Drainage Summary

Marsh Lane
New Mills

Ironside Farrar Limited
3 Worsley Court
High Street
Worsley
Manchester
M28 3NJ

30212/RDE

June 2016

CONTENTS

APPENDICES

DEVELOPMENT AT MARSH LANE
NEW MILLS
DRAINAGE SUMMARY

1.0 Introduction

This Drainage Summary has been prepared in support of a Planning Application by Forrest for a site known as Marsh Lane, New Mills.

The information provided within this drainage summary should be read alongside the Preliminary Drainage Layout prepared for this site (Appendix C). This summary details the drainage proposals for the proposed residential development.

2.0 Site Description

The site measures approximately 0.94 ha in area and is entirely greenfield with no existing impermeable area. It is situated within New Mills and comprises of 37 residential properties. The site was previously a quarry.

3.0 Existing Drainage & Consultations

A 225mm dia. combined sewer runs northwards within Marsh Lane to the junction of Low Leighton Road. No existing connection to the existing sewer network is presumed from the site. The existing sewer records are included in Appendix A.

Greenfield runoff rates from IOH 124 have been calculated as 6.1, 6.3, 10.4 and 12.8 (QBar, Q1, Q30 and Q100).

A wastewater pre development enquiry has been submitted to United Utilities and a response has been received (Appendix B). Foul has been accepted to the 225mm dia combined sewer in Marsh Lane at an unrestricted rate. Surface water has been accepted to the same combined sewer in Marsh Lane at a maximum rate of 6.2 l/s.

There are no other drainage connections or watercourses indicated on or immediately adjacent to the site.

4.0 Proposed Drainage

The Preliminary Drainage Layout prepared (Appendix C) is designed to pass forward a maximum surface water discharge of 6.2 l/s. Two flow control units are proposed to achieve this discharge rate and to keep the large pipes for attenuation as shallow as possible. The last control manhole is a minimum adoptable orifice size of 100mm. Oversized pipes proposed for attenuation are 900mm dia and 1050mm dia pipes with appropriately sized large manholes.

The design flows produced are 5.1, 5.1 and 6.2 l/s for the 1, 30 and 100 year return periods. The 100 year return period includes a 30% climate change allowance. All flows are below United Utilities accepted surface water discharge of 6.2 l/s (hydraulic calculations attached as Appendix D).

The foul drainage from the site is proposed to combine with the surface water just prior to exiting the site and after the surface water control manholes. A new combined sewer connection within Marsh Lane is proposed.

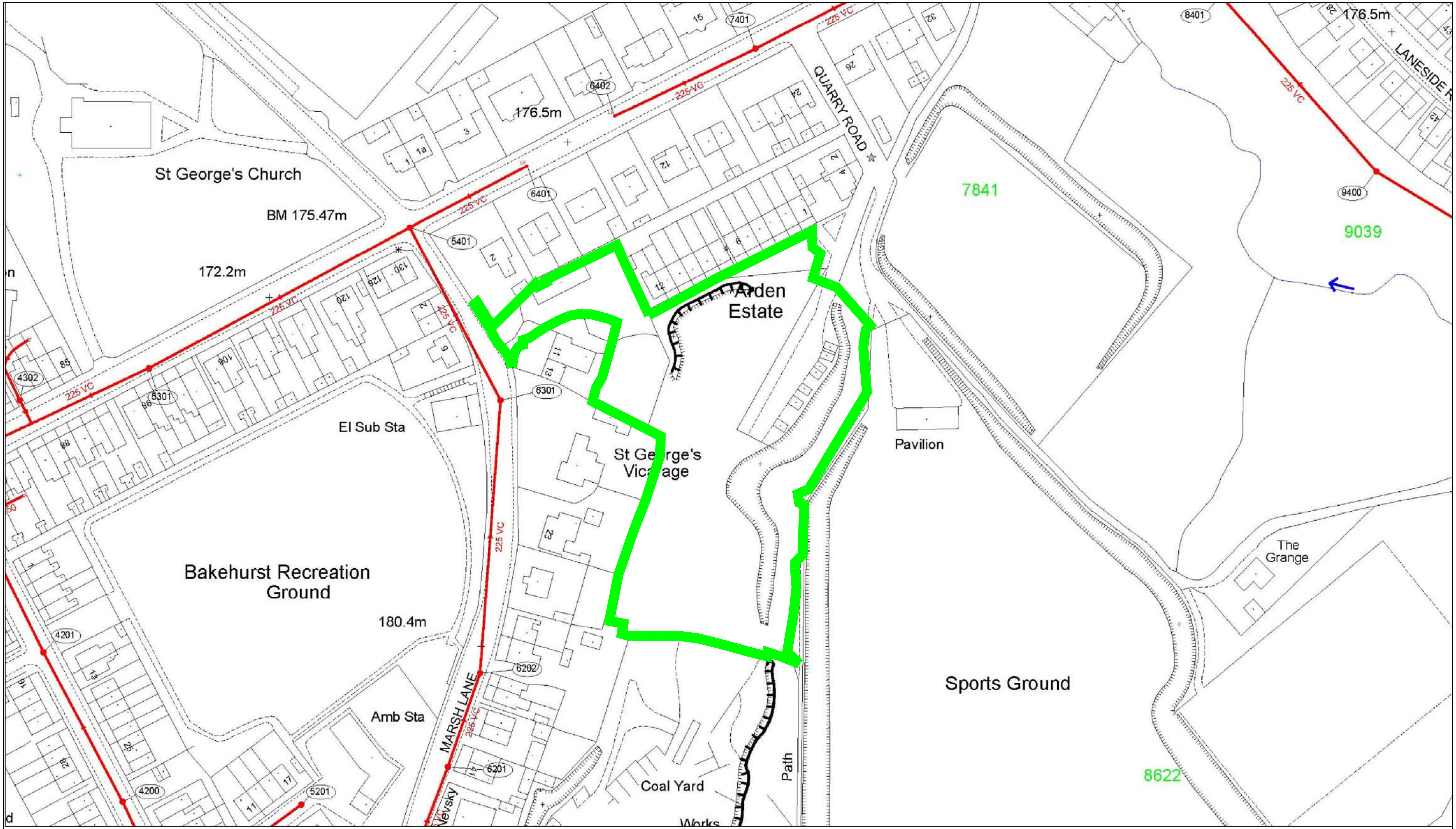
All proposed sewers for the development will be subject to a Section 104 Agreement with United Utilities.

