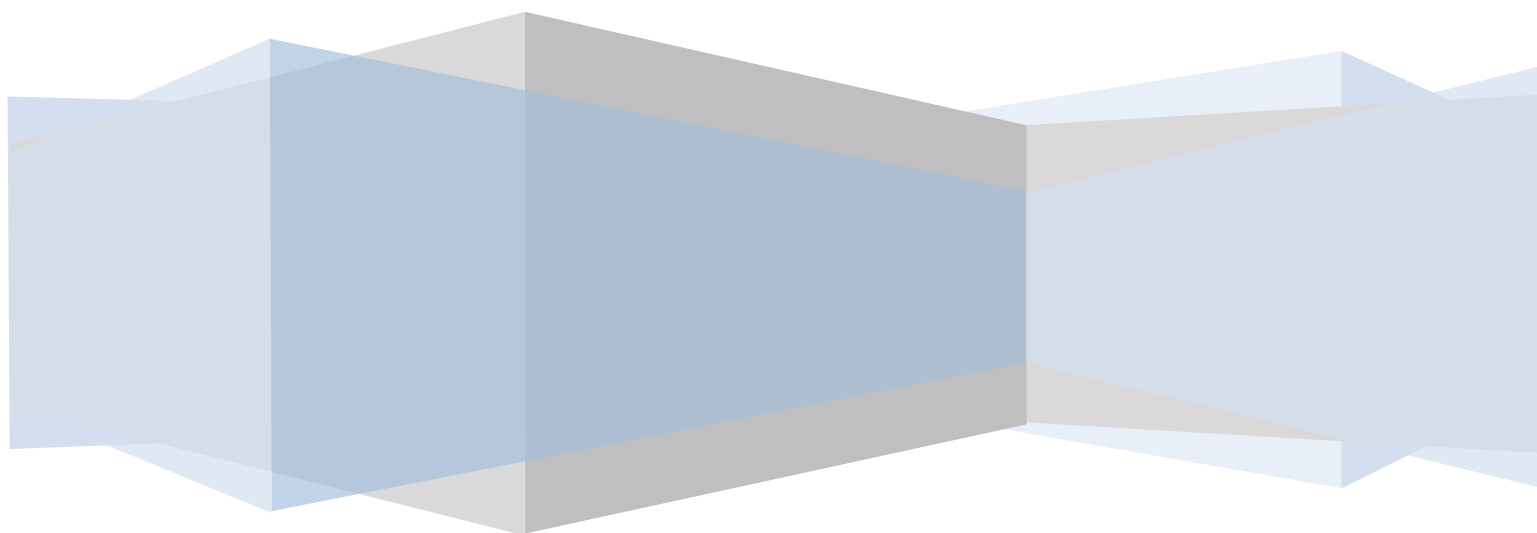


Proposed Commercial Development at Knowsley East Hub, Admin Road, Knowsley



1132-22-REP001-P2

Dated: November 2022



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Issue No.

P1

P2

Date

21 Nov 2022

26 Nov 2022

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Table of contents

1.0 Surface Water	1
1.1 National Guidelines	1
1.2 Proposed Surface Water Design	2
1.3 Proposed Surface Water Maintenance Strategy	3
2.0 Proposed Foul Water Design	3
3.0 Appendices	
Appendix A – Proposed Site Layout	
Appendix B – Flood Risk Maps	
1. Flood Map For Planning	
2. Flood Map Surface Water Extent	
3. Flood Map Rivers & Sea Extent	
4. Flood Map Reservoir Extent	
Appendix C – UK Suds Greenfield Calculation	
Appendix D – Proposed Drainage Strategy Layout	
Appendix E – Drainage System Sizing 1 in 30 + 0%	
Appendix F – Drainage Calculations 1 in 30 + 0%	
Appendix G – Drainage Calculations 1 in 100 + 40%	
Appendix H – United Utilities Sewer Records	
Appendix I – United Utilities Pre App Response	
Appendix J – Site Investigation Extract Showing Infiltration Test Results	
Appendix K – Site Investigation Extract Showing Infiltration Test Locations	

1.0 Surface Water

1.1 National Guidelines

The aim of the surface water drainage proposal is to focus on the capture and management of all surface water within the site boundary, to prevent any likelihood of flooding to the proposed development, adjacent sites and infrastructure.

General national guidance for the design of the surface water drainage systems include the following:

- National Planning Policy Framework (NPPF)
- Non-Statutory Technical Standards for Sustainable Drainage Systems, DEFRA, March 2015
- Written Ministerial Statement regarding Sustainable Drainage (HCWS161)
- The SUDS Manual – C753, CIRIA Industry Best Practice Guidance
- Flood Risk Planning Practice Guidance
- Building Regulations Part H

The NPPF recognises that flood risk and other environmental damage can be managed by minimising changes to the volume and rate of surface runoff from development sites, and recommends that priority is given to the use of sustainable Drainage Systems (SUDS) in new developments.

Building Regulations 2010 Requirement H3 stipulates that rainwater from roofs and paved areas is carried away from the surface to discharge to one of the following, listed in order of hierarchy:

- I. Discharge into the ground;
- II. Discharge to a surface water body;
- III. Discharge to a surface water sewer;
- IV. Discharge to a combined sewer where there are absolutely no other options and only where agreed in advance with the relevant sewage undertaker.

The site details are as follows:

Knowsley East Hub
Admin Road
Knowsley
L33 7TX

OS Grid Reference:

343300, 397750

The proposed development is located on a brownfield site, adjacent to the junction of Gale Road and South Boundary Road, Knowsley. The proposal includes the erection of a single industrial building with associated ancillary parking and service yards. The proposed site plan layout is included in Appendix A.

The site is located in a flood zone 1 as defined on the flood maps for planning website with a copy of the extract shown in appendix B

Discharge into the ground

A review of the site investigation infiltration results and below ground geology in addition to reviewing the proposals for the adjacent sites have indicated that infiltration is unlikely to be feasible due to the ground conditions being dense sandstone and having a poor infiltration rate when tested on site.

The Infiltration tests carried out on site showed potential for infiltration being present in the South West corner of the site, test reference SA103.

As this location is within the footprint of the previous building and at a depth of 2m, it is possible that the test result may be as a result of existing drainage being present allowing the infiltration rate to be recorded as having good soakage potential.

Further investigation will be carried out to establish if the use of soakaways can be accommodated on site however it is deemed unlikely as a result of the other test results within the same geological material recording insufficient fall in water level to allow reliable infiltration test results to be calculated.

Discharge into a surface water body

The nearest watercourse to the site is Knowsley Brook, which is approximately 800m to the south east of the site, and would require significant excavation of public roads and land to enable a connection to this feature to be made available.

Discharge into a surface water sewer

This is the most viable option for this scheme due to the availability of existing 600mm diameter public surface water sewers located within South Boundary Road with a proposed connection to this sewer via an existing manhole ref 3603 located on the South Boundary Road Entrance to the site.

1.2 Proposed Surface Water Design

A surface water connection to the adjacent existing surface water sewer is proposed for the site with a total 4.82 l/s (greenfield equivalent) discharge run-off rate for the 100 year plus climate change event. Qbar is typically specified by Lead Local Flood Authorities (LLFA) as the 100 year plus climate change event discharge rate. This is 4.82 l/s for this site and is marginally below the widely accepted practical minimum for maintenance purposes of 5 l/s.

The surface water runoff will be attenuated in various SuDS features across the site with a controlled discharge.

The following Sustainable Drainage Systems (SuDS) have been proposed:

- Below ground storage within the drainage pipes and manholes, including offline attenuation if required in the form of soakaway crates or similar.

As the storage provided within the above features will be limited, the remaining storage necessary to meet the site surface water discharge limits will be accommodated by the provision of underground cellular attenuation tank in addition to the drainage pipe and manhole network on site.

A Section 106 Agreement will be required for the new connection for the surface water drainage.

The Surface Water Drainage Layout is included in Appendix D.

The new SUDS Manual (CIRIA C753, November 2015) introduced a slightly different approach compared to the previous version for the water quality management of surface water. The manual describes risks posed by the surface water runoff to the receiving environment as a function of:

The pollution hazard at a particular site (i.e. the pollution source);

The effectiveness of the SUDS treatment components in reducing levels of pollutants to environmentally acceptable levels (i.e. the pollutant pathway); and, The sensitivity of the receiving environment (the environmental receptor).

The use of full retention separators will be used to prevent any contamination from HGV use leaving the site.

1.3 Surface Water Maintenance Strategy

The proposed maintenance of the on-site surface water drainage including the oversized pipes used for attenuation will be the responsibility of the building owner/occupiers.

The proposed strategy will require periodic inspection of the system and removal of any silt and debris to ensure the system volume remains effective.

The proposal will be to carry out an inspection typically at 12-24 month intervals.

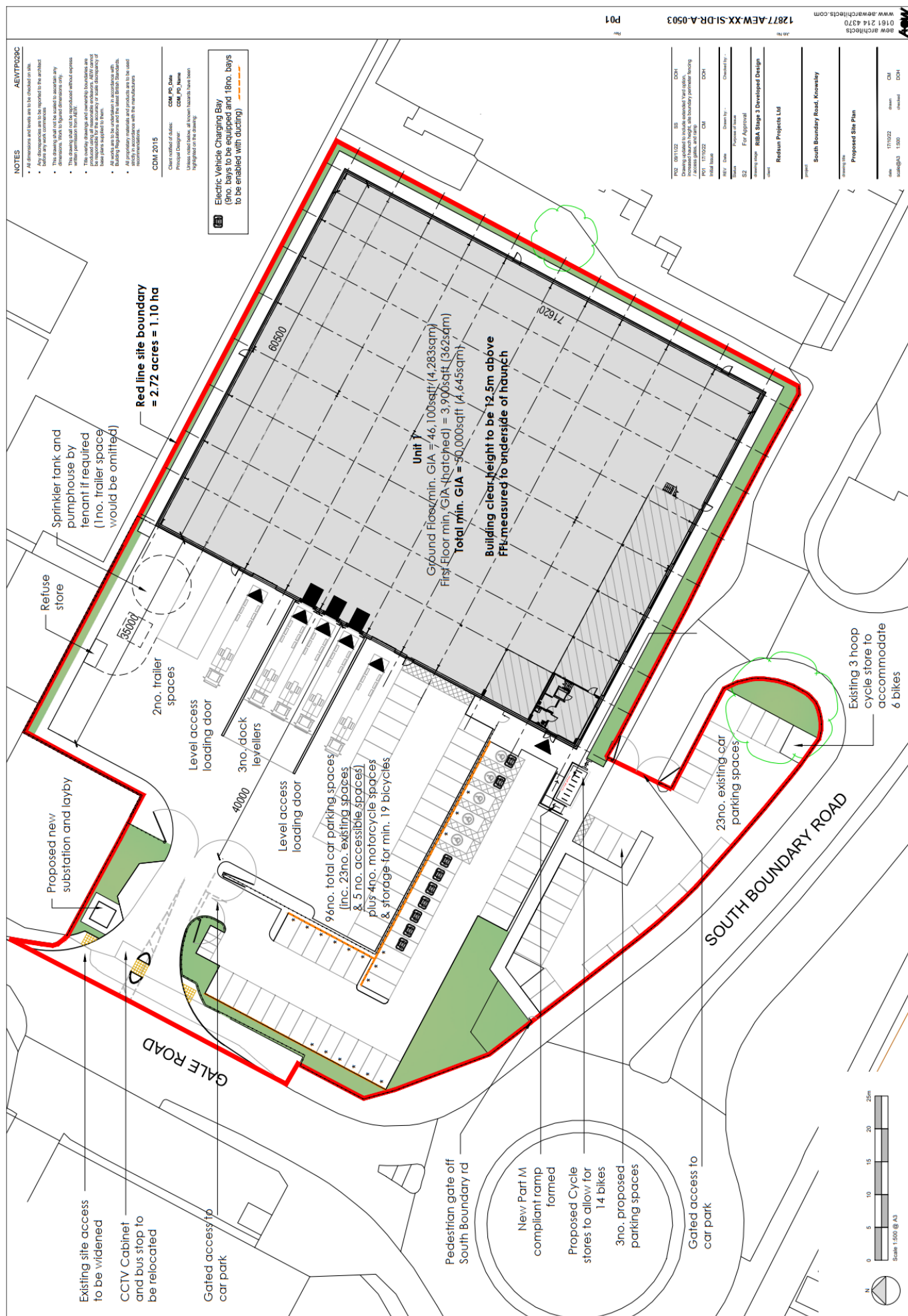
2.0 Foul Water

The proposal for the foul water is to construct a gravity connection to the existing foul water sewer running along the southern boundary of the site which is part of the public sewer network

A Section 106 Agreement will be required for the new connection.

Completion of the foul water drainage network is reliant upon receipt of a finalised and frozen above ground foul drainage design from the project M&E engineering consultant.

The Foul Water Drainage Layout is included in Appendix D.





Flood map for planning

Your reference
Knowsley East Hub

Location (easting/northing)
343314/397761

Created
21 Nov 2022 11:04

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

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

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

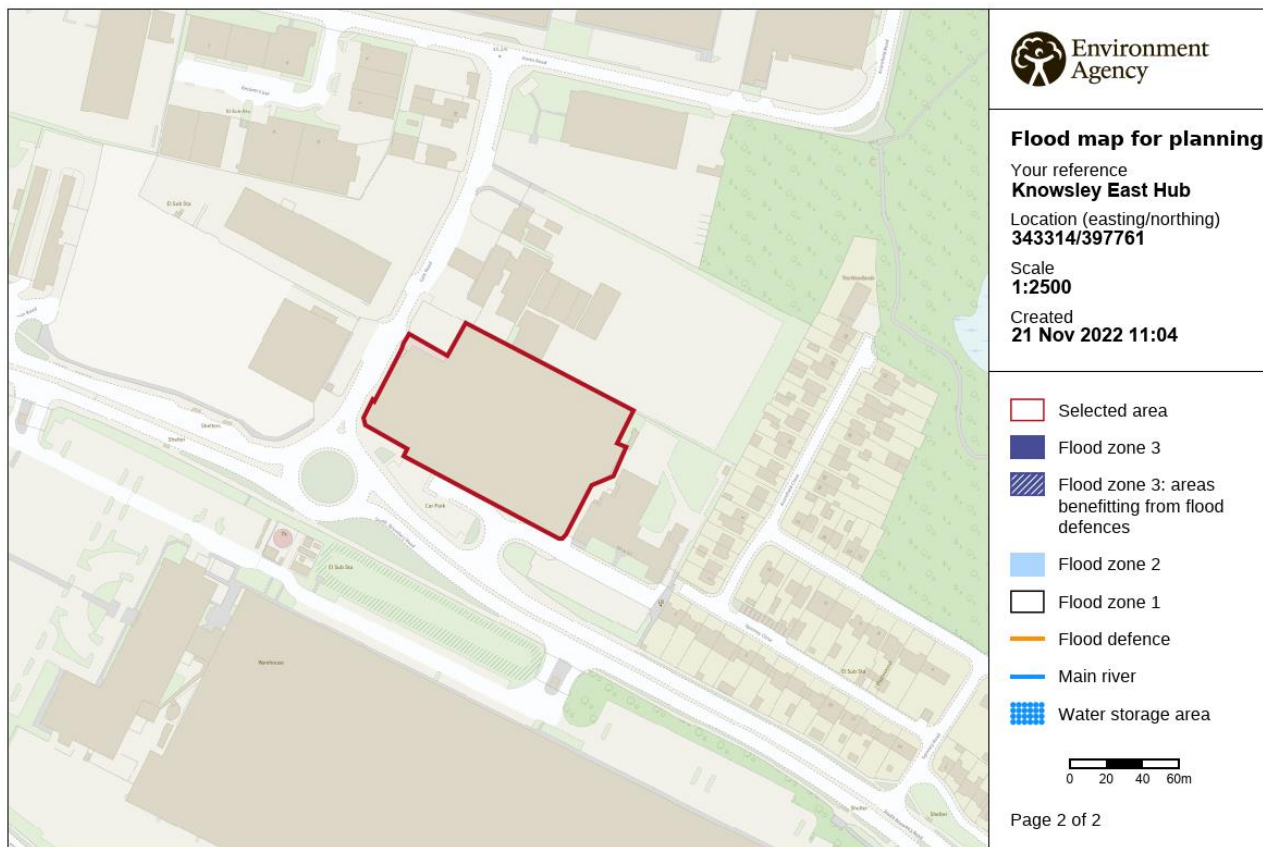
Notes

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

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

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

Use of the address and mapping data is subject to Ordnance Survey public viewing terms under Crown copyright and database rights 2021 OS 100024198. <https://flood-map-for-planning.service.gov.uk/os-terms>



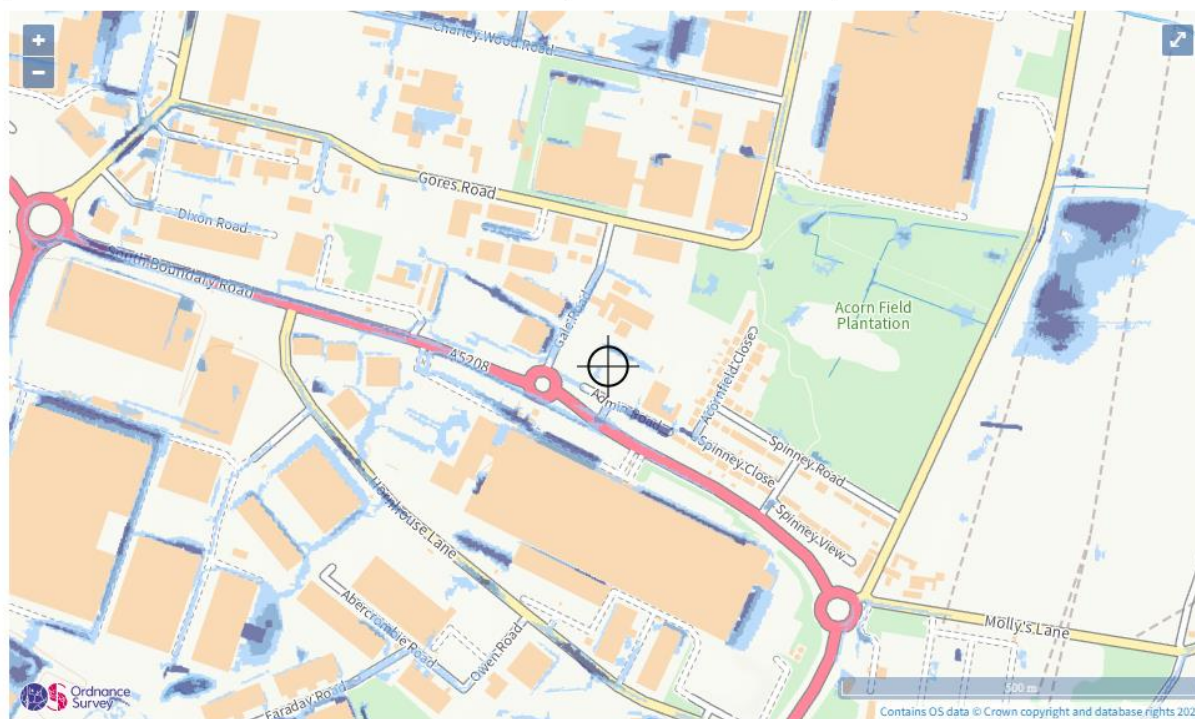
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Flood risk

