

Manchester University Hospital

Flood Risk Assessment

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1 Introduction

1.1 Project Background

Curtins have been appointed by Currie & Brown to produce a Flood Risk Assessment (FRA) in support of the full planning application (143111/FO/2025) for development located within the existing Central Energy Services Complex at Manchester University Hospital, M13 9WL. The proposed development consists of the following:

“Installation of 2no. stand-by generators within acoustic housing units and the temporary installation of 2no. two storey portacabins for a temporary period of 2 years.”

The proposed generators are crucial infrastructure to the wider hospital site by improving electrical provision and resilience. The two stand-by generators will provide emergency back-up for critical operations in the hospital.

The total site area is approximately 2046m².

In recent years, the Government and local Councils have placed increased priority on the need for developers to take full account for the risks of their development at all stages of the planning process. The National Planning Policy Framework (NPPF) and Planning Practice Guidance (PPG) identifies how the issue of flooding is dealt with through the planning process and with the creation of a site-specific FRA for sites over 1ha in area or in Flood Zones 2 & 3.

The purpose of this report is to assist our client and the Local Planning Authority to make an informed decision on the flood risks associated with the site development. Local Planning Authorities have the powers to control developments, in line with recent legislation, and are expected to apply a risk-based approach to development.

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

Where the proposed works, to which this report refers, are undertaken more than twelve months following the issue of this report, Curtins Consulting Ltd shall reserve the right to re-validate the findings and conclusions by undertaking appropriate further investigations at no cost to Curtins Consulting Ltd.

Allowance for the effects of climate change will be made in accordance with government recommendations in place and statistical data available at the time of writing this report. These recommendations may become more onerous and the statistical data may be revised in the future; we will not make any estimate of what changes may result from this. Please be aware that this, and other issues over which Curtins Consulting Ltd has no control, may affect future flood risk at the development and require further work to be undertaken for which we accept no liability.

1.2 Scope of Flood Risk Assessment

The assessment is to be undertaken in accordance with the standing advice and requirements of the Environment Agency for Flood Risk Assessments as outlined in the Communities and Local Governments Technical Guidance to the National Planning Policy Framework (NPPF).

The assessment will:

- Investigate all potential risks of current or future flooding to the site;
- Consider the impact the development may have elsewhere with regards to flooding; and
- Consider design proposals to mitigate any potential risk of flooding determined to be present.

2 National and Local Policy Considerations

2.1 National Planning Policy Framework

The Ministry of Housing, Communities and Local Governments initially published the National Planning Policy Framework (NPPF) in 2012 to identify how the issue of flooding is dealt with through the planning process and to introduce the requirement for a site-specific Flood Risk Assessment (FRA) for sites over 1ha in area or in Flood Zones 2 & 3. The document consolidates the previously used Planning Policy Statements.

2.2 Planning Practice Guidance

The Government's Planning Practice Guidance (PPG) provides additional information to be read alongside the NPPF. The online guidance sets out the definitions for the flood zones and defines the permitted uses of development that can be proposed in them.

Table 1: PPG Tables 1 & Summary

Flood Zone	Appropriate Users
Flood Zone 1 - Low Probability This zone comprises land having less than 1 in 1000 annual probability of river or sea flooding (<0.1%)	All uses of land are appropriate in this zone
Flood Zone 2 - Medium Probability This zone comprises land assessed as having between 1 in 100 and 1 in 1000 annual probability of river flooding (1%-0.1%) or between 1 in 200 and 1 in 1000 annual probability of sea flooding (0.5%-0.1%) in any year	The water-compatible, less vulnerable and more vulnerable uses of land and essential infrastructure in Table D.2 are appropriate in this Zone Subject to the Sequential Test being applied, the highly vulnerable uses in Table D.2 are only appropriate in this zone if the Exception Test is passed
Flood Zone 3a - High Probability This zone comprises land assessed as having a 1 in 100 or greater annual probability of river flooding (>1%) or a 1 in 200 or greater annual probability of flooding from the sea (>0.5%) in any year	The water-compatible and less vulnerable uses of land in Table D.2 area appropriate in this zone. The highly vulnerable uses in Table D.2 should not be permitted in this zone. The more vulnerable and essential infrastructure uses in Table D.2 should only be permitted in this zone if the Exception Test is passed. Essential infrastructure permitted in this should be designed and constructed to remain operational and safe for users in time of flood.
Flood Zone 3b - Functional Floodplain This zone comprises land where water has to flow or be stored in times of flood. SFRAs should identify this Flood Zone (land which would flood with an annual probability of 1 in 20 (5%) or greater in any year or is designed to flood in an extreme (0.1%) flood, or at another probability to be agreed between the LPA and the Environment Agency, including water conveyance routes)	Only the water-compatible uses and the essential infrastructure listed in Table D.2 that has to be there should be permitted in this zone. It should be designed and constructed to: Remain operational and safe for users in times of flood; Result in no net loss of floodplain storage; Not impede water flows; and Not increase flood risk elsewhere. Essential infrastructure in this zone should pass the Exception Test.

2.3 Local Planning and Guidance Documents

2.3.1 Manchester Local Plan 2012 – 2027

The Local Plan, produced by Manchester City Council, guides development within Manchester and acts as the local development framework. It consists of several documents including the Core Strategy (adopted in July 2012) and the 'Places for Everyone (PfE) Joint Development Plan' (adopted in March 2024). The Core Strategy sets out the Council's vision for the area over a 15-year period, alongside the planning policies to achieve this vision. The plan is structured in such a way to identify current challenges facing Manchester, set out the Local Strategic Context and then establish the 2027 vision, which includes outlining strategic objectives.

Of all the policies outlined within the Core Strategy, Policy EN 14 (Flood Risk) is most relevant to this FRA:

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.*

Another relevant policy to this scheme is Policy DM 1 (Development Management). In summary, this policy states that all development should have regard to issues, including flood risk and drainage, when submitting planning documentation. The site is also classified as the City Centre, so it is also subject to policies set out within the City Centre Development Strategy (Policies CC 1 to CC 10). It also falls within the 'regional centre' and therefore is also subject to Policy EC 3 (The Regional Centre). The City Centre Development Strategy has been summarised below, however, due to the proposed development use not all policies are applicable to this scheme and FRA:

City Centre Development Strategy

- *Policy CC1 – Primary Economic Development Focus: City Centre and Fringe – Proposals in this area will need to take flood issues into account in line with the Flood Risk policy.*
- *Policy CC2 – Retail*
- *Policy CC3 – Housing*
- *Policy CC4 – Visitors: Tourism, Culture and Leisure*
- *Policy CC5 – Transport*
- *Policy CC6 – City Centre High Density Development*
- *Policy CC7 – Mixed Use Development*
- *Policy CC8 – Change and Renewal*
- *Policy CC9 – Design and Heritage*
- *Policy CC10 – A Place for Everyone*

'Places for Everyone' is a long-term plan produced by the Greater Manchester Combined Authority (GMCA) on behalf of nine Greater Manchester districts, including Manchester. This plan sets out the framework for development across the city-region and has its own policy relating to flood risk:

Policy JP-S4: Flood Risk and the Water Environment

An integrated catchment-based approach will be taken to protect the quantity and quality of water bodies with reference to the North West River Basin Management Plan and managing flood risk, by:

1. *Returning rivers to a more natural state, where practicable;*
2. *Working with natural processes and adopting a natural flood management approach to slow the speed of water drainage and intercept water pollutants;*
3. *Locating and designing development so as to minimise the impacts of current and future flood risk, including retrofitting or relocating existing developments, infrastructure and places to increase resilience to flooding;*

4. *Expecting developments to manage surface water run-off through sustainable drainage systems and as close to source as possible. Development should achieve greenfield run-off rates unless it is demonstrated to be impracticable. District local plans should consider setting more detailed surface water drainage policies to reflect local circumstances, including alternative surface water discharge rates, such as in areas with critical drainage issues;*
5. *Ensuring that sustainable drainage systems:*
 - i. *Are designed to provide multifunctional benefits wherever possible, including for water quality, nature conservation and recreation;*
 - ii. *Avoid adverse impacts on water quality and any possibility of discharging hazardous substances to ground;*
 - iii. *Are delivered in a holistic and integrated manner, including on larger sites split into different phases; and*
 - iv. *Are managed and maintained appropriately to ensure their proper functioning over the lifetime of the development.*
6. *Securing the remediation of contaminated land and the careful design of developments to minimise the potential for urban diffuse pollution to affect the water environment; and*
7. *As a minimum, residential development should meet the mandatory water efficiency standard of 125 litres/person/day as set out in Building Regulations. District local plans may and should consider setting a tighter water efficiency standard of 110 litres/person/day where there is a clear local need with reference to national guidance on housing optional technical standards*

2.3.2 GMCA Level 1 Strategic Flood Risk Assessment

JBA Consulting produced a Level 1 Strategic Flood Risk Assessment (SFRA) on behalf of GMCA in March 2019. The aim of the Level 1 SFRA is to provide the initial basis for implementing the sequential risk-based approach to allocate land for development and to provide the evidence base for local plans. It assesses all sources of flood risk that could affect the Greater Manchester district. With respect to fluvial flooding, large areas of Manchester, Trafford, Wigan, Bolton and Rochdale have the most risk, where there are significant areas of Flood Zone 3. Fluvial flooding largely stems from the River Mersey and River Irwell.

There is extensive surface water flooding within Greater Manchester, particularly in urban areas where there are major factors contributing to this risk. These include urban watercourse connectivity, sewer capacity and the condition and location road gullies. The SFRA also highlights that the Manchester District has the most 'hotspots' (potential areas of significant surface water flood risk) across Greater Manchester, likely due the increased urbanisation. Detailed groundwater information is not available from the SFRA as it is considered localised and will differ considerably across the Greater Manchester.

2.3.3 GMCA Level 2 Strategic Flood Risk Assessment

JBA Consulting have also produced a Level 2 SFRA, in October 2020, which follows on from the Level 1 SFRA. The Level 2 SFRA assesses high risk sites identified in the Level 1 report. This includes 56 individual Level 2 site screening assessment reports, broad flood risk reviews of 14 strategic sites and identification of possible opportunities for flood management.

2.3.4 Manchester City Council Local Flood Risk Management Strategy 2014

In 2014, Manchester City Council (MCC) issued a Local Flood Risk Management Strategy (LFRMS) with the overall aim to '*ensure that local flood risk is properly managed by using the full range of options in a coordinated way*'. This is to be achieved by two overarching objectives: to reduce flooding likelihood, severity and consequences, and to seek opportunities to improve water quality and biodiversity. There are nine policies that provide the basis of all local flood risk management actions, these include maintaining and improving local flood risk management, reducing flood risk from ordinary watercourses, ground water and surface water runoff, monitoring and maintaining drainage infrastructure, and contributing to sustainable development.

2.3.5 Greater Manchester Surface Water Management Plan 2012

The Surface Water Management Plan (SWMP) was produced by JBA Consulting on the behalf of the Association of Greater Manchester Authorities (AGMA), which is now superseded by GMCA. The plan recognises the cause and effect of flood hazard between districts and communities in Greater Manchester. Its objective is to provide more understanding of flood risk at local hotspots and to provide an evidence base between all Greater Manchester Authorities and external partners. Within Manchester City Centre, the Oxford Road area is identified as hotspot area for surface water flood risk.

2.3.6 GMCA Integrated Water Management Plan 2023

GMCA produced an Integrated Water Management Plan (IWMP) in June 2023 to tackle a wide range of issues involving water for Greater Manchester. The plan sets out GMCA's ambition to transform how water is managed as a natural asset by 2050. Part of this is to ensure there is no net increase in homes or businesses at risk from flooding from any source when considering the effect of climate change. There is a strong theme throughout the plan of delivering local flood risk management and integrating this with other drivers, such as urban regeneration.

3 Existing Site Details

3.1 Site Location

The site is located within the existing Central Energy Services Complex at Manchester University Hospital in Manchester and has the postcode M13 9WL. The Local Authority for the area is Manchester City Council (MCC), who also act as the Lead Local Flood Authority (LLFA). The national grid reference for the Site is SJ 85313 95986 and the redline boundary area is 2046m² (approx. 0.205 hectares (ha)), which is shown indicatively in Figure 1 below.

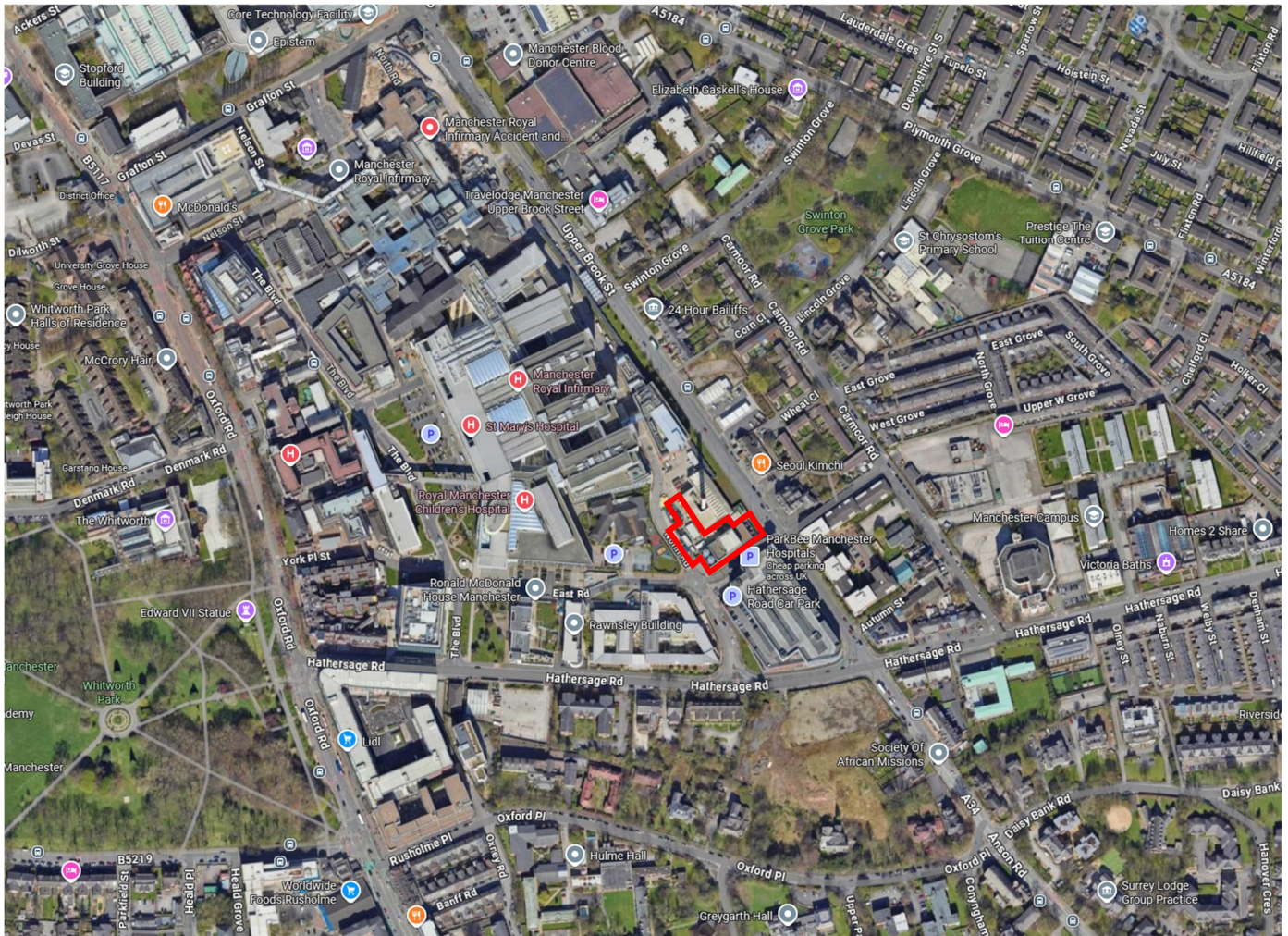


Figure 1 - Site Location Plan

The site is located approximately 2.7km to the south-east of Manchester City Centre and just over 500m to the south-east of the University of Manchester Campus. The site itself is bordered by Upper Brook Street (A34) to the north-east, Hathersage Road Car Park to the south-east and North Road to the south-west. The north of the site is located next to a Sodexo Estates building.

Refer to **Appendix A** for the Existing Site Plans.

3.2 Site Description

Currently, the site is the Central Energy Services Complex with an existing yard area that comprises of the following:

- a vehicle turning area
- waste yard incorporating waste compactor

- bin storage and cleaning area
- mess room and toilet facilities
- a medical gas cylinder compound
- space for skips

It is classified as building K10/02 in the wider hospital plan. Activities on the site have significantly increased since the Private Finance Initiative build in 2008, where increased deliveries and waste quantities directly impact the yard area. The yard area is restricted in space, and this is further constrained by the proposed works of installing crucial stand-by generators.

The primary access point is via the yard from gates along the north-west site boundary, however, there are several restricted access doors along the north-east and south-east facing walls of the existing building.

A topographical survey was produced for the site by Survey Solutions in February 2025. The survey indicates that the existing site levels are relatively flat, with no significant fall within the yard area where levels are mostly between 41.30m Above Ordnance Datum (AOD) and 41.60m AOD. There is a gradual fall from south-east to north-west along and adjacent to North Road. The survey also identifies several drainage channels within the yard area and one next to North Road, near the south-west site boundary. Levels indicate to fall towards these channels. The highest point within the site boundary is 41.64m AOD along the south-west wall of the existing Sodexo Estates building. The lowest point within the site boundary is 41.24m AOD at the north-west end of the drainage channel at the yard's entrance.

Refer to **Appendix B** for the full topographical survey.

3.3 Existing Site Drainage

3.3.1 Public Drainage

The statutory wastewater undertaker for the area is United Utilities.

Public sewer records have been requested but are yet to be received. However, it is unlikely there are any adopted sewers within the proposed site boundary.

