SIDEBOTTOM RICHARDSON CHENG LTD
CONSULTING STRUCTURAL AND CIVIL ENGINEERS

15 High Street,
Spalding,
Lincs. PE11 1TW

Tel: 01775 712660
Fax: 01775 712635
Email: src@srcltd.com

SURFACE & FOUL WATER DRAINAGE ASSESSMENT

UPON

PROPOSED RESIDENTIAL DEVELOPMENT,

OFF BOSTON ROAD, GOSBERTON

LINCOLNSHIRE, PE11 4NR

PROJECT No: 20117

REVISION: B (29.04.20)

DOCUMENT REF: 20117-REP-01B

For Steve Grimston

C/O Oglesby & Limb Ltd.,

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CONSULTING STRUCTURAL AND CIVIL ENGINEERS
15 High Street,
Spalding,
Lincs. PE11 1TW
Tel: 01775 712660
Fax: 01775 712635
Email: src@srcltd.com

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Tel: 01775 712660
Fax: 01775 712635
Email: src@srcltd.com

1. INTRODUCTION

The following drainage assessment has been prepared on behalf of Steve Grimston to support a planning application for a proposed residential development, Off Boston Road, Gosberton.

This assessment is based upon Oglesby & Limb Ltd. Initial Site Layout drawing A1435-11 Rev.B, contained in Appendix A.

The object of this report is to clarify the design philosophy followed when preparing the proposed surface & foul water drainage arrangement and to outline the proposed solution in sufficient detail for all relevant parties to be able to comment. This assessment also demonstrates that the proposed development can be satisfactorily accommodated without increasing flood risk in the area, in line with the National Planning Policy Framework (NPPF).

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Email: src@srcltd.com

2. LOCATION & SITE DESCRIPTION

See Appendix B for the Site Location Plan, Oglesby & Limb Ltd. drawing A1435-01.

2.1 Site Location

The site is approximately 2.25 hectares and is located to the West of Boston Road, National Grid reference TF245318.

2.2 Site Description

The Site is bound by a watercourse maintained by Welland and Deepings IDB to the North, Boston Road (B1397) to the East, a footpath/track and residential dwellings to the South and a riparian watercourse to the West.

The site is largely 'greenfield' an existing agricultural building which is to be demolished.

The topographical survey indicates that the site is generally flat, with ground levels between 2.300 AOD & 2.600 AOD. The level of Boston Road is approximately 3.300 AOD.

2.3 Infiltration Testing

Site investigations took place during February 2018 to establish the infiltration characteristics on the site. These results are included within Appendix C. The findings on site indicated that infiltration on site was potentially viable. To clarify these findings further site investigations were carried out during April 2020, refer to Appendix F for these findings. As highlighted within the ground investigation report, a relatively high ground water level was encountered, therefore infiltration features have been deemed unviable for the proposed development.

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2.4 Site Proposals

The proposed works comprise of 18 No. mixed type dwellings. There is also a 5.5m wide adoptable road, approximately 150m long with a 2m wide footpath to the North. The public open space is bound by the Highway to the south and a proposed ditch to the north. This ditch will be utilised within the surface water drainage design.

3. FLOOD RISK ASSESSMENT

A flood risk assessment has been prepared by S M Hemmings. This assessment has been submitted to support the planning application and its findings and principles will be utilised in the preparation of this report and the detailed designs of the development.

The Finished Floor Levels are to be located 300mm above the existing ground level and at a minimum of 2.95 AOD in accordance with the above risk assessment.

4. SURFACE WATER

4.1 Existing Surface Water

It is assumed that the existing buildings on site are drained via. some form of infiltration method, as there is no public surface water sewer system in the vicinity of the site.

4.2 SuDS Considerations

The SDUS hierarchy has been given consideration during the proposed drainage design.

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Most Sustainable	SUDS technique	Flood Reduction	Pollution Reduction	Landscape & Wildlife Benefit
	Living roofs	✔	✔	✔
	Basins and ponds - Constructed wetlands - Balancing ponds - Detention basins - Retention ponds	✔	✔	✔
	Filter strips and swales	✔	✔	✔
	Infiltration devices - soakaways - infiltration trenches and basins	✔	✔	✔
	Permeable surfaces and filter drains - gravelled areas - solid paving blocks - porous paviors	✔	✔	
Least Sustainable	**Tanked systems** - over-sized pipes/tanks - storms cells	✔		

With reference to filter strips and swales they were deemed unsuitable as a method for the Highway drainage. Due to the requirements set out within 'Lincolnshire County Council Development Road and Sustainable Drainage Specification and Construction' use of these devices with the ground water level on site is not achievable. This is demonstrated by the findings of The Supplementary Ground Investigation Report, Dated April 2020, included within Appendix F. However, it is proposed surface water treatment will be provided downstream via the proposed ditch. In accordance with the CIRIA SuDS Manual 2015, the proposed ditch has been designed to have a velocity of 0.3m/s and is to have vegetation at a suitable level for the 1:1 year event to provide pollutant removal of the surface water run-off.

Living roofs have also been considered inappropriate for the proposed site due to the style of housing which is proposed to be delivered by the development.

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4.3 Surface Water Proposals

The private roof drainage, is going to be collected via a traditional piped system discharging to a catchpit chamber for sediment removal, prior to discharging to the adoptable Anglian Water system within the road.

The drives and shared access are to be constructed of permeable block paving, however due to the infiltration/groundwater characteristics of the site the water is going to be collected in the open-graded sub-base. A fin drain or collector pipe will be incorporated within the sub-base to discharge to a down stream catchpit chamber prior to discharge to the Anglian Water system within the Highway. These design proposals are indicated on the proposed drainage arrangement drawing within Appendix D. This method of driveway construction provides an 'at source' treatment to the surface water. The drives and shared access are to be privately owned and maintained by their relevant dwellings.

With reference to the Highway drainage it is proposed to utilise a traditional network of gullies and buried pipes due to the previously mention issues with providing a swale or filter strip, as highlighted within Appendix F. The pipe network will discharge to a proposed ditch on site to provide further treatment to the water in accordance with the CIRIA SuDS Manual 2015 recommendations.

A flow control device is to be incorporated downstream of the proposed ditch immediately prior to the IDB watercourse. It is proposed to restrict flows to 5 litres / second. Surface water is to be attenuated within the ditch for storm events up to 1:10 year return period. The proposed ditch bank is to have vary levels on the north and south. The northern bank is to have a minimum level of 2.600AOD and will therefore provide approximately 350mm freeboard to the 1:100 year plus climate change storm event. The southern bank, adjacent to the public open space, is to be at 2.100AOD. The public open space is also to be set at this level and have a 1:3 slope to the surrounding highway and plot boundaries. This will therefore form a detention

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basin for storms over 1:10 year return period. The maximum water level within the basin/public open space is 2.245AOD for the 1:100+CC event and therefore have a maximum depth of water of 145mm.

The design proposals are illustrated on our drawing 20117/20E, included within Appendix D.

The proposed site drainage system has been modelled using Windes Microdrainage software, calculations are within Appendix E.

5. FOUL WATER

5.1 Existing System

There is no requirement for foul water drainage on site at present. The closest Anglian Water foul sewer to the development is located within Mill Lane to the South-West of the site.

5.2 Foul Water Proposals

Due to the level of the closest Anglian Water foul sewer, a pumping station will be incorporated on site to serve the proposed dwellings. The pumping station is to be located in the south-west corner of the site, and accessed off the new public Highway by a roadway which will have a turning facility for a tanker. The pumping station is to be offered to Anglian Water and is to be design by a specialist to their requirements/standards. The drainage network serving the new dwellings will be located within the proposed Highway.

The design proposals are illustrated on our drawing 20117/20E, included within Appendix D.

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6. MAINTENANCE STRATEGY

The proposed systems contain the following assets which are all required to be in reasonable working order for the systems to function as a whole and operate as anticipated in design models.

The following assets will be owned and maintained by the individual plot owners;

Gutters, downpipes and other building rainwater goods

SVP and AAV pipes.

Buried pipe networks and chambers on individual plots

Permeable driveway

Catchpit chamber

The following assets will be within the Highway which will become the property and maintenance liability of Lincolnshire County Council.

Road gullies

Road gully laterals

The following assets will become the property and maintenance liability of Anglian Water Services.

Surface & Foul buried pipe network

Surface & Foul Manhole Chambers

Surface water Outfall Headwalls

Surface water Flow control chamber

The following assets will become the property and maintenance liability of a Management Company.

Proposed Ditch

The scope/nature of inspection and maintenance is such that various facilities and structures are inspected and maintained at yearly intervals, as well as after or during use and/or heavy storms, in order that they continue to perform effectively.

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The maintenance schedule for the foul water system, should as a minimum consist of annual inspections and 5 yearly rodding/jetting should no issue be encountered.

The maintenance schedule for the surface water system will comprise the following activities in accordance with the CIRIA publication C753 (The SuDS Manual)

Activity	Frequency	Typical Tasks
Routine/regular maintenance (including inspections and monitoring)	Monthly	• Litter/debris removal • Grass cutting (in season) • Inspection and clearance of gullies and drainage channels • Inspection of pumping station
Occasional maintenance	Annually	• Silt removal from catchpits/gullies • Pipe drainage every 3-5 years: suction sweeping (to Water Jetting Association standards) and CCTV where necessary
Remedial maintenance	As required (tasks to repair problems due to damage or vandalism	• Silt removal • Inlet/outlet repair • Erosion repairs • System rehabilitation following a pollution event • Pump failure

On completion of the above, ensure the drainage system is running freely and cleanly. If not, repeat maintenance activities. Written records should be kept of all maintenance work carried out.

