

RIDGE

ROBERT STREET, MANCHESTER, FRA AND DRAINAGE STRATEGY REPORT

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ROBERT STREET
DRAINAGE STRATEGY REPORT
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1. EXECUTIVE SUMMARY

1.1.1. This report summarises the Flood Risk and details out the Drainage Strategy of the Robert Street development.

1.1.2. To avoid any pre commencement drainage related planning conditions, this report has been prepared with additional drainage information.

1.1.3. The proposed new development is currently located on greenfield area. The assessment is based on the development proposed on the general arrangement which is provided in **Appendix A. Table 1** below provides a summary of the SuDS and drainage strategy for the scheme.

Table 1 – Drainage / SuDS Summary

Item	Brief Description
Geology	British Geological Survey (BGS) data from indicates that the site is underlain by **till, devensian - diamicton**, with bedrock geology **Chester Formation - Sandstone.** There is no borehole data available on the site, awaiting site investigation.
Infiltration Rate	Infiltration is **unlikely to be feasible** due to the geology of the site. However, infiltration testing for the site has not yet taken place, so it has **not yet been discounted** as a method of drainage.
Nearest Watercourses	The closest watercourse is the is the River Irwell, it passes to the west and south of the site, its closest point being around 300m to the west of the site. See **section 3.3.**
Nearest Adopted Sewers	United Utilities mapping shows there are existing combined sewers in proximity to the site running along the site boundary within both Robert Street and Dutton Street. There are no surface water sewers in the vicinity of the site.
Surface Water Outfall and SuDS Hierarchal Approach	Based on the above, Infiltration –**not yet discounted**. There are limited areas available for Infiltration via soakaway that are at least 5m away from any structure or highway, these areas are illustrated in a plan found in **Appendix D**. Falling head tests are proposed to take place when the Phase 2 SI is undertaken at a later date. This will confirm whether the soils are suitable for infiltration. Watercourse – Due to the distance of the River Irwell from the site and the fact that a connection would need to cross a considerable amount third party land, a connection is **not feasible**. The presence of an underground watercourse has also been disproved, **see section 3.3**. Surface Water Sewer – This approach is **not feasible** due to no adopted surface water sewers being present nearby. Combined Water Sewer – This approach is **feasible** due to connections to nearby combined United Utilities sewer.

Item	Brief Description
Existing Discharge Rate	The Existing Greenfield rates are from Infodrainage and its runoff rate calculation tool. Calculations can be found in **Appendix C.** QBAR Rural: **1.6 l/s** Q 1(years): **1.4 l/s** Q 30(years):` **2.7 l/s** Q 100(years): **3.3 l/s** As the site is also brownfield, existing drainage rate has also been assessed using the modified rational method and a rainfall intensity of 35mm/hr. Q = CIA Q = 2.78 x 35 x 0.25 = **24.325 l/s** No CCTV survey has taken place.
Proposed Discharge Rate	For the Robert Street development to comply with non-statutory technical standards for sustainable drainage systems, the **maximum allowable runoff rate should be limited to 1.4l/s** for the **1year** storm and **1.6 l/s** for both **30year and 100year** year storms. However, a flow this small is **not possible as the hydrobrake orifice size must be no smaller than 75mm** to prevent blockages. The difference in levels between the north and south of the site means that draining the site with one network is not feasible. Instead, there will be two separate systems to drain the private courtyard and main structure, with another system draining the public realm. The northern network will have its outflow limited to **3.8 l/s for the 100year + 45% Climate Change event** by a hydrobrake. Flow from the southern network will be limited to **1.2 l/s** with a 25mm orifice the same event. The porous paving being used to drain the southern section reduces risk of blockages downstream and so allows section allows for the use of a smaller orifice. The total discharge rate into the public sewer will therefore **be limited to 5.0 l/s**. This is assessed to be a reduction of circa 80% based on brownfield flows and is as close to greenfield rates as is practical.
Allowance for Climate Change	**Irwell Management Catchment, Upper End Allowance, 2070's** **3.3% AEP – 40%** **1% AEP 45%** The climate change allowances highlighted above has been applied to the modelled drainage calculations

Item	Brief Description
Proposed Attenuation Method and Volume	A geocellular tank will be used to store water within the northern drainage system. The volume of the tank will need to be **55m³** to contain the **100year + 45% event** and **40m³** to contain the **30year + 40% event**. A geocellular tank and three areas of porous paving will be used to attenuate the southern network. Total attenuation for this network will be **17m³** for the **100year + 45% event** and **12m³** to contain the **30year + 40% event**.
SuDS features	Two cellular storage tanks will be used to store surface water runoff one located in each of the private courtyard and another in the public realm. Permeable paving will be used in the public realm, these methods will control the quantity of water, preventing any flooding. There is also potential for the use of tree pits in the outdoor areas as another method of attenuation source control and will provide amenity and biodiversity benefits.
Maintenance Responsibility	Management Company / Site owner
Foul Drainage Outfall	Foul water will be drained to combined sewers belonging to united utilities, there are three manholes within close proximity to the site which can be considered.

1.1.4. There is no residual flood risk from the development site to the surrounding district due to the mimicking of existing greenfield storm water flow rates. Therefore, the development does not increase the risk of flooding to the other adjacent properties and roads. The site surface water drainage system will be designed in accordance with the requirements of the NPPF. Events up to the 30 year will be stored below ground in Cellular Storage. Events in excess of the 30 year and up to the 100 year +45% events may be allowed to flood, but this will be controlled on site. Out of chamber or gully flooding for the events in excess of the 100-year plus 45% climate change event may occur within the development site and is classed as exceedance flows. Flood water from this event will be contained within the development site and directed away from the buildings and to the external hard and soft landscapes.

2. THE SITE

2.1. Site Details

2.1.1. The site details are summarised in **Table 2** below:

Table 2: Site Referencing Information

Item	Brief Description
Site name	Robert Street
Site address and location	24 Robert Street, Manchester, M3 1EY
Planning Authority	Manchester City Council
Lead Local Flood Authority	Manchester City Council
Drainage Statutory Undertaker	United Utilities
Site Area	0.25 Ha
Flood Risk for Planning	Low
Approximate Grid Reference	OS: 383874, 399370
General Locality	The site is located to the north of Manchester City Centre, approximately 300m North of Victoria Station.

2.2. Site Description

2.2.1. The existing site and surrounding boundary conditions is shown **Figure 1**. The redline boundary denotes the detailed application boundary.

2.2.2. The area of the proposed development is approximately 0.25 Ha and is located to the North of Manchester city Centre. The site is bordered to the north by an existing structure and to the south and east is Dutton Street and Robert Street, to the West is a car park and small building. The site of the proposed development itself is brownfield, consisting of a tarmac carpark, there is also an existing structure within the north section of the site. Surface water drainage for the existing site is assumed to be collected on site and discharged to the surrounding combined sewers. A CCTV survey will be completed a later stage.

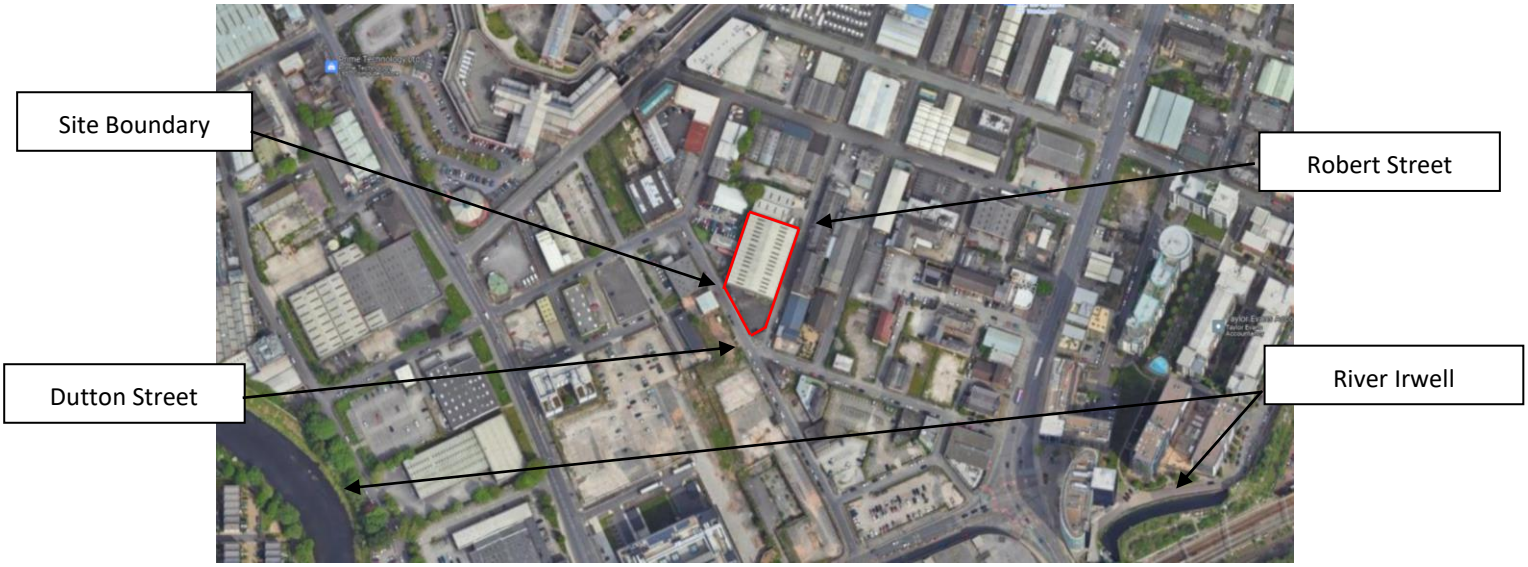


Figure 1: Aerial Photograph of Existing Site (Google, 2024)

2.3. Proposed Development

2.3.1. The report is prepared to support the planning application for the erection of a part 10, part 14 and part 19 storey residential building, comprising 198 apartments (Use Class C3) together with associated residents' amenity space, cycle parking, substation, servicing and associated landscaping works following demolition of existing buildings.

2.3.2. The new development extends to approximately 0.25 Ha in area.

2.3.3. The site can be accessed through private road to the east, via Dutton Street or Robert Street itself.

2.3.4. The current outline General Arrangement of the proposed development attached within **Appendix A** provides an indication of the proposals of the site.

3. ASSESMENT OF FLOOD RISK ON ROBERT STREET DEVELOPMENT SITE (PROBABILITY)

3.1. Summary

3.1.1. **Table 3** below considers each of the sources and defines in tabular format the Probability of Flood Risk associated to each and the likely impacts to the Robert Street Site. Below is the table summary of the flood risks associated with the Ribert Street site.

