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Appendix A – 2123-CIV-XX-XX-D-C-30001 Proposed Surface Water Drainage GA

Appendix B – BGS Borehole record SJ89NW1352

Appendix C – HR Wallingford Calculation Sheet

## Flood Risk Assessment

| | |
|---|---|
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# 1. Introduction

This report has been prepared by Civic Engineers on behalf of Cross Keys Estates Ltd, to support a planning application for the proposed construction of a residential scheme at 19 Cross Keys Street, Manchester. The proposed development comprises construction of a new multi storey apartment block featuring 1-bedroom apartments, 2-bedroom apartments and larger townhouses, which also includes construction of an external garden and lower ground floor.

The purpose of this document is to:

- provide information on the existing site's drainage,
- investigate all existing potential risks of flooding to the site,
- consider the impact the development may have elsewhere with regards to flooding, and
- summarise the potential drainage connections and SuDS implementations for the site, including how this will mitigate any potential risk of flooding determined to be present.

This report is based on currently available information held by Civic Engineers. Proposals contained or forming part of this statement represent the design intent and may be subject to alteration or adjustment in completing the detailed design for this project.

The following information has been reviewed to inform this report:

- Environment Agency Online Flood mapping.
- Historical maps
- Novo Utility searches report (Reference P2194, Dated 04.12.23).
- Manchester City, Salford City and Trafford Councils Level 2 Hybrid SFRA (SFRA).
- Publicly available BGS Borehole records
- British Geological Survey (BGS) Geology of Britain map
- HR Wallingford Tools for the design and evaluation of Sustainable Drainage Systems (SuDS)

## 2. Existing Development

19 Cross Keys Street is located in central Manchester and is bound by Cross Keys Street to the north-west, Goulden street to the north-east, Chadderton street to the south-east and Marshall Street to the south-west to the west. The approximate site area is 0.131 ha. The postcode associated with the site is M4 5EY, and the associated grid reference is SJ 84685 98867.

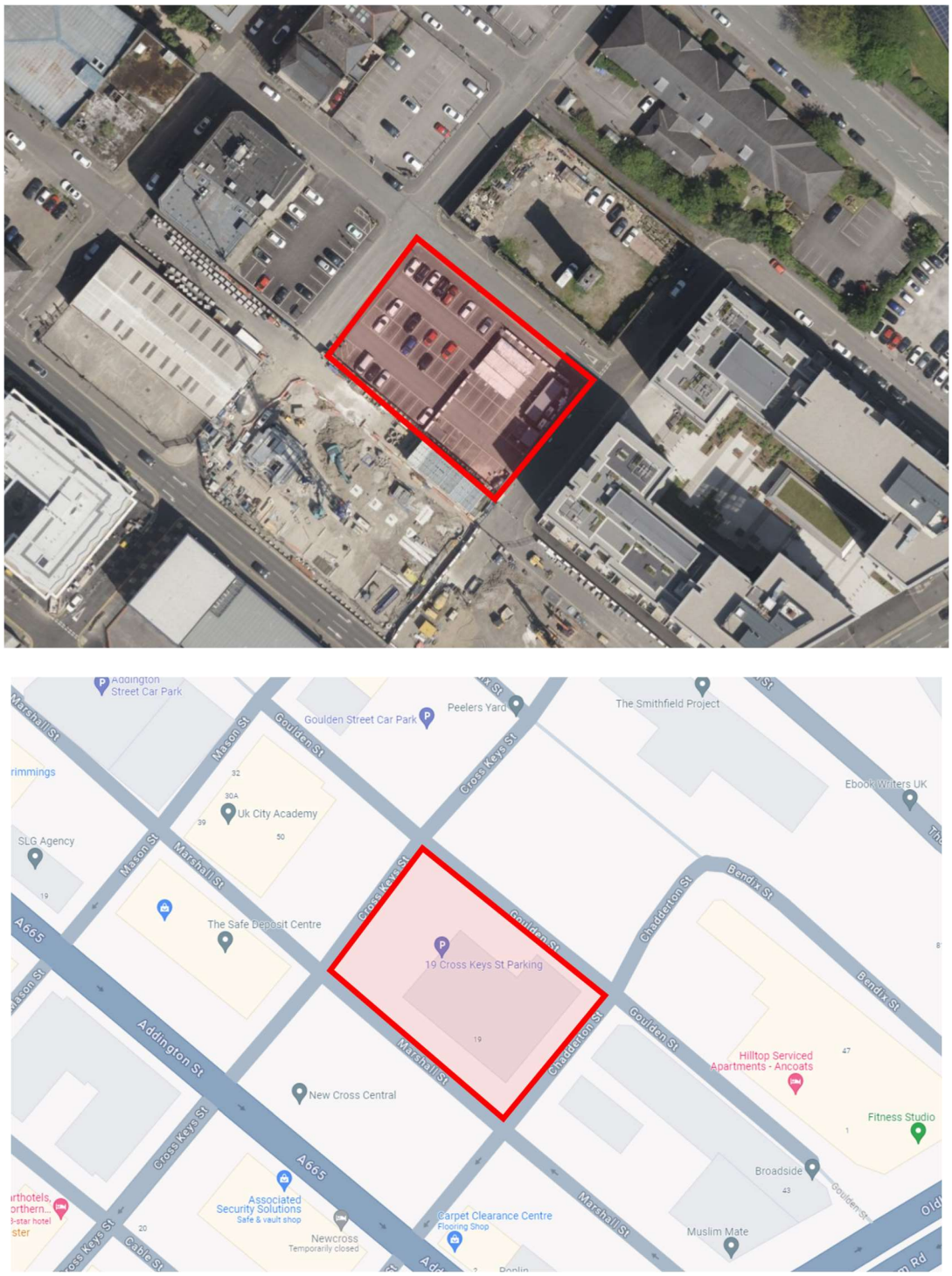



*Figure 1, Overview of existing site, with approximate site boundary shown in red.*

## 2.1 Current and Historic Use

An excerpt from the feasibility study undertaken by Tim Groom Architects (report ref 1111-TGA-XX-XX-RP-A-FI_10_10-00100, received 11.08.2023) is provided in Figure 2, indicating the site has been occupied since at least the 19th century.

*Figure 2. Extracts from historical map data showing the uses of the site approximately over the last 200 years.*

The extracts shown in Figure 2 show that the site has been used previously as the Royal Lancastrian School that is believed to have accommodated 650 pupils.

The site is currently used as an external public car park.

## 2.2 Existing Drainage

A site visit indicated that the existing hard surface car park is positively drained via gullies. The onsite drainage is subject to a CCTV connectivity survey. However, it is assumed that the gullies connect into the public sewer network which bounds the site.

Plans provided by United Utilities (UU) as part of the NOVO desktop report (Reference P2194, dated 04.12.23), which indicate their recorded sewer network within the vicinity of the site, have also been reviewed and summarised below.

The UU asset maps indicate the following public infrastructure beyond the site boundary:

- Existing 900 dia. UU brick (BR) combined water public sewer pipe located within the carriageway of Goulden Road, to the northeast of the site.
- Existing 420 dia. UU brick (BR) combined water public sewer pipe located within the carriageway of Chadderton Street, to the southeast of the site.
- Existing 420x820. UU combined water public sewer pipe located within the carriageway of Marchall Street, to the southwest of the site.
- Existing 900 dia. UU brick (BR) combined water public sewer pipe located within the carriageway of Goulden Road, to the northeast of the site.
- Unknown dimension Existing 900 dia. UU combined water public sewer pipe located within the carriageway of Cross Key Street, to the northwest of the site.

An extract of the sewer records is shown below in Figure 3.

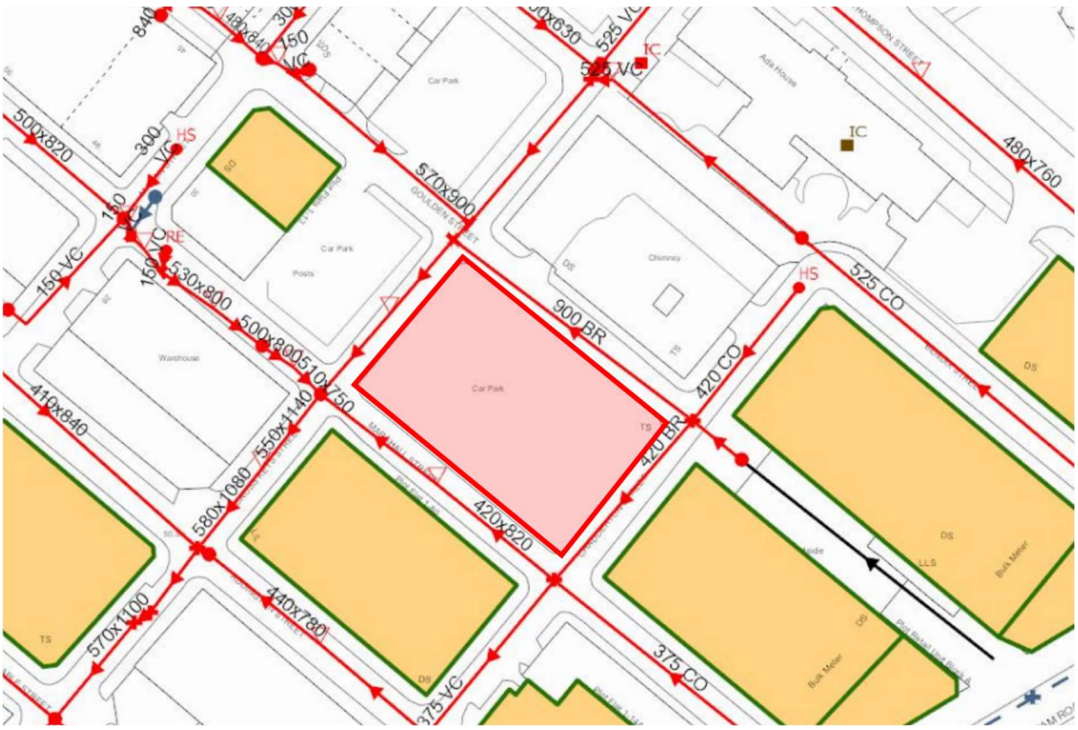



*Figure 3, Extract from UU sewer records, with approximate site boundary highlighted in red.*

It is likely that the surface water runoff from the site currently discharges to the public combined water sewers that surround the site. This assumption requires confirmation by a CCTV survey of onsite drainage to confirm position, condition, and depth of existing private and public drainage within and around the site.

## 2.3 Existing Watercourse and Waterbodies

From review of the Environment Agency (EA) main river map, there are no main rivers in the vicinity of the site.