Overland flow of water caused by blockages should be coned off and any blockages cleared.

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Fax: 01775 712635
Email: src@srcltd.com

7. CONCLUSIONS

As illustrated by our design proposals on drawing 20117 / 20E and the information outlined within this report, it is demonstrable that a viable surface & foul water scheme can be provided for the proposed residential development. With the ongoing maintenance of the systems being undertaken by suitable responsible parties.

For and on behalf of **SIDEBOTTOM RICHARDSON CHENG LTD**

M. PETT **29th April 2020**

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15 High Street,
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Tel: 01775 712660
Fax: 01775 712635
Email: src@srcltd.com

APPENDIX A – Site Layout Plan

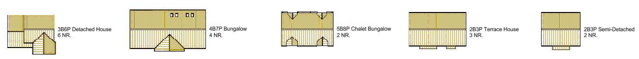
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Site Block Plan as proposed
Scale 1:500
SCALE 1 : 500
SCALE 1 : 1
0m 5m 10m 20m 30m 40m 50m

Building Types and Quantities



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Ref.	Date	Description	Initial
B	30.04.20	Drawing updated in relation to SE changes as follows: 1. Turning head updated. 2. Pumping station, compound and access road added. 3. Ditches updated. 4. Plot 13 repositioned.	RDL
A	16.04.20	Plots 1 to 5 amended as follows: 1. Parking repositioned. 2. Garden increased in depth. 3. Houses moved Slightly to West. Plot 8 layout altered to allow for these changes. Turning head added to plot 12 & 13.	RDL

Oglesby & Limb Ltd
Chartered Architect
Suite 1, Market Chambers
12 Market Place, Spalding, Lincs
PE11 1SL
Tel: 01775 761196
e-mail: design@o-l-ltd.co.uk

Client:
Steve Grimston

Project:
**Proposed Residential Development,
Boston Road,
Gosberton,
Lincolnshire
PE11 4NR**

Drawing Title:
Site Layout Plan
As Proposed
PLANNING APPLICATION ISSUE

Date: OCT 2019	Scale: as shown
Drawn by: EJU	Checked by: AJO

Drawing Number: **A1435 - 11**
Rev: **B**

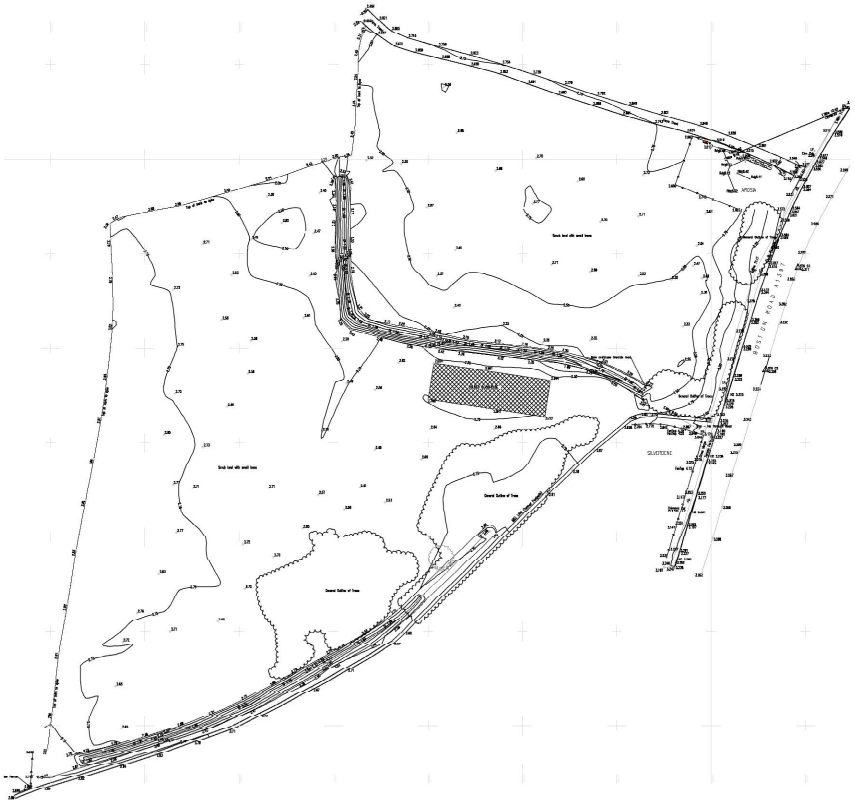
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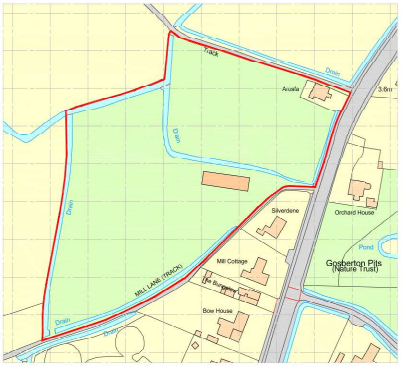
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APPENDIX B – Architects Location Plan

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Site Block Plan As Existing
Scale 1:500 @ A1
SCALE 1 : 500 0m 5m 10m 20m 30m 40m 50m
SCALE 1 : 1



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Site Location Plan
Scale 1:1250
Site outlined in red
SCALE 1 : 1250 0m 10m 20m 40m 60m 80m 100m 120m
SCALE 1 : 1

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Chartered Architect
Suite 1, Market Chambers
12 Market Place, Spalding, Lincs
PE11 1JL
Tel: 01775 761196
e-mail: design@o-l-ltd.co.uk

Client:
Steve Grimoton

Project:
Proposed Residential Development,
Boston Road,
Gosberton,
Lincolnshire
PE11 4NR

Drawing Title:
Site Location and block plan as existing.

GENERAL ISSUE

Date:	Scale:
OCT 2017	as shown
Drawn by: EJU	Checked by: AJO

Drawing Number: **A1435 - 01** Rev: **-**

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APPENDIX C – Infiltration Test Results

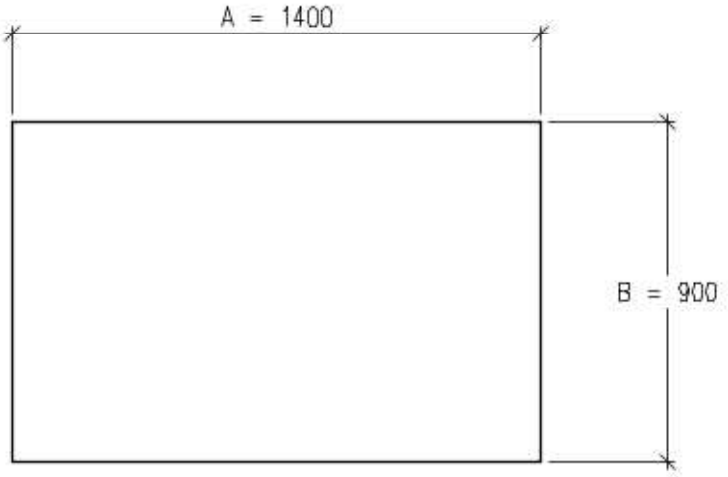
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Email: src@srcltd.com

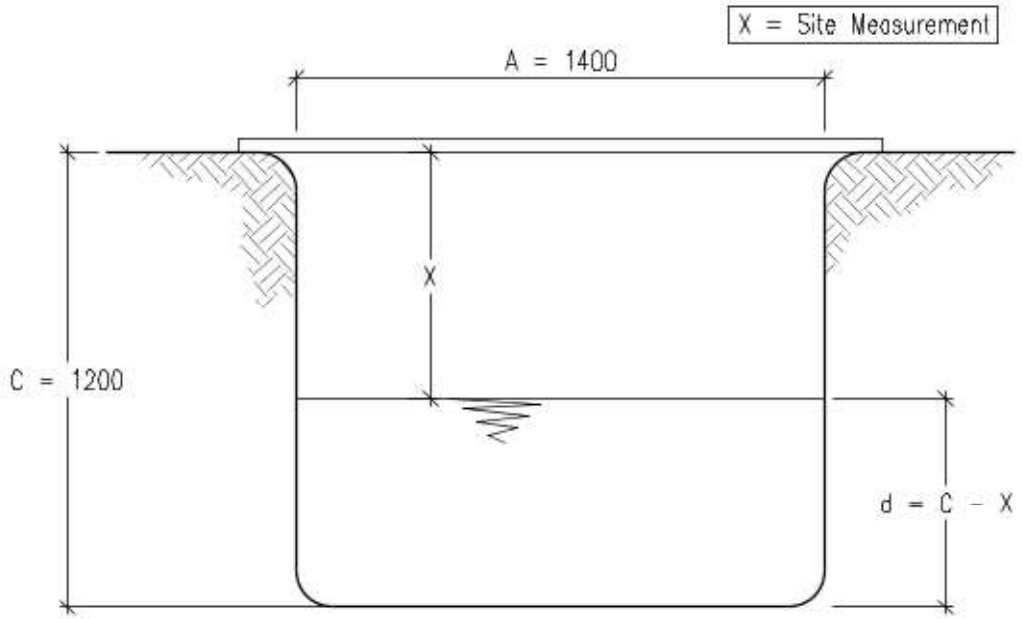
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Status	FOR INFORMATION				
Date	Feb. '18	Drawn	MP	Checked	SRC
Scale	1:20	Design	-	File Name	20117-SA01

Project: Proposed Residential Development
Mill Lane, Gosberton,
Spalding, Lincs.