3.2. Fluvial Flood Risk

3.2.1. The River Irwell to the south and west of the site poses the greatest flood risk to the development.

3.2.2. The site sits within flood zone 1 as seen in **Figure 2,** meaning it is at low risk of fluvial flooding.

3.2.3. Flood data for the 1000year event, see **Appendix B**, indicates that the worst-case flood level from the watercourse adjacent to the site is 30.55m AOD. The minimum FFL is 41.050m, well clear of the design flood level.

3.3. Flood Risk from Lost Watercourse

3.3.1. Manchester city council has suggested that there may be a historical lost watercourse running east to west into the river Irwell, beneath the proposed development. If present, a lost watercourse would need to be considered throughout the development of the project and its potential flood risk assessed.

3.3.2. The Boddington Culvert report from SGI has investigated the presence of the potential hidden watercourse. It shows that historical mapping from 1892 to present day reveals no sign of the watercourse existing with structures being located over the approximate watercourse route. There is also a plan from 1771, prior to any developments, this also shows no sign of there being any watercourse present.

3.3.3. The hidden watercourses of Manchester report was produced to investigate the presence of various 'hidden watercourses' in Manchester. It was produced in 2009 by Scott Wilson for the Environmental Agency. In comparison to the SGI report, this does suggest the presence of a watercourse. The report refers to 'Strangeways Brooks', one of which being located within proximity to the Robert Street development.

3.3.4. Representations of the Brook can be seen in early mapping, Greens 1794 map and Roper and Brittons 1801 map. The report goes on to suggest that the Brook flowed beneath the former Boddingtons Brewery buildings, discharging into the river Irwell. It also highlights how United Utilities records, from 2009, show the downstream section of the relevant Brook to discharge flows from the combined sewer network into the river Irwell, however this is this may only take some surface water runoff and CSO spillage during storm. Finally, the report suggests that the upstream section of the watercourse is considered to be destroyed or replaced by sewers.

3.3.5. On balance, based on these findings from both the SGI and Hidden Watercourses of Manchester Reports, there is sufficient evidence to suggest that the lost watercourse under the site doesn't exist and that even if one does exist its effects on the development will be minimal or it is part of the existing drainage network. Therefore, it can be disregarded when assessing flood risk.

3.4. Overland Flow

3.4.1. There are some areas around the site at risk of flooding but these are contained within existing highways, Robert Street and Dutton Street. There are no flow routes that need to be maintained within the site and so risk from overland flow is low.

3.4.2. Because of this, the development is at low risk from fluvial flooding from the watercourse up to and including the 100year + 35% climate change event.

Table 3 – Flood Risk Summary

Source	Flood Risk	Likely Impacts	Remarks
Tidal	Low	Low	Site not tidally influenced.
Fluvial (Watercourse)	Low	Low	Site located in flood zone 1,also see **Section 3.2**
Overland Flow	Low	Low	No flow routes within site to be contained, also see **section 3.2**
Infrastructure Failure	Low	Low	There are existing structures around the site, these are industrial areas and are of little risk.
Groundwater	Low	Low	Based on the elevated nature of the site compared to surrounding ground to the south and east, groundwater flood risk is considered not negligible.
Artificial Sources	Low	Low	There are no canals located near the site.

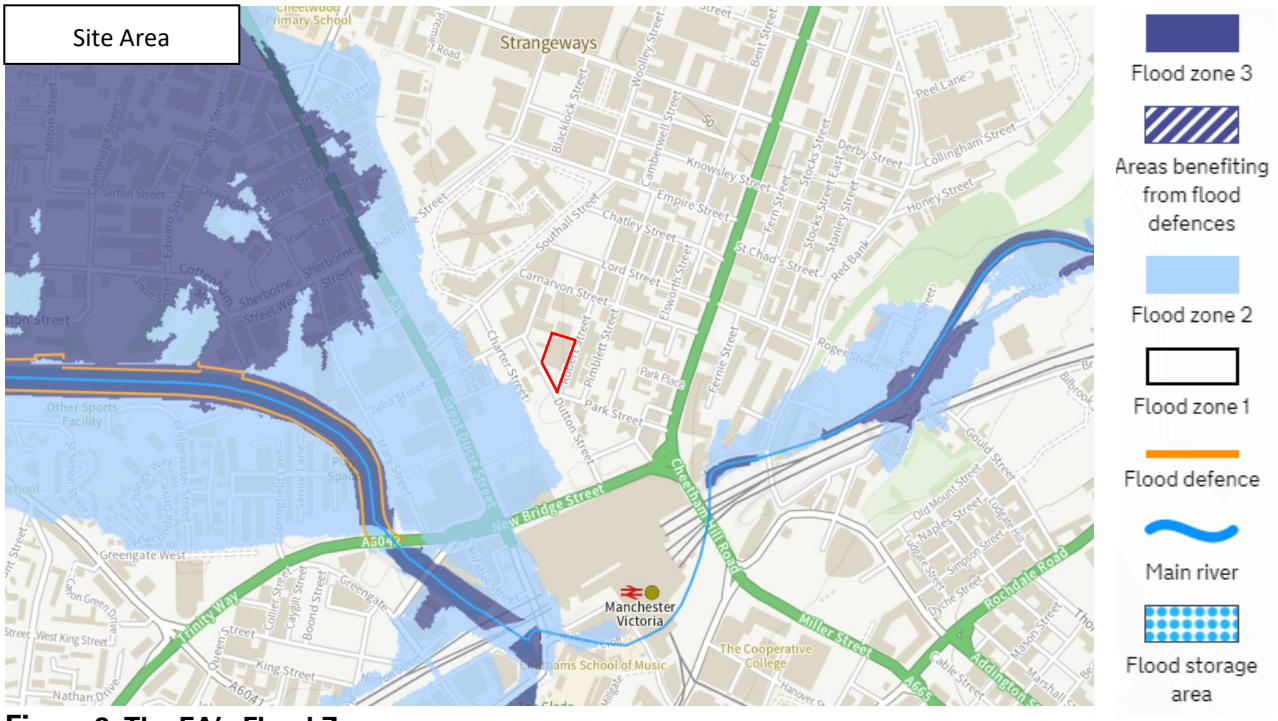


Figure 2: The EA's Flood Zone

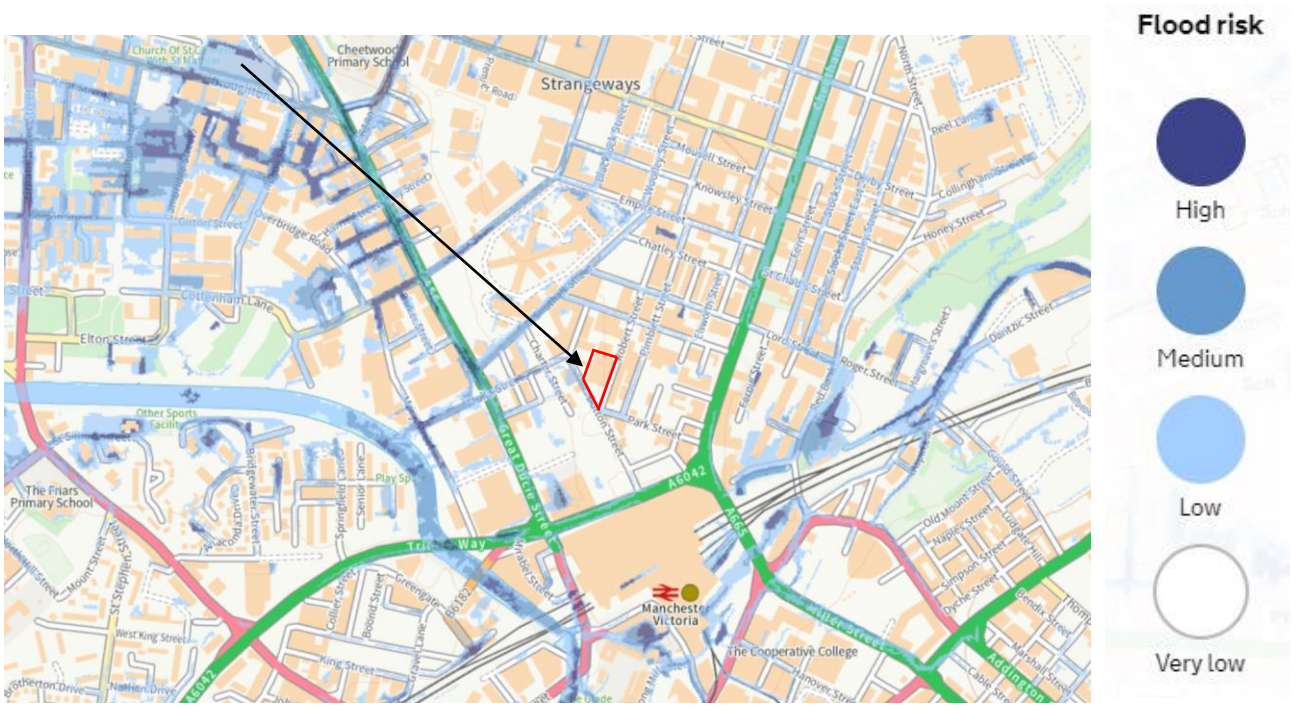


Figure 3: The EA's Indicative Surface Water Flood Map

4. OUTLINE DRAINAGE STRATEGY

4.1. Existing Surface Water Runoff

4.1.1. The existing area of works is approximately 0.25Ha of wholly brownfield area.

4.1.2. Infodrainage the hydraulic software tool has been used to calculate the Greenfield run-off rates for existing area. The Greenfield runoff rates for the existing area are tabulated below. A copy of the greenfield calculations is included in **Appendix C**.

4.1.3. As the site is brownfield, existing drainage rate has also been assessed using the modified rational method and a rainfall intensity of 35mm/hr.

Q = CIA
Q = 2.78 x 35 x 0.25 = **24.325 l/s**

Table 4: Pre-development Greenfield Runoff Rates

	Site Area (m2)	1 Year (l/s)	Qbar (l/s)	30 Year (l/s)	100 year (l/s)
Robert Street	2473	1.4	1.6	2.7	3.3

4.2. Geology

4.2.1. According to the 1:50,000 bedrock and superficial deposit maps from the British Geological Survey (BGS), available online, the site is underlain by **till, devensian - diamicton**, with bedrock geology **Chester Formation - Sandstone.**

4.2.2. Online mapping tool, Landis Soilscapes Map shows ground conditions at the Robert Street Site to be **"Slowly permeable seasonally wet acid loamy clayey soils"**.

