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TALBOT MILL - MANCHESTER

Project No: 251/02

Date: November 2018

PRE-COMMENCEMENT REPORT – BELOW GROUND DRAINAGE

contents

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1.1	LOCATION
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1.0	EXISTING SITE
1.1	LOCATION
1.1.1	The development site is situated in the St George's area of Manchester, in a mixed area of residential, commercial and light industry.
1.1.2	The site is bounded by Ellesmere Street to the south, Worsley Street to the north and adjacent to the Burton Place residential and commercial development to the east and Britannia Mills to the west. The Bridgewater Canal is located to the north of the site beyond the adjacent Timber Wharf development. A canal arm of this canal extends to the western boundary of the site
1.1.3	The development site is shown on the attached overall site plan, ref: 251/02/SI01, included in Appendix A.

2.0	GROUND CONDITIONS						
2.1	A Phase 1 Preliminary Risk Assessment has been undertaken by specialist consultants, Delta- Simons Environmental Consultants Limited. Refer to Report 16-1144.01 dated January 2017. This work allowed the context of the site to be understood so that development risks are better understood informing the brief for the Phase 2 intrusive geotechnical and environmental investigation, the first stage of which is complete. Refer to Report 11264-R1(03) dated October 2018.						
2.2	Site Geology						
2.2.1	The 1: 50,000 BGS Geological Map for the Site (Sheet 85, Manchester) indicated that much of the Site is not underlain by drift deposits apart from the southern boundary of the Site which is shown to be underlain by Glaciofluvial sheet deposits of Devensian age, comprising sand and gravel. The underlying bedrock is the Chester Pebble Beds Formation (sandstone) of Triassic age.						
2.3	Site Investigation						
2.3.1	Intrusive site investigation works comprised a series of cable and rotary boreholes to sample general ground conditions and targeted trial pits to expose existing building foundations.						
2.3.2	Ground conditions on the site typically comprise: <table><tr><td>0 to 1.05m</td><td>Made Ground</td></tr><tr><td>1.05 to 2.70m</td><td>Sand and Gravel</td></tr><tr><td>2.70 to 13.0+m</td><td>Sandstone</td></tr></table>	0 to 1.05m	Made Ground	1.05 to 2.70m	Sand and Gravel	2.70 to 13.0+m	Sandstone
0 to 1.05m	Made Ground						
1.05 to 2.70m	Sand and Gravel						
2.70 to 13.0+m	Sandstone						
2.3.3	The Site Investigation report confirms some background contamination of the made ground associated with former building uses and outlines a remediation strategy involving source removal of contamination hot spots and mitigation of contact linkages through provision of clean cover layer within landscaped areas.						

- 3.0

STATUTORY SERVICES
- 3.1

Available statutory services information relating to plant and services in the vicinity of the site has been provided by Services providers.
- 3.2

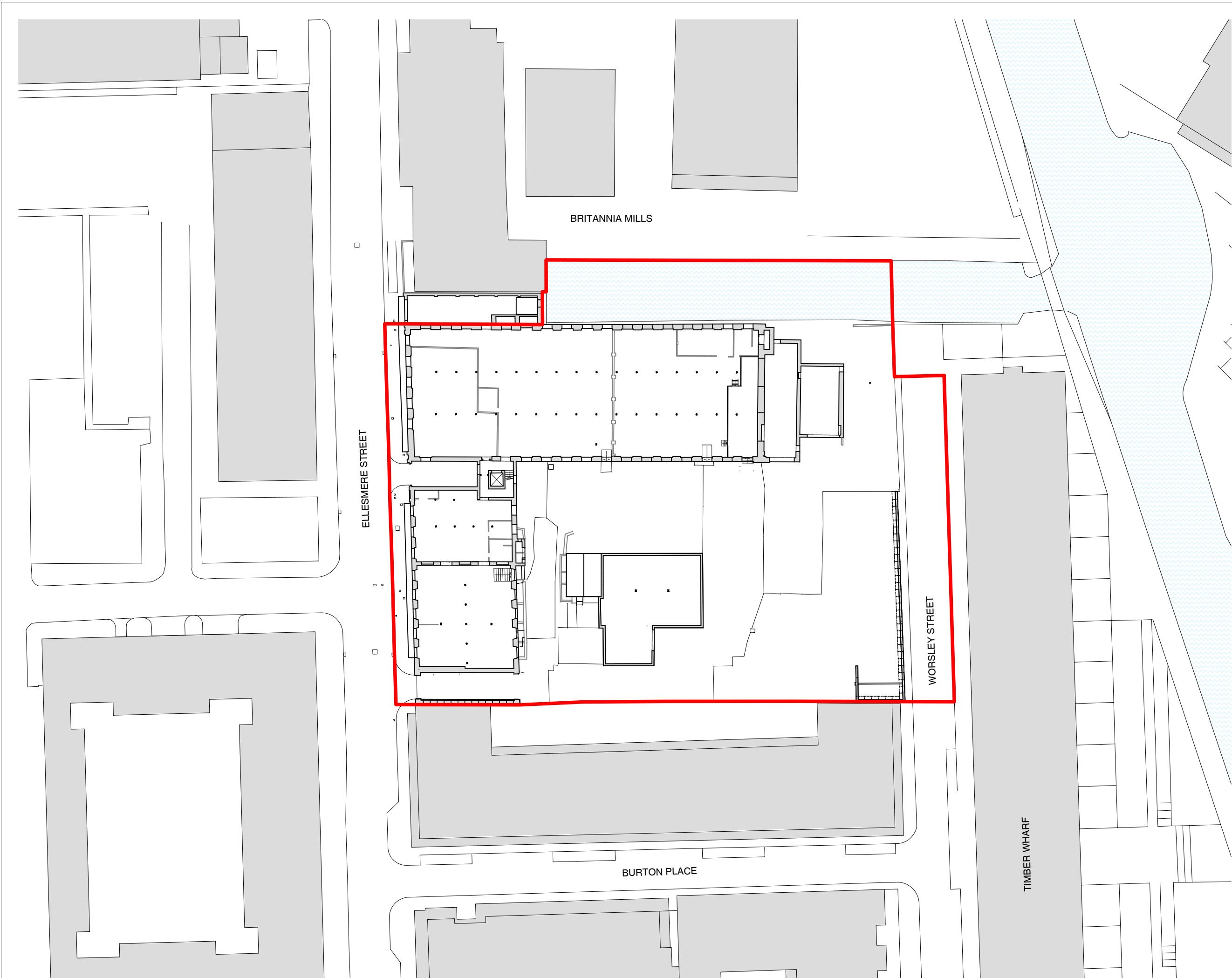
The below ground drainage is shown on 251/02/SI11 in Appendix B. The drawing shows that the services in the vicinity of the site are primarily located in Ellesmere Street to the south.

4.0	BELOW GROUND DRAINAGE
4.1	EXISTING BUILDINGS – APPENDIX A
4.1.1	The recently vacated existing buildings were in various uses including; material storage, parcel storage and distribution, knitwear manufacture, furniture manufacture, scientific instrument refurbishment, artist studio, and offices.
4.1.2	Former uses in the courtyard involve car repair and storage for JCB excavators.
4.1.3	The historic use of the site was as a Cotton Mill. The development site is shown on the attached overall site plan, ref: 251/02/SI01.
4.2	PROPOSED BUILDINGS
4.2.1	The proposals involve the conversion of the Talbot Mill complex to create 114 residential apartments (Use Class C3), including rooftop extensions to Mill 1 and Mill 2, and rear extension to Mill 1; demolitions of Buildings A, B and C; retrospective application for the demolition of Building E; erection of a new building to provide 88 residential apartments (Use Class C3); and creation of new landscaped courtyard, lighting and other associated works.
4.3	EXISTING BELOW GROUND DRAINAGE – APPENDIX B
4.3.1	The existing adopted sewer network is indicated on the statutory services drawings as noted above and comprises a combined system in Ellesmere Street (approximately 550x620 at 5.4m depth).
4.3.2	The existing site drainage network was subject to detailed CCTV survey and assessment and is indicated on the Existing Drainage Plan. The existing system comprises a combined foul and surface water system from the buildings and courtyard with 225mm diameter connections from Mill 1 and Mill 2 to the existing combined sewer.
4.4	PROPOSED BELOW GROUND DRAINAGE – APPENDIX C
4.4.1	The proposed drainage strategy is indicated on the Proposed Drainage Plan. The proposed system comprises new separate systems within the site, combining at the site boundary before connecting to the existing network.
4.5	PROPOSED FOUL DRAINAGE
4.5.1	As shown on the proposed drainage layout and as agreed with United Utilities, foul water will drain under gravity within the site before discharging at an unrestricted rate to the existing combined sewer, via the construction of a new manhole.
4.6	PROPOSED SURFACE WATER DRAINAGE
4.6.1	The scheme proposals have been developed in accordance with the guidance document produced by the Lead Local Flood Authority – Manchester City Council, 'SuDS Requirements for New Developments'. This is in line with the Written Ministerial Statement published by the Secretary of State for the Department of Community and Local Government in December 2014 which came into effect on the 6th April 2015 and further augmented by reference within the PPG Paragraph 079 of the Flood Risk and Coastal Change section which outlined that: <i>'Whether a sustainable drainage system should be considered will depend on the proposed development and its location, for example whether there are concerns about flooding. Sustainable drainage systems may not be practicable for some forms of development. New development should only be considered appropriate in areas at risk of flooding if priority has been given to the use of sustainable drainage systems. Additionally, and more widely, when considering major development, as defined in the Town and Country Planning (Development Planning Procedure) (England) Order 2015, sustainable drainage systems should be provided unless demonstrated to be inappropriate.'</i>

4.6.2	The Drainage Statement reviewed a number of Sustainable Drainage techniques in line with the drainage hierarchy outlined in NPPF PPG Paragraph 80. These are outlined below.
4.6.2.1	INFILTRATION TO THE GROUND A Phase 1 Geo-Environmental Preliminary Risk Assessment has been carried out by Delta-Simons in January 2017, ref: 16-1144.01. This describes the site setting, context and former industrial uses including the potential for various contamination sources which may have affected the existing ground below the site. As noted in the site investigation reports, the use of infiltration techniques has the potential to mobilise sources of contamination within the existing ground below the site which could in turn have an impact on surface water quality within the adjacent canal or principal aquifer. Collection of surface water and Infiltration via soakaways is therefore discounted as an option with the exception of free drainage from newly formed landscaped areas within the courtyard.
4.6.2.2	SWALES / DITCHES / BASINS Due to the city centre location of the proposed development there is insufficient space available for the inclusion of swales, ditches or basins and therefore these methods have been discounted as not being practical.
4.6.2.3	PERMEABLE PAVEMENTS Due to the existing finishes around the site it is not viable to utilise permeable paving as part of the drainage strategy except within the newly formed landscaped areas within the courtyard as noted above.
4.6.2.4	GREEN ROOFS Use of green roof space has been reviewed and has been adopted where practical, ie: to the roofs of the new timekeepers lodge extension within the courtyard.
4.6.2.5	RAINWATER AND GREYWATER HARVESTING Rainwater and greywater harvesting has been reviewed but has been discounted due to lack of available space within the development to make this option viable.
4.6.2.6	DISCHARGE TO A WATERCOURSE The existing Bridgewater Canal runs close to the site with a former canal arm extending adjacent to Mill 2. Surface water from the site is not currently discharged to the canal arm. The relative level of the outfall and canal water level present particular difficulties in the draining of the site under gravity so this option is discounted as not being practical.
4.6.2.7	CONNECTION TO AN EXISTING PUBLIC COMBINED SEWER There is no existing public surface water network in the vicinity of the site so this option is discounted.
4.6.6	CONNECTION TO AN EXISTING PUBLIC COMBINED SEWER There is an existing public combined sewer in Ellesmere Street into which the existing foul and surface water drainage from the site is currently discharged. It is therefore proposed that the new surface water network will remain connected to the existing combined sewer in Ellesmere Street. Since the site is a brownfield site, located within a Critical Drainage Area, the proposed new surface water drainage system will target a minimum reduction of surface water runoff rate of 50% in accordance with the requirements of the Manchester City, Salford and Trafford Council Level 2 Strategic Flood Risk Assessment (MST SFRA).

