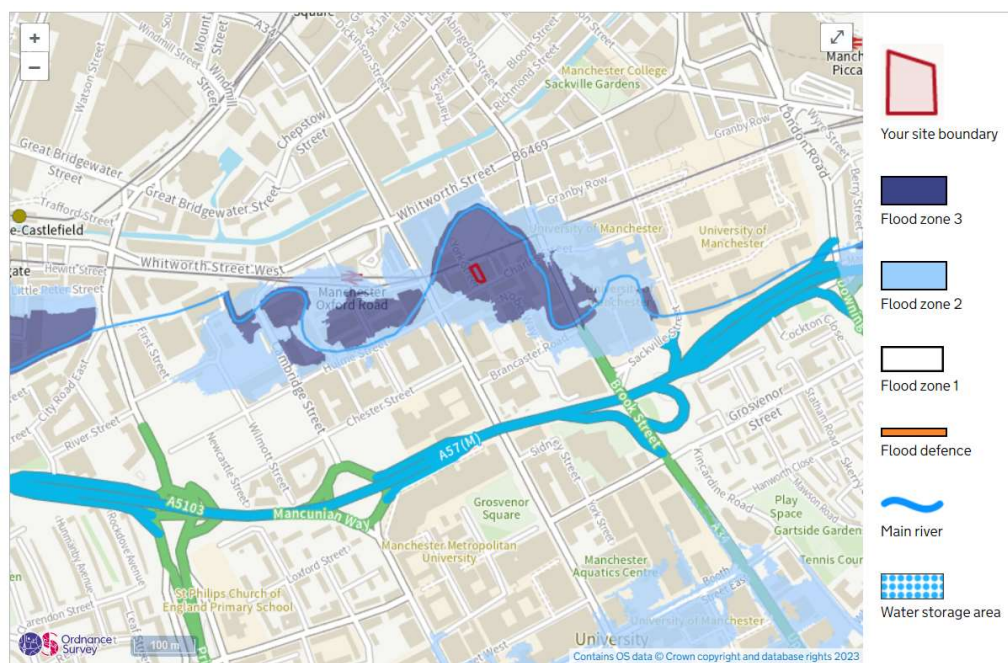
For tidal main rivers, a flood risk activity permit may be required if the development of the site is within 16 metres of a river, flood defence structure or culvert.

Details on obtaining a Flood Risk Activity Permit are available from the Environment Agency.

2.2.2. Sources of Flooding

- **Rivers (fluvial):** Flooding occurs when flow within river channels exceeds capacity; and the type of flood event experienced e.g., flash flooding; depends upon the characteristics of the river catchment.
- **The Sea (tidal):** Flooding at low lying coastline and tidal estuaries is caused by storm surges and high tides; with overtopping and breach failure of sea defences possible during extreme storm events.
- **Pluvial (surface flooding or overland flows):** Heavy rainfall, which is unable to soak away via infiltration or enter drainage systems can flow overland, resulting in localised flooding. Topography generally influences the direction and depth of flooding caused by this mechanism.
- **Groundwater:** Caused when ground water levels rise to the surface; and is most likely to occur in low lying areas underlain by aquifers.
- **Sewers and drains:** Generally, occurs in more urban areas; where sewers and drains are overwhelmed by heavy rainfall or blocked pipes and gullies.
- **Artificial Sources (reservoirs, canals, lakes and ponds):** Reservoir and canal flooding may occur as a result of capacity exceedance or structural failure.

Figure 2.1: The Environment Agency Flood Map



Source: www.gov.uk

2.2.3. Flood Zones

- **Flood Zone 1:** Low probability (less than 1 in 1000 year (<0.1% AEP) annual probability of river or sea flooding in any year).
- **Flood Zone 2:** Medium probability (between 1 in 100 year (1.0% AEP) and 1 in 1000 year (0.1% AEP) annual probability of river flooding; or between 1 in 200 year (0.2% AEP) and 1 in 1000 year (0.1% AEP) annual probability of sea flooding in any year).
- **Flood Zone 3a:** High probability (1 in 100 year (1.0% AEP) or greater annual probability of river flooding in any year or 1 in 200 year (0.5% AEP) or greater annual probability of sea flooding in any year).
- **Flood Zone 3b:** This zone comprises land where water has to flow or be stored in times of flood. Land which would flood with an annual probability of 1 in 20 (5% AEP), or is designed to flood in an extreme flood (0.1%) should provide a starting point for discussions to identify functional floodplain.

2.2.4. Vulnerability of Different Development Types

- **Essential Infrastructure:** Transport infrastructure (railways and motorways etc...); utility infrastructure (primary sub-stations, water treatment facilities; power stations; and wind turbines).
- **Water Compatible Development:** Flood control infrastructure; water and sewage infrastructure; navigation facilities.
- **Highly Vulnerable:** Emergency services; basement dwellings; mobile home parks; industrial or other facilities requiring hazardous substance consent.
- **More Vulnerable:** Hospitals; residential dwellings; educational facilities; landfill sites caravan and camping sites.
- **Less Vulnerable:** Commercial premises; emergency services not required during a flood; agricultural land.

2.2.5. Climate Change

The NPPF requires the application of climate change over the lifetime of a development. As of September 2023 the Technical Guidance for NPPF has updated the climate change allowances based on river basin catchments. The climate change allowance for the Irwell Management Catchment is tabulated below:

Table 1: Irwell Management Catchment Climate Change Allowances¹

Parameter	Allowance Category	2020's	2050's	2080's
Peak Rainfall Intensity	Upper	+ 35%	+ 46%	+ 75%
	Higher	+ 19%	+ 26%	+ 43%
	Central	+ 12%	+ 15%	+ 24%

Due to the proposed development being considered more vulnerable and located within Flood Zones 2 and 3 the central allowance of 24% should be applied to peak river flow to account for climate change.

Table 2: Peak Rainfall Intensity Allowance ¹

Applied Across All of England	2050's	2070's
Upper End	40%	50%
Central	25%	35%

Due to the development having a proposed life span in excess of 50 years, 50% should be applied to rainfall intensity when developing the drainage strategy

¹ Extracted from Tables 1-4 of the Technical Guidance for flood risk assessments: Climate change allowances Document (May 2022)

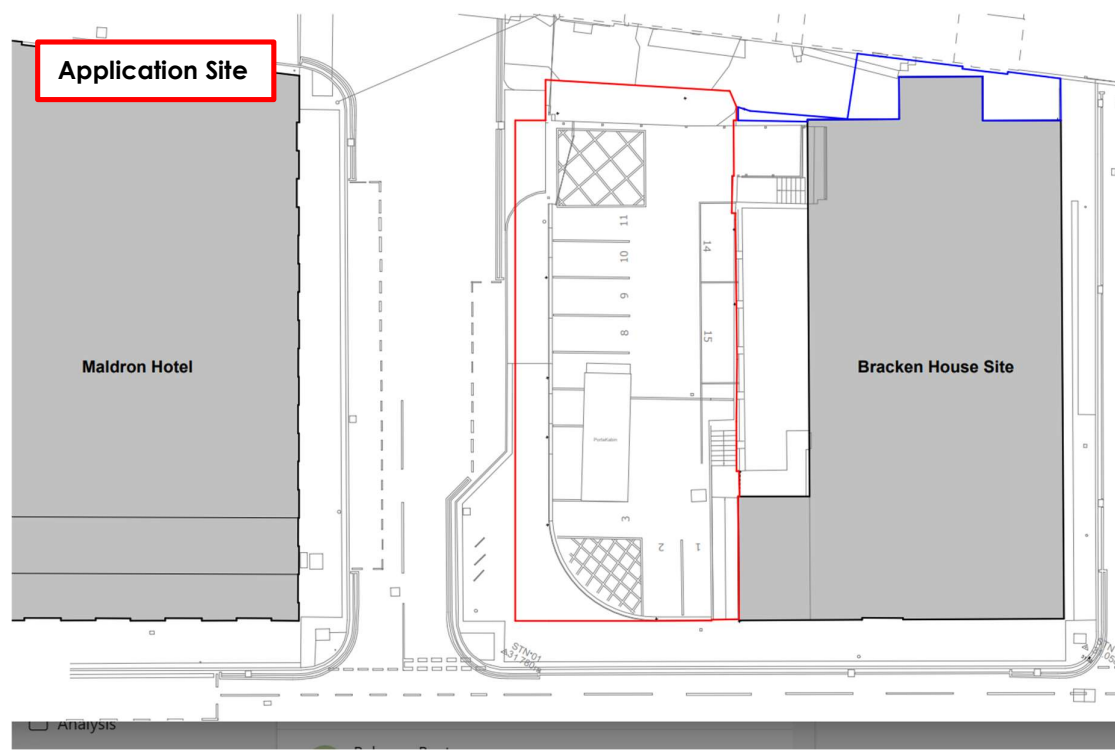
3. Details of the Site

3.1. Site Details

Table 3: Development Location

Site Name:	Car Park Charles Street/York Street
Purpose of Development:	Purpose built student accommodation
Existing Land Use:	Car Parking
OS NGR:	SJ8423997486
Country:	England
County:	Greater Manchester
Local Planning Authority:	Manchester City Centre
Internal Drainage Board:	Not Applicable
Other Authority (e.g. British Waterways/ Harbour Authority)	Not Applicable

Location Plan:



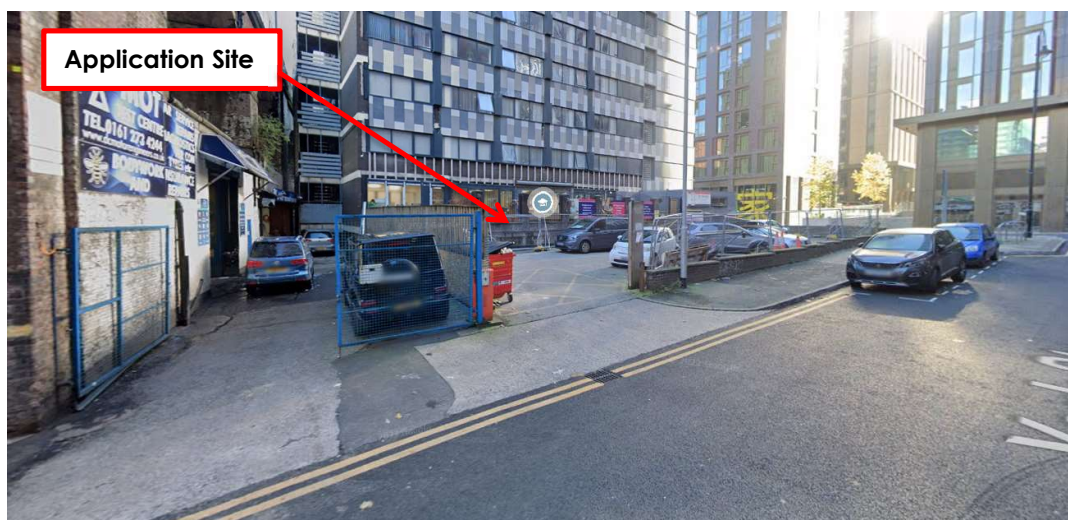
3.2. Site Description

The application site is located directly west of Bracken House and currently comprises of a car parking facility accessed from the west via York Street.

The topographical survey provided identified that the site falls from south to north with levels ranging from 31.600m AOD (pavement of Charles Street) down to 30.620m AOD (adjacent to the bridge).

The nearest watercourse is the River Medlock located approximately 50m north west of the site, which meanders through Central Manchester in a westerly direction.

Figure 3.1: Former Stables Building Viewed West



Source: Google

3.3. Proposed Development Details

Development proposals comprise of erection of a new multi-storey purpose built student accommodation high rise building.

It is proposed that the ground floor level of the building will be set at 31.900m AOD, which is 300mm above the pavement on Charles Street, to allow for internal ramped disabled access.

Underneath the ground floor slab will be a void (undercroft) with cladding around the envelope of the building designed with flood vents to allow flood waters to pass through the undercroft unimpeded in the event of a flood. The soffit of the ground floor slab for ground floor slab will be set no less than 31.400m AOD (1 in 100 year on-site flood level).

The ground floor of the building will also be designed to allow flood waters to enter via flood vents, however a small area of approximately 10m x 8m will require flood proofing which will not be able to flood in which the lift shafts and M&E services will be located.

The ground floor level will only be used for less vulnerable uses, the student accommodation will be located at first floor level and above. The first floor level of the building will be set at 35.000m AOD.

4. Historic Flooding

4.1. Internet Search

An internet search for flooding within the local vicinity of the application site came back with no results.

4.2. Manchester City, Salford City and Trafford Councils Level 1 Hybrid SFRA Level 2 SFRA Final March 2010

The Manchester City, Salford City and Trafford Councils Level 1 Hybrid SFRA LEVEL 2 SFRA was undertaken by JBA Consulting and was released in March 2010. Section 2.8 Historic Flooding does not specifically mention the site as having flooded.

4.3. Critical Drainage Areas

Section 5.3 within the Manchester City, Salford City and Trafford Councils Level 2 Hybrid SFRA LEVEL 2 SFRA Final March 2011 identifies that the site is located within Conurbation Core Critical Drainage Area, which is defined below;

Conurbation Core CDA

Surface water flow paths in this CDA are largely linked to the natural floodplains of 'hidden' or 'lost' culverted watercourses that run through this area, particularly in Manchester city centre.

The most widespread surface water flooding is predicted in the city centre between the Irk and the Medlock with the density of properties at risk to surface water flooding in excess of 100 per 0.25 km². Other hotspots identified are Salford adjacent to Gilda Brook; Crumpsall and Cheetham Hill in Manchester adjacent to the Irk; Clifton Green; Newtown; Charlestown and Broughton. The worst of these is Crumpsall where in excess of 100 properties are predicted to be affected.

