



Drainage Strategy Report

Prepared for Bowlers Yard, Manchester

11/11/2022

Prepared By:

Olivia Blackhurst
Graduate Civil/Structural Engineer
olivia.blackhurst@clancy.co.uk
0151 227 5300

Approved By:

Michael Dean
Chartered Structural Engineer
michael.dean@clancy.co.uk
0151 227 5300

Rev. 00

Clancy Consulting Limited
Old Hall Chambers
31 Old Hall Street
Liverpool
L3 9SY

enquiries@clancy.co.uk
www.clancy.co.uk

TABLE OF CONTENTS

<u>1.</u>	<u>Introduction</u>	<u>3</u>
<u>2.</u>	<u>Local Policy</u>	<u>4</u>
<u>3.</u>	<u>Site Characteristics</u>	<u>5</u>
<u>4.</u>	<u>Sustainable Urban Drainage Systems (SuDS)</u>	<u>9</u>
<u>5.</u>	<u>Drainage Strategy</u>	<u>12</u>
<u>6.</u>	<u>Maintenance & Construction</u>	<u>14</u>
<u>7.</u>	<u>Conclusions and Recommendations</u>	<u>16</u>

APPENDICES

<u>Appendix A</u>	
<u>Appendix B</u>	
<u>Appendix C</u>	

1. INTRODUCTION

1.1. *General*

1.1.1. This report has been prepared on instruction received from ForViva DevCo Limited and relates to the new residential eleven storey building situated on Bowler Yard, Manchester.

1.1.2. The report outlines the initial drainage design philosophy in relation to the proposed development.

1.1.3. This report is prepared solely for the benefit of the Client. This report may not be assigned without prior written permission from Clancy Consulting.

1.1.4. This report is for Planning Application purposes only and does not constitute a construction-ready design.

1.2. *Report Structure*

1.2.1. The report has been structured to follow the general principles set out by Manchester City Council Local Flood Risk Management Strategy.

1.2.2. The drainage strategy will provide justification of the discharge method considering the following (in order of preference);

1. Discharge by Infiltration
2. Discharge to Watercourse
3. Discharge to Surface Water Sewer
4. Discharge to Combined Sewer

1.2.3. The drainage strategy will discuss proposed SUDs techniques and comply with the 'Non-Statutory Technical Standards for Sustainable Drainage Systems'

1.2.4. Sources of information:

- Manchester City Council Local Flood Risk Management Strategy.
- United Utilities Public Sewer Records
- Non-statutory technical standards for sustainable drainage systems.
- Architectural drawings provided by Carey Jones Chapman Tolcher
- Maps by Google and Streetmap
- Historical Maps by National Library of Scotland
- Lead local Flood Authority Critical Drainage Area Maps
- GHD Livgunn Limited on drawing 12502913-GHD-DR-C-5601 and 5602

2. LOCAL POLICY

LLFA SURFACE WATER MANAGEMENT GUIDANCE FOR PLANNING APPLICATIONS

Full details are found in the LLFA's surface water management guidance report and supporting information. In summary this indicates:

Consideration of the site area should be made together with EA flood maps to determine the flood zone and whether a Flood Risk Assessment is required.

Drainage Strategy should follow SUDS hierarchy – i.e. in preferential order – Use on Site*, Infiltration, Watercourse, Surface Water Sewer, Combined Sewer. Infiltration tests are required to demonstrate whether a soakaway is feasible. It should be noted that Utilities companies also apply this strictly and detailed consideration of the hierarchy will need to be demonstrated in supporting documentation.

Appropriate discharge rates should be calculated for the 30 and 100 year flood events for use in drainage design. In line with NPPF this should be attenuated to greenfield rates for greenfield sites/ site area and as close as possible to greenfield rates for brownfield areas (50% betterment on existing). Climate change should be considered appropriately.

A conceptual drainage layout should be prepared indicating runoff areas and calculations provided including attenuation. Interceptors/ filtration may also be deemed appropriate in accordance with SUDS hierarchy/ guidance.

Calculations should show no flooding during the 1 in 30 year storm events and flooding in the 1 in 100 year storm event (plus climate change) is held on the development and without being detrimental to property.

3. SITE CHARACTERISTICS

3.1. *Location*

3.1.1. The site is located as detailed as below:

OS X (Easting)	385607
OS Y (Northings)	398326
Nat Grid	SJ856983 / SJ8560798326
Nearest Post Code	M4 7AY
Lat (WGS84)	N53:28:53 (53.48145520380666)
Long (WGS84)	W2:13:06 (-2.218349897743377)

Table 1 - Site Characteristics (Streetmap)

3.2. *Site Description*



Figure 1 - Site Location (Google Maps)

3.2.1. The new proposed dwelling is located on Pollard Street (boundary highlighted in Figure 1) and represents approximately 0.088 hectares in area.

3.2.2. The current site is a derelict piece of land, areas of overgrown vegetation with a large area of hard standing.

3.2.3. The development is bounded along the Northern boundary by a above ground train line. Munday Street forms the South West boundary, and Pollard Street forms the South East boundary.

3.2.4. A basic topographical plan was provided by GHD Livgunn Limited. This indicated that the site was sloped, falling east to west from 52.38m AOD to 51.88m AOD.