Title: Infiltration Soak Away Sketch



Plan On SA01



Section Through SA01

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15 High Street,
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Tel: 01775 712660
Fax: 01775 712635
Email: src@srcltd.com

Soak-Away Test SA 01

Job Reference Proposed Residential Development
Mill Lane, Gosberton, Spalding, Lincs.

SA01	
TIME (Mins)	DEPTH mm (d)
0	600
15	570
30	560
45	540
60	535
90	516
120	505
150	496
180	478
210	475
240	466

Job No. 20117

Date

Trial Dimensions

A =	1.4	m
B =	0.9	m
C =	1.2	m

C.S.Area of SA01 = 1.26 m^2

Total Volume =	0.169	m^3
75% Volume =	0.127	m^3
25%Volume =	0.042	m^3

Time Taken From 75% Volume to 25% Volume

128 Mins

Effective Depth From 75% Volume to 25% Volume

0.067 m

50% Effective Internal Surface Area Including Base area

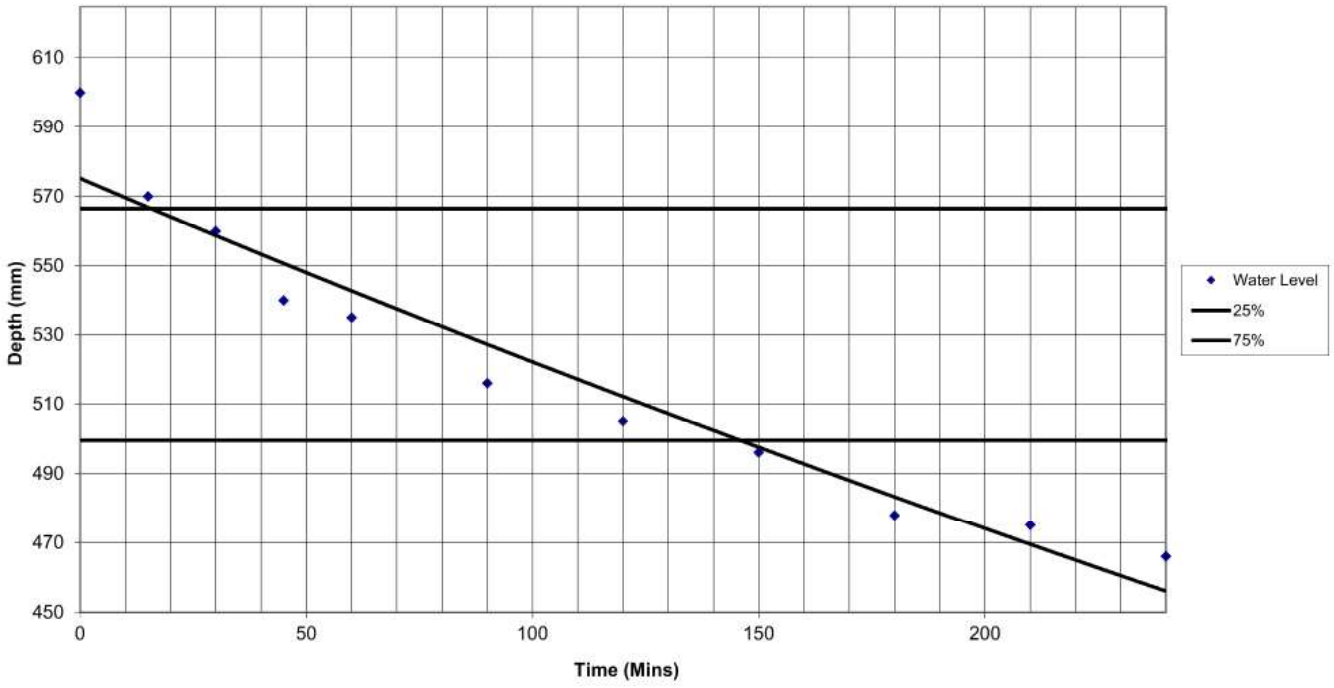
1.5682 m^2

Soil Infiltration rate, f

7.00943E-06 m/s

7.00 x 10^ - 3 mm/s

Proposed Residential Development Mill Lane, Gosberton, Spalding, Lincs.
Job No. 20117
Plot showing water level aginst time for SA01

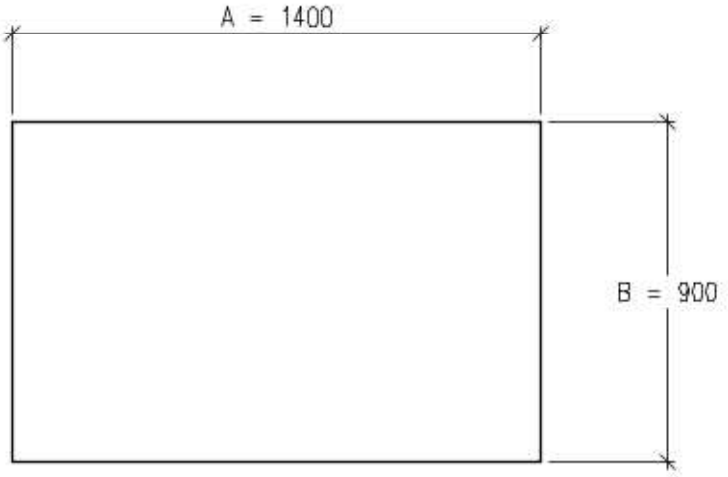


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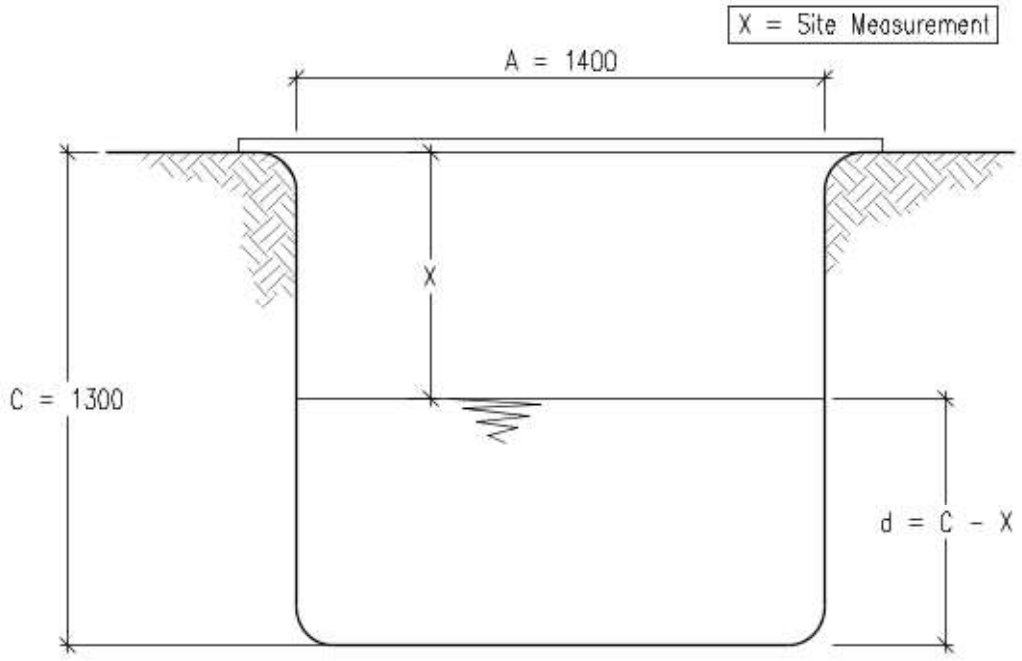
Sheet No. 20117/SA02					Rev -
Status	FOR INFORMATION				
Date	Feb. '18	Drawn	MP	Checked	SRC
Scale	1:20	Design	-	File Name	20117-SA02

Project: Proposed Residential Development
Mill Lane, Gosberton,
Spalding, Lincs.

Title: Infiltration Soak Away Sketch



Plan On SA02



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CONSULTING STRUCTURAL & CIVIL ENGINIEERS

15 High Street,
Spalding,
Lincs. PE11 1TW

Tel: 01775 712660
Fax: 01775 712635
Email: src@srcltd.com

Soak-Away Test SA 02

Job Reference Proposed Residential Development
Mill Lane, Gosberton, Spalding, Lincs.

SA01	
TIME (Mins)	DEPTH mm (d)
0	770
15	700
30	680
45	660
75	630
105	620
135	595
165	590
195	567
225	560
255	558
285	546
315	535

