



Christie TIF Wards, Manchester

DRAINAGE STRATEGY REPORT



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Christie TIF Wards, Manchester

Drainage Strategy Report

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Christie TIF Wards, Manchester

Drainage Strategy Report

The Christie NHS Foundation Trust - Christie TIF Wards, Manchester



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Contents

1.0 INTRODUCTION	4
2.0 SITE DESCRIPTION	4
3.0 PROPOSED DEVELOPMENT	5
4.0 ASSESSMENT OF FLOOD RISK	5
4.1 Flooding from Rivers	5
4.2 Flooding from the Sea	5
4.3 Flooding from Land	5
4.4 Flooding from Groundwater	6
4.5 Flooding from Sewers	6
4.6 Flooding from Reservoirs, Canals and Other Artificial Sources	6
5.0 PROPOSED DEVELOPMENT	7
5.1 Effect of Proposed Development	7
5.2 Existing Drainage Systems	7
5.3 Proposed Drainage Strategy	8
5.3.1 Surface Water Drainage	8
5.3.2 SuDS Summary	12
5.3.4 Foul Water Drainage	13
6.0 FUTURE MANAGEMENT & MAINTENANCE	14
6.1 General Maintenance & Inspection Requirements	14
6.2 Inspection Chambers, Manholes and Catchpits	15
6.3 Pipes	15
6.4 Drainage Channels and Gullies	16

6.5 Vortex Flow Control Device.....	16
7.0 CONCLUSIONS	17
8.0 RECOMMENDATIONS.....	18
Appendix A - Site Location Plan	19
Appendix B - Aerial Photo	20
Appendix C - Existing Drainage Information with Topo	21
Appendix D - Proposed Site Plan.....	22
Appendix E - Flood Risk Maps.....	23
Appendix F - Public Sewer Map & CCTV Survey.....	24
Appendix G - Pre & Post Development Impermeable Areas Drawing	25
Appendix H - Existing Brownfield Runoff Calculations	26
Appendix I - Preliminary Storage Estimate.....	27
Appendix J - Outline Drainage Strategy Drawing & SW Calcs	28
Appendix K - Exceedance Flow Paths Drawing	29



Alan Johnston Partnership Ltd.

Company No. 13204766

Christie TIF Wards, Manchester

Drainage Strategy Report

1.0 INTRODUCTION

This drainage strategy report has been prepared on behalf of The Christie NHS Foundation Trust in connection with a planning application for the construction of a small building extension and internal refurbishment of the existing Oak Road Treatment Centre at The Christie, 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), the Planning Practice Guidance and the National Planning Policy Framework document (Department for Communities and Local Government, March 2014).

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.



2.0 SITE DESCRIPTION

The site is situated on the existing Oak Road Treatment Centre and is located at National Grid reference SJ 84877 94431. The site location is illustrated in Appendix A and the extent of the area to which the application relates is shown on the enclosed aerial photo, attached in Appendix B.

The existing site covers a total area of 0.135ha with the proposed development area covering the entire site. The site currently comprises of the existing active Oak Road Treatment Centre buildings and the site cabins associated with the ongoing adjacent development, to the east of site.

The site generally falls from north east to south west, with levels falling from approximately 34.60mAOD in the north-east of the site to approximately 34.20mAOD in the south of the site. An aerial photo is included in Appendix B to illustrate the site at the present day and the existing topography is indicated on the drainage record information attached in Appendix C.



3.0 PROPOSED DEVELOPMENT

The entire site covers a total area of 0.135ha, with the proposed internal refurbishment area and others areas to drain as per the existing scenario covering a total area of 0.091ha and the remaining 0.044ha of area covering the proposed small extension to the existing building and the associated external works. As the 0.091ha area will continue to drain as per the existing scenario, only the remaining 0.044ha area will require new positive drainage.

To enable a viable scheme, the proposed site levels are constrained by the existing hospital buildings and access roads surrounding the site. Therefore, site levels are likely to remain similar to the existing. The proposed site plan indicating the proposed building extension is attached in Appendix D.

4.0 ASSESSMENT OF FLOOD RISK

Even though a Flood Risk Assessment is not required under the Planning Practice Guidance and National Planning Policy Framework, a small site-specific flood risk assessment has been completed below.

4.1 Flooding from Rivers

The Flood Risk map is included as Appendix E. As can be seen from the Flood Risk map, all three sites are located within Flood Zone 1 and therefore, the sites are all located in Flood Zone 1 with a chance of flooding of less than 0.1% (or 1 in 1000).

The nearest watercourse is the River Mersey, which is located approximately 1.60km south-west 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 sites are not at risk of flooding from the sea. The lowest level across all three sites is approximately 34.20mAOD, 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 site is classified as having a very low risk of surface water flooding, with Oak Road to the south of the site having a low risk of surface water flooding. Therefore, the risk of flooding from overland flows due to surface water flooding is considered to be low.

4.4 Flooding from Groundwater

Due to the existing site cabins a full intrusive site investigation is yet to be undertaken but even with the current limitations a small intrusive site investigation has been completed by GRM. The site investigation encountered strata which corresponds with that found within the site investigation completed as part of the adjacent to the east of the proposed site.

An intrusive site investigation report by CCG, report ref: CCG-C-18-10614, dated April 2019 has been completed for the adjacent development to the east. Numerous boreholes were completed as part of this site investigation and it indicates that there were no groundwater strikes during any of the boreholes. Therefore, indicating that the groundwater is located at depth.

Due to the close proximity of the adjacent site to the east, it is assumed that the proposed development will be similar. Therefore, it is envisaged that the groundwater level for the proposed development site will be similar. As such, it is envisaged that the proposed site has a low risk of flooding from groundwater but this should be confirmed via an intrusive site investigation.

4.5 Flooding from Sewers

A record of public sewers surrounding and serving the development site is included in Appendix F. As can be seen from the public sewer map the only nearby public combined water sewers, which are located in Oak Road to the south of the site and Wilmslow Road to the east of the site. These include a 300mm diameter public combined water sewer running east to west along Oak Road and a 450mm diameter public combined water sewer running north to south along Wilmslow Road.

The site also contains a series of private surface, foul and combined water sewers which are assumed to discharge into the aforementioned public combined water sewers, located within the highways to the south and east of the site.

Therefore, as the proposed drainage networks for the proposed site will be suitably designed and the fact that the surrounding public sewers are all located within the surrounding highways and are maintained by United Utilities, leads to the conclusion that the site itself is considered to have 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. It can be seen from the map that the site is not at risk of flooding from reservoirs. The closest open waterbody is Chorlton Water Park which is located approximately 4.50km west of the site and the nearest reservoir is Gorton Lower Reservoir which is located approximately 5.70km north-east of the site.

Therefore, the site is considered to be at low risk of flooding from reservoirs, canals and other artificial sources.

5.0 PROPOSED DEVELOPMENT

5.1 Effect of Proposed Development

As previously outlined in Section 2.0, the existing site covers a total area of 0.135ha but the 0.091ha internal refurbishment area and other areas are to remain as per the existing scenario and have therefore not been included within the pre and post development impermeable area calculations.

As such, only the remaining 0.044ha area has been incorporated within the pre and post development impermeable area calculations.

The pre and post development impermeable areas for the 0.044ha development area have been assessed and are indicated on the attached drawing in Appendix G. The comparison between the pre and post development impermeable areas is also summarised below;

Total Development Area (ha)	Pre-Development Impermeable Area (ha)	Post Development Impermeable Area (ha)
0.044	0.044	0.031

Given that there is no change to the total impermeable area, the proposed development will have no change to 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, drainage systems are needed to drain the foul and surface water flows arising from the proposed development. Where possible, any existing drainage networks should be utilised. Appropriate design and construction of these systems as set out in Section 5.3 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 Public Sewer Map, attached in Appendix F, there are no public sewers located within the proposed site. The only nearby public sewers are the public combined water sewers, located in Oak Road to the south of the site and Wilmslow Road to the east of the site. These include a 300mm diameter public combined water sewer running east to west along Oak Road and a 450mm diameter public combined water sewer running north to south along Wilmslow Road.

As well as public sewers there are also a number of existing private sewers located within and surrounding the proposed site area. The drainage record information attached in Appendix C, indicates the extent of the existing private drainage within and surrounding the proposed site.

As can be seen from the drainage record information attached in Appendix C, there is an existing private surface water network located to the west of the proposed site and this discharges into an existing private combined water network, within the site boundary. The existing private combined water network then travels west to east through the site, where it is assumed to continue east prior to discharging into the 450mm diameter public combined water sewer running north to south along Wilmslow Road.

The layout plans indicate that the existing private combined water sewer which runs west to east through the site runs through the proposed extension building and as such the existing private combined water sewer will need to be diverted. This has been confirmed via CCTV surveys which have identified the exact location and details of the existing private drainage within and surrounding the proposed site. The CCTV survey is also attached in Appendix F.

As all of the public sewers are located outside of the site and are not being affected by the proposed works, it is envisaged that no public sewer diversions or reduced easement agreements will be required with United Utilities.

5.3 Proposed Drainage Strategy

As outlined above in Section 5.1, 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 Planning Policy Guidance and the CIRIA SuDS Manual detail that surface water runoff from a development should be disposed of as high up the following hierarchy as reasonably practicable:

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

Considering the hierarchy above, the surface water network for the 0.049ha developed area of the site should infiltrate where possible. As indicated in Section 4.4, due to the existing site cabins a full intrusive site investigation is yet to be undertaken.

However, even with the current limitations a small intrusive site investigation has been completed by GRM. The site investigation encountered strata which corresponds with that found within the site investigation completed as part of the adjacent to the east of the proposed site.

An intrusive site investigation report by CCG, report ref: CCG-C-18-10614, dated April 2019 has been completed for the adjacent development to the east. This report includes falling head tests which indicate that the infiltration rate was around 7.45×10^{-8} m/s and therefore is not a viable infiltration rate.

This coupled with the fact that the partial site investigation completed by GRM encountered similar strata to this adjacent site investigation by CCG and that Building Regulations Part-H restrictions indicating that soakaways should not be located within 5m of a building or highway, results in the conclusion that infiltration will not be suitable for the proposed development.

As the possibility of infiltration has been ruled out, the intention for the development would be to discharge to watercourse/surface water body. As indicated in Section 4.1, the nearest watercourse is the River Mersey which is located 1.60km south-west of the site. Given the distance across various plots of developed third party land, it has been deemed impractical to discharge to watercourse.

As such, the only practical solution for discharge of the surface water is to discharge to a public sewer. As indicated within Section 5.2, there is an existing private combined water sewer which runs west to east through the site, prior to discharging into the 450mm diameter public combined water sewer running north to south along Wilmslow Road. Therefore, due to the lack of nearby public surface water sewers, it is envisaged that this will be used as the proposed outfall for the development.

While every effort to use the 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 45% increase in the peak rainfall intensity is applied to allow for the estimated worst-case impacts of climate change. This is in accordance with advice, issued by the Environment Agency, which updates previous climate change allowances outlined in the National Planning Policy Framework.

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 (+45%) event, will be retained on-site in safe storage areas.

In compliance with Section 3.4.1 of the Manchester City, Salford City and Trafford Councils Level 2 Hybrid SFRA User Guide, it is envisaged that as the existing site is brownfield, Manchester City Council will require the proposed surface water runoff rates to be restricted to achieve a minimum 50% betterment on the existing brownfield run off rates.

Therefore, an assessment of the existing surface water run-off from the brownfield site has been completed using a simple three pipe network modelled in Micro Drainage. For the existing ha site, using an existing impermeable area of 1.305ha. The brownfield runoff assessment is attached in Appendix H and the results are summarised within the table below.

Using the pre development impermeable area of 447m² as shown in Appendix G, an assessment of the existing surface water run-off from the brownfield site has been completed using a simple three pipe network modelled in Micro Drainage. For the existing 0.044ha site, the existing brownfield run-off rates were calculated. The brownfield runoff assessment is attached in Appendix H and the results are summarised within the table below.

Rainfall Return Period (years)	Existing Brownfield Runoff Rate (L/s)	Proposed Maximum Discharge Rate (L/s)
1 Year	4.8	2.4
2 Year (Qbar)	6.2	3.1
30 Year	13.3	6.6
100 Year	16.4	8.2

The proposed maximum runoff rates after applying 50% betterment, as per the Lead Local Flood Authority's requirements, are also outlined within the table above. However, as can be seen the 2 year (Qbar) proposed maximum discharge rate is 3.1 L/s and therefore it is envisaged that the minimum discharge restriction of 5.0 L/s will be applied.

The 5.0 L/s 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.

This is further supported by United Utilities, as the guidance notes within the United Utilities Section 104 adoption agreement states that for any flow control device, "*The minimum acceptable orifice size is 100mm.*" and to achieve this minimum orifice diameter a maximum discharge rate of 5.0 L/s is required.

Using a total post development impermeable area of 0.031ha at the restricted discharge rate of 5.0 L/s, for the 1 in 100 year + 45% return period design storm, a storage volume of 4.1m³ is required. The preliminary attenuation storage estimate is attached in Appendix I.

A pre-development enquiry has been submitted to United Utilities to confirm acceptance of the proposed discharge rate, discharge location and over all drainage strategy but to date no response has been received.

Due to the maximum discharge restriction of 5.0 L/s being applied and the fact that the proposed development reduces the overall impermeable areas and therefore the overall runoff volume it is envisaged that United Utilities will accept the proposed drainage strategy.

As seen in from the Outline Drainage Strategy Drawing attached in Appendix J, it is anticipated that the attenuation storage will be provided within the surface water drainage network itself, using oversized manholes, with a vortex flow control device used to restrict the discharge rate to the required 5.0 L/s discharge rate, as indicated above.

The surface water drainage calculations have also been included within Appendix J and as can be seen the proposed surface water drainage and attenuation storage prevent any flooding for all rainfall events up to and including the 1 in 100 year + 45% climate change event and also meet the required 5.0 L/s discharge restriction. This is summarised in the table below.

Rainfall Return Period (years)	Existing Brownfield Runoff Rate (L/s)	Calculated Discharge Rate (L/s)	Proposed Betterment (%)
1 Year	4.8	3.4	29%
2 Year (Qbar)	6.2	4.2	32%
30 Year	13.3	4.9	63%
100 Year	16.4	5.0	69%

As can be seen from the Outline Drainage Strategy Drawing attached in Appendix J, the surface water drainage collects the runoff from the site area via gullies, linear drainage channels and rainwater downpipes and conveys the surface water runoff to the east of the proposed site.

Here, the surface water runoff is restricted via a vortex flow control prior to discharging into the existing private combined water sewer. The vortex flow control device restricts the runoff to the required 5.0 L/s discharge rate, for all rainfall events up to and including the 1 in 100 year +45% climate change event.

An exceedance flow paths drawing is also included in Appendix K, which indicates that the external ground levels fall away from the proposed building, with any new levels being designed to ensure any overland flood routes, for rainfall events in excess of the 1 in 100 year +45% climate change event, exiting towards the surrounding access roads and landscaped areas.

It should be noted that the proposed surface water drainage network provides sufficient storage to prevent any flooding for all rainfall events up to and including the 1 in 100 year

+45% climate change event and therefore the exceedance flow paths are for use in exceptional circumstances only.

The surface water drainage strategy and discharge rate should be confirmed via more detailed discussions with Manchester City Council and United Utilities prior to the commencement of any works.

5.3.2 SuDS Summary

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

SuDS Technique	Suitable for This Development?	Reasoning
Green Roof	✗	Not suitable due to minimal roof area available due to plant and equipment on roof.
Rainwater Harvesting	✗	Impractical due to lack of demand for greywater.
Basins & Ponds	✗	Unsuitable due to lack of available space.
Filter Strips & Swales	✗	Unsuitable due to lack of available space.
Bio-retention Areas	✗	Unsuitable due to lack of available space.
Infiltration Techniques	✗	Unsuitable due existing impermeable strata.
Permeable Surfaces	✗	Unsuitable due to minimal available areas available and existing impermeable strata.
Tanked/Piped Systems	✓	Suitable and incorporated.

Green roof areas have been considered but due to the minimal roof area available due to the size of the building and need for plant and equipment on the roof, the use of a green roof has been discounted. Rainwater harvesting was also considered but due to a lack of greywater demand it has been deemed as impractical to include a rainwater harvesting system.

Due to the lack of available space across the site and the fact that the site is located within an existing hospital building, the use of detention basins and/or ponds has also been discounted. Filter drains/strips, swales and bio-retention areas have also been deemed as impractical due to the lack of available space within the site.

As previously discussed in Section 5.3.1 infiltration is deemed as not feasible across the site and therefore the use of infiltration SuDS techniques is not possible. Non-infiltration (tanked) permeable surfaces such as permeable paving have also been considered but due to the lack of available areas this has also been discounted.

Finally, the use of oversized pipe networks may be required but it is envisaged that the use of the below ground attenuation tank will be required to store the surcharged surface water runoff from the site.

The use of specific SuDS techniques across the site will be confirmed during the later stages of the design process but where possible, the above SuDS summary should be adhered to as close as reasonably possible.

5.3.4 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 (Department for Communities and Local Government, March 2012).
- ◆ Planning Practice Guidance
- ◆ 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 2015).

As can be seen from the Outline Drainage Strategy Drawing attached in Appendix J, the proposed foul water drainage will collect the runoff from the new proposed building extension and conveys the foul water to the east of the proposed site.