3.2.5. A review of historic maps indicates that the current site was developed in 1956.

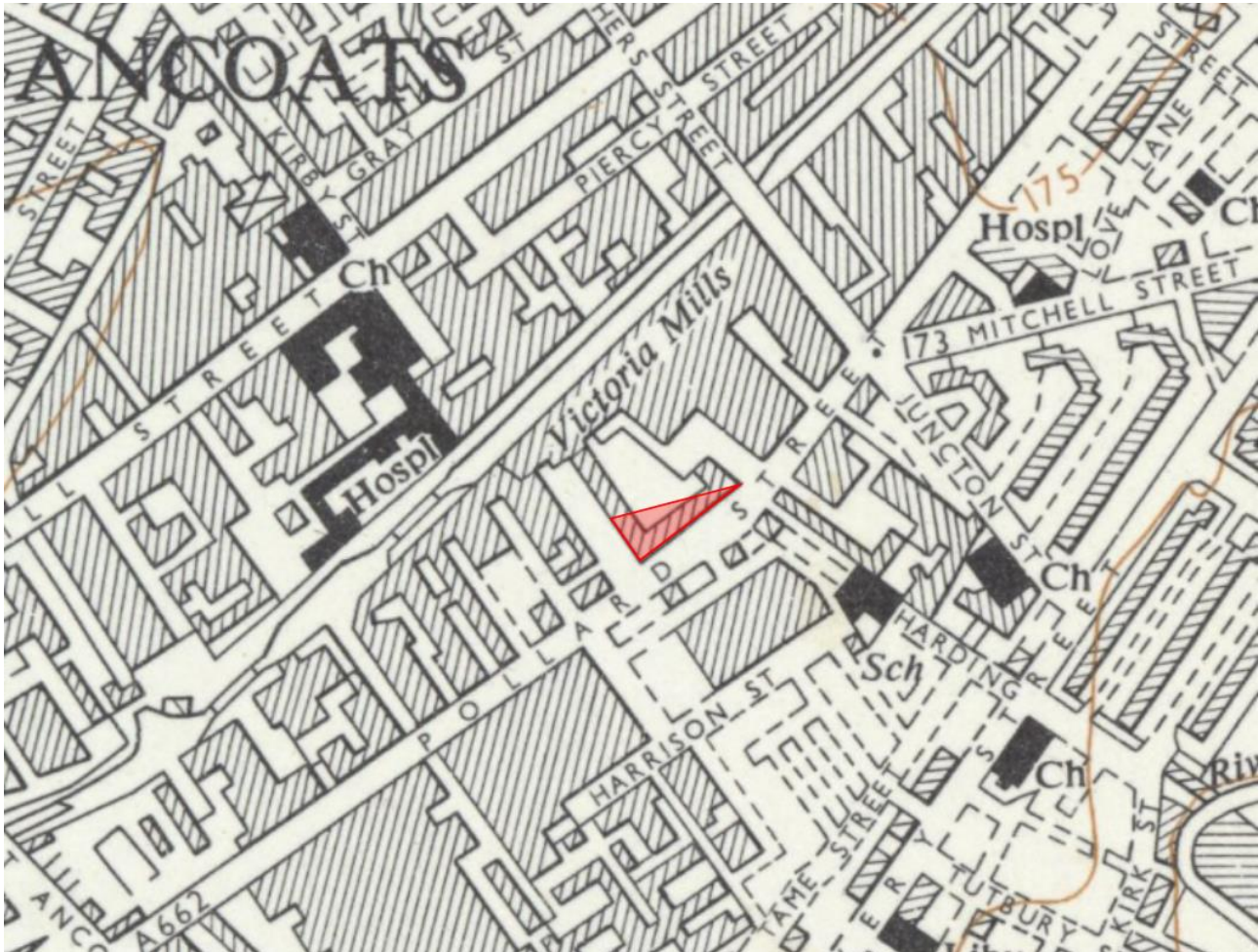


Figure 2 - Historic Map from 1956 (National Library of Scotland)

3.2.6. The development is approximately 90m from Ashton Canal. 305m from River Medlock.

3.2.7. Following review of Flood Maps, the development is within Flood Zone 1 and considered as low probability of flooding.

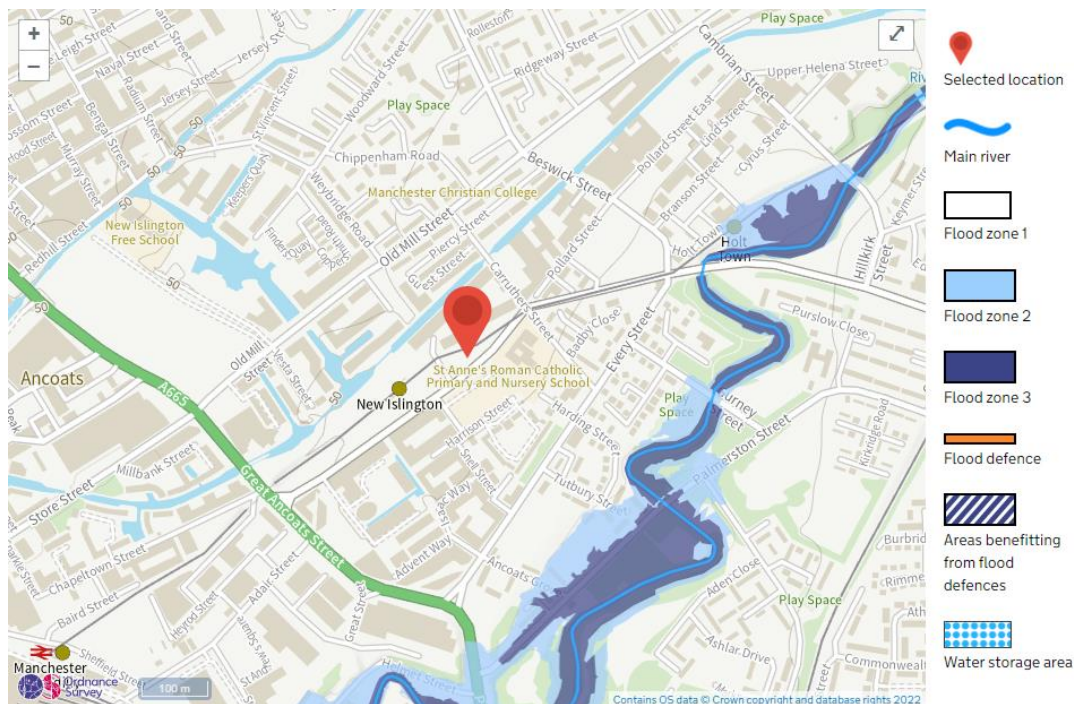


Figure 3 - Flood Risk Mapping (GOV.uk)

3.3. Development Proposals

3.3.1. The current site will host a 11-storey building to form 62 residential apartments with associated landscaping, access and parking.

3.3.2. A private drive will access ground floor parking area from Munday Street.

3.3.3. An area comparison pre and post development is shown below:

Site Region	Pre-Development (m2)	Post Development (m2)
Building	0	619
Hardstand/ Car Parking	881	262
Soft Landscaping/ Garden	0	0
Impermeable	881	881
Permeable	0	0

Table 2- Pre and Post Development Detailed Figures

3.4. Existing Drainage

3.4.1. Following review of existing UU record drawings, there is a combined water drain running north below Pollard Street.