In the case of Lower Broughton and Charlestown in Salford, the problem is further exacerbated by the presence of river flood defences that would not allow excess surface water into the river system. In this case ponding would occur behind the defences, with the potential to form areas of deep and static water that would exacerbate any fluvial flooding that occurred at the same time.

Areas predicted to be most susceptible to climate change are the city centre and Cheetham Hill.

5. Initial Evaluation of Flood Risk

5.1. Sources of Flooding

Table 4: Possible Flooding Mechanisms

Source/Pathway	Significant?	Comment/Reason
Fluvial	Yes	River Medlock
Canal	No	Not Applicable
Tidal/Coastal	No	Not Applicable
Reservoir	No	EA Map shows that the site is affected by reservoir flooding.
Pluvial (urban drainage)	Yes	Site is located within CDA therefore surface water flow reduction is required.
Groundwater	No	SFRA shows site within an area not at risk.
Surface Water Flooding	No	Site is located within an area that has a very low risk.
Overland Flow	No	Generally, very low risk of pluvial flooding
Blockage	No	Not Applicable
Infrastructure failure	No	Not Applicable
Rainfall Ponding	No	Ponding internally will rectify following development.

From the initial assessment it is concluded that the primary source of flood risks will be from fluvial flooding associated with the River Medlock and an increase in surface water flows resulting from the application of climate change.

Fluvial Flooding (River Medlock)

Due to the proposed development being located within Flood Zone 3 the risk of fluvial flooding requires further evaluation, which is presented within Section 6 of this report.

Flooding from Artificial Sources

The site is shown to be at risk of reservoir flooding. The chances of reservoir failure are extremely low as reservoirs and dams are inspected regularly.

There is potential for water depths within the site boundary at the rear of the site and on York Street of between 0.3m and 2m should a breach occur, with the remainder of the site showing potential depths of less than 0.3m, however, again this is highly unlikely to occur due to the measures in place for inspections of reservoirs and dams.

Canal Flooding

The site is located south of the Rochdale Canal. The SFRA map Canal Hazard Zones MM_3.2B indicates the site to be outside of the Canal Breach Zone B Canal Breach Hazard Zone.

There is potential for water depths within the site boundary at the rear of the site and on York Street of between 0.3m and 2m should a breach occur, with the remainder of the site showing potential depths of less than 0.3m, however, again this is highly unlikely to occur due to the measures in place for inspections of reservoirs and dams.

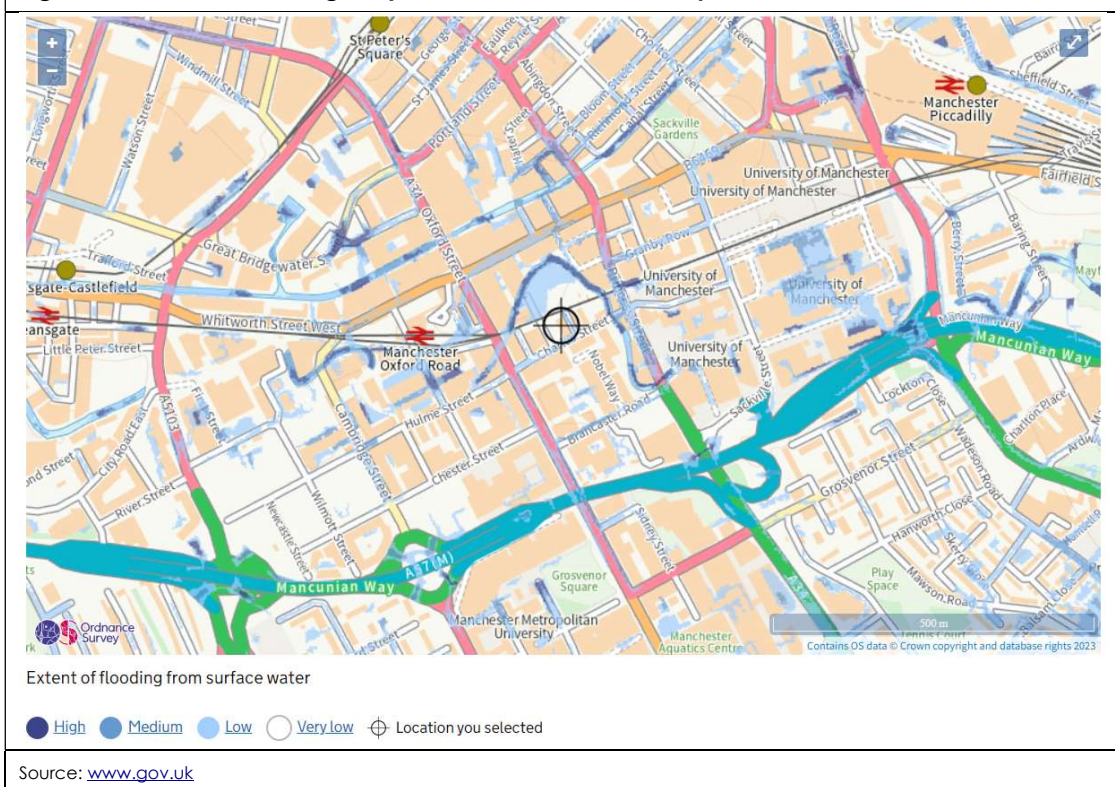
Surface Water Flooding

Surface water flooding comprises pluvial flooding and flooding from sewers and highway drains and gullies.

The Environment Agency Risk of Flooding from Surface Water map indicates that the risk of surface water flooding at the site is largely considered to be low.

- **Very low risk** means that this area has a chance of flooding of less than 0.1% each year. Flooding from surface water is difficult to predict as rainfall location and volume are difficult to forecast. In addition, local features can greatly affect the chance and severity of flooding.

Figure 5.1: Environment Agency Surface Water Flood Map



The main low risk surface water flow route is located within Charles Street to the south of the site. The Environment Agency surface water flood map identifies that flows are contained within the highway.

The finished floor level at ground floor level will be set no less than 300mm above the pavement height, which is well in excess of any surface water flooding experienced within Charles Street at the south of the site.

Taking the above into consideration the risk of pluvial flooding affecting the proposed development is considered to be very low.

Groundwater Flooding

The site is shown to overlie a major aquifer. However, review of the SFRA map Groundwater Flooding GW_2.1 shows the site is not at risk of groundwater flooding.

6. Quantitative Flood Risk Assessment

6.1. Fluvial: River Medlock

6.1.1. River Medlock

The site is located in close proximity to the River Medlock (50m north/west). The Environment Agency's Flood Map identifies that the site is located within Flood Zone 3 (high probability of flooding).

The Flood Zone 3 fluvial outline shows a 1 in 100 chance of flooding at a location in any one given year (i.e., a 1% annual probability of flooding).

6.1.2. Environment Agency Modelled Flood Levels

Information on modelled water levels was obtained from the Environment Agency and have been taken from the Manchester Ship Canal Model.

The Environment Agency have provided 2D Modelled flood levels for the north and south extents of the application site. Node Ref 6 is located at the south of the site and Node Ref 7 is located at the north. These flood levels have been used to determine flood depths on-site for various return periods.

Table 5: Environment Agency Flood Levels

Node Ref	100 Year Event (mAOD)	100 Year + 35% CC Event (mAOD)	1000 Year Event (mAOD)
6 (South)	31.290	32.620	33.830
7 (North)	N/A	32.620	33.770

Flood depths have been based on levels from the topographical survey

- North = 30.387m AOD
- South = 31.600m AOD

Table 6: On-Site Flood Depths

Node Ref	100 Year Event (m)	100 Year + 35% CC Event (m)	1000 Year Event Level (m)
6 (South)	0.310	1.020	2.230
7 (North)	N/A	2.233	3.383

A review of the flood depths determined that the footprint of the proposed building will flood during all events up to and including the 1 in 1000-year event.

Providing that mitigation measures outlined within Section 7 are incorporated into the development the risk of fluvial flooding can be suitably managed.

6.2. Surface Water Runoff

6.2.1. Existing On-Site Drainage Regime

A CCTV drainage survey has been carried out. Currently the surface water flows from the site discharge to a public sewer on York street.

- Total Site Area = 0.0350Ha (350m²)

6.2.2. Sewer Records

United Utilities Sewer Records show the following infrastructure within the vicinity of the site.

- 150mm public surface water sewer located within York Street
- 225mm public combined sewer located within York Street
- 300mm public combined sewer located within Charles Street

6.2.3. Surface Water Drainage Hierarchy

The hierarchy for disposal of surface water from new developments is outlined within the Building Regulations Approved Document H and specifies the following methods in order of preference:

- Infiltration via soakaway or other suitable infiltration device
- Discharge to watercourse
- Discharge to public surface water sewer
- Discharge to public combined sewer

Infiltration

Due to the lack of available space within the buildings envelope to provide the required 5m easement from buildings, the use of infiltration methods such as soakaways is not considered feasible for the disposal of surface water.

Watercourse

There are no available watercourses within a suitable distance in which a surface water outfall could be constructed.

Sewer

Due to the unsuitability of infiltration methods and the lack of available watercourses within the vicinity, it is recommended that surface water from the proposed development is directed to public surface water sewer, located within York Street west of the site.

6.2.4. Sustainable Urban Drainage Systems (SUDS)

SUDS act to reduce the impact of surface water runoff from the development by limiting runoff volumes and rates from leaving the site.

Undertaking an assessment using the SUDS Planner a number of different methods could be used within the development. A summary of the results is tabulated overleaf:

Table 7: SUDS Planner

SUDS Criteria	Rank 1	Rank 2	Rank 3
Hydrological	Blue Roof	Permeable Paving	Infiltration Trench/Soakaways
Land Use	Infiltration Trench/Soakaway	Bioretention Area	Infiltration Trench/Soakaways
Site Features	Blue Roof	Geo-Cell On/Offline Storage	Filtration Techniques
Community & Environment	Bioretention Area	Stormwater Wetlands	Stormwater Wetlands
Economics & Maintenance	Wet Ponds	Grassed Swales	Dry Detention
Total	Blue Roof	Geo-Cell On/Offline Storage	Infiltration Trench/Soakaways

1. Source Control

The inclusion of source control in SUDS schemes is one of the more important principles of SUDS design, and source control components should be upstream of any pond, wetland or other SUDS component.

Source control can help provide interception storage which can handle and treat some of the more frequent but smaller, polluting events (at least 5mm).

Most source control components will be located within the private properties or highway areas. Their purpose is to manage rainfall close to where it falls, not allowing it to become a problem elsewhere.

The main types of source control include:

- Green roofs
- Rainwater harvesting
- Permeable paving
- Other permeable surfaces

Source control methods look to maximize permeability within a site to promote attenuation, treatment and infiltration, thereby reducing the need for off-site conveyance.

a) Green Roofs

Green roof solutions generally comprise of a multi-layered system that covers the roof of a building with vegetation cover, and/or landscaping over a drainage layer, designed to intercept and retain rainfall.

The incorporation of green roofs is to be decided by the architect/developers during the final design stage and is largely dependent on the final building design.

The likelihood of green roofs being utilised is considered to be low due to the increase in structural cost of the development.

b) Rainwater Harvesting

Rainwater harvesting provides a source of non-potable water, for purposes such as car washing; and landscaped area irrigation etc... and can be used for some industrial processes to reduce consumption of water from conventional supplies.

This SUDS solution, like green roof technology, is also designed to provide interception storage i.e. acts to reduce the volume of surface water leaving the proposed development; thereby helping to alleviate the current pressures on the receiving watercourse.

Rainwater harvesting can be installed at relatively low costs dependant on the chosen structure providing that the development site has scope.

2. Blue Roof

A blue roof is specifically designed to provide source control, managing rainfall where it falls by temporarily storing and attenuating it on a roof as part of Sustainable Drainage Systems (SuDS). It mimics the natural environment by managing the discharge of rainwater from roofs at a controlled rate in line with a drainage strategy and overall site flood risk assessment.

Discharges from a blue roof can either be into a downstream SuDS component, or following approval from the Lead Local Flood Authority and/or sewerage undertaker into watercourses or the sewer system.

Blue roofs are installed either at roof or podium level above the structural waterproofing membrane and are a space efficient way of providing source control, without any additional land-take for infiltration, storage and attenuation. There are a variety of different approaches to the design and delivery of blue roofs. However, they commonly attenuate and treat rainfall within various proprietary elements and they can also be combined with more traditional green roof elements.

6.2.5. Existing Runoff Rate

The existing runoff rate for the site has been estimated using the Modified Rational Method for a total area of 350m² (0.035Ha).

- $2.78 \times 50 \times 0.035 = 4.9\text{l/s}$

6.2.6. Restricted Discharge Rates

Due to the application site being located within the Conurbation Core Critical Drainage Area, proposed surface water discharge rates must be restricted to a minimum of 50% compared to existing situation during the 1 in 100 year + 50% climate change event i.e.

- $4.9\text{l/s} \times 0.5 = 2.5\text{l/s}$

6.2.7. Indicative Attenuation Volumes

Indicative attenuation volumes have been estimated below restricting flows to 2.5l/s for a proposed impermeable area of 0.035 Hectares for the 100 year + 50% climate change event.

Table 8: Indicative Attenuation Volumes, Proposed Impermeable Area 0.035Ha, 2.5l/s

Return Period	Storage Volume m ³
100 Year + 50% Climate Change	8 – 13

6.2.8. Preliminary Drainage Strategy

Following development, it is recommended that surface water flows resulting from the building's roof area discharges into the public surface water sewer located at the north of York Street.

Flows should be restricted to 50% of the existing discharge rate i.e., 2.5l/s for all return periods up to and including the 1 in 100 year + 50% climate change event.