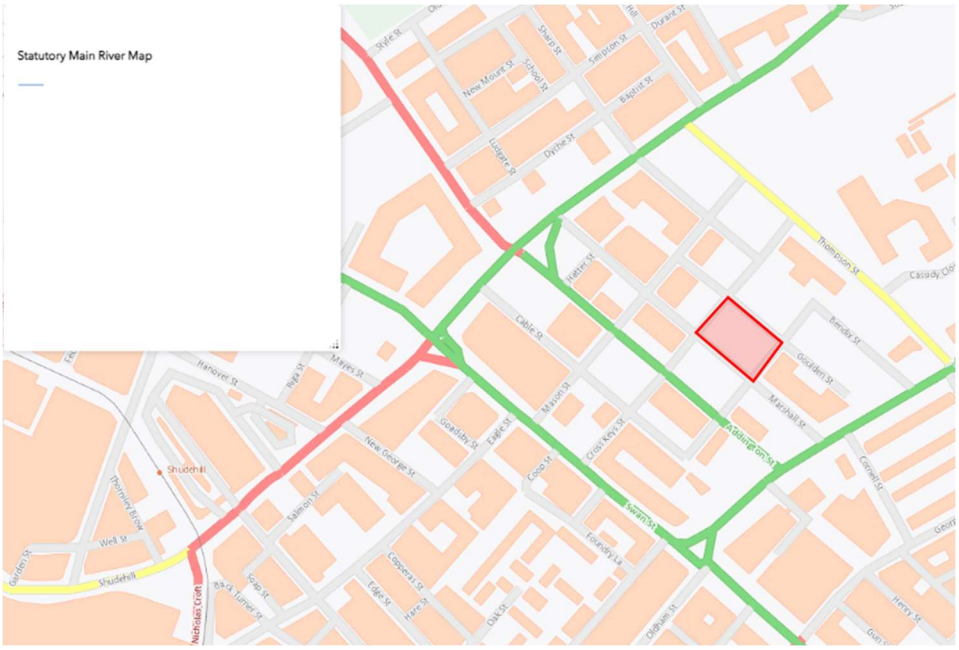



*Figure 4. Environment Agency (EA) Statutory Main River Map*

The closest watercourse to the site is the river Irk, which is approximately 450m northwest of the site. Additionally, the Rochdale canal is located approximately 550m southeast of the site.

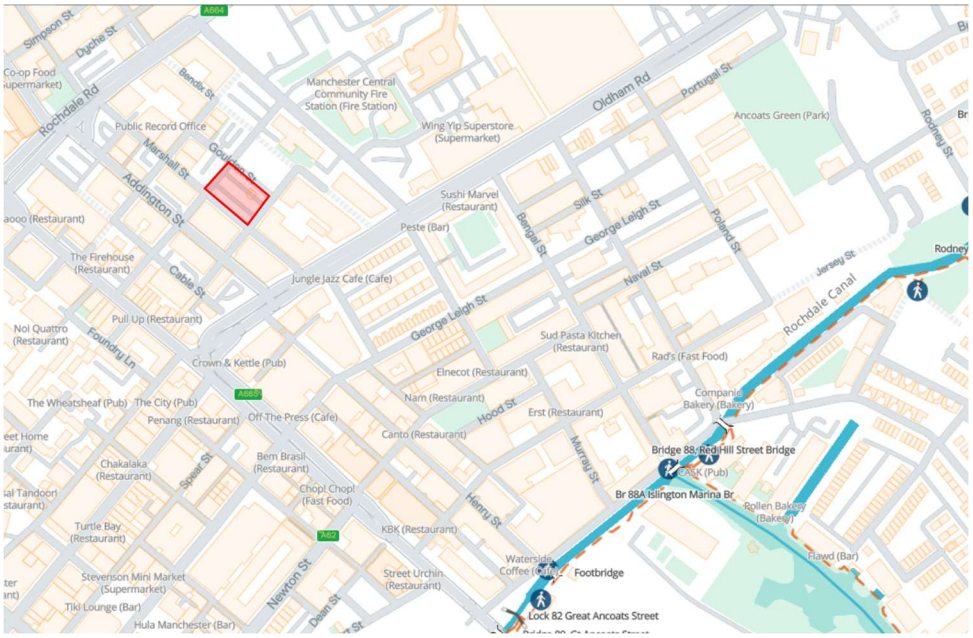



*Figure 5. Map from Canal and River Trust, detailing nearby canals managed by the Trust.*

## 2.4 Existing Site Geology

Information from the British Geological Survey (BGS) Geology of Britain map has been analysed, and indicates superficial deposits of 'Till, Devensian – Diamicton across the site'. The bedrock geology is primarily composed of 'Chester Formation Sandstone'.

Additionally, the publicly available BGS borehole record included in Appendix B shows that the ground surface is made up of tarmac, flagstones and cinder mixed with clay. This made ground makeup is likely to cause issues with any proposed infiltration due to contamination. The borehole also identifies clay strata up to a depth of 12.03m. the location of the borehole being consulted relative to the site is shown in Figure 6 below.

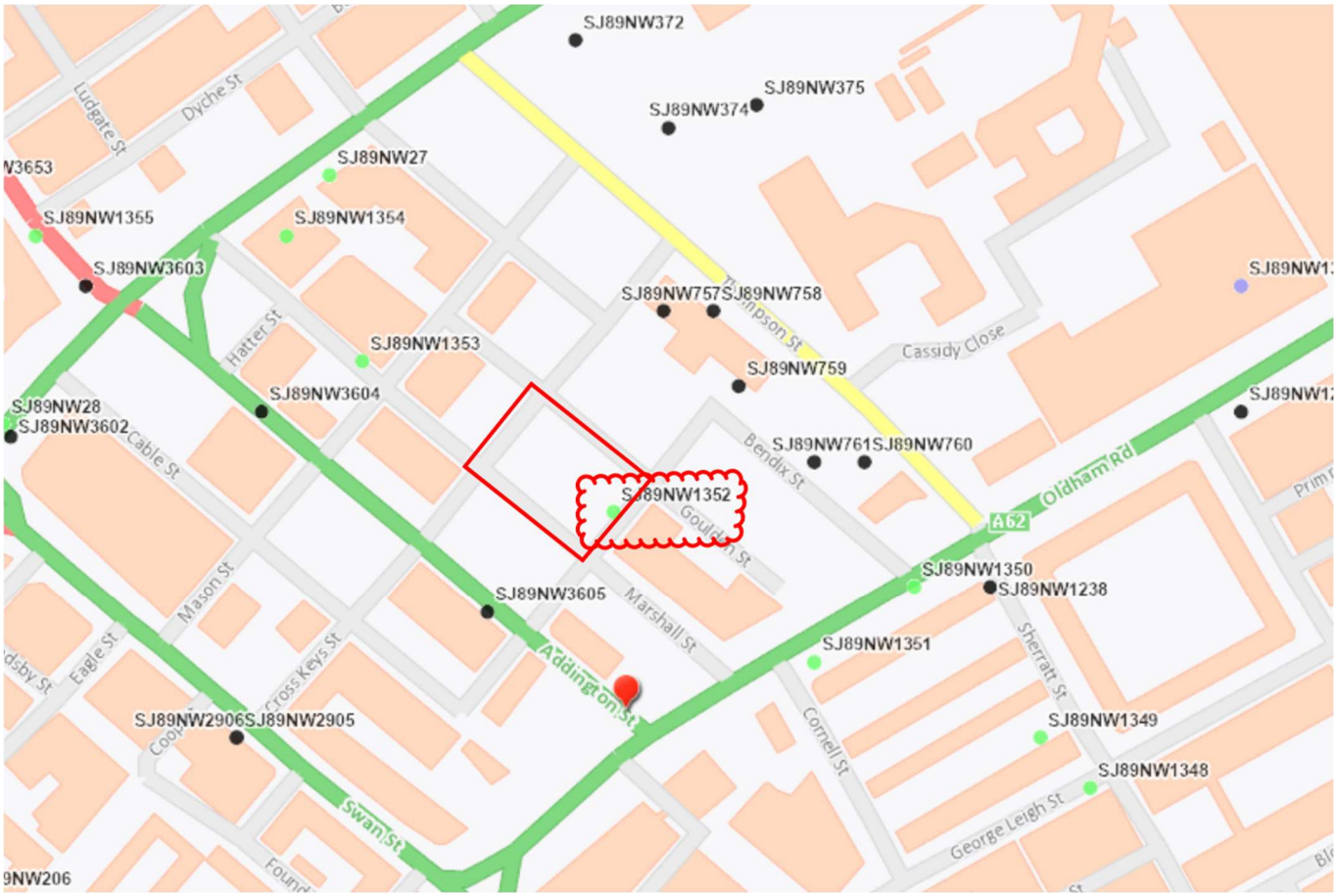



*Figure 6, BGS Online borehole viewer, with relevant borehole from Appendix B highlighted.*

# 3. Flood Risk Assessment

This section presents relevant policy and guidance used to inform the assessment of flood risk to the site, and the subsequent assessment based on various sources of flooding.

## 3.1 Relevant Policy and Guidance

### 3.1.1 National Planning Policy Framework (NPPF)

The National Planning Policy Framework document (NPPF) and the Planning Practice Guidance provide guidance on how flood risk should be assessed during the planning and development process.

The NPPF refers to the Flood Zones which are shown on the Environment Agency Flood Map, and establishes the range of uses which are appropriate, or compatible, land uses for each Flood Zone.

Annex 3 of the National Planning Policy Framework (NPPF) lists these land uses in the context of their flood risk vulnerability. The following extract below outlines the NPPF Flood Risk Vulnerability Classifications and their associated land uses:

**HIGHLY VULNERABLE**

- Police and ambulance stations; fire stations and command centres; telecommunications installations required to be operational during flooding.
- Emergency dispersal points.
- Basement dwellings.
- Caravans, mobile homes and park homes intended for permanent residential
- Installations requiring hazardous substances consent. (Where there is a demonstrable need to locate such installations for bulk storage of materials w port or other similar facilities, or such installations with energy infrastructure c carbon capture and storage installations, that require coastal or water-side locations, or need to be located in other high flood risk areas, in these instan facilities should be classified as 'Essential Infrastructure'.)

**MORE VULNERABLE**

- Hospitals
- Residential institutions such as residential care homes, children's homes, social services homes, prisons and hostels.
- Buildings used for dwelling houses, student halls of residence, drinking establishments, nightclubs and hotels.
- Non–residential uses for health services, nurseries and educational establishments.
- Landfill* and sites used for waste management facilities for hazardous waste.
- Sites used for holiday or short-let caravans and camping, subject to a specific warning and evacuation plan.

**LESS VULNERABLE**

- Police, ambulance and fire stations which are not required to be operational during flooding.
- Buildings used for shops; financial, professional and other services; restaurants, cafes and hot food takeaways; offices; general industry, storage and distribution; non-residential institutions not included in the 'more vulnerable' class; and assembly and leisure.
- Land and buildings used for agriculture and forestry.
- Waste treatment (except landfill* and hazardous waste facilities).
- Minerals working and processing (except for sand and gravel working).
- Water treatment works which do not need to remain operational during times of flood.
- Sewage treatment works, if adequate measures to control pollution and manage sewage during flooding events are in place.
- Car parks.