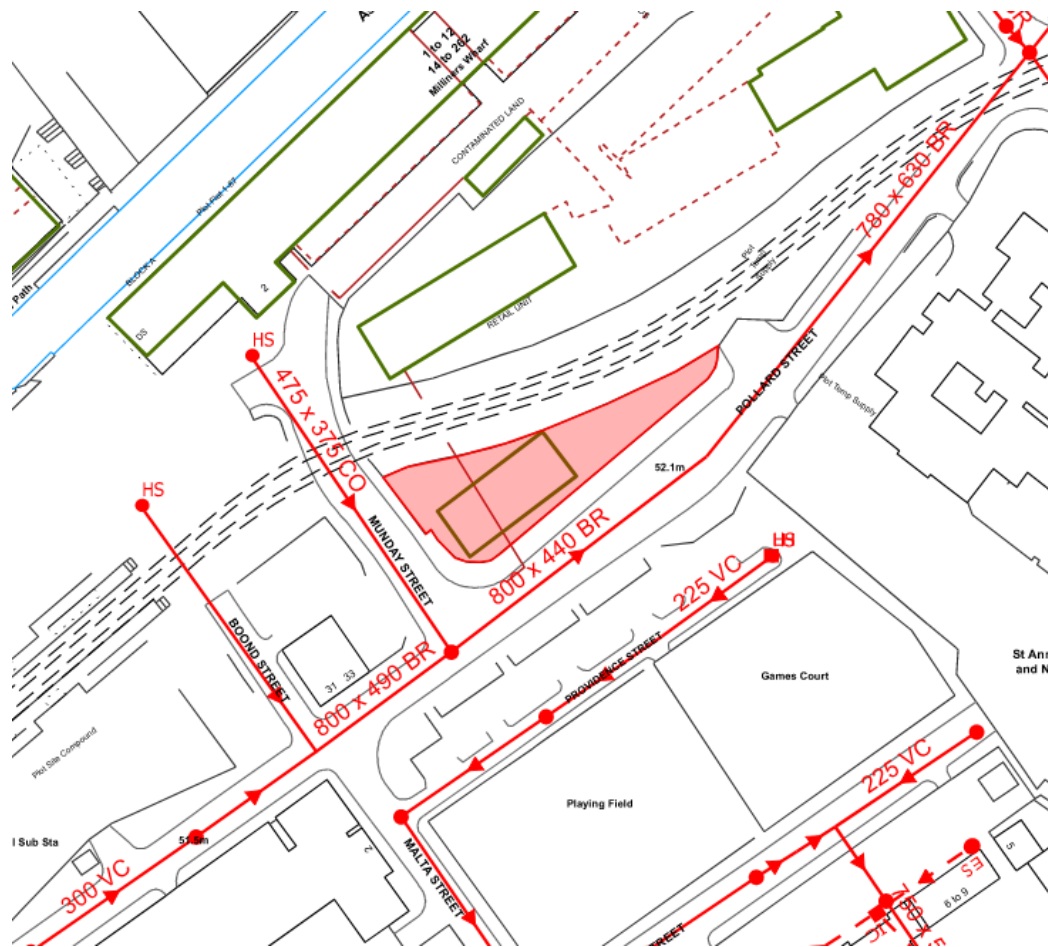


Figure 4 - Existing Infrastructure (United Utilities)

3.4.2. Details regarding the depths, sizes and fall of the public manholes or pipes identified on the above plan have been provided by GHD Livgunn Limited on drawing 12502913-GHD-DR-C-5601 Rev P02. The plans indicate the combined sewer below Munday Street has an invert level of 48.750m AOD at the point of proposed connection. This then backdrops into the main combined sewer run below Pollard Street which has an invert level of 47.100m AOD.

3.4.3. All of the assumed existing drainage will need to be investigated prior to connection – depth, gradients, flow rates etc.

4. SUSTAINABLE URBAN DRAINAGE SYSTEMS (SUDS)

Any new drainage for the development should be designed in accordance with the non-statutory technical guidance for the design of sustainable drainage systems.

4.1. *Surface Water Disposal Hierarchy*

4.1.1. The disposal of surface water should be considered in the following order of priority;

1. Discharge to be used on site.
2. Infiltration into the subsoil via soakaways or permeable paving.
3. Discharge to a water course or the sea.
4. Discharge to a surface water sewer.
5. Discharge to a combined sewer.

4.1.2. If it is not possible to use discharge on site or discharge to a soakaway, then surface water should be controlled with the use of Sustainable Drainage Systems (SuDS) and considered using the SuDS Hierarchy.

Most Sustainable	SUDS technique	Flood Reduction	Pollution Reduction	Landscape & Wildlife Benefit
	Living roofs	✓	✓	✓
	Basins and ponds - Constructed wetlands - Balancing ponds - Detention basins - Retention ponds	✓	✓	✓
	Filter strips and swales	✓	✓	✓
	Infiltration devices - soakaways - infiltration trenches and basins	✓	✓	✓
	Permeable surfaces and filter drains - gravelled areas - solid paving blocks - porous paviers	✓	✓	
	Tanked systems - over-sized pipes/tanks - storms cells	✓		
Least Sustainable				

Table 3 - SuDS Hierarchy (Environment Agency)

4.2. *Disposal Strategy*

4.2.1. Use on Site

Under the new Design and Construction Guidance document introduced at the end of May 2021, Use of Surface Water generated on site is now the preferred first option in the SUDS hierarchy.

This may well be a feasible option during detailed design as further guidance will be required from the Services Consultant as to how extraction is achievable (and cost effective) using greywater to flush toilets is.

The position of any greywater tanks for water extraction for irrigation need to be positioned to avoid a site covered with other services (electric. drainage, telecommunications and as proposed for use on this site – piping for ground sourced heating).

At this stage, and given the site size, layout and use, this would have to be used in conjunction with other options on the SUDS hierarchy as opposed to being the sole option and may only offer a small overall reduction into the existing infrastructure.

4.2.2. Infiltration

There is no potential room for a permeable attenuation tank to be located within the landscaped areas while still maintaining a minimum 5m away from foundations or the site boundary and avoiding tree root protection areas.

