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PROPOSED RESIDENTIAL DEVELOPMENT

PARKSIDE CRESCENT, SPALDING

DRAINAGE STRATEGY

11482/12
REV B.

NOVEMBER 2016

DOCUMENT CONTROL

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Contract: Residential Development, Parkside Crescent, Spalding

Document Title: Drainage Strategy

Our Ref: CM/KW/11482/12.0

Prepared by: C. Melton EngTech MICE MIHE **Date:** November 2016

RECORD OF AMENDMENTS TO DOCUMENT

Ref	Description	Date
A	Minor amendments	24/11/16
B	Appendix A updated	28/11/16

Verified by: A.C. Gibson BEng CEng MICE MCIHT **Date:** November 2016

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.

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1.0 INTRODUCTION

William Saunders have been commissioned by Welland Homes to prepare a Drainage Strategy for the proposed residential development at Parkside Crescent, Spalding. The document is to support a planning application for the development.

2.0 PROPOSED DEVELOPMENT

2.1 SITE LOCATION AND DESCRIPTION

The development site is located off Parkside Crescent, Spalding, PE11 1RA. Its National Grid Reference is TF 24427 23147 (see figure 1 below).



Figure 1

The existing site comprises hardstanding, with surrounding grass areas and natural areas. Pedestrian and vehicular access to the site is available directly from Parkside Crescent, with an additional footway providing access to Park Road. The site has an area of approximately 2780m^2 / 0.278ha.

A topographical plan of the site can be seen at Appendix A.

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 Zone 3. A Flood Risk Assessment for the site has been carried out by RAB Consultants.

2.2 DEVELOPMENT PROPOSALS

It is proposed to develop the site with 10no. residential units with highway access coming from Parkside Crescent. An indicative site layout is shown at Appendix C.

3.0 DRAINAGE STRATEGY

3.1 FOUL DRAINAGE

Anglian Water has confirmed that foul drainage from the proposed development may be accommodated in the 150mm foul sewer within Parkside Crescent. The connection point will be to manhole 4101 in Parkside Crescent at National Grid Reference (NGR) TF2443123172.

3.2 SURFACE WATER DRAINAGE

In accordance with requirement 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 12th October 2016 by Solmek, the ground conditions are not suitable for infiltration as the underlying strata is dark brown sand silt. The Permeability Testing results can be found in Appendix B.

The next preference for disposal of surface waters is to watercourse, there are no nearby watercourses so this method of disposal has been discounted.

As soakaways / infiltration is shown not to be feasible, it is proposed to discharge to Welland & Deeping IDB Surface Water Sewer located within Parkside Crescent. RAB Consultants have held initial informal discussion with the IDB, who suggested that a restriction would need to be applied to any discharge of greenfield runoff rate, 1.4l/s/ha. This flow equates to 0.16l/s. However, the nationally recognised minimum controlled discharge rate is 5l/s to mitigate the risk of blockage within the drainage system.

3.3 EXISTING RUNOFF

Based on the Modified Rational Method, the existing discharge from the 0.071ha impermeable area of the site is calculated to be 9.87 l/s. As the IDB have indicated that they wish to apply a restriction on the discharge to Greenfield runoff rate, the minimum discharge rate is to be based on 5 l/s as stated above.

3.4 ATTENUATION VOLUMES

The preliminary calculated volumes of storage required are summarised in Table 7. These should be confirmed during detailed design. They are based on an impermeable area of 0.105ha which excludes the adoptable highway areas with climate change allowed for in accordance with the requirements of Table 2 of the NPPF-PPG.

Storm Return Period	1	30 (+15 - 35% CC)	100 (+25 - 65%CC)
Attenuation Storage Required (m^3)	2.1 – 5.8	21 - 38	39 - 76

Table 1 – Attenuation Storage

Attenuation will be provided within the network for the 1 in 30-year return period. Additional attenuation volumes have been provided 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 to greenfield rates (5l/s), 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 etc. to ensure reduction of volume and rate of run off and improvement of water quality prior to discharge.

- Attenuation
  - In conjunction with the SUDS elements it is likely that attenuation, in the form of below ground tanks/oversized pipes, will be necessary to further reduce run off rates to meet greenfield conditions. The indicative site layout and topography would suggest an attenuation tank could be situated within the private car park area.

- 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 FRA states that finished floor levels should be set to 150mm above the existing ground level.

