



Welcomb Street, Manchester Drainage Strategy

For *NSJV Ltd*

Date 2 May 2024

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Issued by	Hydrock Consultants Limited St Baldred's Hall 239 Ashley road Hale Cheshire WA15 9NE United Kingdom	T +44 (0)161 2330746 E manchester@hydrock.com hydrock.com
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Prepared by	Sophie Jones, Civil Engineer	
Checked by	Chloe Fell, Principal Engineer	
Approved by	Neil Byrne, Technical Director	

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P04	S2	02/05/24	Proposal description updated

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Executive Summary

This drainage strategy is to support the full application for the erection of four new industrial buildings, with the demolition of existing buildings, to create employment floor space within Use Classes E(g)(ii)(iii), B2 and B8 across the site and ancillary office space, with associated service yards, car parking including electric vehicle charging points, amended site access, refuse storage facilities, substations, boundary treatments, landscaping and associated works and infrastructure.

The surface water drainage hierarchy has been considered, and the preferred drainage solution is for disposal of surface water to the United Utilities existing combined public sewer via below ground gravity networks, where flows will discharge to attenuation tanks before entering the combined public sewer at a restricted flow rate of 45.6l/s, as agreed with United Utilities. The total site area is approximately 1.8 hectares, with 1.5 hectares of developed area.

The use of Sustainable Drainage Systems (SuDS) has been considered. Pollution prevention and site control methods will be utilised prior to outfall.

Pollution treatment measures will be provided in the form of Class 1 oil separators at car parks and SuDS structures (i.e. attenuation tanks, etc). Silt traps on drainage elements will be provided which will filter and trap silts and debris and mitigate against the risk of pollution entering the sewer network. All separators will be alarmed and remotely monitored at all times to ensure reliability.

The drainage network will be regularly maintained by a nominated management company on behalf of the client/occupier.

Foul flows will outfall at an unrestricted rate to the United Utilities existing combined public sewer which runs through the development flowing from east to west.

1. Introduction

1.1 Development Context

- 1.1.1 This report has been prepared by Hydrock Consultants Limited (Hydrock) on behalf of Network Space to support the planning application to be submitted to Manchester City Council for a proposed 4-unit industrial development with associated offices, service yards, car parking and access roads (see Appendix A).
- 1.1.2 The site is currently 'brownfield', whereby numerous buildings that were previously occupied by multiple businesses and Manchester School of Building are located. The existing brownfield development consists of 7 buildings and impermeable areas covering an approximate area of 1.59 Ha.
- 1.1.3 This report should be read in conjunction with the Ground Investigation - Phase 2 Geo-Environmental and Geotechnical Site Investigation Report (JER9536).
- 1.1.4 The surface water drainage strategy has been produced in accordance with the Non-Statutory Technical Standards for Sustainable Drainage Systems (March 2015), and Building Regulations Approved Document H: drainage and waste disposal requirements.

2. Development Description and Location

2.1 Site Location

2.1.1 This site is referenced in Table 1, and a location plan is provided in Figure 1.

Site Referencing Information	
Site Name	Welcomb Street, Manchester
Site Address & Location	Welcomb Street, Openshaw, Manchester, M11 2NJ
Council Area	Manchester City Council
Approximate Grid Reference	387920E, 397258N
Site Area	The total site area is 1.8Ha, of which 1.5ha will be developed area.
Boundaries & Surrounding Land	The site is located within the City Works Business Park, south of Welcomb Street, bound by industrial estate to the north, east and west. To the south it is bound by an Asphalt Supplier Plant.
Existing Land Use and Access	The site is currently brownfield, consisting of 7 buildings and an impermeable area covering approximately 1.59Ha.
Elevation and Topography	A topographical survey has been undertaken and indicates that the site levels fall from a high point of 60.394m at the western corner, to a low point of 59.465m in the centre of the site. As this site is an existing development, there are no steep falls or gradients across the site. See Appendix B for the full topographical survey.
Development Proposals	Erection of four new industrial buildings, with the demolition of existing buildings, to create employment floor space within Use Classes E(g)(ii)(iii), B2 and B8 across the site and ancillary office space, with associated service yards, car parking including electric vehicle charging points, amended site access, refuse storage facilities, substations, boundary treatments, landscaping, and associated works and infrastructure
Vehicular access	The main vehicular access to the site will be from Welcomb Street to the north of site.

Table 1: Site referencing information



Figure 1: Site location

3. Drainage Strategy

3.1 Existing Site Drainage

- 3.1.1 United Utilities sewer records indicate that an existing public combined sewer runs through the development flowing from east to west. The United Utilities sewer record is included within Appendix C.
- 3.1.2 A CCTV survey has been undertaken which indicates the existing private drainage connects into the United Utilities combined public sewer within the site. The site covers a total area of approximately 1.59Ha, with approximately 0.861Ha of this area proven to have a positive drainage connection through CCTV Survey to the existing combined sewer which passes through the centre of the development. The CCTV Survey Report is included within Appendix D.
- 3.1.3 The recorded level information of the sewers within Welcomb Street suggest that a gravity connection from the proposed development would be likely. The topographical survey (Appendix B) indicates numerous chambers around the existing site indicating the existing drainage. It is proposed to utilise part of the existing drainage that has the required depths for a gravity connection.

3.2 Existing Discharge Rates

- 3.2.1 In accordance with Non-Statutory Technical Standards for Sustainable Drainage Systems and Staffordshire County Council SuDS Handbook;

For developments which were previously developed, the peak runoff rate from the development to any drain, sewer or surface water body for the 1 in 1 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.

- 3.2.2 A hydraulic model of the existing drainage has been constructed to determine the existing site runoff based upon an existing hard landscaping catchment area of 0.861 Hectares, which has been proven to discharge into the 900mm United Utilities combined sewer through CCTV survey. MicroDrainage calculations of the existing drainage can be found in Appendix E.

Storm Event (Years)	Discharge Rate (l/s)
1	78.7
2	91.3
30	126.4
100	139.4

Table 2: MicroDrainage Existing Run-off Rates

The existing drainage and the associated catchment areas are indicated within the Existing drainage Layout found within Appendix C.

3.3 Proposed Site Discharge

- 3.3.1 A Pre-Development Enquiry has been submitted to United Utilities to agree proposed flow rates for the proposed surface water run-off. It has been stated by United Utilities that the post development pass forward flow rate does not exceed the 2 year event with betterment applied. Understanding that the Manchester area requires betterment on existing rates of 50%, the rate is not to exceed 45.6l/s.
- 3.3.2 Email correspondence with United Utilities confirming the agreed flow rates can be found within Appendix F.
- 3.3.3 It is therefore proposed that surface water run-off is restricted to a flow of 45.6l/s for a 1 in 1 year, a 30 year, and a 100 year +40% climate change event.

3.4 Drainage Discharge Hierarchy

3.4.1 In accordance with C753 SuDS manual, surface water should be managed following below discharge hierarchy:

- (1) Infiltration to the maximum extent that is practical;
- (2) Discharge to surface water body;
- (3) Discharge to surface water sewer;
- (4) Attenuated discharge to a combined sewer.

3.4.2 *Discharge via Infiltration*

Falling head test have been undertaken in three locations across the site. Only WSo2 indicated a rate of infiltration of 4.11×10^{-6} . This is located within the service yard between unit 3 and 4 where the existing combined sewer is present. Due to the public sewer easement and the requirement for infiltration structures to be located 5m away from buildings, there is insufficient space for infiltration to be the sole method of surface water discharge. Results from falling head test can be found in the ground investigation report included within the planning submission, 'JER9536 - Phase 2 Geo-Environmental and Geotechnical Site Investigation Report'. Infiltration is therefore not considered feasible.

3.4.3 *Discharge to a surface water body*

The nearest existing watercourse to the development is Clayton Brook, located approximately 421m to the west of the development. An existing culverted watercourse is present 330m to the west which discharges into Clayton Brook. Due to the proximity to the nearest watercourse and the requirement for passing through third party land it is unachievable to discharge surface water from the development to a watercourse.

3.4.4 *Discharge to surface water sewer*

United Utilities record information indicates that there are no existing public surface water sewers within the vicinity of the development, with possible connects.

3.4.5 *Discharge to a combined sewer*

United Utilities record information indicates existing combined public sewers are located within the vicinity of this development, one of which runs through the site. It has been proven through CCTV surveys that the existing site has a positive connection into this combined sewer. A Pre-Development Enquiry has been submitted to United Utilities, who have agreed that the proposed site can discharge to the sewer at this location at a restricted rate of 45.6L/s.

3.5 Sustainable Drainage Systems (SuDS)

- 3.5.1 Sustainable drainage developed in line with the ideals of sustainable development is collectively referred to as Sustainable Drainage Systems (SuDS). At a particular site, these systems are designed to manage both the environmental risks resulting from the urban runoff and to contribute, wherever possible, to environmental enhancement. Therefore, SuDS objectives are to minimise the impacts from the development on the quantity and quality of the runoff and maximise amenity and biodiversity opportunities (CIRIA C753, 2015).
- 3.5.2 SuDS help to mimic the natural flow of water ensuring that both the quantity and quality of the surface water is dealt with before feeding it into the drainage network. SuDS features usually come with added maintenance, however the benefits they reap are considered to outweigh this. The selection of the most appropriate SuDS features should consider constraints, requirements and maintenance of the site. It should be remembered that Local Planning Authorities expect SuDS to be investigated on construction projects. The implementation of SuDS features can assist in achieving the drainage requirements set out in the National Planning Policy Framework.
- 3.5.3 A strong design theme is essential if maximum aesthetic benefits are to be gained from the SuDS approach. At a more local scale SuDS should link with the individual plot structure, planting and amenity areas, gaining multiple benefits from a limited area of land.
- 3.5.4 The 'Management Train Approach' should be central to the surface water drainage strategy of a proposed site. The main objective is the treatment and control of runoff as near to source as possible, thus protecting downstream habitats and further enhancing the amenity value of the site. This concept uses a hierarchy of drainage techniques to incrementally reduce pollution, flow rates and volumes of storm water discharge from the site, and is as follows:
- » Prevention - The use of good site design and housekeeping measures to prevent runoff and pollution (e.g. rainwater re-use).
 - » Source Control - Control of runoff at source or as close to source as possible (e.g. soakaways, green roofs, pervious pavements).
 - » Site Control - Management of water in a local area (e.g. ground storage/attenuation, detention ponds/basins).
 - » Regional Control - Management of water from a site or various sites (e.g. wetlands, balancing ponds).
- 3.5.5 The SuDS philosophy for a development site is the promotion of Pollution Prevention and Site Control Techniques. The following design philosophy is proposed:
- » Surface water treatment using the 'Management Train' approach to remove and isolate contamination at all SuDS facilities prior to conveyance.
 - » Site Control features (attenuation) to accommodate the additional surface water runoff generated by the development site before discharging into the combined sewer.
 - » Provision of suitable oil separators (where applicable).
 - » Aim to limit, where possible, the impermeable fraction of development.

3.5.6 It is proposed that the development site has two levels of treatment. Prevention is considered as the first level of treatment and the site control as the second.

3.5.7 A review of the possible SuDS solutions that are feasible include:

- » Below ground storage
- » Oil separators

3.6 Prevention and Source Control - Principles and Objectives

3.6.1 The main objective of prevention and source control is the treatment and control of runoff as near to source as possible. Application of these techniques will require reduction of impermeable areas and techniques to restrict the runoff rates.

3.6.2 Prevention measures to be considered, where possible, as part of the overall approach to the management train at this site include rainwater harvesting. Typical examples are given in the SuDS Manual (Ciria C697) and are briefly described in Table 3 below. It must be noted that the effectiveness of each system is dependent on the final design as well as the actual site conditions.

SuDS Feature	Incorporated within design?	Reasoning
Green/Brown Roof	No	Greenroof systems have been excluded as they are unsuitable for lightweight structures.
Attenuation Pond	No	Attenuation ponds have been excluded for the site due to lack of available space within the development proposals due to existing gas main easements.
Rainwater Harvesting	No	Rainwater harvesting is not effective for this type of development where there are a limited number of toilets/ uses for harvested water.
Infiltration Methods	No	Infiltration is unachievable due to contaminated ground and shallow water table identified by Geotechnical Engineers.
Raingardens/Bio-retention areas	No	Excluded due to the nature of the development.
Filter strips and swales	No	Excluded due to lack of external space available.
Permeable Paving	No	Excluded, given the industrial nature of the development and gradients across the site.
Below ground attenuation systems / Oversized Pipework	Yes	Below ground attenuation will be achieved through the use of below ground cellular attenuation crates within the development.

Table 3: SuDS Considerations

3.7 Surface Water Drainage Strategy

- 3.7.1 It is proposed that the surface water drainage is to be separated into 4 networks to utilise existing drainage connections.
- 3.7.2 The agreed discharge rate of 45.6L/s will be split between each network, outlined below:

Catchment Reference	Total Impermeable Area (m ³)	Proposed Discharge Rate (L/s)
Units 1&2	4390	13.5
Unit 3	5836	18
Unit 4 Yard & Roof	3600	11
Unit 4 Car Park	950	3

Table 4: Proposed Discharge Rates

- 3.7.3 Surface water runoff from roofs and external areas will be directed to the below ground gravity network via rainwater pipes and channel drains before being attenuated within below ground cellular structures prior to outfall into the existing network (see Appendix G for Proposed Drainage Layout).
- 3.7.4 Attenuation storage of approximately 489m³ will be required to store proposed run off during the 1 in 100 Year plus 40% climate change allowance storm event.
- 3.7.5 A hydraulic model has been created using MicroDrainage drainage software as part of the preliminary drainage design, which defines pipe sizes and SuDS attenuation volumes for a range of events including the 1 in 1year, 1 in 30year and 1 in 100year + 40% climate change event. Hydraulic calculations have been provided in Appendix H. It is noted that these rates and volumes are preliminary and may change at detailed design stage when more specific information is available.
- 3.7.6 The proposed drainage layout is designed in accordance with Design and Construction Guidance.
- 3.7.7 In the event of an extreme rainfall beyond the designed storm events, or poor maintenance of the surface water drainage system, exceedance flooding will be safely contained on site and directed away from the buildings, where storm-water volumes will sit in the low points of the car park and yard areas, and drain into the surface water infrastructure as water levels recede.
- 3.7.8 Pollution treatment measures will be provided in the form of Class 1 oil separators for the car park and yard areas, and silt traps on drainage elements which will filter and trap silts and debris and mitigate against the risk of pollution. All separators will be alarmed and remotely monitored at all times to ensure reliability.