4.2.3. Discharge to a Water Course

The nearest watercourse/body of water is Ashton Canal however, accessing this would entail crossing third party land.

4.2.4. Discharge to a Surface Water Sewer

There is no evidence of surface water sewers adjacent to the development.

4.2.5. Combined Sewer

Discharging into the combined sewer at a controlled rate is currently the most feasible option to be considered. A combined sewer passes below Munday Street.

A CCTV drainage survey will also be required to establish if there are existing live connections up stream which may result in a localised diversion when a new connection is made.

4.3. SuDS Strategy

4.3.1. Living Roof

A significant area of the site receiving surface water is roof area. A sustainable solution to control run-off at its source is to provide green or brown roof areas. These roof areas retain part of the rainwater, slow down the speed of run-off and also help to reduce water pollution whilst providing a habitat for nature.

Any green or brown roof system would impose additional weight onto the roof structure which would need to be designed accordingly to accommodate the additional weight.

4.3.2. Ponds/Basins and Swales

There is no area within the development that would be suitable to accommodate a feature like this.

4.3.3. Infiltration/ Permeable Surfaces

All soakaways must be situated at least 5m away from the building footprint and boundary line as per building regulations. This makes soakaways an unfeasible option for this development. Site Investigations have been carried out and identify the ground to be clay which is no suitable for infiltration.

Areas of hard landscaping have the potential to be utilised as subbase reservoirs with either full or partial filtration options to consider subject to testing or use purely as attenuation.

4.3.4. Landscaped Areas

The most sustainable solution to control run-off at its source would be to utilise areas of landscaping (grass and planting). There is an opportunity to make the external areas around the buildings heavily landscaped with tree pits, areas of feature planting to assist with this option. This may need to be used in conjunction with a primary means of surface water discharge.

4.3.5. Tanked System

Typically, a tanked system would be considered as a means to provide additional attenuation storage to control rainfall up to 1 in 100 year change events with an allowance for climate change for existing sites undergoing complete redevelopment.

In this instance, an attenuation tank with a flow control downstream may be the primary SUDS option to be utilised.

4.3.6. Pollution

The development does not contain 50 spaces or an area for parking greater than 800m² therefore a petrol interceptor is not required.

5. DRAINAGE STRATEGY

5.1. *Surface Water Drainage*

- 5.1.1. In accordance with LLFA requirements, the development will be treated as a greenfield site as it has been derelict in excess of 12 months.
- 5.1.2. This has limited the flow to 5l/s and will be maintained using flow control systems such as a Hydro-Brake.
- 5.1.3. The peak runoff rate from the development to any drain, sewer or surface water body for the 1 in 2 year rainfall event and the 1 in 100 year rainfall event must be as close as reasonably practicable to the greenfield runoff rate from the development for the same rainfall event, but should never exceed the rate of discharge from the development prior to redevelopment for that event.
- 5.1.4. Site investigations have determined the geology of the soil to be clay with unfeasible infiltration rates.
- 5.1.5. Following preliminary assessment by calculation using initial layouts and assumed rainwater pipe locations, the development will require an approximate total of 25 cubic metres of storage, 20m³ of which is the attenuation tank with the remainder provided by the manholes and pipes. Storage is provided for storm events up to and including 1 in 100 year plus climate change.
- 5.1.6. This is currently a theoretical design based on the information we have been provided to date and will require confirmation of assumptions made (including invert level of the outfall of the existing sewer) – which will be undertaken during detailed design.
- 5.1.7. Outline proposals are shown on the Drainage Strategy drawing located in Appendix A.
- 5.1.8. Preliminary calculations have been included in the Appendix B.

5.2. *Development Foul Water Drainage*

- 5.2.1. Foul water will be collected in a separate system to surface water. This will be collected via pipes & inspection chambers.
- 5.2.2. All proposed below ground foul water drainage will comply with Building Regulations Part H:2010, BS EN 12056-2:2000 and BS EN 752:2008.
- 5.2.3. Based upon the above, the peak foul flow rate from site is estimated to be 16.6l/s.
- 5.2.4. The proposed foul sewer system has been designed to handle this flow rate.
- 5.2.5. United Utilities approval for the flow rate entering the public sewer will be required to proceed with detailed design.

SUMMARY	Discharge Unit	Totals	Total DU
<i>Shower</i>	0.6	42	25.2
<i>Bath</i>	1.3	62	80.6
<i>Washbasin</i>	0.6	104	62.4
<i>WCs (4l-9l cistern)</i>	2.5	104	260
<i>Kitchen Sink</i>	1.3	62	80.6
<i>Dishwasher</i>	0.8	62	49.6
<i>Floor Drain</i>	2	1	2
			560.4
<i>Peak Flow Discharge</i>	16.6/s		

Table 4 - Foul Flow Discharge Rate Estimation

5.3. Flood Risk within the Development

- 5.3.1. As per Environment Agency Flood Maps, the development is currently in Flood Zone One with a low probability of flooding.
- 5.3.2. The drainage system must be designed so that, unless an area is designated to hold and/or convey water as part of the design, flooding does not occur on any part of the site for a 1 in 30 year rainfall event.
- 5.3.3. The drainage system must be designed so that, unless an area is designated to hold and/or convey water as part of the design, flooding does not occur during a 1 in 100 year rainfall event in any part of: a building (including a basement); or in any utility plant susceptible to water (e.g. pumping station or electricity substation) within the development.
- 5.3.4. The design of the site must ensure that, so far as is reasonably practicable, flows resulting from rainfall in excess of a 1 in 100-year rainfall event are managed in exceedance routes that minimise the risks to people and property.
- 5.3.5. Initial levels have been designed to be sympathetic to the existing levels with no vast areas of landscaping resulting in significant or abrupt level changes.
- 5.3.6. Levels will be designed such that in the event of a more extreme rainfall event water will discharge away from buildings.