5.0 Ground Conditions

The site previously used to be a quarry and therefore ground conditions are not expected to make infiltration viable. Forthcoming site investigations will confirm or disprove this assumption.

6.0 Conclusions

- Surface water and foul drainage is proposed to connect to the existing 225mm dia combined sewer within Marsh Lane.
- Attenuation will be incorporated into the surface water drainage system to restrict flows to 6.2 l/s in the 100 year return period (an allowance of 30% for future climate change is included).
- Infiltration SUDS techniques are assumed to not be suitable.



KEY

SITE BOUNDARY

North Point	Project: Marsh Lane New Mills		IronsideFarrar EnvironmentalConsultants
Quality Ass. UKAS 005 Quality Assurance ISO 9001:2008 SGS Certificate GB02/54539	Client: Forrest		EnvironmentalPlanners CivilEngineers LandscapeArchitects GraphicDesign
	Title: Existing Sewer Records		3 Worsley Court MANCHESTER M28 3NJ Tel. 0161 703 8801 Fax. 0161 703 8279 manchester@ironsidefarrar.com EDINBURGH BELLSHILL
Original Size: A3	Copyright Acknowledgement: Ordnace Survey© ©Crown Copyright. All rights reserved. Licence No. AL100017966.	Drawn: NB Checked By: RDE Date: June 16 Scale: 1:1250	Drawing No.: 30212/App A Revision

Wastewater predevelopment enquiry

United Utilities
bringing life flow smoothly

This form is for all first time enquiries you may have when planning your development.

If your enquiry relates to advice on **connection points and discharge rates**, please complete all sections, providing as much information as you have available. You will notice some fields are marked as optional, all other fields are mandatory.
For **all other enquiries**, please complete Sections 1, 2, 7 and 8.

When answering the yes/no questions please mark an 'x' in the appropriate box.

All enquiries must be accompanied by a site location plan, clearly identifying the site boundary.

Once completed, please return this form by email to WastewaterDeveloperServices@uuplc.co.uk or post to United Utilities, Developer Services and Planning, Warrington North Wastewater Treatment Works, Gatewarth Industrial Estate, Off Liverpool Road, Warrington, WA5 1DS.

We aim to respond to enquiries within 15 working days from receipt of your completed enquiry form.

