



The Civil Engineering Practice
11 Tungsten Building
George Street
Fishergate
Sussex
BN41 1RA



Drainage Statement

Proposed Residential Development at

Old Blacksmiths Yard, Water Lane, Angmering

On behalf of

Dominic Espezel Esq

May 2019

Document History and Status

Project Number 23129

Date	Version	Prepared By	Reviewed By	Approved By
20 Dec 2018	1.0	Steve Doughty Director	Stuart Magowan IE ng MIC E	Stuart Magowan IE ng MIC E
1 May 2019	V1.1	Martin Kempshall C Eng MIC E	Steve Doughty Director	Stuart Magowan IE ng MIC E

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1 Non-Technical Summary

- 1.1 This Drainage Statement has been undertaken on behalf of Dominic Espezel Esq in support of a Planning Application for the construction of a pair of semi-detached dwellings on land at Old Blacksmiths Yard, Water Lane, Angmering, West Sussex.
- 1.2 This report is to be read in conjunction with all planning, architectural and other reports that accompany the Planning Application for the proposed development.
- 1.3 The proposed development will incorporate a sustainable drainage system which will discharge surface water at a suitably restricted rate to the watercourse at the southern site boundary and provide storage for all storm return periods up to and including the 1:100 year rainfall event with an additional 40% allowance to account for the predicted future effects of climate change.
- 1.4 Foul water will be discharged by gravity to the public foul sewer beneath Water Lane to the northwest of the site.

2 Planning Policy Context

2.1 National Planning Policy Framework

- 2.1.1 The proposed development is in Flood Zone 1 and as the main development site is less than 1ha in size a standalone Flood Risk Assessment is not required to support the Planning Application.
- 2.1.2 Following the updates to The National Planning Policy Framework (J uly 2018) in relation to planning and flood risk and in accordance with the Town and Country Planning Order 2015 a SuDS system will be incorporated into the design. This will be designed in accordance with the Non-Statutory Technical Standards for SuDS, CIRIA C753 SuDS Manual Guidance and Approved Document H of the Building Regulations.

2.2 Local Planning Policy

- 2.2.1 The Arun Local Plan 2011-2031 was adopted on 18 J uly 2018
- 2.2.2 The following policies are of specific relevance to this Drainage Statement
- 2.2.3 Policy W DM3 Sustainable Urban Drainage Systems states that :to increase the levels of water capture and storage and improve water quality, all development must identify opportunities to incorporate a range of Sustainable Urban Drainage Systems (SUDS), appropriate to the size of development, at an early stage of the design process.

Proposals for both major and minor development proposals must incorporate SUDS within the private areas of the development in order to provide source control features to the overall SUDS design.

These features include:

- ¿ Green roofs
- ¿ Permeable driveways and parking
- ¿ Soakaways
- ¿ Water harvesting and storage features including water butts

Proposals for major development must also integrate SUDS within public open spaces and roads, reflecting discussion with the appropriate bodies. SUDS must therefore be integrated into the overall design of a development and must:

- a. Contribute positively to the appearance of the area, integrating access to allow maintenance of existing watercourses and the system.
- b. Effectively manage water (including its quality)

- c. Accommodate and enhance biodiversity by making connections to existing Green Infrastructure assets
- d. Provide amenity for local residents (ensuring a safe environment)
- e. Retain the existing drainage network of the site and the wider area,
- f. Be maintained in perpetuity, supported through a Maintenance and Management Plan/Regime, including its financing, agreed with the Local Planning Authority.

In order to ensure that SUDS discharge water from the development at the same or lesser rate, as prior to construction, developers must:

- f. (sic) Follow the hierarchy of preference for different types of surface water drainage disposal systems as set out in Approved Document H of the Building Regulations and the SUDS manual produced by CIRIA.
- g. Undertake up to six months groundwater monitoring within the winter period.
- h. Undertake winter percolation testing in accordance with BRE365.
- i. The proposed drainage system must be designed to ensure that there is no flooding on a 1 in 30 year storm event.
- j. The design must also take account of the 1 in 100 year storm event plus 30% allowance for climate change, on stored volumes, to ensure that there is no flooding of properties or the public highway or inundation of the foul sewerage system.

Any excess flows must be contained within the site boundary, and within designated storage areas.~

3 Existing Site

3.1 Site Location

- 3.1.1 The development site is located adjacent to the Arun Angling building on Water Lane, Angmering, Littlehampton, West Sussex at postcode BN16 4EP, Ordnance Survey reference TQ 072 046.



Image 1: Site Location

- 3.1.2 The site is at the eastern edge of Angmering on the southern side of Water Lane.
- 3.1.3 There is a tributary of Black Ditch adjacent to the southern site boundary which is classified by the Environment Agency as main river.
- 3.1.4 A copy of the site location plan is located in Appendix 1 at the rear of this report.

3.2 Site Description

- 3.2.1 The site is approximately 725m² in area and currently functions as an overflow car park for the Angling Club comprising a tarmac access and unpaved stone parking area.
- 3.2.2 A copy of the existing site layout plan is located in Appendix 2 at the rear of this report.

3.3 Topography

- 3.3.1 The site is generally level with a slight fall from northeast to southwest with existing ground levels ranging between approximately 10.2m AOD to 8.6m

AOD. Ground levels beyond the southern boundary fall to approximately 6.7mAOD at the base of the adjacent stream.

3.4 Existing Drainage

- 3.4.1 There is no positive surface water drainage system on the site and surface water currently discharges by overland flow to the watercourse at the southern site boundary.
- 3.4.2 There is currently no foul discharge from the site but there is a public foul sewer located beneath Water Lane to the northwest of the site.
- 3.4.3 A copy of the sewer records is located in Appendix 3 at the rear of this report.

3.5 Geology and Groundwater

- 3.5.1 British Geological Survey maps and borehole information confirm that the site is within an area underlain by gravels and flints over various clay soils and chalk.
- 3.5.2 Groundwater was not encountered in the local boreholes which extended to a depth of 64m.
- 3.5.3 The presence of the watercourse adjacent to the southern site boundary indicates that the geology in the immediate vicinity of the site is non permeable.
- 3.5.4 The online 'Magic Map' available from Defra confirms that the site is located above a minor aquifer classified as having an intermediate vulnerability.
- 3.5.5 A copy of the geological borehole data is located in Appendix 4 at the rear of this report.

4 Development Proposals

4.1 Description

- 4.1.1 The development proposals are for the construction of a pair of semi-detached dwellings together with onsite parking and gardens.
- 4.1.2 A copy of the proposed site layout plan is located in Appendix 5 at the rear of this report.

