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Upbrooks, Clitheroe

Flood risk assessment for proposed building

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INDEX

1.0 Introduction

2.0 Executive summary

3.0 Existing site, flood risk, history, existing drainage mode

4.0 Proposals, new drainage, sustainable drainage

5.0 Strategic flood risk assessments

6.0 The effect of DEFRA surface water guidelines

7.0 National Planning Policy Framework and Technical Guidance and EA mapping.

8.0 Attachments

1.0 Introduction.

The land area is at Upbrooks/ Lincoln Way. Clitheroe. It is next to Mearley Brook. A new commercial building is proposed and this report covers flood risks from all sources and new drainage.

2.0 Executive summary

The grass area for the development is floodzones 1, 2 and 3a and a new commercial building is proposed plus access roadway and parking areas. Existing floodplain volumes below 1 in 100 year level will be maintained by setting a small part of the site lower to compensate. The new hard areas will generate more surface water runoff and this will be collected and stored on site to enable the peak outflow rate to be limited to 5 l/sec in accord with DEFRA's SC030219 guidance document for new surface water flows from developments. This will improve the current situation of the existing grass area generating unlimited runoff flows to the local surface water systems in storms and this will slightly reduce and lessen runoff flows and downstream flood risk.

New surface water will flow to Mearley Brook and foul flows will drain to the existing public foul sewer network . The site is not at risk from other sources of flood risk and development will lessen downstream flood risk because of the on-site storage as required by DEFRA guidelines.

3.0 Existing site, flood risk, history, existing drainage mode.

The existing site is 0.12 ha gross and is a grass area at the junction of Upbrooks and Lincoln Way close to Mearley Brook.

The general ground slope is downhill towards Mearley Brook and the site level range is 80.23 to 81.37. The site is floodzone 2 and 3a as per the Environment Agency flood map for planning. Mearley Brook risk levels are as per the attached EA data and the site has river model node 6 alongside it. Risk levels from the EA river model data are:-

1 in 100 year risk level 80.54
1 in 1000 year risk level 81.31

The existing drainage mode of the site is sheet overland flow northwards towards Mearley Brook and runoff will reach the Brook via the local drains. The local catchment of Mearley Brook has an area of 8.27km2 and an annual rainfall depth of 1295mm. DPSBAR the average bedslope is 140.7 m /km and BFIHOST is 0.354 indicating on average less absorbent catchment soils. A 6 hour 1 in 100 year rain depth is 78.43mm.

The catchment response time is approx 3.3 hours for a catchment wide storm to produce a peak flow at Upbrooks.

Catchment storm peak rainfall rates are:-

1 in 2.3 year storm -14mm/hr
1 in 30 year storm- 29mm/hr
1 in 100 year storm- 41mm/hr
1 in 100 year + 20% climate change increase -49 mm/hr (see DEFRA guidelines 12 April 2016)

4.0 Proposals, new drainage, sustainable drainage.

The proposals are to build a 440m2 industrial unit on the site and to provide a new carpark and working area. The new access will be from Upbrooks and new drainage will connect to the public sewer network. Surface water will be stored on site in accord with current DEFRA guidance and discharged at the minimum greenfield runoff rate of 5 l/sec to Mearley Brook via existing drains. This limiting flow rate is from the HR Wallingford spreadsheet routine. The public sewer records show surface water manholes 1104 and 1105 with 1105 being in the public footpath next to the site boundary. These manholes will be lifted and dyetested to confirm a connection to Mearley Brook prior to application to United Utilities for a new connection to the system.

The new building slab level will be set at or above the 1 in 1000 year risk level of 81.31 taking access gradient requirements from Upbrooks into account. The new surface water drainage system design criteria will be that all 1 in 100 year plus 30% climate change runoff flows will be accommodated below ground in cellular storage with an in principle storage volume of 25m3. The detail design of the new hard areas and drainage is a post consent item.

A small part of the existing site is floodzone 3a below the 1 in 100 year risk level of 80.54. This area is below the proposed building and to ensure existing local 1 in 100 year floodplain volume is not reduced a thin strip will be excavated down to 80.25 between the back of footpath and the new building which will provide an equivalent volume.

Ground conditions are not yet known. A ground investigation including percolation tests will be carried out shortly and if the ground is permeable then the cellular storage will be turned into a soakaway/storage unit designed in accordance with BRE 365.

All occupants of the new building must be made aware that the area could flood and that in the case of a flood warning they should leave the building and go to higher ground away from Mearley Brook. The business controling the building should sign up to receive flood warnings.

5.0 Strategic Flood Risk Assessments
The Lead Local Flood Authority is Lancashire CC and the site is in the area of Ribble Valley BC.

6.0 The effect of DEFRA surface water guidelines in SC030219
The basis of the former SR744 superseded by SC030219 is to restrict new surface water runoff rates from new developments to prevent an increase in flood risk to anyone or anything downstream. The DEFRA guidelines ensure that new surface water runoff is collected inside the site and stored and released at a specified low flow rate so that new developments lessen flood risk.

Greenfield sites which are developed for buildings or houses or new hard drained areas have to follow DEFRA guidelines and store the new surface water runoff and release it at a low 1 in 2.3 year existing greenfield runoff rate (QBAR) to the local sewers watercourses or rivers. The 0.12 hectare existing area as it stands (rough grass approx 40% runoff) will at present produce an approx peak runoff rate during 3.3 hour length local catchment storms as follows:-

1 in 2.3 year storm - peak rainfall rate 14mm/hr- 2 l/sec
1 in 30 year storm -29mm/hr- 4 l/sec
1 in 100 year storm -41mm/hr- 6 l/sec
1 in 100 year + climate change 20% central allowance- 7 l/sec

The above calculations are approx to simulate an overhead storm and use the peak rainfall rates from the ReFSR/FEH spreadsheet routine for Mearley Brook local storms.

When development is complete and all the surface water storage is constructed plus the limiting flow controller on the site surface water outlet is installed the maximum new peak surface water flow rates to the local stream system from the development area will be as follows

1 in 2.3 year storm 5 l/sec
1 in 30 year storm 5 l/sec
1 in 100 year storm 5 l/sec
1 in 100 year + climate change 5 l/sec

This is a slight improvement on existing present day unlimited greenfield flow rates and will lessen downstream flood risk because the existing grass area will no longer discharge unlimited flow rates to the local Brook system.

7.0 National Planning Policy Framework and Technical Guidance and EA mapping.
The proposed new commercial building is classed as 'less vulnerable' in Table 2 and is 'appropriate' in floodzone 2 and 3a as per Table 3. There is no need for the exception test, or the sequential test.

Types of flooding that could affect the site are:-

1. River- the new building slab level will be
2. Sea- no tidal influence
3. Land- no undrained land slopes towards the site.
4. Groundwater- no springs on site.
5. Sewers- there are no local internet reports of sewer surcharge.
6. Reservoirs canals- none nearby.

Environment Agency mapping is as follows:-

Flood map for Planning- the site is floodzone 1, 2 and 3a

Risk of flooding from rivers and sea- this shows the effect of any flood defences.

Flood warning- this is not applicable to the site.

Groundwater- the site is not in a groundwater protection zone.

Risk of flooding from reservoirs- this shows reservoir risk- all utility company reservoirs are maintained to a 1 in 10,000 year risk standard under the Reservoirs legislation and this is a very rare and unlikely risk.

Risk of flooding from surface water- this mapping shows surface water flood risk and shows a surface water risk from Upbrooks into Mearley Brook. Pluvial mapping is the subject of a separate EA paper made public in November 2013 and is useful in locating possible ground low points and depressions. We quote-' the conveyance effect of ordinary watercourses or drainage channels is not explicitly modelled'- so whilst the EA mapping shows pathways and confirms the stream paths the mapping generally takes little account of any existing drainage and in practice there is a very low risk. The mapping is based on Jflow software and the EA May 2013 notes -'National Scale Surface Water Flood Mapping Methodology'- state that the method does not take account of existing drainage systems except by subtracting an average rain depth from storm profiles.

8.0 Attachments

This report is a copyright email report and can be transmitted in an email series of attachments or it can be transmitted by 'we transfer' with joined up pdf's.

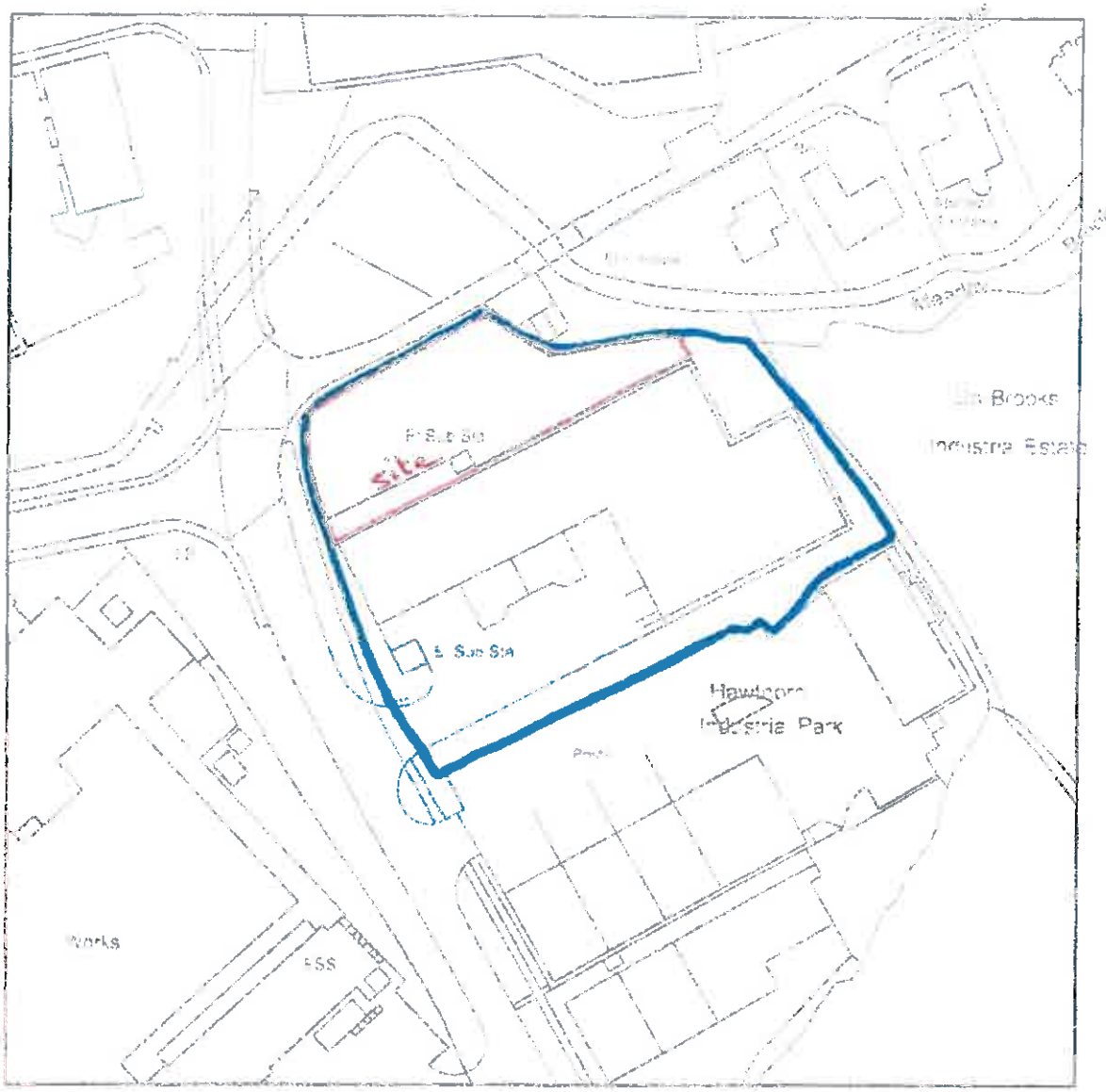
Attachments.
A4
Location plan
Floodzone plan
Mearley Brook EA data
HRW storage

A3
Magic location plan

EA risk levels
Sewer records
Land survey
Proposals
J flow mapping

Should you need further data such as survey drawings please email
floodriskengineer@gmail.com

Email files
180318fra01
180319attach1-A4
180319attach2-A3



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N

GOV.UK

Flood map for planning

BETA This is a new service – your feedback (/feedback) will help us to improve it.

