

M1 PICCADILLY, MANCHESTER



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DRAINAGE STRATEGY REPORT

The Alan Johnston Partnership LLP

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1.0 INTRODUCTION

This drainage strategy report has been prepared in connection with a planning application for the construction of a new residential apartment block. The proposed site is located to the south of Store Street, Manchester.

The purpose of this report is to present the surface water and foul water outline drainage strategies for the site which have been developed by the Alan Johnston Partnership. To demonstrate how the specific drainage requirements are to be met, the report should be read in conjunction with the relevant drawings and supporting information, included within the appendices.

The drainage strategies outlined within this report, have been prepared in accordance with BS EN 752:2017 (Drain and sewer systems outside buildings), Sewers for Adoption, Building Regulations Approved Document H (Drainage and waste disposal) and the National Planning Policy Framework (NPPF) and the associated Planning Practice Guidance.

The site is located within Flood Zone 1, with a total site area under 1.0ha. Therefore, in accordance with DEFRA guidance, a Flood Risk Assessment (FRA) is not required. A review of the Manchester City, Salford City and Trafford Councils Level 2 Hybrid Strategic Flood Risk Assessment (SFRA) identifies that the site is located within the Conurbation Core Critical Drainage Area (CDA).

However, based on guidance within the Manchester City, Salford City and Trafford Councils Level 2 Hybrid SFRA User Guide, only sites with an area greater than 0.5ha within a Critical Drainage Area require a Flood Risk Assessment. As the total site area is less than 0.5ha it has been deemed that an FRA is not required to support the planning application for this development.

2.0 SITE DESCRIPTION

The proposed development site is located to the south of Store Street, Manchester at National Grid reference SJ 84982 98087. The location of the existing site is illustrated in Appendix A and the extent of the area to which the application relates is also shown on the aerial photo, enclosed in Appendix B.

The proposed development site covers a total area of 0.066ha. As can be seen from the aerial photo, attached in Appendix B, the site is currently a greenfield site. The existing site currently consists of an existing greenfield area with existing shrubs, trees and bushes. The site is bounded to the south and east by existing residential developments, to the west by an existing industrial development and to the north by the existing highway, Store Street.

The site slopes steeply from south to north with levels sloping from around 44.50mAOD in the north to around 39.40mAOD in the south. To the south of the site there is an existing retaining wall between the site and the existing Store Street footpath. The retaining wall is around 2.3m high with the footpath levels being around 37.10mAOD. The topographic survey is included in Appendix C.

3.0 PROPOSED DEVELOPMENT

The proposed development consists of a new 15 storey, 54no. unit residential apartment building, with associated terrace areas. To enable a viable scheme, the proposed site levels are constrained by the existing developments to the south, east and west and also the existing highway to the north. Despite this, due to the steep slopes the site levels will be reduced to suit the proposed development and access requirements from the existing highway to the north. The proposed site plan indicating the proposed ground floor level is attached in Appendix D.

4.0 ASSESSMENT OF FLOOD RISK

Even though a Flood Risk Assessment is not required on this site, a small site-specific flood risk assessment has been completed below to ensure compliance with DEFRA guidance, the Planning Practice Guidance and National Planning Policy Framework document.

4.1 Flooding from Rivers

The Flood Risk map is included as Appendix E.

As can be seen from the Flood Risk map, the entire site is located within Flood Zone 1 and therefore, the site is located in Flood Zone 1 with a chance of flooding of less than 0.1% (or 1 in 1000).

The nearest river is the River Medlock, which is located approximately 450m south of the site. As such, the risk of flooding to the new development from rivers is considered to be low.

4.2 Flooding from the Sea

The site is not at risk of flooding from the sea. The lowest level of the site is approximately 39.40mAOD, i.e. well above tidal flood levels.

4.3 Flooding from Land

Intense rainfall, often of short duration, that is unable to soak into the ground or enter drainage systems can run quickly off land and result in local flooding.

The Surface Water Flooding map is included in Appendix E. It can be seen from the map that the entire site is classified as having a very low risk of surface water flooding. The highway to the north is at a high risk of surface water flooding but as the proposed site levels are likely to be higher than the existing highway, the site is considered to be at low risk of surface water flooding.

Therefore, the risk of flooding from overland flows due to surface water flooding is considered to be low and as such the overall site is considered to be at low risk of flooding from surface water/surrounding land.

4.4 Flooding from Groundwater

The Groundwater Flooding Map contained within the Manchester City, Salford City and Trafford Councils Level 2 Hybrid Strategic Flood Risk Assessment (SFRA) Report indicates that the site is not located in an area at risk of groundwater flooding. However, it is recommended that an intrusive site investigation be completed to confirm the underlying strata and also the depth of any underlying groundwater levels.

Due to the information provided within the Manchester City, Salford City and Trafford Councils Level 2 Hybrid SFRA, Groundwater Flooding Map, it is envisaged that the site has a negligible risk of groundwater flooding and therefore, the site is considered to be at low risk of flooding from groundwater but this is to be confirmed via an intrusive site investigation.

4.5 Flooding from Sewers

A record of historic public sewers surrounding and serving the development site has been obtained and this is included in Appendix F. As can be seen from the historic public sewers map, there are no public sewers located within the site boundary, with the only nearby public sewers located within the existing highway, Store Street, to the north of the site.

Therefore, due to the lack of public sewers within the proposed site and the proposed drainage networks for the site being suitably designed, leads to the conclusion that the site has a low risk of flooding from sewers.

4.6 Flooding from Reservoirs, Canals and Other Artificial Sources

The Reservoir Flood Risk map is included in Appendix E and the closest reservoir is Audenshaw Reservoir which is located approximately 6.1km east of the site. As such, it can be seen from the map that the site is not at risk of flooding from reservoirs.

However, the closest canal is the Ashton Canal which is located 30m north-east of the site. Despite this, the Section 3.2.5 of the Manchester City, Salford City and Trafford Councils Level 2 Hybrid SFRA states that; *“There is a limited likelihood of canal overtopping in Manchester. If it does occur, it is unlikely to affect areas beyond the canal towpath”*. Therefore, the proposed development has a low risk of flooding from reservoirs, canals and other artificial sources.

5.0 DEVELOPMENT AND DRAINAGE STRATEGY

5.1 Effect of Proposed Development

As previously outlined in Section 2.0, the existing site covers a total area of 0.066ha and currently consists of an existing greenfield area with existing shrubs, trees and bushes. As such, the introduction of the proposed development will increase the impermeable area across the site. This increase in the impermeable areas within the proposed site will lead to an increase in the;

- Volume of surface water ponding on the site.
- Volume of surface water runoff leaving the site or discharging into surrounding areas.
- Peak discharge rate from the site.

Accordingly, site-wide drainage systems are required to drain the foul and surface water flows arising from the proposed developments. Where possible, any existing drainage networks should be utilised. Appropriate design and construction of these systems as set out in Section 6.3 should ensure that there is no increase in offsite flood risk that would otherwise impact downstream areas.

5.2 Existing Drainage Systems

As can be seen from the historic public sewer map, attached in Appendix F, there are no existing public sewers located within the site boundary. The only nearby public sewers are located within the existing highway, Store Street, to the north of the site. As can be seen there is an existing 1550mm diameter public combined water sewer and a 900mm diameter public surface water sewer, both of which run north-east to south-west along the existing highway, Store Street, to the north of the site.