4.2 Drainage Strategy

- 4.2.1 A preliminary surface water drainage system has been designed in accordance with the National Planning Policy Framework (NPPF) and the accompanying Guidance and Technical Standards for SuDS. The design also complies with the requirements under Building Regulations Part H.
- 4.2.2 CIRIA report C753 The SuDS Manual-v6 provides guidance on the redevelopment of brownfield sites and the aim is to meet greenfield runoff rates and volumes where reasonably achievable.
- 4.2.3 The preferred surface water drainage strategy should where possible be based on infiltration to ground with storage provided on site to accommodate surface water for a 1:100 year storm including an additional 40% to account for the future effects of climate change.
- 4.2.4 Site investigation will be required to confirm but the presence of a watercourse at the southern site boundary indicates that infiltration is unlikely to be a viable method of discharging surface water.
- 4.2.5 For the purposes of this Drainage Statement the proposed surface water drainage strategy has been based on site storage with a restricted discharge to the watercourse at the southern site boundary thereby mimicking the pre-developed greenfield equivalent runoff.
- 4.2.6 Pre-developed greenfield runoff rates have been established using XP Solutions Microdrainage.
- 4.2.7 Qbar has been established at 0.3l/s and the 1:100 year peak runoff 0.8l/s.

ICP GUIDS

ICP GUIDS Input (FSR Method)

Return Period (Years): 100

Area (ha): 5.573

SAAR (mm): 722

Soil: 0.400

Growth Curve: (None)

Partly Urbanised Catchment (QBAR)

Urban: 0.050

Region: Region 7

Calculate

Results

QBAR rural (l/s): 0.3

QBAR urban (l/s): 0.3

Return Period Fixed

	Region	QBAR (l/s)	Q (100 yrs) (l/s)	Q (1 yr) (l/s)	Q (30 yrs) (l/s)	Q (100 yrs) (l/s)
ICP GUIDS	Region 1	0.3	0.6	0.2	0.5	0.6
ADAS 345	Region 2	0.3	0.7	0.2	0.5	0.7
FEH	Region 3	0.3	0.5	0.2	0.5	0.5
FEH	Region 4	0.3	0.7	0.2	0.5	0.7
FEH	Region 5	0.3	0.8	0.2	0.6	0.8
FEH	Region 6/Region 7	0.3	0.8	0.2	0.6	0.8
Greenfield Volume	Region 8	0.3	0.6	0.2	0.5	0.6
Greenfield Volume (Ref H2)	Region 9	0.3	0.6	0.2	0.5	0.6
	Region 10	0.3	0.5	0.2	0.4	0.5

OK Cancel Help

Enter Return Period between 1 and 1000

Image 2: Predeveloped Runoff Calculation

- 4.2.8 Such low levels of restriction are impractical and a maximum restriction of 2l/s is proposed for the peak 1:100 year +40% rainfall event.
- 4.2.9 Storage will be provided to accommodate a 1:100 year storm event with an additional 40% to account for the predicted effects of increased rainfall intensity due to future climate change.
- 4.2.10 The total impermeable area of the site is approximately 50% of the total area totalling approximately 360m².
- 4.2.11 Preliminary calculations have been prepared in order to demonstrate that surface water drainage can be adequately accommodated within the site without any increased flood risk elsewhere.
- 4.2.12 A total volume of storage of approximately 11m³ will be required and could be provided within a tanked voided subbase beneath the driveway, crate style storage or a combination of these.
- 4.2.13 A lined, permeable paved system with a voided subbase beneath the driveway has been presented within the drainage strategy demonstrating there is sufficient space to accommodate surface water on the site.

4.2.14 For a voided driveway a subbase of 290mm depth with 30% void ratio is required beneath the driveway providing approximately 11m³ storage.

4.2.15 The drainage proposals will be confirmed at detailed design stage subject to further site investigations and testing and if infiltration is found to be viable the storage requirement will be reduced.

4.3 Foul Water

4.3.1 Foul water will be discharged by gravity to the public foul sewer beneath Water Lane to the northwest of the site.

4.3.2 Copies of the preliminary drainage strategy plan and calculations are located in Appendix 6 at the rear of this report.

4.4 Water Quality

4.4.1 The proposed development is for residential use. In accordance with CIRIA SuDS Manual 2015 (Report C753), the pollution hazard level for this type of development is between very low and low.

4.4.2 The surface water scheme will include mitigation to ensure that surface water is suitably treated and any pollution risk mitigated prior to discharge.

4.4.3 Table 26.2 in Chapter 26 of CIRIA report C753 The SuDS Manual provides Pollution Hazard Indices for varying land types. Those of relevance to the development proposals are as follows:

Land Use	Pollution hazard level	Total suspended solids (TSS)	Metals	Hydro-carbons
Residential roofs	Very Low	0.20	0.20	0.05
Individual property driveways, residential car park, low-traffic roads	Low	0.50	0.40	0.40

Table 1: Pollution Hazard Indices

4.4.4 Where multiple drainage components are used in series the individual mitigation index of secondary and tertiary components is lowered by 50% due to reduced performance associated with primary treatment.

SuDS Type	Total suspended solids (TSS)	Metals	Hydro-carbons
Permeable paving	0.7	0.6	0.7

Table 2: Pollution Mitigation Indices

- 4.4.5 The detailed drainage design will be undertaken in such a way that its combined elements meet the target treatment level required for runoff with very low to low risk of pollution hazard thus demonstrating that the surface water drainage system for the site can be designed to adequately mitigate against the risk of pollution.
- 4.4.6 An outline drainage maintenance schedule is located in Appendix 7 at the rear of this report.

5 Conclusions

- 5.1 The geology of the local area is underlain by gravels and flints over various clay soils and chalk.
- 5.2 The presence of the watercourse adjacent to the southern site boundary indicates that the geology in the immediate vicinity of the site is non permeable.
- 5.3 Preliminary calculations indicate that surface water runoff generated by the proposed development can be attenuated on site for all rainfall events up to the 1:100 year event including an additional 40% allowance to account for the predicted future effects of climate change.
- 5.4 Water quality improvement will be provided to mitigate against any risk to any receiving waterbody.
- 5.5 Foul water will be discharged by gravity to the public foul sewer beneath Water Lane to the northwest of the site.