3.3.2 Private Drainage

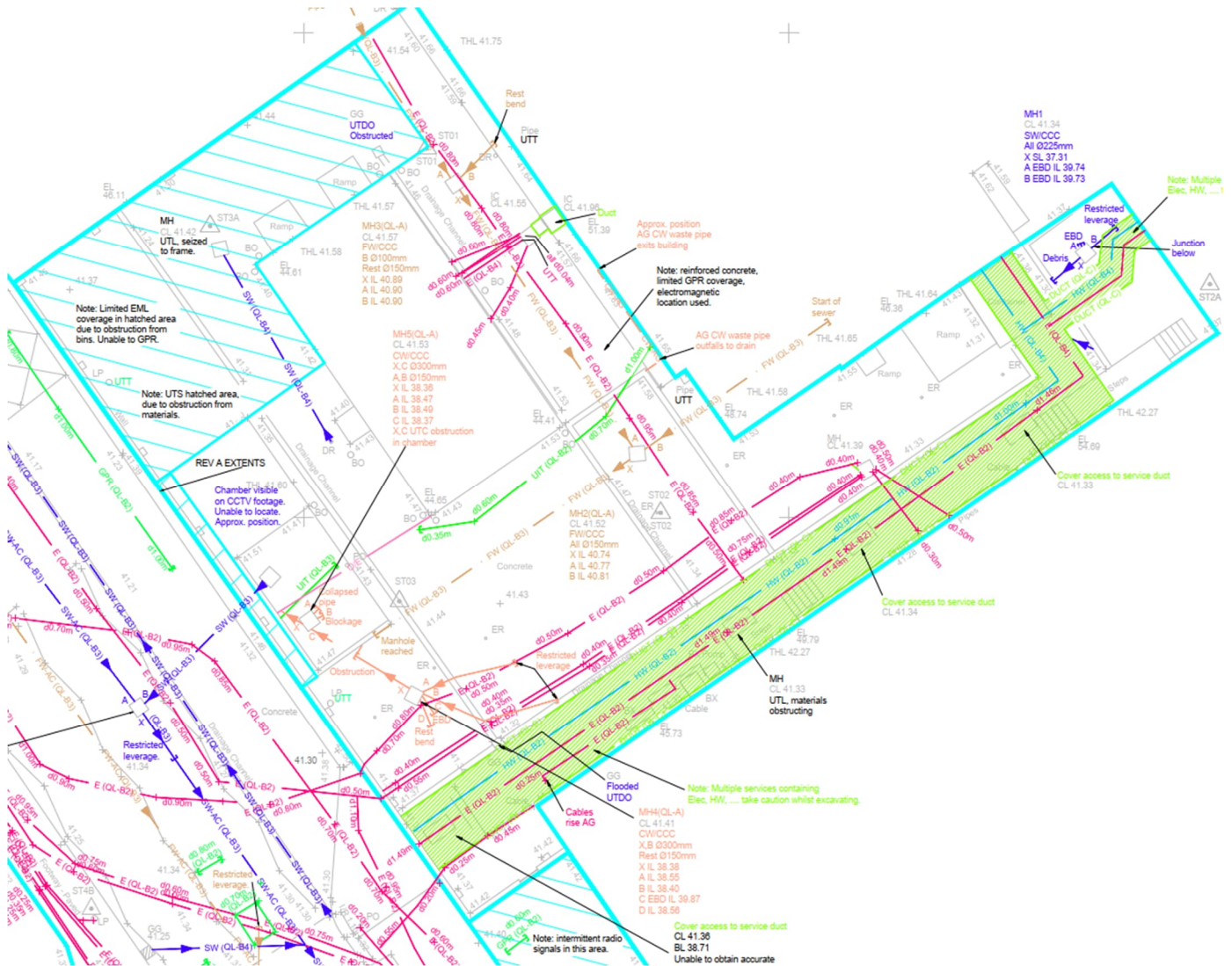
A GPR survey was produced for the site by Survey Solutions in February 2025. The survey identifies several drainage runs across the site for surface, foul and combined water.

Refer to **Appendix C** for the GPR Survey.

Surface Water

As previously mentioned, several drainage channels were identified in the topographical survey. In the eastern corner of the site, there is a surface water manhole directing flows to the south-west but due to the condition of the drainage, it is unclear where flows are discharged to. There is also a drain in the centre of the yard discharging into an unidentified manhole to the north-west. Another unidentified manhole is located along the south-west boundary where it connects into the main surface water run in North Road. This sewer flows from north-west to south-east, whereas the channel drain parallel to it flows in the opposite direction. This can be seen in Figure 2 below.

The survey does not confirm the location of the various outfalls of the drainage channels.



Foul Water

Combined Water

3.4 Existing Land Drainage

3.5 Existing Watercourse

The nearest watercourse is Gore Brook, which is situated 1.1km to the south-east. Gore Brook flows from Lower Gorton Reservoir to the west into Chorlton Brook.

The River Medlock, a tributary of the River Irwell, is located 1.6km north.

3.6 Site Geology

According to British Geological Survey (BGS) data, the site is underlain by two sedimentary bedrock formations. Most of the site is underlain by Collyhurst Sandstone Formation – Sandstone, however, part of the east is underlain by Manchester Marls Formation – Mudstone. This can be seen in Figure 3 below. However, the entire site has superficial deposits of Till, Devensian – Diamicton.

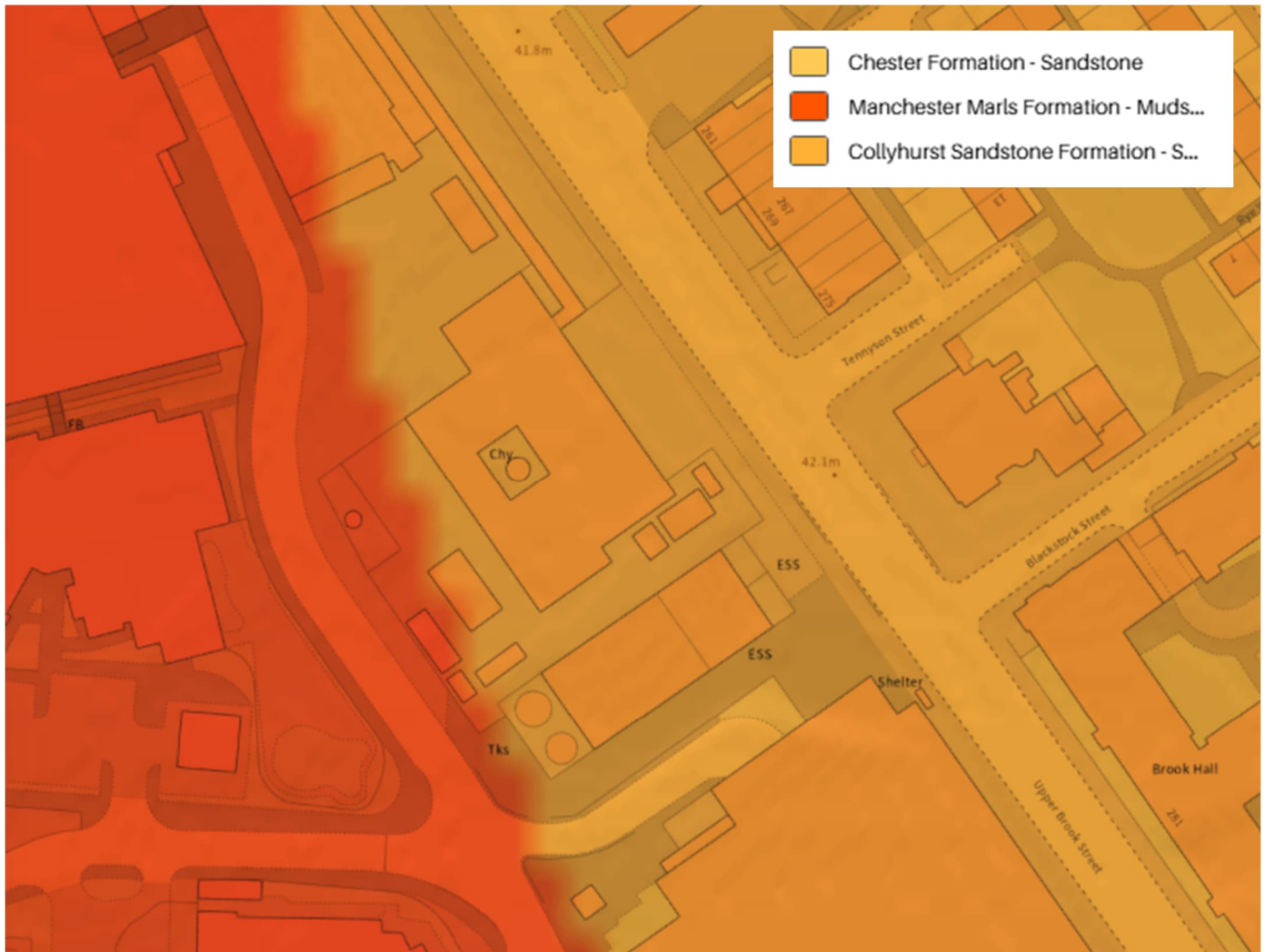


Figure 3 - Excerpt of BGS Bedrock Geology Mapping

A BGS borehole log was recorded within the site boundary, referenced as **SJ89NE460** ('Clinical Waste Incinerator'), however it is confidential and cannot be accessed. There are two borehole logs near to the site within the extents of the hospital site. The closest is **SJ89NE813**, located approximately 50m to the north of the site, and there were slight groundwater entries at 0.60m below ground level (bgl). However, no other water was encountered; the record has been summarised below:

- 0.0 m – 0.7 m bgl: Made Ground
 - o 0.0 m – 0.4 m bgl: Topsoil
 - o 0.4 m – 0.7 m bgl: Black ash & cinders
- 0.4 m – 2.3 m bgl: Clay
 - o 0.7 m – 1.4 m bgl: Soft brown/grey slightly sandy clay

- o 1.4 m – 2.3 m bgl: Soft grey clay
- 2.3 m – 8.0 m bgl: Boulder Clay
 - o 2.3 m – 3.0 m bgl: Stiff dark brown clay
 - o 3.0 m – 6.0 m bgl: Very stiff dark brown sandy clay
 - o 6.0 m – 8.0 m bgl: Stiff dark brown sandy clay

The other borehole, **SJ89NE730**, is located approximately 195m to the south-east. The record indicates a similar build-up where made ground is underlain by clay that contains sand and gravel. No groundwater was encountered in this borehole.

The full borehole logs are shown within **Appendix D**.

When considering the drainage capability of the site, a soils dataset ('Soilscapes') can be consulted. This has been developed from the National Soil Map. From this, it can be concluded that the ground conditions of the site impede drainage, which corresponds with the clay soils identified in the borehole records. Due to their structure, clay soils have low permeability.

4 Sources and Extents of Flooding

Numerous sources of flood risk need to be assessed to be in line with the requirements for planning under NPPF and EA regulations. This report takes into consideration fluvial flooding (rivers and streams), pluvial flood risk (surface water), tidal flooding (coastal or estuarine), reservoir flooding, canal flooding, groundwater flooding, infrastructure failure flooding and any historical flooding reports.

4.1 Natural Drainage

4.1.1 Fluvial Flooding

With reference to the EA's indicative flood maps, it can be seen in Figure 4 that the application site lies entirely within Flood Zone 1. There is a 'low' risk, which means there is between 0.1% and 1% chance each year of fluvial flooding. Land that falls within Flood Zone 1 has a low probability of flooding from rivers and the sea

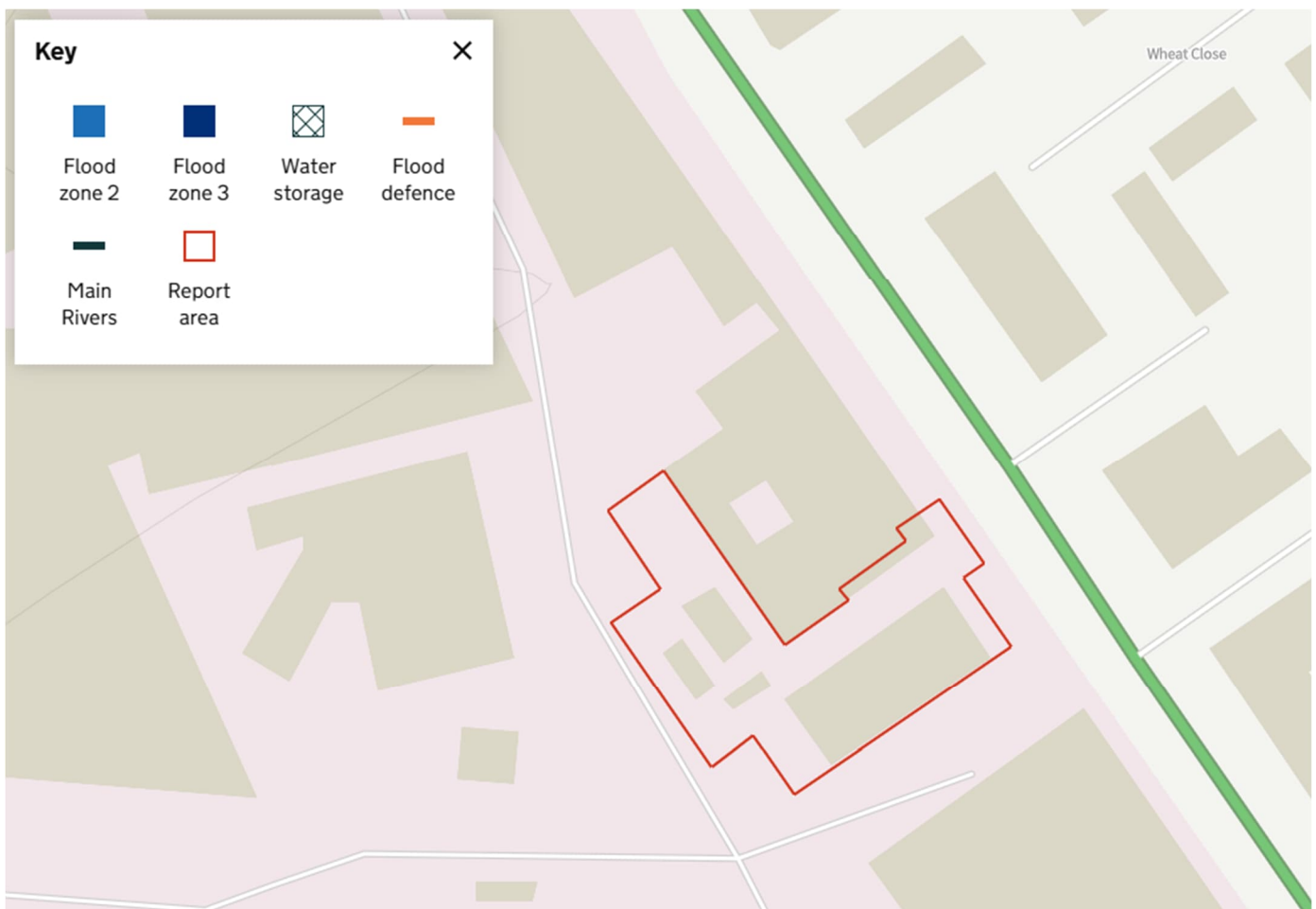


Figure 4 - EA Flood Map for Planning (Fluvial)

4.1.1.1 Long-Term Flood Risk

The EA also provide a long-term flood risk service, where the flood risk from rivers and sea can be assessed for both the extent of the risk and the depth of flooding between 2036 and 2069, which considers the impact of climate change. As seen in Figure 5 below, even in this long-term scenario, the site is not at risk of fluvial flooding.

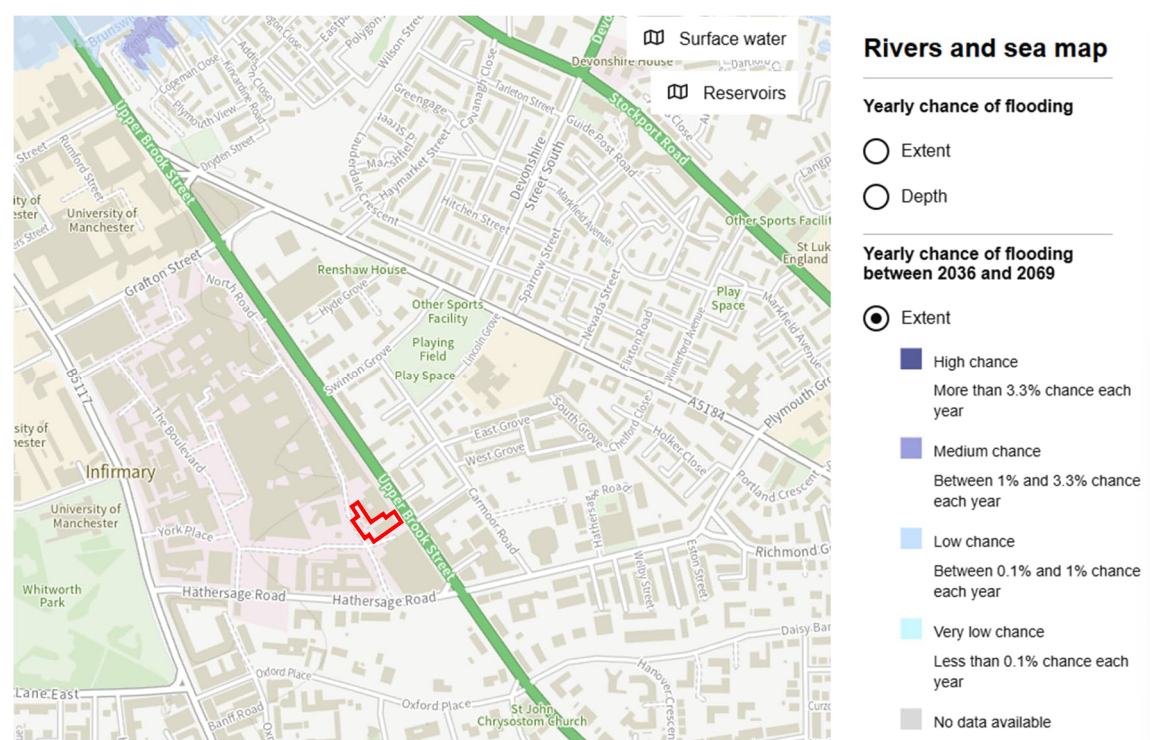


Figure 5 - Long Term Flood Risk Map (Fluvial)

4.1.2 Pluvial Flooding and Overland Flow

With reference to the EA's online mapping, data related to the risk of potential surface water inundation or flooding is also provided. The mapping shows that the site is located in an area which predominantly has areas of low (a chance of flooding between 0.1% and 1%) and very low (a chance of flooding of 0.1% or less) risks of flooding each year, as seen in Figure 6, Figure 7 and Figure 8.