Due to the lack of an existing development on the site and the steep topography, it is anticipated that there is no existing private drainage located within the site boundary. Despite this, surveys of the existing public and private sewers should be undertaken to confirm the location, details, levels and condition of the public and private sewers both within and surrounding the proposed site. This will help identify if there are any existing private connections to the public sewers which can be re-used and also identify if invert levels are such to avoid the need for pumping the proposed drainage.

5.3 Proposed Drainage Strategy

As outlined above in section 4.1, site-wide drainage systems are required to drain the foul and surface water flows arising from the proposed development. The proposed drainage systems must ensure that there is no increase in offsite flood risk that would otherwise impact downstream areas.

5.3.1 Surface Water Drainage

The Building Regulations - Approved Document H (2002) details a hierarchy of potential methods for disposing of surface water as shown below in order of preference:

- Discharge via infiltration
- Discharge to watercourse
- Discharge to sewer

Considering the hierarchy above, the surface water network for the proposed site should infiltrate where possible. An intrusive site investigation has yet to be completed but a desktop study has previously been completed by Geotechnics in September 2014. The desktop study indicates that the British Geological Survey (BGS) 1:50,000 Bedrock geology maps show that the underlying strata comprises of superficial deposits which are reported to be Glacial Till comprising of boulder clays, with the bedrock reported to be of the Chester Formation comprising of sandstone.

As such, due to the site likely being underlain by stiff clay superficial deposits with the sandstone bedrock at depth, it is anticipated that the stiff clay superficial deposits will prevent the use of infiltration to dispose of the surface water runoff from the site.

However, an intrusive site investigation should be undertaken to confirm the underlying strata and the presence of any groundwater. BRE365 compliant soakaway testing should also be completed as part of the site investigation to confirm that infiltration is not a viable option for the disposal of the surface water runoff from the site.

Should it be confirmed, as anticipated, that infiltration is not viable for the proposed development, the intention for the development would be to discharge to watercourse. The nearest watercourse is the River Medlock, which is located approximately 450m south of the site and as such, due to the distance through developed third-party land, discharging to watercourse has been deemed impractical.

Therefore, should infiltration not be a viable option for the proposed development, the only practical solution for discharge of the surface water is discharge to public sewer. As indicated within Section 5.2, there is an existing 900mm diameter public surface water sewer which runs north-east to south-west along the existing highway, Store Street, to the north of the site.

While every effort to utilise any suitable existing systems should be made, the drainage systems should be designed to suit the proposed site layout and topography which aims to provide an efficient design.

In line with Sewers for Adoption (7th Edition), the requirements for the design of a new surface water drainage systems are as follows:

- Below ground piped drainage to be sized to accommodate the 1 in 2 year (50% AEP) design storm without surcharge.
- System to be designed not to flood any part of the site in a 1 in 30 year (3% AEP) design storm.
- For events in exceedance of the 1 in 30 year design storm and up to and including the 1 in 100 year event, site drainage and topography should be designed where practicable to route surface water run-off away from buildings to safe above-ground storage areas on site, thereby preventing this run-off from leaving the site and increasing flood risk elsewhere.

For each design case described above, the design storm is the critical storm duration for the site conditions. In the case of the 1 in 100 year design storm, a 40% increase in the peak rainfall intensity is applied to allow for the estimated worst case impacts of climate change. This is in accordance with new advice, issued by the Environment Agency, which updates previous climate change allowances outlined in the National Planning Policy Framework.

Therefore, suitable systems of below ground drainage will be required to contain as a minimum requirement, the 1 in 30 year event. Additionally, any surface water run-off from events that exceed the design capacity of the new drainage system, up to and including the 1 in 100 year (+40%) event, will be retained on-site in safe storage areas.

As the areas consist mainly of roof areas the risk of pollution has been deemed to be minimal and therefore in line with the requirements of Pollution Prevention Guidelines 3 (PPG3), no measures to prevent oil and other contaminants being passed forward to the existing combined water sewer are required.

In line with common practice, it is proposed the surface water discharge from the proposed development should mimic that from the existing site.

As the site is greenfield, it is envisaged that the proposed surface water runoff will be restricted to the existing greenfield runoff rates, in line with Section 3.4.1 of the Manchester City, Salford City and Trafford Councils Level 2 Hybrid SFRA User Guide. However, discussions with United Utilities should be undertaken regarding the maximum surface water discharge rate from the site, as they may impose more stringent restrictions. A pre development enquiry should be submitted to United Utilities to identify any further restrictions from United Utilities.

Therefore, an assessment of the existing surface water run-off from the greenfield site has been completed using the ICP SuDS method which is available in MicroDrainage. Using the total site area of 0.066ha, the following existing greenfield discharge rates have been generated. The greenfield runoff assessment is attached in Appendix G.

Return Period (Years)	Existing Greenfield Runoff Rate (L/s)
1 Year	0.3
30 Year	0.6
100 Year	0.8

As can be seen from the existing greenfield runoff rates above, they are all less than the maximum discharge restriction of 5.0 L/s. This discharge restriction is generally accepted as the minimum discharge rate to avoid the need for very small orifices, which due to their minimal size are prone to blockage. The 5.0 L/s discharge rate is in compliance with the Environment Agency document; *'Rainfall runoff management for developers'*, Report SC030219. Therefore, the maximum surface water discharge rate for the site as a whole is **5.0 L/s**.

It is envisaged that Manchester City Council (Lead Local Flood Authority) will accept the maximum surface water discharge restriction of 5.0 L/s, due to the rate complying with the Environment Agency document; *'Rainfall runoff management for developers'*, Report SC030219. As such, the surface water drainage system is to be designed to restrict the discharge to 5.0 L/s, for all rainfall events up to and including a 1 in 100 year return period plus 40% climate change design storm.

Using a total post development impermeable area of 0.066ha at the restricted discharge rate of 5.0 L/s, for the 1 in 100 year + 40% return period design storm, a storage volume of **15.2m³** is required. The preliminary attenuation storage assessment is attached in Appendix H.

The calculated storage volume is an estimate only and therefore the actual total storage volume required is likely to change during the detailed design of the proposed surface water drainage system. As such, the actual storage volume required is subject to change and is dependent upon the detailed drainage design.

As seen in the Outline Drainage Strategy Drawing, attached in Appendix I, it is anticipated that the surface water runoff will be collected and conveyed to the north-west of the proposed building. Here it will be restricted to the required 5.0 L/s discharge rate using a vortex flow control chamber, prior to discharging into the existing 900mm diameter public surface water sewer, located on Store Street, to the north of the site.

As the surface water discharge is to be restricted, the runoff will surcharge into the proposed drainage network. Therefore, the required attenuation storage will be provided in the form of a below ground attenuation tank and/or oversized pipes and manholes, with a vortex flow control chamber used to restrict the surface water runoff to the required discharge rate of 5.0 L/s.

It is anticipated that due to lack of areas of sufficient size to safely store flooding at ground level, the proposed surface water drainage network and cellular attenuation tank will be suitably sized to contain the surcharged runoff for all rainfall events up to and including the 1 in 100 year + 40% climate change rainfall event.