This will be achieved through incorporation of free drainage from new landscaping within the courtyard, the use of green roofs to courtyard buildings, supplemented by the use of proprietary below ground attenuation tanks coupled with flow control devices. Hydraulic calculations to demonstrate necessary storage volumes and proposed discharge rates are included.

APPENDIX A - Existing Site Plan



Notes:

1. This drawing is to be read in conjunction with the site survey and all relevant Architects and Engineers drawings and the specification.

2. For general notes refer to drawing no. 251-02-__.

Key:

Site Boundary.

INFORMATION

24.01.17	Issued for Information.	-	TP	SW
Date:	Issue:	Rev:	Revised:	Checked:

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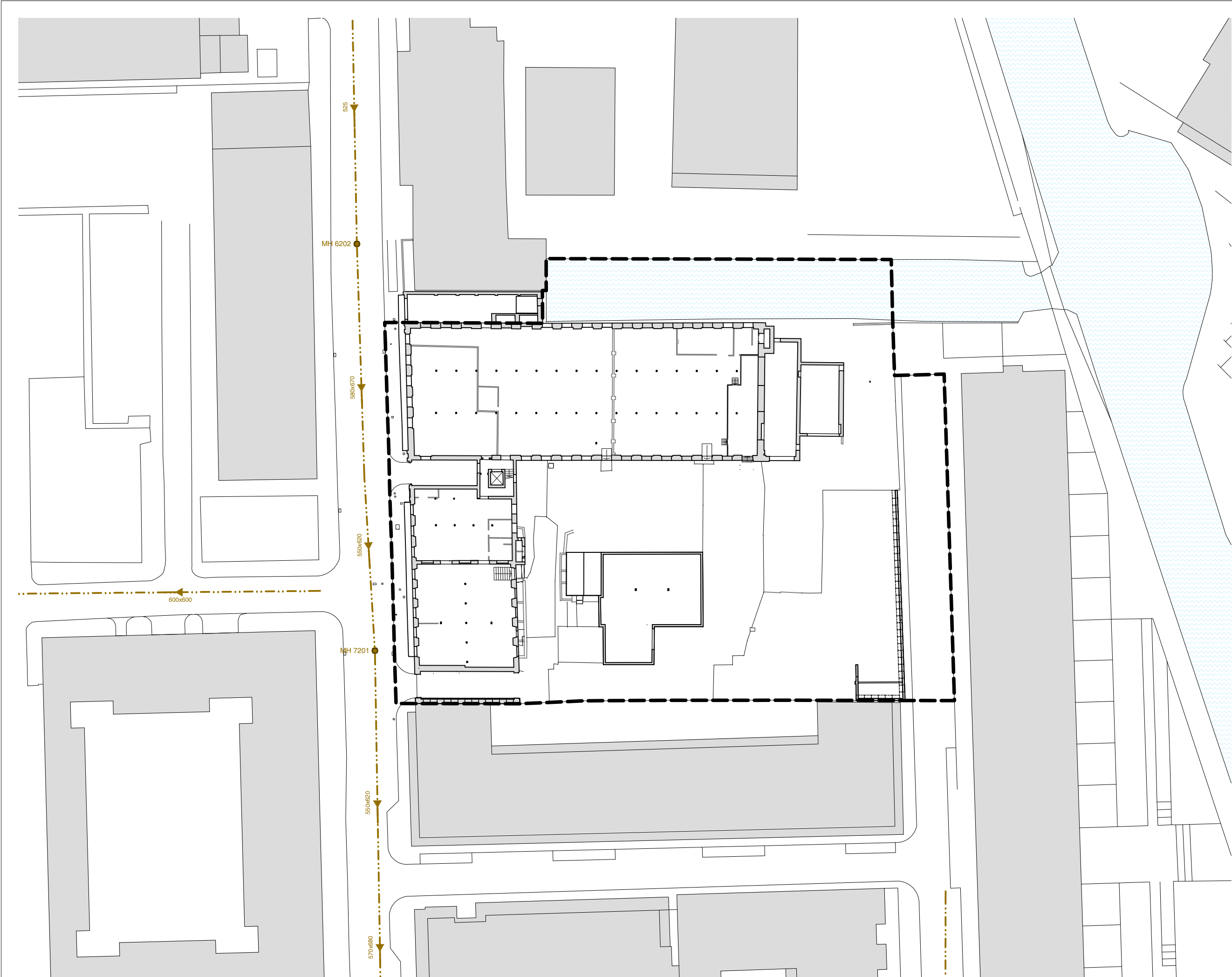
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Project:
Talbot Mill,
Manchester.

Title:
Existing,
Site Plan.

Job No: 251-02	Proj No: SI 01	Rev: -
Scale: 250 @ A1 500 @ A3	Date: 01.17	Drawn: TP



Notes:

1. This drawing is to be read in conjunction with the site survey and all relevant Architects and Engineers drawings and the specification.

2. The statutory services information summarised on this drawing has been collated from information received from the statutory undertakers. The services are summarised so that Joule can comment to the Client an any effect that these may have on the structural works. Contractors are to liaise directly with all statutory undertakers well in advance of commencing the works to confirm the locations of all existing services.

3. For general notes refer to drawing no. 251-02-___.

Key:

Site Boundary.

Stats Key:

Existing Drainage.

(combined foul & storm water)

Reference	Cover Level	Invert Level
MH 6202	29.37	24.21
MH 7201	29.46	24.03

Statutory services information shown are indicative only taken from information obtained November / December 2016 & April 2000. Further information to be added on receipt of statutory service information provided by others.

INFORMATION

Issued for Information.

Date:

Issue:

-

Rev:

TP

Revised:

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Checked:

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Project:

Talbot Mill,
Manchester.

Title:

Existing,
Site Plan,
Statutory Services,
Drainage.

Job No:	Orig No:	Rev:
251-02	SI 11	-

Scale:	Date:	Drawn:
250 @ A1 500 @ A3	01.17	TP

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Notes:

1. This drawing is to be read in conjunction with the site survey and all relevant Architects and Engineers drawings and the specification.
2. For general notes refer to drawing no. 251-02-N01 to N03.

Drainage Key:

- Existing UU Drainage, (Combined sewer).
- Existing Drainage, (Combined sewer).

Drainage layout refer to Fair Flow Ltd inspection report, 20th June 2018.

INFORMATION

Date	Issued for Tender.	Rev.	TP	NR
15.10.18	Issue			

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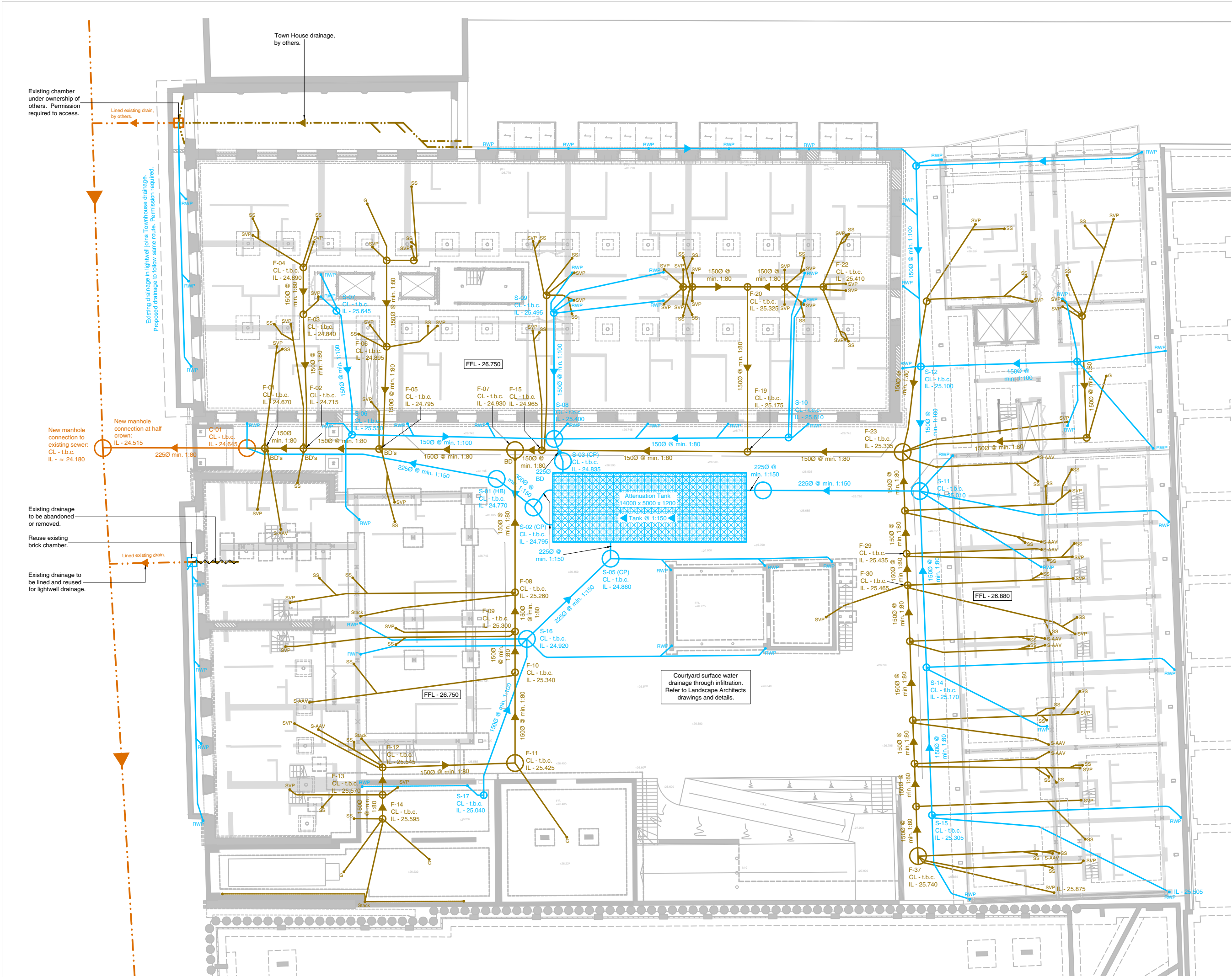
Timber Wharf
40 Worsley Street
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M15 4LD

Project:
Talbot Mill,
Manchester.

