

FLOOD RISK CONSULTANCY LIMITED

Level 2 Flood Risk Assessment

**No161 Mauldeth Road West,
Withington Manchester M20 1BJ**

Client: UDC (Manchester) Ltd

Report No: 2019-092

Date: 27/08/2019

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APPRAISING,
MANAGING
& REDUCING
FLOOD RISK

Level 2 Flood Risk Assessment

No161 Mauldeth Road West, Withington, Manchester M20 1BJ

Report No: 2019-092

Document Control

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Contract

This report describes work commissioned by Rochelle of UDC (Manchester) Ltd Donna Metcalf of Flood Risk Consultancy Limited (FRC) carried out the work.

Prepared by.....Donna Metcalf (Managing Director))

Disclaimer

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Executive Summary

Flood Risk Consultancy Ltd has been appointed by UDC (Manchester) Ltd, to provide a Flood Risk Assessment in support of a planning application for a new residential property on land associated with No161 Mauldeth Road West in the Withington area of Manchester.

The red-line boundary containing the development site is shown to be situated within Flood Zone 2 of the Environment Agency Flood Map.

The nearest watercourse to the application site is the Chorlton Platt Gore which is a tributary of the River Mersey and is located approximately 114m north.

No topographical survey has been provided for the site, however LIDAR Data shows that the ground level on site is approximately 31.6m AOD.

The Environment Agency have provided flood levels associated with the Chorlton Platt Gore for a number of Node locations along its length.

Node Ref 3 is considered to be the most appropriate in terms of proximity to the application site. The defended levels provide a worst-case scenario and therefore have been used to undertake a comparison of sites levels against flood levels.

The EA's Asset Map shows that at the watercourse has a defence along its left bank at the location of Node Ref 3, this is Asset Ref: 60038 and details pertaining to crest levels have not been provided.

The flood defence comprises of high ground and earth embankment; which is elevated approximately 1m above a cycle path which runs along the route of the watercourse.

Comparison of the modelled flood level against the approximate crest level of the flood defence structure, indicates that the flood water is lower, and therefore flow is unlikely to overtop at this location during each of the modelled flood events.

In the event of breach failure, it is considered that the modelled water levels p to and including the 1 in 100-year event are lower than the site; and as such overall it is concluded that these flood events present a low flood risk at the development site.

The flood level associated with Node Ref: 3 for the 1 in 100-year plus climate change; and 1000-year event is estimated to be 31.68mAOD and 31.92m AOD respectively.

Evaluation of full depth breach failure of the flood wall results in a depth of flooding approximating 0.151m; and 0.238m respectively for the 1 in 100-year plus climate change and 1 in 1000-year flood events; and presents a danger to people at the application site to 'Danger for some'. This includes the young, elderly and infirm.

It is highlighted that overall the risk of breach failure is relatively low and therefore the flood risk associated with Chorlton Platt Gore is considered to be residual in nature.

Suitable measures should be applied at the site to mitigate the risk from flooding.

The site is located within the flood envelope associated with reservoir failure. It is noted that although the impact of flooding from this source is significant, the probability for occurrence is low; and as such it is concluded that the risk of reservoir flooding at the application site overall is low.

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The risk of flooding resulting from infrastructure failure associated with Thirlmere Aqueduct has been evaluated and concluded to be low.

Surface water runoff rates and volumes will be increased as a result of the development; and owing to the site location i.e. within a Critical Drainage Area, the management of surface water runoff is an important consideration.

Building Regulations provides a management hierarchy which directs surface water to:

- Infiltration
- Watercourse
- Sewer

It is noted that space constraints on-site mean that the minimum 5m distance for soakaways away from highways and buildings is not achievable.

Furthermore, the highly urbanised nature of the area; prevents a suitable or direct outfall to watercourse from the site being feasible.

Surface water will be directed to the existing on-site drainage system serving the existing residential dwelling. In order to minimise discharge rates and offset any increased surface water runoff volumes, it is recommended that SUDS source control features such as permeable paving and rainwater harvesting and re-use are considered to application at the development.

The risk from secondary flood sources such as pluvial (surface water flooding); groundwater; and artificial sources at the application site are concluded to be low.

Recommended measures to mitigate flood risk are summarized below:

- Flood Zone 2 Standing Advice: Finished floor levels set at 300mm above external ground levels or 600mm above the 1 in 100-year plus climate change flood level whichever is the highest – **32.28m AOD**
- Occupants to sign up to receive EA Flood Warnings/Alerts.
- Occupants to prepare a personal flood plan.
- A safe place of refuge is available within the property at first floor level
- Any route evacuating away from the property in the event of the flood should be directed towards Flood Zone 1.

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Appendices

- Appendix A: - Development Plan
- Appendix B: - Environment Agency Data
- Appendix C: - Critical Drainage Area Plan
- Appendix D: - Personal Flood Plan Template

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1.0 Introduction

1.1 Terms of Reference

Flood Risk Consultancy Ltd has been appointed by UDC (Manchester) Ltd to provide a Flood Risk Assessment in support of a planning application for a new residential dwelling at No161 Mauldeth Road West in the Manchester area known as Withington.

The red-line boundary area approximates 0.035 Hectares; and is shown to be situated within Flood Zone 2 of the Flood Map for Planning.

The design and access statement indicates that the plot for the new dwelling covers an area of only 0.019Ha with the remaining area retained by the existing property located at address No.161.

Definitions of the different Flood Zones are provided within Section 2.2.2 of this report.

It is usual for objections to be raised by Statutory Consultees for new development located within the floodplain, or Zones 2 and 3 of the flood maps until the issue of flood risk has been properly evaluated; or for major planning applications, where the issues surrounding the management of surface water runoff must be addressed.

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.
- 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 (Updated 24th July 2018)
- Planning Practice Guidance at www.gov.uk (March 2014)
- Building Regulations Approved Document H
- Flood Map for Planning
- Long Term Flood Risk Mapping
- Greater Manchester SFRA Sub-Regional Assessment (June 2008)
- Manchester Final MST Level 1 SFRA Update & Level 2 SFRA (March 2010 & 2011 Respectively)
- Manchester Local Flood Risk Management Strategy (March 2014)
- Guide to Development in Manchester – Supplementary Planning Document and Planning Guidance
- British Geological Society – Historic Borehole Logs
- Cranfield University's Soilscape Viewer
- CIRIA C697 The SUDS Manual
- Internet search

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2.0 Planning Policy Context

2.1 Approach to the Assessment

The project will be submitted for planning approval to Manchester City Council. As the site is shown to lie within an area designated as having a medium risk from fluvial flooding, a detailed site-specific flood risk assessment is required.

A Level 2 FRA is designed to provide a qualitative and quantitative appraisal of flood risk both within the application site and any potential impact that the development will have on flood risk elsewhere; and provide recommendations for mitigation measures which may be incorporated into the proposed development plans to reduce flood risk overall.

An initial assessment indicates that the primary flood risks at the proposed development is from the fluvial (river) source known as Chorlton Platt Gore.

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

2.2 National Planning Policy Framework (NPPF Updated 2018)

The requirements for undertaking site specific flood risk assessments are generally as set out in NPPF Planning Practice Guide – Flood Risk & Coastal Change (www.gov.uk).

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 Environment Agency's website.

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

2.2.1 Sources of Flooding

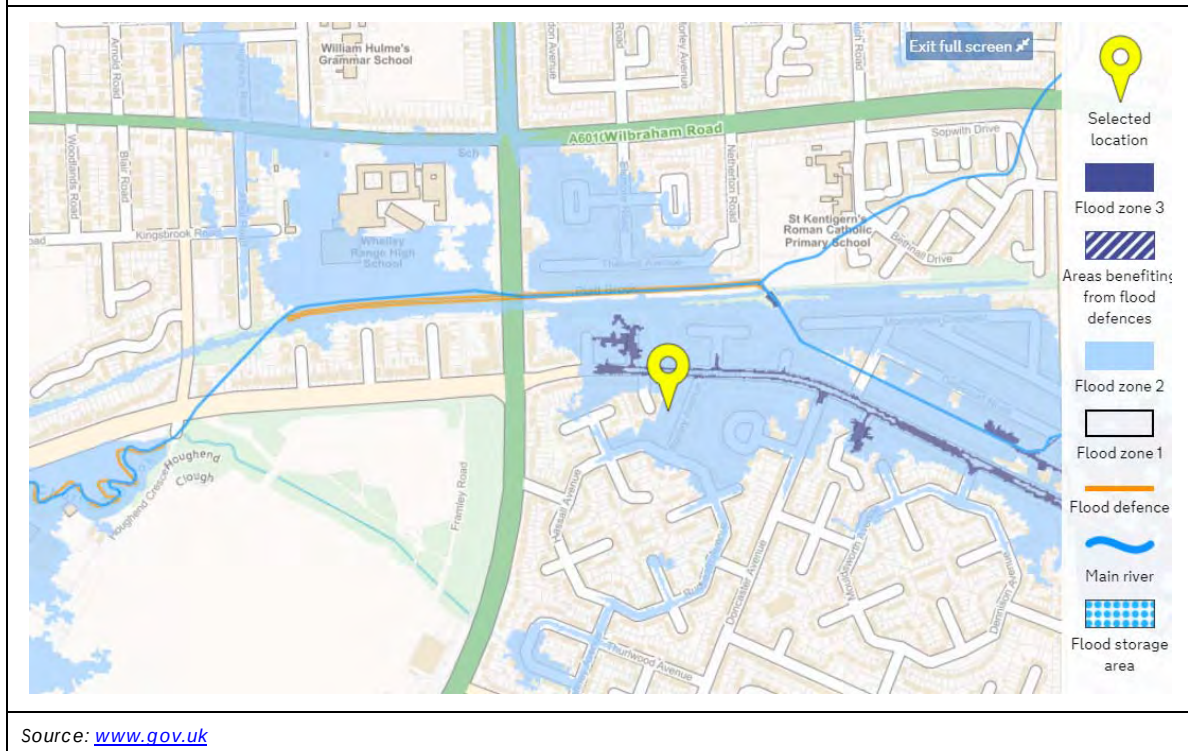
- **Rivers (fluvial):** Flooding occurs when flow within river channels exceeds capacity; and the type of flood event experienced e.g. flash flooding; depends upon the characteristics of the river catchment.
- **The Sea (tidal):** Flooding at low lying coastline and tidal estuaries is caused by storm 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.

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Figure 2.1: Flood Map for Planning



2.2.2 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.

2.2.3 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; outdoor recreational 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.

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2.2.4 Sequential & Exceptions Test

As set out in the National Planning Policy Framework, the aim of the Sequential Test is to steer new development to areas at the lowest probability of flooding.

The Flood Zones are the starting point for the sequential approach.

It is advised that the application is situated wholly within Flood Zone 2; and comprises residential development.

Typically, residential use is classified as a 'more vulnerable' development type; and in accordance with the NPPF, development within Flood Zone 2 must pass the sequential test.

2.2.5 Climate Change

The NPPF requires the application of climate change over the lifetime of a development.

The application site is located within the North West River Basin District; and the climate change allowances for this district are therefore tabulated below:

Table 1: North West Basin Climate Change Allowances¹

Parameter	Allowance Category	2010 - 2039	2040 - 2059	2060 - 2069	2070 - 2115
Peak Rainfall Intensity	Upper end	+ 10%	+ 20%	+ 40%	
	Central	+ 5%	+ 10%	+ 20%	
Peak River Flow	Upper end	+ 20%	+ 35%		+ 70%
	Higher Central	+ 20%	+ 30%		+ 35%
	Central	+ 15%	+ 25%		+ 30%

The selection of climate change allowance for the assessment of flood risk from rainfall and fluvial sources is highlighted above and is considered to be appropriate to the expected lifespan of the proposed development.

In accordance with the latest guidance, a climate change allowance for fluvial flood risk will be required of the Central to Higher Central allowances (30% and 35% respectively); and as such the higher of these should be figures should be applied to fluvial calculations; unless specific data is provided by the Environment Agency which overrides this.

For rainfall, a climate change allowance of 40% will need to be applied to assess the impact to the proposed development.

2.2.6 Planning Policy

The Core Strategy is the key document in the Local Development Framework (LDF) and describes how development will be shaped up to 2026, and the planning policies that will be

¹ Extracted from Tables 1-4 of the Technical Guidance for flood risk assessments: Climate change allowances Document (February 2016)

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used to do this; and reflects the spatial aspects of the work undertaken by Manchester City Council and its partners.

Along with other documents within the LDF, the Core Strategy forms the basis for how planning application decisions are made in Manchester.

The following policies and objectives relating to flood risk and surface water management have been extracted from the Core Strategy for reference:

Policy EN 8: Adaptation to Climate Change

All new development will be expected to be adaptable to climate change in terms of the design, layout, siting and function of both buildings and associated external spaces. In achieving developments which are adaptable to climate change developers should have regard to the following, although this is not an exhaustive list:

- Minimisation of flood risk by appropriate siting, drainage, and treatment of surface areas to ensure rain water permeability
- Reduction in urban heat island effect through the use of Green Infrastructure such as green roofs, green walls, increased tree cover and waterways
- The need to control overheating of buildings through passive design
- The opportunity to provide linked and diverse green space to enhance natural habitats which will assist species adaptation 185 Objective 6 Environment 12 Manchester City Council | Manchester Core Strategy 2012 to 2027
- Developers will be permitted to use green infrastructure elements such as green roofs, green walls, street trees and waterways to contribute to compliance with CO2 mitigation under Policy EN6, subject to sufficient evidence to quantify their contribution to compliance.

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.