3.8 Foul Drainage Strategy

- 3.8.1 It is proposed that the foul drainage from Unit 1 and 2 of the new development is to discharge to a proposed combined manhole located on the existing private combined drainage network before discharging into United Utilities combined public sewer via existing connections that have been proven through CCTV surveys.
- 3.8.2 Foul drainage from Unit 3 of the new development is to discharge to an existing private manhole, previously utilised for surface water. As all surface water connections to this manhole will be abandoned, this manhole will serve as a foul water manhole for the proposed development, which discharges into United Utilities combined public sewer via existing connections that have been proven through CCTV surveys.
- 3.8.3 There is existing private foul drainage located under the proposed Unit 4 building, which will require diverting as part of the works for the new development. The foul drainage is to be relocated into the yard of the adjacent site to the east of the Unit 4 building. Foul flows from Unit 4 will discharge to the diverted foul network, which will discharge into United Utilities combined public sewer via existing connections that have been proven through CCTV surveys.
- 3.8.4 A non-return valve should be provided at the outfalls to ensure surcharging from the public sewer does not enter the private drainage network.
- 3.8.5 See Appendix G for Proposed Drainage Layout.

3.9 Management, Maintenance and Residual Risk

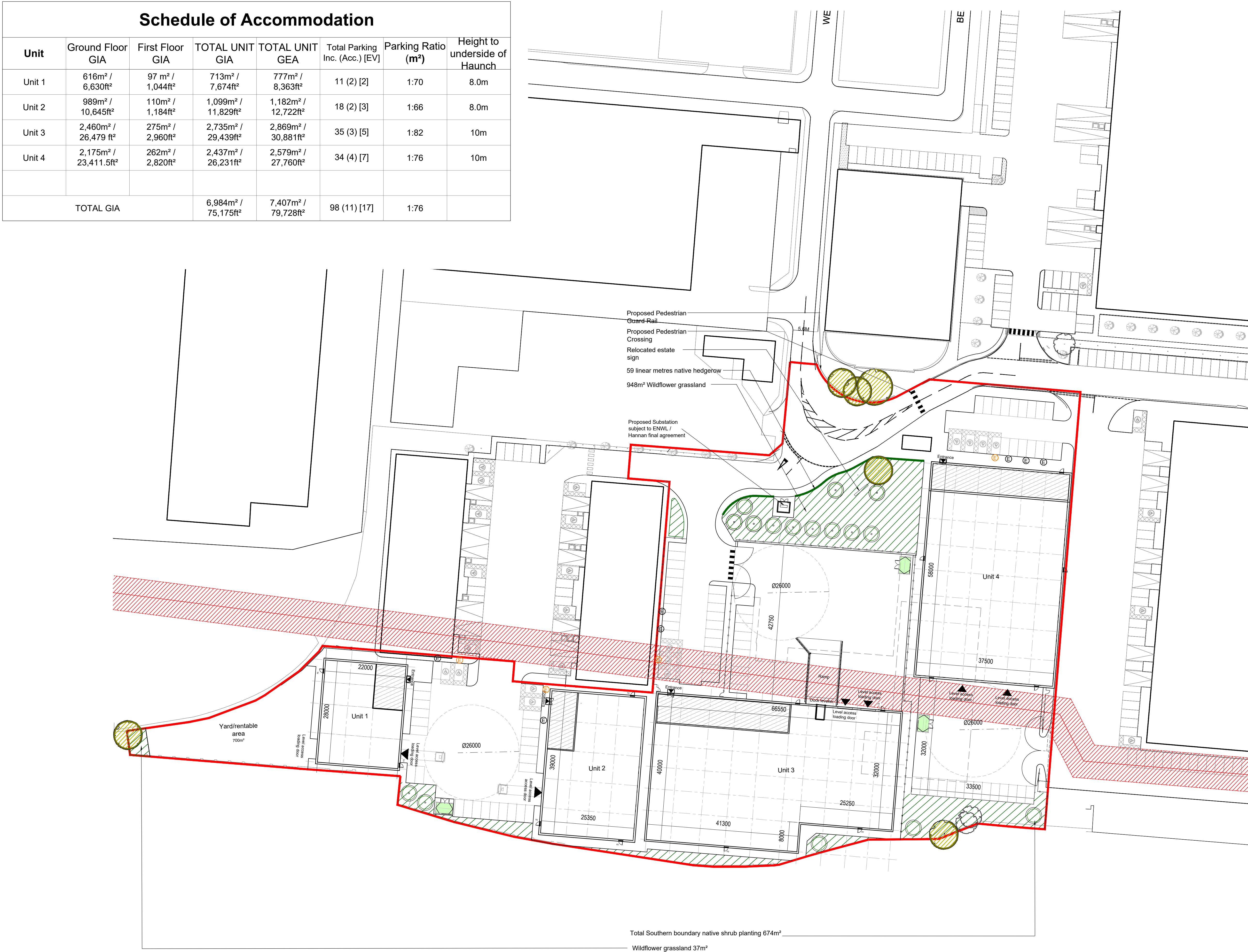
- 3.9.1 The proposed drainage layout will be designed in accordance with building regulations, Design and construction guidance, and Ciria C753 for SuDS structures.
- 3.9.2 Run-off from roofs is considered to be generally clean with limited contamination, and will be discharged directly to the proposed drainage infrastructure and new SuDS Facilities. Silt is to be prevented from entering the drainage system by the use of catchpits and interceptors.
- 3.9.3 Run-off from car park and yard areas will be treated via proprietary treatment system of a full-retention oil interceptor.
- 3.9.4 A private management company will maintain the drainage infrastructure as part of a site-wide management and maintenance schedule as shown in Table 5 below.
- 3.9.5 Access and egress arrangements to and from the new development, should exceedance flooding occur, will be via the existing access road, Welcomb Street, to the north of site. It is anticipated that flood water from an extreme rainfall beyond the designed storm events, or poor maintenance of the surface water drainage system, will be maintained within the proposed development.
- 3.9.6 Flood risk to people and property can be managed but it can never be completely removed. Residual risk remains after flood management or mitigation measures have been put in place. This relates to a rainfall event beyond what can be fully quantified.

Item	Maintenance	Frequency per year
Foul Water Manholes	Manhole covers checked for operation/damage – seating's re-greased or replaced as required. Check for blockages and or damage to invert channel/inlets – jetting pipe runs if blocked, any damage to be repaired. All access ladders & other associated ironworks to be checked for corrosion & fixings to be checked for deterioration. To be repaired or replaced dependant of extent of damage.	1
Surface Water Manholes, Flow Controls	As Above. All catch pits/Vortex Separators to have silt/solid accumulation removed & base jetted clean.	1
Drainage Channels/Kerb Drains	All catch/access pits to have silt/solid accumulation removed. Channel run to be jetted through between access points. Any channel grates to be inspected for damage & replaced as necessary.	2
Rainwater Pipes / Roof Gutters	Check roof gutters for sediment, plant, debris, etc. and clean as necessary.	1
Attenuation Tanks	Inspect and identify any areas that are not operating correctly. If required, take remedial action. Remove debris from the catchment surface (where it may cause risks to performance) Inspect/check all inlets, outlets, vents and overflows to ensure that they are in good condition and operating as designed Repair/rehabilitate inlets, outlet, overflows and vents. Survey inside of tank for sediment build-up and remove if necessary.	1 12 1 As required

Table 5: Drainage Maintenance

Appendix A - Proposed Site Layout

Schedule of Accommodation							
Unit	Ground Floor GIA	First Floor GIA	TOTAL UNIT GIA	TOTAL UNIT GEA	Total Parking Inc. (Acc.) [EV]	Parking Ratio (m²)	Height to underside of Haunch
Unit 1	616m² / 6,630ft²	97 m² / 1,044ft²	713m² / 7,674ft²	777m² / 8,363ft²	11 (2) [2]	1:70	8.0m
Unit 2	989m² / 10,645ft²	110m² / 1,184ft²	1,099m² / 11,829ft²	1,182m² / 12,722ft²	18 (2) [3]	1:66	8.0m
Unit 3	2,460m² / 26,479 ft²	275m² / 2,960ft²	2,735m² / 29,439ft²	2,869m² / 30,881ft²	35 (3) [5]	1:82	10m
Unit 4	2,175m² / 23,411.5ft²	262m² / 2,820ft²	2,437m² / 26,231ft²	2,579m² / 27,760ft²	34 (4) [7]	1:76	10m
TOTAL GIA			6,984m² / 75,175ft²	7,407m² / 79,728ft²	98 (11) [17]	1:76	

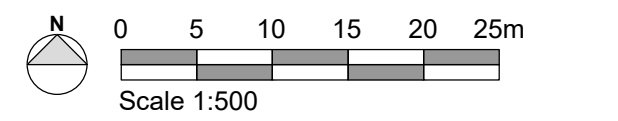


NOTES AEWTP026C

- All dimensions and levels are to be checked on site.
- Any discrepancies are to be reported to the architect before any work commences
- This drawing shall not be scaled to ascertain any dimensions. Work to figured dimensions only.
- This drawing shall not be reproduced without express written permission from AEW.
- Title overlay drawings and ownership boundaries are produced using all reasonable endeavours. AEW cannot be responsible for the accuracy or scale discrepancy of base plans supplied to them.
- All works are to be undertaken in accordance with Building Regulations and the latest British Standards.
- All proprietary materials and products are to be used strictly in accordance with the manufacturers' recommendations.

CDM 2015

Client notified of duties: **07/04/21**
Principal Designer: **Client**
Unless noted below, all known hazards have been highlighted on the drawing:



-  Site Boundary 4.54ac / 1.80ha
-  Mezzanine Extents
-  30" combined sewer with 30ft easement.
Exact alignment TBC by survey
-  Footprint of existing Zone A + B
-  Landscape Planting to Landscape Architect Specification. Existing trees and shrubs to be retained where possible.
-  Existing trees to be retained
-  Proposed tree planting
- Manchester City Council Maximum parking standards:
- B2 = 1:45 sq.m
B8 = 1:100 sq.m
-  Proposed Bin store
-  Pedestrian gate with panic hardware
-  Future provision Electrical Vehicle Charging spaces with cable routes

NOTES

HGV circulation subject to tracking analysis

P12	16/04/24	MW	DRS
Planning Issue			
REV	Date	Drawn by: -	Checked by: -

Status	Purpose of Issue
S4	For Planning

drawing stage **Stage 3**

client

Network Space

project

**Welcomb Street
Openshaw**

drawing title

Proposed Site Plan

date	Apr 2024	drawn	MW
scale@A1	1:500	checked	DRS

Appendix B - Topographical Survey

Appendix C - Existing Drainage Layout



Refo	Cover	Func	Invert	Size x	Size y	Shape	Matl	Length	Grad
1202	65.43	SW	61.82	1100			CO	37.0795	1 in 265
9403	63.4	CO	49.97	1900			CO	188.9577	1 in 212
2100	66.37	SW	62.14	1000			CO	31.14482	1 in 346
9511		CO		100			VC	12.69983	
9500	63.41	CO	59.74	375			VC	72.44308	1 in 60
9500	63.41	CO	59.74	300			VC	62.23983	1 in 603
9600	62.44	CO	58.54	375			VC	49.36598	1 in 69
0512				150			VC	9.004173	
2203	65.44	SW	61.68	1100			CO	47.04253	1 in 784
1104	65.45	SW	62.04	1000			CO	46.36598	1 in 380
2101	66.65	SW	62.39	1000			CO	24.06319	1 in 127
1107	65.49	SW	61.95	1100			CO	37.21559	1 in 372
0513				150			VC	9.943955	
2206	65.55	SW	61.59	1100			CO	19	1 in 6
9605	60.9	CO	57.02	375			BR	70.29698	1 in 64
1304		CO	0	1400			CO	99.04544	
9605	64.19	CO	60.33	300			VC	53.33554	1 in 356
2500	67.51	CO	63.79	300			VC	91.35098	1 in 69
1502	65.43	CO	62.43	300			VC	85.37564	1 in 65
0505	64.19	CO	57.48	300			VC	53.15073	1 in 332
1102	62.83	CO	60.66	300			CO	45.54119	1 in 0.77901454
9603	61.35	CO	57.69	375			VC	42.01919	1 in 63
9400	63.48	CO	59.06	700			BR	17.11724	1 in 74
1402	65.73	CO	62.2	600			BR	128.6353	
1501	65.73	CO	0	300			VC	44.18144	
8500	61.45	CO	58.42	300			VC	51.15662	1 in 54
9302	62.37	CO	58.17	375			VC	111.5078	1 in 153
1100	60.7	CO		225			VC	85.7666	
7403	59.75	CO	55.86	450			CO	55.44366	1 in 43
1205	65.41	CO	55.39	1350			BR	110.3676	1 in 69
9501	61.65	CO	57.48	600			CO	52.61719	1 in 0.9600608
2104	66.85	FO	60.47	375			VC	28.4005	1 in 0.59942079
2207	64.31	CO	55.87	300			VC	49.16299	1 in 62
0508	64.61	CO	61.12	300			VC	52.34501	1 in 145
9501	63.33	CO	59.66	375			BR	181.0414	
1903	59.03	SW	56.13	750			CO	278.2175	1 in 1.67180967
9402	62.02	CO	49.08	1900			VC	91.5478	1 in 86
1203	63.75	CO	61.29	375			VC	18.11077	1 in 82
7400	60.15	CO	56.31	300			VC	34.36568	1 in 0.68910528
9300	62.83	CO	58.66	450			VC	16.18034	
2204	66.38	FO	57.85	300			VC	41.80796	1 in 39
0503	63.59	CO	61.59	230			VC	21.2132	
9406		CO		225			VC	41.43687	
8400	61.57	CO	58.59	300			VC	31.06445	1 in 46
9401	61.39	CO	0	300			VC	25.22783	1 in 25
9301	60.96	CO	57.16	450			VC	48.50773	1 in 25
2301	66.57	CO	62.91	375			VC	53.23532	1 in 154
9402	63.25	CO	60.73	300			CI	78.40918	1 in 1.82648401
0508	64.61	CO	61.22	375			VC	38.20995	
9301	62.16	CO	57.06	300			VC	73.5527	1 in 736
0402	64.29	CO	61.78	300			VC	19.43437	
9303	62.6	CO	57.17	300			VC	38.06688	
9307		CO		225			BR	260.8395	
0516		CO		150			VC	8.250587	1 in 77
6200	59	CO	52.62	600			CO	45.39824	
9408		CO		150			CO	18.27882	1 in 0.33093760
9401	62.67	CO	60.12	300			VC	171.7451	1 in 53
2205	63.87	CO	55.46	450			VC	6.324555	1 in 57
1302	63.14	CO	59.63	450			BR	440.8044	1 in 143
9604	61.45	CO	57.82	375			BR	33.24154	1 in 83
1108	59.41	CO	55.72	900			VC	13	1 in 108
7500	60.03	CO	55.73	600			CO	19.23538	1 in 0.36440015
8300	60.99	CO	57.41	375			BR	15.7502	
1106	65.36	CO	57.72	450			VC	176.8191	1 in 208
2401		CO	0	600			VC	53.15073	
1404	65.55	CO	60.82	1900			VC	7.361735	1 in 77
2300	63.87	CO	0	375			VC	44.29116	1 in 19
0515		CO		150			VC	4.123106	
1500	65.81	CO	62.48	300			BR	4.46521	1 in 0.39662309
0506	64.03	CO	60.91	300			CO	23.34524	1 in 92
1108	59.4	CO	55.7	900			VC	63.28507	1 in 105
1103	65.5	SW	62.27	450			VC	2.842929	1 in 110
1400	65.16	CO	62.71	300			VC	70.41175	1 in 110
7300	59.33	SW	57.63	225			VC	7.071068	1 in 22
0518		CO		150			VC	45.39824	1 in 61
7301	59.03	SW	57.03	225			VC	44.18144	1 in 60
1401	65.15	CO	62.06	300			VC	49.25444	
9400	64.03	CO	57.04	600			BR	48.16638	1 in 3102
0500	64.06	CO	60.48	380			CO	31.01612	1 in 0.46906936
0507	64.89	CO	61.29	375			VC	43.18565	1 in 0.88189659
9401	64.43	CO	60.43	600			VC	85.28175	1 in 140
1001	60.23	CO	59.03	750			BR	16.03122	1 in 94
1201	65.36	CO	57.65	375			VC	94.42987	1 in 90
2202	65.37	CO	57.37	375					
9302	60.94	CO	56.54	300					
2400	65.93	CO	62.39	600					
0403	64.29	CO	61.8	300					