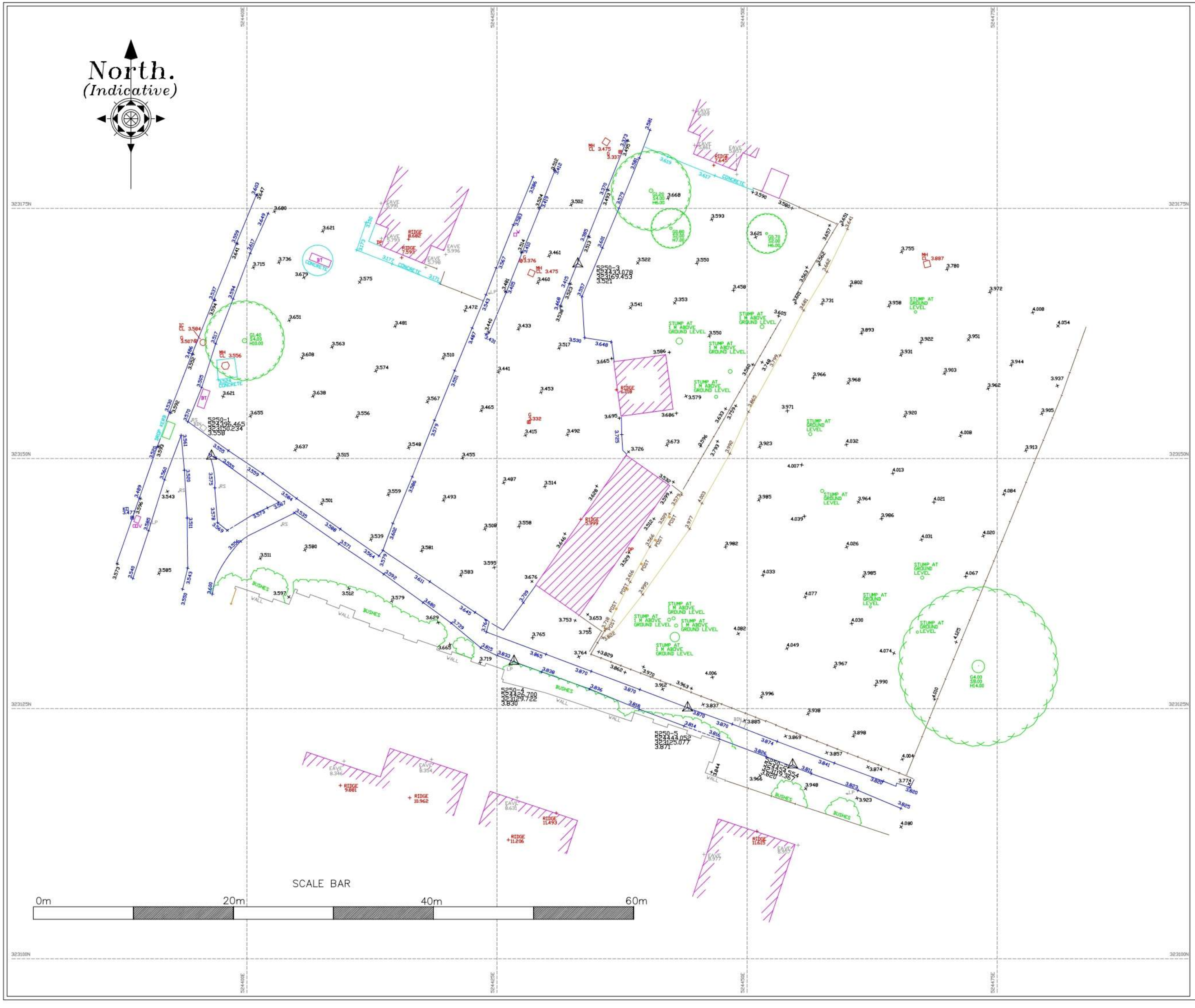
Detailed discussions with the adopting authority for both highways and sewers will be necessary to address potentially conflicting requirements, and designs should be in accordance with "Sewers for Adoption" and the "National Standards for Sustainable Drainage Systems" to ensure adoption requirements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

4.0 CONCLUSIONS

- The proposed development is within Flood Zone 3 and is at risk of from a combination of fluvial and tidal flooding.
- The development will generate quantities of surface water runoff which could pose flood risk to the development itself or to its neighbours, unless appropriate design and management measures are taken.
- Attenuation of the surface water will be required on site before discharge.
- 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 is an existing 750mm IDB Surface Water drain crossing the site.
- Foul water can be accommodated within the Anglian Water Public Sewer located within Parkside Crescent.
- The discharge into the IBD Surface Water sewer will need to be agreed formally with the IDB.