Policy EN 17: Water Quality

With reference to the Manchester-Salford-Trafford SFRA and other relevant documents:

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- Development should avoid any adverse impact on water quality, including during the construction phase, and wherever possible should seek to enhance water quality, both chemical and ecological;
- Development should minimise surface water run-off from development and associated roads, and maximise the use of appropriate sustainable drainage systems, to minimise groundwater contamination, and to avoid pollutants reaching watercourses;
- Development close to a watercourse should also ensure that waste or litter cannot enter the watercourse from the site;
- Development should, where feasible and appropriate, seek to open up any culverted or hidden watercourse beneath the site to improve the ecological status of that watercourse.

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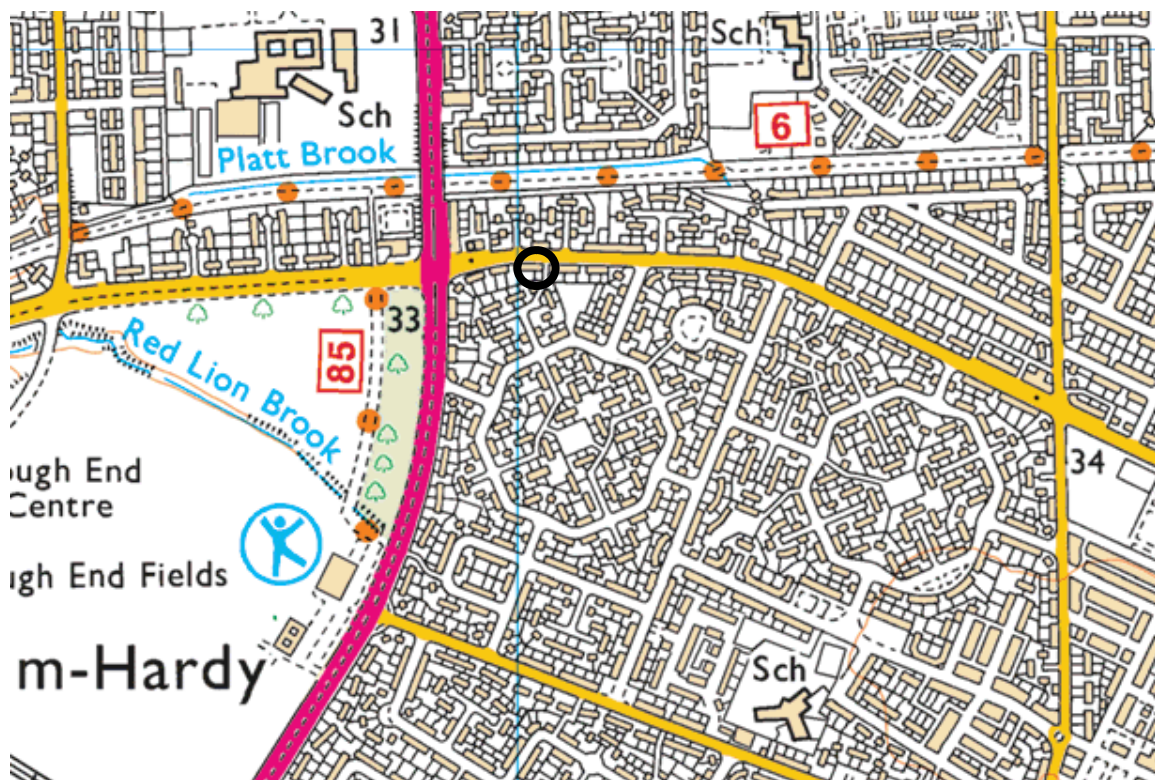
3.0 Details of the Site

3.1 Site Details

Table 2: Development Location

Site Name:	121 Mauldeth Road West
Purpose of Development:	Residential
Existing Land Use:	Private garden space
OS NGR:	SJ 840 937
Country:	England
County:	Manchester
Lead Local Flood Authority	Manchester City Council
Critical Drainage Area:	Yes – Didsbury CDA
Local Planning Authority:	Manchester City Council
Internal Drainage Board:	Not Applicable
Other Authority (e.g. British Waterways/ Harbour Authority)	Not Applicable

Location Plan:



Source: Streetmap

3.2 Site Description

The application site is located on the northern boundary of the Manchester suburb known as Withington in the centre of Northenden, and comprises private garden space to the east side of existing residential dwelling at No 161 Mauldeth Road West.

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The current use of the building comprises a mix of Residential and commercial/retail.

Figure 3.1: No.121 Mauldeth Road West, Withington



Source: Google Maps

The nearest watercourse to the application site is Chorlton Platt Gore which flows generally in a westerly direction, a distance approximating 114m north of the application site.

The site appears to be relatively flat, with a gentle slope rising southwards away from Mauldeth Road West.

A topographical survey of the site is not currently available; however, ground level data to assess local topography has been extracted from Lidar Data and OS Mapping.

- Average ground on site – 31.6mAOD
- FFL existing property – elevated approximately 150mm above external ground level
- Highway level (Mauldeth Road West) – 31.4mAOD

3.3 Proposed Development Details

The development proposal incorporates the construction of a new dwelling, within the existing garden space associated with No161 Mauldeth Road West.

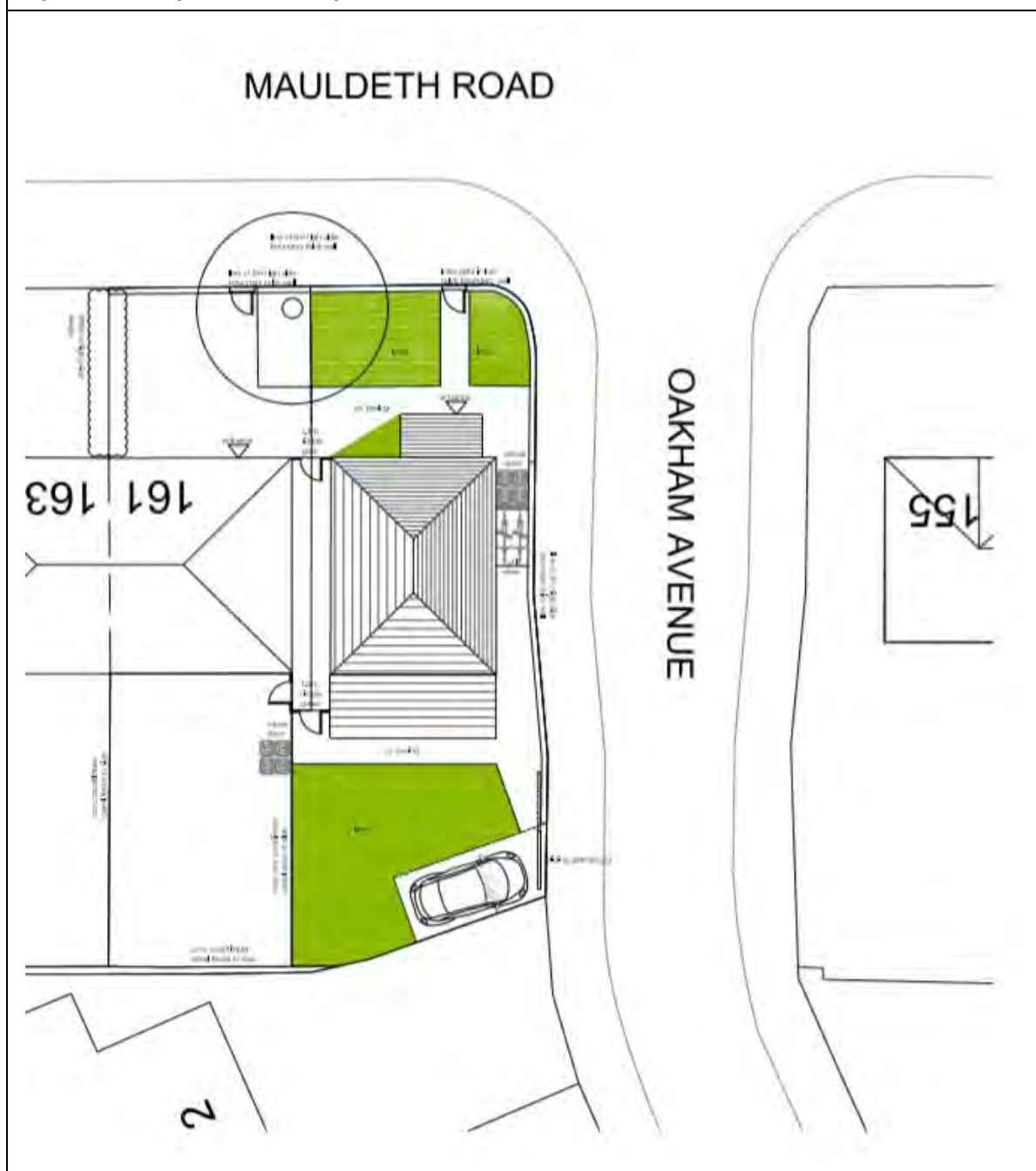
A plan illustrating the configuration of the building within the development space is provided below.

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Figure 3.2: Proposed Development Plan



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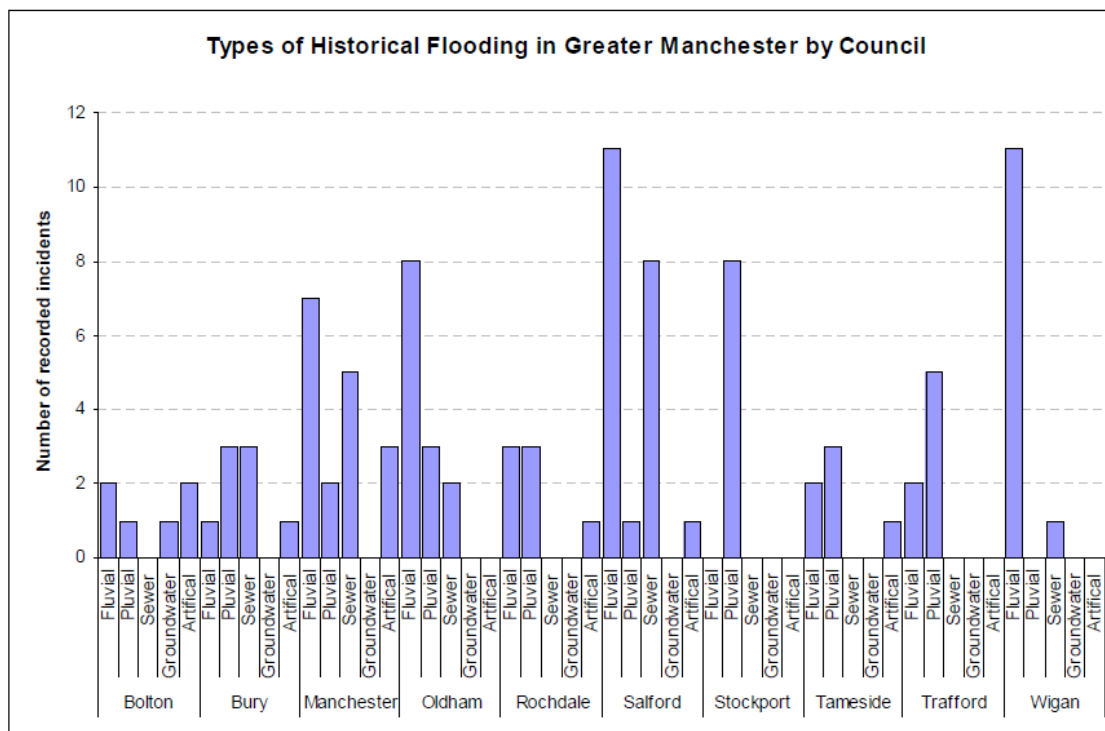
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4.0 Historic Flooding

4.1 Greater Manchester SFRA Sub-Regional Assessment (2008)

Historically, Manchester, Bolton, Bury, Rochdale, Stockport, Salford, Tameside and Trafford have records showing that pluvial flooding has occurred. Some council representatives have stated that there is sometimes confusion between pluvial flooding and sewer flooding when members of the public report events. Therefore, some of the historical references could refer to either pluvial or sewer flooding or a combination of both.

Figure 4.1: Types of Historical Flooding in Greater Manchester



Source: Figure 1-4 Greater Manchester SFRA

Throughout the Greater Manchester Area, it is apparent that Manchester has a high number of recorded incidents of historic flooding, in comparison to other areas within the district, with fluvial identified as the primary cause. Other sources listed as pluvial, sewer and artificial; and it is noted that the records available show no historical flooding from groundwater sources.

4.2 Internet Search

Undertaking an internet search, no historic flooding could be identified in proximity to the application site.

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4.3 Open Data (www.data.gov.uk)

Open Data mapping confirms that the application site is not located within the Historic Flood Map or Recorded Outline Flood map.

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5.0 Initial Evaluation of Flood Risk

5.1 The Environment Agency Flood Map

The Environment Agency Flood Map illustrated within Figure 2.1, confirms that proposed development site is located in Flood Zone 2.

The definition for each of the flood zones highlighted above is provided for reference within Section 2.2.2 of this report.