Here the foul water runoff will discharge via gravity into the existing private combined water sewer. It is anticipated that the foul water can discharge into the existing private sewer at unrestricted rates.

The foul water drainage strategy and unrestricted discharge rate should be confirmed via more detailed discussions with Manchester City Council and United Utilities prior to the commencement of any works.



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 all three of the proposed development sites:

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

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 The Christie NHS Foundation Trust 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 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 are 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 rodding 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.

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 with a low probability of flooding from all sources.
- ◆ Due to the existing site cabins a full intrusive site investigation is yet to be undertaken. However, even with the current limitations a small intrusive site investigation has been completed by GRM. The site investigation encountered strata which corresponds with that found within the site investigation completed as part of the adjacent to the east of the proposed site.
- ◆ An intrusive site investigation report by CCG, report ref: CCG-C-18-10614, dated April 2019 has been completed for the adjacent development to the east. This report includes falling head tests which indicate that the infiltration rate was not a viable.
- ◆ This coupled with the fact that the partial site investigation completed by GRM encountered similar strata to this adjacent site investigation by CCG and that Building Regulations Part-H restrictions indicating that soakaways should not be located within 5m of a building or highway, results in the conclusion that infiltration will not be suitable for the proposed development.
- ◆ Due to the distance across developed third-party land, discharging the surface water from the site to the nearest watercourse has been deemed as impractical. This and the lack of public surface water sewers within and surrounding the proposed site results in the only practical option for the disposal of the surface water runoff from the proposed development is to discharge into the private combined water sewers within the site boundary.
- ◆ The surface water discharge is to be restricted a 50% betterment on the existing brownfield runoff rates, for all rainfall events up to and including the 1 in 100 year +45% climate change design storm, to comply with LLFA requirements. The proposed surface water drainage design meets this criteria and also ensures there is no flooding

for all rainfall events up to and including the 1 in 100 year +45% climate change design storm.

- ◆ The runoff is to be restricted using a vortex flow control device and the surcharged runoff attenuated using the proposed surface water drainage network itself.
- ◆ The foul water drainage is to discharge into the existing private combined water manhole to the east of site, via gravity. It is anticipated that the foul water can discharge into the private sewer at unrestricted rates.
- ◆ The external ground levels around proposed buildings shall fall away from the proposed building with any new levels being designed to ensure any overland flood routes, for events in excess of the 1 in 100 year + 45% climate change, exit towards the surrounding access roads and landscaping areas, for use in exceptional circumstances only.



8.0 RECOMMENDATIONS

- ◆ The surface water drainage strategy and discharge rates should be confirmed via more detailed discussions with Manchester City Council and United Utilities prior to the commencement of any works.
- ◆ The foul water drainage strategy and unrestricted discharge rate should be confirmed via more detailed discussions with Manchester City Council and United Utilities prior to the commencement of any works.

Appendix A – Site Location Plan



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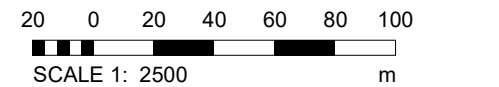
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- NOTES:**
- Application Boundary (Approx. 1266m²)
 - Site Boundary / Client Ownership

P02	CLS	Red line boundary updated to include upper floors	07/12/22
P01	MJC	First Issue	04/11/22
Rev	By	Description	Date



The Cruck Barn, Duxbury Park, Chorley, Lancashire. PR7 4AT
t: 01257 260070 f: 01257 260071

Client Name:
The Christie NHS Foundation Trust

Site Name:
The Christie, Wilmslow Road, Manchester

Project Name:
TIF Wards

Drawing Title:
Site Location Plan

Project No: 8283-002	Sheet Size: A3	Scale: 1 : 2500	
Drawn by: SK	Checked by: CLS	Approved by: NW	Revision: P02
Suitability: Issued for Planning			Status: S4

Drawing Number:
Project Code / Orig / Vol / Level / Type / Disc / System-Number
CHRCW-GDA-V4-S1-DR-A-9901

Appendix B – Aerial Photo



Appendix C – Existing Drainage Information with Topo

Appendix D – Proposed Site Plan

EXISTING OAK ROAD
ENTRANCE BUILDING

EXISTING CCU BUILDING
BLOCK 34

PROPOSED STAIR/LIFT CORE
EXTENSION

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1001
SCALE 1:100

012345
m

N

LEGEND

Proposed Tarmac Pavement (To match existing)

Proposed Block Paving (To match existing)

Proposed Soft Landscape Planting (To match existing)

P01	MJC	Stage 4 Issue	28/04/23
Rev	By	Description	Date

The Cruck Barn, Duxbury Park, Chorley, Lancashire. PR7 4AT
t: 01257 260070 f: 01257 260071

Client Name:
The Christie NHS Foundation Trust

Site Name:
The Christie, Wilmslow Road, Manchester

Project Name:
TIF Wards

Drawing Title:
Proposed Site Plan

Project No: 8283-002	Sheet Size: A1	Scale: As indicated	
Drawn by: MJC	Checked by: BW	Approved by: CLS	Revision: P01
Suitability: For Stage Approval			Status: S4

Drawing Number:
Project Code / Originator / Volume / Level / Type / Discipline / System-Number
CHRCGW-GDA-V4-ZZ-S1-DR-A-0002

Appendix E – Flood Risk Maps

Flood map for planning

Your reference
222-164

Location (easting/northing)
384872/392409

Created
14 Dec 2022 14:19

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

You will need to do a flood risk assessment if your site is **any of the following:**

- bigger than 1 hectare (ha)
- In an area with critical drainage problems as notified by the Environment Agency
- identified as being at increased flood risk in future by the local authority's strategic flood risk assessment
- at risk from other sources of flooding (such as surface water or reservoirs) and its development would increase the vulnerability of its use (such as constructing an office on an undeveloped site or converting a shop to a dwelling)

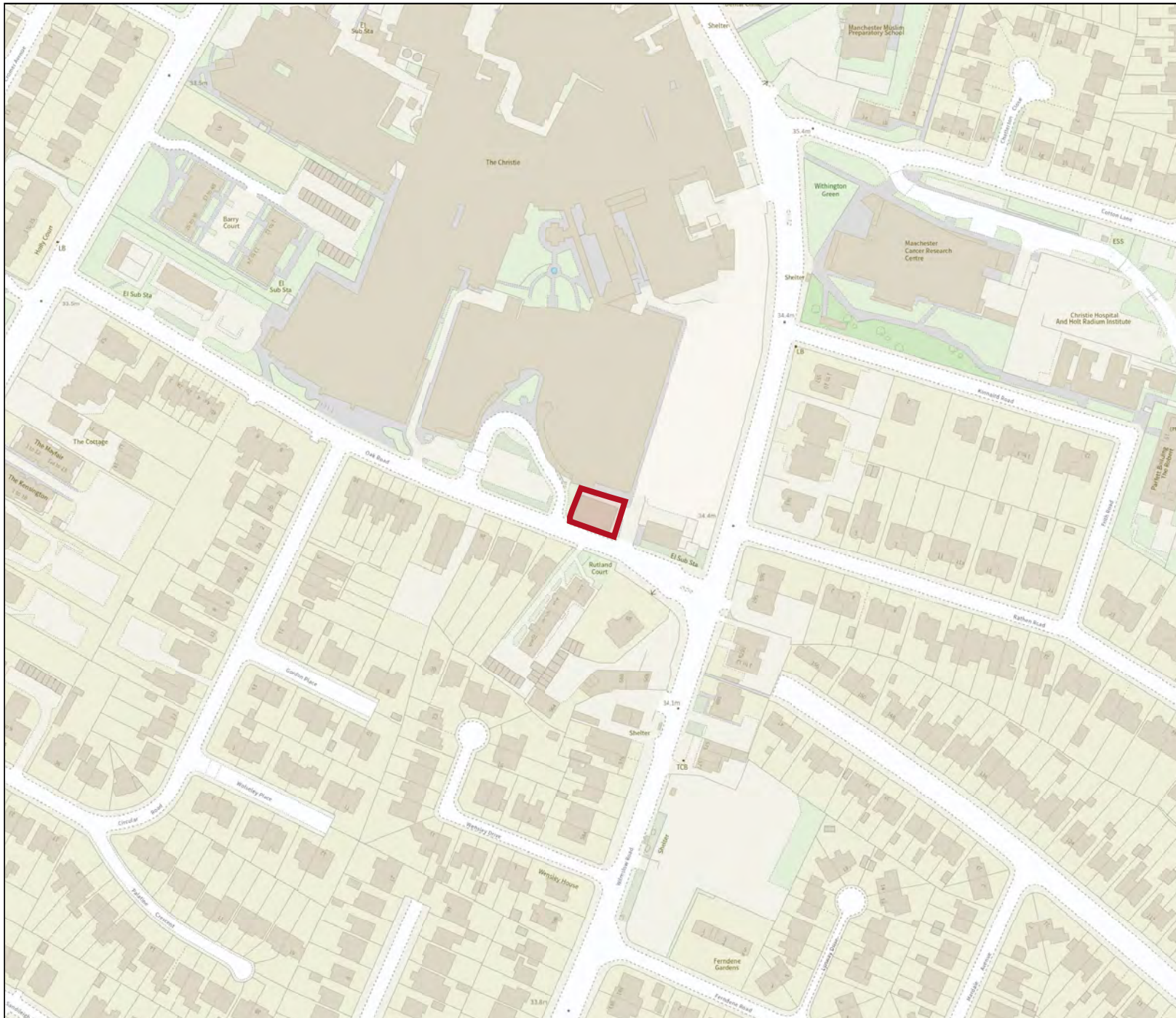
Notes

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.

Flood risk data is covered by the Open Government Licence **which** sets out the terms and conditions for using government data. <https://www.nationalarchives.gov.uk/doc/open-government-licence/version/3/>

Use of the address and mapping data is subject to Ordnance Survey public viewing terms under Crown copyright and database rights 2022 OS 100024198. <https://flood-map-for-planning.service.gov.uk/os-terms>



Flood map for planning

Your reference

222-164

Location (easting/northing)

384872/392409

Scale

1:2500

Created

14 Dec 2022 14:19

-  Selected area
-  Flood zone 3
-  Flood zone 2
-  Flood zone 1
-  Flood defence
-  Main river
-  Water storage area

0 20 40 60m

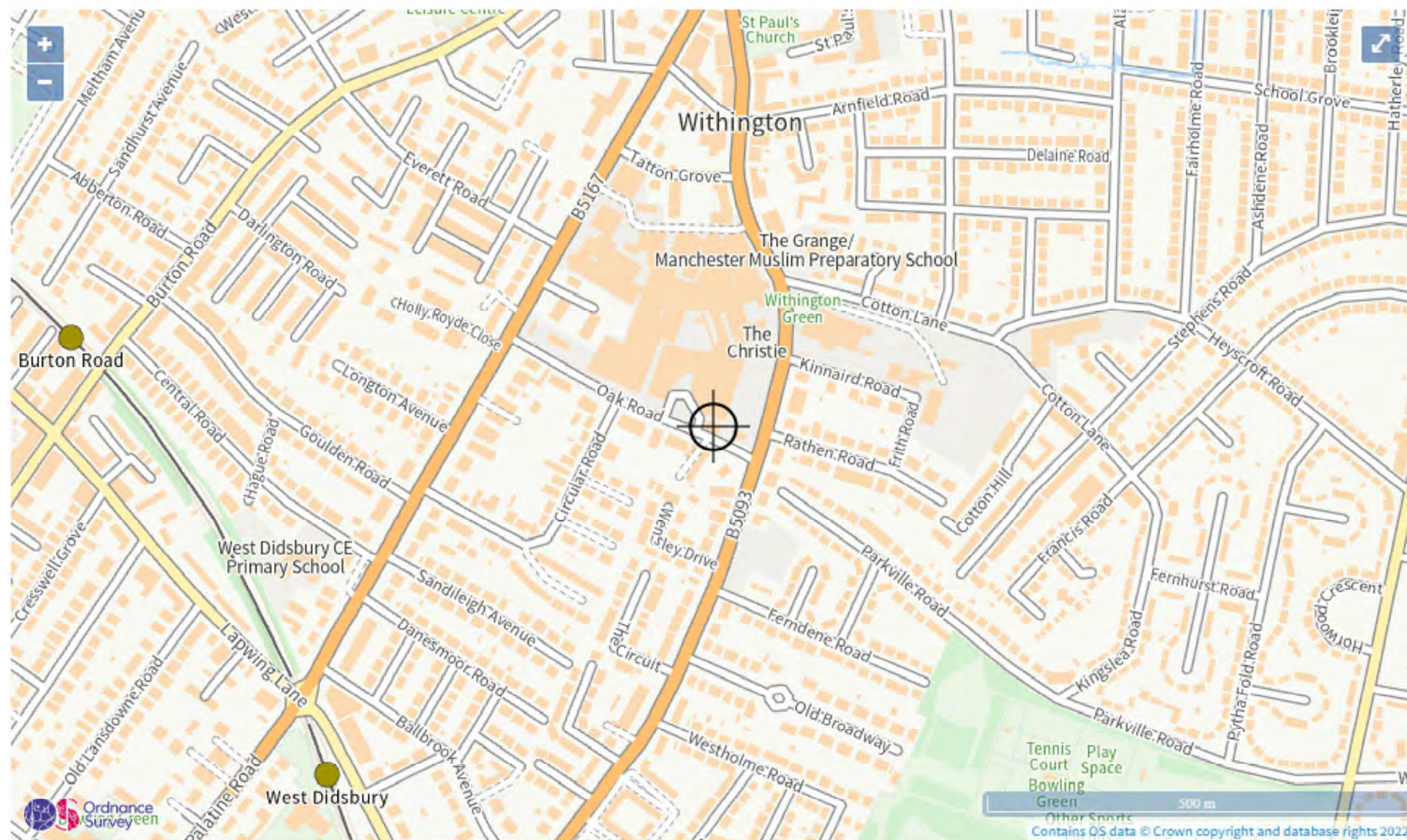
Flood risk

Extent of flooding



Location

Enter a place or postcode



Extent of flooding from rivers or the sea

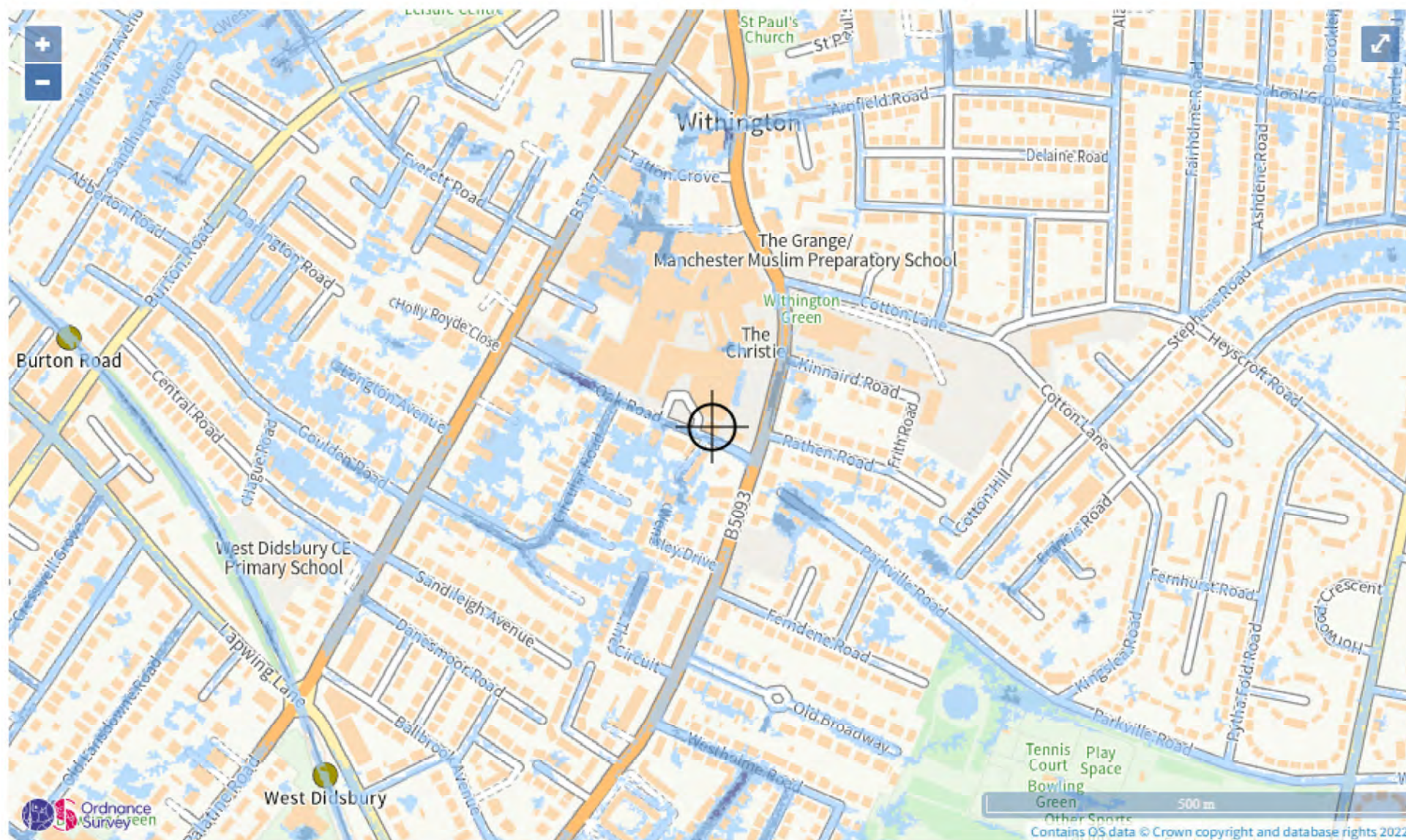
High Medium Low Very low Location you selected

