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architecture : engineering : building consultancy















□RO□OSED RESIDENTIAL DE□ELO□MENT

SMALL DRO□E, WESTON

DRAINA□ E STRATE□ □

11□□□□12 RE□ C

□UNE 2□1□

DOCUMENT CONTROL

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Co□□ra□□□ Residential Development, Small Drove, Weston

Do□□me□□T□□e□ Drainage Strategy

O□r Re□ CM/KW/11505/12.0

□re□ared □□□ C. Melton EngTech MICE MCIHT MIHE **Da□e□** June 2018

RECORD OF AMENDMENTS TO DOCUMENT

Re□	**De□□r□□□o□**	**Da□e**
Rev A	Site layout updated, drainage layout updated, flood data in report updated.	20/04/2018
Rev B	Amendments to drainage strategy for Highway surface water	29/06/2018
Rev C	Updated Pre-Planning en□uiry response from Anglian Water attached.	20/08/2018

□er□□ed □□□ A.C. Gibson BEng CEng MICE MCIHT **Da□e□** June 2018

William Saunders is the trading name of Wm. Saunders Partnership Limited Liability Partnership which is registered in England and Wales (Registration Number OC308323). The Registered Office is Sheppard Lockton House, Cafferata Way, Newark on Trent, Nottinghamshire. NG24 2TN. The Partners are the Members of the LLP.

C O N T E N T S

1.0 **INTRODUCTION**

2.0 **□RO□OSED DE□ELO□MENT**

3. □ **DRAINA□ E STRATE□ □**

4□□ **CONCLUSIONS**

A□□ENDICES

App endix A **□ermea□ □□□□ Te**sting **Re□□□□**

A□□e□d□ B **□ro□o□ed S□e La□o□□**

App endix C **Ca□□□a□o□□**

A□□e□d□ D **A□□□a□ Wa□er** Pre-P **□a**nning **E□□□r□**

App endix E **□ro□o□ed Dra□a□e La□o□□**

1 INTRODUCTION

William Saunders have been commissioned by South Holland District Council to prepare a Drainage Strategy for the proposed residential development at Small Drove, Weston. The document is to support a planning application for the development.

2□ □RO□OSED DE□ELO□MENT

2.1 SITE LOCATION AND DESCRIPTION

The development site is located off Small Drove, Weston near Spalding. Its National Grid Reference is 529272 / 324829 (see figure 1 below).

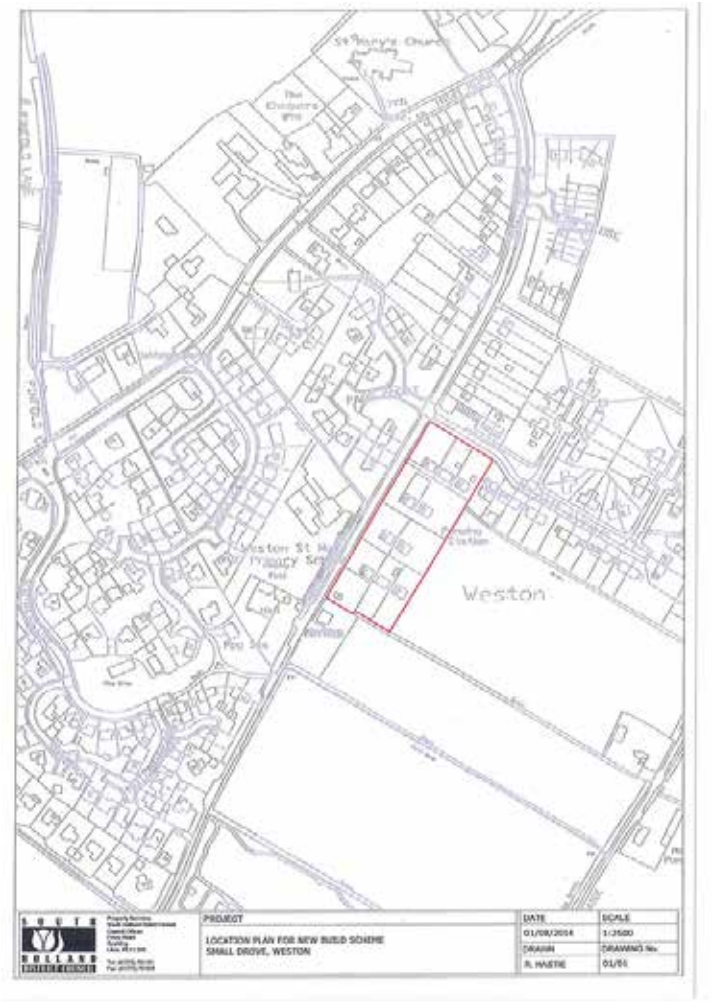

Figure 1 □Location Plan from SKDC.

The existing site comprises 10 no bungalows, with surrounding garden areas. Pedestrian and vehicular access to the site access is available directly from Small Drove. The site has an area of approximately 8400m^2 / 0.84ha.

The proposed development is located in an area identified by the EA at risk of flooding from fluvial, tidal or any natural or artificial water bodies, and the site is within Flood □one 3.

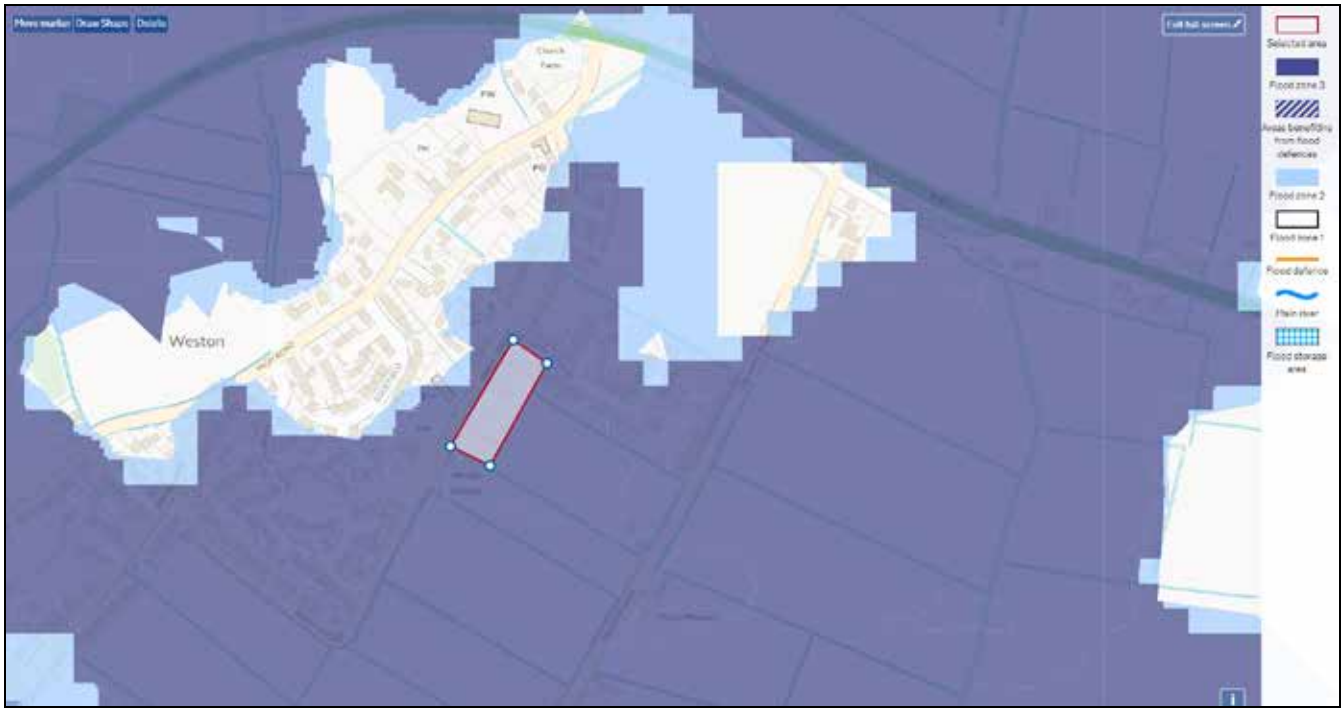

Figure 2 □Gov.uk / Environment Agency Flood Map for Planning



Figure 3 □Gov.uk / Environment Agency Surface Water Flood Map

2.2 DEVELOPMENT PROPOSALS

It is proposed to develop the site with 35no. residential units with highway access coming from Small Drove. An indicative site layout is shown at Appendix C.

3□ DRAINA□ E STRATE□ □

3.1 FOUL DRAINAGE

The Pre-Development En□uiry confirms the discharge locations and that there is sufficient capacity within the network. Anglian Water records indicate there are a number of 150mm foul sewers located to the west and east of the site with one running through the site. The existing manholes of these sewers could be used for connection points. Existing Anglian Water foul sewers will re□uire a 3.0m easement either side of the centre line of the sewer.