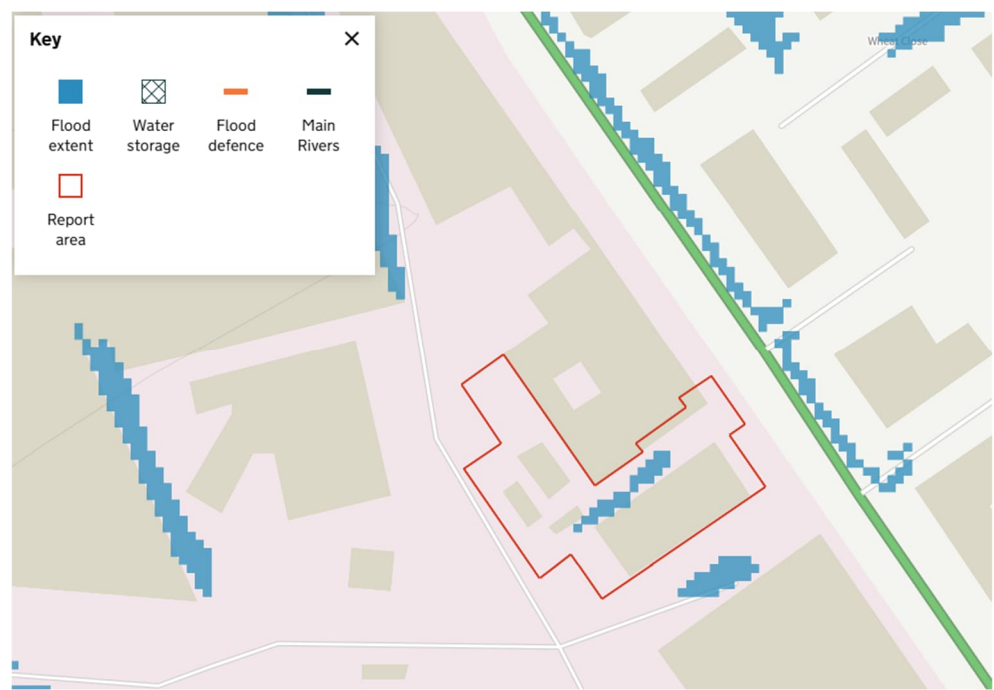


Figure 6 - EA Flood Map for Planning (Pluvial - 1 in 30)

Figure 6, above, shows that there is a small section of the site at a high risk of surface water flooding. This means there is a 3.3% chance or more each year of surface water flooding. This area is situated within one of the site's topographical low points, where channel drains are sited. Therefore, as site levels direct surface runoff towards these drains, they lie lower than the rest of the site. This allows surface water to pool and become stagnant if there is not enough capacity in the drains, as it cannot flow elsewhere.

However, it should be noted that there are limitations with the EA data. The risk of surface water flooding data is based on topographical, rainfall and historical data. Urban areas are modelled as 100% impervious with an allowance for subsurface drainage systems. This means that it is likely the flood map only considers the channel drains as depressions within the ground, rather than drainage features. Therefore, the flood map cannot be considered fully accurate. However, if the existing channel drains are blocked then this may be the resulting flood event.



Figure 7 - EA Flood Map for Planning (Pluvial - 1 in 100)



Figure 8 - EA Flood Map for Planning (Pluvial - 1 in 1000)

Figure 7 and Figure 8 display the medium (between 1% and 3.3% flooding each year) and low risks of surface water flooding. The flood extents only marginally increase for the 1 in 100 year event (medium risk) from the 1 in 30 year event. However, for the 1 in 1000 year event (low risk), the extents of flooding increase due to the increase in storm intensity and site levels.

4.1.2.1 Long-Term Flood Risk

The EA long-term flood risk service also shows where the flood risk from surface water can be assessed for both the extent of the risk and the depth of flooding in the current scenario and between 2040 and 2060, which considers the impact of climate change.

As seen in Figure 9 below, the area classified as high-risk is actually very shallow and the depth of the flood water does not exceed 20cm. The chance of flood water reaching up to 20cm is between 0.1% and 1% each year, so it is a low risk.

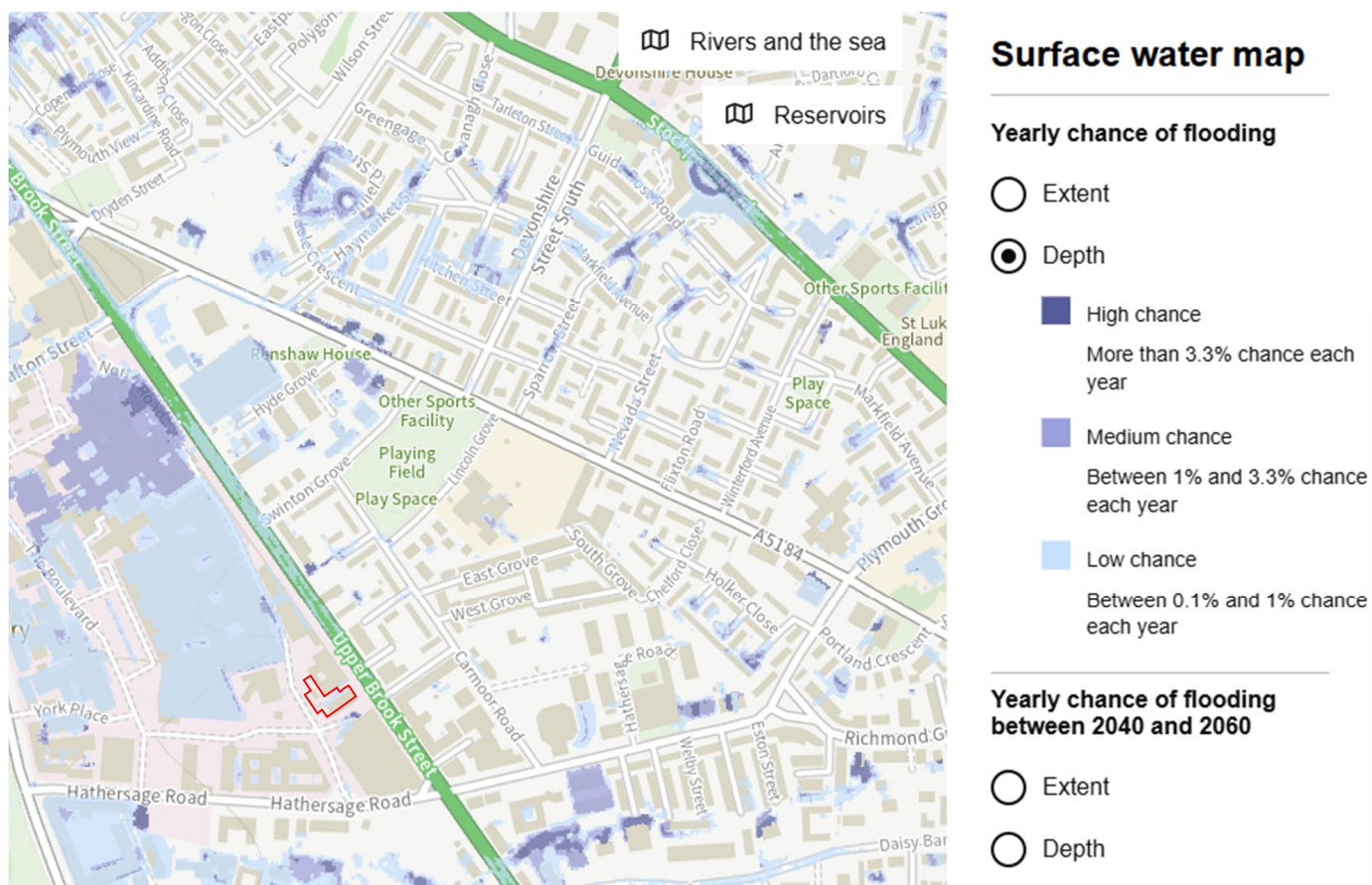


Figure 9 - Long Term Flood Risk Map (Pluvial - Depth)

When assessing the climate change scenario, the extents of surface water flooding marginally increase. The main change is that small areas of low risk are now predicted to be medium, with minor areas of medium risk now being classified as high risk. This is due to the increase in surface runoff generated by the predicted increase in intensity of storm events. The flood map can be seen in Figure 10 below.

As an increased storm intensity has been modelled for the climate change scenario, the estimated flood depths have increased to 30cm for small area, however, this still remains a low risk (between 0.1% and 1% chance). The area at risk of reaching water depths up to 20cm has increased from the present-day scenario. These maps can be seen in detail within **Appendix E**.

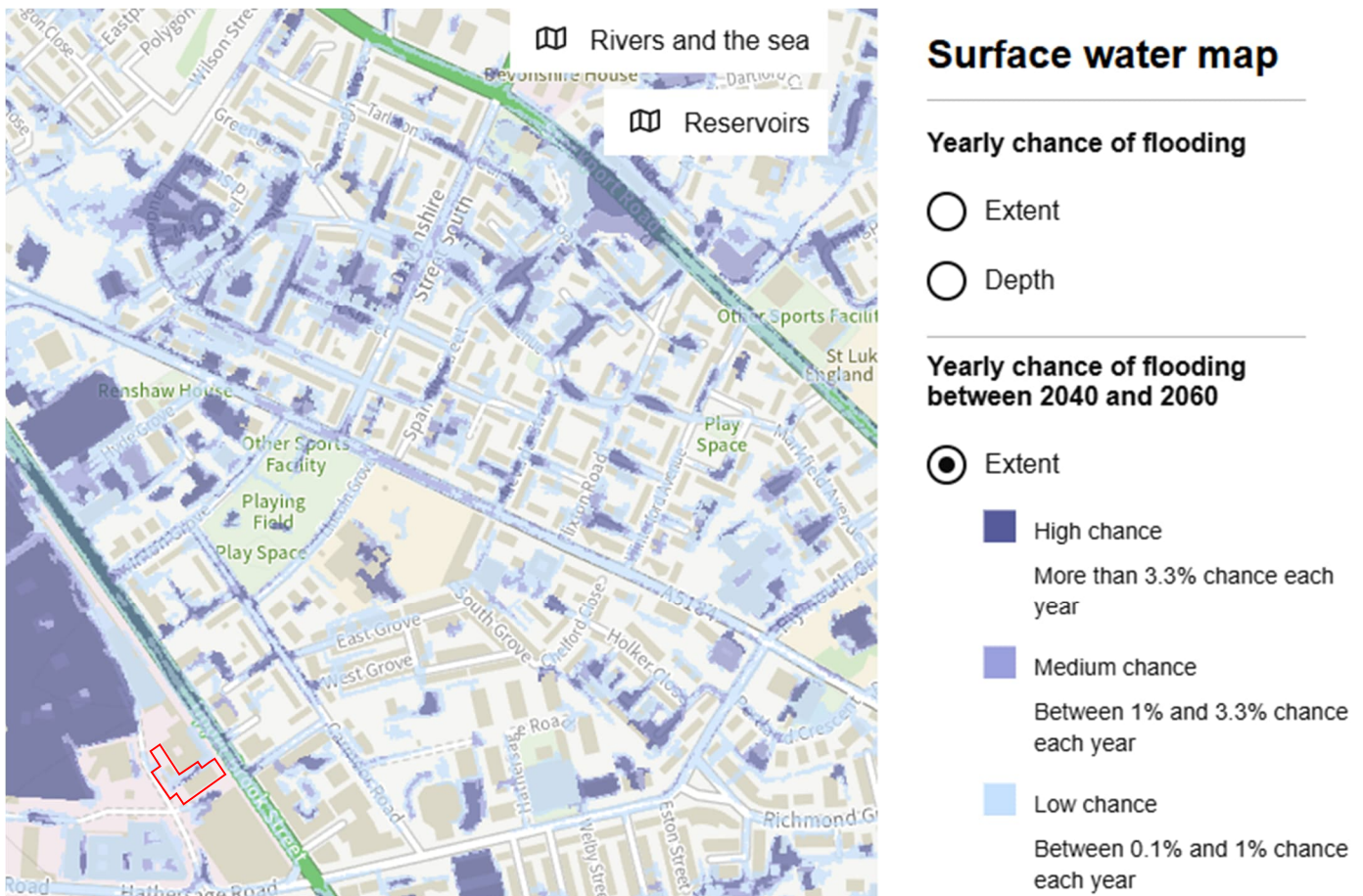


Figure 10 - Long Term Flood Risk Map (Pluvial - 2040 to 2060)

4.1.2.2 Critical Drainage Area

Within the Level 1 SFRA produced for GMCA, it is identified that the site is situated within a Critical Drainage Area (CDA). This means it is considered an area where surface water flood risk is significant and have records of historical flooding. A map produced for the SFRA shows records of historic flooding across Manchester and shows the site within a surface water hotspot.

The map from the SFRA map can be seen within **Appendix F**.

As the site is located within a CDA, Manchester City Council has its own CDA policy for new development. This includes runoff volumes for brownfield sites to be 50% less than pre-development, no flooding in the 1 in 30 year event and no property flooding for the 1 in 100 year plus climate change event.

4.1.3 Ground Water Flooding

Groundwater flooding is caused by the water emergence from beneath the ground. It is usually localised and can be considered to not pose significant risk to life because of the slow rate at which the water rises. Groundwater flooding has not been assessed as part of the Level 1 SFRA due to its localised nature and the study area for the SFRA is very broad.

A previous SFRA from 2011 for Manchester, Salford and Trafford produced a groundwater flooding map which indicates the site is not risk of groundwater rebound, shallow groundwater or groundwater flooding. This map can be found in **Appendix G**.

Furthermore, the long-term flood risk check service provided by the EA also indicates the risk of groundwater flooding is unlikely in the area.

When considering the geology of the site, this would coincide with its soil drainage capability which has been classified as 'impedes drainage'. Borehole logs indicate the presence of clay, which has low permeability, and no groundwater was encountered.

Therefore, it can be considered the risk of groundwater flooding is low.

4.1.4 Climate Change

The Environment Agency requires, in accordance with the Government's PPG-TG document, that there should be no increase in the rate of surface water emanating from a newly developed site above that of any previous development. Furthermore, it is the joint aim of the Environment Agency and Local Planning Authorities, to actively encourage a reduction in the discharge of storm water as a condition of Approval for new developments. In addition, all surface water drainage systems should be sized to accommodate the runoff arising from a 1 in 100-year rainfall event and should include a further allowance to account for the further effects of climate change.

Table 2 and Table 3, below show the climate change allowances for peak river flow and peak rainfall respectively for the site. The site falls within the Irwell Management Catchment peak river flow and peak rainfall allowances. The data presented in these tables is from the climate change allowances maps provided by the EA. The data presented in these tables is from the climate change allowances maps provided by the EA

Table 2: Climate Change Summary (Irwell Management Catchment) - Peak River Flows

Type	Applies across all of England	2020s	2050s	2080s
River	Upper End	24%	43%	75%
	Higher	15%	26%	46%
	Central	12%	19%	35%

Source: <https://environment.data.gov.uk/hydrology/climate-change-allowances/river-flow?mgmtcatid=3049>

Table 3: Climate Change Summary (London Management Catchment) - Peak Rainfall Allowances

Type	Exceedance Rainfall Event	Allowance	2050s	2070s
Rainfall	3.3%	Central	25%	35%
		Upper End	35%	40%
	1%	Central	25%	30%
		Upper End	40%	45%

Source: <https://environment.data.gov.uk/hydrology/climate-change-allowances/rainfall?mgmtcatid=3042>

The permanent development (the stand-by generators) has a longer design life than the temporary portacabins, so climate change allowances should only be considered for the generators.

4.2 Artificial Drainage

4.2.1 Below Ground Drainage

The existing site drainage is all believed to be private and the responsibility of the current site occupier.

A GPR survey was produced for the site by Survey Solutions in February 2025. The survey identifies several drainage runs across the site for surface, foul and combined water.

The GPR survey highlights there are several issues with the condition of the existing private drainage system. This includes collapsed pipes within the foul and combined drainage, and debris within the surface water drainage. A gully located within the channel drains was identified to be flooded, with no outfall determined.

This indicates the existing drainage is in poor condition and is not operating as it was designed to, meaning there is an increased risk of the system flooding or failing. If the system fails, then all flows would be directed by site levels, meaning they would be directed towards the channel drains. Given the collapsed pipes within the foul and combined networks, if they were to fail then there is a risk of contaminated flows entering the surface water network.

The condition of the channel drains is unknown, so there is a chance they could be filled with debris or silt. This means the drains have the potential to not drain the site properly, so there is an increased risk of surface water flooding. This would result in the same effects of pluvial flooding as discussed previously within this chapter of the report.

Refer to **Appendix C** for the GPR Survey.

4.2.2 Reservoir Flooding

With reference to the EA's online mapping, data related to the risk of potential reservoir flooding is also provided. As seen in Figure 11, the extents of flooding from reservoirs does not affect the site even in both dry-day (normal river levels) and wet-day (also flooding from rivers) scenarios. This means that the site lies within an area of very low risk of flooding in the event of a breach from reservoirs, which is a highly unlikely scenario.