Flood risk

Extent of flooding

Location

Enter a place or postcode



Extent of flooding from surface water

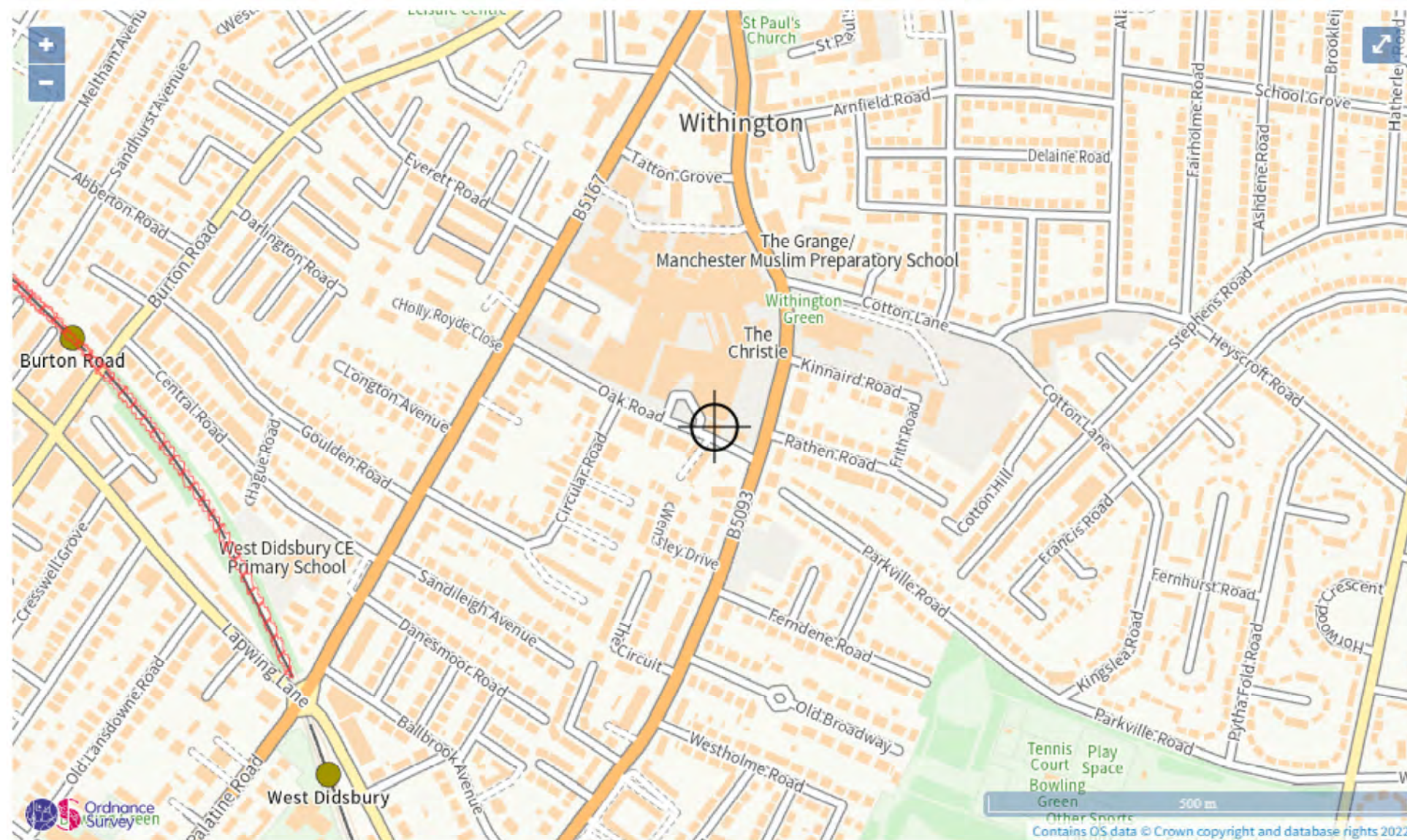
High Medium Low Very low Location you selected

Flood risk

Extent of flooding

Location

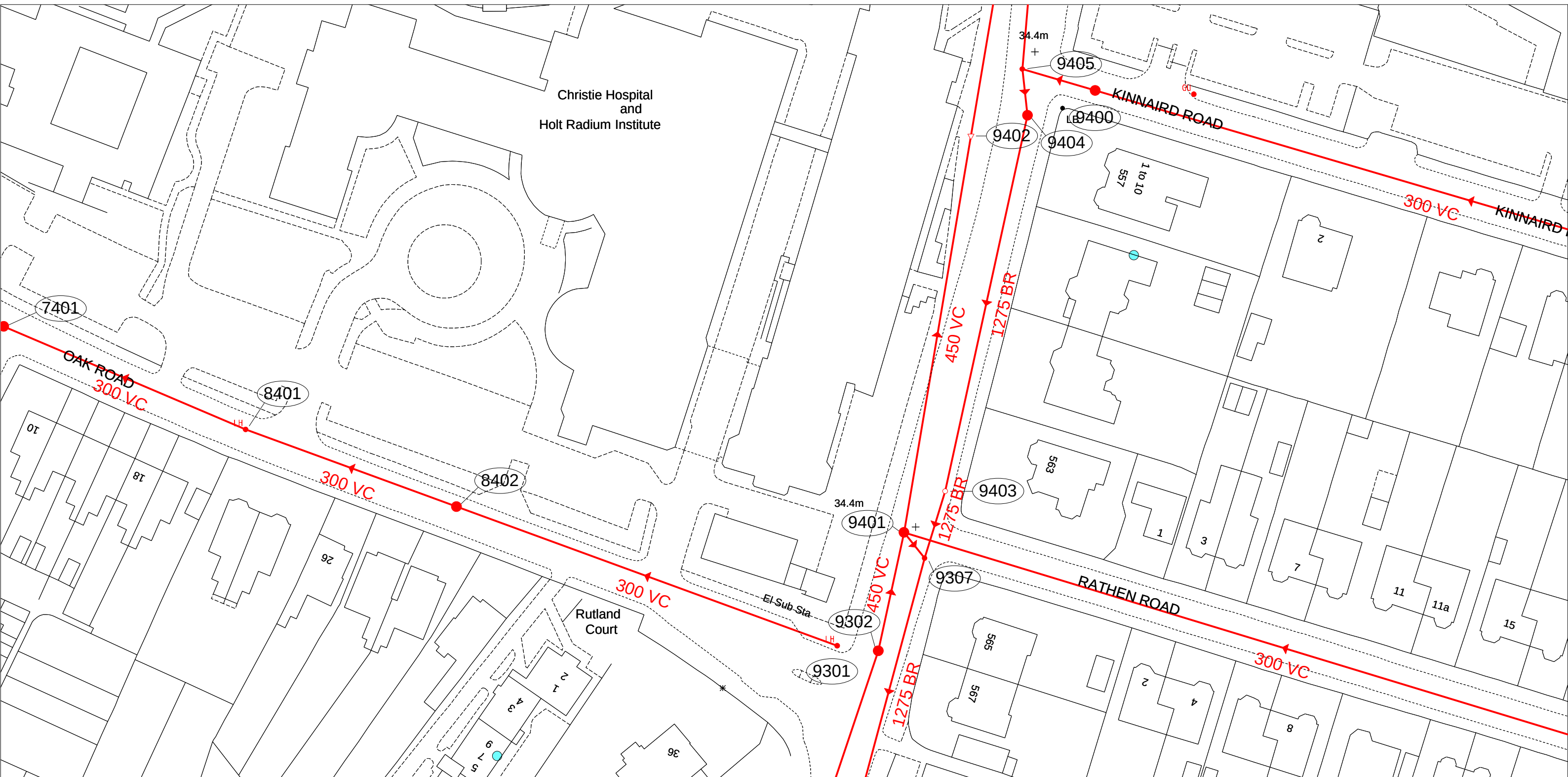
Enter a place or postcode



Maximum extent of flooding from reservoirs:

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

Appendix F – Public Sewer Map & CCTV Survey







LAYER SURVEYS LTD
SEE THE COMPLETE PICTURE

DRAINAGE SURVEY

Job Number LAYERSERV00015480	Surveyed by (Operator) TYLER TODD	Base Unit S10E5CSLD1	Date 14/01/2023
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Client Details:

Alan Johnston Partnership
 1 Dale Street,
 Liverpool,
 L2 2ET

Site Details:

The Christie TIF Wards
 Wilmslow Rd,
 Manchester
 M20 4BX

Contractor Details:

Layer Surveys Ltd
 Francis House
 Meadowcroft Business Park
 Pope Lane
 Preston
 Lancashire
 PR4 4BA

Office Contact Number: 01772 611634

Purpose of Survey:

Job Number LAYERSERV00015480	Surveyed by (Operator) TYLER TODD	Base Unit S10E5CSLD1	Date 14/01/2023
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Report Contents

Page 1	Cover Page
Page 2	Job Overview
Page 3	Contents Page
Page 5	Survey Run Sheet(Survey 1 - MH 11 to BRANCH X)
Page 7	Survey Run Sheet(Survey 2 - MH 11 to BRANCH A)
Page 9	Survey Run Sheet(Survey 3 - MH 11 to BRANCH B)
Page 11	Survey Run Sheet(Survey 4 - MH 11 to BRANCH C)
Page 13	Survey Run Sheet(Survey 5 - MH 11 to BRANCH D)
Page 15	Survey Run Sheet(Survey 6 - MH 10 to BRANCH B)
Page 17	Survey Run Sheet(Survey 7 - MH 10 to BRANCH C)
Page 19	Survey Run Sheet(Survey 8 - MH 10 to BRANCH D)
Page 21	Survey Run Sheet(Survey 9 - MH 12 to BRANCH X)
Page 23	Survey Run Sheet(Survey 10 - MH 12 to BRANCH B)
Page 25	Survey Run Sheet(Survey 11 - MH 12 to BRANCH A)
Page 27	Survey Run Sheet(Survey 12 - MH 13 to BRANCH X)
Page 29	Survey Run Sheet(Survey 13 - MH 13 to BRANCH A)
Page 31	Survey Run Sheet(Survey 14 - MH 08 to BRANCH X)

Job Number LAYERSERV00015480	Surveyed by (Operator) TYLER TODD	Base Unit S10E5CSLD1	Date 14/01/2023
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Report Contents

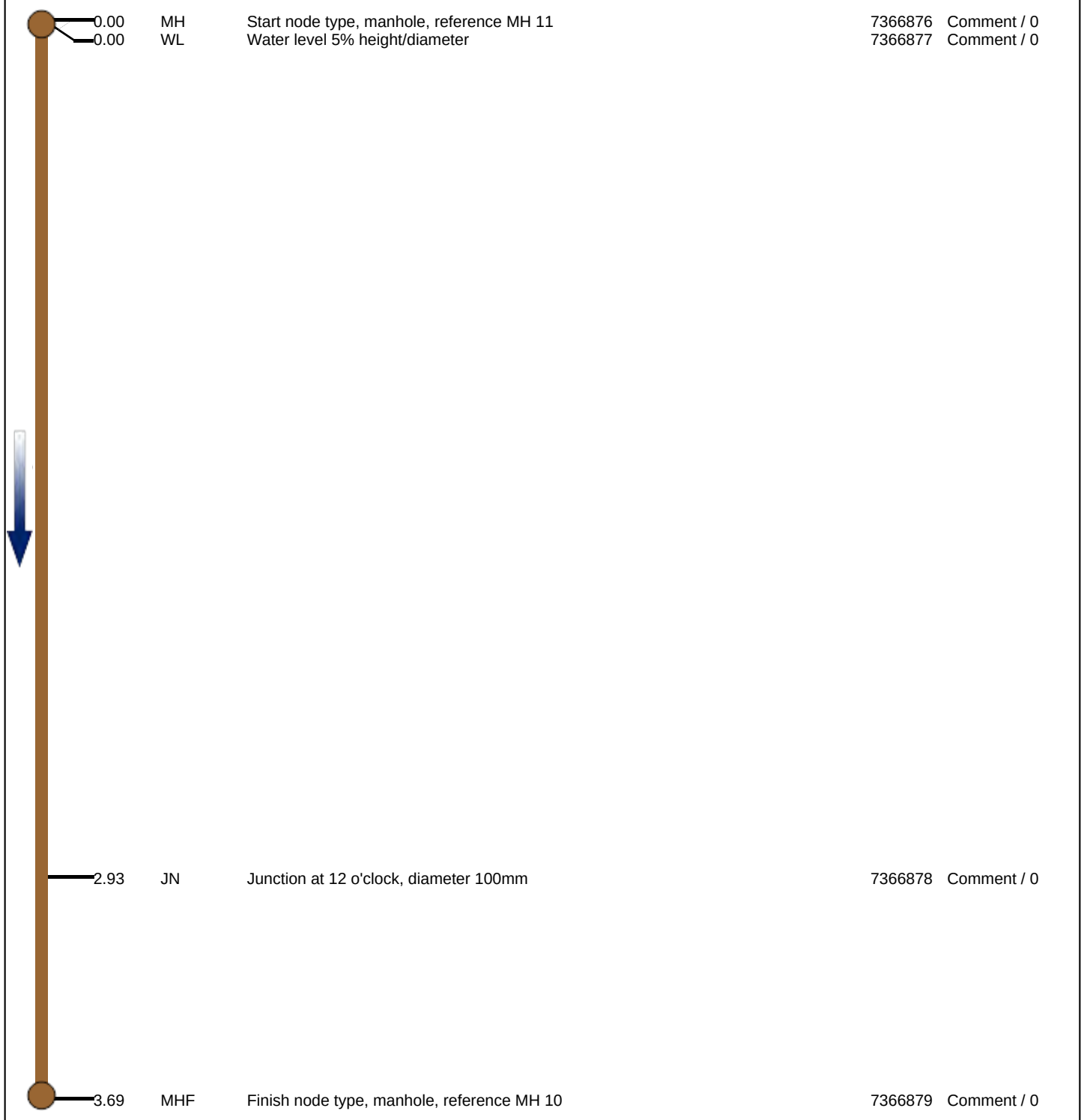
Page 33	Survey Run Sheet(Survey 15 - MH 08 to BRANCH A)
Page 35	Survey Run Sheet(Survey 16 - MH 08 to BRANCH C)
Page 37	Survey Run Sheet(Survey 17 - MH 16 to BRANCH X)
Page 39	Survey Run Sheet(Survey 18 - MH 17 to BRANCH X)
Page 41	Survey Run Sheet(Survey 19 - MH 17 to BRANCH B)
Page 43	Survey Run Sheet(Survey 20 - MH 17 to BRANCH A)
Page 45	Final Page



Surveyed by (Operator) TYLER TODD	Job Number LAYERSERV00015480	Pipe Length Reference(PLR) MH 11 X	Date 14/01/2023	Pre Cleaned Not Cleaned
Weather 3 - Light Rain	Customer Present	Service Grade/Structural Grade 0/0	Base Unit S10E5CSLD1	Section Number 1
Road The Christie TIF Wards Place Wilmslow Rd, Location Manchester		Division District Location Details		
Purpose Duty Foul Catchment	Shape/Size 150mm Material Vitrified clay Category		Start Node MH 11 End Node BRANCH X Total length 3.69 metres	

Scale **1:0.19**
Direction **Downstream**

Start Node Ref:MH 11 | I/L : metres | Depth: 0.68 metres

Position	Code	Description	Photo	Type/Grade
0.00	MH	Start node type, manhole, reference MH 11	7366876	Comment / 0
0.00	WL	Water level 5% height/diameter	7366877	Comment / 0
				
2.93	JN	Junction at 12 o'clock, diameter 100mm	7366878	Comment / 0
3.69	MHF	Finish node type, manhole, reference MH 10	7366879	Comment / 0

End Node Ref:BRANCH X | I/L : metres



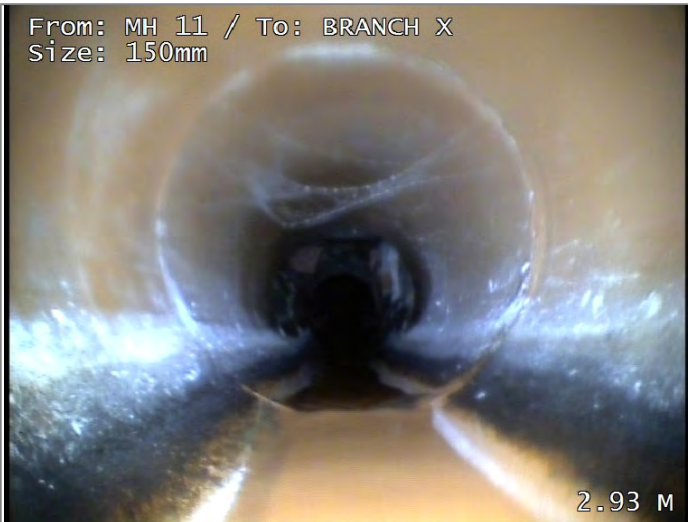
Job Number LAYERSERV00015480	Surveyed by (Operator) TYLER TODD	Base Unit S10E5CSLD1	Date 14/01/2023
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Start node type, manhole, reference MH 11