3.2 SURFACE WATER DRAINAGE

In accordance with re□uirement H3 of the Building Regulations 2000 all possible options for disposal of surface water have been considered using the preferred hierarchy i.e.

- Soakaways
- Infiltration
- Watercourse
- Sewer

Based on the results of Permeability Testing carried out on the site on the 24th November 2016 by Solmek, the ground conditions are considered suitable for infiltration. The Permeability Testing results can be found in Appendix B. During the permeability testing an existing soakaway was located which indicates that the existing buildings are drained via soakaways.

Soakaways should be located 5 metres away from any building and the Highway. It is proposed to use permeable paving for the private parking areas. Roof water is to be discharged to the ground via infiltration through soakaways.

Through consultation with the Highway Authority, due to the poor CBR values (between 0.1□ and 2.6□ CBR) in the underlying strata, the existing ground conditions do not meet the re□uired standard within the Lincolnshire Development Road Specification. Also due to the density of the development, there is not ade□uate space for above ground SUDs features such as swale or infiltration trenches. Therefore, for the adoptable highway areas it is proposed to utilise a traditional pipe and gully highway drainage system with allowance for attenuation and flow control to an agreed discharge rate.

There are two options available for the discharge of highway surface water; watercourse/ditch system to the east or an existing highway surface water system running along the western

frontage of the site in the footway of Small Drove. The final connection point is to be determined and agreed with the receiving body (IDB, LLFA and/or Highway Authority) and is subject to suitable connection levels and access to make a connection.

3.3 PRELIMINARY SOAKAWAY SI□ING

Taking the worst-case infiltration result from the permeability testing, 2.22E-06, and a typical roof size of 90s□m for a semi-detached property. A trench soakaway at 1.0m in width will need to be 10.15m x 1.0m deep.

3.4 ATTENUATION VOLUMES

The preliminary calculated volumes of storage re□uired are summarised in Table 1. These should be confirmed during detailed design. They are based on an impermeable area of 0.115ha which is for the adoptable highway areas with climate change allowed for in accordance with the re□uirements of Table 2 of the NPPF-PPG.

Storm Return Period	1	30	100 (□30□ CC)
Attenuation Storage Re□uired (m^3)	2.3 □6.6	14 □24	31 - 49

Table 1 □Attenuation Storage

Attenuation will be provided within the network for the 1 in 30-year return period with consideration for additional attenuation volumes within the network to minimise flooding to an acceptable level for the 1 in 100 year (□climate change) return period.

3.5 DRAINAGE STRATEGY

In order to reduce the run off from the developed site and accommodate future climate change, the detailed design of the surface water drainage system will need to include the following: -

- Sustainable Drainage Systems
  - Drainage elements such as water butts, permeable paving etc. to ensure reduction of volume and rate of run off and improvement of water □uality prior to discharge.

- Attenuation
  - Attenuation will be re□uired for the highway areas. This is to be provided in the form of oversized pipes located under the adoptable highway, to be agreed with the Highway Authority.

- Flood Flow Routes
  - To address the residual risks of surface water flows and potential infrastructure failure, flow routes for such waters should be analysed and demonstrated to not present a hazard to the development or adjacent properties.

- Plot Level
  - The flood risk assessment states that the finished floor levels should be set to 300mm or 600mm above the existing ground level depending on the position within the site to mitigate the risk from surface water flooding.

Detailed discussions with the adopting authority for both highways and sewers will be necessary to address potentially conflicting re□uirements, and designs should be in accordance with □Sewers for Adoption□and the □National Standards for Sustainable Drainage Systems□to ensure adoption re□uirements are met.

□□□ CONCLUSIONS

- The proposed development is within Flood □one 3 and is at risk of from a combination of fluvial and tidal flooding, as such a Flood Risk Assessment will need to be carried out.
- Ground conditions are favourable for surface water to be discharged through infiltration.
- The surface water runoff generated by the proposed development will be managed in a manner which will ensure no risk of flooding or increased risk to surrounding properties, at present and taking into account allowances for future climate change.
- The residual risks from surface water and infrastructure failure will be addressed by consideration of flood flow routes through the development.
- There are existing 150mm diameter foul sewers crossing the site which will be subject to a 3.0m easement from the centre line of the sewer.
- Soakaways should be located at least 5.0m away from buildings and the Highway.
- Soakaways should be sited above the water table.
- The highway surface water is to be collected through a □traditional□drainage system, this will then be attenuated and discharged with a restricted rate to either the adjacent watercourse or adjacent existing highway surface water sewer. Final connection point is to be confirmed with the relevant approving body.

A□□ENDI□ A

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Site Investigations
♣
Geologists
♣
Environmental &
Geotechnical
Engineers

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FAO Alex Gibson

Date: 29th November 2016

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Permeability Testing

Small Drove, Weston
S161131

Dear Alex,

Solmek visited the above site on 24th November 2016 to carry out a series of percolation tests within four hand dug trial pits to a maximum depth of 0.80mbgl as instructed by the client. Water was then added to the trial pits from a water bowser. During the excavation of Trial Pit 2 (TP2) gravel was encountered from 0.55mbgl to 0.80mbgl which, given the high infiltration rate, could potentially be a soakaway for the existing housing development on site.

Please find attached the details of the percolation tests. The testing was carried out in accordance with BRE Digest 365: Soakaway Design.

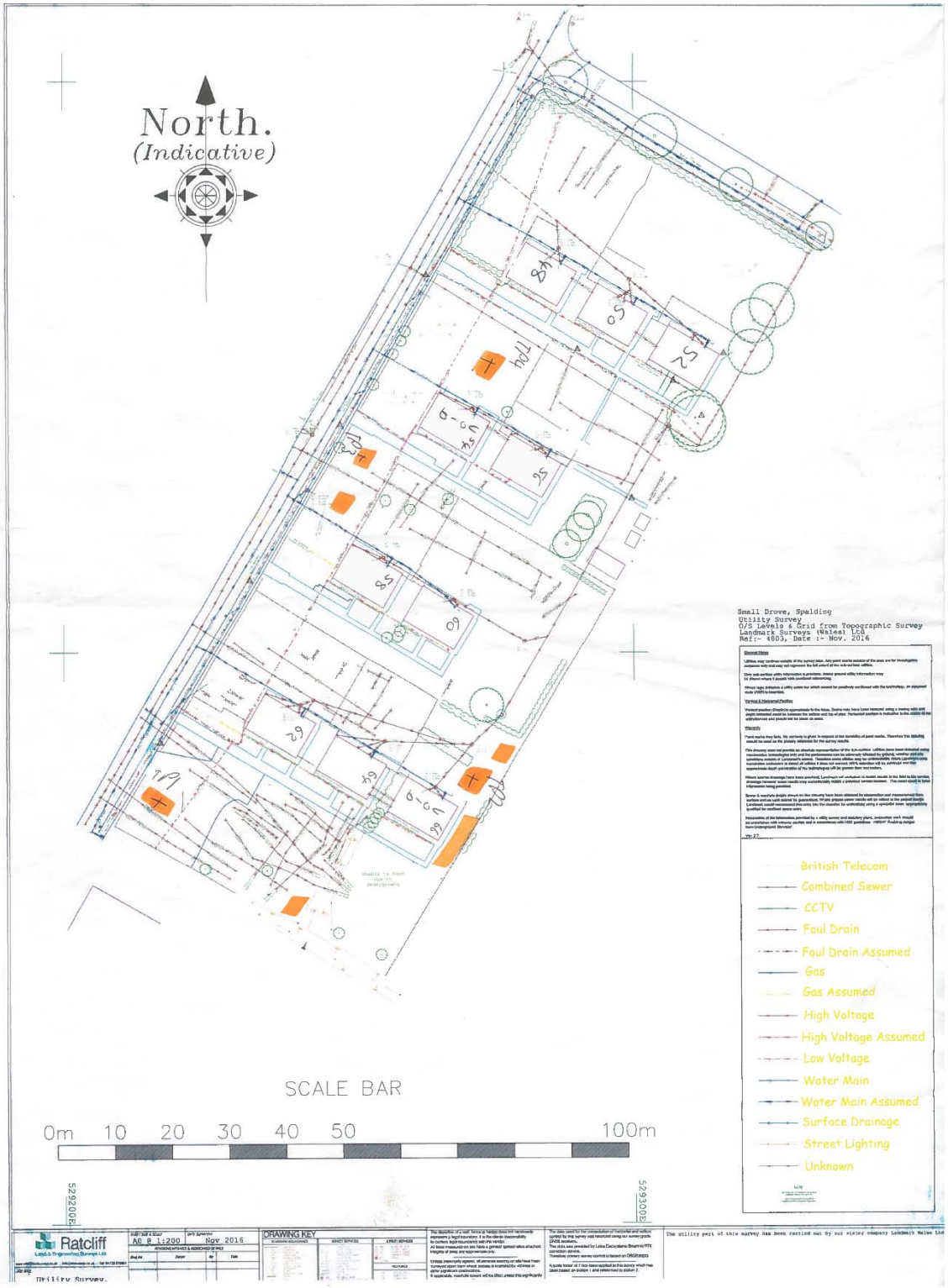
Below gives a summary of the related infiltrations rates for each trial pit.