Flows in excess of this will be attenuated within a blue roof at level 09, full details to be finalised during the detailed design phase.

CIRIA proposal 3084 April 2019 Guidance on the delivery of blue roofs has been provided as an attachment which should be used for reference during the detailed design phase.

An indicative drainage strategy is shown in Appendix H.

6.3. Foul

Foul from the proposed development is proposed to connect into the public combined sewer networks either within York Street or Charles Street, following consent from United Utilities.

An indicative drainage strategy is shown in Appendix H.

7. Mitigation Measures

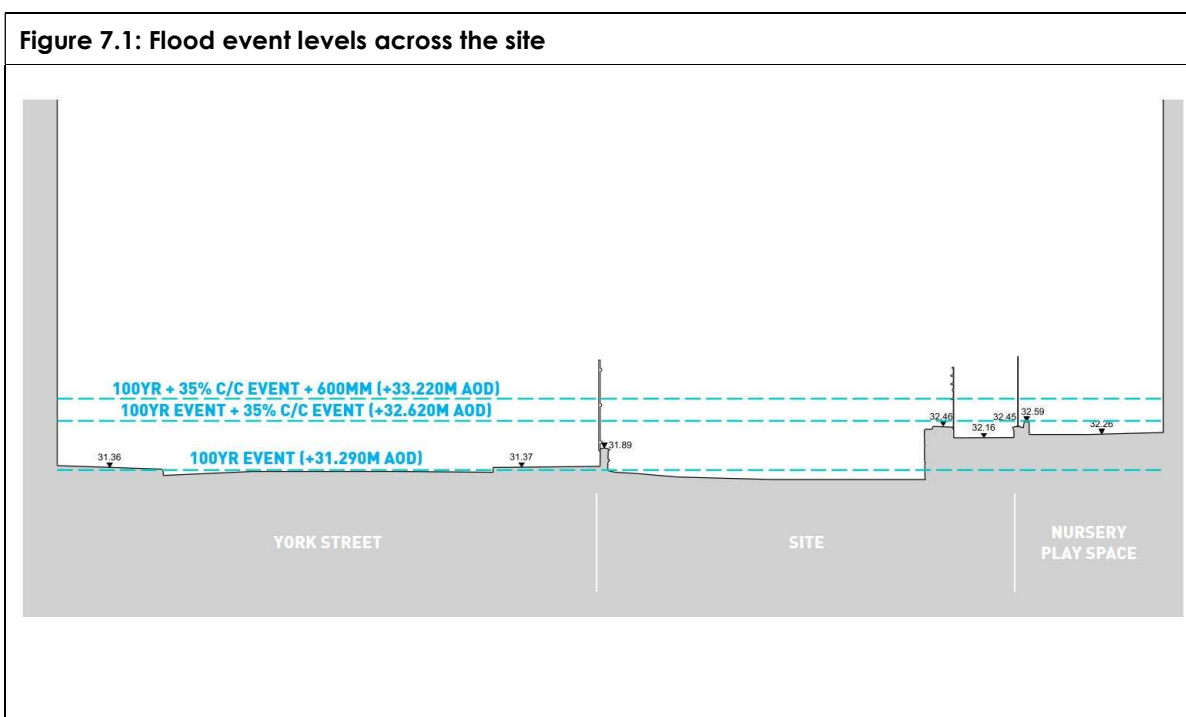
7.1. Finished Development Levels

In order to allow disabled ramped access internally, it is proposed that the ground floor finished floor level will be elevated 300mm above the pavement level on Charles Street.

- **Proposed Ground Floor Level = 31.600m AOD + 0.300 = 31.900m AOD**

It is proposed that most of the ground floor level of the building will be allowed to flood via perforated panels or another venting system. This will allow water to penetrate the building during a flood event and allow it to drain back out again once the flood had subsided. Details to be developed during detailed design phase,

Figure 7.1: Flood event levels across the site



It is highlighted that there will be a proportion of the ground floor level which will not be allowed to flood, this area will comprise of lift shafts and M&E service area. The total footprint of the flood exclusion area is approximately 10m x 8m.

Below the ground floor level will be an undercroft with the full 350m² area available to flood at all times via flood venting system. The soffit of the ground floor level will be set at a level no less than 31.400m AOD, which is higher than the 1 in 100 year flood level associated with the River Medlock.

7.2. Flood Resistance/Resilience Measures

In order to provide an extra element of safety it is recommended that flood resilience/resistance measures outlined within Table 6 are incorporated into the buildings design, set 0.600m above the 1 in 100 year + 35% Climate Change flood level

- **Flood Resilience/Resistance Measures (no less than) = 32.620 + 0.600 = 33.220m AOD**

Flood proofing is a technique by which buildings are designed to withstand the effects of flooding. There are two main categories of flood proofing, which are dry proofing and wet proofing.

Dry proofing methods are designed to keep water out of the building, and wet proofing methods are designed to improve the ability of the property to withstand effects of flooding once the water has entered the building.

In addition, fixtures and fittings should be built to withstand immersion in water or designed to be easily replaced.

The differential pressures across load bearing walls and the flotation effect that will occur during flood events should be taken into account when considering dry proofing techniques.

The table below summarises recommendations for flood proofing measures which can be incorporated within the design for the proposed redevelopment works. Such measures are put forward in accordance with 'Development and Flood Risk Guidance for the Construction Industry' CIRIA C624.

Full details of manufacturers or suppliers of flood protection equipment may be obtained from the Flood Protection Association (website: www.thefpa.org.uk).

An Indicative plan of the flood resistant areas at ground floor is shown in Appendix A.

Table 9: Flood Proofing Measures to be Retro Fitted into the Building

Feature	Considerations to Improve Flood Proofing
Internal Walls	Avoid use of gypsum plaster and plasterboards; use more flood resistant linings (e.g. hydraulic lime, ceramic tiles). Avoid use of stud partition walls.
Floors	Avoid use of chipboard floors. Use concrete floors with integrated and continuous damp proof membrane and damp-proof course. Solid concrete floors are preferable; if a suspended floor is to be used, provide facility for drainage of sub-floor void. Use solid insulation materials.
Fitting, Fixtures and Services	If possible, locate all fittings, fixtures and services above design floor level. Avoid chipboard and MDF. Consider use of removable plastic fittings. Use solid doors treated with waterproof coatings. Avoid using double-glazed window units that may fill with flood water. Avoid fitted carpets. Locate electrical, gas and telephone equipment and systems above flood level. Fit anti-flooding devices to drainage systems.

7.3. Environment Agency Flood Warnings

The application site is situated within an area covered the Environment Agency's Flood Warning's Direct Service, it is recommended that staff sign up to receive flood warnings to enable flood evacuation prior to the onset of flooding.

The Flood Warning's Direct Service is a free service which enables the Environment Agency to send a direct message when flooding is expected and may affect the development. Flood warnings are designed to provide businesses the time to prepare for flooding. Flood warnings can be sent by telephone, mobile, email SMS text message or fax.

The Environment Agency also provides the **Floodline 0845 988 1188** service, where occupants can listen to recorded flood warning information for the area or speak to an operator for advice 24 hours a day.

Table 10: Environment Agency Flood Warning Codes

Flood Warning Code	What it means	When it's used	What to do
	Flooding is possible. Be prepared.	2 hours – 2 days in advance of flooding.	• Be prepared to act on your flood plan • Prepare a flood kit • Monitor local water levels and the flood forecast of the EA website
	Flooding is expected. Immediate action is required.	½ hour – 1 day in advance of flooding.	• Move people to a safe place • Turn off gas, electricity and water supplies if safe to do so • Put flood protection equipment in place
	Severe flooding. Danger to life.	When flooding poses a significant threat to life.	• Stay in a safe place with means of escape • Be ready to evacuate • Co-operate with the emergency services • Call 999 if you are in immediate danger
Warnings no longer in force	No further flooding is currently expected in your area	When river or sea conditions begin to return to normal	• Be careful as flood water may still be around for several days • If you have been flooded, ring your insurance company as soon as possible

Should a flood event reach the level where development is at risk of inundation, then the Environment Agency will issue a Severe Flood Warning.

Using the latest available technology, the Environment Agency is able to monitor rainfall, river levels and sea conditions 24 hours a day and use this information to forecast the possibility of flooding.

If flooding is forecast, they are able to issue warnings using a set of three different warning types.

How are Flood Warnings issued?

- Direct to you – receive warnings by phone, text, email or fax. Sign up for the Environment Agency's FREE Floodline Warnings Direct service via this website link: <https://fwd.environment-agency.gov.uk/app/olr/register> or by calling Floodline on **0845 988 1188**.
- On the flood warnings website – view up-to-date information about flood warnings in force, monitor the river or sea levels in your area and check out the latest flood risk forecast for your county.
- **By calling Floodline on 0845 988 1188** – you can listen to recorded information on the latest warnings and predictions or speak to an operator for more general information 24 hours a day. Environment Agency operators can also provide a quick dial number which gives you faster access to information for your area.
- Through the media – you may see or hear Environment Agency warnings on television and in radio broadcasts. You can also view the latest warnings on Digital Ceefax page 405.
- Flood Wardens – in some areas Flood Wardens are there to alert and support their local community when a flood warning is issued. Call Floodline on 0845 988 1188 to find out if this service is available in your area.
- Sirens/loudhailers – in some areas the Environment Agency uses loudhailer or siren systems to warn people that a flood warning has been issued. Call Floodline on 0845 988 1188 to find out if this type of service operates in your area.
- Flood warning feeds – Flood warning (RSS) feeds shows national and regional flood warnings in force and are updated every 15 minutes. The feeds contain a brief summary and link to the full information on the Environment Agency website.

7.4. Safe Place of temporary refuge

All of the student accommodation will be at second floor level and above, therefore there will be a safe place of temporary refuge available at all times in the event of an extreme flood event. The plan is that the majority of residents, staff and visitors will evacuate due to early warnings of a flood event.

7.5. Emergency Evacuation Route

It is recommended that persons on site are prepared to evacuate away from the property, if advised to do so by the EA Flood Alert Service, the emergency services and/or local authority, in the advance of the onset of any flooding. Routes in 1983-XX-DP2-A180-CA-XX-9010 Rev P02 Proposed flood emergency plan.

7.6. Signage

It is recommended that the building includes internal signage outlining flood protocols and evacuation routes to be adhered to in event of flood.

7.7. Proposed Flood Emergency Plan

It is also recommended that staff create Flood Emergency plan. This is a simple document that assists the occupants to prioritise actions required at the property before, during and following a flood event. It is also aids in the coordination with the Environment agency and local emergency services.

Due to the building being in Flood Zone 3 a Flood Emergency plan (1983-XX-DP2-A180-CA-XX-9010 Rev P02 Proposed flood emergency plan) has been included in the appendices of this report. The Plan includes more detail than is usually provided at planning stage to ensure there is a clear plan for the residents, staff and visitors in the event of a flood.

8. Conclusions & Recommendations

Surface Water & Foul Drainage

Following development, it is recommended that surface water flows resulting from the building's roof area discharges into the public surface water sewer located at the north of York Street.

Flows should be restricted to 50% of the existing discharge rate i.e., 2.5l/s for all return periods up to and including the 1 in 100 year + 50% climate change event.

Flows in excess of this should be attenuated within a blue roof, full details to be finalised during the detailed design phase.

CIRIA proposal 3084 April 2019 Guidance on the delivery of blue roofs has been provided as an attachment which should be used for reference during the detailed design phase.

Foul from the proposed development could connect into the public combined sewer networks either within York Street or Charles Street, following consent from United Utilities.

Please see the indicative Drainage strategy drawing in Appendix H.

Mitigation Measures

Finished Floor Levels

In order to allow disabled ramped access internally, it is proposed that the ground floor finished floor level will be elevated 300mm above the pavement level on Charles Street.

- Proposed Ground Floor Level = 31.600m AOD + 0.300 = 31.900m AOD

It is proposed that most of the ground floor level of the building will be allowed to flood via perforated panels or another venting system. This will allow water to penetrate the building during a flood event and allow it to drain back out again once the flood had subsided. Details to be developed during detailed design phase,

It is highlighted that there will be a proportion of the ground floor level which will not be allowed to flood, this area will comprise of lift shafts and M&E service area. The total footprint of the flood exclusion area is approximately 10m x 8m.

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Flood Resilience/Resistance

In order to provide an extra element of safety it is recommended that flood resilience/resistance measures outlined within Table 6 are incorporated into the buildings design, set 0.600m above the 1 in 100 year + 35% Climate Change flood level

- Flood Resilience/Resistance Measures (no less than) = 32.620 + 0.600 = 33.220m AOD

Environment Agency Flood Warnings

The application site is situated within an area covered the Environment Agency's Flood Warning's Direct Service; it is recommended that staff sign up to receive flood warnings to enable flood evacuation prior to the onset of flooding.

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Emergency Evacuation Plan

It is recommended that persons on site are prepared to evacuate away from the property, if advised to do so by the EA Flood Alert Service, the emergency services and/or local authority, in the advance of the onset of any flooding. Routes in 1983-XX-DP2-A180-CA-XX-9010 Rev P02 Proposed flood emergency plan.