As outlined below, all other SuDS techniques have been considered for this development;

SuDS Technique	Suitable for This Development?	Reasoning
Green Roof	✗	Unsuitable due to minimal available roof area.
Rainwater Harvesting	✗	Impractical due to minimal roof area available and pumping requirement for high multi-storey building.
Basins & Ponds	✗	Unsuitable due to lack of available space on proposed site.
Filter Strips & Swales	✗	Unsuitable due to lack of available space on proposed site and anticipated impermeable strata.
Infiltration Techniques	✗	Likely to be unsuitable due to anticipated impermeable strata and minimal available space.
Permeable Surfaces	✗	Likely to be unsuitable due to anticipated impermeable strata and minimal available space.
Tanked/Piped Systems	✓	Suitable and incorporated.

As previously discussed within Section 5.2, surveys of the existing public and private sewers should be undertaken to confirm the location, details, levels and condition of the public and private sewers both within and surrounding the proposed site. This will help identify if there are any existing private connections to the public sewers which can be re-used and also identify if invert levels are such to avoid the need for pumping the proposed drainage.

The surface water drainage strategy outlined above, is subject to change and is dependent upon detailed drainage design, LLFA and United Utilities approvals, in addition to the finalised site layout and levels. Once finalised, the proposed surface water drainage should be designed in line with the requirements, previously outlined.

5.3.2 Foul Water Drainage

Foul water drainage disposal is set out in Part H of the Building Regulations in order of priority the preferred methods are;

1. Public sewer
2. Septic tank
3. Cesspool.

The foul water system shall be designed in accordance with;

- BS EN 752:2017 (Drain and sewer systems outside buildings)
- Sewers for Adoption (7th Edition)
- National Planning Policy Framework document and associated Planning Practice Guidance (Department for Communities and Local Government, March 2014)
- 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 only realistic public sewer which provide a potential location for connection of the foul water drainage from the site is the existing 1550mm diameter public combined water sewer, which runs north-east to south-west along the existing highway, Store Street, to the north of the site.

As seen in the Outline Drainage Strategy Drawing, attached in Appendix I, it is envisaged that the foul water drainage will be collected and conveyed to the north-west of the proposed building prior to discharging at an unrestricted rate, into the existing 1550mm diameter public combined water sewer located within Store Street, to the north of the site.

As previously discussed within Section 5.2, surveys of the existing public and private sewers should be undertaken to confirm the location, details, levels and condition of the public and private sewers both within and surrounding the proposed site. This will help identify if there are any existing private connections to the public sewers which can be re-used and also identify if invert levels are such to avoid the need for pumping the proposed drainage.

The foul water drainage strategy outlined above, is subject to change and is dependent upon detailed drainage design, LLFA and United Utilities approvals, in addition to the finalised site layout and levels. Once finalised, the proposed foul water drainage should be designed in line with the requirements, previously outlined.

6.0 FUTURE MANAGEMENT & MAINTENANCE

The proposed drainage solution uses SUDS techniques in accordance with the CIRIA SUDS Manual C753. The surface water run-off from the proposed development is restricted using a vortex flow control device and the attenuated run-off is stored using a below ground cellular attenuation tank.

It is envisaged that the following components have been or will be included within the drainage strategy for the proposed development:

- Inspection chambers, manholes and catchpits.
- Pipes.
- Drainage channels and gullies.
- Vortex flow control device.
- Cellular attenuation tank.

A suitable maintenance strategy should be adopted to ensure the drainage network is cleaned regularly and the routine maintenance and cleansing regime should be documented. It is assumed that the proposed drainage will remain private and therefore maintenance of the surface and foul water drainage systems will be the responsibility of M1 Piccadilly Ltd or an on-site facilities management team and therefore a copy of the final construction drainage layout should be provided in the final Operations and Maintenance Manual.

As such, the maintenance of the specified SuDS should be included within the developments Operation and Maintenance Manual and should be detailed in accordance with the CIRIA SuDS Manual C753, as per the operation and maintenance guidance outlined below.

6.1 General Maintenance & Inspection Requirements

- No work shall be carried out on the drainage system without permission from a nominated person, who has access to information/a working knowledge of the system.
- Maintenance/inspection work shall be carried out in a safe/planned manner.
- All work is to be carried out by competent persons suitably trained and equipped in accordance with current statutory safe working policies.
- Entry into confined spaces shall be kept to a minimum and be restricted to suitably qualified/equipped persons working in accordance with current statutory safe working policies.
- Drainage systems shall be inspected on a regular basis or should any problems be suspected. Any debris/defects discovered shall be recorded and a programme of cleaning/ repair initiated. Urgent repairs/cleaning shall be actioned as soon as practicable.
- It is recommended that the drainage system is inspected as a minimum twice a year, with the system also being inspected after any major storm event.

- Clearing of the drainage system can be achieved by a number of methods depending on the nature of the work;
 - Rodding – Manual/Mechanical with flexible rods.
 - Jetting – High pressure water jetting.
 - Plunging.

6.2 Inspection Chambers, Manholes and Catchpits

The appropriate health and safety equipment must be used when accessing manholes/catchpits. Confined space certificates must be held by any personnel entering a manhole and the appropriate permits should be obtained from the Maintenance Manager prior to any access. The following operations should be carried out annually.

- Covers of inspection chambers and manholes shall be removed and the sides, benchings and channels cleared.
- Accumulated deposits of silt in inspection chambers, catchpits and manholes shall be removed. Any traps shall then be plunged and thoroughly flushed out with clean water. This should be completed in Autumn, after leaf fall.
- Main and branch drains shall be cleared as required and afterwards be flushed with clean water. Any obstructions found shall be removed and not flushed down the system.
- Covers of inspection chambers, manholes and catchpits shall be replaced, bedded in suitable grease or other sealing material as required and bolted/locked down as appropriate. Missing bolts and broken items shall be replaced in accordance with the manufacturer's details.

6.3 Pipes

Regular inspection and maintenance is important to identify areas which may have become obstructed/clogged and may not be draining correctly, as failure to do so would expose the development to a greater level of flood risk.

Pipes are proprietary products and therefore the materials used can vary across the site. As such, where used the manufacturer's recommendations should be followed. Access for maintenance of the pipes is provided through inspection chambers and manholes. The below table sets out the maintenance schedule for the pipe components of the proposed drainage systems.

Maintenance Schedule	Required Action	Typical Frequency
Regular Maintenance	Inspect for evidence of poor operation via water levels. If required take remedial action.	Monthly for 3 months, then six-monthly intervals. Also, 48 hours after large storms.
	Check and remove large debris and/or vegetation growth near pipe runs.	Monthly or as required.
Remedial Actions	Rod through poorly performing runs as initial remediation.	As required.
	If continued poor performance jet and CCTV survey poorly performing runs.	As required.
	Seek advice as to remediation techniques suitable for the type of performance issue.	As required, if above actions do not improve performance.
Monitoring	Initial Inspection should be provided as post construction CCTV survey.	N/A
	Inspect/check all inlets, outlets and overflows to ensure they are in good condition and operating as designed.	Monthly for 3 months, then six-monthly intervals. Also, 48 hours after large storms.

6.4 Drainage Channels and Gullies

Channels and gullies should be inspected and cleaned in accordance with the manufacturer's details. Channel units can be cleaned through the use of a high-pressure hose; this can be fed into the channel system through access units strategically placed along the channel run. The throat section of channel units should be kept clear at all times to ensure uninterrupted flow of surface water into the drainage channel and any debris within the throat should be removed.

Locking bolts should be replaced and sufficiently tightened, taking care that the bolt heads do not stand above the top surface of the cover or grate. If covers are allowed to move within their frame, this may cause damage to the frame or seating. The below table sets out the maintenance schedule for the drainage channel and gullies components of the proposed drainage systems.