Download report

Flood probability

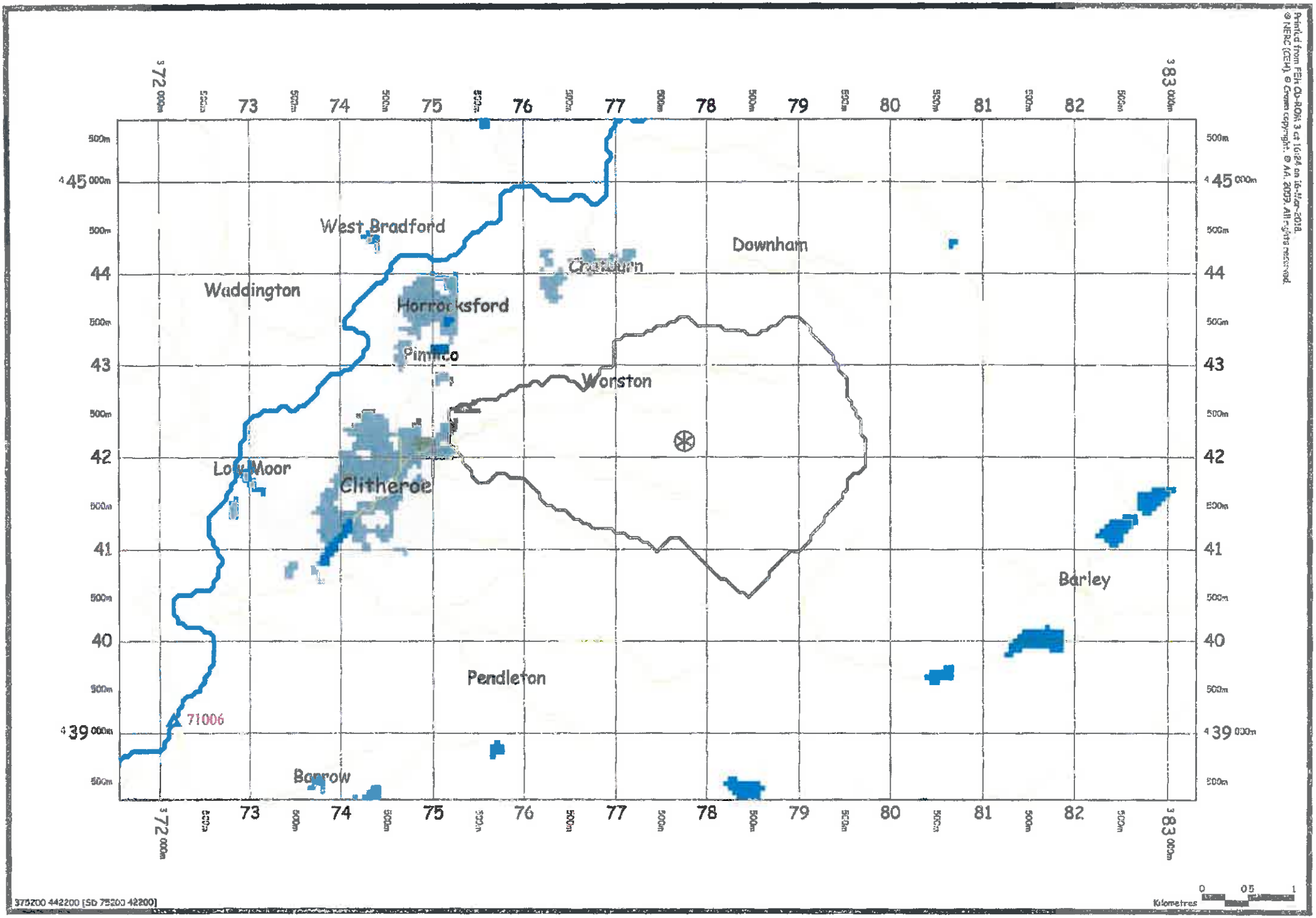
Your proposed development is in an area with a high probability of flooding

FLOOD ZONE 3

Land and property in flood zone 3 have a high probability of flooding

More information about flood zones (http://planningguidance.communities.gov.uk/blog/guidance/flood-risk-and-coastal-change/flood-zone-and-flood-risk-tables/table-1-flood-zones)

1 You must carry out a flood risk assessment (https://www.gov.uk/guidance/flood-risk-assessment-for-planning-applications) for development in flood zone 3



375200 442200 [SD 75200 42200]

VERSION	FEH CD-R Version	3	exported at	16:22:57 GMT	Fri	16-Mar-18
CATCHMENT	GB	375200	442200	SD 75200 42200		
AREA	8.27					
ALTBAR	215					
ASPBAR	298					
ASPVAR	0.67					
BFIHOST	0.354					
DPLBAR	3.29					
DPSBAR	140.7					
FARL	1					
LDP	6.1					
PROPWET	0.6					
RMED-1H	10.8					
RMED-1D	42.5					
RMED-2D	57.7					
SAAR	1295					
SAAR4170	1271					
SPRHOST	41.47					
URBCONC1990	-999999					
URBEXT1990	0.0017					
URBLOC1990	-999999					
URBCONC2000	0.565					
URBEXT2000	0.0092					
URBLOC2000	0.169					
C	-0.02578					
D1	0.41442					
D2	0.37365					
D3	0.41011					
E	0.3022					
F	2.47582					
C(1 km)	-0.025					
D1(1 km)	0.405					
D2(1 km)	0.385					
D3(1 km)	0.437					
E(1 km)	0.301					
F(1 km)	2.458					

VERSION FEH CD-R Version 3 exported a 16:23:40 GMT Fri 16-Mar-18 B2065
Parameters Unadjusted rainfall depths mel
Calculation Design rainfall Clitheroe
Calculation For a point
Calculation 1 km point GB 375000 442000 SD 75000 42000
Duration= 6 1 (hours)
Fixed dura no
Return per 100 1 (years)
Annual ma yes

c	d1	d2	d3	e	f
-0.025	0.405	0.385	0.437	0.301	2.458

A design rainfall of 78.4 mm was calculated.
No warning(s) or note(s) were present for this calculation.
The data in the following table have been computed using sliding durations.

Duration minutes	Duration hours	Duration days	10 year rainfall mm	20 year rainfall mm	50 year rainfall mm	100 year rainfall mm	200 year rainfall mm	500 year rainfall mm
15	0.25	0.010417	14.18	18.06	24.69	31.21	39.41	53.63
30	0.5	0.020833	18.06	22.71	30.55	38.15	47.61	63.77
45	0.75	0.03125	20.8	25.97	34.61	42.91	53.18	70.56
60	1	0.041667	23	28.56	37.81	46.65	57.51	75.81
75	1.25	0.052083	24.86	30.75	40.49	49.77	61.12	80.16
90	1.5	0.0625	26.49	32.66	42.83	52.47	64.24	83.89
105	1.75	0.072917	27.95	34.37	44.9	54.87	66.99	87.18
120	2	0.083333	29.29	35.92	46.79	57.03	69.48	90.14
135	2.25	0.09375	30.51	37.35	48.51	59.02	71.74	92.83
150	2.5	0.104167	31.66	38.67	50.11	60.85	73.83	95.3
165	2.75	0.114583	32.73	39.91	51.6	62.55	75.78	97.6
180	3	0.125	33.73	41.07	53	64.15	77.6	99.74
195	3.25	0.135417	34.69	42.18	54.32	65.66	79.31	101.75
210	3.5	0.145833	35.6	43.22	55.57	67.08	80.93	103.65
225	3.75	0.15625	36.46	44.22	56.76	68.44	82.46	105.46
240	4	0.166667	37.29	45.17	57.9	69.73	83.93	107.17
255	4.25	0.177083	38.09	46.09	58.99	70.97	85.33	108.8
270	4.5	0.1875	38.86	46.97	60.03	72.16	86.67	110.37
285	4.75	0.197917	39.6	47.82	61.04	73.3	87.95	111.87
300	5	0.208333	40.31	48.63	62.01	74.39	89.19	113.31
315	5.25	0.21875	41	49.43	62.95	75.45	90.39	114.7
330	5.5	0.229167	41.67	50.19	63.85	76.48	91.54	116.04
345	5.75	0.239583	42.33	50.94	64.73	77.47	92.65	117.33
360	6	0.25	42.96	51.66	65.59	78.43	93.74	118.58
375	6.25	0.260417	43.57	52.36	66.41	79.37	94.78	119.8
390	6.5	0.270833	44.17	53.04	67.22	80.28	95.8	120.98
405	6.75	0.28125	44.76	53.71	68	81.16	96.79	122.12
420	7	0.291667	45.33	54.36	68.77	82.02	97.76	123.24
435	7.25	0.302083	45.89	54.99	69.52	82.86	98.7	124.32
450	7.5	0.3125	46.43	55.61	70.24	83.68	99.61	125.38
465	7.75	0.322917	46.97	56.22	70.96	84.48	100.51	126.41
480	8	0.333333	47.49	56.81	71.65	85.26	101.38	127.41
495	8.25	0.34375	48	57.4	72.33	86.02	102.24	128.4
510	8.5	0.354167	48.51	57.97	73	86.77	103.07	129.36
525	8.75	0.364583	49	58.52	73.65	87.5	103.89	130.3
540	9	0.375	49.48	59.07	74.29	88.22	104.69	131.22
555	9.25	0.385417	49.96	59.61	74.92	88.92	105.48	132.12
570	9.5	0.395833	50.42	60.14	75.54	89.61	106.25	133
585	9.75	0.40625	50.88	60.66	76.14	90.29	107	133.87
600	10	0.416667	51.33	61.17	76.74	90.96	107.74	134.71
615	10.25	0.427083	51.78	61.67	77.32	91.61	108.47	135.55
630	10.5	0.4375	52.22	62.16	77.9	92.25	109.18	136.37
645	10.75	0.447917	52.65	62.65	78.46	92.88	109.89	137.17
660	11	0.458333	53.07	63.13	79.02	93.51	110.58	137.96
675	11.25	0.46875	53.49	63.6	79.57	94.12	111.26	138.73
690	11.5	0.479167	53.9	64.06	80.11	94.72	111.93	139.5
705	11.75	0.489583	54.3	64.52	80.64	95.31	112.58	140.25
720	12	0.5	54.7	64.97	81.16	95.9	113.23	140.99
735	12.25	0.510417	55.08	65.39	81.65	96.43	113.82	141.66
750	12.5	0.520833	55.44	65.8	82.12	96.96	114.41	142.32
765	12.75	0.53125	55.81	66.2	82.59	97.48	114.98	142.97
780	13	0.541667	56.16	66.6	83.05	97.99	115.54	143.6
795	13.25	0.552083	56.52	67	83.51	98.5	116.1	144.23
810	13.5	0.5625	56.86	67.39	83.96	98.99	116.65	144.85
825	13.75	0.572917	57.21	67.78	84.4	99.49	117.19	145.47
840	14	0.583333	57.55	68.16	84.84	99.97	117.73	146.07
855	14.25	0.59375	57.88	68.53	85.27	100.45	118.26	146.66
870	14.5	0.604167	58.22	68.9	85.7	100.92	118.78	147.25
885	14.75	0.614583	58.54	69.27	86.12	101.39	119.29	147.83