6. **MAINTENANCE & CONSTRUCTION**

6.1. ***Maintenance Considerations***

- 6.1.1. This section is intended to give an overview of the operation and maintenance for the drainage features included with the drainage strategy and in relation to typical details.
- 6.1.2. Where proprietary products are specified, the manufacturer's instructions and recommendations should be followed in priority to this document unless specifically noted otherwise due to project constraints.
- 6.1.3. The surface water network has been designed to accommodate the 1 in 100-year storm rainfall event plus an allowance for climate change particular to the requirements of the development.
- 6.1.4. As the flows are generally being attenuated on site, there will be a period after storm events where the network is still partially or fully surcharged and is draining down.
- 6.1.5. Where this surcharging is still present after 48hrs appropriate action should be taken.
- 6.1.6. 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.
- 6.1.7. No large shrubs should be planted over any geocellular tanks within 3m in all directions and 6m from small/medium specimen tree planting. Larger trees should not be planted within 20m of the tanks.
- 6.1.8. It is advisable that above ground signage is installed detailing size and depth of any below ground structures to make any future works manageable.
- 6.1.9. It is assumed that the maintenance of the drainage network will be the responsibility of an on-site facilities management team.
- 6.1.10. A copy of the final construction drainage layout should be provided in the final Operations and Maintenance Manual.
- 6.1.11. 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.
- 6.1.12. Significant sediment deposition is likely in areas used for storage, so a post clean-up operation may be required including the removal of litter, vegetation, sewerage debris and larger objects.
- 6.1.13. Long-term management practices include monthly sweeping of external paved areas. The sweeping program will remove sand and contaminants directly from paved surfaces before they become mobilised during storm events and transported to the drainage system.
- 6.1.14. During the winter months, drainage features such as gullies and channels should be cleared of ice, snow, debris or litter.

6.1.15. Sediment/material removal should be undertaken in consultation with the environmental regulator to confirm appropriate protocols; especially where run-off is taken from potentially contaminated areas such as the filter drains and the upstream/downstream chambers.

6.1.16. Pumping should only be used to facilitate drainage for those parts of the site where it is not reasonably practicable to drain water by gravity.

6.2. Construction

6.2.1. Components must be designed to ensure structural integrity of the drainage system and any adjacent structures or infrastructure under anticipated loading conditions over the design life of the development taking into account the requirement for reasonable levels of maintenance.

6.2.2. Damage to the drainage system resulting from associated construction activities must be minimised and must be rectified before the drainage system is considered to be completed.

6.2.3. The materials, including products, components, fittings or naturally occurring materials, which are specified by the designer, must be of a suitable nature and quality for their intended use.

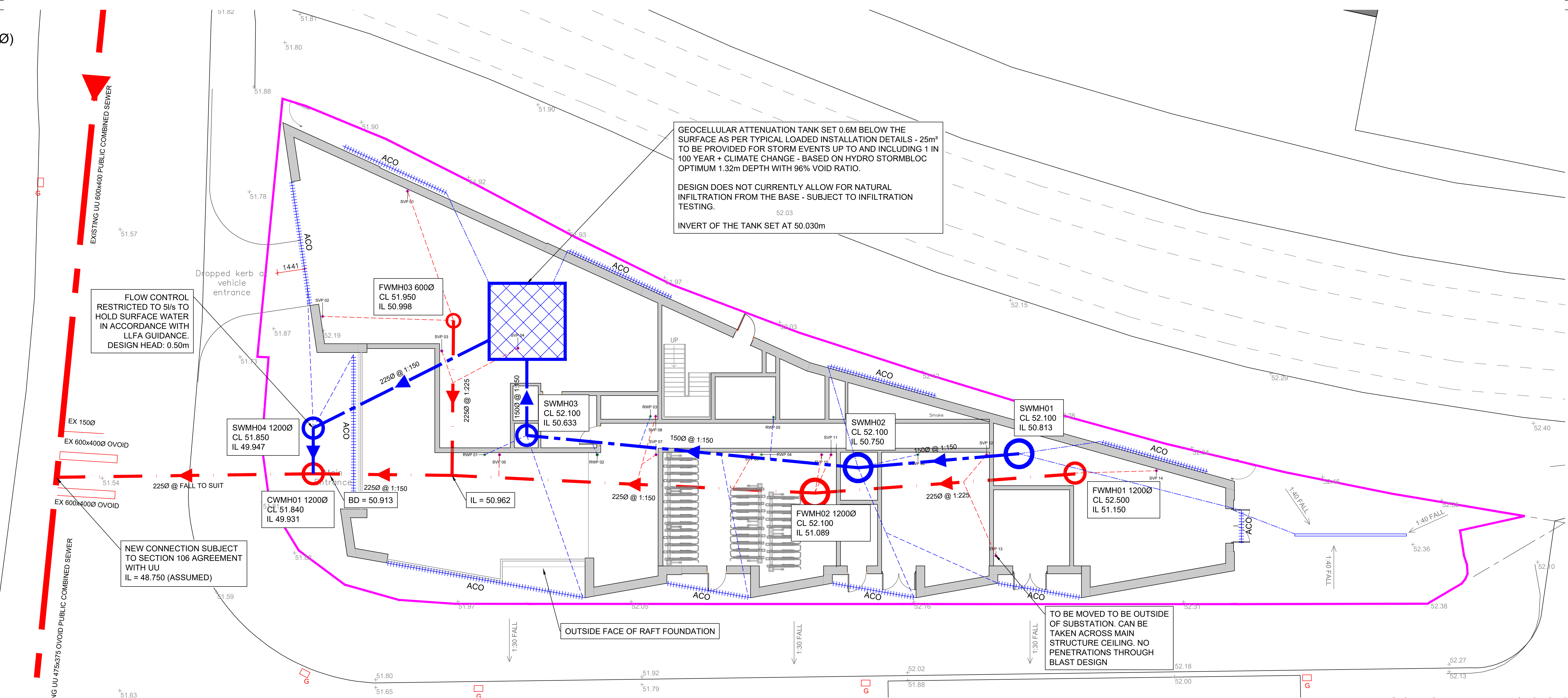
6.2.4. The detailed design of the system and product selection for the storage and pipe solution will be made at the detailed design stage when all the site constraints can be considered. There are numerous products available for storage of water below ground and care will be needed to ensure that the right product is chosen for the final loading conditions.

