



FLOOD RISK ASSESSMENT

Site Address

59 Kingston Road
Manchester
M20 2SB

Client

Andrew Wallace Architects

Date

09/04/2021



1 Document Control



FLOOD RISK ASSESSMENT



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2 Abbreviations

Abbreviation	Description
STM	STM Environmental Consultants Limited
BGS	British Geological Survey
EA	Environment Agency
OS	Ordnance Survey of Great Britain
FRA	Flood Risk Assessment
NPPF	National Planning Policy Framework
FWD	Floodline Warning Direct
FRMS	Flood Risk Management Strategy
MCC	Manchester City Council
SWMP	Surface Water Management Plan
SFRA	Strategic Flood Risk Assessment
CDA	Critical Drainage Area
SuDS	Sustainable Drainage Systems
GWSPZ	Groundwater Source Protection Zone
LLFA	Lead Local Flood Authority
mbgl	metres below ground level
DCLG	Department for Communities and Local Government
PPGPS	Planning practice guidance and Planning system

3 Disclaimer

This report and any information or advice which it contains, is provided by STM Environmental Consultants Ltd (STM) and can only be used and relied upon by Andrew Wallace Architects (Client).

STM has exercised such professional skill, care and diligence as may reasonably be expected of a properly qualified and competent consultant when undertaking works of this nature. However, STM gives no warranty, representation or assurance as to the accuracy or completeness of any information, assessments or evaluations presented within this report. Furthermore, STM accepts no liability whatsoever for any loss or damage arising from the interpretation or use of the information contained within this report. Any party other than the Client using or placing reliance upon any information contained in this report, do so at their own risk.

4 Executive Summary

Location	59 Kingston Rd, Manchester, M20 2SB Grid reference: 384959, 390030
Proposed Development	Erection of a two-storey rear extension, single storey side extension and loft conversion.
Flood Zone	Flood Zone 1 & 2.
Topography	The average ground level is 33.51mAOD. The site of the extension is 33.61mAOD.
Sequential and Exception Tests	Development is minor and more vulnerable so Sequential and Exception Tests should not be required. LLFA to decide.
Main Sources of Flooding	Fluvial from the River Mersey.
Flood Defences	Flood defences in the area have a standard of protection up to 1 in 100-year with a 34.27mAOD upstream crest level. See Appendix 10 for asset summary.
Records of Historic Flooding	The EA data does not identify any historic flood events on site. Didsbury experienced a flooding event in 1964 close to the site.
Fluvial (River) and Tidal (Sea) Flood Risk	Low – The site does not flood during the 1 in 100 +35% CC or +70%CC event at the closest Node point provided (Node 7). Site benefits from flood defences.
Pluvial (Surface Water) Flood Risk	Low – Site remains dry during the 1 in 100 and 1 in 1000-year scenarios. No significant surface water flooding incidents identified.
Flood Risk from Artificial (Canals and Reservoirs) Sources	Low – Although the site is within the reservoir flooding extent, the residual risk associated with them is classified as being low.
Groundwater Flood Risk	Low – Although site is potentially susceptible to groundwater flooding, no recorded incidents have been identified.
Development Impacts on Local Flood Risk	The development is external and therefore will increase the site impermeable area. As such it may adversely impact on local surface water runoff rates if unmitigated.
Proposed Flood Risk Mitigation Measures	- Finished floor level can be set to match existing which are 280mm above ground level. - Construction will utilise flood resistant materials and services will be placed as high as practicable to reduce impact of flooding; - Occupants will sign up for EA Emergency Flood Warning Direct Service; - Safe egress to flood zone 1 is available within the site and safe refuge is available on upper floors.
Surface Water Management (SuDS)	SuDS would reduce current surface water run off rates however given the size of the site (650m ²), there is good potential for implementation. Consideration should be given to rainwater harvesting and permeable paving where possible.
Conclusions	The site is considered to be at low overall risk of flooding. No previous records of fluvial, tidal, groundwater or surface water flooding incidents were found. With the implementation of the above mitigation measures and a suitable SuDs strategy, the proposed development will be safe

for its residents and it is unlikely to have a significant impact on local flood risk.

5 Introduction

STM Environmental Consultants Limited (STM) has been appointed by Andrew Wallace Architects (Client) to provide a Flood Risk Assessment (FRA) at a site located at 59 Kingston Road, Manchester, M20 2SB.

6 Development Proposal

The FRA is required to support a planning application for the erection of a two-storey rear extension, single storey side extension and loft conversion.

Further details including drawings of the development plans are available in [Appendix 2](#).

7 Report Aims and Objectives

The purpose of this report is to establish the flood risk to the site from all potential sources and, where possible, to propose suitable mitigation methods to reduce any risks to an acceptable level. It aims to make an assessment of whether the development will be safe for its lifetime, taking into account climate change and the vulnerability of its users, without increasing flood risk elsewhere.

The FRA assesses flood risk to the site from tidal, fluvial, surface water, groundwater, sewers and artificial sources. The FRA has been produced in accordance with the National Planning Policy Framework (NPPF) and its supporting guidance.

8 Summary of Data Review Undertaken

The following research has been undertaken as part of the FRA:

-  Desktop assessment of topographical, hydrological and hydrogeological settings through review of the information sourced from the British Geological Survey (BGS), the Environment Agency (EA) and the Ordnance Survey (OS);
-  Review of publicly available flood risk mapping provided by the EA;
-  Review of the Preliminary Flood Risk Assessment (PFRA) and Level 1 Strategic Flood Risk Assessment (SFRA) produced by the LLFA outlining flood risk from various sources within the borough.

9 Legislative and Policy Context

9.1 Legislative Context

The Flood and Water Management Act was introduced in 2010. The Act defines the role of lead local flood authority (LLFA) for an area. All LLFA are required to develop, maintain, apply and monitor a strategy for local flood risk management in its area, called “local flood risk management strategy”.