APPENDIX A

Topographical Survey



DRAWING KEY

STANDARD BOUNDARIES

	FENCE
BF	BOARDED
CLF	CHAIN LINK
CF	CHESTNUT
BWF	BARBED WIRE
EF	ELECTRIC
PRF	POST & RAIL
PWF	POST & WIRE
GP	GATEPOST
PF	PANEL
IR	IRON RAILING
	GATE
PT	POST

SURFACES

	ROAD EDGE (NON KERBED)
	FOOTPATH
DK	DROP KERB
KO	KERB OUTLET
TK	TRACK
7.621	KERB

FEATURES

BW	BRICK WALL
BG	BUILDING
SW	STONE WALL
CW	CONCRETE WALL
BLW	BLOCK WALL
RW	RETAINING WALL
	SHED
	STRUCTURE
+ 5.55	GROUND LEVEL IS 5.55M
BM	BENCHMARK
STN	SURVEY STATION
G 0.5	TREE GIRTH CIRCUM 0.5M
S 6	SPREAD RADIUS 6M
H 10	HEIGHT 10M
ASH	SPECIES ASH
STUMP	STUMP GIRTH TO SCALE

	HEDGE
	FOLIAGE OUTLINE
	BANKING

STREET SERVICES

LP	LAMPPOST
	NAME SIGN/PLATE
MS	MILE STONE
TS	TRAFFIC SIGNAL
RS	ROAD SIGN
BCN	BELISHA BEACON
BD	BOLLARD
HR	HAND RAIL
CB	CRASH BARRIER
BENCH	BENCH
BS	BUS STOP
CB	BT CALL BOX
BTBX	BT ABOVE GROUND BOX
BTMH	BT MANHOLE
TP	BT TELEGRAPH POLE
CATV	CABLE TELEVISION
EP	ELECTRICITY POLE
ELMH	ELECTRICITY MANHOLE
ER	EARTH ROD
GAS	GAS
FH	FIRE HYDRANT
FHMP	FIRE HYDRANT M/POST
WM	WATER METER
WSV	WATER STOP VALVE
SV	STOP VALVE
SVMP	STOP VALVE M/POST
MTR	METER
US	UNIDENTIFIED SERVICE
TSCB	TRAFFIC SIGNAL CNTL BOX
MHS	MANHOLES
MHT	MANHOLES
MHC	MANHOLES
CP	CATCH PIT
DP	DOWNPIPE
VP	VENT PIPE
RE	RODDING EYE
CL	COVER LEVEL
SL	SOFFIT LEVEL
IL	INVERT LEVEL
G 7.564	GULLY

The depiction of a wall, fence or hedge does not necessarily represent a legal boundary. It is the clients responsibility to confirm legal boundaries with the vendor
All trees measured on site have a general spread value attached. Heights of trees are approximate only.

Unless previously agreed, all services existing on site have been surveyed apart from where access is restricted by vehicles or other significant obstructions.
If applicable, manhole covers will be lifted unless this significantly obstructs the flow of traffic or vehicular access.
Manhole covers will not be lifted if this were to present any health & safety risk to staff or the public. Irreplaceable or cracked covers will also not be lifted.
All pipe directions are indicative only and have not been proved unless indicated.
For safety reasons, pipe sizes and directions are estimated from above ground and are therefore approximate.

All drawing units, levels and dimensions are in meters, unless otherwise stated.

The data used for the computation of horizontal and vertical control for this survey was recorded using our survey grade GNSS receivers.
This data was provided by Leica Geosystems Smartnet RTK correction service.
Therefore primary survey control is based on OSGB36(02)

A scale factor of 1 has been applied to this survey which has been based on station 1 and referenced to station 2.

