

King's Somborne

Hampshire

Drainage Note

November 2021

Project Information	
Project:	King's Somborne
Report Title:	Drainage Note
Client:	King's Somborne Parish Council
Instruction:	The instruction to undertake this Drainage Note was received from Liz Manship of King's Somborne Parish Council
File Ref:	14083-Drainage Note-01

Approval Record	
Author:	Aled Williams BSc (Hons) MCIWEM
Checker:	David Hughes MEng (Hons) GMICE
Approver:	Victoria Griffin BSc (Hons) MSc MEnvSc CEnv

Document History		
Revision	Date	Comment
01	04/11/2021	First issue

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This report will remain valid for a period of twelve months (from the date of last issue) after which the source data should be reviewed in order to reassess the findings and conclusions on the basis of latest available information.

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Introduction

Waterco have been commissioned by King's Somborne Parish Council to undertake a Drainage Note in relation to potential future site allocations for residential development in King's Somborne.

The purpose of this Drainage Note is to establish the viability of draining surface water generated by up to 5no. development sites located throughout King's Somborne. Focus is given to:

- Estimating existing greenfield runoff rates.
- Establishing proposed surface water discharge rates (where off-site discharge to watercourse is required).
- Establishing whether gravity connection to Somborne Stream is achievable from proposed development surface water drainage systems (taking into account site levels, the invert level of below ground attenuation storage features, and outfall levels at Somborne Stream).
- Providing a typical detail of a below ground geo-cellular attenuation tank.
- Advising on any other drainage constraints and requirements for future developers to consider.

This Drainage Note should be read in conjunction with the Waterco Hydraulic Modelling Report (document reference 14083-HMN-01 – dated November 2021). The Hydraulic Modelling Report sets out the impact of surface water discharges from up to 5no. development sites to Somborne Stream on flood risk elsewhere throughout King's Somborne.

The 5no. development sites considered are:

- KS3 – Developable area of 3,300m² - Up to 15 dwellings
- KS5 (SHELAA 148b) - Developable area of 3,100m² - Up to 15 dwellings
- KS7 (SHELAA 80) - Developable area of 1,600m² - Up to 7 dwellings
- SHELAA 81 – Developable area of 1,600m² - Up to 7 dwellings
- KS6 – Developable area of 900m² - Up to 4 dwellings.

A location plan and an aerial image are included in Appendix A.

Existing Conditions

The 5no. development sites are all previously undeveloped and are considered to be greenfield.

Topographic levels to metres Above Ordnance Datum (m AOD) have been derived from a 1m resolution Environment Agency (EA) composite 'Light Detecting and Ranging' (LiDAR) Digital Terrain Model (DTM). A review of LiDAR data shows that the topography of the developable areas of each site vary as follows:

- KS3 – Level slope from 36m AOD in the north to 33m AOD in the south.
- KS5 (SHELAA 148b) – Levels slope from 41m AOD in the north-west to 37m AOD in the south-west.
- KS7 (SHELAA 80) – Levels slope from 37m AOD in the north to 36m AOD in the south-west.
- SHELAA 81 – Levels slope from 38m AOD in the south-west to 35m AOD in the north.
- KS6 – Levels slope from 37m AOD in the south to 35m AOD in the north.

A LiDAR extract is included in Appendix B. The developable areas of each site are derived from document 'Site Assessment Phase II' provided by the Client.

Ground Conditions

The British Geological Survey (BGS) online mapping (1:50,000 scale) indicates that all the development sites considered in this study are underlain by superficial deposits of Head, generally comprising clay, silt, sand and gravel. The superficial deposits are identified as being underlain by the Newhaven Chalk Formation.

The geological mapping is available at a scale of 1:50,000 and as such may not be accurate on a site-specific basis.

Historical BGS borehole records are available in the western extent of SHELAA 81 (BGS reference: SU33SE9) and immediately south of KS1 (BGS reference: SU33SE41). The borehole records are included in Appendix C.