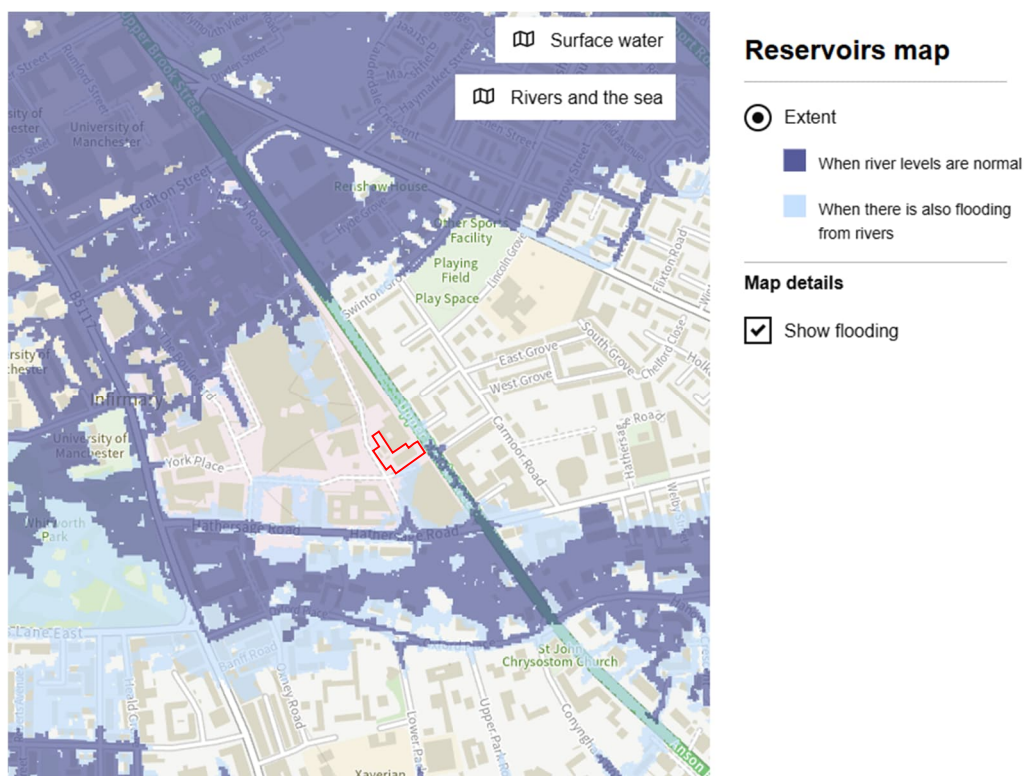


Figure 11 - Long Term Flood Risk Map (Reservoir)

5 Flood Risk Mitigation

This section responds to the major risks outlined to the undeveloped site in Section 4 and offers mitigating measures that will aim to reduce the risk of flooding to the site, as well as sites both up and down stream.

5.1 Existing Flood Risk Summary

5.1.1 Fluvial Flooding

With reference to the EA's published flood maps (see Figure 4 in Section 4.1.1) the site can be shown to lie entirely within Flood Zone 1. This means the site has a low risk, between 0.1% and 1% chance each year, of flooding from rivers and the sea.

The site can therefore be classified as within the Flood Zone 1 and does not require any further mitigation measures.

5.1.2 Pluvial Flooding and Overland Flow

With reference to the EA's published flood maps (see Figure 6, Figure 7 and Figure 8 in Section 4.1.2), the site can be shown to be located in an area which has predominantly low and very low risks of flooding each year. However, there are areas of medium and high risk where the channel drains are situated, as this where site levels are lowest.

The estimated flood water depths are shallow, with the deepest at 20cm in the present-day scenario and a very small area reaching 30cm in the future scenario. The site is also located within a CDA and a surface water flooding hotspot, as identified from the Level 1 SFRA.

As the site has areas of medium and high risk of pluvial flooding, further mitigation measures are required, particularly as it is located within a CDA and surface water hotspot.

5.1.3 Groundwater Flooding

As discussed in Section 4.1.3, the site can be considered to not be at risk of groundwater flooding based on SFRA information and its geology.

It is recommended that groundwater is measured and monitored as part of any future intrusive ground investigation to confirm site groundwater levels, however, it can be concluded that no further mitigation measures are required.

5.1.4 Private Drainage

As discussed in Section 4.2.1, the GPR survey identifies several drainage runs across the site for surface, foul and combined water. The survey highlights there are several issues with the condition of the existing private drainage system, which indicates the existing drainage is in poor condition and is not operating as it was designed to. This means there is an increased risk of the system flooding or failing. If the system fails, then all flows would be directed by site levels, meaning they would be directed towards the channel drains.

Further mitigation measures may be required for the existing drainage system if it is to remain as part of the proposed drainage strategy.

5.1.5 Reservoir Flooding

With reference to the EA's published flood maps (see Figure 11 in Section 4.2.2) the site can be shown to lie entirely outside of the extents of reservoir flooding, for both dry-day and wet-day scenarios.

This means the site has a low risk of flooding from reservoirs and does not require any further mitigation measures.

5.2 Mitigation Measures

5.2.1 Development Drainage

It will be necessary to provide a suitably designed storm water drainage system to collect, convey and attenuate the additional runoff generated by the development of this site for a design event, which is typically the 1 in 100 year event. However, it is reasonably impracticable to mitigate against extreme flood events (i.e. those greater than the design event) so proposed measures should be adequate whilst also be proportional to the site space and its proposed use.

Based on the development proposals, which are to install two stand-by generators and two temporary portacabins, the proposed mitigation measures should be suitable for their use. It has been established there is a risk of surface water flooding, originating from where the channel drains are situated, and the existing drainage appears to be in a sub-standard condition.

To prevent any flooding from sewer failure or surcharge, the existing drainage should be subject to further investigation such as CCTV and manhole surveys to determine the condition of all drainage located on site. This should confirm which parts of the existing foul, combined and surface networks are in poor condition and require improvements. The GPR survey has already identified collapsed pipes; these pipes will require remediation works so they can allow for the network to operate as intended to. Debris should be removed from pipes by jetting to ensure there are no obstructions to flows. For channel drains, if it is identified that debris or silt are present, then they should also be jetted to ensure they have the maximum capacity available to drain all surface water runoff from the site.

Furthermore, a rigorous and regular maintenance strategy should be implemented during operation. This means all of the site drainage will be properly looked after, to allow for the networks to operate as efficiently as they can.

As the surface water drainage on site largely consists of channels drains, it is critical that the proposed drainage keeps the surface separate from the foul and combined networks. Maintenance of the networks is key in ensuring the risk of failure or surcharging of the drainage is minimal, so there is no chance of contaminated water entering the surface network.

To minimise the risk of surface water flooding to the proposed development, particularly in the event the channel drains are either blocked or at capacity, there are several mitigation measures that are recommended for the site. Under the Local Plan Policy for Flood Risk, it is recommended that SuDS should be utilised to manage surface runoff, however, SuDS are not suitable for the site. Based on the site's geology, where clay is present (low permeability) and has poor drainage properties, infiltration can be concluded to be unfeasible. The only potential location for green or blue roofs would be the portacabins, however, these are temporary and would unlikely be able to structurally support a significant storage volume. Furthermore, the restricted site space means ponds, swales, tanks and open water features are not possible, especially due to the extensive existing drainage networks and below ground services present.

It is important to note that the proposed development is situated on a site which is currently an entirely impermeable area. Therefore, the same volume of surface water runoff is being generated and the existing flood risk will not be made worse by the proposed works. This means the proposed development could be managed effectively by the current drainage strategy, if the measures to improve the condition of the existing networks are implemented. Additionally, the use of the existing drainage ensures there is no change to the flood risk upstream and downstream of the site.

Given the existing site topography is relatively flat, proposed site levels should not be altered in such a way that benefits the site but increases the surface water flood risk to other hospital land off site or third-party land along the A34. Therefore, the recommended solution is to raise the Finished Floor Levels (FFLs).

For the two stand-by generators, they are proposed to be located within the yard area between the south-western boundary and existing Energy Services Building. The depths of the estimated surface water flooding this location is up to 20cm for both present-day and future scenarios, with the 30cm depth flooding to the north-east, between the two buildings. It appears the generators lie outside the extents of the 30cm depth flooding, within the climate change scenario. Therefore, in line with Environment Agency guidance, it is recommended that FFLs are set to 600mm above the estimated flood level. The estimate flood level can be considered to be 20cm above ground level, so FFLs

should be set to 800mm above ground level. This means the generators will require plinths to achieve the raised FFL.

For the portacabins, as they are to be located within the yard area they will be situated within the extents of the 1 in 1000 year rainfall event (i.e. the low risk), but not the 1 in 100 or 1 in 30. The estimated flood level here is also very shallow, with only some of the yard area reaching up to the 20cm flood depth. The flooding can be considered to be a lower risk where the portacabins are and likely to be shallower than where the generators are to be situated. Additionally, the portacabins are a temporary development which are only proposed for a two year timeframe. This means the proposed FFL for the portacabins can be reduced from 600mm to 300mm above the estimated flood level. Therefore, the FFL for the portacabins is to be set to 500mm above ground level.

To provide additional flood resistance measures, where possible, materials within 600mm of the estimated flood level should be flood resistant with a low permeability.

5.3 Summary

From the above, it can be seen that there is an existing flood risk to the site from surface water flooding. However, the proposed development does not increase the existing flood risk, the proposed development actually may provide an opportunity to improve the current drainage strategy. The retention of the existing drainage strategy ensures the surface water flood risk will not worsen and prevents the increase in flood risk to nearby land off-site, as well as upstream and downstream.

By proposing mitigation measures such as remediation works to the existing networks and raising FFLs, these will improve the current circumstances and protect the new development which is crucial infrastructure.

Table 4 below summarises the flood risk to the proposed development.

Table 4: Flood Risk Summary

Potential Source of Flooding	Is there a flood risk to the development?	Does the proposed development increase the flood risk upstream?	Does the proposed development increase the flood risk downstream?
Fluvial Flooding	No	No	No
Pluvial Flooding	Yes	No	No
Ground Water Flooding	No	No	No
Adopted Drainage	No	No	No
Private Drainage	No	No	No
Reservoir Flooding	No	No	No
Development Drainage	No	No	No

6 Sequential Test

The site is currently classed as being in Flood Zone 1, meaning it has less than 0.1% chance of flooding from rivers or the sea.

This places the site in the lowest flood classification. However, in accordance with Paragraph 024 of the PPG for Flood Risk and Coastal Change, the site would require a Sequential Test. This is because development should be located within low-risk areas from *all* sources of flooding and this site has some areas of medium and high surface water flood risk.

As seen within Figure 6 and Figure 7 in Section 4.1.2, these maps show the high and medium flood risk, respectively. The areas of risk are limited to the topographical low spots where the channel drains are situated. These areas also would only impact the stand-by generators, which are proposed to have raised FFLs of 600mm above the estimated flood level. The portacabins are located outside of the areas and are at a low-risk, but are also proposed to have raised FFLs of 300mm above the estimated flood level. The portacabins are also temporary and are not affected by climate change as they have a two year timeframe.

The site's surface water flood risk has been mitigated effectively and proportionally to the proposed scheme. Furthermore, the stand-by generators are crucial to the hospital as they provide emergency back-up for critical operations in the hospital. Under Annex 3: Flood Risk Vulnerability Classification of the NPPF, the generators can be classified as 'Essential Infrastructure' because it is essential utility infrastructure which has to be located within a flood risk area for operational reasons. There is nowhere else suitable within the hospital site for the generators and measures set out in this FRA are able to effectively mitigate the surface water flood risk.

Therefore, a proportionate approach has been applied to ensure that users of the development remain safe from the current and future surface water flood risk for the lifetime of the development, whilst not increasing flood risk elsewhere. Under Paragraph 027 of the PPG (Flood Risk), the Sequential Test need not be applied.

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

Key:

✓ Exception test is not required

X Development should not be permitted

Figure 12 - Table 2 (PPG: Flood Risk & Coastal Change)

As previously stated, under Annex 3 of the NPPF, the generators are classified as 'Essential Infrastructure' and the temporary portacabin offices can be classified as 'Less Vulnerable'. In accordance with Table 2 of the Flood Risk PPG (see Figure 12), the Exception Test would not be required if the Sequential Test were applicable to the development.

7 Conclusions and Recommendations

7.1 Overview

Curtins have been appointed by Currie & Brown to prepare a Flood Risk Assessment to assess the flooding risk for the development located within the Energy Services Complex at Manchester University Hospital and to act as additional support of the planning application. The FRA provides information on the nature of flood risk at the site and follows Government guidance with regards to development and flood risk. The report is based on currently available information.

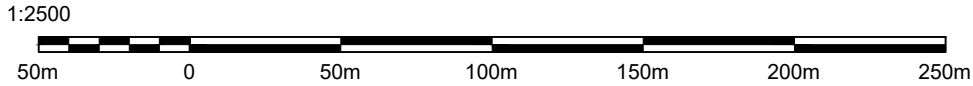
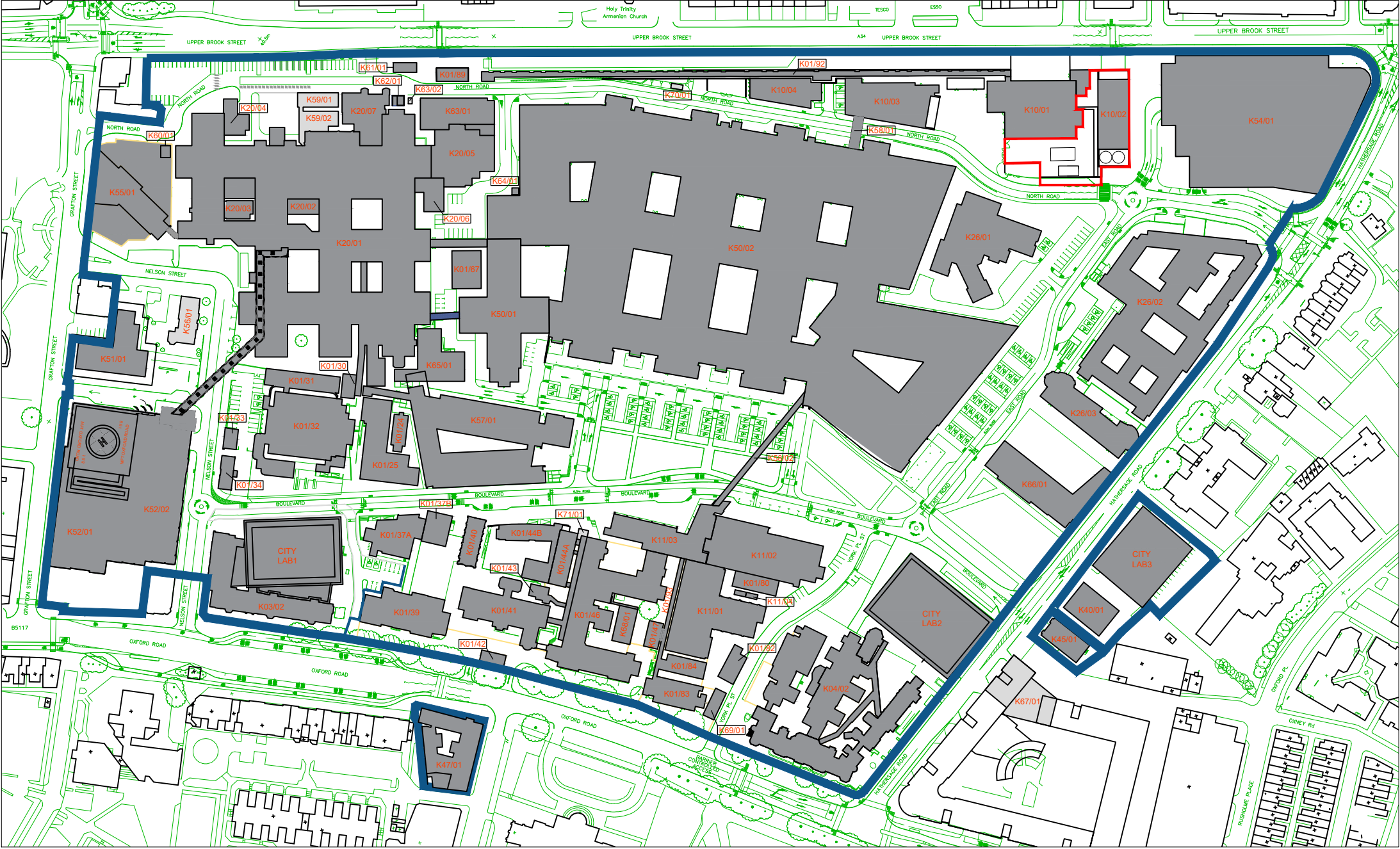
The assessment has been undertaken in accordance with the standing advice and requirements of the EA as outlined in the Government's NPPF and accompanying PPG.

The conclusions to be drawn from this report are as follows:

- The site is located entirely within Flood Zone 1, defined as having a 'Low' probability with less than a 1 in 1000 (0.1%) Annual Probability of flooding from rivers and the sea.
- The site is at a low risk of flooding from all sources, except for surface water flooding. The site can be shown to be located in an area which has predominantly low and very low risks of flooding each year. However, there are areas of medium and high risk where existing channel drains are situated, as this where site levels are lowest. The site is also located within a CDA and a surface water flooding hotspot, as identified from the Level 1 SFRA. Due to this, further mitigation measures have been proposed.
- The existing drainage networks are to be investigated further to fully identify the conditions of the drainage and to determine what remediation works are required. All debris and silt should be removed so full network capacity can be achieved and there are no obstructions to flows.
- FFLs of the generators should be raised to 600mm above the estimated flood level, meaning they will require plinths. FFLs of the temporary portacabins are to be raised to 300mm above the estimated flood level. Low permeability flood-resistance materials should be used where possible within 600mm of the estimated flood level.
- The Sequential Test is not applicable to the site as proportional approach has been undertaken to suitably mitigate surface water flood risk so users of the development are kept safe and flood risk is not increased off-site.