REVISIONS/UPDATES & ASSOCIATED DETAILS

Dwg No	Details	By	Date
5250-1-revA	Trees amended as per instructions from client.	LJ	Nov 2016

Ratcliff
Land & Engineering Surveys Ltd
www.ratclifflandsurveys.co.uk ~ info@rlesurveys.co.uk ~ Tel: 01733 270851

JOB TITLE
TOPOGRAPHIC SURVEY OF LAND AT PARKSIDE CRESCENT, SPALDING

SHEET SIZE & SCALE	*DATE SURVEYED*	*DRAWN BY*
A2 @ 1:250	JUNE 2015	AR

DRAWING NUMBER
5250-1-revA

CLIENT
SOUTH HOLLAND DISTRICT COUNCIL

APPENDIX B

Permeability Testing Results

Site Investigations

Geologists

Environmental & Geotechnical Engineers

Solmek Limited
12 Yarm Road
Stockton on Tees
Cleveland, TS18 3NA
Tel: 01642 607083
Fax: 01642 612355
Web: www.solmek.com
Email: south@solmek.com

FAO Alex Gibson

Contract Ref: S161012

William Saunders
Sheppard Lockton House
Cafferata Way
Newark
Nottinghamshire
NG24 2TN

19th October 2016

S161012, Permeability Testing at Parkside Crescent, Spalding.

Dear Alex,

Solmek visited the above site on 12th October 2016 to carry out a series of percolation tests within two trial pits, carried out to the south and in the centre of the proposed residential development as per the client's instructions. Please find attached the details of the percolation tests. The testing was carried out in accordance with BRE Digest 365: Soakaway Design.

The trial pits were excavated by Solmek using a machine excavator with a 0.40m wide bucket, then water was poured into the pits from a bowser. During trial pit excavation initial deep soakaways were attempted, however groundwater was encountered at 1.8mbgl, therefore shallow soakaways were carried out at 1.2mbgl. Each soakaway was executed in a dark brown sandy SILT. Soakaway locations are presented in Figure 1 appended to this report.

Below gives a summary of the related infiltrations rates for each trial pit, where an advisory classification has been given.

Test Number	Infiltration Rate ($m/sec \times 10^{-6}$)	Description of Base stratum
TP1	0.90	Dark brown sandy SILT
TP2	0.00	Dark brown sandy 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



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OS data © Crown copyright and database right 2015

Title
Soakaway Location Plan

Project
Parkside Crescent, Spalding

Client
William Saunders

Date
October 2016

Fig No.
Figure 1

Scale
Do Not Scale

Key

Site Boundary

Chain Link Fence Across Site

Soakaway Location

N

Solmek Ltd.
12 Yarm Road
Stockton-on-Tees
TS18 3NA

Tel: +44 (0) 1642 607083
Fax: +44 (0) 1642 612355
e-mail: south@solmek.com
www.solmek.com

SOLMEK

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

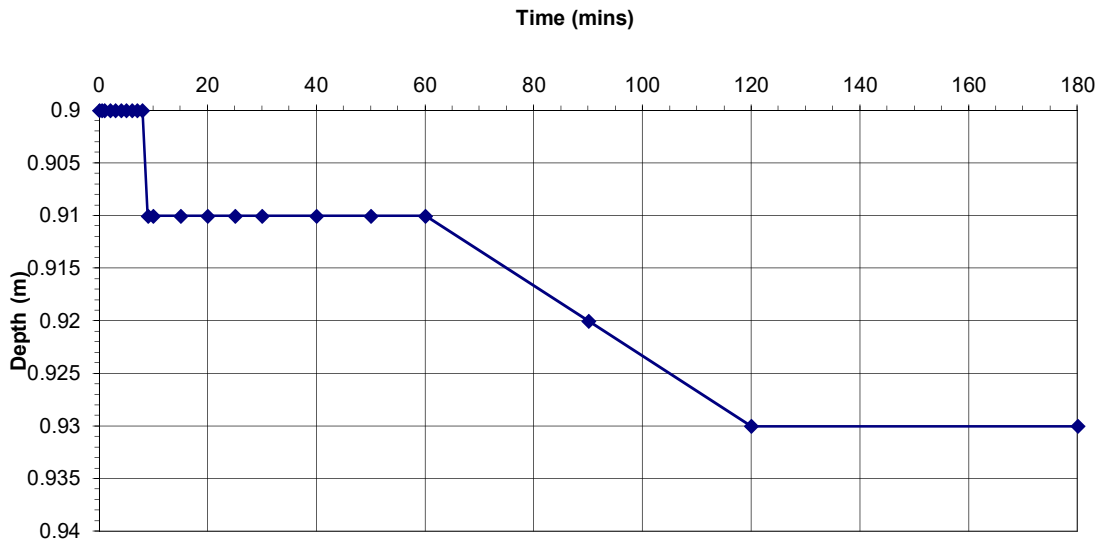
Client:	**William Saunders**				
Site:	**Parkside Crescent, Spalding**				
Job No:	**S161012**				
Pit No:	**TP1**		**Test No:**	**1**	