Test Number	Infiltration Rate (m/sec x10^{-6})	Description of Base stratum
TP1	2.22	Brown sandy clayey SILT
TP2	3370	Rounded fine to coarse GRAVEL
TP3	10.2	Brown very sandy clayey SILT
TP4	38.0	Brown very sandy clayey SILT

We would like to take this opportunity to thank you for using Solmek.

Yours sincerely
On behalf of Solmek Ltd

S Alexander
Engineering Geologist



Title	Date
Site Location Plan	November 2016
Project	**Fig No.**
Small Drove, Weston	Figure 1
Client	**Scale**
William Saunders	Do Not Scale
Key	

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SOAKAWAY DESIGN IN ACCORDANCE WITH BRE DIGEST 365: 1991
BRE Digest 365, Figure 2, Page 5

Client:	**William Saunders**				
Site:	**Small Drove, Weston**				
Job No:	**S161131**				
Pit No:	**TP1**		**Test No:**	**1**	

CALCULATION OF SOIL INFILTRATION RATE

Time (min)	Depth (m)
0	0.47
0.5	0.47
1	0.47
2	0.47
3	0.48
4	0.48
5	0.48
6	0.48
7	0.48
8	0.48
9	0.48
10	0.48
15	0.48
20	0.48
25	0.48
30	0.48
40	0.48
50	0.48
60	0.49
90	0.5
120	0.51
180	0.52

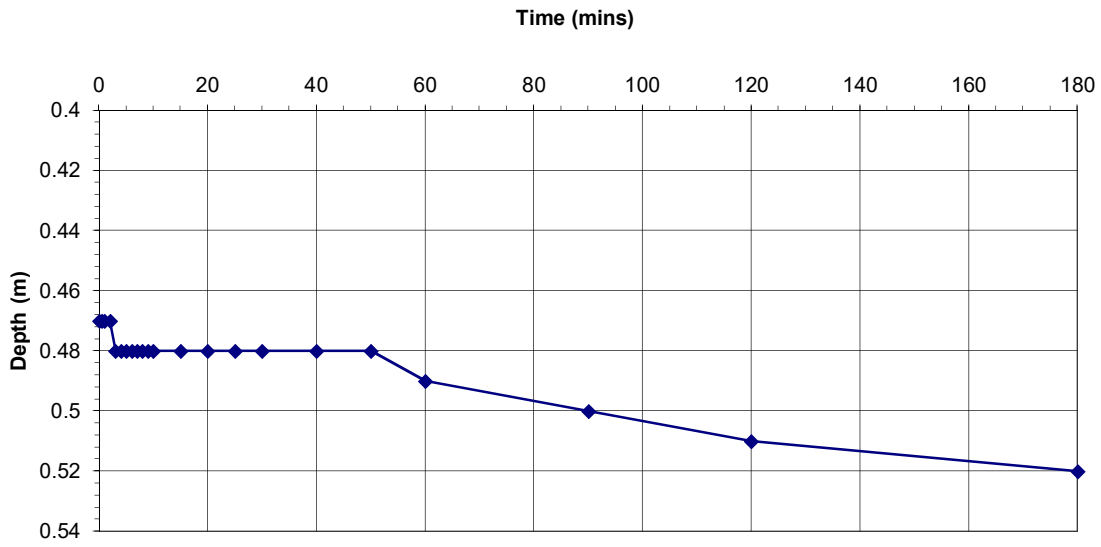
Pit Dimensions	
Length (m) =	0.60
Width (m) =	0.45
Depth (m) =	0.75

Depth at start of test (m) =	0.470
Depth at end of test (m)=	0.520
75% level (m)=	0.483
50% Effective Depth	0.255
25% level (m)=	0.508
Base area of pit (m^2) =	0.270
Vp_{75-25} (m^3) =	0.007
a_{p50} (m^2) =	0.806

From the graph:	
tp 75 (min) =	52
tp 25 (min) =	115

Soil infiltration rate, f, (m/s) =	**2.22E-06**	**normal test**

Input by:	**SA**	**Date:**	**29/11/2016**
Checked by:	**RW**	**Date:**	**29/11/2016**



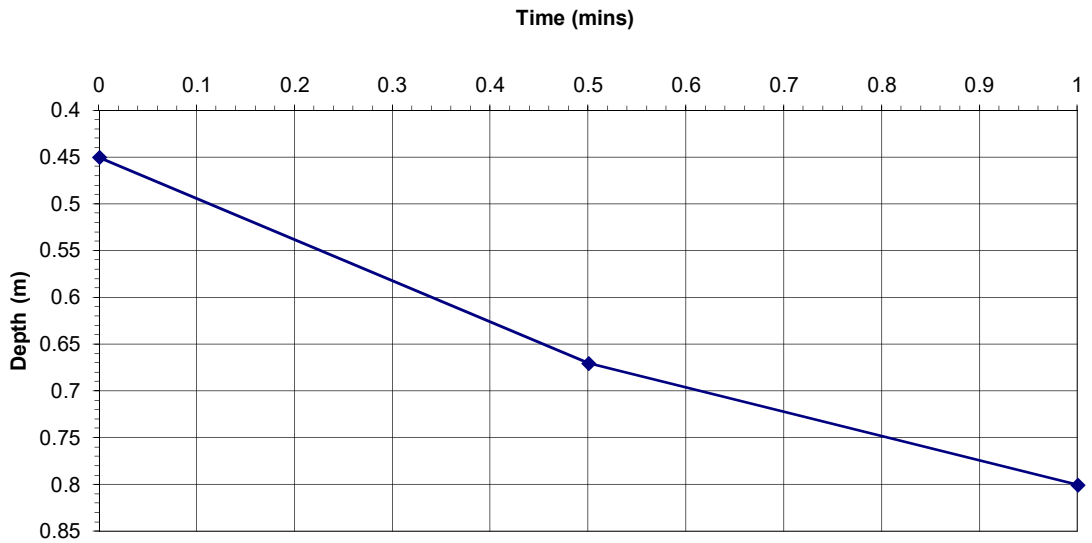
SOAKAWAY DESIGN IN ACCORDANCE WITH BRE DIGEST 365: 1991
BRE Digest 365, Figure 2, Page 5

Client:	**William Saunders**				
Site:	**Small Drove, Weston**				
Job No:	**S161131**				
Pit No:	**TP2**		**Test No:**	**1**	

CALCULATION OF SOIL INFILTRATION RATE

Time (min)	Depth (m)
0	0.45
0.5	0.67
1	0.8
2	
3	
4	
5	
6	
7	
8	
9	
10	
15	
20	
25	
30	
40	
50	
60	
90	
120	
180	

Pit Dimensions	Length (m) =	0.70	
	Width (m) =	0.55	
	Depth (m) =	0.80	
Depth at start of test (m) =		0.450	
Depth at end of test (m)=		0.800	
75% level (m)=		0.538	
50% Effective Depth		0.175	
25% level (m)=		0.713	
Base area of pit (m^2) =		0.385	
Vp_{75-25} (m^3) =		0.067	
a_{p50} (m^2) =		0.823	
From the graph:			
tp 75 (min) =		0.31	
tp 25 (min) =		0.715	
Soil infiltration rate, f, (m/s) =		**3.37E-03**	**normal test**
Input by:	**SA**	**Date:**	**29/11/2016**
Checked by:	**RW**	**Date:**	**29/11/2016**



SOAKAWAY DESIGN IN ACCORDANCE WITH BRE DIGEST 365: 1991
BRE Digest 365, Figure 2, Page 5