8 Appendices

Appendix A – Existing Site Plans



-  Manchester University Hospital - Site Boundary
-  Generator Application - Site Area 2046sqm / 0.5 Acres / 0.2 Hectares

A	Issued for Planning Submission	30.05.25	CR	EH
--	Issued for Comment	25.03.25	CR	xx
rev.	description	date	by	ckd

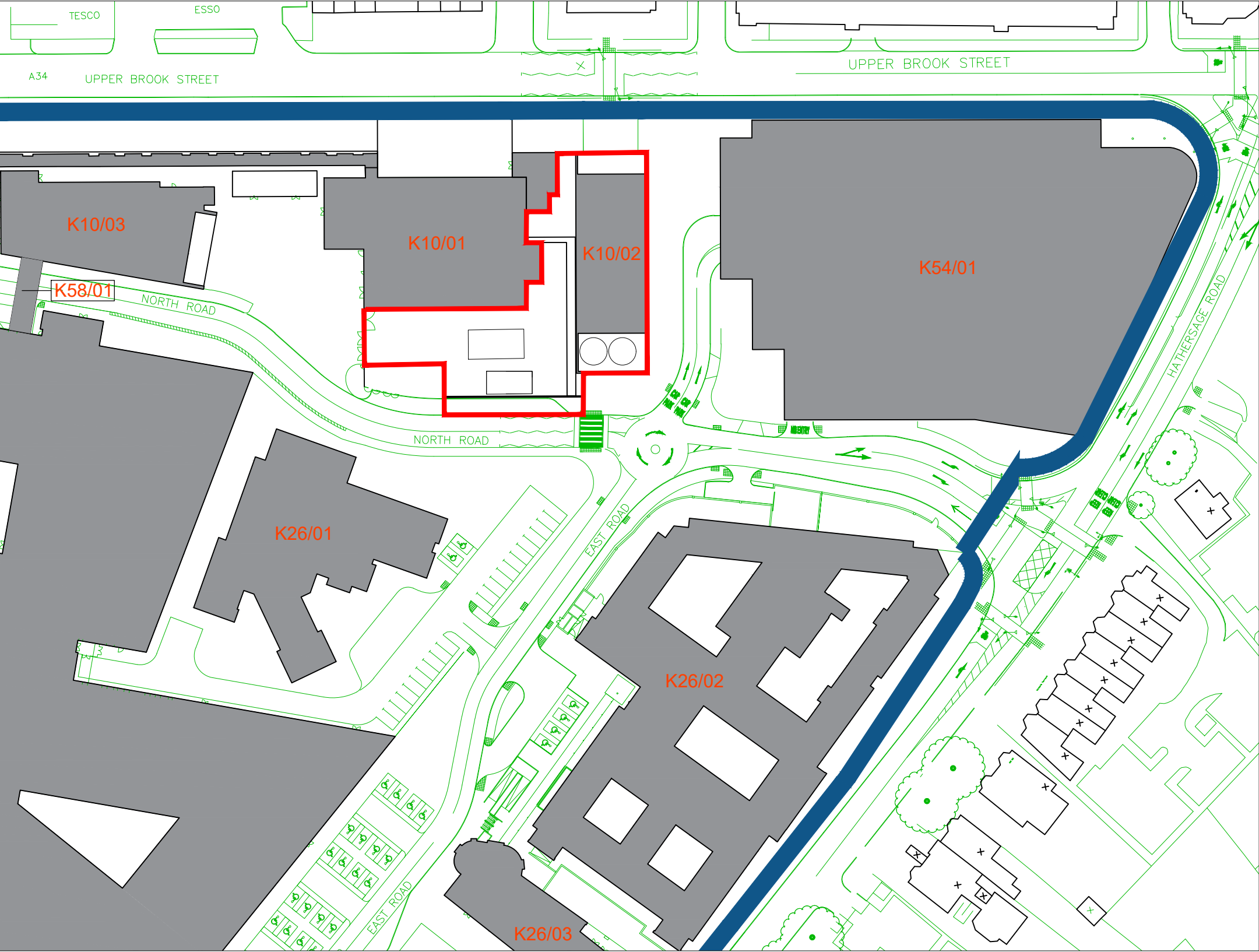
DO NOT SCALE. Use annotated dimensions only. Any discrepancies to be reported to Sodexo. All dimensions to be checked on site by Contractor prior to construction. Any queries relating to drawings should be discussed with Sodexo drawing office prior to work commencing.

CONTACT: ArchitecturalTeam.SO.UK@sodexo.com



FOR APPROVAL

client	date
NHS Trust - Manchester Uni	20.02.2025
address	drawn by
Manchester University Hospital Oxford Road Campus M13 9WL	C Ritchie
title	scale
Site Location Plan DSS310 Generator Project	1:2500@ A3
dwg. no.	job no.
00-DR-A-00-001-A	TSP25-002



- Manchester University Hospital - Site Boundary
- Generator Application - Site Area 2046sqm / 0.5 Acres / 0.2 Hectares

A	Issued for Planning Submission	30.05.25	CR	EH
--	Issued for Comment	25.03.25	CR	xx
rev.	description	date	by	ckd

DO NOT SCALE. Use annotated dimensions only. Any discrepancies to be reported to Sodexo. All dimensions to be checked on site by Contractor prior to construction. Any queries relating to drawings should be discussed with Sodexo drawing office prior to work commencing.

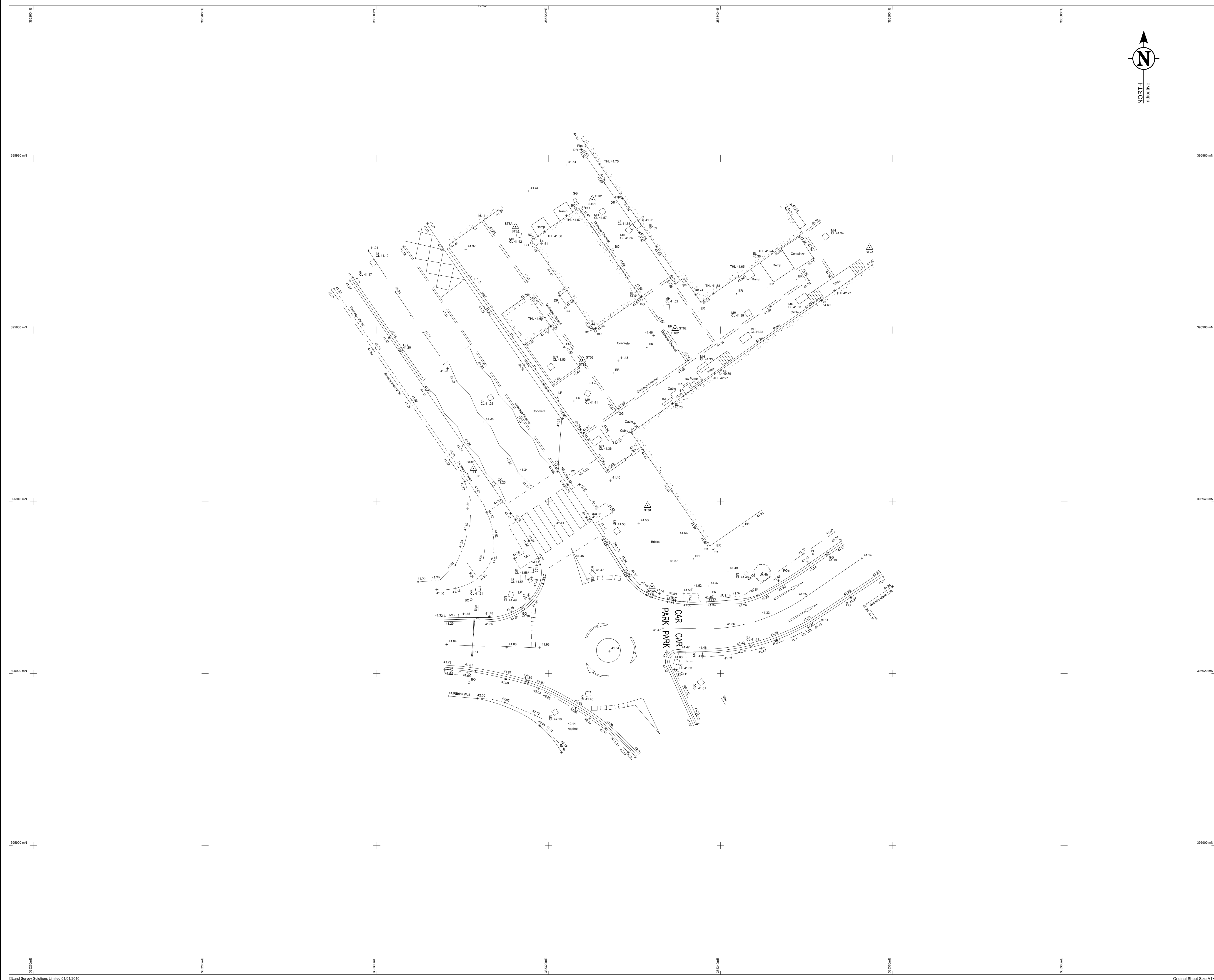
CONTACT: ArchitecturalTeam.SO.UK@sodexo.com



FOR APPROVAL

client	date
NHS Trust - Manchester Uni	20.02.2025
address	drawn by
Manchester University Hospital Oxford Road Campus M13 9WL	C Ritchie
title	scale
Existing Block Plan DSS310 Generator Project	1:1000@ A3
dwg. no.	job no.
00-DR-A-00-002-A	TSP25-002

Appendix B – Topographical Survey



TOPOGRAPHICAL & MEASURED BUILDING SURVEYS

ABBREVIATIONS & SYMBOLS			
AH	Arch Head Level	ET	EP+Transformer
AB	Air Brick	FB	Flower Bed
AR	Assumed Route	FC	Floor Board Direction
AV	Air Valve	FBD	Floor Board Direction
BB	Bellshoe Beacon	FI	Fire Hydrant
BH	Bore Hole	FL	Floor Level
BL	Bed Level	FP	Flag Pole
BO	Bollard	FW	Foul Water
BS	Bus Stop	GG	Gully Grate
BU	Butt	GV	Gas Valve
BW	Barbed Wire Fence	HL	Window Head Level
BX	Box (Utilities)	IC	Inspection Cover
C/B	Close Board Fence	IL	Inset Light
CL	Cover Level	IR	Iron Railings
CL	Chain Link Fence	KO	Kerb Outlet
C-Lv	Ceiling Level	LP	Lamp Post
Col.	Column	MH	Manhole
C/P	Chestnut Paling Fence	MP	Marker Post
CR	Cable River	NB	Name Board
CW	Chicken Wire	OHL	Overhead Line (approx)
DC	Drainage Channel	Pan	Panel Fence
DL	Disaligned	PB	Post Box
DL	Door Level	PM	Parking Meter
DP	Down Pipe	PO	Post
DR	Drain	PR	Post & Rail Fence
EB	Electric Box	PW	Post & Wire Fence
EC	Electric Supply Cover	RE	Rodding Eye
EL	Eaves Level	RL	Ridge Level
EP	Electric Pole	RP	Reflector Post
ER	Earth Road	RS	Road Sign
		RSD	Roller Shutter Door
		RSJ	Roller Steel Joist
		SL	Window Sill Level
		SP	Arch Spring Point Level
		SV	Stop Valve
		SW	Surface Water
		SY	Cable Stay
		Tac	Tactile Paving
		TC	Telecom Cover
		TH	Thresh
		TL	Threshold Level
		TL	Traffic Light
		Tof	Top of Fence
		ToW	Top of Wall
		TP	Telegraph Pole
		TS	Traffic Signal Cover
		TV	Cable TV Cover
		UC	Unknown Cover
		UK	Unknown Tree
		UMG	Unmade Ground
		USB	Under Side Beam
		UTL	Unable To Lift
		UTS	Unable To Survey
		VP	Vent Pipe
		WB	Waste Bin
		WH	Weep Hole
		WL	Water Level
		WM	Water Meter
		WO	Wash Out
			Survey Control Station

DRAWING NOTES

Topographical Surveys
Trees are drawn to scale showing the average canopy spread. Descriptions and heights should be used as a guide only.

All building names, descriptions, number of storeys, construction type including roof line details are indicative only and taken externally from ground level.

All below ground details including drainage, voids and services have been identified from above ground and therefore all details relating to these features including: sizes, depth, description etc will be approximate only. All critical dimensions and connections should be checked and verified prior to starting work.

Detail, services and features may not have been surveyed if obstructed or not reasonably visible at the time of the survey.

Surveyed physical features may not necessarily represent the legal boundary line.

Measured Building Surveys
Measurements to internal walls are taken to the wall finishes at approx 1m above the floor level and the wall assumed to be vertical.

General

The contractor must check and verify all site and building dimensions, levels, utilities and drainage details and connections prior to commencing work. Any errors or discrepancies must be notified to Survey Solutions immediately.

The accuracy of the digital data is the same as the plotting scale implies. All dimensions are in metres unless otherwise stated.

The survey control listed is only to be used for topographical surveys at the stated scale. All control must be checked and verified prior to use.

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This drawing should only be scaled using digital methods.

SURVEY GRID AND LEVEL DATUM

The coordinate system established for this survey is related to Ordnance Survey (OS) National Grid at multiple points using GNSS with a scale factor of 1.000.

The level datum established for this survey is related to Ordnance Survey (OS) using GPS Smartnet.

To avoid discrepancies within the survey, adding to the survey or setting out points from the survey, any coordinated data must be directly derived from the original survey control. Survey Solutions are not responsible for any third-party adding survey data to the existing information.

A	Area adjacent Sodexo Stores added.	SO	SR	14/02/25
REV	DESCRIPTION	DRAWN	APPR	DATE



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PROJECT TITLE Manchester Royal Infirmary, Manchester, M13 9WL				
DRAWING DETAIL TOPOGRAPHICAL SURVEY Sheet 1 of 1				
CLIENT CCS CONSULTING LTD				SCALE 1:200
SURVEYOR SE / SO	SURVEY DATE October 2024	CHECKED BY SR	APPROVED BY SR	DWG STATUS FINAL
DRAWING NUMBER 70661MCLS-01	REVISION A		ISSUE DATE 04/10/2024	



Appendix C – GPR Survey

Q-LEVEL	DESCRIPTION	ACC.	Q-LEVEL	DESCRIPTION
QL-D	Service positions taken from records.	Undefined	QL-B2	Horizontal & vertical location using only one geophysical technique.
QL-C	Visual evidence of service evidence but undetectable by geophysical techniques.	Undefined	QL-B1	Horizontal & vertical location using multiple geophysical techniques.
QL-B4	Undetectable service present shown as an assumed route (AMR)	± 15, ±50mm ± 1m	QL-A	Horizontal & vertical position verification by open excavation, manholes and/or inspection chambers.
QL-B3	Horizontal location by one geophysical technique but with some or poor depth information.	Undefined		

DETECTION METHOD
IN ACCORDANCE WITH PAS 128: 2014 SURVEY TYPE E

All accessible Manholes and Inspection chambers have had their respective covers lifted with pipe sizes, inverts, chamber sizes/types and service data recorded from ground level. All connections from DP's, Gullies, Drains, VP's, RE's and lampholes have been proven wherever possible using audible connections (AC) and/or sonde instrumentation where applicable. Where these methods have proved unsuccessful then assumed (AR) straight line connections will be shown.

All accessible Manholes and Inspection chambers have had their respective covers lifted with pipe sizes, inverts, chamber sizes/type and service data recorded from ground level. Pipework has been traced, accessed and collected for post processing. Drainage layout, including manhole covers not located by topographical survey, may be taken from CCTV chainage and will be shown as indicative only.

Elec cables will have been predominantly located using EML methodology with electronically derived depths shown. GPR techniques will be employed to achieve greater quality levels as required.

BT cables will have been predominantly located using EML methodology with electronically derived depths shown. GPR techniques will be employed to achieve greater quality levels as required. Due to current laws and legislation protecting all BT apparatus, cabling can only be located remotely. We therefore compare all our telecom findings against recorded information to produce the final service layout. In some instances, where high amount of cable ducts are present, we may only be able to identify a linear centre peak signal rather than identifying all the individual duct positions. For further information regarding Telecoms apparatus, please contact Openreach directly.

CTV and/or Com cables will have been predominantly located using EML methodology with electronically derived depths shown. GPR techniques will be employed to achieve greater quality levels as required.

FO cables will have been predominantly located using GPR methodology. This is due to the materials used within fibre optic cabling. In some rare instances, tracer cabling or conductible non fibre optic cabling will be present within some or all ducting. When this is the case, both EML and GPR methodology will be combined to identify service network and achieve greater quality levels.

LC, TS and/or Sec cables will have been predominantly located using EML methodology with electronically derived depths shown. GPR techniques will be employed to achieve greater quality levels as required.

GM/GS and/or WM/WS pipe work will have been attempted and located using both EML & GPR methodology with electronically derived depths shown for the former and depths to crown levels shown for the latter.

When the Gas/Water pipe work is constructed using conductable materials, then we are able to employ multiple geophysical techniques to identify service network and achieve greater quality levels. When a non conductible material is used, GPR methodology will be employed to locate and plot the final service layout.

GPR methodology is used to identify and locate all non metallic, non conductive piping and cabling. We also employ GPR to obtain a greater accuracy levels on EML located services. The GPR has a greater success rate on pipe or service diameter upward of Ø63mm, C63mm, as size increments increase, so does the chance of detection. The GPR can produces varying results and as such, wouldn't be used as an independent utility surveying instrument.

All UITS will have been predominantly located using EML methodology with electronically derived depths shown. GPR techniques will be employed to achieve greater quality levels as required. Every effort has been made to identify the service but in this instance, is not achievable. We recommend excavation work to determine identity and depth where applicable.

Scarring has been identified on site with a potential of an undetectable service present.