Extent of flooding

Location

Enter a place or postcode



Extent of flooding from surface water

High
 Medium
 Low
 Very low

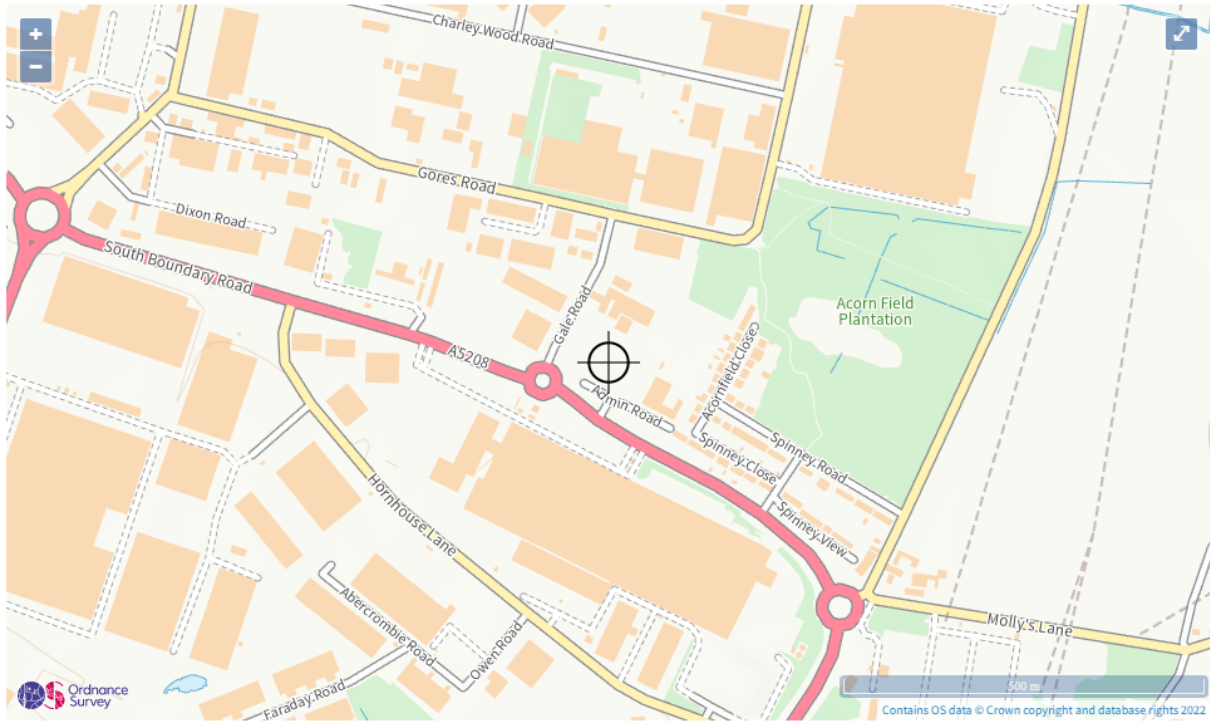
+
-
 Location you selected

Flood risk

Extent of flooding

Location

Enter a place or postcode



Extent of flooding from rivers or the sea

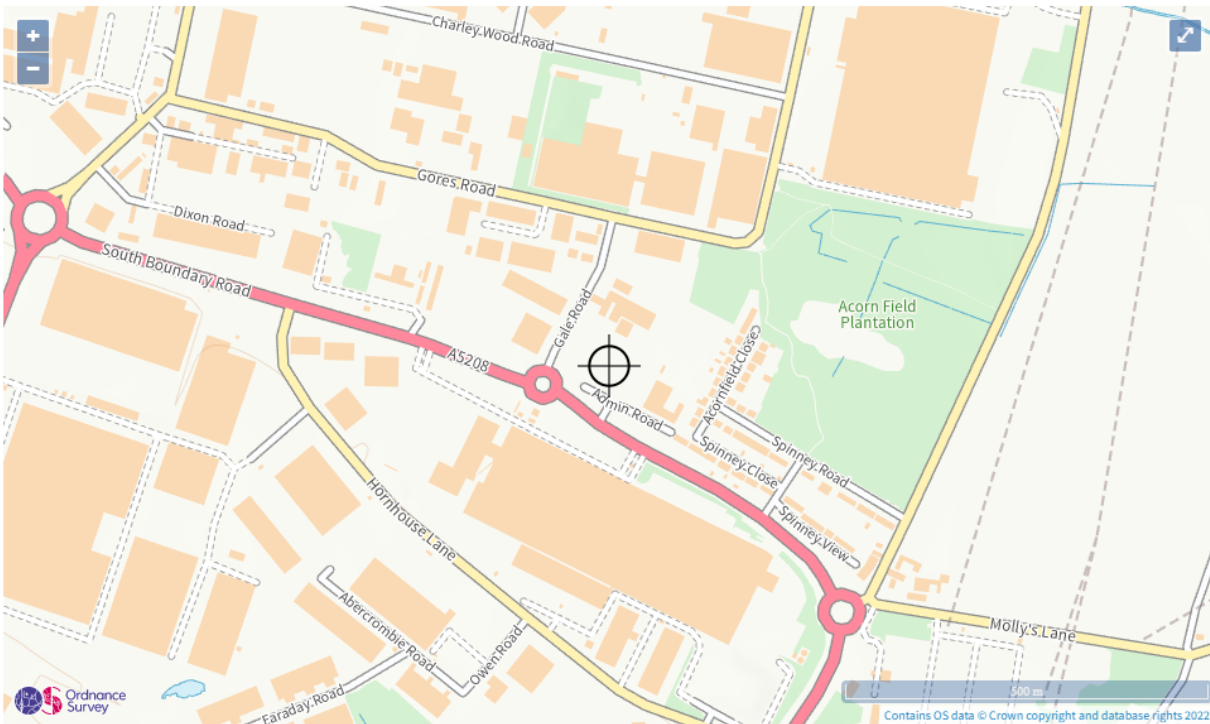
● High
 ● Medium
 ● Low
 ● Very low
 ⊕ Location you selected

Flood risk

Extent of flooding

Location

Enter a place or postcode



Maximum extent of flooding from reservoirs:

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

Greenfield runoff rate estimation for sites

www.uksuds.com | Greenfield runoff tool

Calculated by:

Site name:

Site location:

This is an estimation of the greenfield runoff rates that are used to meet normal best practice criteria in line with Environment Agency guidance "Rainfall runoff management for developments", SC030219 (2013), the SuDS Manual C753 (Ciria, 2015) and the non-statutory standards for SuDS (Defra, 2015). This information on greenfield runoff rates may be the basis for setting consents for the drainage of surface water runoff from sites.

Site Details

Latitude:

Longitude:

Reference:

Date:

Runoff estimation approach

Site characteristics

Total site area (ha):

Methodology

Q_{BAR} estimation method:

SPR estimation method:

Soil characteristics

Default Edited

SOIL type:

HOST class:

SPR/SPRHOST:

Hydrological characteristics

Default Edited

SAAR (mm):

Hydrological region:

Growth curve factor 1 year:

Growth curve factor 30 years:

Growth curve factor 100 years:

Growth curve factor 200 years:

Notes

(1) Is $Q_{BAR} < 2.0$ l/s/ha?

When Q_{BAR} is < 2.0 l/s/ha then limiting discharge rates are set at 2.0 l/s/ha.

(2) Are flow rates < 5.0 l/s?

Where flow rates are less than 5.0 l/s consent for discharge is usually set at 5.0 l/s if blockage from vegetation and other materials is possible. Lower consent flow rates may be set where the blockage risk is addressed by using appropriate drainage elements.

(3) Is $SPR/SPRHOST \leq 0.3$?

Where groundwater levels are low enough the use of soakaways to avoid discharge offsite would normally be preferred for disposal of surface water runoff.

Greenfield runoff rates

Default Edited

Q_{BAR} (l/s):

1 in 1 year (l/s):

1 in 30 years (l/s):

1 in 100 year (l/s):

1 in 200 years (l/s):

This report was produced using the greenfield runoff tool developed by HR Wallingford and available at www.uksuds.com. The use of this tool is subject to the UK SuDS terms and conditions and licence agreement, which can both be found at www.uksuds.com/terms-and-conditions.htm. The outputs from this tool are estimates of greenfield runoff rates. The use of these results is the responsibility of the users of this tool. No liability will be accepted by HR Wallingford, the Environment Agency, CEH, Hydrosolutions or any other organisation for the use of this data in the design or operational characteristics of any drainage scheme.



MasterDrain
HY 11.0

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				Sheet no.1	
				Date27/10/22	
ProjectKnowsley East Hub				By	
TitleIoH 124 Runoff Calculation				Checked	
				Reviewed	

Hydrological Data:-

FSR Hydrology:-

Location	= LIVERPOOL	Grid reference	= SJ9766
M5-60 (mm)	= 19	r	= 0.40
Soil runoff	= 0.45	SAAR (mm/yr)	= 800
WRAP	= 4	Area	= England & Wales
Hydrological area	= 9	Hydrological zone	= 8

Soil classification for WRAP type 4

Clayey, or loamy over clayey soils with an impermeable layer at shallow depth.

Design data:-

Area = 0.009377 Km² - 0.938 Ha - 9377 m²

Calculation method:-

Runoff is calculated from:-

$$Q_{BAR(rural)} = 0.00108 \text{ AREA}^{0.89} \cdot \text{SAAR}^{1.17} \cdot \text{SOIL}^{2.17}$$

where

AREA = Site area in Km²
SAAR = Standard Average Annual Rainfall (mm/yr)
SOIL = Soil value derived from Winter Rainfall Acceptance Potential
 $Q_{BAR(rural)}$ = Runoff (cumecs)

$Q_{BAR(rural)}$ is then multiplied by a growth factor - GC(T) - for different storm return periods derived from EA publication W5-074/A.

Calculated data:-

For areas less than 50Ha, a modified calculation which multiplies the 50Ha runoff value by the ratio of the site area to 50Ha is used
Reducing factor used for these calculations is 0.019

Mean Annual Peak Flow $Q_{BAR(rural)} = 4.82 \text{ l/s}$

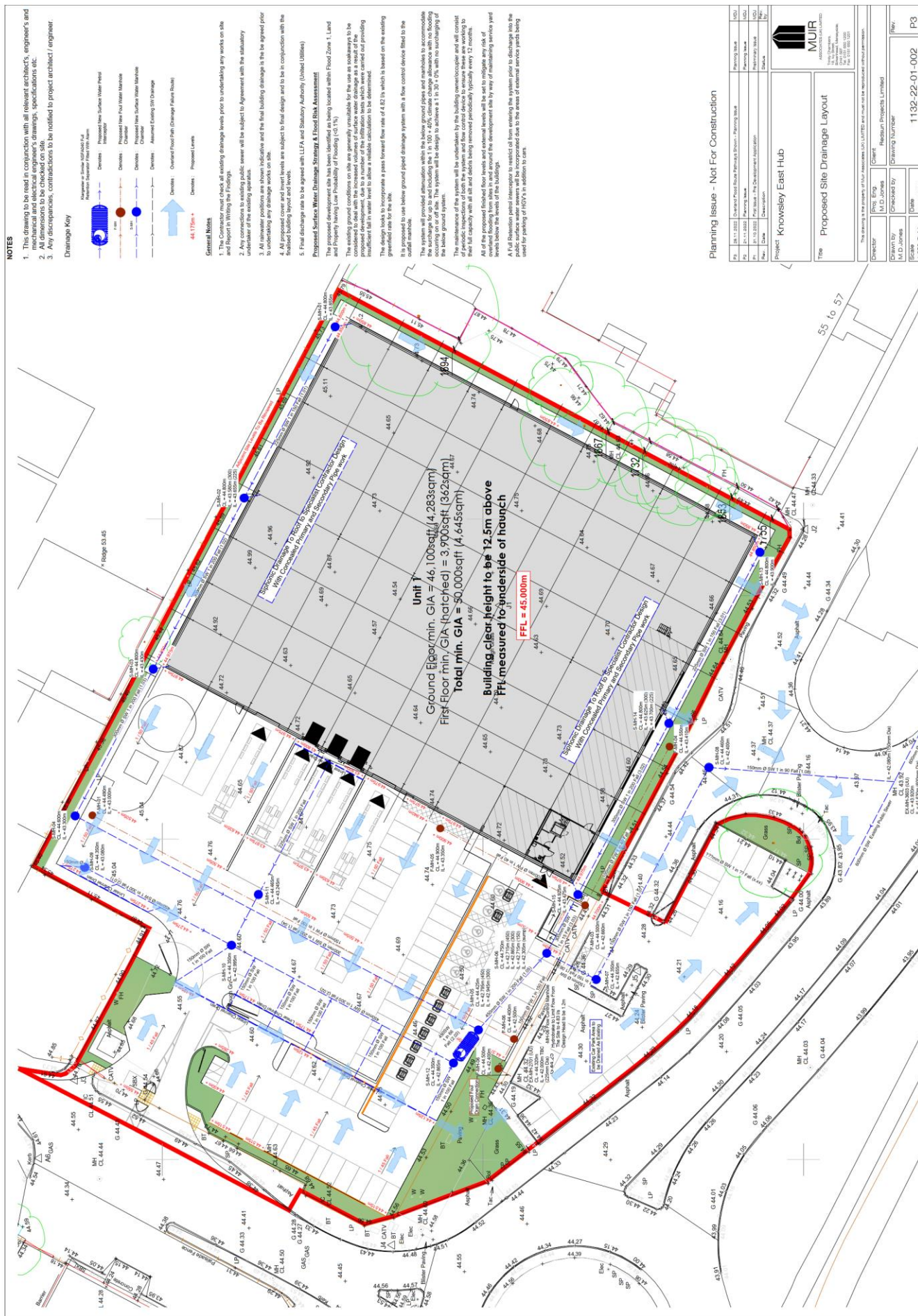
Values for $Q_{BAR(rural)}$

Ret. per.	m ³ /hr	l/s	l/s/ha	Ret. per.	m ³ /hr	l/s	l/s/ha
1yr	14.737	4.094	4.366	100yr+20%	45.355	12.599	13.436
2yr	16.124	4.479	4.776	100yr+30%	49.135	13.649	14.555
5yr	21.152	5.876	6.266	100yr+40%	52.914	14.698	15.675
10yr	24.619	6.839	7.293	200yr	43.344	12.040	12.840
30yr	30.341	8.428	8.988	200yr + 30%	56.347	15.652	16.692
50yr	33.635	9.343	9.964	500yr	49.586	13.774	14.689
100yr	37.796	10.499	11.196	1000yr	55.307	15.363	16.384

Growth factors -

1yr	2yr	5yr	10yr	30yr	50yr	100yr	200yr	500yr	1000yr
0.85	0.93	1.22	1.42	1.75	1.94	2.18	2.50	2.86	3.19

The above is based on the Institute of Hydrology Report 124 to which you are referred for further details (see Sect 7).
Note that the 200 and above year growth curves were taken from W5-074.



Appendix E

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Project Knowsley East Hub		By MJ	Checked Reviewed
Title Surface Water Drainage System Sizing 1 in 30 + 0%			

Entry No.	Section No.	Diam mm	Fall mm	Grad 1 in	Length m	Imperm. area	Perm area	Flow l/s	Pipe cap full l/s	Depth of flow %	H.M.D.	Veloc. m/s	Proport. vel. m/s	Time of flow m:s	Time of conc m:s	Rain mm/hr	System vol
1	1.01	225#	200	151	30.2	555	0	17.4	42.1	43.5	0.91	1.06	1.00	0:29	4:59	122.3	
2	1.02	300#	149	202	30.3	1107	0	50.4	77.8	61.7	1.13	1.10	1.19	0:27	5:26	118.1	
3	1.03	300#	130	199	25.9	555	0	65.3	78.4	78.0	1.21	1.11	1.26	0:23	5:49	114.8	
4	1.04	300#	354	201	71.2	0	0	60.7	78.0	72.7	1.20	1.10	1.24	1:05	6:54	106.8	
5	2.01	450#	84	305	25.9	1121	0	35.5	184.0	25.0	0.59	1.16	0.81	0:22	4:52	123.3	
6	2.02	450#	129	302	39.2	2626	0	113.5	184.9	59.1	1.10	1.16	1.24	0:34	5:26	118.1	
7	2.03	450#	70	66	4.6	0	0	113.3	398.2	32.9	0.74	2.50	2.04	0:02	5:28	117.9	
8	1.05	450#	80	200	16.0	0	0	161.4	227.8	67.1	1.17	1.43	1.59	0:11	7:05	105.5	
9	3.01	225#	200	151	30.3	555	0	17.4	42.1	43.5	0.91	1.06	1.00	0:29	4:59	122.3	
10	3.02	300#	225	134	30.2	1110	0	50.8	95.8	52.6	1.03	1.35	1.38	0:22	5:21	118.9	
11	3.03	300#	740	14	10.4	555	0	67.5	298.4	28.1	0.65	4.22	3.16	0:02	5:23	118.5	
12	1.06	150#	59	146	8.7	0	0	4.8*	14.6	36.6	0.80	0.83	0.71	0:11	7:16	104.3	
13	1.07	150#	254	147	37.5	0	0	4.8	14.6	36.6	0.80	0.82	0.71	0:45	8:01	99.7	
14	1.08	150#	318	91	29.0	0	0	4.8	18.6	30.9	0.70	1.05	0.83	0:28	8:29	97.1	

Column heading definitions.

Input data - light blue areas on printout

Entry number - The file position (number) of this section's data. This is automatically calculated.

Section number - The reference number of this section, in the format XX.YY where XX is the run number and YY is the section number down that run.

Fall - The fall of this section along its length. This will be automatically calculated if not entered.*

Gradient - The gradient of this section as 1:XX. This is automatically calculated if not entered.*

Length - The length of this section between manhole centres.

* Refer to the workbook for methods of inputting gradient, fall or invert levels.

Output (calculated) data

Diameter - The calculated diameter (mm) for this section (yellow area on printout).

Flow l/s - The flow in litre/second along this section.

Pipe capacity full l/s - The capacity of the pipe running full (calculated using Colebrook-White) in litres/second.

Depth of flow% - The percentage depth of flow in this section for the given design parameters.

Hydraulic Mean Depth - The HMD in this section for the given design parameters.

Proportional area% - The proportional area of the pipe occupied by the flow.

Velocity m/s - The velocity of this section running full bore (calculated using Colebrook-White).

Proportional Velocity m/s - The calculated velocity of the actual flow (pipe full velocity x HMD).

Time of flow (s) - The time in seconds that is taken by the flow to traverse this section.

Time of Concentration (minutes) - A function of the time of flow plus the time of entry to give the actual rainfall intensity.

Rainfall intensity (mm/hr) - The calculated actual rainfall intensity used to derive the flow in this section

Pipe volume (m³) - The volume of this section.

System volume (m³) - The cumulative volume of the system, up to and including this section.

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Project Knowsley East Hub		By MJ	Checked Reviewed
Title Data summary for printout			
Location LIVERPOOL	Nat. Grid ref: SJ9766	MS-50 19	r 0.40
		wrapx 4	SAAR 800

Design data

Maximum rainfall rate allowed = **unlimited**
Urban creep factor (%) = **1**
Minimum velocity (m/s) = **0.75**
Pipe roughness factor (mm) = **0.60**
Climate change factor = **0**

Return period = **30**
Growth period (years) = **10**
Percentage gradient = **80%**
Maximum depth of flow = **100%**

System data

Final Rainfall rate (mm/hr) = **97.11**
Total fall of index run (m) = **1.55**
Total permeable area (Ha) = **0.0**
Time of concentration (mins) = **8.48**
Outfall diameter (mm) = **150**

Total flow rate (l/s) = **4.83**
Total length of index run (m) = **248.83**
Total impermeable area (Ha) = **0.8184**
Time of entry (mins) = **4.5**
Percentage impermeable area = **100.00**

Calculated variables

Routing coefficient (Cr) = **1.3**
UCWI = **86.00**

Volumetric coefficient (Cv) = **0.802**
Areal reduction factor = **0.996**

Notes:-

Percentage runoff (combined) = **80.16 (see note 1 below).**

Note 1 - Percentage runoff for combined areas is calculated from:-

$$PR = (0.829 \times PIMP) + (25 \times SOIL) + (0.078 \times UCWI) - 20.7$$

Note 2 - Rainfall calculated using FSR data.

Note 3 - * against flow rate indicates upstream restrictor present (flow reduced if restrictor rate exceeded).

Note 4 - ‡ against diameter indicates preferred diameter used.

Note 5 - ¤ against diameter indicates preferred diameter too small and therefore not used.

Note 6 - § against diameter indicates throttle pipe used.

Note 7 - « against diameter indicates carrier pipe used in cellular storage.

Pipe sizes

The pipe definition file used for these calculations allows the following diameters:-

100	allowed	375	allowed	600	-----	900	-----	1200	-----	1800	-----
150	allowed	400	allowed	700	-----	1000	-----	1350	-----	1950	-----
225	allowed	450	allowed	750	-----	1050	-----	1500	-----	2100	-----
300	allowed	500	allowed	800	-----	1125	-----	1650	-----	2400	-----

Appendix F



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SW

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Project Knowsley East Hub			Sheet no. 1
Title Surface Water Drainage Design 1 in 30 + 0%			Date 21/11/22
		By MJ	Checked Reviewed

Using in-line restrictors
Return period = 30 yrs
Climate change factor = 0

PEAK hydrograph values printed
Storm duration = 15 mins
No offline storage

Mean rain intens. 72.00 mm/hr
Storm profile = Summer
Using FSR data

Peak rain intens. 282.24 mm/hr
Sample period = 7.5 secs.

Entry No.	SECT. No.	MANHOLE REF	PIPE CAPACITY l/s	RATE FLOW l/s	PIPE SIZE mm	CHAMBER DIAM/LxW mm	INVERT LEVEL m	WATER LEVEL m	GRND LEVEL m	SURCHARGE fract.	Depth	EXCESS FLOW l/s	FLOODED VOL m³	DRAINED AREA (m²) :x FACTOR	STATUS
1	I	1.01 S-MH-01	42.1	17.9	225	1200	43.85	43.95	44.80	0.43	0.10	0.00	0.000	527	OK
2	I	1.02 S-MH-02	77.8	53.7	300	1200	43.58	43.78	44.80	0.69	0.20	0.00	0.000	1579	OK
3	I	1.03 S-MH-03	78.4	71.6	300	1200	43.43	43.69	44.80	0.91	0.26	0.00	0.000	2106	OK
4	I	1.04 S-MH-04	78.0	71.6	300	1500	43.30	43.56	44.60	0.92	0.26	0.00	0.000	2106	OK
5	B	2.01 S-MH-09	184.0	36.2	450	1500	43.08	43.19	44.35	0.20	0.11	0.00	0.000	1065	OK
6	B	2.02 S-MH-10	184.9	121.0	450	1500	42.99	43.28	44.35	0.65	0.28	0.00	0.000	3560	OK
7	B	2.03 S-MH-12	398.2	121.0	450	1500	42.87	43.02	44.35	0.30	0.16	0.00	0.000	3560	OK
8	I	1.05 S-MH-05	227.8	192.5	450	1500	42.79	43.15	44.42	0.85	0.36	0.00	0.000	5666	OK
9	B	3.01 S-MH-13	42.1	17.9	225	1200	43.90	44.00	44.80	0.43	0.10	0.00	0.000	527	OK
10	B	3.02 S-MH-14	95.8	53.7	300	1200	43.70	43.87	44.80	0.56	0.17	0.00	0.000	1582	OK
11	B	3.03 S-MH-15	298.4	71.7	300	1200	43.47	43.56	44.92	0.24	0.09	0.00	0.000	2109	OK
12	I	1.06 S-MH-06†	14.6	4.8	150	1500	42.72	42.77	44.75	0.33	0.05	0.00	0.000	7775	OK
13	I	1.07 S-MH-07	14.6	0.0	150	1200	42.65	42.66	44.35	0.00	0.00	0.00	0.000	0	OK
14	I	1.08 S-MH-08	18.6	0.0	150	1200	42.40	42.40	44.46	0.00	0.00	0.00	0.000	0	OK



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Project Surcharge calcs (Sized at 30 yrs storm) for SURFACE WATER DESIGN.SW			Sheet no. 1
			Date 21/11/22
		By MJ	Checked Reviewed

Using in-line restrictors
Return period = 30 yrs
Climate change factor = 0

PEAK hydrograph values printed
Storm duration = 30 mins
No offline storage

Mean rain intens. 47.00 mm/hr
Storm profile = Summer
Using FSR data

Peak rain intens. 184.24 mm/hr
Sample period = 15.0 secs.