LEGEND

Abandoned

Foul

Surface Water

Combined

Public Sewer

Private Sewer

Section 104

Rising Main

Sludge Main

Overflow

Water Course

Highway Drain

All point assets follow the standard colour convention:

red - combined

blue - surface water

brown - foul

purple - overflow

Manhole

Head of System

Extent of Survey

Rodding Eye

Inlet

Discharge Point

Vortex

Penstock

Washout Chamber

Air Valve

Non Return Valve

Soakaway

Gully

Cascade

Flow Meter

Hatch Box

Oil Interceptor

Summit

Drop Shaft

Orifice Plate

Side Entry Manhole

Outfall

Screen Chamber

Inspection Chamber

Bifurcation Chamber

Lamp Hole

T Junction / Saddle

Catchpit

Valve Chamber

Vent Column

Vortex Chamber

Penstock Chamber

Network Storage Tank

Sewer Overflow

Ww Treatment Works

Ww Pumping Station

Septic Tank

Control Kiosk

Change of Characteristic

MANHOLE FUNCTION

FO Foul

SW Surface Water

CO Combined

OV Overflow

SEWER SHAPE

CI Circular

EG Egg

OV Oval

FT Flat Top

RE Rectangular

SQ Square

TR Trapezoidal

AR Arch

BA Barrel

HO HorseShoe

UN Unspecified

SEWER MATERIAL

AC Asbestos Cement

BR Brick

PE Polyethylene

RP Reinforced Plastic Matrix

CO Concrete

CSB Concrete Segment Bolted

CSU Concrete Segment Unbolted

CC Concrete Box Culverted

PSC Plastic / Steel Composite

GRC Glass Reinforced Plastic

DI Ductile Iron

PVC Polyvinyl Chloride

CI Cast Iron

SI Spun Iron

ST Steel

VC Vitrified Clay

PP Polypropylene

PF Pitch Fibre

MAC Masonry, Coursed

MAR Masonry, Random

U Unspecified

Address or Site Reference:

Welcomb Street Openshaw,

Scale: 1:1250 Date: 24/05/2022

Sheet: 1 of 1

Printed by: Property Searches

SEWER RECORDS



United Utilities

Water for the North West

The position of the underground apparatus shown on this plan is approximate only and is given in accordance with the best information currently available. United Utilities Water will not accept liability for any loss or damage caused by the actual position being different from those shown.

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Ex. UU 6200
CL:59.000
IL:52.620
DEPTH:6.380

1.002 900 @ 1:73

NO DRAINAGE VISIBLE
IN THIS AREA

Connection 02
IL: 54.503

5.003 300 @ 1:72

8.001 300 @ 1:72

7.007 150 @ 1:72

8.000 225 @ 1:72

5.003 150 @ 1:72

6.004 150 @ 1:72

5.003 150 @ 1:72

5.003 150 @ 1:72

5.003 150 @ 1:72

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5.003 150 @ 1:72

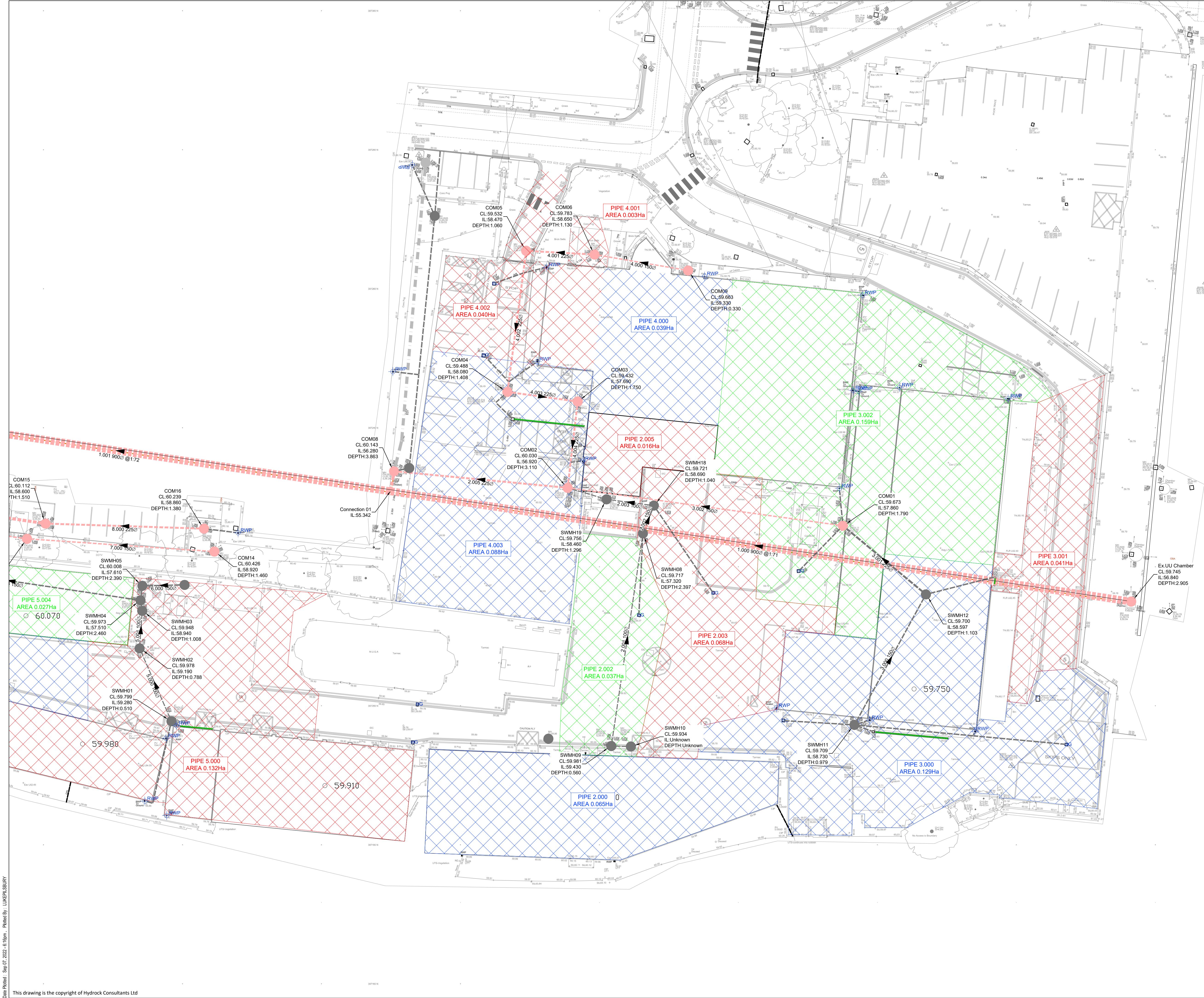
NOTE:
INFORMATION SHOWN ON THIS
DRAWING IS FOR PLANNING
PURPOSES ONLY, AND IS NOT TO
BE USED FOR CONSTRUCTION.
SUBJECT TO CHANGE
FOLLOWING DETAILED DESIGN.

- NOTES
- THIS DRAWING IS NOT TO BE SCALED.
 - ALL DIMENSIONS AND LEVELS ARE TO BE CHECKED ON SITE BEFORE THE COMMENCEMENT OF WORKS. ANY DISCREPANCIES ARE TO BE REPORTED TO THE ARCHITECT AND ENGINEER FOR VERIFICATION. FIGURED DIMENSIONS ONLY ARE TO BE TAKEN FROM THIS DRAWING.
 - THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL RELEVANT ENGINEERS' AND SERVICE ENGINEERS' DRAWINGS AND SPECIFICATIONS.
 - ALL LEVELS ARE IN METRES UNLESS NOTED OTHERWISE
 - EXISTING GROUND INFORMATION SHOWN ON THIS DRAWING IS ARE BASED UPON TOPOGRAPHICAL SURVEY "UAR3182_A.dwg" DATED 08.07.2022.

- LEGEND
- EXISTING COMBINED DRAINAGE
 - EXISTING SURFACE WATER
 - EXISTING FOUL DRAINAGE
 - EXISTING CHANNEL DRAIN
 - EXISTING GULLY DRAIN
 - EXISTING RAIN WATER PIPE

PO2	PRELIMINARY ISSUE			
J. BOOTH	07.09.22	L. PILSBURY	07.09.22	R. HENSHALL
PO1	PRELIMINARY ISSUE			
J. BOOTH	02.08.22	L. PILSBURY	02.08.22	R. HENSHALL
REV	REVISION NOTES/COMMENTS			
DRAWN BY	DATE	CHECKED BY	DATE	APPROVED BY
Hydrock				
North Assurance Buildings 9-21 Princess Street, St Albans Square Manchester M2 4DN t: +44(0)161 804 5550 e: manchester@hydrock.com				

CLIENT	NETWORK SPACE		
PROJECT	WELCOMB STREET, MANCHESTER		
TITLE	EXISTING SURFACE WATER DRAINAGE		
HYDROCK PROJECT NO. C-22975		SCALE AT A1 1:250	
STATUS DESCRIPTIC INFORMATION ONLY			STATUS
DRAWING NO. (PROJECT CL. INJINATOR ZONE-LEVEL-ROLE-NUMBER)	C22975-HYD-XX-XX-SK-C-0530		REVISION P02



NOTES

1. THIS DRAWING IS NOT TO BE SCALED.

2. ALL DIMENSIONS AND LEVELS ARE TO BE CHECKED ON SITE BEFORE THE COMMENCEMENT OF WORKS. ANY DISCREPANCIES ARE TO BE REPORTED TO THE ARCHITECT AND ENGINEER FOR VERIFICATION. FIGURED DIMENSIONS ONLY ARE TO BE TAKEN FROM THIS DRAWING.

3. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL RELEVANT ENGINEERS' AND SERVICE ENGINEERS' DRAWINGS AND SPECIFICATIONS.

4. ALL LEVELS ARE IN METRES UNLESS NOTED OTHERWISE

5. EXISTING GROUND INFORMATION SHOWN ON THIS DRAWING IS ARE BASED UPON TOPOGRAPHICAL SURVEY "UAR3182_A.dwg" DATED 08.07.2022.

LEGEND

EXISTING COMBINED DRAINAGE

EXISTING SURFACE WATER

EXISTING FOUL DRAINAGE

EXISTING CHANNEL DRAIN

EXISTING GULLY DRAIN

EXISTING RAIN WATER PIPE

P01	PRELIMINARY ISSUE				
J. BOOTH	02.08.22	L. PILSBURY	02.08.22	R. HENSHALL	02.08.22
REV	REVISION NOTES/COMMENTS				
DRAWN BY	DATE	CHECKED BY	DATE	APPROVED BY	DATE

Hydrock

North Assurance Buildings

9-21 Princess Street, St Albans Square

Manchester

M2 4DN

t: +44(0)161 804 5550

e: manchester@hydrock.com

CLIENT

NETWORK SPACE

PROJECT

WELCOMB STREET, MANCHESTER

TITLE

EXISTING SURFACE WATER DRAINAGE

HYDROCK PROJECT NO.	SCALE AT A1
C-22975	1:250
STATUS DESCRIPTION*	STATUS
INFORMATION ONLY	
DRAWING NO. (PROJECT CODE) (INATOR-ZONE-LEVEL-TYPE-ROLE-NUMBER)	REVISION
C22975-HYD-XX-XX-SK-C-0531	P01

Date Plotted: Sep 07, 2022 - 8:10pm

Plotted By: LUNEPILSBURY

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Filepath: P:\Manchester Central Office\STRUCTURES\C-22975 Welcomb St Manchester\01_VIP\SK_Sketches\C-22975-HYD-XX-XX-SK-C-0530_Existing Catchment Areas.dwg

Appendix D - CCTV Survey Report

Manchester College, Welcomb Street

PLEASE NOTE: Upon further inspection of the whole boundary, we discovered that from SW01 -> SW12 may in fact be combined systems not surface water, the system is disused meaning it was difficult to judge at start of the survey the function of the sewer.