Job No. 20117

Date

Trial Dimensions

A =	1.4	m
B =	0.9	m
C =	1.3	m

C.S.Area of SA01 = 1.26 m^2

Total Volume =	0.296	m^3
75% Volume =	0.222	m^3
25%Volume =	0.074	m^3

Time Taken From 75% Volume to 25% Volume

122 Mins

Effective Depth From 75% Volume to 25% Volume

0.1175 m

50% Effective Internal Surface Area Including Base area

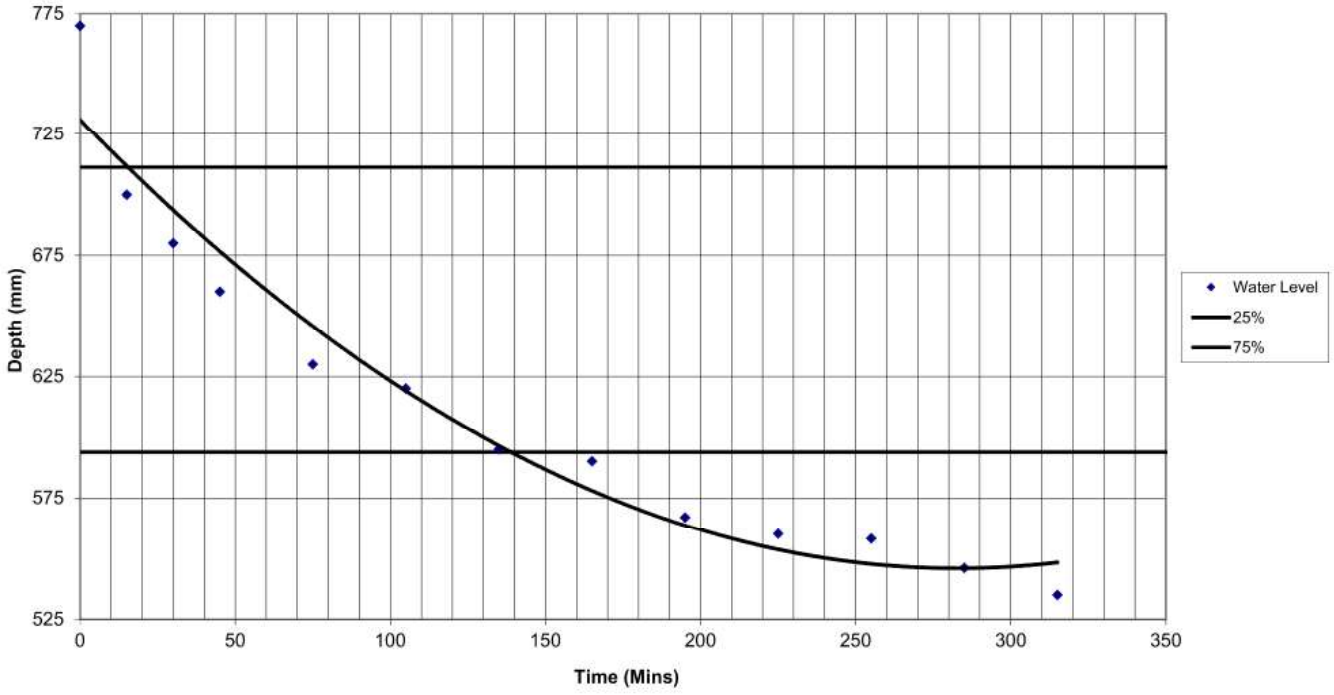
1.8005 m^2

Soil Infiltration rate, f

1.12332E-05 m/s

1.12 x 10^ - 2 mm/s

Proposed Residential Development Mill Lane, Gosberton, Spalding, Lincs.
Job No. 20117
Plot showing water level aginst time for SA02



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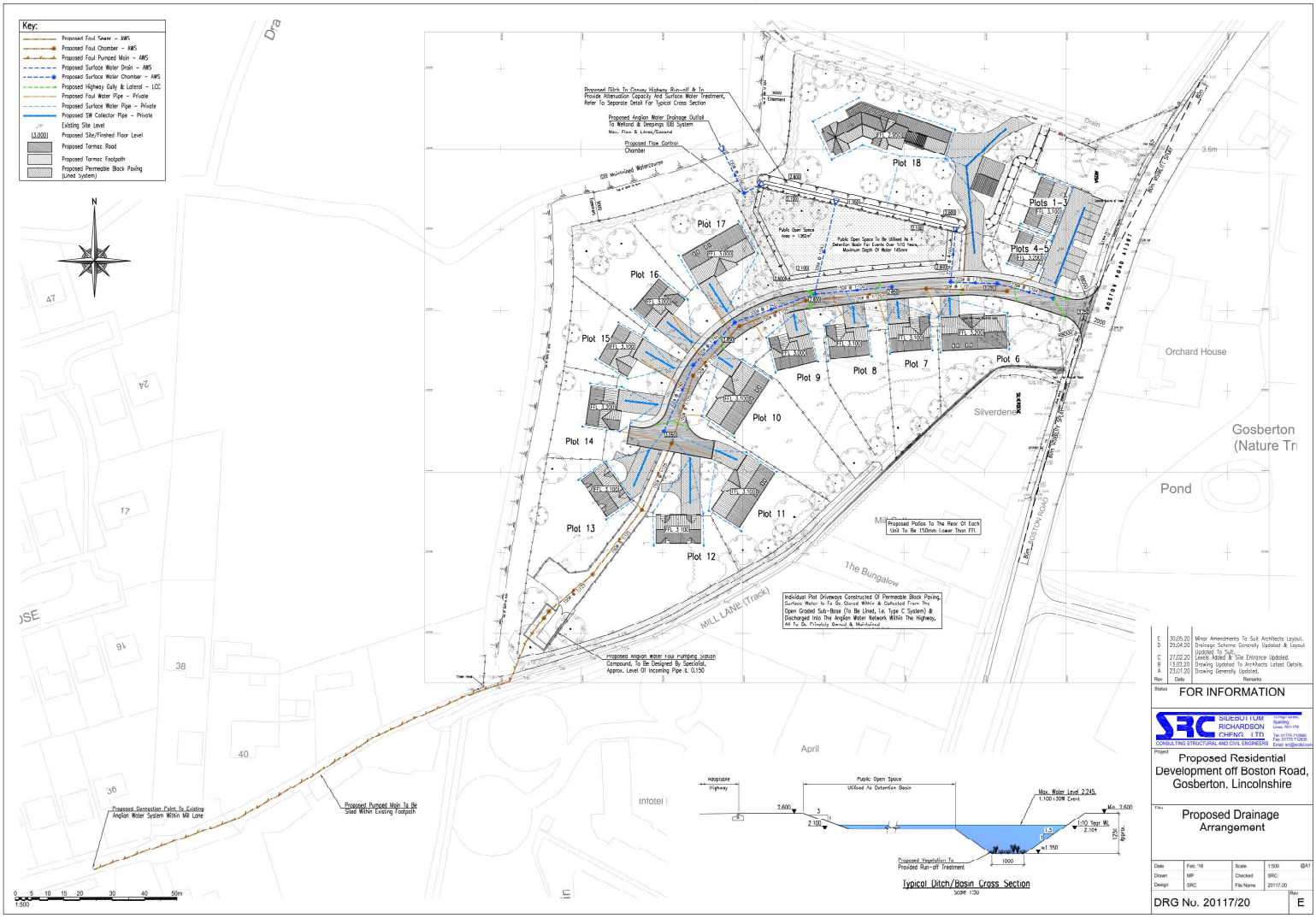
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APPENDIX D – Proposed Drainage Arrangement Drawing

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Rev	Date	Remarks
E	30.05.20	Minor Amendments To Suit Architects Layout.
D	29.04.20	Drainage Scheme Generally Updated & Layout Updated To Suit.
C	27.02.20	Levels Added & Site Entrance Updated.
B	13.02.20	Drawing Updated To Architects Latest Details.
A	23.01.20	Drawing Generally Updated.

Status: FOR INFORMATION

SHEBBEAR RICHARDSON CHENG LTD
CONSULTING STRUCTURAL AND CIVIL ENGINEERS
Tel: 01775 710660
Fax: 01775 713835
Email: src@srcltd.com

Project: Proposed Residential Development off Boston Road, Gosberton, Lincolnshire

Title: Proposed Drainage Arrangement

Date	Feb.'18	Scale	1:500 @A1
Drawn	MP	Checked	SRC
Design	SRC	File Name	20117-20

DRG No. 20117/20 Rev. E

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SIDEBOTTOM
RICHARDSON
CHENG LTD
CONSULTING STRUCTURAL AND CIVIL ENGINEERS

15 High Street,
Spalding,
Lincs. PE11 1TW

Tel: 01775 712660
Fax: 01775 712635
Email: src@srcltd.com

APPENDIX E – Surface Water Calculations

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CONSULTING STRUCTURAL AND CIVIL ENGINEERS

15 High Street,
Spalding,
Lincs. PE11 1TW

Tel: 01775 712660
Fax: 01775 712635
Email: src@srcltd.com

Project No. 20117	
Sheet No. 1	Rev. -
Date 29.04.2020	
Designer MP	

Title:	**Surface Water Design Calculations**
Project:	**Proposed Residential Development off**
Location:	**Boston Road, Gosberton**
Client:	**Mr S. Grimston**
Project Ref:	**20117**
Prepared By:	**M.Pett**
Date:	**April 2020**
Doc Ref:	**20117-MD-01A**

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CONSULTING STRUCTURAL AND CIVIL ENGINEERS

15 High Street,
Spalding,
Lincs. PE11 1TW

Tel: 01775 712660
Fax: 01775 712635
Email: src@srcltd.com

Project: **Proposed Residential Development off Boston Road, Gosberton**

Calculation Summary:

The following calculations demonstrate the design of the full surface water drainage system serving the adoptable Highway and footpath and private dwelling roof water and driveways. The design proposals are shown on SRC drawing 20117/01.

The system has been designed for storms up to and including the 1:100yr +30% climate change event.

The surface water from driveways is proposed to be collected via a permeable block paving surface, i.e. a Type C system, however the following calculations have consider a traditional drainage system with no sub-base storage and reduced run-off time, therefore a worse-case scenario.

A ditch is proposed at the downstream end of the system, prior to the flow control chamber, and stores up to the 1:10 year event.

A storage pond (i.e. detention basin) has been modelled on PN1.004 at a level of 2.100 to attenuate water over the 1:10 year event up to and including the 1:100+CC event.

The proposed flow control is to limit discharge to a maximum of 5 litres / second.

The purpose of these calculation is to support the planning application and therefore they should not be used solely, for the detailed design/construction.