Signage

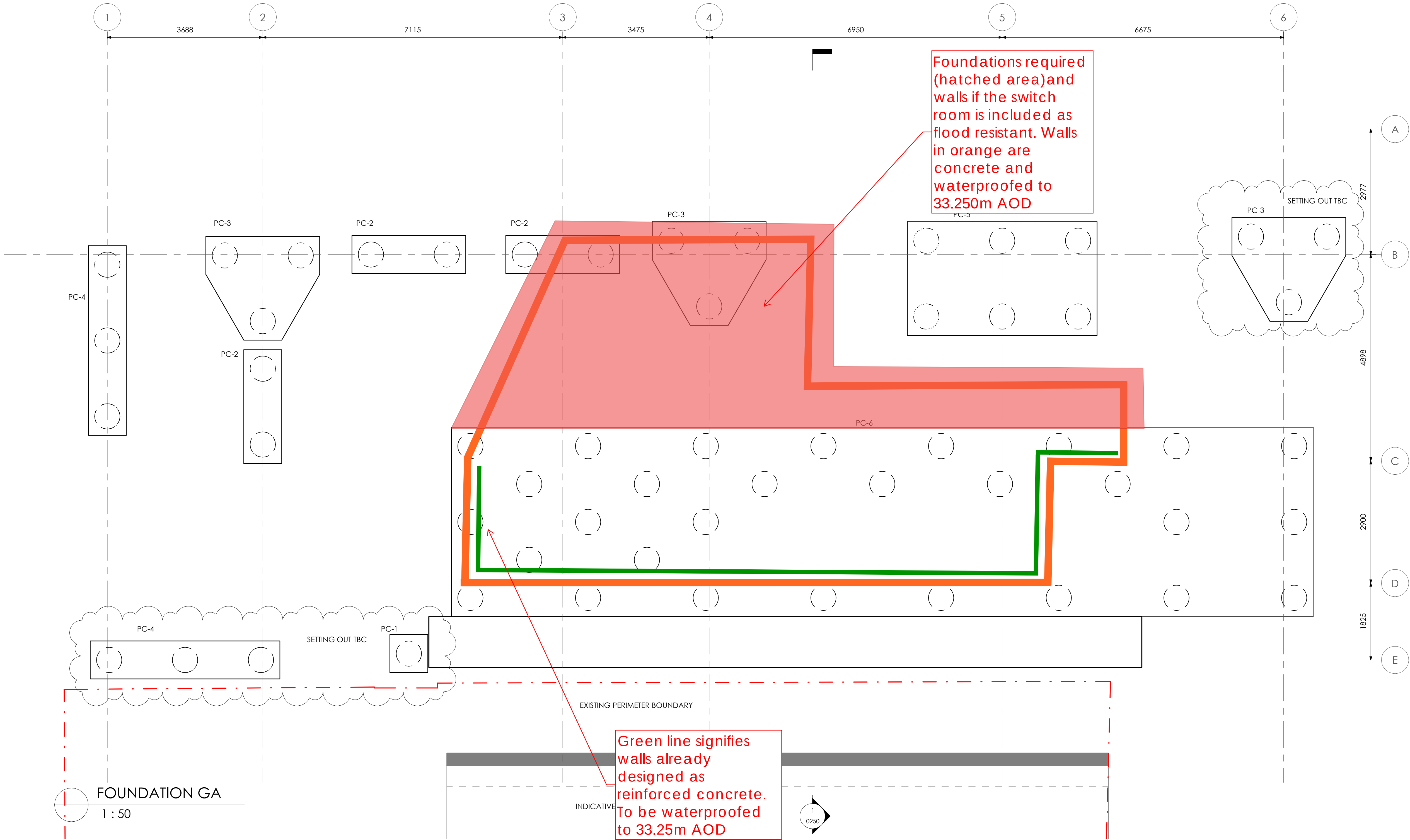
It is recommended that the building includes internal signage outlining flood protocols and evacuation routes to be adhered to in event of flood.

Business Flood Plan

See 1983-XX-DP2-A180-CA-XX-9010 Rev P02 Proposed flood emergency plan.

Appendices

Appendix A: - Development Proposals



NOTES:

DO NOT SCALE FROM THIS DRAWING

ALL DIMENSIONS ARE IN MILLIMETRES U.N.O.

ALL HEIGHTS ARE IN METRES ABOVE ORDNANCE DATUM U.N.O.

THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL RELEVANT ARCHITECTS AND ENGINEERS DRAWINGS AND SPECIFICATIONS

REFER TO ARCHITECTS DRAWINGS FOR SETTING OUT INFORMATION NOT SHOWN ON THIS DRAWING

PILECAP SCHEDULE

Pilecap Type	Pile Cut Off Level	Pile Cap Depth	Dead + Live	Dead + Live + Wind
PC-1	28.175	900		
PC-2	29.075	1000		
PC-3	28.875	1200		
PC-4	28.875	1200		
PC-5	28.675	1400		
PC-6	28.475	1600		

ALL PILECAPS AT 30.000m AOD U.N.O.

Green line signifies walls already designed as reinforced concrete. To be waterproofed to 33.25m AOD

Foundations required (hatched area) and walls if the switch room is included as flood resistant. Walls in orange are concrete and waterproofed to 33.25m AOD

1983-CS-DP2-G200-SK-XX-0009 Flood resistant area
Rev 02

Notes:
Lifts, 1 stair, lobby and switch room included as flood resistant - inside red line.
Refer to Architects layout for the room locations
All other areas on the ground floor will be designed as flood resilient

Drawing No.: 1983-CS-DP2-G200-PL-FD-0090	Rev: P01
Client: JADEBRICKS	DP Squared Limited (dp) ²
Project: CHARLES STREET	A DESIMONE Company
Title: FOUNDATION GA	contact@dpquared.net
	Suite 3, Unit 8, Pennine Industrial Park, Valley Road, Hebden Bridge, HX7 7BZ
	www.dpquared.net
	www.de-simone.com

P01	Preliminary	22/22	22/22/22
Rev	Revision Description:	Drm/Chk	Date:

Scale of A1: 1:50	Drawn by: SL	Checked by: ??	Date: ??
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INDICATIVE DETAILS TO ILLUSTRATE VISUAL INTENT ONLY. ALL
TO CONTRACTORS DESIGN.
ALL DETAILS TO BE COORDINATED WITH ADJACENT TRADES
AND SE AND M+E ENGINEER DETAILS.
THE CONTRACTOR IS RESPONSIBLE FOR MEETING THE
SPECIFIED PERFORMANCE CRITERIA.

Rev	Date	Description
P01	2023-12-05	PLANNING ISSUE
P02	2023-12-11	PLANNING UPDATE

Project Title
Charles Street
Manchester

Status
Planning

Drawing Title
General Arrangement
Plan
Ground Floor

Project No 10489	Scale 1 : 200 @ A3
SHP Drawing Code 10489-SHP-ZZ-A-B5D8-G200-PL-00-001	Revision P02

simpsonhaugh

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London
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TO CONTRACTORS DESIGN.
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AND SE AND M+E ENGINEER DETAILS.
THE CONTRACTOR IS RESPONSIBLE FOR MEETING THE
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Rev	Date	Description
P01	2023-12-05	PLANNING ISSUE
P02	2023-12-11	PLANNING UPDATE

Project Title
Charles Street
Manchester

Status
Planning

Drawing Title
General Arrangement
Plan
Level 01

Project No 10489	Scale 1 : 200 @ A3
SHP Drawing Code 10489-SHP-ZZ-A-B5D8-G200-PL-01-001	Revision P02

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Appendix B:- Topographical Survey

Key	
A/C	Air Conditioning Unit
B	Bollard
BP	Brick paving
BT	BT Inspection Cover
CATV	Cable Television Inspection Cover
CH	Coal Hole
CPS	Concrete Paving Slab
DK	Dropped Kerb
DP	Down Pipe
EL	Eaves Level
FI	Fire Hydrant
G	Gully
GP	Gate Post
IL	Illuminated Bollard
IRS	Illuminated Road Sign
IC	Inspection Cover
JB	Junction Box
LP	Lamp Post
MH	Man Hole Cover
PL	Post Box
PL	Pavement Light
RL	Ridge Level
S/D	Smoke Outlet
SL	Smoke Outlet
SV	Stop Valve
SWC	Surface Change
SV	Stop Valve
TCS	Telephone Call Box
W	Water Inspection Cover
WM	Water Meter



Control Stations
C1, 384236.853, 397468.811, 31.780
C2, 384267.341, 397485.089, 31.058
C3, 384214.762, 397511.377, 29.777

Notes:
Levels are related to Ordnance Survey
Datum via GPS Observations
Survey location is related to Ordnance
Survey Grid via GPS Observations
All information contained in this drawing
(including digital data) should be checked and
verified prior to any fabrication or construction.

Project: Charles Street
Manchester
M1 7BD

Title: Topographic Survey
Sheet 1 of 2

Drawn By: HH Scale: 1:100 Date: August 2023

Dwg No: LS2770/T A0

Point 2 Surveyors Limited
17 Singaby Place
London
WC2E 9AB
0207 836 5828



point2.co.uk



VC	A/C	IC	IC
B	Brick paving	JB	Inspection Cover
BT	BT Inspection Cover	JP	Junction Box
CATV	Cable Television Inspection Cover	LP	Lamp Post
CH	Coal Hole	MH	Man Hole Cover
CPS	Concrete Paving Slab	PL	Pavement Light
DK	Down Pipe	RD	Ridge Level
EL	Eaves Level	S/D	Smoke Outlet
EV	Fire Hydrant	S/C	Surface Change
FL	Fire Valve	SV	Stop Valve
G	Gully	T/C	Telephone Call Box
GS	Gate Post	TP	Traffic Pole
IB	Illuminated Bollard	W	Water Inspection Cover
IRS	Illuminated Road Sign	WM	Water Meter



Control Stations
C1, 384236.953, 397468.811, 31.780
C2, 384267.341, 397485.089, 31.058
C3, 384214.762, 397511.377, 29.777

Notes:
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Datum via GPS Observations
Survey location is related to Ordnance
Survey Grid via GPS Observations
All information contained in this drawing
(including digital data) should be checked and
verified prior to any fabrication or construction.

Project: Charles Street
Manchester
M1 7BD

Title: Topographic Survey
Sheet 2 of 2

Drawn by:	HH	Scale:	1:100	Date:	August 2023
Dwg No:	LS2770/T				A0

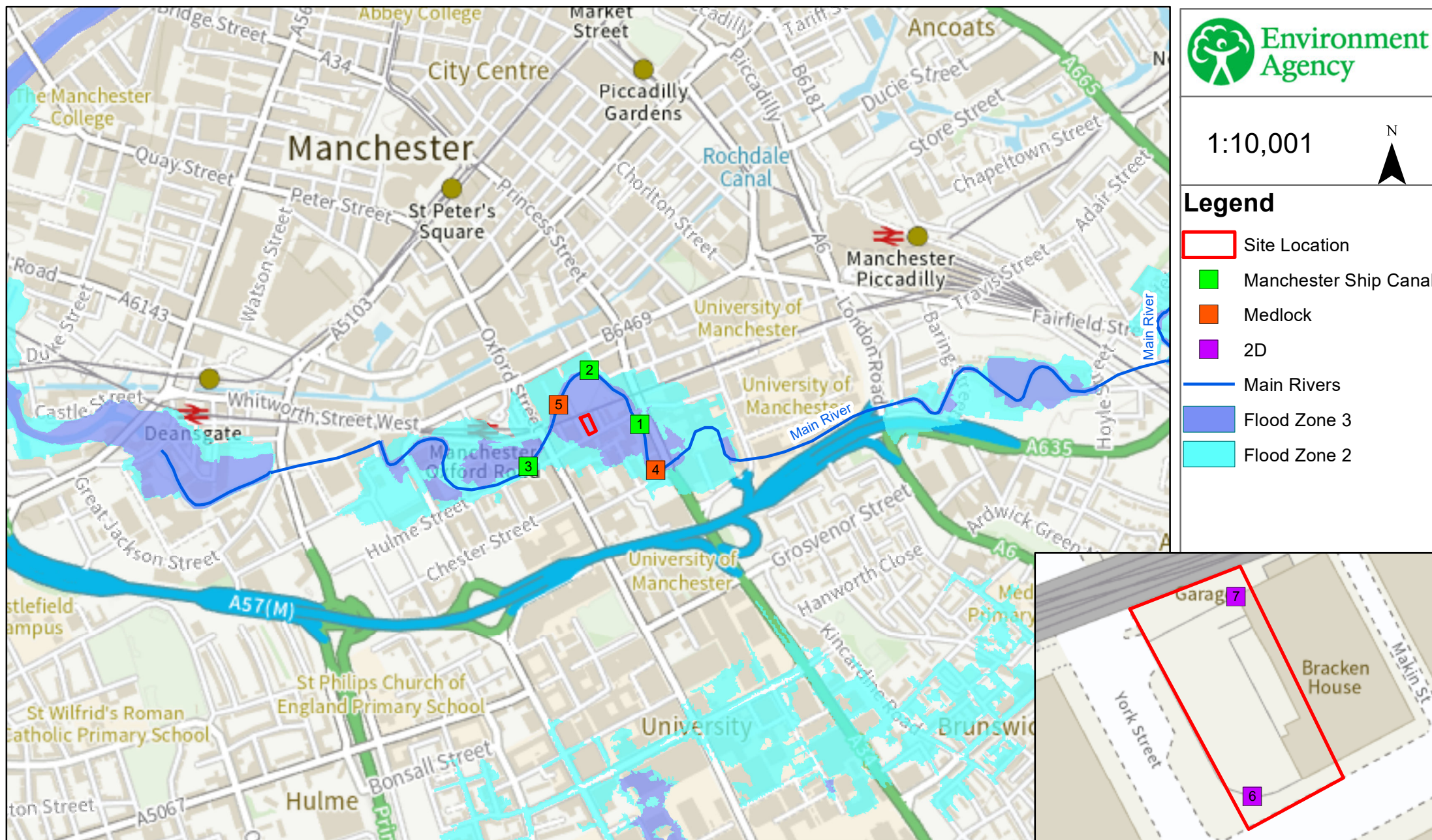
Point 2 Surveyors Limited
17 Slingby Place
London
WC2E 9AB
0207 836 5828

point2.co.uk



Appendix C:- Environment Agency Flood Data

Detailed Flood Map Centred on York Street, Manchester, M1 7DE. Created 06/09/2023 [GMMC323245JM]