5.2 Review of Potential Flood Mechanisms

5.2.1 General Review

Table 3: Possible Flooding Mechanisms

Source/Pathway	Significant?	Comment/Reason
Fluvial	Yes	Site is shown to be located within the influence of fluvial flooding from Chorlton Platt Gore
Canal	No	Site is not located within close proximity of a canal
Tidal/Coastal	No	Site is located outside of tidal influences.
Reservoir	Yes	Site lies within the area which is not liable to flood in the event of failure of a reservoir
Groundwater	No	Groundwater flooding has not been documented within proximity of the proposed development area (SFRA)
Pluvial - Overland flow	No	Local topography is relatively flat and overland flows are considered to present a low risk at the development site.
Pluvial – Surface Water Flood Routes & Ponding	No	Long Term Flood Risk Maps indicate a low risk of flooding on-site, however a low and medium risk of surface water flooding within the surrounding highways.
Pluvial – Surface Water Runoff	Yes	Management of surface water runoff from the development will require consideration in accordance with current planning policy. The site is located within the Didsbury CDA.
Blockage	No	Not Applicable
Infrastructure failure	Yes	Thirlmere Aqueduct is located between the site and Chorlton Platt Gore; and requires consideration as a source of flood risk at the application site

From the initial assessment it has been determined that the primary flooding at the site is presented by Chorlton Platt Gore (fluvial); and that the risk presented by this source is residual in nature. Secondary flood risk is identified to be from surface water management and reservoir sources.

Further evaluation of the sources and mechanisms is presented within Section 6 of this report.

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6.0 Quantitative Flood Risk Assessment

6.1 National Planning Policy Framework

The flood risk assessment must be undertaken in accordance with the checklist provided within the NPPF Planning Practice Guidance Paragraph: 068, updated in November 2016.

6.2 Fluvial: Chorlton Platt Gore

6.2.1 General

Gore Brook is fed by the Gorton Lower reservoir; and flows in a westerly direction, where it joins Levenshulme Road Brook at Knutsford Vale. The watercourse continues to flow in a south-west direction to Thoresway Road, near to Birchfields Park, where it is joined by a smaller stream known as Crowcroft Brook.

Continuing south-west through Platt Fields the watercourse is joined by Fallowfield Brook, at Sopwith Drive; and Ley Brook to the south side of Kentigern's RC Primary School. At Hough end Crescent, a watercourse known as the Red Lion Brook flows into Chorlton Platt Gore; and the stream continues west, through Chorlton High School; and flows into the River Mersey near to the Sale Water Park.

Figure 6.1: Chorlton Platt Gore



Source: www.geograph.org (Karel Hladky)

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6.2.2 Environment Agency Data

Consultation has been undertaken with the Environment Agency; to obtain flood level information appropriate for the development site.

Modelled Flood Levels:

Model data has been extracted from the Chorlton Platt Gore 2012 Study; with data for 5 nodes provided. The nearest model node to the application site is Node 3, model flood levels provided for reference below:

- Node Location
 - o Easting: 384027
 - o Northing: 393840
- 1 in 10-year flood event – 31.06mAOD (defended & undefended)
- 1 in 25-year flood event – 31.29mAOD (defended & undefended)
- 1 in 75-year flood event – 31.48mAOD (undefended) & 31.49mAOD (defended)
- 1 in 100-year flood event – 31.52mAOD (undefended) & 31.53mAOD (defended)
- 1 in 1000-year flood event – 31.84mAOD (undefended) & 31.92mAOD (defended)

Flood Defences:

- Flood defence Asset ID - 60038.
- High ground & raised banks

The crest level of the flood defence has not been provided within the EA Data, however from LiDAR information, at Node 3, the top of the river bank is identified to have a level approximating 32.00mAOD.

Climate Change:

EA Guidance indicates that the local precautionary allowance for climate change for 'more vulnerable' development types within Flood Zone 2 is 0.15m (central allowance).

Therefore the 1 in 100-year plus climate change flood level is $31.53 + 0.15 = 31.68\text{mAOD}$.

6.2.3 Overtopping

At Model Node 3, the crest level of the river bank is shown to be higher than the flood levels associated with all modelled return period events.

It is concluded that the risk of flooding resulting from overtopping is low.

6.2.4 Breach Failure

Due to the proximity of the application site to the watercourse, along with the placement of flood defences along the river bank, it is necessary to consider the risk to the proposed development in the event of a breach failure of the existing flood defences.

Under certain conditions embankments and flood walls can fail, and flow can pass through the breach onto the adjacent floodplain, causing inundation to large areas of low-lying land.

Development situated within close proximity of the breach location is likely to be affected by high flood depths and flow velocities, with little or no warning. Consequently, attention has

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been given to the effects of a breach of the existing flood defences and its likely impact on the site.

Adopting the simple approach as recommended in DEFRA report FD2320/TR2 and utilising table 12.2 of that report:

- Site Level – 31.60mAOD
- Defence crest level 32.00mAOD
- Existing cycle path to rear of flood defence – 31.00mAOD
- 1 in 100-year flood level – 31.53mAOD
 - Lower than the site, in the event of a breach in the flood defences occurring, flood waters are unlikely to reach the site.
- 1 in 100-year plus climate change flood level – 31.68mAOD
 - Marginally higher than the site with potential flooding occurring in the event of a breach failure occurring at the flood defence.
- 1 in 1000-year flood level – 31.92mAOD
 - Marginally higher than the site with potential flooding occurring in the event of a breach failure occurring at the flood defence.

Data obtained from LiDAR suggests that the flood embankment is approximately 1.0m above the level of the cycle path adjacent to the watercourse; and as such the head of water above the floodplain at the flood defence is 0.68m and 0.92m respectively for the 1 in 100-year plus climate change and 1 in 1000-year flood events.

In accordance with Table 4 below, the initial danger classification for both flood events is considered to be 'danger for some' as the site is situated approximately 114 metres from the rear of the flood defence.

As such a more detailed assessment of the breach is required.

An indication of the flood risk to the development can be made by a simple breach analysis.

Assuming that flow through a breach can be represented by the broad-crested weir equation:

$$Q = C_d B h^{1.5}$$

Where:

Q = flow through the breach (m³/s)

B = width of the breach (m)

h = depth of water through the breach (m)

C_d = coefficient (usually between 0.5 and 1.7)

The 1 in 100-year plus climate change and 1 in 1000-year flood levels within the Chorlton Platt Gore, in line with the proposed development is calculated to be 0.68m and 0.92m above the ground level at rear of the flood defence.

Therefore, a value for h_{100cc} has been taken as 0.68m; and 0.92m for h₁₀₀₀. The value of C_d has been assumed to be a conservative 1.5.

Putting these values into the weir equation estimates flows of:

- $Q_{100cc} = 1.5 \times 50 \times 0.68^{1.5} = 42.06 \text{ m}^3/\text{s}$
- $Q_{1000} = 1.5 \times 50 \times 0.92^{1.5} = 66.18 \text{ m}^3/\text{s}$
- Note: full height breach of 50m wide, which is considered to be an appropriate width for earth embanked flood defences; on fluvial watercourses.

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Table 4: Danger to People from Breaching Relative to Distance from Defence²

Distance from Breach (m)	Head Above Floodplain (m)						
	0.5	1	2	3	4	5	6
100	✓						
250							
500							
1000							
1500							
2000							
	Danger for none						
	Danger for some e.g. elderly, infirm, and small children						
	Danger for most e.g. the general public						
	Danger for all e.g. the public and emergency services						

The depth of flooding such flows would generate are dependent on many factors, but a simple assumption based on trigonometry is that the maximum width of flow (w) a distance (a) from the breach is reached when $w = Q$. This gives the critical distance from the breach where flow depth would be significant as:

$$A = (Q - b) / 2$$

Using this equation, the critical distance for flooding from breach location is considered to approximate <10m. The proposed development is located approximately 114 metres from the flood defences and therefore given the conservative nature of these calculations, this indicates that the building lies outside the point where the flood depth and the flood velocity would be significant; hence the site is considered to lie outside of the rapid inundation zone.

The worst-case scenario of a prolonged breach has also been considered. The velocity, V (m/s), at the embankment toe (on the floodplain side) can be estimated using a theoretical equation for spillway flow defined by the U.S. Bureau of reclamation, as given in Chow (Chow, V.T. 1973 Open-Channel Hydraulics). This velocity is independent of the discharge over the crest of the breached section of flood defence.

$$V = \sqrt{2g(Z-0.5H)}$$

g = acceleration due to gravity (m/s²) = 9.81

Z = fall or vertical distance between the flow elevation and the embankment toe

- $Z_{100cc} = 0.68m$
- $Z_{1000} = 0.92m$

H = head above the weir crest (breached section)

- $H_{100cc} = 0.68m$ (full height breach)
- $H_{1000} = 0.92m$ (full height breach)

And the peak velocity at the breach is therefore estimated to be:

- $V_{100cc} = 2.58m/s$

² Note: Table copied from Table 12.2, Section 12, FD2320/TR2

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- $V_{1000} = 3.00\text{m/s}$

The corresponding average depth (d) of the flow is estimated using the continuity equation:

$$Q = wdV$$

The approximate depth of water to the rear of the flood defences is therefore estimated to be 0.326m for the 1 in 100-year plus climate change event; and 0.441m for the 1 in 1000-year flood event.

For the purpose of these calculations it is assumed that the flood water will spread at 45 degrees from the location of the breach in the flood defence. Hence by the time the flood water is level with the proposed development the flow width will extend to 278m (114m+50m+114m).

Assuming that the flow velocity outside of the rapid inundation zone is reduced to 1m/s then the depth of water at the proposed development is calculated to be approximately **0.151m; and 0.238m** respectively for the 1 in 100-year plus climate change and 1 in 1000-year flood events. This confirms the danger to people at the application site to 'Danger for some'.

Table 5: Danger to People from Breaching Relative to Distance from Defence³

Distance from Breach (m)	Head Above Floodplain (m)						
	0.5	1	2	3	4	5	6
100	✓						
250							
500							
1000							
1500							
2000							
	Danger for none						
	Danger for some e.g. elderly, infirm, and small children						
	Danger for most e.g. the general public						
	Danger for all e.g. the public and emergency services						

6.2.5 Fluvial: Conclusion

In terms of overtopping & breach failure, it is concluded that the 1 in 100-year flood events present a low risk to the application site.

The risk of overtopping during the 1 in 100-year plus climate change and 1 in 1000-year flood events is also concluded to be low.

However, the risk is increased to medium for breach analysis for the 1 in 100-year plus climate change and 1 in 1000-year event, which translates to 'Danger for some'.

³ Note: Table copied from Table 12.2, Section 12, FD2320/TR2

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Given the overall low statistical likelihood of this flood event occurring, the flood risk at the development is concluded to be residual in nature, however suitable mitigation should be considered.

In conclusion the assessment concurs with the flood map, confirming placement of the application site within Flood Zone 2.

6.3 Pluvial: Surface Water Runoff

6.3.1 Existing On-site Drainage Regime

The site currently comprises undeveloped garden space; associated with an existing residential property.

Engineering judgment suggests that the existing dwelling is already positively drained, directing surface water flows to an adjacent United Utilities sewer which is likely to be located within Mauldeth Road West.

6.3.2 Proposed Drainage Regime

It is considered that surface water runoff from the new dwelling will be connected to the drainage system serving the existing residence.

The site is located within a Critical Drainage Area; and local policy is to require new development to restrict surface water discharge rates leaving the site to greenfield runoff rates or brownfield rates with 50% reduction.

Applying the surface water management hierarchy, as outlined within Building Regulations:

- Infiltration – space constraints and highly urbanised area mean that a minimum distance of 5m from buildings and highways is unachievable
- Watercourse – Chorlton Platt Gore 120m north of the site. There is no direct route available for provision of a dedicated outfall to watercourse in order to serve the development site.
- Sewer – on-site drainage system serves the existing property; and therefore, discharge to the public sewer system via existing plot drainage is the most suitable management solution for surface water runoff from the development.

SUDS: It is recommended that source control methods such as permeable paving; and rainwater harvesting are considered for application to the development in order to minimise surface water runoff rates; and offset the increased volume of surface water potentially leaving the site.

6.4 Foul

It is recommended that foul flows from the site reutilise existing foul connections which currently serve No161 Mauldeth Road West.

6.5 Reservoir Flooding

The EA have provided mapping which indicates that the site is located within an area which is likely to become flooded in the event of reservoir failure.

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Figure 6.2: EA Map – Reservoir Flooding



Source: Environment Agency

The map presented above provides a general indication of the largest area that might be flooded if a reservoir were to fail and release the water it holds. It is taken from a national assessment and displays a worst-case scenario.

It is highlighted that the map is only intended as a guide and is not a prediction of what will happen.

Reservoirs in the UK have an extremely good safety record with no failures resulting in the loss of life since 1925; and are more carefully maintained now, meaning that reservoir flooding is very unlikely to happen.

The Environment Agency is the enforcement authority for the Reservoirs Act 1975 in England; and ensures that reservoirs are regularly inspected and essential safety work is carried out.

In conclusion the risk of flooding from reservoirs at the application site is overall considered to be low.

6.6 Infrastructure Failure - Thirlmere Aqueduct

Thirlmere Aqueduct is located under the highway at Mauldeth Road West; adjacent to the application site.

The 96-mile aqueduct was built between 1890 and 1925 to serve the growing demand for water in post-industrial revolution Manchester; and delivers over 220 million litres of clean drinking water (11% of the North West's water) from the Lake District to Manchester over a 36-hour journey. It is the longest gravity-fed aqueduct in the world.

Historically self-closing valves would stop the flow of water if the aqueduct burst, but had to be reopened by hand. They have now been replaced by remotely operated valves.