6 List of Appendices, Images and Tables

Appendix 1	Site Location Plan
Appendix 2	Existing Site Layout Plan
Appendix 3	Southern Water Sewer Records
Appendix 4	BGS Borehole Records
Appendix 5	Proposed Site Layout Plan
Appendix 6	Preliminary Drainage Strategy Plan and Calculations
Appendix 7	Drainage Maintenance Schedule

Image 1	Site Location
Image 2	Greenfield Runoff Calculation

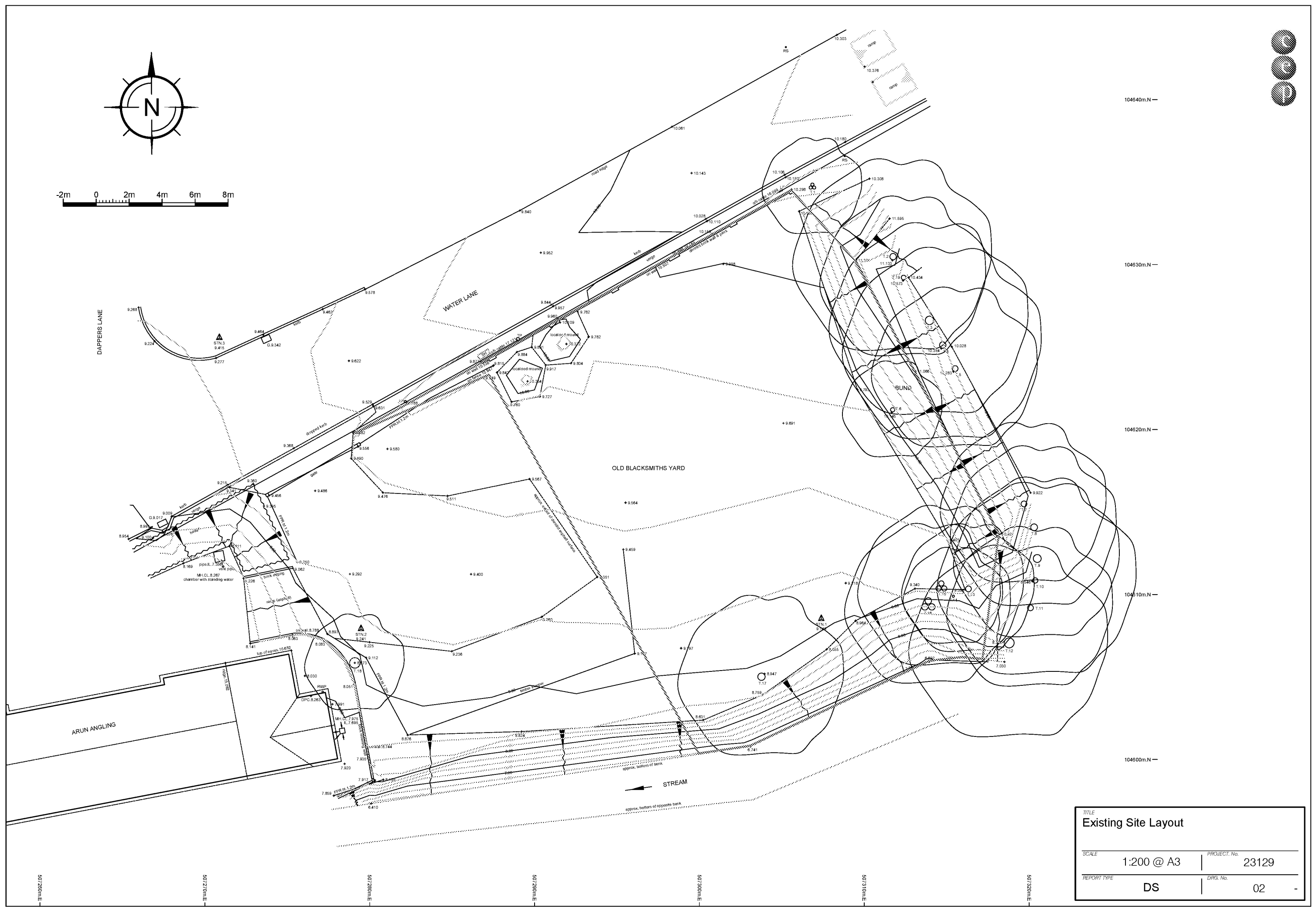
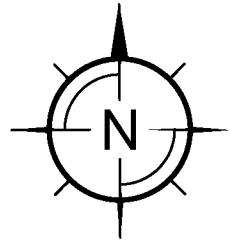
Table 1	Pollution Hazard Indices
Table 2	Pollution Mitigation Indices

Appendix 1

Site Location Plan

Appendix 2

Existing Site Layout Plan



ARUN DISTRICT COUNCIL A/77/20/DOC

Appendix 3

Southern Water Sewer Records

SEWER RECORDS PAGE 1 OF 2

104922



104345

506907

O.S. REF.

TQ0704NW

Title: 321822_Old Blacksmiths Yard, A

Drawn by: yadavsa

Scale: 1:2500

Date: 15/01/2019

The positions of pipes shown on this plan are believed to be correct, but Southern Water Services Ltd accept no responsibility in the event of inaccuracy.

The actual positions should be determined on site.

WARNING: BAC pipes are constructed of Bonded Asbestos Cement

WARNING: Unknown (UNK) materials may include Bonded Asbestos Cement

Based upon Ordnance Survey Digital Data with the permission of the controller of H.M.S.O. Crown Copyright Reserved
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507851