Title:
Drainage,
Existing,
Plan.

Job No:	Orig No:	Rev:
251-02	395	-

Scale:	Date:	Drawn:
125 @ A1 250 @ A3	08.18	TP



- Notes:
- This drawing is to be read in conjunction with the site survey and all relevant Architects and Engineers drawings and the specification.
 - For general notes refer to drawing no. 251-02-N01 to N03.
- Drainage Key:
- Existing UU Drainage.
 - Existing Drainage, by others.
 - Proposed Drainage, (Surface Water).
 - Proposed Drainage, (Foul Water).
 - Proposed Drainage, (Combined).
- SVP - Soil vent pipe. Foul, full height, vent to roof.
 - S-AAV - Stack. Foul, full height, air admittance valve.
 - Stack - Stack. Gray water, full height.
 - SS - Sub stack. Foul, single story.
 - RWP - Rain water pipe.
- (HB) - Hydrobrake Flow Control, 26 l/s to Contractor design and details. Refer to specification.
- (CP) - Catchpit.
- BD - Back Drop.
- Tank - Attenuation storage tank to Contractors design and details. refer to specification.

All vent pipes and rainwater pipes are to be roddable above ground. Refer to Architects details.

Drainage gradients noted are minimum gradients between access points. Refer to invert levels at each end of drainage runs.

All surface water drainage 100mm Ø UPVC @ 1:100, unless noted otherwise.

All foul drainage 100mm Ø UPVC @ 1:80, unless noted otherwise.

All combined drainage 225mm Ø UPVC @ 1:80, unless noted otherwise.

Cover levels refer to Architects drawings.

INFORMATION

15.11.18	Issued for Information & comment. Sub Stacks added, drainage layout updated.	C	TP	SW
15.10.18	Issued for Tender. layout updated.	B	TP	SW
27.06.18	Preliminary. Issued for Information, layout updated.	A	TP	SW
22.06.18	Preliminary. Issued for Information.	Rev:	TP	NR
Date:	Issue:	Rev:	Revised:	Checked:

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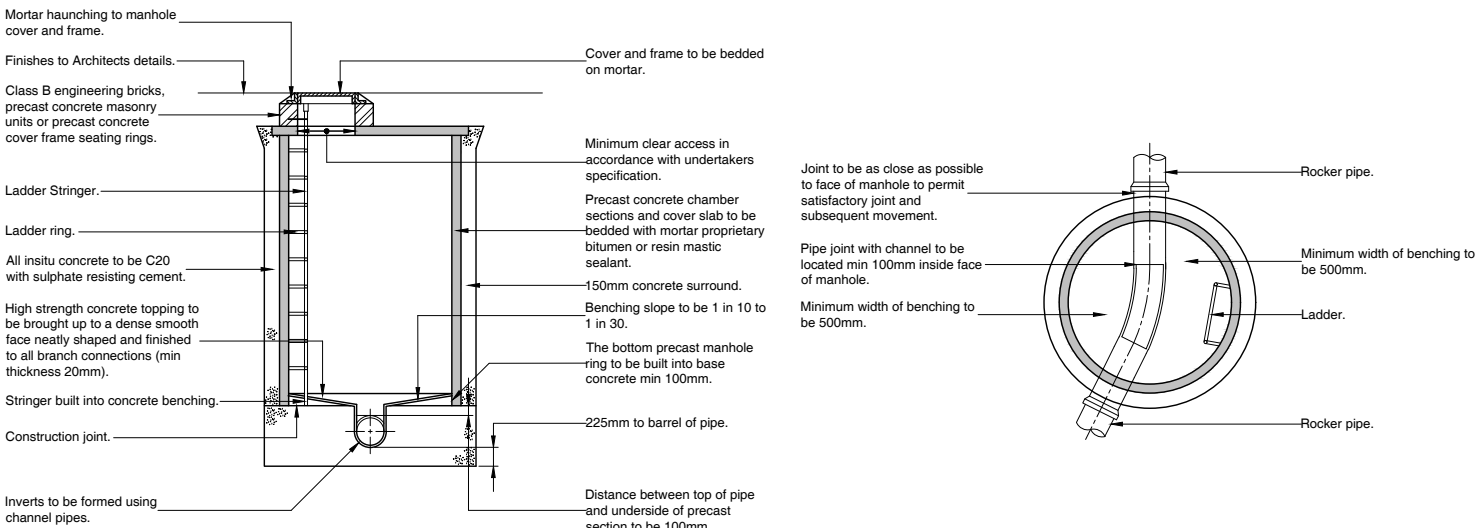
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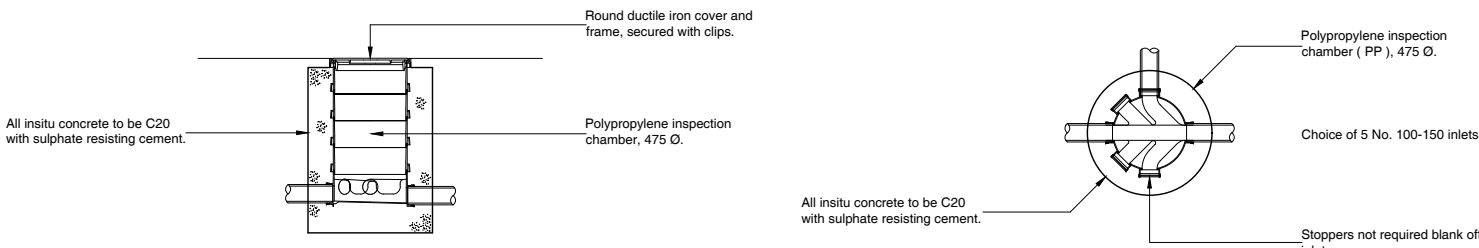
Project:
Talbot Mill,
Manchester.

Title:
Drainage,
Proposed,
Plan.

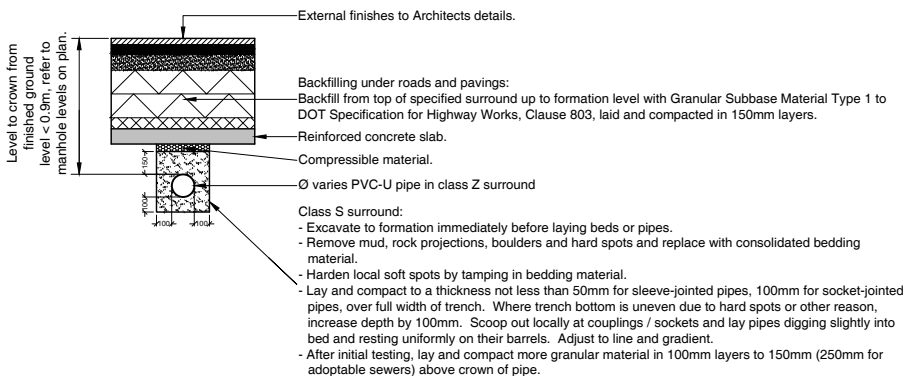
Job No:	251-02	Orig No:	400	Rev:	C
Scale:	125@A1 250@A3	Date:	06.18	Drawn:	TP



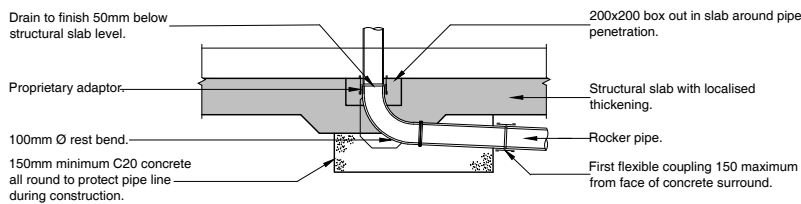
TYPICAL PRECAST MANHOLE SHAFT DETAIL
(For manholes greater than 1.5m but less than 4m depth to invert.)



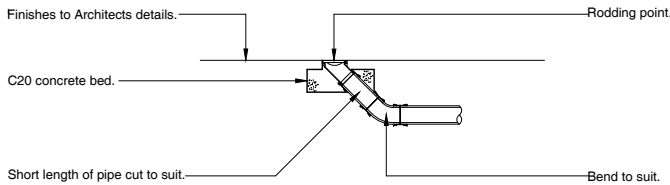
TYPICAL PPIC INSPECTION CHAMBER DETAIL



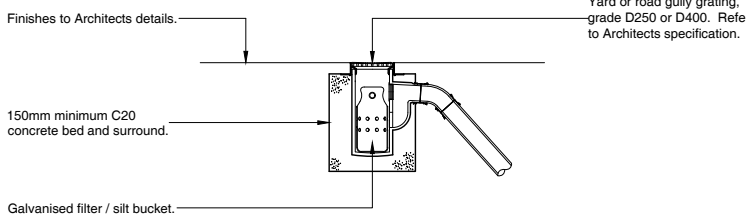
TYPICAL DRAIN PROTECTION DETAIL DEPTH < 0.9m
- UNDER ROADS AND PAVINGS



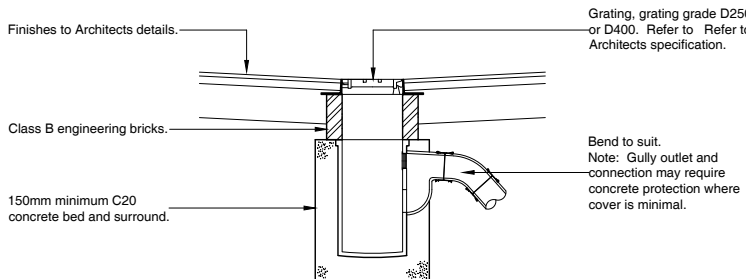
CONNECTION OF INTERNAL DRAINAGE TO
BELOW GROUND FOUL DRAINAGE
(Shallow pipeline below slab encased in concrete
in accordance with the specification.)



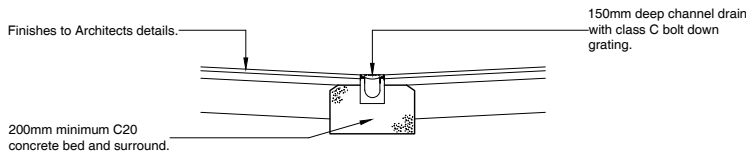
TYPICAL RODDING EYE (RE)



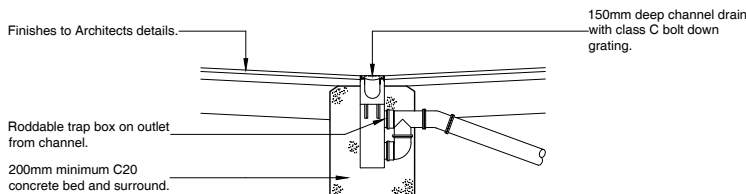
TYPICAL YARD GULLY



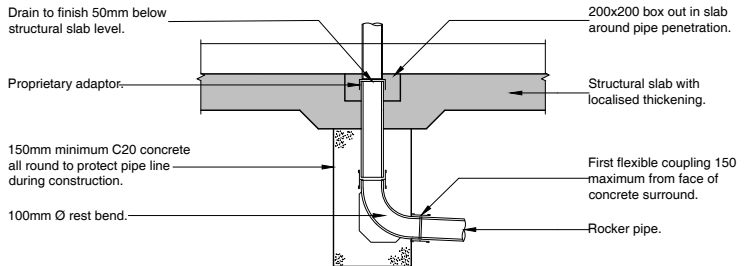
TYPICAL ROAD GULLY



TYPICAL ACO DRAIN



TYPICAL ACO SUMP DRAIN



CONNECTION OF INTERNAL DRAINAGE
TO BELOW GROUND DRAINAGE

- Notes:
1. This drawing is to be read in conjunction with the site survey and all relevant Architects and Engineers drawings and the specification.
 2. For general notes refer to drawing No. 284-04-N01 & N02.