Maintenance Schedule	Required Action	Typical Frequency
Regular Maintenance	Litter and debris removal.	Monthly or as required.
	Check and remove large debris and/or vegetation growth near pipe runs.	Monthly or as required.
	Inspect for evidence of poor operation and/or weed growth. If required take remedial action. Inspect silt accumulation rates and establish appropriate brushing frequencies.	Monthly for 3 months, then six-monthly intervals. Also, 48 hours after large storms.
Remedial Actions	Inspect access/outlet boxes and rod through poorly performing channels and outlets as initial remediation.	As required.
	Seek advice as to remediation techniques suitable for the type of performance issue.	As required, if above actions do not improve performance.
Monitoring	Initial Inspection including channel outlet boxes and gully sumps.	Monthly for 3 months, then six-monthly intervals. Also, 48 hours after large storms.

6.5 Vortex Flow Control Device

Regular inspection and maintenance is important to identify if the vortex flow control device has become obstructed/clogged and may not be functioning correctly, as failure to do so would expose the development to a greater level of flood risk.

Vortex flow control devices are proprietary products and therefore can vary from manufacturer to manufacturer. As such, where used the manufacturer's recommendations should be followed.

- Normally, little maintenance is required as there are generally a vortex flow control device has no moving parts.
- If blockages occur they tend to do so at the intake of the vortex flow control device.
- Vortex flow control devices are generally fitted with a pivoting by-pass door, which allows the manhole chamber to be drained down should blockages occur.
- The smaller type conical units, below the minimum recommended size, are also supplied with roding facilities or vortex suppressor pipes as standard.
- Following installation of the vortex flow control device it is vitally important that any extraneous material i.e. Building materials are removed from the unit and the chamber.
- After the system is made live, it is recommended that each unit be inspected monthly for three months and thereafter at six monthly intervals with hose down if required. Units should also be inspected within 48 hours after large storms.

6.6 Cellular Attenuation Tanks

Regular inspection and maintenance is important to identify if the inlets/outlets have become obstructed/clogged and may not be functioning correctly, as failure to do so would expose the development to a greater level of flood risk. The maintenance requirements for cellular attenuation tanks are outlined within Table 21.3 of the CIRIA SUDS Manual C753. An extract of that table is given below to set out the maintenance schedule for the cellular attenuation tank component of the proposed drainage systems.

TABLE 21.3 Operation and maintenance requirements for attenuation storage tanks		
Maintenance schedule	Required action	Typical frequency
Regular maintenance	Inspect and identify any areas that are not operating correctly. If required, take remedial action	Monthly for 3 months, then annually
	Remove debris from the catchment surface (where it may cause risks to performance)	Monthly
	For systems where rainfall infiltrates into the tank from above, check surface of filter for blockage by sediment, algae or other matter; remove and replace surface infiltration medium as necessary.	Annually
	Remove sediment from pre-treatment structures and/or internal forebays	Annually, or as required
Remedial actions	Repair/rehabilitate inlets, outlet, overflows and vents	As required
Monitoring	Inspect/check all inlets, outlets, vents and overflows to ensure that they are in good condition and operating as designed	Annually
	Survey inside of tank for sediment build-up and remove if necessary	Every 5 years or as required

It should be noted that the Main Contractor should provide a Verification Report, including photographic evidence, to demonstrate that the drainage has been constructed as per the design drawings. As-built drawings should as be supplied by the Main Contractor, where the construction of the drainage varies from the design construction status drawings.