					Latchford 3 Gates Closed Scenario		Latchford 1 Gates Closed Scenario	Normal operation										
Map Reference	Model Node Reference	Easting	Northing	Data	1 % AEP (1 in 100 year)	0.1 % AEP (1 in 1000 year)	1 % AEP (1 in 100 year)	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) + 30% increase in flow	1 % AEP (1 in 100 year) + 35% increase in flow	1 % AEP (1 in 100 year) + 70% increase in flow	0.5 % AEP (1 in 200 year)	0.1 % AEP (1 in 1000 year)
1	ea013_0251_MEDL01_1379	384343	397490	Modelled Water Level (m aodN)	32.43	33.90	32.43	29.86	30.32	30.89	31.59	32.02	32.43	33.35	33.41	33.66	33.19	33.90
				Modelled Flow (cumecs)	57.32	117.17	57.32	30.28	35.35	41.75	48.62	53.30	57.32	72.97	75.56	93.15	68.59	117.17
2	ea013_0251_MEDL01_1240	384240	397600	Modelled Water Level (m aodN)	32.39	33.87	32.39	29.73	30.17	30.77	31.44	31.95	32.39	33.33	33.39	33.65	33.18	33.87
				Modelled Flow (cumecs)	58.19	118.74	58.19	30.74	35.89	42.39	49.27	54.10	58.19	74.10	76.73	95.45	69.63	118.74
3	ea013_0251_MEDL01_0998	384117	397404	Modelled Water Level (m aodN)	31.37	32.28	31.37	29.41	29.76	30.20	30.70	31.06	31.37	31.80	31.84	32.10	31.72	32.28
				Modelled Flow (cumecs)	59.70	121.21	59.70	31.53	36.82	43.49	50.55	55.50	59.70	76.05	78.75	99.10	71.42	121.21

Model data taken from Manchester Ship Canal 2018

AEP - Annual Exceedence Probability

m aodN - metres above ordnance datum Newlyn

cumecs - cubic metres per second

Notes: Climate Change Scenario - 30%, 35% and 70% increases in flow calculated for the 2080's (2070 - 2115). Please see <https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances> for more information regarding the new climate change guidance.

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

1. Normal Operation: All sluice gates operate automatically to maintain a navigable pounded 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. Latchford 1 Gate Closed Scenario: This scenario represents a single operational sluice gate at Latchford Locks fixed closed. Therefore, only operational movements from 2 active sluice gates. The model setup removes the gate from PID controller setup and an IED file is used to define the sluice gate as fixed in the closed position.
3. Latchford 3 Gates Closed Scenario: This scenario has been defined as the removal of operational rules at all three sluice gates at Latchford 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 PID controller setup and an IED file is used to define sluice gates fixed in the closed position.

					Undefended				
Map Reference	Model Node Reference	Easting	Northing	Data	4 % AEP (1 in 25 year)	1 % AEP (1 in 100 year)	1 % AEP (1 in 100 year) + 35% increase in flow	1 % AEP (1 in 100 year) + 70% increase in flow	0.1 % AEP (1 in 1000 year)
4	MEDL01_1499	384375	397398	Modelled Water Level (m aodN)	30.81	31.62	32.82	33.29	33.83
				Modelled Flow (cumecs)	50.79	59.90	66.12	66.56	67.54
5	MEDL01_1104B	384175	397486	Modelled Water Level (m aodN)	30.12	30.94	32.44	33.02	33.68
				Modelled Flow (cumecs)	51.54	57.18	58.32	58.25	58.37

					Undefended			
Map Reference	Model Node Reference	Easting	Northing	Data	1 % AEP (1 in 100 year)	1 % AEP (1 in 100 year) + 35% increase in flow	1 % AEP (1 in 100 year) + 70% increase in flow	0.1 % AEP (1 in 1000 year)
6	2D Levels	384240	397474	Modelled Water Level (m aodN)		32.62	33.17	33.77
7		384238	397505	Modelled Water Level (m aodN)	31.29	32.62	33.21	33.83

Model data taken from River Medlock 2011

AEP - Annual Exceedence Probability

m aodN - metres above ordnance datum Newlyn

cumecs - cubic metres per second

Notes: Climate Change Scenario - 35% and 70% increases in flow calculated for the 2080's (2070 - 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.

Appendix D:- Sewer Records

Appendix 1.2 United Utilities Sewer Record Plan



Appendix E:- Indicative Attenuation Volumes

Storage Estimate

Return Period (years)	100	OK
Climate Change (%)	50	Cancel
Impermeable Area (ha)	0.035	Update
Peak Discharge (l/s)	2.500	
Infiltration Coefficient (m/hr) (leave blank if no infiltration)		Calc
Required Storage (m³)	Calc	
from	8	
to	13	
With infiltration (m³)		
from		
to		

Appendix F:- Blue Roof Guidance CIRIA proposal 3084

Guidance on the delivery of blue roofs

Summary

A blue roof provides the attenuation and management of rainfall at its source. They are becoming a common approach to deliver SuDS and manage local flood risk, particularly in dense urban environments where space is at a premium. Despite their popularity there is a lack of high quality, independent guidance. This project will provide guidance on blue roofs to improve confidence in their specification, design, delivery and approval.

Background and justification

A blue roof is specifically designed to provide source control, managing rainfall where it falls by temporarily storing and attenuating it on a roof as part of Sustainable Drainage Systems (SuDS). It mimics the natural environment by managing the discharge of rainwater from roofs at a controlled rate in line with a drainage strategy and overall site flood risk assessment.

Discharges from a blue roof can either be into a downstream SuDS component, or following approval from the Lead Local Flood Authority and/or sewerage undertaker into watercourses or the sewer system.

Blue roofs are installed either at roof or podium level above the structural waterproofing membrane and are a space efficient way of providing source control, without any additional land-take for infiltration, storage and attenuation. There are a variety of different approaches to the design and delivery of blue roofs. However, they commonly attenuate and treat rainfall within various proprietary elements and they can also be combined with more traditional green roof elements.

With the increasing challenges around urbanisation, urban retrofitting, building densities and climate change those working in the built environment need to expand their approaches to managing flood risks and urban sewer systems. Blue roofs are becoming a more popular option for providing attenuation and temporary storage within the building footprint without the associated headaches of land-take issues.

Although there is some limited advice on blue roofs in guidance on sustainable drainage (CIRIA 753 the SuDS Manual) and green roofs, there is an over-reliance on the technical and performance information from blue roof manufacturers. As a result, there is fragmentation of the industry and differences and potential conflicts with definitions and approaches amongst different parts of the built-environment sector that need explanation and resolution.

Professionals managing risks both at a building (surveyors, insurers etc) and city levels (flood risk managers) need to have the confidence that blue roofs have been specified, designed, constructed and maintained in accordance with regulations, standards and good practice.

There is an exciting opportunity to consider how blue roof design can deliver better water management and benefits around the provision of biodiversity and amenity. Making buildings more functional, attractive and also reducing resource and cost implications. This should assist with delivering attractive buildings and improved ratings for BREAM and LEED and lower costs.

Blue roofs could also be part of an approach that delivers greater resilience, particularly around climate change as well as promoting attractive buildings and liveable, healthier cities.

The guidance will provide a consolidated approach based on consensus and will give professionals the competence and confidence to cost effectively deliver and assess blue roofs. This should improve the quality of design and process of approval as well as the overall acceptance and specification of blue roofs. Key elements that the guidance will consider include:

- **Design framework** – this will include an overall framework for the design, that includes principles supported by design criteria and methods for delivering (and assessing) them.
- **The lifecycle of the building** – this will consider the interaction of blue roof delivery with planning requirements, its design, construction, operation and maintenance as well as any requirements for inspections and approvals.
- **Retrofitting blue roofs** – this will cover the structural considerations and other opportunities and challenges.
- **Roof deck construction** – consideration of various options and structural loading during construction, operation and building maintenance.
- **Waterproofing specification and construction** – the consideration of the main waterproofing options, with an overview of the delivery, application, compliance testing and performance against set criteria.
- **Blue roof components** – ensuring these are appropriately specified including insulation, barriers, outlets etc
- **Designing for multi-functionality** – this will focus on water management (flood risk management and rainwater harvesting) biodiversity and amenity.
- **Resilience of components** – this will consider the impact of extreme weather on blue roof components, including snow loading and wind stresses.
- **Maintenance of the blue roof system** – including activities to support the roofs primary drainage function as well as any designed multiple benefits.

Objectives

The overall objective of the project is to provide guidance on the planning, design, construction and management of blue roofs to help manage local flood risk and also provide multiple benefits.

Specific objectives are to:

1. Engage with relevant stakeholder to understand the challenges and opportunities of delivering blue roofs
2. Undertake a review of literature, evidence, practices and experiences covering the delivery of blue roofs
3. Align good practice guidance with the needs of relevant stakeholders supporting greater compliance with regulation, approvals and delivery of good practice
4. Provide guidance that delivers design criteria for managing runoff and delivery of multiple benefits through blue roofs.
5. Develop good practice guidance that covers the planning, design, construction and management of blue roofs (drawing on international good practice and UK experiences).
6. Disseminate the guidance to a wide audience, raising awareness of blue roofs, as well as competency and confidence across the industry.

Project benefits and outcomes

There are a number of potential beneficiaries of the guidance, those designing and approving blue roofs will have greater confidence. The reputation for those involved in the blue roof supply chain will also benefit from greater confidence and maintaining a good reputation for the approach. Other benefits include:

1. **Confidence in blue roof design** – the guidance will provide a number of different disciplines the confidence to design blue roofs, with specific consideration given structural loading, waterproofing and hydraulic control.
2. **Confidence in blue roof approval** – this will give those professionals (surveyors, flood risk managers, insurers) involved in managing risks associated with blue roofs assurance that their long term performance enables blue roofs to meet the necessary standards and regulatory requirements.
3. **Improving water management** – the guidance will ensure that a well-designed blue roof manages the flow rates and volumes of runoff, providing source control of runoff, rainwater harvesting and effective attenuation often in dense and challenging environments.
4. **Delivery for biodiversity and amenity** – the guidance will enable designers and engineers to deliver green roofs to design criteria that ensures they are functional provide biodiversity value and attractive spaces.
5. **Supporting cost effective blue roof delivery and maintenance** – the guidance will underpin a logical framework for delivery that enables considerations of initial specification, construction and maintenance to be incorporated into the process for implementation

Outputs

The main output will be guidance on the delivery of blue roofs. The key elements mentioned above will be covered, however the exact content will be informed by engagement with those involved in blue roof delivery, the collation of evidence and guidance and the availability of funds. The guidance will be image-rich, full of illustrations and case studies. A summary presentation will also be produced to help disseminate the value of blue roofs and the guidance.

The anticipated target audiences include:

- Developers
- Architects and landscape architects
- Engineers – primarily structural engineers and drainage engineers but also public health engineers.
- Approvers/regulators – those managing risks, like insurers and flood risk managers.
- Supply chain – this will include the manufacturers and designers involved in the specification of blue roofs and relevant components.

Approach and methodology

The project will be managed by CIRIA, guided by an independently chaired Project Steering Group (PSG) that represents the target audience, key stakeholders groups and funders. The project will be undertaken collaboratively to develop consensus. It is envisaged that the project will include:

1. **Development and fundraising** – CIRIA working with interested parties will develop and fundraise the proposal (including the development of the PSG).
2. **Research contractor appointment** – this will be based on ensuring they have the right skills and approach to delivering collaboratively and consensus-based outputs.

3. **Engagement** – this will be undertaken with the potential target audience and will include a survey and workshop to understand the challenges and opportunities to deliver blue roofs. It will identify critical success factors, good practice and case studies.
4. **Literature review** – A thematic review of the drivers, relevant standards and guidance (primarily internationally) and manufacturers information will be undertaken.
5. **Scoping report** – this will essentially focus on the challenges, opportunities (relating to functionality and the benefits) and suggestions for design criteria to overcome challenges and deliver opportunities. It will present the structure and contents of the guidance and explain how it relates with existing processes.
6. **Production of guidance** – the guidance will be developed with input from the PSG, who will review and comment on drafts.
7. **Dissemination** – Once the guidance has been reviewed by the PSG and an external reviewer, it will be edited, desktop-published and produced for sale. Dissemination activities will include a webinars.

Progress against an agreed programme will be driven by milestones based on project deliverables and co-ordinated with four project steering group meetings. Meetings will advise CIRIA and the research contractor on the technical quality of outputs.

Benefits of involvement

At this stage CIRIA is primarily looking for funds to enable the project to start. There are a number of benefits of this kind of involvement, this includes:

- Guaranteed membership of the Project Steering Group with the chance to:
 - Obtain early and privileged access to draft outputs enabling members to proactively respond to emerging good practice
 - Influence the direction of the project
 - Sharing experiences and networking with peers from the supply chain
 - Sharing experiences and networking with key approval bodies, as well as decision and policy makers
- Demonstrate thought leadership by showcasing commitment to the development of good practice on blue roof delivery
- Raise the organisation's profile through acknowledgement and inclusion of logos on the cover of the guidance. Reference to funders will also be made in CIRIA's newsletters with a circulation of around 50,000 readers.
- Contribute to the project at a fraction of the overall project cost, potentially benefiting from at least a 1:10 rate of leverage.

Project information

Once funded, the project will take between 12 - 18 months to complete. The overall budget is estimated to be between £75,000 and £115,000. The variation is dependent on scope of content.