4.2.3. At the time of writing this report there is no site investigation or borehole data available.

4.3. Hydrology

4.3.1. The river Irwell is located to the South and East of the site. See **section 3.3** for lost watercourse.

4.4. Existing Drainage

4.4.1. It isn't yet known whether there is any existing drainage within the site area itself, however United Utilities mapping shows there are existing combined sewers in proximity to the site running along the outside of the site boundary within both Robert Street and Dutton Street.

4.5. Sustainable Drainage Systems

4.5.1. SuDS Objectives:

Sustainable drainage developed in line with the ideals of sustainable development is collectively referred to as Sustainable Drainage Systems (SuDS). At a particular site, these systems are designed both to manage the environmental risks resulting from the urban runoff and to contribute wherever possible to environmental enhancement. SuDS objectives are therefore to minimise the impacts from the development on the quantity and quality of the runoff and maximise amenity and biodiversity opportunities (CIRIA C753, 2015).

4.5.2. SuDS's Design Themes

A strong design theme is essential if the maximum aesthetic benefits are to be gained from the SuDS approach. At a more local scale the SuDS should link with the individuals plot structure, planting, public open space requirements and amenity areas, gaining multiple benefits from a limited area of land.

4.5.3. The SuDS Management Train

The 'Management Train Approach' should be central to the surface water drainage strategy of the proposed site. The main objective is treatment and control of runoff as near to the source as possible protecting downstream habitats and further enhancing the amenity value of the site. This concept uses a hierarchy of drainage techniques to incrementally reduce pollution, flow rates and volumes of storm water discharge from the site, and is as follows:

1. **Prevention** – The use of good site design and housekeeping measures to prevent runoff and pollution and includes the use of rainwater reuse / harvesting.
2. **Source Controls** – Control of runoff at source or as close to source as possible (e.g. soakaways, green roofs, pervious pavements).
3. **Site Control** – Management of water in a local area and can include below ground storage / attenuation, detention basins, large infiltration devices.
4. **Regional Control** – Management of water from a site or various sites and can include wetlands and balancing ponds.

4.5.4. SuDS Site Constraints

SuDS techniques are suitable for all sites; therefore, an assessment of the existing site is required so that SuDS limitations can be determined.

- Land Use Characteristics: The size and type of the development plot means that a range of source control and site control SuDS devices can be considered.
- Site Characteristics: British Geological Survey (BGS) map data, suggests **till, devensian – diamicton/clay** beneath the site. On this basis, infiltration has been discounted.
- Catchment Characteristics: The site is currently classed as Brownfield.
- Environmental and Amenity Performance: The inclusion of SuDS within the overall development is a key driver in providing both amenity and habitat creation. Safety to all future occupiers is paramount and so best practice guidance will be incorporated so that these devices blend into the surrounding without the for significant safety precautions. Maintenance plans will be prepared for all SuDS devices that are included.

4.5.5. SuDS Methods

Tables 5 and 6, below, provide an assessment of various above and below ground SuDS methods that can provide water quality treatment and management of flows to reduce runoff rates and volumes and whether they can be suitability incorporated at this development site. The purpose of this assessment is to set out options to be considered at the planning stage with consideration to time constraints, viability and lifetime maintenance of the development.

Table 5: Surface SuDS Methods

Method	Comment	Suitability for Development
Green Roofs	• Can be used on suitable low-rise buildings to provide retention, attenuation and treatment of rainwater, and promotes evaporation and local biodiversity.	*Not suitable*: • Balconies and communal areas are proposed in roof, making the areas unsuitable for green roofing systems.
Water Butts	• Plastic tanks placed at the base of rainwater down pipes to collect rainwater runoff from the roof areas.	*Not Suitable:* • Internal rain water pipes are not suitable for collection of water via water butts.
Rainwater Harvesting	• Rainwater harvesting reduces the total runoff volume from the developed site and reduces treated water consumption.	*Not Suitable*: • Additional costs of installation would have severe effect of viability of development. • Running and maintenance costs would not be acceptable to client and future occupiers.
Infiltration Options	• Reduces total run off volume from the development.	*TBC:* • Ground conditions will be confirmed at a later stage, infiltration testing will be undertaken at that point.
Permeable Surfacing (Infiltration)	• Reduces total run off volume from the development. • Can be used to enhance water quality.	*TBC:* • Ground conditions will be confirmed at a later stage, infiltration testing will be undertaken at that point.
Permeable Surfacing (Standard)	• Can be used to enhance quality of runoff water. • Sub-base provides 'source' storage and reduces the volume of storage downstream. • The storage can be created with selection of the stone fill or use of plastic box stems. • Impermeable membrane at base of construction to prevent impact on pavement stability.	*Suitable*: • Suitable for proposed private courtyard and public realm areas only.

Swales, basins and ponds	• Provide areas for above ground surface runoff storage. • Swales also allow filtering of particulate matter, improving water quality	*Not Suitable*: • Communal areas of the site do not have sufficient space to locate ponds and swales.

Table 6: Sub-Surface SuDS Methods

Method	Comment	Suitability for Development
Geocellular Storage	• Suitable for sites with insufficient space for basins etc. • Suitable for sites where topography prevents the use of open basins etc. • Can be very effective infiltration devices subject to ground conditions.	*Suitable:* • Geocellular storage tanks will be used to attenuate surface water and prevent flooding.
Large Diameter Pipes, Culverts or Tanks	• Suitable for sites with insufficient space for basins etc. • Provide a volume of below ground storage with a high void ratio and good man entry provision to allow for future maintenance and cleaning. • Generally suitable for adoption by the statutory water company.	*Not Suitable:* • Public open spaces have large changes in level that would make piped attenuation incredibly deep.

4.5.6. SuDS Hierarchal Approach

Based on the SuDS assessment in **Tables 5 and 6**, plus an assessment of the local site conditions, the SuDS hierarchal approach for discharge of surface water at the development site is considered in greater detail below.

4.5.7. The presence of a lost culvert, flowing into the river Irwell has been disproven. There is sufficient evidence to suggest that there is no available watercourse to drain to, see **section 3.4**. For this reason, drainage to watercourse is not feasible and so the next methos in the SuDS hierarchy will be used.

Table 7: SuDS Hierarchal Approach

Method	Suitability	Suitability for Development
Infiltration to Ground	TBC	Infiltration testing has not yet taken place and so infiltration has **not yet been discounted.**
Connection to Watercourse	No	Connection to ordinary watercourse is not feasible. See **section 3.4**.
Connection to Surface Water Sewer	No	There are no surface water sewers available for connection nearby.
Connection to a Combined Sewer	Yes	There is a combined sewer nearby available for connection.

4.5.8. SuDS Design Philosophy

The SuDS assessment and hierarchal approach discussed in **Tables 5, 6 and 7** above has defined the overall SuDS strategy. Thus, the SuDS philosophy for the development site is the promotion of Prevention, Source Control and Site Control techniques with discharge rates to be restricted to greenfield rates, to reduce the risk of both site and downstream flooding.

The following design philosophy is proposed:

- The site is generally low risk.
- Discharge to the combined sewers as close as possible to greenfield runoff rates as practicable.
- Site control in the form of geocellular tanks, permeable paving and tree pits..

4.6. Surface Water Drainage Strategy

4.6.1. The Surface water Drainage strategy is accompanied by a Surface Water Drainage Plan in **Appendix E.**

4.6.2. A drainage strategy has been undertaken for the site to demonstrate that surface water runoff can be effectively managed within the site, without increasing the risk of flooding to the site or elsewhere. The proposed drainage layout for the Robert Street development will be designed in accordance with Design & Construction Guidance (DCG), BS EN 752: 2008 and Building Regulations Part H guidance, i.e., up to the 30-year (including 40% increase to account for climate change) storm return period criterion and tested for the 1 in 100 year return period including a 45% increase to account for climate change to confirm that there is no flood risk to the properties.

4.6.3. Due to the difference in levels between the north and south of the site, it is not considered practical to drain the site as one and so it will be drained in two parts. The levels are illustrated on the impermeable areas plan, see **Appendix D**, with the areas that need to be drained. Both the public realm and private courtyard areas slope towards the low point of the site from different catchment. Draining with a single system would need pipes with a positive gradient in some areas which is not possible, making drainage via one network impractical.

4.6.4. The proposed building and public courtyard area will be drained via a system of internal pipes and gullies into manholes. Flow control in the form of a hydrobrake will limit outflow from this area to **3.8 l/s.** This is the lowest possible outflow **as the hydrobrake orifice size must be no smaller than 75mm** to prevent blockages.

4.6.5. The public realm will be drained separately via porous paving which will flow into the proposed drainage system. Porous paving **reduces risk of potential blockages** meaning that a smaller **orifice size of 25mm can be used to limit the outflow from this area to 1.4 l/s.**

4.6.6. In order for the Robert Street development to comply with non-statutory technical standards for sustainable drainage systems, the **maximum allowable runoff rate should be limited to 1.3l/s** for the **1year** storm and **1.6 l/s** for both **30year and 100year** year storms. However, this is not possible due to the minimum 75mm orifice size, explained in **section 4.6.2.** Therefore, when

considering the maximum outflows of both systems, the total outflow from the Surface Water Drainage System will be limited to **3.1 l/s for the 1year storm event** and **5.0 l/s for the 30year + 40 CC and 100year + 45% CC events. Table 8** below summarises the post development SW flows.

`Table 8: Post-Development Runoff Rates

	Impermeable Area (m^2)	1 Year (l/s)	30 Year (l/s)	100 year (l/s)
Robert Street	1896	3.1	5.0 (Maximum Allowable)	

4.6.7. An impermeable area drawing can be found in **Appendix D.**

4.6.8. The flows from both systems will be stored in two geocellular storage tanks, one beneath each the proposed outdoor areas.

4.6.9. Thereafter, the surface water is to be discharged into the existing surface water sewer, located within Dutton Street, at a maximum allowable rate of **3.1 l/s for the 1year storm event** and **5.0 l/s for the 30year + 40 CC** and **100year + 45% CC events**. This proposed discharge rate of 5.0 l/s is a reduction of the assessed brownfield flow rate of 79%.

4.6.10. To achieve the post-development runoff rates (**Table 8**), a flow control device (hydrobrake) and a 25mm orifice, both situated at the downstream end of the surface water network.

4.6.11. Table 9 below defines the outline post-development attenuation volume. The volume identified below was calculated on Infodrainage software, it is preliminary for this outline assessment and may alter at detailed design stage.