TENDER STAGE
DEVELOPED DESIGN

15.10.18	Issued for Tender.	-	TP	SW
Date:	Issue:	Rev:	Revised	Checked

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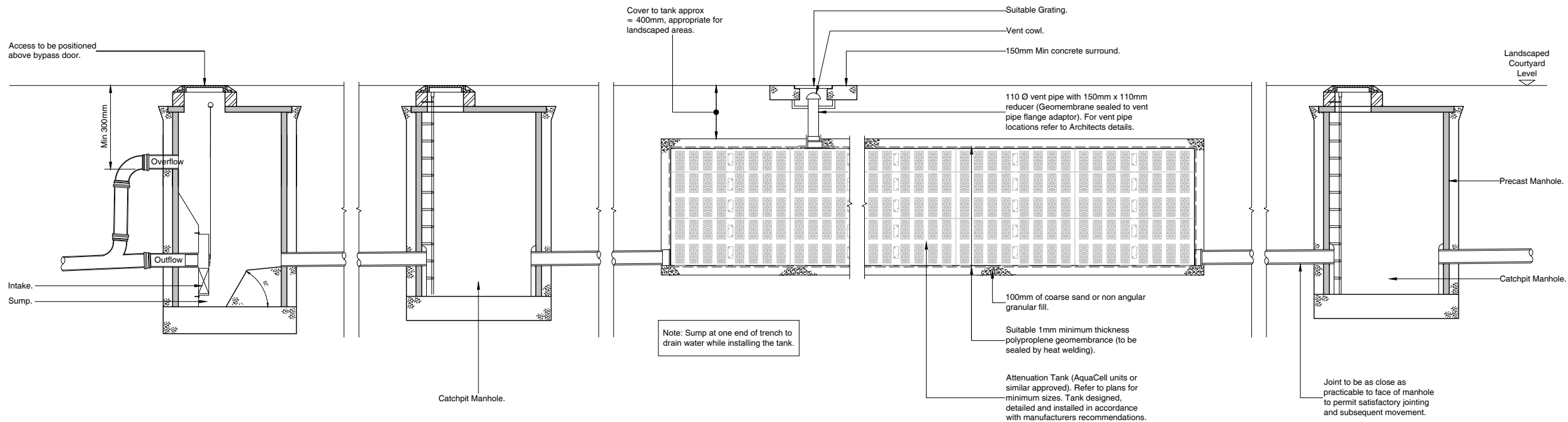
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Project:
New Islington,
Mansion House.

Title:
Drainage,
Proposed,
Details.

Job No:	251-02	Org No:	420	Rev:	-
Scale:	25 @ A1 50 @ A3	Date:	10.18	Drawn:	TP



TYPICAL ATTENUATION TANK DETAIL
(Attenuation Tank and Flow Control to specialist manufacturers
design and details to satisfy performance requirements.)

Notes:

1. This drawing is to be read in conjunction with the site survey and all relevant Architects and Engineers drawings and the specification.
2. For general notes refer to drawing No. 284-04-N01 & N02.

TENDER STAGE
DEVELOPED DESIGN

15.10.18	Issued for Tender.	-	TP	SW
Date:	Issue:	Rev:	Revised	Checked

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Project:
New Islington,
Mansion House.

Title:
Drainage,
Proposed,
Details.

Job No:	Org No:	Rev:
251-02	421	-

Scale:	Date:	Drawn:
25 @ A1 50 @ A3	10.18	TP

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APPENDIX D – HYDRAULIC CALCULATIONS

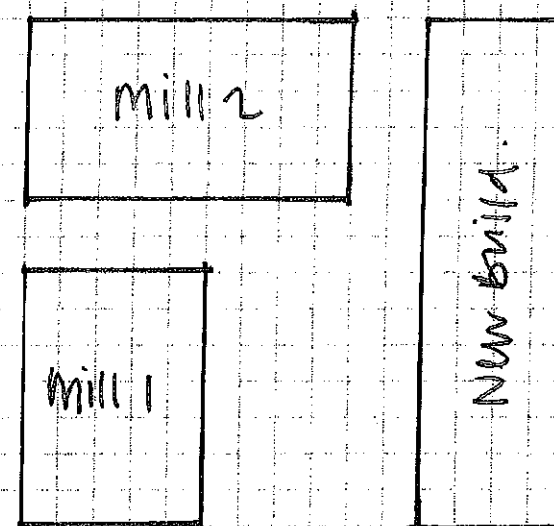
Job No 251/02	Sheet No D01	
Project TAVBOT MIU	Engineer sjw	Date 10/18
Element Foul DRAINAGE.	Checked by	Date

Adopt :-

- 150mm ϕ drainage at 1:80 generally.
- For lateral connections from individual risers serving not more than 10 units adopt 100mm ϕ drainage at 1:80 generally.
- For individual lateral connections where necessary adopt 100mm ϕ drainage at 1:40.

Job No	251/02	Sheet No	002
Project	TALBOT MILL	Engineer	sjw
Element	Foul DRAINAGE - DESIGN PRINCIPLES.	Checked by	Date

Foul DRAINAGE



Mill 1 Approx 50 units

Mill 2 Approx 50 units

New build Approx 100 units

Overall Approx 200 units

Assuming 1400 per apartments

$$\Sigma \text{SU} = 14 \times 200 = 2800$$

$$\therefore \text{Flow} = \underline{\underline{14 \text{ l/s max.}}}$$

$$150\text{mm pipe at } 1:80, \text{ flow} = 20 \text{ l/s full} \\ = 18 \text{ l/s @ } 3/4 \text{ depth.}$$

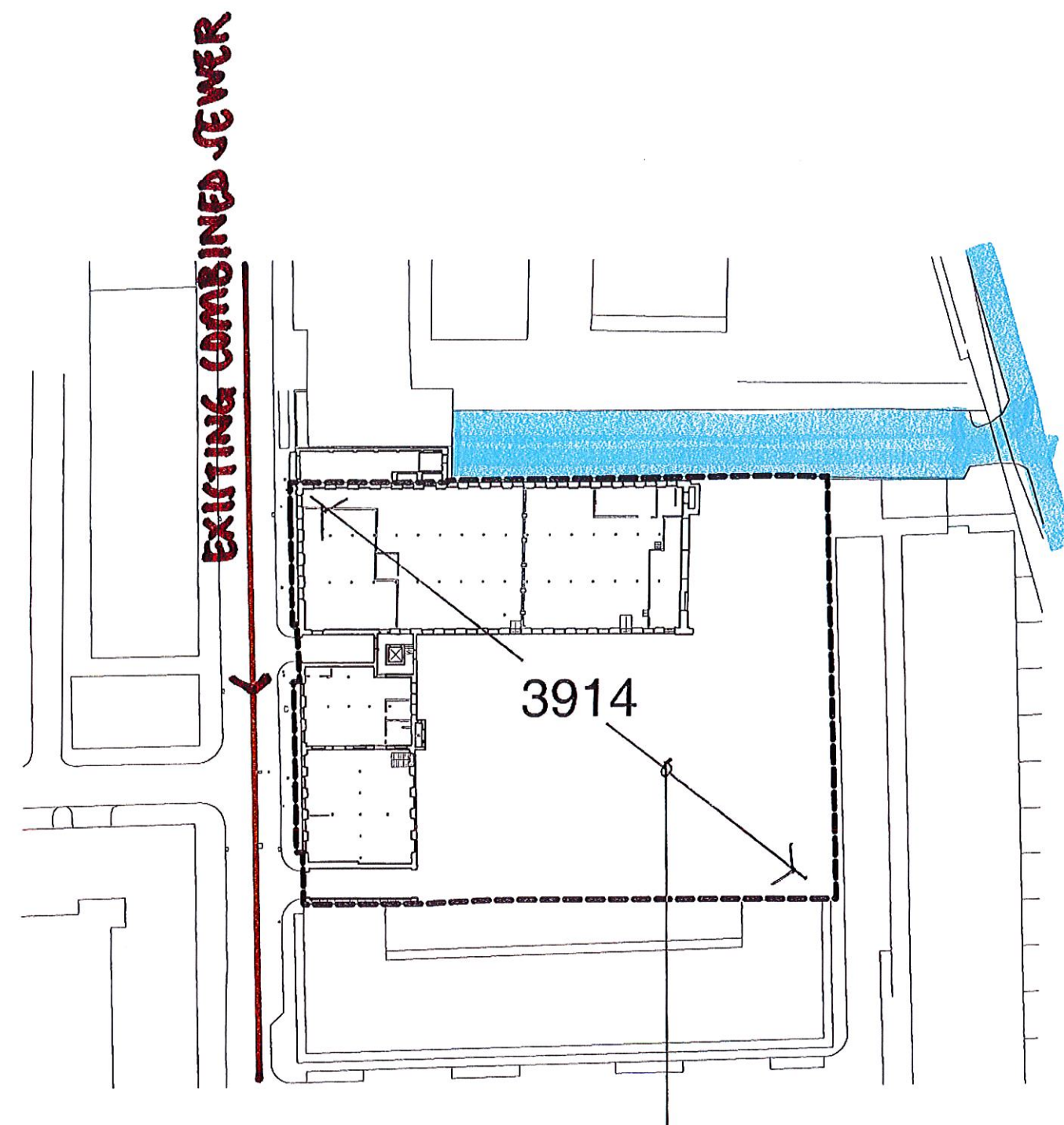
Job No 251/02	Sheet No 003
Project TRUBOT MILL	Engineer SJW Date 07/17
Element DRAINAGE - PROPOSED.	Checked by Date

PROPOSED SITE:

WITHIN THE PROPOSED SITE OPTIONS FOR REDUCING OVERFLOW TO THE SEWER ARE LIMITED. THIS IS DUE TO THE EXISTING BUILDING ARRANGEMENT AND COURTYARD ARRANGEMENT AND REQUIREMENT FOR BUILDING SERVICING.

WITHIN THE COURTYARD PERMEABLE FINISHES ARE SPECIFIED BY THE LANDSCAPE ARCHITECT WHERE APPROPRIATE. THIS ALLOWS NATURAL PERCOLATION TO THE GROUND TO REDUCE OVERFLOW RUNOFF WHERE POSSIBLE. GREEN ROOFS ARE ALSO PROVIDED TO COURTYARD BUILT. EVERYWHERE ATTENUATION TANKS ARE PROVIDED TO STORE RAIN WATER FROM ROOFS/HATCH SURFACING TO MANAGE FLOWS OFF SITE. AT THIS STAGE IT IS ASSUMED THAT TANKS WILL BE POSITIONED CENTRALLY AND CAN TAKE FEEDS FROM ALL CONTRIBUTING SURFACES.