7. **CONCLUSIONS AND RECOMMENDATIONS**

- 7.1. This report gives details of the Drainage Strategy which has been undertaken in relation to the proposed development on Pollard, Manchester.
- 7.2. The development will be situated on the derelict site to provide an eleven storey building with 62 one and two bedroom apartments.
- 7.3. Separate foul and surface water systems will be provided on the development, only connecting at the final manhole on the development before discharge to the public combined sewer.
- 7.4. The development has been considered to be greenfield as it has the site has been derelict for in excess of 12 months. Therefore, a 5l/s discharge rate for the surface water is agreed as in accordance with the LLFA requirements.
- 7.5. The proposed development provides an opportunity to reduce local area flood risk by controlling surface water on site. Following the SuDS and water disposal hierarchy it has been determined the most viable solution will be to control surface water using flow controls and stored on site before being discharged to the public combined sewer.
- 7.6. The proposed system will be designed to control surface water run-off for all storms up to and including the 100 year plus climate change event. Water will be stored on site below ground before being discharged at the agreed flow rate. Final run-off rates will be dependent on approval by United Utilities
- 7.7. A total of 25 cubic metres of storage is required for the for the entire development provided through the use of an attenuation tank (20m³) the pipes and manhole chambers providing the remainder.
- 7.8. New connections will be required from the development into the existing combined sewer with preliminary details shown on the Drainage Strategy drawing. These may require temporary sewer diversions and road closures to form the connection safely.
- 7.9. A Wastewater Pre-Development Enquiry has been submitted to United Utilities for comment on the proposed drainage strategy presented within this report. At the time of writing, no response has been received.
- 7.10. The proposed system will be designed to meet the Sustainable Drainage Systems Non-statutory technical standards for sustainable drainage systems, March 2015.

APPENDIX A***Drainage Strategy Drawing***

50)



KEY	
ACO	LINEAR DRAINAGE CHANNEL
G	GULLY
RWP	RAINWATER PIPE
SVP	SOIL VENT PIPE
F(X)	MANHOLE (FOUL)
S(X)	MANHOLE (SURFACE WATER)
---	NEW FOUL WATER
---	NEW SURFACE WATER
---	Ex COMBINED WATER DRAIN
---	Ex FOUL WATER DRAIN
---	UNDERSLUNG FW RUNS
---	UNDERSLUNG SW RUNS
---	BOUNDARY

SW DISPOSAL HIERARCHY STATEMENT

- USE ON SITE** - SUBJECT TO DETAILED DESIGN AND INPUT FROM M&E CONSULTANTS. POSITIONING OF GREYWATER TANKS MAY PROVE DIFFICULT. MAY PROVE TO BE ONLY USED IN CONJUNCTION WITH OTHER OPTIONS.
- INFILTRATION** - LIMITATIONS OF LOCATION DUE TO CLEARANCE REQUIREMENTS FROM FOUNDATIONS AND BOUNDARY LINES. INFILTRATION TESTS TO BE CARRIED OUT TO DETERMINE FEASIBILITY.
- DISCHARGE TO WATERCOURSE** - DISTANCE TO NEAREST WATERCOURSE WOULD ENTAIL CROSSING THIRD PARTY LAND.
- DISCHARGE TO SURFACE WATER SEWERS** - NO SURFACE WATER SEWER WITHIN PROXIMITY OF THE DEVELOPMENT.
- DISCHARGE TO COMBINED SEWER** - THIS IS CURRENTLY THE FEASIBLE OPTION WITH A COMBINED SEWER BELOW MUNDAY STREET.

NOTES:

- THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL OTHER ENGINEER'S AND ARCHITECT'S DRAWINGS, DETAILS AND SPECIFICATIONS.
- OWNERSHIP OF PIPE NETWORKS ARE TO BE CONFIRMED PRIOR TO ANY DIVERSION WORKS.
- THIS DRAWING INDICATES DRAINAGE PRINCIPLES AND STRATEGY ONLY AND FURTHER DETAIL DESIGN IS REQUIRED FOLLOWING CONFIRMATION OF BUILDING SET OUT, PROPOSED LEVELS, PROPOSED INTERNAL POP UPS AND FURTHER DISCUSSIONS WITH ALL RELEVANT PARTIES REGARDING ALLOWABLE DISCHARGE.
- THE DEVELOPMENT HAS BEEN CONSIDERED AS GREENFIELD IN ACCORDANCE WITH LLFA GUIDANCE.
- DURING THE DETAILED DESIGN PHASE, ALL STORM EVENT DURATIONS UP TO AND INCLUDING 6 HOURS WILL BE MODELED TO DETERMINE THE FINAL STORAGE REQUIREMENT FOR THE DEVELOPMENT.
- ALL PROPOSED RESTRICTED FLOW RATES AND CONNECTION POINTS WILL BE SUBJECT TO UNITED UTILITIES AGREEMENT AND APPROVAL.
- FOUL WATER FLOW RATES ARE ESTIMATED IN ACCORDANCE WITH BS EN 752:2008 AND DESIGNED FOR PEAK FLOW RATES.
- UNITED UTILITIES CONFIRMATION OF APPROVAL FOR THE FLOW RATE ENTERING THE PUBLIC SEWER WILL BE REQUIRED TO PROCEED WITH THE DETAILED DESIGN.
- ALL EXISTING ON-SITE DRAINAGE (ABANDONED OR LIVE) TO BE IDENTIFIED AND TERMINATED AT SITE BOUNDARY UNO.

SURFACE WATER STRATEGY:

THE DEVELOPMENT HAS BEEN CLASSIFIED BY MANCHESTER CITY COUNCIL AS GREENFIELD AND THE MAXIMUM SURFACE WATER DISCHARGE FROM THE SITE IS TO BE 5l/s. DISCHARGE IS TO CONNECT TO THE FOUL AT A DEMARCATION CHAMBER LOCATED WITHIN THE SITE BOUNDARY BEFORE DISCHARGING INTO THE PUBLIC SEWER BELOW MUNDAY STREET.

BASED ON AREAS SUPPORTED, MAXIMUM TOTAL STORAGE VOLUME OF 25m³ IS REQUIRED FOR THE SYSTEM FOR ALL STORM EVENTS UP TO AND INCLUDING THE 1:100 YEAR STORM + 30% CLIMATE CHANGE TO BE CONTAINED BELOW GROUND. 20m³ OF THIS IS PROVIDED BY THE ATTENUATION TANK, THE REMAINDER PROVIDED BY THE NETWORK OF MANHOLES AND PIPES.