Section 1: About you

	Applicant			Agent (if applicable)	
Name	IAN CALDER			ROBERT EASTAFF	
Company name	FORREST			IRONSIDE FARRAR LIMITED	
Home or company address *(including postcode)*	THE YARD, DODD YARD, WESTHOUGHTON, BOLTON, BL5 3NU			3 WORSLEY COURT, WORSLEY, MANCHESTER, M28 3NJ	
Contact telephone number *(a mobile number is fine)*	01942 841122			0161 703 8801	
Email	Ian.Calder@forrest.co.uk			robert.eastaff@ironsidefarrar.com	
What is your enquiry?	DISCHARGE POINT AND RATE CONFIRMATION				
Who should we send the enquiry response to?	Applicant		Agent		Both	X

Section 2: About your site

Site name	MARSH LANE, NEW MILLS							
Site address *(or nearest main road)*	MARSH LANE, NEW MILLS, HIGH PEAK, DERBYSHIRE							
Nearest postcode	SK22 4PN							
Site grid reference (mid point)	X:	400694		Y:	385331			
Approx. number of dwellings	37							
Approx. numbers of non-household units	N/A							
Total site area (hectares)	0.94							
Development area - hectares *(Optional)*	Residential	0.94	Commercial	-	Industrial	-		
Estimated onsite date *(Optional)*								
Estimated first occupation *(Optional)*								
Does the site have planning permission? Full	Yes		No	X	Application submitted		Planning Ref *(if applicable)*	
Does the site have planning permission? Outline	Yes		No	X	Application submitted		Planning Ref *(if appropriate)*	
Have you approached us about this site previously?	Yes		No	X	If yes, please provide Ref No. &/or contact details			

Section 3: Your site drainage strategy

Type of site	**GREENFIELD (Go to Q 3.1)**	X	**BROWNFIELD (Go to Q 3.2)**	

3.1 Greenfield site *(Optional)*	*Confirmed attachment:*			
Please provide full calculations to show **existing** greenfield run off rates	Yes	X	No	
3.2 Brownfield site *(Optional)*	*Confirmed attachment:*			
Please provide a plan showing **existing** foul water drainage from this site to the public sewer network (including location of existing drains, pipe sizes and points of connection)	Yes		No	
Please provide a plan showing the **existing** surface water drainage from this site to the public sewer network, including location of existing drains, pipe sizes and points of connection	Yes		No	
Will this development produce trade effluent?	Yes		No	X
If yes, have you applied for a trade effluent consent from United Utilities?	Yes		No	
Do you intend to discharge highways drainage to the public sewer network?	Yes	X	No	
If yes, to which sewer?	PROPOSED SW SEWERS			

Section 4: Foul water connection

Are you proposing to use an existing connection to the public sewer?	Yes	X	No	
If yes, please provide manhole number or grid reference number If no, please provide the proposed flow rate and connection points (litres per second)	COMBINED CONNECTION TO EX 225 DIA COMBINED SEWER DOWNSTREAM OF MH 6301. FOUL FLOW RATE FOR 37 NO. UNITS = 1.71 L/S.			
Is the foul water discharge to be pumped?	Yes		No	X

Section 5: Surface water connection

If you are proposing to connect surface water to a public sewer, please attach evidence that all options for Sustainable Urban Drainage Systems (SUDs) have been explored in accordance with part H of the Building Regulations 2010. Details of SUDs can be found at http://www.ciria.com/sudsdesign_guidance.htm

How do you propose to drain surface water from the site?	SUDs *(Go to Section 6)*		Discharge to public sewer *(Go to Q5.1)*	X

(5.1) Does the site have existing surface water connections to the public sewer?	Yes *(Go to Q5.2)*		No *(Go to Q5.3)*	X
(5.2) Proposed surface water discharging to public sewer via **existing connection** Are you proposing to use an existing connection?	Yes		No *(Go to Q5.3)*	X
If yes, please provide manhole number or grid reference number & proposed flow rates				
(5.3) Proposed surface water discharging to public sewer via a **new connection** If a new connection point is required, please provide proposed point of connection and proposed flow rates (litres per second)	SW CONNECTION TO PROPOSED 150 DIA COMBINED SEWER AT 6.2 L/S (QBAR = 6.1 L/S)			
Have you completed a flood risk assessment in support of your planning application?	Yes		No	X
Is the surface water to be controlled? *(Optional)*	Yes	X	No	
Is the surface water to be pumped? *(Optional)*	Yes		No	X

Section 6: Development details *(Optional)*

Is the development part of a larger site that will be developed in phases or will be subject to separate planning applications? If yes, please provide details below	Yes		No	