Table 9: Attenuation Volumes

	Maximum Volume Attenuation (m3)
Robert Street	Network 1 – 55m^3 Network 2 – 17m^3

4.6.12. During infodrainage simulation, porous paving 1 flooded during the **100year + 45% Climate Change** event, by 5.4m^3, however this is minimal and will be contained within the site, flowing downstream and re-entering the system at the lower permeable paving area.

4.6.13. The full set of Hydraulic calculations can be found in **Appendix C.**

4.6.14. Infiltration in the form of soakaways have not yet been discounted. Soakaways must be located at least 5m from any highway or structure. The areas that may be suitable are illustrated in **Appendix D.** The use of infiltration as a method of drainage depends on infiltration testing, which has not yet taken place, however ground geology means this is unlikely to be unfeasible.

4.6.15. Any future drainage calculations carried out as part of a site-wide drainage strategy or for the development layouts themselves must include the appropriate increase in rainfall to satisfy the future Climate Change allowances.

4.7. Foul Water Drainage Strategy

4.7.1. Foul water will drain into the existing combined sewers. There are combined sewers within both Robert Street and Dutton Street.

4.7.2. The proposed private drainage layout for the new development site will be designed in accordance with BS EN 752: 2008 and Building Regulations Part H guidance.

4.8. Pollution Control

4.8.1. Risk of pollution from discharge from the Robert Street site post-development is low as the site is residential and won't be exposed to any pollutants.

5. CONCLUSION & RECOMMENDATIONS

5.1. Flood Risk Management Measures

5.1.1. The surface water drainage strategy will restrict runoff to maximum 5.0 l/s in accordance with CIRIA 753 and with agreement with Manchester City Council.

5.1.2. It is recommended that infiltration testing and a CCTV survey to existing drainage takes place.

5.1.3. The use of SuDS in the form of Source Control and Site Control measures, with controlled (restricted) outflow, will help to minimise the flood risk impact to the downstream network.

5.1.4. Attenuation has been proposed in the form of type 3 sub-base storage. The new surface water networks will be designed in line with current British Standard and Design & Construction Guidance up to the 100-year storm return period including an allowance for climate change.

5.1.5. The use of SuDS in the form of Site Control measures, with controlled (restricted) outflow, will help to minimise the flood risk impact to the surrounding sewer network.

5.1.6. The long-term maintenance of the new drainage infrastructure will be the responsibility of a private management company, to be appointed at build completion. Annual inspections will need to be carried out and clearing of drainage gullies and the petrol interceptor is to be undertaken. There will be a site management health and safety document prepared in respect of the final development. This will include the required maintenance regime for the on-site drains and drainage facilities such as the channels, gullies, pipes, manholes and all SUDS facilities. The property management team will be responsible for site cleanliness, gully emptying and drain cleansing to ensure that the surface water drainage system will always operate at its maximum efficiency.

5.1.7. Should any flooding occur from the new sewers and drains it will be directed away from the buildings to the external areas. Calculations have shown that no flooding occurs up to the 100 year +45% event.

5.2. Off Site Impacts

5.2.1. Up to and including the 100-year plus 45% increase in rainfall allowance due to climate change (CC) event, the report has justified that there is no risk of flooding.

5.2.2. Surface water runoff does not increase from the pre-development regime and unitises SuDS solutions to satisfy the site constraints, the proposed development will therefore not increase flood risk onto its locality.

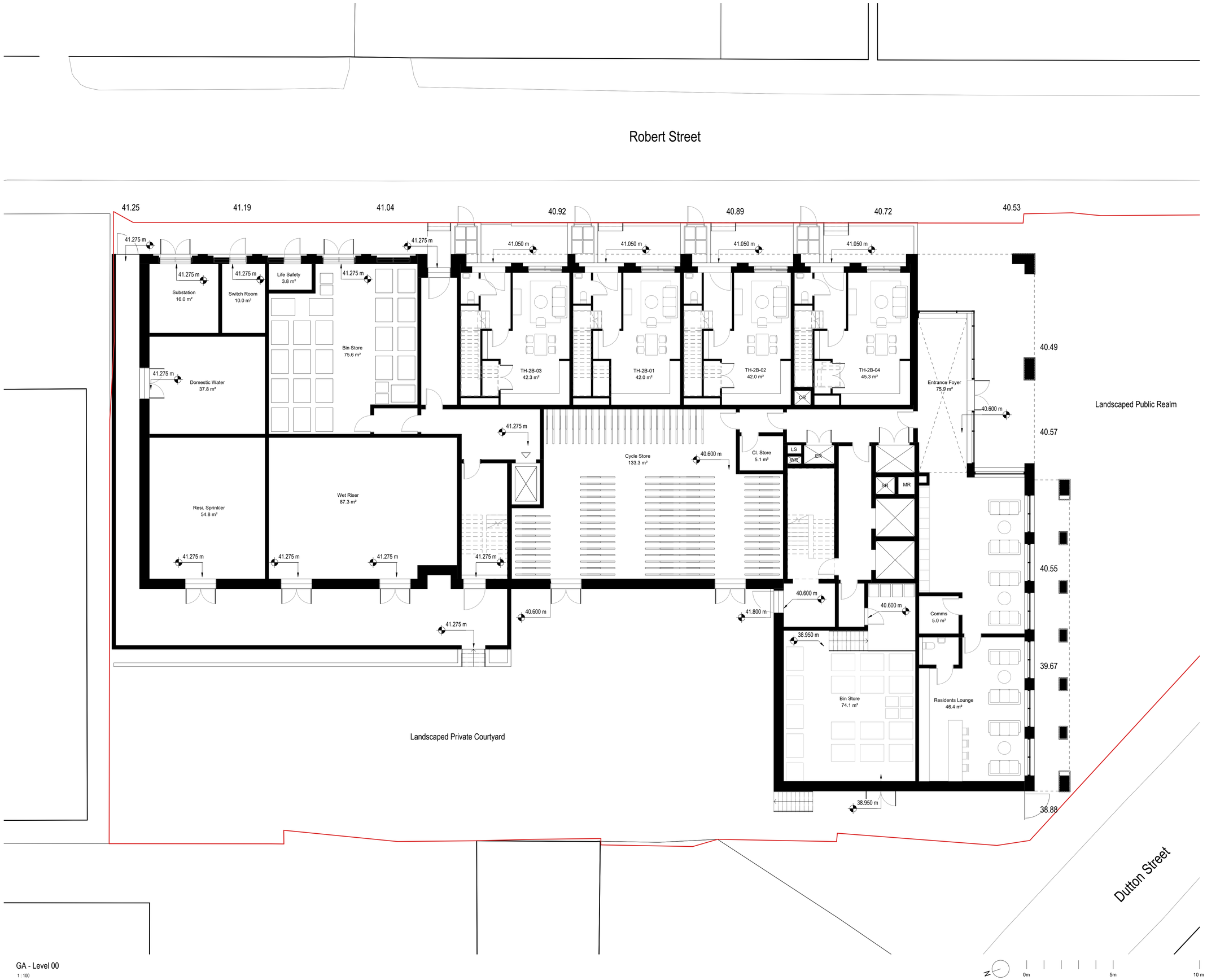
5.3. Residual Risk

5.3.1. With careful design of the drainage elements as described above there will be no residual flood-related risks that will remain after the development has been completed.

6. APPENDICES

- Appendix A – Architectural Site Layout
- Appendix B – Existing Site Information
- Appendix C – Existing Discharge Rates and Proposed Hydraulic Calculations
- Appendix D – Ridge Design Drawings

APPENDIX A – ARCHITECTURAL SITE LAYOUT



GA - Level 00

1 : 100

General Notes

Use figured dimensions only. Do not scale off this drawing. All dimensions must be set out and checked by the contractor on site prior to commencement of construction. Any variations between drawings and site must be reported to TGA before work proceeds.

Drawings to be read in conjunction with Architectural Specification, Structural Engineer's Drawings and Specifications, Mechanical & Electrical Engineer's Drawings and Specifications, all Supplemental Information, including but not limited to; Detailed Fire Strategy, Acoustic Report, Thermal Report & Overheating Report.

No portion of the Works to commence without acceptance of the required submittals by the Employer.

Main Contractor to submit relevant documents to building regulation and legislation approval authorities as required to comply with the Specification.

Rev	Description	Date	By
P01	Issue for Viability Review	29.09.23	TGA
P02	Co-ordination Issue	22.01.24	TGA