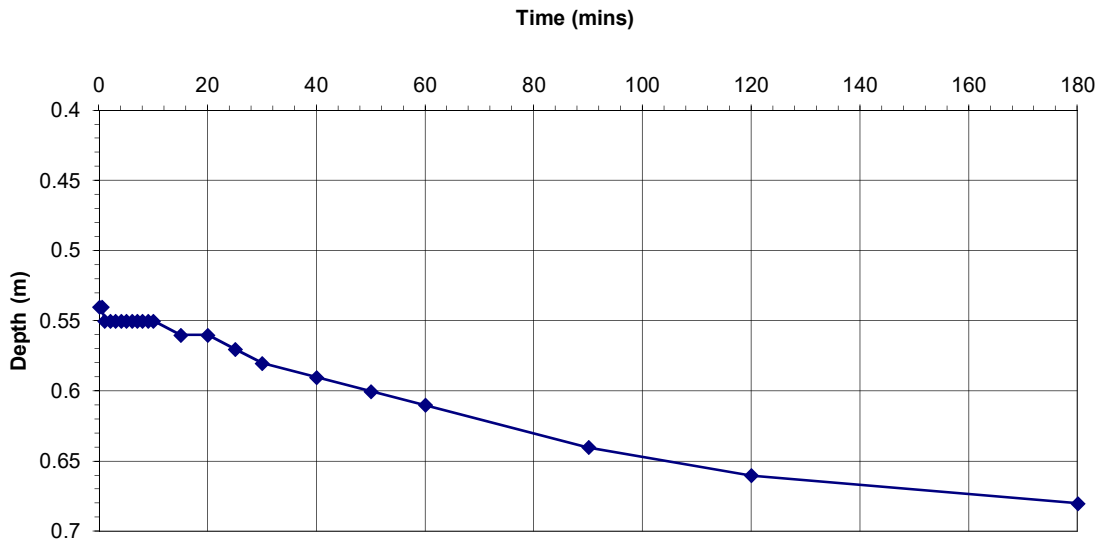
Client:	**William Saunders**				
Site:	**Small Drove, Weston**				
Job No:	**S161131**				
Pit No:	**TP3**		**Test No:**	**1**	

CALCULATION OF SOIL INFILTRATION RATE

Time (min)	Depth (m)
0	0.54
0.5	0.54
1	0.55
2	0.55
3	0.55
4	0.55
5	0.55
6	0.55
7	0.55
8	0.55
9	0.55
10	0.55
15	0.56
20	0.56
25	0.57
30	0.58
40	0.59
50	0.6
60	0.61
90	0.64
120	0.66
180	0.68

Pit Dimensions	
Length (m) =	0.60
Width (m) =	0.45
Depth (m) =	0.70
Depth at start of test (m) =	0.540
Depth at end of test (m)=	0.680
75% level (m)=	0.575
50% Effective Depth	0.090
25% level (m)=	0.645
Base area of pit (m^2) =	0.270
Vp_{75-25} (m^3) =	0.019
a_{p50} (m^2) =	0.459
From the graph:	
tp 75 (min) =	27.5
tp 25 (min) =	95
Soil infiltration rate, f, (m/s) =	**1.02E-05** **normal test**

Input by:	**SA**	**Date:**	**29/11/2016**
Checked by:	**RW**	**Date:**	**29/11/2016**



SOAKAWAY DESIGN IN ACCORDANCE WITH BRE DIGEST 365: 1991
BRE Digest 365, Figure 2, Page 5

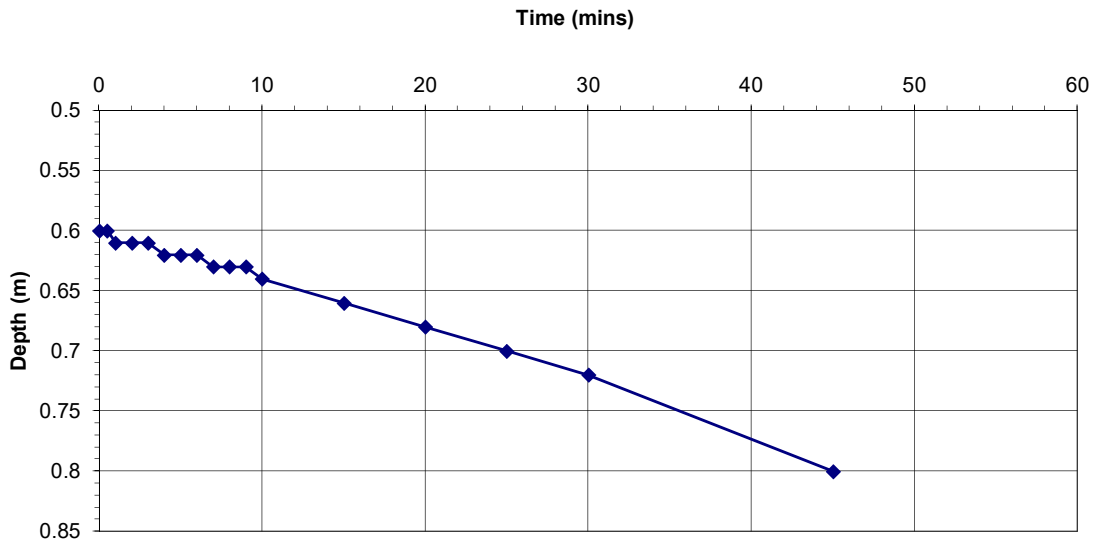
Client:	**William Saunders**				
Site:	**Small Drove, Weston**				
Job No:	**S161131**				
Pit No:	**TP4**		**Test No:**	**1**	

CALCULATION OF SOIL INFILTRATION RATE

Time (min)	Depth (m)
0	0.6
0.5	0.6
1	0.61
2	0.61
3	0.61
4	0.62
5	0.62
6	0.62
7	0.63
8	0.63
9	0.63
10	0.64
15	0.66
20	0.68
25	0.7
30	0.72
45	0.8
50	
60	
90	
120	
180	

Pit Dimensions	
Length (m) =	0.65
Width (m) =	0.45
Depth (m) =	0.80
Depth at start of test (m) =	0.600
Depth at end of test (m)=	0.800
75% level (m)=	0.650
50% Effective Depth	0.100
25% level (m)=	0.750
Base area of pit (m^2) =	0.293
Vp_{75-25} (m^3) =	0.029
a_{p50} (m^2) =	0.513
From the graph:	
tp 75 (min) =	12.5
tp 25 (min) =	37.5
Soil infiltration rate, f, (m/s) =	**3.80E-05** **normal test**

Input by:	**SA**	**Date:**	**29/11/2016**
Checked by:	**RW**	**Date:**	**29/11/2016**



♠Solmek conditions of offer, notes on limitations & basis for contract (ref: version1/2016)

These conditions accompany our tender and supercede any previous conditions issued. Solmek will prepare a report solely for the use of the Client (the party invoiced) and its agent(s). No reliance should be placed on the contents of this report, in whole or in part by 3rd parties. The report, its content and format and associated data are copyright, and the property of Solmek. Photocopying of part or all of the contents, transfer or reproduction of any kind is forbidden without written permission from Solmek. A charge may be levied against such approval, the same to be made at the discretion of Solmek. Solmek was a trading name of Hymas Geoenvironmental Ltd.

Solmek cannot be held liable and do not warrant, or otherwise guarantee the validity of information provided by third parties and subsequently used in our reports. Solmek are not responsible for the action negligent of otherwise of subcontractors or third parties.

Site investigation is a process of sampling. The scope and size of an investigation may be considered proportional to levels of confidence regarding the ground and groundwater conditions. The exploratory holes undertaken investigate only a small volume of the ground in relation to the overall size of the site, and can only provide a general indication of site conditions. The opinions provided and recommendations given in this report are based on the ground conditions as encountered within each of the exploratory holes. There may be different ground conditions elsewhere on the site which have not been identified by this investigation and which therefore have not been taken into account in this report. Reports are generally subject to the comments of the local authority and Environment Agency. The comments made on groundwater conditions are based on observations made at the time that site work was carried out. It should be noted that mobile contamination, ground gas levels and groundwater levels may vary owing to seasonal, tidal and/or weather related effects. Solmek cannot be held liable for any unrecorded or unforeseen obstructions between exploratory boreholes and trial pits. This includes instances where previous structures on the site (buried man made structures) or the presence of boulder clay (cobbles and/or boulder obstructions) have been anticipated. All types of piling operations should make allowance for obstructions within the construction budget to accommodate this. Unrecorded ancient mining may occur anywhere where seams that have been worked and influence the rock and soil above. Dissolution cavities can occur where gypsum or chalk is present. Rotary drilling is the recommended technique to prove the integrity of the rock.

Where the scope of the investigation is limited via access to information, time constraints, equipment limitations, testing, interpretation or by the client or his agents budgetary constraints, elements not set out in the proposal and excluded from the report are deemed to be omitted from the scope of the investigation.

Desk studies are generally prepared in accordance with RICS guidelines. Environmental site investigations are generally undertaken as 'exploratory investigations' in accordance with the definitions provided in paragraph 5.4 of BS 10175:2001 in order to confirm the conceptual assumptions. You are advised to familiarize yourself with the typical scope of such an investigation. No pumping of water will be undertaken unless a licence or facilities/equipment have been arranged by others.

Where the type, number or/and depth of exploratory hole is specified by others, Solmek cannot and will not be responsible for any subsequent shortfall or inadequacy in data, and any consequent shortfall in interpretation of environmental and geotechnical aspects which may be required at a later date in order to facilitate the design of permanent or temporary works.

All information acquired by Solmek in the course of investigation is the property of Solmek, and, only also becomes the joint property of the Client only on the complete settlement of all invoices relating to the project. Solmek reserve the right to use the information in commercial tendering and marketing, unless the Client expressly wishes otherwise in writing. The quoted rates do not include VAT, and payment terms are 30 days from dispatch of invoice from our offices. Quotes are subject to a site visit.