Entry No.	SECT. No.	MANHOLE REF	PIPE CAPACITY l/s	RATE FLOW l/s	PIPE SIZE mm	CHAMBER DIAM/LxW mm	INVERT LEVEL m	WATER LEVEL m	GRND LEVEL m	SURCHARGE fract.	Depth	EXCESS FLOW l/s	FLOODED VOL m³	DRAINED AREA (m²) :x FACTOR	STATUS
1	I	1.01 S-MH-01	42.1	11.7	225	1200	43.85	43.93	44.80	0.28	0.07	0.00	0.000	527	OK
2	I	1.02 S-MH-02	77.8	34.9	300	1200	43.58	43.72	44.80	0.45	0.14	0.00	0.000	1579	OK
3	I	1.03 S-MH-03	78.4	46.6	300	1200	43.43	43.60	44.80	0.59	0.17	0.00	0.000	2106	OK
4	I	1.04 S-MH-04	78.0	46.6	300	1500	43.30	43.47	44.60	0.60	0.17	0.00	0.000	2106	OK
5	B	2.01 S-MH-09	184.0	23.6	450	1500	43.08	43.16	44.35	0.13	0.08	0.00	0.000	1065	OK
6	B	2.02 S-MH-10	184.9	78.8	450	1500	42.99	43.19	44.35	0.43	0.20	0.00	0.000	3560	OK
7	B	2.03 S-MH-12	398.2	78.8	450	1500	42.87	42.98	44.35	0.20	0.11	0.00	0.000	3560	OK
8	I	1.05 S-MH-05	227.8	125.4	450	1500	42.79	43.04	44.42	0.55	0.24	0.00	0.000	5666	OK
9	B	3.01 S-MH-13	42.1	11.7	225	1200	43.90	43.97	44.80	0.28	0.07	0.00	0.000	527	OK
10	B	3.02 S-MH-14	95.8	35.0	300	1200	43.70	43.82	44.80	0.37	0.12	0.00	0.000	1582	OK
11	B	3.03 S-MH-15	298.4	46.7	300	1200	43.47	43.54	44.92	0.16	0.07	0.00	0.000	2109	OK
12	I	1.06 S-MH-06†	14.6	4.8	150	1500	42.72	42.77	44.75	0.33	0.05	0.00	0.000	7775	OK
13	I	1.07 S-MH-07	14.6	0.0	150	1200	42.65	42.66	44.35	0.00	0.00	0.00	0.000	0	OK
14	I	1.08 S-MH-08	18.6	0.0	150	1200	42.40	42.40	44.46	0.00	0.00	0.00	0.000	0	OK



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Project Surcharge calcs (Sized at 30 yrs storm) for SURFACE WATER DESIGN.SW			Sheet no. 1
			Date 21/11/22
		By MJ	Checked Reviewed

Using in-line restrictors
Return period = 30 yrs
Climate change factor = 0

PEAK hydrograph values printed
Storm duration = 45 mins
No offline storage

Mean rain intens. 36.00 mm/hr
Storm profile = Summer
Using FSR data

Peak rain intens. 141.12 mm/hr
Sample period = 22.5 secs.

Entry No.	SECT. No.	MANHOLE REF	PIPE CAPACITY l/s	RATE FLOW l/s	PIPE SIZE mm	CHAMBER DIAM/LxW mm	INVERT LEVEL m	WATER LEVEL m	GRND LEVEL m	SURCHARGE fract.	Depth	EXCESS FLOW l/s	FLOODED VOL m³	DRAINED AREA (m²) :x FACTOR	STATUS
1	I	1.01 S-MH-01	42.1	8.9	225	1200	43.85	43.91	44.80	0.21	0.06	0.00	0.000	527	OK
2	I	1.02 S-MH-02	77.8	26.6	300	1200	43.58	43.69	44.80	0.34	0.11	0.00	0.000	1579	OK
3	I	1.03 S-MH-03	78.4	35.5	300	1200	43.43	43.57	44.80	0.45	0.14	0.00	0.000	2106	OK
4	I	1.04 S-MH-04	78.0	35.5	300	1500	43.30	43.44	44.60	0.46	0.14	0.00	0.000	2106	OK
5	B	2.01 S-MH-09	184.0	18.0	450	1500	43.08	43.15	44.35	0.10	0.07	0.00	0.000	1065	OK
6	B	2.02 S-MH-10	184.9	60.0	450	1500	42.99	43.16	44.35	0.32	0.16	0.00	0.000	3560	OK
7	B	2.03 S-MH-12	398.2	60.0	450	1500	42.87	42.96	44.35	0.15	0.09	0.00	0.000	3560	OK
8	I	1.05 S-MH-05	227.8	95.5	450	1500	42.79	42.99	44.42	0.42	0.20	0.00	0.000	5666	OK
9	B	3.01 S-MH-13	42.1	8.9	225	1200	43.90	43.96	44.80	0.21	0.06	0.00	0.000	527	OK
10	B	3.02 S-MH-14	95.8	26.7	300	1200	43.70	43.80	44.80	0.28	0.10	0.00	0.000	1582	OK
11	B	3.03 S-MH-15	298.4	35.6	300	1200	43.47	43.53	44.92	0.12	0.05	0.00	0.000	2109	OK
12	I	1.06 S-MH-06†	14.6	4.8	150	1500	42.72	42.77	44.75	0.33	0.05	0.00	0.000	7775	OK
13	I	1.07 S-MH-07	14.6	0.0	150	1200	42.65	42.66	44.35	0.00	0.00	0.00	0.000	0	OK
14	I	1.08 S-MH-08	18.6	0.0	150	1200	42.40	42.40	44.46	0.00	0.00	0.00	0.000	0	OK



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Job No. 1132-22		
Sheet no. 1		
Date 21/11/22		
By MJ	Checked	Reviewed

Project	
Title	Surcharge calcs (Sized at 30 yrs storm) for SURFACE WATER DESIGN.SW

Using in-line restrictors
Return period = 30 yrs
Climate change factor = 0

PEAK hydrograph values printed
Storm duration = 60 mins
No offline storage

Mean rain intens. 29.00 mm/hr
Storm profile = Summer
Using FSR data

Peak rain intens. 113.68 mm/hr
Sample period = 30.0 secs.

Entry No.	SECT. No.	MANHOLE REF	PIPE CAPACITY l/s	RATE FLOW l/s	PIPE SIZE mm	CHAMBER DIAM/LxW mm	INVERT LEVEL m	WATER LEVEL m	GRND LEVEL m	SURCHARGE fract.	Depth	EXCESS FLOW l/s	FLOODED VOL m³	DRAINED AREA (m²) x FACTOR	STATUS
1	I	1.01 S-MH-01	42.1	7.3	225	1200	43.85	43.91	44.80	0.17	0.05	0.00	0.000	527	OK
2	I	1.02 S-MH-02	77.8	21.8	300	1200	43.58	43.68	44.80	0.28	0.10	0.00	0.000	1579	OK
3	I	1.03 S-MH-03	78.4	29.1	300	1200	43.43	43.55	44.80	0.37	0.12	0.00	0.000	2106	OK
4	I	1.04 S-MH-04	78.0	29.1	300	1500	43.30	43.42	44.60	0.37	0.12	0.00	0.000	2106	OK
5	B	2.01 S-MH-09	184.0	14.7	450	1500	43.08	43.14	44.35	0.08	0.06	0.00	0.000	1065	OK
6	B	2.02 S-MH-10	184.9	49.1	450	1500	42.99	43.14	44.35	0.27	0.14	0.00	0.000	3560	OK
7	B	2.03 S-MH-12	398.2	49.1	450	1500	42.87	42.95	44.35	0.12	0.08	0.00	0.000	3560	OK
8	I	1.05 S-MH-05	227.8	78.2	450	1500	42.79	42.97	44.42	0.34	0.17	0.00	0.000	5666	OK
9	B	3.01 S-MH-13	42.1	7.3	225	1200	43.90	43.95	44.80	0.17	0.05	0.00	0.000	527	OK
10	B	3.02 S-MH-14	95.8	21.8	300	1200	43.70	43.78	44.80	0.23	0.08	0.00	0.000	1582	OK
11	B	3.03 S-MH-15	298.4	29.1	300	1200	43.47	43.52	44.92	0.10	0.05	0.00	0.000	2109	OK
12	I	1.06 S-MH-06	14.6	4.8	150	1500	42.72	42.77	44.75	0.33	0.05	0.00	0.000	7775	OK
13	I	1.07 S-MH-07	14.6	0.0	150	1200	42.65	42.66	44.35	0.00	0.00	0.00	0.000	0	OK
14	I	1.08 S-MH-08	18.6	0.0	150	1200	42.40	42.40	44.46	0.00	0.00	0.00	0.000	0	OK



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Job No.		
1132-22		
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1		
Date		
21/11/22		
By	Checked	Reviewed
MJ		

Project	
Title	Surcharge calcs (Sized at 30 yrs storm) for SURFACE WATER DESIGN.SW

Using in-line restrictors
Return period = 30 yrs
Climate change factor = 0

PEAK hydrograph values printed
Storm duration = 120 mins
No offline storage

Mean rain intens. 18.00 mm/hr
Storm profile = Summer
Using FSR data

Peak rain intens. 70.56 mm/hr
Sample period = 60.0 secs.

Entry No.	SECT. No.	MANHOLE REF	PIPE CAPACITY l/s	RATE FLOW l/s	PIPE SIZE mm	CHAMBER DIAM/LxW mm	INVERT LEVEL m	WATER LEVEL m	GRND LEVEL m	SURCHARGE fract.	Depth	EXCESS FLOW l/s	FLOODED VOL m³	DRAINED AREA (m²) x FACTOR	STATUS
1	I	1.01 S-MH-01	42.1	4.4	225	1200	43.85	43.89	44.80	0.10	0.04	0.00	0.000	527	OK
2	I	1.02 S-MH-02	77.8	13.2	300	1200	43.58	43.65	44.80	0.17	0.07	0.00	0.000	1579	OK
3	I	1.03 S-MH-03	78.4	17.6	300	1200	43.43	43.51	44.80	0.22	0.08	0.00	0.000	2106	OK
4	I	1.04 S-MH-04	78.0	17.6	300	1500	43.30	43.38	44.60	0.23	0.08	0.00	0.000	2106	OK
5	B	2.01 S-MH-09	184.0	8.9	450	1500	43.08	43.12	44.35	0.05	0.04	0.00	0.000	1065	OK
6	B	2.02 S-MH-10	184.9	29.7	450	1500	42.99	43.09	44.35	0.16	0.10	0.00	0.000	3560	OK
7	B	2.03 S-MH-12	398.2	29.7	450	1500	42.87	42.92	44.35	0.07	0.06	0.00	0.000	3560	OK
8	I	1.05 S-MH-05	227.8	47.3	450	1500	42.79	42.91	44.42	0.21	0.12	0.00	0.000	5666	OK
9	B	3.01 S-MH-13	42.1	4.4	225	1200	43.90	43.94	44.80	0.10	0.04	0.00	0.000	527	OK
10	B	3.02 S-MH-14	95.8	13.2	300	1200	43.70	43.76	44.80	0.14	0.06	0.00	0.000	1582	OK
11	B	3.03 S-MH-15	298.4	17.6	300	1200	43.47	43.51	44.92	0.06	0.03	0.00	0.000	2109	OK
12	I	1.06 S-MH-06	14.6	4.8	150	1500	42.72	42.77	44.75	0.33	0.05	0.00	0.000	7775	OK
13	I	1.07 S-MH-07	14.6	4.6	150	1200	42.65	42.71	44.35	0.32	0.05	0.00	0.000	0	OK
14	I	1.08 S-MH-08	18.6	4.6	150	1200	42.40	42.45	44.46	0.25	0.05	0.00	0.000	0	OK



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Job No. 1132-22		
Sheet no. 1		
Date 21/11/22		
By MJ	Checked	Reviewed

Project	
Title	Surcharge calcs (Sized at 30 yrs storm) for SURFACE WATER DESIGN.SW

Using in-line restrictors
Return period = 30 yrs
Climate change factor = 0

PEAK hydrograph values printed
Storm duration = 180 mins
No offline storage

Mean rain intens. 13.00 mm/hr
Storm profile = Summer
Using FSR data

Peak rain intens. 50.96 mm/hr
Sample period = 90.0 secs.

Entry No.	SECT. No.	MANHOLE REF	PIPE CAPACITY l/s	RATE FLOW l/s	PIPE SIZE mm	CHAMBER DIAM/LxW mm	INVERT LEVEL m	WATER LEVEL m	GRND LEVEL m	SURCHARGE fract.	Depth	EXCESS FLOW l/s	FLOODED VOL m³	DRAINED AREA (m²) x FACTOR	STATUS
1	I	1.01 S-MH-01	42.1	3.3	225	1200	43.85	43.88	44.80	0.08	0.03	0.00	0.000	527	OK
2	I	1.02 S-MH-02	77.8	9.7	300	1200	43.58	43.64	44.80	0.13	0.06	0.00	0.000	1579	OK
3	I	1.03 S-MH-03	78.4	13.0	300	1200	43.43	43.50	44.80	0.17	0.07	0.00	0.000	2106	OK
4	I	1.04 S-MH-04	78.0	13.0	300	1500	43.30	43.37	44.60	0.17	0.07	0.00	0.000	2106	OK
5	B	2.01 S-MH-09	184.0	6.6	450	1500	43.08	43.12	44.35	0.04	0.04	0.00	0.000	1065	OK
6	B	2.02 S-MH-10	184.9	22.0	450	1500	42.99	43.08	44.35	0.12	0.08	0.00	0.000	3560	OK
7	B	2.03 S-MH-12	398.2	22.0	450	1500	42.87	42.91	44.35	0.06	0.05	0.00	0.000	3560	OK
8	I	1.05 S-MH-05	227.8	34.9	450	1500	42.79	42.89	44.42	0.15	0.10	0.00	0.000	5666	OK
9	B	3.01 S-MH-13	42.1	3.3	225	1200	43.90	43.93	44.80	0.08	0.03	0.00	0.000	527	OK
10	B	3.02 S-MH-14	95.8	9.8	300	1200	43.70	43.75	44.80	0.10	0.05	0.00	0.000	1582	OK
11	B	3.03 S-MH-15	298.4	13.0	300	1200	43.47	43.50	44.92	0.04	0.03	0.00	0.000	2109	OK
12	I	1.06 S-MH-06	14.6	4.8	150	1500	42.72	42.77	44.75	0.33	0.05	0.00	0.000	7775	OK
13	I	1.07 S-MH-07	14.6	4.8	150	1200	42.65	42.71	44.35	0.33	0.05	0.00	0.000	7775	OK
14	I	1.08 S-MH-08	18.6	4.8	150	1200	42.40	42.45	44.46	0.26	0.05	0.00	0.000	7775	OK



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Project		By MJ	Checked
Title Surchage calcs (Sized at 30 yrs storm) for SURFACE WATER DESIGN.SW			Reviewed

Using in-line restrictors
Return period = 30 yrs
Climate change factor = 0

PEAK hydrograph values printed
Storm duration = 240 mins
No offline storage

Mean rain intens. 10.00 mm/hr
Storm profile = Summer
Using FSR data

Peak rain intens. 39.20 mm/hr
Sample period = 120.0 secs.

Entry No.	SECT. No.	MANHOLE REF	PIPE CAPACITY l/s	RATE FLOW l/s	PIPE SIZE mm	CHAMBER DIAM/LxW mm	INVERT LEVEL m	WATER LEVEL m	GRND LEVEL m	SURCHARGE fract.	Depth	EXCESS FLOW l/s	FLOODED VOL m³	DRAINED AREA (m²) : x FACTOR	STATUS
1	I	1.01 S-MH-01	42.1	2.6	225	1200	43.85	43.88	44.80	0.06	0.03	0.00	0.000	527	OK
2	I	1.02 S-MH-02	77.8	7.8	300	1200	43.58	43.63	44.80	0.10	0.05	0.00	0.000	1579	OK
3	I	1.03 S-MH-03	78.4	10.4	300	1200	43.43	43.49	44.80	0.13	0.06	0.00	0.000	2106	OK
4	I	1.04 S-MH-04	78.0	10.4	300	1500	43.30	43.36	44.60	0.13	0.06	0.00	0.000	2106	OK
5	B	2.01 S-MH-09	184.0	5.3	450	1500	43.08	43.11	44.35	0.03	0.03	0.00	0.000	1065	OK
6	B	2.02 S-MH-10	184.9	17.6	450	1500	42.99	43.06	44.35	0.10	0.07	0.00	0.000	3560	OK
7	B	2.03 S-MH-12	398.2	17.6	450	1500	42.87	42.91	44.35	0.04	0.04	0.00	0.000	3560	OK
8	I	1.05 S-MH-05	227.8	28.1	450	1500	42.79	42.88	44.42	0.12	0.08	0.00	0.000	5666	OK
9	B	3.01 S-MH-13	42.1	2.6	225	1200	43.90	43.93	44.80	0.06	0.03	0.00	0.000	527	OK
10	B	3.02 S-MH-14	95.8	7.8	300	1200	43.70	43.74	44.80	0.08	0.04	0.00	0.000	1582	OK
11	B	3.03 S-MH-15	298.4	10.4	300	1200	43.47	43.50	44.92	0.03	0.02	0.00	0.000	2109	OK
12	I	1.06 S-MH-06†	14.6	4.8	150	1500	42.72	42.77	44.75	0.33	0.05	0.00	0.000	7775	OK
13	I	1.07 S-MH-07	14.6	4.8	150	1200	42.65	42.71	44.35	0.33	0.05	0.00	0.000	7775	OK
14	I	1.08 S-MH-08	18.6	4.8	150	1200	42.40	42.45	44.46	0.26	0.05	0.00	0.000	7775	OK



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Project		By MJ	Checked
Title Surchage calcs (Sized at 30 yrs storm) for SURFACE WATER DESIGN.SW			Reviewed

Using in-line restrictors
Return period = 30 yrs
Climate change factor = 0

PEAK hydrograph values printed
Storm duration = 360 mins
No offline storage

Mean rain intens. 8.00 mm/hr
Storm profile = Summer
Using FSR data

Peak rain intens. 31.36 mm/hr
Sample period = 180.0 secs.

Entry No.	SECT. No.	MANHOLE REF	PIPE CAPACITY l/s	RATE FLOW l/s	PIPE SIZE mm	CHAMBER DIAM/LxW mm	INVERT LEVEL m	WATER LEVEL m	GRND LEVEL m	SURCHARGE fract.	Depth	EXCESS FLOW l/s	FLOODED VOL m³	DRAINED AREA (m²) : x FACTOR	STATUS
1	I	1.01 S-MH-01	42.1	1.9	225	1200	43.85	43.88	44.80	0.05	0.02	0.00	0.000	527	OK
2	I	1.02 S-MH-02	77.8	5.7	300	1200	43.58	43.62	44.80	0.07	0.04	0.00	0.000	1579	OK
3	I	1.03 S-MH-03	78.4	7.6	300	1200	43.43	43.48	44.80	0.10	0.05	0.00	0.000	2106	OK
4	I	1.04 S-MH-04	78.0	7.6	300	1500	43.30	43.35	44.60	0.10	0.05	0.00	0.000	2106	OK
5	B	2.01 S-MH-09	184.0	3.9	450	1500	43.08	43.10	44.35	0.02	0.02	0.00	0.000	1065	OK
6	B	2.02 S-MH-10	184.9	12.9	450	1500	42.99	43.05	44.35	0.07	0.06	0.00	0.000	3560	OK
7	B	2.03 S-MH-12	398.2	12.9	450	1500	42.87	42.90	44.35	0.03	0.03	0.00	0.000	3560	OK
8	I	1.05 S-MH-05	227.8	20.5	450	1500	42.79	42.86	44.42	0.09	0.07	0.00	0.000	5666	OK
9	B	3.01 S-MH-13	42.1	1.9	225	1200	43.90	43.92	44.80	0.05	0.02	0.00	0.000	527	OK
10	B	3.02 S-MH-14	95.8	5.7	300	1200	43.70	43.73	44.80	0.06	0.03	0.00	0.000	1582	OK
11	B	3.03 S-MH-15	298.4	7.6	300	1200	43.47	43.49	44.92	0.03	0.02	0.00	0.000	2109	OK
12	I	1.06 S-MH-06†	14.6	4.8	150	1500	42.72	42.77	44.75	0.33	0.05	0.00	0.000	7775	OK
13	I	1.07 S-MH-07	14.6	4.8	150	1200	42.65	42.71	44.35	0.33	0.05	0.00	0.000	7775	OK
14	I	1.08 S-MH-08	18.6	4.8	150	1200	42.40	42.45	44.46	0.26	0.05	0.00	0.000	7775	OK



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Muir Associates (UK) Limited www.muir-associates.co.uk		Trinity Chambers, 18 Ivy Street, Birkenhead CH41 5EF Tel: 0151 650 1200 Mob: 07813 7770514 email: design@muir-associates.co.uk	Job No. 1132-22 Sheet no. 1 Date 21/11/22
Project		By MJ	Checked
Title Surchage calcs (Sized at 30 yrs storm) for SURFACE WATER DESIGN.SW			Reviewed

Using in-line restrictors
Return period = 30 yrs
Climate change factor = 0

PEAK hydrograph values printed
Storm duration = 720 mins
No offline storage

Mean rain intens. 4.00 mm/hr
Storm profile = Summer
Using FSR data

Peak rain intens. 15.68 mm/hr
Sample period = 360.0 secs.