Title
General Arrangement - Level 00

Drawing No.
1181-TGA-XX-00-DR-A-03100

Revision
P02

Status
For Information

Scale
1 : 100@A1

Project
Robert Street

Client
RAA Capital

TIM GROOM ARCHITECTS

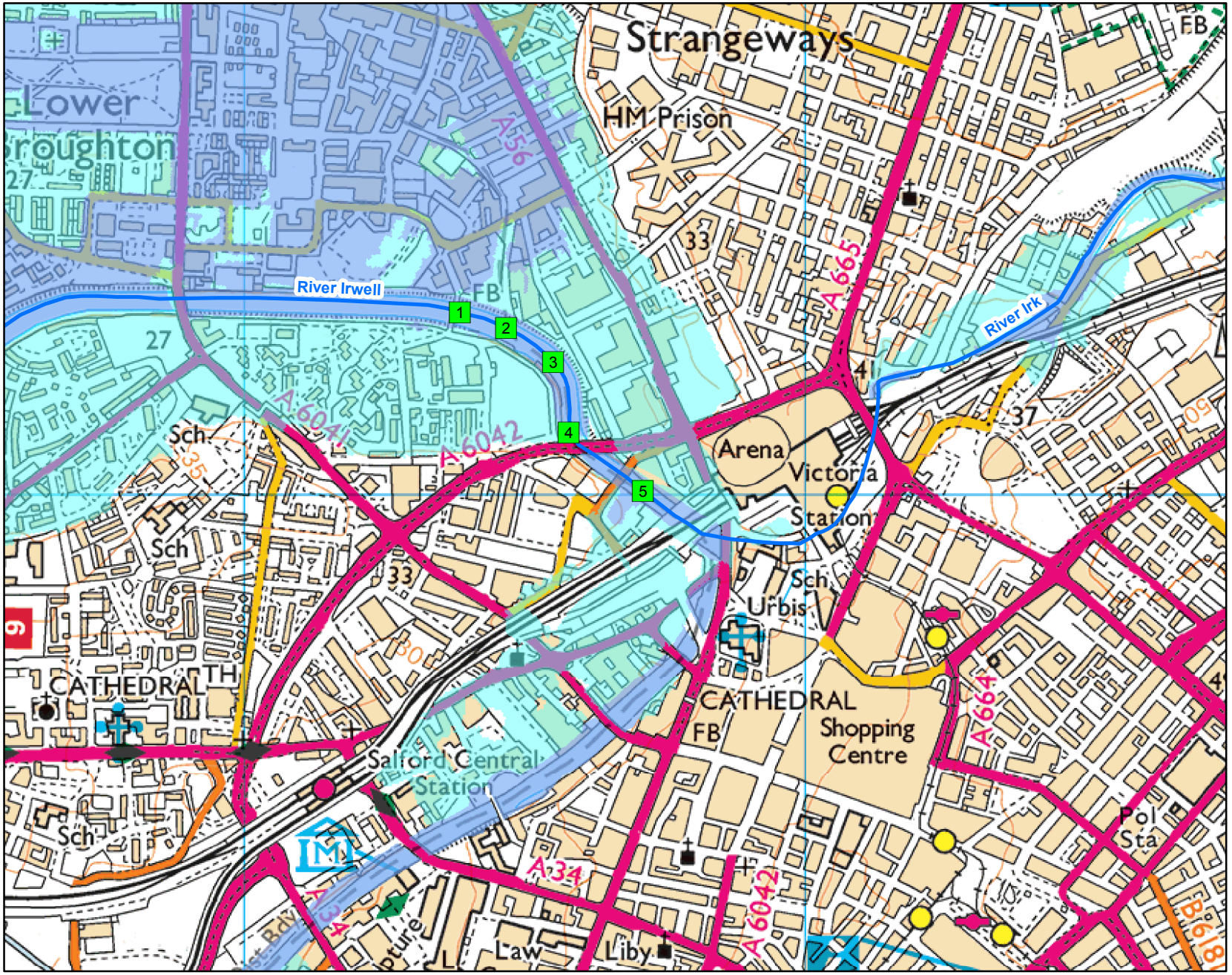
Eastgate, 2 Castle Street, Manchester, M3 4LZ 0161 870 1152

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APPENDIX B – EXISTING SITE INFORMATION


MANCHESTER
CARNARVON STREET
Factory
Depot
Warehouse
Garage
Dikybn House
PH
Works
Tanks
FRANCIS STREET
NEWCOMBE STREET
BURY STREET
COWBURN STREET
7406
7410
7409
7408
7402
7404
7405
8402
8404
9405
9406
9407
9404
9402
8401
8400
8408
7407
7303
7302
7304
7306
7307
8309
8311
7312
8301
8310
7311
7310
8308
8305
7202
8304
8303
8302
9306
8307
9303
9301
9212
9205
9201
8201

Detailed Flood Map centred on Great Ducie St, Cheetham Hill, Manchester M3 1PT.
Created on 13/07/2021 [GMMC224504AB]



Environment Agency

1:10,001

N

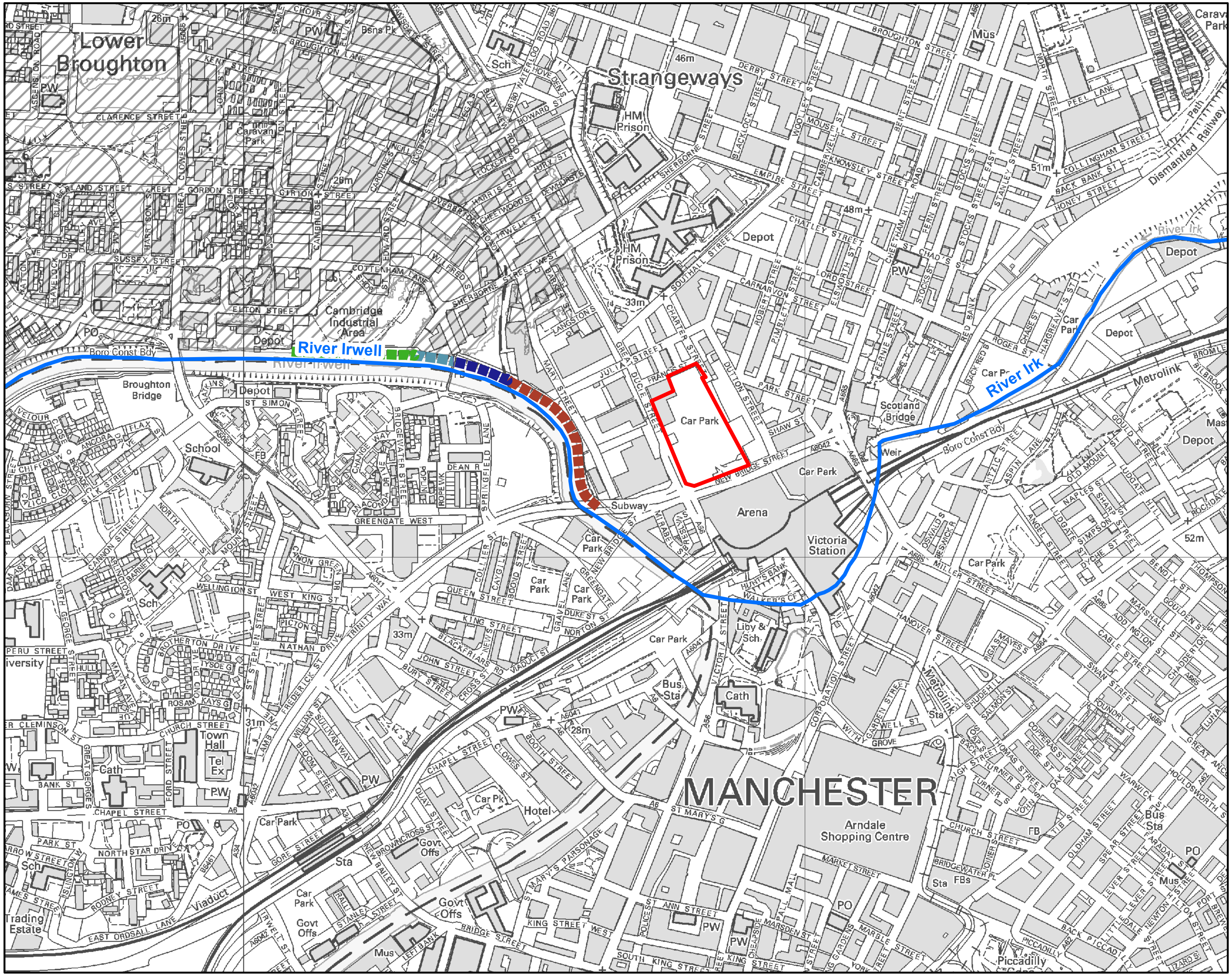
Legend

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

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Flood Defence Map centred on Great Ducie St, Cheetham Hill, Manchester M3 1PT.
Created on 13/07/2021 [GMMC224504AB]



Environment Agency

1:10,001

N

Legend

Site Location

Main River

Defences

ASSET_ID

- 88831
- 88893
- 181081
- 452758

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					Defended											Undefended										
Map Reference	Model Node Reference	Easting	Northing	Data	20 % AEP (1 in 5 year)	10 % AEP (1 in 10 year)	4 % AEP (1 in 25 year)	2 % AEP (1 in 50 year)	1.33 % AEP (1 in 75 year)	1 % AEP (1 in 100 year)	1 % AEP (1 in 100 year) + 30% increase in flows	1 % AEP (1 in 100 year) + 35% increase in flows	1 % AEP (1 in 100 year) + 70% increase in flows	0.5 % AEP (1 in 200 year)	0.1 % AEP (1 in 1000 year)	20 % AEP (1 in 5 year)	10 % AEP (1 in 10 year)	4 % AEP (1 in 25 year)	2 % AEP (1 in 50 year)	1.33 % AEP (1 in 75 year)	1 % AEP (1 in 100 year)	1 % AEP (1 in 100 year) + 30% increase in flows	1 % AEP (1 in 100 year) + 35% increase in flows	1 % AEP (1 in 100 year) + 70% increase in flows	0.5 % AEP (1 in 200 year)	0.1 % AEP (1 in 1000 year)
1	ea013_0208_IRW13692	383422	399255	Modelled Water Level (m aodN)	25.54	25.92	26.26	26.48	26.61	26.68	27.52	27.69	29.53	26.98	30.24	25.32	25.64	26.18	26.48	26.61	26.83	28.18	28.44	29.95	27.35	30.60
				Modelled Flow (cumecs)	318.42	356.75	387.29	406.85	417.61	425.33	516.71	518.61	509.23	472.52	474.40	294.54	333.01	388.01	416.70	433.33	457.32	508.89	506.19	480.96	498.71	466.21
2	ea013_0208_IRW13665	383485	399266	Modelled Water Level (m aodN)	25.52	25.90	26.24	26.47	26.59	26.66	27.50	27.66	29.52	26.96	30.24	25.30	25.62	26.15	26.46	26.59	26.80	28.16	28.42	29.95	27.32	30.59
				Modelled Flow (cumecs)	318.43	356.77	387.32	406.88	417.65	425.36	526.40	532.84	523.37	472.53	494.47	294.55	333.02	388.03	416.72	434.26	460.26	525.61	522.09	502.07	507.94	489.16
3	ea013_0208_IRW13571	383575	399205	Modelled Water Level (m aodN)	25.39	25.77	26.11	26.34	26.47	26.55	27.36	27.53	29.45	26.83	30.19	25.17	25.48	26.02	26.33	26.46	26.67	28.02	28.30	29.89	27.18	30.55
				Modelled Flow (cumecs)	318.47	356.83	387.40	406.98	417.76	425.47	528.87	539.41	541.44	472.59	519.73	294.60	333.04	388.06	416.74	434.28	460.28	548.53	545.82	530.36	509.27	517.98
4	ea013_0208_IRW13363	383608	399068	Modelled Water Level (m aodN)	25.27	25.66	26.02	26.25	26.38	26.46	27.26	27.42	29.27	26.74	30.07	25.05	25.37	25.91	26.23	26.37	26.57	27.90	28.16	29.76	27.09	30.46
				Modelled Flow (cumecs)	318.61	357.00	387.63	407.25	418.05	425.74	533.13	547.56	634.40	472.74	622.17	294.75	333.13	388.16	416.86	434.36	460.29	583.44	592.73	606.14	511.82	595.14
5	ea013_0208_IRW1_3304	383749	398955	Modelled Water Level (m aodN)	25.21	25.59	25.94	26.17	26.30	26.37	27.13	27.28	28.75	26.63	29.45	25.00	25.30	25.83	26.14	26.28	26.46	27.71	27.92	29.14	26.96	29.84
				Modelled Flow (cumecs)	318.65	357.04	387.68	407.31	418.12	425.81	533.15	547.37	678.74	472.77	674.11	294.78	333.15	388.19	416.90	434.38	460.37	587.64	606.72	685.05	511.67	672.60

Model data taken from Lower Irwell 2017 Study

AEP - Annual Exceedence Probability

m aodN - metres above ordnance datum Newlyn

cumecs - cubic metres per second

Notes:

*Climate Change Scenario - 30%, 35% and 70% increases in flow calculated for the 2080's (2070 - 2115). Please see https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances for more information regarding the new climate change guidance. The location of the site and the type (vulnerability) of development determine the climate change allowances to consider in any flood risk assessment.