We have allowed for 1 mobilisation and normal working hours unless otherwise stated. The scope of the investigation may be reviewed following the desk study and/or fieldwork. The presence or otherwise of Japanese Knotweed or other invasive plants can be difficult to identify especially during winter months. If Japanese Knotweed or other invasive species are suspect, it should be confirmed by an ecologist. We have not allowed for acquiring services information, and cannot be responsible for damage to underground services or pipes not shown to us or not clearly shown on plans. Costs incurred will be passed on to you, and in commissioning Solmek you understand and accept that you/your agent have a contractual relationship with Solmek & you accept this. Our rates assume unobstructed, reasonably level and firm access to the exploratory positions and adequate clear working areas and headroom. We have priced on the basis that you or your client have the necessary permissions, wayleaves and approvals to access land. All boreholes and pits are backfilled with arisings except where gas monitoring pipes are installed with stopcock covers. Solmek are not responsible for any uneven surfaces as a result of siteworks and rutting and backfilled excavations may require re-levelling and/or making good by others after fieldwork is complete, and Solmek has not allowed for this. No price has been provided or requested for a return visit to remove pipework and covers. Hourly rates apply to consultancy only and do not include expenses unless otherwise shown. If warranties are required, legal costs incurred will be passed on to you assuming Solmek agree to complete such warranties, modified or otherwise and you understand and agree to pay all costs.

We reserve the right to pursue full payment of the invoice prior to release of any information including reports. We advise you/your client that we may elect to pursue our statutory rights under late payment legislation, and will apply 8% to the base rate for unreasonably late payments. Solmek are exempt from the CIS Scheme. Solmek offer to undertake work only in strict accordance with conditions covered by our current insurances, which are available for inspection. Solmek are not responsible for acts, negligent or otherwise of subcontractors and as a matter of policy cannot indemnify any other parties. Professional indemnity Insurance is limited to ten times the invoice net total except where stated otherwise by Solmek. Solmek give notice that consequential loss as a direct or indirect result of Solmek's activities or omission of the same are excluded.

A□□ENDI□ B

□re□m□□ar□ S□□e La□o□□

Do not scale off this drawing – All dimensions and setting out to be verified on site. If in doubt contact the originator for clarification.

This drawing is the property of FRAMEWORK. Copyright is reserved by them and the drawing is issued on the condition that it is not copied, reproduced, retained or disclosed to any unauthorised person, either wholly or in part without the consent in writing of FRAMEWORK

KEY

- ADOPTED HIGHWAYS BOUNDARY
- ADOPTED FOOTWAY SURFACE Bituminous Finish as per LLC's Highways specifications
- PRIVATE PAVED SURFACE Marshalls Saxon Textured Paving Slabs 450mm x 450mm x 50mm on 50mm sand bed on 150mm sub base with cross fall max 1:40. All main access paths to be min. 900mm wide. Paths around perimeter of dwellings to be min. 900mm wide. Bonded pattern. Colours To Be Confirmed
- SHARED PEDESTRIAN AND VEHICLE SURFACE PARKING TO PROVITS Marshalls Tegular Block Paving or similar approved. Colours To Be Confirmed

Do not scale from this drawing or consider any dimension or room position as accurate.
In the event of any discrepancy being found, these should be brought to the attention of the Architect for further instruction. If in doubt ask!
The proposed layouts are subject to the following, although not exhaustive;

1. Discussions with Local Planning Authority
2. Further client design development
3. Structural Engineer Requirements.
4. Mechanical and Electrical Engineers Requirements.
5. Drainage Engineer Requirement.
6. Landscape Architect Requirements.
7. Highway Engineer Requirements.
8. Local Authority Planning/Conservation/Highways/ Building Control dept. and Fire Officer vetting notes and Approvals and agreements.
9. Approvals and agreements of all statutory authorities and undertakers necessary for all supplies, way leaves and diversions.

38a
38b
Pumping Station
Drain
DELGATE AVENUE
SMALL DROVE
potential access to future development
3m easement from the centre of the existing foul sewer
existing foul drain to be removed
proposed line of adopted surface
TURNING HEAD
PLOT 01 Type A +FFL 3.650
PLOT 02 Type A +FFL 3.650
PLOT 03 Type A +FFL 3.650
PLOT 04 Type A +FFL 3.650
PLOT 05 Type D +FFL 3.650
PLOT 06 Type D +FFL 3.650
PLOT 07 Type C +FFL 3.650
PLOT 08 Type C +FFL 3.650
PLOT 09 Type C +FFL 3.650
PLOT 10 Type C +FFL 3.650
PLOT 11 Type D +FFL 3.650
PLOT 12 Type D +FFL 3.650
PLOT 13 Type D +FFL 3.650
PLOT 14 Type D +FFL 3.650
PLOT 15 Type E +FFL 3.650
PLOT 16 Type E +FFL 3.650
PLOT 17 Type E +FFL 3.650
PLOT 18 Type E +FFL 3.650
PLOT 19 Type E +FFL 3.650
PLOT 20 Type E +FFL 3.650
PLOT 21 Type B +FFL 3.425
PLOT 22 Type B +FFL 3.425
PLOT 23 Type B +FFL 3.425
PLOT 24 Type B +FFL 3.425
PLOT 25 Type D +FFL 3.650
PLOT 26 Type D +FFL 3.650
PLOT 27 Type E +FFL 3.650
PLOT 28 Type D +FFL 3.650
PLOT 29 Type D +FFL 3.650
PLOT 30 Type D +FFL 3.650
PLOT 31 Type D +FFL 3.650
PLOT 32 Type E +FFL 3.650
PLOT 33 Type D +FFL 3.650
PLOT 34 Type D +FFL 3.650
Existing Drain; easement re- ulirements and acceptable boundary type to be investigated
apparent connection between low voltage cable proposed for diversion and adjacent plot; to be investigated
apparent connection between overhead telephone post & cable to adjacent plot; retention, removal or diversion of services TBC
existing foul drain running through site to adjacent plot/pump station to be retained
Existing Lamp Post to be Relocated to the approval of LCC highways.
apparent connection between overhead telephone post & cable to adjacent plot; retention, removal or diversion of services TBC
apparent connection between low voltage cable proposed for diversion and adjacent plot; to be investigated
apparent connection between overhead telephone post & cable to adjacent plot; retention, removal or diversion of services TBC
1800mm HIGH TIMBER FENCE TO PLOTS
1800mm HIGH LEVEL BRICK WALL - BOUNDARY TYPE C
1.8m HIGH CLOSE BOARDED TIMBER BOUNDARY FENCE AND GATE - BOUNDARY TYPE A
900mm LOW LEVEL TIMBER D - BOUNDARY TYPE D
SHED
39
45

provisional

Rev	Revision note	Date	Drawn by

RESIDENTIAL DEVELOPMENT
AT SMALL DROVE WESTON
FOR WELLAND HOMES

Drawn by	Checked	Date	Scale
PC		FEB 2018	1:200@A1
SITE PLAN		Dwg No J1651 (08) 03	Rev

Framework Architects
3 MARINE STUDIOS, BURTON LANE END, BURTON WATERS, LINCOLN, LN1 2UA
T 01522 535383 E info@frameworklincoln.co.uk W frameworkarchitects.co.uk

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Results from design calculations for trench soakaway

Small Drove, Weston : 82.37m2

Total excavated depth of soakaway : 2.00 m
Ground level to invert of inflow pipe : 1.00 m

Impermeable surface area (A) : 82.37 m^2
Soil infiltration rate (f) : 2.22E-06 m/s

Rainfall ratio : 0.4
Aggregate void : 35%

Soakaway width 1.0 m	
Storm duration (min)	Soakaway length (m)
5	2.10
10	3.05
15	3.70
30	4.65
60	5.70
120	6.70
240	7.60
360	8.00
<u>600</u>	<u>8.20</u>
1440	7.90

NOTE: Critical storm durations are underlined

Total excavated volume = 16.40 m^3

Volume of granular fill required = 8.20m^3

Emptying time to 50% storage = 19.5 hours

Calculations are in accordance with BRE Digest 365

Results from design calculations for trench soakaway

Small Drove, Weston : 92.68m2

Total excavated depth of soakaway : 2.00 m
Ground level to invert of inflow pipe : 1.00 m

Impermeable surface area (A) : 92.68 m^2
Soil infiltration rate (f) : 2.22E-06 m/s

Rainfall ratio : 0.4
Aggregate void : 35%

Soakaway width 1.0 m	
Storm duration (min)	Soakaway length (m)
5	2.40
10	3.40
15	4.15
30	5.25
60	6.40
120	7.55
240	8.55
360	9.00
600	9.25
1440	8.95