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Existing Network Details for Existing

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	n	HYD SECT	DIA (mm)	Section Type
SW1.000	18.000	0.110	163.6	0.076	5.00	0.0	0.600		o	225	Pipe/Conduit
SW1.001	14.404	0.085	170.0	0.014	0.00	0.0	0.600		o	225	Pipe/Conduit
SW1.002	17.345	0.105	165.2	0.025	0.00	0.0	0.600		o	225	Pipe/Conduit
SW1.003	39.097	0.010	3909.7	0.079	0.00	0.0		0.040	1.5 _/	1000	1:1.5 Ditch
SW2.000	22.500	0.090	250.0	0.112	5.00	0.0	0.600		o	300	Pipe/Conduit
SW2.001	18.387	0.075	245.2	0.089	0.00	0.0	0.600		o	300	Pipe/Conduit
SW2.002	26.270	0.105	250.0	0.069	0.00	0.0	0.600		o	300	Pipe/Conduit
SW3.000	24.000	0.160	150.0	0.051	5.00	0.0	0.600		o	150	Pipe/Conduit
SW2.003	30.376	0.125	243.0	0.018	0.00	0.0	0.600		o	300	Pipe/Conduit
SW1.004	24.105	0.005	4821.0	0.000	0.00	0.0		0.040	1.5 _/	1000	1:1.5 Ditch
SW1.005	5.968	0.020	300.0	0.000	0.00	0.0	0.600		o	375	Pipe/Conduit
SW1.006	14.982	0.100	149.8	0.000	0.00	0.0	0.600		o	150	Pipe/Conduit

Network Results Table

PN	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Vel (m/s)	Cap (l/s)
SW1.000	2.100	0.076	0.0	1.02	40.5
SW1.001	1.990	0.090	0.0	1.00	39.8
SW1.002	1.905	0.115	0.0	1.01	40.3
SW1.003	1.355	0.194	0.0	0.30	1071.5
SW2.000	1.845	0.112	0.0	0.99	70.0
SW2.001	1.755	0.202	0.0	1.00	70.7
SW2.002	1.680	0.271	0.0	0.99	70.0
SW3.000	1.885	0.051	0.0	0.82	14.5
SW2.003	1.575	0.340	0.0	1.00	71.0
SW1.004	1.345	0.534	0.0	0.27	982.1
SW1.005	1.340	0.534	0.0	1.04	115.0
SW1.006	1.320	0.534	0.0	0.82	14.5

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Manhole Schedules for Existing

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam.,L*W (mm)	Pipe Out PN	Pipe Out Invert Level (m)	Pipe Out Diameter (mm)	Pipes In PN	Pipes In Invert Level (m)	Pipes In Diameter (mm)	Backdrop (mm)
SW01	3.200	1.100	Open Manhole	1200	SW1.000	2.100	225				
SW02	3.050	1.060	Open Manhole	1200	SW1.001	1.990	225	SW1.000	1.990	225	
SW03	2.975	1.070	Open Manhole	1200	SW1.002	1.905	225	SW1.001	1.905	225	
SW04	2.600	1.245	Open Manhole	1200	SW1.003	1.355	1000	SW1.002	1.800	225	370
SW08	3.050	1.205	Open Manhole	1200	SW2.000	1.845	300				
SW09	2.925	1.170	Open Manhole	1200	SW2.001	1.755	300	SW2.000	1.755	300	
SW10	2.800	1.120	Open Manhole	1200	SW2.002	1.680	300	SW2.001	1.680	300	
SW12	2.850	0.965	Open Manhole	1200	SW3.000	1.885	150				
SW11	2.650	1.075	Open Manhole	1200	SW2.003	1.575	300	SW2.002	1.575	300	
								SW3.000	1.725	150	
SW05	2.600	1.255	Open Manhole	1200	SW1.004	1.345	1000	SW1.003	1.345	1000	
								SW2.003	1.450	300	105
SW06	2.600	1.260	Open Manhole	1200	SW1.005	1.340	375	SW1.004	1.340	1000	
SW07	2.600	1.280	Open Manhole	1200	SW1.006	1.320	150	SW1.005	1.320	375	
SW	2.500	1.280	Open Manhole	0		OUTFALL		SW1.006	1.220	150	

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
SW01	524512220.025	331784903.819	524512220.025	331784903.819	Required	
SW02	524512202.646	331784908.505	524512202.646	331784908.505	Required	
SW03	524512188.250	331784908.986	524512188.250	331784908.986	Required	
SW04	524512190.814	331784926.140	524512190.814	331784926.140	Required	
SW08	524512099.472	331784862.731	524512099.472	331784862.731	Required	
SW09	524512108.605	331784883.294	524512108.605	331784883.294	Required	
SW10	524512121.418	331784896.482	524512121.418	331784896.482	Required	

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Manhole Schedules for Existing

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
SW12	524512170.076	331784907.472	524512170.076	331784907.472	Required	
SW11	524512146.179	331784905.256	524512146.179	331784905.256	Required	
SW05	524512152.716	331784934.921	524512152.716	331784934.921	Required	
SW06	524512129.133	331784939.908	524512129.133	331784939.908	Required	
SW07	524512124.276	331784936.439	524512124.276	331784936.439	Required	
SW	524512117.604	331784949.853			No Entry	

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PIPELINE SCHEDULES for Existing

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)
SW1.000	o	225	SW01	3.200	2.100	0.875	Open Manhole	1200
SW1.001	o	225	SW02	3.050	1.990	0.835	Open Manhole	1200
SW1.002	o	225	SW03	2.975	1.905	0.845	Open Manhole	1200
SW1.003	1.5 _/	1000	SW04	2.600	1.355	0.945	Open Manhole	1200
SW2.000	o	300	SW08	3.050	1.845	0.905	Open Manhole	1200
SW2.001	o	300	SW09	2.925	1.755	0.870	Open Manhole	1200
SW2.002	o	300	SW10	2.800	1.680	0.820	Open Manhole	1200
SW3.000	o	150	SW12	2.850	1.885	0.815	Open Manhole	1200
SW2.003	o	300	SW11	2.650	1.575	0.775	Open Manhole	1200
SW1.004	1.5 _/	1000	SW05	2.600	1.345	0.955	Open Manhole	1200
SW1.005	o	375	SW06	2.600	1.340	0.885	Open Manhole	1200
SW1.006	o	150	SW07	2.600	1.320	1.130	Open Manhole	1200

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)
SW1.000	18.000	163.6	SW02	3.050	1.990	0.835	Open Manhole	1200
SW1.001	14.404	170.0	SW03	2.975	1.905	0.845	Open Manhole	1200
SW1.002	17.345	165.2	SW04	2.600	1.800	0.575	Open Manhole	1200
SW1.003	39.097	3909.7	SW05	2.600	1.345	0.955	Open Manhole	1200
SW2.000	22.500	250.0	SW09	2.925	1.755	0.870	Open Manhole	1200
SW2.001	18.387	245.2	SW10	2.800	1.680	0.820	Open Manhole	1200
SW2.002	26.270	250.0	SW11	2.650	1.575	0.775	Open Manhole	1200
SW3.000	24.000	150.0	SW11	2.650	1.725	0.775	Open Manhole	1200
SW2.003	30.376	243.0	SW05	2.600	1.450	0.850	Open Manhole	1200
SW1.004	24.105	4821.0	SW06	2.600	1.340	0.960	Open Manhole	1200
SW1.005	5.968	300.0	SW07	2.600	1.320	0.905	Open Manhole	1200
SW1.006	14.982	149.8	SW	2.500	1.220	1.130	Open Manhole	0

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Area Summary for Existing

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
1.000	User	-	100	0.009	0.009	0.009
	User	-	100	0.012	0.012	0.021
	User	-	100	0.031	0.031	0.053
	User	-	100	0.010	0.010	0.062
	User	-	100	0.014	0.014	0.076
1.001	User	-	100	0.014	0.014	0.014
1.002	User	-	100	0.025	0.025	0.025
1.003	User	-	100	0.032	0.032	0.032
	User	-	100	0.047	0.047	0.079
2.000	User	-	100	0.020	0.020	0.020
	User	-	100	0.027	0.027	0.047
	User	-	100	0.023	0.023	0.070
	User	-	100	0.022	0.022	0.092
	User	-	100	0.020	0.020	0.112
2.001	User	-	100	0.024	0.024	0.024
	User	-	100	0.025	0.025	0.049
	User	-	100	0.021	0.021	0.070
	User	-	100	0.020	0.020	0.089
2.002	User	-	100	0.025	0.025	0.025
	User	-	100	0.017	0.017	0.041
	User	-	100	0.028	0.028	0.069
3.000	User	-	100	0.018	0.018	0.018
	User	-	100	0.017	0.017	0.034
	User	-	100	0.017	0.017	0.051
2.003	User	-	100	0.018	0.018	0.018
1.004	-	-	100	0.000	0.000	0.000
1.005	-	-	100	0.000	0.000	0.000
1.006	-	-	100	0.000	0.000	0.000
				Total	Total	Total
				0.534	0.534	0.534

Free Flowing Outfall Details for Existing

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
SW1.006	SW	2.500	1.220	1.220	0	0

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Simulation Criteria for Existing

Volumetric Runoff Coeff	0.750	Additional Flow - % of Total Flow	0.000
Areal Reduction Factor	1.000	MADD Factor * 10m³/ha Storage	0.000
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	1
Number of Online Controls	1	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Summer
Return Period (years)	2	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	19.000	Storm Duration (mins)	30
Ratio R	0.400		

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Online Controls for Existing