SEWER RECORDS PAGE 2 OF 2

Node	Cover	Invert	Size	Material	Shape	Node	Cover	Invert	Size	Material	Shape	Node	Cover	Invert	Size	Material	Shape	Node	Cover	Invert	Size	Material	Shape
0301X	13.06	10.04	175	VC	CIRC	9302X	11.62	9.52	175	VC	CIRC	9801X	12.78	10.66	150	VC	CIRC	9809X	15.83	15.82	150	VC	CIRC
0401X	11.59	9.97	150	VC	CIRC	930DX	11.54	11.07	100	VC	CIRC	980DY	15.83	15.82	150	VC	CIRC	980DX	15.83	15.82	150	VC	CIRC
0402X	12.17	9.54	150	VC	CIRC	9401X	5.76	2.83	175	VC	CIRC	981DX			150	VC	CIRC	982DX			150	VC	CIRC
0403X	12.35	10.76	150	VC	CIRC	9402X	6.28	4.48	150	VC	CIRC	9902X	16.06	14.14	150	VC	CIRC						
0404X			100	VC	CIRC	9403X	7.66	6.06	150	VC	CIRC												
040DX	11.62	10.49	100	VC	CIRC	940DX			UNK	UNK	UNK												
041DX	12.04	11.7	100	VC	CIRC	9501X	5.59	3.11	175	VC	CIRC												
042DX	12.46	11.15	100	VC	CIRC	950BX			175	VC	CIRC												
043DX	12.54		100	VC	CIRC	950DX			UNK	UNK	UNK												
044DX	12.42		100	VC	CIRC	951BX			UNK	UNK	UNK												
0501X	5.55	3.34	175	VC	CIRC	951DX			UNK	UNK	UNK												
0502X	6.27	4.31	150	VC	CIRC	952BX			175	VC	CIRC												
0503X	5.54	3.56	175	VC	CIRC	952DX			UNK	UNK	UNK												
0504X	6.59	3.74	150	VC	CIRC	953DX			UNK	UNK	UNK												
0505X	6.78	4.51	150	VC	CIRC	954DX			UNK	UNK	UNK												
0506X	7.1	5.41	150	VC	CIRC	9601X			150	VC	CIRC												
0507X	8.59	7.15	150	VC	CIRC	9701X	13.88	12.38	150	VC	CIRC												
0508X	5.7	3.94	175	VC	CIRC	9802X	15.37	13.51	150	VC	CIRC												
0509X			100	VC	CIRC	9803X			UNK	UNK	CIRC												
050BX			UNK	UNK	UNK	9804X			UNK	UNK	CIRC												
050BY			UNK	UNK	UNK	9805X			UNK	UNK	CIRC												
050DX			175	VC	CIRC	9806X			UNK	UNK	CIRC												
0510X			100	PF	CIRC	9807X			UNK	UNK	CIRC												
0511X			100	PF	CIRC	9808X			100	VC	CIRC												
051BX			UNK	UNK	UNK	9809X			100	VC	CIRC												
051DX			175	VC	CIRC	980DY	15.83	15.82	150	VC	CIRC	*											
052BX			175	VC	CIRC	980DX	15.83	15.82	150	VC	CIRC	*											
052DX			UNK	UNK	UNK	981DX			150	VC	CIRC												
053BX			175	VC	CIRC	982DX			150	VC	CIRC												
053DX			UNK	UNK	UNK	9902X	16.06	14.14	150	VC	CIRC												
054BX			UNK	UNK	UNK																		
054DX			UNK	UNK	UNK																		
05ABX			UNK	UNK	UNK																		
05BBX			UNK	UNK	UNK																		
05CBX			UNK	UNK	UNK																		
05DBX			150	VC	CIRC																		
05EBX			100	PF	CIRC																		
1301X	13.34	10.54	175	VC	CIRC																		
1302X	13.46	10.33	175	VC	CIRC																		
1303X			100	VC	CIRC																		
131DX			100	VC	CIRC																		
132DX			100	VC	CIRC																		
133DX			175	VC	CIRC																		
1401X	12.65	11.05	150	VC	CIRC																		
1501X	6.52	4.73	150	VC	CIRC																		
1502X	7.25	4.97	150	VC	CIRC																		
1503X	7.35	6.04	150	VC	CIRC																		
1504X	8.33	7.04	150	VC	CIRC																		
1505X			UNK	UNK	CIRC																		
150DX			UNK	UNK	UNK																		
151DX			150	VC	CIRC																		
152DX	10.26	9.11	150	VC	CIRC																		
153DX			150	VC	CIRC																		
1601X			150	VC	CIRC																		
1602X			150	VC	CIRC																		
1801X			UNK	UNK	CIRC																		
1802X			UNK	UNK	CIRC																		
190DX			UNK	UNK	CIRC																		
2302X	13.66	11.58	150	VC	CIRC																		
2501X	7.35	5.27	150	VC	CIRC																		
2701X			UNK	UNK	CIRC																		
2702X			UNK	UNK	CIRC																		
2703X			UNK	UNK	CIRC																		
2704X			UNK	UNK	CIRC																		
271DX			UNK	UNK	CIRC																		

LINE STYLES / COLOURS

Brown

-----Foul

-----Foul Siphon Sewer

-----Foul Vacuum Main

-----Foul Rising Main

-----Combined

-----Combined Siphon Sewer

-----Combined Rising Main

-----Lateral Drain

-----Building Over Agreement Area

Dark Blue

-----Treated Effluent

Purple

-----Sludge

-----Sewer Catchment

-----Section 104 Area

Light Blue

-----Surface Water

-----Surface Water Rising Main

Yellow

-----Private

Green

-----Access Shaft

-----Decommissioned

MATERIALS

AK Alkaline

BAC Bonded Asbestos Cement

BRC Bricks (Common)

BRE Brick (Engineering)

CC Concrete Box Culvert

CI Cast Iron

CO Concrete (In-Situ)

CP Concrete (Pre-Cast)

CSB Concrete Segments (bolted)

CSU Concrete Segments (unbolted)

DI Ductile Iron

GRG Glass Reinforced Concrete

GRP Glass Reinforced Plastic

MAC Masonry In regular Courses

MAR Masonry In random Courses

PE Polyethylene

PF Pitch Fibre

PP Polypropylene

PVC Polyvinyl Chloride

RPM Reinforced Plastic Matrix

SI Spun Iron

ST Steel

VC Vertifluid Clay

XXX Other

ZZZ Unknown

LEGEND - SEWERS

Manhole (SW)

Manhole (F&C)

Lamp hole (SW)

Lamp hole (F&C)

Pumping Station (SW)

Pumping Station (F&C)

Side entry manhole (SW)

Side entry manhole (F&C)

Blind shaft (SW)

Blind shaft (F&C)

Ejector station (SW)

Ejector station (F&C)

Watertight door (SW)

Watertight door (F&C)

Flushing ch. Min-e (SW)

Flushing ch. Min-e (F&C)

Flushing ch. No-e (SW)

Flushing ch. No-e (F&C)

Demonstration Chamber

Washout (SW)

Washout (F&C)

Rodding Eye (SW)

Rodding Eye (F&C)

Gauging point (SW)

Gauging point (F&C)

Intercept chamber (SW)

Intercept chamber (F&C)

Storm Tank (SW)

Storm Tank (F&C)

Vortex chamber (SW)

Vortex chamber (F&C)

Label ellipse

Dummy/S24 manhole

Outfall

Penstock chamber

Demiboards

Storm Overflow

Backdrop manhole

Other (s)

Other

Change In sewer (s)

Change In sewer

Rafflux valve

Flap valve

Cascade

Anode

Valve

Closed Valve

Air Valve

Hatch box (SW)

Hatch box (F&C)

Direction arrow

Emptying valve

Catchpit

Soakaway

Inlet

Balancing Pond

Wastewater treatment works

Marine treatment works

Outfall headworks

Vent

Vent column

Tidal storage tank

Blank end

Head of Public Sewer

Micro Pumping Station

SHAPES (S)

A Arched

B Barrel

C Circular

E Egg

H Horseshoe

R Rectangular

S Square

T Trapezoidal

U U Shape

X Other

NODE REFERENCING SYSTEM

1st digit: hundred metre easting identifier

2nd digit: hundred metre northing identifier

3rd digit: sewer type identifier

4th digit: next sequential node

0-4 = Foul/Combined

5-9 = Surface Water

Drawn by:	yadavs	
Title:	321822_Old Blacksmiths Yard, A	
Date:	15/01/2019	

ARUN DISTRICT COUNCIL A/7720/DOC

Appendix 4

BGS Borehole Records



British
Geological Survey

NATURAL ENVIRONMENT RESEARCH COUNCIL

Geology of Britain viewer

Try the Beta version of our 3D Geology of Britain viewer

Surface
Geology

3D
Models

Borehole
Scans

Geological
Exposures

Borehole Scans

Click on a borehole to view
scan.