Revitalised FSR/FEH rainfall runoff method

User name	mikel	Catchment name		Date/time modelled	16-Mar-2018 11:35
Company name	mk	Catchment easting	375200	Version	5.4
Project name	mearley brook	Catchment northing	442200		
		Catchment area	0.27		

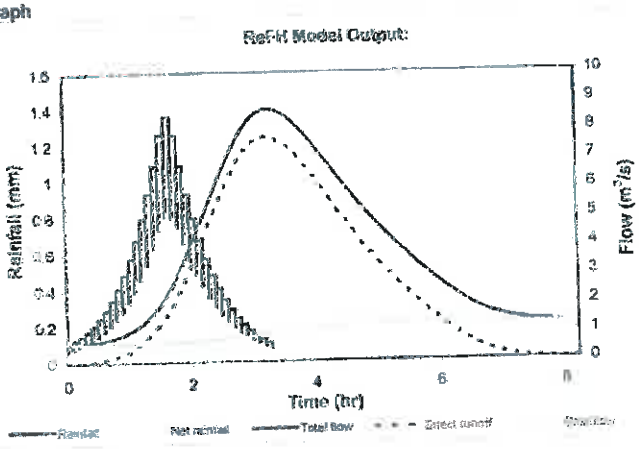
Design rainfall parameters		Loss model parameters		Routing model parameters		Baseflow model parameters	
Return period (yr)	2.3	C_{max} (mm)	252	T_p (hr)	1.39	BL (hr)	26.2
Duration (hr)	3.3	C_{ini} (mm)	137	U_p	0.65	BR	1.02
Timestep (hr)	0.1	α factor	1	U_k	0.8	BF_0 (m^3/s)	0.7
Season	Winter						

FEH DDF rainfall (mm)	22.7	Peak rainfall (mm)	14 14 mm/hr
Design rainfall (mm)	17	Peak flow (m^3/s)	8.7

Results

Series	Design Rainfall	Net rainfall	Direct runoff	Baseflow	Total flow
Unit	mm	mm	m^3/s	m^3/s	m^3/s
0.0	0.1	0.1	0.0	0.7	0.7
0.1	0.1	0.1	0.0	0.7	0.7
0.2	0.1	0.1	0.0	0.7	0.7
0.3	0.2	0.1	0.0	0.7	0.7
0.4	0.2	0.1	0.0	0.7	0.7
0.5	0.2	0.1	0.1	0.7	0.8
0.6	0.3	0.2	0.1	0.7	0.8
0.7	0.3	0.2	0.2	0.7	0.9
0.8	0.4	0.2	0.2	0.7	0.9
0.9	0.5	0.3	0.3	0.7	1.0
1.0	0.6	0.3	0.4	0.7	1.1
1.1	0.7	0.4	0.5	0.7	1.2
1.2	0.8	0.4	0.7	0.7	1.3
1.3	0.9	0.5	0.8	0.7	1.5
1.4	1.1	0.6	1.1	0.7	1.7
1.5	1.3	0.7	1.3	0.7	2.0
1.6	1.4	0.8	1.6	0.7	2.3
1.7	1.3	0.7	2.0	0.7	2.6
1.8	1.1	0.6	2.4	0.7	3.0
1.9	0.9	0.6	2.8	0.7	3.5
2.0	0.8	0.5	3.3	0.7	4.0
2.1	0.7	0.4	3.8	0.7	4.5
2.2	0.6	0.3	4.3	0.7	5.0
2.3	0.5	0.3	4.8	0.7	5.5
2.4	0.4	0.2	5.3	0.7	6.0
2.5	0.3	0.2	5.7	0.8	6.5
2.6	0.3	0.2	6.2	0.8	7.0
2.7	0.2	0.1	6.6	0.8	7.4
2.8	0.2	0.1	7.0	0.8	7.8
2.9	0.2	0.1	7.3	0.9	8.1
3.0	0.1	0.1	7.5	0.9	8.4
3.1	0.1	0.1	7.7	0.9	8.6
3.2	0.1	0.1	7.8	0.9	8.7
3.3	0.0	0.0	7.8	1.0	8.7
3.4	0.0	0.0	7.7	1.0	8.7
3.5	0.0	0.0	7.6	1.0	8.6
3.6	0.0	0.0	7.4	1.0	8.4
3.7	0.0	0.0	7.2	1.1	8.2
3.8	0.0	0.0	6.9	1.1	8.0
3.9	0.0	0.0	6.6	1.1	7.7
4.0	0.0	0.0	6.4	1.1	7.5
4.1	0.0	0.0	6.0	1.1	7.2
4.2	0.0	0.0	5.7	1.2	6.9
4.3	0.0	0.0	5.4	1.2	6.6
4.4	0.0	0.0	5.1	1.2	6.3
4.5	0.0	0.0	4.8	1.2	6.0
4.6	0.0	0.0	4.5	1.2	5.8
4.7	0.0	0.0	4.2	1.2	5.5
4.8	0.0	0.0	4.0	1.2	5.2
4.9	0.0	0.0	3.7	1.3	5.0
5.0	0.0	0.0	3.5	1.3	4.7
5.1	0.0	0.0	3.2	1.3	4.5
5.2	0.0	0.0	3.0	1.3	4.3
5.3	0.0	0.0	2.8	1.3	4.1
5.4	0.0	0.0	2.6	1.3	3.9
5.5	0.0	0.0	2.4	1.3	3.7
5.6	0.0	0.0	2.2	1.3	3.5
5.7	0.0	0.0	2.0	1.3	3.3
5.8	0.0	0.0	1.8	1.3	3.1
5.9	0.0	0.0	1.6	1.3	2.9
6.0	0.0	0.0	1.4	1.3	2.7
6.1	0.0	0.0	1.2	1.3	2.6
6.2	0.0	0.0	1.1	1.3	2.4
6.3	0.0	0.0	0.9	1.3	2.2
6.4	0.0	0.0	0.8	1.3	2.1
6.5	0.0	0.0	0.7	1.3	2.0
6.6	0.0	0.0	0.6	1.3	1.9
6.7	0.0	0.0	0.6	1.3	1.9
6.8	0.0	0.0	0.4	1.3	1.7
6.9	0.0	0.0	0.3	1.3	1.6
7.0	0.0	0.0	0.2	1.3	1.5
7.1	0.0	0.0	0.2	1.3	1.5
7.2	0.0	0.0	0.1	1.3	1.4
7.3	0.0	0.0	0.1	1.3	1.4
7.4	0.0	0.0	0.1	1.3	1.4
7.5	0.0	0.0	0.1	1.3	1.3

Graph



Revitalised FSR/FEH rainfall runoff method

User name	mikel	Catchment name		Date/time modelled	16-Mar-2018 11:38
Company name	mia	Catchment easting	375200	Version	1.4
Project name	mearley brook	Catchment northing	442200		
		Catchment area	8.27		

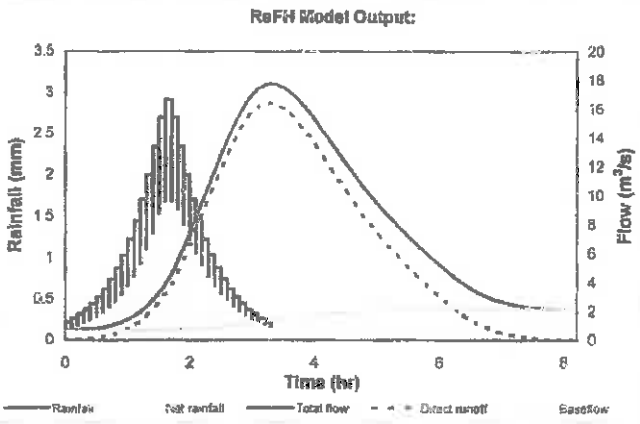
Design rainfall parameters		Loss model parameters		Routing model parameters		Baseflow model parameters	
Return period (yr)	30	C_{max} (mm)	252	T_p (hr)	1.39	BL (hr)	26.2
Duration (hr)	3.3	C_{ini} (mm)	137	U_p	0.65	BR	1.02
Timestep (hr)	0.1	α factor	0.91	U_k	0.8	BF_0 (m^3/s)	0.7
Season	Winter						

FEH DDF rainfall (mm)	43.9	Peak rainfall (mm)	(2.9) 29 mm/hr
Design rainfall (mm)	36.6	Peak flow (m^3/s)	17.7