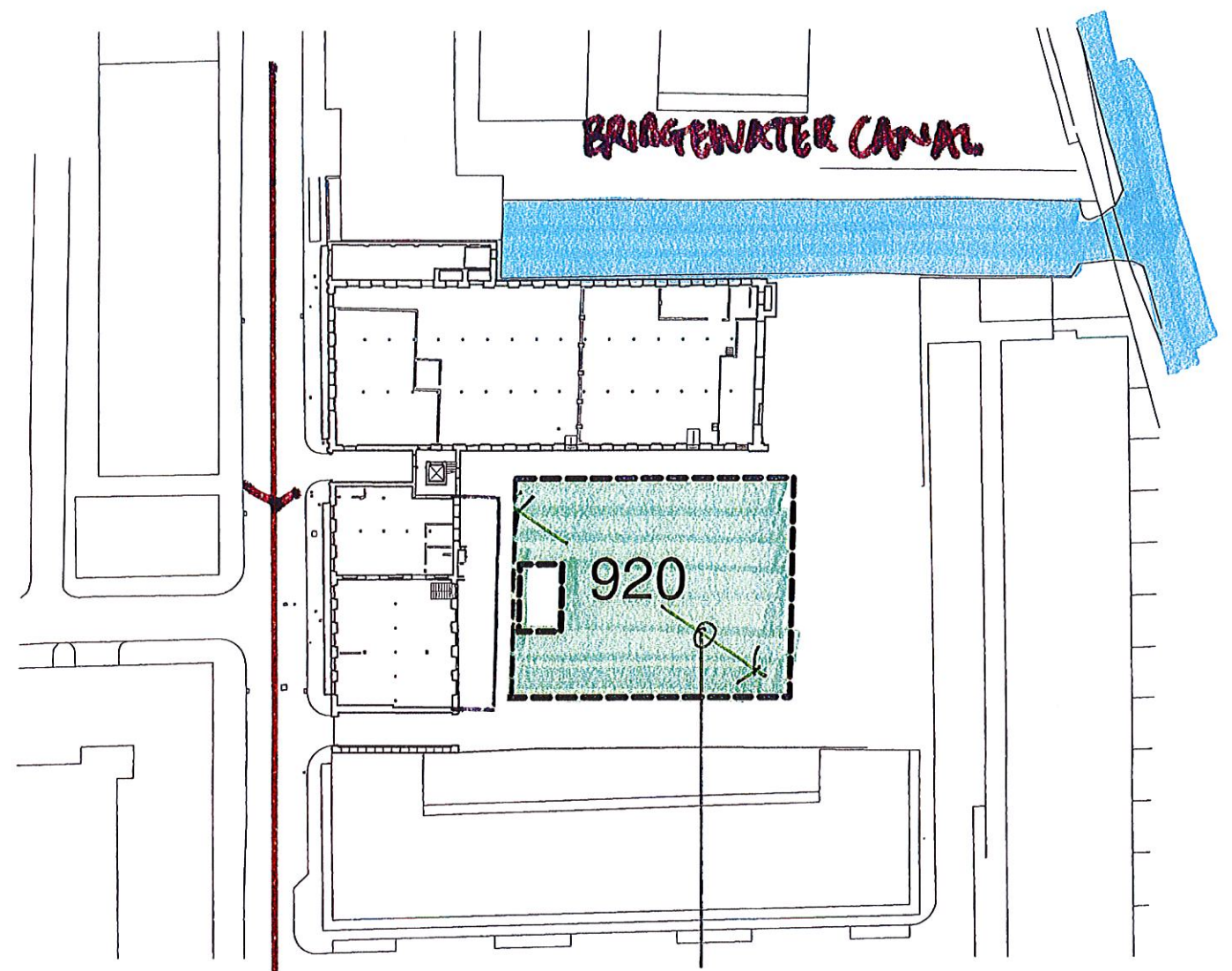
IN ACCORDANCE WITH THE REQUIREMENTS OF THE MANCHESTER CITY, Salford AND TRAFFORD COUNCIL LEVEL 2 STRATEGIC FLOOD RISK ASSESSMENT (MST/SFRA) A MINIMUM REDUCTION OF SURFACE WATER RUNOFF RATE IS TARGETED AT 50%.



SITE COMPOSED BUILDINGS/
HARD LANDSCAPING, ASSUMED
TO DRAIN DIRECTLY TO THE
EXISTING COMBINED SEWER IN
EUREKA STREET.

SITE AREA = 3914m²
PIMP = 100%.

EXISTING SITE.



COMBINED
SEWER.

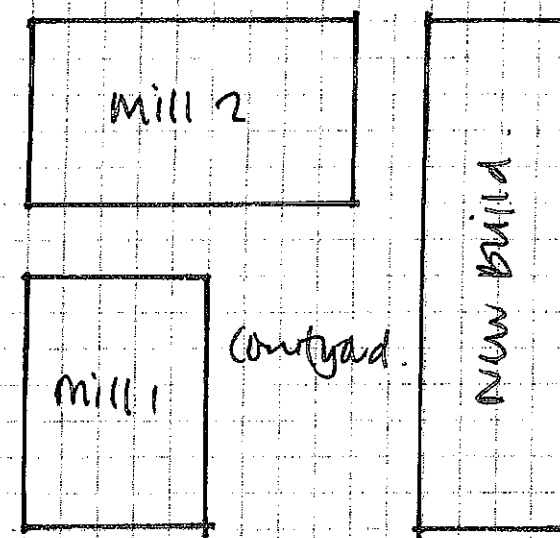
PERMEABLE FINISHES TO
COURTYARD / GREEN ROOF.

$$\begin{aligned} \text{SITE AREA} &= 3914 \text{ m}^2 \\ \text{LANDSCAPE} &= 920 \text{ m}^2 \\ \text{PIMP} &= \frac{3914 - 920}{3914} = 76\% \end{aligned}$$

PROPOSED SITE.

Job No 25/02	Sheet No D06	
Project TALBOT MILL	Engineer SJW	Date 10/18
Element SURFACE WATER — DESIGN PRINCIPLES.	Checked by	Date

SURFACE WATER DRAINAGE:



Adopting
 0.0312 l/s/m^2
 (30 gals/5 min storm/
 Manchester).

Mill 1. Approx $A = 30 \times 20 = 600 \text{ m}^2$
 Approx Flow = 18.72 l/s .

Mill 2. Approx $A = 50 \times 20 = 1000 \text{ m}^2$
 Approx Flow = 31.2 l/s .

NEW BUILD. Approx $A = 50 \times 14 = 700 \text{ m}^2$
 Approx Flow = 21.8 l/s .

Pipe Capacities:

125 mm $\varnothing$ @ 1:150.

Flow = 4 l/s

150 mm $\varnothing$ @ 1:80

Flow = 19.8 l/s .

150 mm $\varnothing$ @ 1:100

Flow = 18 l/s .

100 mm $\varnothing$ @ 1:100

Flow = 6 l/s .

(Max connected
 area $\neq 6/0.031 = 194 \text{ m}^2$)

Joule Consulting Engineers Timber Wharf, 40 Worsley Street Manchester M15 4LD	Project Talbot Mill			Job no. 251-02	
	Calcs for 30Year 5Min Flow			Start page no./Revision 1	
	Calcs by SW	Calcs date 24/10/2018	Checked by	Checked date	Approved by Approved date

DESIGN RAINFALL

In accordance with the Wallingford Procedure

Tedds calculation version 2.0.00

Design rainfall intensity

Location of catchment area Manchester
Storm duration D = 5 min
Return period Period = 30 yr
Ratio 60 min to 2 day rainfall of 5 yr return period $r = 0.360$
5-year return period rainfall of 60 minutes duration $M5_60min = 18.0 \text{ mm}$
Increase of rainfall intensity due to global warming $p_{climate} = 0 \%$
Factor Z1 (Wallingford procedure) $Z1 = 0.36$
Rainfall for 5min storm with 5 year return period $M5_5min_i = Z1 \times M5_60min = 6.5 \text{ mm}$
Factor Z2 (Wallingford procedure) $Z2 = 1.45$
Rainfall for 5min storm with 30 year return period $M30_5min = Z2 \times M5_5min_i = 9.4 \text{ mm}$
Design rainfall intensity $I_{max} = M30_5min / D = 112.4 \text{ mm/hr}$

Maximum surface water runoff

Catchment area $A_{catch} = 10000 \text{ m}^2$
Percentage of area that is impermeable $p = 100 \%$
Maximum surface water runoff $Q_{max} = A_{catch} \times p \times I_{max} = 312.2 \text{ l/s}$

$$312.2 / 10000 = \underline{\underline{0.0312 \text{ l/s/m}^2}}$$

Job No 251/02

Sheet No 008

Project TRUBOTMILU.

Engineer J/W

Date 10/18

Element SURFACE WATER - DESIGN
PRINCIPLES.

Checked by

Date

Adopt: -

- 225mm ϕ drainage from each building to the attenuation tank.
- 150mm ϕ drainage from connected tanks.
- 100mm ϕ drainage from individual RWP outlets.
- 300mm ϕ drainage from tank to fine control.
- 225mm ϕ drainage down to can where flow limited via hydrobrake to max 26 l/s.

Job No	251/02	Sheet No	009
Project	TALBOT MILL	Engineer	SW
Element	COMBINED DRAINAGE - DESIGN PRINCIPLES	Checked by	Date

From final chamber from and surface
water combine before connecting to the
combined sewer.

$$Q_{\text{from}} = 14 \text{ l/s}$$

$$Q_{\text{surface}} = 26 \text{ l/s}$$

$$\Sigma = \underline{40 \text{ l/s}}$$

Adopt 225mm ϕ outfall at 1:80. AVAILABLE
 $Q_{\text{out}} = \underline{58 \text{ l/s}}$

Job No 251/02

Sheet No 010

Project TRUBOT MILU.

Engineer JIW

Date 11/18

Element SURFACE WATER.

Checked by

Date

Refer to Attached Micro Drainage Calc.

EXISTING.

2 Year Return Period

15 min Winter storm $Q = 48.24/l$.PROPOSEDConsider Available Discharge $= 48/2 = 24/l$.Check based on Tank $12 \times 5 \times 1.2 \times 0.95 = 68.4m^3$ NOTE: Where Micro Drainage Reports "FLOOD"
Check upgraded tank and network to
improve storage.