Water level 5% height/diameter



Junction at 12 o'clock, diameter 100mm



Finish node type, manhole, reference MH 10



Surveyed by (Operator) TYLER TODD	Job Number LAYERSERV00015480	Pipe Length Reference(PLR) BRANCH A X	Date 14/01/2023	Pre Cleaned Not Cleaned
Weather 3 - Light Rain	Customer Present	Service Grade/Structural Grade 0/0	Base Unit S10E5CSLD1	Section Number 2
Road The Christie TIF Wards Place Wilmslow Rd, Location Manchester		Division District Location Details		
Purpose Duty Foul Catchment	Shape/Size 150mm Material Vitrified clay Category		Start Node MH 11 End Node BRANCH A Total length 9.17 metres	

Scale **1:0.48**
Direction **Upstream**

Start Node Ref:MH 11 | I/L : metres | Depth: 0.68 metres

Position	Code	Description	Photo	Type/Grade
0.00	MH	Start node type, manhole, reference MH 11	7366880	Comment / 0
0.00	WL	Water level 5% height/diameter	7366881	Comment / 0
1.90	LL	Line of drain/sewer deviates left	7366882	Comment / 0
3.12	LL	Line of drain/sewer deviates left	7366883	Comment / 0
9.17	BRF	Finish node type, major connection without manhole, reference REST BEND	7366884	Comment / 0

End Node Ref:BRANCH A | I/L : metres



Job Number LAYERSERV00015480	Surveyed by (Operator) TYLER TODD	Base Unit S10E5CSLD1	Date 14/01/2023
			
Start node type, manhole, reference MH 11			
			
Water level 5% height/diameter			
From: MH 11 / To: BRANCH A Size: 150mm 			
Line of drain/sewer deviates left			
From: MH 11 / To: BRANCH A Size: 150mm 			
Line of drain/sewer deviates left			
From: MH 11 / To: BRANCH A Size: 150mm 			
Finish node type, major connection without manhole, reference REST BEND			



Surveyed by (Operator) TYLER TODD	Job Number LAYERSERV00015480	Pipe Length Reference(PLR) BRANCH B X	Date 14/01/2023	Pre Cleaned Not Cleaned
Weather 3 - Light Rain	Customer Present	Service Grade/Structural Grade 0/0	Base Unit S10E5CSLD1	Section Number 3
Road The Christie TIF Wards Place Wilmslow Rd, Location Manchester		Division District Location Details		
Purpose Duty Foul Catchment	Shape/Size 100mm Material Vitrified clay Category		Start Node MH 11 End Node BRANCH B Total length 3.48 metres	

Scale **1:0.18**
Direction **Upstream**

Start Node Ref:MH 11 | I/L : metres | Depth: 0.68 metres

Position	Code	Description	Photo	Type/Grade
0.00	MH	Start node type, manhole, reference MH 11	7366885	Comment / 0
0.00	WL	Water level 5% height/diameter	7366886	Comment / 0
				
2.21	LR	Line of drain/sewer deviates right	7366887	Comment / 0
3.48	BRF	Finish node type, major connection without manhole, reference REST BEND	7366888	Comment / 0

End Node Ref:BRANCH B | I/L : metres



Job Number LAYERSERV00015480	Surveyed by (Operator) TYLER TODD	Base Unit S10E5CSLD1	Date 14/01/2023
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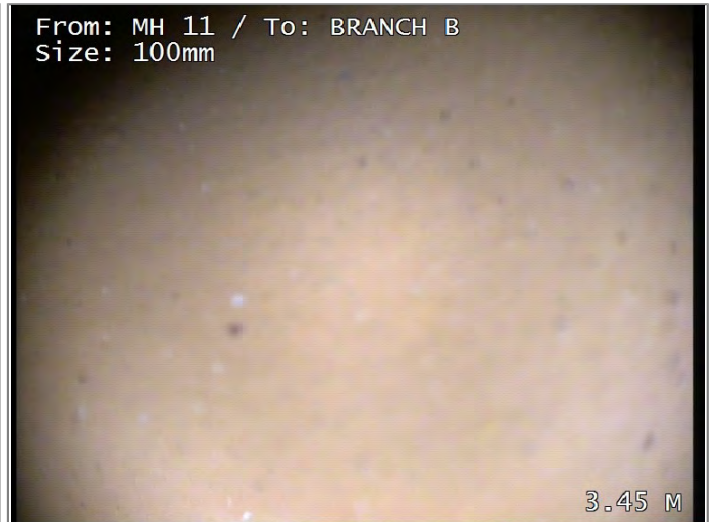
Start node type, manhole, reference MH 11



Water level 5% height/diameter



Line of drain/sewer deviates right



Finish node type, major connection without manhole, reference REST BEND



Surveyed by (Operator) TYLER TODD	Job Number LAYERSERV00015480	Pipe Length Reference(PLR) BRANCH C X	Date 14/01/2023	Pre Cleaned Not Cleaned
Weather 3 - Light Rain	Customer Present	Service Grade/Structural Grade 0/0	Base Unit S10E5CSLD1	Section Number 4
Road The Christie TIF Wards Place Wilmslow Rd, Location Manchester		Division District Location Details		
Purpose Duty Foul Catchment	Shape/Size 100mm Material Vitrified clay Category		Start Node MH 11 End Node BRANCH C Total length 2.79 metres	

Scale **1:0.15**
Direction **Upstream**

Start Node Ref:MH 11 | I/L : metres | Depth: 0.68 metres

Position	Code	Description	Photo	Type/Grade
0.00	MH	Start node type, manhole, reference MH 11	7366889	Comment / 0
0.00	WL	Water level 5% height/diameter	7366890	Comment / 0
1.81	LR	Line of drain/sewer deviates right	7366891	Comment / 0
2.79	BRF	Finish node type, major connection without manhole, reference REST BEND	7366892	Comment / 0

End Node Ref:BRANCH C | I/L : metres



Job Number LAYERSERV00015480	Surveyed by (Operator) TYLER TODD	Base Unit S10E5CSLD1	Date 14/01/2023
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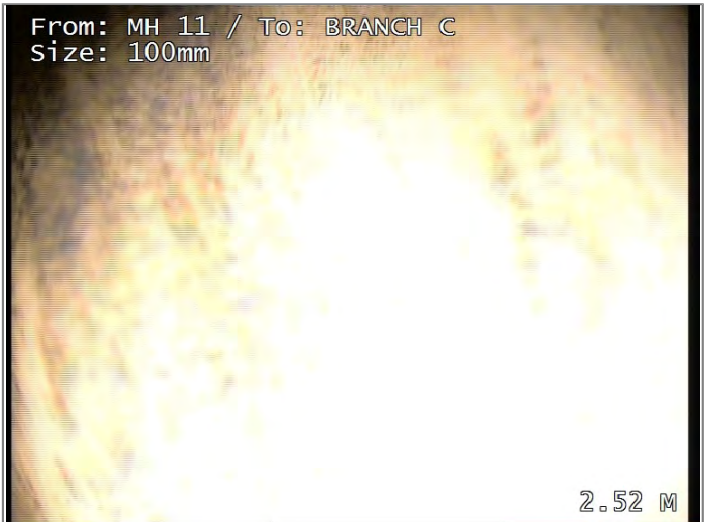
Start node type, manhole, reference MH 11



Water level 5% height/diameter



Line of drain/sewer deviates right



Finish node type, major connection without manhole, reference REST BEND



Surveyed by (Operator) TYLER TODD	Job Number LAYERSERV00015480	Pipe Length Reference(PLR) BRANCH D X	Date 14/01/2023	Pre Cleaned Not Cleaned
Weather 3 - Light Rain	Customer Present	Service Grade/Structural Grade 0/0	Base Unit S10E5CSLD1	Section Number 5
Road The Christie TIF Wards Place Wilmslow Rd, Location Manchester		Division District Location Details		
Purpose Duty Foul Catchment	Shape/Size 100mm Material Vitrified clay Category		Start Node MH 11 End Node BRANCH D Total length 3.07 metres	

Scale **1:0.16**
Direction **Upstream**

Start Node Ref:MH 11 | I/L : metres | Depth: 0.68 metres

Position	Code	Description	Photo	Type/Grade
0.00	MH	Start node type, manhole, reference MH 11	7366893	Comment / 0
0.00	WL	Water level 5% height/diameter	7366894	Comment / 0
1.60	LL	Line of drain/sewer deviates left	7366895	Comment / 0
2.00	LR	Line of drain/sewer deviates right	7366896	Comment / 0
3.07	BRF	Finish node type, major connection without manhole, reference REST BEND	7366897	Comment / 0

End Node Ref:BRANCH D | I/L : metres



Job Number LAYERSERV00015480	Surveyed by (Operator) TYLER TODD	Base Unit S10E5CSLD1	Date 14/01/2023
 0.02 M Start node type, manhole, reference MH 11			
 0.02 M Water level 5% height/diameter			
 From: MH 11 / To: BRANCH D Size: 100mm 1.45 M Line of drain/sewer deviates left			
 From: MH 11 / To: BRANCH D Size: 100mm 1.98 M Line of drain/sewer deviates right			
 From: MH 11 / To: BRANCH D Size: 100mm 2.98 M Finish node type, major connection without manhole, reference REST BEND			



Surveyed by (Operator) TYLER TODD	Job Number LAYERSERV00015480	Pipe Length Reference(PLR) BRANCH B X	Date 14/01/2023	Pre Cleaned Not Cleaned
Weather 3 - Light Rain	Customer Present	Service Grade/Structural Grade 0/0	Base Unit S10E5CSLD1	Section Number 6
Road The Christie TIF Wards Place Wilmslow Rd, Location Manchester		Division District Location Details		
Purpose Duty Foul Catchment	Shape/Size 100mm Material Vitrified clay Category		Start Node MH 10 End Node BRANCH B Total length 5.38 metres	

Scale **1:0.28**
Direction **Upstream**

Start Node Ref:MH 10 | I/L : metres | Depth: 0.98 metres

Position	Code	Description	Photo	Type/Grade
0.00	MH	Start node type, manhole, reference MH 10	7366898	Comment / 0
0.00	WL	Water level 5% height/diameter	7366899	Comment / 0
5.38	BRF	Finish node type, major connection without manhole, reference REST BEND	7366903	Comment / 0

End Node Ref:BRANCH B | I/L : metres



Job Number LAYERSERV00015480	Surveyed by (Operator) TYLER TODD	Base Unit S10E5CSLD1	Date 14/01/2023
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Start node type, manhole, reference MH 10



Water level 5% height/diameter



Finish node type, major connection without manhole, reference REST BEND



Surveyed by (Operator) TYLER TODD	Job Number LAYERSERV00015480	Pipe Length Reference(PLR) BRANCH C X	Date 14/01/2023	Pre Cleaned Not Cleaned
Weather 3 - Light Rain	Customer Present	Service Grade/Structural Grade 0/0	Base Unit S10E5CSLD1	Section Number 7

Road The Christie TIF Wards Place Wilmslow Rd, Location Manchester	Division District Location Details
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Purpose Duty Foul Catchment	Shape/Size 100mm Material Vitrified clay Category	Start Node MH 10 End Node BRANCH C Total length 8.98 metres
--	---	--

Scale 1:0.47 Direction Upstream
--

Start Node Ref:MH 10 I/L : metres Depth: 0.98 metres						
Position	Code	Description		Photo	Type/Grade	
0.00	MH	Start node type, manhole, reference MH 10		7366906	Comment / 0	
0.00	WL	Water level 5% height/diameter		7366907	Comment / 0	
8.98	BRF	Finish node type, major connection without manhole, reference REST BEND		7366908	Comment / 0	
End Node Ref:BRANCH C I/L : metres						



Job Number LAYERSERV00015480	Surveyed by (Operator) TYLER TODD	Base Unit S10E5CSLD1	Date 14/01/2023
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Start node type, manhole, reference MH 10



Water level 5% height/diameter



Finish node type, major connection without manhole, reference REST BEND



Surveyed by (Operator) TYLER TODD	Job Number LAYERSERV00015480	Pipe Length Reference(PLR) BRANCH D X	Date 14/01/2023	Pre Cleaned Not Cleaned
Weather 3 - Light Rain	Customer Present	Service Grade/Structural Grade 0/0	Base Unit S10E5CSLD1	Section Number 8
Road The Christie TIF Wards Place Wilmslow Rd, Location Manchester		Division District Location Details		
Purpose Duty Foul Catchment	Shape/Size 100mm Material Vitrified clay Category		Start Node MH 10 End Node BRANCH D Total length 8.64 metres	

Scale **1:0.45**
Direction **Upstream**

Start Node Ref:MH 10 | I/L : metres | Depth: 0.98 metres

Position	Code	Description	Photo	Type/Grade
0.00	MH	Start node type, manhole, reference MH 10	7366909	Comment / 0
0.00	WL	Water level 5% height/diameter	7366910	Comment / 0
3.86	LR	Line of drain/sewer deviates right	7366911	Comment / 0
8.64	BRF	Finish node type, major connection without manhole, reference REST BEND	7366912	Comment / 0

End Node Ref:BRANCH D | I/L : metres



Job Number LAYERSERV00015480	Surveyed by (Operator) TYLER TODD	Base Unit S10E5CSLD1	Date 14/01/2023
			
Start node type, manhole, reference MH 10			
			
Water level 5% height/diameter			
From: MH 10 / To: BRANCH D Size: 100mm 			
Line of drain/sewer deviates right			
From: MH 10 / To: BRANCH D Size: 100mm 			
Finish node type, major connection without manhole, reference REST BEND			



Surveyed by (Operator) TYLER TODD	Job Number LAYERSERV00015480	Pipe Length Reference(PLR) MH 12 X	Date 14/01/2023	Pre Cleaned Not Cleaned
Weather 3 - Light Rain	Customer Present	Service Grade/Structural Grade 0/0	Base Unit S10E5CSLD1	Section Number 9
Road The Christie TIF Wards Place Wilmslow Rd, Location Manchester		Division District Location Details		
Purpose Duty Surface water Catchment	Shape/Size 150mm Material Vitrified clay Category		Start Node MH 12 End Node BRANCH X Total length 0.93 metres	

Scale **1:0.05**
Direction **Downstream**

Start Node Ref:MH 12 | I/L : metres | Depth: 1.13 metres

Position	Code	Description	Photo	Type/Grade
0.00	MH	Start node type, manhole, reference MH 12	7366916	Comment / 0
0.00	WL	Water level 5% height/diameter	7366917	Comment / 0
0.93	MHF	Finish node type, manhole, reference MH 13	7366918	Comment / 0

End Node Ref:BRANCH X | I/L : metres



Job Number LAYERSERV00015480	Surveyed by (Operator) TYLER TODD	Base Unit S10E5CSLD1	Date 14/01/2023
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Start node type, manhole, reference MH 12



Water level 5% height/diameter



Finish node type, manhole, reference MH 13



Surveyed by (Operator) TYLER TODD	Job Number LAYERSERV00015480	Pipe Length Reference(PLR) BRANCH B X	Date 14/01/2023	Pre Cleaned Not Cleaned
Weather 3 - Light Rain	Customer Present	Service Grade/Structural Grade 0/0	Base Unit S1OE5CSLD1	Section Number 10

Road The Christie TIF Wards Place Wilmslow Rd, Location Manchester	Division District Location Details
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Purpose Duty Surface water Catchment	Shape/Size 150mm Material Vitrified clay Category	Start Node MH 12 End Node BRANCH B Total length 13.64 metres
---	---	---

Scale 1:0.72 Direction Upstream
--

Start Node Ref:MH 12 I/L : metres Depth: 1.13 metres						
Position	Code	Description		Photo	Type/Grade	
0.00	MH	Start node type, manhole, reference MH 12		7366921	Comment / 0	
0.00	WL	Water level 10% height/diameter		7366922	Comment / 0	
5.98	CUW (S01)	Loss of vision, camera under water, Start		7366923	Comment / 0	
8.00	CUW (F01)	Loss of vision, camera under water, Finished		7366924	Comment / 0	
13.64	MHF	Finish node type, manhole, reference MH 17		7366925	Comment / 0	
End Node Ref:BRANCH B I/L : metres						



Job Number LAYERSERV00015480	Surveyed by (Operator) TYLER TODD	Base Unit S10E5CSLD1	Date 14/01/2023
 0.00 M Start node type, manhole, reference MH 12		 0.00 M Water level 10% height/diameter	
From: MH 12 / To: BRANCH B Size: 150mm  6.00 M Loss of vision, camera under water, Start		From: MH 12 / To: BRANCH B Size: 150mm  8.07 M Loss of vision, camera under water, Finished	
From: MH 12 / To: BRANCH B Size: 150mm  13.52 M Finish node type, manhole, reference MH 17			



Surveyed by (Operator) TYLER TODD	Job Number LAYERSERV00015480	Pipe Length Reference(PLR) BRANCH A X	Date 14/01/2023	Pre Cleaned Not Cleaned
Weather 1 - Dry	Customer Present	Service Grade/Structural Grade 0/0	Base Unit S10E5CSLD1	Section Number 11
Road The Christie TIF Wards Place Wilmslow Rd, Location Manchester		Division District Location Details		
Purpose Duty Surface water Catchment	Shape/Size 150mm Material Vitrified clay Category		Start Node MH 12 End Node BRANCH A Total length 3.24 metres	