Also, FW01 AND FW02 can be accounted as combined which would make the entirety of the site combined.

Although we couldn't prove where SW08 discharges so we are unable to determine the function of SW08/09 and 10.

SW01

Firstly we surveyed downstream to SW02, survey abandoned due to 80% silt at 6.9m, overlap not attempted, see below location and internal pictures and also the silt within the line.



Also from SW01 we surveyed upstream towards ACO1, the survey was complete with only a large displaced joint within the line see picture below



Lastly from SW01 we surveyed upstream to RP01, not much to report about within line other than a protruding sealing ring and survey abandoning due to silt at 11.93m. See below



SW02

From SW02 we surveyed downstream to SW03, no defects to report within sewer length see below Internal and location of SW02



SW03

From SW03 we surveyed downstream to SW04, no defects to report withinline. See below internal and location of SW03

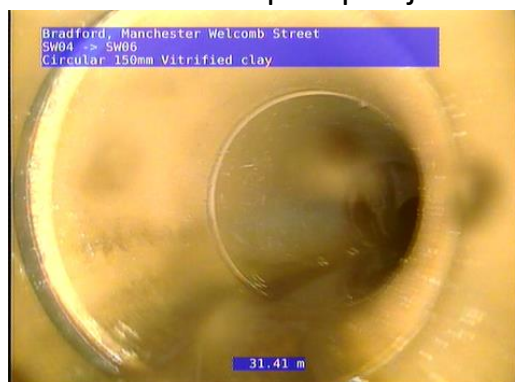


SW04

Firstly from SW04 we surveyed up stream to SW05, no defects to report within line. See below internal and location pictures of SW04.



Also from SW04 we surveyed downstream to SW06, not much to report within this sewer length other than a couple open joints. See picture below.



SW06

From SW06 we attempted to survey downstream to COM10 but abandoned 1.1m in due to silt, we attempted an overlap from COM10 upstream to SW06 but also abandoned at 0.83 due to silt and mass roots. We sound tested to prove the connection of the two manholes, see below pictures

COM10 U/S



SW05



From SW05 we surveyed up stream to SW07, this pipe has been lined and there are also mass roots at the mouth of the pipe in SW07. Unfortunately we were unable to locate SW07. Mass Roots in SW07



SW08



SW08 internal

SW08 is a catch pit, Firstly we surveyed upstream to G01 but we abandoned due to compact solids in pipe at 8.13m. Also there were a couple of other defects within line like fractures. See pictures below



Secondly we completed the survey upstream from SW08 to SW09, within this line there were defects such as a displaced joint and silt, see below.



SW09 Internal and Location



Lastly we surveyed downstream from SW08 towards UNKNOWN02 in which we survey abandoned due to collapse in pipe at 3.99, unable to trace line any further as it goes underneath building.



SW11



First of all we surveyed downstream from SW11 to SW12, this pipe is a 150mm but at 12.21m it changes to 100mm. There is also silt within line, see pictures below.



SW12 couldn't be located, line runs under building.

Next we surveyed upstream from SW11 to G02, several defects found within this line such as fractures, cracks and a piece of masonry which was pushed through until we had to abandon on silt. See pictures below.



Thirdly we surveyed upstream from SW11 to G03, no defects to report within this sewer length.

Finally from SW11 we surveyed upstream to G04 but had to abandon due to a broken/deformed pipe. See picture below.



COM12 – set up here CCTV upstream 64.2m had to survey abandon due to obstruction what looks like a spade in the invert camera would not pass this point, line would need cleaning to carry out a full survey

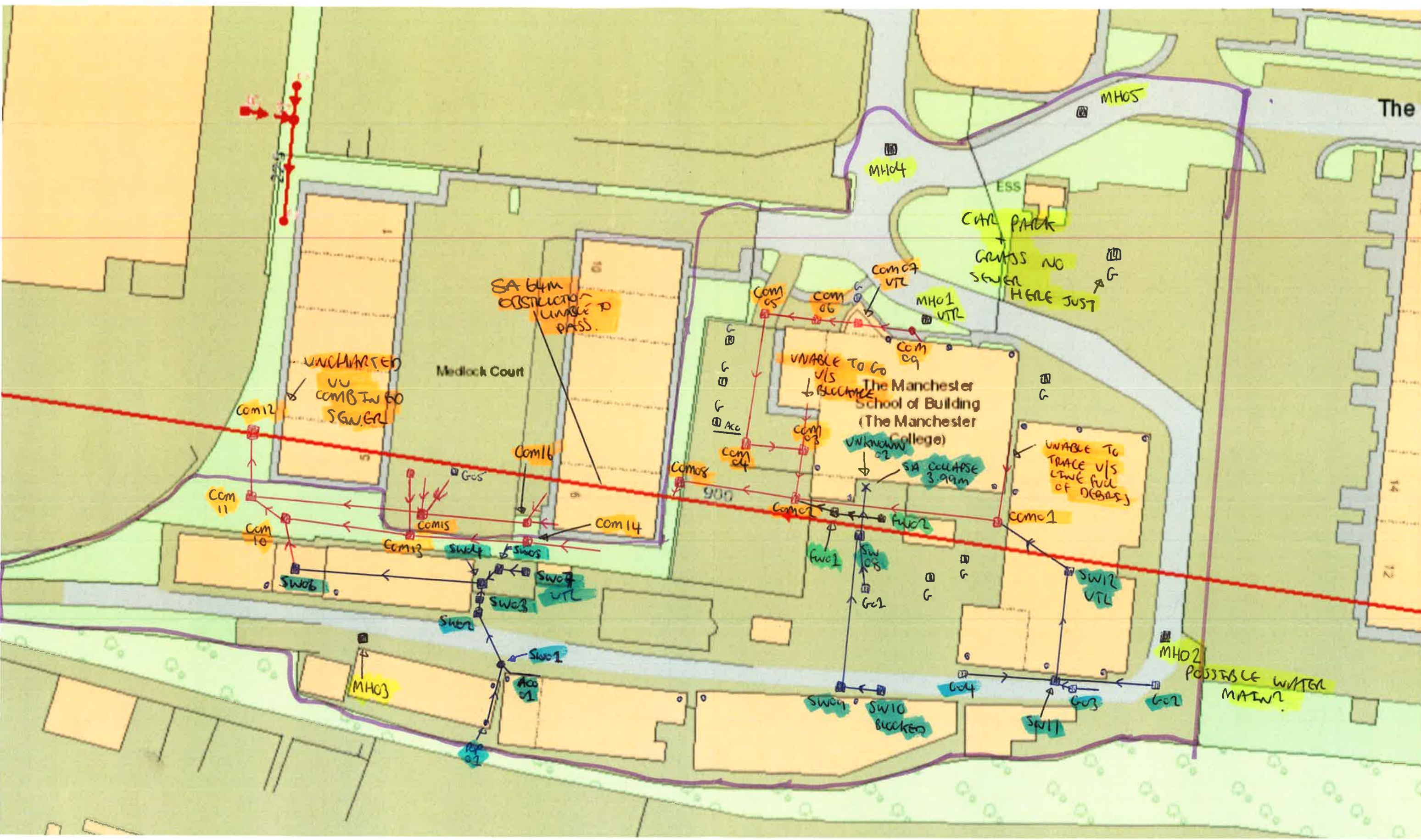


- x COM01 D/S TO COM02 – Survey complete
- x COM01 B PIPE – Unable to survey due to heavy silt, picture taken
- x COM01 U/S TO SW12 – Survey complete, we believe SW12 (UTL) is in-between SW11 and COM01, sound tested to prove connections.
SW11 -> SW12 -> COM01
- x FW01 U/S TO FW02 – Survey abandoned due to blockage 100% at 4.7m, overlap not attempted
- x FW01 D/S TO COM02 – Survey complete
- x COM05 U/S TO COM06 – Survey complete
- x COM05 D/S TO COM04 – Survey complete
- x COM04 D/S TO COM03 – Survey complete

- x COM02 D/S TO COM08 – Survey complete
- x COM02 U/S TO COM03 – Survey complete
- x COM03 U/S (B PIPE) - Unable to survey due to 100% blockage, picture taken
- x COM09 D/S TO COM07 – Survey complete
- x COM10 D/S TO COM11 – Survey complete

- x COM11 D/S TO COM12 – Survey complete, COM12 is a United Utilities combined sewer
- x COM13 D/S TO COM10 – Survey complete
- x COM13 U/S TO COM14 – Survey complete
- x COM15 U/S TO COM16 – Survey complete
- x COM15 U/S TO GO5 – Survey abandoned at 3.25m due to silt and sludge, residue noticed on car park which could be the cause
- x COM15 D/S TO COM11 – Survey abandoned at 12.52m due to being unable to pass right bend in sewer, white residue found all in line. Sound tested to COM11 to prove connections, unable to overlap as pipe high level drop shaft in COM11

- x MH01 - Unable to raise therefor unknown asset
- x MH02 - Unknown asset, possible water main?
- x MH03 – Unknown asset, unable to trace or CCTV. Small pipe coming through soil in chamber
- x MH04 – Unable to survey due to being in middle of 3-way junction
- x MH05 - Unable to survey due to being located next to existing road works



• ← circles on buildings = main water pipes

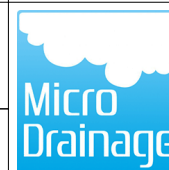
SW08 = catch pit

UNABLE to survey Fw02 full of clay

Appendix E - Existing Surface Water Calculations

[illegible]

Welcomb Street
Manchester
Existing Drainage Network



Date	07/09/2022
------	------------

Designed by L Pilsbury

File EXISTING CALCS.MDX

Checked by

Innovyze

Network 2020.1.3

Existing Network Details 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
6.000	6.144	0.105	58.5	0.000	5.00	0.0	0.600	o	150	Pipe/Conduit
6.001	2.112	0.040	52.8	0.000	5.00	0.0	0.600	o	150	Pipe/Conduit
5.003	37.642	0.350	107.5	0.000	5.00	0.0	0.600	o	150	Pipe/Conduit
5.004	6.251	0.180	34.7	0.044	5.00	0.0	0.600	o	225	Pipe/Conduit
7.000	27.137	1.060	25.6	0.000	5.00	0.0	0.600	o	150	Pipe/Conduit
7.001	21.459	1.040	20.6	0.000	5.00	0.0	0.600	o	150	Pipe/Conduit
5.005	5.660	-0.020	-283.0	0.000	5.00	0.0	0.600	o	300	Pipe/Conduit
8.000	22.861	0.190	120.3	0.000	5.00	0.0	0.600	o	225	Pipe/Conduit
8.001	28.776	0.130	221.4	0.000	5.00	0.0	0.600	o	225	Pipe/Conduit
5.006	12.041	2.098	5.7	0.000	5.00	0.0	0.600	o	300	Pipe/Conduit

Network Results Table

PN	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Vel (m/s)	Cap (l/s)
6.000	59.190	0.000	0.0	1.32	23.3
6.001	57.610	0.000	0.0	1.39	24.5
5.003	57.510	0.132	0.0	0.97	17.1
5.004	57.140	0.176	0.0	2.23	88.6
7.000	58.920	0.000	0.0	2.00	35.3
7.001	57.840	0.000	0.0	2.23	39.4
5.005	56.950	0.176	0.0	0.00	0.0
8.000	58.860	0.000	0.0	1.19	47.3
8.001	58.600	0.000	0.0	0.87	34.8
5.006	56.950	0.176	0.0	6.60	466.8

Hydrock Consultants Ltd		Page 3																																																								
. . .	Welcomb Street Manchester Existing Drainage Network																																																									
Date 07/09/2022 File EXISTING CALCS.MDX	Designed by L Pilsbury Checked by																																																									
Innovyze Network 2020.1.3																																																										
<u>Simulation Criteria for Storm</u> <table> <tr> <td>Volumetric Runoff Coeff</td> <td>0.750</td> <td>Additional Flow - % of Total Flow</td> <td>0.000</td> </tr> <tr> <td>Areal Reduction Factor</td> <td>1.000</td> <td>MADD Factor * 10m³/ha Storage</td> <td>0.000</td> </tr> <tr> <td>Hot Start (mins)</td> <td>0</td> <td>Inlet Coefficient</td> <td>0.800</td> </tr> <tr> <td>Hot Start Level (mm)</td> <td>0</td> <td>Flow per Person per Day (l/per/day)</td> <td>0.000</td> </tr> <tr> <td>Manhole Headloss Coeff (Global)</td> <td>0.500</td> <td>Run Time (mins)</td> <td>60</td> </tr> <tr> <td>Foul Sewage per hectare (l/s)</td> <td>0.000</td> <td>Output Interval (mins)</td> <td>1</td> </tr> <tr> <td colspan="2">Number of Input Hydrographs</td> <td>0</td> <td>Number of Storage Structures</td> </tr> <tr> <td colspan="2">Number of Online Controls</td> <td>0</td> <td>Number of Time/Area Diagrams</td> </tr> <tr> <td colspan="2">Number of Offline Controls</td> <td>0</td> <td>Number of Real Time Controls</td> </tr> </table> <u>Synthetic Rainfall Details</u> <table> <tr> <td>Rainfall Model</td> <td>FSR</td> <td>Profile Type</td> <td>Summer</td> </tr> <tr> <td>Return Period (years)</td> <td>2</td> <td>Cv (Summer)</td> <td>0.750</td> </tr> <tr> <td>Region</td> <td>England and Wales</td> <td>Cv (Winter)</td> <td>0.840</td> </tr> <tr> <td>M5-60 (mm)</td> <td>18.000</td> <td>Storm Duration (mins)</td> <td>30</td> </tr> <tr> <td>Ratio R</td> <td>0.358</td> <td></td> <td></td> </tr> </table>			Volumetric Runoff Coeff	0.750	Additional Flow - % of Total Flow	0.000	Areal Reduction Factor	1.000	MADD Factor * 10m³/ha Storage	0.000	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 Storage Structures	Number of Online Controls		0	Number of Time/Area Diagrams	Number of Offline Controls		0	Number of Real Time Controls	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	0.358		
Volumetric Runoff Coeff	0.750	Additional Flow - % of Total Flow	0.000																																																							
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Hot Start (mins)	0	Inlet Coefficient	0.800																																																							
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M5-60 (mm)	18.000	Storm Duration (mins)	30																																																							
Ratio R	0.358																																																									
©1982-2020 Innovyze																																																										

Appendix F - United Utilities Correspondence

Luke Pilsbury

From: wastewaterdeveloperservices@uuplc.co.uk
Sent: 22 September 2022 15:39
To: Luke Pilsbury
Cc: Robert Henshall; brownl@rpsgroup.com; Jingchao Yang
Subject: RE: RE:[Hydrock: 22975-SMAN] 02435665 welcomb Street Openshaw Manchester M11 2NJ

Categories: Scanned by Gekko

CAUTION: This email originated from outside of Hydrock. Do not click links or open attachments unless you recognise the sender and know the content is safe.