30 Year Return Period (+40%)

Max Storage Volume = 52.4m³

100 Year Return Period (+40%)

Max Storage Volume = 92.7m³

Check assumed storage:-

TANK. $14 \times 5 \times 1.2 \times 0.95 = 79.8m^3$ MH. $4 \times 1.20 \times 1.6 = 7.2m^3$ Catch pits $4 \times 1.20 \times 1.9 = 9.6m^3$ IC. $9 \times 0.450 \times 1.0 = 4.5m^3$ 2250 $30m \times 0.04m^3/m = 1.2m^3$ 1500 $100m \times 0.08m^3/m = 1.8m^3$ $\Sigma = 100.1m^3 > 92.7m^3 \therefore OK.$

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AEA - Ambiental					Page 1
Science Park Square		Talbot Mill			
Brighton		FEH existing runoff			
East Sussex		Designed by Mark.Naumann			
Date 06/11/2018 15:48		Checked by			
File existing lin100.SRCX		Innovyze			Source Control 2018.1
Summary of Results for 2 year Return Period					
Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	1.318	0.318	43.4	0.5	O K
30 min Summer	1.313	0.313	42.6	0.5	O K
60 min Summer	1.272	0.272	34.6	0.5	O K
120 min Summer	1.237	0.237	26.0	0.4	O K
180 min Summer	1.192	0.192	21.0	0.4	O K
240 min Summer	1.165	0.165	17.4	0.3	O K
360 min Summer	1.138	0.138	13.5	0.2	O K
480 min Summer	1.124	0.124	11.1	0.2	O K
600 min Summer	1.116	0.116	9.6	0.2	O K
720 min Summer	1.111	0.111	8.5	0.2	O K
960 min Summer	1.101	0.101	6.9	0.2	O K
1440 min Summer	1.086	0.086	5.2	0.1	O K
2160 min Summer	1.075	0.075	4.0	0.1	O K
2880 min Summer	1.068	0.068	3.3	0.1	O K
4320 min Summer	1.059	0.059	2.5	0.1	O K
5760 min Summer	1.054	0.054	2.1	0.1	O K
7200 min Summer	1.051	0.051	1.9	0.1	O K
8640 min Summer	1.048	0.048	1.7	0.1	O K
10080 min Summer	1.046	0.046	1.5	0.1	O K
15 min Winter	1.347	0.347	48.2	0.5	O K
30 min Winter	1.317	0.317	43.2	0.5	O K
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)	
15 min Summer	34.407	0.0	25.3	11	
30 min Summer	22.306	0.0	32.8	19	
60 min Summer	13.935	0.0	41.0	32	
120 min Summer	8.966	0.0	52.7	64	
180 min Summer	6.838	0.0	60.3	92	
240 min Summer	5.620	0.0	66.1	124	
360 min Summer	4.248	0.0	74.9	186	
480 min Summer	3.478	0.0	81.8	246	
600 min Summer	2.978	0.0	87.6	306	
720 min Summer	2.623	0.0	92.5	366	
960 min Summer	2.146	0.0	101.0	484	
1440 min Summer	1.622	0.0	114.5	734	
2160 min Summer	1.229	0.0	130.1	1068	
2880 min Summer	1.012	0.0	142.7	1464	
4320 min Summer	0.773	0.0	163.7	2176	
5760 min Summer	0.644	0.0	181.7	2936	
7200 min Summer	0.562	0.0	198.2	3640	
8640 min Summer	0.505	0.0	213.8	4408	
10080 min Summer	0.463	0.0	228.7	5072	
15 min Winter	34.407	0.0	28.3	12	
30 min Winter	22.306	0.0	36.7	19	
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AEA - Ambiental					Page 2
Science Park Square Brighton East Sussex			Talbot Mill FEH existing runoff		
Date 06/11/2018 15:48 File existing lin100.SRCX			Designed by Mark.Naumann Checked by		
Innovyze			Source Control 2018.1		
<u>Summary of Results for 2 year Return Period</u>					
Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
60 min Winter	1.254	0.254	30.5	0.5	O K
120 min Winter	1.189	0.189	20.8	0.4	O K
180 min Winter	1.153	0.153	15.6	0.3	O K
240 min Winter	1.135	0.135	13.0	0.2	O K
360 min Winter	1.118	0.118	9.8	0.2	O K
480 min Winter	1.108	0.108	8.0	0.2	O K
600 min Winter	1.101	0.101	6.9	0.2	O K
720 min Winter	1.094	0.094	6.1	0.2	O K
960 min Winter	1.084	0.084	5.0	0.1	O K
1440 min Winter	1.073	0.073	3.8	0.1	O K
2160 min Winter	1.064	0.064	2.9	0.1	O K
2880 min Winter	1.057	0.057	2.4	0.1	O K
4320 min Winter	1.050	0.050	1.8	0.1	O K
5760 min Winter	1.046	0.046	1.5	0.1	O K
7200 min Winter	1.043	0.043	1.3	0.1	O K
8640 min Winter	1.040	0.040	1.2	0.1	O K
10080 min Winter	1.039	0.039	1.1	0.1	O K
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)	
60 min Winter	13.935	0.0	45.9	34	
120 min Winter	8.966	0.0	59.0	62	
180 min Winter	6.838	0.0	67.5	94	
240 min Winter	5.620	0.0	74.0	124	
360 min Winter	4.248	0.0	83.9	188	
480 min Winter	3.478	0.0	91.6	248	
600 min Winter	2.978	0.0	98.1	306	
720 min Winter	2.623	0.0	103.6	364	
960 min Winter	2.146	0.0	113.1	478	
1440 min Winter	1.622	0.0	128.2	728	
2160 min Winter	1.229	0.0	145.7	1060	
2880 min Winter	1.012	0.0	159.9	1472	
4320 min Winter	0.773	0.0	183.4	2196	
5760 min Winter	0.644	0.0	203.5	2992	
7200 min Winter	0.562	0.0	222.0	3624	
8640 min Winter	0.505	0.0	239.4	4280	
10080 min Winter	0.463	0.0	256.2	4888	
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Science Park Square Brighton East Sussex	Talbot Mill FEH existing runoff	
Date 06/11/2018 15:48 File existing lin100.SRCX	Designed by Mark.Naumann Checked by	
Innovyze	Source Control 2018.1	

Rainfall Details

Rainfall Model	FEH	Winter Storms	Yes
Return Period (years)	2	Cv (Summer)	0.750
FEH Rainfall Version	2013	Cv (Winter)	0.840
Site Location	GB 382720 397311	Shortest Storm (mins)	15
Data Type	Point	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+0

Time Area Diagram

Total Area (ha) 0.392

Time (mins)	Area (ha)	Time (mins)	Area (ha)
From: 0	To: 4 0.196	From: 4	To: 8 0.196

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Science Park Square	Talbot Mill	
Brighton	FEH existing runoff	
East Sussex		
Date 06/11/2018 15:48	Designed by Mark.Naumann	
File existing lin100.SRCX	Checked by	
Innovyze	Source Control 2018.1	
<u>Model Details</u> Storage is Online Cover Level (m) 3.000 <u>Pipe Structure</u> Diameter (m) 0.225 Length (m) 5.000 Slope (1:X) 150.000 Invert Level (m) 1.000 <u>Pipe Outflow Control</u> Diameter (m) 0.225 Entry Loss Coefficient 0.500 Slope (1:X) 150.0 Coefficient of Contraction 0.600 Length (m) 5.000 Upstream Invert Level (m) 1.000 Roughness k (mm) 0.600		
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Science Park Square Brighton East Sussex		Talbot Mill FEH existing runoff			
Date 06/11/2018 15:48 File existing lin100.SRCX		Designed by Mark.Naumann Checked by			
Innovyze		Source Control 2018.1			
Summary of Results for 20 year Return Period					
Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	1.792	0.792	87.1	1.0	O K
30 min Summer	1.798	0.798	87.5	1.0	O K
60 min Summer	1.574	0.574	71.8	0.8	O K
120 min Summer	1.358	0.358	49.8	0.6	O K
180 min Summer	1.290	0.290	38.4	0.5	O K
240 min Summer	1.261	0.261	32.1	0.5	O K
360 min Summer	1.230	0.230	24.0	0.4	O K
480 min Summer	1.180	0.180	19.5	0.3	O K
600 min Summer	1.159	0.159	16.5	0.3	O K
720 min Summer	1.144	0.144	14.3	0.3	O K
960 min Summer	1.127	0.127	11.6	0.2	O K
1440 min Summer	1.111	0.111	8.5	0.2	O K
2160 min Summer	1.096	0.096	6.3	0.2	O K
2880 min Summer	1.085	0.085	5.1	0.1	O K
4320 min Summer	1.074	0.074	3.9	0.1	O K
5760 min Summer	1.066	0.066	3.1	0.1	O K
7200 min Summer	1.062	0.062	2.8	0.1	O K
8640 min Summer	1.058	0.058	2.4	0.1	O K
10080 min Summer	1.055	0.055	2.2	0.1	O K
15 min Winter	1.958	0.958	97.2	1.2	O K
30 min Winter	1.796	0.796	87.4	1.0	O K
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)	
15 min Summer	69.639	0.0	51.2	12	
30 min Summer	45.553	0.0	67.0	19	
60 min Summer	28.656	0.0	84.3	34	
120 min Summer	17.276	0.0	101.6	64	
180 min Summer	12.776	0.0	112.7	92	
240 min Summer	10.294	0.0	121.1	124	
360 min Summer	7.575	0.0	133.6	188	
480 min Summer	6.084	0.0	143.1	244	
600 min Summer	5.132	0.0	150.9	302	
720 min Summer	4.466	0.0	157.6	366	
960 min Summer	3.591	0.0	168.9	488	
1440 min Summer	2.643	0.0	186.5	730	
2160 min Summer	1.949	0.0	206.3	1080	
2880 min Summer	1.576	0.0	222.3	1436	
4320 min Summer	1.175	0.0	248.8	2188	
5760 min Summer	0.961	0.0	271.3	2928	
7200 min Summer	0.827	0.0	291.8	3536	
8640 min Summer	0.735	0.0	311.0	4384	
10080 min Summer	0.666	0.0	329.2	5120	
15 min Winter	69.639	0.0	57.3	12	
30 min Winter	45.553	0.0	75.0	19	
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Science Park Square Brighton East Sussex			Talbot Mill FEH existing runoff		
Date 06/11/2018 15:48 File existing lin100.SRCX			Designed by Mark.Naumann Checked by		
Innovyze			Source Control 2018.1		
<u>Summary of Results for 20 year Return Period</u>					
Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
60 min Winter	1.458	0.458	62.1	0.7	O K
120 min Winter	1.294	0.294	39.0	0.5	O K
180 min Winter	1.249	0.249	29.3	0.4	O K
240 min Winter	1.230	0.230	23.8	0.4	O K
360 min Winter	1.166	0.166	17.5	0.3	O K
480 min Winter	1.143	0.143	14.1	0.3	O K
600 min Winter	1.129	0.129	11.9	0.2	O K
720 min Winter	1.120	0.120	10.3	0.2	O K
960 min Winter	1.110	0.110	8.4	0.2	O K
1440 min Winter	1.094	0.094	6.1	0.2	O K
2160 min Winter	1.080	0.080	4.6	0.1	O K
2880 min Winter	1.073	0.073	3.7	0.1	O K
4320 min Winter	1.062	0.062	2.7	0.1	O K
5760 min Winter	1.056	0.056	2.3	0.1	O K
7200 min Winter	1.053	0.053	2.0	0.1	O K
8640 min Winter	1.049	0.049	1.7	0.1	O K
10080 min Winter	1.047	0.047	1.6	0.1	O K
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)	
60 min Winter	28.656	0.0	94.4	34	
120 min Winter	17.276	0.0	113.8	66	
180 min Winter	12.776	0.0	126.2	98	
240 min Winter	10.294	0.0	135.6	130	
360 min Winter	7.575	0.0	149.7	186	
480 min Winter	6.084	0.0	160.3	244	
600 min Winter	5.132	0.0	169.0	298	
720 min Winter	4.466	0.0	176.5	358	
960 min Winter	3.591	0.0	189.2	480	
1440 min Winter	2.643	0.0	208.8	720	
2160 min Winter	1.949	0.0	231.0	1096	
2880 min Winter	1.576	0.0	249.0	1464	
4320 min Winter	1.175	0.0	278.6	2124	
5760 min Winter	0.961	0.0	303.8	2912	
7200 min Winter	0.827	0.0	326.9	3544	
8640 min Winter	0.735	0.0	348.3	4304	
10080 min Winter	0.666	0.0	368.7	5056	
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Science Park Square Brighton East Sussex	Talbot Mill FEH existing runoff	
Date 06/11/2018 15:48 File existing lin100.SRCX	Designed by Mark.Naumann Checked by	
Innovyze	Source Control 2018.1	