Entry No.	SECT. No.	MANHOLE REF	PIPE CAPACITY l/s	RATE FLOW l/s	PIPE SIZE mm	CHAMBER DIAM/LxW mm	INVERT LEVEL m	WATER LEVEL m	GRND LEVEL m	SURCHARGE fract.	Depth	EXCESS FLOW l/s	FLOODED VOL m³	DRAINED AREA (m²) : x FACTOR	STATUS
1	I	1.01 S-MH-01	42.1	1.1	225	1200	43.85	43.87	44.80	0.03	0.01	0.00	0.000	527	OK
2	I	1.02 S-MH-02	77.8	3.3	300	1200	43.58	43.61	44.80	0.04	0.03	0.00	0.000	1579	OK
3	I	1.03 S-MH-03	78.4	4.4	300	1200	43.43	43.46	44.80	0.06	0.03	0.00	0.000	2106	OK
4	I	1.04 S-MH-04	78.0	4.4	300	1500	43.30	43.33	44.60	0.06	0.03	0.00	0.000	2106	OK
5	B	2.01 S-MH-09	184.0	2.2	450	1500	43.08	43.10	44.35	0.01	0.02	0.00	0.000	1065	OK
6	B	2.02 S-MH-10	184.9	7.5	450	1500	42.99	43.03	44.35	0.04	0.04	0.00	0.000	3560	OK
7	B	2.03 S-MH-12	398.2	7.5	450	1500	42.87	42.89	44.35	0.02	0.02	0.00	0.000	3560	OK
8	I	1.05 S-MH-05	227.8	12.0	450	1500	42.79	42.84	44.42	0.05	0.05	0.00	0.000	5666	OK
9	B	3.01 S-MH-13	42.1	1.1	225	1200	43.90	43.91	44.80	0.03	0.01	0.00	0.000	527	OK
10	B	3.02 S-MH-14	95.8	3.3	300	1200	43.70	43.72	44.80	0.03	0.02	0.00	0.000	1582	OK
11	B	3.03 S-MH-15	298.4	4.5	300	1200	43.47	43.49	44.92	0.01	0.01	0.00	0.000	2109	OK
12	I	1.06 S-MH-06†	14.6	4.8	150	1500	42.72	42.77	44.75	0.33	0.05	0.00	0.000	7775	OK
13	I	1.07 S-MH-07	14.6	4.5	150	1200	42.65	42.71	44.35	0.31	0.05	0.00	0.000	7775	OK
14	I	1.08 S-MH-08	18.6	4.5	150	1200	42.40	42.44	44.46	0.24	0.04	0.00	0.000	7775	OK

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18 Ivy Street,
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email: design@muir-associates.co.ukJob No.
1132-22Sheet no. **1**Date **21/11/22**Project
Title **Surcharge calcs (Sized at 30 yrs storm) for SURFACE WATER DESIGN.SW**By **MJ** Checked ReviewedUsing in-line restrictors
Return period = 30 yrs
Climate change factor = 0**PEAK hydrograph values printed**
Storm duration = 1440 mins
No offline storageMean rain intens. 3.00 mm/hr
Storm profile = Summer
Using FSR dataPeak rain intens. 11.76 mm/hr
Sample period = 720.0 secs.

Entry No.	SECT. No.	MANHOLE REF	PIPE CAPACITY l/s	RATE FLOW l/s	PIPE SIZE mm	CHAMBER DIAM/LxW mm	INVERT LEVEL m	WATER LEVEL m	GRND LEVEL m	SURCHARGE fract.	Depth	EXCESS FLOW l/s	FLOODED VOL m ³	DRAINED AREA (m ²)	STATUS
1	I	1.01 S-MH-01	42.1	0.6	225	1200	43.85	43.87	44.80	0.02	0.01	0.00	0.000	527	OK
2	I	1.02 S-MH-02	77.8	1.9	300	1200	43.58	43.60	44.80	0.02	0.02	0.00	0.000	1579	OK
3	I	1.03 S-MH-03	78.4	2.6	300	1200	43.43	43.45	44.80	0.03	0.02	0.00	0.000	2106	OK
4	I	1.04 S-MH-04	78.0	2.6	300	1500	43.30	43.32	44.60	0.03	0.02	0.00	0.000	2106	OK
5	B	2.01 S-MH-09	184.0	1.3	450	1500	43.08	43.09	44.35	0.01	0.01	0.00	0.000	1065	OK
6	B	2.02 S-MH-10	184.9	4.4	450	1500	42.99	43.02	44.35	0.02	0.03	0.00	0.000	3560	OK
7	B	2.03 S-MH-12	398.2	4.4	450	1500	42.87	42.88	44.35	0.01	0.02	0.00	0.000	3560	OK
8	I	1.05 S-MH-05	227.8	7.0	450	1500	42.79	42.83	44.42	0.03	0.03	0.00	0.000	5666	OK
9	B	3.01 S-MH-13	42.1	0.6	225	1200	43.90	43.91	44.80	0.02	0.01	0.00	0.000	527	OK
10	B	3.02 S-MH-14	95.8	1.9	300	1200	43.70	43.72	44.80	0.02	0.02	0.00	0.000	1582	OK
11	B	3.03 S-MH-15	298.4	2.6	300	1200	43.47	43.48	44.92	0.01	0.01	0.00	0.000	2109	OK
12	I	1.06 S-MH-06†	14.6	4.8	150	1500	42.72	42.77	44.75	0.33	0.05	0.00	0.000	7775	OK
13	I	1.07 S-MH-07	14.6	4.5	150	1200	42.65	42.71	44.35	0.31	0.05	0.00	0.000	7775	OK
14	I	1.08 S-MH-08	18.6	4.5	150	1200	42.40	42.44	44.46	0.24	0.04	0.00	0.000	7775	OK

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Tel: 0151 650 1200 Mob: 07813 7770514
email: design@muir-associates.co.ukJob No.
1132-22Sheet no. **1**Date **21/11/22**Project **Knowsley East Hub**
Title **Surface Water Drainage Design 1 in 30 + 0%**By **MJ** Checked ReviewedUsing in-line restrictors
Return period = 30 yrs
Climate change factor = 0**PEAK hydrograph values printed**
Storm duration = 15 mins
No offline storageMean rain intens. 72.00 mm/hr
Storm profile = Winter
Using FSR dataPeak rain intens. 180.00 mm/hr
Sample period = 7.5 secs.

Entry No.	SECT. No.	MANHOLE REF	PIPE CAPACITY l/s	RATE FLOW l/s	PIPE SIZE mm	CHAMBER DIAM/LxW mm	INVERT LEVEL m	WATER LEVEL m	GRND LEVEL m	SURCHARGE fract.	Depth	EXCESS FLOW l/s	FLOODED VOL m ³	DRAINED AREA (m ²)	STATUS
1	I	1.01 S-MH-01	42.1	11.4	225	1200	43.85	43.93	44.80	0.27	0.07	0.00	0.000	527	OK
2	I	1.02 S-MH-02	77.8	34.2	300	1200	43.58	43.72	44.80	0.44	0.14	0.00	0.000	1579	OK
3	I	1.03 S-MH-03	78.4	45.6	300	1200	43.43	43.60	44.80	0.58	0.17	0.00	0.000	2106	OK
4	I	1.04 S-MH-04	78.0	45.6	300	1500	43.30	43.47	44.60	0.59	0.17	0.00	0.000	2106	OK
5	B	2.01 S-MH-09	184.0	23.1	450	1500	43.08	43.16	44.35	0.13	0.08	0.00	0.000	1065	OK
6	B	2.02 S-MH-10	184.9	77.1	450	1500	42.99	43.19	44.35	0.42	0.20	0.00	0.000	3560	OK
7	B	2.03 S-MH-12	398.2	77.1	450	1500	42.87	42.98	44.35	0.19	0.11	0.00	0.000	3560	OK
8	I	1.05 S-MH-05	227.8	122.8	450	1500	42.79	43.04	44.42	0.54	0.24	0.00	0.000	5666	OK
9	B	3.01 S-MH-13	42.1	11.4	225	1200	43.90	43.97	44.80	0.27	0.07	0.00	0.000	527	OK
10	B	3.02 S-MH-14	95.8	34.3	300	1200	43.70	43.82	44.80	0.36	0.12	0.00	0.000	1582	OK
11	B	3.03 S-MH-15	298.4	45.7	300	1200	43.47	43.54	44.92	0.15	0.06	0.00	0.000	2109	OK
12	I	1.06 S-MH-06†	14.6	4.8	150	1500	42.72	42.77	44.75	0.33	0.05	0.00	0.000	7775	OK
13	I	1.07 S-MH-07	14.6	0.0	150	1200	42.65	42.66	44.35	0.00	0.00	0.00	0.000	0	OK
14	I	1.08 S-MH-08	18.6	0.0	150	1200	42.40	42.40	44.46	0.00	0.00	0.00	0.000	0	OK

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email: design@muir-associates.co.ukJob No.
1132-22Sheet no. **1**Date **21/11/22**Project
Title **Surcharge calcs (Sized at 30 yrs storm) for SURFACE WATER DESIGN.SW**By **MJ** Checked ReviewedUsing in-line restrictors
Return period = 30 yrs
Climate change factor = 0**PEAK hydrograph values printed**
Storm duration = 30 mins
No offline storageMean rain intens. 47.00 mm/hr
Storm profile = Winter
Using FSR dataPeak rain intens. 117.50 mm/hr
Sample period = 15.0 secs.

Entry No.	SECT. No.	MANHOLE REF	PIPE CAPACITY l/s	RATE FLOW l/s	PIPE SIZE mm	CHAMBER DIAM/LxW mm	INVERT LEVEL m	WATER LEVEL m	GRND LEVEL m	SURCHARGE fract.	Depth	EXCESS FLOW l/s	FLOODED VOL m ³	DRAINED AREA (m ²)	STATUS
1	I	1.01 S-MH-01	42.1	7.4	225	1200	43.85	43.91	44.80	0.18	0.05	0.00	0.000	527	OK
2	I	1.02 S-MH-02	77.8	22.3	300	1200	43.58	43.68	44.80	0.29	0.10	0.00	0.000	1579	OK
3	I	1.03 S-MH-03	78.4	29.7	300	1200	43.43	43.55	44.80	0.38	0.12	0.00	0.000	2106	OK
4	I	1.04 S-MH-04	78.0	29.7	300	1500	43.30	43.42	44.60	0.38	0.12	0.00	0.000	2106	OK
5	B	2.01 S-MH-09	184.0	15.0	450	1500	43.08	43.14	44.35	0.08	0.06	0.00	0.000	1065	OK
6	B	2.02 S-MH-10	184.9	50.2	450	1500	42.99	43.14	44.35	0.27	0.14	0.00	0.000	3560	OK
7	B	2.03 S-MH-12	398.2	50.2	450	1500	42.87	42.95	44.35	0.13	0.08	0.00	0.000	3560	OK
8	I	1.05 S-MH-05	227.8	80.0	450	1500	42.79	42.97	44.42	0.35	0.17	0.00	0.000	5666	OK
9	B	3.01 S-MH-13	42.1	7.4	225	1200	43.90	43.95	44.80	0.18	0.05	0.00	0.000	527	OK
10	B	3.02 S-MH-14	95.8	22.3	300	1200	43.70	43.79	44.80	0.23	0.09	0.00	0.000	1582	OK
11	B	3.03 S-MH-15	298.4	29.8	300	1200	43.47	43.52	44.92	0.10	0.05	0.00	0.000	2109	OK
12	I	1.06 S-MH-06†	14.6	4.8	150	1500	42.72	42.77	44.75	0.33	0.05	0.00	0.000	7775	OK
13	I	1.07 S-MH-07	14.6	0.0	150	1200	42.65	42.66	44.35	0.00	0.00	0.00	0.000	0	OK
14	I	1.08 S-MH-08	18.6	0.0	150	1200	42.40	42.40	44.46	0.00	0.00	0.00	0.000	0	OK



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Project		By MJ	Checked
Title Surcharge calcs (Sized at 30 yrs storm) for SURFACE WATER DESIGN.SW			Reviewed

Using in-line restrictors
Return period = 30 yrs
Climate change factor = 0

PEAK hydrograph values printed
Storm duration = 45 mins
No offline storage

Mean rain intens. 36.00 mm/hr
Storm profile = Winter
Using FSR data

Peak rain intens. 90.00 mm/hr
Sample period = 22.5 secs.

Entry No.	SECT. No.	MANHOLE REF	PIPE CAPACITY l/s	RATE FLOW l/s	PIPE SIZE mm	CHAMBER DIAM/LxW mm	INVERT LEVEL m	WATER LEVEL m	GRND LEVEL m	SURCHARGE fract.	Depth	EXCESS FLOW l/s	FLOODED VOL m ³	DRAINED AREA (m ²)	STATUS
1	I	1.01 S-MH-01	42.1	5.7	225	1200	43.85	43.90	44.80	0.13	0.04	0.00	0.000	527	OK
2	I	1.02 S-MH-02	77.8	17.0	300	1200	43.58	43.66	44.80	0.22	0.08	0.00	0.000	1579	OK
3	I	1.03 S-MH-03	78.4	22.6	300	1200	43.43	43.53	44.80	0.29	0.10	0.00	0.000	2106	OK
4	I	1.04 S-MH-04	78.0	22.6	300	1500	43.30	43.40	44.60	0.29	0.10	0.00	0.000	2106	OK
5	B	2.01 S-MH-09	184.0	11.4	450	1500	43.08	43.13	44.35	0.06	0.05	0.00	0.000	1065	OK
6	B	2.02 S-MH-10	184.9	38.3	450	1500	42.99	43.11	44.35	0.21	0.12	0.00	0.000	3560	OK
7	B	2.03 S-MH-12	398.2	38.3	450	1500	42.87	42.93	44.35	0.10	0.07	0.00	0.000	3560	OK
8	I	1.05 S-MH-05	227.8	60.9	450	1500	42.79	42.94	44.42	0.27	0.14	0.00	0.000	5666	OK
9	B	3.01 S-MH-13	42.1	5.7	225	1200	43.90	43.94	44.80	0.13	0.04	0.00	0.000	527	OK
10	B	3.02 S-MH-14	95.8	17.0	300	1200	43.70	43.77	44.80	0.18	0.07	0.00	0.000	1582	OK
11	B	3.03 S-MH-15	298.4	22.7	300	1200	43.47	43.51	44.92	0.08	0.04	0.00	0.000	2109	OK
12	I	1.06 S-MH-06†	14.6	4.8	150	1500	42.72	42.77	44.75	0.33	0.05	0.00	0.000	7775	OK
13	I	1.07 S-MH-07	14.6	0.0	150	1200	42.65	42.66	44.35	0.00	0.00	0.00	0.000	0	OK
14	I	1.08 S-MH-08	18.6	0.0	150	1200	42.40	42.40	44.46	0.00	0.00	0.00	0.000	0	OK



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Project		By MJ	Checked
Title Surcharge calcs (Sized at 30 yrs storm) for SURFACE WATER DESIGN.SW			Reviewed

Using in-line restrictors
Return period = 30 yrs
Climate change factor = 0

PEAK hydrograph values printed
Storm duration = 60 mins
No offline storage

Mean rain intens. 29.00 mm/hr
Storm profile = Winter
Using FSR data

Peak rain intens. 72.50 mm/hr
Sample period = 30.0 secs.

Entry No.	SECT. No.	MANHOLE REF	PIPE CAPACITY l/s	RATE FLOW l/s	PIPE SIZE mm	CHAMBER DIAM/LxW mm	INVERT LEVEL m	WATER LEVEL m	GRND LEVEL m	SURCHARGE fract.	Depth	EXCESS FLOW l/s	FLOODED VOL m ³	DRAINED AREA (m ²)	STATUS
1	I	1.01 S-MH-01	42.1	4.6	225	1200	43.85	43.89	44.80	0.11	0.04	0.00	0.000	527	OK
2	I	1.02 S-MH-02	77.8	13.9	300	1200	43.58	43.65	44.80	0.18	0.07	0.00	0.000	1579	OK
3	I	1.03 S-MH-03	78.4	18.5	300	1200	43.43	43.52	44.80	0.24	0.09	0.00	0.000	2106	OK
4	I	1.04 S-MH-04	78.0	18.5	300	1500	43.30	43.39	44.60	0.24	0.09	0.00	0.000	2106	OK
5	B	2.01 S-MH-09	184.0	9.4	450	1500	43.08	43.13	44.35	0.05	0.05	0.00	0.000	1065	OK
6	B	2.02 S-MH-10	184.9	31.3	450	1500	42.99	43.10	44.35	0.17	0.10	0.00	0.000	3560	OK
7	B	2.03 S-MH-12	398.2	31.3	450	1500	42.87	42.93	44.35	0.08	0.06	0.00	0.000	3560	OK
8	I	1.05 S-MH-05	227.8	49.8	450	1500	42.79	42.92	44.42	0.22	0.12	0.00	0.000	5666	OK
9	B	3.01 S-MH-13	42.1	4.6	225	1200	43.90	43.94	44.80	0.11	0.04	0.00	0.000	527	OK
10	B	3.02 S-MH-14	95.8	13.9	300	1200	43.70	43.76	44.80	0.15	0.06	0.00	0.000	1582	OK
11	B	3.03 S-MH-15	298.4	18.6	300	1200	43.47	43.51	44.92	0.06	0.03	0.00	0.000	2109	OK
12	I	1.06 S-MH-06†	14.6	4.8	150	1500	42.72	42.77	44.75	0.33	0.05	0.00	0.000	7775	OK
13	I	1.07 S-MH-07	14.6	0.0	150	1200	42.65	42.66	44.35	0.00	0.00	0.00	0.000	0	OK
14	I	1.08 S-MH-08	18.6	0.0	150	1200	42.40	42.40	44.46	0.00	0.00	0.00	0.000	0	OK



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Project		By MJ	Checked
Title Surcharge calcs (Sized at 30 yrs storm) for SURFACE WATER DESIGN.SW			Reviewed

Using in-line restrictors
Return period = 30 yrs
Climate change factor = 0

PEAK hydrograph values printed
Storm duration = 120 mins
No offline storage

Mean rain intens. 18.00 mm/hr
Storm profile = Winter
Using FSR data

Peak rain intens. 45.00 mm/hr
Sample period = 60.0 secs.

Entry No.	SECT. No.	MANHOLE REF	PIPE CAPACITY l/s	RATE FLOW l/s	PIPE SIZE mm	CHAMBER DIAM/LxW mm	INVERT LEVEL m	WATER LEVEL m	GRND LEVEL m	SURCHARGE fract.	Depth	EXCESS FLOW l/s	FLOODED VOL m ³	DRAINED AREA (m ²)	STATUS
1	I	1.01 S-MH-01	42.1	2.8	225	1200	43.85	43.88	44.80	0.07	0.03	0.00	0.000	527	OK
2	I	1.02 S-MH-02	77.8	8.4	300	1200	43.58	43.63	44.80	0.11	0.05	0.00	0.000	1579	OK
3	I	1.03 S-MH-03	78.4	11.2	300	1200	43.43	43.49	44.80	0.14	0.06	0.00	0.000	2106	OK
4	I	1.04 S-MH-04	78.0	11.2	300	1500	43.30	43.36	44.60	0.14	0.06	0.00	0.000	2106	OK
5	B	2.01 S-MH-09	184.0	5.7	450	1500	43.08	43.11	44.35	0.03	0.03	0.00	0.000	1065	OK
6	B	2.02 S-MH-10	184.9	19.0	450	1500	42.99	43.07	44.35	0.10	0.07	0.00	0.000	3560	OK
7	B	2.03 S-MH-12	398.2	19.0	450	1500	42.87	42.91	44.35	0.05	0.04	0.00	0.000	3560	OK
8	I	1.05 S-MH-05	227.8	30.2	450	1500	42.79	42.88	44.42	0.13	0.09	0.00	0.000	5666	OK
9	B	3.01 S-MH-13	42.1	2.8	225	1200	43.90	43.93	44.80	0.07	0.03	0.00	0.000	527	OK
10	B	3.02 S-MH-14	95.8	8.4	300	1200	43.70	43.74	44.80	0.09	0.04	0.00	0.000	1582	OK
11	B	3.03 S-MH-15	298.4	11.2	300	1200	43.47	43.50	44.92	0.04	0.02	0.00	0.000	2109	OK
12	I	1.06 S-MH-06†	14.6	4.8	150	1500	42.72	42.77	44.75	0.33	0.05	0.00	0.000	7775	OK
13	I	1.07 S-MH-07	14.6	4.8	150	1200	42.65	42.71	44.35	0.33	0.05	0.00	0.000	7775	OK
14	I	1.08 S-MH-08	18.6	4.8	150	1200	42.40	42.45	44.46	0.26	0.05	0.00	0.000	7775	OK



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Job No.
1132-22

Sheet no.
1

Date
21/11/22

Project
Title
Surcharge calcs (Sized at 30 yrs storm) for SURFACE WATER DESIGN.SW

By
MJ

Checked

Reviewed

Using in-line restrictors
Return period = 30 yrs
Climate change factor = 0

PEAK hydrograph values printed
Storm duration = 180 mins
No offline storage

Mean rain intens. 13.00 mm/hr
Storm profile = Winter
Using FSR data

Peak rain intens. 32.50 mm/hr
Sample period = 90.0 secs.

Entry No.	SECT. No.	MANHOLE REF	PIPE CAPACITY l/s	RATE FLOW l/s	PIPE SIZE mm	CHAMBER DIAM/LxW mm	INVERT LEVEL m	WATER LEVEL m	GRND LEVEL m	SURCHARGE fract.	Depth	EXCESS FLOW l/s	FLOODED VOL m ³	DRAINED AREA (m ²) :x FACTOR	STATUS
1	I	1.01 S-MH-01	42.1	2.1	225	1200	43.85	43.88	44.80	0.05	0.02	0.00	0.000	527	OK
2	I	1.02 S-MH-02	77.8	6.2	300	1200	43.58	43.62	44.80	0.08	0.04	0.00	0.000	1579	OK
3	I	1.03 S-MH-03	78.4	8.3	300	1200	43.43	43.48	44.80	0.11	0.05	0.00	0.000	2106	OK
4	I	1.04 S-MH-04	78.0	8.3	300	1500	43.30	43.35	44.60	0.11	0.05	0.00	0.000	2106	OK
5	B	2.01 S-MH-09	184.0	4.2	450	1500	43.08	43.11	44.35	0.02	0.03	0.00	0.000	1065	OK
6	B	2.02 S-MH-10	184.9	14.0	450	1500	42.99	43.05	44.35	0.08	0.06	0.00	0.000	3560	OK
7	B	2.03 S-MH-12	398.2	14.0	450	1500	42.87	42.90	44.35	0.04	0.04	0.00	0.000	3560	OK
8	I	1.05 S-MH-05	227.8	22.3	450	1500	42.79	42.87	44.42	0.10	0.07	0.00	0.000	5666	OK
9	B	3.01 S-MH-13	42.1	2.1	225	1200	43.90	43.92	44.80	0.05	0.02	0.00	0.000	527	OK
10	B	3.02 S-MH-14	95.8	6.2	300	1200	43.70	43.74	44.80	0.06	0.04	0.00	0.000	1582	OK
11	B	3.03 S-MH-15	298.4	8.3	300	1200	43.47	43.50	44.92	0.03	0.02	0.00	0.000	2109	OK
12	I	1.06 S-MH-06+	14.6	4.8	150	1500	42.72	42.77	44.75	0.33	0.05	0.00	0.000	7775	OK
13	I	1.07 S-MH-07	14.6	4.8	150	1200	42.65	42.71	44.35	0.33	0.05	0.00	0.000	7775	OK
14	I	1.08 S-MH-08	18.6	4.8	150	1200	42.40	42.45	44.46	0.26	0.05	0.00	0.000	7775	OK



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Job No.
1132-22

Sheet no.
1

Date
21/11/22

Project
Title
Surcharge calcs (Sized at 30 yrs storm) for SURFACE WATER DESIGN.SW

By
MJ

Checked

Reviewed

Using in-line restrictors
Return period = 30 yrs
Climate change factor = 0

PEAK hydrograph values printed
Storm duration = 240 mins
No offline storage

Mean rain intens. 10.00 mm/hr
Storm profile = Winter
Using FSR data

Peak rain intens. 25.00 mm/hr
Sample period = 120.0 secs.