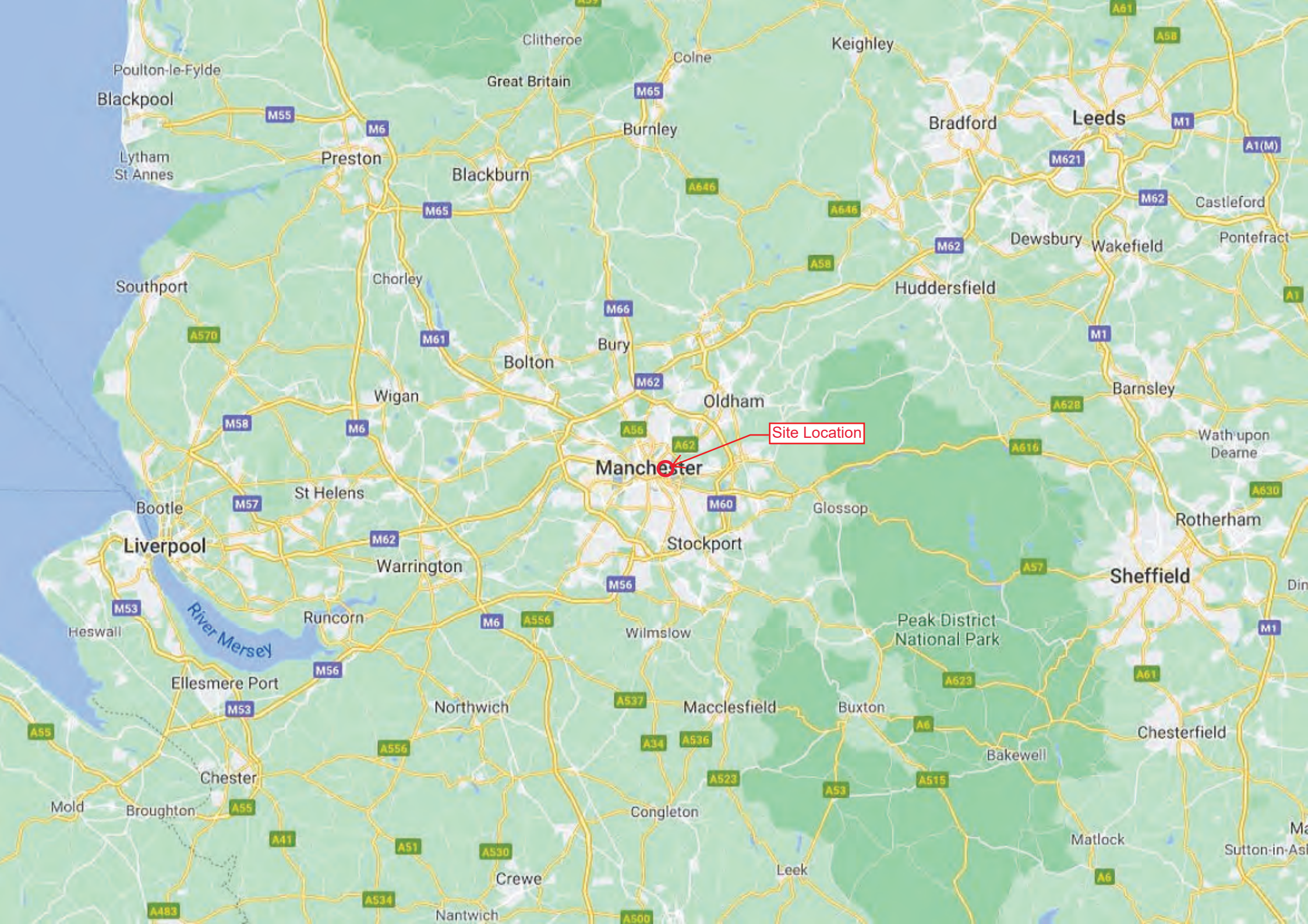
7.0 CONCLUSIONS

- The site is located within Flood Zone 1 and is less than 0.5ha in area, therefore no Flood Risk Assessment is required to support the planning application. Despite this, all forms of flooding have been considered and the proposed development has been assessed as having a low risk of flooding from all sources.
- An intrusive site investigation has yet to be completed but a desktop study has previously been completed by Geotechnics in September 2014. The desktop study indicates that the British Geological Survey (BGS) 1:50,000 Bedrock geology maps show that the underlying strata comprises of superficial deposits which are reported to be Glacial Till comprising of boulder clays, with the bedrock reported to be of the Chester Formation comprising of sandstone.
- Due to the site likely being underlain by stiff clay superficial deposits, it is anticipated that the stiff clay superficial deposits will prevent the use of infiltration to dispose of the surface water runoff from the site.
- Should it be confirmed, as anticipated, that infiltration is not viable for the proposed development, the intention for the development would be to discharge to watercourse. The nearest watercourse is the River Medlock, which is located approximately 450m south of the site and as such, due to the distance through developed third-party land, discharging to watercourse has been deemed impractical.
- Therefore, the only practical solution for discharge of the surface water is discharge to public sewer. There is an existing 900mm diameter public surface water sewer which runs north-east to south-west along the existing highway, Store Street, to the north of the site.
- Surface water discharge from the proposed site will be collected and conveyed to the north-west corner of the proposed building. Here it will be restricted to the required 5.0 L/s discharge rate using a vortex flow control chamber, prior to discharging into the existing 900mm diameter public surface water sewer, located on Store Street, to the north of the site.
- The surface water discharge is to be restricted to the discharge rate of 5.0 L/s, for all rainfall events up to and including the 100 year plus 40% climate change design storm, to comply with the LLFA requirements. The surcharged runoff is to be stored using a below ground cellular attenuation tank and the proposed surface water drainage network itself. The network should prevent any flooding for all rainfall events up to and including the 1 in 100 year + 40% climate change rainfall event.
- Foul water discharge from the proposed site will be collected and conveyed to the north-west corner of the proposed building prior to discharging, at an unrestricted rate, into the existing 1550mm diameter public combined water sewer located within Store Street, to the north of the site.
- Further discussions with the Lead Local Flood Authority and United Utilities should be completed to ensure agreement of the surface and foul water drainage strategies, discharge rates and the overall approach.

8.0 RECOMMENDATIONS

- An intrusive site investigation should be undertaken to confirm the underlying strata and the presence of any groundwater. BRE365 compliant soakaway testing should also be completed as part of the site investigation to confirm that infiltration is not a viable option for the disposal of the surface water runoff from the site.
- Surveys of the existing public and private sewers should be undertaken to confirm the location, details, levels and condition of the public and private sewers both within and surrounding the proposed site. This will help identify if there are any existing private connections to the public sewers which can be re-used and also identify if invert levels are such to avoid the need for pumping the proposed drainage.
- A below ground cellular attenuation tank and a vortex flow control chamber should be utilised to restrict the surface water runoff to the required 5.0 L/s discharge rate and prevent any flooding for rainfall events up to and including the 1 in 100 year plus 40% climate change event.
- Discussions with United Utilities should be undertaken regarding the maximum surface water discharge rate from the site, as they may impose more stringent restrictions. A pre development enquiry should be submitted to United Utilities to identify any further restrictions from United Utilities.
- The calculated storage volume is an estimate only and therefore the actual total storage volume required is likely to change during the detailed design of the proposed surface water drainage system. As such, the actual storage volume required is subject to change and is dependent upon the detailed drainage design.
- The external ground levels around the proposed building shall fall away from the proposed building with any new levels being designed to ensure any exceedance flood routes, for events in excess of the 100 Year + 40% climate change event, exit towards the highway, for use in exceptional circumstances.
- The surface and foul water drainage strategies outlined above, are subject to change and are dependent upon detailed drainage design, LLFA and United Utilities approvals, in addition to the finalised site layout and levels. Once finalised, the proposed surface and foul water drainage networks should be designed in line with the relevant requirements.