		Phase No.						
		1	2	3	4	5	6	7
Start date on site								
Anticipated date of first occupation								
Anticipated completion date								
No. of dwellings								
Sustainability code for dwellings								
Public houses and/or restaurants	No. of seats							
	Floor space (m^2)							
Hotels: Total No. of beds								
Schools: Total No. of pupils								
Hospitals: Total No. of beds								
Nursing homes: Total No. of beds								
Retail units: Total No. of units								
Office space: Total No. of units								
Industrial / manufacturing: Total No. of units								
Other: Foul water (litres per second)								

Section 7: Supporting information

Please confirm you have included all supporting information in relation to your enquiry

Site location plan	Yes	X	No	
Site boundary	Yes		No	
Proposed drainage layout plan (optional)	Yes	X	No	
Indicative layout plan (optional)	Yes	X	No	
Calculations in support of proposed flow rates or run off rates (optional)	Yes	X	No	
Flood risk assessment (if appropriate)	Yes		No	

Section 8: Declaration

I understand that the submission of this form is to be treated as a preliminary enquiry and the information may be subject to change. In particular, I understand that the information United Utilities Water Limited provides in response is valid only in conjunction with the information provided in relation to this enquiry, any changes to regulation or development layout will invalidate our response.

Name (please print)	ROBERT EASTAFF	Signature	
Company	IRONSIDE FARRAR	Date	16/06/16

For United Utilities use only			
Date received		UUW Ref No.	

From: McDermott, Daniel <Daniel.McDermott@uuplc.co.uk>
Sent: 22 June 2016 14:26
To: Robert Eastaff
Subject: RE: DE2342: Wastewater Predevelopment Enquiry Marsh Lane, New Mills (30212) due 8/7/16

Good Afternoon

6.2l/s is acceptable

If I can be of any further assistance please don't hesitate to contact me.

Regards

Daniel McDermott
Assistant Developer Engineer
Developer Services and Planning
Operational Services
United Utilities
T: 01925679409
Unitedutilities.com

From: Robert Eastaff [mailto:robert.eastaff@ironsidefarrar.com]
Sent: 21 June 2016 17:24
To: McDermott, Daniel <Daniel.McDermott@uuplc.co.uk>
Cc: Wastewater Developer Services <WastewaterDeveloperServices@uuplc.co.uk>; Ian Calder <Ian.Calder@forrest.co.uk>; Simon Gough <simon.gough@ironsidefarrar.com>
Subject: RE: DE2342: Wastewater Predevelopment Enquiry Marsh Lane, New Mills (30212) due 8/7/16

Our Ref: 30212
Date: 21/06/16

Hi Daniel,

Many thanks for your response. We will of course take into account the ground conditions within the final design. If however soakaways are not viable, would you consider a slight increase in SW discharge rate to the combined sewer?

To achieve UU's 100mm minimum orifice requirements, for a flow of 5.0 l/s the head for a typical vortex flow control is only 1.4m. The system we have designed uses a head of 2.1m to make better use of the large diameter pipes and to use the storage available within a surface feature like a swale or underground crate storage (set above the 30 year water level). The flow produced with a 2.1m head is 6.2 l/s with a minimum 100mm diameter orifice.

Please would you reconsider either allowing the 6.2 l/s SW discharge rate OR accepting the use of a smaller diameter orifice (less than 100mm) so that we can make better use of the large diameter pipes proposed for adoption and other storage features closer to the surface?

Regards,

Rob

Robert Eastaff | Ironside Farrar | 3 Worsley Court | Worsley | Manchester |M28 3NJ |
Tel: 0161 703 8801 | Fax: 0161 703 8279 | Web:ironsidefarrar.com

From: McDermott, Daniel [mailto:Daniel.McDermott@uuplc.co.uk]
Sent: 21 June 2016 14:28
To: Robert Eastaff <robert.eastaff@ironsidefarrar.com>
Cc: Wastewater Developer Services <WastewaterDeveloperServices@uuplc.co.uk>
Subject: RE: DE2342: Wastewater Predevelopment Enquiry Marsh Lane, New Mills (30212) due 8/7/16

Good Afternoon Rob,

We have carried out an assessment of your application which is based on the information provided; this pre development advice will be valid for 12 months.

Foul will be allowed to drain to the public combined sewer network. Our preferred point of discharge would be to the 225mm combined sewer on Marsh Lane at an unrestricted rate.

Surface water from this site must drain to soak away or some other form of infiltration system but if ground conditions confirm that this is not a viable solution all surface water can drain to the 225mm combined sewer on Marsh Lane at a maximum pass forward flow of 5l/s.