Borehole depth

- ☒ 0 - 10m
- ☐ 10 - 30m
- ☐ 30m+
- ☐ Unknown
- ☐ Confidential
or Restricted

More on boreholes

TLO5E4

0m
10m
20m
30m
40m
50m
60m
70m
80m
90m
100m

Angmering

TLO5E5

RECORD of WELL or BORING

TO 00 SE/4
0716 0498

Survey No. 508
F.N.S. 317
F.O.S.

Place (house or farm) Nursery 1 Doppers Lane 1/2 m NNE of Ch.

Town, Village, &c. Angmering County W Sussex Six-inch map 126

Exact site (unless a tracing from a map is supplied, give distance and direction from parish church, cross-roads, or other object shown on map).

Popular Edition Sheet 126 of one-inch map. Square

Surface level of ground 126 ft. above Ordnance Datum. Well or Bore commenced at 126 ft. below surface level of ground.

Sunk 126 ft. diameter 126 ft. Bored 126 ft.; diameter of boring: at top 126 in., at bottom 126 in.

Details of lining tubes (internal diameters preferred)

Water struck at depths of (feet) 37' (small supply), + 179'

Rest-level of water below top of well or bore 1000 ft. Pumping level 1000 ft. Time of recovery 1000 hours.

Suction at 1000 ft. depth. Yield: (i) on test 1000 galls. per hour (ii) normal 1000 galls. per hour

Quality (attach copy of analysis if available)

Made by Major Pogson for Mr. Boxall. Date of boring 1935

Information from Major Pogson

(For Survey use only). GEOLOGICAL CLASSIFICATION.	NATURE OF STRATA. (and any additional remarks)	THICKNESS.		DEPTH.	
		Fest.	Inches.	Fest.	Inches.
<u>Ly. S. & E.</u> <u>1.11.35</u>					
<u>Drift</u>	<u>Loam (Hard)</u>	<u>5</u>		<u>5</u>	<u>1.5</u>
<u>London Reading Clay</u>	<u>Gravel + flints (Brighton Road Bank)</u>	<u>14</u>	<u>43</u>	<u>19</u>	<u>5.8</u>
<u>U. Chalk</u>	<u>Blue clay</u>	<u>155</u>	<u>47.2</u>	<u>174</u>	<u>53.0</u>
	<u>Chalk</u>	<u>29</u>	<u>8.9</u>	<u>203</u>	<u>61.9</u>
	<u>* Green clay</u>	<u>2</u>	<u>0.6</u>	<u>205</u>	<u>62.5</u>
	<u>* probably an infilling of a fissure. S. & E.</u>				
<u>Chapman</u>					
<u>Onge (Welling</u>	<u>Loam</u>	<u>5</u>	<u>0</u>	<u>5</u>	<u>0</u>
<u>gravel) 19'</u>	<u>Gravel and flints</u>	<u>14</u>	<u>0</u>	<u>19</u>	<u>0</u>
<u>London Clay</u>	<u>Blue clay</u>	<u>155</u>	<u>0</u>	<u>174</u>	<u>0</u>
<u>Reading (Bore)</u>	<u>Chalk</u>	<u>29</u>	<u>0</u>	<u>203</u>	<u>0</u>
<u>Upper Chalk</u>	<u>Green clay</u>	<u>29</u>	<u>0</u>	<u>203</u>	<u>0</u>
<u>28'</u>		<u>2</u>		<u>205</u>	<u>0</u>
<u>M.H. 1/2/72</u>				<u>212</u>	<u>0</u>

Transdowne Nursery
Sited on 6" furrow 63 NE. W
OD 60 Bored by Paris Thompson & Lephart, Worthing
Discontinued because pump brought up large quantities of clay. May be re-bored & deepened.
Visited P. Jackson
27.2.71.

Re-bored by Dando about 1938 to a depth of 212 feet.
In use continually for nurseries & according to Mr Boxall the water level is generally at about 40 feet b.s.
Pumping equipment present measurement of R.W.L. Visited M.H. 20.10.59

TQ00 SE 8
071 043

ANEMERING

31/201

ANEMERING Cottage. Old well. Cleared out Dec. 1903 by Duke & Ockenden.
Depth 156½ ft., with 8½ ft. of water. Riser 18 inches from
the bottom yielding about 1000 gallons per hour. i.e. RWL 148'65.

6" Saxon 63 SE/W.

Exact site not determined, but probably on south side of High Street
about half way between Roundstone Lane and Station Road. OS 46