For further information please contact Paul Shaffer (paul.shaffer@ciria.org, 0207 549 3309).

Appendix G:- Business Flood Plan



Environment
Agency

would your business stay afloat?

A guide to preparing your
business for flooding



Flooding is the most common and widespread natural disaster in the UK. Since 1998 there has been at least one serious flood every year. Businesses like yours are more likely to be flooded than destroyed by fire. As our climate changes we can expect to see more extreme weather – and more floods.

We aim to reduce the likelihood of flooding by managing land, rivers, coastal systems and flood defences. While we do everything we can to reduce the chance of flooding, it is a natural process and can never be completely eliminated.

By taking action to prepare in advance for flooding, most businesses can save between 20 and 90 per cent on the cost of lost stock and movable equipment, as well as some of the trouble and stress that goes with such an event.

This is a simple guide to some of the easy actions that you can take to make sure that your business is as well prepared as possible.

It tells you about how to find out if your business is at risk, our flood warning service and what our flood warning codes mean. It also has a simple template to use to design a flood plan for your company.

For more information about flooding, visit our website at **www.gov.uk/flood** or call Floodline on **0345 988 1188**.

Make sure that your business is prepared for flooding.

How do I find out if my business is at risk from flooding?

There are two quick and easy ways for you to find out if you're at risk.

call us on
0345 988 1188

Our Floodline service is open 24 hours, calls are charged at local rate. By taking your postcode, our operators will check and see if your business is in a flood risk area.

Look at our website
www.gov.uk/flood

You need to be aware of flooding and keep an eye on the water levels and weather situation at all times. You can do this by checking the flood forecasts and the river and sea levels on our website.

Our online flood map uses the latest technology and data gathered over many years to give the most accurate view of flooding in your area.

By entering your postcode you can find out if your business is at risk. Areas at risk from flooding are shown in dark blue and areas at risk from extreme flooding in light blue.

My business is at risk from flooding. What should I do now?

Start preparing now. If the weather conditions are right, flooding can happen at any time.

Remember, floods can happen at any time and any day – make sure you provide a number that can be contacted at all times – even out of working hours.

Sign up for flood warnings.

The first thing you should do is find out if you can receive flood warnings. In areas of high flood risk, we offer a service called Floodline Warnings Direct. This is a free, 24 hour service that sends automated flood warnings by telephone, SMS text, email, fax or pager.

To find out if you can receive this service, call Floodline on 0345 988 1188.

If your business isn't in an area covered by our warnings you can still check the latest flood warnings in force on our website.

When the situation is serious, flood warnings will also be broadcast on local television and radio news.

What practical steps can I take to protect my business?

Now that you've checked your risk and found out about flood warnings, it's time to start thinking about preparing a flood plan specifically for your business.

Taking simple steps can go a long way to protecting your business from flooding. Preparing a flood plan could:

- Significantly reduce financial losses, damage to property and business interruption;
- Help compliance with regulatory requirements (for example, Occupier's Liability Act 1984);
- Reduce exposure to civil or criminal liability;
- Enhance your company's image and credibility with employees, customers, suppliers and the community;
- Help fulfil your moral responsibility to protect employees, the community and the environment;
- Help you to obtain insurance cover.

What is a flood plan?

Just as many businesses have health and safety policies and contingency plans for an emergency, they should also have flood plans.

A flood plan is a written document that outlines how your business will respond to a flood.

This might include a list of steps you will take in case of a flood and the order you will take them in. It could also include the purchase of flood products and insurance.

A written plan can make information **easy** to access during a flood, **easy** to communicate to staff, and **easy** to remember.

Small businesses should make sure there is a plan of action in case of flooding. As the business owner, this may be your responsibility.

If your business is **medium sized**, flood preparation might be the responsibility of a team of people from different areas of the business.

If your business decides to have a flood planning team, this could be led by the business owner or Managing Director.

The leader of the flood planning team will need to let staff know about the plan once it is finished.

All members of the team should also keep a copy of important flood contacts at home for easy access.

Key areas to consider in your flood plan are:

- human resources;
- maintenance/facilities;
- finance and purchasing.

Once you have completed your plan don't forget about it. Look at it regularly and make sure it is up to date and in the event of a flood **use it**.



business flood plan



A written flood plan is recommended for businesses.

It should include:

- A list of important contacts, including Floodline, building services, suppliers and evacuation contacts for staff;
- A description or map showing locations of key property, protective materials and service shut-off points;
- Basic strategies for protecting property, preventing business disruption and assisting recovery;
- Checklists of procedures that can be quickly accessed by staff during a flood.

If a flood is imminent, your main priority is to make sure that your staff are safe. However there may be other actions that you can take to prepare your building and it's contents to minimise damage and post-flood repair and restoration costs.

Business flood plan

Flood plan for _____ dated _____

Registered address _____

Postcode _____

Staff contact list

Name	Address	Telephone/mobile	Emergency contact	Emergency telephone and address

Note staff who may require assistance in the event of a flood.

Name	Office location

Key locations

Service cut-off	Description of location
Electricity	
Gas	
Water	

Answer the following if applicable

	Description of location	How to protect from a flood (for example, move, cover, tie down)
First Aid Kit		
Oil based products (gasoline, oil, cooking oil etc.)		
Chemicals (including cleaning products)		

Protective actions

Identify stock, equipment and possessions that may need special protective measures, and describe the actions you will take to prevent damage in the event of a flood. We have suggested items and ways to protect them, but make sure you follow through on your plans.

think about:

- Computers;
- Tables / heavy furniture;
- Vehicles;
- Paper files;
- Electrical items;
- Chairs / stools;
- Databases;
- Soft furnishings;
- Computer files;
- Staff files.

ways to protect items

- Make a copy of important documentation and store in safe location;
- Raise items above ground level;
- Buy flood protection products;
- Buy new flood-resistant items;
- Move items to a safer location if possible – to an upper level of the building or off site.

Valuable item	Protective action	New location (if applicable)	Done
			☐
			☐
			☐
			☐
			☐
			☐
			☐
			☐
			☐

Suggested basic building materials to help protect your property

If materials are not needed, leave the relevant section blank

Materials	Used for	Items to protect / where to use	Storage location	Done
Sand and sand bags (unfilled), shovel	Creating flood barriers (used with plastic sheeting)			☐
Tools – hammer, nails, saw	Boarding up doors, windows and openings, creating shelves			☐
Wood – plywood, blocks of wood	Boarding up doors, windows and openings, creating shelves			☐
Sturdy plastic sheeting	Sandbag barriers, pulling up around furniture and appliances			☐
Strong plastic bags	Putting around legs of tables and chairs			☐
Pallets	Raising stored stock above flood level			☐
Emergency power generator	Maintaining function of air conditioning units (can help dry out a building), running fridges and freezers, medical equipment if appropriate			☐

Identify people who can help you before, during and after a flood, and what they can do.

We have suggested ways they might be able to help, but you'll need to discuss this with them.

Name	Address	Telephone day	Telephone evening	Mobile

Ways people can help

- assistance with installing flood products;
- assistance with transporting stock/materials to new location if possible;
- provision of emergency storage;
- provision of emergency supplies or medical support if required.

discussion guide

This discussion guide sums up the key areas of flood planning. Some of this information can be found in this pack to help get you started.



Research

- Look at your existing business policies, and think about whether they are appropriate in the event of a flood.

Staff

- Make a list of **employees' contact details in the event of an evacuation**. This might include mobile telephone numbers, or numbers for their home or the home of a friend or relative;
- Think about staff who **may need special assistance** in the event of a flood (for example, elderly, deaf, blind etc.)

Security procedures

- **Locking windows, doors and setting the alarm**. You might need more than one person to help do this;
- Insurance policies – **Are you insured for flood damage**, business interruption and lost revenue?
- Employee manuals – You might **add flood safety to staff information packs**, or adapt job descriptions to include flood warden duties;
- Hazardous materials plan – You must ensure that **chemicals, oils and other substances in your possession are kept safe** and do not contaminate flood water;
- Health and safety assessment – Plan to **check the functioning of flood products and flood warning systems regularly**, just as you do for fire safety equipment.

Check codes and regulations that might apply to your business in the event of a flood. The following could provide guidance on the right actions to take:

- Occupational health and safety regulations;
- Environmental regulations.



Important contacts

Make a list of important telephone numbers, including contacts for gas, electricity, water and telephone providers.

Key locations

- **Know the location** of cut-off points for gas, electricity and water. Ideally, these should be marked on a map that is stored with your flood plan;
- Know the location of chemicals, oils or other materials that could be dangerous or contaminate flood water. These should be stored safe from floods and other damage.

Protective actions

- Note key stock, equipment and possessions that may need special protection from flood water;
- Consider things you may need during or after a flood (for example, sandbags, plastic sheeting, loudspeaker);
- See if it's **possible to move key operations**, such as shipping or customer services, to another building.

Suppliers and external links

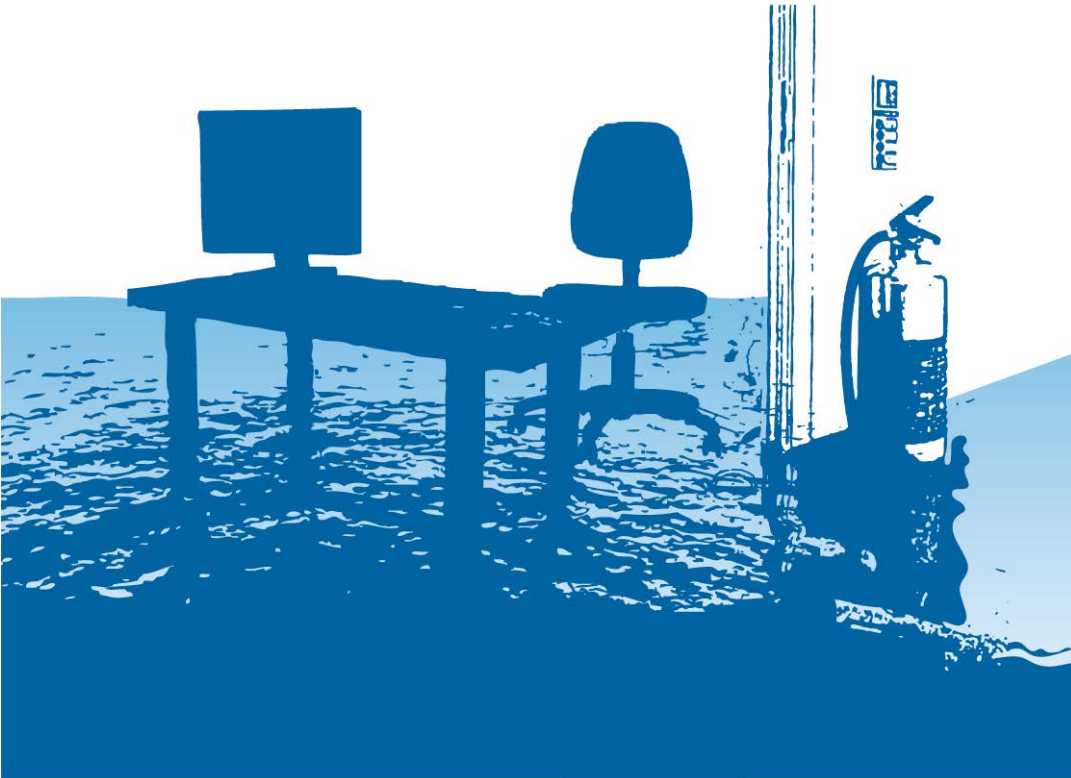
- Identify products and services you won't need in the event of a flood, or which suppliers may not be able to provide. **Make back-up plans** or arrangements for short-notice cancellation of deliveries;
- Consider contracting in advance with companies whose help you may need after a flood.

business checklist

Are you prepared for flooding?

If you answer no to any of the questions overleaf, there may be more you can do to protect your business.

The individual sections will give you valuable information on effective actions you can take to prepare for a flood.



If you can answer yes, please ☒, otherwise leave blank for no.

Know if you're at risk

- ☐ Do you know if you're at risk of flooding?
- ☐ Are flood warnings available in your area?
- ☐ Do you know how you can receive flood warnings?

Preparing a flood plan

- ☐ Do you know how your business will respond to a flood?
- ☐ Do you have a list of useful numbers including Floodline, local authority and insurance company?
- ☐ Do you know how to shut off your gas/electric/water supplies?
- ☐ Are your stock, fittings and valuable equipment stored above flood level?
- ☐ Have you developed flood contingency plans with suppliers and/or clients?
- ☐ Can you call someone to help you in the event of a flood?

Staff training and evacuation

- ☐ Are you aware of correct flood safety procedures for you and your staff?
- ☐ Have you trained your staff on flood safety procedures?
- ☐ Can your staff work quickly and efficiently to protect your business in the event of a flood?

Protecting your property

- ☐ Have you installed flood protection products?
- ☐ Do you have a stockpile of useful materials including plywood, plastic sheeting, sandbags (unfilled), sand, nails, hammer, shovel, blocks of wood and a saw?
- ☐ Have you installed non return valves in your toilets and drains?
- ☐ Do you and your staff have high ground where you can park your cars?
- ☐ Are your electrical sockets above flood level?
- ☐ Do you have computer equipment in the basement?

Flood insurance

- ☐ Do you have sufficient insurance cover in the event of a flood situation?
- ☐ Do you know what information your insurer will require to support a claim?

Evacuation

- ☐ Do you have an easy way to let your staff know about an evacuation?
- ☐ Do you know which roads will stay open in your area during a flood?
- ☐ Have you identified where staff can shelter in the event of a flood?
- ☐ Could you control staff panic during a flood?

understand your flood warning codes

Our warning service has three types of warnings - Flood Alert, Flood Warning and Severe Flood Warning - that will help you prepare for flooding and take necessary actions.