Flood Defences

Start Date	Asset Type	Asset ID	Standard of Protection	†Overall Condition Grade	Upstream Actual Crest Level (m aod)	Downstream Actual Crest Level (m aod)
14/12/2018	high Ground	88831	75	3	27.66	27.44
14/12/2018	high Ground	88893	75	2	27.44	27.20
14/12/2018	Wall	181081	75	3	27.10	27.07
14/12/2018	Embankment	452758	75	3	27.10	27.10

† Overall condition of the asset based on the (weighted) condition of each element of the latest inspection of the asset. See the attached document 'Visual Condition Grading of FCRM Assets' for interpretation of score given.

APPENDIX C – EXISTING DRAINAGE RATES AND PROPOSED HYDRAULIC CALCULATIONS

Project:	Date: 26/02/2024		
	Designed by: tombowers	Checked by:	Approved By:
Report Title: UK and Ireland Rural Runoff Calculator	Company Address:		

ICP SUDS / IH 124

Details

Method	ICP SUDS
Area (ha)	0.247
SAAR (mm)	889.0
Soil	0.47
Region	Region 10
Urban	0
Return Period (years)	0

Results

Region	QBAR Rural (L/s)	QBAR Urban (L/s)	Q 1 (years) (L/s)	Q 30 (years) (L/s)	Q 100 (years) (L/s)
Region 10	1.6	1.6	1.4	2.7	3.3

Project:	Date: 26/02/2024		
	Designed by: tombowers	Checked by:	Approved By:
Report Details: Type: Junctions Storm Phase: Phase	Company Address:		

Name	Junction Type	Easting (m)	Northing (m)	Cover Level (m)	Depth (m)	Invert Level (m)	Chamber Shape	Diameter (m)
MH10	Manhole	383854.809	399369.951	38.880	1.230	37.650	Circular	1.200
FLOW CONTROL	Manhole	383859.914	399384.201	40.600	2.750	37.850	Circular	1.200
SW05	Manhole	383878.763	399413.585	40.600	2.100	38.500	Circular	1.200
SW06	Manhole	383872.354	399395.278	40.600	2.350	38.250	Circular	1.200
SW07	Manhole	383867.916	399381.593	40.600	2.550	38.050	Circular	1.200
SW01	Manhole	383888.686	399363.397	40.600	2.100	38.500	Circular	1.200
SW02	Manhole	383885.758	399355.418	40.500	2.100	38.400	Circular	1.200
MH11 (CONNECTION)	Manhole	383846.305	399371.800	38.530	1.030	37.500	Circular	1.200
SW04	Manhole	383857.634	399367.256	39.140	1.400	37.740	Circular	1.200
SW03	Manhole	383857.715	399364.746	38.990	1.150	37.840	Circular	1.200

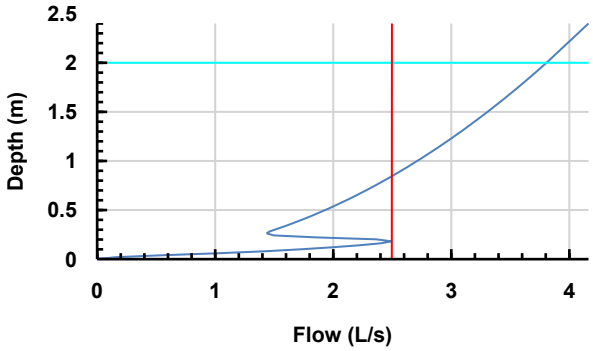
Name	Lock
MH10	None
FLOW CONTROL	None
SW05	None
SW06	None
SW07	None
SW01	None
SW02	None
MH11 (CONNECTION)	None
SW04	None
SW03	None

Inlets

Junction	Inlet Name	Incoming Item(s)	Bypass Destination	Capacity Type
MH10	Inlet	1.011	(None)	No Restriction
	Inlet (1)	1.005	(None)	No Restriction
FLOW CONTROL	Inlet	1.012	(None)	No Restriction
	Inlet (1)	1.010	(None)	No Restriction
SW05	Inlet	Catchment Area (4)	(None)	No Restriction
SW06	Inlet	1.008	(None)	No Restriction
	Inlet (1)	Catchment Area	(None)	No Restriction
SW07	Inlet	1.009	(None)	No Restriction
	Inlet (1)	Catchment Area (2)	(None)	No Restriction
SW01	Inlet (2)	1.001	(None)	No Restriction
SW02	Inlet	1.002	(None)	No Restriction
MH11 (CONNECTION)	Inlet	1.014	(None)	No Restriction
SW04	Inlet	1.004	(None)	No Restriction
SW03	Inlet (1)	1.003 1.013	(None)	No Restriction
	Inlet (2)	1.007	(None)	No Restriction

Project:	Date: 26/02/2024		
	Designed by: tombowers	Checked by:	Approved By:
Report Details: Type: Junctions Storm Phase: Phase	Company Address:		

Outlets

Junction	Outlet Name	Outgoing Connection	Outlet Type
MH10	Outlet	1.014	Free Discharge
FLOW CONTROL	Outlet	1.011	Hydro-Brake®
	Invert Level (m)	37.850	
	Design Depth (m)	2.000	
	Design Flow (L/s)	3.8	
	Objective	Minimise Upstream Storage Requirements	
	Application	Surface Water Only	
	Sump Available	☐	
	Unit Reference	CHE-0075-3800-2000-3800	
			
SW05	Outlet	1.008	Free Discharge
SW06	Outlet	1.009	Free Discharge
SW07	Outlet	1.010	Free Discharge
SW01	Outlet	1.002	Free Discharge
SW02	Outlet	1.003	Free Discharge
SW04	Outlet	1.005	Orifice
	Diameter (m)	0.025	
	Coefficient of Discharge	0.600	
	Invert Level (m)	37.740	
SW03	Outlet	1.004	Free Discharge

Project:	Date: 26/02/2024		
	Designed by: tombowers	Checked by:	Approved By:
Report Details: Type: Stormwater Controls Storm Phase: Phase	Company Address:		



Porous Paving

Type : Porous Paving

Dimensions

Exceedance Level (m)	40.600
Depth (m)	0.300
Base Level (m)	40.300
Paving Layer Depth (mm)	130
Membrane Percolation (m/hr)	10000.0
Porosity (%)	30
Length (m)	46.673
Long. Slope (1:X)	85.00
Width (m)	1.827
Total Volume (m³)	4.348

Inlets

Inlet

Inlet Type	Point Inflow
Incoming Item(s)	Catchment Area (3)
Bypass Destination	(None)
Capacity Type	No Restriction

Outlets

Outlet

Outgoing Connection	1.001
Outlet Type	Free Discharge

Advanced

Conductivity (m/hr)	10000.0

Project:	Date: 26/02/2024		
	Designed by: tombowers	Checked by:	Approved By:
Report Details: Type: Stormwater Controls Storm Phase: Phase	Company Address:		



Porous Paving (1)

Type : Porous Paving

Dimensions

Exceedance Level (m)	38.800
Depth (m)	0.400
Base Level (m)	38.400
Paving Layer Depth (mm)	130
Membrane Percolation (m/hr)	10000.0
Porosity (%)	30
Length (m)	22.918
Long. Slope (1:X)	20.00
Width (m)	5.553
Total Volume (m³)	10.309

Inlets

Inlet

Inlet Type	Point Inflow
Incoming Item(s)	1.006
Bypass Destination	(None)
Capacity Type	No Restriction

Outlets

Outlet

Outgoing Connection	1.007
Outlet Type	Free Discharge

Advanced

Conductivity (m/hr)	10000.0

Project:	Date: 26/02/2024		
	Designed by: tombowers	Checked by:	Approved By:
Report Details: Type: Stormwater Controls Storm Phase: Phase	Company Address:		



Porous Paving (2)

Type : Porous Paving

Dimensions

Exceedance Level (m)	40.125
Depth (m)	0.400
Base Level (m)	39.725
Paving Layer Depth (mm)	130
Membrane Percolation (m/hr)	10000.0
Porosity (%)	30
Length (m)	28.330
Long. Slope (1:X)	20.00
Width (m)	6.833
Total Volume (m³)	15.680

Inlets

Inlet

Inlet Type	Lateral Inflow
Incoming Item(s)	Catchment Area (1)
Bypass Destination	(None)
Capacity Type	No Restriction

Outlets

Outlet

Outgoing Connection	1.006
Outlet Type	Free Discharge

Advanced

Conductivity (m/hr)	10000.0

Project:	Date: 26/02/2024		
	Designed by: tombowers	Checked by:	Approved By:
Report Details: Type: Stormwater Controls Storm Phase: Phase	Company Address:		



Cellular Storage Type : Cellular Storage

Dimensions

Exceedance Level (m)	40.600
Depth (m)	2.000
Base Level (m)	38.000
Number of Crates Long	6
Number of Crates Wide	5
Number of Crates High	2
Porosity (%)	95
Crate Length (m)	1
Crate Width (m)	1
Crate Height (m)	1
Total Volume (m³)	57.600

Outlets

Outlet

Outgoing Connection	1.012
Outlet Type	Free Discharge



Cellular Storage (1) Type : Cellular Storage

Dimensions

Exceedance Level (m)	39.010
Depth (m)	1.000
Base Level (m)	37.900
Number of Crates Long	5
Number of Crates Wide	2
Number of Crates High	1
Porosity (%)	95
Crate Length (m)	1
Crate Width (m)	1
Crate Height (m)	1
Total Volume (m³)	9.610

Outlets

Outlet

Outgoing Connection	1.013
Outlet Type	Free Discharge

Project:	Date: 26/02/2024		
	Designed by: tombowers	Checked by:	Approved By:
Report Details: Type: Connections Storm Phase: Phase	Company Address:		