Results

Series	Design Rainfall	Net rainfall	Direct runoff	Baseflow	Total flow
Unit	mm	mm	m^3/s	m^3/s	m^3/s
0.0	0.2	0.1	0.0	0.7	0.7
0.1	0.3	0.1	0.0	0.7	0.7
0.2	0.3	0.2	0.0	0.7	0.7
0.3	0.4	0.2	0.0	0.7	0.7
0.4	0.4	0.2	0.1	0.7	0.8
0.5	0.5	0.3	0.1	0.7	0.8
0.6	0.6	0.3	0.2	0.7	0.9
0.7	0.7	0.4	0.3	0.7	1.0
0.8	0.8	0.4	0.4	0.7	1.1
0.9	1.0	0.5	0.5	0.7	1.2
1.0	1.2	0.6	0.8	0.7	1.4
1.1	1.4	0.8	1.0	0.7	1.7
1.2	1.7	0.9	1.3	0.7	2.0
1.3	2.0	1.1	1.7	0.7	2.3
1.4	2.3	1.3	2.1	0.7	2.8
1.5	2.7	1.5	2.6	0.7	3.3
1.6	2.9	1.7	3.2	0.7	3.9
1.7	2.7	1.6	3.9	0.7	4.6
1.8	2.3	1.4	4.7	0.7	5.5
1.9	2.0	1.2	5.7	0.7	6.4
2.0	1.7	1.0	6.6	0.8	7.4
2.1	1.4	0.9	7.7	0.8	8.4
2.2	1.2	0.8	8.7	0.8	9.5
2.3	1.0	0.6	9.8	0.8	10.6
2.4	0.9	0.5	10.8	0.9	11.7
2.5	0.7	0.5	11.9	0.9	12.8
2.6	0.6	0.4	12.8	1.0	13.8
2.7	0.5	0.3	13.8	1.0	14.8
2.8	0.4	0.3	14.6	1.1	15.6
2.9	0.4	0.2	15.3	1.1	16.4
3.0	0.3	0.2	15.8	1.2	17.0
3.1	0.3	0.2	16.2	1.2	17.4
3.2	0.2	0.1	16.4	1.3	17.7
3.3	0.0	0.0	16.4	1.3	17.7
3.4	0.0	0.0	16.3	1.4	17.7
3.5	0.0	0.0	16.0	1.5	17.5
3.6	0.0	0.0	15.7	1.5	17.2
3.7	0.0	0.0	15.3	1.6	16.8
3.8	0.0	0.0	14.7	1.6	16.4
3.9	0.0	0.0	14.2	1.7	15.9
4.0	0.0	0.0	13.6	1.7	15.3
4.1	0.0	0.0	12.9	1.8	14.7
4.2	0.0	0.0	12.3	1.8	14.1
4.3	0.0	0.0	11.8	1.8	13.5
4.4	0.0	0.0	11.0	1.9	12.9
4.5	0.0	0.0	10.3	1.9	12.3
4.6	0.0	0.0	9.7	1.9	11.7
4.7	0.0	0.0	9.1	2.0	11.1
4.8	0.0	0.0	8.5	2.0	10.5
4.9	0.0	0.0	8.0	2.0	10.0
5.0	0.0	0.0	7.4	2.0	9.5
5.1	0.0	0.0	6.9	2.1	9.0
5.2	0.0	0.0	6.4	2.1	8.5
5.3	0.0	0.0	6.0	2.1	8.1
5.4	0.0	0.0	5.5	2.1	7.6
5.5	0.0	0.0	5.1	2.1	7.2
5.6	0.0	0.0	4.7	2.1	6.8
5.7	0.0	0.0	4.2	2.2	6.4
5.8	0.0	0.0	3.8	2.2	6.0
5.9	0.0	0.0	3.4	2.2	5.6
6.0	0.0	0.0	3.1	2.2	5.2
6.1	0.0	0.0	2.7	2.2	4.9
6.2	0.0	0.0	2.4	2.2	4.5
6.3	0.0	0.0	2.1	2.2	4.2
6.4	0.0	0.0	1.7	2.2	3.9
6.5	0.0	0.0	1.5	2.2	3.6
6.6	0.0	0.0	1.2	2.2	3.4
6.7	0.0	0.0	1.0	2.2	3.2
6.8	0.0	0.0	0.8	2.2	3.0
6.9	0.0	0.0	0.7	2.2	2.8
7.0	0.0	0.0	0.5	2.1	2.7
7.1	0.0	0.0	0.4	2.1	2.6
7.2	0.0	0.0	0.3	2.1	2.5
7.3	0.0	0.0	0.2	2.1	2.4
7.4	0.0	0.0	0.2	2.1	2.3
7.5	0.0	0.0	0.1	2.1	2.2

Graph



Revitalised FSR/FEH rainfall runoff method

User name	mikel	Catchment name		Date/time modelled	18-Mar-2018 11:36
Company name	mla	Catchment easting	375200	Version	1.4
Project name	meavley brook	Catchment northing	442200		
		Catchment area	6.27		

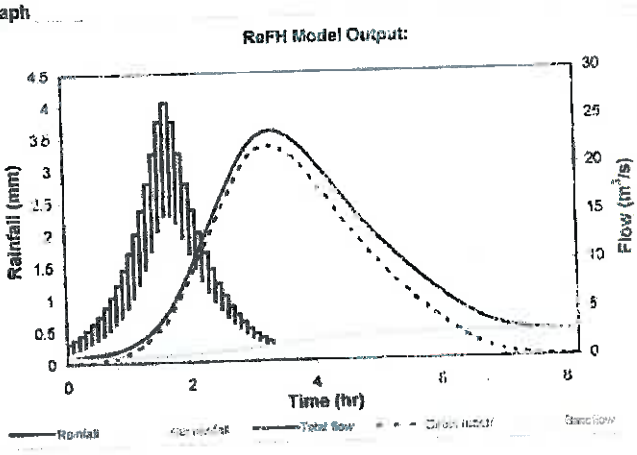
Design rainfall parameters		Loss model parameters		Routing model parameters		Baseflow model parameters	
Return period (yr)	100	C_{max} (mm)	252	T_p (hr)	1.39	SL (hr)	26.2
Duration (hr)	3.3	C_{ini} (mm)	137	U_p	0.65	BR	1.02
Timestep (hr)	0.1	α factor	0.83	U_k	0.8	BF_0 (m^3/s)	0.7
Season	Winter						

FEH DDF rainfall (mm)	68	Peak rainfall (mm)	4.1 → 41 mm/hr
Design rainfall (mm)	50.9	Peak flow (m^3/s)	23.9

Results

Series	Design Rainfall	Net rainfall	Direct runoff	Baseflow	Total flow
Unit	mm	mm	m^3/s	m^3/s	m^3/s
0.0	0.3	0.1	0.0	0.7	0.7
0.1	0.4	0.2	0.0	0.7	0.7
0.2	0.4	0.2	0.0	0.7	0.7
0.3	0.5	0.2	0.1	0.7	0.8
0.4	0.6	0.3	0.1	0.7	0.8
0.5	0.7	0.3	0.2	0.7	0.9
0.6	0.9	0.4	0.3	0.7	1.1
0.7	1.0	0.5	0.4	0.7	1.2
0.8	1.2	0.6	0.5	0.7	1.4
0.9	1.4	0.7	0.7	0.7	1.4
1.0	1.7	0.8	1.0	0.7	1.7
1.1	2.0	1.0	1.3	0.7	2.0
1.2	2.4	1.2	1.7	0.7	2.3
1.3	2.8	1.4	2.1	0.7	2.8
1.4	3.2	1.7	2.7	0.7	3.4
1.5	3.8	2.0	3.4	0.7	4.1
1.6	4.1	2.2	4.2	0.7	4.9
1.7	3.8	2.1	5.1	0.7	5.8
1.8	3.2	1.9	6.2	0.7	6.9
1.9	2.8	1.7	7.4	0.8	8.2
2.0	2.4	1.4	8.7	0.8	9.5
2.1	2.0	1.2	10.1	0.8	10.9
2.2	1.7	1.1	11.5	0.9	12.4
2.3	1.4	0.9	13.0	0.9	13.9
2.4	1.2	0.8	14.4	1.0	15.4
2.5	1.0	0.7	15.8	1.0	16.9
2.6	0.9	0.6	17.2	1.1	18.3
2.7	0.7	0.5	18.5	1.1	19.6
2.8	0.6	0.4	19.6	1.2	20.8
2.9	0.5	0.3	20.6	1.3	21.9
3.0	0.4	0.3	21.4	1.4	22.7
3.1	0.4	0.2	21.9	1.4	23.3
3.2	0.3	0.2	22.2	1.5	23.7
3.3	0.0	0.0	22.3	1.6	23.9
3.4	0.0	0.0	22.2	1.7	23.8
3.5	0.0	0.0	21.9	1.8	23.6
3.6	0.0	0.0	21.4	1.8	23.3
3.7	0.0	0.0	20.9	1.9	22.8
3.8	0.0	0.0	20.2	2.0	22.2
3.9	0.0	0.0	19.4	2.0	21.5
4.0	0.0	0.0	18.6	2.1	20.7
4.1	0.0	0.0	17.8	2.2	19.9
4.2	0.0	0.0	16.9	2.2	19.1
4.3	0.0	0.0	16.0	2.3	18.3
4.4	0.0	0.0	15.1	2.3	17.4
4.5	0.0	0.0	14.2	2.4	16.6
4.6	0.0	0.0	13.4	2.4	15.8
4.7	0.0	0.0	12.5	2.5	15.0
4.8	0.0	0.0	11.7	2.6	14.2
4.9	0.0	0.0	11.0	2.5	13.5
5.0	0.0	0.0	10.2	2.6	12.8
5.1	0.0	0.0	9.6	2.6	12.2
5.2	0.0	0.0	8.9	2.6	11.5
5.3	0.0	0.0	8.2	2.7	10.9
5.4	0.0	0.0	7.6	2.7	10.3
5.5	0.0	0.0	7.0	2.7	9.7
5.6	0.0	0.0	6.4	2.7	9.1
5.7	0.0	0.0	5.9	2.7	8.6
5.8	0.0	0.0	5.3	2.7	8.0
5.9	0.0	0.0	4.8	2.7	7.5
6.0	0.0	0.0	4.3	2.7	7.0
6.1	0.0	0.0	3.8	2.8	6.5
6.2	0.0	0.0	3.3	2.8	6.1
6.3	0.0	0.0	2.9	2.8	5.6
6.4	0.0	0.0	2.4	2.8	5.2
6.5	0.0	0.0	2.1	2.8	4.8
6.6	0.0	0.0	1.7	2.8	4.5
6.7	0.0	0.0	1.4	2.8	4.2
6.8	0.0	0.0	1.1	2.7	3.9
6.9	0.0	0.0	0.9	2.7	3.7
7.0	0.0	0.0	0.7	2.7	3.5
7.1	0.0	0.0	0.6	2.7	3.3
7.2	0.0	0.0	0.5	2.7	3.2
7.3	0.0	0.0	0.3	2.7	3.1
7.4	0.0	0.0	0.3	2.7	3.0
7.5	0.0	0.0	0.2	2.7	2.9

Graph



HR Wallingford
Working with water

Surface water storage requirements for sites

www.uksuds.com | Storage estimation tool

Calculated by: michael lambert
Site name: upbrooks cle
Site location: clitheroe

This is an estimation of the storage volume requirements that are needed to meet normal best practice criteria in line with Environment Agency guidance "Preliminary rainfall runoff management for developments" W5-074/A/TR/1 rev E (2012) and the SuDS Manual C753 (Ciria 2015). It is not to be used for detailed design of drainage systems. It is recommended that hydraulic modelling software is used to calculate volume requirements and design details before finalising the drainage scheme.