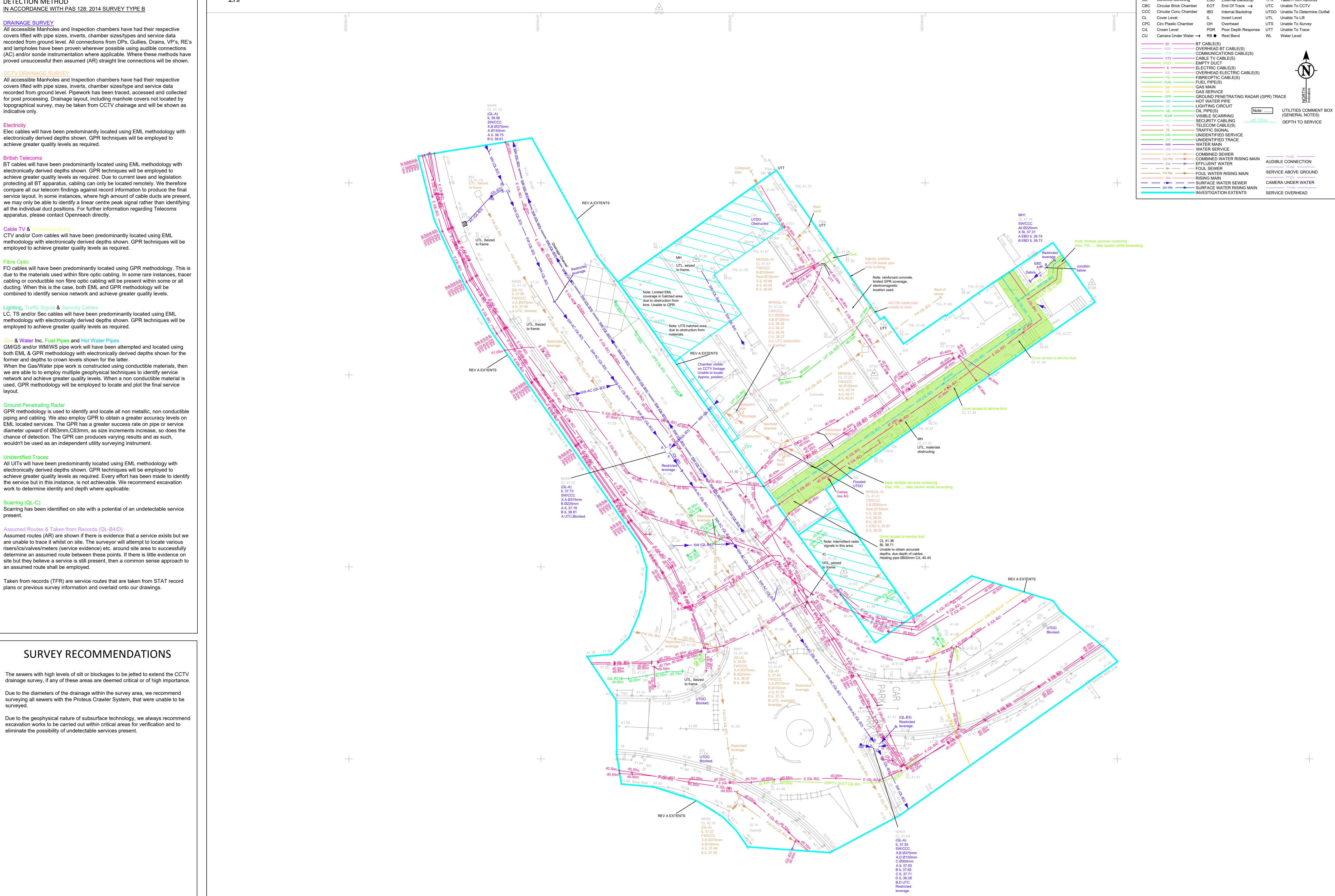
Assumed routes (AR) are shown if there is evidence that a service exists but we are unable to trace it whilst on site. The surveyor will attempt to locate various risers/cables/meters (service evidence) etc. around site area to successfully determine an assumed route between these points. If there is little evidence on site but they believe a service is still present, then a common sense approach to an assumed route shall be employed.

Taken from records (TFR) are service routes that are taken from STAT record plans or previous survey information and overlaid onto our drawings.

The sewers with high levels of silt or blockages to be jetted to extend the CCTV drainage survey, if any of these areas are deemed critical or of high importance.

Due to the diameters of the drainage within the survey area, we recommend surveying all sewers with the Proteus Crawler System, that were unable to be surveyed.

Due to the geophysical nature of subsurface technology, we always recommend excavation works to be carried out within critical areas for verification and to eliminate the possibility of undetectable services present.



10 DC	1 to 52 Caster	DO	Depth To Crown	RBC	Rectangular Brick Chamber
D	Diameter	DI	Depth To Invert	RCB	Rectangular Concrete Chamber
AC	Accession Connection	DS	Depth To Silt	RE	Rodding Eye
AG	Above Ground	DSB	Depth To Base	RB	Round Bottomed
AS	Assumed Road	DTW	Depth To Water	SL	Side Level
BL	Base Level	DTS	Depth To Surcharge	SL	Surcharge Level
CB	Concrete Borehole	EBD	External Backdrop	TRN	Taken From Records
CBR	Concrete Brick Chamber	EF	End of Frame	U	Unknown
CC	Circular Concrete Chamber	IBD	Internal Backdrop	UTLO	Unable To Determine Outfall
CL	Cover Level	IL	Invert Level	UTL	Unable To Lift
CPC	Circular Plastic Chamber	OH	Overhead	UTS	Unable To Survey
CR	Circular Road	PD	Peak Depth Response	UTW	Unable To Water
CU	Camera Under Water	RB	Rest Bend	WL	Water Level

DRAWING NOTES

All below ground details shown have been identified from above ground without excavation. Survey Solution use electro-magnetic and/or ground penetrating radar (GPR) methods to investigate for underground utilities, services and features. Results using these methods are not infallible and we recommend trial excavations are carried out to confirm any identifications, positions and depths.

Any areas on the drawing where services or features have not been shown are not necessarily clear of services or features but are an indication that no items have been identified during our investigations. All reasonable care and normal good practice should still be employed during design and construction processes.

Certain types of services such as plastic or concrete pipes, some conduit and ducting where direct access can not be achieved for tracing may not be shown and alternative locating methods should be used.

Survey Solutions has used all reasonable care to research available service records but the completeness or use of the service records supplied to or by Survey Solutions cannot be guaranteed. Therefore Survey Solutions cannot be held responsible for any features annotated as 'taken from records' (TFR).

Depths obtained using electro-magnetic or GPR are effected by ground conditions and should be treated as indicative only. Electro-magnetic depths to utilities and services are generally taken to the centre of a feature, GPR depths to the top of a feature and drainage depth shown to inverts, unless otherwise indicated.

Drainage pipe sizes will be obtained without entering the chamber and therefore should be treated as approximate. Pipe dimensions which have not been obtained visually will be taken from records when available.

All services, drainage and utilities routes are assumed straight between access points, unless otherwise stated. The numbers of cables in runs will not be shown unless specifically requested. All services are below ground unless indicated.

Services, utilities and features may not have been surveyed if obstructed or not reasonably visible or accessible at the time of survey.

Survey Solutions accept no responsibility for the completeness or accuracy of either the topographical survey or base mapping on this project.

All critical dimensions and measurements should be checked and verified with any errors or discrepancies notified to Survey Solutions immediately. The accuracy of the digital data is the same as the plotting scale implies. All dimensions are in metres unless otherwise stated.

The contractor must check and verify all site and building dimensions, levels, utilities and drainage details and connections prior to commencing work.

© Land Survey Solutions Limited hold the copyright to all the information contained within this document and their written consent must be obtained before copying or using the data other than for the purpose it was originally supplied.

This drawing should only be scaled using digital methods.

This survey has been carried out in accordance with PAS 128: 2014 & our version of the Royal Institution of Chartered Surveyors (RICS) specification for Measured Surveys of Land, Buildings and Utilities. Our survey extents have been agreed and confirmed with formal acceptance of 70661 from CCS CONSULTING LTD. If you have any queries regarding the final services layout, please may we ask you to carefully read all the information within this title block in its entirety before continuing to do so.

TOPOGRAPHICAL SURVEY DATE 14/02/2025		
SURVEY TYPE	DESCRIPTION	EFFECT ON SURVEY RESULTS
TOPO	LSS	
OUTDATED		
OS		
NTS		

GENERAL SITE CONDITIONS	
AVERAGE	
ADDITIONAL INFORMATION	EFFECT ON SURVEY RESULTS

UTILITY	AVAILABILITY	UTILITY COMPANY PROVIDER
SEWER	YES	UNITED UTILITIES
WATER MAIN	YES	UNITED UTILITIES
GAS MAIN	YES	CADENT GAS
TELECOM	YES	BRITISH TELECOMS, CITYFIBRE, C.A TELECOM UK
CABLE TV	YES	VODAFONE
ELECTRICITY	YES	ELECTRICITY NORTH WEST
OIL PIPES	NO	N/A
OTHER	NO	GM UTC, UTILITY ASSETS, ENVIRONMENT AGENCY

REV	DESCRIPTION	DRAWN	CHECKED	APPR	SURVEY DATE



IPSWICH / BEDFORD / BIRMINGHAM / COVENTRY / CRAWLEY / GLASGOW / LEEDS / LONDON-CENTRAL /
LONDON-EAST / MANCHESTER / NEWCASTLE / NORWICH / NOTTINGHAM / THAMES VALLEY

PROJECT TITLE
Manchester Royal Infirmary,
Manchester, M13 9WL

DRAWING DETAIL
UTILITIES AND CCTV DRAINAGE SURVEY.
SHEET 1 OF 1

CLIENT CCS CONSULTING LTD				SCALE 1:200
SURVEYOR OB TH AC	SURVEY DATE 01/10/2024	CHECKED BY DWR	APPROVED BY DWR	DWG STATUS FINAL
DRAWING NUMBER 70661MCUG-01			REVISION A	ISSUE DATE 08/10/2024



Appendix D – Borehole Logs



MANCHESTER CITY COUNCIL
CITY ENGINEER AND SURVEYORS DEPARTMENT

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SITE INVESTIGATION FOR MAIN DRAINAGE				DATE COMMENCED 1.7.87						
LOCATION ANSON ROAD				BORING METHOD CABLE PERCUSSIVE						
BOREHOLE No. 1 (SHEET 1 OF 2)				BORING DIAMETER 150 mm						
GRID REFERENCE				SCALE: 1:50 (Approx.)						
DATE	CASING DEPTH (m)	WATER LEVEL MORNING & EVENING	DEPTH OF STRATA BELOW GL	Reduced Level	DESCRIPTION	No. and Type of Sample	SAMPLE DEPTH PENETRATION		No. of Blows	Legend
							From	To		
			0.15		Bituminous surfacing on to setts					
			0.40		Bricks, cinders, ash, clay lenses soil, gravel, etc. MADEGROUND	D1	0.25			
			0.75		Brick, clay gravel, etc. MADEGROUND (drillers description)					
					Very stiff brown silty and sandy CLAY with roots and grey fissures in the upper zone, silt laminae, sand lenses, fine-medium gravel and slightly laminated in parts	B1 U1 D2 U2 D3 U3 D4 U4 D5 U5 D6 U6	0.75 1.50 2.10 2.50 3.10 3.50 4.10 4.50 5.10 5.30 6.10 6.50	1.50 2.00 3.00 4.00 5.00 6.00 7.00		
			7.00		continued					
WATER OBSERVATIONS DURING BORING					WATER LEVEL IN CASED/UNCASED BOREHOLE ON COMPLETION					
DEPTH OF WATER ENTRY (m)	ESTIMATED SEE PAGE	STANDING LEVEL (m)	DEPTH OF CASING WHEN SEALED (m)	DATE	WATER LEVEL	DEPTH OF CASING				
SAMPLE TEST KEY				D – DISTURBED SAMPLE B – BULK SAMPLE U – UNDISTURBED SAMPLE P – SPT SAMPLE W – WATER SAMPLE						
NOTE: WHERE FULL 0.3 PENETRATION HAS NOT BEEN ACHIEVED, THE NUMBER OF BLOWS FOR THE QUOTED PENETRATION IS GIVEN (NOT N – VALUE)										
ALL DEPTHS AND REDUCED LEVELS IN (m) UNLESS OTHERWISE STATED										
REMARKS										
M/c 5931										

MANCHESTER CITY COUNCIL

CITY ENGINEER AND SURVEYORS DEPARTMENT

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[illegible]