Model Details

Storage is Online Cover Level (m) 3.000

Pipe Structure

Diameter (m) 0.225 Length (m) 5.000
Slope (1:X) 150.000 Invert Level (m) 1.000

Pipe Outflow Control

Diameter (m) 0.225 Entry Loss Coefficient 0.500
Slope (1:X) 150.0 Coefficient of Contraction 0.600
Length (m) 5.000 Upstream Invert Level (m) 1.000
Roughness k (mm) 0.600

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Science Park Square Brighton East Sussex			Talbot Mill FEH existing runoff		
Date 06/11/2018 15:47 File existing 1in100.SRCX			Designed by Mark.Naumann Checked by		
Innovyze			Source Control 2018.1		
<u>Summary of Results for 100 year Return Period</u>					
Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	2.726	1.726	134.2	1.9	Flood Risk
30 min Summer	2.772	1.772	136.1	2.0	Flood Risk
60 min Summer	2.263	1.263	113.3	1.5	O K
120 min Summer	1.653	0.653	77.7	0.9	O K
180 min Summer	1.432	0.432	59.7	0.6	O K
240 min Summer	1.351	0.351	48.8	0.5	O K
360 min Summer	1.279	0.279	36.2	0.5	O K
480 min Summer	1.250	0.250	29.4	0.4	O K
600 min Summer	1.233	0.233	24.7	0.4	O K
720 min Summer	1.197	0.197	21.2	0.4	O K
960 min Summer	1.162	0.162	16.9	0.3	O K
1440 min Summer	1.130	0.130	12.2	0.2	O K
2160 min Summer	1.113	0.113	8.9	0.2	O K
2880 min Summer	1.102	0.102	7.0	0.2	O K
4320 min Summer	1.086	0.086	5.2	0.1	O K
5760 min Summer	1.076	0.076	4.1	0.1	O K
7200 min Summer	1.071	0.071	3.6	0.1	O K
8640 min Summer	1.067	0.067	3.2	0.1	O K
10080 min Summer	1.063	0.063	2.8	0.1	O K
15 min Winter	3.000	2.000	145.2	2.7	FLOOD
30 min Winter	2.769	1.769	136.0	2.0	Flood Risk
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)	
15 min Summer	107.380	0.0	78.9	12	
30 min Summer	71.168	0.0	104.6	19	
60 min Summer	45.184	0.0	132.8	34	
120 min Summer	26.943	0.0	158.4	64	
180 min Summer	19.755	0.0	174.2	94	
240 min Summer	15.796	0.0	185.8	124	
360 min Summer	11.467	0.0	202.3	186	
480 min Summer	9.126	0.0	214.6	244	
600 min Summer	7.638	0.0	224.6	304	
720 min Summer	6.601	0.0	232.9	366	
960 min Summer	5.235	0.0	246.2	482	
1440 min Summer	3.777	0.0	266.5	722	
2160 min Summer	2.731	0.0	289.0	1084	
2880 min Summer	2.176	0.0	307.0	1440	
4320 min Summer	1.590	0.0	336.6	2180	
5760 min Summer	1.281	0.0	361.5	2936	
7200 min Summer	1.089	0.0	384.2	3600	
8640 min Summer	0.957	0.0	405.3	4400	
10080 min Summer	0.861	0.0	425.2	5024	
15 min Winter	107.380	0.5	88.4	13	
30 min Winter	71.168	0.0	117.2	19	
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Science Park Square Brighton East Sussex			Talbot Mill FEH existing runoff		
Date 06/11/2018 15:47			Designed by Mark.Naumann		
File existing lin100.SRCX			Checked by		
Innovyze			Source Control 2018.1		
<u>Summary of Results for 100 year Return Period</u>					
Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
60 min Winter	1.975	0.975	98.1	1.2	O K
120 min Winter	1.448	0.448	61.2	0.6	O K
180 min Winter	1.329	0.329	45.3	0.5	O K
240 min Winter	1.280	0.280	36.3	0.5	O K
360 min Winter	1.240	0.240	26.8	0.4	O K
480 min Winter	1.197	0.197	21.2	0.4	O K
600 min Winter	1.168	0.168	17.7	0.3	O K
720 min Winter	1.151	0.151	15.3	0.3	O K
960 min Winter	1.130	0.130	12.2	0.2	O K
1440 min Winter	1.112	0.112	8.8	0.2	O K
2160 min Winter	1.096	0.096	6.4	0.2	O K
2880 min Winter	1.085	0.085	5.1	0.1	O K
4320 min Winter	1.073	0.073	3.7	0.1	O K
5760 min Winter	1.065	0.065	3.0	0.1	O K
7200 min Winter	1.059	0.059	2.5	0.1	O K
8640 min Winter	1.056	0.056	2.3	0.1	O K
10080 min Winter	1.054	0.054	2.1	0.1	O K
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)	
60 min Winter	45.184	0.0	148.8	34	
120 min Winter	26.943	0.0	177.4	64	
180 min Winter	19.755	0.0	195.1	96	
240 min Winter	15.796	0.0	208.1	126	
360 min Winter	11.467	0.0	226.6	178	
480 min Winter	9.126	0.0	240.4	248	
600 min Winter	7.638	0.0	251.5	302	
720 min Winter	6.601	0.0	260.8	370	
960 min Winter	5.235	0.0	275.8	484	
1440 min Winter	3.777	0.0	298.5	730	
2160 min Winter	2.731	0.0	323.7	1076	
2880 min Winter	2.176	0.0	343.9	1456	
4320 min Winter	1.590	0.0	376.9	2156	
5760 min Winter	1.281	0.0	404.8	2848	
7200 min Winter	1.089	0.0	430.4	3560	
8640 min Winter	0.957	0.0	454.0	4424	
10080 min Winter	0.861	0.0	476.2	5040	
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Science Park Square	Talbot Mill																																	
Brighton	FEH existing runoff																																	
East Sussex																																		
Date 06/11/2018 15:47	Designed by Mark.Naumann																																	
File existing lin100.SRCX	Checked by																																	
Innovyze	Source Control 2018.1																																	
<u>Rainfall Details</u> <table><tr><td>Rainfall Model</td><td>FEH</td><td>Winter Storms</td><td>Yes</td></tr><tr><td>Return Period (years)</td><td>100</td><td>Cv (Summer)</td><td>0.750</td></tr><tr><td>FEH Rainfall Version</td><td>2013</td><td>Cv (Winter)</td><td>0.840</td></tr><tr><td>Site Location</td><td>GB 382720 397311</td><td>Shortest Storm (mins)</td><td>15</td></tr><tr><td>Data Type</td><td>Point</td><td>Longest Storm (mins)</td><td>10080</td></tr><tr><td>Summer Storms</td><td>Yes</td><td>Climate Change %</td><td>+0</td></tr></table> <u>Time Area Diagram</u> Total Area (ha) 0.392 <table><thead><tr><th>Time (mins)</th><th>Area (ha)</th><th>Time (mins)</th><th>Area (ha)</th></tr></thead><tbody><tr><td>From: 0</td><td>To: 4 0.196</td><td>From: 4</td><td>To: 8 0.196</td></tr></tbody></table>			Rainfall Model	FEH	Winter Storms	Yes	Return Period (years)	100	Cv (Summer)	0.750	FEH Rainfall Version	2013	Cv (Winter)	0.840	Site Location	GB 382720 397311	Shortest Storm (mins)	15	Data Type	Point	Longest Storm (mins)	10080	Summer Storms	Yes	Climate Change %	+0	Time (mins)	Area (ha)	Time (mins)	Area (ha)	From: 0	To: 4 0.196	From: 4	To: 8 0.196
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AEA - Ambiental		Page 4
Science Park Square	Talbot Mill	
Brighton	FEH existing runoff	
East Sussex		
Date 06/11/2018 15:47	Designed by Mark.Naumann	
File existing lin100.SRCX	Checked by	
Innovyze	Source Control 2018.1	

Model Details

Storage is Online Cover Level (m) 3.000

Pipe Structure

Diameter (m) 0.225 Length (m) 5.000
Slope (1:X) 150.000 Invert Level (m) 1.000

Pipe Outflow Control

Diameter (m) 0.225 Entry Loss Coefficient 0.500
Slope (1:X) 150.0 Coefficient of Contraction 0.600
Length (m) 5.000 Upstream Invert Level (m) 1.000
Roughness k (mm) 0.600

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AEA - Ambiental		Page 2
Science Park Square	Talbot Mill	
Brighton	FEH proposed runoff	
East Sussex	perm courtyard	
Date 09/11/2018 11:52	Designed by Mark.Naumann	
File proposed initial assess...	Checked by	
XP Solutions	Source Control 2018.1	

Summary of Results for 30 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max E Outflow (l/s)	Max Volume (m³)	Status
30 min Winter	2.150	1.150	0.0	24.0	24.0	61.4	O K
60 min Winter	2.135	1.135	0.0	24.0	24.0	60.7	O K
120 min Winter	1.878	0.878	0.0	24.0	24.0	46.9	O K
180 min Winter	1.566	0.566	0.0	24.0	24.0	30.3	O K
240 min Winter	1.356	0.356	0.0	24.0	24.0	19.0	O K
360 min Winter	1.204	0.204	0.0	21.1	21.1	10.9	O K
480 min Winter	1.171	0.171	0.0	17.1	17.1	9.1	O K
600 min Winter	1.152	0.152	0.0	14.5	14.5	8.1	O K
720 min Winter	1.139	0.139	0.0	12.6	12.6	7.4	O K
960 min Winter	1.122	0.122	0.0	10.1	10.1	6.5	O K
1440 min Winter	1.102	0.102	0.0	7.4	7.4	5.4	O K
2160 min Winter	1.086	0.086	0.0	5.5	5.5	4.6	O K
2880 min Winter	1.076	0.076	0.0	4.4	4.4	4.1	O K
4320 min Winter	1.065	0.065	0.0	3.3	3.3	3.5	O K
5760 min Winter	1.058	0.058	0.0	2.7	2.7	3.1	O K
7200 min Winter	1.054	0.054	0.0	2.3	2.3	2.9	O K
8640 min Winter	1.050	0.050	0.0	2.0	2.0	2.7	O K
10080 min Winter	1.048	0.048	0.0	1.8	1.8	2.5	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
30 min Winter	71.532	0.0	93.1	30
60 min Winter	45.026	0.0	117.2	48
120 min Winter	27.030	0.0	140.7	86
180 min Winter	19.951	0.0	155.9	116
240 min Winter	16.051	0.0	167.2	142
360 min Winter	11.781	0.0	184.0	190
480 min Winter	9.451	0.0	196.8	250
600 min Winter	7.962	0.0	207.3	310
720 min Winter	6.920	0.0	216.2	368
960 min Winter	5.546	0.0	231.0	490
1440 min Winter	4.059	0.0	253.7	724
2160 min Winter	2.980	0.0	279.3	1104
2880 min Winter	2.401	0.0	300.0	1460
4320 min Winter	1.782	0.0	334.1	2140
5760 min Winter	1.452	0.0	362.9	2904
7200 min Winter	1.246	0.0	389.2	3632
8640 min Winter	1.103	0.0	413.6	4240
10080 min Winter	0.998	0.0	436.7	5120