Scale **1:0.17**
Direction **Upstream**

Start Node Ref:MH 12 | I/L : metres | Depth: 1.13 metres

Position	Code	Description	Photo	Type/Grade
0.00	MH	Start node type, manhole, reference MH 12	7366926	Comment / 0
0.00	WL	Water level 5% height/diameter	7366927	Comment / 0
3.24	GYF	Finish node type, gully, reference GULLY	7366928	Comment / 0

End Node Ref:BRANCH A | I/L : metres



Job Number LAYERSERV00015480	Surveyed by (Operator) TYLER TODD	Base Unit S10E5CSLD1	Date 14/01/2023
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Start node type, manhole, reference MH 12



Water level 5% height/diameter



Finish node type, gully, reference GULLY



Surveyed by (Operator) TYLER TODD	Job Number LAYERSERV00015480	Pipe Length Reference(PLR) MH 13 X	Date 14/01/2023	Pre Cleaned Not Cleaned
Weather 3 - Light Rain	Customer Present	Service Grade/Structural Grade 0/0	Base Unit S10E5CSLD1	Section Number 12
Road The Christie TIF Wards Place Wilmslow Rd, Location Manchester		Division District Location Details		
Purpose Duty Surface water Catchment	Shape/Size 150mm Material Vitrified clay Category		Start Node MH 13 End Node BRANCH X Total length 0.45 metres	

Scale **1:0.02**
Direction **Downstream**

Start Node Ref:MH 13 | I/L : metres | Depth: 1.26 metres

Position	Code	Description	Photo	Type/Grade
0.00	MH	Start node type, manhole, reference MH 13	7366939	Comment / 0
0.00	WL	Water level 5% height/diameter	7366940	Comment / 0
0.45	MHF	Finish node type, manhole, reference MH 08	7366941	Comment / 0

End Node Ref:BRANCH X | I/L : metres



Job Number LAYERSERV00015480	Surveyed by (Operator) TYLER TODD	Base Unit S10E5CSLD1	Date 14/01/2023
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Start node type, manhole, reference MH 13



Water level 5% height/diameter



Finish node type, manhole, reference MH 08



Surveyed by (Operator) TYLER TODD	Job Number LAYERSERV00015480	Pipe Length Reference(PLR) BRANCH A X	Date 14/01/2023	Pre Cleaned Not Cleaned
Weather 3 - Light Rain	Customer Present	Service Grade/Structural Grade 0/0	Base Unit S10E5CSLD1	Section Number 13
Road The Christie TIF Wards Place Wilmslow Rd, Location Manchester		Division District Location Details		
Purpose Duty Surface water Catchment	Shape/Size 150mm Material Vitrified clay Category		Start Node MH 13 End Node BRANCH A Total length 15.05 metres	

Scale 1:0.79 Direction Upstream
--

Start Node Ref:MH 13 I/L : metres Depth: 1.26 metres						
Position	Code	Description		Photo	Type/Grade	
0.00	MH	Start node type, manhole, reference MH 13		7366948	Comment / 0	
0.00	WL	Water level 5% height/diameter		7366949	Comment / 0	
15.05	MHF	Finish node type, manhole, reference MH 13A		7366950	Comment / 0	
End Node Ref:BRANCH A I/L : metres						



Job Number LAYERSERV00015480	Surveyed by (Operator) TYLER TODD	Base Unit S10E5CSLD1	Date 14/01/2023
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Start node type, manhole, reference MH 13



Water level 5% height/diameter



Finish node type, manhole, reference MH 13A



Surveyed by (Operator) TYLER TODD	Job Number LAYERSERV00015480	Pipe Length Reference(PLR) BRANCH X X	Date 14/01/2023	Pre Cleaned Not Cleaned
Weather 3 - Light Rain	Customer Present	Service Grade/Structural Grade 0/0	Base Unit S1OE5CSLD1	Section Number 14
Road The Christie TIF Wards Place Wilmslow Rd, Location Manchester		Division District Location Details		
Purpose Duty Combined Catchment	Shape/Size 225mm Material Vitrified clay Category		Start Node MH 08 End Node BRANCH X Total length 26.12 metres	

Scale **1:1.37**
Direction **Upstream**

Start Node Ref:MH 08 | I/L : metres | Depth: 4.97 metres

Position	Code	Description	Photo	Type/Grade
0.00	MH	Start node type, manhole, reference MH 08	7366951	Comment / 0
0.00	WL	Water level 5% height/diameter	7366952	Comment / 0
8.67	LL	Line of drain/sewer deviates left	7366953	Comment / 0
26.12	MHF	Finish node type, manhole, reference MH 14	7366954	Comment / 0

End Node Ref:BRANCH X | I/L : metres



Job Number LAYERSERV00015480	Surveyed by (Operator) TYLER TODD	Base Unit S10E5CSLD1	Date 14/01/2023
			
Start node type, manhole, reference MH 08			
			
Water level 5% height/diameter			
From: MH 08 / To: BRANCH X Size: 225mm 			
Line of drain/sewer deviates left			
From: MH 08 / To: BRANCH X Size: 225mm 			
Finish node type, manhole, reference MH 14			



Surveyed by (Operator) TYLER TODD	Job Number LAYERSERV00015480	Pipe Length Reference(PLR) BRANCH A X	Date 14/01/2023	Pre Cleaned Not Cleaned
Weather 3 - Light Rain	Customer Present	Service Grade/Structural Grade 0/0	Base Unit S10E5CSLD1	Section Number 15
Road The Christie TIF Wards Place Wilmslow Rd, Location Manchester		Division District Location Details		
Purpose Duty Combined Catchment	Shape/Size 225mm Material Vitrified clay Category		Start Node MH 08 End Node BRANCH A Total length 25.19 metres	

Scale **1:1.32**
Direction **Upstream**

Start Node Ref:MH 08 | I/L : metres | Depth: 4.97 metres

Position	Code	Description	Photo	Type/Grade
0.00	MH	Start node type, manhole, reference MH 08	7366955	Comment / 0
0.00	WL	Water level 5% height/diameter	7366956	Comment / 0
25.19	MHF	Finish node type, manhole, reference MH 15	7366957	Comment / 0

End Node Ref:BRANCH A | I/L : metres



Job Number LAYERSERV00015480	Surveyed by (Operator) TYLER TODD	Base Unit S10E5CSLD1	Date 14/01/2023
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Start node type, manhole, reference MH 08



Water level 5% height/diameter



Finish node type, manhole, reference MH 15



Surveyed by (Operator) TYLER TODD	Job Number LAYERSERV00015480	Pipe Length Reference(PLR) BRANCH C X	Date 14/01/2023	Pre Cleaned Not Cleaned
Weather 3 - Light Rain	Customer Present	Service Grade/Structural Grade 0/0	Base Unit S1OE5CSLD1	Section Number 16
Road The Christie TIF Wards Place Wilmslow Rd, Location Manchester		Division District Location Details		
Purpose Duty Combined Catchment	Shape/Size 100mm Material Vitrified clay Category		Start Node MH 08 End Node BRANCH C Total length 2.98 metres	

Scale **1:0.16**
Direction **Upstream**

Start Node Ref:MH 08 | I/L : metres | Depth: 4.97 metres

Position	Code	Description	Photo	Type/Grade
	0.00 MH	Start node type, manhole, reference MH 08	7366958	Comment / 0
	0.00 WL	Water level 5% height/diameter	7366959	Comment / 0
				
	1.64 REM	MCPVC - Material of drain/sewer changes to polyvinyl chloride at this point	7366960	Comment / 0
				
	2.98 SA	Survey abandoned - Remark: SILT IN LINE, GULLY IN VIEW	7366961	Comment / 0

End Node Ref:BRANCH C | I/L : metres



Job Number LAYERSERV00015480	Surveyed by (Operator) TYLER TODD	Base Unit S10E5CSLD1	Date 14/01/2023
			
Start node type, manhole, reference MH 08			
			
Water level 5% height/diameter			
			
MCPVC - Material of drain/sewer changes to polyvinyl chloride at this point			
			
Survey abandoned - Remark: SILT IN LINE, GULLY IN VIEW			



Surveyed by (Operator) TYLER TODD	Job Number LAYERSERV00015480	Pipe Length Reference(PLR) MH 16 X	Date 14/01/2023	Pre Cleaned Not Cleaned
Weather 3 - Light Rain	Customer Present	Service Grade/Structural Grade 0/0	Base Unit S10E5CSLD1	Section Number 17
Road The Christie TIF Wards Place Wilmslow Rd, Location Manchester		Division District Location Details		
Purpose Duty Surface water Catchment	Shape/Size 100mm Material Vitrified clay Category		Start Node MH 16 End Node BRANCH X Total length 6.64 metres	

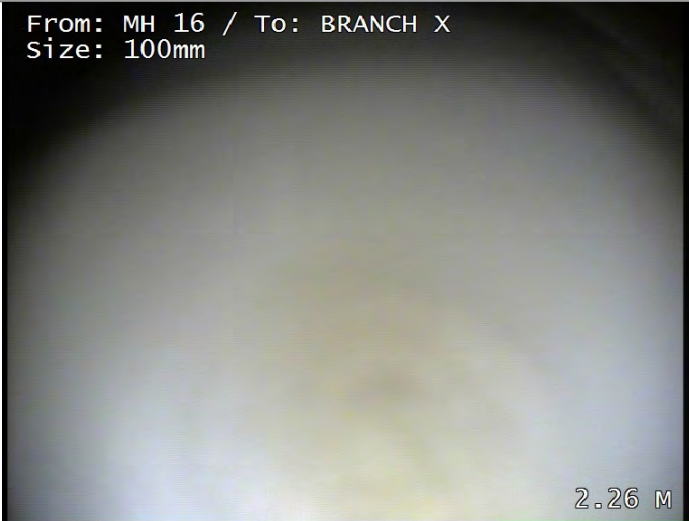
Scale **1:0.35**
Direction **Downstream**

Start Node Ref:MH 16 | I/L : metres | Depth: 0.15 metres

Position	Code	Description	Photo	Type/Grade
0.00	MH	Start node type, manhole, reference MH 16	7366962	Comment / 0
0.00	WL	Water level 5% height/diameter	7366963	Comment / 0
2.31	LU	Line of drain/sewer deviates up	7366964	Comment / 0
5.52	JN	Junction at 6 o'clock, diameter 100mm	7366965	Comment / 0
6.64	MHF	Finish node type, manhole, reference MH 08	7366966	Comment / 0

End Node Ref:BRANCH X | I/L : metres



Job Number LAYERSERV00015480	Surveyed by (Operator) TYLER TODD	Base Unit S10E5CSLD1	Date 14/01/2023
			
Start node type, manhole, reference MH 16			
			
Water level 5% height/diameter			
			
From: MH 16 / To: BRANCH X Size: 100mm			
Line of drain/sewer deviates up			
			
From: MH 16 / To: BRANCH X Size: 100mm			
Junction at 6 o'clock, diameter 100mm			
			
From: MH 16 / To: BRANCH X Size: 100mm			
Finish node type, manhole, reference MH 08			



Surveyed by (Operator) TYLER TODD	Job Number LAYERSERV00015480	Pipe Length Reference(PLR) MH 17 X	Date 14/01/2023	Pre Cleaned Not Cleaned
Weather 3 - Light Rain	Customer Present	Service Grade/Structural Grade 0/4	Base Unit S1OE5CSLD1	Section Number 18
Road The Christie TIF Wards Place Wilmslow Rd, Location Manchester		Division District Location Details		
Purpose Duty Surface water Catchment	Shape/Size 150mm Material Vitrified clay Category		Start Node MH 17 End Node BRANCH X Total length 13.64 metres	

Scale **1:0.72**
Direction **Downstream**

Start Node Ref:MH 17 | I/L : metres | Depth: 0.86 metres

Position	Code	Description	Photo	Type/Grade
0.00	MH	Start node type, manhole, reference MH 17	7366967	Comment / 0
0.00	WL	Water level 10% height/diameter	7366968	Comment / 0
6.98	CUW (S01)	Loss of vision, camera under water, Start	7366969	Comment / 0
8.38	H	Hole in drain/sewer at 3 o'clock	7366971	Structural / 4
9.98	CUW (F01)	Loss of vision, camera under water, Finished	7366970	Comment / 0
13.64	MHF	Finish node type, manhole, reference MH 12	7366972	Comment / 0

End Node Ref:BRANCH X | I/L : metres



Job Number LAYERSERV00015480	Surveyed by (Operator) TYLER TODD	Base Unit S10E5CSLD1	Date 14/01/2023
			
Start node type, manhole, reference MH 17			
			
Water level 10% height/diameter			
			
From: MH 17 / To: BRANCH X Size: 150mm Loss of vision, camera under water, Start			
			
From: MH 17 / To: BRANCH X Size: 150mm Hole in drain/sewer at 3 o'clock			
			
From: MH 17 / To: BRANCH X Size: 150mm Loss of vision, camera under water, Finished			
			
From: MH 17 / To: BRANCH X Size: 150mm Finish node type, manhole, reference MH 12			

Surveyed by (Operator) TYLER TODD	Job Number LAYERSERV00015480	Pipe Length Reference(PLR) BRANCH B X	Date 14/01/2023	Pre Cleaned Not Cleaned
Weather 3 - Light Rain	Customer Present	Service Grade/Structural Grade 0/0	Base Unit S10E5CSLD1	Section Number 19

Road The Christie TIF Wards Place Wilmslow Rd, Location Manchester	Division District Location Details
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Purpose Duty Surface water Catchment	Shape/Size 100mm Material Vitrified clay Category	Start Node MH 17 End Node BRANCH B Total length 5.38 metres
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Scale **1:0.28**
Direction **Upstream**

Start Node Ref:MH 17 | I/L : metres | Depth: 0.86 metres

Position	Code	Description	Photo	Type/Grade
0.00	MH	Start node type, manhole, reference MH 17	7366978	Comment / 0
0.00	WL	Water level 5% height/diameter	7366979	Comment / 0
0.00	JN	Junction at 3 o'clock, diameter 100mm	7366980	Comment / 0
5.38	SA	Survey abandoned - Remark: FILLED IN	7366981	Comment / 0

End Node Ref: BRANCH B | I/L : metres



Job Number LAYERSERV00015480	Surveyed by (Operator) TYLER TODD	Base Unit S10E5CSLD1	Date 14/01/2023
			
Start node type, manhole, reference MH 17			
			
Water level 5% height/diameter			
			
From: MH 17 / To: BRANCH B Size: 100mm			
Junction at 3 o'clock, diameter 100mm			
			
From: MH 17 / To: BRANCH B Size: 100mm			
Survey abandoned - Remark: FILLED IN			



Surveyed by (Operator) TYLER TODD	Job Number LAYERSERV00015480	Pipe Length Reference(PLR) BRANCH A X	Date 14/01/2023	Pre Cleaned Not Cleaned
Weather 3 - Light Rain	Customer Present	Service Grade/Structural Grade 0/0	Base Unit S10E5CSLD1	Section Number 20
Road The Christie TIF Wards Place Wilmslow Rd, Location Manchester		Division District Location Details		
Purpose Duty Surface water Catchment	Shape/Size 150mm Material Vitrified clay Category		Start Node MH 17 End Node BRANCH A Total length 7.77 metres	

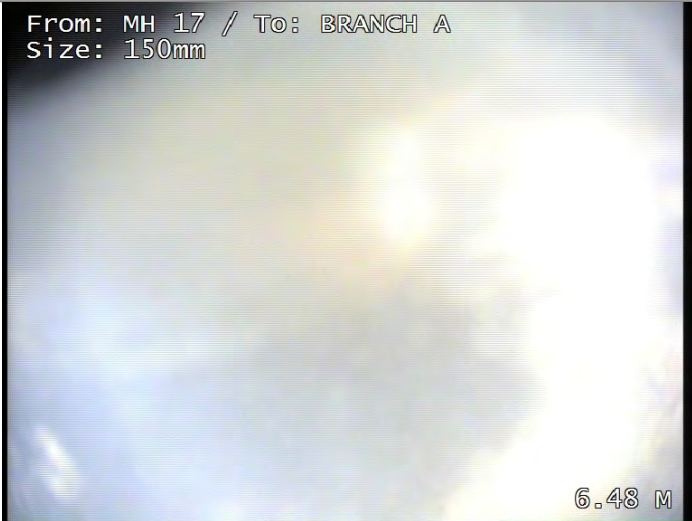
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Direction **Upstream**

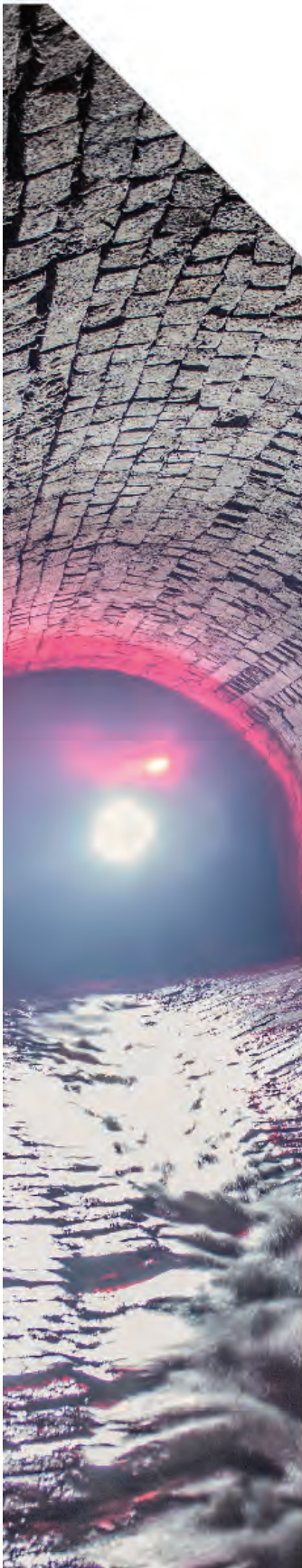
Start Node Ref:MH 17 | I/L : metres | Depth: 0.86 metres