**WATER-COMPATIBLE DEVELOPMENT**

- Flood control infrastructure.
- Water transmission infrastructure and pumping stations.
- Sewage transmission infrastructure and pumping stations.
- Sand and gravel working.
- Docks, marinas and wharves.
- Navigation facilities.
- Ministry of Defence installations.
- Ship building, repairing and dismantling, dockside fish processing and refrigeration and compatible activities requiring a waterside location.
- Water-based recreation (excluding sleeping accommodation).
- Lifeguard and coastguard stations.
- Amenity open space, nature conservation and biodiversity, outdoor sports and recreation and essential facilities such as changing rooms.
- Essential ancillary sleeping or residential accommodation for staff required by uses in this category, subject to a specific warning and evacuation plan.

The Flood Zones can be summarised as follows:

**Zone 1**: Low Probability. This zone comprises land assessed as having a less than 1 in 1000 annual probability of river or sea flooding in any one year. (<0.1%)

**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 a 1 in 200 and 1 in 1000 annual probability of sea flooding (0.5% - 0.1%) in any year.

**Zone 3a**: High Probability. This zone comprises land assessed as having 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.

**Zone 3b**: Functional Flood Plain. This zone comprises land where water must flow or be stored in times of flood. Strategic Flood Risk Assessments should identify this zone.

The flood risk vulnerability and flood zone 'compatibility' has been summarised in Table 1 below. The EA presents a set of recommendations based on the level of vulnerability of a proposed structure and its flood zone.

*Table 1. Flood Risk Vulnerability Classification Table, with applicable categorisation highlighted*

| Flood Risk Vulnerability Classification | | Essential Infrastructure | Highly Vulnerable | More Vulnerable | Less Vulnerable | Water Compatible |
|---|---|---|---|---|---|---|
| Flood Zone | Zone 1 | √ | √ | √ | √ | √ |
| | Zone 2 | √ | Exception Test Required | √ | √ | √ |
| | Zone 3a | Exception Test Required | × | Exception Test Required | √ | √ |
| | Zone 3b (functional floodplain) | Exception Test Required | × | × | × | √ |
| | √ Development is appropriate | | × Development should not be permitted. | | | |

The flood zone categorisation for the site and evaluation of whether the development is appropriate is carried out in Section 3.1.2.

### 3.1.1 Site Specific NPPF Flood Risk Categorisation

To assess the NPPF flood risk classification for the site, the Government web based 'Flood Map for Planning' is reviewed. The flood map identifies the probability of flooding from rivers or sea (not considering the presence of flood defences). The Government web based 'Long Term Flood Risk Assessment for Locations in England' was also used to identify the flood risks from rivers and seas, surface water and reservoirs. The Flood Map for Planning and surrounding areas is shown in Figure 7 below.

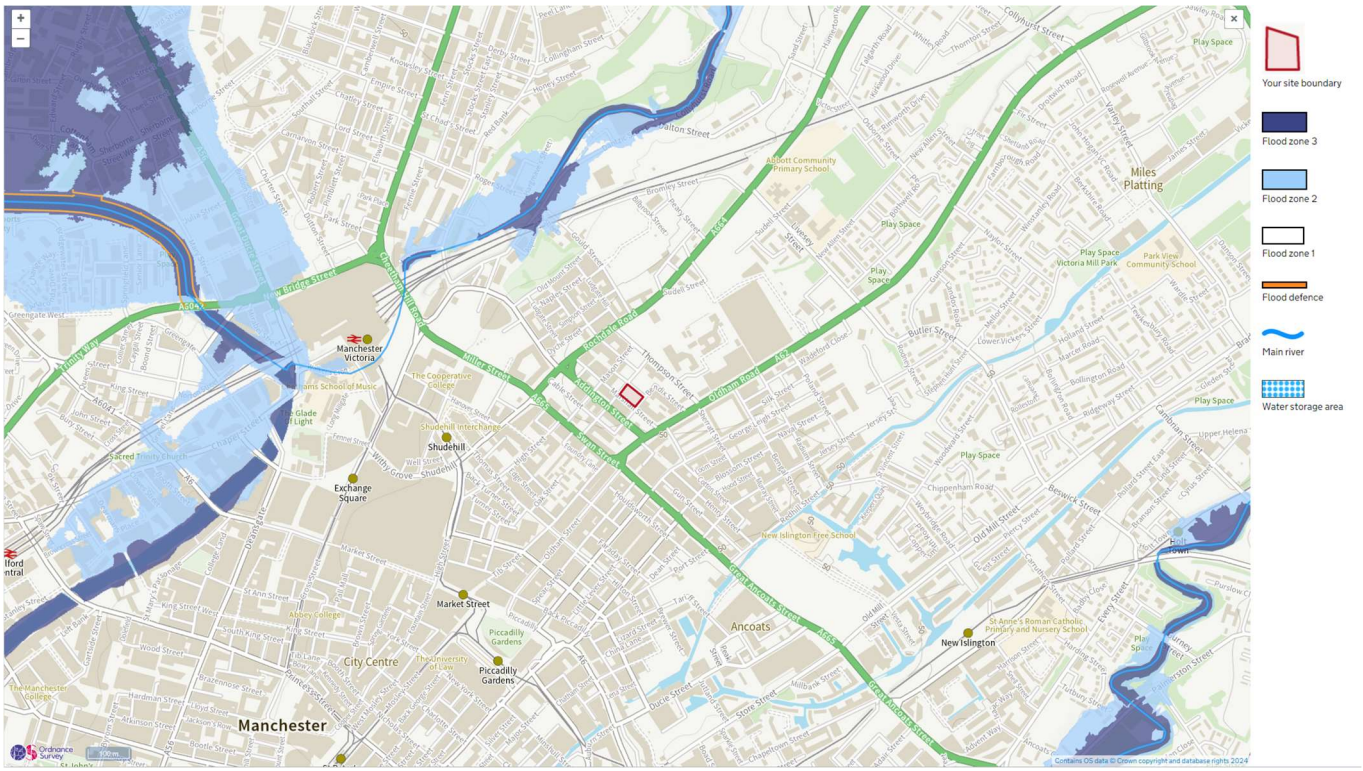



*Figure 7. Flood Map for Planning*

### 3.1.2 Site Specific Flood Zone Compatibility

The proposed development sits within Flood Zone 1, meaning there is a low probability of annual flooding from rivers and sea. As per Table 1 above, given that the development is within Flood Zone 1 and is considered as 'more vulnerable' the development is deemed appropriate and additionally does not require an exception test.

### 3.1.3 Manchester City, Salford City and Trafford Councils Level 2 Hybrid SFRA (2010)

Manchester City, Salford City and Trafford Councils SFRA states:

Manchester City Council's and Trafford Council's Sustainability Appraisal have a flood risk objective to *'Reduce the impacts of climate change'*, with the sub-objective to, 'minimise risk of flooding and increase use of Suds'. There are two indicators for Manchester and Trafford:

- New developments incorporating SuDS.
- New developments in Flood Zone 3

The key objectives of a SFRA are to:

- Investigate and identify the extent and severity of flood risk to the area at present and in the future, under the terms of PPS25.
- Contribute to the Council's Sustainability Appraisal (SA) and LDF.
- Enable the Council to apply the Sequential Test and the Exception Test.
- Provide strategic flood risk guidance and advice to planners and developers.
- Help LPAs to identify specific locations where further and more detailed flood risk data and assessment work is required. This includes the scope for Surface Water Management Plans (SWMPs) and/or Water Cycle Studies (WCSs).
- Identify the level of detail required for site-specific Flood Risk Assessments (FRAs).

Development should aim for a minimum reduction in surface water runoff rates of 50% for Brownfield sites, with an aim of reducing runoff to Greenfield rates up to a 1 in 100 year storm event, considering climate change.

## 3.2 Tidal/Fluvial (Rivers and Sea) Flood Risk

Fluvial (main river) flooding occurs when the capacity of a main river is exceeded, resulting in water overtopping its banks. Heavy or prolonged rainfall, melting of ice and snow and – in rivers subjected to tidal processes – high tides and storm surges are the primary causes of this source of flooding.

The EA Flood Map for Planning (Rivers and Sea) highlights the risk of flooding to the site from fluvial sources:

- Where a site is located in a dark blue shaded zone, this indicates that the site is within Flood Zone 3 where there is a chance of flooding of 1 in 100 (1%) or greater.
- Where a site is located in a light blue shaded zone; this indicates that the site is within Flood Zone 2 where there is a chance of flooding between 1 in 1000 (0.1%) and 1 in 100 (1%).
- Where a site is located in a white (unshaded) area, it is generally deemed to be classified as Flood Zone 1 where there is a chance of flooding of less than 1 in 1000 (0.1%).

The map, shown in Figure 8 below, indicates a very low probability of annual flooding from rivers and sea.