Entry No.	SECT. No.	MANHOLE REF	PIPE CAPACITY l/s	RATE FLOW l/s	PIPE SIZE mm	CHAMBER DIAM/LxW mm	INVERT LEVEL m	WATER LEVEL m	GRND LEVEL m	SURCHARGE fract.	Depth	EXCESS FLOW l/s	FLOODED VOL m ³	DRAINED AREA (m ²) :x FACTOR	STATUS
1	I	1.01 S-MH-01	42.1	1.7	225	1200	43.85	43.87	44.80	0.04	0.02	0.00	0.000	527	OK
2	I	1.02 S-MH-02	77.8	5.0	300	1200	43.58	43.62	44.80	0.06	0.04	0.00	0.000	1579	OK
3	I	1.03 S-MH-03	78.4	6.7	300	1200	43.43	43.47	44.80	0.08	0.04	0.00	0.000	2106	OK
4	I	1.04 S-MH-04	78.0	6.7	300	1500	43.30	43.34	44.60	0.09	0.04	0.00	0.000	2106	OK
5	B	2.01 S-MH-09	184.0	3.4	450	1500	43.08	43.10	44.35	0.02	0.02	0.00	0.000	1065	OK
6	B	2.02 S-MH-10	184.9	11.2	450	1500	42.99	43.05	44.35	0.06	0.05	0.00	0.000	3560	OK
7	B	2.03 S-MH-12	398.2	11.2	450	1500	42.87	42.90	44.35	0.03	0.03	0.00	0.000	3560	OK
8	I	1.05 S-MH-05	227.8	17.9	450	1500	42.79	42.86	44.42	0.08	0.06	0.00	0.000	5666	OK
9	B	3.01 S-MH-13	42.1	1.7	225	1200	43.90	43.92	44.80	0.04	0.02	0.00	0.000	527	OK
10	B	3.02 S-MH-14	95.8	5.0	300	1200	43.70	43.73	44.80	0.05	0.03	0.00	0.000	1582	OK
11	B	3.03 S-MH-15	298.4	6.7	300	1200	43.47	43.49	44.92	0.02	0.02	0.00	0.000	2109	OK
12	I	1.06 S-MH-06+	14.6	4.8	150	1500	42.72	42.77	44.75	0.33	0.05	0.00	0.000	7775	OK
13	I	1.07 S-MH-07	14.6	4.8	150	1200	42.65	42.71	44.35	0.33	0.05	0.00	0.000	7775	OK
14	I	1.08 S-MH-08	18.6	4.8	150	1200	42.40	42.45	44.46	0.26	0.05	0.00	0.000	7775	OK



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Job No.
1132-22

Sheet no.
1

Date
21/11/22

Project
Title
Surcharge calcs (Sized at 30 yrs storm) for SURFACE WATER DESIGN.SW

By
MJ

Checked

Reviewed

Using in-line restrictors
Return period = 30 yrs
Climate change factor = 0

PEAK hydrograph values printed
Storm duration = 360 mins
No offline storage

Mean rain intens. 8.00 mm/hr
Storm profile = Winter
Using FSR data

Peak rain intens. 20.00 mm/hr
Sample period = 180.0 secs.

Entry No.	SECT. No.	MANHOLE REF	PIPE CAPACITY l/s	RATE FLOW l/s	PIPE SIZE mm	CHAMBER DIAM/LxW mm	INVERT LEVEL m	WATER LEVEL m	GRND LEVEL m	SURCHARGE fract.	Depth	EXCESS FLOW l/s	FLOODED VOL m ³	DRAINED AREA (m ²) :x FACTOR	STATUS
1	I	1.01 S-MH-01	42.1	1.2	225	1200	43.85	43.87	44.80	0.03	0.02	0.00	0.000	527	OK
2	I	1.02 S-MH-02	77.8	3.6	300	1200	43.58	43.61	44.80	0.05	0.03	0.00	0.000	1579	OK
3	I	1.03 S-MH-03	78.4	4.9	300	1200	43.43	43.46	44.80	0.06	0.03	0.00	0.000	2106	OK
4	I	1.04 S-MH-04	78.0	4.9	300	1500	43.30	43.33	44.60	0.06	0.03	0.00	0.000	2106	OK
5	B	2.01 S-MH-09	184.0	2.5	450	1500	43.08	43.10	44.35	0.01	0.02	0.00	0.000	1065	OK
6	B	2.02 S-MH-10	184.9	8.2	450	1500	42.99	43.04	44.35	0.04	0.04	0.00	0.000	3560	OK
7	B	2.03 S-MH-12	398.2	8.2	450	1500	42.87	42.89	44.35	0.02	0.02	0.00	0.000	3560	OK
8	I	1.05 S-MH-05	227.8	13.1	450	1500	42.79	42.84	44.42	0.06	0.05	0.00	0.000	5666	OK
9	B	3.01 S-MH-13	42.1	1.2	225	1200	43.90	43.92	44.80	0.03	0.02	0.00	0.000	527	OK
10	B	3.02 S-MH-14	95.8	3.6	300	1200	43.70	43.72	44.80	0.04	0.02	0.00	0.000	1582	OK
11	B	3.03 S-MH-15	298.4	4.9	300	1200	43.47	43.49	44.92	0.02	0.01	0.00	0.000	2109	OK
12	I	1.06 S-MH-06+	14.6	4.8	150	1500	42.72	42.77	44.75	0.33	0.05	0.00	0.000	7775	OK
13	I	1.07 S-MH-07	14.6	4.7	150	1200	42.65	42.71	44.35	0.32	0.05	0.00	0.000	7775	OK
14	I	1.08 S-MH-08	18.6	4.7	150	1200	42.40	42.45	44.46	0.25	0.05	0.00	0.000	7775	OK



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Job No. 1132-22		
Sheet no. 1		
Date 21/11/22		
By MJ	Checked	Reviewed

Project
Title Surcharge calcs (Sized at 30 yrs storm) for SURFACE WATER DESIGN.SW

Using in-line restrictors
Return period = 30 yrs
Climate change factor = 0

PEAK hydrograph values printed
Storm duration = 720 mins
No offline storage

Mean rain intens. 4.00 mm/hr
Storm profile = Winter
Using FSR data

Peak rain intens. 10.00 mm/hr
Sample period = 360.0 secs.

Entry No.	SECT. No.	MANHOLE REF	PIPE CAPACITY l/s	RATE FLOW l/s	PIPE SIZE mm	CHAMBER DIAM/LxW mm	INVERT LEVEL m	WATER LEVEL m	GRND LEVEL m	SURCHARGE fract.	Depth	EXCESS FLOW l/s	FLOODED VOL m ³	DRAINED AREA (m ²) x FACTOR	STATUS
1	I	1.01 S-MH-01	42.1	0.7	225	1200	43.85	43.87	44.80	0.02	0.01	0.00	0.000	527	OK
2	I	1.02 S-MH-02	77.8	2.1	300	1200	43.58	43.60	44.80	0.03	0.02	0.00	0.000	1579	OK
3	I	1.03 S-MH-03	78.4	2.8	300	1200	43.43	43.45	44.80	0.04	0.02	0.00	0.000	2106	OK
4	I	1.04 S-MH-04	78.0	2.8	300	1500	43.30	43.32	44.60	0.04	0.02	0.00	0.000	2106	OK
5	B	2.01 S-MH-09	184.0	1.4	450	1500	43.08	43.09	44.35	0.01	0.01	0.00	0.000	1065	OK
6	B	2.02 S-MH-10	184.9	4.8	450	1500	42.99	43.02	44.35	0.03	0.03	0.00	0.000	3560	OK
7	B	2.03 S-MH-12	398.2	4.8	450	1500	42.87	42.88	44.35	0.01	0.02	0.00	0.000	3560	OK
8	I	1.05 S-MH-05	227.8	7.6	450	1500	42.79	42.83	44.42	0.03	0.03	0.00	0.000	5666	OK
9	B	3.01 S-MH-13	42.1	0.7	225	1200	43.90	43.91	44.80	0.02	0.01	0.00	0.000	527	OK
10	B	3.02 S-MH-14	95.8	2.1	300	1200	43.70	43.72	44.80	0.02	0.02	0.00	0.000	1582	OK
11	B	3.03 S-MH-15	298.4	2.8	300	1200	43.47	43.48	44.92	0.01	0.01	0.00	0.000	2109	OK
12	I	1.06 S-MH-06‡	14.6	4.8	150	1500	42.72	42.77	44.75	0.33	0.05	0.00	0.000	7775	OK
13	I	1.07 S-MH-07	14.6	4.7	150	1200	42.65	42.71	44.35	0.32	0.05	0.00	0.000	7775	OK
14	I	1.08 S-MH-08	18.6	4.7	150	1200	42.40	42.45	44.46	0.25	0.05	0.00	0.000	7775	OK



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Job No. 1132-22		
Sheet no. 1		
Date 21/11/22		
By MJ	Checked	Reviewed

Project
Title Surcharge calcs (Sized at 30 yrs storm) for SURFACE WATER DESIGN.SW

Using in-line restrictors
Return period = 30 yrs
Climate change factor = 0

PEAK hydrograph values printed
Storm duration = 1440 mins
No offline storage

Mean rain intens. 3.00 mm/hr
Storm profile = Winter
Using FSR data

Peak rain intens. 7.50 mm/hr
Sample period = 720.0 secs.

Entry No.	SECT. No.	MANHOLE REF	PIPE CAPACITY l/s	RATE FLOW l/s	PIPE SIZE mm	CHAMBER DIAM/LxW mm	INVERT LEVEL m	WATER LEVEL m	GRND LEVEL m	SURCHARGE fract.	Depth	EXCESS FLOW l/s	FLOODED VOL m ³	DRAINED AREA (m ²) x FACTOR	STATUS
1	I	1.01 S-MH-01	42.1	0.4	225	1200	43.85	43.86	44.80	0.01	0.01	0.00	0.000	527	OK
2	I	1.02 S-MH-02	77.8	1.2	300	1200	43.58	43.59	44.80	0.02	0.01	0.00	0.000	1579	OK
3	I	1.03 S-MH-03	78.4	1.6	300	1200	43.43	43.45	44.80	0.02	0.02	0.00	0.000	2106	OK
4	I	1.04 S-MH-04	78.0	1.6	300	1500	43.30	43.32	44.60	0.02	0.02	0.00	0.000	2106	OK
5	B	2.01 S-MH-09	184.0	0.8	450	1500	43.08	43.09	44.35	0.00	0.01	0.00	0.000	1065	OK
6	B	2.02 S-MH-10	184.9	2.8	450	1500	42.99	43.02	44.35	0.02	0.02	0.00	0.000	3560	OK
7	B	2.03 S-MH-12	398.2	2.8	450	1500	42.87	42.88	44.35	0.01	0.01	0.00	0.000	3560	OK
8	I	1.05 S-MH-05	227.8	4.4	450	1500	42.79	42.82	44.42	0.02	0.02	0.00	0.000	5666	OK
9	B	3.01 S-MH-13	42.1	0.4	225	1200	43.90	43.91	44.80	0.01	0.01	0.00	0.000	527	OK
10	B	3.02 S-MH-14	95.8	1.2	300	1200	43.70	43.71	44.80	0.01	0.01	0.00	0.000	1582	OK
11	B	3.03 S-MH-15	298.4	1.7	300	1200	43.47	43.48	44.92	0.01	0.01	0.00	0.000	2109	OK
12	I	1.06 S-MH-06‡	14.6	4.8	150	1500	42.72	42.77	44.75	0.33	0.05	0.00	0.000	7775	OK
13	I	1.07 S-MH-07	14.6	4.8	150	1200	42.65	42.71	44.35	0.33	0.05	0.00	0.000	7775	OK
14	I	1.08 S-MH-08	18.6	4.8	150	1200	42.40	42.45	44.46	0.26	0.05	0.00	0.000	7775	OK

Appendix G



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Project Knowsley East Hub		Sheet no. 1	Date 21/11/22
Title Surface Water Drainage Design 1 in 100 + 40%		By MJ	Checked Reviewed

Using in-line restrictors
Return period = 100 yrs
Climate change factor = 40

PEAK hydrograph values printed
Storm duration = 15 mins
No offline storage

Mean rain intens. 131.00 mm/hr
Storm profile = Summer
Using FSR data

Peak rain intens. 513.52 mm/hr
Sample period = 7.5 secs.

Entry No.	SECT. No.	MANHOLE REF	PIPE CAPACITY l/s	RATE FLOW l/s	PIPE SIZE mm	CHAMBER DIAM/LxW mm	INVERT LEVEL m	WATER LEVEL m	GRND LEVEL m	SURCHARGE fract.	Depth	EXCESS FLOW l/s	FLOODED VOL m³	DRAINED AREA (m²) x FACTOR	STATUS
1	I	1.01 S-MH-01	42.1	32.5	225	1200	43.85	44.02	44.80	0.77	0.16	0.00	0.000	527	OK
2	I	1.02 S-MH-02	77.8	97.3	300	1200	43.58	44.01	44.80	1.25	0.43	19.48	0.000	1579	Surch.
3	I	1.03 S-MH-03	78.4	129.8	300	1200	43.43	44.07	44.80	1.66	0.64	51.38	0.000	2106	Surch.
4	I	1.04 S-MH-04	78.0	129.8	300	1500	43.30	43.82	44.60	1.66	0.52	51.78	0.000	2106	Surch.
5	B	2.01 S-MH-09	184.0	65.6	450	1500	43.08	43.25	44.35	0.36	0.17	0.00	0.000	1065	OK
6	B	2.02 S-MH-10	184.9	219.4	450	1500	42.99	43.59	44.35	1.19	0.60	34.41	0.000	3560	Surch.
7	B	2.03 S-MH-12	398.2	219.4	450	1500	42.87	43.11	44.35	0.55	0.24	0.00	0.000	3560	OK
8	I	1.05 S-MH-05	227.8	349.1	450	1500	42.79	43.76	44.42	1.53	0.97	121.36	0.000	5666	Surch.
9	B	3.01 S-MH-13	42.1	32.5	225	1200	43.90	44.06	44.80	0.77	0.16	0.00	0.000	527	OK
10	B	3.02 S-MH-14	95.8	97.5	300	1200	43.70	44.01	44.80	1.02	0.31	1.71	0.000	1582	Surch.
11	B	3.03 S-MH-15	298.4	130.0	300	1200	43.47	43.61	44.92	0.44	0.14	0.00	0.000	2109	OK
12	I	1.06 S-MH-06	14.6	4.8	150	1500	42.72	42.77	44.75	0.33	0.05	0.00	0.000	7775	OK
13	I	1.07 S-MH-07	14.6	0.0	150	1200	42.65	42.66	44.35	0.00	0.00	0.00	0.000	0	OK
14	I	1.08 S-MH-08	18.6	0.0	150	1200	42.40	42.40	44.46	0.00	0.00	0.00	0.000	0	OK



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Project Surcharge calcs (Sized at 30 yrs storm) for SURFACE WATER DESIGN.SW CCF = 40%		Sheet no. 1	Date 21/11/22
		By MJ	Checked Reviewed

Using in-line restrictors
Return period = 100 yrs
Climate change factor = 40

PEAK hydrograph values printed
Storm duration = 30 mins
No offline storage

Mean rain intens. 86.00 mm/hr
Storm profile = Summer
Using FSR data

Peak rain intens. 337.12 mm/hr
Sample period = 15.0 secs.

Entry No.	SECT. No.	MANHOLE REF	PIPE CAPACITY l/s	RATE FLOW l/s	PIPE SIZE mm	CHAMBER DIAM/LxW mm	INVERT LEVEL m	WATER LEVEL m	GRND LEVEL m	SURCHARGE fract.	Depth	EXCESS FLOW l/s	FLOODED VOL m³	DRAINED AREA (m²) x FACTOR	STATUS
1	I	1.01 S-MH-01	42.1	21.4	225	1200	43.85	43.97	44.80	0.51	0.11	0.00	0.000	527	OK
2	I	1.02 S-MH-02	77.8	63.9	300	1200	43.58	43.81	44.80	0.82	0.23	0.00	0.000	1579	OK
3	I	1.03 S-MH-03	78.4	85.3	300	1200	43.43	43.82	44.80	1.09	0.39	6.89	0.000	2106	Surch.
4	I	1.04 S-MH-04	78.0	85.3	300	1500	43.30	43.66	44.60	1.09	0.36	7.28	0.000	2106	Surch.
5	B	2.01 S-MH-09	184.0	43.1	450	1500	43.08	43.21	44.35	0.23	0.13	0.00	0.000	1065	OK
6	B	2.02 S-MH-10	184.9	144.2	450	1500	42.99	43.32	44.35	0.78	0.33	0.00	0.000	3560	OK
7	B	2.03 S-MH-12	398.2	144.2	450	1500	42.87	43.04	44.35	0.36	0.18	0.00	0.000	3560	OK
8	I	1.05 S-MH-05	227.8	229.4	450	1500	42.79	43.26	44.42	1.01	0.46	1.67	0.000	5666	Surch.
9	B	3.01 S-MH-13	42.1	21.4	225	1200	43.90	44.01	44.80	0.51	0.11	0.00	0.000	527	OK
10	B	3.02 S-MH-14	95.8	64.1	300	1200	43.70	43.89	44.80	0.67	0.19	0.00	0.000	1582	OK
11	B	3.03 S-MH-15	298.4	85.4	300	1200	43.47	43.57	44.92	0.29	0.10	0.00	0.000	2109	OK
12	I	1.06 S-MH-06	14.6	4.8	150	1500	42.72	42.77	44.75	0.33	0.05	0.00	0.000	7775	OK
13	I	1.07 S-MH-07	14.6	0.0	150	1200	42.65	42.66	44.35	0.00	0.00	0.00	0.000	0	OK
14	I	1.08 S-MH-08	18.6	0.0	150	1200	42.40	42.40	44.46	0.00	0.00	0.00	0.000	0	OK



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Project Surcharge calcs (Sized at 30 yrs storm) for SURFACE WATER DESIGN.SW CCF = 40%		Sheet no. 1	Date 21/11/22
		By MJ	Checked Reviewed

Using in-line restrictors
Return period = 100 yrs
Climate change factor = 40

PEAK hydrograph values printed
Storm duration = 45 mins
No offline storage

Mean rain intens. 66.00 mm/hr
Storm profile = Summer
Using FSR data

Peak rain intens. 258.72 mm/hr
Sample period = 22.5 secs.

Entry No.	SECT. No.	MANHOLE REF	PIPE CAPACITY l/s	RATE FLOW l/s	PIPE SIZE mm	CHAMBER DIAM/LxW mm	INVERT LEVEL m	WATER LEVEL m	GRND LEVEL m	SURCHARGE fract.	Depth	EXCESS FLOW l/s	FLOODED VOL m³	DRAINED AREA (m²) x FACTOR	STATUS
1	I	1.01 S-MH-01	42.1	16.3	225	1200	43.85	43.95	44.80	0.39	0.09	0.00	0.000	527	OK
2	I	1.02 S-MH-02	77.8	48.9	300	1200	43.58	43.76	44.80	0.63	0.18	0.00	0.000	1579	OK
3	I	1.03 S-MH-03	78.4	65.2	300	1200	43.43	43.66	44.80	0.83	0.23	0.00	0.000	2106	OK
4	I	1.04 S-MH-04	78.0	65.2	300	1500	43.30	43.53	44.60	0.84	0.23	0.00	0.000	2106	OK
5	B	2.01 S-MH-09	184.0	33.0	450	1500	43.08	43.19	44.35	0.18	0.11	0.00	0.000	1065	OK
6	B	2.02 S-MH-10	184.9	110.2	450	1500	42.99	43.26	44.35	0.60	0.26	0.00	0.000	3560	OK
7	B	2.03 S-MH-12	398.2	110.2	450	1500	42.87	43.01	44.35	0.28	0.14	0.00	0.000	3560	OK
8	I	1.05 S-MH-05	227.8	175.4	450	1500	42.79	43.12	44.42	0.77	0.33	0.00	0.000	5666	OK
9	B	3.01 S-MH-13	42.1	16.3	225	1200	43.90	43.99	44.80	0.39	0.09	0.00	0.000	527	OK
10	B	3.02 S-MH-14	95.8	49.0	300	1200	43.70	43.85	44.80	0.51	0.15	0.00	0.000	1582	OK
11	B	3.03 S-MH-15	298.4	65.3	300	1200	43.47	43.56	44.92	0.22	0.08	0.00	0.000	2109	OK
12	I	1.06 S-MH-06	14.6	4.8	150	1500	42.72	42.77	44.75	0.33	0.05	0.00	0.000	7775	OK
13	I	1.07 S-MH-07	14.6	0.0	150	1200	42.65	42.66	44.35	0.00	0.00	0.00	0.000	0	OK
14	I	1.08 S-MH-08	18.6	0.0	150	1200	42.40	42.40	44.46	0.00	0.00	0.00	0.000	0	OK



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Sheet no.
1

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21/11/22

Project

By

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Title
Surcharge calcs (Sized at 30 yrs storm) for SURFACE WATER DESIGN.SW CCF = 40%

Using in-line restrictors
Return period = 100 yrs
Climate change factor = 40

PEAK hydrograph values printed
Storm duration = 60 mins
No offline storage

Mean rain intens. 54.00 mm/hr
Storm profile = Summer
Using FSR data

Peak rain intens. 211.68 mm/hr
Sample period = 30.0 secs.