Hydro-Brake® Optimum Manhole: SW07, DS/PN: SW1.006, Volume (m³): 2.0

Unit Reference	MD-SHE-0097-5000-1600-5000
Design Head (m)	1.600
Design Flow (l/s)	5.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	97
Invert Level (m)	1.320
Minimum Outlet Pipe Diameter (mm)	150
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.600	5.0
Flush-Flo™	0.425	4.7
Kick-Flo®	0.865	3.8
Mean Flow over Head Range	-	4.2

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	3.1	1.200	4.4	3.000	6.7	7.000	10.0
0.200	4.3	1.400	4.7	3.500	7.2	7.500	10.3
0.300	4.6	1.600	5.0	4.000	7.7	8.000	10.7
0.400	4.7	1.800	5.3	4.500	8.1	8.500	11.0
0.500	4.7	2.000	5.5	5.000	8.5	9.000	11.3
0.600	4.6	2.200	5.8	5.500	8.9	9.500	11.6
0.800	4.1	2.400	6.0	6.000	9.3		
1.000	4.0	2.600	6.3	6.500	9.7		

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Storage Structures for Existing

Tank or Pond Manhole: SW05, DS/PN: SW1.004

Invert Level (m) 2.100

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	980.0	0.500	1115.0

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

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	0.000
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	1
Number of Online Controls	1	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 0.400
Region	England and Wales	Cv (Summer)	0.750
M5-60 (mm)	19.000	Cv (Winter)	0.840

Margin for Flood Risk Warning (mm)	450.0
Analysis Timestep	2.5 Second Increment (Extended)
DTS Status	OFF
DVD Status	ON
Inertia Status	ON

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 240, 360, 480, 960, 1440
Return Period(s) (years)	1, 2, 10, 30, 100
Climate Change (%)	0, 0, 0, 0, 30

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.
SW1.000	SW01	15 Winter	1	+0%	100/15 Summer			
SW1.001	SW02	15 Winter	1	+0%	100/15 Summer			
SW1.002	SW03	15 Winter	1	+0%	30/120 Winter			
SW1.003	SW04	120 Winter	1	+0%				
SW2.000	SW08	15 Winter	1	+0%	10/15 Winter			
SW2.001	SW09	15 Winter	1	+0%	10/15 Winter	100/15 Summer		
SW2.002	SW10	15 Winter	1	+0%	10/15 Summer	100/15 Summer		
SW3.000	SW12	15 Winter	1	+0%	10/30 Winter			
SW2.003	SW11	120 Winter	1	+0%	2/60 Winter			
SW1.004	SW05	120 Winter	1	+0%				
SW1.005	SW06	120 Winter	1	+0%	1/15 Winter			
SW1.006	SW07	120 Winter	1	+0%	1/15 Summer			

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
SW1.000	SW01	2.181	-0.144	0.000	0.27		9.9	OK	

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

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
SW1.001	SW02	2.080	-0.135	0.000	0.33		11.5	OK	
SW1.002	SW03	2.003	-0.127	0.000	0.40		14.3	OK	
SW1.003	SW04	1.821	-0.779	0.000	0.00		8.2	OK	
SW2.000	SW08	1.947	-0.198	0.000	0.23		14.5	OK	
SW2.001	SW09	1.888	-0.167	0.000	0.40		24.3	OK	4
SW2.002	SW10	1.831	-0.149	0.000	0.50		31.3	OK	4
SW3.000	SW12	1.960	-0.075	0.000	0.48		6.6	OK	
SW2.003	SW11	1.824	-0.051	0.000	0.22		14.1	OK	
SW1.004	SW05	1.821	-0.779	0.000	0.01		11.3	OK	
SW1.005	SW06	1.822	0.107	0.000	0.07		5.2	SURCHARGED	
SW1.006	SW07	1.842	0.372	0.000	0.35		4.7	SURCHARGED	

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

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	0.000
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	1
Number of Online Controls	1	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	0.400
Region	England and Wales	Cv (Summer)	0.750
M5-60 (mm)	19.000	Cv (Winter)	0.840

Margin for Flood Risk Warning (mm)	450.0
Analysis Timestep	2.5 Second Increment (Extended)
DTS Status	OFF
DVD Status	ON
Inertia Status	ON

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 240, 360, 480, 960, 1440
Return Period(s) (years)	1, 2, 10, 30, 100
Climate Change (%)	0, 0, 0, 0, 30

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.
SW1.000	SW01	15 Winter	2	+0%	100/15 Summer			
SW1.001	SW02	15 Winter	2	+0%	100/15 Summer			
SW1.002	SW03	15 Winter	2	+0%	30/120 Winter			
SW1.003	SW04	120 Winter	2	+0%				
SW2.000	SW08	15 Winter	2	+0%	10/15 Winter			
SW2.001	SW09	120 Winter	2	+0%	10/15 Winter	100/15 Summer		
SW2.002	SW10	120 Winter	2	+0%	10/15 Summer	100/15 Summer		
SW3.000	SW12	15 Winter	2	+0%	10/30 Winter			
SW2.003	SW11	120 Winter	2	+0%	2/60 Winter			
SW1.004	SW05	120 Winter	2	+0%				
SW1.005	SW06	120 Winter	2	+0%	1/15 Winter			
SW1.006	SW07	60 Winter	2	+0%	1/15 Summer			

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
SW1.000	SW01	2.193	-0.132	0.000	0.35		12.8	OK	

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

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
SW1.001	SW02	2.094	-0.121	0.000	0.43		14.8	OK	
SW1.002	SW03	2.019	-0.111	0.000	0.51		18.4	OK	
SW1.003	SW04	1.915	-0.685	0.000	0.01		10.2	OK	
SW2.000	SW08	1.965	-0.180	0.000	0.30		18.7	OK	
SW2.001	SW09	1.923	-0.132	0.000	0.18		10.9	OK	4
SW2.002	SW10	1.921	-0.059	0.000	0.23		14.3	OK	4
SW3.000	SW12	1.972	-0.063	0.000	0.62		8.5	OK	
SW2.003	SW11	1.919	0.044	0.000	0.26		16.6	SURCHARGED	
SW1.004	SW05	1.915	-0.685	0.000	0.01		12.7	OK	
SW1.005	SW06	1.914	0.199	0.000	0.07		5.5	SURCHARGED	
SW1.006	SW07	1.937	0.467	0.000	0.35		4.7	SURCHARGED	

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

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	0.000
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	1
Number of Online Controls	1	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 0.400
Region	England and Wales	Cv (Summer)	0.750
M5-60 (mm)	19.000	Cv (Winter)	0.840

Margin for Flood Risk Warning (mm)	450.0
Analysis Timestep	2.5 Second Increment (Extended)
DTS Status	OFF
DVD Status	ON
Inertia Status	ON

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 240, 360, 480, 960, 1440
Return Period(s) (years)	1, 2, 10, 30, 100
Climate Change (%)	0, 0, 0, 0, 30

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.
SW1.000	SW01	15 Winter	10	+0%	100/15 Summer			
SW1.001	SW02	15 Winter	10	+0%	100/15 Summer			
SW1.002	SW03	120 Winter	10	+0%	30/120 Winter			
SW1.003	SW04	120 Winter	10	+0%				
SW2.000	SW08	15 Winter	10	+0%	10/15 Winter			
SW2.001	SW09	60 Winter	10	+0%	10/15 Winter	100/15 Summer		
SW2.002	SW10	60 Winter	10	+0%	10/15 Summer	100/15 Summer		
SW3.000	SW12	120 Winter	10	+0%	10/30 Winter			
SW2.003	SW11	120 Winter	10	+0%	2/60 Winter			
SW1.004	SW05	120 Winter	10	+0%				
SW1.005	SW06	120 Winter	10	+0%	1/15 Winter			
SW1.006	SW07	240 Winter	10	+0%	1/15 Summer			

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
SW1.000	SW01	2.218	-0.107	0.000	0.53		19.2	OK	

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

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
SW1.001	SW02	2.125	-0.090	0.000	0.65		22.8	OK	
SW1.002	SW03	2.107	-0.023	0.000	0.26		9.2	OK	
SW1.003	SW04	2.104	-0.496	0.000	0.01		15.1	OK	
SW2.000	SW08	2.159	0.014	0.000	0.44		27.2	SURCHARGED	
SW2.001	SW09	2.137	0.082	0.000	0.40		24.3	SURCHARGED	4
SW2.002	SW10	2.121	0.141	0.000	0.50		31.1	SURCHARGED	4
SW3.000	SW12	2.113	0.078	0.000	0.30		4.1	SURCHARGED	
SW2.003	SW11	2.109	0.234	0.000	0.36		22.9	SURCHARGED	
SW1.004	SW05	2.104	-0.496	0.000	0.01		17.0	OK	
SW1.005	SW06	2.105	0.390	0.000	0.07		5.5	SURCHARGED	
SW1.006	SW07	2.124	0.654	0.000	0.35		4.7	SURCHARGED	

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

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	0.000
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	1
Number of Online Controls	1	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 0.400
Region	England and Wales	Cv (Summer)	0.750
M5-60 (mm)	19.000	Cv (Winter)	0.840

Margin for Flood Risk Warning (mm)	450.0
Analysis Timestep	2.5 Second Increment (Extended)
DTS Status	OFF
DVD Status	ON
Inertia Status	ON

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 240, 360, 480, 960, 1440
Return Period(s) (years)	1, 2, 10, 30, 100
Climate Change (%)	0, 0, 0, 0, 30