Appendix A Site Location Plan

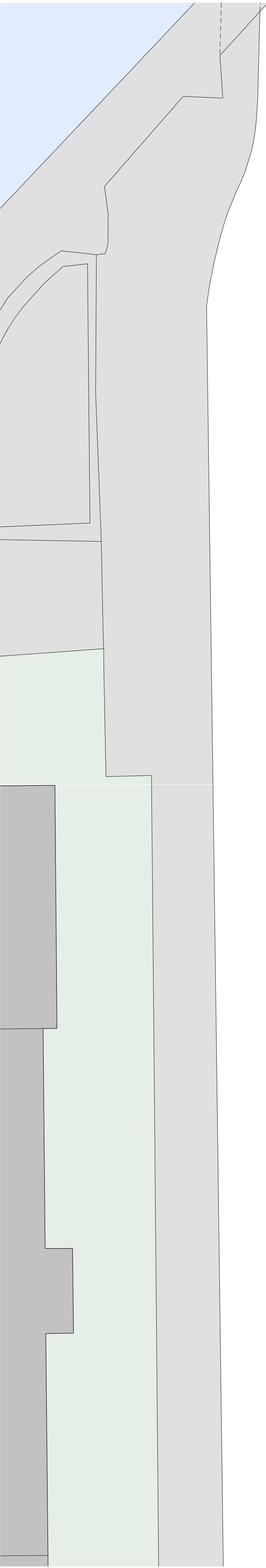


Appendix B Aerial Photograph

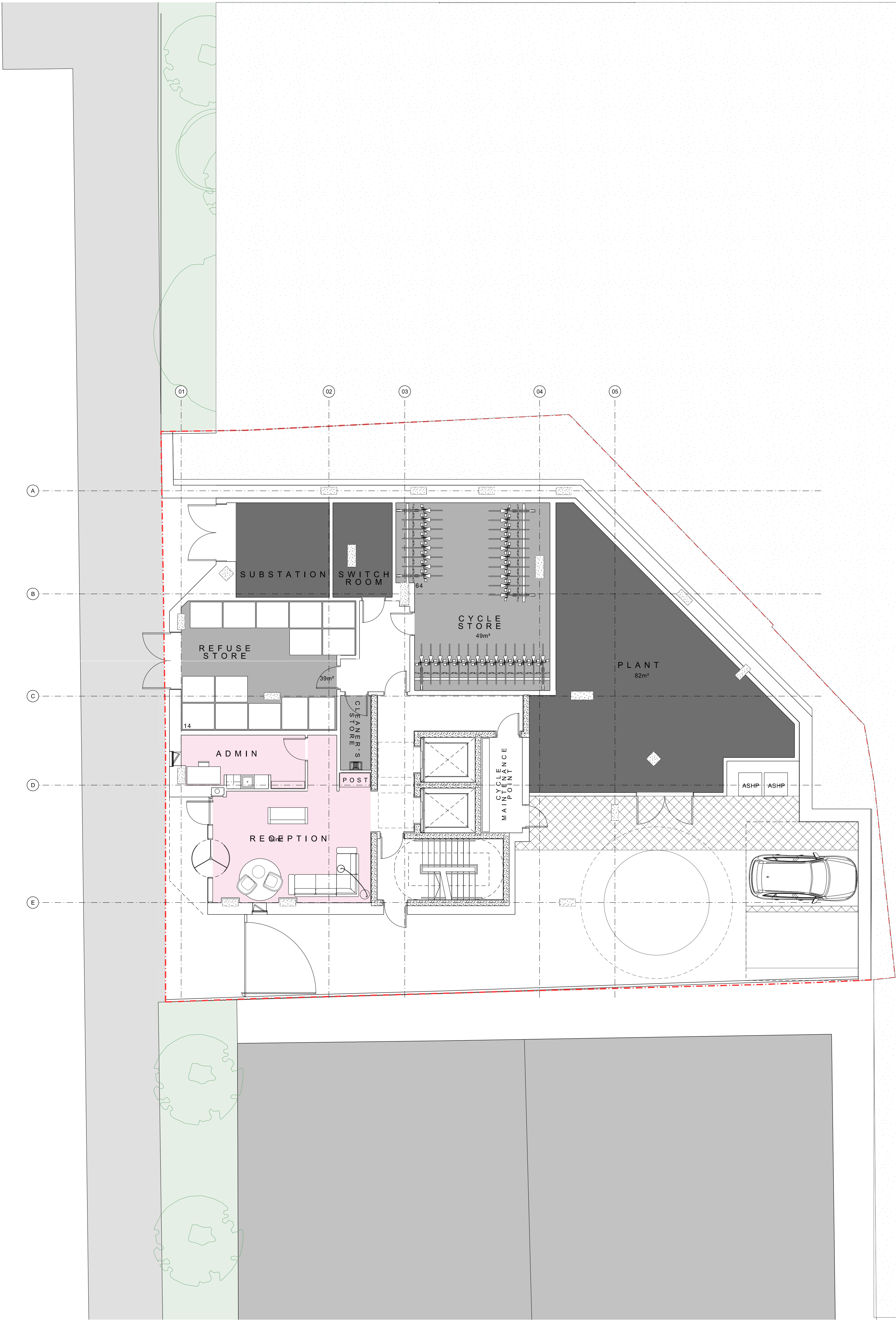


Appendix C Topographic Survey

Appendix D Proposed Site Plan



STORE STREET



Copyright of this drawing is vested in 5plus Architects and it must not be copied or reproduced without written consent. Figured dimensions only are to be taken from this drawing. Do not scale from this drawing.

All Contractors must note the date and are responsible for noting and checking all dimensions ready to their work. 5plus Architects are to be advised of any variation between drawings and site conditions.

Electronic files should be used as 'read only' and should not be interpreted for interpretation. All dimensions and levels should be 'read only' from those values stated in text, on the drawings.

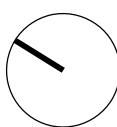
CONSTRUCTION - It is considered that the proposed works are within the scope of a competent Contractor and as such no detailed requests have been identified, refer to relevant RIBA Schedule of Work Assessment.

KEY PLAN:

- Application Boundary
- Studio
- One Bed Apartment
- Two Bed Apartment
- Two Bed Duplex
- Three Bed Duplex
- Reception
- Resident's Lounge
- Refuse / Cycle Store
- Plant Space
- Terrace

E 01/06/21 Issued for information.
D 17/03/21 Structural design added. Issued for information.
C 05/03/21 Issued for information.
B 20/01/21 Issued for information.
A 03/11/20 Indicative structural layout added

REV: DATE: DETAILS:



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PROJECT:
M1 Piccadilly
Store Street

TITLE:
Proposed General Arrangement Plans
Ground Floor

SCALE: 1:100 @ A1 ORIGIN DATE: 22/10/20 DRAWN: MS CHECKED: PN

STATUS:
Information

PROJECT DRAWING NO:
05868_B1_02_2200

REV:
E

Appendix E Flood Risk Maps

Flood map for planning

Your reference
220-232

Location (easting/northing)
384987/398078

Created
24 Mar 2021 16:37

Your selected location is in flood zone 1, an area with a low probability of flooding.

This means:

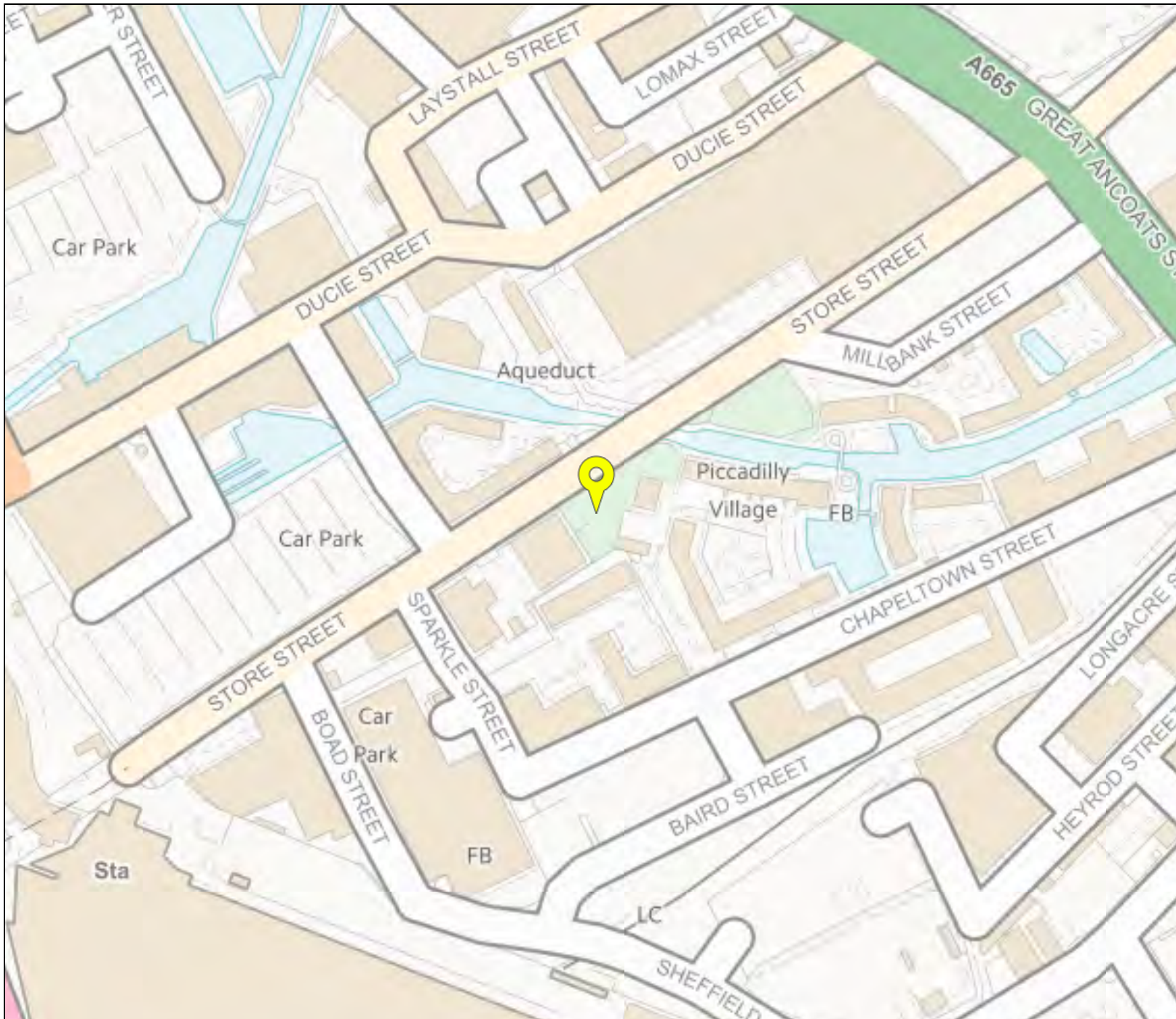
- you don't need to do a flood risk assessment if your development is smaller than 1 hectare and not affected by other sources of flooding
- you may need to do a flood risk assessment if your development is larger than 1 hectare or affected by other sources of flooding or in an area with critical drainage problems

Notes

The flood map for planning shows river and sea flooding data only. It doesn't include other sources of flooding. It is for use in development planning and flood risk assessments.