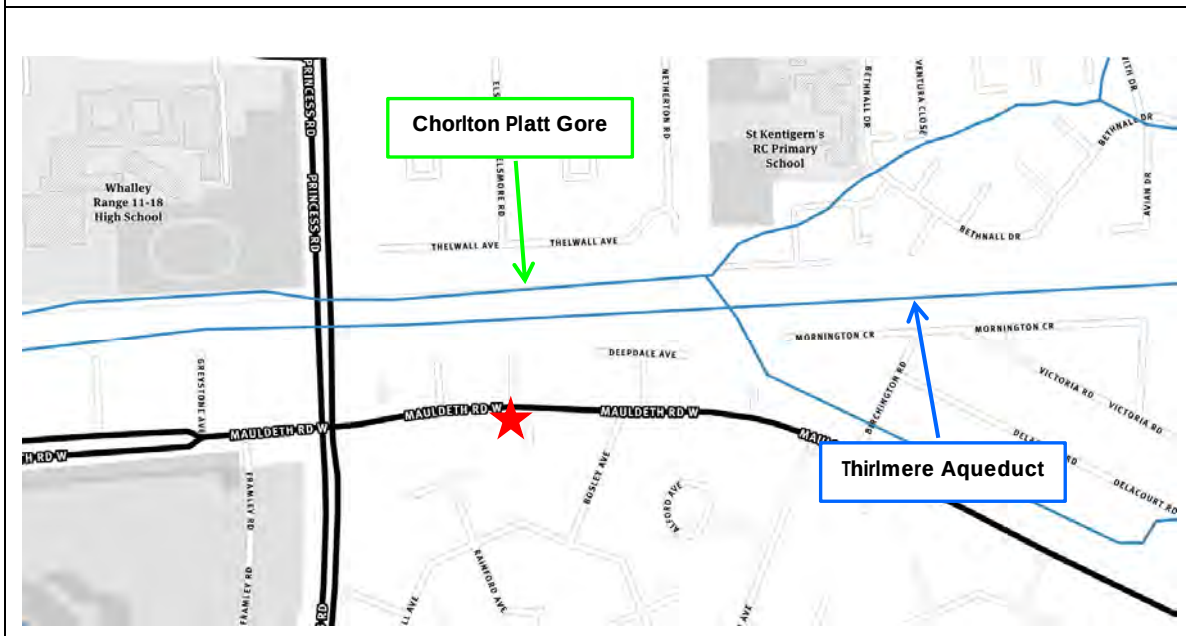
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There is no evidence documented to suggest that flooding has occurred within proximity of the application site due to infrastructure failure associated with the Thirlmere Aqueduct; and it is therefore concluded that the overall risk presented by this source is low.

Figure 6.3: Map Illustrating Location of Thirlmere Aqueduct



Source: <https://hidden-manchester.org.uk/#/waterways/chorton-brook>

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7.0 Mitigation Measures

7.1 Finished Floor Levels

In accordance with the NPPF finished floor levels for new development within Zone 2 should be set to whichever is the highest:

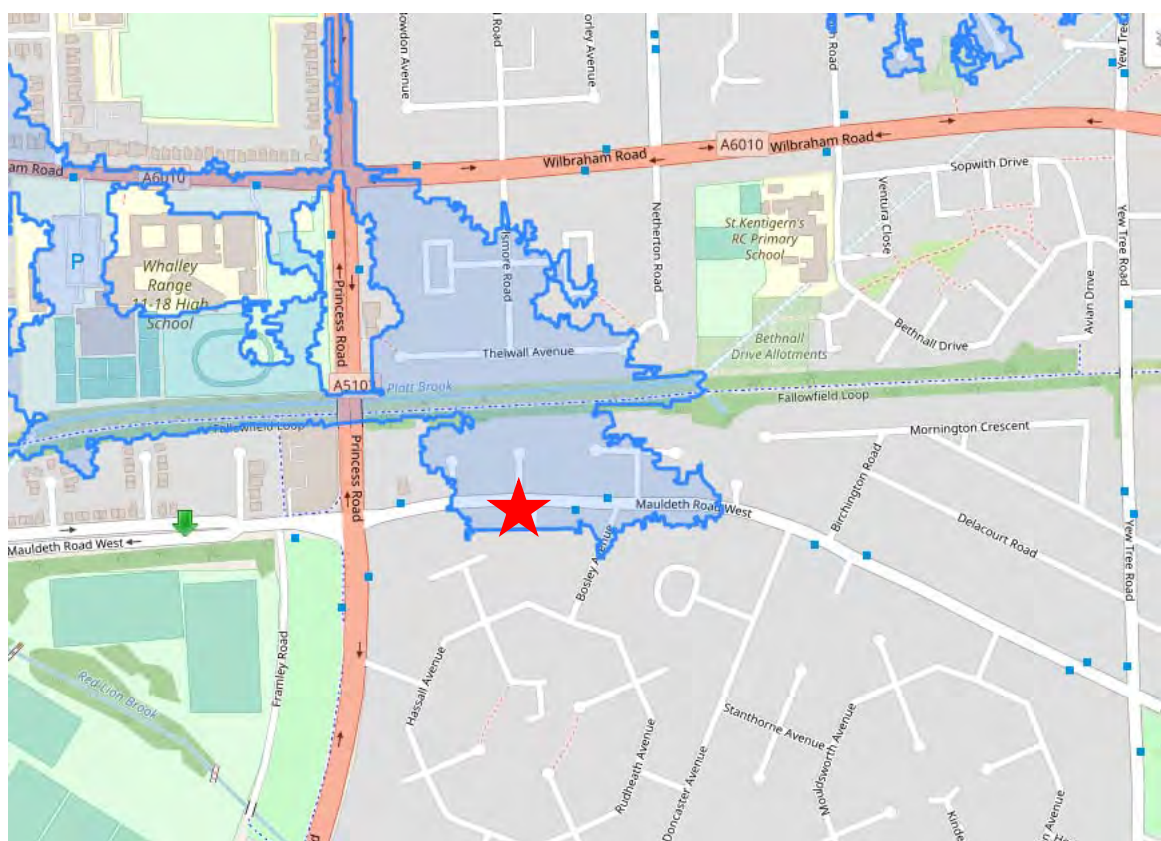
- 300mm above the existing ground level = $31.6 + 0.30 = 31.90\text{m AOD}$
- 600mm above the 100 year plus climate change event = $31.68 + 0.60 = \underline{\underline{32.28\text{m AOD}}}$

7.2 Flood Warnings

Due to the nature of the proposed development i.e. residential within Flood Zone 2, it is considered prudent that the occupants sign up to receive flood warnings or alerts via the Flood Warnings Direct Service.

A copy of the coverage map which encompasses the site is provided overleaf for reference.

Figure 7.1: Flood Alert/Warning Area



Source: <http://riverlevels.uk/flood-warning-chorton-and-platt-brooks-at-whalley-range-and-chorton-cum-hardy>

The service provided by the Environment Agency is free and can be accessed at the following web address: <https://www.gov.uk/sign-up-for-flood-warnings>.

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

If flooding is forecast, they are able to issue alerts using a set of three different types. These types of flood warning are presented within Figure 8 overleaf.

Flood Warnings & Alerts can be accessed online via the following:

- Three-day flood risk forecast
- River and sea levels
- Floodline Warnings Direct - FREE flood warning/alert service
- Flood warnings on Facebook
- Live Flood Warning map

Table 6: 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 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 of 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

7.3 Access and Egress

Although the fluvial flood risk at the development is considered to be residual in nature, it is considered that dry access and egress will not be possible at all times.

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During the 1 in 1000-year breach event depths of flooding are anticipated to reach between 0.238m at the application site, therefore it is recommended that residents are prepared to evacuate away from the property, if advised to do so by the emergency services and/or local authority, in the advance of the onset of any flooding.

Evacuation away from the property should be directed east or west along Mauldeth Road West towards Flood Zone 1.

It is noted that the closest community facility to the application site is Withington Library (Wilmslow Road) at a distance approximating 1km south east from the site.

Alternatively, the LadyBarn Community Hub at Royle Street is located 1.78km east of the site.

7.4 Personal Flood Plan

It is recommended that residents create a personal flood plan. This is a simple document that assists the occupant to prioritise actions required at the property before, during and following a flood event.

A copy of a personal flood plan template has been provided within the appendices of this report.

7.5 Safe Place of Refuge

In the event of rapid flooding, where occupants are unable to evacuate safely from the residence, it is highlighted that there is a safe place of refuge available at first floor level within the property.

At this location, occupants will be safe above predicted flood water levels, and may remain until flooding has subsided, or Environment Agency Flood Warnings are no longer active.

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8.0 Conclusions & Recommendations

Flood Risk Consultancy Ltd has been appointed by UDC (Manchester) Ltd, to provide a Flood Risk Assessment in support of a planning application for a new residential property on land associated with No161 Mauldeth Road West, in Withington, Manchester.

The red-line boundary containing the development site is shown to be situated within Flood Zone 2 of the Environment Agency Flood Map.

An initial assessment indicates that the primary flood risk at the proposed development is fluvial from the Chorlton Platt Gore, located at a distance approximating 114m north of the site.

Following detailed assessment, it can be confirmed that the site is within Flood Zone 2 and as such has a medium risk from fluvial flooding.

Fluvial:

Existing flood defences are located along the banks of the watercourse in the form of high ground and flood embankments. Crest levels for the flood defences has been extracted from LiDAR data for the area, which indicates that the modelled flood levels for all events up to and including the 1 in 1000-year flood event are lower than the top of the defence and therefore, overtopping is considered to present a low flood risk.

An assessment of breach failure however indicates that flood depths of 0.151m; and 0.238m are achievable at the application site for the 1 in 100-year plus climate change and 1 in 1000-year flood events.

Given the low probability of the occurrence, the risk associated with fluvial flooding is considered to be residual in nature.

Management of Surface Water Runoff:

In terms of surface water runoff and its management on-site, it is highlighted there will be an increase in surface water runoff rates and volumes resulting from the development. The site is located within a critical drainage area; and therefore, any flows leaving the site must be restricted to greenfield runoff rates or provide a 50% reduction to brownfield runoff rates.

Application of the management hierarchy, indicates that there are special constraints associated with the use of soakaways; and a direct route to watercourse is not economically feasible, given the highly urbanised environment surrounding the site. Therefore, foul and surface water drainage for the new development are likely to be connected to the existing on-site drainage system.

In order to minimise the impact of the new development and assist with offsetting increased surface water volumes, it is recommended that source control SUDS features are considered for inclusion within the development plan i.e. permeable paving and rainwater harvesting and re-use.

Reservoirs:

Although the site is located within the area considered to be impacted by the event of reservoir failure, the risk associated with this source is overall concluded to be low.

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Infrastructure Failure – Thirlmere Aqueduct

Forms part of the water supply infrastructure for Manchester, which is maintained and operated by United Utilities.

Undertaking a search did not provide any evidence of recorded incidents of flooding within the Withington area resulting from failure of the aqueduct structure; and as such it is concluded that flooding from this source overall is considered to be low.

Flood Mitigation Measures

- Flood Zone 2 Standing Advice: Finished floor levels set at 300mm above external ground levels or 600mm above the 1 in 100-year plus climate change flood level whichever is the highest – **32.28m AOD**
- Occupants to sign up to receive EA Flood Warnings/Alerts.
- Occupants to prepare a personal flood plan.
- A safe place of refuge is available within the property at first floor level
- Any route evacuating away from the property in the event of the flood should be directed towards Flood Zone 1.

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APPENDICES

Level 2 Flood Risk Assessment

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Appendix A: - Development Plan

Design & Access Statement

Prepared in support of a full planning application
to be submitted for the provision of

a new dwelling

at

**161 Mauldeth Road West
Withington
Manchester M20 1BJ**

Contents:

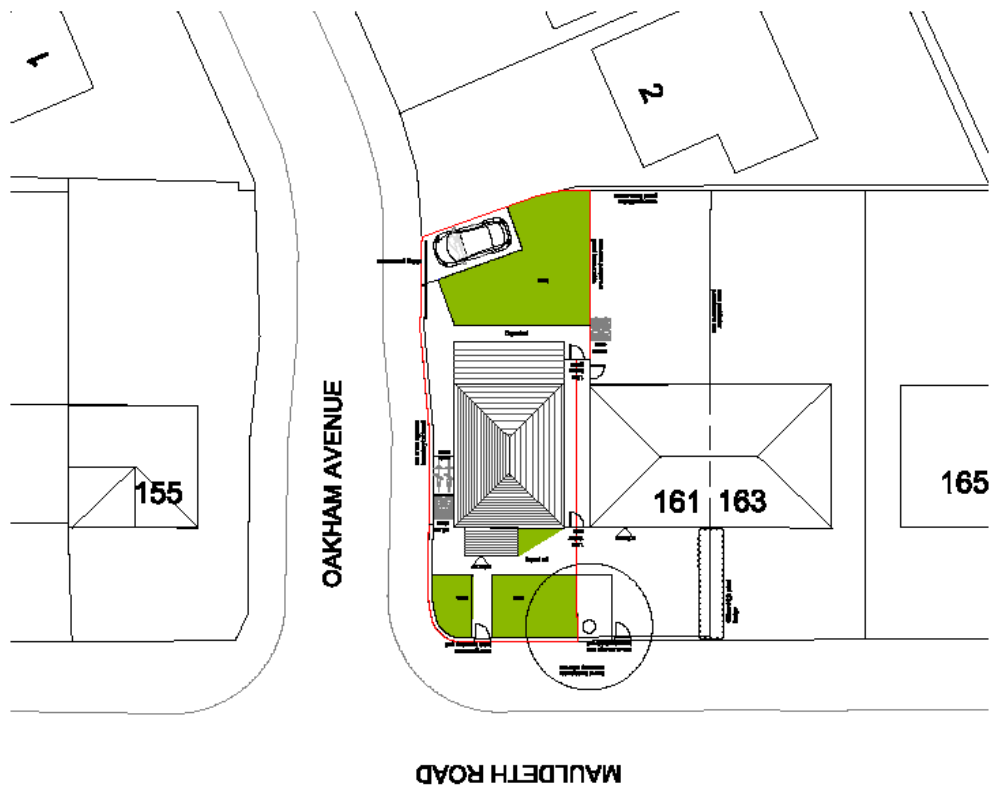
- 1. Extent of development**
- 2. Layout**
- 3. Scale of the proposal**
- 4. Landscaping measures**
- 5. Aesthetic treatment**
- 6. Access proposal**
- 7. Context -**
 - Visual Impact Assessment**
 - Involvement**
 - Evaluation**
 - Design**
 - Conclusion**

Appendix A – Site Photographs

Introduction

This Statement is to be read in conjunction with the following drawings prepared in support of the full application for planning approval being submitted.