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.
SW1.000	SW01	15 Winter	30	+0%	100/15 Summer			
SW1.001	SW02	15 Winter	30	+0%	100/15 Summer			
SW1.002	SW03	120 Winter	30	+0%	30/120 Winter			
SW1.003	SW04	240 Winter	30	+0%				
SW2.000	SW08	15 Winter	30	+0%	10/15 Winter			
SW2.001	SW09	60 Winter	30	+0%	10/15 Winter	100/15 Summer		
SW2.002	SW10	60 Winter	30	+0%	10/15 Summer	100/15 Summer		
SW3.000	SW12	15 Winter	30	+0%	10/30 Winter			
SW2.003	SW11	60 Winter	30	+0%	2/60 Winter			
SW1.004	SW05	240 Winter	30	+0%				
SW1.005	SW06	120 Winter	30	+0%	1/15 Winter			
SW1.006	SW07	120 Winter	30	+0%	1/15 Summer			

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
SW1.000	SW01	2.237	-0.088	0.000	0.67		24.3	OK	

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

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
SW1.001	SW02	2.151	-0.064	0.000	0.82		28.5	OK	
SW1.002	SW03	2.138	0.008	0.000	0.33		11.8	SURCHARGED	
SW1.003	SW04	2.135	-0.465	0.000	0.01		11.1	OK	
SW2.000	SW08	2.376	0.231	0.000	0.53		33.0	SURCHARGED	
SW2.001	SW09	2.309	0.254	0.000	0.52		31.6	SURCHARGED	4
SW2.002	SW10	2.271	0.291	0.000	0.67		41.8	SURCHARGED	4
SW3.000	SW12	2.231	0.196	0.000	1.05		14.4	SURCHARGED	
SW2.003	SW11	2.192	0.317	0.000	0.79		51.3	SURCHARGED	
SW1.004	SW05	2.135	-0.465	0.000	0.01		14.3	OK	
SW1.005	SW06	2.135	0.420	0.000	0.07		5.5	SURCHARGED	
SW1.006	SW07	2.159	0.689	0.000	0.35		4.7	FLOOD RISK	

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

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	0.000
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	1
Number of Online Controls	1	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 0.400
Region	England and Wales	Cv (Summer)	0.750
M5-60 (mm)	19.000	Cv (Winter)	0.840

Margin for Flood Risk Warning (mm)	450.0
Analysis Timestep	2.5 Second Increment (Extended)
DTS Status	OFF
DVD Status	ON
Inertia Status	ON

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 240, 360, 480, 960, 1440
Return Period(s) (years)	1, 2, 10, 30, 100
Climate Change (%)	0, 0, 0, 0, 30

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.
SW1.000	SW01	15 Winter	100	+30%	100/15 Summer			
SW1.001	SW02	15 Winter	100	+30%	100/15 Summer			
SW1.002	SW03	15 Winter	100	+30%	30/120 Winter			
SW1.003	SW04	240 Winter	100	+30%				
SW2.000	SW08	15 Winter	100	+30%	10/15 Winter			
SW2.001	SW09	15 Winter	100	+30%	10/15 Winter	100/15 Summer		
SW2.002	SW10	30 Winter	100	+30%	10/15 Summer	100/15 Summer		
SW3.000	SW12	15 Winter	100	+30%	10/30 Winter			
SW2.003	SW11	30 Winter	100	+30%	2/60 Winter			
SW1.004	SW05	240 Winter	100	+30%				
SW1.005	SW06	240 Winter	100	+30%	1/15 Winter			
SW1.006	SW07	240 Winter	100	+30%	1/15 Summer			

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
SW1.000	SW01	2.597	0.272	0.000	1.10		39.9	SURCHARGED	

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

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
SW1.001	SW02	2.461	0.246	0.000	1.35		46.9	SURCHARGED	
SW1.002	SW03	2.303	0.173	0.000	1.64		59.0	SURCHARGED	
SW1.003	SW04	2.245	-0.355	0.000	0.01		19.9	FLOOD RISK	
SW2.000	SW08	3.016	0.871	0.000	0.96		59.3	FLOOD RISK	
SW2.001	SW09	2.928	0.873	3.110	1.40		85.6	FLOOD	4
SW2.002	SW10	2.801	0.821	0.835	1.63		102.2	FLOOD	4
SW3.000	SW12	2.846	0.811	0.000	1.50		20.6	FLOOD RISK	
SW2.003	SW11	2.557	0.682	0.000	1.95		126.1	FLOOD RISK	
SW1.004	SW05	2.245	-0.355	0.000	0.02		19.7	FLOOD RISK	
SW1.005	SW06	2.244	0.529	0.000	0.07		5.3	FLOOD RISK	
SW1.006	SW07	2.269	0.799	0.000	0.35		4.7	FLOOD RISK	

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SIDEBOTTOM RICHARDSON CHENG LTD
CONSULTING STRUCTURAL AND CIVIL ENGINEERS
15 High Street,
Spalding,
Lincs. PE11 1TW
Tel: 01775 712660
Fax: 01775 712635
Email: src@srcltd.com

APPENDIX F – Supplementary Ground Investigation Report

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SIDEBOTTOM
RICHARDSON
CHENG LTD
CONSULTING STRUCTURAL AND CIVIL ENGINEERS

15 High Street,
Spalding,
Lincs. PE11 1TW

Tel: 01775 712660
Fax: 01775 712635
Email: src@srcltd.com

SUPPLEMENTARY GROUND INVESTIGATION REPORT

PROPOSED RESIDENTIAL DEVELOPMENT

BOSTON ROAD

GOSBERTON

SPALDING

LINCOLNSHIRE

PE11 4NR

Mr S. Grimston
c/o Oglesby & Limb
Suite 1, 12 Market Place
Spalding
Lincolnshire
PE11 1SL

SUPPLEMENTARY GROUND INVESTIGATION REPORT

PROPOSED RESIDENTIAL DEVELOPMENT

BOSTON ROAD

GOSBERTON

SPALDING

LINCOLNSHIRE

PE11 4NR

REF: 20117 **APRIL 2020**

INTRODUCTION

Acting upon instruction from Mr S. Grimston, we re-visited the site on the 6th April 2020, with a view to determining the basic characteristics of the soils strata, and ground water levels.

Three Hand Auger Boreholes were undertaken, and our comments are based upon a visual inspection only of the disturbed samples obtained.

We would suggest that groundwater conditions may vary seasonally and that recorded water levels should not necessarily be taken as constant as they may be subject to fluctuation.

The opinions and comments expressed in this report are based upon ground conditions encountered in the boreholes sunk at the time of our visit.

LOCATION & BRIEF DESCRIPTION OF THE SITE

Situated on the West side of Boston Road, Gosberton, approximate National Grid Reference TF 245 318, the site is situated along Boston Road with limited vehicular access at this present time.

Numerous small trees are present within the site, all of which are to be removed as part of the development.

The Site is bound by a watercourse maintained by Welland and Deepings IDB to the North, Boston Road (B1397) to the East, a footpath/track and residential dwellings to the South and a riparian watercourse to the West.

The site is largely 'greenfield', however, an existing agricultural building occupies a small area of the site, which is to be demolished.

The topographical survey indicates that the site is generally flat, with ground levels between 2.300 AOD & 2.600 AOD. The level of Boston Road is approximately 3.300 AOD.

GROUNDWORKS UNDERTAKEN

Three hand auger boreholes were undertaken in the approximate location shown on attached drawing No.d 20117/SK01.

A visual inspection of the disturbed samples took place, the details of which are reproduced on sheets No.d 20117/BH01, BH02 + BH03.

Ground water levels were recorded and are shown on the respective borehole log, upon completion of the augering and 60 minutes after completion.

CONCLUSIONS

The location of boreholes took place in the region of the proposed LCC adopted roadway, since the ground water levels need to be taken into account with respect to highway and drainage design.

It is clear the strata is constant across the site being firm clayey silt below the topsoil, extending to a depth of 0.6m below the surface.

At this depth stiff silty/sandy clay was encountered, to a depth of 0.9m below the surface, where stiff reddy brown clay was found.

At a depth of 1.4m below the surface a layer of immediately wet/saturated loose sandy silt was encountered extending to a depth of 1.8m.

Thereafter the strata reverted to clayey silt, becoming stiff silty clay.

Augering was terminated at a depth of 2.5m below the surface, due to suction within the clay strata.

The upper clay strata remains relatively moist. However, once the sandy silt layer is penetrated at the approximate of 1.100 Above Ordnance Datum the water level rose to a level of 1.200 AOD.

5.

Supplementary Ground Investigation Report / 20117

Mr S. Grimston

RECOMMENDATIONS

A further geotechnical ground investigation report is required to specifically address the requirements for highway design.

However, it is anticipated maximum construction depth of 880mm will be needed to comply with roadway design.

Nevertheless, the depth of excavation for roadway construction will not extend into the water laden strata.

The recorded ground water levels will not allow the requirements of the "Lincolnshire County Council Development Road and Sustainable Drainage Specification and Construction" to be adhered to.