This information relates to the selected location and is not specific to any property within it. The map is updated regularly and is correct at the time of printing.

The Open Government Licence sets out the terms and conditions for using government data.
<https://www.nationalarchives.gov.uk/doc/open-government-licence/version/3/>



Flood map for planning

Your reference

220-232

Location (easting/northing)

384987/398078

Scale

1:2500

Created

24 Mar 2021 16:37

-  Selected point
-  Flood zone 3
-  Flood zone 3: areas benefiting from flood defences
-  Flood zone 2
-  Flood zone 1
-  Flood defence
-  Main river
-  Flood storage area

0 20 40 60m

Flood risk

Extent of flooding



Location

Enter a place or postcode



Extent of flooding from rivers or the sea

High Medium Low Very low Location you selected

Flood risk

Location

Extent of flooding

Enter a place or postcode



Extent of flooding from surface water

High Medium Low Very low Location you selected

Flood risk

Location

Extent of flooding

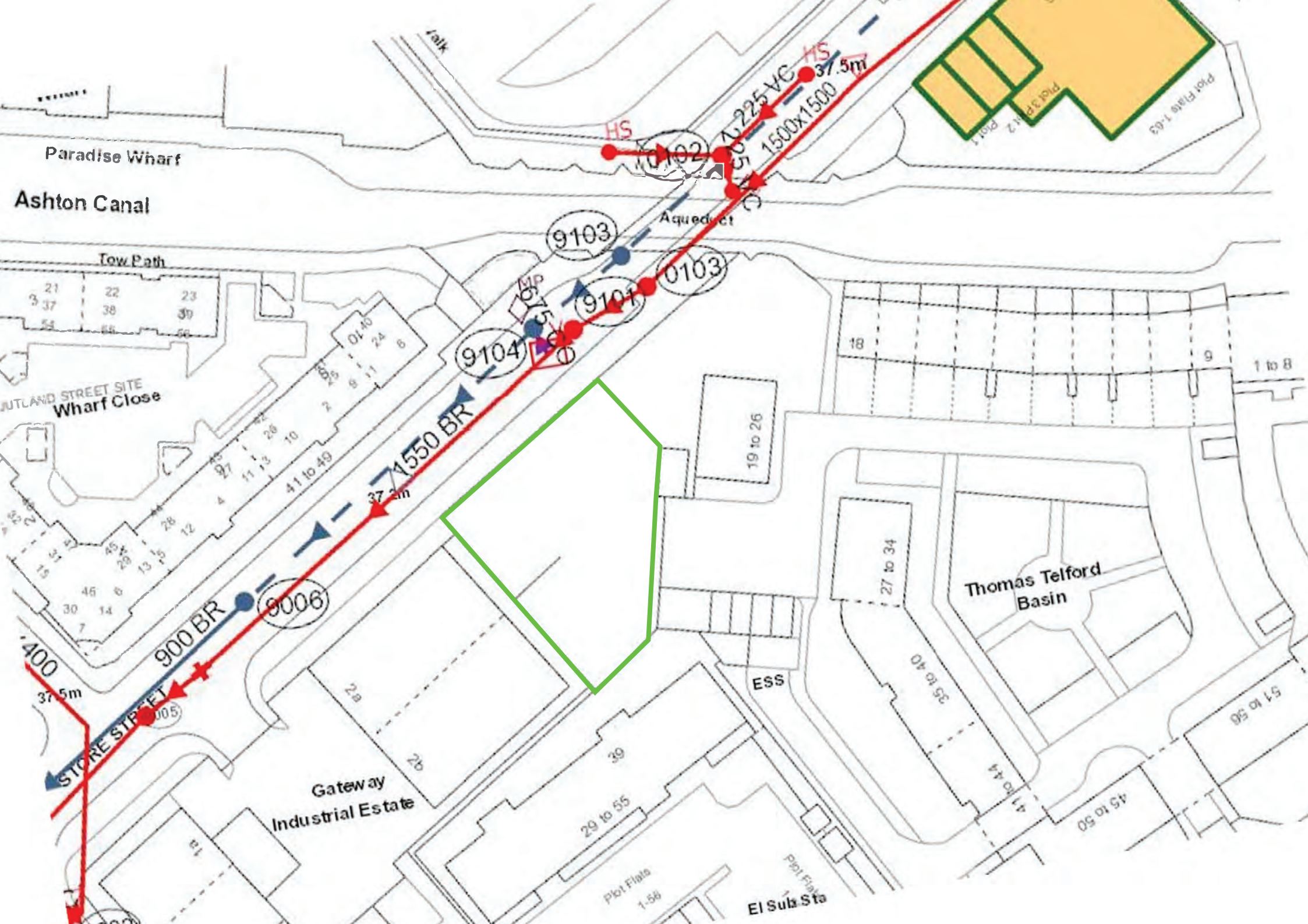
Enter a place or postcode



Extent of flooding from reservoirs

Maximum extent of flooding Location you selected

Appendix F Historic Public Sewer Map



Appendix G Greenfield Runoff Calculations

The Alan Johnston Partnership		Page 1
1 Dale Street Liverpool L2 2ET	220-232 Piccadilly Wharf, Manchester Greenfield Runoff Rates	
Date 25/03/2021 10:29 File	Designed by JRS Checked by DJS	
XP Solutions	Source Control 2020.1	

ICP SUDS Mean Annual Flood

Input

Return Period (years) 1 SAAR (mm) 868 Urban 0.000
Area (ha) 0.066 Soil 0.450 Region Number Region 10

Results 1/s

QBAR Rural 0.4
QBAR Urban 0.4

Q1 year 0.3

Q1 year 0.3
Q30 years 0.6
Q100 years 0.8

Appendix H Preliminary Attenuation Assessment

The Alan Johnston Partnership		Page 1
1 Dale Street Liverpool L2 2ET	220-232 Piccadilly Wharf, Manchester Prelim Storage Estimate	
Date 25/03/2021 10:42 File 220-232 - Prelim Storage	Designed by JRS Checked by DJS	
XP Solutions		Source Control 2020.1

Summary of Results for 100 year Return Period (+40%)