NOTE: Critical storm durations are underlined

Total excavated volume = 18.50 m^3

Volume of granular fill required = 9.25m^3

Emptying time to 50% storage = 19.8 hours

Calculations are in accordance with BRE Digest 365

Results from design calculations for trench soakaway

Small Drove, Weston : 99.82m2

Total excavated depth of soakaway : 2.00 m
Ground level to invert of inflow pipe : 1.00 m

Impermeable surface area (A) : 99.82 m^2
Soil infiltration rate (f) : 2.22E-06 m/s

Rainfall ratio : 0.4
Aggregate void : 35%

Soakaway width 1.0 m	
Storm duration (min)	Soakaway length (m)
5	2.55
10	3.65
15	4.45
30	5.65
60	6.90
120	8.15
240	9.20
360	9.70
<u>600</u>	<u>9.95</u>
1440	9.65

NOTE: Critical storm durations are underlined

Total excavated volume = 19.90 m^3

Volume of granular fill required = 9.95m^3

Emptying time to 50% storage = 19.9 hours

Calculations are in accordance with BRE Digest 365

Results from design calculations for trench soakaway

Small Drove, Weston : 124.32m2

Total excavated depth of soakaway : 2.00 m
Ground level to invert of inflow pipe : 1.00 m

Impermeable surface area (A) : 124.32 m^2
Soil infiltration rate (f) : 2.22E-06 m/s

Rainfall ratio : 0.4
Aggregate void : 35%

Soakaway width 1.0 m	
Storm duration (min)	Soakaway length (m)
5	3.20
10	4.55
15	5.55
30	7.00
60	8.60
120	10.15
240	11.50
360	12.10
600	12.45
1440	12.10

NOTE: Critical storm durations are underlined

Total excavated volume = 24.90 m^3

Volume of granular fill required = 12.45m^3

Emptying time to 50% storage = 20.3 hours

Calculations are in accordance with BRE Digest 365

Results from design calculations for trench soakaway

Small Drove, Weston : 139.02m2

Total excavated depth of soakaway : 2.00 m
Ground level to invert of inflow pipe : 1.00 m

Impermeable surface area (A) : 139.02 m^2
Soil infiltration rate (f) : 2.22E-06 m/s

Rainfall ratio : 0.4
Aggregate void : 35%

Soakaway width 1.0 m	
Storm duration (min)	Soakaway length (m)
5	3.55
10	5.10
15	6.20
30	7.85
60	9.65
120	11.35
240	12.85
360	13.55
<u>600</u>	<u>13.90</u>
1440	13.55

NOTE: Critical storm durations are underlined

Total excavated volume = 27.80 m^3

Volume of granular fill required = 13.90m^3

Emptying time to 50% storage = 20.4 hours

Calculations are in accordance with BRE Digest 365

Results from design calculations for trench soakaway

Small Drove, Weston : 140.65m2

Total excavated depth of soakaway : 2.00 m
Ground level to invert of inflow pipe : 1.00 m

Impermeable surface area (A) : 140.65 m^2
Soil infiltration rate (f) : 2.22E-06 m/s

Rainfall ratio : 0.4
Aggregate void : 35%

Soakaway width 1.0 m	
Storm duration (min)	Soakaway length (m)
5	3.60
10	5.15
15	6.30
30	7.95
60	9.75
120	11.50
240	13.00
360	13.70
<u>600</u>	<u>14.10</u>
1440	13.70

NOTE: Critical storm durations are underlined

Total excavated volume = 28.20 m^3

Volume of granular fill required = 14.10m^3

Emptying time to 50% storage = 20.4 hours

Calculations are in accordance with BRE Digest 365

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Pre-Planning Assessment Report

SMALL DROVE **918/93100096/1/0000513**

Report published 16/08/2018

Section 1: Proposed development

Thank you for submitting a pre-planning enquiry. This has been produced for South Holland District Council. Your reference number is **918/93100096/1/0000513**. If you have any questions upon receipt of this report, please contact the Pre-Development team on 0345 60 66 087 or email planningliaison@anglianwater.co.uk.

The response within this report has been based on the following information which was submitted as part of your application:

List of planned developments	
Type of development	**No. Of units**
Dwellings	34

The anticipated residential build rate is:

Year	Y1	Y2	Y3	Y4	Y5	Y6	Y7	Y8	Y9	Y10	Y11	Y12
Build rate	34	0	0	0	0	0	0	0	0	0	0	0

Site grid reference no.

TF2927024822

Development type

Brownfield

Planning application status

Approved

The comments contained within this report relate to the public water mains and sewers indicated on our records. Your attention is drawn to the disclaimer in the useful information section of this report.

Section 2: Assets affected

Our records indicate that we have the following types of assets within or overlapping the boundary of your development site as listed in the table below.

Additionally, it is highly recommended that you carry out a thorough investigation of your proposed working area to establish whether any unmapped public or private sewers and lateral drains are in existence. We are unable to permit development either over or within the easement strip without our prior consent. The extent of the easement is provided in the table below. Please be aware that the existing water mains/public sewers should be located in highway or open space and not in private gardens. This is to ensure available access for any future maintenance and repair and this should be taken into consideration when planning your site layout.

Water and Used water easement information		
Asset type	Pipe size (mm)	Total easement required (m)
Water mains	76	4.50 m either side of the centre line
Water mains	76	4.50 m either side of the centre line
Sewer mains	150	3.00 m either side of the centre line
Sewer mains	150	3.00 m either side of the centre line
Sewer mains	150	3.00 m either side of the centre line
Sewer mains	150	3.00 m either side of the centre line
Sewer mains	150	3.00 m either side of the centre line

If it is not possible to avoid our assets then these may need to be diverted in accordance with Section 185 of the Water Industry Act (1991). You will need to make a formal application if you would like a diversion to be considered.

Due to the private sewer transfer in October 2011 many newly adopted public used water assets and their history are not indicated on our records. You also need to be aware that your development site may contain private water mains, drains or other assets not shown on our records. These are private assets and not the responsibility of Anglian Water but that of the landowner.

Section 3: Water recycling services

In examining the used water system we assess the ability for your site to connect to the public sewerage network without causing a detriment to the operation of the system. We also assess the receiving water recycling centre and determine whether the water recycling centre can cope with the increased flow and influent quality arising from your development.

Water recycling centre

The foul drainage from the proposed development is in the catchment of Moulton Water Recycling Centre, which currently has capacity to treat the flows from your development site. Anglian Water cannot reserve capacity and the available capacity at the water recycling centre can be reduced at any time due to growth, environmental and regulation driven changes.

Used water network

Our assessment has been based on development flows connecting to the nearest foul water sewer of the same size or greater pipe diameter to that required to drain the site. The infrastructure to convey foul water flows to the receiving sewerage network is assumed to be the responsibility of the developer. Conveyance to the connection point is considered as Onsite Work and includes all work carried out upstream from of the point of connection, including making the connection to our existing network. This connection point has been determined in reference to the calculated design flow using criteria from Sewers for Adoption (6th edition). On this basis, a 150mm internal diameter pipe is required to drain the development site. Anglian water has assessed the impact of gravity flows from the planned development to the public foul sewerage network. We can confirm that this is acceptable as the foul sewerage system, at present, has available capacity for your site. The connection point will be to the nearest 150mm diameter sewer at manhole 3801, at National Grid Reference TF2928324848, located in the on-site foul sewer.

It is assumed that the developer will provide the necessary infrastructure to convey flows from the site to the network. Consequently, this report does not include any costs for the conveyance of flows.

Surface water disposal

You indicated on the Pre-Planning Application form that a connection to the public surface water sewer network is not required as infiltration and a connection to a watercourse is to be utilised. A new surface water sewer can be used as a mechanism to discharge surface water to a watercourse or as part of a Suds scheme where appropriate. Subject to the sewer being designed in accordance with the current version of Sewers For Adoption, the sewer can be put forward for adoption by Anglian Water under Section 104 of the Water Industry Act 1991. If the outfall is to a watercourse, the applicant will be required to obtain consent to discharge via the appropriate body. Therefore a capacity assessment has not been made on the public surface water network. However, should this situation change and you wish to have a surface water connection assessment on the local network, then we will provide this free of charge if requested within 12 months of this report and you are able to provide the relevant evidence that your original strategy was unviable.

As you may be aware, Anglian Water will consider the adoption of SuDs provided that they meet the criteria outline in our SuDs adoption manual. This can be found on our website at http://www.anglianwater.co.uk/developers/suds.aspx. We will adopt features located in public open space that are designed and constructed, in conjunction with the Local Authority and Lead Local Flood Authority (LLFA), to the criteria within our SuDs adoption manual. Specifically, developers must be able to demonstrate:

1. Effective upstream source control,
2. Effective exceedance design, and
3. Effective maintenance schedule demonstrating than the assets can be maintained both now and in the future with adequate access.