Entry No.	SECT. No.	MANHOLE REF	PIPE CAPACITY l/s	RATE FLOW l/s	PIPE SIZE mm	CHAMBER DIAM/LxW mm	INVERT LEVEL m	WATER LEVEL m	GRND LEVEL m	SURCHARGE fract.	Depth	EXCESS FLOW l/s	FLOODED VOL m³	DRAINED AREA (m²) :x FACTOR	STATUS
1	I	1.01 S-MH-01	42.1	13.4	225	1200	43.85	43.94	44.80	0.32	0.08	0.00	0.000	527	OK
2	I	1.02 S-MH-02	77.8	40.1	300	1200	43.58	43.73	44.80	0.51	0.15	0.00	0.000	1579	OK
3	I	1.03 S-MH-03	78.4	53.4	300	1200	43.43	43.62	44.80	0.68	0.19	0.00	0.000	2106	OK
4	I	1.04 S-MH-04	78.0	53.4	300	1500	43.30	43.50	44.60	0.69	0.20	0.00	0.000	2106	OK
5	B	2.01 S-MH-09	184.0	27.0	450	1500	43.08	43.17	44.35	0.15	0.09	0.00	0.000	1065	OK
6	B	2.02 S-MH-10	184.9	90.3	450	1500	42.99	43.22	44.35	0.49	0.22	0.00	0.000	3560	OK
7	B	2.03 S-MH-12	398.2	90.3	450	1500	42.87	42.99	44.35	0.23	0.13	0.00	0.000	3560	OK
8	I	1.05 S-MH-05	227.8	143.8	450	1500	42.79	43.07	44.42	0.63	0.27	0.00	0.000	5666	OK
9	B	3.01 S-MH-13	42.1	13.4	225	1200	43.90	43.98	44.80	0.32	0.08	0.00	0.000	527	OK
10	B	3.02 S-MH-14	95.8	40.1	300	1200	43.70	43.83	44.80	0.42	0.13	0.00	0.000	1582	OK
11	B	3.03 S-MH-15	298.4	53.5	300	1200	43.47	43.55	44.92	0.18	0.07	0.00	0.000	2109	OK
12	I	1.06 S-MH-06†	14.6	4.8	150	1500	42.72	42.77	44.75	0.33	0.05	0.00	0.000	7775	OK
13	I	1.07 S-MH-07	14.6	0.0	150	1200	42.65	42.66	44.35	0.00	0.00	0.00	0.000	0	OK
14	I	1.08 S-MH-08	18.6	0.0	150	1200	42.40	42.40	44.46	0.00	0.00	0.00	0.000	0	OK



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Title
Surcharge calcs (Sized at 30 yrs storm) for SURFACE WATER DESIGN.SW CCF = 40%

Using in-line restrictors
Return period = 100 yrs
Climate change factor = 40

PEAK hydrograph values printed
Storm duration = 120 mins
No offline storage

Mean rain intens. 33.00 mm/hr
Storm profile = Summer
Using FSR data

Peak rain intens. 129.36 mm/hr
Sample period = 60.0 secs.

Entry No.	SECT. No.	MANHOLE REF	PIPE CAPACITY l/s	RATE FLOW l/s	PIPE SIZE mm	CHAMBER DIAM/LxW mm	INVERT LEVEL m	WATER LEVEL m	GRND LEVEL m	SURCHARGE fract.	Depth	EXCESS FLOW l/s	FLOODED VOL m³	DRAINED AREA (m²) :x FACTOR	STATUS
1	I	1.01 S-MH-01	42.1	8.1	225	1200	43.85	43.91	44.80	0.19	0.06	0.00	0.000	527	OK
2	I	1.02 S-MH-02	77.8	24.3	300	1200	43.58	43.69	44.80	0.31	0.11	0.00	0.000	1579	OK
3	I	1.03 S-MH-03	78.4	32.4	300	1200	43.43	43.56	44.80	0.41	0.13	0.00	0.000	2106	OK
4	I	1.04 S-MH-04	78.0	32.4	300	1500	43.30	43.43	44.60	0.42	0.13	0.00	0.000	2106	OK
5	B	2.01 S-MH-09	184.0	16.4	450	1500	43.08	43.15	44.35	0.09	0.07	0.00	0.000	1065	OK
6	B	2.02 S-MH-10	184.9	54.7	450	1500	42.99	43.15	44.35	0.30	0.15	0.00	0.000	3560	OK
7	B	2.03 S-MH-12	398.2	54.7	450	1500	42.87	42.95	44.35	0.14	0.09	0.00	0.000	3560	OK
8	I	1.05 S-MH-05	227.8	87.1	450	1500	42.79	42.98	44.42	0.38	0.18	0.00	0.000	5666	OK
9	B	3.01 S-MH-13	42.1	8.1	225	1200	43.90	43.96	44.80	0.19	0.06	0.00	0.000	527	OK
10	B	3.02 S-MH-14	95.8	24.3	300	1200	43.70	43.79	44.80	0.25	0.09	0.00	0.000	1582	OK
11	B	3.03 S-MH-15	298.4	32.4	300	1200	43.47	43.53	44.92	0.11	0.05	0.00	0.000	2109	OK
12	I	1.06 S-MH-06†	14.6	4.8	150	1500	42.72	42.77	44.75	0.33	0.05	0.00	0.000	7775	OK
13	I	1.07 S-MH-07	14.6	0.0	150	1200	42.65	42.66	44.35	0.00	0.00	0.00	0.000	0	OK
14	I	1.08 S-MH-08	18.6	0.0	150	1200	42.40	42.40	44.46	0.00	0.00	0.00	0.000	0	OK



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Title
Surcharge calcs (Sized at 30 yrs storm) for SURFACE WATER DESIGN.SW CCF = 40%

Using in-line restrictors
Return period = 100 yrs
Climate change factor = 40

PEAK hydrograph values printed
Storm duration = 180 mins
No offline storage

Mean rain intens. 24.00 mm/hr
Storm profile = Summer
Using FSR data

Peak rain intens. 94.08 mm/hr
Sample period = 90.0 secs.

Entry No.	SECT. No.	MANHOLE REF	PIPE CAPACITY l/s	RATE FLOW l/s	PIPE SIZE mm	CHAMBER DIAM/LxW mm	INVERT LEVEL m	WATER LEVEL m	GRND LEVEL m	SURCHARGE fract.	Depth	EXCESS FLOW l/s	FLOODED VOL m³	DRAINED AREA (m²) :x FACTOR	STATUS
1	I	1.01 S-MH-01	42.1	6.0	225	1200	43.85	43.90	44.80	0.14	0.05	0.00	0.000	527	OK
2	I	1.02 S-MH-02	77.8	17.9	300	1200	43.58	43.66	44.80	0.23	0.08	0.00	0.000	1579	OK
3	I	1.03 S-MH-03	78.4	23.9	300	1200	43.43	43.53	44.80	0.30	0.10	0.00	0.000	2106	OK
4	I	1.04 S-MH-04	78.0	23.9	300	1500	43.30	43.40	44.60	0.31	0.10	0.00	0.000	2106	OK
5	B	2.01 S-MH-09	184.0	12.1	450	1500	43.08	43.13	44.35	0.07	0.05	0.00	0.000	1065	OK
6	B	2.02 S-MH-10	184.9	40.3	450	1500	42.99	43.12	44.35	0.22	0.12	0.00	0.000	3560	OK
7	B	2.03 S-MH-12	398.2	40.3	450	1500	42.87	42.94	44.35	0.10	0.07	0.00	0.000	3560	OK
8	I	1.05 S-MH-05	227.8	64.2	450	1500	42.79	42.94	44.42	0.28	0.15	0.00	0.000	5666	OK
9	B	3.01 S-MH-13	42.1	6.0	225	1200	43.90	43.95	44.80	0.14	0.05	0.00	0.000	527	OK
10	B	3.02 S-MH-14	95.8	17.9	300	1200	43.70	43.77	44.80	0.19	0.07	0.00	0.000	1582	OK
11	B	3.03 S-MH-15	298.4	23.9	300	1200	43.47	43.52	44.92	0.08	0.04	0.00	0.000	2109	OK
12	I	1.06 S-MH-06†	14.6	4.8	150	1500	42.72	42.77	44.75	0.33	0.05	0.00	0.000	7775	OK
13	I	1.07 S-MH-07	14.6	0.0	150	1200	42.65	42.66	44.35	0.00	0.00	0.00	0.000	0	OK
14	I	1.08 S-MH-08	18.6	0.0	150	1200	42.40	42.40	44.46	0.00	0.00	0.00	0.000	0	OK



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Title **Surcharge calcs (Sized at 30 yrs storm) for SURFACE WATER DESIGN.SW CCF = 40%**

Using in-line restrictors
Return period = 100 yrs
Climate change factor = 40

PEAK hydrograph values printed
Storm duration = 240 mins
No offline storage

Mean rain intens. 19.00 mm/hr
Storm profile = Summer
Using FSR data

Peak rain intens. 74.48 mm/hr
Sample period = 120.0 secs.

Entry No.	SECT. No.	MANHOLE REF	PIPE CAPACITY l/s	RATE FLOW l/s	PIPE SIZE mm	CHAMBER DIAM/LxW mm	INVERT LEVEL m	WATER LEVEL m	GRND LEVEL m	SURCHARGE fract.	Depth	EXCESS FLOW l/s	FLOODED VOL m ³	DRAINED AREA (m ²) :x FACTOR	STATUS
1	I	1.01 S-MH-01	42.1	4.8	225	1200	43.85	43.89	44.80	0.11	0.04	0.00	0.000	527	OK
2	I	1.02 S-MH-02	77.8	14.3	300	1200	43.58	43.65	44.80	0.18	0.07	0.00	0.000	1579	OK
3	I	1.03 S-MH-03	78.4	19.1	300	1200	43.43	43.52	44.80	0.24	0.09	0.00	0.000	2106	OK
4	I	1.04 S-MH-04	78.0	19.1	300	1500	43.30	43.39	44.60	0.24	0.09	0.00	0.000	2106	OK
5	B	2.01 S-MH-09	184.0	9.7	450	1500	43.08	43.13	44.35	0.05	0.05	0.00	0.000	1065	OK
6	B	2.02 S-MH-10	184.9	32.3	450	1500	42.99	43.10	44.35	0.17	0.10	0.00	0.000	3560	OK
7	B	2.03 S-MH-12	398.2	32.3	450	1500	42.87	42.93	44.35	0.08	0.06	0.00	0.000	3560	OK
8	I	1.05 S-MH-05	227.8	51.4	450	1500	42.79	42.92	44.42	0.23	0.12	0.00	0.000	5666	OK
9	B	3.01 S-MH-13	42.1	4.8	225	1200	43.90	43.94	44.80	0.11	0.04	0.00	0.000	527	OK
10	B	3.02 S-MH-14	95.8	14.3	300	1200	43.70	43.76	44.80	0.15	0.06	0.00	0.000	1582	OK
11	B	3.03 S-MH-15	298.4	19.1	300	1200	43.47	43.51	44.92	0.06	0.04	0.00	0.000	2109	OK
12	I	1.06 S-MH-06+	14.6	4.8	150	1500	42.72	42.77	44.75	0.33	0.05	0.00	0.000	7775	OK
13	I	1.07 S-MH-07	14.6	0.0	150	1200	42.65	42.66	44.35	0.00	0.00	0.00	0.000	0	OK
14	I	1.08 S-MH-08	18.6	0.0	150	1200	42.40	42.40	44.46	0.00	0.00	0.00	0.000	0	OK



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Title **Surcharge calcs (Sized at 30 yrs storm) for SURFACE WATER DESIGN.SW CCF = 40%**

Using in-line restrictors
Return period = 100 yrs
Climate change factor = 40

PEAK hydrograph values printed
Storm duration = 360 mins
No offline storage

Mean rain intens. 14.00 mm/hr
Storm profile = Summer
Using FSR data

Peak rain intens. 54.88 mm/hr
Sample period = 180.0 secs.

Entry No.	SECT. No.	MANHOLE REF	PIPE CAPACITY l/s	RATE FLOW l/s	PIPE SIZE mm	CHAMBER DIAM/LxW mm	INVERT LEVEL m	WATER LEVEL m	GRND LEVEL m	SURCHARGE fract.	Depth	EXCESS FLOW l/s	FLOODED VOL m ³	DRAINED AREA (m ²) :x FACTOR	STATUS
1	I	1.01 S-MH-01	42.1	3.5	225	1200	43.85	43.89	44.80	0.08	0.03	0.00	0.000	527	OK
2	I	1.02 S-MH-02	77.8	10.4	300	1200	43.58	43.64	44.80	0.13	0.06	0.00	0.000	1579	OK
3	I	1.03 S-MH-03	78.4	13.9	300	1200	43.43	43.50	44.80	0.18	0.07	0.00	0.000	2106	OK
4	I	1.04 S-MH-04	78.0	13.9	300	1500	43.30	43.37	44.60	0.18	0.07	0.00	0.000	2106	OK
5	B	2.01 S-MH-09	184.0	7.0	450	1500	43.08	43.12	44.35	0.04	0.04	0.00	0.000	1065	OK
6	B	2.02 S-MH-10	184.9	23.4	450	1500	42.99	43.08	44.35	0.13	0.08	0.00	0.000	3560	OK
7	B	2.03 S-MH-12	398.2	23.4	450	1500	42.87	42.92	44.35	0.06	0.05	0.00	0.000	3560	OK
8	I	1.05 S-MH-05	227.8	37.3	450	1500	42.79	42.90	44.42	0.16	0.10	0.00	0.000	5666	OK
9	B	3.01 S-MH-13	42.1	3.5	225	1200	43.90	43.93	44.80	0.08	0.03	0.00	0.000	527	OK
10	B	3.02 S-MH-14	95.8	10.4	300	1200	43.70	43.75	44.80	0.11	0.05	0.00	0.000	1582	OK
11	B	3.03 S-MH-15	298.4	13.9	300	1200	43.47	43.50	44.92	0.05	0.03	0.00	0.000	2109	OK
12	I	1.06 S-MH-06+	14.6	4.8	150	1500	42.72	42.77	44.75	0.33	0.05	0.00	0.000	7775	OK
13	I	1.07 S-MH-07	14.6	4.7	150	1200	42.65	42.71	44.35	0.32	0.05	0.00	0.000	7775	OK
14	I	1.08 S-MH-08	18.6	4.7	150	1200	42.40	42.45	44.46	0.25	0.05	0.00	0.000	7775	OK



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Title **Surcharge calcs (Sized at 30 yrs storm) for SURFACE WATER DESIGN.SW CCF = 40%**

Using in-line restrictors
Return period = 100 yrs
Climate change factor = 40

PEAK hydrograph values printed
Storm duration = 720 mins
No offline storage

Mean rain intens. 8.00 mm/hr
Storm profile = Summer
Using FSR data

Peak rain intens. 31.36 mm/hr
Sample period = 360.0 secs.

Entry No.	SECT. No.	MANHOLE REF	PIPE CAPACITY l/s	RATE FLOW l/s	PIPE SIZE mm	CHAMBER DIAM/LxW mm	INVERT LEVEL m	WATER LEVEL m	GRND LEVEL m	SURCHARGE fract.	Depth	EXCESS FLOW l/s	FLOODED VOL m ³	DRAINED AREA (m ²) :x FACTOR	STATUS
1	I	1.01 S-MH-01	42.1	2.0	225	1200	43.85	43.88	44.80	0.05	0.02	0.00	0.000	527	OK
2	I	1.02 S-MH-02	77.8	6.0	300	1200	43.58	43.62	44.80	0.08	0.04	0.00	0.000	1579	OK
3	I	1.03 S-MH-03	78.4	8.0	300	1200	43.43	43.48	44.80	0.10	0.05	0.00	0.000	2106	OK
4	I	1.04 S-MH-04	78.0	8.0	300	1500	43.30	43.35	44.60	0.10	0.05	0.00	0.000	2106	OK
5	B	2.01 S-MH-09	184.0	4.1	450	1500	43.08	43.11	44.35	0.02	0.03	0.00	0.000	1065	OK
6	B	2.02 S-MH-10	184.9	13.6	450	1500	42.99	43.05	44.35	0.07	0.06	0.00	0.000	3560	OK
7	B	2.03 S-MH-12	398.2	13.6	450	1500	42.87	42.90	44.35	0.03	0.03	0.00	0.000	3560	OK
8	I	1.05 S-MH-05	227.8	21.6	450	1500	42.79	42.86	44.42	0.09	0.07	0.00	0.000	5666	OK
9	B	3.01 S-MH-13	42.1	2.0	225	1200	43.90	43.92	44.80	0.05	0.02	0.00	0.000	527	OK
10	B	3.02 S-MH-14	95.8	6.0	300	1200	43.70	43.73	44.80	0.06	0.03	0.00	0.000	1582	OK
11	B	3.03 S-MH-15	298.4	8.0	300	1200	43.47	43.49	44.92	0.03	0.02	0.00	0.000	2109	OK
12	I	1.06 S-MH-06+	14.6	4.8	150	1500	42.72	42.77	44.75	0.33	0.05	0.00	0.000	7775	OK
13	I	1.07 S-MH-07	14.6	4.8	150	1200	42.65	42.71	44.35	0.33	0.05	0.00	0.000	7775	OK
14	I	1.08 S-MH-08	18.6	4.8	150	1200	42.40	42.45	44.46	0.26	0.05	0.00	0.000	7775	OK



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SW

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Project			By MJ
Title	Surcharge calcs (Sized at 30 yrs storm) for SURFACE WATER DESIGN.SW CCF = 40%		Checked Reviewed

Using in-line restrictors
Return period = 100 yrs
Climate change factor = 40

PEAK hydrograph values printed
Storm duration = 1440 mins
No offline storage

Mean rain intens. 5.00 mm/hr
Storm profile = Summer
Using FSR data

Peak rain intens. 19.60 mm/hr
Sample period = 720.0 secs.

Entry No.	SECT. No.	MANHOLE REF	PIPE CAPACITY l/s	RATE FLOW l/s	PIPE SIZE mm	CHAMBER DIAM/LxW mm	INVERT LEVEL m	WATER LEVEL m	GRND LEVEL m	SURCHARGE fract.	Depth	EXCESS FLOW l/s	FLOODED VOL m ³	DRAINED AREA (m ²)	STATUS
1	I	1.01 S-MH-01	42.1	1.2	225	1200	43.85	43.87	44.80	0.03	0.01	0.00	0.000	527	OK
2	I	1.02 S-MH-02	77.8	3.5	300	1200	43.58	43.61	44.80	0.04	0.03	0.00	0.000	1579	OK
3	I	1.03 S-MH-03	78.4	4.6	300	1200	43.43	43.46	44.80	0.06	0.03	0.00	0.000	2106	OK
4	I	1.04 S-MH-04	78.0	4.6	300	1500	43.30	43.33	44.60	0.06	0.03	0.00	0.000	2106	OK
5	B	2.01 S-MH-09	184.0	2.3	450	1500	43.08	43.10	44.35	0.01	0.02	0.00	0.000	1065	OK
6	B	2.02 S-MH-10	184.9	7.8	450	1500	42.99	43.03	44.35	0.04	0.04	0.00	0.000	3560	OK
7	B	2.03 S-MH-12	398.2	7.8	450	1500	42.87	42.89	44.35	0.02	0.02	0.00	0.000	3560	OK
8	I	1.05 S-MH-05	227.8	12.4	450	1500	42.79	42.84	44.42	0.05	0.05	0.00	0.000	5666	OK
9	B	3.01 S-MH-13	42.1	1.2	225	1200	43.90	43.91	44.80	0.03	0.01	0.00	0.000	527	OK
10	B	3.02 S-MH-14	95.8	3.5	300	1200	43.70	43.72	44.80	0.04	0.02	0.00	0.000	1582	OK
11	B	3.03 S-MH-15	298.4	4.6	300	1200	43.47	43.49	44.92	0.02	0.01	0.00	0.000	2109	OK
12	I	1.06 S-MH-06†	14.6	4.8	150	1500	42.72	42.77	44.75	0.33	0.05	0.00	0.000	7775	OK
13	I	1.07 S-MH-07	14.6	4.7	150	1200	42.65	42.71	44.35	0.32	0.05	0.00	0.000	7775	OK
14	I	1.08 S-MH-08	18.6	4.7	150	1200	42.40	42.45	44.46	0.25	0.05	0.00	0.000	7775	OK



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SW

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Project	Knowsley East Hub		By MJ
Title	Surface Water Drainage Design 1 in 100 + 40%		Checked Reviewed

Using in-line restrictors
Return period = 100 yrs
Climate change factor = 40

PEAK hydrograph values printed
Storm duration = 15 mins
No offline storage

Mean rain intens. 131.00 mm/hr
Storm profile = Winter
Using FSR data

Peak rain intens. 327.50 mm/hr
Sample period = 7.5 secs.

Entry No.	SECT. No.	MANHOLE REF	PIPE CAPACITY l/s	RATE FLOW l/s	PIPE SIZE mm	CHAMBER DIAM/LxW mm	INVERT LEVEL m	WATER LEVEL m	GRND LEVEL m	SURCHARGE fract.	Depth	EXCESS FLOW l/s	FLOODED VOL m ³	DRAINED AREA (m ²)	STATUS
1	I	1.01 S-MH-01	42.1	20.7	225	1200	43.85	43.97	44.80	0.49	0.11	0.00	0.000	527	OK
2	I	1.02 S-MH-02	77.8	62.1	300	1200	43.58	43.80	44.80	0.80	0.22	0.00	0.000	1579	OK
3	I	1.03 S-MH-03	78.4	82.8	300	1200	43.43	43.76	44.80	1.06	0.33	4.37	0.000	2106	Surch.
4	I	1.04 S-MH-04	78.0	82.8	300	1500	43.30	43.62	44.60	1.06	0.32	4.76	0.000	2106	Surch.
5	B	2.01 S-MH-09	184.0	41.9	450	1500	43.08	43.21	44.35	0.23	0.13	0.00	0.000	1065	OK
6	B	2.02 S-MH-10	184.9	139.9	450	1500	42.99	43.32	44.35	0.76	0.32	0.00	0.000	3560	OK
7	B	2.03 S-MH-12	398.2	139.9	450	1500	42.87	43.04	44.35	0.35	0.17	0.00	0.000	3560	OK
8	I	1.05 S-MH-05	227.8	222.7	450	1500	42.79	43.22	44.42	0.98	0.42	0.00	0.000	5666	OK
9	B	3.01 S-MH-13	42.1	20.7	225	1200	43.90	44.01	44.80	0.49	0.11	0.00	0.000	527	OK
10	B	3.02 S-MH-14	95.8	62.2	300	1200	43.70	43.89	44.80	0.65	0.19	0.00	0.000	1582	OK
11	B	3.03 S-MH-15	298.4	82.9	300	1200	43.47	43.57	44.92	0.28	0.10	0.00	0.000	2109	OK
12	I	1.06 S-MH-06†	14.6	4.8	150	1500	42.72	42.77	44.75	0.33	0.05	0.00	0.000	7775	OK
13	I	1.07 S-MH-07	14.6	0.0	150	1200	42.65	42.66	44.35	0.00	0.00	0.00	0.000	0	OK
14	I	1.08 S-MH-08	18.6	0.0	150	1200	42.40	42.40	44.46	0.00	0.00	0.00	0.000	0	OK



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Project			By MJ
Title	Surcharge calcs (Sized at 30 yrs storm) for SURFACE WATER DESIGN.SW CCF = 40%		Checked Reviewed

Using in-line restrictors
Return period = 100 yrs
Climate change factor = 40

PEAK hydrograph values printed
Storm duration = 30 mins
No offline storage

Mean rain intens. 86.00 mm/hr
Storm profile = Winter
Using FSR data

Peak rain intens. 215.00 mm/hr
Sample period = 15.0 secs.