Alongside the Act, Flood Risk Regulations (2009) outline the roles and responsibilities of the various authorities, which include preparing Flood Risk Management Plans and identifying how significant flood risks are to be mitigated.

9.2 Policy Context

9.2.1 National Planning Policy Framework (NPPF)

The NPPF sets out the government’s planning policies for England and how these are expected to be applied. It also provides a set of guidelines and philosophy with which local planning authorities (LPAs) can build their own unique policies to appropriately regulate development within their jurisdictions.

Section 14 entitled “Meeting the challenge of climate change, flooding and coastal change” deals specifically with flood risk. Among other things it states that LPAs should try to ensure that “Inappropriate development in areas at risk of flooding should be avoided by directing development away from areas at highest risk (whether existing or future). Where development is necessary in such areas, the development should be made safe for its lifetime without increasing flood risk elsewhere”. It further states that when determining planning application, LPAs should “ensure that flood risk is not increased elsewhere. Where appropriate, applications should be supported by a site-specific flood-risk assessment⁵⁰. Development should only be allowed in areas at risk of flooding where, in the light of this assessment (and the sequential and exception tests, as applicable) it can be demonstrated that:

-  within the site, the most vulnerable development is located in areas of lowest flood risk, unless there are overriding reasons to prefer a different location;
-  development is appropriately flood resilient and resistant;
-  it incorporates sustainable drainage systems, unless there is clear evidence that this would be inappropriate;
-  any residual risk can be safely managed; and
-  safe access and escape routes are included where appropriate, as part of an agreed emergency plan.

Applications for minor development and changes of use should not be subject to the Sequential or Exception Tests but should still meet the requirements for site-specific flood risk assessments set out in footnote 50.

Footnote 50 states: “A site-specific flood risk assessment should be provided for all development in Flood Zones 2 and 3. In Flood Zone 1, an assessment should accompany all proposals involving: sites of 1 hectare or more; land which has been identified by the Environment Agency as having critical drainage problems; land identified in a strategic flood risk assessment as being at increased flood risk in future; or land that may be subject to other sources of flooding, where its development would introduce a more vulnerable use.”

The NPPF also lays out requirements for how LPAs should deal with planning applications in coastal areas. They should ensure that should they “reduce risk from coastal change by avoiding inappropriate development in vulnerable areas or adding to the impacts of physical changes to the coast.”

Developments in Coastal Change Management Areas should only be considered appropriate where it is demonstrated that:

-  it will be safe over its planned lifetime and will not have an unacceptable impact on coastal change;
-  the character of the coast including designations is not compromised;
-  the development provides wider sustainability benefits;
-  the development does not hinder the creation and maintenance of a continuous signed and managed route around the coast.

9.2.2 Local Planning Policy

Policy EN 14 Flood Risk In line with the risk-based sequential approach contained within PPS25, development should be directed away from sites at the greatest risk of flooding, and towards sites with little or no risk of flooding; this should take account of all sources of flooding identified in the Manchester-Salford-Trafford Strategic Flood Risk Assessment (SFRA). In addition to the requirements for site-specific Flood Risk Assessments (FRAs) set out in PPS25, an appropriate FRA will also be required for all development proposals, including changes of use, on sites greater than 0.5ha within Critical Drainage Areas (CDAs) and Canal Hazard Zones identified in the SFRA. All new development should minimise surface water run-off, including through Sustainable Drainage Systems (SUDS) and the appropriate use of Green Infrastructure. Developers should have regard to the surface water run-off rates in the SFRA User Guide. In CDAs, evidence to justify the surface water run-off approach / rates will be required. The City of Manchester contains many sections of rivers which are culverted or 'hidden'; where these are indicated in the SFRA beneath the proposed development site, further investigation will be required and the development proposal

should take this into account; where feasible and appropriate development should seek to open up culverted/hidden rivers to reduce the associated flood risk and danger of collapse, taking advantage of opportunities to enhance biodiversity and Green Infrastructure.

New development should minimise the risk of flooding to people, property and the environment within the site, without increasing risk elsewhere; where possible it should also seek to reduce flood risk elsewhere. Development can help to mitigate and manage flood risk by creating storage areas and reducing surface water run-off, and developments should be designed in a way that can contribute to these objectives, incorporating SUDS and GI where possible. Minimising surface water run-off rates from new developments, including through the use of SUDS, is an important part of managing the risk from surface water flooding both in the vicinity of the development site and over a wider area. The cumulative effect of a number of developments could be significant in managing flood risk, particularly in Critical Drainage Areas where this is a more significant issue. There may be opportunities to deliver SUDS through integrated solutions for collections of strategic sites. Developers should consider how their site could support wider flood risk management, including through partnership working with local authorities as Lead Local Flood Authorities (LLFAs), the Environment Agency, United Utilities and other stakeholders.

9.3 EA Standing Advice on Flood Risk

The Environment Agency's [standing advice](#) lays out the process that must be followed when carrying out flood risk assessments for developments.