Half Drain Time : 28 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	36.670	0.670	0.0	5.0	5.0	10.2	O K
30 min Summer	36.836	0.836	0.0	5.0	5.0	12.7	O K
60 min Summer	36.872	0.872	0.0	5.0	5.0	13.3	O K
120 min Summer	36.800	0.800	0.0	5.0	5.0	12.2	O K
180 min Summer	36.689	0.689	0.0	5.0	5.0	10.5	O K
240 min Summer	36.541	0.541	0.0	5.0	5.0	8.2	O K
360 min Summer	36.327	0.327	0.0	5.0	5.0	5.0	O K
480 min Summer	36.209	0.209	0.0	4.9	4.9	3.2	O K
600 min Summer	36.147	0.147	0.0	4.6	4.6	2.2	O K
720 min Summer	36.120	0.120	0.0	4.3	4.3	1.8	O K
960 min Summer	36.098	0.098	0.0	3.5	3.5	1.5	O K
1440 min Summer	36.077	0.077	0.0	2.6	2.6	1.2	O K
2160 min Summer	36.063	0.063	0.0	1.9	1.9	1.0	O K
2880 min Summer	36.056	0.056	0.0	1.5	1.5	0.8	O K
4320 min Summer	36.046	0.046	0.0	1.1	1.1	0.7	O K
5760 min Summer	36.041	0.041	0.0	0.9	0.9	0.6	O K
7200 min Summer	36.037	0.037	0.0	0.7	0.7	0.6	O K
8640 min Summer	36.034	0.034	0.0	0.6	0.6	0.5	O K
10080 min Summer	36.032	0.032	0.0	0.6	0.6	0.5	O K
15 min Winter	36.774	0.774	0.0	5.0	5.0	11.8	O K
30 min Winter	36.963	0.963	0.0	5.0	5.0	14.6	O K
60 min Winter	36.999	0.999	0.0	5.0	5.0	15.2	O K
120 min Winter	36.872	0.872	0.0	5.0	5.0	13.3	O K
180 min Winter	36.688	0.688	0.0	5.0	5.0	10.5	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	118.382	0.0	14.6	21
30 min Summer	79.333	0.0	19.6	32
60 min Summer	50.812	0.0	25.1	50
120 min Summer	31.498	0.0	31.2	84
180 min Summer	23.499	0.0	34.9	118
240 min Summer	18.972	0.0	37.6	148
360 min Summer	13.913	0.0	41.3	204
480 min Summer	11.171	0.0	44.2	260
600 min Summer	9.415	0.0	46.6	316
720 min Summer	8.183	0.0	48.6	372
960 min Summer	6.552	0.0	51.9	492
1440 min Summer	4.782	0.0	56.8	734
2160 min Summer	3.483	0.0	62.1	1100
2880 min Summer	2.778	0.0	66.0	1452
4320 min Summer	2.016	0.0	71.8	2196
5760 min Summer	1.604	0.0	76.2	2856
7200 min Summer	1.343	0.0	79.7	3600
8640 min Summer	1.160	0.0	82.7	4344
10080 min Summer	1.025	0.0	85.3	5088
15 min Winter	118.382	0.0	16.4	22
30 min Winter	79.333	0.0	22.0	32
60 min Winter	50.812	0.0	28.2	52
120 min Winter	31.498	0.0	34.9	90
180 min Winter	23.499	0.0	39.1	126

The Alan Johnston Partnership		Page 2
1 Dale Street Liverpool L2 2ET	220-232 Piccadilly Wharf, Manchester Prelim Storage Estimate	
Date 25/03/2021 10:42 File 220-232 - Prelim Storage	Designed by JRS Checked by DJS	
XP Solutions Source Control 2020.1		

Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max E Outflow (l/s)	Max Volume (m³)	Status
240 min Winter	36.453	0.453	0.0	5.0	5.0	6.9	O K
360 min Winter	36.199	0.199	0.0	4.8	4.8	3.0	O K
480 min Winter	36.121	0.121	0.0	4.3	4.3	1.8	O K
600 min Winter	36.102	0.102	0.0	3.6	3.6	1.5	O K
720 min Winter	36.090	0.090	0.0	3.2	3.2	1.4	O K
960 min Winter	36.077	0.077	0.0	2.5	2.5	1.2	O K
1440 min Winter	36.063	0.063	0.0	1.9	1.9	1.0	O K
2160 min Winter	36.052	0.052	0.0	1.4	1.4	0.8	O K
2880 min Winter	36.046	0.046	0.0	1.1	1.1	0.7	O K
4320 min Winter	36.039	0.039	0.0	0.8	0.8	0.6	O K
5760 min Winter	36.034	0.034	0.0	0.6	0.6	0.5	O K
7200 min Winter	36.031	0.031	0.0	0.5	0.5	0.5	O K
8640 min Winter	36.029	0.029	0.0	0.5	0.5	0.4	O K
10080 min Winter	36.027	0.027	0.0	0.4	0.4	0.4	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
240 min Winter	18.972	0.0	42.1	154
360 min Winter	13.913	0.0	46.3	204
480 min Winter	11.171	0.0	49.5	252
600 min Winter	9.415	0.0	52.2	312
720 min Winter	8.183	0.0	54.4	370
960 min Winter	6.552	0.0	58.1	492
1440 min Winter	4.782	0.0	63.6	734
2160 min Winter	3.483	0.0	69.5	1100
2880 min Winter	2.778	0.0	73.9	1468
4320 min Winter	2.016	0.0	80.5	2132
5760 min Winter	1.604	0.0	85.4	2904
7200 min Winter	1.343	0.0	89.3	3672
8640 min Winter	1.160	0.0	92.6	4376
10080 min Winter	1.025	0.0	95.5	5072

The Alan Johnston Partnership		Page 3
1 Dale Street Liverpool L2 2ET	220-232 Piccadilly Wharf, Manchester Prelim Storage Estimate	
Date 25/03/2021 10:42 File 220-232 - Prelim Storage	Designed by JRS Checked by DJS	
XP Solutions	Source Control 2020.1	

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	18.000	Shortest Storm (mins)	15
Ratio R	0.358	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.066

Time (mins) Area			Time (mins) Area			Time (mins) Area		
From:	To:	(ha)	From:	To:	(ha)	From:	To:	(ha)
0	4	0.022	4	8	0.022	8	12	0.022

The Alan Johnston Partnership		Page 4
1 Dale Street Liverpool L2 2ET	220-232 Piccadilly Wharf, Manchester Prelim Storage Estimate	
Date 25/03/2021 10:42 File 220-232 - Prelim Storage	Designed by JRS Checked by DJS	
XP Solutions	Source Control 2020.1	

Model Details

Storage is Online Cover Level (m) 38.000

Cellular Storage Structure

Invert Level (m) 36.000 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m ²)	Inf. Area (m ²)	Depth (m)	Area (m ²)	Inf. Area (m ²)	Depth (m)	Area (m ²)	Inf. Area (m ²)
0.000	16.0	0.0	1.000	16.0	0.0	1.001	0.0	0.0

Hydro-Brake® Optimum Outflow Control

Unit Reference MD-SHE-0105-5000-1000-5000
Design Head (m) 1.000
Design Flow (l/s) 5.0
Flush-Flo™ Calculated
Objective Minimise upstream storage
Application Surface
Sump Available Yes
Diameter (mm) 105
Invert Level (m) 36.000
Minimum Outlet Pipe Diameter (mm) 150
Suggested Manhole Diameter (mm) 1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.000	5.0	Kick-Flo®	0.637	4.1
Flush-Flo™	0.296	5.0	Mean Flow over Head Range	-	4.3

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	3.6	0.800	4.5	2.000	6.9	4.000	9.6	7.000	12.5
0.200	4.8	1.000	5.0	2.200	7.2	4.500	10.1	7.500	12.9
0.300	5.0	1.200	5.4	2.400	7.5	5.000	10.6	8.000	13.3
0.400	4.9	1.400	5.8	2.600	7.8	5.500	11.1	8.500	13.7
0.500	4.7	1.600	6.2	3.000	8.4	6.000	11.6	9.000	14.1
0.600	4.3	1.800	6.6	3.500	9.0	6.500	12.1	9.500	14.5

Appendix I Outline Drainage Strategy Drawing