Site coordinates
Latitude: 53.87501° N
Longitude: 2.37916° W

Reference: 6325598
Date: 2018-03-16T16:48:49

Methodology	FEH Statistical

Site characteristics

Total site area (ha)	0.12
Significant public open space (ha)	0
Area positively drained (ha)	0.12
Pervious area contribution (%)	30
Impermeable area (ha)	0.1
Percentage of drained area that is impermeable (%)	83
Impervious area drained via infiltration (ha)	0
Return period for infiltration system design (year)	10
Impervious area drained to rainwater harvesting systems (ha)	0
Return period for rainwater harvesting system design (year)	10
Compliance factor for rainwater harvesting system design (%)	66
Net site area for storage volume design (ha)	0.12
Net impermeable area for storage volume design (ha)	0.1

* Where rainwater harvesting or infiltration has been used for managing surface water runoff such that the effective impermeable area is less than 50 % of the 'area positively drained' the 'net site area' and the estimates of Qbar and other flow rates will have been reduced accordingly.

Design criteria

Volume control approach: Use long term storage

	Default	Edited
Climate change allowance factor	1.3	1.3
Urban creep allowance factor	1.1	1.1
Interception rainfall depth (mm)	5	5
Minimum flow rate (l/s)	5	5

Qmed estimation method: Calculate from BFI and SAAR
BFI & SPR estimation method: Specify BFI and SPR manually

	Default	Edited
Qmed (l/s)	1.66	–
Qbar / Qmed Conversion Factor	1.075	1.075
HOST class	–	N/A
BFI / BFIHOST	0.354	0.354
SPR / SPRHOST	0.41	0.41

Hydrology

	Default	Edited
SAAR (mm)	1241	1241
M5-60 Rainfall Depth (mm)	20	20
'r' Ratio M5-60/M5-2 day	0.3	0.3
Rainfall 100 yrs 6 hrs	70	
Rainfall 100 yrs 12 hrs	96.6	
FEH/FSR conversion factor	1.15	1.15
Hydrological region	10	
Growth curve factor: 1 year	0.87	0.87
Growth curve factor: 10 year	1.38	1.38
Growth curve factor: 30 year	1.7	1.7
Growth curve factor: 100 year	2.08	2.08

Site discharge rates

	Default	Edited
Qbar total site area (l/s)	–	1.79
Qbar net site area (l/s)	–	1.79
1 in 1 year (l/s)	–	5
1 in 30 years (l/s)	–	5
1 in 100 years (l/s)	–	5

Estimated storage volumes

	Default	Edited
Interception storage (m³)	–	4
Attenuation storage (m³)	–	25
Long term storage (m³)	–	0
Treatment storage (m³)	–	12
Total storage *(excluding treatment)* (m³)	–	29

Lancashire and Blackpool Local Flood Risk Management Strategy

October 2013
Draft for Consultation

Blackpool Council

Lancashire County Council

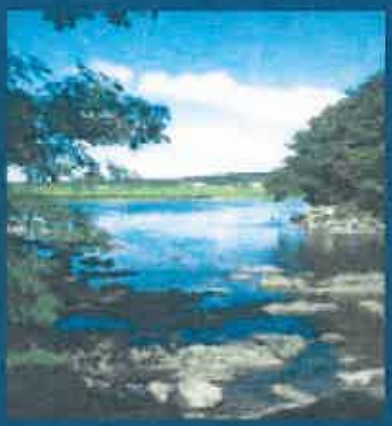
Ribble Valley Borough Council

Strategic Flood Risk Assessment

-Level One-

ADOPTION REPORT

MAY 2010



RibbleValley
Local Development Framework

NON-STATUTORY TECHNICAL STANDARDS FOR SUSTAINABLE DRAINAGE

Practice Guidance

HBF HBA

GOV.UK

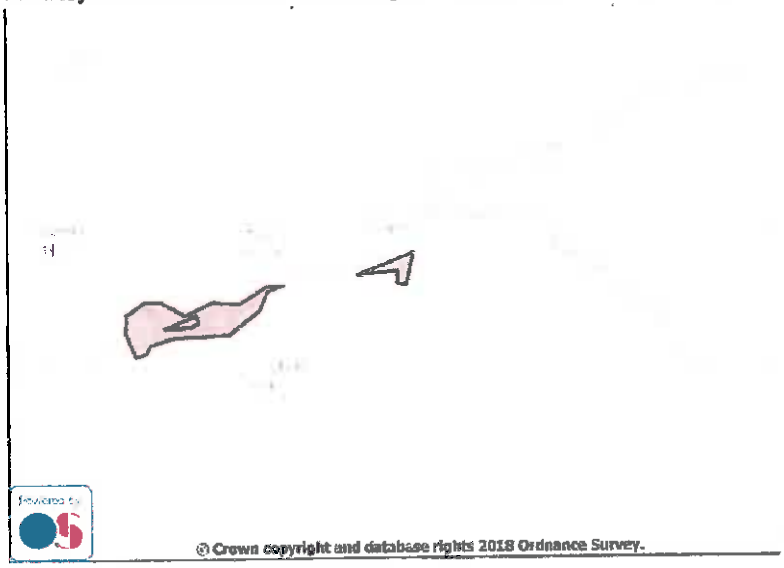
Sign up for flood warnings

BETA This is a new service - your feedback (http://www.smartsurvey.co.uk/s/FloodWarningService) will help us to improve it

◂ Back (https://www.gov.uk/app/olr/locationList)

Flood warning or alert area map

Mearley Brook at Clitheroe, bordering Up-Brooks, Taylor St and Peel St



Sign up for this area (https://www.gov.uk/app/olr/locationdetails?method=selectedLocation&tald=c243aca90ab7aa447f70d0e59e86884)

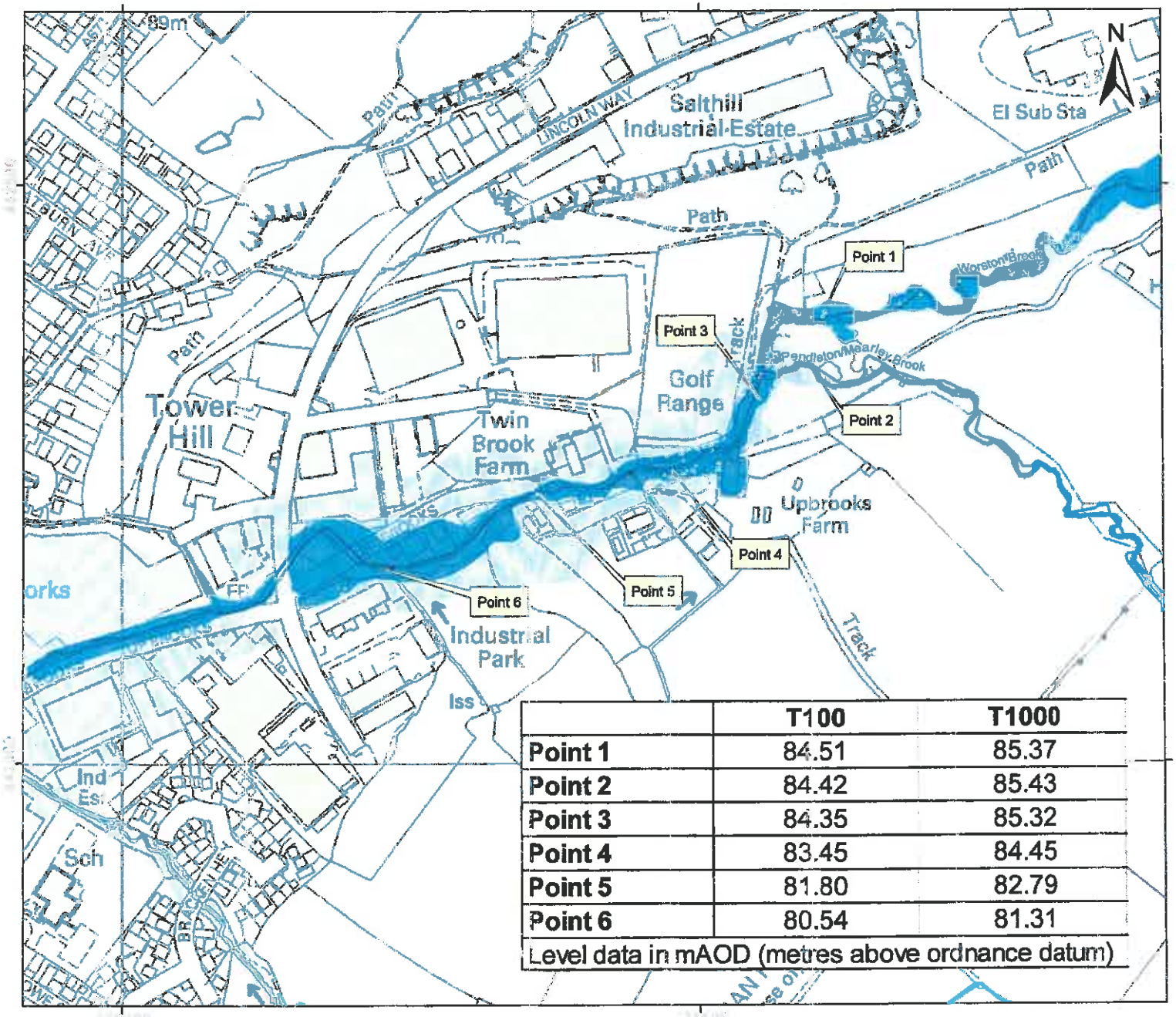
MAGIC

upbrooks

Projection = OSGB36
xmin = 374600
ymin = 441900
xmax = 375800
ymax = 442400

0 0.045 0.09
km

Map produced by MAGIC on 16 March, 2018.
Copyright resides with the data suppliers and the map must not be reproduced without their permission. Some information in MAGIC is a snapshot of the information that is being maintained or continually updated by the originating organisation. Please refer to the metadata for details as information may be illustrative or representative rather than definitive at this stage.