Name	Length (m)	Connection Type	Slope (1:X)	Manning's n	Colebrook-White Roughness (mm)	Diameter / Base Width (mm)	Upstream Cover Level (m)	Upstream Invert Level (m)
1.008	19.397	Pipe	77.588		0.6	225	40.600	38.500
1.011	15.137	Pipe	75.687		0.6	100	40.600	37.850
1.002	8.499	Pipe	84.993		0.6	225	40.600	38.500
1.014	8.702	Pipe	58.016		0.6	100	38.880	37.650
1.012	10.630	Pipe	70.865		0.6	225	40.600	38.000
1.005	3.904	Pipe	43.380		0.6	100	39.140	37.740
1.009	14.386	Pipe	71.929		0.6	225	40.600	38.250
1.010	8.416	Pipe	42.079		0.6	225	40.600	38.050
1.004	2.511	Pipe	25.113		0.6	225	38.990	37.840
1.003	29.554	Pipe	52.775		0.6	225	40.500	38.400
1.001	1.207	Pipe	9.978		0.6	225	41.149	40.300
1.007	2.085	Pipe	3.723		0.6	225	39.946	38.400
1.013	5.579	Pipe	92.987		0.6	225	39.010	37.900
1.006	2.495	Pipe	14.257		0.6	225	4.125	39.725

Name	Downstream Cover Level (m)	Downstream Invert Level (m)	Lock	Flow Restriction (L/s)
1.008	40.600	38.250	None	
1.011	38.880	37.650	None	4.2
1.002	40.500	38.400	None	
1.014	38.530	37.500	None	
1.012	40.600	37.850	None	
1.005	38.880	37.650	None	1.5
1.009	40.600	38.050	None	
1.010	40.600	37.850	None	
1.004	39.140	37.740	None	
1.003	38.990	37.840	None	
1.001	40.600	40.179	None	
1.007	38.990	37.840	None	
1.013	38.990	37.840	None	
1.006	39.946	39.550	Levels	

Project:	Date: 26/02/2024		
	Designed by: tombowers	Checked by:	Approved By:
Report Details: Type: Manhole Schedule Storm Phase: Phase	Company Address:		

Name	Cover Level (m) Invert Level (m)	Manhole Size (m)	Connection Details				Type
Coordinates (m)	Depth (m)		Incoming Connections	Connection Type	Connection Invert (m)	Connection Size (mm)	Junction Type
			Outgoing Connections				Cover
MH10	38.880 37.650	Diameter / Length: 1.200	{1} 1.011 {2} 1.005	Pipe Pipe	37.650 37.650	Diam/Width:100 Diam/Width:100	Manhole
E:383854.809 N:399369.951	1.230		{a} 1.014	Pipe	37.650	Diam/Width:100	Not Applicable
FLOW CONTROL	40.600 37.850	Diameter / Length: 1.200	{1} 1.012 {2} 1.010	Pipe Pipe	37.850 37.850	Diam/Width:225 Diam/Width:225	Manhole
E:383859.914 N:399384.201	2.750		{a} 1.011	Pipe	37.850	Diam/Width:100	Not Applicable
SW05	40.600 38.500	Diameter / Length: 1.200					Manhole
E:383878.763 N:399413.585	2.100		{a} 1.008	Pipe	38.500	Diam/Width:225	Not Applicable
SW06	40.600 38.250	Diameter / Length: 1.200	{1} 1.008	Pipe	38.250	Diam/Width:225	Manhole
E:383872.354 N:399395.278	2.350		{a} 1.009	Pipe	38.250	Diam/Width:225	Not Applicable
SW07	40.600 38.050	Diameter / Length: 1.200	{1} 1.009	Pipe	38.050	Diam/Width:225	Manhole
E:383867.916 N:399381.593	2.550		{a} 1.010	Pipe	38.050	Diam/Width:225	Not Applicable

Project:	Date: 26/02/2024		
	Designed by: tombowers	Checked by:	Approved By:
Report Details: Type: Manhole Schedule Storm Phase: Phase	Company Address:		

Name	Cover Level (m) Invert Level (m)	Manhole Size (m)	Connection Details				Type
Coordinates (m)	Depth (m)		Incoming Connections	Connection Type	Connection Invert (m)	Connection Size (mm)	Junction Type
			Outgoing Connections				Cover
SW01	40.600 38.500	Diameter / Length: 1.200	{1} 1.001	Pipe	40.179	Diam/Width:225	Manhole
E:383888.686 N:399363.397	2.100		{a} 1.002	Pipe	38.500	Diam/Width:225	Not Applicable
SW02	40.500 38.400	Diameter / Length: 1.200	{1} 1.002	Pipe	38.400	Diam/Width:225	Manhole
E:383885.758 N:399355.418	2.100		{a} 1.003	Pipe	38.400	Diam/Width:225	Not Applicable
MH11 (CONNECTION)	38.530 37.500	Diameter / Length: 1.200	{1} 1.014	Pipe	37.500	Diam/Width:100	Manhole
E:383846.305 N:399371.800	1.030						Not Applicable
SW04	39.140 37.740	Diameter / Length: 1.200	{1} 1.004	Pipe	37.740	Diam/Width:225	Manhole
E:383857.634 N:399367.256	1.400		{a} 1.005	Pipe	37.740	Diam/Width:100	Not Applicable

Project:	Date: 26/02/2024		
	Designed by: tombowers	Checked by:	Approved By:
Report Details: Type: Manhole Schedule Storm Phase: Phase	Company Address:		

Name	Cover Level (m) Invert Level (m)	Manhole Size (m)	Connection Details				Type
Coordinates (m)	Depth (m)		Incoming Connections	Connection Type	Connection Invert (m)	Connection Size (mm)	Junction Type
			Outgoing Connections				Cover
SW03	38.990 37.840	Diameter / Length: 1.200	{1} 1.003	Pipe	37.840	Diam/Width:225	Manhole
E:383857.715 N:399364.746	1.150		{2} 1.013	Pipe	37.840	Diam/Width:225 Diam/Width:225	
			{3} 1.007	Pipe	37.840		
			{a} 1.004	Pipe	37.840	Diam/Width:225	Not Applicable

Project:	Date: 26/02/2024		
	Designed by: tombowers	Checked by:	Approved By:
Report Details: Type: Network Design Criteria Storm Phase: Phase	Company Address:		

Flow Options

Peak Flow Calculation	(UK) Modified Rational Method
Min. Time of Entry (mins)	5
Max. Travel Time (mins)	30

Pipe Options

Lock Slope Options	None
Design Options	Minimise Excavation
Design Level	Level Soffits
Min. Cover Depth (m)	1.200
Min. Slope (1:X)	500.00
Max. Slope (1:X)	40.00
Min. Velocity (m/s)	1.0
Max. Velocity (m/s)	3.0
Use Flow Restriction	☐
Reduce Channel Depths	☐

Pipe Size Library

Default

Add. Increment (mm)	75
Max. Diameter (mm)	0

Diameter (mm)	Min. Slope (1:X)	Max. Slope (1:X)
100	0.00	0.00
150	0.00	0.00

Project:	Date: 26/02/2024		
	Designed by: tombowers	Checked by:	Approved By:
Report Details: Type: Network Design Criteria Storm Phase: Phase	Company Address:		

Manhole Options

Apply Offset	☐

Manhole Size Library

Default

Diameter / Width

Connection (mm)	Diameter / Length (m)	Width (m)
0	1.200	0.000
375	1.350	0.000
500	1.500	0.000
750	1.800	0.000

Additional Sizing

Connection (mm)	900
Diameter / Length (m)	0.900
Width (m)	0.000

Depth

Depth (m)	Diameter / Length (m)	Width (m)
0.000	1.050	0.000
1.500	1.200	0.000

Access

Depth (m)	Ladder Protrusion (mm)
0.000	130
3.000	230

Benching Requirements

Landing Width (mm)	500
Benching Width (mm)	225

Project:	Date: 26/02/2024		
	Designed by: tombowers	Checked by:	Approved By:
Report Details: Type: Outfall Details Storm Phase: Phase	Company Address:		

Outfalls

Outfall	Outfall Type	Fixed Surcharged Level (m)	Level Curve
MH11 (CONNECTION)	Free Discharge		

Project:	Date: 26/02/2024		
	Designed by: tombowers	Checked by:	Approved By:
Report Title: Rainfall Analysis Criteria	Company Address:		

Runoff Type	Dynamic
Output Interval (mins)	1
Time Step	Shortest
Urban Creep	Apply Global Value
Urban Creep Global Value (%)	0
Junction Flood Risk Margin (mm)	300
Perform No Discharge Analysis	☐