Flood risk assessments are required for developments within one of the flood zones. This includes developments:

-  in flood zone 2 or 3 including minor development and change of use more than 1 hectare (ha) in flood zone 1;
-  less than 1 ha in flood zone 1, including a change of use in development type to a more vulnerable class (for example from commercial to residential), where

they could be affected by sources of flooding other than rivers and the sea (for example surface water drains, reservoirs);

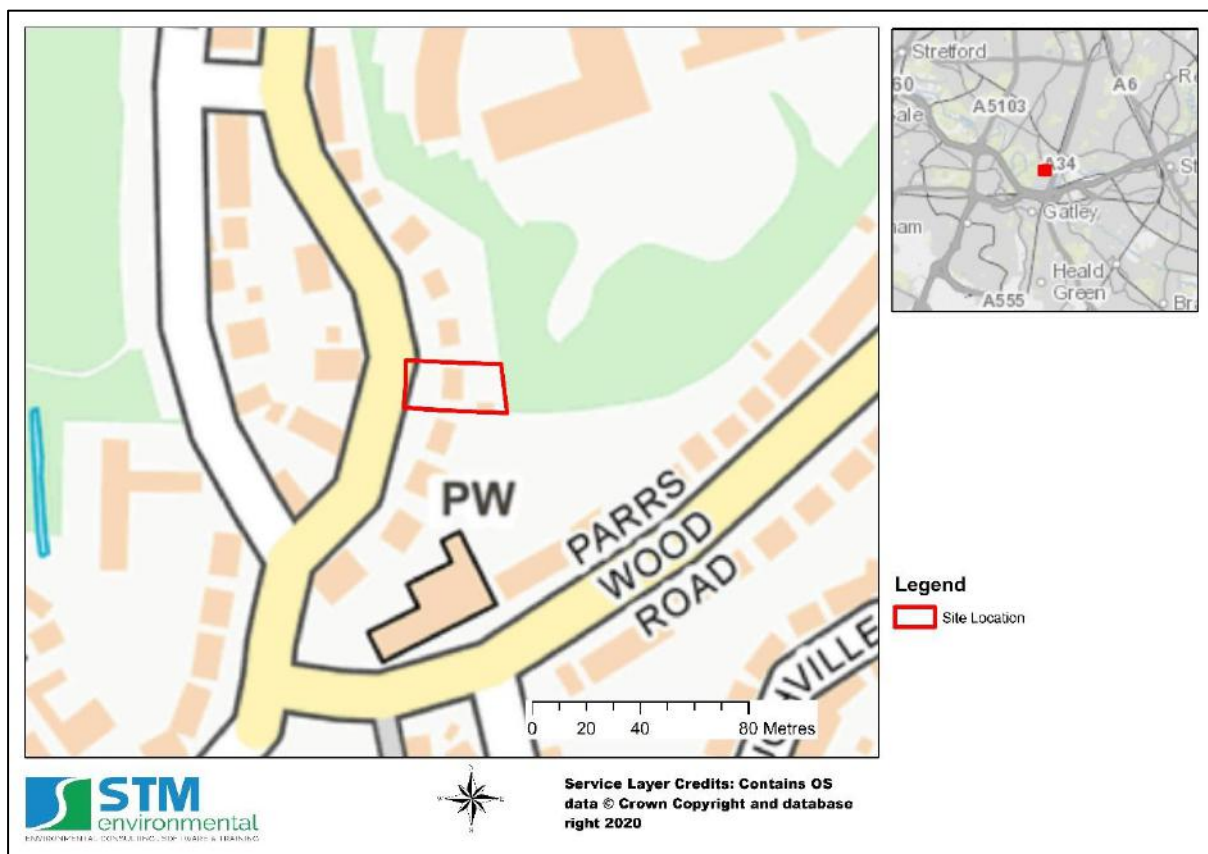
- in an area within flood zone 1 which has critical drainage problems as notified by the Environment Agency.

10 Site Description and Environmental Characteristics

10.1 Site Location and Area

The site is located at 59 Kingston Rd, Manchester, M20 2SB. It is centred at national grid reference 384959, 390030. The site has an area of 650m².

A site location map and aerial photo are shown below. Photographs of the site are available in [Appendix 1](#).





10.2 Site Access

The site is accessed via Kingston Road.

10.3 Local Planning Authority

The site falls within the jurisdiction of Manchester City Council in terms of the planning process.

10.4 Lead Local Flood Authority

Manchester City Council is also the Lead Local Flood Authority (LLFA).

10.5 Flood Zone

For planning purposes, the site is located in Flood Zone 1 and 2 as defined by the EA and LLFA.

10.6 Site and Surrounding Land Uses

10.6.1 Site Current Land Use

The site is currently used as a residential dwelling.

10.6.2 Surrounding Land Uses

A description of current land uses surrounding the boundaries of the site is given below in Table 1 below.

Table 1: Summary of surrounding land uses

Boundary	Land Use Description	
	Immediately Adjacent (within 0 – 25m)	General Local Area (i.e. within 25 - 250m)
Northern	Residential / Commercial	Residential / Commercial
Eastern	Residential / Commercial	Residential / Commercial
Southern	Residential / Commercial	Residential / Commercial
Western	Residential / Commercial	Residential / Commercial

10.7 Hydrology

The nearest main watercourse is the River Mersey which is located 650m to the South.

10.8 Geology

Data from the British Geological Survey indicates that the underlying superficial geology is characterised as River Terrace Deposits. The underlying bedrock geology is characterized as Wilmslow Sandstone Formation.

10.9 Hydrogeology

The site lies upon a Secondary A superficial aquifer and bedrock aquifer.

[Appendix 3](#) provides BGS mapping showing the hydrogeology at the site location.

10.10 Topography

The average ground level of the site is 33.51mAOD. The ground level of the proposed extension is 33.61mAOD. A LIDAR map showing the topology of the site and surrounding area is available in [Appendix 3](#).

11 The Sequential and Exception Tests

11.1 The Sequential Test

The Sequential Test aims to steer developments and redevelopments to areas of lower flood risk. The test compares the proposed development site with other available sites, in terms of flood risk, to aid the steering process. The Sequential Test is not required if the proposed development is a minor development or if it involves a change of use unless the development is a caravan, camping chalet, mobile home or park home site.