27.2.91

Estimated classification

Drift (valley gravel) } 156½
Upper chalk

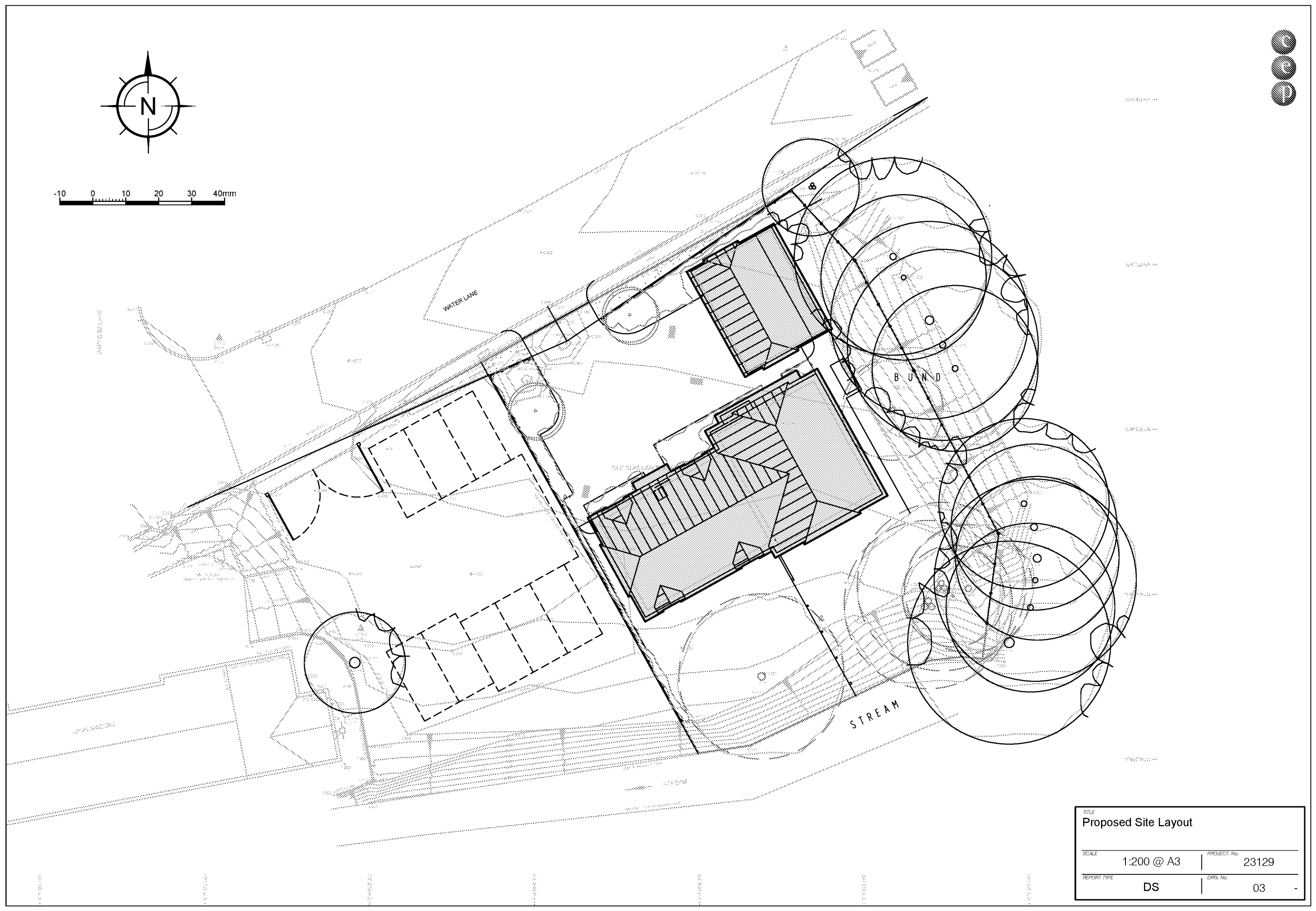
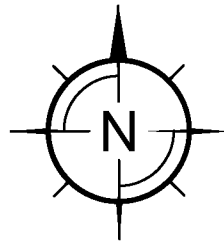
5/4/73

DATA Bank

W.S. 52. 11E p. 154

Appendix 5

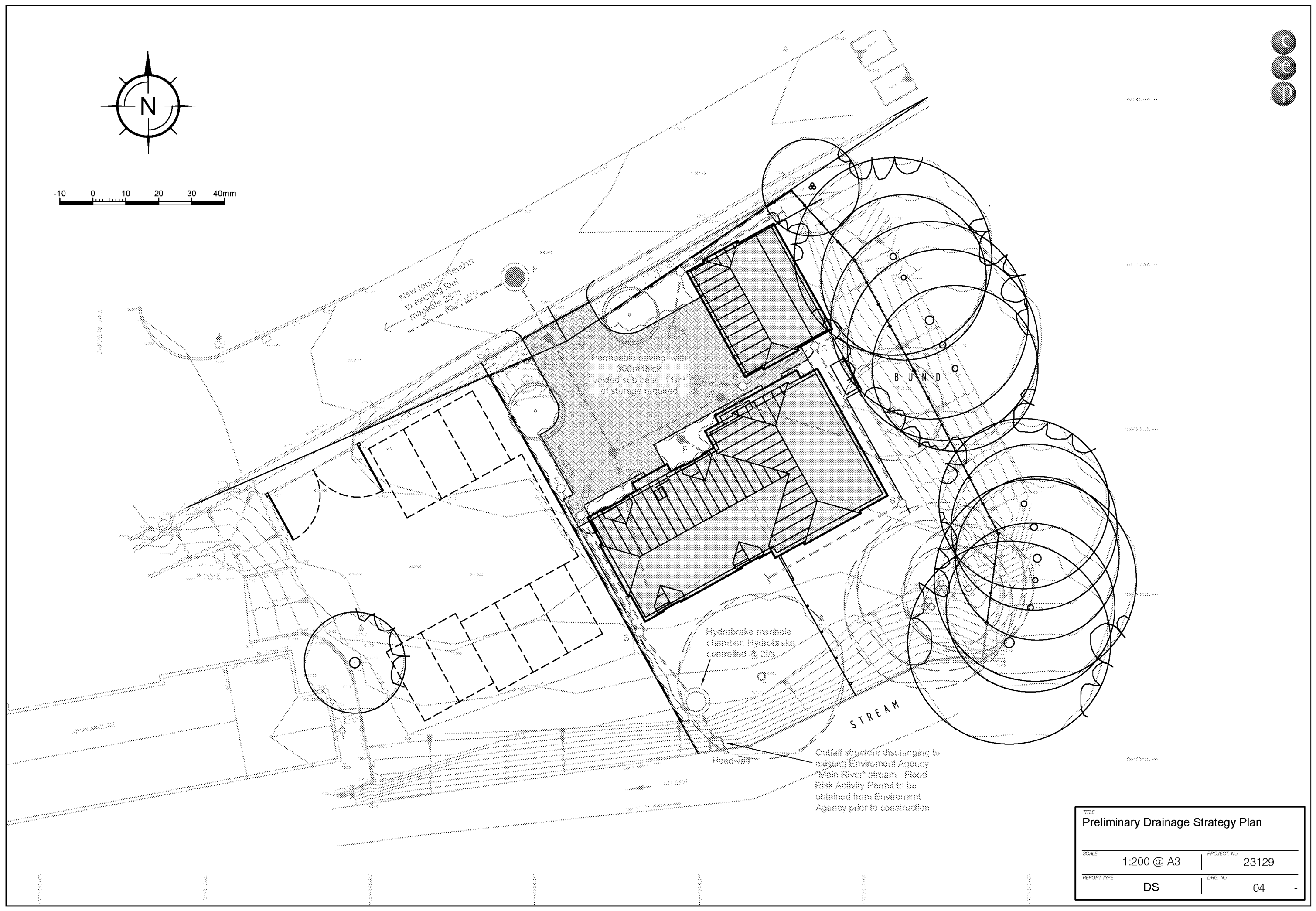
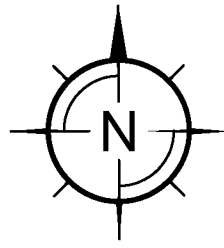
Proposed Site Layout Plan