Good Afternoon, Luke

Thank you for the attachments in your latest email.

I am happy with the amended microdrainage model and discharge rates.

As is our company stance, similarly to that regarding the Winwick Road development, we request that the post development pass forward flow rate does not exceed the 2 year event with betterment applied. Understanding that the Manchester area requires betterment on existing rates of 50%, we request the rate does not exceed 45.6l/s.

As discussed in previous emails, a connection to the combined sewer is acceptable in principle at this rate, subject to a 106 connection application and approval.

If I can be of any further assistance, please do not hesitate to contact me.

Kind regards



Gary Jaundrell
Assistant Developer Engineer
Developer Services & Metering
Customer Services
T: 07388 715 589
unitedutilities.com

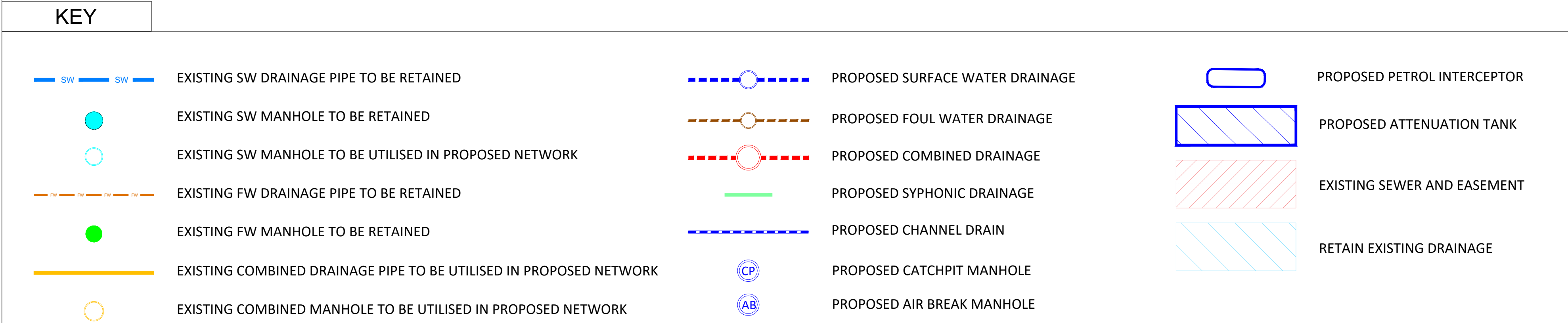
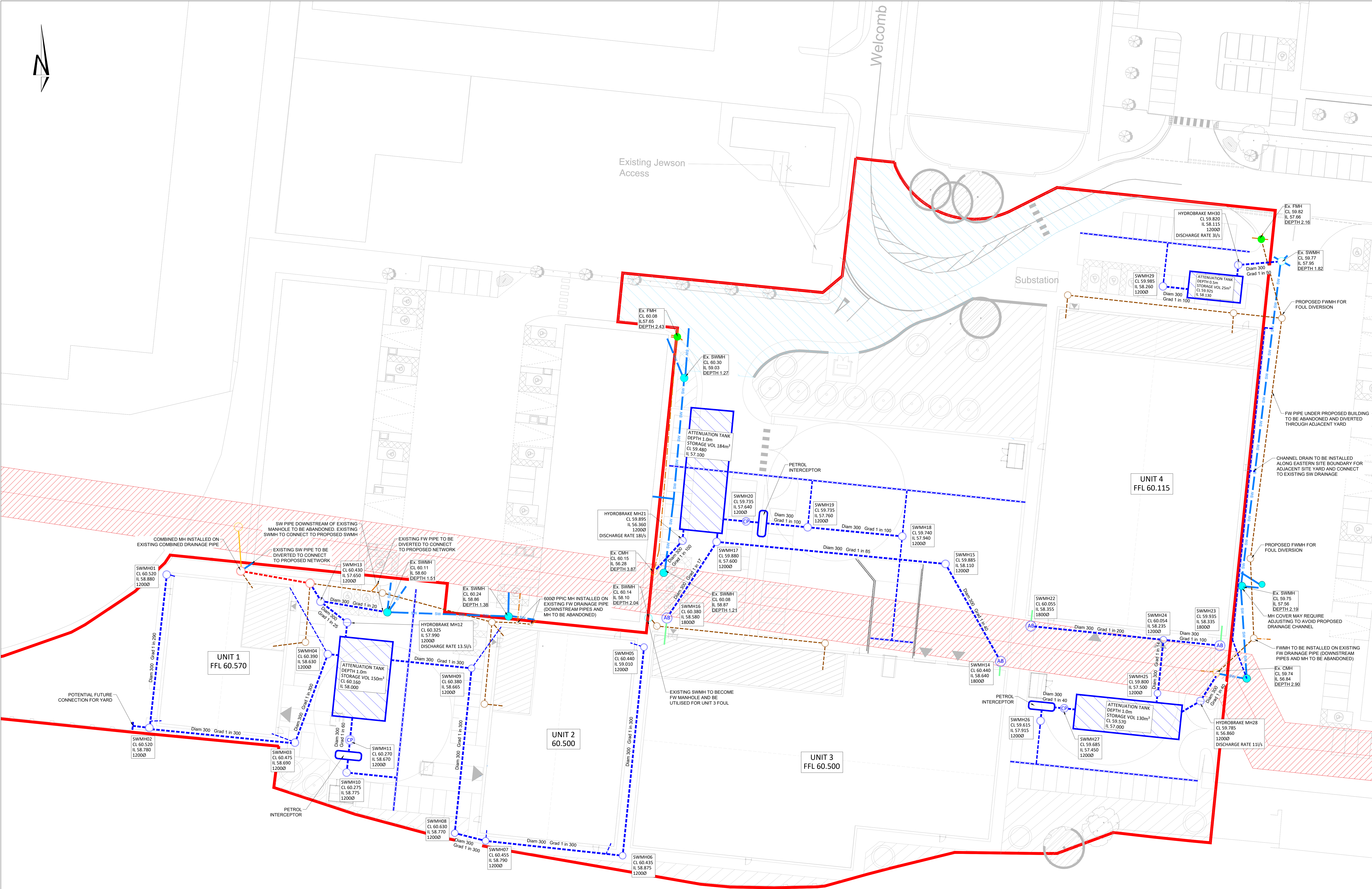
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Did you know we now have a live chat facility available to you Mon to Friday 8 -5pm. You just click on the orange live chat box on our webpage and one of our advisors will be ready to chat to you and help you with your enquiry <https://www.unitedutilities.com/builders-developers/> or you can email us at WastewaterDeveloperServices@uuplc.co.uk

----- Original Message -----

Appendix G - Proposed Drainage Layout



- NOTES
- This drawing is to be read in conjunction with all relevant drawings, specifications and documentation.
 - The position, size and levels of all drains are to be confirmed on site prior to the commencement of the works and any discrepancies reported immediately to the Engineer.
 - Do not scale from this drawing, work to dimensions or co-ordinates provided. All levels are in metres and all dimensions are in millimetres, unless otherwise noted.
 - The Contractor shall allow for the protection, temporary and permanent support and diversion works as necessary, to all existing services to the satisfaction of the public utilities.
 - The Contractor shall allow for dealing with surface water run-off into excavations and from groundwater by means of sumps, pumping and de-watering as appropriate, in order to keep the excavation as reasonably dry as possible during the construction of the works.
 - Finished floor levels are approximate only and may vary by +/- 300mm.
 - Any gradients of drains indicated are indicative only and the Contractor shall install the drains to the specified levels shown for each manhole (U.N.O.). Catchpit invert levels are for the outgoing pipe with the sump level specified separately.
 - Co-ordinate setting out information for manholes is to the intersection the drains and not the centre of the manhole.
 - Cover levels of the manholes are provisional and subject to adjustment on site to suit the finished ground levels. All external works construction areas to be as located by the architect.
 - Positions and sizes of above ground foul and surface water drainage connections are to be confirmed prior to construction with the Architect and M&E Engineer.
 - Diameter of PCC manholes varies with pipe size, and is to be in accordance with the tables shown on the Hydrock Standard Details drawings at Construction stage.
 - Channels are to be sized by the supplier and approved by the Engineer in writing prior to ordering. Drainage channels to be installed to manufacturers' requirements. Design of channels shall be based on a 1 in 30 year storm return period, 15 minute duration.
 - All works are assumed to be within public highway or within land owners lands & no works are required on third party land owners property.
 - Design assumes that no water authority sewers or other drainage systems require modification, diversion or abandoning.
 - All works within the public highway to be reinstated to highway authority requirements.
 - No deep rooting trees/vegetation should be planted within 5.0m of any drainage works.
 - All WPC's, SRWP's and RWP's are shown indicatively. Locations shall be confirmed by others.
 - All manholes less than 1.5m deep are considered as none man entry and shall be maintained from ground level.
 - Rainwater downpipe locations in abeyance.

REVISIONS

P05	UPDATED TO SUIT LATEST ARCHITECTS LAYOUT	J.MANTLE	25.04.24	S.JONES	25.04.24	N.BYRNE	25.04.24
P04	REVISED TO SUIT LATEST ARCHITECTS LAYOUT	J.ROOTH	12.06.23	C.FELL	12.06.23	N.BYRNE	12.06.23
P03	FLOW RATES AMENDED TO SUIT UUI CORRESPONDENCE	J.ROOTH	26.09.22	L.PULSBURY	26.09.22	R.HENSHALL	26.09.22
P02	MANHOLE SIZES ADDED	J.ROOTH	19.07.22	L.PULSBURY	19.07.22	R.HENSHALL	19.07.22

REVISION NOTES/COMMENTS

DRAWN BY	DATE	CHECKED BY	DATE	APPROVED BY	DATE

CLIENT

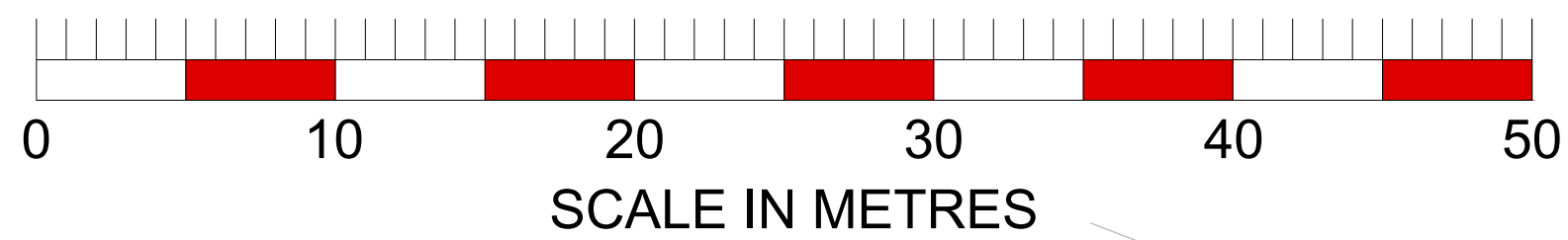
NETWORK SPACE

PROJECT
WELCOMB STREET
MANCHESTER

TITLE
PROPOSED DRAINAGE LAYOUT

HIDROCK PROJECT NO. C-22975	SCALE @ A0 1:500	STATUS S2
PURPOSE OF ISSUE INFORMATION ONLY		REVISION P05
DRAWING NO. C22975-HYD-XX-XX-DR-C-0501		

NOTE: ALL EXISTING DRAINAGE EXCLUDED FROM THE DRAINAGE LAYOUT IS TO BE ABANDONED - TBC DURING DETAILED DESIGN VIA SITE CLEARANCE DRAWINGS.