Rainfall

FSR

Type: FSR

Region	England And Wales
M5-60 (mm)	18.2
Ratio R	0.357
Summer	☑
Winter	☑

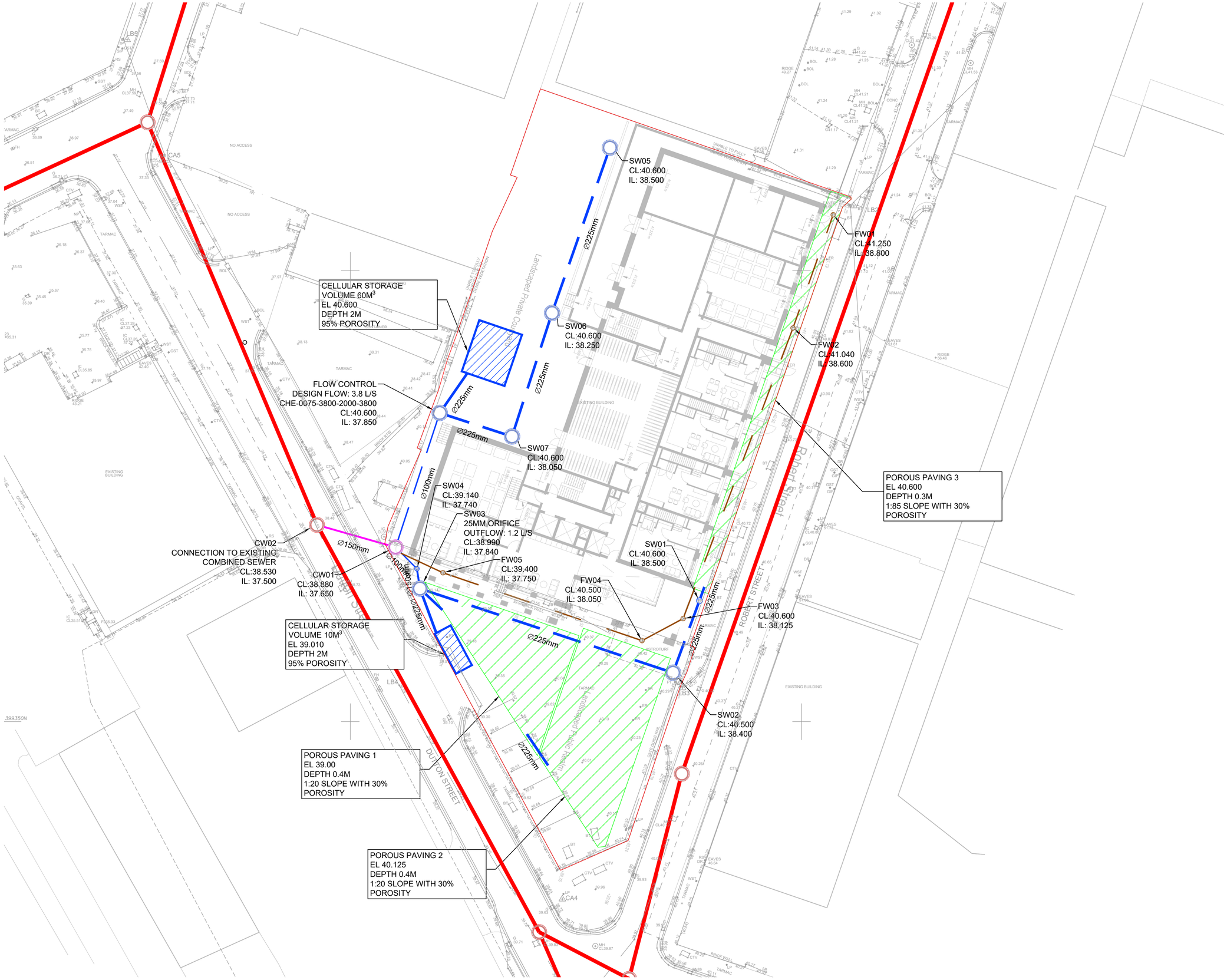
Return Period

Return Period (years)	Increase Rainfall (%)
1.0	0.000
30.0	40.000
100.0	45.000

Storm Durations

Duration (mins)	Run Time (mins)
15	30
30	60
60	120
120	240
240	480
360	720
480	960
960	1920
1440	2880

APPENDIX D – RIDGE DESIGN DRAWINGS



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KEY

- PROPOSED SW DRAINAGE
- PROPOSED SW MANHOLE
- EXISTING PUBLIC COMBINED DRAINAGE
- EXISTING PUBLIC COMBINED MANHOLE
- PROPOSED FW DRAINAGE
- PROPOSED FW MANHOLE
- PROPOSED COMBINED DRAINAGE
- PROPOSED COMBINED MANHOLE

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REV	DESCRIPTION	DATE	BY	CHKD
P01	PRELIMINARY ISSUE	13.03.24	TB	PB

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IN ASSOCIATION WITH:

PROJECT:
ROBERT STREET

TITLE:
PROPOSED DRAINAGE GA

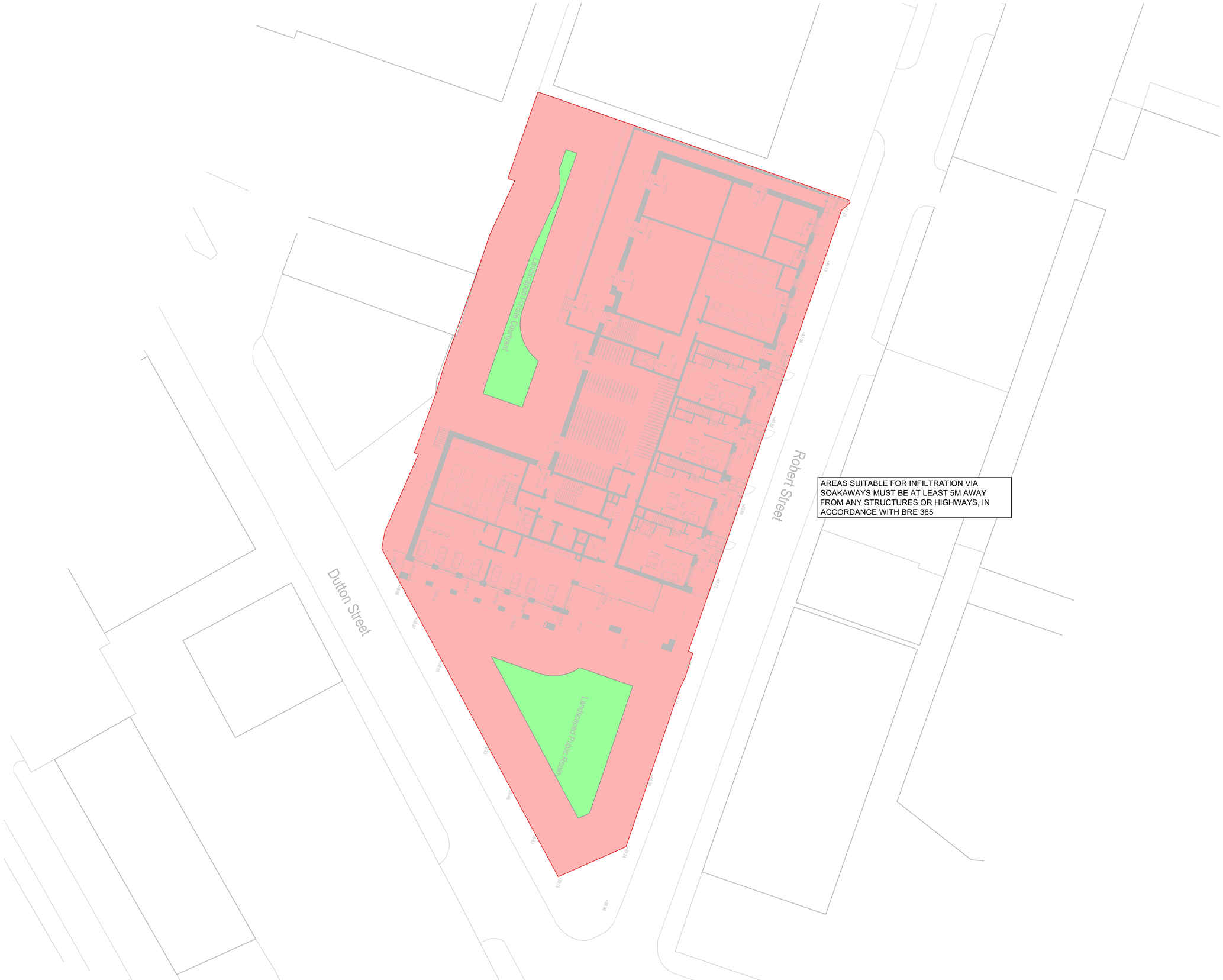
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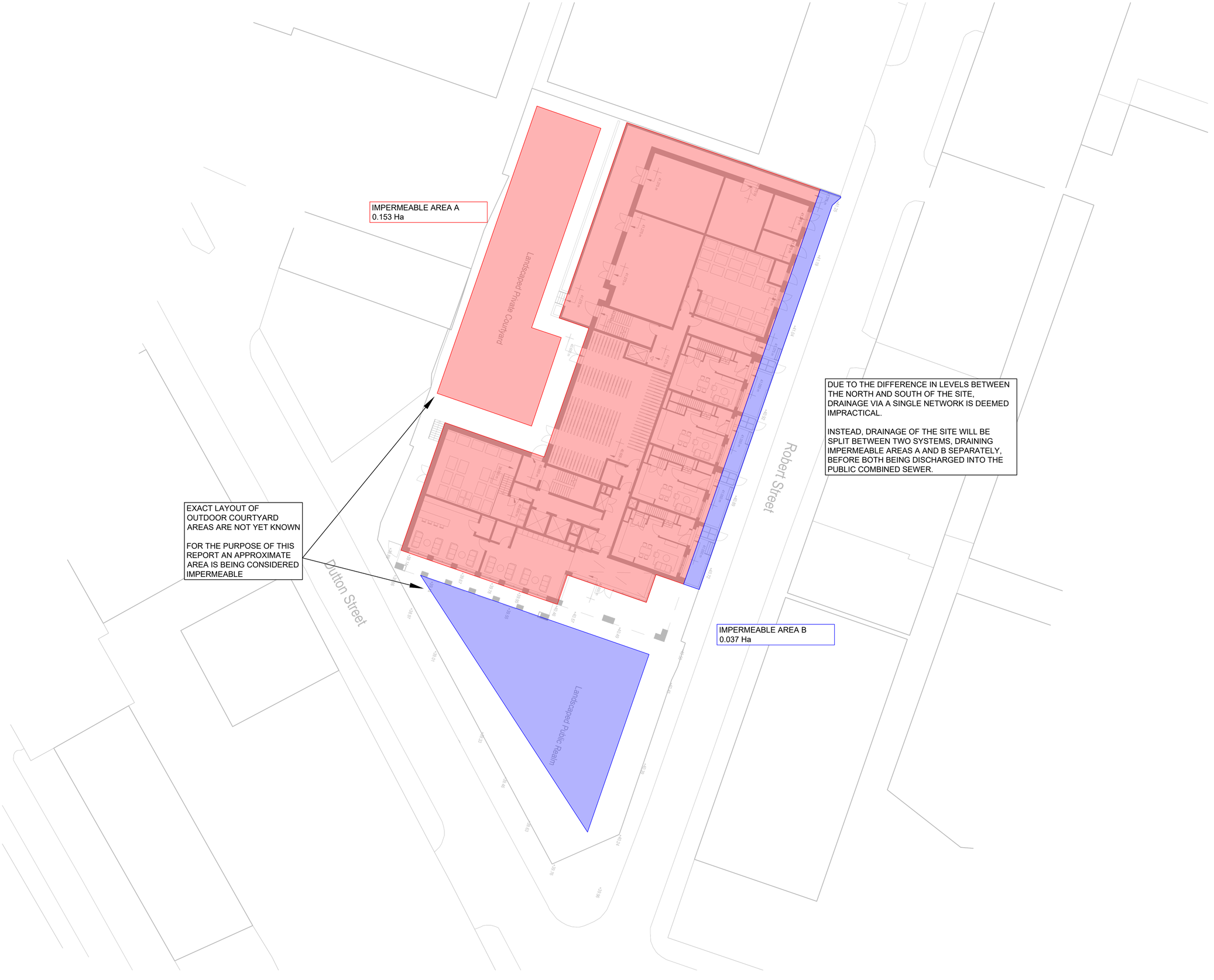
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TITLE:
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