Minor development means:

-  minor non-residential extensions: industrial/commercial/leisure etc extensions with a footprint less than 250 square metre.
-  alterations: development that does not increase the size of buildings eg alterations to external appearance.
-  householder development: For example; sheds, garages, games rooms etc within the curtilage of the existing dwelling, in addition to physical extensions to the existing dwelling itself. This definition excludes any proposed development that would create a separate dwelling within the curtilage of the existing dwelling eg subdivision of houses into flats.

The development is considered to be minor and as such the Sequential Test should not be required by the LLFA.

11.2 The Exception Test

If alternative sites of lower flood risk are not available then the proposed development may require an Exception Test to be granted planning permission. Where the exception test is required, it should be applied as soon as possible to all local development document allocations for developments and all planning applications other than for minor developments. All three elements of the exception test have to be passed before development is allocated or permitted. For the exception test to be passed:

-  It must demonstrate that the development provides wider sustainability benefits to the community that outweigh the flood risk, informed by an SFRA, where one has been prepared;
-  The development should be on developed land or on previously developed land;
-  A flood risk assessment must demonstrate that the development will be safe without increasing flood risk elsewhere, and where possible will reduce the overall flood risk.

The requirements for an Exception Test are given in Table 2 and are defined in terms of Flood Zone and development vulnerability classification.

Table 2: NPPF flood zone vulnerability compatibility (source: NPPF).

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

Zone 3b	Exception Test required	X	X	X	✓
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Key:

- ✓ Development is appropriate
- X Development should not be permitted.

Based on its scale and nature, the development is considered to be minor and “more vulnerable”. As such the Exception Test should not be required by the LLFA.

12 Site Specific Flood Risk Analysis

The PFRA and Level 1 SFRA produced by the LLFA and maps from the EA provide information regarding historic flooding events and incidents as well as predictions of flood extents and depths during extreme rainfall events.

12.1 Fluvial (River) and Tidal (Sea) Flood Risk

12.1.1 Mechanisms for Fluvial Flooding

Fluvial, or river flooding, occurs when excessive rainfall over an extended period of time or heavy snow melt causes a river to exceed its capacity. The damage from a fluvial flood can be widespread as the overflow may affect downstream tributaries, overtopping defences and flooding nearby inhabited areas. Fluvial flooding consists of two main types:

-  Overbank flooding – this occurs when water rises steadily and overflows over the edges of a river or stream;
-  Flash flooding – this is characterized by an intense, high velocity torrent of water that occurs in an existing river channel with little to no notice. Flash floods are very dangerous and destructive not only because of the force of the water, but also the hurtling debris that is often swept up in the flow.

12.1.2 Definition of EA Modelled Fluvial Flood Risk Zones

Fluvial flood risk is assessed using flooding maps produced by the Environment Agency. These maps use available historic data and hydraulic modelling to define zones of flood risk. The maps allow a site to be defined in terms of its flood zone (e.g. 1, 2, 3) and in terms of the overall flood risk (very low, low, medium or high). It is important to note that existing flood defences are not taken into account within the models or the maps. The EA fluvial flood zones are defined as follows:

-  Flood zone 1: Less than 1 in 1000 (0.1%) annual probability of flooding;
-  Flood zone 2: Between 1 in 100 (1%) and 1 in 1000 (0.1%) annual probability of flooding;
-  Flood zone 3: Greater than 1 in 100 (1%) annual probability of fluvial flooding.

Flood zone 3 is split into two sub-categories (3a and 3b) by LLFAs depending on whether the land is considered to be a functional flood plain (i.e. an important storage area for flood waters in extreme events).

-  Flood zone 3a: Greater than 1 in 100 (1%) annual probability of fluvial flooding and/or greater than 1 in 200 (0.5%) annual probability of tidal flooding;
-  Flood zone 3b: Functional flood plain (definition specific to the LLFA). Less than a 1 in 20 (5%) annual probability of fluvial and/or tidal flooding.

12.1.3 Main Potential Sources of Local Fluvial Flooding

The nearest potential source of fluvial flooding to the site is considered to be River Mersey.

12.1.4 Records of Historic Fluvial Flooding Incidents

The EA data has no records of flood incidents at the site location. They do identify one flood event from 1964 which affects the local area.

12.1.5 Designated Fluvial Flood Risk Zone for the Site

The site is considered to be located within flood zone 1 & 2 as defined by the Environment Agency and the LLFA indicating that it has up to 1 in 100 and less than 1 in 1000 annual probability of fluvial flooding.

12.1.6 Mechanisms for Tidal Flooding

Tidal flooding may be described simply as the inundation of low-lying coastal areas by the sea, or the overtopping or breaching of sea defences. Tidal flooding may be caused by seasonal high tides, storm surges and where increase in water level above the astronomical tide level is created by strong on shore winds or by storm driven wave action.

12.1.7 Definition of EA Tidal Flood Risk Zones

As with fluvial flood risk, tidal flood risk is assessed using flooding maps produced by the Environment Agency. The difference is in the probability return periods used to define tidal flood zones. The EA tidal flood zones are defined as:

- | | |
|---|--|
|  | Flood zone 1: Less than 1 in 1000 (0.1%) annual probability of flooding; |
|  | Flood zone 2: Between 1 in 200 (0.5%) and 1 in 1000 (0.1%) annual probability of tidal flooding; |
|  | Flood zone 3: Greater 1 in 200 (0.5%) annual probability of tidal flooding. |

12.1.8 Potential Sources of Tidal Flooding

The area in which the site is located is considered unlikely to be affected by tidal flooding.

12.1.9 Flood Defences

The flood defences in the local area offer a up to 1 in 100-year Standard of protection with an Upstream Actual Crest level of 34.27mAOD and a Downstream Actual Crest Level of 33.59mAOD. A full summary and map are available in [Appendix 10](#).

12.1.10 Climate Change - EA Modelled Predictions of Fluvial and Tidal Flood Levels and Extents

The EA Product 4 dataset which is presented in [Appendix 10](#) provides modelled flood levels and flows for model node points close to the site. These are summarised in below.