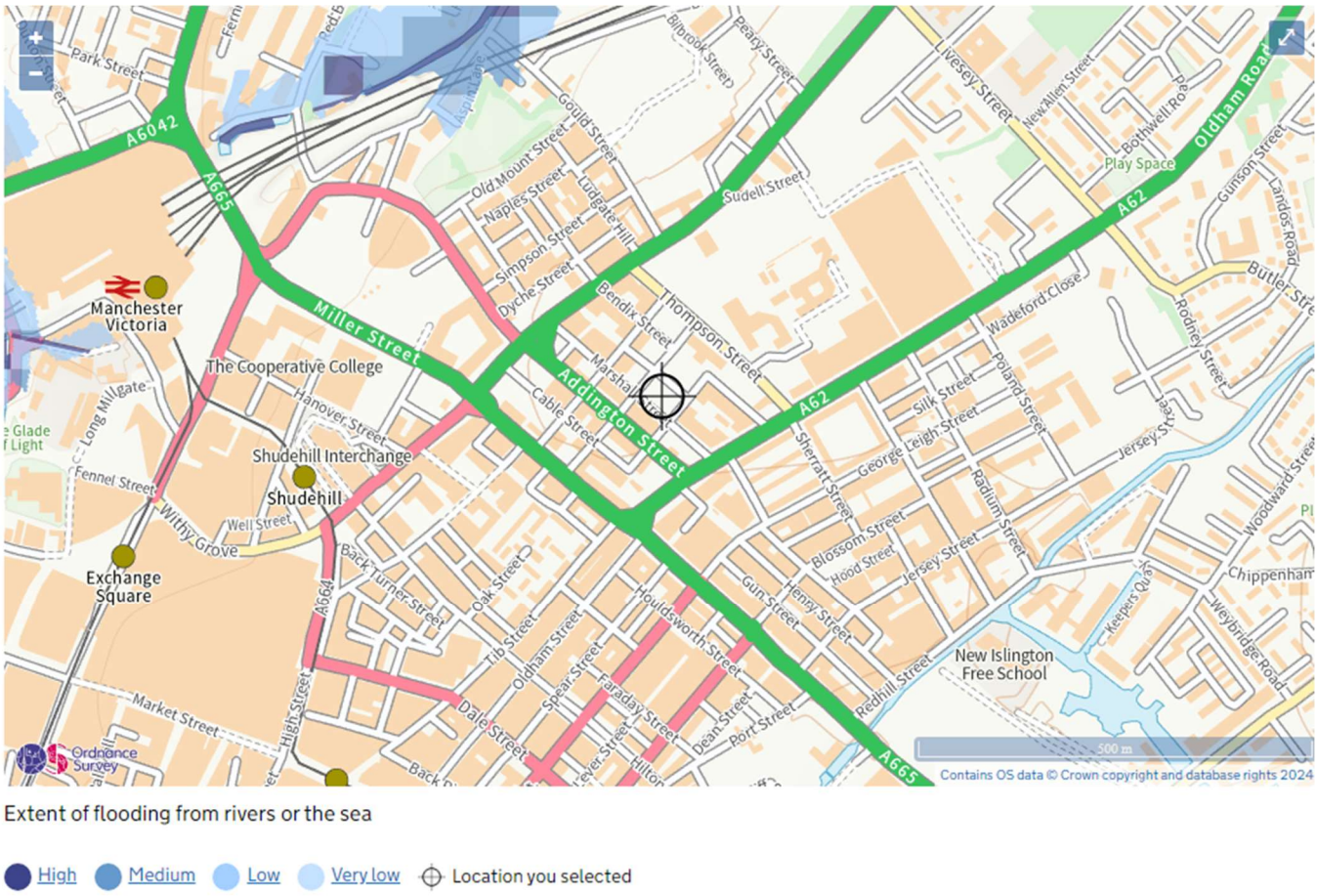
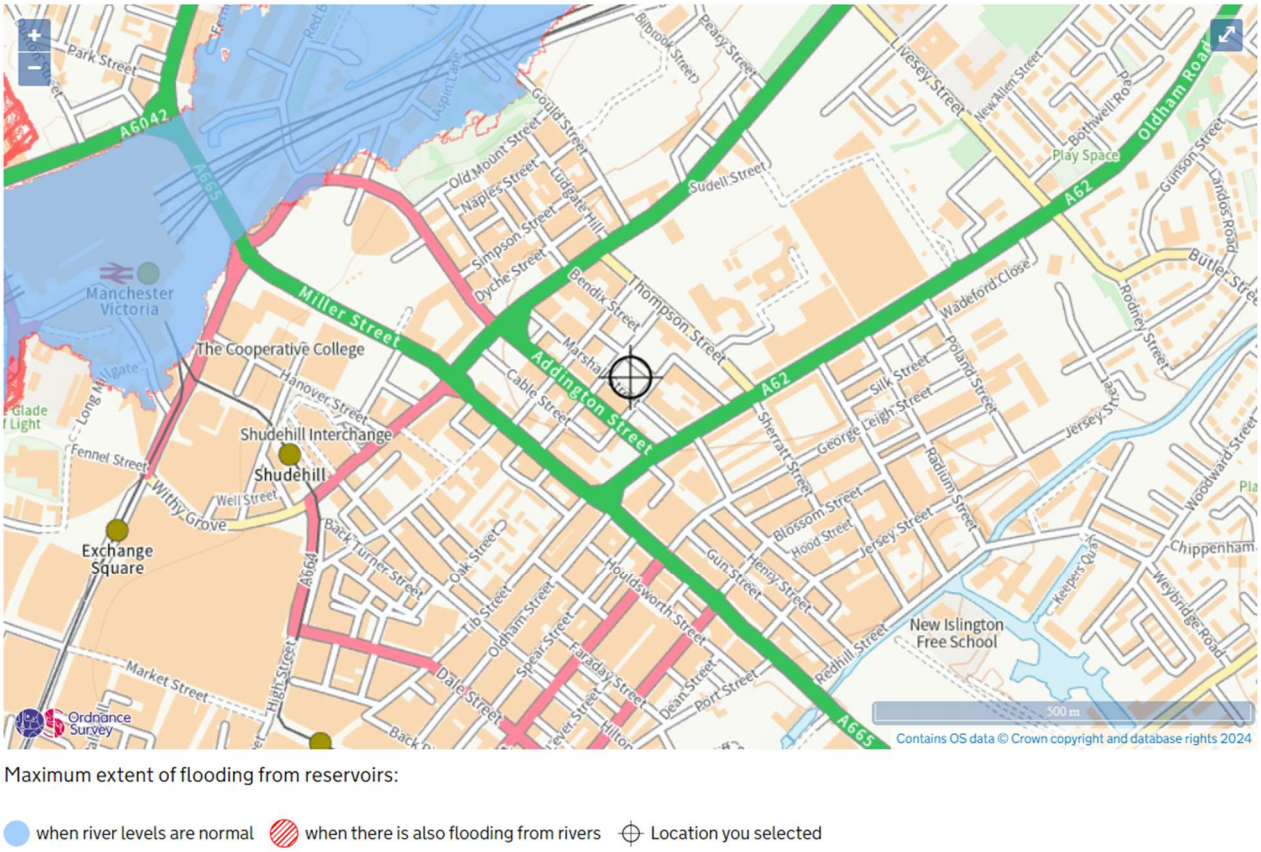



*Figure 8. Flood Risk Map from rivers or sea*

## 3.3 Reservoir Flood Risk

The 'Flood Risk Map from reservoirs', shown in Figure 9 below indicates a very low to zero probability of flooding from reservoirs.




Maximum extent of flooding from reservoirs:

when river levels are normal | when there is also flooding from rivers | Location you selected

*Figure 9. Flood Risk Map from reservoirs*

## 3.4 Groundwater Flood Risk

Groundwater flooding is the result of an elevated underground water table enabling water to permeate to the surface.

According to the Manchester City, Salford City and Trafford Council's Level 2 Hybrid SFRA, there is a moderate risk of alluvial groundwater flooding due to high river levels. However, as presented in section 2.4, the site geology features clay strata up to 12m depth. Based on the low permeability of the clay strata together with the sites proximity to the river it is considered that the site is at low risk of ground water flooding.

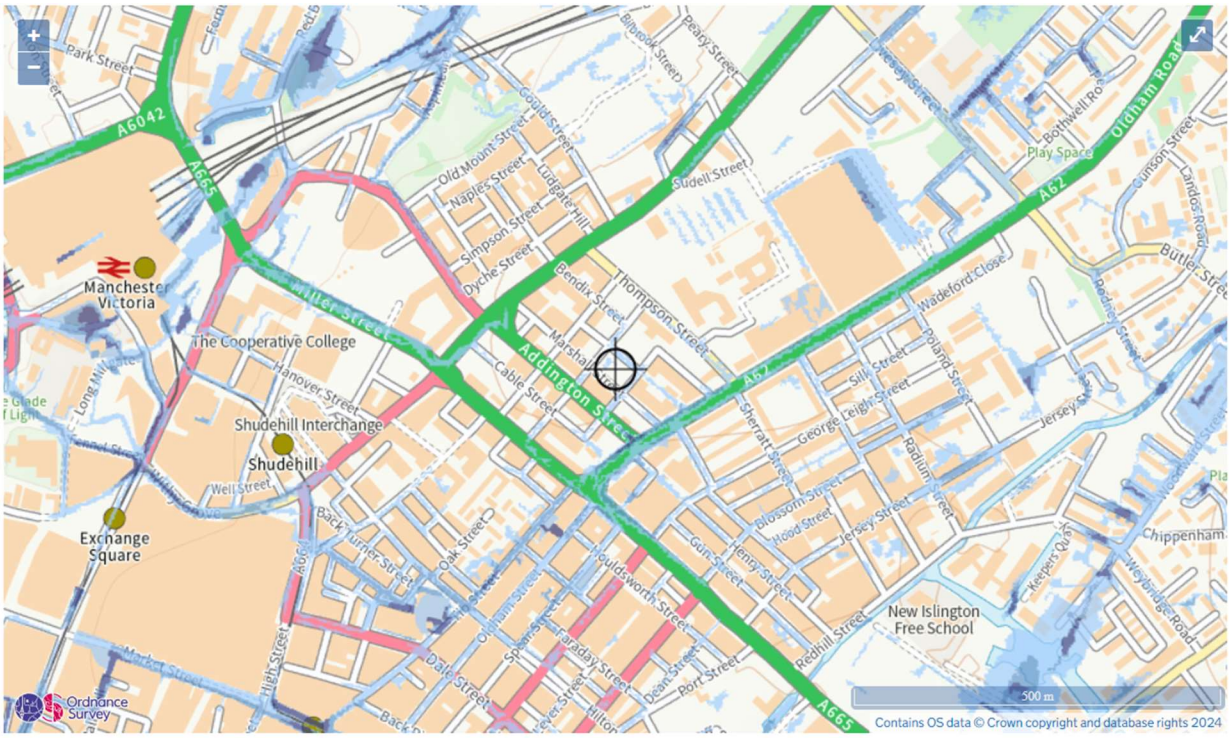
## 3.5 Surface Water Flood Risk

Surface water flooding can be caused when rainwater, during extreme rainfall events, does not drain away through the normal drainage system or soak into the ground. Surcharging sewers can result in overland flows which, if originating at a higher elevation than the development site, can potentially pose a flood risk.

Surface water flooding is dependent primarily on topography which dictates either the flow path of overland flow which is not contained within public sewers, or areas in which ponding may occur. Surface water flooding is more difficult to predict than the risk of flooding from Rivers or Sea as it is dependent on the amount of rain which will fall in a very localised area, the specific topography of that region and the capacity and functionality of the drainage network within that section.

From the UK Government's Flood Risk from Surface Water (extent of flooding) map.

- Where a site is in a dark blue shaded zone, this indicates that the site is at high risk of flooding where there is a chance of flooding of greater than 1 in 30 (3.3%).
- Where a site is in a mid-blue shaded zone, this indicates that the site is at medium risk of flooding where there is a chance of flooding of between 1 in 100 (1%) and 1 in 30 (3.3%).
- Where a site is in a light blue shaded zone; this indicates that the site is at low risk of flooding where there is a chance of flooding between 1 in 1000 (0.1%) and 1 in 100 (1%).
- Where a site is in a white (unshaded) area; this indicates that the site is at very low risk of flooding where there is a chance of flooding of less than 1 in 1000 (0.1%).




Extent of flooding from surface water

High Medium Low Very low Location you selected

*Figure 10. Surface Water Flood Risk Map*

The extent of flooding to the site from surface water is indicated in Figure 10 above. It shows that there is low risk of flooding to the northwest of the site, as well as on all 4 of the surrounding streets. The rest of the site has a very low surface water flood risk.

### 3.6 Sewer Flood Risk

Sewers may also flood due to exceeded capacity or blockages outside of major storm events. No data on the site's existing flood risk from sewers, including any historic records of sewer flood events, have been found as part of this Flood Risk Assessment. Data will be required from United Utilities to confirm this risk. Nevertheless, sewers are man-made infrastructure and are regularly monitored and maintained by the statutory undertaker United Utilities; the risk of sewer flooding is considered to be low.

### 3.7 Summary of Flood Risk

From the evidence collated and subsequent negotiations, the flood risk for the proposed development can be summarised as follows:

- Rivers and Sea – Very low risk
- Reservoir – Very low risk
- Groundwater – Low risk, TBC by site investigation
- Public Sewers – TBC by UU, presumed low
- Surface Water – Very Low risk (whilst areas of low risk are present, these affect only a small portion of the development and thus the overall risk is deemed to be very low).