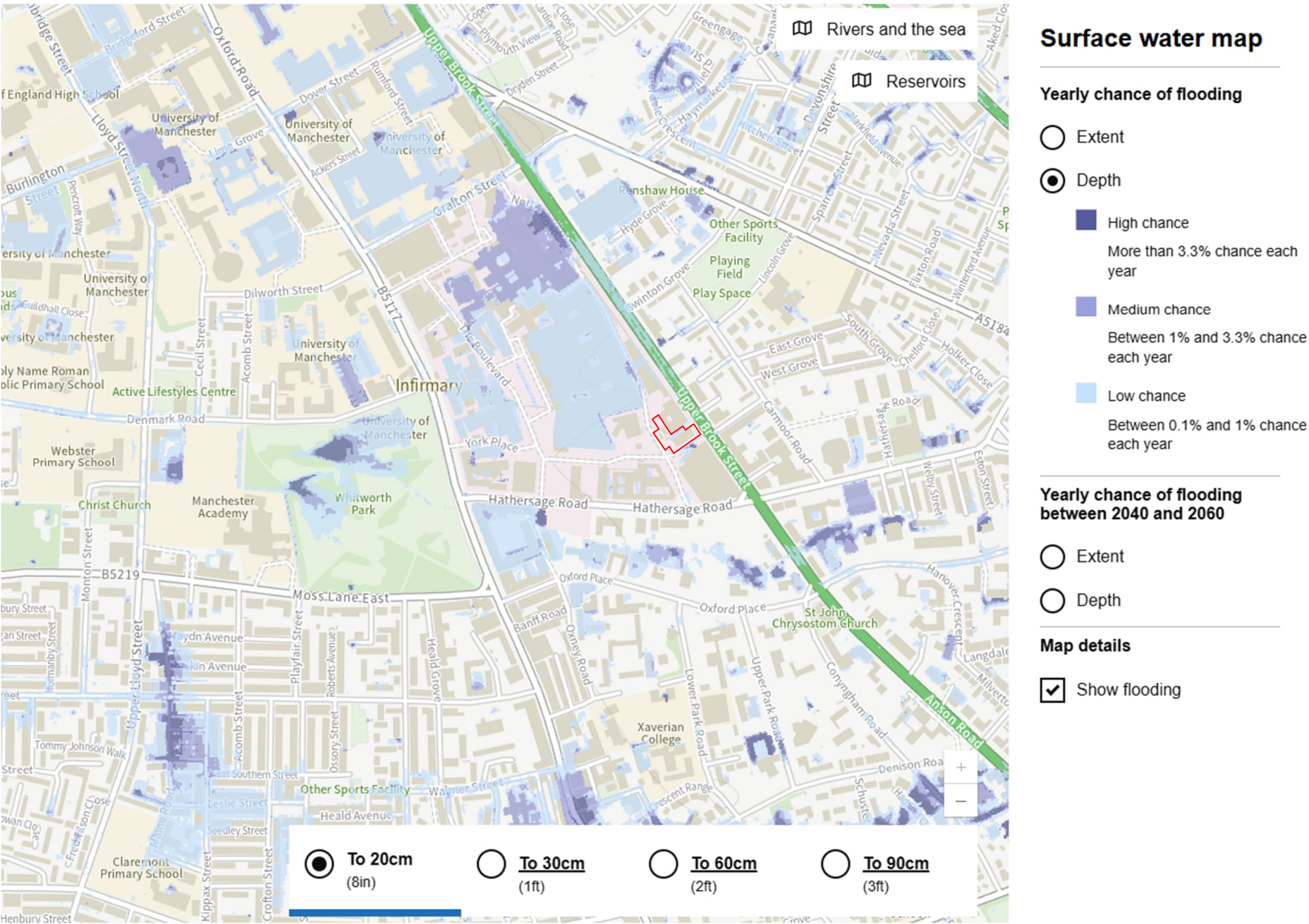


SJ89NE 813

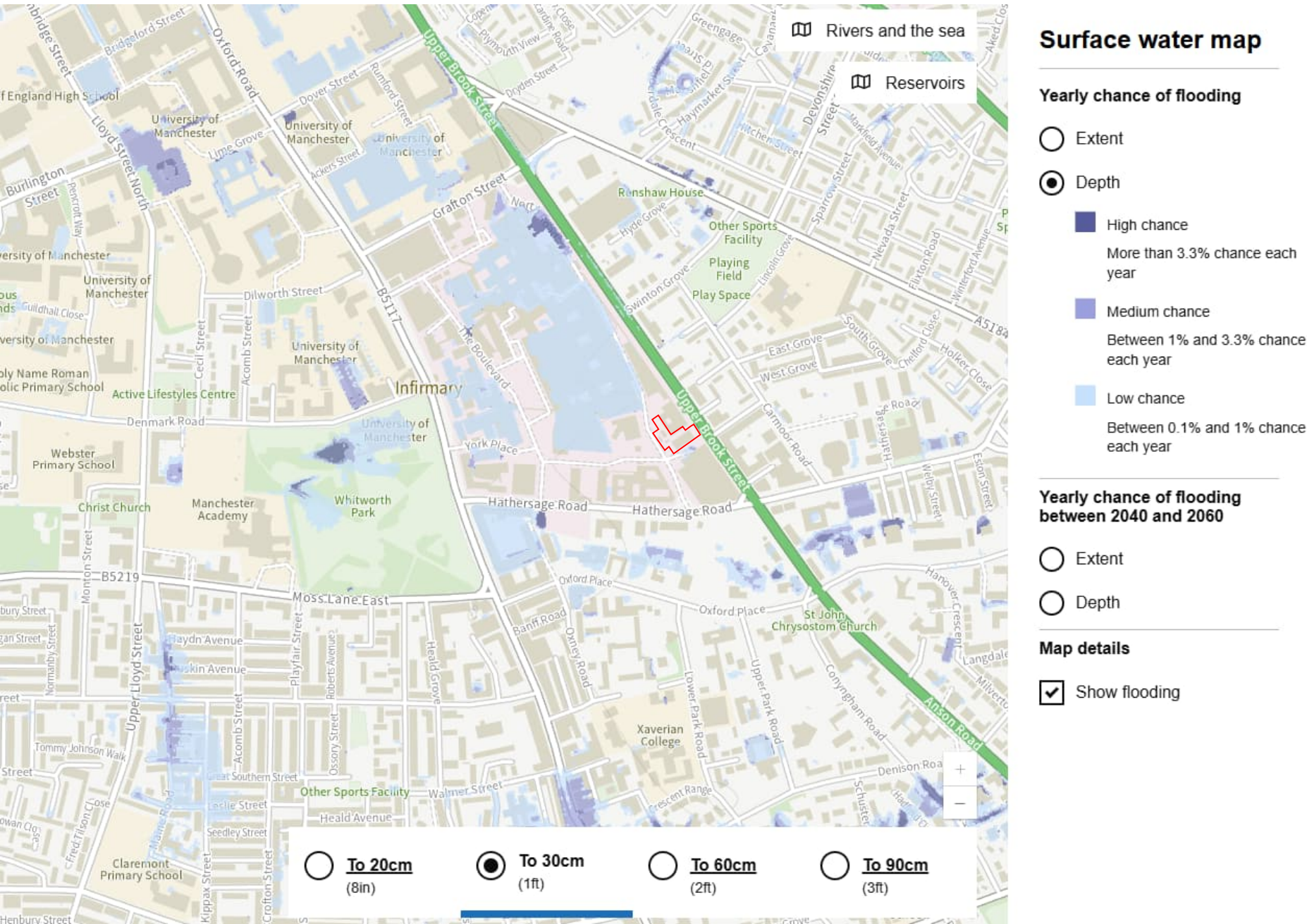
 Job No.: 9069/48	Location Upper Brook Street, Manchester Client: BeWT		Borehole No. BHB6 Project Ref.: 9-00-04-805					
	Equipment and methods Light Cable Percussion Start Date: 19/01/1998 End Date: 19/01/1998 Final Depth: 8.00m Diameter 150mm Casing Depth 4.30m							
FIELD RECORDS	Samples / Tests				Description	Depth & Thickness (m)	Strata Reduced Level (m)	Legend
	Casing (Water) Depth (m)	Depth (m) from	to	SAMPLE Type & No SPT (N) (Cu)				
T1 M1 0.60 0.60	0.50	0.60	D 1		MADE GROUND (Grass over 100mm of topsoil over soft to firm topsoily clay)	(0.40)	41.40	
					MADE GROUND (Black ash & cinders)	(0.40)		
[u15]	1.00	1.10	D 2		Soft brown/grey slightly sandy CLAY with a little fine to medium gravel	(0.70)	41.10	
[u15]	1.30	1.75	U 1	{27}	Soft grey CLAY with some organic matter	1.40	40.40	
[u50]	1.80	1.90	D 3			(0.90)		
[u50]	2.30	2.75	U 2	{134}	Stiff dark brown CLAY with many grey fissures (Boulder Clay)	2.30	39.50	
[u70]	2.80	2.90	D 4			(0.70)	38.80	
[u70]	3.30	3.75	U 3		Very stiff dark brown sandy CLAY with a little fine to coarse rounded gravel and some grey fissures (Boulder Clay)	3.00		
[u110]	3.80	3.90	D 5					
[u85]	4.30	4.75	U 4	{514}		(3.00)		
[u85]	4.80	4.90	D 6					
[u60]	5.30	5.75	U 5					
[u60]	5.80	5.90	D 7					
[u60]	6.30	6.75	U 6		Stiff dark brown sandy CLAY with a little fine gravel and some grey fissures (Boulder Clay)	6.00	35.80	
[u50]	6.80	6.90	D 8			(2.00)		
[u50]	7.30	7.75	U 7	{83}				
[u50]	7.80	7.90	D 9					
-(19/01/1998)-					Borehole Completed	8.00	33.80	
Remarks 1) Service pit dug 0.70m x 0.70m x 1.20m. 2) Groundwater struck at 0.60m (slight groundwater entries). 3) Piezometer installed with tip at 7.50m and seal from 4.50m to 5.50m. 4) Dry before and after installation. 5) Reading Dry 20-01, 4.75m 11-02.								
Logged by G.L Drilled by T.M Ground level 41.80mAD Co-ordinates: E:385330 N:396045								

Appendix E – Long Term Flood Risk Maps

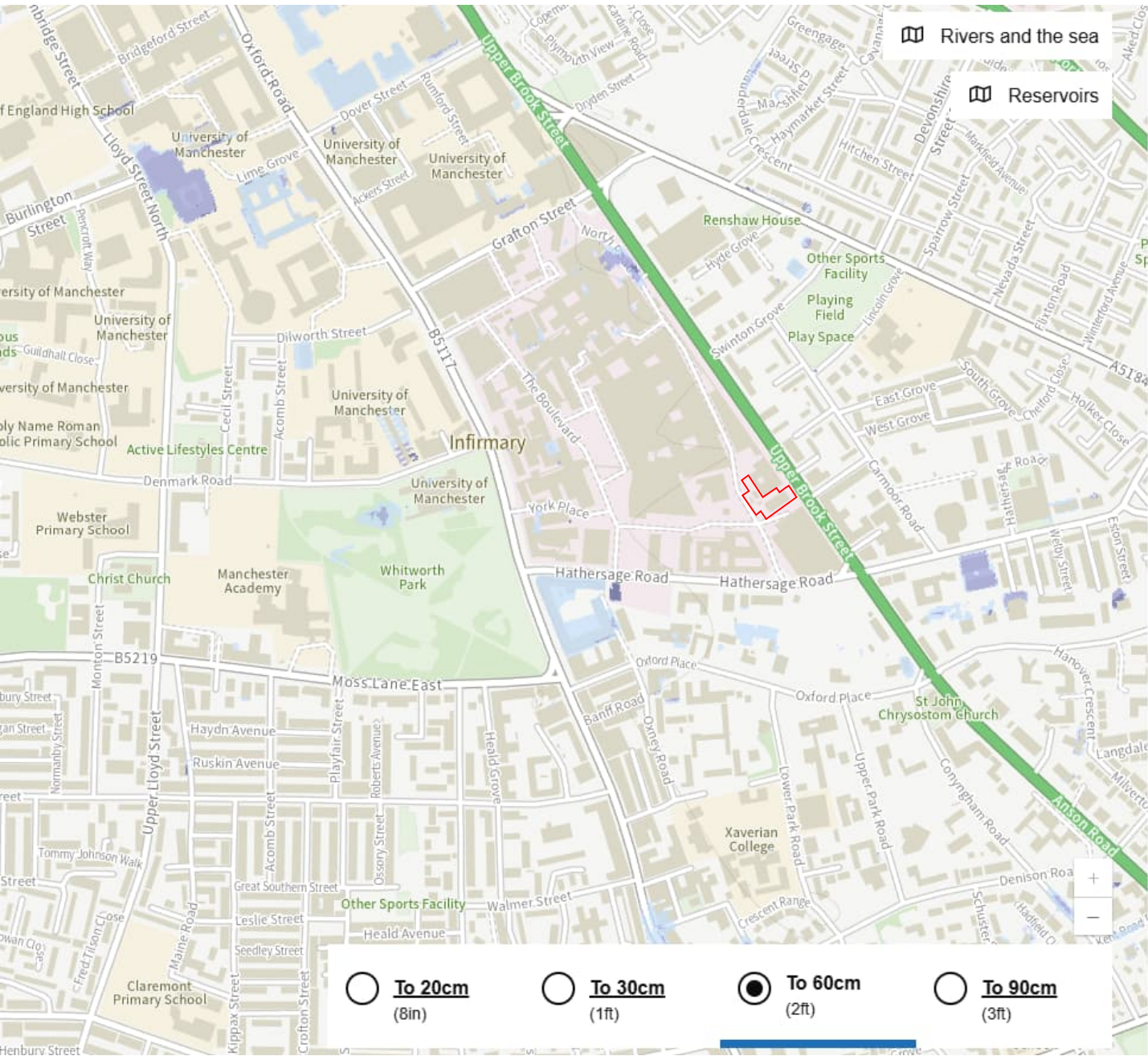
1.1 EA Long Term Flood Risk Service – Surface water map: Yearly chance of flooding, Depth up to 20cm



1.2 EA Long Term Flood Risk Service – Surface water map: Yearly chance of flooding, Depth up to 30cm



1.3 EA Long Term Flood Risk Service – Surface water map: Yearly chance of flooding, Depth up to 60cm



Surface water map

Yearly chance of flooding

- ☐ Extent
- ☒ Depth
 - High chance
More than 3.3% chance each year
 - Medium chance
Between 1% and 3.3% chance each year
 - Low chance
Between 0.1% and 1% chance each year

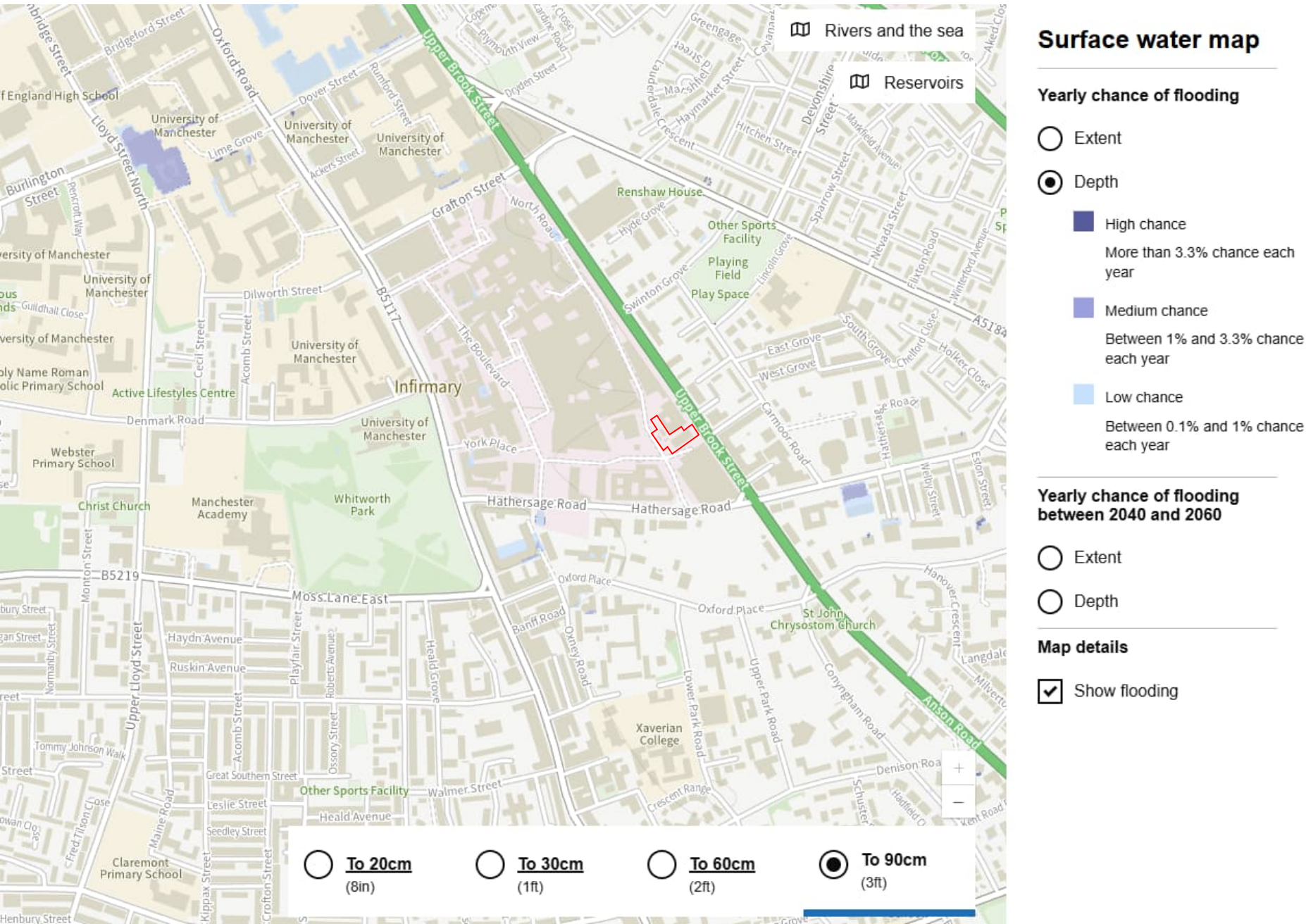
Yearly chance of flooding between 2040 and 2060

- ☐ Extent
- ☐ Depth

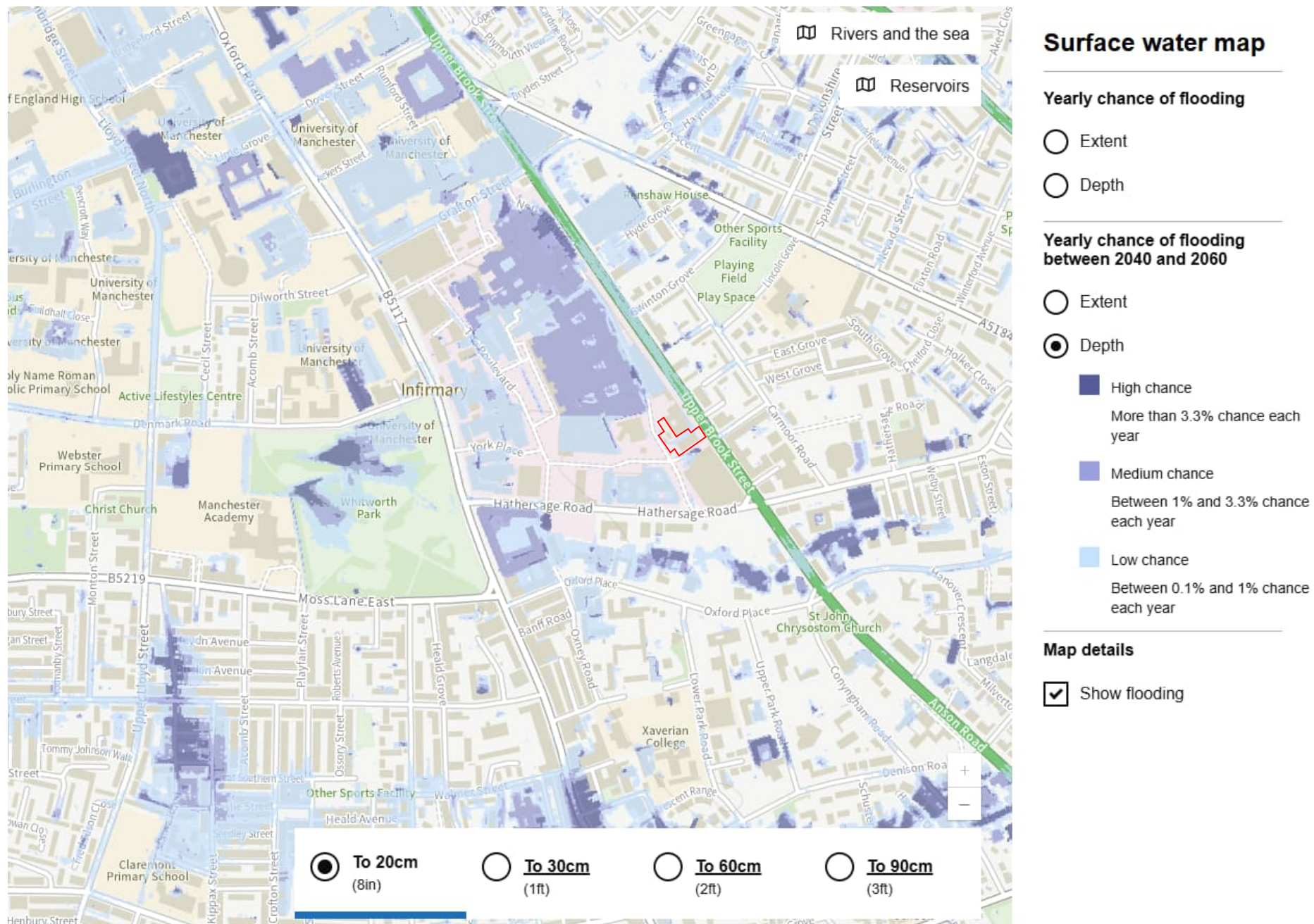
Map details

- ☒ Show flooding

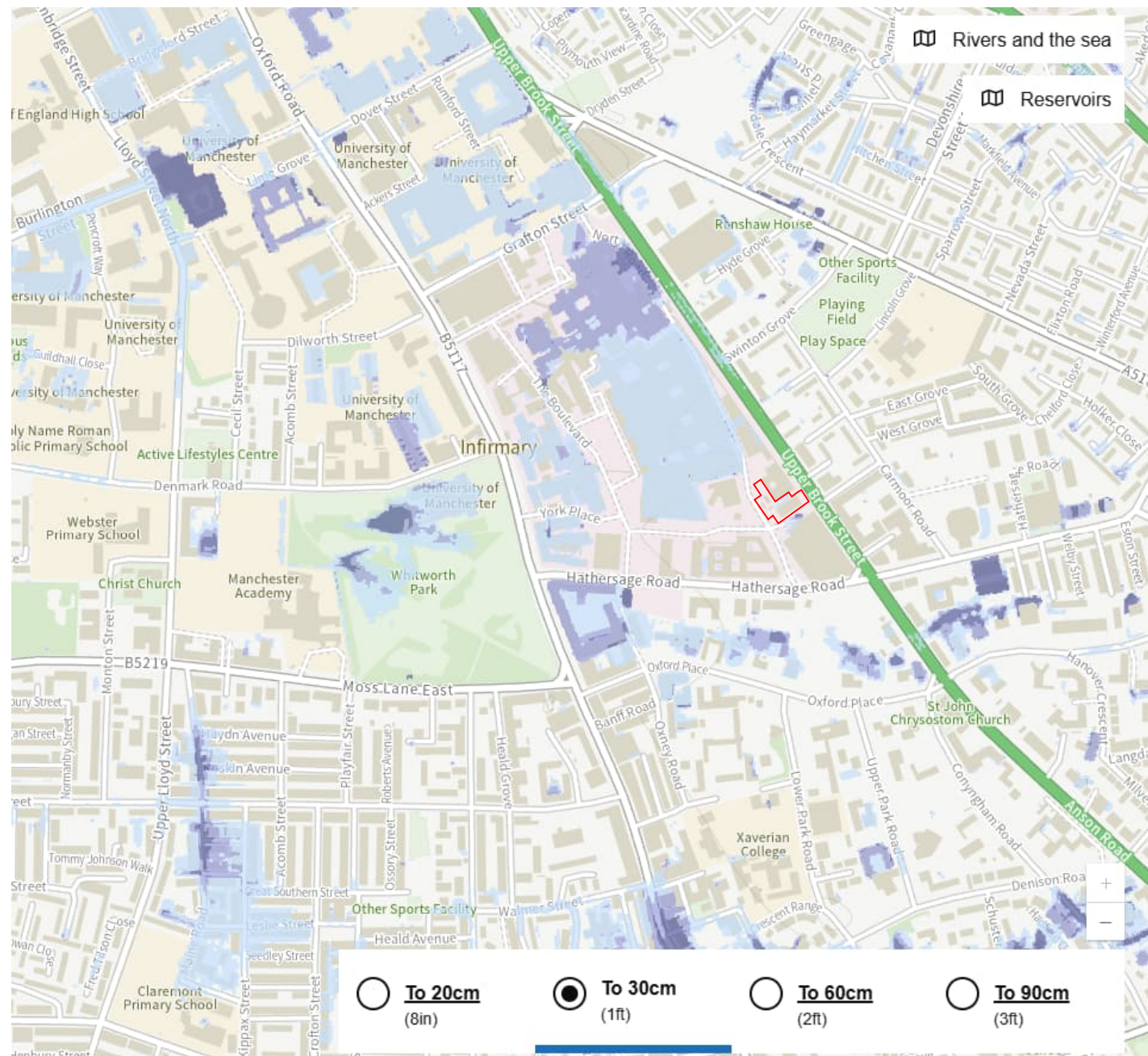
1.4 EA Long Term Flood Risk Service – Surface water map: Yearly chance of flooding, Depth up to 90cm