The product 4 data provided has only given 2D data measurements for a point to the South of the site in the garden of 61 Kingston Road (Node 7) and to the Northeast of the site (Node 6).

Both these data points have provided a “no data” value for the 1 in 100 year + 35% climate change events for undefended and defended scenarios indicating the site will not flood during this event. There are no values for on site flood depths for other modelled scenarios. In channel results are available in the product 4 data in [Appendix 10](#).

12.1.11 Long Term Fluvial Flood Risk Considering Flood Defences

The EA's [long term flood risk maps](#) give an indication of the actual risk associated with flooding after taking into account the effect of any flood defences in the area. Copies of maps for the site which are available in [Appendix 8](#) indicate that the long-term risk from fluvial flooding to the site is very low.

12.2 Pluvial (Surface Water) Flood Risk

A pluvial, or surface water flood, is caused when heavy rainfall creates a flood event independent of an overflowing water body. Surface water flooding occurs when high intensity rainfall leads to run-off which flows over the ground surface, causing ponding in low-lying areas when the precipitation rate or overland flow rate is greater than the rate of infiltration, or return into watercourses. Surface water flooding can be exacerbated when the underlying soil and geology is saturated (as a result of prolonged precipitation or a high-water table) or when the drainage network has insufficient capacity.

12.2.1 Mechanisms of Pluvial Flooding

The chief mechanisms for surface water flooding can be divided into the following categories:

-  Runoff from higher topography;
-  Localised surface water runoff – as a result of localised ponding of surface water;
-  Sewer Flooding – areas where extensive and deep surface water flooding is likely to be influenced by sewer flooding. Where the sewer network has reached capacity, and surcharged, this will exacerbate the flood risk in these areas;
-  Low Lying Areas – areas such as underpasses, subways and lowered roads beneath railway lines are more susceptible to surface water flooding;
-  Railway Cuttings – railway infrastructure cut into the natural geological formations can cause extra surface run off and pooling disrupting service and potentially affecting adjacent structures;
-  Railway Embankments – discrete surface water flooding locations along the upstream side of the raised network rail embankments where water flows are interrupted and ponding can occur;
-  Failure of artificial sources (i.e. man-made structures) such as such as canals and reservoirs.

12.2.2 Main Potential Sources of Local Pluvial Flooding

The main potential source of pluvial flooding to the site is considered to be surface water ponding and flooding associated with reservoirs and canals in the area.

12.2.3 Records of Historic Pluvial Flooding Incidents

A map showing surface water incidents is not available.

The surface water flood risk assessment future scenario predicts the postal area the site is in will have 1 -5 properties at risk.

12.2.4 Surface Water Flood Risk from Artificial Sources (Reservoirs and Canals)

An examination of OS mapping and the EA's mapping revealed that there are significant reservoirs or canals in the area of the site.

The EA's reservoir flood risk map indicates that the site does lie within an area that is at risk of reservoir flooding.

The government guidance for flooding from reservoirs has the below details.

"Flooding from reservoirs is extremely unlikely. An area is considered at risk if peoples' lives could be threatened by an uncontrolled release of water from a reservoir."

The below reservoirs have been identified as Reservoirs that could affect this area.

- Torside (grid reference SK0551098334)

Owner: United Utilities Water plc

Lead Local Flood Authority: Derbyshire

Comments: If you have questions about local emergency plans for this reservoir you should contact the named Local Authority

- Woodhead (grid reference SK0800899372)

Owner: United Utilities Water plc

Lead Local Flood Authority: Derbyshire

Comments: If you have questions about local emergency plans for this reservoir you should contact the named Local Authority

12.2.5 Sewer Flooding

A map showing recorded incidents of sewer flooding was not available.

The MCC level 2 SFRA analysis shows a significant surface water flooding hotspot between Didsbury and Heaton Mersey. 3 Postcode areas with over 10 properties affected in the DG5 Register.

12.2.6 Climate Change - Modelled Predictions of Surface Water Run-off Flooding

Mapping of the predicted extent and depth of surface water flooding for the 1 in 100-year and 1 in 1000-year rainfall return periods provided by the EA are available in [Appendix 6](#).

The maps show that the site would remain dry during both precipitation events.

12.2.7 Long Term Surface Water Flood Risk

The EA's [long term flood risk maps](#) which are available in [Appendix 8](#) indicate that the long term risk of flooding from surface water is also considered to be low.

12.3 Risk of Flooding from Multiple Sources (ROFMS)

The Environment Agency provides a map which gives an indication the overall flood risk from fluvial, tidal and surface water sources considering the presence of river defences. This map indicates that there is below 0.1% chance of flooding at the site in any year. A copy of the map is presented in [Appendix 8](#).

12.4 Groundwater Flood Risk

Groundwater flooding occurs when water rises from the underlying aquifer at the location of a spring – where the underlying impermeable geology meets the ground surface. This tends to occur after much longer periods of intense precipitation, in often low-lying areas where the water table is likely to be at a shallow depth. Groundwater flooding is known to occur in areas underlain by principal aquifers, although increasingly it is also being associated with more localised floodplain sands and gravels. A high groundwater table also has the potential to exacerbate the risk of surface water and fluvial flooding by reducing rainfall infiltration capacity, and to increase the risk of sewer flooding through sewer/groundwater interactions.

12.4.1 Historic Records of Groundwater Flooding

Groundwater flooding does not generally pose a significant risk to life due to the slow rate at which the water level rises; however, it can cause significant damage to property, especially in urban areas. According to Greater Manchester sub-regional SFRA there are no known reports of groundwater flooding in the Manchester, Trafford and Salford authorities.