Although we may discuss and agree discharge points & 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 ultimatley 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

http://www.unitedutilities.com/connecting-public-sewer.aspx

You may wish to offer the proposed new sewers for adoption. United Utilities assess adoption appliation based on Sewers adoption 6th Edition and for any pumping stations our company addenda document. Please refer to link below to obtain further guidance and application pack:

http://www.unitedutilities.com/sewer-adoption.aspx

Please be aware that on site drainage must be designed in accordance with Building Regulations, National Planning Policy, Planning Conditions and local flood authority guidelines, we would recommend that you laise and make suitable agreements with the relevant statutory bodies.

If I can be of any further assistance please don’t hesitate to contact me.

Regards

Daniel McDermott
Assistant Developer Engineer
Developer Services and Planning

Operational Services
United Utilities
T: 01925679409
Unitedutilities.com

From: Robert Eastaff [mailto:robert.eastaff@ironsidefarrar.com]
Sent: 16 June 2016 17:28
To: Wastewater Developer Services <WastewaterDeveloperServices@uuplc.co.uk>
Cc: Ian Calder <Ian.Calder@forrest.co.uk>
Subject: Wastewater Predevelopment Enquiry Marsh Lane, New Mills (30212)

Our Ref: 30212
Date: 16/06/16

Dear Sirs,

On behalf of our client Forrest please find attached completed wastewater predevelopment enquiry for a site known as Marsh Lane, New Mills.

Please can you confirm the point of connection and discharge rates proposed are acceptable to UU?

If you require any further information to progress the enquiry please do not hesitate to contact me.

Regards,

Rob

Robert Eastaff | Ironside Farrar | 3 Worsley Court | Worsley | Manchester |M28 3NJ |
Tel: 0161 703 8801 | Fax: 0161 703 8279 | Web:ironsidefarrar.com

this message by a third party.

BASIS FOR DRAINAGE DESIGN

1. Site Area = 0.94 ha.
Assumed greenfield runoff, no existing impermeable area.

2. Greenfield runoff rates from IOH 124:
   - Qbar = 6.1 l/s
   - Q1 = 5.3 l/s
   - Q30 = 10.4 l/s
   - Q100 = 12.8 l/s

3. Maximum flow rate to be 6.2 l/s for 100 year return period event (+30% climate change).

4. Flows controlled with 2 no. vortex flow control units to limit flows to 6.2 l/s @ 2.2m head (minimum adoptable 100mmØ orifice) & 6.7 l/s @ 2.2m head. Attenuation provided in underground oversized pipes.

5. Design flow rates calculated as:
   - Q1 = 5.1 l/s
   - Q30 = 5.1 l/s
   - Q100 +30% CC = 6.2 l/s

6. Surface water connection to new 150mmØ combined sewer in site access at flow rates stated above.

7. Foul / combined connection to new manhole on existing 225mmØ combined sewer in Marsh Lane. Foul flow from 37 no. units = 1.71 l/s.

8. Sewers to be offered for adoption under S104 Agreement with United Utilities.

REVISIONS

REV.	DATE	INT.	DETAILS
A	270616	RDE	Arch layout updated to Rev B & drainage amended to client's comments.

KEY

S.W.	Foul	
		Proposed sewer
		1200mm dia I.C
182.00		Proposed Plot Level
		Existing Combined Sewer
		Proposed level
29.35		Existing Level

North Point

Project
Marsh Lane,
New Mills

Client
Forrest

Title
Preliminary Drainage Layout

Quality Ass.
UKAS 005
Quality
Assurance
ISO 9001:2008
SGS Certificate
GB02/54539

IronsideFarrar
Environmental**Consultants**
Environmental**Planners**
Civil**Engineers**
Landscape**Architects**
Graphic**Design**

3 Worsley Court **MANCHESTER** M28 3NJ
Tel. 0161 703 8801 Fax. 0161 703 8279
manchester@ironsidefarrar.com

EDINBURGH BELLSHILL

Original Size	Copyright Acknowledgement	Drawn	Checked By
A1	Ordnace Survey© ©Crown Copyright. All rights reserved. Licence No. AL100017966.	RDE	SRG
		Date	Scale
		Jun 16	1:500

Drawing No. 30212/100 Revision A

PRELIMINARY

ICP SUDS Mean Annual Flood

Input

Return Period (years)	100	Soil	0.450
Area (ha)	0.938	Urban	0.000
SAAR (mm)	983	Region Number	Region 10

Results	**l/s**
QBAR Rural	6.1
QBAR Urban	6.1
Q100 years	12.8
Q1 year	5.3
Q30 years	10.4
Q100 years	12.8