BGS borehole SU33SE9 in the western extent of SHELAA 81 identifies topsoil to 1.21m below ground level (m.bgl) underlain by ballast (natural superfcials) and grit to 3.7m.bgl. The grit is underlain by soft chalk to 30.48m.bgl. The resting groundwater level was identified at 2.43m.bgl.

BGS borehole SU33SE41 south of KS1 identifies soft chalk from ground level to 18.28m.bgl. The resting groundwater level was identified at 4.57m.bgl.

Hydrology

Somborne Stream flows south-west through King's Somborne and generally north of Winchester Road. The location of Somborne Stream is identified on the Location Plan (Appendix A).

Runoff Rate Estimation & Attenuation Storage

The existing greenfield runoff rates for the developable areas of each site have been estimated using the Revitalised Flood Hydrograph Model (ReFH2) method. A summary of the greenfield runoff rates for a range of events is provided as Appendix D. A summary is also provided in Table 1:

Table 1 – Greenfield Runoff Rates

	KS3	KS5 (SHELAA 148b)	KS7 (SHELAA 80)	SHELAA 81	KS6
Storm Event	Runoff Rate (litres/second)				
1 in 2	0.19	0.18	0.09	0.09	0.05
1 in 30	0.44	0.42	0.21	0.21	0.12
1 in 100	0.58	0.54	0.28	0.28	0.16

The greenfield runoff rates are considered to be minimal due to the permeable nature of the underlying geology.

In order to reduce the risk of blockage and ensure drainage systems are self-cleansing, a limited discharge rate of up to 2 l/s may need to be applied to the surface water drainage system for each development site.

Attenuation Storage

In order to achieve a discharge rate of 2 l/s, attenuation storage will be required. An attenuation storage estimate for a typical development of up to 15 dwellings is included in Appendix E. The attenuation storage estimate is based on an impermeable drainage area of 1,240m², equating to 40% of a 3,100m² development site area (equivalent to KS5).

An estimated storage volume of 58m³ will be required to accommodate the 1 in 100 year plus 40% Climate Change (CC) event. The storage estimate is based on storage within a tank or pond structure, a design head of 1m and hydro-brake flow control.

A typical cross section through a geo-cellular attenuation storage tank is provided as Appendix F.

Discharge to Somborne Stream

An assessment of the viability of gravity drainage from each development site to Somborne Stream has been undertaken using LiDAR data. A comparison has been made of the bank level at Somborne Stream in its nearest position to each development site with the approximate invert level of an attenuation storage tank / flow control device. The invert level of an attenuation tank / flow control device is assumed at 1.5m below

ground level, accounting for a 0.8m deep tank and minimum 0.7m of ground cover.

An assessment of the viability of gravity drainage is provided in Table 2.

Table 2 – Gravity Drainage Feasibility

Site	Minimum Ground Level in Developable Area (m AOD)	Approximate Drainage System Invert Level at Flow Control Device (m AOD) – 1.5m below ground level.	Bank Level at Somborne Stream (m AOD)	Gravity Drainage Achievable
KS3	33m AOD	31.5m AOD	32m AOD	Gravity discharge may be feasible subject to limited land level raising and utilisation of shallow depth attenuation storage features (0.4m in height).
KS5 (SHELAA 148b)	37m AOD	35.5m AOD	34m AOD	Gravity connection appears feasible subject to route of piped outfall
KS7 (SHELAA 80)	36m AOD	34.5m AOD	34.5m AOD	Gravity connection appears feasible subject to route of piped outfall. Limited ground level raising may be required.
SHELAA 81	35m AOD	33.5m AOD	34m AOD	Gravity discharge may be feasible subject to limited land level raising and utilisation of shallow depth attenuation storage features (0.4m in height).
KS6	35m AOD	33.5m AOD	34m AOD	Gravity discharge may be feasible subject to limited land level raising and utilisation of shallow depth attenuation storage features (0.4m in height).