AEA - Ambiental		Page 3																																				
Science Park Square	Talbot Mill																																					
Brighton	FEH proposed runoff																																					
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Date 09/11/2018 11:52	Designed by Mark.Naumann																																					
File proposed initial assess...	Checked by																																					
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Brighton	FEH proposed runoff	
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XP Solutions	Source Control 2018.1	

Model Details

Storage is Online Cover Level (m) 3.000

Cellular Storage Structure

Invert Level (m) 1.000 Safety Factor 2.0
 Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
 Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	56.3	56.3	1.201	0.0	92.3
1.200	56.3	92.3			

Hydro-Brake® Optimum Outflow Control

Unit Reference MD-SHE-0212-2400-1200-2400
 Design Head (m) 1.200
 Design Flow (l/s) 24.0
 Flush-Flo™ Calculated
 Objective Minimise upstream storage
 Application Surface
 Sump Available Yes
 Diameter (mm) 212
 Invert Level (m) 1.000
 Minimum Outlet Pipe Diameter (mm) 225
 Suggested Manhole Diameter (mm) 1500

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.200	24.0
Flush-Flo™	0.387	24.0
Kick-Flo®	0.841	20.3
Mean Flow over Head Range	-	20.4

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	7.2	1.200	24.0	3.000	37.2	7.000	56.1
0.200	20.6	1.400	25.8	3.500	40.1	7.500	58.0
0.300	23.7	1.600	27.5	4.000	42.8	8.000	59.9
0.400	24.0	1.800	29.1	4.500	45.3	8.500	61.6
0.500	23.7	2.000	30.6	5.000	47.7	9.000	63.4
0.600	23.3	2.200	32.1	5.500	49.9	9.500	65.1
0.800	21.2	2.400	33.4	6.000	52.1		
1.000	22.0	2.600	34.8	6.500	54.1		

AEA - Ambiental		Page 1
Science Park Square	Talbot Mill	
Brighton	FEH proposed runoff	
East Sussex	perm courtyard	
Date 16/11/2018 11:47	Designed by Mark.Naumann	
File PROPOSED INITIAL ASSESS...	Checked by	
XP Solutions	Source Control 2018.1	

Summary of Results for 100 year Return Period (+40%)

Half Drain Time : 31 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max E (l/s)	Max Outflow Volume (m³)	Status
15 min Summer	3.002	2.002	0.0	30.6	30.6	66.7	FLOOD
30 min Summer	3.013	2.013	0.0	30.7	30.7	78.0	FLOOD
60 min Summer	3.016	2.016	0.0	30.8	30.8	81.1	FLOOD
120 min Summer	3.007	2.007	0.0	30.7	30.7	71.6	FLOOD
180 min Summer	2.532	1.532	0.0	27.0	27.0	64.5	O K
240 min Summer	2.042	1.042	0.0	24.0	24.0	55.7	O K
360 min Summer	1.662	0.662	0.0	24.0	24.0	35.4	O K
480 min Summer	1.412	0.412	0.0	24.0	24.0	22.0	O K
600 min Summer	1.279	0.279	0.0	23.6	23.6	14.9	O K
720 min Summer	1.218	0.218	0.0	22.6	22.6	11.7	O K
960 min Summer	1.180	0.180	0.0	18.3	18.3	9.6	O K
1440 min Summer	1.144	0.144	0.0	13.3	13.3	7.7	O K
2160 min Summer	1.119	0.119	0.0	9.7	9.7	6.3	O K
2880 min Summer	1.104	0.104	0.0	7.7	7.7	5.6	O K
4320 min Summer	1.087	0.087	0.0	5.7	5.7	4.7	O K
5760 min Summer	1.078	0.078	0.0	4.6	4.6	4.1	O K
7200 min Summer	1.071	0.071	0.0	3.9	3.9	3.8	O K
8640 min Summer	1.066	0.066	0.0	3.4	3.4	3.5	O K
10080 min Summer	1.063	0.063	0.0	3.1	3.1	3.3	O K
15 min Winter	3.011	2.011	0.0	30.7	30.7	75.7	FLOOD

* }

* }

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	150.332	2.5	87.4	18
30 min Summer	99.635	13.9	115.8	28
60 min Summer	63.258	17.0	147.0	46
120 min Summer	37.720	7.4	175.4	80
180 min Summer	27.657	0.0	192.9	114
240 min Summer	22.115	0.0	205.7	148
360 min Summer	16.054	0.0	223.9	208
480 min Summer	12.776	0.0	237.6	262
600 min Summer	10.693	0.0	248.6	316
720 min Summer	9.241	0.0	257.8	370
960 min Summer	7.329	0.0	272.6	490
1440 min Summer	5.288	0.0	295.0	734
2160 min Summer	3.823	0.0	320.0	1092
2880 min Summer	3.046	0.0	339.9	1468
4320 min Summer	2.226	0.0	372.6	2148
5760 min Summer	1.793	0.0	400.2	2904
7200 min Summer	1.525	0.0	425.4	3608
8640 min Summer	1.340	0.0	448.7	4336
10080 min Summer	1.205	0.0	470.7	5088
15 min Winter	150.332	11.5	97.8	18

" FLOOD" BASED ON
168m³.
CHECK INCREASED
STORAGE VOLUME
WITH LARGEST DRAIN
AND NETWORK
100m³ FLOWING.

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Science Park Square	Talbot Mill	
Brighton	FEH proposed runoff	
East Sussex	perm courtyard	
Date 16/11/2018 11:47	Designed by Mark.Naumann	
File PROPOSED INITIAL ASSESS...	Checked by	
XP Solutions		Source Control 2018.1

Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max E Outflow (l/s)	Max Volume (m³)	Status
30 min Winter	3.025	2.025	0.0	30.8	30.8	89.9	FLOOD
60 min Winter	3.028	2.028	0.0	30.8	30.8	92.7	FLOOD
120 min Winter	3.013	2.013	0.0	30.7	30.7	77.5	FLOOD
180 min Winter	3.000	2.000	0.0	30.6	30.6	65.0	FLOOD
240 min Winter	1.992	0.992	0.0	24.0	24.0	53.0	O K
360 min Winter	1.431	0.431	0.0	24.0	24.0	23.0	O K
480 min Winter	1.224	0.224	0.0	22.8	22.8	12.0	O K
600 min Winter	1.189	0.189	0.0	19.4	19.4	10.1	O K
720 min Winter	1.169	0.169	0.0	16.8	16.8	9.0	O K
960 min Winter	1.145	0.145	0.0	13.4	13.4	7.7	O K
1440 min Winter	1.118	0.118	0.0	9.7	9.7	6.3	O K
2160 min Winter	1.098	0.098	0.0	7.0	7.0	5.2	O K
2880 min Winter	1.087	0.087	0.0	5.6	5.6	4.6	O K
4320 min Winter	1.073	0.073	0.0	4.1	4.1	3.9	O K
5760 min Winter	1.065	0.065	0.0	3.3	3.3	3.5	O K
7200 min Winter	1.060	0.060	0.0	2.8	2.8	3.2	O K
8640 min Winter	1.056	0.056	0.0	2.5	2.5	3.0	O K
10080 min Winter	1.053	0.053	0.0	2.2	2.2	2.8	O K

*
see previous!

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
30 min Winter	99.635	25.8	129.7	30
60 min Winter	63.258	28.6	164.7	50
120 min Winter	37.720	13.3	196.4	84
180 min Winter	27.657	0.8	216.1	118
240 min Winter	22.115	0.0	230.3	160
360 min Winter	16.054	0.0	250.8	212
480 min Winter	12.776	0.0	266.1	254
600 min Winter	10.693	0.0	278.4	310
720 min Winter	9.241	0.0	288.7	370
960 min Winter	7.329	0.0	305.3	488
1440 min Winter	5.288	0.0	330.4	736
2160 min Winter	3.823	0.0	358.3	1076
2880 min Winter	3.046	0.0	380.7	1456
4320 min Winter	2.226	0.0	417.3	2164
5760 min Winter	1.793	0.0	448.2	2888
7200 min Winter	1.525	0.0	476.4	3656
8640 min Winter	1.340	0.0	502.6	4376
10080 min Winter	1.205	0.0	527.2	5104

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Science Park Square	Talbot Mill	
Brighton	FEH proposed runoff	
East Sussex	perm courtyard	
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XP Solutions	Source Control 2018.1	

Rainfall Details

Rainfall Model	FEH	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
FEH Rainfall Version	2013	Cv (Winter)	0.840
Site Location	GB 382720 397311	Shortest Storm (mins)	15
Data Type	Point	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.310

Time (mins)		Area	Time (mins)		Area
From:	To:	(ha)	From:	To:	(ha)
0	4	0.155	4	8	0.155

AEA - Ambient		Page 4
Science Park Square	Talbot Mill	Micro Drainage
Brighton	FEH proposed runoff	
East Sussex	perm courtyard	
Date 16/11/2018 11:47	Designed by Mark.Naumann	
File PROPOSED INITIAL ASSESS...	Checked by	
XP Solutions	Source Control 2018.1	

Model Details

Storage is Online Cover Level (m) 3.000

Cellular Storage Structure

Invert Level (m) 1.000 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m ²)	Inf. Area (m ²)	Depth (m)	Area (m ²)	Inf. Area (m ²)
0.000	56.3	56.3	1.201	0.0	92.3
1.200	56.3	92.3			

Hydro-Brake® Optimum Outflow Control

Unit Reference MD-SHE-0212-2400-1200-2400
Design Head (m) 1.200
Design Flow (l/s) 24.0
Flush-Flow™ Calculated
Objective Minimise upstream storage
Application Surface
Sump Available Yes
Diameter (mm) 212
Invert Level (m) 1.000
Minimum Outlet Pipe Diameter (mm) 225
Suggested Manhole Diameter (mm) 1500

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.200	24.0
Flush-Flow™	0.387	24.0
Kick-Flow®	0.841	20.3
Mean Flow over Head Range	-	20.4

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	7.2	1.200	24.0	3.000	37.2	7.000	56.1
0.200	20.6	1.400	25.8	3.500	40.1	7.500	58.0
0.300	23.7	1.600	27.5	4.000	42.8	8.000	59.9
0.400	24.0	1.800	29.1	4.500	45.3	8.500	61.6
0.500	23.7	2.000	30.6	5.000	47.7	9.000	63.4
0.600	23.3	2.200	32.1	5.500	49.9	9.500	65.1
0.800	21.2	2.400	33.4	6.000	52.1		
1.000	22.0	2.600	34.8	6.500	54.1		

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