## 4. Proposed Surface Water Drainage

It is recommended that any surface water drainage proposals aim to reduce the rate of runoff to improve the existing brownfield runoff rate from the site. This reduction in rate should be facilitated through implementation of Sustainable Drainage Systems (SuDS). Nature-based SuDS solutions can improve the quality of surface water discharged to the public sewer, whilst reducing the volume and flow rate of these discharges.

CIRIA C753 (The SuDS Manual) presents the four pillars of SuDS design: Water Quality, Water Quantity, Amenity and Biodiversity, as illustrated in Figure 11 below.

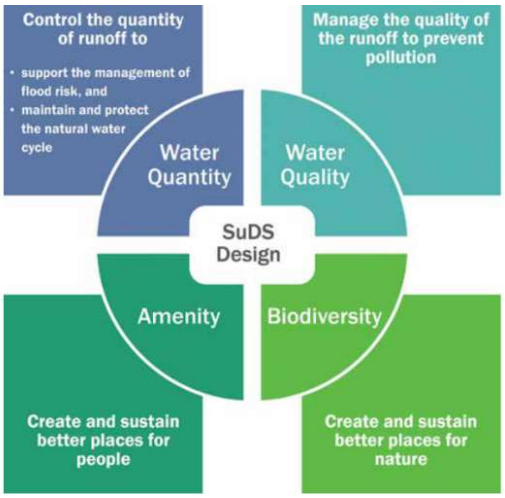



*Figure 11. Sustainability Development Objectives (Figure 2.1. of of CIRIA 753)*

The following sections describe how the proposed drainage design for the development should aim to satisfy these four pillars as well as mitigate the flood risks identified in the previous section.

## 4.1 Sustainable Drainage Systems (SuDS) Features

Table 2 summarises numerous SuDS components that have been adopted within the current strategy, are currently being considered, or have been deemed unsuitable for use; and explains the basis for these decisions.

*Table 2. Summary of SuDS components and assessment of their suitability for use within the proposed development.*

| SuDS Component | Description | Site Specific Suitability |
|---|---|---|
| SuDS considered feasible for implementation | | |
| Attenuation tanks | Attenuation storage tanks come in a variety of forms such as proprietary geo-cellular tanks and oversized pipes. They provide large amounts of attenuation and can be incorporated within highways and under landscaping, however, they provide limited benefit beyond this with regard to the SuDS pillars. | An attenuation tank in the form of a geocellular tank is currently proposed as part of the scheme located in the northern corner of the site. It has been advised that a minimum easement distance from proposed foundations is provided to facilitate access and maintenance. The proposed building will be set on piled foundations; therefore, no loading will be imposed onto the drainage assets. An easement of 2.5m has therefore been suggested to facilitate access for maintenance |
| Rainwater harvesting | Rainwater harvesting includes the collection and storage of rainwater from hardscaping and roofs for later reuse, generally in non-potable applications, providing attenuation benefits. | Rainwater harvesting is currently considered feasible as runoff from the proposed building's roof drainage system. Harvested rainwater could be reused in a proposed WC and/or for irrigation of planting during dry weather periods. |

| SuDS Component | Description | Site Specific Suitability |
|---|---|---|
| Permeable paving | Permeable paving incorporates voids in its surface to allow rainfall to percolate below ground at the point at which it falls. It removes the requirement to provide entry points (gullies etc.), provides pollution treatment and allows water to be stored within the aggregate sub-base of the paving. | Implementation of permeable paving on this site is considered feasible as part of an external pathway to the entrance of the building and will be considered in the design. |
| SuDS not considered feasible for implementation | | |
| Green/blue roofs | Green roofs involve the planting or vegetation on the roofs of buildings or structures, which intercept rainfall and provide attenuation and biodiversity benefits.<br>A blue roof is similar in that rainfall is intercepted but instead conveyed to a storage tank housed within the roof and therefore only provide attenuation benefit. | There are currently no proposals for the roof of the building to feature any accessible areas or amenities that could be used as green or blue roofs, therefore it is not considered feasible to implement them. |
| Rain gardens | Rain gardens are areas of planting that can provide surface water attenuation whilst increasing biodiversity and amenity. Rain gardens additionally provide improvements to water quality due to filtration of surface water runoff as it flows through the growing media of planting. | Some soft-landscaped areas have been proposed however they do not cover a large enough area and therefore it is considered unfeasible to provide the required volume of attenuation within them. |
| Tree planting | Similar to rain gardens, tree planting provides amenity, biodiversity, treatment, and small amounts of attenuation benefits within the tree's growing medium or 'pit'. | There are some proposed tree pits in the entrance courtyard however they do not cover a large enough area and therefore it is considered unfeasible to provide the required volume of attenuation within them. |
| Basins, ponds and swales | Basins, ponds and swales are large, often planted, depressions in the ground which can increase biodiversity and amenity of the area, provide more significant attenuation, and improve water quality.<br>Swales can be used adjacent to any impervious surfaces to collect surface water run off at source and convey it to downstream drainage infrastructure. | These features are unlikely to be applicable as they take up large amounts of usable space which would undermine architectural proposals for the site due to space limitations. |

The current preliminary surface water drainage design is presented in Appendix A.

## 4.2 Potential Proposed Drainage Outfalls

The National Planning Policy Framework (NPPF) Planning Practice Guidance Paragraph 080 states that:

***"Generally, the aim should be to discharge surface run off as high up the following hierarchy of drainage options as reasonably practicable:***

- ***into the ground (infiltration).***
- ***to a surface water body.***
- ***to a surface water sewer, highway drain, or another drainage system.***
- ***to a combined sewer."***

The proposed drainage outfalls for the site have been considered in line with this hierarchy below, and an assessment made of their suitability:

### Infiltration

The BGS geology data presented in Section 2.4 suggests estimated infiltration rates may not be sufficient for infiltration to be used as the primary method of discharge for the site, however components such as permeable paving may utilise infiltration as a secondary method of disposal. An intrusive Phase 2 site investigation and soakaway infiltration testing to BRE365 will be required to confirm feasibility of infiltration.

### Water Body

The Rochdale canal and the River Irk are both approximately 500m away from the site. A connection to these assets will require crossing large swathes of third-party land, requiring numerous agreements. A direct outfall from the site to a water body is therefore not considered feasible.

### Surface Water Sewer

According to the UU asset map shown in Figure 3, there are no public surface water sewers in the direct vicinity of the site. A CCTV survey or similar utility survey is recommended to confirm whether there is a feasible separated surface water sewer to connect into. Additionally, any connection to UU assets and discharge to public sewer would be subject to UU and LLFA approval.

### Combined Sewer

The UU asset map maps shown in Figure 3 show that there are combined public sewer runs surrounding the site, and it is currently assumed that the existing site drainage currently connects into one of these sewers. Following review of information obtained from the planning application from adjacent site, it is estimated that the depth of the sewer that runs underneath Goulden Street is approximately 4m, and the depth of the sewer hat runs under Cross Keys Street is approximately 7m deep. This would suggest that connection of the proposed network is feasible. The traces and inverts of the existing sewers are TBC by CCTV survey of the sewers surrounding the site. Additionally, any connection to UU assets and discharge to public sewer would be subject to UU and LLFA approval.

## 4.3 Water Quantity

### 4.3.1 Pre-development discharge rate

The SFRA states that:

***For all sites, development proposals should look at opportunities to incorporate SUDS to reduce the risk of surface water flooding (Sustainability Appraisal indicator). Surface water run-off from these sites should not increase as a result of development (reduced run-off should be sought, if possible, in some areas) and not discharge into the combined sewer system.***

Given the small area of the development site it is not practicable to restrict run off to greenfield run off rates. It is therefore proposed to restrict the development flows to the 1 in 1 year brownfield run-off rate with a 50% betterment. The existing site area is 0.131ha which produces a runoff rate of 5.46l/s based on a rainfall intensity of 50mm/hr which is the equivalent of a 1 in 1 year storm event. Applying a 50% betterment to the existing run off rate results in a restricted flow of 2.73l/s, however, in order to prevent pipe blockages, it is recommended that the minimum restricted flow rate is 3.5l/s. It is assumed that the current hardstanding areas drain to the existing public sewer which will need to be confirmed by a CCTV connectivity survey.

### 4.3.2 Environment Agency Climate Change Allowances

In May 2022, the EA released updated climate change allowances for peak rainfall intensities which should be applied to new developments. Figure 12 displays the climate change allowances for the Irwell Management Catchment, in which the site resides.

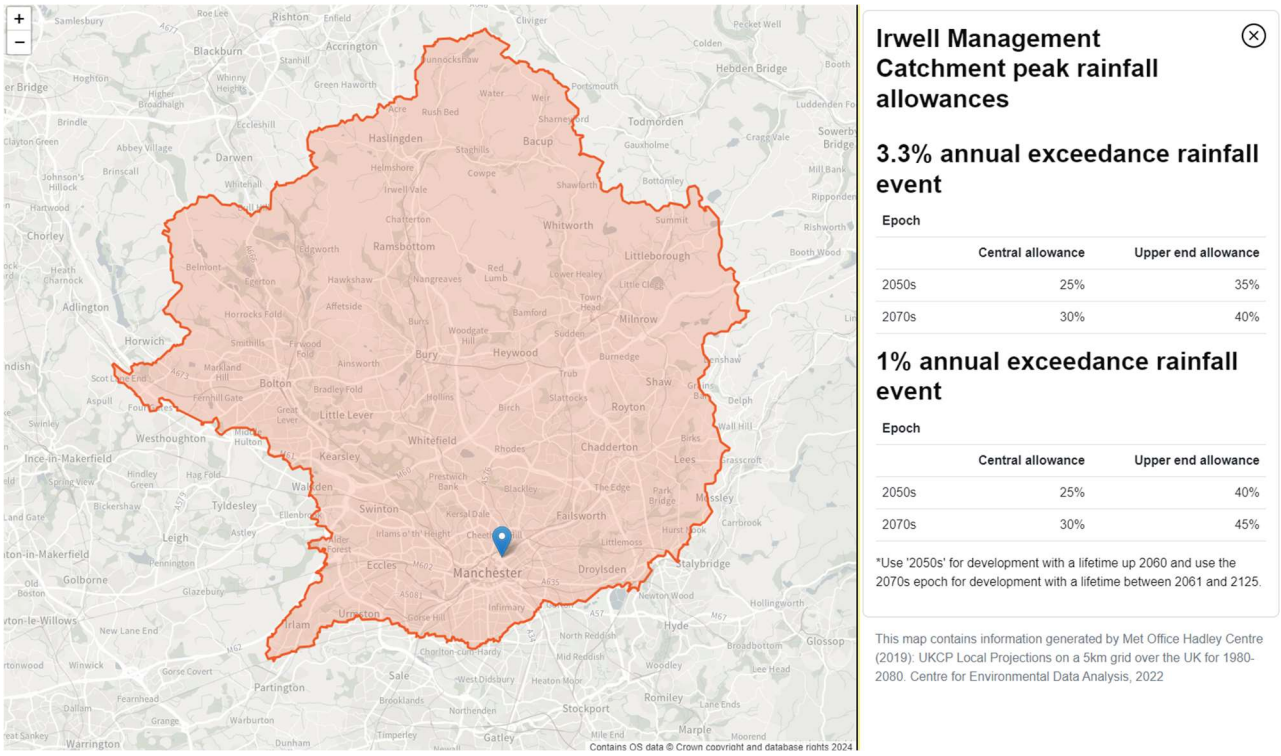



*Figure 12. Climate change allowances for peak rainfall intensities for the site*

Based on the nature of the development, a lifespan in excess of 60 years is anticipated and the upper end allowances have been adopted within the drainage calculations detailed above.