It can be concluded that a gravity drainage solution is achievable however would be subject to utilising shallow depth attenuation storage (0.4m high geo-cellular systems or box culverts) and limited site level

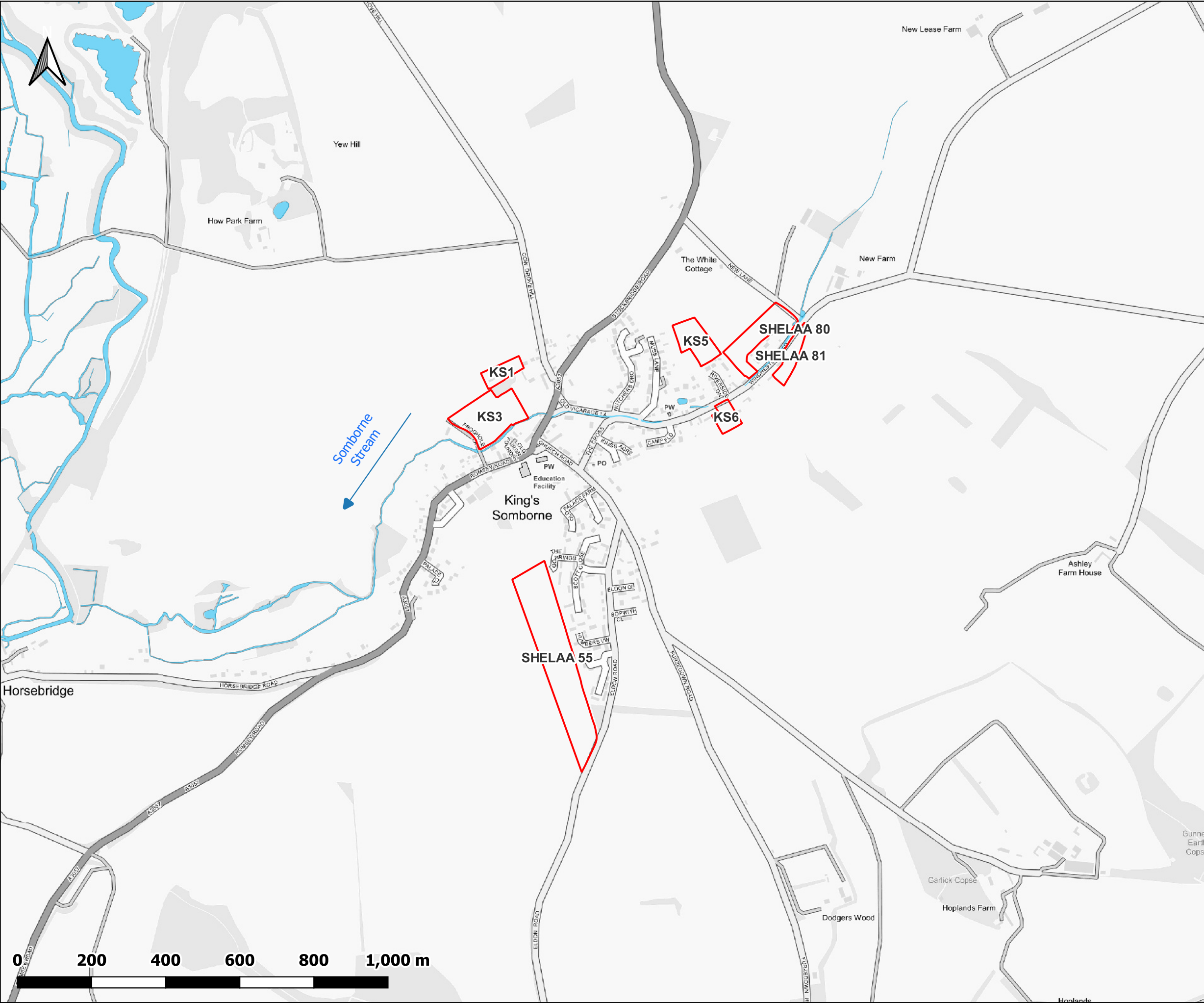
raising on sites KS3, SHELAA 81 and KS6. Where ground level raising is not permitted (due to other planning constraints) and sufficient space is not made available for shallow depth attenuation storage solutions, a pumped solution may be required.