CALCULATION OF SOIL INFILTRATION RATE

Time (min)	Depth (m)
0	0.9
0.5	0.9
1	0.9
2	0.9
3	0.9
4	0.9
5	0.9
6	0.9
7	0.9
8	0.9
9	0.91
10	0.91
15	0.91
20	0.91
25	0.91
30	0.91
40	0.91
50	0.91
60	0.91
90	0.92
120	0.93
180	0.93

Pit Dimensions	
Length (m) =	1.20
Width (m) =	0.40
Depth (m) =	1.20
Depth at start of test (m) =	0.900
Depth at end of test (m)=	0.930
75% level (m)=	0.908
50% Effective Depth	0.285
25% level (m)=	0.923
Base area of pit (m^2) =	0.480
Vp_{75-25} (m^3) =	0.007
a_{p50} (m^2) =	1.392
From the graph:	
tp 75 (min) =	8.5
tp 25 (min) =	104
Soil infiltration rate, f, (m/s) =	**9.03E-07** **normal test**

Input by:	**SA**	**Date:**	**17/10/2016**
Checked by:	**SA**	**Date:**	**17/10/2016**



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

Client:	**William Saunders**				
Site:	**Parkside Crescent, Spalding**				
Job No:	**S161012**				
Pit No:	**TP2**		**Test No:**	**1**	

CALCULATION OF SOIL INFILTRATION RATE

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

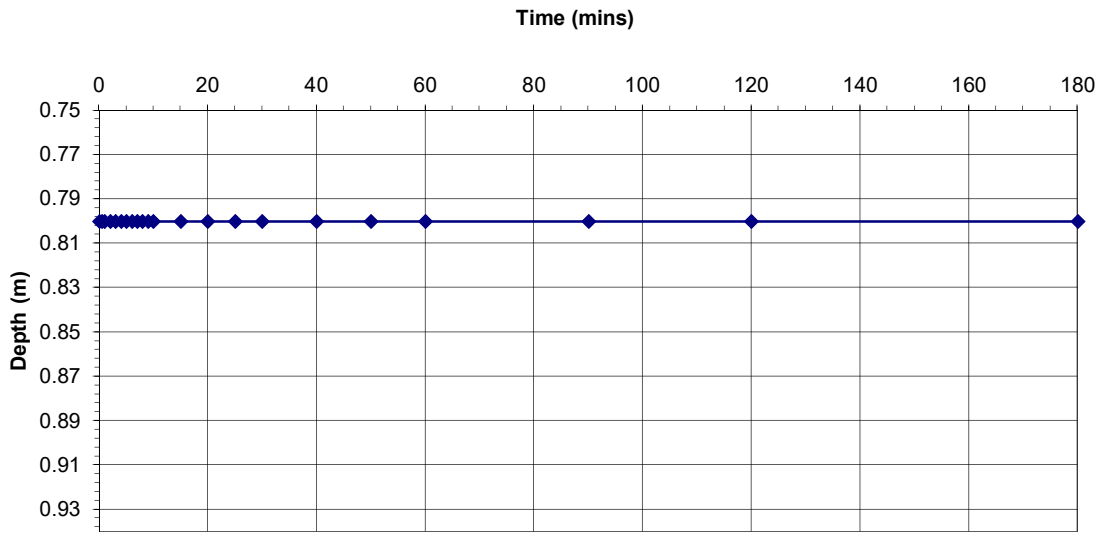
Pit Dimensions	
Length (m) =	1.20
Width (m) =	0.40
Depth (m) =	1.25

Depth at start of test (m) =	0.800
Depth at end of test (m)=	0.800
75% level (m)=	0.800
50% Effective Depth	0.450
25% level (m)=	0.800
Base area of pit (m^2) =	0.480
Vp_{75-25} (m^3) =	0.000
a_{p50} (m^2) =	1.920

From the graph:	
tp 75 (min) =	0
tp 25 (min) =	1

Soil infiltration rate, f, (m/s) =	**0.00E+00**	**normal test**

Input by:	**SA**	**Date:**	**17/10/2016**
Checked by:	**SA**	**Date:**	**17/10/2016**



♠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.