Where possible, flood water generated in storms with higher return periods up to the critical 1 in

100-year plus 45 % climate change storm event should be constrained within specified exceedance storage areas above ground so as not to cause damage to buildings, essential services, or adjoining developments.

### 4.3.3 Required Surface Water attenuation.

The required surface water attenuation volumes in order to achieve the reduced rates have been estimated using the HR Wallingford Surface water storage requirements for sites tool. The resulting rate is laid out in table below.

*Table 3 - required attenuation volume breakdown.*

| Improved rate | Approximate attenuation volume required to achieve rate reduction in the 1:100+45%CC year storm ($m^3$) |
|---|---|
| 3.5l/s | 48 |

The full calculations are attached in Appendix C.

The surface water runoff rate from the site is subject to the approval of the Lead Local Flood Authority (LLFA) and the Local Water Provider (United Utilities)

## 4.4 Water Quality

The SuDS design for the development site will ensure that the quality of any receiving water body is not adversely affected and preferably enhanced in accordance with CIRIA SuDS Manual C753, Chapter 4. The "CIRIA SuDS Manual (C753) Simple Index Approach to Proprietary/ Manufactured Stormwater Treatment Devices" will be used to show that the proposed SuDS features will provide adequate water treatment in terms of total suspended solids (TSS), hydrocarbons and metals.

| | Mitigation indices[1] | | |
|---|---|---|---|
| Type of SuDS component | TSS | Metals | Hydrocarbons |
| Filter strip | 0.4 | 0.4 | 0.5 |
| Filter drain | 0.4[2] | 0.4 | 0.4 |
| Swale | 0.5 | 0.6 | 0.6 |
| Bioretention system | 0.8 | 0.8 | 0.8 |
| Permeable pavement | 0.7 | 0.6 | 0.7 |
| Detention basin | 0.5 | 0.5 | 0.6 |
| Pond[4] | 0.7[3] | 0.7 | 0.5 |
| Wetland | 0.8[3] | 0.8 | 0.8 |
| Proprietary treatment systems[5,6] | These must demonstrate that they can address each of the contaminant types to acceptable levels for frequent events up to approximately the 1 in 1 year return period event, for inflow concentrations relevant to the contributing drainage area. | | |

**Notes**

1 SuDS components only deliver these indices if they follow design guidance with respect to hydraulics and treatment set out in the relevant technical component chapters.

2 Filter drains can remove coarse sediments, but their use for this purpose will have significant implications with respect to maintenance requirements, and this should be taken into account in the design and Maintenance Plan.

3 Ponds and wetlands can remove coarse sediments, but their use for this purpose will have significant implications with respect to the maintenance requirements and amenity value of the system. Sediment should normally be removed upstream, unless they are specifically designed to retain sediment in a separate part of the component, where it cannot easily migrate to the main body of water.

4 Where a wetland is not specifically designed to provide significantly enhanced treatment, it should be considered as having the same mitigation indices as a pond.

5 See Chapter 14 for approaches to demonstrate product performance. A British Water/Environment Agency assessment code of practice is currently under development that will allow manufacturers to complete an agreed test protocol for systems intended to treat contaminated surface water runoff. Full details can be found at: **http://tinyurl.com/qf7yuj7**

6 SEPA only considers proprietary treatment systems as appropriate in exceptional circumstances where other types of SuDS component are not practicable. Proprietary treatment systems may also be considered appropriate for existing sites that are causing pollution where there is a requirement to retrofit treatment. SEPA (2014) also provides a flowchart with a summary of checks on suitability of a proprietary system.

| Land use | Pollution hazard level | Total suspended solids (TSS) | Metals | Hydro-carbons |
|---|---|---|---|---|
| Residential roofs | Very low | 0.2 | 0.2 | 0.05 |
| Other roofs (typically commercial/ industrial roofs) | Low | 0.3 | 0.2 (up to 0.8 where there is potential for metals to leach from the roof) | 0.05 |
| Individual property driveways, residential car parks, low traffic roads (eg cul de sacs, homezones and general access roads) and non-residential car parking with infrequent change (eg schools, offices) ie < 300 traffic movements/day | Low | 0.5 | 0.4 | 0.4 |
| Commercial yard and delivery areas, non-residential car parking with frequent change (eg hospitals, retail), all roads except low traffic roads and trunk roads/motorways[1] | Medium | 0.7 | 0.6 | 0.7 |
| Sites with heavy pollution (eg haulage yards, lorry parks, highly frequented lorry approaches to industrial estates, waste sites), sites where chemicals and fuels (other than domestic fuel oil) are to be delivered, handled, stored, used or manufactured; industrial sites; trunk roads and motorways[1] | High | 0.8[2] | 0.8[2] | 0.9[2] |

**Notes**

1 Motorways and trunk roads should follow the guidance and risk assessment process set out in Highways Agency (2009).

2 These should only be used if considered appropriate as part of a detailed risk assessment – required for all these land use types (Table 4.3). When dealing with high hazard sites, the environmental regulator should first be consulted for pre-permitting advice. This will help determine the most appropriate approach to the development of a design solution.

*Figure 13. SuDS manual extracts showing breakdown of pollution indices.*

Figure 13 has been extracted from the SuDS Manual (CIRIA C753) to assess the pollution indices relative to the proposed development. Given the proposed development is a residential block, the corresponding pollution hazard level is determined to be 'Very low'.

Implementations of SuDS such as permeable pavements or can function as source control for hardstanding runoff, cleansing this runoff via filtration as it passes through filtration media.

### 4.5 Amenity & Biodiversity

The landscaping strategy for the development should be closely coordinated with proposed SuDS to provide amenity and biodiversity improvements across the site. Planting selection is to be appropriate for use within the proposed SuDS infrastructure. In particular, planting in rain gardens designed to attenuate stormwater runoff shall be tolerant to periods of waterlogged ground.

## 5. Proposed Foul Water Drainage

The foul water system must be designed in accordance with;

- BS EN 752:2008 (Drain and sewer systems outside buildings)
- Sewers for Adoption (6th Edition)
- Technical Guidance to the National Planning Policy Framework document (Department for Communities and Local Government, March 2012).
- BS EN 12056-2:2000 (Drainage systems inside buildings)
- Building Regulations Approved Document H, Drainage and waste disposal. (Office of the Deputy Prime Minister, December 2010).

The proposed foul water drainage network is proposed to be a traditional piped gravity network that conveys foul water flows from the proposed residential block as well as gullies receiving potentially contaminated flows within any proposed bin stores compound or similar areas that are likely to house contaminants. The current preliminary foul water drainage design is presented in Appendix A

All connections to the public sewer will be subject to agreement with United Utilities under Section 106 of the Water Industry Act 1991.

It is currently understood that a trade effluent agreement will not be required for the development.

## 6. Conclusions

This report has assessed the current risk of flooding to the New Cross residential block on New Cross Street, Manchester, which to be constructed on the site of an existing car park.

The assessment has been undertaken in accordance with the National Planning Policy Framework (NPPF) and associated guidance on flood risk and coastal change contained within the Planning Practice Guidance. The Manchester City, Salford City and Trafford Councils Level 2 Hybrid SFRA (2010) has served as a further source of information and guidance where relevant.

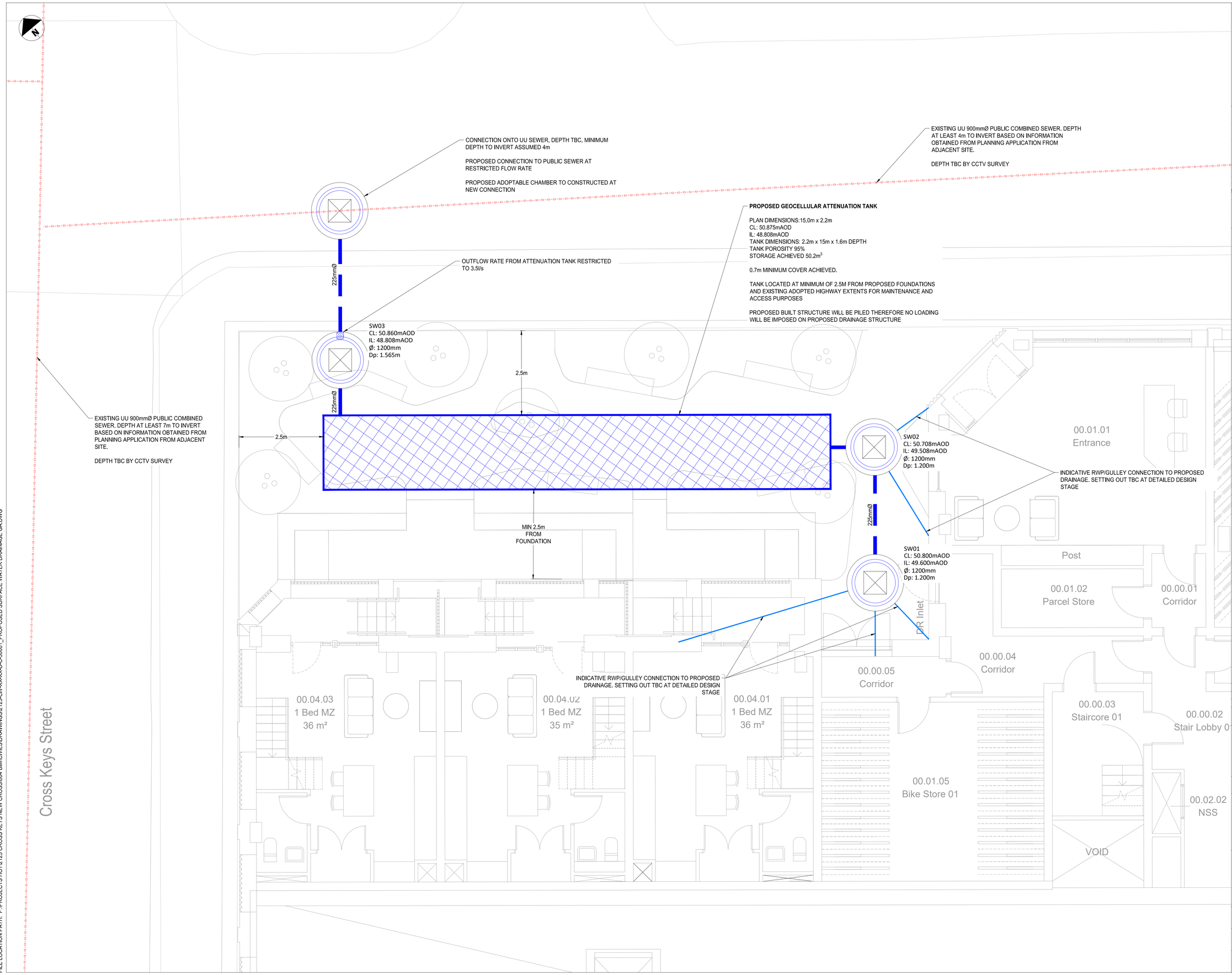
In its present form, the site is at very low risk from fluvial flooding and Environment Agency (EA) data places the site in Flood Zone 1. The majority of the site is additionally deemed to be at very low risk from surface water/pluvial flooding. It is noted that the surrounding carriageways are at a higher risk of pluvial flooding, as well as a small portion of the area within the site boundary. Groundwater flooding is deemed to be low risk pending confirmation via an invasive Phase 2 Site Investigation. The flood risk from public sewers is to be confirmed by United Utilities (UU) but is presumed low. Other sources of flooding – reservoirs and canals – are deemed very low risk.