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm

Pipe Sizes STANDARD Manhole Sizes STANDARD

FSR Rainfall Model - England and Wales

Return Period (years)	2	Add Flow / Climate Change (%)	0
M5-60 (mm)	18.000	Minimum Backdrop Height (m)	0.000
Ratio R	0.335	Maximum Backdrop Height (m)	0.000
Maximum Rainfall (mm/hr)	0	Min Design Depth for Optimisation (m)	1.200
Maximum Time of Concentration (mins)	30	Min Vel for Auto Design only (m/s)	1.00
Foul Sewage (l/s/ha)	0.000	Min Slope for Optimisation (1:X)	500
Volumetric Runoff Coeff.	0.750		

Designed with Level Soffits

Time Area Diagram for Storm

Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.330	4-8	0.127

Total Area Contributing (ha) = 0.457

Total Pipe Volume (m³) = 138.377

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
1.000	47.445	0.119	400.0	0.111	4.00	0.0	0.600	o	900	Pipe/Conduit	🔒
1.001	19.765	0.049	400.0	0.097	0.00	0.0	0.600	o	1050	Pipe/Conduit	🔒
2.000	35.957	0.090	400.0	0.089	4.00	0.0	0.600	o	1050	Pipe/Conduit	🔒
1.002	5.122	0.034	150.0	0.029	0.00	0.0	0.600	o	150	Pipe/Conduit	🔓
1.003	38.725	0.097	400.0	0.040	0.00	0.0	0.600	o	1050	Pipe/Conduit	🔒

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
1.000	0.00	4.51	179.528	0.111	0.0	0.0	0.0	1.56	992.7	0.0
1.001	0.00	4.70	179.259	0.208	0.0	0.0	0.0	1.72	1486.6	0.0
2.000	0.00	4.35	179.300	0.089	0.0	0.0	0.0	1.72	1486.6	0.0
1.002	0.00	4.80	179.210	0.326	0.0	0.0	0.0	0.82	14.5	0.0
1.003	0.00	5.18	177.397	0.366	0.0	0.0	0.0	1.72	1486.6	0.0

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
1.004	10.989	0.027	400.0	0.063	0.00	0.0	0.600	o	1050	Pipe/Conduit	
1.005	19.105	0.048	400.0	0.028	0.00	0.0	0.600	o	1050	Pipe/Conduit	
1.006	5.413	0.068	79.6	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
1.007	9.484	0.348	27.3	0.000	0.00	0.0	1.500	o	150	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
1.004	0.00	5.29	177.300	0.429	0.0	0.0	0.0	1.72	1486.6	0.0
1.005	0.00	5.47	177.273	0.457	0.0	0.0	0.0	1.72	1486.6	0.0
1.006	0.00	5.55	177.225	0.457	0.0	0.0	0.0	1.13	19.9	0.0
1.007	0.00	5.64	177.157	0.457	0.0	0.0	0.0	1.68	29.7	0.0

PIPELINE SCHEDULES for Storm

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
1.000	o	900	1	183.144	179.528	2.716	Open Manhole	2400
1.001	o	1050	2	182.212	179.259	1.903	Open Manhole	2400
2.000	o	1050	3	181.950	179.300	1.600	Open Manhole	2400
1.002	o	150	4	181.601	179.210	2.241	Open Manhole	2700
1.003	o	1050	4	181.500	177.397	3.053	Open Manhole	2400
1.004	o	1050	5	180.660	177.300	2.310	Open Manhole	2400
1.005	o	1050	6	180.200	177.273	1.877	Open Manhole	2400
1.006	o	150	7	179.500	177.225	2.125	Open Manhole	2700
1.007	o	150	8	179.300	177.157	1.993	Open Manhole	1350

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
1.000	47.445	400.0	2	182.212	179.409	1.903	Open Manhole	2400
1.001	19.765	400.0	4	181.601	179.210	1.341	Open Manhole	2700
2.000	35.957	400.0	4	181.601	179.210	1.341	Open Manhole	2700
1.002	5.122	150.0	4	181.500	179.175	2.175	Open Manhole	2400
1.003	38.725	400.0	5	180.660	177.300	2.310	Open Manhole	2400
1.004	10.989	400.0	6	180.200	177.273	1.877	Open Manhole	2400
1.005	19.105	400.0	7	179.500	177.225	1.225	Open Manhole	2700
1.006	5.413	79.6	8	179.300	177.157	1.993	Open Manhole	1350
1.007	9.484	27.3		178.830	176.809	1.871	Open Manhole	1350