Position	Code	Description	Photo	Type/Grade
0.00	MH	Start node type, manhole, reference MH 17	7366973	Comment / 0
0.00	WL	Water level 5% height/diameter	7366974	Comment / 0
6.48	CUW (S01)	Loss of vision, camera under water, Start	7366975	Comment / 0
7.57	CUW (F01)	Loss of vision, camera under water, Finished	7366976	Comment / 0
7.57	SA	Survey abandoned - Remark: BRICK IN LINE, UNABLE TO PASS	7366977	Comment / 0

End Node Ref:BRANCH A | I/L : metres



Job Number LAYERSERV00015480	Surveyed by (Operator) TYLER TODD	Base Unit S10E5CSLD1	Date 14/01/2023
 0.00 M Start node type, manhole, reference MH 17		 0.00 M Water level 5% height/diameter	
From: MH 17 / To: BRANCH A Size: 150mm  6.48 M Loss of vision, camera under water, Start		From: MH 17 / To: BRANCH A Size: 150mm  7.79 M Loss of vision, camera under water, Finished	
From: MH 17 / To: BRANCH A Size: 150mm  7.57 M Survey abandoned - Remark: BRICK IN LINE, UNABLE TO PASS			



LAYER SURVEYS LTD

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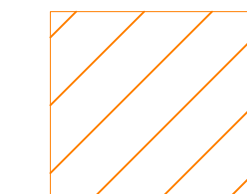
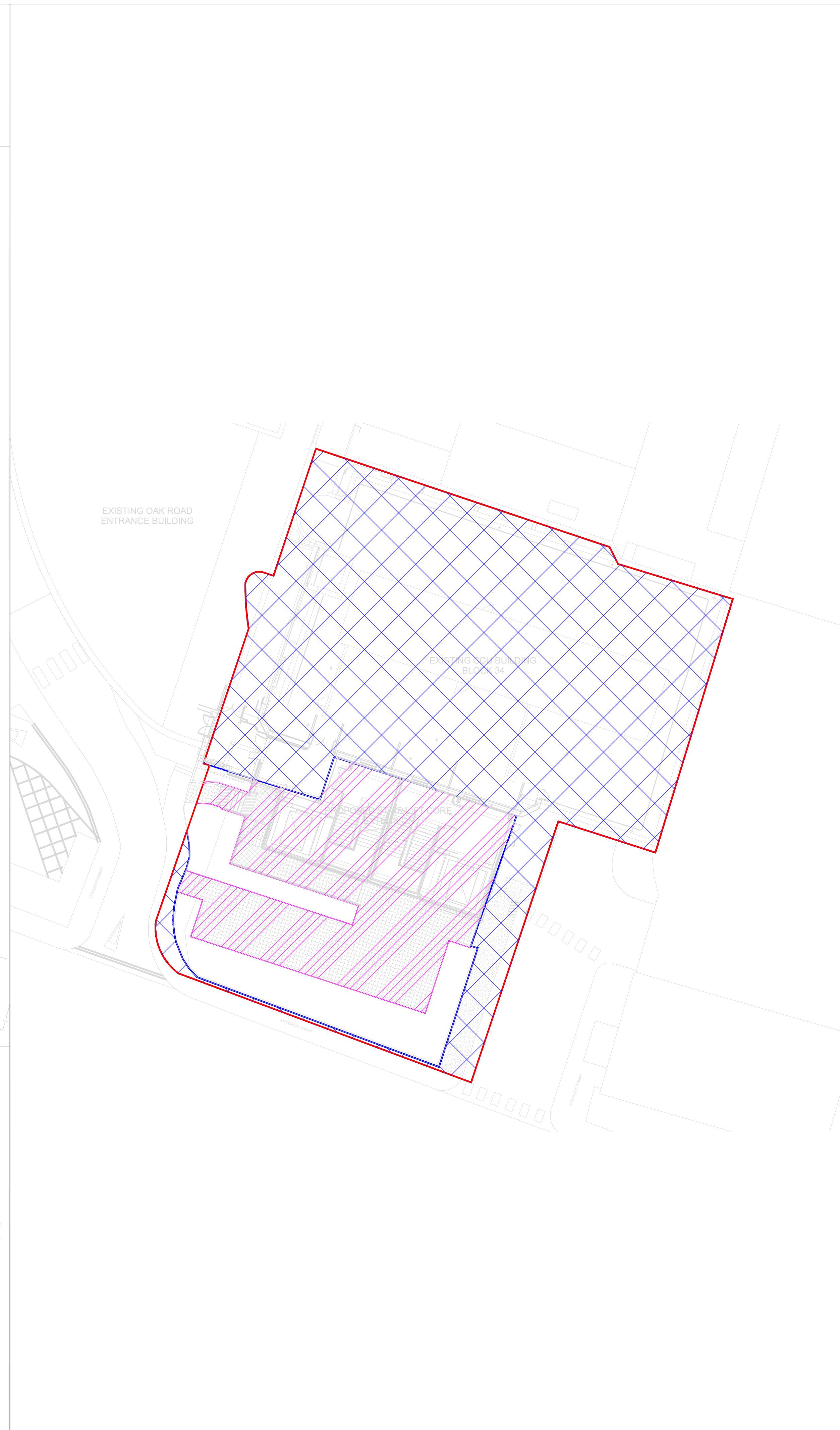
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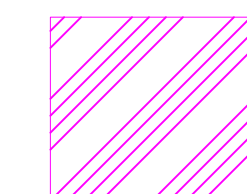
LinkedIn



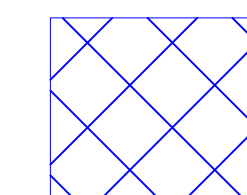
Appendix G – Pre & Post Development Impermeable Areas Drawing



PRE DEVELOPMENT IMPERMEABLE AREAS = 447m²



POST DEVELOPMENT IMPERMEABLE AREAS = 314m²



PROPOSED AREAS TO DRAIN AS PER
EXISTING SCENARIO = 906m²

[illegible]

DRAWING STATUS: **P R E L I M I N A R Y**

CLIENT: NHS INTEGRATED HEALTH PROJECTS

ARCHITECT: GILLING DOD

PROJECT: THE CHRISTIE HOSPITAL
TIF WARDS

TITLE: BELOW GROUND DRAINAGE
PRE & POST DEVELOPMENT IMPERMEABLE AREAS

STATUS:	PROJECT No.	PROJECT	ORIGINATOR	VOL/SYS	LEVEL	TYPE	ROLE	DRAWING No.	REV:
S2	222-164	CHRCW-AJP-V4 - 00 - SK - C - 0001							P03

SCALE @ A1: 1:200	DESIGNED: JJR	DRAWN: JJR	CHECKED: JRS	APPROVED: PB	DATE: DEC 2022
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Appendix H – Existing Brownfield Runoff Calculations

The Alan Johnston Partnership		Page 1
1 Dale Street Liverpool L2 2ET	222-164 Christie TIF Brownfield Run Off Rates	
Date 05/05/2023 20:03	Designed by JJR	
File BROWNFIELD RUN OFF RATES.MDX	Checked by JRS	
Micro Drainage	Network 2019.1	

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm

Pipe Sizes STANDARD Manhole Sizes STANDARD

FSR Rainfall Model - England and Wales

Return Period (years)	2	PIMP (%)	100
M5-60 (mm)	18.000	Add Flow / Climate Change (%)	0
Ratio R	0.361	Minimum Backdrop Height (m)	0.200
Maximum Rainfall (mm/hr)	50	Maximum Backdrop Height (m)	1.500
Maximum Time of Concentration (mins)	30	Min Design Depth for Optimisation (m)	1.200
Foul Sewage (l/s/ha)	0.000	Min Vel for Auto Design only (m/s)	1.00
Volumetric Runoff Coeff.	0.750	Min Slope for Optimisation (1:X)	500

Designed with Level Soffits

Time Area Diagram for Storm

Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.039	4-8	0.005

Total Area Contributing (ha) = 0.044

Total Pipe Volume (m³) = 0.265

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
1.000	5.000	0.050	99.8	0.015	5.00	0.0	0.600	o	150	Pipe/Conduit	
1.001	5.000	0.050	99.8	0.015	0.00	0.0	0.600	o	150	Pipe/Conduit	
1.002	5.000	0.050	99.8	0.014	0.00	0.0	0.600	o	150	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
1.000	50.00	5.08	33.000	0.015	0.0	0.0	0.0	1.01	17.8	2.0
1.001	50.00	5.17	32.950	0.030	0.0	0.0	0.0	1.01	17.8	4.1
1.002	50.00	5.25	32.900	0.044	0.0	0.0	0.0	1.01	17.8	6.0

The Alan Johnston Partnership		Page 2
1 Dale Street Liverpool L2 2ET	222-164 Christe TIF Brownfield Run Off Rates	
Date 05/05/2023 20:03 File BROWNFIELD RUN OFF RATES.MDX	Designed by JJR Checked by JRS	
Micro Drainage	Network 2019.1	

Area Summary for Storm

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
1.000	-	-	100	0.015	0.015	0.015
1.001	-	-	100	0.015	0.015	0.015
1.002	-	-	100	0.014	0.014	0.014
				Total	Total	Total
				0.044	0.044	0.044

Free Flowing Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D, L (mm)	W (mm)
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1.002		34.000	32.850	32.000	1200	0
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Simulation Criteria for Storm

Volumetric Runoff Coeff	0.750	Additional Flow - % of Total Flow	0.000
Areal Reduction Factor	1.000	MADD Factor * 10m ³ /ha Storage	2.000
Hot Start (mins)	0	Inlet Coefficient	0.800
Hot Start Level (mm)	0	Flow per Person per Day (l/per/day)	0.000
Manhole Headloss Coeff (Global)	0.500	Run Time (mins)	60
Foul Sewage per hectare (l/s)	0.000	Output Interval (mins)	1

Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 0
Number of Online Controls 0 Number of Storage Structures 0 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Summer
Return Period (years)	2	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	18.000	Storm Duration (mins)	30
Ratio R	0.361		

The Alan Johnston Partnership		Page 3
1 Dale Street Liverpool L2 2ET	222-164 Christe TIF Brownfield Run Off Rates	
Date 05/05/2023 20:03	Designed by JJR	
File BROWNFIELD RUN OFF RATES.MDX	Checked by JRS	
Micro Drainage	Network 2019.1	

1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria

Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 0.000
 Hot Start (mins) 0 MADD Factor * 10m³/ha Storage 2.000
 Hot Start Level (mm) 0 Inlet Coefficient 0.800
 Manhole Headloss Coeff (Global) 0.500 Flow per Person per Day (l/per/day) 0.000
 Foul Sewage per hectare (l/s) 0.000

Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 0
 Number of Online Controls 0 Number of Storage Structures 0 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR M5-60 (mm) 18.000 Cv (Summer) 0.750
 Region England and Wales Ratio R 0.361 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0 DVD Status OFF
 Analysis Timestep Fine Inertia Status OFF
 DTS Status ON

Profile(s)

Duration(s) (mins) 15, 30, 60, 120, 240, 360, 480, 960, 1440
 Return Period(s) (years) 1, 2, 30, 100
 Climate Change (%) 0, 0, 0, 0

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)
1.000	SW01	15 Winter	1	+0%					33.036	-0.114	0.000
1.001	SW02	15 Winter	1	+0%					33.000	-0.100	0.000
1.002	SW03	15 Winter	1	+0%	100/15 Summer				32.960	-0.090	0.000

		<u>Pipe</u>			
PN	US/MH Name	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Level Exceeded
1.000	SW01	0.13		1.8	OK
1.001	SW02	0.24		3.3	OK
1.002	SW03	0.34		4.8	OK

The Alan Johnston Partnership		Page 4
1 Dale Street Liverpool L2 2ET	222-164 Christe TIF Brownfield Run Off Rates	
Date 05/05/2023 20:03	Designed by JJR	
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Micro Drainage	Network 2019.1	

2 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria

Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 0.000
 Hot Start (mins) 0 MADD Factor * 10m³/ha Storage 2.000
 Hot Start Level (mm) 0 Inlet Coefficient 0.800
 Manhole Headloss Coeff (Global) 0.500 Flow per Person per Day (l/per/day) 0.000
 Foul Sewage per hectare (l/s) 0.000

Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 0
 Number of Online Controls 0 Number of Storage Structures 0 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR M5-60 (mm) 18.000 Cv (Summer) 0.750
 Region England and Wales Ratio R 0.361 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0 DVD Status OFF
 Analysis Timestep Fine Inertia Status OFF
 DTS Status ON

Profile(s)

Duration(s) (mins) 15, 30, 60, 120, 240, 360, 480, 960, 1440
 Return Period(s) (years) 1, 2, 30, 100
 Climate Change (%) 0, 0, 0, 0

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m ³)
1.000	SW01	15 Winter	2	+0%					33.041	-0.109	0.000
1.001	SW02	15 Winter	2	+0%					33.007	-0.093	0.000
1.002	SW03	15 Winter	2	+0%	100/15 Summer				32.970	-0.080	0.000

		Pipe		Level	
PN	US/MH Name	Flow / Cap.	Overflow (l/s)	Flow (l/s)	Status
1.000	SW01	0.17		2.3	OK
1.001	SW02	0.31		4.3	OK
1.002	SW03	0.44		6.2	OK

The Alan Johnston Partnership		Page 5
1 Dale Street Liverpool L2 2ET	222-164 Christe TIF Brownfield Run Off Rates	
Date 05/05/2023 20:03	Designed by JJR	
File BROWNFIELD RUN OFF RATES.MDX	Checked by JRS	
Micro Drainage	Network 2019.1	

30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria

Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 0.000
 Hot Start (mins) 0 MADD Factor * 10m³/ha Storage 2.000
 Hot Start Level (mm) 0 Inlet Coefficient 0.800
 Manhole Headloss Coeff (Global) 0.500 Flow per Person per Day (l/per/day) 0.000
 Foul Sewage per hectare (l/s) 0.000

Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 0
 Number of Online Controls 0 Number of Storage Structures 0 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR M5-60 (mm) 18.000 Cv (Summer) 0.750
 Region England and Wales Ratio R 0.361 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0 DVD Status OFF
 Analysis Timestep Fine Inertia Status OFF
 DTS Status ON

Profile(s)

Duration(s) (mins) 15, 30, 60, 120, 240, 360, 480, 960, 1440
 Return Period(s) (years) 1, 2, 30, 100
 Climate Change (%) 0, 0, 0, 0

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m ³)
1.000	SW01	15 Winter	30	+0%					33.058	-0.092	0.000
1.001	SW02	15 Winter	30	+0%					33.039	-0.061	0.000
1.002	SW03	15 Winter	30	+0%	100/15 Summer				33.017	-0.033	0.000

		Pipe		Level	
PN	US/MH Name	Flow / Cap.	Overflow (l/s)	Flow (l/s)	Status
1.000	SW01	0.31		4.4	OK
1.001	SW02	0.65		9.0	OK
1.002	SW03	0.95		13.3	OK

The Alan Johnston Partnership		Page 6
1 Dale Street Liverpool L2 2ET	222-164 Christe TIF Brownfield Run Off Rates	
Date 05/05/2023 20:03	Designed by JJR	
File BROWNFIELD RUN OFF RATES.MDX	Checked by JRS	
Micro Drainage	Network 2019.1	

100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria

Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 0.000
 Hot Start (mins) 0 MADD Factor * 10m³/ha Storage 2.000
 Hot Start Level (mm) 0 Inlet Coefficient 0.800
 Manhole Headloss Coeff (Global) 0.500 Flow per Person per Day (l/per/day) 0.000
 Foul Sewage per hectare (l/s) 0.000

Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 0
 Number of Online Controls 0 Number of Storage Structures 0 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR M5-60 (mm) 18.000 Cv (Summer) 0.750
 Region England and Wales Ratio R 0.361 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0 DVD Status OFF
 Analysis Timestep Fine Inertia Status OFF
 DTS Status ON

Profile(s)

Duration(s) (mins) 15, 30, 60, 120, 240, 360, 480, 960, 1440
 Return Period(s) (years) 1, 2, 30, 100
 Climate Change (%) 0, 0, 0, 0

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)
1.000	SW01	15 Winter	100	+0%					33.108	-0.042	0.000
1.001	SW02	15 Winter	100	+0%					33.097	-0.003	0.000
1.002	SW03	15 Winter	100	+0%	100/15 Summer				33.064	0.014	0.000

PN	US/MH Name	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	SW01	0.40		5.7	OK	
1.001	SW02	0.80		11.2	OK	
1.002	SW03	1.17		16.4	SURCHARGED	

Appendix I – Preliminary Storage Estimate

The Alan Johnston Partnership		Page 1
1 Dale Street Liverpool L2 2ET	222.164 Christie TIF Prelim Storage 5.0 L/s	
Date 05/05/2023 20:15	Designed by JJR	
File PRELIM STORAGE CALCS 5.0LS.SRCX	Checked by JRS	
Micro Drainage	Source Control 2019.1	