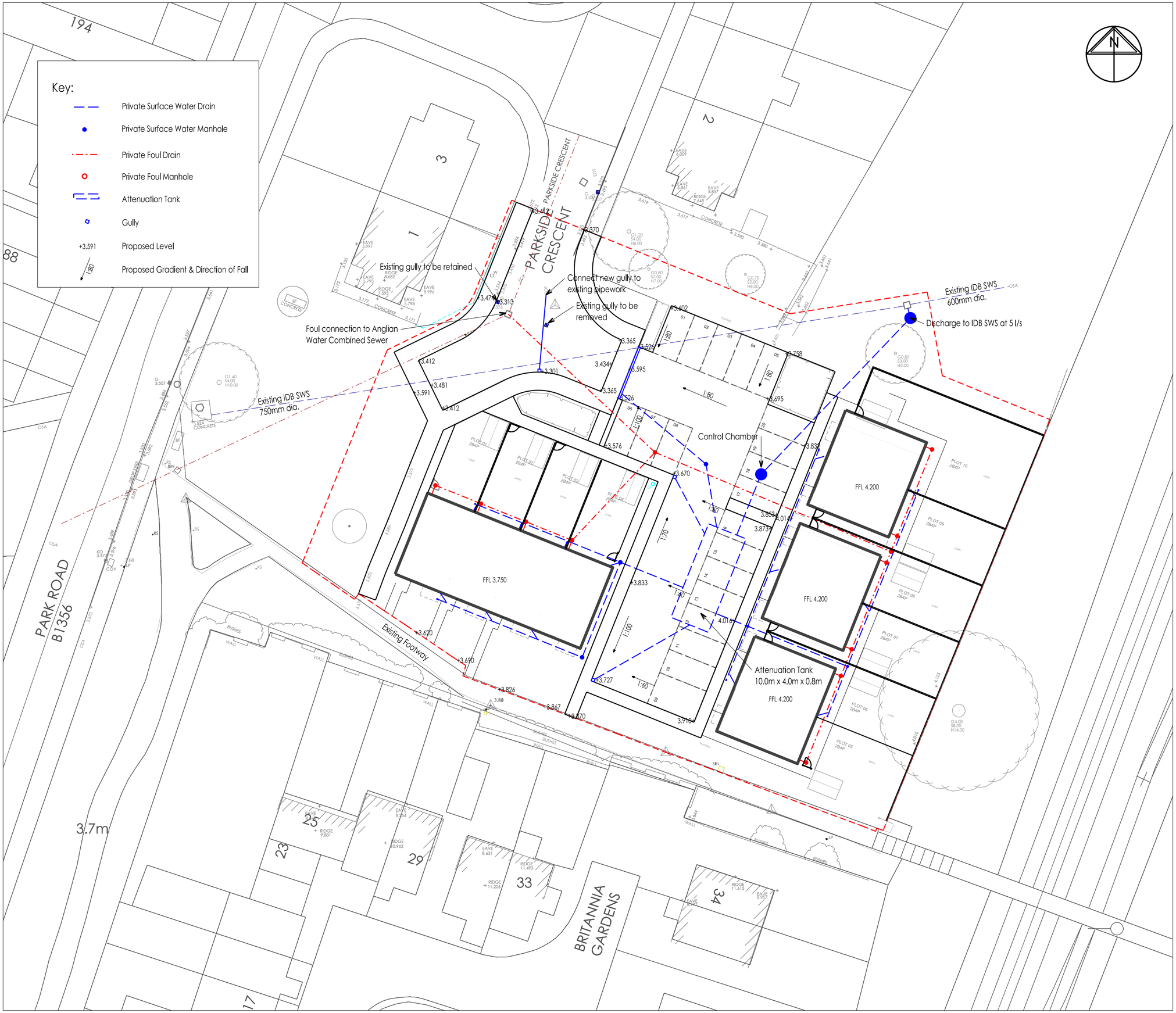
We have allowed for 1 mobilisation and normal working hours unless otherwise stated. The scope of the investigation may be reviewed following the desk study and/or fieldwork. The presence or otherwise of Japanese Knotweed or other invasive plants can be difficult to identify especially during winter 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.