ONLINE FLOOD RISK FORECAST

What it means

Be aware.
Keep an eye on the weather situation.

When it's used

Forecasts of flooding on the Environment Agency website are updated at least once a day.

What to do

- Check weather conditions.
- Check for updated flood forecasts on our website.



FLOOD ALERT

What it means

Flooding is possible.
Be prepared.

When it's used

Two hours to two days in advance of flooding.

What to do

- Be prepared to act on your flood plan.
 - Prepare a flood kit of essential items.
 - Monitor local water levels and the flood forecast on our website.
-



FLOOD WARNING

What it means

Flooding is expected.
Immediate action required.

When it's used

Half an hour to one day
in advance of flooding.

What to do

- Move staff, stock and valuables to a safe place.
 - Turn off gas, electricity and water supplies if safe to do so.
 - Put flood protection equipment in place.
-



SEVERE FLOOD WARNING

What it means

Severe flooding.
Danger to life.

When it's used

When flooding poses a
significant risk to life.

What to do

- Stay in a safe place with means of escape.
 - Be ready should you need to evacuate.
 - Co-operate with the emergency services.
 - Call 999 if you are in immediate danger.
-

WARNING NO LONGER IN FORCE

What it means

No further flooding is
currently expected in
you area.

When it's used

When river or sea
conditions begin to
return to normal.

What to do

- Be careful. Flood water may still be around for several days.
 - If you've been flooded, ring your insurance company as soon as possible.
-

useful contacts

Fill in the contact details you may need if your business floods.
Keep it in a safe place, where you can hold of it quickly.

	Company name	Telephone number/s
Environment Agency Floodline		0345 988 1188
Electricity supplier and meter number		
Gas supplier and meter number		
Water supplier and meter number		
Telephone provider		
Local authority emergency services		
Insurance company 24-hour number and policy number		
Insurance agent		
Local radio station for news alerts and weather updates		
Companies that may be able to help you after a flood		
Electrician		
Plumber		
Builder		
Equipment repair/suppliers		
Security services		
Water pumping services		
Emergency power suppliers		

**Would you like to find out more about us,
or about your environment?**

Then call us on

08708 506 506* (Mon-Fri 8-6)

email

enquiries@environment-agency.gov.uk

or visit our website

www.gov.uk/environment-agency

incident hotline 0800 80 70 60 (24hrs)

floodline 0345 988 1188 (24hrs)

*** Weekday Daytime calls cost 8p plus up to 6p/min from BT Weekend Unlimited. Mobile and other providers' charges may vary.**

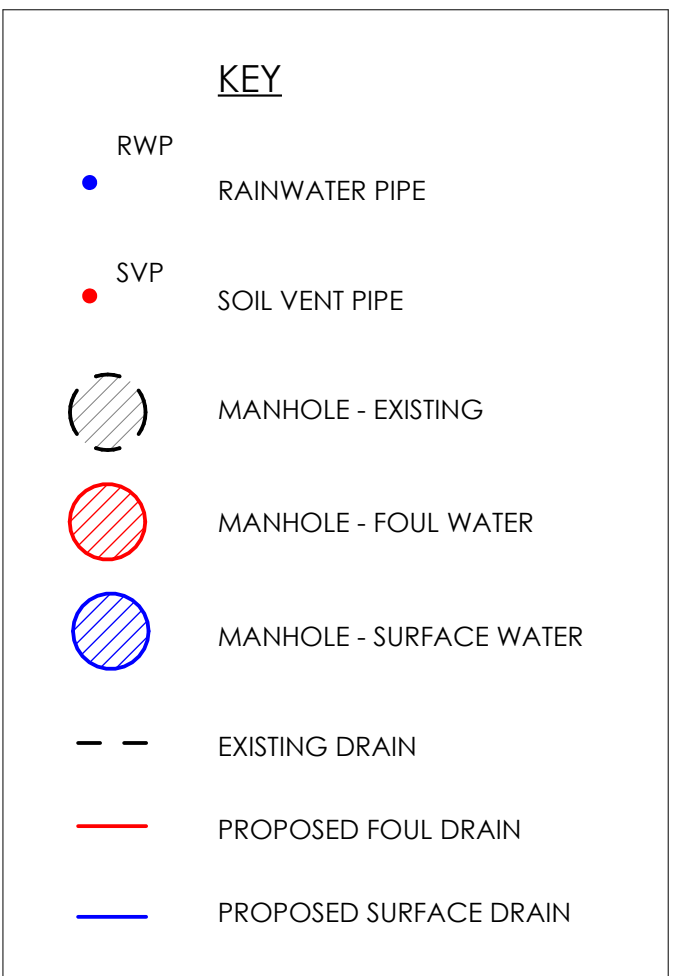


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Appendix H – Indicative drainage strategy

REFER TO ARCHITECTS DRAWINGS FOR SETTING OUT
INFORMATION NOT SHOWN ON THIS DRAWING



Scale of A1: 1:100	Drawn by: JH	Checked by: ES	Date: 28-11-23
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(dp)²
A DESIMONE Company

1983

Charles Street

Manchester]

Proposed Flood Emergency plan

**1983-CS-DP2-A180-RP-XX-9010
Rev P02**

DP Squared Ltd

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HX7 7BZ

www.dpsquared.net

Charles Street, Manchester

For

Jadebricks (Charles Street) Ltd

January 2024

Ref: 1983-CS-DP2-A180-RP-XX-9010

Report prepared by E Strouts

MEng CEng MStructE PG Dip Law

Report checked and approved by D Paine

BEng MICE

Rev	Date	By	Comment
P01	15 Jan 2024	ES	Preliminary issue - DRAFT
P02	18 Jan 2024	ES	Revised from comments

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Proposed Flood Emergency plan

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1. Scope, Objectives, and background

The Flood risk assessment (FRA) for produced the Charles Street site planning submission used information provided by the Environment agency (EA) which designated the proposed building to be in Flood Zone 3.

The FRA submission for planning included site-specific information from the EA that the designed for flood level of 1 in 100-year event + 35% climate change level would be 720mm above the proposed ground floor level of 31.900mm AOD.

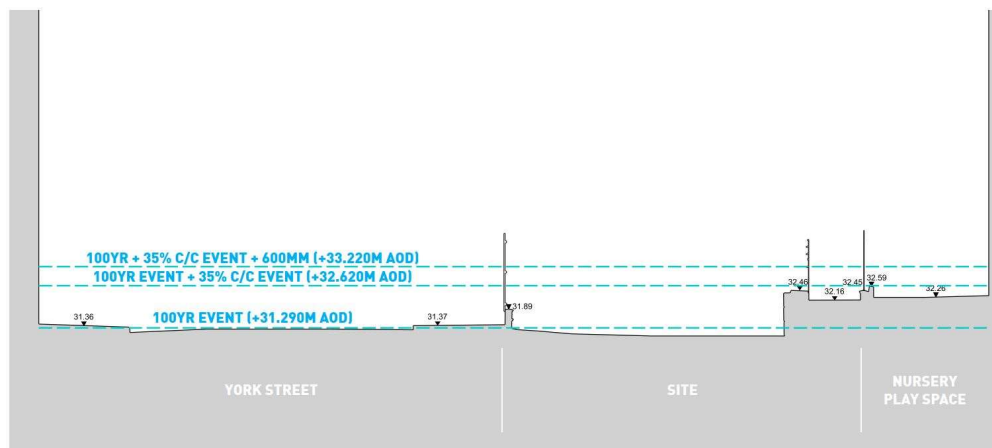


Figure 1 - Flood levels from EA data

A Pre-planning application for feedback from the EA on the FRA included the request for a detailed Proposed Flood Emergency plan (FEP) as part of the Planning submission. This is to specifically address a flood hazard assessment and specifically focussed on the safe access/egress of stakeholders in a flood event.

The aim of this FEP is to mitigate the identified risks for the proposed development. The objectives with the known detail at this stage of the project is provide certainty in relation to the bullets below:

- More detailed information for the planning and EA assessment.
- Will notify all stakeholders immediately in the event of a flood and safely evacuate residents, visitors, and staff.
- All building users will be educated sufficiently to know what to do when they get a flood alert.
- Keeps all occupants/staff safe in the event of a flood reducing the risk to life.

2. Location and proposal

The proposed Charles Street development is located at the corner of Charles Street and York Street in Manchester City centre.

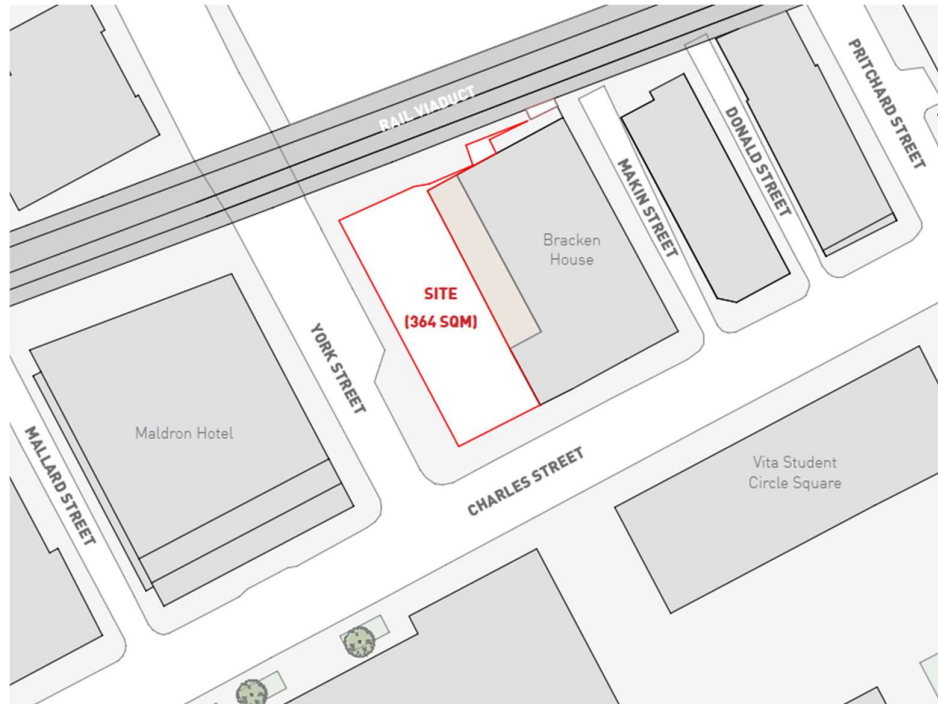


Figure 2 - Site location

The existing site slopes downwards from the front (Charles Street) to the back. The site decreases in level by approximately 1.2m from Charles Street which means the various entrances along the York Street facade need to be at different levels.

The development consists of a 15-storey new build with studio apartments for students with some amenity area. The height of the building has been dictated by the surrounding buildings. The client requires a minimum of 107 students' units to make the project financially viable.

All critical infrastructure for the project is located above first floor level where it is safe from flood zone levels. Any infrastructure (lifts, switch room) for the building within the flood zone level is contained within a flood resistant 'box' of waterproof concrete walls. All other ground floor areas are designed with flood resilient finishes, allowing flood water to enter and then drain away.

Any potentially vulnerable people housed in the building or visiting during a flood event who cannot escape before flood levels overwhelm the ground floor have amenity spaces on first and second floors plus studio apartments from second floor upwards to seek temporary refuge.

2.1. Access and escape points.

Main access and egress is at the Charles Street end of the building. This is the highest point of the ground floor. There is a main entrance/exit and two fire escapes that exist onto Charles Street from down the side of the building.

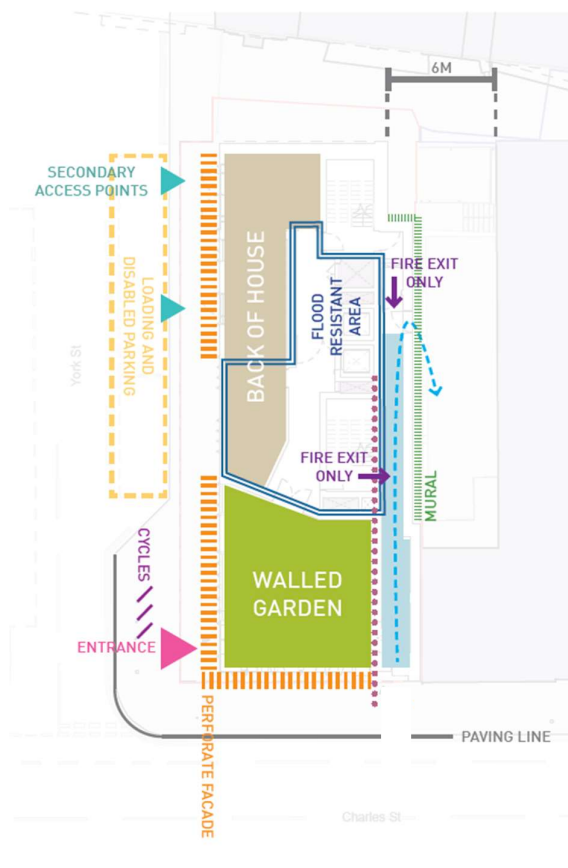


Figure 3 - Access and egress points

A 1 in 100-year flood event level as provided by the EA is below the level of the ground floor at the Charles Street entrance so any flood to this extreme will be mean all residents and staff will be able to escape prior to flood waters entering the building.

3. Risk Summary

3.1. Source of flooding

All the sources of flooding, be they surface water or Pluvial are outlined in 1983-CS-DP2-A180-RP-XX-9041 Rev P05 Flood risk assessment and drainage strategy. The main sources of flooding and result of flood zone 3 classification is fluvial or river flooding from the Medlock.