12.4.2 Susceptibility to Groundwater Flooding

The Groundwater Flood Susceptibility Map provided by BGS, which is available in [Appendix 9](#) indicates that the potential for groundwater flooding to occur at the surface is limited. The Groundwater Depth map also provided by BGS indicates that the groundwater level may be at approximately less than 3 mbgl.

The SFRA indicates the site location is in an “Area at risk of GW flooding”, see [Appendix 9](#).

12.5 Critical Drainage Area

A Critical Drainage Area (CDA) may be defined as “a discrete geographic area (usually a hydrological catchment) where multiple and interlinked sources of flood risk (surface water, groundwater, sewer, main river and/or tidal) cause flooding in one or more Local Flood Risk Zones during severe weather thereby affecting people, property or local infrastructure”. A CDA is defined in the Town and Country Planning (General Development Procedure) (Amendment) (No. 2) (England) Order 2006 as “an area within Flood Zone 1 which has critical drainage problems and which has been notified... [to]...the local planning authority by the Environment Agency”.

The site is located within the Didsbury Critical Drainage Area. The SFRA describes the Didsbury CDA as below:

Didsbury CDA¹³

Didsbury CDA is bounded by the Mersey to the south and Chorlton Platt Gore and Cringle Black Brook to the north. The natural drainage of the catchment between these two watercourses is generally via lost watercourses. The surface water flood hotspots identified in the Didsbury CDA are linked to these lost watercourses and the restricted nature of these channels would be expected to have a negative impact on

flood risk. The railway runs parallel to the A34 and the flood maps show ponding of surface water against this structure in the worst affected areas. In addition, an area to the north of Didsbury centre is also susceptible to surface water flooding.

The climate change assessment shows a general increase in flood risk across the Didsbury area with the worst affected area in central Didsbury.

13 Potential Impacts of the Development on Local Flood Risk

13.1 Impacts on Flood Storage

13.1.1 Changes to Impermeable Area and Building Footprint

Changes in ground cover arising from the development are presented in Table 3 below. The change to the impermeable area of the site is considered to be insignificant.

Table 3: Existing and proposed site ground cover.

	Impermeable Area (m ²)	Permeable Area (m ²)	Total Area (m ²)
Existing	Building: 90m ² Garage/Shed: 28m ² Paving/Tarmac: 150m ² Total : 268 m ²	207m ² (Back Garden) 172m ² (Front Garden) Total : 379 m ²	671m ²
Proposed	Building: 136m ² Garage/Shed: 28m ² Paving/Tarmac: 87m ² Total: 251 m ²	203m ² (Back Garden) 183m ² (Front Garden) Total: 386 m ²	671m ²

As the development will not significantly alter the site impermeable area, it is considered unlikely that it will impact surface water runoff rates. The proposed

development intends to replace 63m² of existing impermeable paving to permeable. See development plans in [Appendix 2](#) for a detailed layout.

The proposed development will change the site's built-up area, however, as it is not expected to flood, it is unlikely to impact upon local flood storage.

13.2 Impacts on Flood Flow Routes

As the development does involve the significant redesign of buildings at the site, it may alter flood flow paths. However, given that the site will remain dry during extreme flooding scenarios, this is not considered to be significant.

14 Flood Risk Mitigation Measures

14.1 SuDS

Planning practice guidance (PPG) which is prepared by the Ministry of Housing, Communities and Local Government (DCLG) states that developers and Local Authorities should seek opportunities to reduce the overall level of flood risk in the area through the layout and form of the development, and the appropriate application of sustainable drainage techniques.

As such, the developer has the option to implement a SuDS strategy in line with the drainage hierarchy as outlined in Table 5 below to reduce surface water discharges from the site.

Table 4: SuDs Options

	Store rainwater for later use;
	Use infiltration techniques, such as porous surfaces in non-clay areas;
	Attenuate rainwater in ponds or open water features for gradual release;
	Attenuate rainwater by storing in tanks or sealed water features for gradual release;
	Discharge directly to a water course;

- Discharge rainwater directly to a surface water sewer/drain;
- Discharge to a combined sewer.