It is recommended that the surface water drainage design includes SuDS in the drainage design and aims to reduce the impact of surface water flows and facilitate attenuation storage to provide a betterment on the site's existing runoff rate. The proposed site outfall location and surface water discharge rate is subject to the obtention of necessary agreements and approvals from the Lead Local Flood Authority (LLFA) and UU (where connections are to be made to UU assets).

Foul water flows from the proposed residential block, as well as gullies serving potentially contaminated flows from the site (i.e., from bin stores) will be required to be connected to be conveyed from the site to a foul or combined sewer. As above, any proposed connection is subject to approval from the LLFA and UU.

Overall, the development is deemed to have a low overall flood risk and is not expected to have a detrimental impact on flood risk in the area. Furthermore, it is recommended that the proposed development aims to provide a betterment on existing run-off rates, which would reduce the probability of flooding post-development both on-site and in the immediate vicinity.

**Appendix A** – 2123-CIV-XX-XX-D-C-30001 Proposed Surface Water Drainage GA, 2123-CIV-XX-XX-D-C-30002 Proposed Foul Water Drainage GA

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2. THIS DRAWING SHOULD NOT BE SCALED.
3. ALL DIMENSIONS ARE TO BE VERIFIED BY THE CONTRACTOR ON SITE.
4. ALL DISCREPANCIES SHOULD BE REPORTED TO C.A./E.A. PRIOR TO THE COMMENCEMENT OF WORKS.

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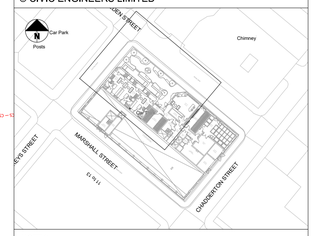


NOTES

1. SITE BOUNDARY, PROPOSED LAYOUT AND LEVELS BY LAYER STUDIO, DATED 05.02.24
2. EXISTING UU SEWER TRACE VIA CAD PACK OF PUBLIC RECORDS PRODUCED BY NOVO, DATED 14.12.23
3. ALL EXISTING SEWER TRACES, TYPES, CONDITIONS AND INVERTS ARE TO BE CONFIRMED VIA CCTV SURVEY. CCTV SURVEY ALSO REQUIRED TO DETERMINE EXISTENCE AND EXTENTS OF ANY EXISTING DRAINAGE ONSITE, INCLUDING EXISTING DISCHARGE POINTS AND FEASIBILITY OF RE-USE
4. ALL PROPOSED CONNECTIONS TO PUBLIC SEWER ARE SUBJECT TO S106 APPROVAL BY ASSET OWNER (UNITED UTILITIES)
5. SURFACE WATER DISCHARGE RATE SUBJECT TO APPROVAL OF LOCAL WATER PROVIDER (UU) AND LEAD LOCAL FLOOD AUTHORITY (LLFA)
6. NOT INDICATIVE OF FINAL DESIGN. ALL FIGURES AND PROPOSED LEVELS ARE APPROXIMATE AND SUBJECT TO CHANGE AS DESIGN DEVELOPS.

KEY

- SITE BOUNDARY
- PROPOSED SURFACE WATER MANHOLE
- PROPOSED SURFACE WATER DRAINAGE RUN
- INDICATIVE CONNECTION SPURS
- CS – CS – EXISTING UU COMBINED SEWER

| DATE | REV | DESCRIPTION | DRAWN | CHKD |
|---|---|---|---|---|
| 04.03.25 | P02 | UPDATED ARCHITECTS PLAN | ZHH | JF |
| 12.07.24 | P01 | SUBMITTED FOR INFORMATION | ZHH | JF |

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PROJECT

CROSS KEYS STREET
NEW CROSS

TITLE

PROPOSED SURFACE WATER DRAINAGE GA

| DRAWING STATUS | STATUS CODE |
|---|---|
| INFORMATION | - |

| CE PROJECT No. | SCALE @ A1 | DATE CREATED | DRAWN | CHECKED |
|---|---|---|---|---|
| 2123 | 1:50 | JUL '24 | ZHH | JF |

| DRAWING No. | REV |
|---|---|
| 2123-CIV-XX-XX-D-C-30001 | P02 |

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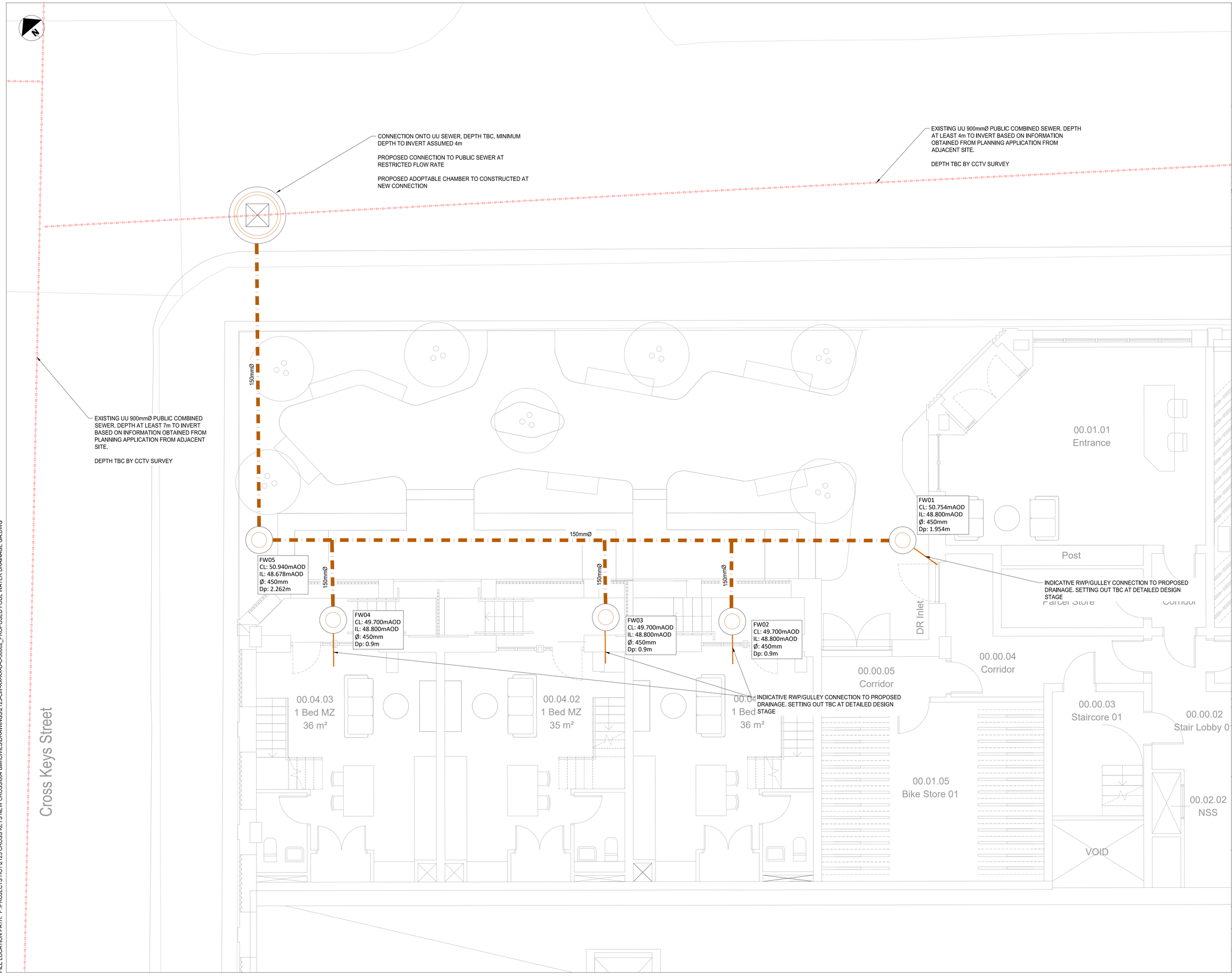


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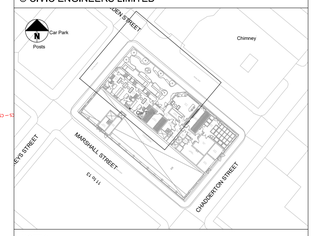


NOTES

1. SITE BOUNDARY, PROPOSED EXTERNAL LAYOUT AND LEVELS BY LAYER STUDIO, DATED 05.02.24
2. EXISTING UU SEWER TRACE VIA CAD PACK OF PUBLIC RECORDS PRODUCED BY NOVO, DATED 14.12.23
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4. ALL PROPOSED CONNECTIONS TO PUBLIC SEWER ARE SUBJECT TO S106 APPROVAL BY ASSET OWNER (UNITED UTILITIES)
5. NOT INDICATIVE OF FINAL DESIGN. ALL FIGURES AND PROPOSED LEVELS ARE APPROXIMATE AND SUBJECT TO CHANGE AS DESIGN DEVELOPS.

KEY

- SITE BOUNDARY
- PROPOSED SURFACE WATER MANHOLE
- PROPOSED SURFACE WATER DRAINAGE RUN
- INDICATIVE CONNECTION SPURS
- — CS — CS — EXISTING UU COMBINED SEWER

| DATE | REV | DESCRIPTION | DRAWN | CHKD |
|---|---|---|---|---|
| 04.03.25 | P01 | SUBMITTED FOR INFORMATION | ZHH | JF |

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PROJECT

CROSS KEYS STREET
NEW CROSS

TITLE

PROPOSED FOUL WATER DRAINAGE GA

| DRAWING STATUS | STATUS CODE |
|---|---|
| INFORMATION | - |

| CE PROJECT No. | SCALE @ A1 | DATE CREATED | DRAWN | CHECKED |
|---|---|---|---|---|
| 2123 | 1:50 | FEB '25 | ZHH | JF |

| DRAWING No. | REV |
|---|---|
| 2123-CIV-XX-XX-D-C-30002 | P01 |

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**Appendix B** – BGS Borehole Record SJ89NW1352

SJ89NW 8470 9885 1352

GEO – RESEARCH LTD. B/H No. 18

CONTRACT INNER RING ROAD, SECTION 2, PHASE I
LOCATION MANCHESTER

SHEET No. 1
No. of sheets 2

CLIENT
MANCHESTER CORPORATION

Percussion: SPT U D B
Rotary: Cored runs O/H
Legend

CASING
Size 0.150 to 3.040 Size to.