Appendix H - Proposed Surface Water Calculations

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Date	25/04/2024
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Existing Network Details 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
1.000	29.063	0.100	290.6	0.024	15.00	0.0	0.600	o	300	Pipe/Conduit
1.001	27.578	0.090	306.4	0.091	0.00	0.0	0.600	o	300	Pipe/Conduit
1.002	18.089	0.060	301.5	0.016	0.00	0.0	0.600	o	300	Pipe/Conduit
1.003	7.223	0.630	11.5	0.019	0.00	0.0	0.600	o	300	Pipe/Conduit
2.000	39.508	0.135	292.7	0.025	5.00	0.0	0.600	o	300	Pipe/Conduit
2.001	25.971	0.085	305.5	0.025	0.00	0.0	0.600	o	300	Pipe/Conduit
2.002	6.007	0.020	300.0	0.044	0.00	0.0	0.600	o	300	Pipe/Conduit
2.003	31.236	0.105	297.5	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit
2.004	19.229	0.665	28.9	0.028	0.00	0.0	0.600	o	300	Pipe/Conduit
3.000	6.213	0.105	59.2	0.159	5.00	0.0	0.600	o	300	Pipe/Conduit
3.001	17.314	0.670	25.8	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit
1.004	5.171	0.010	517.1	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit
1.005	8.711	0.340	25.6	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit
4.000	25.355	0.120	211.3	0.120	5.00	0.0	0.600	o	300	Pipe/Conduit
5.000	10.449	0.100	104.5	0.107	5.00	0.0	0.600	o	300	Pipe/Conduit
4.001	10.188	0.735	13.9	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit

Network Results Table

PN	US/IL (m)	Σ I.A. Area (ha)	Σ Base Flow (l/s)	Vel (m/s)	Cap (l/s)
1.000	58.880	0.024	0.0	0.92	64.8
1.001	58.780	0.115	0.0	0.89	63.1
1.002	58.690	0.131	0.0	0.90	63.6
1.003	58.630	0.150	0.0	4.67	330.0
2.000	59.010	0.025	0.0	0.91	64.6
2.001	58.875	0.050	0.0	0.89	63.2
2.002	58.790	0.095	0.0	0.90	63.8
2.003	58.770	0.095	0.0	0.91	64.1
2.004	58.665	0.123	0.0	2.93	207.5
3.000	58.775	0.159	0.0	2.05	144.7
3.001	58.670	0.159	0.0	3.11	219.5
1.004	58.000	0.432	0.0	0.68	48.4
1.005	57.990	0.432	0.0	3.12	220.5
4.000	58.355	0.120	0.0	1.08	76.2
5.000	58.335	0.107	0.0	1.54	108.7
4.001	58.235	0.227	0.0	4.24	300.1

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	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
	4.002	3.899	0.500	7.8	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit
	6.000	4.982	0.465	10.7	0.136	5.00	0.0	0.600	o	300	Pipe/Conduit
	6.001	19.078	0.450	42.4	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit
	4.003	6.805	0.140	48.6	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit
	4.004	6.218	0.160	38.9	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit
	7.000	21.086	0.530	39.8	0.117	5.00	0.0	0.600	o	300	Pipe/Conduit
	7.001	43.295	0.510	84.9	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit
	8.000	17.097	0.980	17.4	0.137	5.00	0.0	0.600	o	300	Pipe/Conduit
	7.002	3.312	0.500	6.6	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit
	9.000	17.852	0.180	99.2	0.169	5.00	0.0	0.600	o	300	Pipe/Conduit
	9.001	11.677	0.120	97.3	0.134	0.00	0.0	0.600	o	300	Pipe/Conduit
	9.002	7.316	0.540	13.5	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit
	7.003	5.423	0.740	7.3	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit
	7.004	7.986	0.080	99.8	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit

	PN	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Vel (m/s)	Cap (l/s)
	4.002	57.500	0.227	0.0	5.66	400.3
	6.000	57.915	0.136	0.0	4.83	341.4
	6.001	57.450	0.136	0.0	2.42	171.2
	4.003	57.000	0.363	0.0	2.26	159.8
	4.004	56.860	0.363	0.0	2.53	178.8
	7.000	58.640	0.117	0.0	2.50	176.7
	7.001	58.110	0.117	0.0	1.71	120.7
	8.000	58.580	0.137	0.0	3.78	267.3
	7.002	57.600	0.255	0.0	6.15	434.5
	9.000	57.940	0.169	0.0	1.58	111.6
	9.001	57.760	0.303	0.0	1.59	112.7
	9.002	57.640	0.303	0.0	4.29	303.5
	7.003	57.100	0.558	0.0	5.84	413.0
	7.004	56.360	0.558	0.0	1.57	111.2

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Existing Network Details 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
10.000	9.257	0.130	71.2	0.090	5.00	0.0	0.600	o	300	Pipe/Conduit
10.001	7.091	0.015	472.7	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit
10.002	8.169	0.165	49.5	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit

Network Results Table

PN	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Vel (m/s)	Cap (l/s)
10.000	58.260	0.090	0.0	1.87	131.9
10.001	58.130	0.090	0.0	0.72	50.6
10.002	58.115	0.090	0.0	2.24	158.3

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Manhole Schedules for Storm

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam., L*W (mm)	Pipe Out PN	Pipe Invert Level (m)	Pipe Out Diameter (mm)	Pipes In PN	Pipes In Invert Level (m)	Pipes In Diameter (mm)	Barrel Diameter (mm)
SW01	60.520	1.640	Open Manhole	1200	1.000	58.880	300				
SW02	60.520	1.740	Open Manhole	1200	1.001	58.780	300	1.000	58.780	300	
SW03	60.475	1.785	Open Manhole	1200	1.002	58.690	300	1.001	58.690	300	
SW04	60.390	1.760	Open Manhole	1200	1.003	58.630	300	1.002	58.630	300	
SW05	60.440	1.430	Open Manhole	1200	2.000	59.010	300				
SW06	60.435	1.560	Open Manhole	1200	2.001	58.875	300	2.000	58.875	300	
SW07	60.455	1.665	Open Manhole	1200	2.002	58.790	300	2.001	58.790	300	
SW08	60.630	1.860	Open Manhole	1200	2.003	58.770	300	2.002	58.770	300	
SW09	60.380	1.715	Open Manhole	1200	2.004	58.665	300	2.003	58.665	300	
SW10	60.275	1.500	Open Manhole	1200	3.000	58.775	300				
SW11	60.270	1.600	Open Manhole	1200	3.001	58.670	300	3.000	58.670	300	
SWUNIT 1/2 TANK	60.160	2.160	Open Manhole	1200	1.004	58.000	300	1.003	58.000	300	
								2.004	58.000	300	
								3.001	58.000	300	
SW12	60.325	2.335	Open Manhole	1200	1.005	57.990	300	1.004	57.990	300	
SW13	60.430	2.780	Open Manhole	0		OUTFALL		1.005	57.650	300	
SW22	60.055	1.700	Open Manhole	1800	4.000	58.355	300				
SW23	59.935	1.600	Open Manhole	1800	5.000	58.335	300				
SW24	60.054	1.819	Open Manhole	1200	4.001	58.235	300	4.000	58.235	300	
								5.000	58.235	300	
SW25	59.800	2.300	Open Manhole	1200	4.002	57.500	300	4.001	57.500	300	
SW26	59.615	1.700	Open Manhole	1200	6.000	57.915	300				
SW27	59.685	2.235	Open Manhole	1200	6.001	57.450	300	6.000	57.450	300	
SWUNIT 4 TANK1	59.570	2.570	Open Manhole	1200	4.003	57.000	300	4.002	57.000	300	
								6.001	57.000	300	
SW28	59.785	2.925	Open Manhole	1200	4.004	56.860	300	4.003	56.860	300	
SW	59.890	3.190	Open Manhole	0		OUTFALL		4.004	56.700	300	
SW14	60.440	1.800	Open Manhole	1800	7.000	58.640	300				
SW15	59.885	1.775	Open Manhole	1200	7.001	58.110	300	7.000	58.110	300	
SW16	60.380	1.800	Open Manhole	1200	8.000	58.580	300				
SW17	59.880	2.280	Open Manhole	1200	7.002	57.600	300	7.001	57.600	300	
								8.000	57.600	300	
SW18	59.740	1.800	Open Manhole	1200	9.000	57.940	300				
SW19	59.735	1.975	Open Manhole	1200	9.001	57.760	300	9.000	57.760	300	
SW20	59.735	2.095	Open Manhole	1200	9.002	57.640	300	9.001	57.640	300	
SWUNIT 3 TANK	59.480	2.380	Open Manhole	1200	7.003	57.100	300	7.002	57.100	300	
								9.002	57.100	300	
SW21	59.895	3.535	Open Manhole	1200	7.004	56.360	300	7.003	56.360	300	

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Manhole Schedules for Storm

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam., L*W (mm)	PN	Pipe Out Invert Level (m)	Diameter (mm)	PN	Pipes In Invert Level (m)	Diameter (mm)	PN
SW	60.000	3.720	Open Manhole	0		OUTFALL		7.004	56.280	300	
SW29	59.985	1.725	Open Manhole	1200	10.000	58.260	300				
SWUNIT 4 TANK2	59.925	1.795	Open Manhole	1200	10.001	58.130	300	10.000	58.130	300	
SW30	59.820	1.705	Open Manhole	1200	10.002	58.115	300	10.001	58.115	300	
SW	59.770	1.820	Open Manhole	0		OUTFALL		10.002	57.950	300	

	MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
	SW01	387798.709	397233.341	387798.709	397233.341	Required	
	SW02	387795.445	397204.462	387795.445	397204.462	Required	
	SW03	387822.883	397201.686	387822.883	397201.686	Required	
	SW04	387830.076	397218.284	387830.076	397218.284	Required	
	SW05	387888.669	397219.678	387888.669	397219.678	Required	
	SW06	387884.643	397180.376	387884.643	397180.376	Required	
	SW07	387858.821	397183.159	387858.821	397183.159	Required	
	SW08	387852.998	397184.632	387852.998	397184.632	Required	
	SW09	387856.192	397215.704	387856.192	397215.704	Required	
	SW10	387832.646	397196.029	387832.646	397196.029	Required	
	SW11	387833.247	397202.213	387833.247	397202.213	Required	

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MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
SWUNIT 1/2 TANK	387837.258	397219.057	387837.258	397219.057	Required	
SW12	387835.247	397223.820	387835.247	397223.820	Required	
SW13	387827.719	397228.204			No Entry	
SW22	387961.595	397223.640	387961.595	397223.640	Required	
SW23	387997.209	397219.960	387997.209	397219.960	Required	
SW24	387986.819	397221.066	387986.819	397221.066	Required	
SW25	387985.453	397210.970	387985.453	397210.970	Required	
SW26	387963.464	397205.819	387963.464	397205.819	Required	
SW27	387967.895	397208.095	387967.895	397208.095	Required	
SWUNIT 4 TANK1	387986.959	397207.373	387986.959	397207.373	Required	
SW28	387993.436	397209.461	387993.436	397209.461	Required	
SW	387996.540	397214.848			No Entry	
SW14	387955.864	397216.998	387955.864	397216.998	Required	
SW15	387945.493	397235.357	387945.493	397235.357	Required	
SW16	387893.011	397225.223	387893.011	397225.223	Required	

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Manhole Schedules for Storm

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
SW17	387902.397	397239.512	387902.397	397239.512	Required	
SW18	387937.330	397240.585	387937.330	397240.585	Required	
SW19	387919.557	397242.261	387919.557	397242.261	Required	
SW20	387907.933	397243.377	387907.933	397243.377	Required	
SWUNIT 3 TANK	387900.689	397242.350	387900.689	397242.350	Required	
SW21	387895.923	397239.764	387895.923	397239.764	Required	
SW	387890.483	397233.917			No Entry	
SW29	387986.533	397287.654	387986.533	397287.654	Required	
SWUNIT 4 TANK2	387995.734	397286.635	387995.734	397286.635	Required	
SW30	388000.693	397291.704	388000.693	397291.704	Required	
SW	388008.833	397292.384			No Entry	

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Area Summary for Storm

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
1.000	User	-	100	0.017	0.017	0.017
	User	-	100	0.006	0.006	0.024
1.001	User	-	100	0.014	0.014	0.014
	User	-	100	0.077	0.077	0.091
1.002	User	-	100	0.016	0.016	0.016
1.003	User	-	100	0.019	0.019	0.019
2.000	User	-	100	0.025	0.025	0.025
2.001	User	-	100	0.025	0.025	0.025
2.002	User	-	100	0.028	0.028	0.028
	User	-	100	0.017	0.017	0.044
2.003	-	-	100	0.000	0.000	0.000
2.004	User	-	100	0.028	0.028	0.028
3.000	User	-	100	0.159	0.159	0.159
3.001	-	-	100	0.000	0.000	0.000
1.004	-	-	100	0.000	0.000	0.000
1.005	-	-	100	0.000	0.000	0.000
4.000	User	-	100	0.120	0.120	0.120
5.000	User	-	100	0.107	0.107	0.107
4.001	-	-	100	0.000	0.000	0.000
4.002	-	-	100	0.000	0.000	0.000
6.000	User	-	100	0.136	0.136	0.136
6.001	-	-	100	0.000	0.000	0.000
4.003	-	-	100	0.000	0.000	0.000
4.004	-	-	100	0.000	0.000	0.000
7.000	User	-	100	0.117	0.117	0.117
7.001	-	-	100	0.000	0.000	0.000
8.000	User	-	100	0.137	0.137	0.137
7.002	-	-	100	0.000	0.000	0.000
9.000	User	-	100	0.169	0.169	0.169
9.001	User	-	100	0.134	0.134	0.134
9.002	-	-	100	0.000	0.000	0.000
7.003	-	-	100	0.000	0.000	0.000
7.004	-	-	100	0.000	0.000	0.000
10.000	User	-	100	0.090	0.090	0.090
10.001	-	-	100	0.000	0.000	0.000
10.002	-	-	100	0.000	0.000	0.000
				Total	Total	Total
				1.443	1.443	1.443

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)
1.005	SW13	60.430	57.650	0.000	0	0

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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)
------------------------	-----------------	-----------------	-----------------	------------------------	-------------	-----------

4.004	SW	59.890	56.700	0.000	0	0
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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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7.004	SW	60.000	56.280	0.000	0	0
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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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10.002	SW	59.770	57.950	0.000	0	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 Coeffiecient	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 Storage Structures	4
Number of Online Controls	4	Number of Time/Area Diagrams	0
Number of Offline Controls	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	0.358		