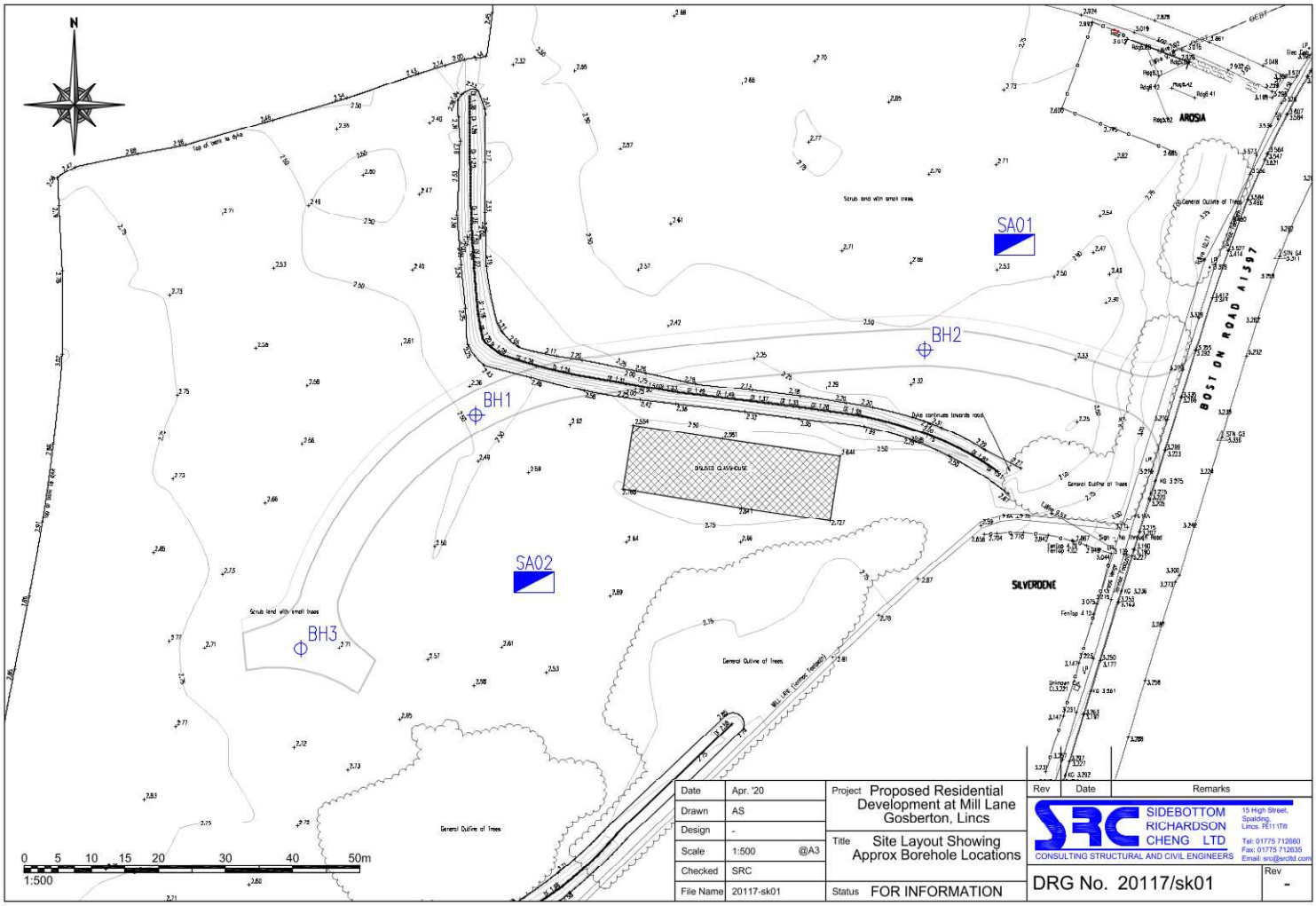
Please refer to extracts from pages 78 and 81 of the above document.

Consequently a surface water drainage system utilizing gullies and below ground pipework will need to be incorporated.

For and on behalf of **SIDEBOTTOM RICHARDSON CHENG LTD**

J.A. RICHARDSON I Eng. AMIStructE **APRIL 2020**

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Date	Apr. '20	Project	Proposed Residential Development at Mill Lane Gosberton, Lincs
Drawn	AS		
Design	-		
Scale	1:500 @A3	Title	Site Layout Showing Approx Borehole Locations
Checked	SRC		
File Name	20117-sk01	Status	FOR INFORMATION

Rev	Date	Remarks

SIDEBOTTOM RICHARDSON CHENG LTD
CONSULTING STRUCTURAL AND CIVIL ENGINEERS
15 High Street, Spalding, Lincs. PE11 1TW
Tel: 01775 712660
Fax: 01775 712635
Email: src@srcltd.com

DRG No. 20117/sk01 Rev -

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CONSULTING STRUCTURAL AND CIVIL ENGINEERS
15 High Street, Spalding, Lincs. PE11 1TW
Tel: 01775 712660
Fax: 01775 712635
Email: src@srcltd.com

Sheet No. 20117/BH01					Rev -
Status FOR INFORMATION					
Date	Apr. '20	Drawn	AS	Checked	SRC
Scale	1:20	Design	-	File Name	20117-BH01

Location: Proposed Residential Development at Mill Lane, Gosberton, Lincs

Carried Out For: Mr S Grimstom

Date Undertaken: April 2020

Logged By: JAR

Equipment & Methods
100mmø HandAuger

Site Coordinates: E:524503 N:331847

Ground Level: 2.50

Borehole No. 1

Description	Reduced Level	Legend	Depth (Thick)	Samples: Depth	Samples: Sample Reference	Samples: Sample Type	Samples: Sample No.	Test Required	M.P.T. Blow Count (Depth)
Grass/Topsoil.	+2.200		300mm (300mm)						
Moist Firm Mid-Brown Slightly Clayey Silt.	+1.900		600mm (300mm)						
Moist Stiff Brown Silty/Sandy Clay With Rootlets Up To 10mm Dia.	+1.600		900mm (300mm)						
Moist Stiff Slightly Reddy/Brown Silty Clay.	+1.100		1400mm (500mm)						
Immediately Wet/Saturated Mid-Brown Sandy Silt.	+0.700		1800mm (400mm)						
Saturated Grey/Brown Soft Slightly Clayey Silt.	+0.400		2100mm (300mm)						
Saturated Stiff Becoming Soft, Grey With Black Inclusions Silty Clay.	±0.000		2500mm (400mm)						

Remarks
Borehole Terminated @ 2.5m Deep Due To Suction.
Water Recorded @ 1.8m Deep Immediately After Completion.
Water Level Rose to 1.3m Deep After 1 Hour (Approx Level = 1.200).

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CONSULTING STRUCTURAL AND CIVIL ENGINEERS
15 High Street, Spalding, Lincs. PE11 1TW
Tel: 01775 712660
Fax: 01775 712635
Email: src@srcltd.com

Sheet No. 20117/BH02					Rev -
Status FOR INFORMATION					
Date	Apr. '20	Drawn	AS	Checked	SRC
Scale	1:20	Design	-	File Name	20117-BH02

Location: Proposed Residential Development at Mill Lane, Gosberton, Lincs

Carried Out For: Mr S Grimstom

Date Undertaken: April 2020

Logged By: JAR

Equipment & Methods
100mmø HandAuger

Site Coordinates: E:524570 N:331857

Ground Level: 2.45

Borehole No. 2

Description	Reduced Level	Legend	Depth (Thick)	Samples: Depth	Samples: Sample Reference	Samples: Sample Type	Samples: Sample No.	Test Required	M.P.T. Blow Count (Depth)
Grass/Topsoil.	+2.150		300mm (300mm)						
Moist Firm Mid-Brown Slightly Clayey Silt.	+1.750		700mm (400mm)						
Moist Stiff Brown Silty/Sandy Clay With Rootlets Up To 10mm Dia.	+1.500		950mm (250mm)						
Moist Stiff Slightly Reddy/Brown Silty Clay.	+1.050		1400mm (450mm)						
Immediately Wet/Saturated Mid-Brown Sandy Silt.	+0.650		1800mm (400mm)						
Saturated Grey/Brown Soft Slightly Clayey Silt.	+0.350		2100mm (300mm)						
Saturated Stiff Becoming Soft, Grey With Black Inclusions Silty Clay.	-0.050		2500mm (400mm)						

Remarks
Borehole Terminated @ 2.5m Deep Due To Suction.
Water Recorded @ 1.8m Deep Immediately After Completion.
Water Level Rose to 1.3m Deep After 1 Hour (Approx Level = 1.200).

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CONSULTING STRUCTURAL AND CIVIL ENGINEERS
15 High Street, Spalding, Lincs. PE11 1TW
Tel: 01775 712660
Fax: 01775 712635
Email: src@srcltd.com

Sheet No.	20117/BH03			Rev	-
Status	FOR INFORMATION				
Date	Apr. '20	Drawn	AS	Checked	SRC
Scale	1:20	Design	-	File Name	20117-BH03

Location: Proposed Residential Development at Mill Lane, Gosberton, Lincs

Carried Out For: Mr S Grimstom

Date Undertaken: April 2020

Logged By: JAR

Equipment & Methods
100mmø HandAuger

Site Coordinates: E:524476 N:331812

Ground Level: 2.70

Borehole No. 3

Description	Reduced Level	Legend	Depth (Thick)	Samples: Depth	Samples: Sample Reference	Samples: Sample Type	Samples: Sample No.	Test Required	M.P.T. Blow Count (Depth)
Grass/Topsoil.	+2.400		300mm (300mm)						
Moist Firm Mid-Brown Slightly Clayey Silt.	+1.900		800mm (500mm)						
Moist Stiff Brown Silty/Sandy Clay With Rootlets Up To 10mm Dia.	+1.700		1000mm (200mm)						
Moist Stiff Slightly Reddy/Brown Silty Clay.	+1.200		1500mm (500mm)						
Immediately Wet/Saturated Mid-Brown Sandy Silt.	+0.800		1900mm (400mm)						
Saturated Grey/Brown Soft Slightly Clayey Silt.	+0.500		2200mm (300mm)						
Saturated Stiff Becoming Soft, Grey With Black Inclusions Silty Clay.	+0.100		2500mm (400mm)						

Remarks
Borehole Terminated @ 2.5m Deep Due To Suction.
Water Recorded @ 1.9m Deep Immediately After Completion.
Water Level Rose to 1.5m Deep After 1 Hour (Approx Level = 1.200).

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