- 19-186 - PL000 OS Location Plan
- 19 186 – PL100 Plans and elevations as existing
- 19 186 - PL200 Plans as Proposed
- 19 186 - PL201 Elevations as Proposed 1
- 19 186 - PL202 Elevations as Proposed 2
- Waste storage strategy



1. Extent of development

Site areas:

- Plot for proposed dwelling – 187.7m²
- Plot remaining for 161 Mauldeth Road West – 162.1m²

Total site area 349.8m²=0.035 ha/0.08 acres

New House - gross internal floor area:

- Ground floor 50.0m²
- First floor 35.3m²

Total Floor area 85.3m²

2. Layout

The site is currently occupied by a two storey semi-detached dwelling, built circa 1920, refurbished at a later date, with a concrete tiled pitched roof, common brick external walling and white upvc framed double glazed windows.

The house lies in a corner garden plot with a large area of land to the side of the dwelling. The front of the dwelling faces Mauldeth Road West, the side of the dwelling faces Oakham Avenue. A mature deciduous tree is located to the front of the existing dwelling.

The existing dwelling has no on site parking.

Following the demolition of nos 157 and 159 Mauldeth Road West to create a new housing development along Oakham Ave. residual land was added to the original boundary of 161 Mauldeth Road West, bordered by a 2m high brick

wall to Oakham Ave., and a similar height timber panel fence encloses the rear boundary

The proposed dwelling occupies the land between 161 Mauldeth Road West and Oakham Avenue

The front elevation and first floor rear elevation of the proposed dwelling is aligned with the adjacent dwellings along Mauldeth Road West, with matching eaves height and hipped roof profile.

The proposed dwelling is set out 1.5m from the side elevation of 161 Mauldeth Road West is 1.1-1.5m from the eastern boundary, sufficient to allow for access to the rear to a private enclosed garden area and where cycle storage will be provided. Enclosed refuse storage provision is located at the front of the dwelling.

The site has a very slight cross fall from front to back, lawns and planting are proposed to the front and rear, with access for parking provided from Oakham Avenue

The detached house is laid out over two storeys, a modest kitchen, wc and storage/ utility space are set to the front of the premises with living accommodation at the rear of the ground floor level, 3 bedrooms and a family bathroom are located at first floor level.

3. Scale of the proposal

The proposed building is similar in height and footprint to the adjacent residential property. The external appearance takes reference from the hipped roof form and brickwork elevations of the houses along Mauldeth Road West. The proposal is positioned on the site to maintain the streetscene along Mauldeth Road West

4. Landscaping

The landscaping around the dwelling will feature a paved driveway, with perimeter paving around the dwellings and turfed lawns and shrubs/planting beds to the perimeter.

5. Aesthetic treatment

The proposed dwelling is of traditional appearance, utilising facing brickwork, upvc double glazed windows and doors, black upvc fascias soffits and bargeboards and rainwater goods, concrete tiled pitched roofs.

6. Access proposal

The dwelling has pedestrian access to the level threshold front door via a new gated opening in the boundary wall to the front, and a new vehicular access is created in the existing boundary wall to Oakham Avenue towards the rear of the site. The property has adequate driveway/car parking area for a car and cycle storage provision created to the side of the house.

The site is located within an area well served by public transport, on arterial bus routes into the City to the north, and along the east west routes to Chorlton and Fallowfield. The Withington tram station is within 10 minutes walk.

7. Context

- **Visual Impact Assessment**

The level topography and trees along Mauldeth Road West give limited visibility of the proposed dwelling from the east and west. The dwelling occupies a plot with existing brick walling to back of pavement providing a high level of privacy. There are no issues with regard to loss of privacy or policy on overlooking distances.

- **Evaluation**

Social - As the proposal is for a single new dwelling the social impact is negligible.

Economic - As the proposal is for a single new dwelling the economic impact is negligible.

- **Design**

The design of the proposal, as described above, seeks to maintain the character of residential premises in the area.

The size, height, massing and location of the dwelling on the site is consistent with adjacent buildings, as is the choice of external materials.

- **Conclusion**

In conclusion the applicant is striving to produce a quality building that fits comfortably within the environment and that complements the surrounding architecture. The applicants brief is to create a new home with quality finishes throughout, with a long life span, that meet, as a minimum the current

Land to the side of 161 Mauldeth Road West, Withington, Manchester

building legislation requirements for quality of construction and insulation, that represent a worthwhile investment.

The development utilises a limited percentage of the available site, and as such there is no issue regarding overdevelopment.

The proposal responds well to its context, utilizing the existing aspect and creating new views within the design whilst seeking to maintain privacy for the occupants and the neighbouring residents.

We are confident that this proposal will meet with the approval of the LA Planning Authority and subject to that approval will enhance the character of the area.

Appendix A – Site Photographs



View to site from Mauldeth Road West



View of 157 Mauldeth Road West/ Oakham Ave junction, site on tight right

Land to the side of 161 Mauldeth Road West, Withington, Manchester



161 Mauldeth Road West front/side view



161 Mauldeth Road West side/rear view

Land to the side of 161 Mauldeth Road West, Withington, Manchester



View from site to rear



View from site to front (Mauldeth Road West)

Land to the side of 161 Mauldeth Road West, Withington, Manchester

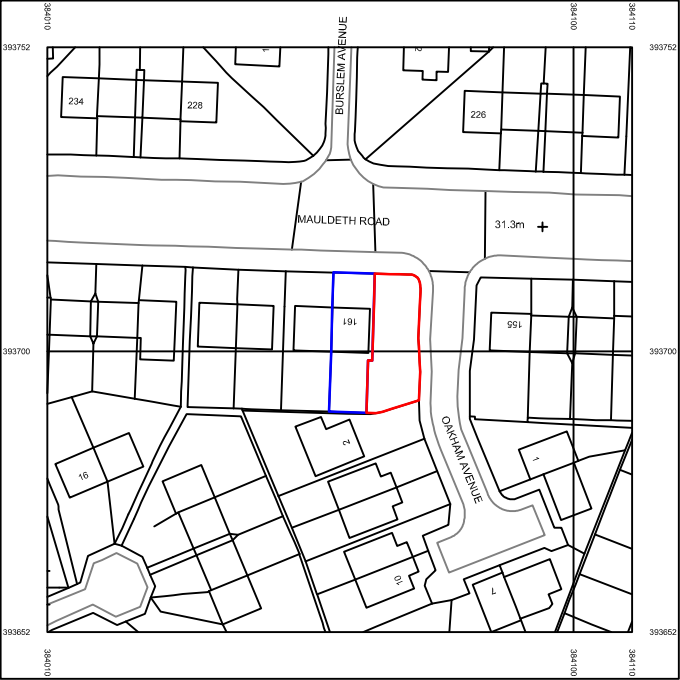


View to west along Mauldeth Road West from site



View of site from Oakham Ave towards Mauldeth Road West

Ordnance Survey
Ukmapcentre.com



Serial number: 164608

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Site Boundary

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Do not scale. Contractors must check all dimensions on site before preparing production drawings or commencing any work. This drawing and its design is the copyright of S.R.Miles Ltd and may not be reproduced in any form whatsoever without their prior express written consent.

Project :
Site adjacent to 161 Mauldeth Road Withington
Title :
OS location plan
Drawing number : Issue :
19.186 PL000
Client :
Mr G Crane