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		Micro Drainage
Date 25/04/2024	Designed by S. Jones	
File 24-04-23 - P05.MDX	Checked by N. Byrne	
Innovyze	Network 2020.1.3	
Online Controls for Storm		
Hydro-Brake® Optimum Manhole: SW12, DS/PN: 1.005, Volume (m³): 2.9		
Unit Reference MD-SHE-0152-1350-2000-1350 Design Head (m)2.000 Design Flow (l/s)13.5 Flush-Flo™Calculated ObjectiveMinimise upstream storage ApplicationSurface Sump AvailableYes Diameter (mm)152 Invert Level (m)57.990 Minimum Outlet Pipe Diameter (mm)225 Suggested Manhole Diameter (mm)1500		
Control Points Head (m)Flow (l/s) Design Point (Calculated)2.00013.5 Flush-Flo™0.58613.5 Kick-Flo®1.21710.7 Mean Flow over Head Range-11.8		
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) 0.1005.5 0.20011.3 0.30012.5 0.40013.2 0.50013.4 0.60013.5 0.80013.2 1.00012.5 Depth (m)Flow (l/s) 1.20010.9 1.40011.4 1.60012.1 1.80012.8 2.00013.5 2.20014.1 2.40014.7 2.60015.3 Depth (m)Flow (l/s) 3.00016.3 3.50017.6 4.00018.8 4.50019.8 5.00020.9 5.50021.8 6.00022.8 6.50023.7 Depth (m)Flow (l/s) 7.00024.5 7.50025.4 8.00026.2 8.50026.9 9.00027.7 9.50028.4		
Hydro-Brake® Optimum Manhole: SW28, DS/PN: 4.004, Volume (m³): 3.7		
Unit Reference MD-SHE-0145-1100-1500-1100 Design Head (m)1.500 Design Flow (l/s)11.0 Flush-Flo™Calculated ObjectiveMinimise upstream storage ApplicationSurface Sump AvailableYes Diameter (mm)145 Invert Level (m)56.860 Minimum Outlet Pipe Diameter (mm)225 Suggested Manhole Diameter (mm)1500		
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Date 25/04/2024	Designed by S. Jones	
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Innovyze	Network 2020.1.3	

Hydro-Brake® Optimum Manhole: SW28, DS/PN: 4.004, Volume (m³): 3.7

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.500	11.0
Flush-Flo™	0.442	11.0
Kick-Flo®	0.939	8.8
Mean Flow over Head Range	-	9.6

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)
0.100	5.2	1.200	9.9	3.000	15.3	7.000	22.9
0.200	9.9	1.400	10.6	3.500	16.4	7.500	23.7
0.300	10.7	1.600	11.3	4.000	17.5	8.000	24.4
0.400	11.0	1.800	12.0	4.500	18.5	8.500	25.2
0.500	10.9	2.000	12.6	5.000	19.5	9.000	25.9
0.600	10.8	2.200	13.2	5.500	20.4	9.500	26.5
0.800	10.1	2.400	13.7	6.000	21.3		
1.000	9.1	2.600	14.3	6.500	22.1		

Hydro-Brake® Optimum Manhole: SW21, DS/PN: 7.004, Volume (m³): 4.3

Unit Reference MD-SHE-0179-1800-1700-1800	
Design Head (m)	1.700
Design Flow (l/s)	18.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	179
Invert Level (m)	56.360
Minimum Outlet Pipe Diameter (mm)	225
Suggested Manhole Diameter (mm)	1500

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.700	18.0
Flush-Flo™	0.499	17.9
Kick-Flo®	1.071	14.4
Mean Flow over Head Range	-	15.6

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)
0.100	6.3	0.300	17.1	0.500	17.9	0.800	17.2
0.200	15.7	0.400	17.8	0.600	17.8	1.000	15.6

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Innovyze				Network 2020.1.3											
<u>Hydro-Brake® Optimum Manhole: SW21, DS/PN: 7.004, Volume (m³): 4.3</u>															
Depth (m)		Flow (l/s)		Depth (m)		Flow (l/s)		Depth (m)		Flow (l/s)		Depth (m)		Flow (l/s)	
1.200		15.2		2.400		21.2		5.000		30.1		8.000		37.8	
1.400		16.4		2.600		22.0		5.500		31.5		8.500		38.9	
1.600		17.5		3.000		23.6		6.000		32.9		9.000		40.0	
1.800		18.5		3.500		25.4		6.500		34.2		9.500		41.1	
2.000		19.4		4.000		27.0		7.000		35.4					
2.200		20.3		4.500		28.6		7.500		36.6					
<u>Hydro-Brake® Optimum Manhole: SW30, DS/PN: 10.002, Volume (m³): 2.3</u>															
Unit Reference MD-SHE-0079-3000-1200-3000															
Design Head (m)								1.200							
Design Flow (l/s)								3.0							
Flush-Flo™								Calculated							
Objective								Minimise upstream storage							
Application								Surface							
Sump Available								Yes							
Diameter (mm)								79							
Invert Level (m)								58.115							
Minimum Outlet Pipe Diameter (mm)								100							
Suggested Manhole Diameter (mm)								1200							
Control Points				Head (m)				Flow (l/s)							
Design Point (Calculated)				1.200				3.0							
Flush-Flo™				0.348				2.9							
Kick-Flo®				0.707				2.4							
Mean Flow over Head Range				-				2.6							
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)	
0.100		2.3		1.200		3.0		3.000		4.6		7.000		6.8	
0.200		2.8		1.400		3.2		3.500		4.9		7.500		7.0	
0.300		2.9		1.600		3.4		4.000		5.2		8.000		7.3	
0.400		2.9		1.800		3.6		4.500		5.5		8.500		7.5	
0.500		2.8		2.000		3.8		5.000		5.8		9.000		7.7	
0.600		2.7		2.200		4.0		5.500		6.1		9.500		7.9	
0.800		2.5		2.400		4.1		6.000		6.3					
1.000		2.8		2.600		4.3		6.500		6.6					
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Date 25/04/2024	Designed by S. Jones																																																	
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Innovyze	Network 2020.1.3																																																	
Storage Structures for Storm Tank or Pond Manhole: SWUNIT 1/2 TANK, DS/PN: 1.004 Invert Level (m) 58.000 <table><tr><th>Depth (m)</th><th>Area (m²)</th><th>Depth (m)</th><th>Area (m²)</th><th>Depth (m)</th><th>Area (m²)</th></tr><tr><td>0.000</td><td>150.0</td><td>1.000</td><td>150.0</td><td>1.001</td><td>0.0</td></tr></table> Tank or Pond Manhole: SWUNIT 4 TANK1, DS/PN: 4.003 Invert Level (m) 57.000 <table><tr><th>Depth (m)</th><th>Area (m²)</th><th>Depth (m)</th><th>Area (m²)</th><th>Depth (m)</th><th>Area (m²)</th></tr><tr><td>0.000</td><td>130.0</td><td>1.000</td><td>130.0</td><td>1.001</td><td>0.0</td></tr></table> Tank or Pond Manhole: SWUNIT 3 TANK, DS/PN: 7.003 Invert Level (m) 57.100 <table><tr><th>Depth (m)</th><th>Area (m²)</th><th>Depth (m)</th><th>Area (m²)</th><th>Depth (m)</th><th>Area (m²)</th></tr><tr><td>0.000</td><td>184.0</td><td>1.000</td><td>184.0</td><td>1.001</td><td>0.0</td></tr></table> Tank or Pond Manhole: SWUNIT 4 TANK2, DS/PN: 10.001 Invert Level (m) 58.130 <table><tr><th>Depth (m)</th><th>Area (m²)</th><th>Depth (m)</th><th>Area (m²)</th><th>Depth (m)</th><th>Area (m²)</th></tr><tr><td>0.000</td><td>50.0</td><td>0.500</td><td>50.0</td><td>0.501</td><td>0.0</td></tr></table>			Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	0.000	150.0	1.000	150.0	1.001	0.0	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	0.000	130.0	1.000	130.0	1.001	0.0	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	0.000	184.0	1.000	184.0	1.001	0.0	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	0.000	50.0	0.500	50.0	0.501	0.0
Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)																																													
0.000	150.0	1.000	150.0	1.001	0.0																																													
Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)																																													
0.000	130.0	1.000	130.0	1.001	0.0																																													
Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)																																													
0.000	184.0	1.000	184.0	1.001	0.0																																													
Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)																																													
0.000	50.0	0.500	50.0	0.501	0.0																																													
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1 year Return Period Summary of Critical Results by Maximum Level (Rank 1)
for Storm

PN	US/MH Name	Overflow Act.	Water	Surcharged	Flooded	Flow / Cap.	Half Drain	Pipe
			Level (m)	Depth (m)	Volume (m³)		Overflow (l/s)	Time (mins)
1.000	SW01		58.913	-0.267	0.000	0.03		1.6
1.001	SW02		58.866	-0.214	0.000	0.18		10.2
1.002	SW03		58.784	-0.206	0.000	0.21		11.8
1.003	SW04		58.681	-0.249	0.000	0.07		13.5
2.000	SW05		59.053	-0.257	0.000	0.05		2.9
2.001	SW06		58.939	-0.236	0.000	0.09		5.3
2.002	SW07		58.885	-0.205	0.000	0.22		9.6
2.003	SW08		58.851	-0.219	0.000	0.16		9.5
2.004	SW09		58.716	-0.249	0.000	0.07		12.0
3.000	SW10		58.874	-0.201	0.000	0.23		19.0
3.001	SW11		58.734	-0.236	0.000	0.10		18.8
1.004	SWUNIT 1/2 TANK		58.163	-0.137	0.000	0.23		10.5
1.005	SW12		58.158	-0.132	0.000	0.07		10.5
4.000	SW22		58.449	-0.206	0.000	0.21		14.2
5.000	SW23		58.416	-0.219	0.000	0.16		12.8
4.001	SW24		58.306	-0.229	0.000	0.13		27.0
4.002	SW25		57.578	-0.222	0.000	0.15		27.2
6.000	SW26		57.977	-0.238	0.000	0.10		16.4
6.001	SW27		57.517	-0.233	0.000	0.11		16.7

PN	US/MH	Level
	Name	Status Exceeded
1.000	SW01	OK
1.001	SW02	OK
1.002	SW03	OK
1.003	SW04	OK
2.000	SW05	OK
2.001	SW06	OK
2.002	SW07	OK
2.003	SW08	OK
2.004	SW09	OK
3.000	SW10	OK
3.001	SW11	OK
1.004	SWUNIT 1/2 TANK	OK
1.005	SW12	OK
4.000	SW22	OK
5.000	SW23	OK
4.001	SW24	OK
4.002	SW25	OK
6.000	SW26	OK
6.001	SW27	OK

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Date	25/04/2024
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1 year Return Period Summary of Critical Results by Maximum Level (Rank 1)
for Storm

US/MH		Return	Climate	First (X)	First (Y)	First (Z)	Overflow
PN	Name	Storm	Period	Change	Surcharge	Flood	Overflow Act.
4.003	SWUNIT 4	TANK1	30	Winter	1	+0%	30/15 Winter
4.004		SW28	30	Winter	1	+0%	2/30 Winter
7.000		SW14	15	Winter	1	+0%	
7.001		SW15	15	Winter	1	+0%	
8.000		SW16	15	Winter	1	+0%	
7.002		SW17	15	Winter	1	+0%	100/30 Winter
9.000		SW18	15	Winter	1	+0%	100/15 Summer
9.001		SW19	15	Winter	1	+0%	100/15 Summer
9.002		SW20	15	Winter	1	+0%	100/30 Winter
7.003	SWUNIT 3	TANK	30	Winter	1	+0%	30/15 Winter
7.004		SW21	30	Winter	1	+0%	1/15 Summer
10.000		SW29	15	Winter	1	+0%	100/30 Winter
10.001	SWUNIT 4	TANK2	60	Winter	1	+0%	100/15 Summer
10.002		SW30	60	Winter	1	+0%	100/15 Summer

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain	Pipe
							Time (mins)	Flow (l/s)
4.003	SWUNIT 4	TANK1	57.124	-0.176	0.000	0.12		11.7
4.004		SW28	57.119	-0.041	0.000	0.10		10.5
7.000		SW14	58.701	-0.239	0.000	0.09		14.1
7.001		SW15	58.181	-0.229	0.000	0.12		14.0
8.000		SW16	58.633	-0.247	0.000	0.07		16.5
7.002		SW17	57.684	-0.216	0.000	0.17		30.3
9.000		SW18	58.034	-0.206	0.000	0.21		20.2
9.001		SW19	57.891	-0.169	0.000	0.39		33.8
9.002		SW20	57.727	-0.213	0.000	0.18		34.0
7.003	SWUNIT 3	TANK	57.222	-0.178	0.000	0.13		27.6
7.004		SW21	57.245	0.585	0.000	0.25		17.8
10.000		SW29	58.329	-0.231	0.000	0.12		10.8
10.001	SWUNIT 4	TANK2	58.223	-0.207	0.000	0.06		2.4
10.002		SW30	58.221	-0.194	0.000	0.02		2.4

PN	US/MH	Status	Level
	Name		Exceeded
4.003	SWUNIT 4 TANK1		OK
4.004	SW28		OK
7.000	SW14		OK
7.001	SW15		OK
8.000	SW16		OK
7.002	SW17		OK
9.000	SW18		OK
9.001	SW19		OK

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

PN	US/MH Name	Status	Level Exceeded
9.002	SW20	OK	
7.003	SWUNIT 3 TANK	OK	
7.004	SW21	SURCHARGED	
10.000	SW29	OK	
10.001	SWUNIT 4 TANK2	OK	
10.002	SW30	OK	

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Network 2020.1.3

for Storm

Sanitation Officer			
Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m ³ /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 Storage Structures	4
Number of Online Controls	4	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

Rainfall Model	FSR	Ratio R	0.358
Region	England and Wales	Cv (Summer)	0.750
M5-60 (mm)	18.000	Cv (Winter)	0.840

Margin for Flood Risk Warning (mm)	300.0
Analysis Timestep 2.5 Second Increment (Extended)	
DTS Status	OFF
DVD Status	ON
Inertia 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, 40