	T100	T1000
Point 1	84.51	85.37
Point 2	84.42	85.43
Point 3	84.35	85.32
Point 4	83.45	84.45
Point 5	81.80	82.79
Point 6	80.54	81.31

Level data in mAOD (metres above ordnance datum)

Environment Agency

Fluvial Flood Level Map: Mearley Brook/ Worston Brook, Clitheroe

Produced: 14 November 2014
Our Ref: CL3390
NGR: SD 75413, 42227

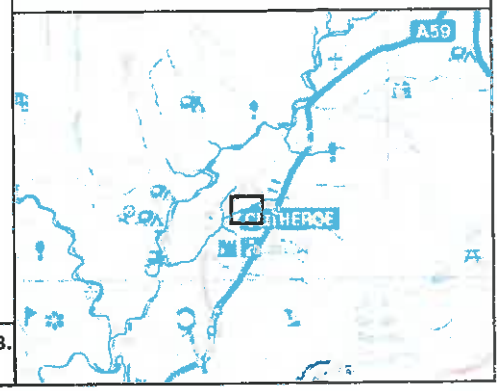
Key

- Main River
- Historic Flooding
- Areas Benefitting from Defences
- Flood Zone 3
- Flood Zone 2

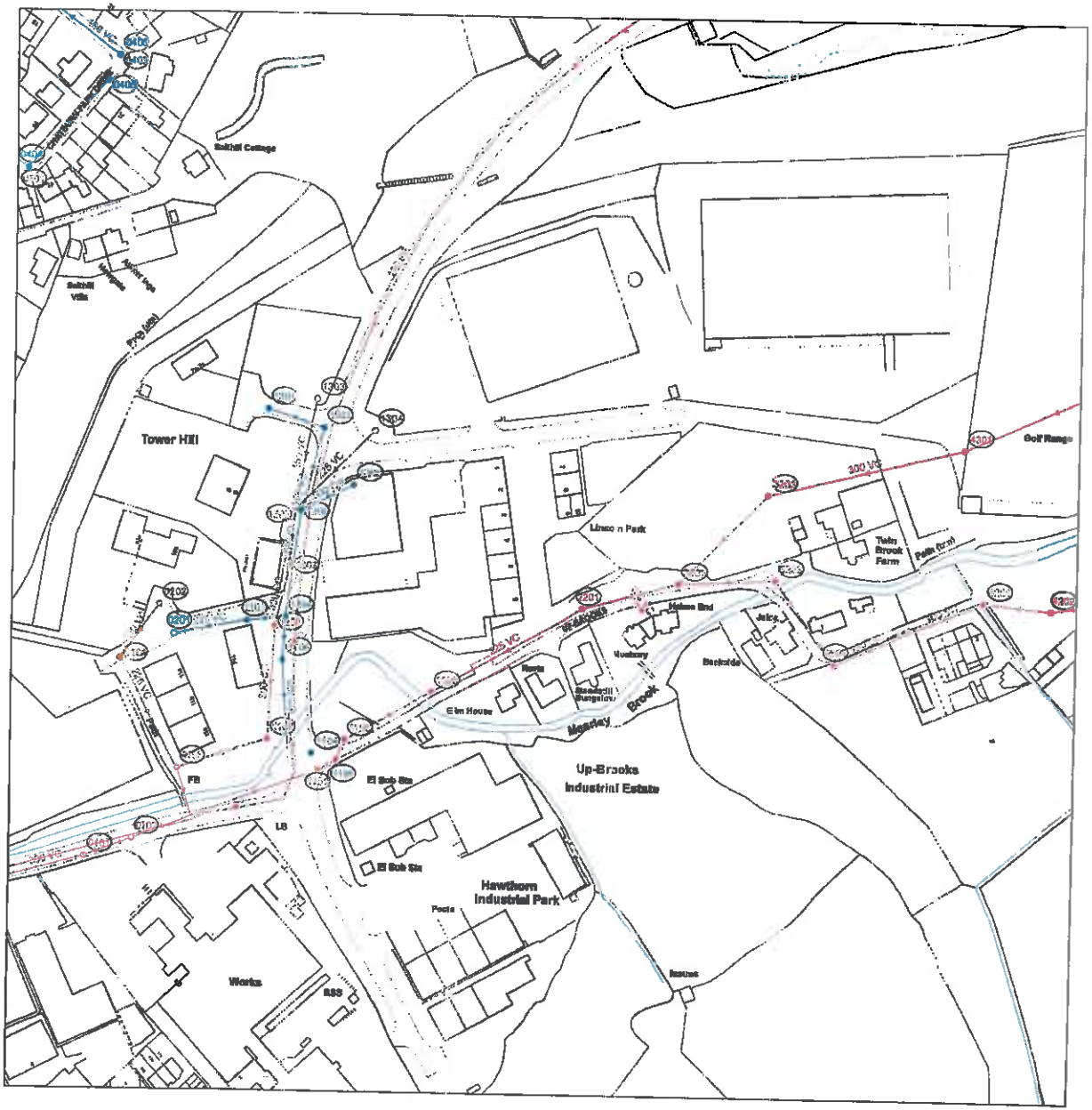
Flood Zone 3 shows the are that could be affected by flooding:
- from the sea with a 1 in 200 or greater chance of happening each year
- or from a river with a 1 in 100 or greater chance of happening each year.

Flood Zone 2 shows the extent of an extreme flood from rivers or the sea with up to a 1 in 1000 chance of occurring each year.

ABDs (Areas Benefiting from Defences) show the area benefiting from defences during a 1 in 200 tidal, or 1 in 100 fluvial flood event.



Contact Us: National Customer Contact Centre, PO Box 544, Rotherham, S60 1BY. Tel: 03708 506 506 (Mon-Fri 9-6). Email: enquiries@environment-agency.gov.uk



OS Sheet No: SD76428W

Scale: 1: 1250 Date: 26/08/2014

Printed By:Liz Bywater

WASTE WATER SYMBOLOGY

LEGEND

The position of underground apparatus shown on this plan is approximate only and is given in accordance with the best information currently available.
The actual positions may be obtained from those shown on the plan and private pipes, culverts or drains may not be recorded.
United Utilities will not accept any liability for any damages caused by the actual positions being different from those shown.

OS Sheet No: SD7542SW

Scale: 1: 1250 Date: 26/08/2014

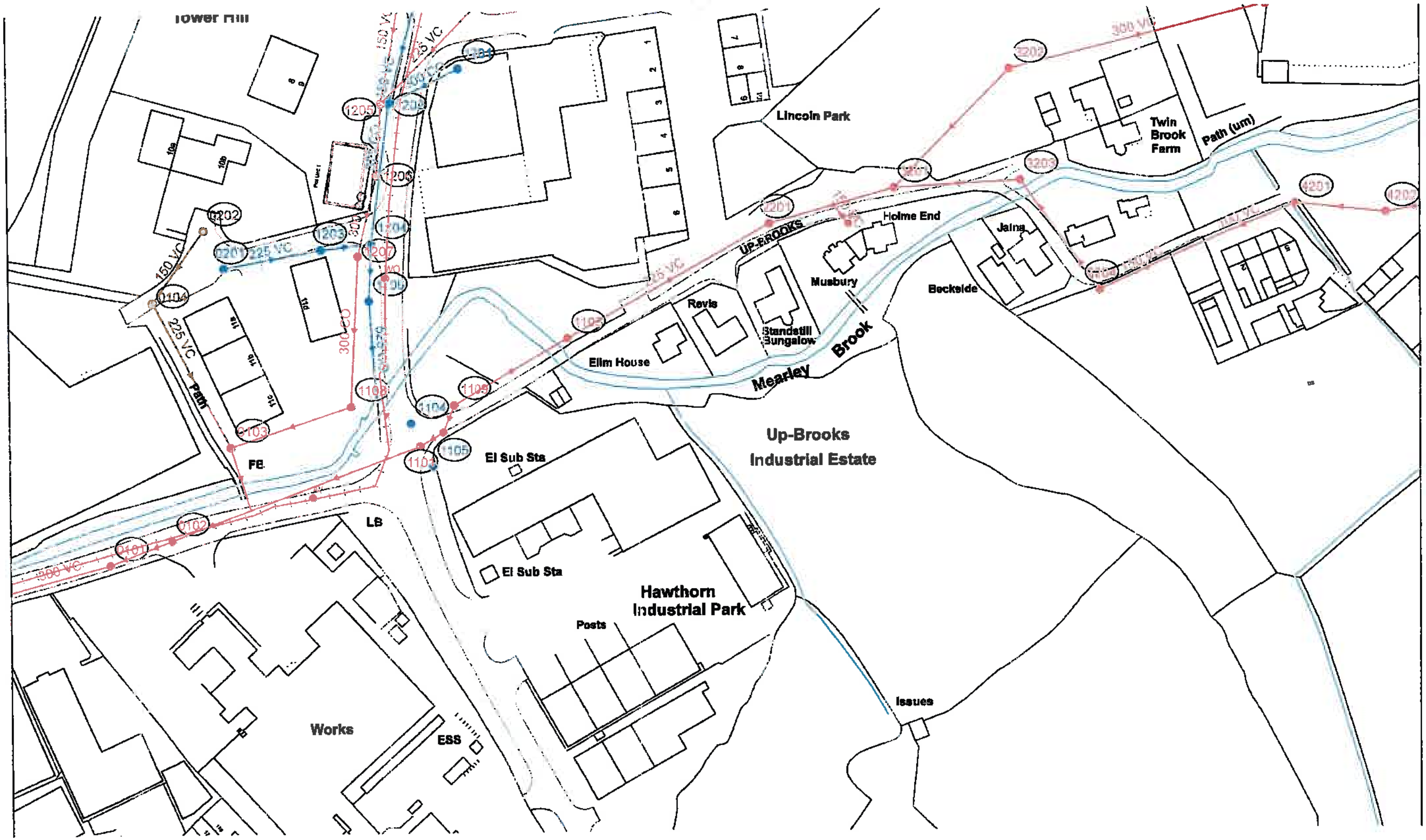
47 Nodes

Sheet 1 of 1

United Utilities

keeping life flow smoothly

SEWER RECORDS


Tower Hill
Lincoln Park
Twin Brook Farm
Path (um)
Holme End
Jains
UP-BROOKS
Musbury
Beckside
Revis
Standstill Bungalow
Elim House
Mearley Brook
Up-Brooks Industrial Estate
El Sub Sta
El Sub Sta
Hawthorn Industrial Park
Posts
Issues
Works
ESS
LB
FB
Path
300 VC
225 VC
150 VC
300 CO
1201
1202
1203
1204
1205
1206
1207
1101
1102
1103
1104
1105
1106
0101
0102
0103
0104
0201
0202
4201
4202
3202
3203