TITLE Proposed Site Layout			
SCALE 1:200 @ A3		PROJECT No. 23129	
REPORT TYPE DS		DRG. No. 03	

Appendix 6

Preliminary Drainage Strategy Plan and Calculations



TITLE Preliminary Drainage Strategy Plan			
SCALE 1:200 @ A3		PROJECT No. 23129	
REPORT TYPE DS		DRG. No. 04	

The Civil Engineering Practice							Page 1	
11 Tungsten Building George Street Fishersgate BN41 1RA			Old Blacksmiths Yard Angmering Preliminary Surface Water					
Date 30/04/2019 File Preliminary Drainage - ...			Designed by MK Checked by					
Innovyze			Source Control 2017.1.2					
<u>Summary of Results for 100 year Return Period (+40%)</u> Half Drain Time : 54 minutes.								
Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max √ Outflow (l/s)	Max Volume (mE)	Status	
15 min Summer	9.483	0.183	0.0	1.9	1.9	6.4	Flood Risk	
30 min Summer	9.530	0.230	0.0	1.9	1.9	8.1	Flood Risk	
60 min Summer	9.547	0.247	0.0	1.9	1.9	8.8	Flood Risk	
120 min Summer	9.539	0.239	0.0	1.9	1.9	8.5	Flood Risk	
180 min Summer	9.520	0.220	0.0	1.9	1.9	7.8	Flood Risk	
240 min Summer	9.497	0.197	0.0	1.9	1.9	7.0	Flood Risk	
360 min Summer	9.456	0.156	0.0	1.9	1.9	5.4	Flood Risk	
480 min Summer	9.418	0.118	0.0	1.8	1.8	4.1	Flood Risk	
600 min Summer	9.386	0.086	0.0	1.8	1.8	2.9	O K	
720 min Summer	9.360	0.060	0.0	1.8	1.8	2.0	O K	
960 min Summer	9.324	0.024	0.0	1.7	1.7	0.7	O K	
1440 min Summer	9.300	0.000	0.0	1.5	1.5	0.0	O K	
2160 min Summer	9.300	0.000	0.0	1.1	1.1	0.0	O K	
2880 min Summer	9.300	0.000	0.0	0.9	0.9	0.0	O K	
4320 min Summer	9.300	0.000	0.0	0.6	0.6	0.0	O K	
5760 min Summer	9.300	0.000	0.0	0.5	0.5	0.0	O K	
7200 min Summer	9.300	0.000	0.0	0.4	0.4	0.0	O K	
8640 min Summer	9.300	0.000	0.0	0.4	0.4	0.0	O K	
10080 min Summer	9.300	0.000	0.0	0.3	0.3	0.0	O K	
15 min Winter	9.510	0.210	0.0	1.9	1.9	7.4	Flood Risk	
Storm Event	Rain (mm/hr)	Flooded Volume (mE)	Discharge Volume (mE)	Time-Peak (mins)				
15 min Summer	128.960	0.0	8.1	19				
30 min Summer	86.656	0.0	11.1	32				
60 min Summer	55.544	0.0	14.3	52				
120 min Summer	34.343	0.0	18.0	86				
180 min Summer	25.523	0.0	20.0	120				
240 min Summer	20.520	0.0	21.5	154				
360 min Summer	15.103	0.0	23.8	220				
480 min Summer	12.133	0.0	25.5	282				
600 min Summer	10.229	0.0	26.9	342				
720 min Summer	8.892	0.0	28.1	400				
960 min Summer	7.122	0.0	29.9	510				
1440 min Summer	5.200	0.0	32.7	0				
2160 min Summer	3.787	0.0	35.7	0				
2880 min Summer	3.021	0.0	37.8	0				
4320 min Summer	2.193	0.0	40.9	0				
5760 min Summer	1.744	0.0	43.2	0				
7200 min Summer	1.461	0.0	44.9	0				
8640 min Summer	1.265	0.0	46.4	0				
10080 min Summer	1.120	0.0	47.6	0				
15 min Winter	128.960	0.0	9.1	19				
ø1982- 2017 XP Solutions								

The Civil Engineering Practice							Page 2
11 Tungsten Building George Street Fishersgate BN41 1RA			Old Blacksmiths Yard Angmering Preliminary Surface Water				
Date 30/04/2019 File Preliminary Drainage - ...			Designed by MK Checked by				
Innovyze			Source Control 2017.1.2				
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 √ Outflow (l/s)	Max Volume (mE)	Status
30 min Winter	9.566	0.266	0.0	2.0	2.0	9.5	Flood Risk
60 min Winter	9.592	0.292	0.0	2.0	2.0	10.4	Flood Risk
120 min Winter	9.577	0.277	0.0	2.0	2.0	9.8	Flood Risk
180 min Winter	9.546	0.246	0.0	1.9	1.9	8.7	Flood Risk
240 min Winter	9.511	0.211	0.0	1.9	1.9	7.5	Flood Risk
360 min Winter	9.446	0.146	0.0	1.9	1.9	5.1	Flood Risk
480 min Winter	9.392	0.092	0.0	1.8	1.8	3.1	O K
600 min Winter	9.348	0.048	0.0	1.8	1.8	1.6	O K
720 min Winter	9.318	0.018	0.0	1.7	1.7	0.4	O K
960 min Winter	9.300	0.000	0.0	1.5	1.5	0.0	O K
1440 min Winter	9.300	0.000	0.0	1.1	1.1	0.0	O K
2160 min Winter	9.300	0.000	0.0	0.8	0.8	0.0	O K
2880 min Winter	9.300	0.000	0.0	0.6	0.6	0.0	O K
4320 min Winter	9.300	0.000	0.0	0.5	0.5	0.0	O K
5760 min Winter	9.300	0.000	0.0	0.4	0.4	0.0	O K
7200 min Winter	9.300	0.000	0.0	0.3	0.3	0.0	O K
8640 min Winter	9.300	0.000	0.0	0.3	0.3	0.0	O K
10080 min Winter	9.300	0.000	0.0	0.2	0.2	0.0	O K
Storm Event	Rain (mm/hr)	Flooded Volume (mE)	Discharge Volume (mE)	Time-Peak (mins)			
30 min Winter	86.656	0.0	12.5	32			
60 min Winter	55.544	0.0	16.2	58			
120 min Winter	34.343	0.0	20.1	92			
180 min Winter	25.523	0.0	22.4	130			
240 min Winter	20.520	0.0	24.2	166			
360 min Winter	15.103	0.0	26.7	234			
480 min Winter	12.133	0.0	28.6	294			
600 min Winter	10.229	0.0	30.2	350			
720 min Winter	8.892	0.0	31.5	398			
960 min Winter	7.122	0.0	33.6	0			
1440 min Winter	5.200	0.0	36.8	0			
2160 min Winter	3.787	0.0	40.1	0			
2880 min Winter	3.021	0.0	42.5	0			
4320 min Winter	2.193	0.0	46.0	0			
5760 min Winter	1.744	0.0	48.6	0			
7200 min Winter	1.461	0.0	50.6	0			
8640 min Winter	1.265	0.0	52.3	0			
10080 min Winter	1.120	0.0	53.7	0			
ø1982- 2017 XP Solutions							