US/MH		Return	Climate	First (X)	First (Y)	First (Z)
PN	Name	Storm	Period	Change	Surcharge	Flood Overflow
1.000	SW01	30 Winter	2	+0%		
1.001	SW02	15 Winter	2	+0%		
1.002	SW03	15 Winter	2	+0%		
1.003	SW04	15 Winter	2	+0%	100/120 Winter	
2.000	SW05	15 Winter	2	+0%		
2.001	SW06	15 Winter	2	+0%		
2.002	SW07	15 Winter	2	+0%		
2.003	SW08	15 Winter	2	+0%		
2.004	SW09	15 Winter	2	+0%	100/120 Winter	
3.000	SW10	15 Winter	2	+0%	100/15 Winter	
3.001	SW11	15 Winter	2	+0%	100/120 Winter	
1.004	SWUNIT 1/2 TANK	60 Winter	2	+0%	30/15 Winter	
1.005	SW12	60 Winter	2	+0%	30/15 Winter	
4.000	SW22	15 Winter	2	+0%		
5.000	SW23	15 Winter	2	+0%		
4.001	SW24	15 Winter	2	+0%		
4.002	SW25	15 Winter	2	+0%	100/60 Winter	
6.000	SW26	15 Winter	2	+0%		
6.001	SW27	15 Winter	2	+0%	100/30 Winter	

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

PN	US/MH Name	Overflow Act.	Water	Surcharged	Flooded	Flow / Cap.	Overflow (l/s)	Half Drain	Pipe
			Level (m)	Depth (m)	Volume (m³)			Time (mins)	Flow (l/s)
1.000	SW01	58.918	-0.262	0.000	0.03				2.0
1.001	SW02	58.879	-0.201	0.000	0.23				13.3
1.002	SW03	58.798	-0.192	0.000	0.28				15.3
1.003	SW04	58.690	-0.240	0.000	0.09				17.6
2.000	SW05	59.060	-0.250	0.000	0.06				3.8
2.001	SW06	58.949	-0.226	0.000	0.12				6.9
2.002	SW07	58.898	-0.192	0.000	0.28				12.4
2.003	SW08	58.863	-0.207	0.000	0.21				12.2
2.004	SW09	58.724	-0.241	0.000	0.09				15.5
3.000	SW10	58.889	-0.186	0.000	0.30				24.6
3.001	SW11	58.743	-0.227	0.000	0.13				24.4
1.004	SWUNIT 1/2 TANK	58.210	-0.090	0.000	0.25				11.5
1.005	SW12	58.206	-0.084	0.000	0.08				11.5
4.000	SW22	58.462	-0.193	0.000	0.27				18.4
5.000	SW23	58.428	-0.207	0.000	0.21				16.6
4.001	SW24	58.316	-0.219	0.000	0.16				35.0
4.002	SW25	57.591	-0.209	0.000	0.20				35.1
6.000	SW26	57.985	-0.230	0.000	0.12				21.2
6.001	SW27	57.526	-0.224	0.000	0.14				21.0

PN	US/MH	Level	
	Name	Status	Exceeded
1.000	SW01	OK	
1.001	SW02	OK	
1.002	SW03	OK	
1.003	SW04	OK	
2.000	SW05	OK	
2.001	SW06	OK	
2.002	SW07	OK	
2.003	SW08	OK	
2.004	SW09	OK	
3.000	SW10	OK	
3.001	SW11	OK	
1.004	SWUNIT 1/2 TANK	OK	
1.005	SW12	OK	
4.000	SW22	OK	
5.000	SW23	OK	
4.001	SW24	OK	
4.002	SW25	OK	
6.000	SW26	OK	
6.001	SW27	OK	

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for Storm

US/MH		Return	Climate	First (X)	First (Y)	First (Z)	Overflow
PN	Name	Storm	Period	Change	Surcharge	Flood	Overflow Act.
4.003	SWUNIT 4	TANK1	60	Winter	2	+0%	30/15 Winter
4.004		SW28	60	Winter	2	+0%	2/30 Winter
7.000		SW14	15	Winter	2	+0%	
7.001		SW15	15	Winter	2	+0%	
8.000		SW16	15	Winter	2	+0%	
7.002		SW17	15	Winter	2	+0%	100/30 Winter
9.000		SW18	15	Winter	2	+0%	100/15 Summer
9.001		SW19	15	Winter	2	+0%	100/15 Summer
9.002		SW20	15	Winter	2	+0%	100/30 Winter
7.003	SWUNIT 3	TANK	30	Winter	2	+0%	30/15 Winter
7.004		SW21	30	Winter	2	+0%	1/15 Summer
10.000		SW29	15	Winter	2	+0%	100/30 Winter
10.001	SWUNIT 4	TANK2	60	Winter	2	+0%	100/15 Summer
10.002		SW30	60	Winter	2	+0%	100/15 Summer

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain	Pipe
							Time (mins)	Flow (l/s)
4.003	SWUNIT 4	TANK1	57.172	-0.128	0.000	0.12		10.9
4.004		SW28	57.167	0.007	0.000	0.11		10.7
7.000		SW14	58.709	-0.231	0.000	0.12		18.2
7.001		SW15	58.191	-0.219	0.000	0.16		18.1
8.000		SW16	58.642	-0.238	0.000	0.09		21.4
7.002		SW17	57.696	-0.204	0.000	0.22		39.1
9.000		SW18	58.047	-0.193	0.000	0.27		26.2
9.001		SW19	57.913	-0.147	0.000	0.50		43.7
9.002		SW20	57.740	-0.200	0.000	0.24		44.0
7.003	SWUNIT 3	TANK	57.274	-0.126	0.000	0.11		24.4
7.004		SW21	57.306	0.646	0.000	0.25		17.8
10.000		SW29	58.339	-0.221	0.000	0.15		14.0
10.001	SWUNIT 4	TANK2	58.252	-0.178	0.000	0.07		2.6
10.002		SW30	58.250	-0.165	0.000	0.02		2.5

	US/MH	Level
PN	Name	Status Exceeded
4.003	SWUNIT 4 TANK1	OK
4.004	SW28	SURCHARGED
7.000	SW14	OK
7.001	SW15	OK
8.000	SW16	OK
7.002	SW17	OK
9.000	SW18	OK
9.001	SW19	OK

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

PN	US/MH Name	Status	Level Exceeded
9.002	SW20	OK	
7.003	SWUNIT 3 TANK	OK	
7.004	SW21	SURCHARGED	
10.000	SW29	OK	
10.001	SWUNIT 4 TANK2	OK	
10.002	SW30	OK	

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

PN	US/MH Name	Overflow Act.	Water	Surcharged	Flooded	Flow / Cap.	Overflow (l/s)	Half Drain	Pipe
			Level (m)	Depth (m)	Volume (m³)			Time (mins)	Flow (l/s)
1.000	SW01		58.949	-0.231	0.000	0.06			3.7
1.001	SW02		58.939	-0.141	0.000	0.53			30.0
1.002	SW03		58.862	-0.128	0.000	0.62			34.0
1.003	SW04		58.720	-0.210	0.000	0.20			39.0
2.000	SW05		59.080	-0.230	0.000	0.12			7.2
2.001	SW06		58.994	-0.181	0.000	0.25			14.0
2.002	SW07		58.958	-0.132	0.000	0.59			26.4
2.003	SW08		58.910	-0.160	0.000	0.44			25.8
2.004	SW09		58.752	-0.213	0.000	0.18			32.8
3.000	SW10		58.940	-0.135	0.000	0.57			46.6
3.001	SW11		58.772	-0.198	0.000	0.25			46.1
1.004	SWUNIT 1/2 TANK		58.451	0.151	0.000	0.31			14.2
1.005	SW12		58.458	0.168	0.000	0.09			13.3
4.000	SW22		58.509	-0.146	0.000	0.51			34.7
5.000	SW23		58.467	-0.168	0.000	0.40			31.3
4.001	SW24		58.350	-0.185	0.000	0.31			66.2
4.002	SW25		57.627	-0.173	0.000	0.38			66.5
6.000	SW26		58.014	-0.201	0.000	0.23			40.1
6.001	SW27		57.556	-0.194	0.000	0.27			39.7

PN	US/MH	Status	Level
	Name		Exceeded
1.000	SW01	OK	
1.001	SW02	OK	
1.002	SW03	OK	
1.003	SW04	OK	
2.000	SW05	OK	
2.001	SW06	OK	
2.002	SW07	OK	
2.003	SW08	OK	
2.004	SW09	OK	
3.000	SW10	OK	
3.001	SW11	OK	
1.004	SWUNIT 1/2 TANK	SURCHARGED	
1.005	SW12	SURCHARGED	
4.000	SW22	OK	
5.000	SW23	OK	
4.001	SW24	OK	
4.002	SW25	OK	
6.000	SW26	OK	
6.001	SW27	OK	

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

PN	US/MH Name	Status	Level Exceeded
9.002	SW20	OK	
7.003	SWUNIT 3 TANK	SURCHARGED	
7.004	SW21	SURCHARGED	
10.000	SW29	OK	
10.001	SWUNIT 4 TANK2	OK	
10.002	SW30	OK	

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

PN	US/MH Name	Overflow Act.	Water	Surcharged	Flooded	Flow / Cap.	Half Drain	Pipe
			Level (m)	Depth (m)	Volume (m³)		Overflow (l/s)	Time (mins)
1.000	SW01	59.057	-0.123	0.000	0.12			7.2
1.001	SW02	59.050	-0.030	0.000	0.90			51.2
1.002	SW03	58.987	-0.003	0.000	1.00			54.8
1.003	SW04	58.977	0.047	0.000	0.14			27.1
2.000	SW05	59.117	-0.193	0.000	0.21			12.9
2.001	SW06	59.077	-0.098	0.000	0.43			24.6
2.002	SW07	59.045	-0.045	0.000	1.00			44.4
2.003	SW08	58.982	-0.088	0.000	0.30			17.4
2.004	SW09	58.978	0.013	0.000	0.12			22.5
3.000	SW10	59.078	0.003	0.000	1.01			82.2
3.001	SW11	58.979	0.009	0.000	0.16			29.3
1.004	SWUNIT 1/2 TANK	58.975	0.675	0.000	0.42			19.5
1.005		SW12	58.987	0.697	0.000	0.09		13.5
4.000	SW22	58.586	-0.069	0.000	0.92			62.7
5.000	SW23	58.526	-0.109	0.000	0.72			56.6
4.001	SW24	58.397	-0.138	0.000	0.56			119.6
4.002	SW25	57.968	0.168	0.000	0.24			41.8
6.000	SW26	58.052	-0.163	0.000	0.42			72.6
6.001	SW27	57.970	0.220	0.000	0.17			25.5

PN	US/MH	Status	Level
	Name		Exceeded
1.000	SW01	OK	
1.001	SW02	OK	
1.002	SW03	OK	
1.003	SW04	SURCHARGED	
2.000	SW05	OK	
2.001	SW06	OK	
2.002	SW07	OK	
2.003	SW08	OK	
2.004	SW09	SURCHARGED	
3.000	SW10	SURCHARGED	
3.001	SW11	SURCHARGED	
1.004	SWUNIT 1/2 TANK	SURCHARGED	
1.005	SW12	SURCHARGED	
4.000	SW22	OK	
5.000	SW23	OK	
4.001	SW24	OK	
4.002	SW25	SURCHARGED	
6.000	SW26	OK	
6.001	SW27	SURCHARGED	

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<u>100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm</u>									
PN		US/MH Name		Storm		Return Climate Period Change		First (X) First (Y) First (Z) Surge Flood Overflow	
4.003		SWUNIT 4 TANK1		120 Winter		100 +40%		30/15 Winter	
4.004		SW28		120 Winter		100 +40%		2/30 Winter	
7.000		SW14		15 Winter		100 +40%			
7.001		SW15		15 Winter		100 +40%			
8.000		SW16		15 Winter		100 +40%			
7.002		SW17		120 Winter		100 +40%		100/30 Winter	
9.000		SW18		15 Winter		100 +40%		100/15 Summer	
9.001		SW19		15 Winter		100 +40%		100/15 Summer	
9.002		SW20		120 Winter		100 +40%		100/30 Winter	
7.003		SWUNIT 3 TANK		120 Winter		100 +40%		30/15 Winter	
7.004		SW21		120 Winter		100 +40%		1/15 Summer	
10.000		SW29		120 Winter		100 +40%		100/30 Winter	
10.001		SWUNIT 4 TANK2		120 Winter		100 +40%		100/15 Summer	
10.002		SW30		120 Winter		100 +40%		100/15 Summer	
PN		US/MH Name		Overflow Act.		Water Level (m)		Surcharged Depth (m)	
								Flooded Volume (m³)	
								Flow / Cap. (l/s)	
								Half Drain Time (mins)	
								Pipe Flow (l/s)	
4.003		SWUNIT 4 TANK1				57.967		0.667	
4.004		SW28				57.981		0.821	
7.000		SW14				58.773		-0.167	
7.001		SW15				58.271		-0.139	
8.000		SW16				58.697		-0.183	
7.002		SW17				58.078		0.178	
9.000		SW18				58.529		0.289	
9.001		SW19				58.369		0.309	
9.002		SW20				58.081		0.141	
7.003		SWUNIT 3 TANK				58.076		0.676	
7.004		SW21				58.091		1.431	
10.000		SW29				59.329		0.769	
10.001		SWUNIT 4 TANK2				59.327		0.897	
10.002		SW30				59.326		0.911	
PN		US/MH Name		Status		Level Exceeded			

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100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm																														
<table><tr><th>PN</th><th>US/MH Name</th><th>Status</th><th>Level Exceeded</th></tr><tr><td>9.002</td><td>SW20</td><td>SURCHARGED</td><td></td></tr><tr><td>7.003</td><td>SWUNIT 3 TANK</td><td>SURCHARGED</td><td></td></tr><tr><td>7.004</td><td>SW21</td><td>SURCHARGED</td><td></td></tr><tr><td>10.000</td><td>SW29</td><td>SURCHARGED</td><td></td></tr><tr><td>10.001</td><td>SWUNIT 4 TANK2</td><td>SURCHARGED</td><td></td></tr><tr><td>10.002</td><td>SW30</td><td>SURCHARGED</td><td></td></tr></table>			PN	US/MH Name	Status	Level Exceeded	9.002	SW20	SURCHARGED		7.003	SWUNIT 3 TANK	SURCHARGED		7.004	SW21	SURCHARGED		10.000	SW29	SURCHARGED		10.001	SWUNIT 4 TANK2	SURCHARGED		10.002	SW30	SURCHARGED	
PN	US/MH Name	Status	Level Exceeded																											
9.002	SW20	SURCHARGED																												
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10.001	SWUNIT 4 TANK2	SURCHARGED																												
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