Entry No.	SECT. No.	MANHOLE REF	PIPE CAPACITY l/s	RATE FLOW l/s	PIPE SIZE mm	CHAMBER DIAM/LxW mm	INVERT LEVEL m	WATER LEVEL m	GRND LEVEL m	SURCHARGE fract.	Depth	EXCESS FLOW l/s	FLOODED VOL m ³	DRAINED AREA (m ²)	STATUS
1	I	1.01 S-MH-01	42.1	13.6	225	1200	43.85	43.94	44.80	0.32	0.08	0.00	0.000	527	OK
2	I	1.02 S-MH-02	77.8	40.8	300	1200	43.58	43.74	44.80	0.52	0.16	0.00	0.000	1579	OK
3	I	1.03 S-MH-03	78.4	54.4	300	1200	43.43	43.63	44.80	0.69	0.20	0.00	0.000	2106	OK
4	I	1.04 S-MH-04	78.0	54.4	300	1500	43.30	43.50	44.60	0.70	0.20	0.00	0.000	2106	OK
5	B	2.01 S-MH-09	184.0	27.5	450	1500	43.08	43.17	44.35	0.15	0.09	0.00	0.000	1065	OK
6	B	2.02 S-MH-10	184.9	91.9	450	1500	42.99	43.22	44.35	0.50	0.22	0.00	0.000	3560	OK
7	B	2.03 S-MH-12	398.2	91.9	450	1500	42.87	42.99	44.35	0.23	0.13	0.00	0.000	3560	OK
8	I	1.05 S-MH-05	227.8	146.3	450	1500	42.79	43.07	44.42	0.64	0.28	0.00	0.000	5666	OK
9	B	3.01 S-MH-13	42.1	13.6	225	1200	43.90	43.98	44.80	0.32	0.08	0.00	0.000	527	OK
10	B	3.02 S-MH-14	95.8	40.9	300	1200	43.70	43.83	44.80	0.43	0.13	0.00	0.000	1582	OK
11	B	3.03 S-MH-15	298.4	54.5	300	1200	43.47	43.55	44.92	0.18	0.07	0.00	0.000	2109	OK
12	I	1.06 S-MH-06†	14.6	4.8	150	1500	42.72	42.77	44.75	0.33	0.05	0.00	0.000	7775	OK
13	I	1.07 S-MH-07	14.6	0.0	150	1200	42.65	42.66	44.35	0.00	0.00	0.00	0.000	0	OK
14	I	1.08 S-MH-08	18.6	0.0	150	1200	42.40	42.40	44.46	0.00	0.00	0.00	0.000	0	OK



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Job No.	1132-22		
Sheet no.	1		
Date	21/11/22		
By	MJ	Checked	Reviewed

Project	Surcharge calcs (Sized at 30 yrs storm) for SURFACE WATER DESIGN.SW CCF = 40%		
Title			

Using in-line restrictors
Return period = 100 yrs
Climate change factor = 40

PEAK hydrograph values printed
Storm duration = 45 mins
No offline storage

Mean rain intens. 66.00 mm/hr
Storm profile = Winter
Using FSR data

Peak rain intens. 165.00 mm/hr
Sample period = 22.5 secs.

Entry No.	SECT. No.	MANHOLE REF	PIPE CAPACITY l/s	RATE FLOW l/s	PIPE SIZE mm	CHAMBER DIAM/LxW mm	INVERT LEVEL m	WATER LEVEL m	GRND LEVEL m	SURCHARGE fract.	Depth	EXCESS FLOW l/s	FLOODED VOL m ³	DRAINED AREA (m ²) :x FACTOR	STATUS
1	I	1.01 S-MH-01	42.1	10.4	225	1200	43.85	43.92	44.80	0.25	0.07	0.00	0.000	527	OK
2	I	1.02 S-MH-02	77.8	31.2	300	1200	43.58	43.71	44.80	0.40	0.13	0.00	0.000	1579	OK
3	I	1.03 S-MH-03	78.4	41.6	300	1200	43.43	43.59	44.80	0.53	0.16	0.00	0.000	2106	OK
4	I	1.04 S-MH-04	78.0	41.6	300	1500	43.30	43.46	44.60	0.53	0.16	0.00	0.000	2106	OK
5	B	2.01 S-MH-09	184.0	21.0	450	1500	43.08	43.16	44.35	0.11	0.08	0.00	0.000	1065	OK
6	B	2.02 S-MH-10	184.9	70.3	450	1500	42.99	43.18	44.35	0.38	0.18	0.00	0.000	3560	OK
7	B	2.03 S-MH-12	398.2	70.3	450	1500	42.87	42.97	44.35	0.18	0.11	0.00	0.000	3560	OK
8	I	1.05 S-MH-05	227.8	111.8	450	1500	42.79	43.02	44.42	0.49	0.22	0.00	0.000	5666	OK
9	B	3.01 S-MH-13	42.1	10.4	225	1200	43.90	43.97	44.80	0.25	0.07	0.00	0.000	527	OK
10	B	3.02 S-MH-14	95.8	31.2	300	1200	43.70	43.81	44.80	0.33	0.11	0.00	0.000	1582	OK
11	B	3.03 S-MH-15	298.4	41.6	300	1200	43.47	43.53	44.92	0.14	0.06	0.00	0.000	2109	OK
12	I	1.06 S-MH-06+	14.6	4.8	150	1500	42.72	42.77	44.75	0.33	0.05	0.00	0.000	7775	OK
13	I	1.07 S-MH-07	14.6	0.0	150	1200	42.65	42.66	44.35	0.00	0.00	0.00	0.000	0	OK
14	I	1.08 S-MH-08	18.6	0.0	150	1200	42.40	42.40	44.46	0.00	0.00	0.00	0.000	0	OK



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Job No.	1132-22		
Sheet no.	1		
Date	21/11/22		
By	MJ	Checked	Reviewed

Project	Surcharge calcs (Sized at 30 yrs storm) for SURFACE WATER DESIGN.SW CCF = 40%		
Title			

Using in-line restrictors
Return period = 100 yrs
Climate change factor = 40

PEAK hydrograph values printed
Storm duration = 60 mins
No offline storage

Mean rain intens. 54.00 mm/hr
Storm profile = Winter
Using FSR data

Peak rain intens. 135.00 mm/hr
Sample period = 30.0 secs.

Entry No.	SECT. No.	MANHOLE REF	PIPE CAPACITY l/s	RATE FLOW l/s	PIPE SIZE mm	CHAMBER DIAM/LxW mm	INVERT LEVEL m	WATER LEVEL m	GRND LEVEL m	SURCHARGE fract.	Depth	EXCESS FLOW l/s	FLOODED VOL m ³	DRAINED AREA (m ²) :x FACTOR	STATUS
1	I	1.01 S-MH-01	42.1	8.5	225	1200	43.85	43.91	44.80	0.20	0.06	0.00	0.000	527	OK
2	I	1.02 S-MH-02	77.8	25.6	300	1200	43.58	43.69	44.80	0.33	0.11	0.00	0.000	1579	OK
3	I	1.03 S-MH-03	78.4	34.1	300	1200	43.43	43.57	44.80	0.43	0.14	0.00	0.000	2106	OK
4	I	1.04 S-MH-04	78.0	34.1	300	1500	43.30	43.44	44.60	0.44	0.14	0.00	0.000	2106	OK
5	B	2.01 S-MH-09	184.0	17.2	450	1500	43.08	43.15	44.35	0.09	0.07	0.00	0.000	1065	OK
6	B	2.02 S-MH-10	184.9	57.6	450	1500	42.99	43.15	44.35	0.31	0.16	0.00	0.000	3560	OK
7	B	2.03 S-MH-12	398.2	57.6	450	1500	42.87	42.96	44.35	0.14	0.09	0.00	0.000	3560	OK
8	I	1.05 S-MH-05	227.8	91.7	450	1500	42.79	42.99	44.42	0.40	0.19	0.00	0.000	5666	OK
9	B	3.01 S-MH-13	42.1	8.5	225	1200	43.90	43.96	44.80	0.20	0.06	0.00	0.000	527	OK
10	B	3.02 S-MH-14	95.8	25.6	300	1200	43.70	43.80	44.80	0.27	0.10	0.00	0.000	1582	OK
11	B	3.03 S-MH-15	298.4	34.1	300	1200	43.47	43.53	44.92	0.11	0.05	0.00	0.000	2109	OK
12	I	1.06 S-MH-06+	14.6	4.8	150	1500	42.72	42.77	44.75	0.33	0.05	0.00	0.000	7775	OK
13	I	1.07 S-MH-07	14.6	0.0	150	1200	42.65	42.66	44.35	0.00	0.00	0.00	0.000	0	OK
14	I	1.08 S-MH-08	18.6	0.0	150	1200	42.40	42.40	44.46	0.00	0.00	0.00	0.000	0	OK



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Job No.	1132-22		
Sheet no.	1		
Date	21/11/22		
By	MJ	Checked	Reviewed

Project	Surcharge calcs (Sized at 30 yrs storm) for SURFACE WATER DESIGN.SW CCF = 40%		
Title			

Using in-line restrictors
Return period = 100 yrs
Climate change factor = 40

PEAK hydrograph values printed
Storm duration = 120 mins
No offline storage

Mean rain intens. 33.00 mm/hr
Storm profile = Winter
Using FSR data

Peak rain intens. 82.50 mm/hr
Sample period = 60.0 secs.

Entry No.	SECT. No.	MANHOLE REF	PIPE CAPACITY l/s	RATE FLOW l/s	PIPE SIZE mm	CHAMBER DIAM/LxW mm	INVERT LEVEL m	WATER LEVEL m	GRND LEVEL m	SURCHARGE fract.	Depth	EXCESS FLOW l/s	FLOODED VOL m ³	DRAINED AREA (m ²) :x FACTOR	STATUS
1	I	1.01 S-MH-01	42.1	5.2	225	1200	43.85	43.90	44.80	0.12	0.04	0.00	0.000	527	OK
2	I	1.02 S-MH-02	77.8	15.5	300	1200	43.58	43.66	44.80	0.20	0.08	0.00	0.000	1579	OK
3	I	1.03 S-MH-03	78.4	20.7	300	1200	43.43	43.52	44.80	0.26	0.09	0.00	0.000	2106	OK
4	I	1.04 S-MH-04	78.0	20.7	300	1500	43.30	43.39	44.60	0.26	0.09	0.00	0.000	2106	OK
5	B	2.01 S-MH-09	184.0	10.4	450	1500	43.08	43.13	44.35	0.06	0.05	0.00	0.000	1065	OK
6	B	2.02 S-MH-10	184.9	34.9	450	1500	42.99	43.11	44.35	0.19	0.11	0.00	0.000	3560	OK
7	B	2.03 S-MH-12	398.2	34.9	450	1500	42.87	42.93	44.35	0.09	0.06	0.00	0.000	3560	OK
8	I	1.05 S-MH-05	227.8	55.6	450	1500	42.79	42.93	44.42	0.24	0.13	0.00	0.000	5666	OK
9	B	3.01 S-MH-13	42.1	5.2	225	1200	43.90	43.94	44.80	0.12	0.04	0.00	0.000	527	OK
10	B	3.02 S-MH-14	95.8	15.5	300	1200	43.70	43.77	44.80	0.16	0.07	0.00	0.000	1582	OK
11	B	3.03 S-MH-15	298.4	20.7	300	1200	43.47	43.51	44.92	0.07	0.04	0.00	0.000	2109	OK
12	I	1.06 S-MH-06+	14.6	4.8	150	1500	42.72	42.77	44.75	0.33	0.05	0.00	0.000	7775	OK
13	I	1.07 S-MH-07	14.6	0.0	150	1200	42.65	42.66	44.35	0.00	0.00	0.00	0.000	0	OK
14	I	1.08 S-MH-08	18.6	0.0	150	1200	42.40	42.40	44.46	0.00	0.00	0.00	0.000	0	OK



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Job No.
1132-22

Sheet no. **1**

Date **21/11/22**

Project

By

MJ

Checked

Reviewed

Title **Surcharge calcs (Sized at 30 yrs storm) for SURFACE WATER DESIGN.SW CCF = 40%**

Using in-line restrictors
Return period = 100 yrs
Climate change factor = 40

PEAK hydrograph values printed
Storm duration = 180 mins
No offline storage

Mean rain intens. 24.00 mm/hr
Storm profile = Winter
Using FSR data

Peak rain intens. 60.00 mm/hr
Sample period = 90.0 secs.

Entry No.	SECT. No.	MANHOLE REF	PIPE CAPACITY l/s	RATE FLOW l/s	PIPE SIZE mm	CHAMBER DIAM/LxW mm	INVERT LEVEL m	WATER LEVEL m	GRND LEVEL m	SURCHARGE fract.	Depth	EXCESS FLOW l/s	FLOODED VOL m ³	DRAINED AREA (m ²) :x FACTOR	STATUS
1	I	1.01 S-MH-01	42.1	3.8	225	1200	43.85	43.89	44.80	0.09	0.03	0.00	0.000	527	OK
2	I	1.02 S-MH-02	77.8	11.4	300	1200	43.58	43.64	44.80	0.15	0.06	0.00	0.000	1579	OK
3	I	1.03 S-MH-03	78.4	15.2	300	1200	43.43	43.51	44.80	0.19	0.08	0.00	0.000	2106	OK
4	I	1.04 S-MH-04	78.0	15.2	300	1500	43.30	43.38	44.60	0.20	0.08	0.00	0.000	2106	OK
5	B	2.01 S-MH-09	184.0	7.7	450	1500	43.08	43.12	44.35	0.04	0.04	0.00	0.000	1065	OK
6	B	2.02 S-MH-10	184.9	25.7	450	1500	42.99	43.08	44.35	0.14	0.09	0.00	0.000	3560	OK
7	B	2.03 S-MH-12	398.2	25.7	450	1500	42.87	42.92	44.35	0.06	0.05	0.00	0.000	3560	OK
8	I	1.05 S-MH-05	227.8	40.9	450	1500	42.79	42.90	44.42	0.18	0.11	0.00	0.000	5666	OK
9	B	3.01 S-MH-13	42.1	3.8	225	1200	43.90	43.93	44.80	0.09	0.03	0.00	0.000	527	OK
10	B	3.02 S-MH-14	95.8	11.4	300	1200	43.70	43.75	44.80	0.12	0.05	0.00	0.000	1582	OK
11	B	3.03 S-MH-15	298.4	15.2	300	1200	43.47	43.51	44.92	0.05	0.03	0.00	0.000	2109	OK
12	I	1.06 S-MH-06+	14.6	4.8	150	1500	42.72	42.77	44.75	0.33	0.05	0.00	0.000	7775	OK
13	I	1.07 S-MH-07	14.6	4.7	150	1200	42.65	42.71	44.35	0.32	0.05	0.00	0.000	7775	OK
14	I	1.08 S-MH-08	18.6	4.7	150	1200	42.40	42.45	44.46	0.25	0.05	0.00	0.000	7775	OK



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Job No.
1132-22

Sheet no. **1**

Date **21/11/22**

Project

By

MJ

Checked

Reviewed

Title **Surcharge calcs (Sized at 30 yrs storm) for SURFACE WATER DESIGN.SW CCF = 40%**

Using in-line restrictors
Return period = 100 yrs
Climate change factor = 40

PEAK hydrograph values printed
Storm duration = 240 mins
No offline storage

Mean rain intens. 19.00 mm/hr
Storm profile = Winter
Using FSR data

Peak rain intens. 47.50 mm/hr
Sample period = 120.0 secs.

Entry No.	SECT. No.	MANHOLE REF	PIPE CAPACITY l/s	RATE FLOW l/s	PIPE SIZE mm	CHAMBER DIAM/LxW mm	INVERT LEVEL m	WATER LEVEL m	GRND LEVEL m	SURCHARGE fract.	Depth	EXCESS FLOW l/s	FLOODED VOL m ³	DRAINED AREA (m ²) :x FACTOR	STATUS
1	I	1.01 S-MH-01	42.1	3.1	225	1200	43.85	43.88	44.80	0.07	0.03	0.00	0.000	527	OK
2	I	1.02 S-MH-02	77.8	9.1	300	1200	43.58	43.63	44.80	0.12	0.05	0.00	0.000	1579	OK
3	I	1.03 S-MH-03	78.4	12.2	300	1200	43.43	43.49	44.80	0.16	0.06	0.00	0.000	2106	OK
4	I	1.04 S-MH-04	78.0	12.2	300	1500	43.30	43.37	44.60	0.16	0.07	0.00	0.000	2106	OK
5	B	2.01 S-MH-09	184.0	6.2	450	1500	43.08	43.11	44.35	0.03	0.03	0.00	0.000	1065	OK
6	B	2.02 S-MH-10	184.9	20.6	450	1500	42.99	43.07	44.35	0.11	0.08	0.00	0.000	3560	OK
7	B	2.03 S-MH-12	398.2	20.6	450	1500	42.87	42.91	44.35	0.05	0.05	0.00	0.000	3560	OK
8	I	1.05 S-MH-05	227.8	32.8	450	1500	42.79	42.89	44.42	0.14	0.09	0.00	0.000	5666	OK
9	B	3.01 S-MH-13	42.1	3.1	225	1200	43.90	43.93	44.80	0.07	0.03	0.00	0.000	527	OK
10	B	3.02 S-MH-14	95.8	9.2	300	1200	43.70	43.75	44.80	0.10	0.05	0.00	0.000	1582	OK
11	B	3.03 S-MH-15	298.4	12.2	300	1200	43.47	43.50	44.92	0.04	0.03	0.00	0.000	2109	OK
12	I	1.06 S-MH-06+	14.6	4.8	150	1500	42.72	42.77	44.75	0.33	0.05	0.00	0.000	7775	OK
13	I	1.07 S-MH-07	14.6	4.7	150	1200	42.65	42.71	44.35	0.32	0.05	0.00	0.000	7775	OK
14	I	1.08 S-MH-08	18.6	4.7	150	1200	42.40	42.45	44.46	0.25	0.05	0.00	0.000	7775	OK



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Job No.
1132-22

Sheet no. **1**

Date **21/11/22**

Project

By

MJ

Checked

Reviewed

Title **Surcharge calcs (Sized at 30 yrs storm) for SURFACE WATER DESIGN.SW CCF = 40%**

Using in-line restrictors
Return period = 100 yrs
Climate change factor = 40

PEAK hydrograph values printed
Storm duration = 360 mins
No offline storage

Mean rain intens. 14.00 mm/hr
Storm profile = Winter
Using FSR data

Peak rain intens. 35.00 mm/hr
Sample period = 180.0 secs.

Entry No.	SECT. No.	MANHOLE REF	PIPE CAPACITY l/s	RATE FLOW l/s	PIPE SIZE mm	CHAMBER DIAM/LxW mm	INVERT LEVEL m	WATER LEVEL m	GRND LEVEL m	SURCHARGE fract.	Depth	EXCESS FLOW l/s	FLOODED VOL m ³	DRAINED AREA (m ²) :x FACTOR	STATUS
1	I	1.01 S-MH-01	42.1	2.2	225	1200	43.85	43.88	44.80	0.05	0.02	0.00	0.000	527	OK
2	I	1.02 S-MH-02	77.8	6.6	300	1200	43.58	43.62	44.80	0.09	0.04	0.00	0.000	1579	OK
3	I	1.03 S-MH-03	78.4	8.8	300	1200	43.43	43.48	44.80	0.11	0.05	0.00	0.000	2106	OK
4	I	1.04 S-MH-04	78.0	8.8	300	1500	43.30	43.35	44.60	0.11	0.05	0.00	0.000	2106	OK
5	B	2.01 S-MH-09	184.0	4.5	450	1500	43.08	43.11	44.35	0.02	0.03	0.00	0.000	1065	OK
6	B	2.02 S-MH-10	184.9	14.9	450	1500	42.99	43.06	44.35	0.08	0.06	0.00	0.000	3560	OK
7	B	2.03 S-MH-12	398.2	14.9	450	1500	42.87	42.90	44.35	0.04	0.04	0.00	0.000	3560	OK
8	I	1.05 S-MH-05	227.8	23.8	450	1500	42.79	42.87	44.42	0.10	0.07	0.00	0.000	5666	OK
9	B	3.01 S-MH-13	42.1	2.2	225	1200	43.90	43.92	44.80	0.05	0.02	0.00	0.000	527	OK
10	B	3.02 S-MH-14	95.8	6.6	300	1200	43.70	43.74	44.80	0.07	0.04	0.00	0.000	1582	OK
11	B	3.03 S-MH-15	298.4	8.9	300	1200	43.47	43.50	44.92	0.03	0.02	0.00	0.000	2109	OK
12	I	1.06 S-MH-06+	14.6	4.8	150	1500	42.72	42.77	44.75	0.33	0.05	0.00	0.000	7775	OK
13	I	1.07 S-MH-07	14.6	4.7	150	1200	42.65	42.71	44.35	0.32	0.05	0.00	0.000	7775	OK
14	I	1.08 S-MH-08	18.6	4.7	150	1200	42.40	42.45	44.46	0.25	0.05	0.00	0.000	7775	OK



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Job No.	1132-22		
Sheet no.	1		
Date	21/11/22		
By	MJ	Checked	Reviewed

Project

Title Surchage calcs (Sized at 30 yrs storm) for SURFACE WATER DESIGN.SW CCF = 40%

Using in-line restrictors
Return period = 100 yrs
Climate change factor = 40

PEAK hydrograph values printed
Storm duration = 720 mins
No offline storage

Mean rain intens. 8.00 mm/hr
Storm profile = Winter
Using FSR data

Peak rain intens. 20.00 mm/hr
Sample period = 360.0 secs.