APPENDIX C

Proposed Site & Drainage Layout

williamsaunders



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.

This drawing & any design thereon is the copyright of Wm Saunders Partnership LLP and must not be reproduced without their written consent.

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.

Preliminary drainage layout.

Allowable discharge rate and attenuation volumes to be confirmed following consultation with IDB.

All proposed levels shown are preliminary.

Quick Storage Estimate - Attenuation Volumes
30yr (+15% to 30% c/c) = 15m3 to 28m3
100yr (+25% to 65% c/c) = 29m3 to 58 m3

Rev	Description	Drn	Vf'd	Date
A	Site layout amended, drainage layout amended	CM	AG	11/16
-	Initial issue for comment	CM	AG	10/16

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: H

☒ 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 10/16

Drawing Status
PRELIMINARY

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architecture: engineering: building consultancy

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Project
Residential Development
Parkside Crescent
Spalding
Lincolnshire

Client
Welland Homes

Title
Preliminary Drainage Layout

Drawn	Date	Scale	
CM	October 2016	1:250	@ A2
Discipline	**Project Number**	**Drawing Number**	**Revision**
Civils	11482	(SK)03	A

APPENDIX D

Calculations

CALCULATION COVER SHEET

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architecture : engineering : building consultancy
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Project: Parkside Crescent, Spalding

Client: Welland Homes Ltd

Our Ref: 11482/12

Volume No: 1 **Section No:** 1 **No of Pages:** 3

Calculations for: Surface Water Calculations

Prepared by: C.Melton EngTech MICE MIHE **Date:** 23/11/16

Sheets Checked	Checked by	Date
Existing Drainage Areas	**A.Gibson BEng CEng MICE MCIHT**	**23/11/16**
Proposed Surface Water Areas	**A.Gibson BEng CEng MICE MCIHT**	**23/11/16**
Quick Storage Estimate	**A.Gibson BEng CEng MICE MCIHT**	**23/11/16**

Verified by: A.Gibson BEng CEng MICE MCIHT **Date: 23/11/16**

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CALCULATION SHEET

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Project: Parkside Crescent Our Ref: 11482

Calculations for: Existing Drainage Areas.

Volume: Section: Revision:

Calc by: CM Date: Checked by: Date: 11/16 Sheet 1 of 3

Existing Discharge + Existing Imp Areas

Existing Paved Area = 601.94m²

Existing Roofs = 112.76m²

Total Existing = 714.7m² / 0.071 ha

Existing Run Off to IDB sewer :

$Q = 2.78 \times 50 \times A_{imp}$

$Q = 2.78 \times 50 \times 0.071$

$Q = 9.869$ l/s

Less 30% for proposed run-off gives allowable discharge of : 6.903 l/s *

* Based on brownfield site requirements.

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Project: PARKSIDE CRESCENT **Our Ref:** 11482/12

Calculations for: SURFACE WATER AREAS - PROPOSED.

Volume: _____ **Section:** _____ **Revision:** _____

Calc by: CM **Date:** _____ **Checked by:** [signature] **Date:** 11/16 **Sheet** 1 **of** 3

SITE AREA = 0.278 ha.

Impermeable area =

Total Development = 1343.48 m² / 0.134 ha.

Private Drives/Parking Area = 613.27 m²

Roof Areas = 435.08 m²

Adoptable Areas = 295.13 m²

Adoptable areas to drain to existing highway Drainage.

Areas to discharge to 1D3 drain = 1048.35 m².

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Project: PARKSIDE CRESCENT **Our Ref:** 11482/12

Calculations for: Qsich Storage Estimate.

Volume: _____ **Section:** _____ **Revision:** _____

Calc by: CM **Date:** _____ **Checked by:** [signature] **Date:** 11/16 **Sheet** 3 **of** 3

Qsich Storage Estimate

FEH:

5 l/s - 0.105ha impArea.

1 yr	=	2.1 - 5.8m³
30 yr + 15%	=	21 - 31m³
30 yr + 35%	=	26 - 38m³
100 yr + 25%	=	39 - 54m³
100 yr + 65%	=	56 - 76m³

30 yr + 10%	=	19 - 29m³.
100 yr + 30%	=	41 - 57m³

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