THIS IS A THEORETICAL PRELIMINARY DESIGN AS ASSUMPTIONS MADE MUST BE CONFIRMED (I.E. LEVELS, AREAS SUPPORTED). CONSTRUCTION STAGE DESIGN IS SUBJECT TO DETAILED DESIGN. DO NOT CONSTRUCT FROM THIS DRAWING.

FOUL WATER STRATEGY:

THIS WILL BE COLLECTED ON SITE THROUGH A SEPERATE FOUL DRAINAGE SYSTEM WHICH COMBINES WITH THE SURFACE WATER AT THE BOUNDARY OF THE SITE - DOWNSTREAM OF THE FLOW CONTROL CHAMBERS. THE ESTIMATED PEAK FOUL FLOW IS SUBJECT TO CONFIRMATION OF NUMBERS AND LAYOUTS OF ROOMS.

THE INDICATIVE DRAINAGE ARRANGEMENTS SHOWN ON EACH PLOT IS SUBJECT TO COORDINATION WITH THE ARCHITECT AND LANDSCAPE ARCHITECT FOR LEVELS, M&E CONSULTANT FOR POP-UPS.

THIS DRAWING IS FOR INFORMATION ONLY AND IS SUBJECT TO FURTHER DISCUSSIONS WITH THE RELEVANT AUTHORITIES AND SUBSEQUENT FURTHER DETAILED DESIGN - DO NOT CONSTRUCT FROM THIS DRAWING.

IT IS PROPOSED TO FORM A CONNECTION TO THE LIVE SEWER OUTSIDE THE DEVELOPMENT AS SHOWN SUBJECT TO FURTHER CCTV INVESTIGATIONS.

SHOULD THE RESULTS OF THIS CONCLUDE THAT THE CONNECTION IS NOT VIABLE, A NEW CONNECTION AND MANHOLE WILL BE REQUIRED RESULTING IN POTENTIAL ROAD CLOSURES.

DETAILS SHOWN ARE SUBJECT TO CONFIRMATION OF LAYOUTS, ABOVE GROUND DRAINAGE, CONFIRMATION OF EXISTING DRAINAGE INFRASTRUCTURE DETAILS AND AGREEMENTS FROM ALL REGULATORY BODIES.

THE STRATEGY SHOWN IS SUBJECT TO CONFIRMATION OF THE EXISTING DRAINAGE INFRASTRUCTURE (LEVELS, FALLS, PIPE DIAMETERS, ETC).

THE STRATEGY ASSUMES DUE TO LEVELS, PUMPING WILL NOT BE REQUIRED.

PUMPING WOULD REQUIRE AN ALARM SYSTEM, A STANDBY PUMP AND 24 HOUR STORAGE AS MINIMUM REQUIREMENTS.

DO NOT PRICE OR CONSTRUCT FROM THIS DRAWING

01	11.11.22	ISSUED FOR INFORMATION	OB	MD	BRH
Rev	Date	Description	By	Check	App.

COPYRIGHT: THE COPYRIGHT OF THIS DRAWING IS VESTED IN CLANCY CONSULTING. IT SHALL NOT BE USED WITHOUT PERMISSION BY ANYONE FOR ANY PURPOSE. DO NOT SCALE THIS DRAWING ELECTRONICALLY OR MANUALLY. WORK TO FIGURED DIMENSIONS ONLY. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS STATED OTHERWISE. DO NOT TURN ON LAYERS THAT HAVE BEEN TURNED OFF. DO NOT TURN LAYERS THAT HAVE BEEN FROZEN. DRAWING MUST BE PRINTED IN BLACK AND WHITE ONLY.

Client	FORVIVA DEVCO LIMITED				
Project	BOWLERS YARD LIVERPOOL				
Office	LIVERPOOL				
Discipline	CIVIL				
Title	DRAINAGE STRATEGY				
Scale @ A1	1-100	Status	INFORMATION		



www.clancy.co.uk

Job Number	Originator	Building/Zone	Level
4/8578	CCL	ALL	DRN
Type	Discipline	Drawing No.	Revision
GA	C	050	01

APPENDIX B***Initial Drainage Model Calculations***

Design Settings

Rainfall Methodology	FSR	Maximum Time of Concentration (mins)	30.00
Return Period (years)	30	Maximum Rainfall (mm/hr)	50.0
Additional Flow (%)	0	Minimum Velocity (m/s)	1.00
FSR Region	England and Wales	Connection Type	Level Soffits
M5-60 (mm)	19.000	Minimum Backdrop Height (m)	0.200
Ratio-R	0.400	Preferred Cover Depth (m)	1.200
CV	0.750	Include Intermediate Ground	✓
Time of Entry (mins)	5.00	Enforce best practice design rules	✓

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
2	0.018	5.00	52.100	1200	52.181	73.009	1.350
3	0.028	5.00	52.100	1200	34.701	74.516	1.467
4	0.023	5.00	51.850	1200	23.511	74.904	1.903
5			51.840	1200	23.477	72.491	1.909
6			51.540	1200	10.045	72.322	1.699
tank	0.015	5.00	51.950		34.506	80.850	1.920
1	0.018	5.00	52.100	1200	61.623	73.643	1.287

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
1.001	2	3	17.545	0.600	50.750	50.633	0.117	150.0	150	5.55	50.0
1.002	3	tank	6.337	0.600	50.633	50.591	0.042	150.0	150	5.68	50.0
1.004	4	5	2.413	0.600	49.947	49.931	0.016	150.0	225	5.91	50.0
1.005	5	6	13.433	0.600	49.931	49.841	0.090	150.0	225	6.12	50.0
1.003	tank	4	12.500	0.600	50.030	49.947	0.083	150.0	225	5.88	50.0
1.000	1	2	9.463	0.600	50.813	50.750	0.063	150.0	150	5.19	50.0

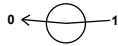
Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
1.001	0.818	14.5	4.9	1.200	1.317	0.036	0.0	60	0.739
1.002	0.818	14.5	8.7	1.317	1.209	0.064	0.0	83	0.853
1.004	1.065	42.3	13.8	1.678	1.684	0.102	0.0	88	0.955
1.005	1.065	42.3	13.8	1.684	1.474	0.102	0.0	88	0.955
1.003	1.065	42.3	10.7	1.695	1.678	0.079	0.0	77	0.891
1.000	0.818	14.5	2.4	1.137	1.200	0.018	0.0	42	0.611