Summary of Results for 100 year Return Period (+45%)

Half Drain Time : 7 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	32.713	0.713	0.0	5.0	5.0	3.0	0 K
30 min Summer	32.852	0.852	0.0	5.0	5.0	3.6	0 K
60 min Summer	32.775	0.775	0.0	5.0	5.0	3.2	0 K
120 min Summer	32.431	0.431	0.0	5.0	5.0	1.8	0 K
180 min Summer	32.218	0.218	0.0	4.9	4.9	0.9	0 K
240 min Summer	32.132	0.132	0.0	4.5	4.5	0.6	0 K
360 min Summer	32.098	0.098	0.0	3.5	3.5	0.4	0 K
480 min Summer	32.083	0.083	0.0	2.9	2.9	0.3	0 K
600 min Summer	32.074	0.074	0.0	2.4	2.4	0.3	0 K
720 min Summer	32.068	0.068	0.0	2.1	2.1	0.3	0 K
960 min Summer	32.060	0.060	0.0	1.7	1.7	0.3	0 K
1440 min Summer	32.050	0.050	0.0	1.2	1.2	0.2	0 K
2160 min Summer	32.042	0.042	0.0	0.9	0.9	0.2	0 K
2880 min Summer	32.037	0.037	0.0	0.7	0.7	0.2	0 K
4320 min Summer	32.031	0.031	0.0	0.5	0.5	0.1	0 K
5760 min Summer	32.028	0.028	0.0	0.4	0.4	0.1	0 K
7200 min Summer	32.025	0.025	0.0	0.4	0.4	0.1	0 K
8640 min Summer	32.023	0.023	0.0	0.3	0.3	0.1	0 K
10080 min Summer	32.022	0.022	0.0	0.3	0.3	0.1	0 K
15 min Winter	32.862	0.862	0.0	5.0	5.0	3.6	0 K
30 min Winter	32.991	0.991	0.0	5.0	5.0	4.1	0 K
60 min Winter	32.824	0.824	0.0	5.0	5.0	3.4	0 K
120 min Winter	32.278	0.278	0.0	5.0	5.0	1.2	0 K
180 min Winter	32.122	0.122	0.0	4.3	4.3	0.5	0 K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	123.207	0.0	7.2	20
30 min Summer	82.373	0.0	9.6	28
60 min Summer	52.627	0.0	12.2	44
120 min Summer	32.545	0.0	15.1	74
180 min Summer	24.251	0.0	16.9	102
240 min Summer	19.566	0.0	18.2	130
360 min Summer	14.331	0.0	20.0	188
480 min Summer	11.497	0.0	21.4	246
600 min Summer	9.684	0.0	22.5	308
720 min Summer	8.412	0.0	23.5	366
960 min Summer	6.731	0.0	25.0	488
1440 min Summer	4.907	0.0	27.4	720
2160 min Summer	3.570	0.0	29.9	1092
2880 min Summer	2.846	0.0	31.8	1464
4320 min Summer	2.064	0.0	34.5	2200
5760 min Summer	1.641	0.0	36.6	2920
7200 min Summer	1.373	0.0	38.3	3632
8640 min Summer	1.186	0.0	39.7	4272
10080 min Summer	1.048	0.0	40.9	5080
15 min Winter	123.207	0.0	8.0	20
30 min Winter	82.373	0.0	10.7	29
60 min Winter	52.627	0.0	13.7	46
120 min Winter	32.545	0.0	16.9	74
180 min Winter	24.251	0.0	18.9	98

The Alan Johnston Partnership		Page 2
1 Dale Street Liverpool L2 2ET	222.164 Christie TIF Prelim Storage 5.0 L/s	
Date 05/05/2023 20:15 File PRELIM STORAGE CALCS 5.0LS.SRCX	Designed by JJR Checked by JRS	
Micro Drainage	Source Control 2019.1	

Summary of Results for 100 year Return Period (+45%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Outflow (l/s)	Max Volume (m³)	Status
240 min Winter	32.099	0.099	0.0	3.5	3.5	0.4	0 K
360 min Winter	32.078	0.078	0.0	2.6	2.6	0.3	0 K
480 min Winter	32.068	0.068	0.0	2.1	2.1	0.3	0 K
600 min Winter	32.061	0.061	0.0	1.8	1.8	0.3	0 K
720 min Winter	32.056	0.056	0.0	1.5	1.5	0.2	0 K
960 min Winter	32.050	0.050	0.0	1.2	1.2	0.2	0 K
1440 min Winter	32.042	0.042	0.0	0.9	0.9	0.2	0 K
2160 min Winter	32.035	0.035	0.0	0.7	0.7	0.1	0 K
2880 min Winter	32.031	0.031	0.0	0.5	0.5	0.1	0 K
4320 min Winter	32.026	0.026	0.0	0.4	0.4	0.1	0 K
5760 min Winter	32.023	0.023	0.0	0.3	0.3	0.1	0 K
7200 min Winter	32.021	0.021	0.0	0.3	0.3	0.1	0 K
8640 min Winter	32.020	0.020	0.0	0.2	0.2	0.1	0 K
10080 min Winter	32.019	0.019	0.0	0.2	0.2	0.1	0 K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
240 min Winter	19.566	0.0	20.4	128
360 min Winter	14.331	0.0	22.4	186
480 min Winter	11.497	0.0	23.9	246
600 min Winter	9.684	0.0	25.2	306
720 min Winter	8.412	0.0	26.3	366
960 min Winter	6.731	0.0	28.0	492
1440 min Winter	4.907	0.0	30.7	720
2160 min Winter	3.570	0.0	33.5	1096
2880 min Winter	2.846	0.0	35.6	1452
4320 min Winter	2.064	0.0	38.7	2204
5760 min Winter	1.641	0.0	41.0	2848
7200 min Winter	1.373	0.0	42.9	3624
8640 min Winter	1.186	0.0	44.5	4280
10080 min Winter	1.048	0.0	45.8	5040

The Alan Johnston Partnership		Page 3
1 Dale Street Liverpool L2 2ET	222.164 Christie TIF Prelim Storage 5.0 L/s	
Date 05/05/2023 20:15	Designed by JJR	
File PRELIM STORAGE CALCS 5.0LS.SRCX	Checked by JRS	
Micro Drainage	Source Control 2019.1	

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	0.363	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+45

Time Area Diagram

Total Area (ha) 0.031

Time (mins) Area			Time (mins) Area			Time (mins) Area		
From:	To:	(ha)	From:	To:	(ha)	From:	To:	(ha)
0	4	0.011	4	8	0.010	8	12	0.010

The Alan Johnston Partnership		Page 4
1 Dale Street Liverpool L2 2ET	222.164 Christie TIF Prelim Storage 5.0 L/s	
Date 05/05/2023 20:15 File PRELIM STORAGE CALCS 5.0LS.SRCX	Designed by JJR Checked by JRS	
Micro Drainage	Source Control 2019.1	

Model Details

Storage is Online Cover Level (m) 34.000

Cellular Storage Structure

Invert Level (m) 32.000 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	4.4	0.0	1.000	4.4	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) 32.000
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 J – Outline Drainage Strategy Drawing & SW Calcs

PRELIMINARY SUBJECT TO CONFIRMATION OF
LANDSCAPE ARCHITECTS PROPOSED SITE LEVELS
AND ALL FOUL WATER POP UP AND RAINWATER
DOWNPIPE LOCATIONS AND FLOW RATES

PRELIMINARY SUBJECT TO CONFIRMATION OF
UNITED UTILITIES AND MANCHESTER CITY
COUNCIL ACCEPTANCE OF DISCHARGE
CONNECTION LOCATIONS AND FLOW RATES

ABANDONMENT OF ALL EXISTING BRANCHES AND PIPES TO BE
CONFIRMED ON SITE PRIOR TO THE COMMENCEMENT OF ANY WORKS.
ANY BRANCHES OR PIPES CURRENTLY SHOWN AS ABANDONED WHICH
ARE FOUND TO BE LIVE AND THEREFORE CANNOT BE ABANDONED ARE
TO BE HIGHLIGHTED TO THE ENGINEER PRIOR TO THE COMMENCEMENT
OF ANY WORKS TO ENABLE A SUITABLE DIVERSION TO BE DESIGNED.

CCTV SURVEYS HAVE PROVIDED INVERT LEVELS OF THE
EXISTING DRAINAGE TO BE DIVERTED BUT INVERT
LEVELS OF AL EXISTING DRAINAGE TO BE CONFIRMED ON
SITE PRIOR TO THE COMMENCEMENT OF ANY WORKS.

CCTV SURVEYS INDICATE THAT THIS EXISTING
FOUL WATER PIPE HAS BEEN CAPPED OFF
AND IT IS THEREFORE ASSUMED THAT THIS
BRANCH CAN BE ABANDONED.

CCTV SURVEYS INDICATE THAT THIS
EXISTING SURFACE WATER PIPE HAS BEEN
FILLED IN AND IT IS THEREFORE ASSUMED
THAT THIS BRANCH CAN BE ABANDONED.

PROPOSED DRAINAGE DIVERSION TO DIVERT
EXISTING PRIVATE COMBINED WATER
AROUND THE PROPOSED EXTENSION.

ATTENUATION STORAGE TO BE PROVIDED
THROUGH OVERSIZED MANHOLES AND
SURFACE WATER NETWORK ITSELF

LINEAR DRAINAGE CHANNEL TO COLLECT
RUN OFF FROM HARD LANDSCAPED AREAS.
SUBJECT TO CHANGE FOLLOWING
CONFIRMATION OF PROPOSED SITE LEVELS.

PROPOSED INTERNAL REFURBISHMENT AREAS
ASSUMED TO DRAIN AS PER EXISTING SCENARIO.
ALLOWANCE TO BE MADE FOR POTENTIAL
WORKS BELOW SLAB TO DIVERT/AMEND BELOW
GROUND DRAINAGE WHERE REQUIRED

PROPOSED DRAINAGE DESIGN SUBJECT TO
CHANGE FOLLOWING CONFIRMATION OF FOUL
WATER POP UP AND RAINWATER DOWNPIPE
LOCATIONS AND PROPOSED SITE LEVELS.

EXACT LOCATION OF ALL RWP AND FOUL
POP-UPS TO BE CONFIRMED BY OTHERS.

CCTV SURVEYS INDICATE THAT THIS
EXISTING BRANCH IS CONNECTED TO A
GULLY AND IT IS THEREFORE ASSUMED
THAT THIS BRANCH CAN BE ABANDONED.

CCTV SURVEYS UNABLE TO DETERMINE WHAT THIS
EXISTING BRANCH IS CURRENTLY DRAINING DUE TO THE
PIPE BEING COLLAPSED. ALLOWANCE TO BE MADE TO
DIVERT EXISTING BRANCH AND PROPOSED FOUNDATIONS.

ABANDONMENT OF ALL EXISTING BRANCHES AND PIPES TO BE
CONFIRMED ON SITE PRIOR TO THE COMMENCEMENT OF ANY WORKS.
ANY BRANCHES OR PIPES CURRENTLY SHOWN AS ABANDONED WHICH
ARE FOUND TO BE LIVE AND THEREFORE CANNOT BE ABANDONED ARE
TO BE HIGHLIGHTED TO THE ENGINEER PRIOR TO THE COMMENCEMENT
OF ANY WORKS TO ENABLE A SUITABLE DIVERSION TO BE DESIGNED.

PROPOSED COMBINED WATER SEWER DIVERSION TO
DISCHARGE INTO THE EXISTING COMBINED WATER
SEWER MANHOLE VIA BACKDROP CONNECTION.

LOCATION AND DEPTHS OF ALL EXISTING SERVICES ALONG THE
LINE OF THE PROPOSED OUTFALL PIPELINE TO BE IDENTIFIED AND
CONFIRMED ON SITE PRIOR TO THE COMMENCEMENT OF ANY
WORKS. ANY POTENTIAL CLASHES BETWEEN EXISTING SERVICES
AND PROPOSED OUTFALL PIPELINE TO BE HIGHLIGHTED TO
ENGINEER PRIOR TO THE COMMENCEMENT OF ANY WORKS.

ANY REQUIREMENTS FOR LIFT PIT DRAINAGE TO
BE CONFIRMED BY OTHERS. ANY REQUIREMENT
FOR LIFT PIT DRAINAGE TO BE CONNECTED TO
PROPOSED FOUL WATER DRAINAGE.

EXISTING SERVICE TRENCH IDENTIFIED BY UTILITIES
SURVEY. SERVICE TRENCH ANTICIPATED TO BE NO
DEEPER THAN 1.0m. THEREFORE, ENVISAGED THAT
PROPOSED OUTFALL PIPELINE WILL PASS BELOW
EXISTING SERVICE TRENCH. THIS IS TO BE CONFIRMED
ON SITE PRIOR TO THE COMMENCEMENT OF ANY WORKS.

SURFACE WATER RUNOFF FROM PROPOSED
FOOTPATH TO FALL INTO EXISTING ROAD AND
SUBSEQUENTLY INTO EXISTING ROAD GULLIES.

PROPOSED HYDROBRAKE CHAMBER BY HYDRO
INTERNATIONAL OR SIMILAR APPROVED. TO
RESTRICT DISCHARGE TO REQUIRED RATE
DESIGN FLOW: 5.0 L/s
DESIGN HEAD: 1.2m
UNIT REF: 0103-5000-1000-5000

PROPOSED DRAINAGE BRANCHES (SVP & RWP) KEY

IL:33.67	PROPOSED RWP OR SVP BRANCH INVERT LEVEL
A	PROPOSED DRAINAGE BRANCH PASSES ABOVE FOUNDATIONS
T	PROPOSED DRAINAGE BRANCH PASSES THROUGH FOUNDATIONS
U	PROPOSED DRAINAGE BRANCH PASSES UNDER FOUNDATIONS

IMPORTANT NOTES

- SETTING OUT SHALL BE UNDERTAKEN USING ONLY THE INFORMATION GIVEN. DISTANCES SHOULD NOT BE SCALED FROM THIS DRAWING.
- ALL SEWERS SHALL BE CONSTRUCTED IN ACCORDANCE WITH SEWERS FOR ADOPTION 7TH EDITION AND UNITED UTILITIES DETAILS & GUIDELINES.
- THE MINIMUM GRAVITY PIPE DIAMETER UNDER ADOPTABLE HIGHWAYS SHALL BE 150mm
- IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO VERIFY ALL INFORMATION GIVEN WITH REGARDS TO EXISTING SERVICES AND DRAINAGE CONNECTIONS ETC. PRIOR TO COMMENCING THE WORKS. THE RATES SHALL INCLUDE FOR HAND DIG AROUND SERVICES WHERE NECESSARY. THE CONTRACTOR SHALL ADHERE TO THE CDM REGULATIONS AT ALL TIMES
- THE OUTSIDES OF ALL SEWERS SHALL BE A MINIMUM OF 1.0m FROM KERB LINES AND THE OUTSIDE OF MANHOLES SHALL BE A MINIMUM OF 0.5m FROM KERB LINES
- EXISTING FLOWS IN WATERCOURSES, SEWERS AND LAND DRAINS SHALL BE MAINTAINED AT ALL TIMES
- ONLY TRAINED PERSONNEL SHALL BE PERMITTED TO ENTER CONFINED SPACES
- ALL MATERIALS TO BEAR THE RELEVANT B.S. KITEMARK AND COMPLY FULLY WITH THE SPECIFICATIONS. ALL CONCRETE & CONCRETE PRODUCTS MUST USE SULPHATE RESISTANT CEMENT (UNLESS THE SITE INVESTIGATION REPORT PROVES THAT SULPHATE ATTACK FROM SOILS AND GROUNDWATER WILL NOT OCCUR TO WITHSTAND A CLASS
- ALL OPENING NOTICES ETC. AS REQUIRED UNDER HIGHWAYS ACTS ETC. ARE TO BE OBTAINED PRIOR TO COMMENCEMENT OF WORKS. ALL WORKS ARE TO BE INSPECTED BY L.A., NHBC OR THE NETWORK OPERATOR AS APPLICABLE.
- WHERE "ULTRA RIB" UPVC PIPES (OR SIMILAR APPROVED) ARE USED IN ADOPTABLE DRAINAGE THEY SHALL STILL BE HANDLED AND LAID IN ACCORDANCE WITH THE SPECIFICATION AND GUIDANCE ISSUED BY THE HIGH PERFORMANCE PIPE ASSOCIATION.
- A CLASS S BED AND SURROUND MUST BE USED FOR SUCH PIPES. TRENCH BACKFILL IN HIGHWAYS TO WITHIN 1M OF HIGHWAY SHALL AS DIRECTED BY THE HIGHWAY AUTHORITY BE A SUITABLE GRANULAR MATERIAL ALL IN ACCORDANCE WITH SEWERS FOR ADOPTION CL. 4.3.4.
- SLAB LEVELS SHALL NOT BE VARIED WITHOUT REFERENCE TO THE ENGINEER FOR GUIDANCE
- ALL GULLY CONNECTIONS TO BE 150mm VITRIFIED CLAY UNLESS NOTED OTHERWISE
- ALL MANHOLE COVERS TO BE RECESSED TO ACCEPT FINISH AS DETAILED BY LANDSCAPE ARCHITECT
- SLOW REST BENDS TO BE USED IN ALL LOCATIONS MADE UP FROM 2No. 45 DEG BENDS (600mm TO INVERT FROM FFL)
- MANHOLE POSITIONS AND ACCESS COVERS TO BE ACCURATELY SET-OUT BY LANDSCAPE ARCHITECT TO SUIT EXTERNAL FINISHES
- ALL DRAINS CAST THROUGH FOUNDATIONS TO HAVE ROCKER PIPES ON BOTH SIDES OF FOUNDATION
- ALL POP UP POSITIONS TO BE CONFIRMED SET OUT DIMENSIONS TO BE AGREED & PROVIDED BY OTHERS
- ALL DISCHARGE RATES TO BE CONFIRMED BY M&E DESIGNER
- ALL SURFACE WATER COLLECTION FEATURES TO BE CONFIRMED BY THE LANDSCAPE ARCHITECT
- STORAGE HAS BEEN PROVIDED IN A CELLULAR STORAGE TANK AND UP-SIZED MANHOLES AND PIPES.
- EXISTING SEWER DEPTHS HAVE BEEN APPROXIMATED FROM LIMITED INFORMATION. NEW CONNECTIONS TO BE CONFIRMED PRIOR TO CONSTRUCTION OF ANY DRAINAGE WORKS.
- LANDSCAPE ARCHITECT TO CONFIRM GULLY AND DRAINAGE CHANNEL LOCATIONS TO LANDSCAPED AREAS.
- FOUL NETWORK TO BE CONFIRMED FOLLOWING CONFIRMATION OF BRANCH CONNECTION POINTS FROM BUILDING M&E DESIGNER
- CCTV SURVEY OF EXISTING SITE DRAINAGE REQUIRED PRIOR TO THE COMMENCEMENT OF ANY WORKS STARTING ON SITE