1.5 EA Long Term Flood Risk Service – Surface water map: Yearly chance of flooding between 2040 and 2060, Depth up to 20cm



1.6 EA Long Term Flood Risk Service – Surface water map: Yearly chance of flooding between 2040 and 2060, Depth up to 30cm



Surface water map

Yearly chance of flooding

- ☐ Extent
- ☐ Depth

Yearly chance of flooding between 2040 and 2060

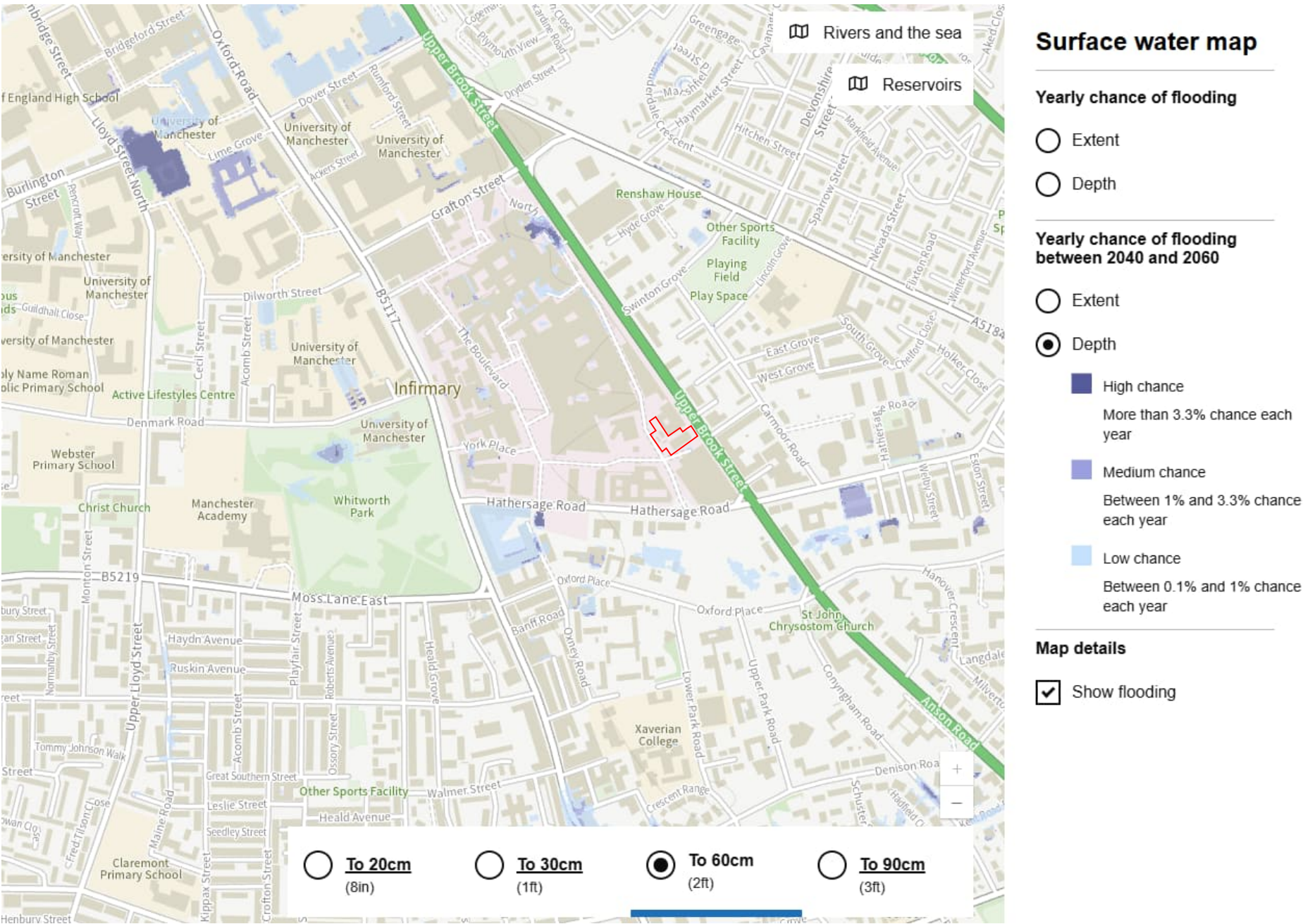
- ☐ Extent
- ☒ Depth

- ☐ High chance
More than 3.3% chance each year
- ☐ Medium chance
Between 1% and 3.3% chance each year
- ☐ Low chance
Between 0.1% and 1% chance each year

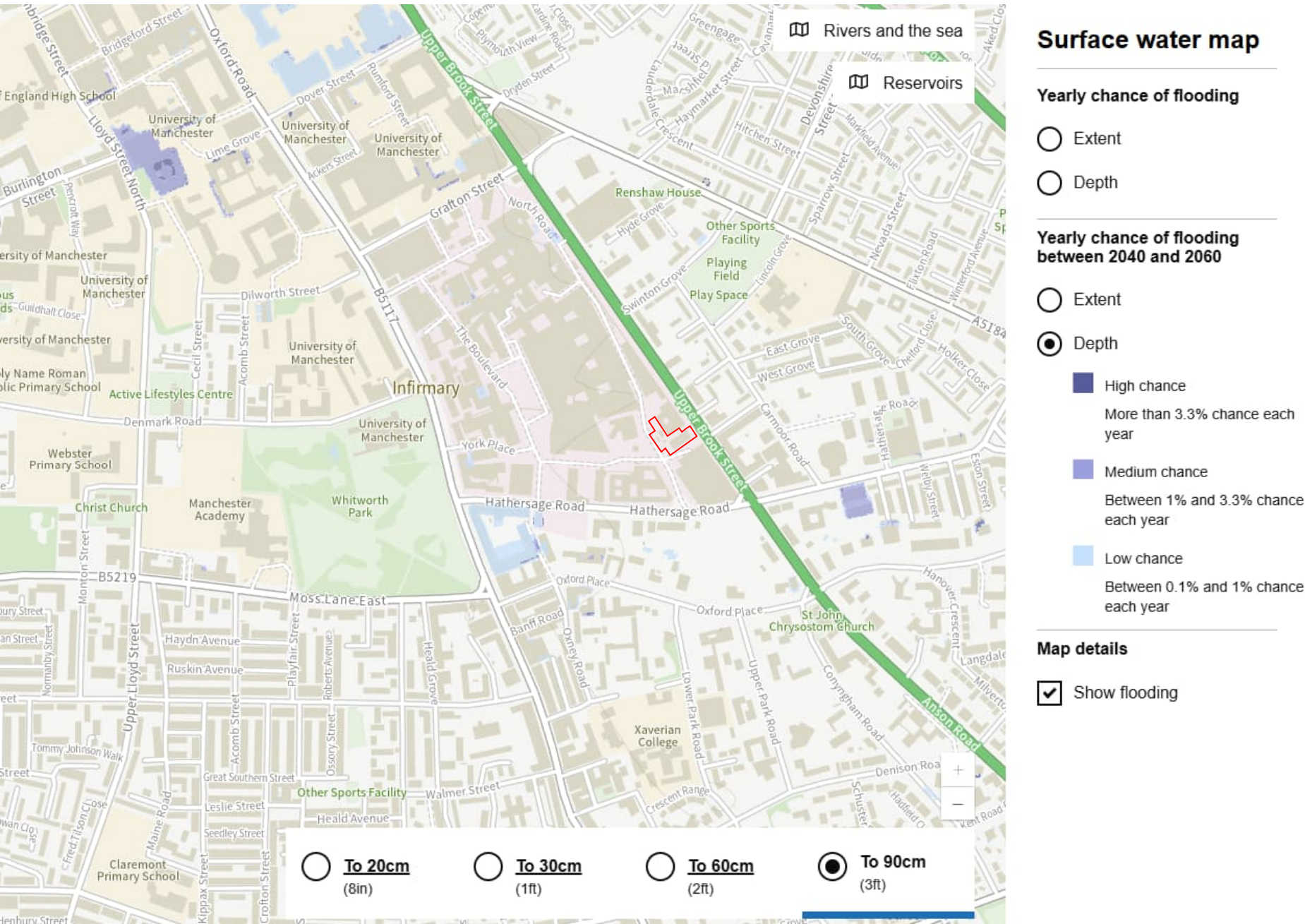
Map details

- ☒ Show flooding

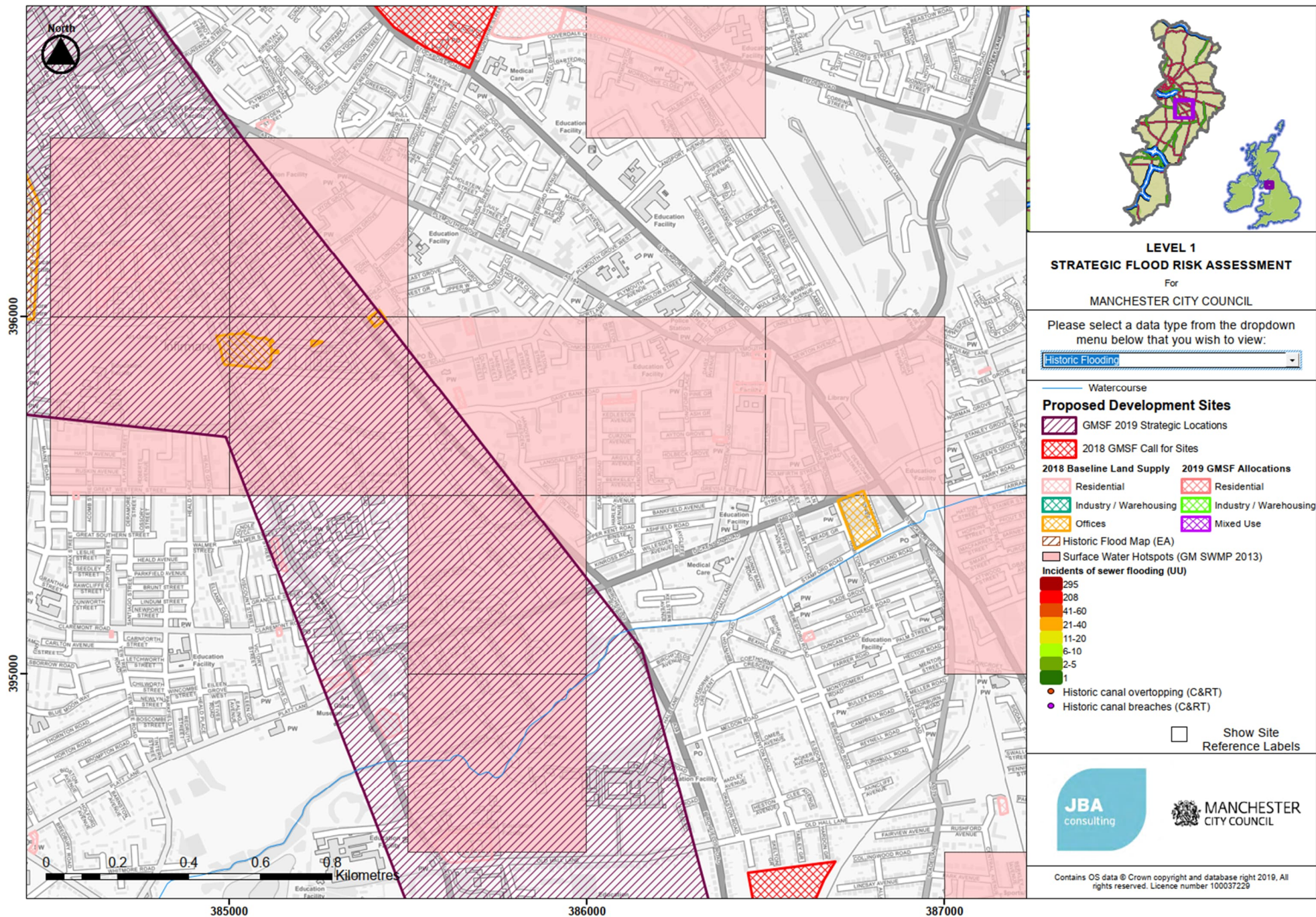
1.7 EA Long Term Flood Risk Service – Surface water map: Yearly chance of flooding between 2040 and 2060, Depth up to 60cm



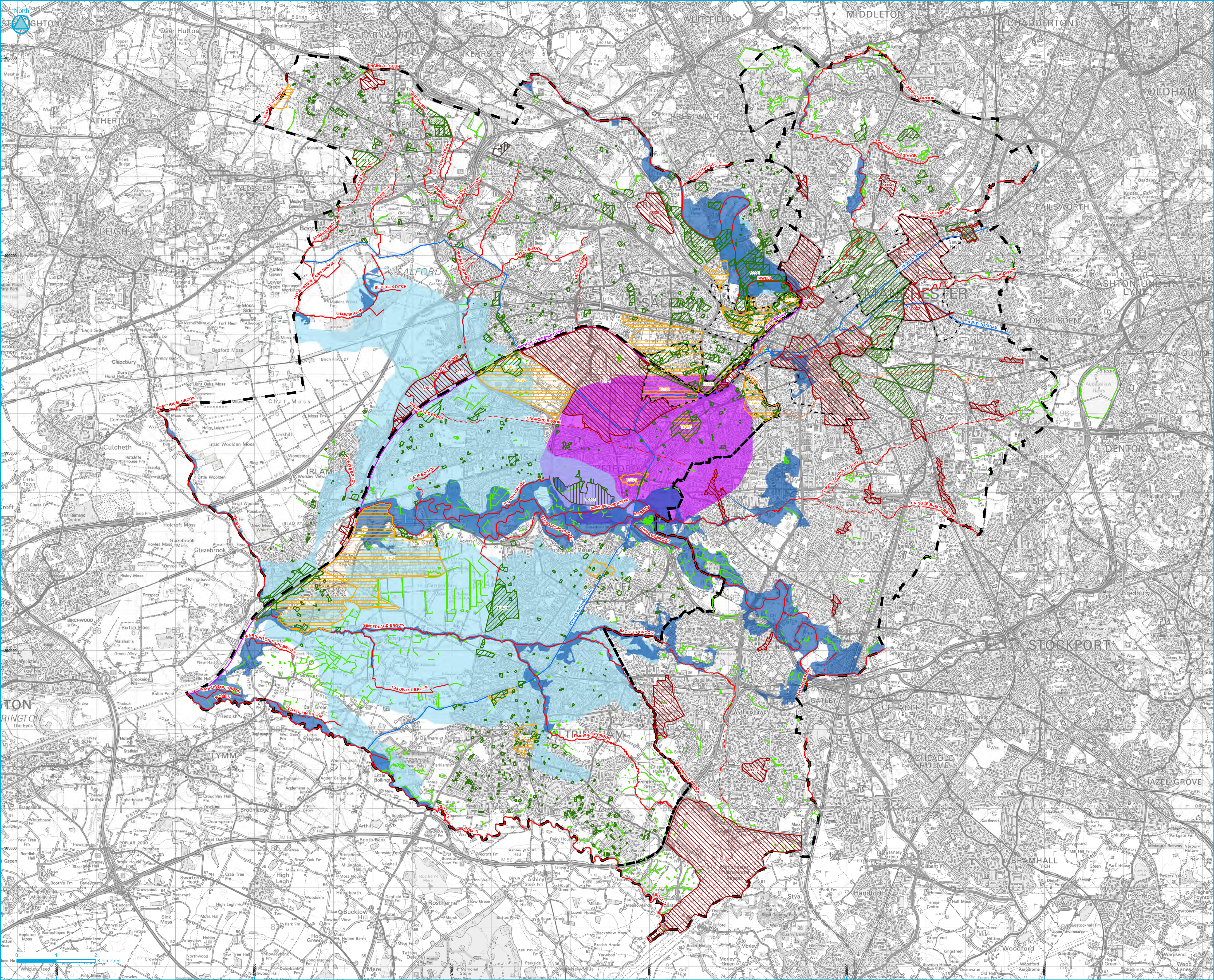
1.8 EA Long Term Flood Risk Service – Surface water map: Yearly chance of flooding between 2040 and 2060, Depth up to 90cm



Appendix F – SFRA Historic Flooding Map



Appendix G – SFRA Groundwater Flood Risk Map



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

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

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

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

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

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for

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

Groundwater Flooding

Drawn by: J Cheetham	Date: 08/03/2011	This map is based upon Ordnance Survey material with the permission of Ordnance Survey on behalf of the Controller of Her Majesty's Stationery Office © Crown copyright. Unauthorised reproduction infringes Crown copyright and may lead to prosecution or civil proceedings. Licence number: 100019068 2011.
Checked by: J Dimelow	Date: 01/02/2011	
Approved by: J Cooper	Date: 01/02/2011	
File Name: ..\ArcViewMapping\Level1\MS2_GroundwaterFlooding_V1.3.mxd		
Drawing Number:	Status:	Scale:
GW_2.1	FINAL	1:45,000
Original © A1		