Entry No.	SECT. No.	MANHOLE REF	PIPE CAPACITY l/s	RATE l/s	PIPE SIZE mm	CHAMBER DIAM/LxW mm	INVERT LEVEL m	WATER LEVEL m	GRND LEVEL m	SURCHARGE fract.	Depth	EXCESS FLOW l/s	FLOODED VOL m³	DRAINED AREA (m²) x FACTOR	STATUS
1	I	1.01 S-MH-01	42.1	1.3	225	1200	43.85	43.87	44.80	0.03	0.02	0.00	0.000	527	OK
2	I	1.02 S-MH-02	77.8	3.8	300	1200	43.58	43.61	44.80	0.05	0.03	0.00	0.000	1579	OK
3	I	1.03 S-MH-03	78.4	5.1	300	1200	43.43	43.47	44.80	0.07	0.04	0.00	0.000	2106	OK
4	I	1.04 S-MH-04	78.0	5.1	300	1500	43.30	43.34	44.60	0.07	0.04	0.00	0.000	2106	OK
5	B	2.01 S-MH-09	184.0	2.6	450	1500	43.08	43.10	44.35	0.01	0.02	0.00	0.000	1065	OK
6	B	2.02 S-MH-10	184.9	8.6	450	1500	42.99	43.04	44.35	0.05	0.04	0.00	0.000	3560	OK
7	B	2.03 S-MH-12	398.2	8.6	450	1500	42.87	42.89	44.35	0.02	0.03	0.00	0.000	3560	OK
8	I	1.05 S-MH-05	227.8	13.8	450	1500	42.79	42.85	44.42	0.06	0.05	0.00	0.000	5666	OK
9	B	3.01 S-MH-13	42.1	1.3	225	1200	43.90	43.92	44.80	0.03	0.02	0.00	0.000	527	OK
10	B	3.02 S-MH-14	95.8	3.8	300	1200	43.70	43.73	44.80	0.04	0.03	0.00	0.000	1582	OK
11	B	3.03 S-MH-15	298.4	5.1	300	1200	43.47	43.49	44.92	0.02	0.01	0.00	0.000	2109	OK
12	I	1.06 S-MH-06‡	14.6	4.8	150	1500	42.72	42.77	44.75	0.33	0.05	0.00	0.000	7775	OK
13	I	1.07 S-MH-07	14.6	4.8	150	1200	42.65	42.71	44.35	0.33	0.05	0.00	0.000	7775	OK
14	I	1.08 S-MH-08	18.6	4.8	150	1200	42.40	42.45	44.46	0.26	0.05	0.00	0.000	7775	OK



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Job No.	1132-22		
Sheet no.	1		
Date	21/11/22		
By	MJ	Checked	Reviewed

Project

Title Surchage calcs (Sized at 30 yrs storm) for SURFACE WATER DESIGN.SW CCF = 40%

Using in-line restrictors
Return period = 100 yrs
Climate change factor = 40

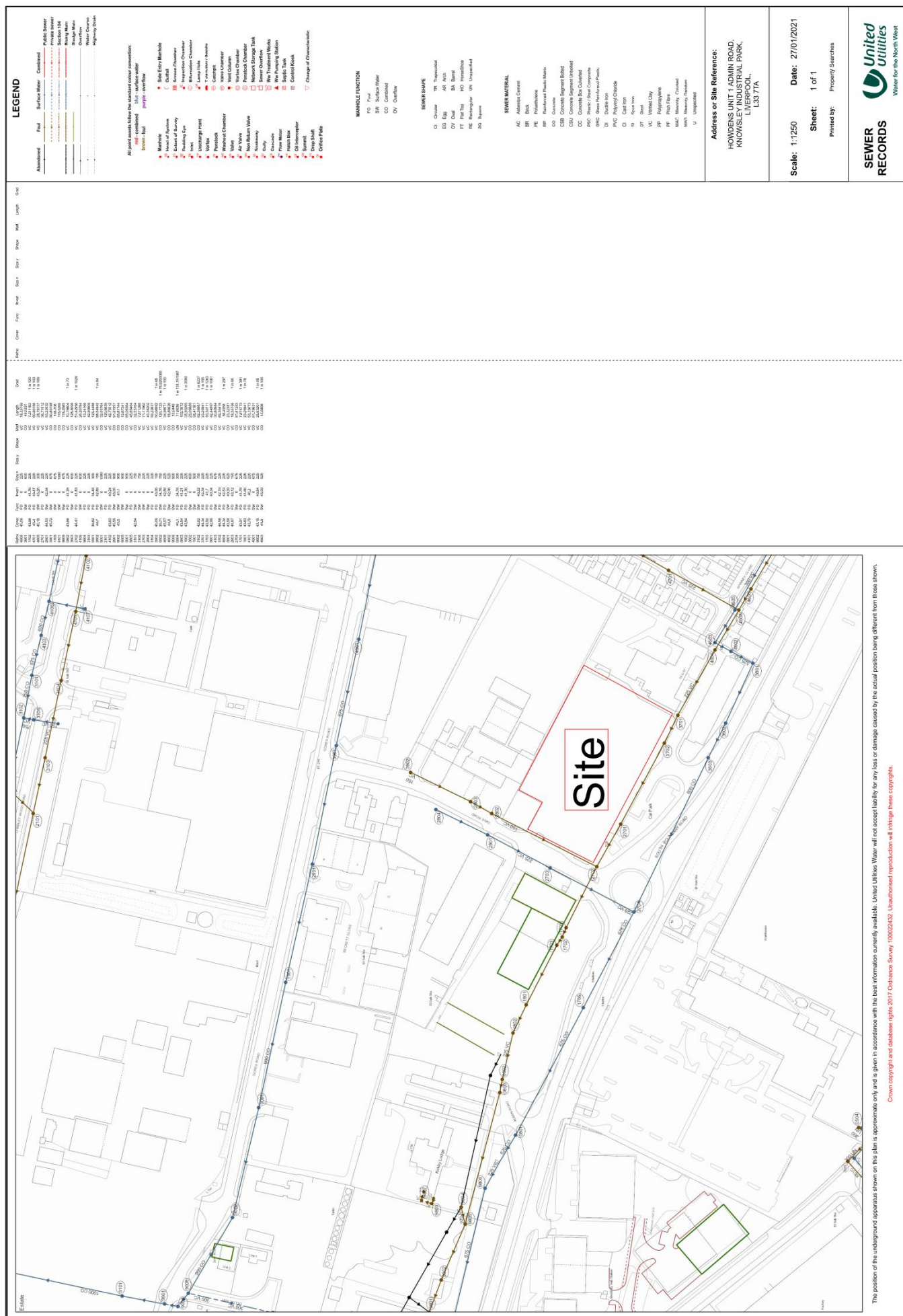
PEAK hydrograph values printed
Storm duration = 1440 mins
No offline storage

Mean rain intens. 5.00 mm/hr
Storm profile = Winter
Using FSR data

Peak rain intens. 12.50 mm/hr
Sample period = 720.0 secs.

Entry No.	SECT. No.	MANHOLE REF	PIPE CAPACITY l/s	RATE l/s	PIPE SIZE mm	CHAMBER DIAM/LxW mm	INVERT LEVEL m	WATER LEVEL m	GRND LEVEL m	SURCHARGE fract.	Depth	EXCESS FLOW l/s	FLOODED VOL m³	DRAINED AREA (m²) x FACTOR	STATUS
1	I	1.01 S-MH-01	42.1	0.7	225	1200	43.85	43.87	44.80	0.02	0.01	0.00	0.000	527	OK
2	I	1.02 S-MH-02	77.8	2.2	300	1200	43.58	43.60	44.80	0.03	0.02	0.00	0.000	1579	OK
3	I	1.03 S-MH-03	78.4	2.9	300	1200	43.43	43.45	44.80	0.04	0.02	0.00	0.000	2106	OK
4	I	1.04 S-MH-04	78.0	2.9	300	1500	43.30	43.32	44.60	0.04	0.02	0.00	0.000	2106	OK
5	B	2.01 S-MH-09	184.0	1.5	450	1500	43.08	43.09	44.35	0.01	0.01	0.00	0.000	1065	OK
6	B	2.02 S-MH-10	184.9	5.0	450	1500	42.99	43.02	44.35	0.03	0.03	0.00	0.000	3560	OK
7	B	2.03 S-MH-12	398.2	5.0	450	1500	42.87	42.88	44.35	0.01	0.02	0.00	0.000	3560	OK
8	I	1.05 S-MH-05	227.8	7.9	450	1500	42.79	42.83	44.42	0.03	0.04	0.00	0.000	5666	OK
9	B	3.01 S-MH-13	42.1	0.7	225	1200	43.90	43.91	44.80	0.02	0.01	0.00	0.000	527	OK
10	B	3.02 S-MH-14	95.8	2.2	300	1200	43.70	43.72	44.80	0.02	0.02	0.00	0.000	1582	OK
11	B	3.03 S-MH-15	298.4	2.9	300	1200	43.47	43.48	44.92	0.01	0.01	0.00	0.000	2109	OK
12	I	1.06 S-MH-06‡	14.6	4.8	150	1500	42.72	42.77	44.75	0.33	0.05	0.00	0.000	7775	OK
13	I	1.07 S-MH-07	14.6	4.8	150	1200	42.65	42.71	44.35	0.33	0.05	0.00	0.000	7775	OK
14	I	1.08 S-MH-08	18.6	4.8	150	1200	42.40	42.45	44.46	0.26	0.05	0.00	0.000	7775	OK

Appendix H



Mark Jones

From: wastewaterdeveloperservices@uuplc.co.uk
Sent: 09 November 2022 09:14
To: Mark Jones
Subject: Pre Development Enquiry for: Former Admin Building, Land North of Admin Road, Liverpool, L33 7TX UU Reference Number : 03021776

Good Morning,

Pre Development Enquiry for: Former Admin Building, Land North of Admin Road, Liverpool, L33 7TX UU Reference Number : 03021776

We have carried out an assessment of your application which is based on the information provided. This pre-development advice on your drainage strategy will be valid for 12 months. Your drainage strategy will need to be reviewed by other competent authorities as part of the planning process, and we advise that you carry out the necessary site investigations to confirm the viability of your proposals.

If your investigations require access to our public sewer network, we ask that you contact our network engineers with a request for an access certificate via our main contact telephone number 0345 6723 723 or refer to the link below:

<https://www.unitedutilities.com/builders-developers/working-near-our-assets/>

Foul Water

Foul flow from this site will be allowed to drain into the public foul water/combined sewer system.

Our preferred point of discharge would be to the 225mm diameter public foul water sewer located within the site boundary of your proposed development at an unrestricted rate.

If you are able to identify an alternative, more suitable point of discharge, we request that you contact us at your earliest convenience so that we can assess suitability.

In accordance with our infrastructure plans we may ask you to change your point of connection. Therefore please contact us when you are ready to formalise your drainage proposals, we would suggest before you submit for Full Planning.

Surface Water

All surface water flow from the proposed development should drain in-line with the drainage hierarchy, as outlined in Paragraph 80, (Reference ID: 7-080-20150323), of the National Planning Practice Guidance. We also recommend you prioritise the use of multi-functional sustainable drainage systems for the management of surface water in accordance with national planning policy.

Generally, the aim should be to discharge surface run off as high up the following hierarchy of drainage options as reasonably practicable.

This is outlined as follows, in order of priority:

1. into the ground (infiltration);
2. to a surface waterbody;
3. to a surface water sewer or highway drain;

4. to a combined sewer.

For guidance, The [North West SuDS Pro-Forma](#) provides information on the appropriate evidence required at each stage of the hierarchy, to demonstrate how each level has been discounted.

The Lead Local Flood Authority has responsibility for all surface water drainage concerns and their input to your proposal is critical. You should also consider whether it is necessary to discuss your proposal with the Environment Agency, or Internal Drainage Board (if operating in your area).

The Local Planning Authority are the determining authority for any application for planning permission and the appropriate authority for determining cost viability of a proposed drainage scheme, such assessments are outside of the jurisdiction of United Utilities.

Infiltration

Surface water runoff generated from this development should discharge to the ground via infiltration system where feasible.

A detailed evidence based feasibility assessment must be carried out in line with Chapter 25 of the CIRIA SuDS Manual 2015 to determine whether infiltration is a suitable method of surface water disposal.

Particular attention must be paid to Ground Water Source Protection Zones to ensure that the risk of pollution to these valuable resources is not compromised. Details can be obtained from the government website:

<https://www.gov.uk/guidance/groundwater-source-protection-zones-spzs#find-groundwater-spzs>

If your site is in a Groundwater Source Protection Zone, you should have regard to the Environment Agency's approach to Groundwater Protection. Information on this is available via the link below:

<https://www.gov.uk/government/publications/groundwater-protection-position-statements>

Please note that such a location could have implications for the principle of your development and the need for additional mitigating measures to protect the groundwater environment and public water supply in the detailed design of your site.

It appears only 2 of the 3 tests were carried out in SA103, which appears to be viable for infiltration. We request information as to why test no.3 wasn't carried out. Further, we request a plan of where each test was undertaken on the site.

Highway Drainage

If an evidence based assessment has been carried out and confirms that infiltration is not feasible, we recommend that you investigate the possibility of draining surface water to the highway drain where this ultimately discharges to a watercourse, by contacting the relevant Highway Authority.

Public Sewer

In accordance with the hierarchy of drainage options within the National Planning Practice Guidance, both discharge to ground via infiltration and discharge to a waterbody should be discounted prior to consideration of discharging surface water to the public sewer system. Evidence should be provided to demonstrate how these have been discounted, as outlined in the North West SuDS pro-forma.

Once evidence is provided as outlined above, United Utilities will consider a connection to the 525mm diameter public surface water sewer located to the South West corner of the proposed site at a pass forward flow to be agreed by the Lead Local Flood Authority. United Utilities request that any agreed rate does not exceed 5l/s.

As a Water Company, we have no obligation to accept highway drainage into our public sewer network. However, should your proposals include runoff from highways, we would request that consideration is given to SuDS components that deliver source control are incorporated within the design of the scheme to reduce the volume and frequency of discharges of these flows to the public sewer.

Levels

For low-lying sites, (where the ground level of the site or the level of a basement is below the ground level at the point where the drainage connects to the public sewer), care should be taken to ensure that the property is not at increased risk of flooding. If these circumstances exist, we recommend that you contact us to discuss further. It could affect the detailed design of your site and result in the need to incorporate appropriate mitigating measures in your drainage scheme.

Land drainage / Overland flows / track drainage

United Utilities have no obligation, and furthermore we do not accept land drainage, overland flows or track drainage into the public sewerage network under any circumstances

Existing Wastewater Assets Crossing the Site

According to our public sewer records there are public sewers located within your site boundary. We will require unrestricted access to the sewer for maintenance purposes, we would ask that you maintain a minimum clearance of 6m which is measured 3m from the centre line of the pipe unless there happens to be a formal easement agreement in place, in which case the specified easement width would apply. If you cannot achieve this then you may wish to consider diverting and or abandoning the public sewer.

Please be aware that any proposed diversion may require modelling. This process may take up to 6 months in order to reach an acceptable design.

Surcharge Risk

Existing public sewers pass through this site which modelling data identifies as being at higher risk of sewer surcharge. These represent a higher risk of public sewer flooding. The existence of any flood risk from the public sewer may limit the capacity of the development site. It may be necessary to apply the sequential approach as outlined in national planning policy, subject to the detail of the proposal that is brought forward. If a proposal is brought forward at this site, applicants will need to demonstrate that any flood risk is safely managed and that flood risk is not increased elsewhere.

If you are minded to bring forward a proposal you must engage with United Utilities prior to any masterplanning process to ensure development is not located in an area at risk of sewer flooding. You should consider site topography and any exceedance flow paths. Resultant layouts and levels should take account of such existing circumstances to ensure the most flood resilient solution is achieved. Given the existence of sewer flood risk, you should not assume that changes in levels or any proposed diversion of the public sewerage system will be acceptable as such proposals could increase flood risk.

Please refer to the link below to obtain full details of the processes involved with sewer diversions:

<https://www.unitedutilities.com/builders-developers/larger-developments/wastewater/sewer-diversions/>

Existing Water Assets Crossing the Site

It is the developer responsibility to identify utilities on-site. Where clean water assets are shown on our records, we recommend that you contact our Water Pre-Development Team, via the following email address: DeveloperServicesWater@uuplc.co.uk. Further information for this service can be found on our website via the link below:

<https://www.unitedutilities.com/builders-developers/larger-developments/pre-development/water-pre-dev/>

Connection Application

Although we may discuss and agree discharge points and rates in principle, please be aware that you will have to apply for a formal sewer connection. This is so that we can assess the method of construction, Health & Safety requirements and to ultimately inspect the connection when it is made. Details of the application process and the form itself can be obtained from our website by following the link below:

<https://www.unitedutilities.com/builders-developers/wastewater-services/sewer-connections/sewer-connection/>

We recommend that the detailed design should confirm the locations of all utilities in the area and ensure that any proposed drainage solution considers routing and clash checks where required.

If we can be of any further assistance please don't hesitate to contact us further.

Many thanks and 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 -----

From: wastewaterdeveloperservices@uuplc.co.uk [wastewaterdeveloperservices@uuplc.co.uk]
Sent: 01/11/2022 09:33
To: markjones@muir-associates.co.uk

East Hub, Knowsley

Phase II Geoenvironmental Site Assessment
July 2022

3.9. PARTICLE SIZE DISTRIBUTION

Particle Size Distribution Tests have been undertaken on selected samples of granular material via wet sieve to obtain information on the soil fractions. The results are included in Table 3.5. The full results can be found in Appendix VIII.

TABLE 3.5 SUMMARY OF PARTICLE SIZE DISTRIBUTION TEST RESULTS

LOCATION	DEPTH (m)	SOIL FRACTION (%)			
		COBBLES	GRAVEL	SAND	SILT/CLAY
SA103/TP114b	1.50 (Natural)	0	49	43	8
TP105	1.80 (Natural)	0	55	40	5
TP103e	0.40 (Made Ground)	0	50	43	7

3.10. SOIL DENSITY/MOISTURE CONTENT RELATIONSHIP

Dry density/moisture content relationship analysis has been conducted on soils using via utilising proctor compaction tests utilising a 4.5 kg rammer. The results of the tests have been summarised in Table 3.6. The full test results can be found in Appendix VIII.

TABLE 3.6 SUMMARY DRY DENSITY AND MOISTURE CONTENT

LOCATION	LABORATORY DESCRIPTION	TOP DEPTH (m)	METHOD OF COMPACTION	INITIAL MOISTURE CONTENT (%)	OPTIMUM MOISTURE CONTENT (%)	MATERIAL RETAINED ON 37.5 mm SIEVE (%)	MAX DRY DENSITY (mg/m ³)	MATERIAL RETAINED ON 20.0 mm TEST SIEVE (%)
TP103e	MADE GROUND brown very sandy clayey gravel.	0.40	4.5 kg	13	11	5	1.97	25
TP105	Brown very sandy silty GRAVEL.	1.80	4.5 kg	12	12	20	1.94	10

The proctor compaction tests have indicated that the materials on site are variable with the material in TP103e being wet of the optimum. It should be noted that if this material is excavated for use in a cut/fill operation careful consideration should be taken in the stabilisation of this material.

Engineering of this type of material will need to be completed during dry weather periods only.

3.11. SOIL INFILTRATION

In-situ BRE 365 Soakaway tests were undertaken within trial pits completed as SA101-SA104.

The results are presented in Table 3.7 and the test certificates are included within Appendix IX.



TABLE 3.7 BRE365 SOAKAWAY TESTING RESULTS

LOCATION	DEPTH (m)	MATERIAL	TEST NO.	SOIL INFILTRATION RATE (m/s)
SA101	1.70	MADE GROUND/Gravelly SAND	Test No.1	N/A
SA102	2.40	MADE GROUND/Gravelly SAND	Test No.1	N/A
SA103	2.00	MADE GROUND/Gravelly SAND	Test No.1	1.78 E-05
SA103			Test No.2	1.42 E-05
SA104	1.90	MADE GROUND/Gravelly SAND	Test No.1	N/A

Three of the five tests did not record a sufficient fall in water level to allow a reliable calculation of the infiltration rate. Tests in SA103 showed the granular drift deposits to have good soakage potential.

However, the application of soakaway drainage will ultimately be dependent on the specific requirements of the development. All soakaways should be designed in accordance with BRE Special Digest 365 – *Soakaway Design*.

3.12. pH AND SULPHATE

Chemical analyses for pH and soluble sulphate content contained in Appendix VI (summarised in Table 3.8), shows that the soils at the site generally meet Class DS-1, Aggressive Chemical Environment for Concrete Classification (ACEC) AC-1s in accordance with BRE *Special Digest 1* (2005).

Elevated sulphate concentrations meeting Class DS-3, AC-2s and Class DS-2, AC-1s were noted within Made Ground deposits in TP105 at 0.90 m bgl and TP111 at 1.50 m bgl, respectively.

TABLE 3.8 SUMMARY OF pH AND SULPHATE DATA

LOCATION	DEPTH (m)	SO ₄ IN 2:1 WATER/SOIL (g/l)	pH VALUE	CLASSIFICATION
TP114a	0.50	0.35	7.9	DS-1, AC-1s
TP105	0.90	1.8	7.5	DS-3, AC-2s
TP102	0.40	0.025	8.4	DS-1, AC-1s
TP106	1.00	0.089	5.8	DS-1, AC-1s
TP110	0.80	0.13	7.9	DS-1, AC-1s
WS101	0.40	0.31	7.5	DS-1, AC-1s
TP112/SA104	0.50	0.32	7.8	DS-1, AC-1s
TP115	1.50	0.084	7.9	DS-1, AC-1s
TP111	1.50	0.53	5.9	DS-2, AC-1s
TP109	1.00	0.01	7.0	DS-1, AC-1s
TP103a	0.25	0.11	8.1	DS-1, AC-1s
TP108	2.00	0.18	8.2	DS-1, AC-1s
TP113	1.50	0.051	8.2	DS-1, AC-1s