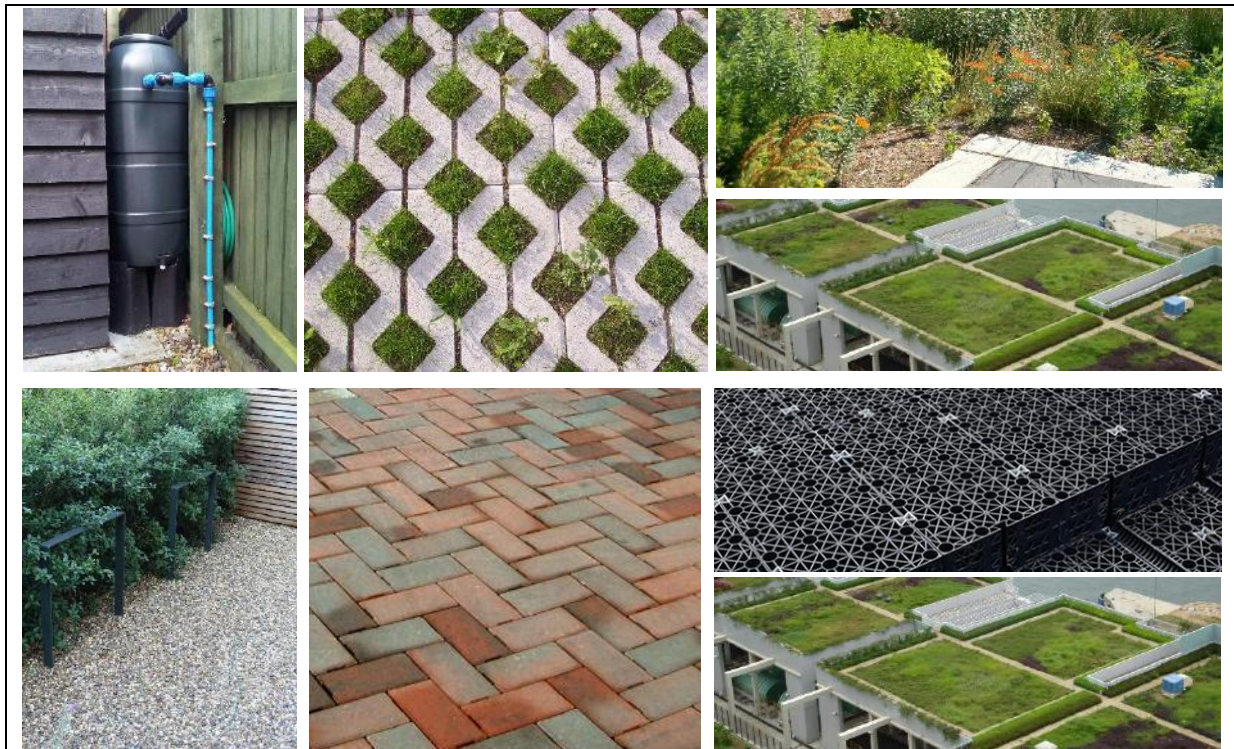


Figure 1: Surface water storage facilities and potential SuDS features - rainwater harvesting, on-site tank storage, rain garden soak-away and green roofs. (Source: UK SuDS Manual)

Given the nature of the development and the size of the site, it is considered that there are good opportunities for implementing SuDS. Measures such as green roofs, rainwater harvesting, infiltration (soakaways, permeable paving, rain gardens) or attenuation storage tanks should be considered. If required, the SuDS strategy will be detailed in a separate report as is outside the scope of works of this FRA.

14.2 Flood Resilience

Flood resilient construction uses methods and materials that reduce the impact from a flood, ensuring that structural integrity is maintained, and the drying out and cleaning required, following inundation and before reoccupation, is minimised.

14.2.1 Finished Floor Levels

The average ground level of the site is 33.51mAOD.

For minor extensions, EA Standing Advice states that finished floor levels are either no lower than existing floor levels or 300 millimetres (mm) above the estimated flood level. Where floor levels cannot be set to 300mm above existing flood levels, applicants should check with the LPA if they need to take flood resistance and resilience measures.

As outlined in section **12.1.***, the site does not flood during the 1% AEP + 35% CC event is ([see Appendix 10](#)). Based on this, finished ground floor levels across internal areas of the development will be set to match existing floor levels which are at 280mm above ground level.

14.2.2 Flood displacement storage

All new development within Flood Zone 3 must not result in a net loss of flood storage capacity. Where possible, opportunities should be sought to achieve an increase in the provision of floodplain storage.

Where proposed development results in a change in building footprint, the developer must ensure that it does not impact upon the ability of the floodplain to store water, and should seek opportunities to provide a betterment with respect to floodplain storage.

As the site is located in flood zone 1 and 2, flood compensatory storage is not required.

14.2.3 Flood Resilience Measures

In terms of achieving resilience, there are two main strategies, whose applicability is dependent on the water depth the property is subjected to. These are:

 Water exclusion strategy - where emphasis is placed on minimising water entry whilst maintaining structural integrity, and on using materials and construction techniques to facilitate drying and cleaning. This strategy is favoured when low flood water depths are involved (not more than 0.3m);

- Water entry strategy - buildings are at significant risk of structural damage if there is a water level difference between outside and inside of about 0.6m or more. This strategy is therefore favoured when high flood water depths are involved (greater than 0.6m).

Given that flood depths less than 0.3m are predicted in extreme scenarios, the water exclusion strategy is considered most applicable for this site.

Flood resilience design and measures that will be implemented are outlined below. Water-resistant and resilient materials will be utilized through the construction to minimize the flood risk and potential impacts.

Floor construction:

- Use of resilient flooring materials as ceramic tiles or stone floor finishes;
- Use of a concrete slab 150mm thick;
- Use of ceramic tiles or stone floor finishes is recommended;
- Maintain existing under floor ventilation by UPVC telescopic vents above 400 mm to external face of extension;
- Damp proof membrane of impermeable polythene at least 1200 gauge;
- Avoid the use of MDF carpentry.

Wall construction:

- Include in the external face of the extension a damp – proof course, 250 mm above ground level, to prevent damp rising through the wall;
- Use rigid closed – cell material for insulation above the DPC;
- Spread hardcore over the site within the external walls of the building to such thickness as required to raise the finished surface of the site concrete. The hardcore should be spread until it is roughly level and rammed until it forms a compact bed for the oversite concrete. This hardcore bed will be 100 mm thick and composed by well compacted inert material, blinded with fine inert material.

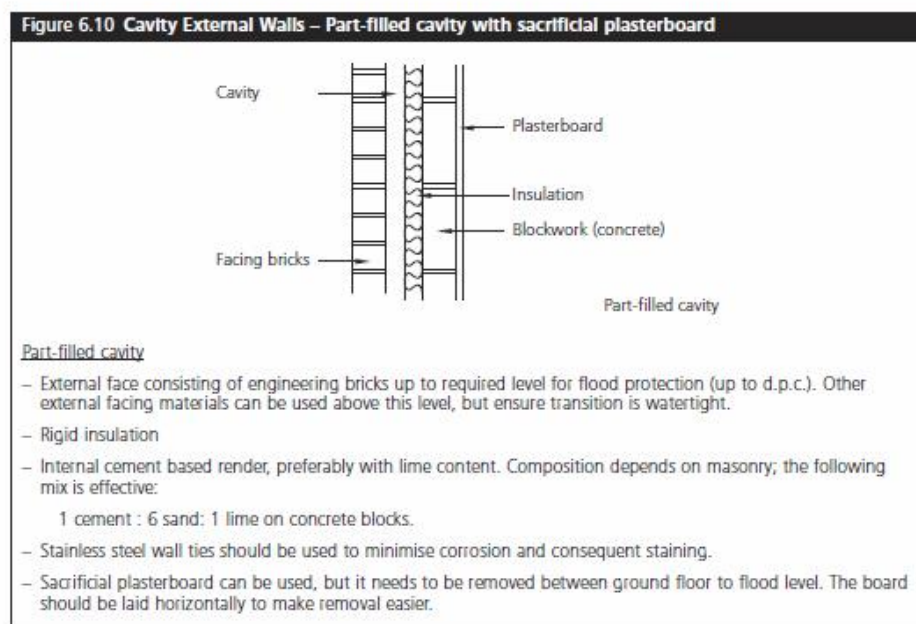
Doors:

-  Seal doors around edges and openings. UPVC or composite material will be used with passive protection meaning that minimal intervention will be required in the event of flooding.

Underground drainage:

-  Avoid use of metal for any underground piping;
-  Use closed cell insulation for pipes that are below the predicted flood level;
-  Provide non – return valves for the drainage system to prevent back water flow;
-  Use UPVC or clay pipework for fould and surface water drainage.

Improving the flood performance of new buildings



As well as the above the following flood resilience features should be applied as part of the development:

-  Electrical sockets should be installed above flood level for the ground floor;
-  Utility services such as fuse boxes, meters, main cables, gas pipes, phone lines and sockets will be positioned as high as practicable;

-  All external openings for pipes or vents below 400mm to be sealed around pipe or vent with expanding foam and mastic.

14.3 Emergency Plan

The dangers associated with flood water to people are possible injury and/or death. This can occur as a result of drowning or being carried along by the waters into hard objects or vice versa.

The risk to life is largely a function of the depth and velocity of the floodwater as it crosses the floodplain. Fast flowing deep water that contains debris would represent the greatest hazard.

The assessment of danger to people from walking in floodwater is described in the Flood Risks to People guidance documents (FD2321_TR1 and FD2321_TR2) by DEFRA/EA. Danger can be estimated by the simple formula:

$$HR = d \times (v + 0.5) + DF$$

where, HR = (flood) hazard rating; d = depth of flooding (m); v = velocity of floodwaters (m/sec); and DF = debris factor.

The scoring methodology and calculation matrix for this is summarised in [Appendix 12](#).

The site is not expected to flood during the 1 in 100 year + 35% CC event. As such, the related flood hazard score at the site can be classified as being very low.

The use of a flood emergency plan is therefore sufficient for the proposed development. The key elements of the emergency plan are described below.

14.3.1 EA Flood Warnings Direct Service Subscription

The occupants will subscribe to the EA Flood Warnings Direct Service which is a free service offered by the EA providing flood warnings direct to people by telephone,

mobile, email, SMS text message and fax. The EA aims to provide 2 hours' notice of flood, day or night, allowing timely evacuation of the site.

The agency operates a 24-hour telephone service on 0345 988 1188 that provides frequently updated flood warnings and associated floodplain information. In addition, this information can also be found at <https://fwd.environment-agency.gov.uk/app/olr/home> along with recommendations on what steps should be taken to prepare for floods, what to do when warnings are issued, and how best to cope with the aftermath of floods.

14.3.2 Access and Safe Egress

Access to and egress from the site is via Kingston Road. LIDAR data indicates that the ground levels along Kingston Road range from 32 to 33mAOD.

Safe egress to Flood Zone 1 is available on site. Directions of this route are presented in [Appendix 11](#).

14.3.3 Safe Refuge

The proposed development will have internal connections to upper floors in the property which will act to provide sufficient safe refuge in the event of an extreme flood event.

15 Conclusions and Recommendations

This assessment has considered the potential risks to the application site associated with flooding from fluvial, tidal, surface water, artificial and groundwater sources and the potential impacts of climate change.

A review of LLFA's PFRA and SFRA as well as data provided by the EA was undertaken. The main findings of the review and assessment are provided below:

-  The site is classified as a more vulnerable minor development and is therefore unlikely to require sequential and exception tests to be undertaken;
-  The main sources of potential flooding to the site is fluvial;
-  The EA defines the site as being within flood zone 1 & 2;
-  No records of fluvial, tidal, surface water or artificial flooding incidents were identified at the site;
-  The site is within a CDA. It is not in an area that has had a significant number of sewage flooding incidents;
-  The development will not result in a significant change in the impermeable area of the site and therefore is unlikely to increase local flood risk;
-  There is good opportunity for implementing SuDS mitigation measures. Consideration should be given to use of permeable paving, soakaways and rainwater harvesting where possible;
-  Flood resilient materials and construction methods will be used so as to ensure that the impacts of any potential flooding are minimised as much as possible;
-  Occupants will subscribe to the EA Flood Warnings Direct Service;
-  Safe egress to flood zone 1 is available on site;
-  In the event that evacuation is not possible, safe refuge is available in the upper floors of the building which are accessible via an internal staircase.

The site is considered to be at low overall risk of flooding. No previous records of fluvial, tidal, groundwater or surface water flooding incidents were found and the proposed development will not significantly impact on local flood risk.

16 References

1. Communities and Local Government - National Planning Policy Framework NPPF, March 2012.
2. Communities and Local Government - Planning Practice Guidance: Flood Risk and Coastal Change, Updated 06 March 2014.
3. Strategic Flood Risk Assessment - Manchester council 2011
4. CIRIA, Defra, Environment Agency – UK SuDS Manual, 2015.
5. Greater London Authority – London Sustainable Drainage Action Plan, 2015.
6. Google Maps accessed April 21.

17 Appendices

17.1 Appendix 1 – Site Photographs