Scale :
1:1250 @ A4
Date :
19.06.2019
CAD Ref :
PL100
Drawn by :
SRM

SRM

Simon R Miles BA(Stu) Dip Arch(Stu)
Chartered Architect

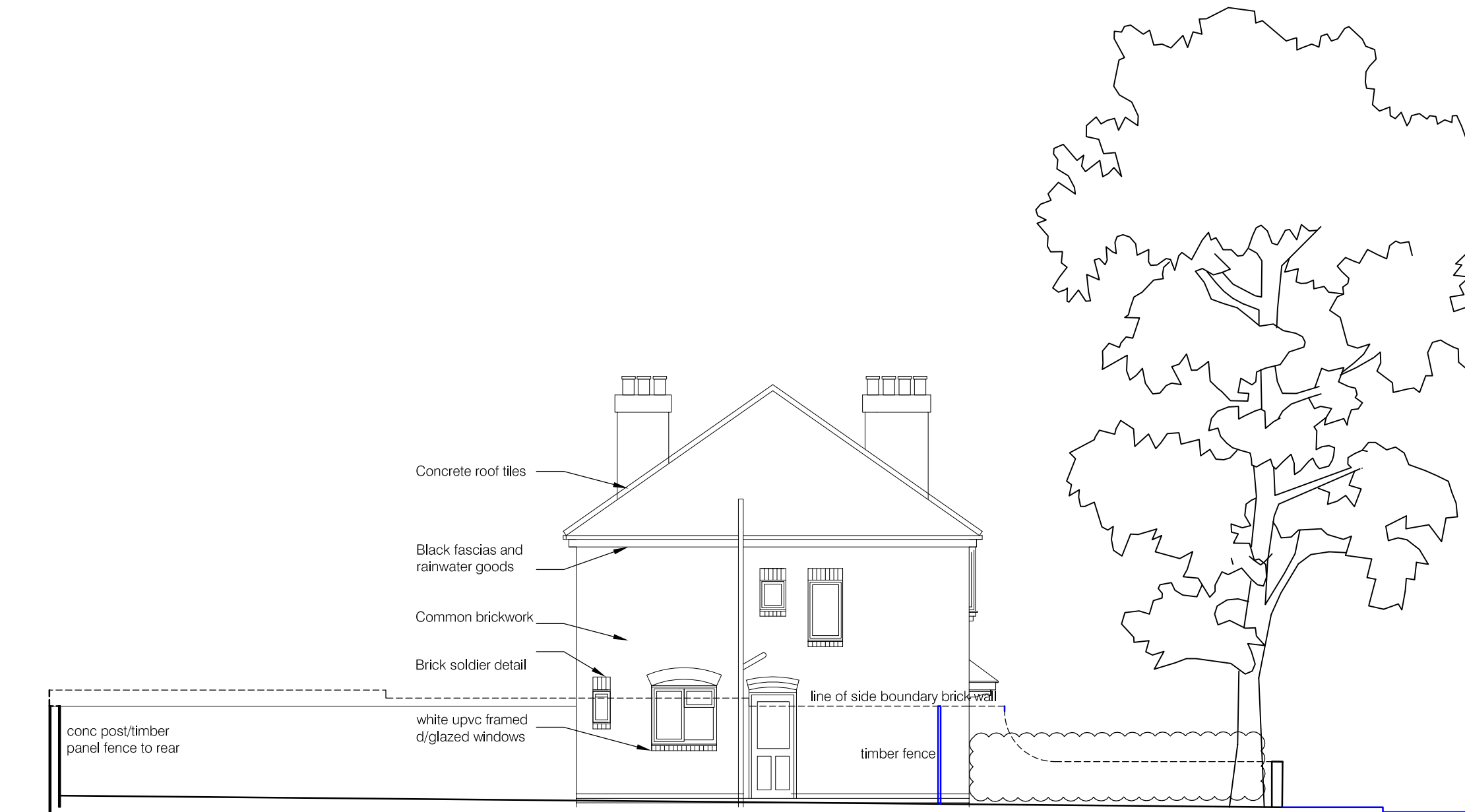
MAULDETH ROAD



Front Elevation

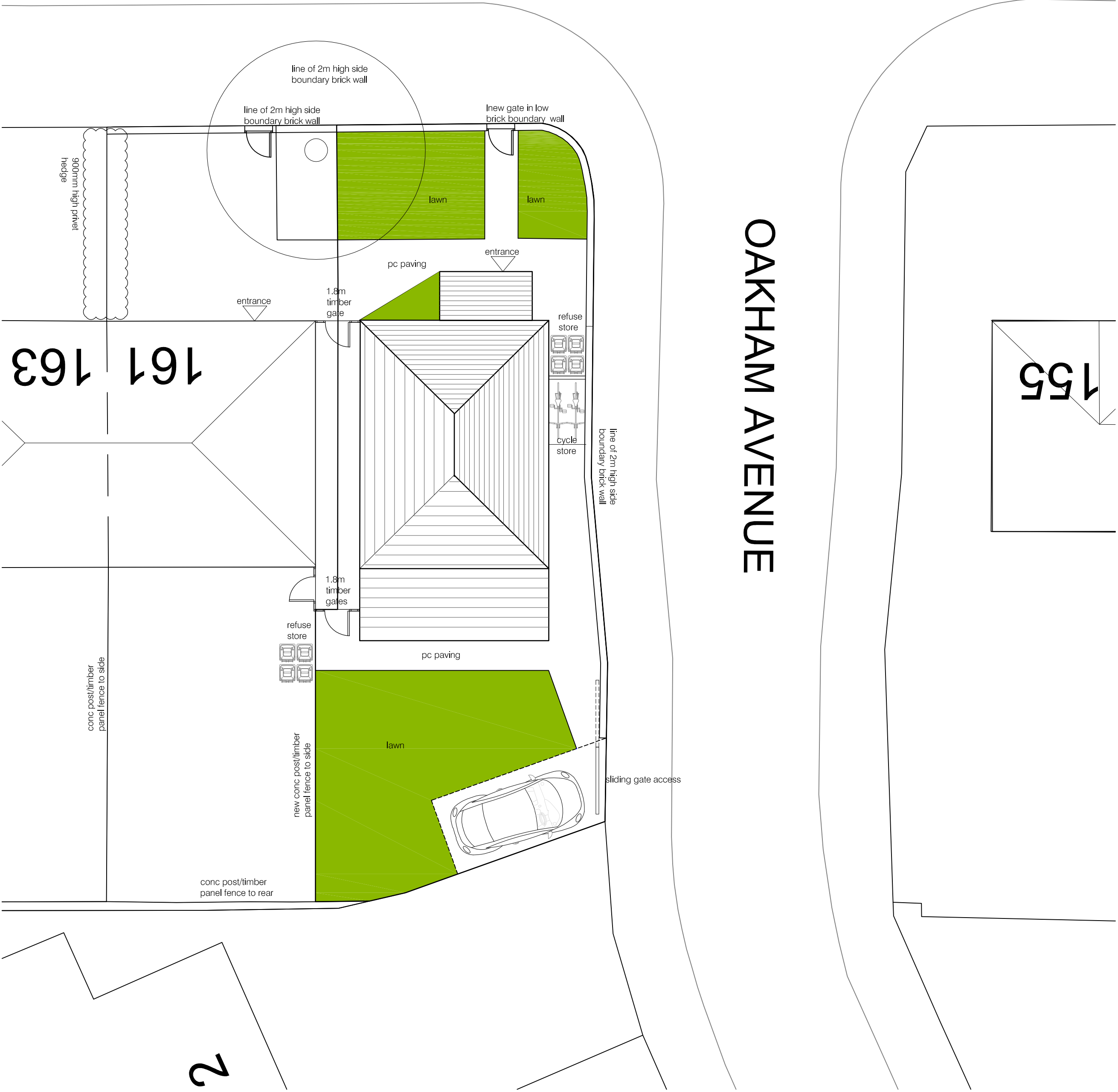


Rear Elevation

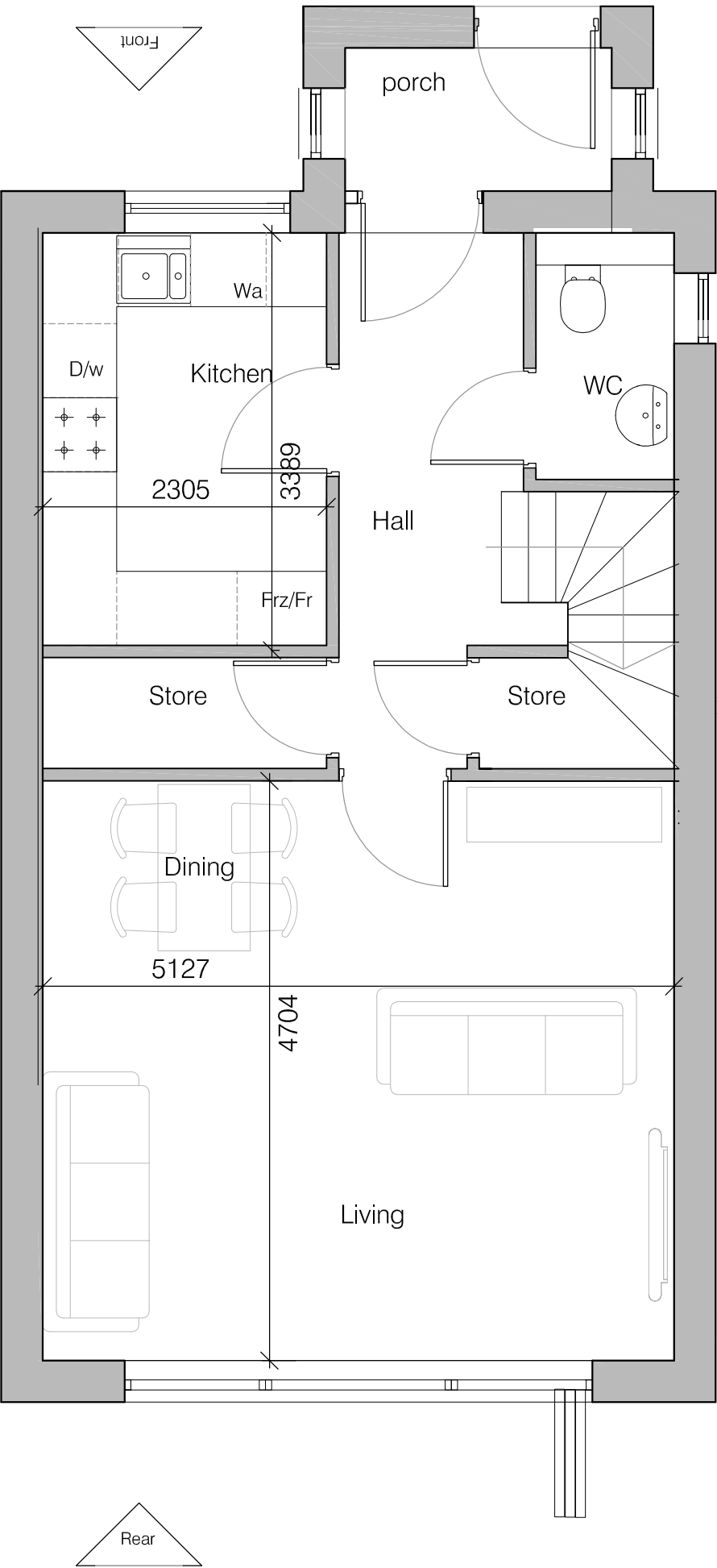


Side Elevation

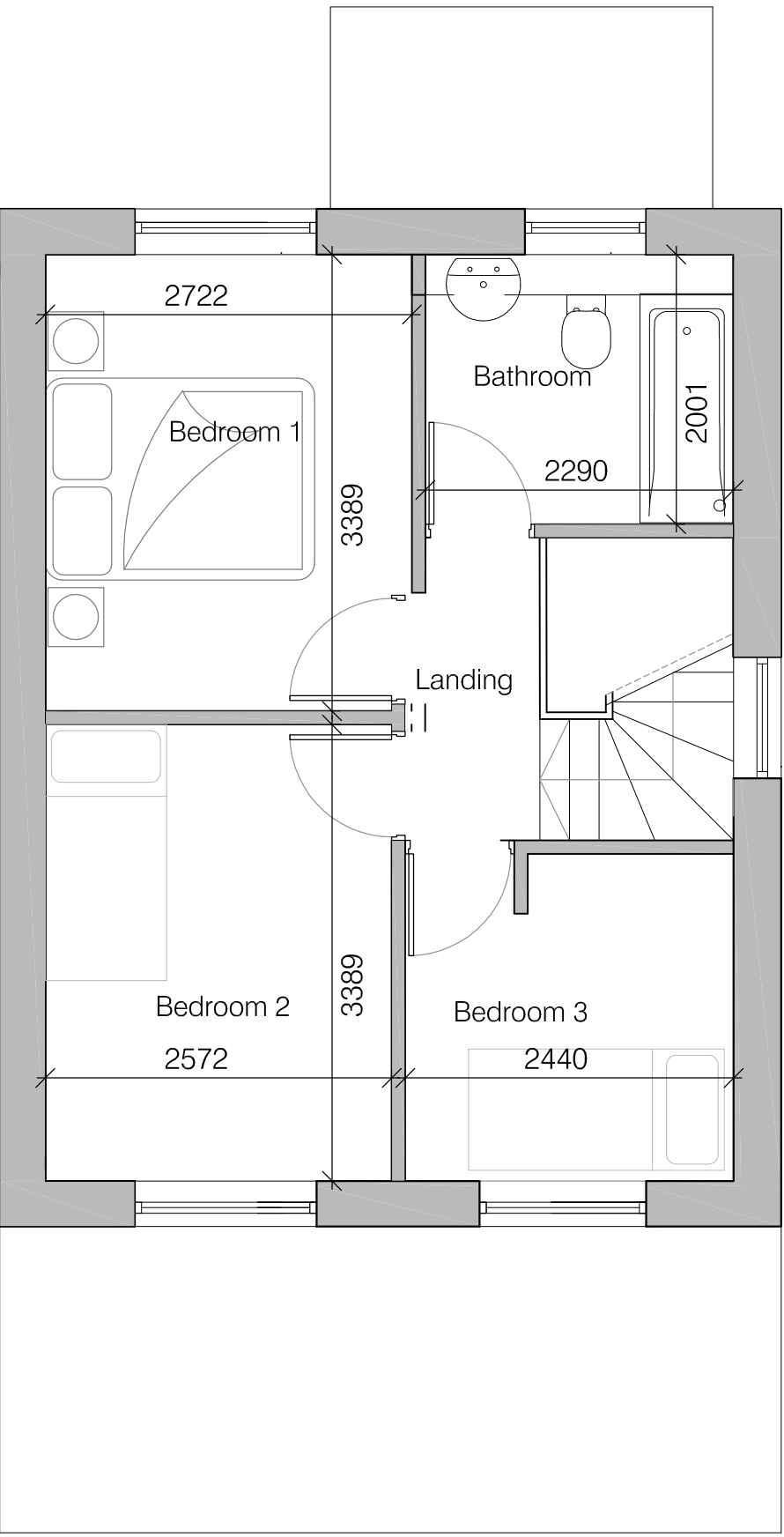
MAULDETH ROAD



Site plan as proposed 1:100



Ground Floor
50.0m2 G.I.A (538sq ft)



First Floor
35.3m2 G.I.A (385 sq ft)

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Appendix B: - Environment Agency Data

Flood risk assessments: Climate change allowances

Application of the allowances and local considerations

Greater Manchester, Merseyside & Cheshire

1) The climate change allowances

The [National Planning Practice Guidance](#) refers planners, developers and advisors to the Environment Agency guidance on considering climate change in Flood Risk Assessments (FRAs). This guidance was updated in February 2016 and is available on [Gov.uk](#) and should be read in conjunction with this document. The guidance can be used for planning applications, local plans, neighbourhood plans and other projects. It provides climate change allowances for peak river flow, peak rainfall, sea level rise, wind speed and wave height. The guidance provides a range of allowances to assess fluvial flooding, rather than a single national allowance. It advises on what allowances to use for assessment based on vulnerability classification, flood zone and development lifetime.

2) Assessment of climate change impacts on fluvial flooding

Table A below indicates the level of technical assessment of climate change impacts on fluvial flooding appropriate for new developments depending on their scale and location. This should be used as **a guide only**. Ultimately, the agreed approach should be based on expert local knowledge of flood risk conditions, local sensitivities and other influences. **For these reasons we recommend that applicants and / or their consultants should contact the Environment Agency at the pre-planning application stage to confirm the assessment approach, on a case by case basis.** **Table A** defines three possible approaches to account for flood risk impacts due to climate change, in new development proposals:

- **Basic:** Developer can add an allowance to the 'design flood' (i.e. 1% annual probability) peak levels to account for potential climate change impacts. The allowance should be derived and agreed locally by Environment Agency teams.
- **Intermediate:** Developer can use existing modelled flood and flow data to construct a stage-discharge rating curve, which can be used to interpolate a flood level based on the required peak flow allowance to apply to the 'design flood' flow.
- **Detailed:** Perform detailed hydraulic modelling, through either re-running Environment Agency hydraulic models (if available) or construction of a new model by the developer.

Table A – Indicative guide to assessment approach

<u>VULNERABILITY CLASSIFICATION</u>	<u>FLOOD ZONE</u>	<u>DEVELOPMENT TYPE</u>		
		<u>MINOR</u>	<u>SMALL-MAJOR</u>	<u>LARGE-MAJOR</u>
ESSENTIAL INFRASTRUCTURE	Zone 2	Detailed		
	Zone 3a	Detailed		
	Zone 3b	Detailed		
HIGHLY VULNERABLE	Zone 2	Intermediate/ Basic	Intermediate/ Basic	Detailed
	Zone 3a	Not appropriate development		
	Zone 3b	Not appropriate development		
MORE VULNERABLE	Zone 2	Basic	Basic	Intermediate/ Basic
	Zone 3a	Basic	Detailed	Detailed
	Zone 3b	Not appropriate development		
LESS VULNERABLE	Zone 2	Basic	Basic	Intermediate/ Basic
	Zone 3a	Basic	Basic	Detailed
	Zone 3b	Not appropriate development		
WATER COMPATIBLE	Zone 2	None		
	Zone 3a	Intermediate/ Basic		
	Zone 3b	Detailed		

NOTES:

- Minor: 1-9 dwellings/ less than 0.5 ha | Office / light industrial under 1ha | General industrial under 1 ha | Retail under 1 ha | Gypsy/traveller site between 0 and 9 pitches
- Small-Major: 10 to 30 dwellings | Office / light industrial 1ha to 5ha | General industrial 1ha to 5ha | Retail over 1ha to 5ha | Gypsy/traveller site over 10 to 30 pitches
- Large-Major: 30+ dwellings | Office / light industrial 5ha+ | General industrial 5ha+ | Retail 5ha+ | Gypsy/traveller site over 30+ pitches | any other development that creates a non residential building or development over 1000 sq m.