Node	Cover Level	Depth	Section Type	Shape	Material	Length	Gradient
0101	78.61	CO					
0102	79.77	CO					
0103	79.35	CO					
0104	79.97	FO					
0201	80.05	SW	78.99	225	CI	VC 34.97	261
0202	80.23	FO	78.6	150	CI	VC 31.37	40
0401	88.38	CO	88.4	150	CI	VC 47.82	
0402	88.98	CO	88.72	150	CI	VC 55.81	26
0403	90.15	CO	88.33	150	CI	VC 88.97	53
0404	89.28	SW					
0405	89.66	SW					
0406	90.15	SW					
1101	80.43	CO	77.11	225	CI	VC 84.04	
1102	80.46	CO	77.13	225	CI	VC 9.8	960
1103	80.63	CO					
1104		SW					
1105		SW					
1106	80.29	SW					
1107	80.07	CO					
1108		CO	0	225	CI	VC 19.27	
1201	81.78	SW	79.51	300	CI	CO 27.88	
1202		SW					
1203	80.34	SW	76.86	300	CI	CO 18	139
1204	80.33	SW					
1205		FO					
1206	80.94	FO					
1207	80.48	CO					
1301	84.18	SW	81.86	150	CI	VC 27.83	30
1302	82.48	SW					
1303	84.43	FO	80.76	150	CI	VC 52.58	
1304	82.17	FO	79.48	225	CI	VC 52.79	
2201	81.35	CO	78.98	225	CI	VC 81.76	71
3201	82.09	CO	79.22	225	CI	VC 48.13	136
3202	82.0	CO	81.31	200	CI	VC 38.0	35
3203	82.14	CO					
3204	82.51	CO					
4201	83.48	CO	82.16	100	CI	VC 38.8	86
4202	83.61	CO	82.61	100	CI	VC 32.04	49
4301	86.96	CO	81.83	300	CI	VC 93.27	91
0108		CO	0	300	CI	VC 10.69	
3302		CO	0	150	CI	VC 8.96	
3205		CO	80.1	225	CI	VC 24.18	45
4203		CO	81.43	150	CI	VC 36.34	48
0106		CO	0	225	CI	VC 30.13	
2205		CO					
1110		CO					
2401		CO					

Node	Cover Level	Depth	Section Type	Shape	Material	Length	Gradient

Cascade
Non Return Valve
Extent of Survey
Flow Meter
Gulley
Hatch Box
Head of System
Hydrobrake / Vortex
Inlet
Inspection Chamber
Bifurcation
Catchpit
Contaminated Surface Water
WW Pumping Station
Sludge Pumping Station
Sewer Overflow
T Junction/Saddle
LampHole
OilInterceptor
PenStock
Pump
RoddingEye
Soakaway
Summit
Valve
Valve Chamber
Washout Chamber
Dropshaft
WW Treatment Works
Septic Tank
Vent Column
Network Storage Tank
Orifice Plate
Vortex Chamber
Penstock Chamber
Blind Manhole
Foul Surface Combined Overflow
Screen Chamber
Discharge Point
Outfall

LEGEND

MANHOLE FUNCTION

FO	Foul
SW	Surface Water
CO	Combined
OV	Overflow

SEWER SHAPE

CI	Circular	TR	Trapezoidal
EG	Egg	AR	Arch
OV	Oval	BA	Barrel
FT	Flat Top	HO	HorseShoe
RE	Rectangular	UN	Unspecified
SQ	Square		

SEWER MATERIAL

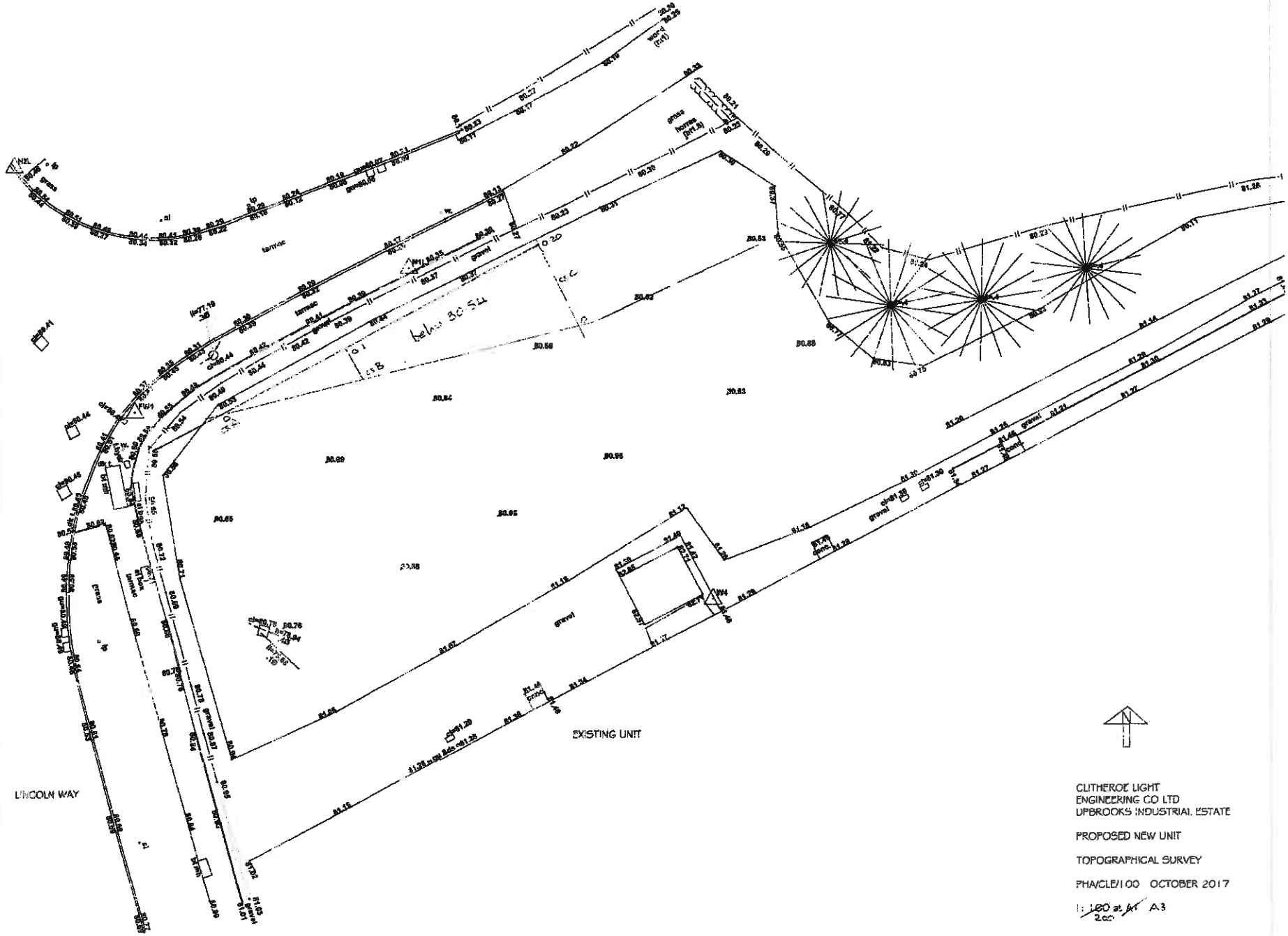
AC	Asbestos Cement	DI	DI
BR	Brick	PVC	P
PE	Polyethylene	CI	C
RP	Reinforced Plastic Matrix	SI	S
CO	Concrete	ST	S
CSB	Concrete Segment Bolted	VC	V
CSU	Concrete Segment Unbolted	PP	P
CC	Concrete Box Culverted	PF	P
PSC	Plastic/Steel Composite	MAC	M
GRC	Glass Reinforced Concrete	MAR	M
GRP	Glass Reinforced Plastic	U	U

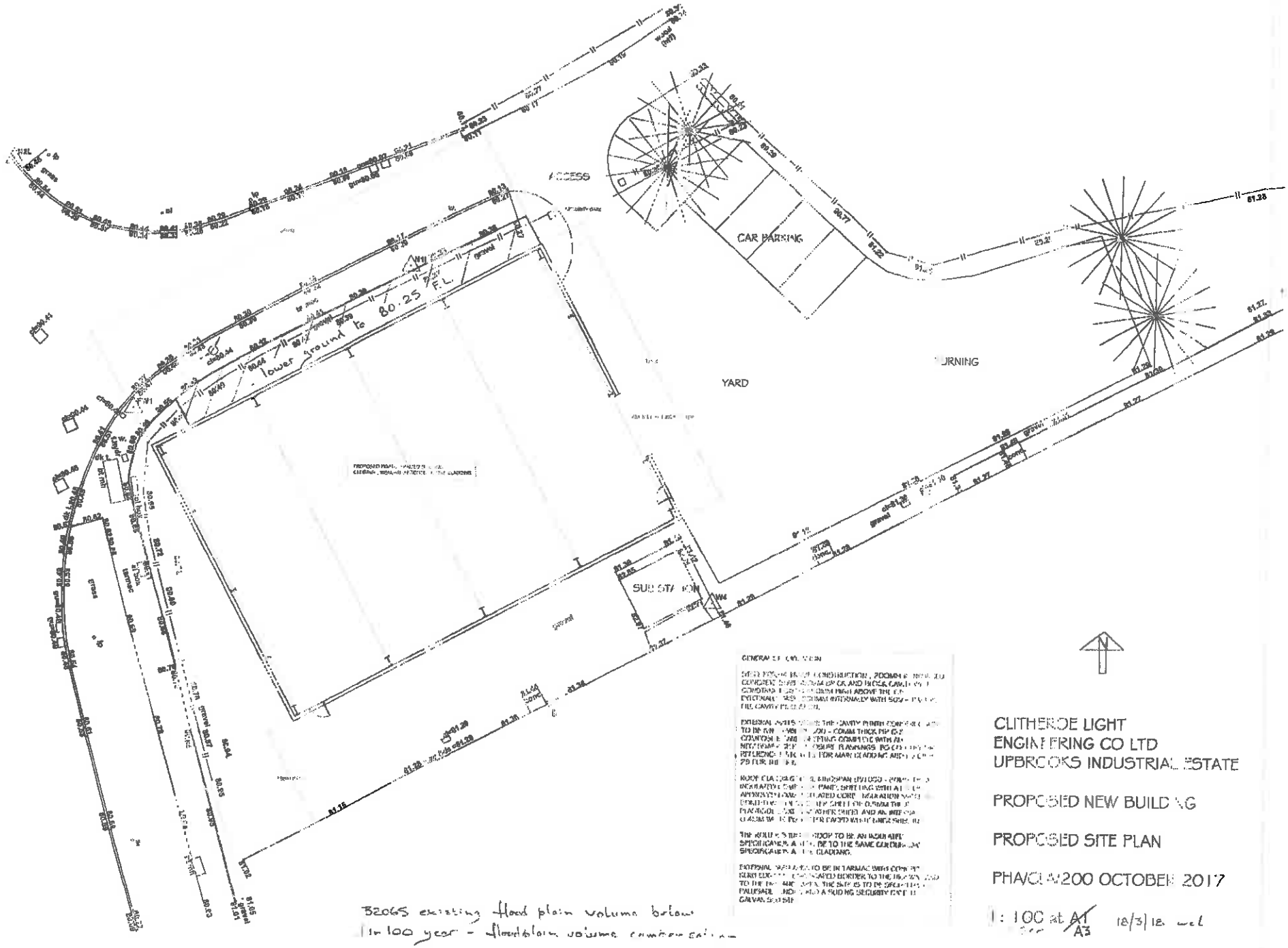
The position of underground apparatus shown on this pla
accordance with the best information currently available.
The actual positions may be different from those shown on
the plan and private pipes, sewers or drains may not be recor
United Utilities will not accept any liability for any damag
different from those shown.