3.2. Flood Hazard Rating (HR) and thresholds

The Flood Hazard Rating based on the 'Flood Risks to People Methodology' (FD2321/TR11) during the 100 year + Climate Change Event is as follows:

The revised 'hazard rating' expression based primarily on consideration to the direct risks of people exposed to floodwaters.

$$HR = d \times (v + n) + DF$$

where, HR = (flood) hazard rating.

d = depth of flooding (m); 1.020m during the 100 year + CC Event @ the south

v = velocity of floodwaters (m/sec); and 0.5 for flat and low-lying flood plains

DF = debris factor (0, 0.5, 1 depending on probability that debris will lead to a hazard) depth in excess of 0.75m in an urban environment = 1

n = a constant of 0.5

The Hazard Rating at the south access of the site during the 1 in 100 year + climate change event = $1.020 \times (0.5 + 0.5) + 1 = 2.02$

Based on Table 2: Hazard to People (Source Table 3.2 in FD2321/TR1) 2.02 is considered to be Significant i.e., Dangerous for most people - "Danger: flood zone with deep fast flowing water"

The first-floor level is above the 1 in 1000-year flood level.

3.3. Specific risks for the proposed site

- Height of Flooding
- Debris in the flood water
- Speed/flow of flood water

4. Mitigation

4.1. Possible measures

The mitigation measures applied to the building design are flood resistance and flood resilient design of the ground floor. Protecting the buildings vital infrastructure with waterproof concrete walls and allowing flood water into flood resilient areas means the building can recover faster from the flood event.

Flood prevention remedies are beyond the scope of this report. These can only be achieved with flood prevention schemes for the North-west of England.

Education and regular practice of flood event evacuation of the building will mitigate the number of people who are present in the building who are unaware of the correct procedure in a flood event.

Possible mitigation for the fast and safe evacuation of the building can be enhanced with technology. There are two possible systems that are recommended:

- Install a flood sensor on the lowest part of the proposed building. An alarm could be added to the building, with text alert to residents and emergency services. The alarm could be triggered in the event of the flood water level breaching the Bin store facade, giving the residents more time to evacuate.
- App based flood warnings are available all over the UK. Some are linked to insurance companies, some could be bespoke, linked to a flood sensor (as above) with other information such as a bespoke evacuation plan from your room in the App.

The ongoing operation of the building in the event of flood overwhelming the ground floor is possible from the flood resistant walls protecting the power supply to the building. In the event of power loss due flooding affecting infrastructure, a generator is installed in the building above first floor level, this means power for emergency and escape lighting is available in the building.

4.2. Mitigation implementation

The building design measures have already been implemented in the proposed scheme.

Evacuation planning and education will also be implemented.

The sensor and App proposal are all measures that could be considered by the owner and operator. The costs of these proposals could be shared with the surrounding buildings that will be subject to similar flooding scenarios.

5. Flood warnings and associated actions

There should be an explanation of Flood Warnings available for the site and how Floodline operates, with contact numbers within the EP.

It is crucial the Operator fully explores the variety of flood warnings available to a specific development and decided on their preferred method or combinations of warnings such as:

- EA
- Media
- App
- Alarm
- Local sirens
- Media

Flood Warning Code	What it means	When it's used	What to do
	Flooding is possible. Be prepared.	2 hours – 2 days in advance of flooding.	• Be prepared to act on you flood plan • Prepare a flood kit • Monitor local water levels and the flood forecast of the EA website
	Flooding is expected. Immediate action is required.	½ hour – 1 day in advance of flooding.	• Move people to a safe place • Turn off gas, electricity and water supplies if safe to do so • Put flood protection equipment in place
	Severe flooding. Danger to life.	When flooding poses a significant threat to life.	• Stay in a safe place with means of escape • Be ready to evacuate • Co-operate with the emergency services • Call 999 if you are in immediate danger
Warnings no longer in force	No further flooding is currently expected in your area	When river or sea conditions begin to return to normal	• Be careful as flood water may still be around for several days • If you have been flooded, ring your insurance company as soon as possible

Figure 4 - Access and egress points

As noted above in Mitigation a development flood sensor could be installed.

There should be a clear statement that the occupants/organisation, including successive tenures, will sign up to the Floodline service. Businesses should clearly identify a point-of-contact for receiving the warnings.

The Operator should outline actions and procedures for all parties upon receiving flood alerts and warnings and any further dissemination of the information.

5.1. Floodline

The site is located in a flood risk area; therefore, the site will participate in the Environment Agency Flood Warning service in order to receive flood warnings by telephone, text, or email. The site will register contact details with the Environment Agency's Flood Warnings Service (Floodline 0345 988 1188) in order to receive Flood Warnings for the following Flood Warning area.

The occupants of the site will be made aware of the Environment Agency Floodline telephone number (on 0345 988 1188) and the flood warning meaning. A Flood Warden for the site will be appointed from the staff of the site. The Flood Warden will have an understanding of the flood mechanisms of the site and will ensure that the safety of the occupants and visitors will not be compromised. The Flood Warden will:

- Inform occupants and visitors of the existence of the FEP where required.
- Ensure that the site is registered with the Environment Agency Floodline service.
- Ensure that flood protection equipment and materials, if required, are installed, and maintained including any flood boards and pumps.
- Co-ordinate with the emergency services.
- Identify equipment or possessions that require special protective measures and co-ordinate the action required to prevent their damage in the event of a flood.
- Monitor flood levels and keep, occupants and visitors informed.
- Review the FEP annually.
- To further manage the flood risk and to confirm that the exit route is safe an on-the-spot risk assessment will be undertaken by the Flood Warden, if required.
- Liaise with the Environment Agency on a regular basis.
- The needs of disabled, people who have reduced mobility or pregnant visitors will also need to be taken into account by the Flood Warden.

The FEP will be passed onto the occupants and visitors of the building who will be made aware of the Safe Access and Egress Route, Environment Agency Floodline, Flood Warning Notice and Flood Warning Codes. Any flood warnings will be passed onto the occupants and visitors of the building verbally, by telephone and/or in person. It will be ensured that everyone receives the flood warnings when required.

5.1.1. How to Register

1. Internet using the Environment Agency's website:

<https://www.gov.uk/sign-up-for-flood-warnings>

2. Telephone

Calling Floodline on 0345 988 1188

5.1.2. Floodline by Telephone

During a heavy rainfall event, call Floodline on 0345 988 1188.

5.1.3. Updates

The Environment Agency website contains regular updates and information (<https://flood-warninginformation.service.gov.uk/warnings>).

6. Safe access and escape

6.1. Procedures

Safe access to and from the development are shown in figure 3.

Evacuation procedure is only needed for flooding of the river Medlock and will be planned for in the event of flood alert on the river. Procedure will include a recommendation to evacuate in the event of a flood warning from the Environment agency and will continue until the point flood waters reach the level of Charles Street.

The evacuation procedure will be triggered by the flood alerts from a privately installed flood sensor or App or flood warning from Floodline or alarm. – To be determined by the operator.

It is recommended the Operator installs and maintains a flood alarm system in the building. This may be a different warning sound from the fire alarm, so residents and staff are aware it is an imminent flood risk evacuations.

All residents and staff will be trained to follow fire escape routes and to muster across Charles Street at an agreed location in the elevated Symphony Park. A suitable emergency shelter should be arranged once the Operator has been appointed.

All residents and staff with special needs such are to be prioritised in the event of a flood. Flood alerts issued prior to flood warnings, will be used to trigger a message to all residents and staff with special needs that a possible flood evacuation could happen. All will also have a specific flood evacuation prepared for them.

6.2. Routes

Occupants and visitors should initially undertake a visual check to ensure that no floodwater is present within Charles Street prior to evacuation. If the visual check determines that the floodwater is yet to reach Charles Street occupiers and visitors should exit the building. Occupants and visitors should proceed swiftly but calmly either way along Charles Street or across the street and into Symphony Park. Occupiers and visitors should not take from the building any bulky items that may impede their evacuation. Occupiers and visitors should provide assistance to those who may need it, such as children, the elderly or disabled.

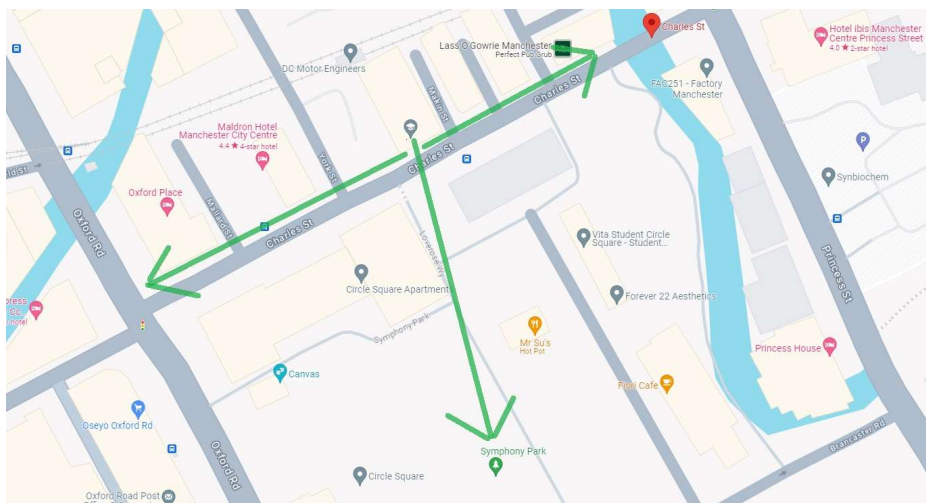


Figure 5 - Escape routes from the building

The emergency services should be contacted if floodwater has reached the Bin Store doors to allow time for them to attend and assist any occupants who are unable to evacuate the quickly.

Facilities such as hotels, shops etc. are located to the south, east and west of the building which may be used in the event of a flood event.

7. Temporary refuge

7.1. Onsite refuge

The priority is that majority of residents and staff are evacuated prior to flood due to multiple flood warnings and evacuation procedure.

All areas above first floor level all form refuge of staff and residents in the building. This includes offices for management and staff to coordinate any temporary refuge. All residents have the possibility of refuge in their own apartments. Staff and guests have refuge in the amenity areas on level 01 and level 02

On-site refuge is considered appropriate, as the place of refuge is well above the predicted 1 in 100year + 35% climate change +600mm flood level. On-site refuge would only be considered during a very extreme flood event or if a flood warning was not received.

Depending on the severity of the flood and stage of flooding, an emergency vehicle could access the first floor of the building from Charles Street using windows to the amenity space and offices to evacuate any residents or staff taking temporary refuge.

7.2. Offsite refuge

The building is in the centre of Manchester with a number of hotels, churches and university buildings within easy walking distance that could be used as places of refuge.

8. After the flood

Procedures for post-flood recovery will be generated by the operator and other stakeholders when appointed. The procedures for cleaning, drying, repairing any damage to the ground floor flood resilient areas can be determined nearer the time of operation of the building.

The time taken for a return to normal use will be minimised by the flood resistant and flood resilient design of the ground floor.

The bin store, bike store and garden area are all allowed to flood. The finishes are to be specified accordingly.

8.1. First steps

Only return to the buildings once it is safe to do so and once permission has been granted by any emergency services in attendance.

Floodwater may be still around and could be contaminated (see Appendix 3). Take care as there may be hidden dangers in the flood water like sharp objects, raised manhole covers and pollution. Flood water could have caused structural damage to the building.

Upon returning to the building, it will be important to consider some of the hazards that may be present on the building following a flood event, including:

- Standing water remaining on the site.
- Transported debris from within the watercourse or from elsewhere on the site that could be
- a tripping hazard.
- Silt or residue deposited on the site that may be slippery.
- Potentially contaminated water.

As a priority, insurance companies should be contacted, and the structural condition of the property should be visually inspected from the outside by a competent professional prior to reoccupation. This is to identify if there has been any damage to the integrity of the building.

In almost all cases the insurance company will send a loss adjuster to look at the building. They will confirm what repairs and replacements are needed and covered by your policy.

8.2. Things to be Aware Of

Flood water can contain sewage, chemicals, and animal waste. Always wear:

- Waterproof outerwear, including gloves.
- Wellington boots.
- Face mask.

If the electricity supply is not already switched off at the mains, get a qualified person to do this. DO NOT touch sources of electricity when standing in flood water. Upon entering the premises, a clean-up operation can commence.

Occupiers may need to:

- Commission immediate emergency pumping/repair work, if necessary, to prevent further
- damage.
- Open doors and windows to ventilate.
- Contact local authority or health service to find out where you can get help to clean up.
- Contact utility providers to have them check services before re-use.
- Dispose of all food that may have been in contact with floodwater as contamination could have occurred. For further assistance, contact your local authority Environmental Health department for advice.
- Keep comprehensive records of flood damage (photographs, videos etc.).
- Contact your insurance broker (24 hour) Emergency Helpline. They will be able to provide information on dealing with compensation claims.

Get an advice guide to repairing damaged property from Floodline (0345 988 1188).

9. List of roles

List the roles and responsibilities of all relevant parties, including occupants. State how awareness of such duties will be ensured and passed on to successive tenures (To be agreed at point of appointment of operator):

- Residents TBC
- On site staff TBC
- Operators TBC
- Owners TBC
- Emergency services TBC
- Local Authority TBC
- Environment agency TBC

10. Plan upkeep and awareness

All residents and staff will need to learn the evacuation procedure, when to evacuate and be provided with all the warning types provided by the Operator. The introduction information for staff and residents should include a section on flood evacuation and have an acceptance of understanding at orientation at the development. This section should include:

- Education on dangers of flood water and debris.
- Exercise/test/practise of plan and evacuation.
- Monitoring and review