Ground Level 49.76m
Commenced 4/12/71
Completed 6/12/71

Weather FINE

| STRATUM. (Scale: 20mm to 1 metre) 1. Thickness | Depth 2.m | Sample No. | Blow Count (N) LL/PL/PI | M.C % Core Rec. % 6. | Type of Test 7. | Grading % Passing Sieve mm 75 mm 2.40 | mm 40 µm 600 | mm 20 µm 210 | mm 10 µm 150 | mm 5 µm 75 | TRIAXIAL TEST Bulk Density Kg/m³ | Dev. Stress kN/m² | Lat. U.C.T. Pres. Stren. kN/m² kN/m² Shear/χ° kN/m² | WATER REMARKS 10. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Tarmac, flagstones, cinder and brown CLAY (Fill) (iii) 1.82 | 1.82 | | | | | | | | | | | | | |
| Firm to hard brown silty CLAY with occasional pebbles (Boulder Clay) (i) | 1.98 | D1 | | 19.3 | | | | | | | | | | |
| | 2.13 | U1 | 40.13.27. (CI) | 20.3 | | | | | | | 2080 | 228 | 100 | |
| | | | | 19.5 | TAQ | | | | | | 2060 | 255 | 200 | |
| | | | | 22.5 | | | | | | | 2030 | 167 | 400 | |
| | | | | | | | | | | | | | 108/0° | |
| | 3.50 | D2 | | 19.7 | | | | | | | | | | |
| | 3.65 | U2 | 42.19.23. (CI) | 20.2 | | | | | | | 2090 | 476 | 100 | |
| | | | | 20.2 | TAQ | | | | | | 2080 | 471 | 200 | |
| | | | | 20.1 | $SO_3S$ | 0.02 | | | | | 1990 | 460 | 400 | |
| | | | | | | | | | | | | | 235/0° | |
| | 5.02 | D3 | | 22.0 | | | | | | | | | | |
| | 5.18 | U3* | | 19.3 | | | | | | | 2070 | 235 | 100 | |
| | | | | 19.7 | TAQ | | | | | | 2100 | 219 | 200 | |
| | | | | 21.8 | | | | | | | 2060 | 197 | 400 | |
| | | | | | | | | | | | | | 109/0° | Damp |
| | 6.40 | D4 | | 19.6 | | | | | | | | | | |
| | 6.70 | U4* | | 18.1 | | | | | | | 2060 | 163 | 100 | |
| | | | | 17.8 | TAQ | | | | | | 2120 | 194 | 200 | |
| | | | | 18.2 | | | | | | | 2070 | 180 | 400 | |
| | | | | | | | | | | | | | 90/0° | |
| | 8.07 | D5 | | 18.4 | | | | | | | | | | |
| | 8.22 | U5* | 55.17.38. (CH) | 30.1 | | | | | | | 1910 | 133 | 100 | |
| | | | | 30.0 | TAQ | | | | | | 1890 | 114 | 200 | |
| | | | | 30.2 | | | | | | | 1900 | 105 | 400 | |
| | | | | | | | | | | | | | 59/0° | |
| 7.18 | 9.00 | | | | | | | | | | | | | |

Continued on Sheet 2.

REMARKS:
Trial Pit dug for Services
1.520 x 1.220 x 1.830

* Consolidation Results – see separate sheet.

| Sample | Depth m | M.C. % D.W. | S.G. | C. B. R. Air Voids | Type | TOP 0.1 | TOP 0.2 | BOTTOM 0.1 | BOTTOM 0.2 | Value | COMPACTION B.S. 1377 No. | Max. Dry Density | Opt. M.C. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| U1 | 2.13 | | 2.65 | 5% | Static | 6 | 5 | 5 | 5 | | | | |
| U2 | 3.65 | | 2.65 | 4% | Static | 6 | 5 | 4 | 3 | | | | |

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For other symbols used see overleaf

SJ89NW 1352

GEO – RESEARCH LTD. B/H No. 18

CONTRACT INNER RING ROAD, SECTION 2, PHASE I
LOCATION MANCHESTER
SHEET No. 2
No. of sheets 2

CLIENT
MANCHESTER CORPORATION

Percussion: SPT U D B
CASING: Size 0.150 to 3.040 Size to.
Ground Level 49.76m
Commenced 4/12/71
Completed 6/12/71

Weather FINE

Rotary: Cored runs, O/H
Legend

| STRATUM. (Scale:20mm to 1 metre) 1. Thickness | Depth 2.m | Sample No. | Blow Count (N) LL/PL/PI | M.C % Core Rec. % 6. | Type of Test 7. | Grading % Passing Sieve 8 Results of any other Tests: 75 mm / 40 mm / 20 mm / 10 mm / 5 mm; 2.40 mm / 600 µm / 210 µm / 150 µm / 75 µm | TRIAXIAL TEST: Bulk Density Kg/m³ | Dev. Stress kN/m² | Lat. U.C.T. Pres. Stren. kN/m² kN/m² Shear/χ° kN/m² | WATER REMARKS 10. |
|---|---|---|---|---|---|---|---|---|---|---|
| Firm to hard brown silty CLAY with occasional pebbles | 9.00 | | | | | | | | | |
| | 9.60 | D6 | | 16.3 | SO3S | 0.03 | | | | |
| (Boulder Clay) | 9.75 | U6 | | 16.2 | | | 2160 | 330 | 100 | |
| (i) | | | | 15.8 | TAQ | | 2160 | 385 | 200 | |
| | | | | 15.6 | | | 2150 | 379 | 400 182/0° | Damp |
| | 11.27 | D7 | | 15.8 | | | | | | |
| | 11.58 | U7 | | 15.9 | | | 2130 | 277 | 100 | |
| | | | | 16.5 | TAQ | | 2140 | 366 | 200 | |
| 3.03 | 12.03 | | | 16.2 | | | 2170 | 385 | 400 171/0° 110/8° | Water Table Not Establishe |
| | | | BOREHOLE | | COMPLETE | | | | | |

REMARKS:

| Sample | Depth | M.C. % D.W. | | C. B. R.: Air Voids | Type | TOP 0.1 | TOP 0.2 | BOTTOM 0.1 | BOTTOM 0.2 | Value | COMPACTION: B.S. 1377 No. | Max. Dry Density | Optm. M.C. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | | |

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**Appendix C** – HR Wallingford Calculation Sheet

# Surface water storage requirements for sites

www.uksuds.com | Storage estimation tool

| | |
|---|---|
| Calculated by: | Zakir Hafeji |
| Site name: | New Cross |
| Site location: | Cross Keys Street |

This is an estimation of the storage volume requirements that are needed to meet normal best practice criteria in line with Environment Agency guidance "Rainfall runoff management for developments", SC030219 (2013), the SuDS Manual C753 (Ciria, 2015) and the non-statutory standards for SuDS (Defra, 2015). It is not to be used for detailed design of drainage systems. It is recommended that hydraulic modelling software is used to calculate volume requirements and design details before finalising the design of the drainage scheme.

## Site Details

| | |
|---|---|
| Latitude: | 53.48628° N |
| Longitude: | 2.23232° W |
| Reference: | 2792470424 |
| Date: | Jul 05 2024 15:00 |

## Site characteristics

| | |
|---|---|
| Total site area (ha): | 0.131 |
| Significant public open space (ha): | 0 |
| Area positively drained (ha): | 0.131 |
| Impermeable area (ha): | 0.131 |
| Percentage of drained area that is impermeable (%): | 100 |
| Impervious area drained via infiltration (ha): | 0 |
| Return period for infiltration system design (year): | 10 |
| Impervious area drained to rainwater harvesting (ha): | 0 |
| Return period for rainwater harvesting system (year): | 10 |
| Compliance factor for rainwater harvesting system (%): | 66 |
| Net site area for storage volume design (ha): | 0.13 |
| Net impermable area for storage volume design (ha): | 0.13 |
| Pervious area contribution to runoff (%): | 30 |

* where rainwater harvesting or infiltration has been used for managing surface water runoff such that the effective impermeable area is less than 50% of the 'area positively drained', the 'net site area' and the estimates of $Q_{BAR}$ and other flow rates will have been reduced accordingly.

## Methodology

| | |
|---|---|
| esti | IH124 |
| $Q_{BAR}$ estimation method: | Calculate from SPR and SAAR |
| SPR estimation method: | Calculate from SOIL type |

## Soil characteristics

| | Default | Edited |
|---|---|---|
| SOIL type: | 4 | 4 |
| SPR: | 0.47 | 0.47 |

## Hydrological characteristics

| | Default | Edited |
|---|---|---|
| Rainfall 100 yrs 6 hrs: | -- | 55 |
| Rainfall 100 yrs 12 hrs: | -- | 72.45 |
| FEH / FSR conversion factor: | 1.15 | 1.15 |
| SAAR (mm): | 891 | 891 |
| M5-60 Rainfall Depth (mm): | 17 | 17 |
| 'r' Ratio M5-60/M5-2 day: | 0.4 | 0.4 |
| Hydological region: | 10 | 10 |
| Growth curve factor 1 year: | 0.87 | 0.87 |
| Growth curve factor 10 year: | 1.38 | 1.38 |
| Growth curve factor 30 year: | 1.7 | 1.7 |

## Design criteria

| | | | | |
|---|---|---|---|---|
| Climate change allowance factor: | 1.4 | Growth curve factor 100 years: | 2.08 | 2.08 |
| Urban creep allowance factor: | 1.1 | $Q_{BAR}$ for total site area (l/s): | 0.84 | 0.84 |
| Volume control approach | Use long term storage | $Q_{BAR}$ for net site area (l/s): | 0.84 | 0.84 |
| Interception rainfall depth (mm): | 5 | | | |
| Minimum flow rate (l/s): | 3.5 | | | |

## Site discharge rates

| | Default | Edited |
|---|---|---|
| 1 in 1 year (l/s): | 3.5 | 3.5 |
| 1 in 30 years (l/s): | 3.5 | 3.5 |
| 1 in 100 year (l/s): | 3.5 | 3.5 |

## Estimated storage volumes

| | Default | Edited |
|---|---|---|
| Attenuation storage 1/100 years ($m^3$): | 48 | 48 |
| Long term storage 1/100 years ($m^3$): | 0 | 0 |
| Total storage 1/100 years ($m^3$): | 48 | 48 |

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

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