The assessment approach should be agreed with the Environment Agency as part of pre-planning application discussions to avoid abortive work.

3) Specific local considerations

Where the Environment Agency and the applicant and / or their consultant has agreed that a 'basic' level of assessment is appropriate the figures in Table B below can be used as a precautionary allowance for potential climate change impacts on peak 'design' (i.e. 1% annual probability) fluvial flood level rather than undertaking detailed modelling.

Table B – Local precautionary allowances for potential climate change impacts

Watercourse	Central	Higher Central	Upper
All	0.15m	0.24m	0.48m

Use of these allowances will only be accepted after discussion with the Environment Agency.

4) Fluvial food risk mitigation

Read the guidance on [Gov.uk](https://www.gov.uk) to find out which allowances to use to **assess** the impact of climate change on flood risk.

For planning consultations where we are a statutory consultee and our [Flood risk standing advice](#) **does not** apply we use the following benchmarks to inform flood risk **mitigation** for different vulnerability classifications. **These are a guide only. We strongly recommend you contact us at the pre-planning application stage to confirm this on a case by case basis. Please note you may be charged for this advice.** For planning consultations where we are not a statutory consultee or our [Flood risk Standing advice](#) applies we recommend local planning authorities and developers use these benchmarks but we do not expect to be consulted.

- For development classed as '[Essential Infrastructure](#)' our benchmark for flood risk mitigation is for it to be designed to the '**upper end**' climate change allowance for the epoch that most closely represents the lifetime of the development, including decommissioning.
- For [highly vulnerable](#) in flood zone 2, the '**higher central**' climate change allowance is our minimum benchmark for flood risk mitigation. In sensitive locations it may be necessary to use the **upper end** allowance.
- For [more vulnerable developments](#) in flood zone 2, the '**central**' climate change allowance is our minimum benchmark for flood risk mitigation, and in flood zone 3 the '**higher central**' climate change allowance is our minimum benchmark for flood risk

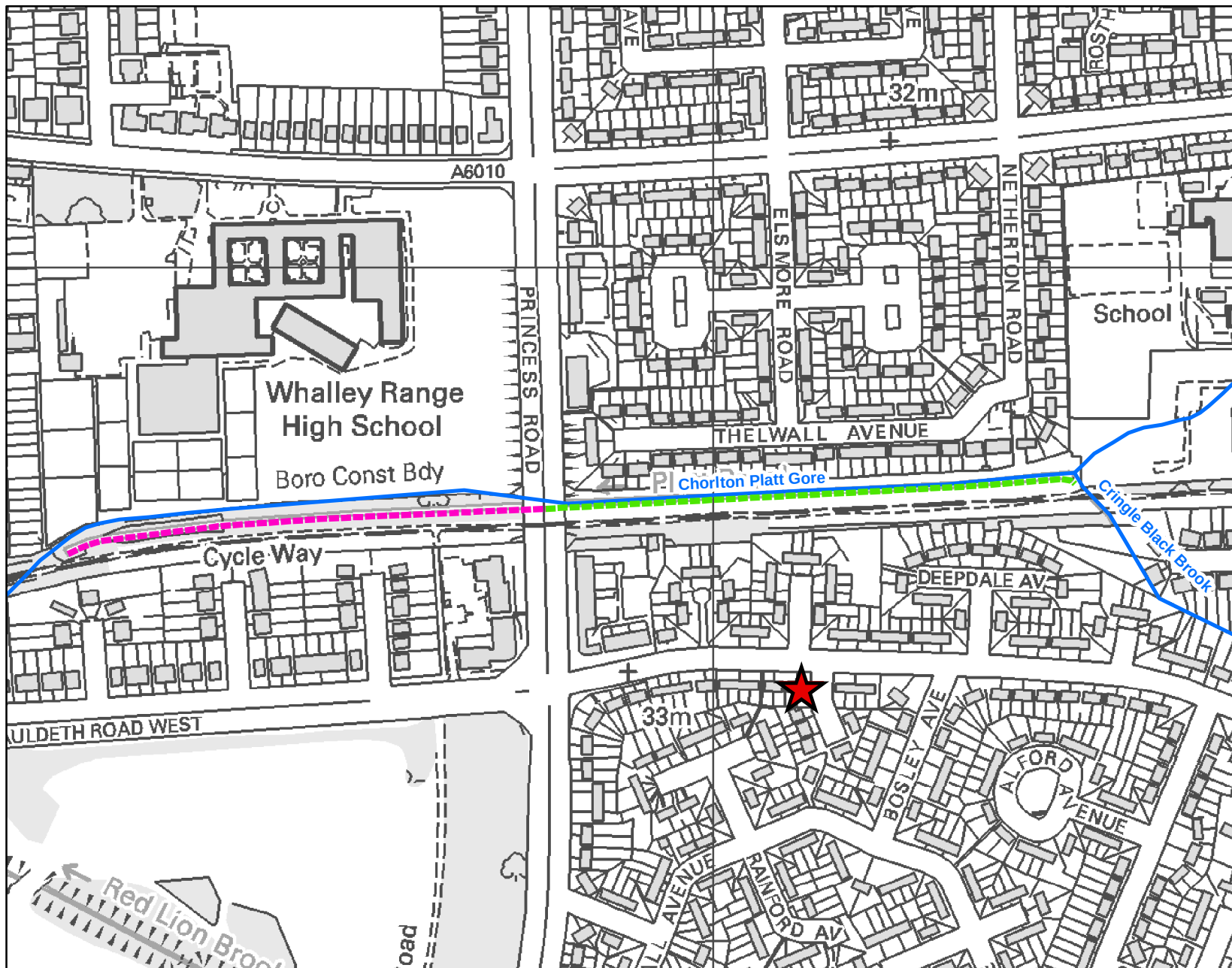
mitigation. In sensitive locations it may be necessary to use the **higher central** (in flood zone 2) and the **upper end** allowance (in flood zone 3).

- For [water compatible](#) or [less vulnerable](#) development (e.g. commercial), the 'central' climate change allowance for the epoch that most closely represents the lifetime of the development is our minimum benchmark for flood risk mitigation. In sensitive locations it may be necessary to use the **higher central** (particularly in flood zone 3) to inform built in resilience.

There may be circumstances where local evidence supports the use of other data or allowances. Where you think this is the case we may want to check this data and how you propose to use it.

END.

Flood Defence Map centred on Mauldeth Road West, Manchester, M20 1BJ. Created on 13/08/2019 [GMMC137941AB]



1:4,000



Legend



Site Location

Defences (EA maintained)

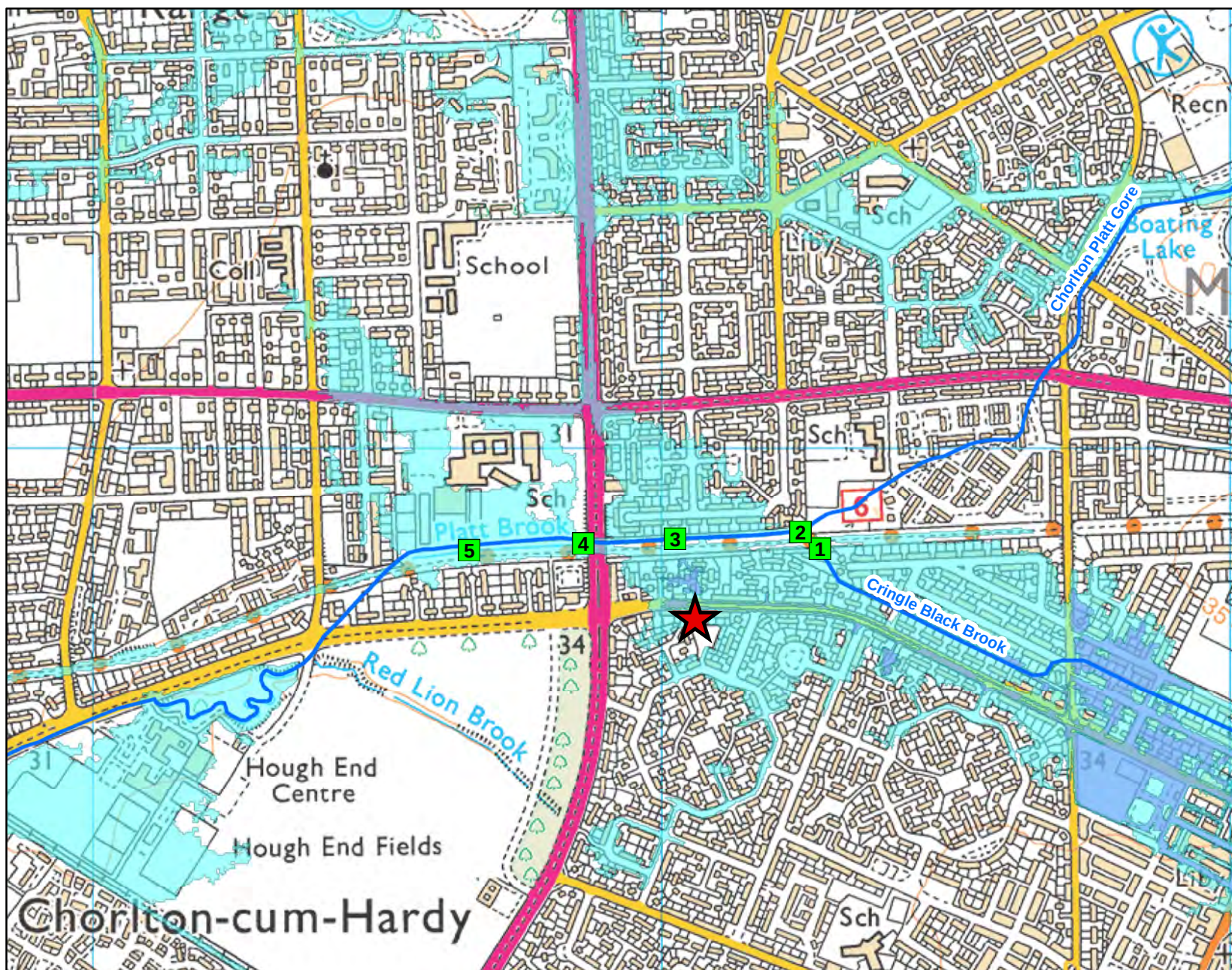
Asset Id

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Main River

Detailed Flood Map centred on Mauldeth Road West, Manchester, M20 1BJ. Created on 13/08/2019 [GMMC137941AB]



1:10,001



Legend

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

Map Reference	Model Node Reference	Easting	Northing	Data	Undefended					Defended				
					10 % AEP (1 in 10 year)	4 % AEP (1 in 25 year)	1.33 % AEP (1 in 75 year)	1 % AEP (1 in 100 year)	0.1 % AEP (1 in 1000 year)	10 % AEP (1 in 10 year)	4 % AEP (1 in 25 year)	1.33 % AEP (1 in 75 year)	1 % AEP (1 in 100 year)	0.1 % AEP (1 in 1000 year)
1	ea013_Model_CHOP01_00001	384282	393823	Modelled Water Level (m aodN)	31.41	31.64	31.84	31.88	32.14	31.41	31.65	31.84	31.88	32.20
				Modelled Flow (cumecs)	2.95	3.72	3.70	3.69	3.66	2.95	3.75	3.73	3.73	3.70
2	ea013_Model_CHOP01_00003	384247	393852	Modelled Water Level (m aodN)	31.39	31.61	31.81	31.84	32.13	31.39	31.61	31.81	31.85	32.20
				Modelled Flow (cumecs)	10.14	13.52	16.85	17.59	24.07	10.14	13.55	16.87	17.63	24.19
3	ea013_Model_CHOP01_00007	384027	393840	Modelled Water Level (m aodN)	31.06	31.29	31.48	31.52	31.84	31.06	31.29	31.49	31.53	31.92
				Modelled Flow (cumecs)	10.25	13.64	17.00	17.72	23.83	10.25	13.67	17.03	17.76	24.61
4	ea013_Model_CHOP01_00010	383865	393832	Modelled Water Level (m aodN)	30.74	30.93	31.10	31.13	31.46	30.74	30.94	31.10	31.13	31.51
				Modelled Flow (cumecs)	10.25	13.64	17.00	17.71	23.19	10.25	13.67	17.03	17.75	24.14
5	ea013_Model_CHOP01_00013	383664	393820	Modelled Water Level (m aodN)	29.46	29.63	29.78	29.82	31.00	29.46	29.63	29.79	29.82	31.07
				Modelled Flow (cumecs)	10.25	13.64	17.00	17.71	23.09	10.25	13.67	17.03	17.75	24.72