Simulation Criteria for Storm

Volumetric Runoff Coeff	0.840	Additional Flow - % of Total Flow	0.000
Areal Reduction Factor	1.000	MADD Factor * 10m³/ha Storage	2.000
Hot Start (mins)	0	Inlet Coeffiecient	0.800
Hot Start Level (mm)	0	Flow per Person per Day (l/per/day)	0.000
Manhole Headloss Coeff (Global)	0.500	Run Time (mins)	60
Foul Sewage per hectare (l/s)	0.000	Output Interval (mins)	1

Number of Input Hydrographs	0	Number of Storage Structures	0
Number of Online Controls	2	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	Region	England and Wales
Return Period (years)	2	M5-60 (mm)	18.000

Synthetic Rainfall Details

Ratio R	0.335	Cv (Winter)	0.840
Profile Type	Winter	Storm Duration (mins)	30
Cv (Summer)	0.750		

Online Controls for Storm

Hydro-Brake Optimum® Manhole: 4, DS/PN: 1.002, Volume (m³): 57.5

Unit Reference	MD-SHE-0104-6700-2200-6700
Design Head (m)	2.200
Design Flow (l/s)	6.7
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	104
Invert Level (m)	179.210
Minimum Outlet Pipe Diameter (mm)	150
Suggested Manhole Diameter (mm)	1200

Control Points	**Head (m)**	**Flow (l/s)**
Design Point (Calculated)	2.200	6.7
Flush-Flo™	0.454	5.6
Kick-Flo®	0.928	4.5
Mean Flow over Head Range	-	5.3

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake Optimum® as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	**Flow (l/s)**	**Depth (m)**	**Flow (l/s)**	**Depth (m)**	**Flow (l/s)**	**Depth (m)**	**Flow (l/s)**
0.100	3.5	1.200	5.0	3.000	7.7	7.000	11.6
0.200	5.0	1.400	5.4	3.500	8.3	7.500	12.0
0.300	5.5	1.600	5.8	4.000	8.9	8.000	12.3
0.400	5.6	1.800	6.1	4.500	9.4	8.500	12.7
0.500	5.6	2.000	6.4	5.000	9.9	9.000	13.0
0.600	5.5	2.200	6.7	5.500	10.3	9.500	13.4
0.800	5.1	2.400	7.0	6.000	10.7		
1.000	4.6	2.600	7.2	6.500	11.2		

Hydro-Brake Optimum® Manhole: 7, DS/PN: 1.006, Volume (m³): 27.4

Unit Reference	MD-SHE-0100-6200-2200-6200
Design Head (m)	2.200
Design Flow (l/s)	6.2
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	100
Invert Level (m)	177.225
Minimum Outlet Pipe Diameter (mm)	150
Suggested Manhole Diameter (mm)	1200

Hydro-Brake Optimum® Manhole: 7, DS/PN: 1.006, Volume (m³): 27.4

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	2.200	6.2
Flush-Flo™	0.435	5.1
Kick-Flo®	0.894	4.1
Mean Flow over Head Range	-	4.9

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake Optimum® as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	3.3	1.200	4.7	3.000	7.2	7.000	10.7
0.200	4.6	1.400	5.0	3.500	7.7	7.500	11.1
0.300	5.0	1.600	5.3	4.000	8.2	8.000	11.4
0.400	5.1	1.800	5.6	4.500	8.7	8.500	11.8
0.500	5.1	2.000	5.9	5.000	9.1	9.000	12.1
0.600	5.0	2.200	6.2	5.500	9.6	9.500	12.4
0.800	4.6	2.400	6.5	6.000	10.0		
1.000	4.3	2.600	6.7	6.500	10.3		

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

Simulation Criteria

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

Number of Input Hydrographs	0	Number of Storage Structures	0
Number of Online Controls	2	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	Ratio R	0.335
Region	England and Wales	Cv (Summer)	0.750
M5-60 (mm)	18.000	Cv (Winter)	0.840

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

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160
Return Period(s) (years)	1, 30, 100
Climate Change (%)	0, 0, 30

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.
1.000	1	15 Winter	1	+0%	100/60 Summer			
1.001	2	60 Winter	1	+0%	100/30 Winter			
2.000	3	60 Winter	1	+0%	100/60 Summer			
1.002	4	60 Winter	1	+0%	1/15 Summer	100/120 Winter		
1.003	4	180 Winter	1	+0%	100/120 Winter			
1.004	5	180 Winter	1	+0%	100/120 Winter			
1.005	6	180 Winter	1	+0%	100/120 Winter			
1.006	7	180 Winter	1	+0%	1/15 Summer			
1.007	8	180 Winter	1	+0%				