LEGEND

- PROPOSED SURFACE WATER MANHOLE
- PROPOSED FOUL WATER PPIC
- PROPOSED SURFACE WATER DRAINAGE
- PROPOSED FOUL WATER DRAINAGE
- PROPOSED ACO CHANNEL DRAIN
- PROPOSED FLOOR GULLY
- PROPOSED YARD GULLY
- EXISTING PRIVATE SURFACE WATER SEWER
- EXISTING PRIVATE FOUL WATER SEWER
- EXISTING PRIVATE COMBINED WATER SEWER
- PROPOSED COMBINED WATER SEWER DIVERSION
- PRIVATE DRAINAGE TO BE ABANDONED
- AREAS TO DRAIN AS PER EXISTING SCENARIO

P03	05.05.2023	UPDATED TO SUIT LATEST SITE LAYOUT	JJR	JRS	PB
P02	27.01.2023	RIBA - STAGE 3	JJR	PB	PB
P01	14.12.2022	PRELIMINARY ISSUE	JJR	JRS	PB
REV	DATE	DESCRIPTION	BY	CHK	APP

DRAWING STATUS:

PRELIMINARY

CLIENT:

NHS INTEGRATED HEALTH PROJECTS

ARCHITECT:

GILLING DOD

PROJECT:

THE CHRISTIE HOSPITAL
TIF WARDS

TITLE:

BELOW GROUND DRAINAGE
OUTLINE DRAINAGE STRATEGY

STATUS:	PROJECT No:	PROJECT	ORIGINATOR	VOL/SYS/LEVEL	TYPE	ROLE	DRAWING No.	REV:
S2	222-164	CHRCW-AJP-V4-00-DR-C-0001	P03					

SCALE @ A1:	DESIGNED:	DRAWN:	CHECKED:	APPROVED:	DATE
1:100	JJR	JJR	JRS	PB	DEC 2022

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consulting engineers

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The Alan Johnston Partnership		Page 1
1 Dale Street Liverpool L2 2ET	222-164 Christie TIF SW Network	
Date 06/05/2023 00:19 File SW NETWORK.MDX	Designed by JJR Checked by PB	
Micro Drainage	Network 2019.1	

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm

Pipe Sizes STANDARD Manhole Sizes STANDARD

FSR Rainfall Model - England and Wales

Return Period (years)	2	PIMP (%)	100
M5-60 (mm)	18.000	Add Flow / Climate Change (%)	0
Ratio R	0.371	Minimum Backdrop Height (m)	0.200
Maximum Rainfall (mm/hr)	50	Maximum Backdrop Height (m)	1.500
Maximum Time of Concentration (mins)	30	Min Design Depth for Optimisation (m)	1.200
Foul Sewage (l/s/ha)	0.000	Min Vel for Auto Design only (m/s)	1.00
Volumetric Runoff Coeff.	0.750	Min Slope for Optimisation (1:X)	500

Designed with Level Soffits

Time Area Diagram for Storm

Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.027	4-8	0.004

Total Area Contributing (ha) = 0.031

Total Pipe Volume (m³) = 0.241

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
1.000	7.223	0.140	51.6	0.016	5.00	0.0	0.600	o	150	Pipe/Conduit	
1.001	6.436	0.325	19.8	0.015	0.00	0.0	0.600	o	150	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
1.000	50.00	5.09	32.240	0.016	0.0	0.0	0.0	1.40	24.8	2.2
1.001	50.00	5.13	32.100	0.031	0.0	0.0	0.0	2.27	40.2	4.2

Manhole Schedules for Storm

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam., L*W (mm)	Pipe Out PN	Pipe Out Invert Level (m)	Pipe Out Diameter (mm)	Pipes In PN	Pipes In Invert Level (m)	Pipes In Diameter (mm)	Backdrop (mm)
SW01	34.310	2.070	Open Manhole	1500	1.000	32.240	150				
SW02	34.240	2.140	Open Manhole	1500	1.001	32.100	150	1.000	32.100	150	
CW02	34.180	2.405	Open Manhole	1200		OUTFALL		1.001	31.775	150	

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
SW01	384871.184	392408.816	384871.184	392408.816	Required	
SW02	384878.046	392406.559	384878.046	392406.559	Required	
CW02	384884.055	392408.864			No Entry	

The Alan Johnston Partnership		Page 3
1 Dale Street Liverpool L2 2ET	222-164 Christie TIF SW Network	
Date 06/05/2023 00:19 File SW NETWORK.MDX	Designed by JJR Checked by PB	
Micro Drainage	Network 2019.1	

PIPELINE SCHEDULES for Storm

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
1.000	o	150	SW01	34.310	32.240	1.920	Open Manhole	1500
1.001	o	150	SW02	34.240	32.100	1.990	Open Manhole	1500

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
1.000	7.223	51.6	SW02	34.240	32.100	1.990	Open Manhole	1500
1.001	6.436	19.8	CW02	34.180	31.775	2.255	Open Manhole	1200

The Alan Johnston Partnership		Page 4
1 Dale Street Liverpool L2 2ET	222-164 Christie TIF SW Network	
Date 06/05/2023 00:19 File SW NETWORK.MDX	Designed by JJR Checked by PB	
Micro Drainage	Network 2019.1	

Area Summary for Storm

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
1.000	-	-	100	0.016	0.016	0.016
1.001	-	-	100	0.015	0.015	0.015
				Total	Total	Total
				0.031	0.031	0.031

Free Flowing Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D, L (mm)	W (mm)
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1.001	CW02	34.180	31.775	31.700	1200	0
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Simulation Criteria for Storm

Volumetric Runoff Coeff	0.750	Additional Flow - % of Total Flow	0.000
Areal Reduction Factor	1.000	MADD Factor * 10m ³ /ha Storage	2.000
Hot Start (mins)	0	Inlet Coefficient	0.800
Hot Start Level (mm)	0	Flow per Person per Day (l/per/day)	0.000
Manhole Headloss Coeff (Global)	0.500	Run Time (mins)	60
Foul Sewage per hectare (l/s)	0.000	Output Interval (mins)	1

Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 0
Number of Online Controls 1 Number of Storage Structures 0 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Summer
Return Period (years)	2	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	18.000	Storm Duration (mins)	30
Ratio R	0.371		

The Alan Johnston Partnership		Page 5
1 Dale Street Liverpool L2 2ET	222-164 Christie TIF SW Network	
Date 06/05/2023 00:19 File SW NETWORK.MDX	Designed by JJR Checked by PB	
Micro Drainage	Network 2019.1	

Online Controls for Storm

Hydro-Brake® Optimum Manhole: SW02, DS/PN: 1.001, Volume (m³): 3.9

Unit Reference	MD-SHE-0103-5000-1200-5000
Design Head (m)	1.200
Design Flow (l/s)	5.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	103
Invert Level (m)	32.100
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)	1.200	5.0	Kick-Flo®	0.745	4.0
Flush-Flo™	0.354	5.0	Mean Flow over Head Range	-	4.4

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	3.4	0.800	4.1	2.000	6.3	4.000	8.8	7.000	11.5
0.200	4.7	1.000	4.6	2.200	6.6	4.500	9.3	7.500	11.8
0.300	5.0	1.200	5.0	2.400	6.9	5.000	9.8	8.000	12.2
0.400	5.0	1.400	5.4	2.600	7.2	5.500	10.2	8.500	12.6
0.500	4.9	1.600	5.7	3.000	7.7	6.000	10.7	9.000	12.9
0.600	4.7	1.800	6.0	3.500	8.3	6.500	11.1	9.500	13.3

The Alan Johnston Partnership		Page 6
1 Dale Street Liverpool L2 2ET	222-164 Christie TIF SW Network	
Date 06/05/2023 00:19 File SW NETWORK.MDX	Designed by JJR Checked by PB	
Micro Drainage	Network 2019.1	

1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria

Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 0.000
 Hot Start (mins) 0 MADD Factor * 10m³/ha Storage 2.000
 Hot Start Level (mm) 0 Inlet Coefficient 0.800
 Manhole Headloss Coeff (Global) 0.500 Flow per Person per Day (l/per/day) 0.000
 Foul Sewage per hectare (l/s) 0.000

Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 0
 Number of Online Controls 1 Number of Storage Structures 0 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR M5-60 (mm) 18.000 Cv (Summer) 0.750
 Region England and Wales Ratio R 0.371 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0 DVD Status OFF
 Analysis Timestep Fine Inertia Status OFF
 DTS Status ON

Profile(s)

Duration(s) (mins) 15, 30, 60, 120, 240, 360, 480, 960, 1440
 Return Period(s) (years) 1, 2, 30, 100
 Climate Change (%) 0, 0, 0, 45

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surge	First (Y) Flood	First (Z) Overflow	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)
1.000	SW01	15 Winter	1	+0%	30/15	Summer		32.271	-0.119	0.000
1.001	SW02	15 Winter	1	+0%	30/15	Summer		32.199	-0.051	0.000

Pipe

PN	US/MH Name	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	SW01	0.09		1.9	OK	
1.001	SW02	0.10		3.4	OK	

The Alan Johnston Partnership		Page 7
1 Dale Street Liverpool L2 2ET	222-164 Christie TIF SW Network	
Date 06/05/2023 00:19 File SW NETWORK.MDX	Designed by JJR Checked by PB	
Micro Drainage	Network 2019.1	

2 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria

Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 0.000
 Hot Start (mins) 0 MADD Factor * 10m³/ha Storage 2.000
 Hot Start Level (mm) 0 Inlet Coefficient 0.800
 Manhole Headloss Coeff (Global) 0.500 Flow per Person per Day (l/per/day) 0.000
 Foul Sewage per hectare (l/s) 0.000

Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 0
 Number of Online Controls 1 Number of Storage Structures 0 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR M5-60 (mm) 18.000 Cv (Summer) 0.750
 Region England and Wales Ratio R 0.371 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0 DVD Status OFF
 Analysis Timestep Fine Inertia Status OFF
 DTS Status ON

Profile(s)

Duration(s) (mins) 15, 30, 60, 120, 240, 360, 480, 960, 1440
 Return Period(s) (years) 1, 2, 30, 100
 Climate Change (%) 0, 0, 0, 45

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surge	First (Y) Flood	First (Z) Overflow	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m ³)
1.000	SW01	15 Winter	2	+0%	30/15	Summer		32.274	-0.116	0.000
1.001	SW02	15 Winter	2	+0%	30/15	Summer		32.229	-0.021	0.000

Pipe

PN	US/MH Name	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Level Exceeded
1.000	SW01	0.12		2.5	OK
1.001	SW02	0.13		4.2	OK

The Alan Johnston Partnership		Page 8
1 Dale Street Liverpool L2 2ET	222-164 Christie TIF SW Network	
Date 06/05/2023 00:19 File SW NETWORK.MDX	Designed by JJR Checked by PB	
Micro Drainage	Network 2019.1	

30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria

Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 0.000
 Hot Start (mins) 0 MADD Factor * 10m³/ha Storage 2.000
 Hot Start Level (mm) 0 Inlet Coefficient 0.800
 Manhole Headloss Coeff (Global) 0.500 Flow per Person per Day (l/per/day) 0.000
 Foul Sewage per hectare (l/s) 0.000

Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 0
 Number of Online Controls 1 Number of Storage Structures 0 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR M5-60 (mm) 18.000 Cv (Summer) 0.750
 Region England and Wales Ratio R 0.371 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0 DVD Status OFF
 Analysis Timestep Fine Inertia Status OFF
 DTS Status ON

Profile(s)

Duration(s) (mins) 15, 30, 60, 120, 240, 360, 480, 960, 1440
 Return Period(s) (years) 1, 2, 30, 100
 Climate Change (%) 0, 0, 0, 45

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surge	First (Y) Flood	First (Z) Overflow	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m ³)
1.000	SW01	15 Winter	30	+0%	30/15	Summer		32.540	0.150	0.000
1.001	SW02	15 Winter	30	+0%	30/15	Summer		32.533	0.283	0.000

		Pipe		Level	
PN	US/MH Name	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status
1.000	SW01	0.14		3.0	SURCHARGED
1.001	SW02	0.14		4.9	SURCHARGED

The Alan Johnston Partnership		Page 9
1 Dale Street Liverpool L2 2ET	222-164 Christie TIF SW Network	
Date 06/05/2023 00:19 File SW NETWORK.MDX	Designed by JJR Checked by PB	
Micro Drainage	Network 2019.1	

100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria

Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 0.000
 Hot Start (mins) 0 MADD Factor * 10m³/ha Storage 2.000
 Hot Start Level (mm) 0 Inlet Coefficient 0.800
 Manhole Headloss Coeff (Global) 0.500 Flow per Person per Day (l/per/day) 0.000
 Foul Sewage per hectare (l/s) 0.000

Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 0
 Number of Online Controls 1 Number of Storage Structures 0 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR M5-60 (mm) 18.000 Cv (Summer) 0.750
 Region England and Wales Ratio R 0.371 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0 DVD Status OFF
 Analysis Timestep Fine Inertia Status OFF
 DTS Status ON

Profile(s)

Summer and Winter
 Duration(s) (mins) 15, 30, 60, 120, 240, 360, 480, 960, 1440
 Return Period(s) (years) 1, 2, 30, 100
 Climate Change (%) 0, 0, 0, 45

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surge	First (Y) Flood	First (Z) Overflow	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)
1.000	SW01	30 Winter	100	+45%	30/15	Summer		33.336	0.946	0.000
1.001	SW02	30 Winter	100	+45%	30/15	Summer		33.328	1.078	0.000

		<u>Pipe</u>		<u>Level</u>	
PN	US/MH Name	Flow / Cap.	Overflow (l/s)	Flow (l/s)	Status
1.000	SW01	0.14		2.9	SURCHARGED
1.001	SW02	0.15		5.0	SURCHARGED

Appendix K – Exceedance Flow Paths Drawing

NO FLOODING FROM DRAINAGE SYSTEMS FOR ALL RAINFALL EVENTS UP TO AND INCLUDING THE 1 IN 100 YEAR +45% CLIMATE CHANGE EVENT. THEREFORE, EXCEEDANCE FLOW PATHS ONLY USED DURING EXCEPTIONAL CIRCUMSTANCES (RAINFALL EVENTS IN EXCEEDANCE OF THE 1 IN 100 YEAR +45% CLIMATE CHANGE EVENT)

PRELIMINARY SUBJECT TO
CONFIRMATION OF LANDSCAPE
ARCHITECTS PROPOSED SITE LEVELS

PROPOSED INTERNAL REFURBISHMENT AREAS
ASSUMED TO DRAIN AS PER EXISTING SCENARIO.
ALLOWANCE TO BE MADE FOR POTENTIAL
WORKS BELOW SLAB TO DIVERT/AMEND BELOW
GROUND DRAINAGE WHERE REQUIRED

PROPOSED COMBINED
WATER SEWER DIVERSION.

PROPOSED SITE LEVELS.

EXCEEDANCE FLOW PATHS

PROPOSED SURFACE
WATER DRAINAGE

SITE BOUNDARY

P01	05.05.2023	PRELIMINARY ISSUE		JJR	JRS	PB
REV	DATE	DESCRIPTION		BY	CHK	APP

DRAWING STATUS:

PRELIMINARY

CLIENT:

NHS INTEGRATED HEALTH PROJECTS

ARCHITECT:

GILLING DOD

PROJECT:

THE CHRISTIE HOSPITAL
TIF WARDS

TITLE:

BELOW GROUND DRAINAGE
EXCEEDANCE FLOW PATHS

STATUS:	PROJECT No:	PROJECT	ORIGINATOR	VOL/SYS	LEVEL	TYPE	ROLE	DRAWING No:	REV:
S2	222-164	CHRCW-AJP-V4 - 00 - DR - C - 0006	P01						

SCALE @ A1:	DESIGNED:	DRAWN:	CHECKED:	APPROVED:	DATE:
1:100	JJR	JJR	JRS	PB	MAY 2023

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