The Civil Engineering Practice		Page 3																																						
11 Tungsten Building George Street Fishersgate BN41 1RA	Old Blacksmiths Yard Angmering Preliminary Surface Water																																							
Date 30/04/2019 File Preliminary Drainage - ...	Designed by MK Checked by																																							
Innovyze		Source Control 2017.1.2																																						
<u>Rainfall Details</u> <table> <tr> <td>Rainfall Model</td> <td>FSR</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>Region</td> <td>England and Wales</td> <td>Cv (Winter)</td> <td>0.840</td> </tr> <tr> <td>M5-60 (mm)</td> <td>19.600</td> <td>Shortest Storm (mins)</td> <td>15</td> </tr> <tr> <td>Ratio R</td> <td>0.350</td> <td>Longest Storm (mins)</td> <td>10080</td> </tr> <tr> <td>Summer Storms</td> <td>Yes</td> <td>Climate Change %</td> <td>+40</td> </tr> </table> <u>Time Area Diagram</u> Total Area (ha) 0.036 <table> <thead> <tr> <th>Time (mins)</th> <th>Area (ha)</th> <th>Time (mins)</th> <th>Area (ha)</th> </tr> <tr> <th>From</th> <th>To</th> <th>From</th> <th>To</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>4</td> <td>0.018</td> <td>4</td> <td>8</td> <td>0.018</td> </tr> </tbody> </table>			Rainfall Model	FSR	Winter Storms	Yes	Return Period (years)	100	Cv (Summer)	0.750	Region	England and Wales	Cv (Winter)	0.840	M5-60 (mm)	19.600	Shortest Storm (mins)	15	Ratio R	0.350	Longest Storm (mins)	10080	Summer Storms	Yes	Climate Change %	+40	Time (mins)	Area (ha)	Time (mins)	Area (ha)	From	To	From	To	0	4	0.018	4	8	0.018
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ø1982- 2017 XP Solutions																																								

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11 Tungsten Building George Street Fishersgate BN41 1RA	Old Blacksmiths Yard Angmering Preliminary Surface Water	
Date 30/04/2019 File Preliminary Drainage - ...	Designed by MK Checked by	
Innovyze Source Control 2017.1.2		

Model Details

Storage is Online Cover Level (m) 9.700

Porous Car Park Structure

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	11.0
Membrane Percolation (mm/hr)	1000	Length (m)	11.0
Max Percolation (l/s)	33.6	Slope (1:X)	1000.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	9.300	Membrane Depth (m)	110

Hydro-Brake÷ Optimum Outflow Control

Unit Reference	MD-SHE-0067-2000-1000-2000
Design Head (m)	1.000
Design Flow (l/s)	2.0
Flush-Flow	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	67
Invert Level (m)	8.600
Minimum Outlet Pipe Diameter (mm)	100
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.000	2.0
Flush-Flow	0.296	1.9
Kick-Flow	0.599	1.6
Mean Flow over Head Range	-	1.7

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	1.6	1.200	2.2	3.000	3.3	7.000	4.9
0.200	1.9	1.400	2.3	3.500	3.5	7.500	5.1
0.300	1.9	1.600	2.5	4.000	3.8	8.000	5.2
0.400	1.9	1.800	2.6	4.500	4.0	8.500	5.4
0.500	1.8	2.000	2.7	5.000	4.2	9.000	5.5
0.600	1.6	2.200	2.9	5.500	4.4	9.500	5.7
0.800	1.8	2.400	3.0	6.000	4.6		
1.000	2.0	2.600	3.1	6.500	4.7		

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Appendix 7

Drainage Maintenance Schedule

Drainage Maintenance Schedule



The Civil Engineering Practice
11 Tungsten Building
George Street
Fishergate
Sussex
BN41 1RA

Project	Old Blacksmith Yard, Water Lane, Angmering
Project Number	23129

By Martin Kempshall

Date 1 May 2019



1 Indicative Schedule of Maintenance

- 1.1 Once appointed the Contractor will prepare a site specific method statement for the control of silt and other pollutants during construction. CIRIA Report C532, Control of water pollution from construction sites, provides further guidance on this.
- 1.2 The Contractor will maintain the proposed drainage system during construction and until the handing over of the site. Upon completion the maintenance will be passed on to the property owner.
- 1.3 The following maintenance schedule details the typical tasks to be undertaken at different intervals.

Maintenance Schedule	Required Action	Frequency
Regular Maintenance	Remove sediment and debris from silt trap chambers, channel drains and inlet chambers	6 monthly
	Litter and debris removal - Catch Pits and Channel Debris	Monthly or as required
	Surface and foul water pipework - jetting / rodding	Every 2 years or as required
	Manage other vegetation and remove nuisance plants - aesthetics	As required
	Visual inspection of permeable paving for defects and settlement	Annually
	Sweeping / brushing of permeable paving	Every 2 years
Corrective Maintenance	Remove debris / blockages to silt traps / channel drains	As required
	Repairs to access chambers / manhole covers	As required
	Replace any broken permeable blocks / surface, remedial works to any depressions or rutting	As required
	Inspect inlet, outlet from downpipe and gullies for blockages, standing water and clear	As required

Indicative Schedule of Maintenance for the Proposed Drainage System



Inspection / Action Required	Gullies, Channels and Gutters	Catchpits	Permeable Surface	Surface Water Pipework
After leaf fall in Autumn	V	V		
6 Months	V	V	V	
1 Year			V	
2 Years				V
When alarm indicates				

Drainage System Maintenance Summary