Model data taken from Chorlton Platt Gore 2012

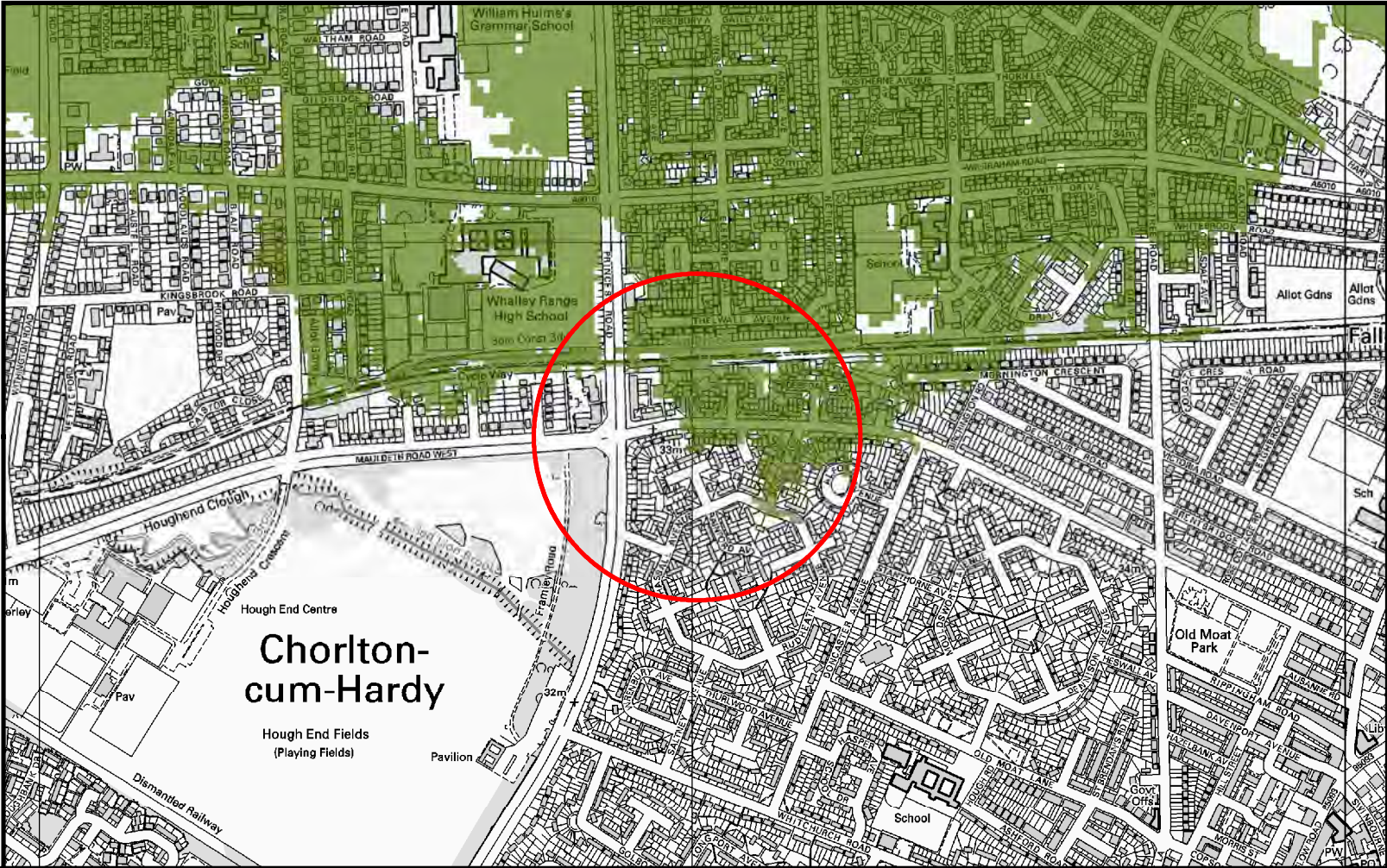
AEP - Annual Exceedence Probability

m aodN - metres above ordnance datum Newlyn

cumecs - cubic metres per second

Notes: Climate Change Scenario - We do not hold climate change measurements at this location. For further guidance on climate change within the GMMC area please see the attachment 'Flood risk assessments: Climate change allowances'. Particularly section 3, table B which shows the Local precautionary allowances for potential climate change impacts.

Reservoir Flood Map



The area within the red circle could be at risk of flooding from the following reservoirs:

Reservoir Name	Reservoir Owner	Location	Local Authority	Environment Agency Office
Gorton Upper	United Utilities Water plc	389893, 396254	Manchester	Environment Agency - Greater Manchester, Merseysid
Audenshaw No. 3	United Utilities Water plc	390934, 396835	Tameside	Environment Agency - Greater Manchester, Merseysid
Audenshaw No.2	United Utilities Water plc	391643, 396093	Tameside	Environment Agency - Greater Manchester, Merseysid
Audenshaw No.1	United Utilities Water plc	391852, 396483	Tameside	Environment Agency - Greater Manchester, Merseysid

Note - this map provides a general indication of the largest area that might be flooded if a reservoir were to fail and release the water it holds. It is taken from a national assessment and displays a worst case scenario. The map is only intended as a guide and is not a prediction of what will happen.

Important

- This map has been produced for emergency planning purposes and displays a worst case scenario.
- It is not suitable for use at an individual property scale due to the method used.
- This map does not give any information on the likelihood of reservoir flooding or on the depth or speed of floodwaters. It also does not include any smaller reservoirs (which hold less than 25,000 cubic metres of water) or reservoirs commissioned or registered after Spring 2009.
- The information should not be interpreted as stating that the location you are interested in will or won't actually flood, but simply that it is in or not in an area that could be affected by reservoir flooding as shown on the maps

Maximum extent of flood

1:10,000

Reservoir Flood Map

This text must be read with the extract from the Reservoir Flood Map which we have sent to you

How to use the maps

Reservoir flood maps are available to help you find out if you could be affected by reservoir flooding. Even though reservoir flooding is very unlikely it may be helpful to you to find out if you live or work in an area that could be affected. If you do, you might want to think about what you would do if an emergency did happen.

For more information on what to do if you live or work near a reservoir, including some frequently asked questions, visit our website at <http://www.environment-agency.gov.uk/flood>.

The maps have been prepared for emergency planning purposes and for this reason they reflect a credible worst case scenario – this means that if a reservoir failure did occur it would most likely be far less severe than the scenario shown in the maps. We've mapped a credible worst case scenario so that emergency planners have all the information they might need to increase public safety.

Reservoir safety

Reservoirs in the UK have an extremely good safety record with no failures resulting in the loss of life since 1925. Reservoirs are more carefully maintained now. This means reservoir flooding is very unlikely to happen.

The Environment Agency is the enforcement authority for the Reservoirs Act 1975 in England. All large reservoirs that we think could endanger human life must be inspected and supervised by reservoir engineers. We ensure that reservoirs are regularly inspected and essential safety work is carried out.

For more information on reservoir safety visit our website at:

<https://www.gov.uk/guidance/reservoirs-owner-and-operator-requirements>.

Emergency planning

Lead Local flood authorities are responsible for coordinating emergency plans for reservoir flooding and ensuring communities are well prepared. Lead Local flood authorities work with other members of the Local Resilience Forum (LRF) to develop generic and site-specific emergency plans, depending on local circumstances and priorities.

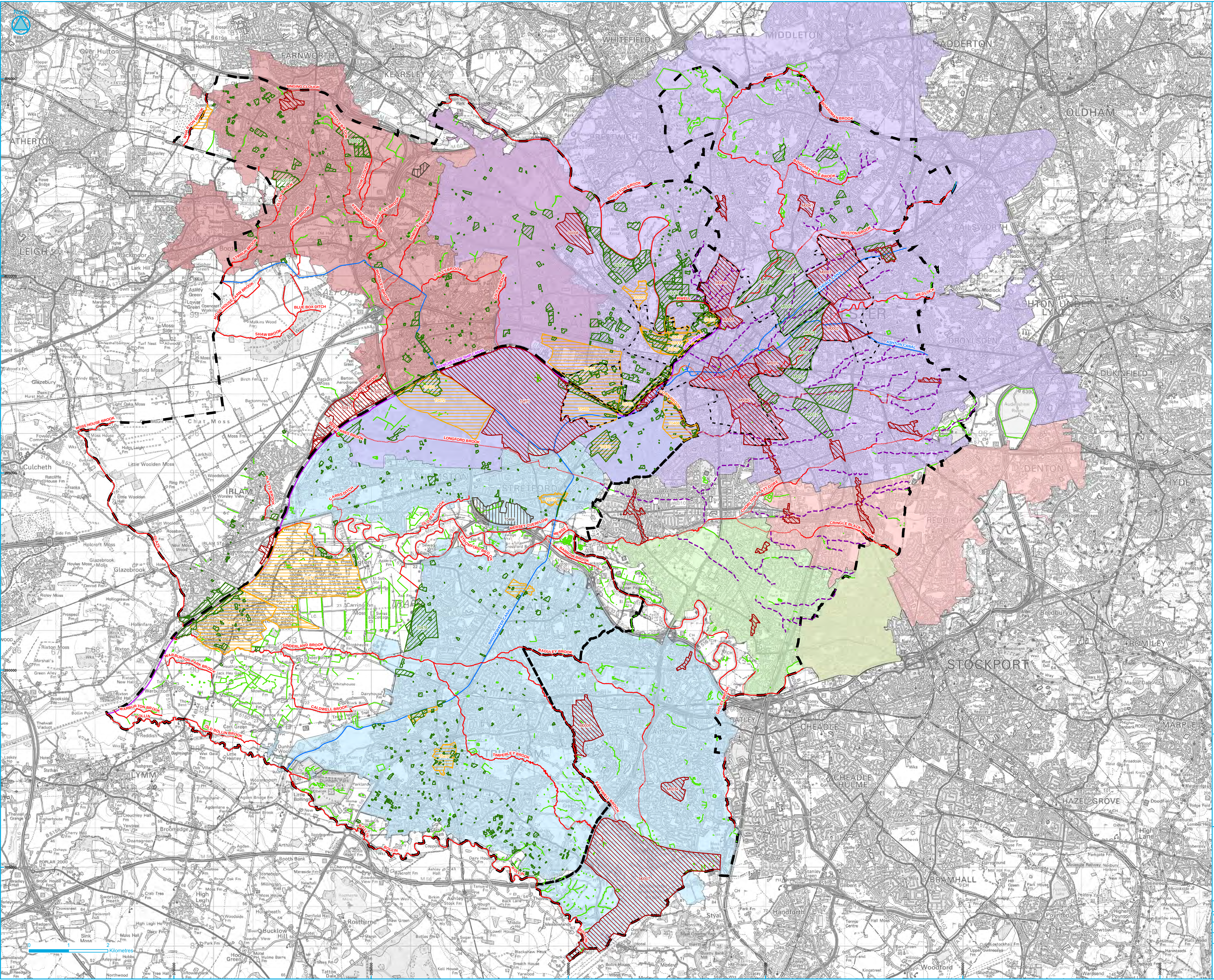
If you want to find out about local emergency plans you should contact the responsible lead local flood authority as identified on the map.

Level 2 Flood Risk Assessment

No161 Mauldeth Road West, Withington, Manchester M20 1BJ

Report No: 2019-092

Appendix C: -Critical Drainage Area Plan



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

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

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

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

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

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



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

Critical Drainage Areas

Drawn by: J Cheetham	Date: 16/03/2011	This map is based upon Ordnance Survey material with the permission of Ordnance Survey on behalf of the Controller of Her Majesty's Stationery Office. © Crown copyright. Unauthorised reproduction infringes Crown copyright and may lead to prosecution or civil proceedings. Licence number: 100016588/2011.
Checked by: J Dimelow	Date: 01/02/2011	
Approved by: J Cooper	Date: 01/02/2011	
File Name: ...ArcViewMapping\Level2MST_CDA_Current_V1.2.mxd		
Drawing Number: SS_4.5	Status: FINAL	Scale: 1:45,000

Original © A

Level 2 Flood Risk Assessment

No161 Mauldeth Road West, Withington, Manchester M20 1BJ

Report No: 2019-092

Appendix D: - Personal Flood Plan Template

Personal flood plan

Name



Are you signed up to receive flood warnings?

If not call Floodline on 0345 988 1188 to see if your area receives free flood warnings.

☐

Let us know when you've completed your flood plan by calling Floodline on **0345 988 1188**. This will help us learn more about how people are preparing for flooding.

General contact list	Company name	Contact name	Telephone
Floodline	Environment Agency		0345 988 1188
Electricity provider			
Gas provider			
Water company			
Telephone provider			
Insurance company and policy number			
Local council			
Local radio station			
Travel/weather info			

Key locations

Service cut-off	Description of location
Electricity	
Gas	
Water	

Who can help/who can you help?

Relationship	Name	Contact details	How can they/you help?
Relative			
Friend or neighbour			

Be prepared for flooding. Act now

Personal flood plan

What can I do NOW?



Put important documents out of flood risk and protect in polythene

☐

Look at the best way of stopping floodwater entering your property

☐

Find out where you can get sandbags

☐

Identify what you would need to take with you if you had to leave your home

☐

Check your insurance covers you for flooding

☐

Make a flood plan and prepare a flood kit

☐

Identify who can help you/ who you can help

☐

Understand the flood warning codes

☐

What can you do if a flood is expected in your area?

Actions	Location
Home	
• Move furniture and electrical items to safety	
• Put flood boards, polythene and sandbags in place	
• Make a list now of what you can move away from the risk	
• Turn off electricity, water and gas supplies	
• Roll up carpets and rugs	
• Unless you have time to remove them hang curtains over rods	
• Move sentimental items to safety	
• Put important documents in polythene bags and move to safety	
Garden and outside	
• Move your car out of the flood risk area	
• Move any large or loose items or weigh them down	
Business	
• Move important documents, computers and stock	
• Alert staff and request their help	
• Farmers move animals and livestock to safety	
Evacuation - Prepare a flood kit in advance	
• Inform your family or friends that you may need to leave your home	
• Get your flood kit together and include a torch, warm and waterproof clothing, water, food, medication, toys for children and pets, rubber gloves and wellingtons	

There are a range of flood protection products on the market to help you protect your property from flood damage. A directory of these is available from the **National Flood Forum** at www.bluepages.org.uk

Be prepared for flooding. Act now