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	1	179.604	-0.824	0.000	0.02		13.6	OK	
1.001	2	179.593	-0.716	0.000	0.01		10.3	OK	
2.000	3	179.593	-0.757	0.000	0.00		4.5	OK	

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

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
1.002	4	179.593	0.234	0.000	0.48		5.6	SURCHARGED	2
1.003	4	177.664	-0.783	0.000	0.01		6.4	OK	
1.004	5	177.664	-0.687	0.000	0.01		6.6	OK	
1.005	6	177.663	-0.659	0.000	0.01		6.5	OK	
1.006	7	177.664	0.289	0.000	0.31		5.1	SURCHARGED	
1.007	8	177.201	-0.106	0.000	0.19		5.1	OK	

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

Simulation Criteria

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

Number of Input Hydrographs 0 Number of Storage Structures 0
Number of Online Controls 2 Number of Time/Area Diagrams 0
Number of Offline Controls 0 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR Ratio R 0.335
Region England and Wales Cv (Summer) 0.750
M5-60 (mm) 18.000 Cv (Winter) 0.840

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

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160
Return Period(s) (years) 1, 30, 100
Climate Change (%) 0, 0, 30

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.
1.000	1	120 Winter	30	+0%	100/60 Summer			
1.001	2	120 Winter	30	+0%	100/30 Winter			
2.000	3	120 Winter	30	+0%	100/60 Summer			
1.002	4	120 Winter	30	+0%	1/15 Summer	100/120 Winter		
1.003	4	600 Winter	30	+0%	100/120 Winter			
1.004	5	600 Winter	30	+0%	100/120 Winter			
1.005	6	600 Winter	30	+0%	100/120 Winter			
1.006	7	600 Winter	30	+0%	1/15 Summer			
1.007	8	240 Summer	30	+0%				

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	1	180.000	-0.428	0.000	0.01		9.9	OK	
1.001	2	180.000	-0.309	0.000	0.01		10.2	OK	
2.000	3	180.000	-0.350	0.000	0.01		7.7	OK	

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

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
1.002	4	180.000	0.641	0.000	0.48		5.6	SURCHARGED	2
1.003	4	178.311	-0.136	0.000	0.01		6.6	OK	
1.004	5	178.311	-0.040	0.000	0.01		6.4	OK	
1.005	6	178.311	-0.012	0.000	0.01		6.4	OK	
1.006	7	178.310	0.935	0.000	0.31		5.1	SURCHARGED	
1.007	8	177.201	-0.106	0.000	0.19		5.1	OK	

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

Simulation Criteria

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

Number of Input Hydrographs	0	Number of Storage Structures	0
Number of Online Controls	2	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	Ratio R	0.335
Region	England and Wales	Cv (Summer)	0.750
M5-60 (mm)	18.000	Cv (Winter)	0.840

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

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160
Return Period(s) (years)	1, 30, 100
Climate Change (%)	0, 0, 30

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.
1.000	1	180 Winter	100	+30%	100/60 Summer			
1.001	2	180 Winter	100	+30%	100/30 Winter			
2.000	3	180 Winter	100	+30%	100/60 Summer			
1.002	4	180 Winter	100	+30%	1/15 Summer	100/120 Winter		
1.003	4	1440 Winter	100	+30%	100/120 Winter			
1.004	5	1440 Winter	100	+30%	100/120 Winter			
1.005	6	1440 Winter	100	+30%	100/120 Winter			
1.006	7	1440 Winter	100	+30%	1/15 Summer			
1.007	8	1440 Winter	100	+30%				

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	1	181.603	1.175	0.000	0.02		12.7	SURCHARGED	
1.001	2	181.603	1.294	0.000	0.01		10.4	SURCHARGED	
2.000	3	181.603	1.253	0.000	0.01		9.8	SURCHARGED	

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

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
1.002	4	181.603	2.243	1.723	0.60		7.0	FLOOD	2
1.003	4	179.488	1.041	0.000	0.01		7.0	SURCHARGED	
1.004	5	179.488	1.138	0.000	0.01		7.8	SURCHARGED	
1.005	6	179.488	1.165	0.000	0.01		7.7	SURCHARGED	
1.006	7	179.488	2.113	0.000	0.38		6.2	FLOOD RISK	
1.007	8	177.205	-0.102	0.000	0.23		6.2	OK	