OS Sheet No: SD
Scale: 1: 1250 Date
47 Nod
Sheet 1 o

Uni Utili
helping life flow sm

SEWER REC


LINCOLN WAY
EXISTING UNIT
CLITHEROE LIGHT
ENGINEERING CO LTD
UPBROOKS INDUSTRIAL ESTATE
PROPOSED NEW UNIT
TOPOGRAPHICAL SURVEY
PHA/CLE/100 OCTOBER 2017
1:100 at A1 A3



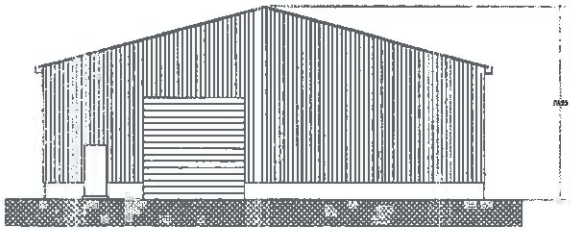
CLITHEROE LIGHT
ENGINEERING CO LTD
UPBROOKS INDUSTRIAL ESTATE

PROPOSED NEW BUILDING

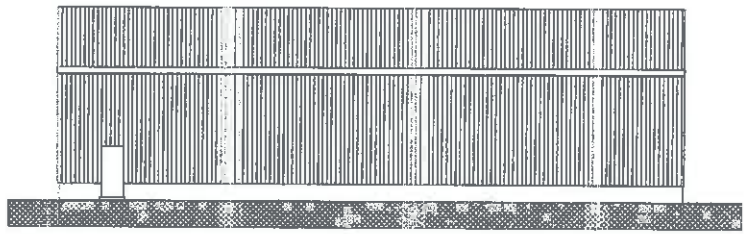
PROPOSED SITE PLAN

PHA/CLA/200 OCTOBER 2017

1 : 100 at ~~A1~~ A3 18/3/18 wd



NORTH EAST ELEVATION



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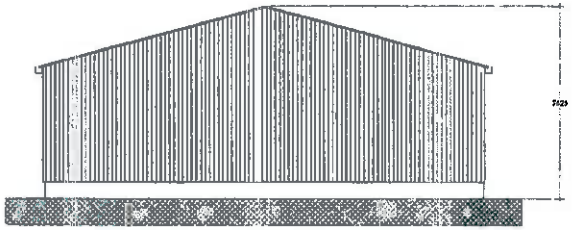

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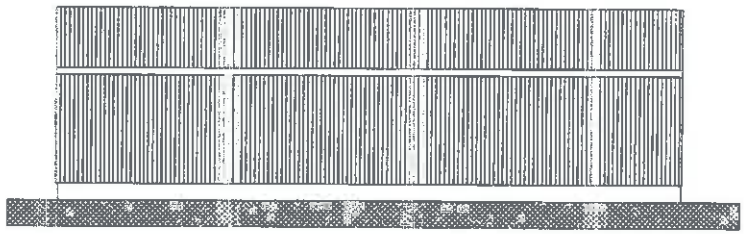
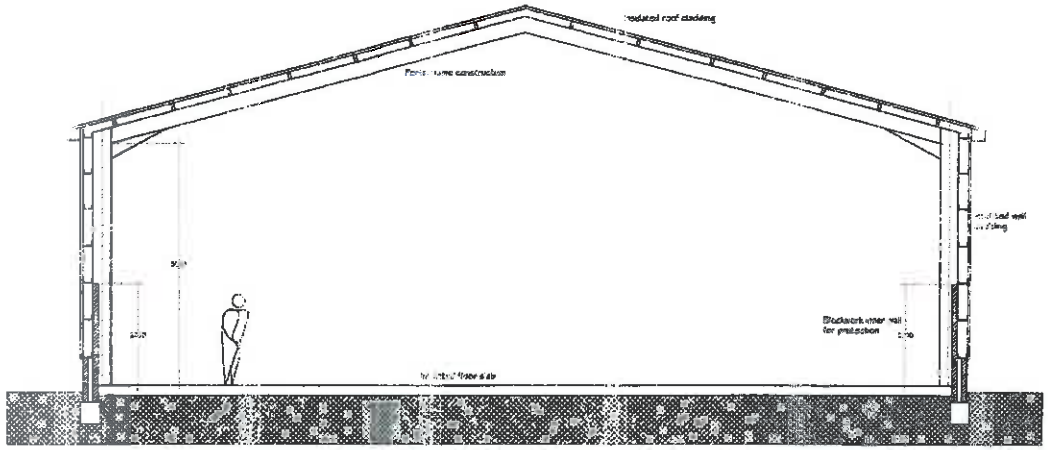


NORTH WEST ELEVATION



CROSS SECTION

GENERAL SPECIFICATION

STEEL PORTAL FRAME CONSTRUCTION . 200MM REINFORCED CONCRETE SLAB 300MM BRICK AND BLOCK CAVITY WALL CONSTRUCTION TO 450MM HIGH ABOVE THE F.F.L EXTERNALLY AND 2000MM INTERNALLY WITH 50MM PARTIAL FILL CAVITY INSULATION.

EXTERNAL WALLS ABOVE THE CAVITY PLINTH CONSTRUCTION TO BE KINGSPAN LP1000 - 60MM THICK PIR CORE COMPOSITE PANEL SHEETING COMPLETE WITH ALL NECESSARY DRIPS, CLOSURE FLASHINGS, BS COLOURCOAT REFERENCE BS10 B 19 FOR MAIN CLADDING AND BS 08 B 29 FOR THE TRIMS.

ROOF CLADDING TO BE KINGSPAN LP1000 - 80MM THICK INSULATED COMPOSITE PANEL SHEETING WITH A FIRE LPC APPROVED FOAM INSULATED CORE, INSULATION MATERIAL BONDED WITH AN OUTER SHEET OF 0.5MM THICK PLASTISOL COATED WEATHER SHEET AND AN INTERNAL 0.4MM WHITE POLYESTER FACED LIGHTWEIGHT LINER SHEETING.

THE ROLLER SHUTTER DOOR TO BE AN INSULATED SPECIFICATION AND TO BE TO THE SAME COLOURCOAT SPECIFICATION AS THE CLADDING

EXTERNAL YARD AREA TO BE IN TARMAC WITH CONCRETE KERB EDGINGS, LANDSCAPED BOARDER TO THE HIGHWAY AND TO THE ENTRANCE AREA. THE SITE IS TO BE SECURED WITH PALLISADE FENCING AND A SLIDING SECURITY GATE IN GALVANISED STEEL.

ELEVATIONS AND CROSS SECTION THROUGH THE NEW UNIT. REFER TO THE TOPOGRAPHICAL SURVEY AND SITE PLAN FOR FURTHER INFORMATION

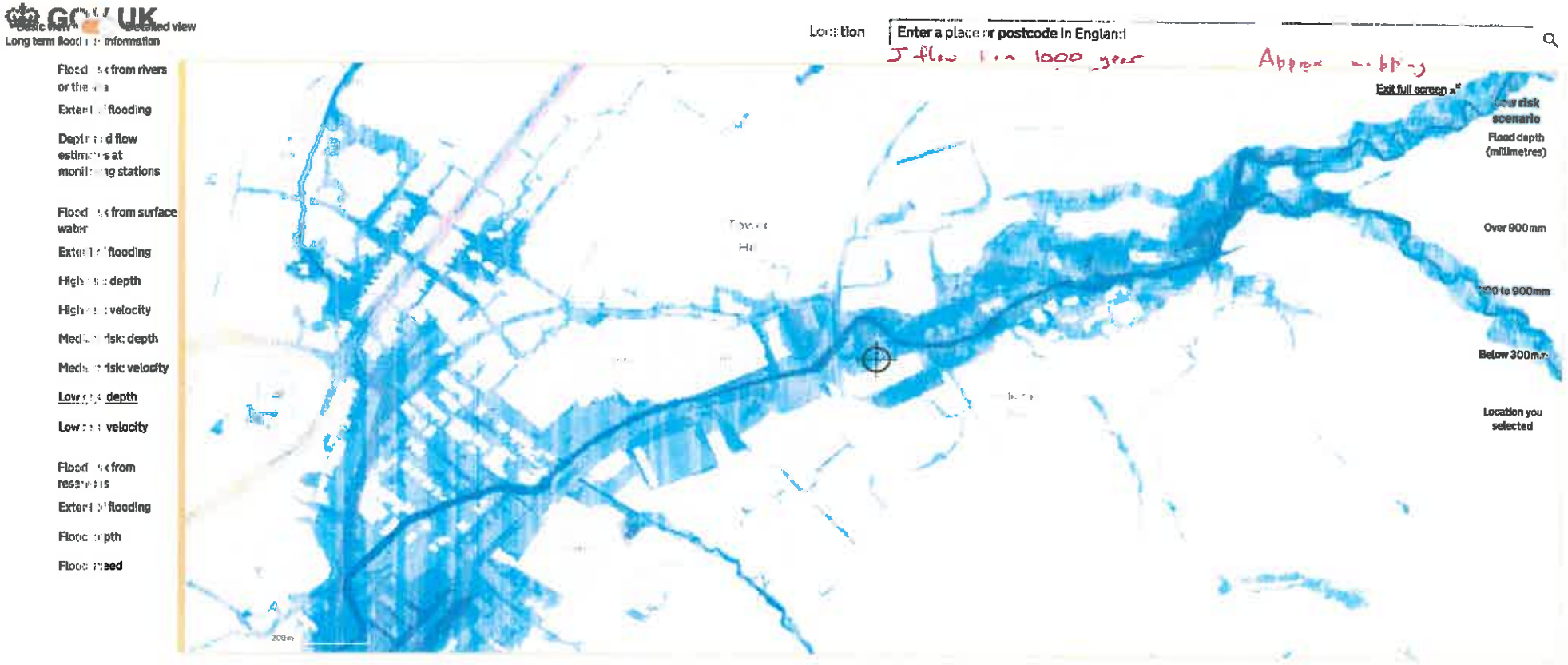
CUTHERSIDE LIGHT ENGINEERING CO LTD
UPBROOKS INDUSTRIAL ESTATE

PROPOSED NEW UNIT

ELEVATIONS AND SECTION

PHA/CLE/300 OCTOBER 2017

1 : 100 @ A1


GOV.UK
Basic view
Detailed view
Long term flood risk information
Location
Enter a place or postcode in England
Flood risk from rivers or the sea
Extent of flooding
Depth and flow estimates at monitoring stations
Flood risk from surface water
Extent of flooding
Higher risk: depth
Higher risk: velocity
Medium risk: depth
Medium risk: velocity
Lower risk: depth
Lower risk: velocity
Flood risk from reservoirs
Extent of flooding
Flood depth
Flood speed
Exit full screen
Flood risk scenario
Flood depth (millimetres)
Over 900mm
300 to 900mm
Below 300mm
Location you selected