Pipeline Schedule

Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
1.001	17.545	150.0	150	Circular	52.100	50.750	1.200	52.100	50.633	1.317
1.002	6.337	150.0	150	Circular	52.100	50.633	1.317	51.950	50.591	1.209
1.004	2.413	150.0	225	Circular	51.850	49.947	1.678	51.840	49.931	1.684
1.005	13.433	150.0	225	Circular	51.840	49.931	1.684	51.540	49.841	1.474
1.003	12.500	150.0	225	Circular	51.950	50.030	1.695	51.850	49.947	1.678
1.000	9.463	150.0	150	Circular	52.100	50.813	1.137	52.100	50.750	1.200

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
1.001	2	1200	Manhole	Adoptable	3	1200	Manhole	Adoptable
1.002	3	1200	Manhole	Adoptable	tank		Junction	
1.004	4	1200	Manhole	Adoptable	5	1200	Manhole	Adoptable
1.005	5	1200	Manhole	Adoptable	6	1200	Manhole	Adoptable
1.003	tank		Junction		4	1200	Manhole	Adoptable
1.000	1	1200	Manhole	Adoptable	2	1200	Manhole	Adoptable

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
2	52.181	73.009	52.100	1.350	1200		1.000	50.750	150
3	34.701	74.516	52.100	1.467	1200		1.001	50.633	150
4	23.511	74.904	51.850	1.903	1200		1.003	49.947	225
5	23.477	72.491	51.840	1.909	1200		1.004	49.931	225
6	10.045	72.322	51.540	1.699	1200		1.005	49.841	225
tank	34.506	80.850	51.950	1.920			1.002	50.591	150
1	61.623	73.643	52.100	1.287	1200		1.003	50.030	225
							1.000	50.813	150

Simulation Settings

Rainfall Methodology	FSR	Analysis Speed	Normal
FSR Region	England and Wales	Skip Steady State	x
M5-60 (mm)	19.000	Drain Down Time (mins)	240
Ratio-R	0.400	Additional Storage (m ³ /ha)	20.0
Summer CV	0.750	Check Discharge Rate(s)	x
Winter CV	0.840	Check Discharge Volume	x

Storm Durations

15 | 30 | 60 | 120 | 180 | 240 | 360 | 480 | 600 | 720 | 960 | 1440

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
30	0	0	0
100	30	0	0

Node 4 Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	✓	Sump Available	✓
Invert Level (m)	49.947	Product Number	CTL-SHE-0112-5000-0500-5000
Design Depth (m)	0.500	Min Outlet Diameter (m)	0.150
Design Flow (l/s)	5.0	Min Node Diameter (mm)	1200

Node tank Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	50.030
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.96	Time to half empty (mins)	42

Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)
0.000	16.0	0.0	1.320	16.0	0.0	1.321	0.0	0.0

Results for 30 year Critical Storm Duration. Lowest mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	2	11	50.879	0.129	11.7	0.1808	0.0000	OK
15 minute winter	3	11	50.814	0.181	19.6	0.2736	0.0000	SURCHARGED
30 minute winter	4	27	50.719	0.772	7.6	1.0596	0.0000	SURCHARGED
30 minute winter	5	27	49.990	0.059	6.0	0.0666	0.0000	OK
30 minute winter	6	27	49.898	0.057	6.0	0.0000	0.0000	OK
30 minute winter	tank	27	50.720	0.690	19.8	10.7079	0.0000	SURCHARGED
15 minute winter	1	11	50.887	0.074	5.9	0.1041	0.0000	OK
Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	2	1.001	3	11.1	0.656	0.767	0.2961	
15 minute winter	3	1.002	tank	19.5	1.115	1.349	0.1065	
30 minute winter	4	Hydro-Brake®	5	6.0				
30 minute winter	5	1.005	6	6.0	0.742	0.141	0.1078	20.1
30 minute winter	tank	1.003	4	5.3	0.248	0.126	0.4971	
15 minute winter	1	1.000	2	5.8	0.566	0.402	0.1172	

Results for 100 year +30% CC Critical Storm Duration. Lowest mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
60 minute winter	2	47	51.294	0.544	10.2	0.7607	0.0000	SURCHARGED
60 minute winter	3	47	51.289	0.656	17.7	0.9925	0.0000	SURCHARGED
60 minute winter	4	47	51.281	1.334	8.3	1.8310	0.0000	SURCHARGED
60 minute winter	5	48	49.999	0.068	7.8	0.0766	0.0000	OK
60 minute winter	6	48	49.906	0.065	7.8	0.0000	0.0000	OK
60 minute winter	tank	47	51.283	1.253	21.6	19.4376	0.0000	SURCHARGED
60 minute winter	1	47	51.295	0.482	5.1	0.6798	0.0000	SURCHARGED

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
60 minute winter	2	1.001	3	9.9	0.645	0.682	0.3089	
60 minute winter	3	1.002	tank	17.4	1.019	1.205	0.1116	
60 minute winter	4	Hydro-Brake®	5	7.8				
60 minute winter	5	1.005	6	7.8	0.797	0.183	0.1307	42.7
60 minute winter	tank	1.003	4	6.9	0.246	0.162	0.4971	
60 minute winter	1	1.000	2	5.1	0.554	0.353	0.1666	

APPENDIX C***United Utilities Service Record Drawing***

Extract from Map of Public Sewers

The position of underground apparatus shown on this plan is approximate only and is given in accordance with the best information currently available.

The actual positions may be different from those shown on the plan and private pipes, sewers or drains may not be recorded.

United Utilities will not accept any liability for any damage caused by the actual positions being different from those shown.

LEGEND

Foul	Surface	Combined	Overflow	
				MainSewer, Public
				MainSewer, Private
				MainSewer, S104
				Rising Main, Public
				Rising Main, Private
				Rising Main, S104
				Highway Drain, Private

ABANDONED SEWER

	MainSewer
	Rising Main
	Highway Drain

United Utilities 2001
The plan is based upon the Ordnance Survey Map with the sanction of the Controller of H.M. Stationery Office. Crown and United Utilities copyrights are reserved. Unauthorised reproduction will infringe these copyrights.

30 Pollard Street
Manchester

Printed By : Lee Edwards Date: 20/01/2014

DO NOT SCALE

Approximate Scale: 1:1250