If you wish to look at the adoption of any SuDs then an expression of interest form can be found on our website at: http://www.anglianwater.co.uk/developers/suds.aspx

The proposed method of surface water disposal is not relevant to Anglian Water; we suggest that you contact the relevant Local Authority, Lead Local Flood Authority, the Environment Agency or the Internal Drainage Board, as appropriate.

Trade Effluent

We note that you do not have any trade effluent requirements. Should this be required in the future you will need our written formal consent. This is in accordance with Section 118 of the Water Industry Act (1991).

Used Water Budget Costs

As a result of the recent charging rules published by Ofwat, our charging regime has changed. Your development site will be required to pay a Zonal charge for each new property connecting to the public sewer that benefits from Full planning permission.

Payment of the Zonal charge must be made before premises are connected to the public sewer. More information on the Zonal charge can be found at http://www.anglianwater.co.uk/developers/charges

The Zonal charge consists of two elements. The first is called the ‘Fixed Element’ which is the same in nature to the Infrastructure charge applied prior to April 2018. The second is called the ‘Variable Element’ which may vary each financial year.

The elements are combined together to create the 2018/19 Zonal charge for Sewerage:

Fixed Element	£ 370
Variable Element	£ 101

In most circumstances zonal charges are raised on a standard basis of one charge per new connection (one for water and one for sewerage). However, if the new connection is to non-household premises, the fixed element is calculated according to the number and type of water fittings in the premises.This is called the "relevant multiplier" method of calculating the charge. Details of the relevant multiplier for each fitting can be found at our web-page: http://www.anglianwater.co.uk/developers/charges/

The total Zonal charge payable for your site for Sewerage is:

Zonal charge per new connection - Sewerage	No. Of Units	Total amount payable
£ 471	34	£ 16,014.00

It has been assumed that the onsite used water network will be provided under a section 104 Water Industry Act application.

It is recommended that you also budget for connection costs. Please note that we offer alternative types of connections depending on your needs and these costs are available at our website.

Section 4: Map of Proposed Connection Points

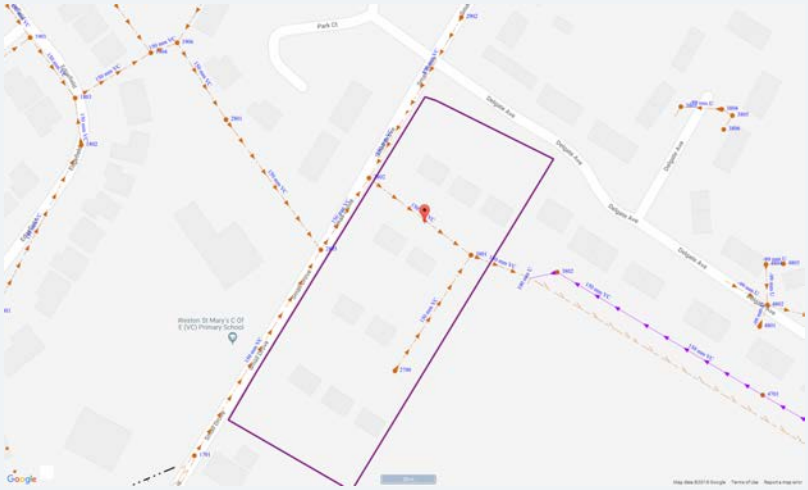

Figure 1:Showing your used water point of connection

Section 5: Useful Information

Used water

Water Industry Act – Key Used Water Sections:

Section 98:

This provides you with the right to requisition a new public sewer. The new public sewer can be constructed by Anglian Water on your behalf. Alternatively, you can construct the sewer yourself under section 30 of the Anglian Water Authority Act 1977.

Section 102:

This provides you with the right to have an existing sewerage asset vested by us. It is your responsibility to bring the infrastructure to an adoptable condition ahead of the asset being vested.

Section 104:

This provides you with the right to have a design technically vetted and an agreement reached that will see us adopt your assets following their satisfactory construction and connection to the public sewer.

Section 106:

This provides you with the right to have your constructed sewer connected to the public sewer.

Section 185:

This provides you with the right to have a public sewerage asset diverted.

Details on how to make a formal application for a new sewer, new connection or diversion are available on our website at http://www.anglianwater.co.uk/developers or via our Developer Services team on 0345 60 66 087.

Sustainable drainage systems:

Many existing urban drainage systems can cause problems of flooding, pollution or damage to the environment and are not resilient to climate change in the long term. Therefore our preferred method of surface water disposal is through the use of Sustainable Drainage Systems (SuDS). SuDS are a range of techniques that aim to mimic the way surface water drains in natural systems within urban areas. For more information on SuDS, please visit our website at http://www.anglianwater.co.uk/developers/suds.aspx . We also recommend that you contact the Local Authority and Lead Local Flood Authority (LLFA) for the area to discuss your application.

Private sewer transfers:

Sewers and lateral drains connected to the public sewer on the 1 July 2011 transferred into Water Company ownership on the 1 October 2011. This follows the implementation of the Floods and Water Management Act (FWMA). This included sewers and lateral drains that were subject to an existing Section 104 Adoption Agreement and those that were not. There were exemptions and the main non-transferable assets were as follows:

- Surface water sewers and lateral drains that did not discharge to the public sewer, e.g. those that discharged to a watercourse.
- Foul sewers and lateral drains that discharged to a privately owned sewage treatment/collection facility.
- Pumping stations and rising mains will transfer between 1 October 2011 and 1 October 2016.

The implementation of Section 42 of the FWMA will ensure that future private sewers will not be created. It is anticipated that all new sewer applications will need to have an approved section 104 application ahead of a section 106 connection.

Encroachment:

Anglian Water operates a risk based approach to development encroaching close to our used water infrastructure. We assess the issue of encroachment if you are planning to build within 400 metres of a water recycling centre or, within 15 metres to 100 metres of a pumping station. We have more information available on our website at http://anglianwater.co.uk/developers/encroachment.aspx

Locating our assets:

Maps detailing the location of our water and used water infrastructure including both underground assets and above ground assets such as pumping stations and recycling centres are available from . All requests from members of the public or non-statutory bodies for maps showing the location of our assets will be subject to an appropriate administrative charge. We have more information on our website at: http://www.anglianwater.co.uk/developers/our-assets/

Summary of charges:

A summary of this year's water and used water connection and infrastructure charges can be found at http://www.anglianwater.co.uk/developers/charges

Disclaimer:

The information provided in this report is based on data currently held by Anglian Water Services Limited ('Anglian Water') or provided by a third party. Accordingly, the information in this report is provided with no guarantee of accuracy, timeliness, completeness and is without indemnity or warranty of any kind (express or implied).

This report should not be considered in isolation and does not nullify the need for the enquirer to make additional appropriate searches, inspections and enquiries. Anglian Water supports the plan led approach to sustainable development that is set out in the National Planning Policy Framework ('NPPF') and any infrastructure needs identified in this report must be considered in the context of current, adopted and/or emerging local plans. Where local plans are absent, silent or have expired these needs should be considered against the definition of sustainability holistically as set out in the NPPF.

Whilst the information in this report is based on the presumption that proposed development obtains planning permission, nothing in this report confirms that planning permission will be granted or that Anglian Water will be bound to carry out the works/proposals contained within this report.

No liability whatsoever, including liability for negligence is accepted by Anglian Water, or its partners, employees or agents, for any error or omission, or for the results obtained from the use of this report and/or its content. Furthermore in no event will any of those parties be liable to the applicant or any third party for any decision made or action taken as a result of reliance on this report.

This report is valid for the date printed and the enquirer is advised to resubmit their request for an up to date report should there be a delay in submitting any subsequent application for water supply/sewer connection(s).

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Key:

- Proposed private surface water drain
- Proposed private surface water manhole
- Proposed private trench soakaway
- Proposed Highway Drain
- Proposed permeable parking area
- Area <5m from building or highway available for soakaways
- Proposed private foul drain
- Proposed private foul manhole
- Existing foul sewer
- Proposed S38 Boundary
- Proposed Private Permeable Paving

William Saunders is the trading name of Wm Saunders Partnership LLP. Wm Saunders Partnership Limited Liability Partnership is registered in England and Wales with the Registration number OC 308323. The Registered Office is Sheppard Lockton House, Cafferata Way, Newark on Trent, Notts. NG24 2TN.

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Contractors must verify all dimensions, levels and co-ordinates at the site before commencing any work or making any shop drawings; no dimensions to be taken from drawing.

Delgate Avenue

Plots 1,2,3,4 to drain roof water to the permeable paving

Existing 150mm Ø Public Foul Sewer

IC - Surface
CL - 2.92m
IL - 1.60m
IL - 1.50m (Gully)

IC - Foul
CL - 2.99m
IL - 0.01m (A)
IL - 0.04m (B)
IL - 0.15m (C)

IC - Surface
CL - 2.93m
IL - 1.61m
IL - 2.02m (Gully)

Existing 150mm Ø Public Foul Sewer

Highway Surface Water Drain

ADOPTABLE HIGHWAY

Highway Surface Water Drain

Flow Control chamber

IC - Foul
CL - 3.11m
IL - -0.23m (A)
IL - 1.12m (B)
IL - -0.13m (C)

Possible connection to open watercourse/ditch, subject to approval and confirmation of invert levels.

New connections into existing Anglian Water foul manhole subject to S106 application approval.

Small Drove

IC - Foul
CL - 2.89m
IL - 0.37m

Existing 150mm Ø Public Foul Sewer

IC - Surface
CL - 2.93m
IL - 1.63m
IL - 1.53m (Gully)

PRIVATE DRIVE

6.0m easement

IC - Surface
CL - 3.12m
IL - 1.87m
IL - 1.80m (Gully)

ADOPTABLE HIGHWAY

Highway Surface Water Drain

Easement required through private drive for Highway Drain

Existing foul drain to be removed

Notes:

Soakaways have been calculated using an infiltration rate of 2.22 x10-06 m/s.

Soakaways have been calculated as trench fill soakaways with 35% void fill material.

Foul drainage is to be discharged to the existing public foul sewer crossing the site as indicated by Anglian Water in the pre-planning enquiry response ref: 00002616.

Positions of SVP's and RWP's to be confirmed by Architect.

All highway drainage to be in accordance with the Lincolnshire Development Road Specification and Design Guide.

Invert levels and access to watercourse to be confirmed.

Rev	Description	Drn	Vf'd	Date
-	Issued for submission with Drainage Strategy	CM	AG	06/18

As outlined in section 2.3 of the CITB Industry Guidance to Designers, insignificant risks can usually be ignored, as can risks arising from routine construction activities, unless the design compounds or significantly alters these risks. In accordance with CDM Regulations 8, 9 and 11, any significant risks relating to the design features shown on this drawing have been identified and are annotated thus: [!]

☒ No significant risks have been identified.

☐ Significant risks have been identified - refer to notes on drawing for information on residual risks and any control measures to be employed.

Refer to the current Designer's Risk Assessment sheets for further details.

Designer's Signature CM | Date 06/18

Drawing Status: PLANNING

williamsaunders
architecture: engineering: building consultancy
Sheppard Lockton House
Cafferata Way
Newark-on-Trent
Nottinghamshire. NG24 2TN
Tel: 01636 704361
Fax: 01636 702809
W: wm-saunders.co.uk
Also at Leeds, Cardiff, Wirksworth

Project: RESIDENTIAL DEVELOPMENT
SMALL DROVE
WESTON
SPALDING

Client: SOUTH HOLLAND DISTRICT COUNCIL

Title: DRAINAGE STRATEGY - OPTION A

Drawn	Date	Scale	
CM	JUNE 2018	1:200	@ A1
Discipline	**Project Number**	**Drawing Number**	**Revision**
CIVILS	11505	(SK)03	-

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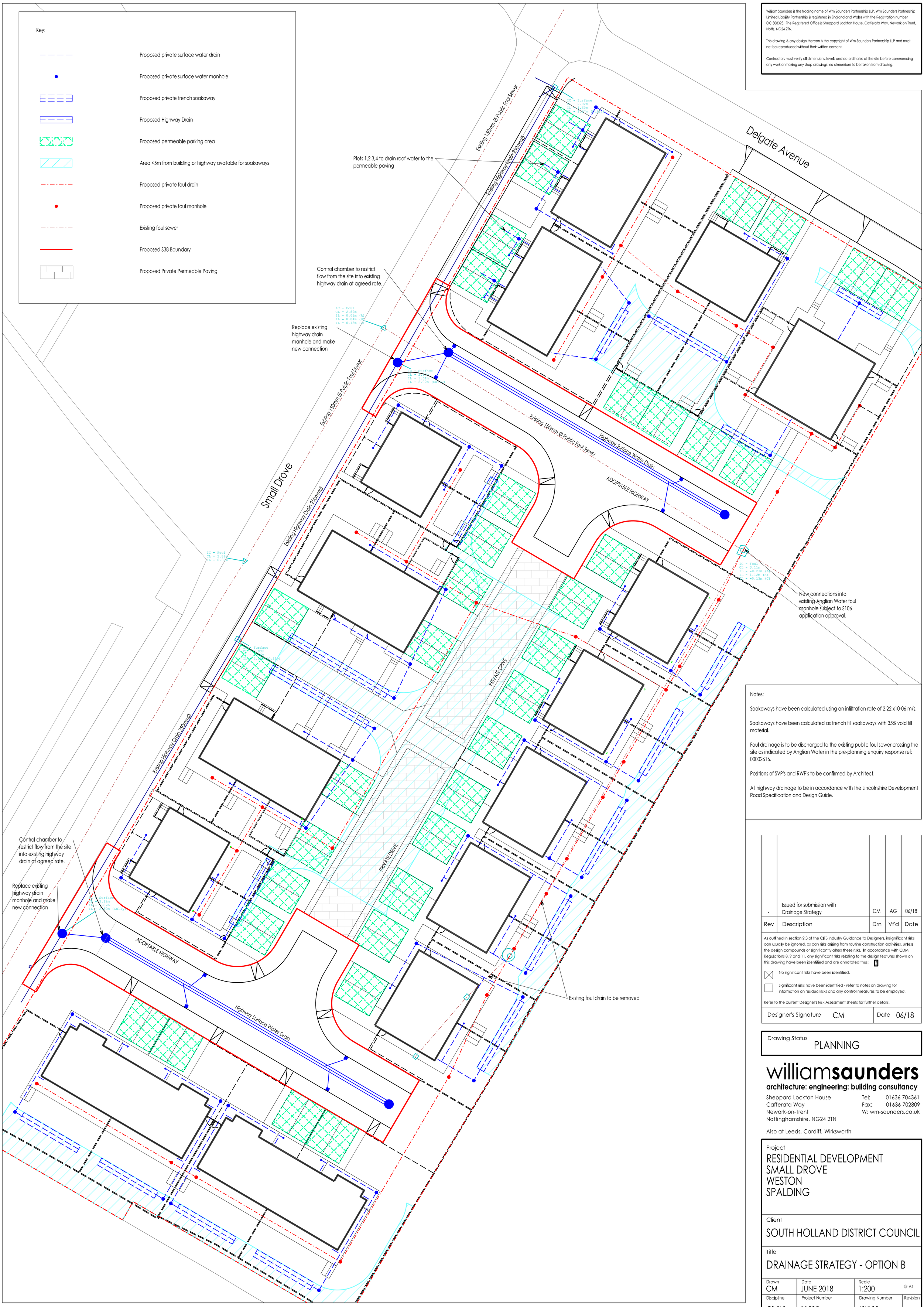
Contractors must verify all dimensions, levels and co-ordinates at the site before commencing any work or making any shop drawings; no dimensions to be taken from drawing.

Key:

- Proposed private surface water drain
- Proposed private surface water manhole
- Proposed private trench soakaway
- Proposed Highway Drain
- Proposed permeable parking area
- Area <5m from building or highway available for soakaways
- Proposed private foul drain
- Proposed private foul manhole
- Existing foul sewer
- Proposed S38 Boundary
- Proposed Private Permeable Paving



Notes:

Soakaways have been calculated using an infiltration rate of 2.22 x10-06 m/s.

Soakaways have been calculated as trench fill soakaways with 35% void fill material.

Foul drainage is to be discharged to the existing public foul sewer crossing the site as indicated by Anglian Water in the pre-planning enquiry response ref: 00002616.

Positions of SVP's and RWP's to be confirmed by Architect.

All highway drainage to be in accordance with the Lincolnshire Development Road Specification and Design Guide.

Rev	Description	Drn	Vf'd	Date
-	Issued for submission with Drainage Strategy	CM	AG	06/18

As outlined in section 2.3 of the CITB Industry Guidance to Designers, insignificant risks can usually be ignored, as can risks arising from routine construction activities, unless the design compounds or significantly alters these risks. In accordance with CDM Regulations 8, 9 and 11, any significant risks relating to the design features shown on this drawing have been identified and are annotated thus: [I]

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☐ Significant risks have been identified - refer to notes on drawing for information on residual risks and any control measures to be employed.

Refer to the current Designer's Risk Assessment sheets for further details.

Designer's Signature CM | Date 06/18

Drawing Status: PLANNING

williamsaunders
architecture: engineering: building consultancy
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Also at Leeds, Cardiff, Wirksworth

Project: RESIDENTIAL DEVELOPMENT
SMALL DROVE
WESTON
SPALDING

Client: SOUTH HOLLAND DISTRICT COUNCIL

Title: DRAINAGE STRATEGY - OPTION B

Drawn	Date	Scale	
CM	JUNE 2018	1:200	@ A1
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