Future Development Considerations

The following information should be provided to support future planning applications / discharge of conditions applications as appropriate:

- Flood Risk Assessment (FRA) for sites within or adjacent to Flood Zone 2 and Flood Zone 3. The FRA should consider flood risk from Somborne Stream and should be supported by a detailed hydraulic modelling study. Consideration should be given to the flood risk associated with blockage of structures (culverts, bridges etc.) along Somborne Stream.
- Ground Investigations including groundwater monitoring (duration of monitoring to be agreed with the Lead Local Flood Authority) to confirm the underlying geological sequence and establish seasonal groundwater levels. Infiltration tests in accordance with the BRE365 specification should be undertaken where infiltration techniques (soakaways and permeable surfaces) can be used on site i.e. where the invert level of a soakaway or other infiltration device can be set a minimum of 1m above the highest recorded groundwater level.
- Drainage Strategy setting out how surface water and foul flows will be managed. Where surface water discharge to Somborne Stream is made, the Drainage Strategy should detail how a limited discharge rate of 2 l/s (or lower where possible) will be achieved (provide details of flow control and attenuation storage). The Drainage Strategy should also consider the requirement for a non-return valve on the surface water and foul drainage system and should also consider storm water storage requirements in the event that the outfall to Somborne Stream becomes surcharged (submerged in flooding conditions).
- Detailed Drainage Design setting out the drainage layout and levels. Where the invert level of below ground attenuation feature is within 1m of the identified groundwater level, groundwater floatation calculations should be undertaken, and appropriate mitigation specified where required to prevent floatation of the attenuation storage feature.

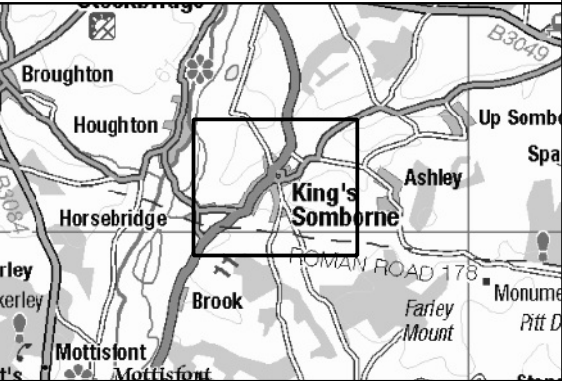
Appendix A Location Plan and Aerial Image



Notes:
1) All dimensions are in metres and all levels in metres above Ordnance Datum unless stated otherwise

LEGEND

- Proposed Development Sites
- Watercourses / Water Bodies



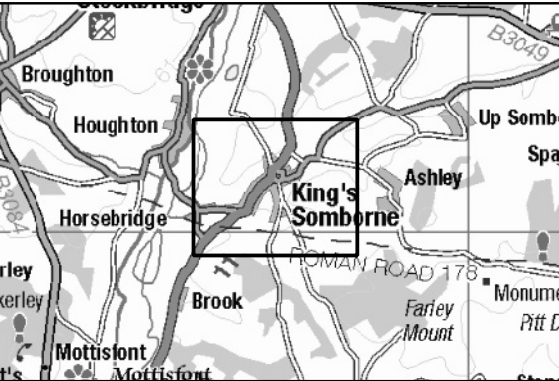
CLIENT: <div>King's Somborne Parish Council</div>			
<div> www.waterco.co.uk</div>			
SCHEME: <div>King's Somborne - Drainage Note</div>			
PLOT TITLE: <div>Location Plan</div>			
PLOT STATUS: <div>FINAL</div>		DATE: <div>29-10-2021</div>	
DRAWN: <div>DH</div>	CHECKED: <div>SB</div>	APPROVED: <div>AW</div>	PLOT SCALE AT A3: <div>1:10000</div>
PLOT NAME: <div>14083-Location_Plan</div>			REVISION: <div>-</div>



Notes:
1) All dimensions are in metres and all levels in metres above Ordnance Datum unless stated otherwise

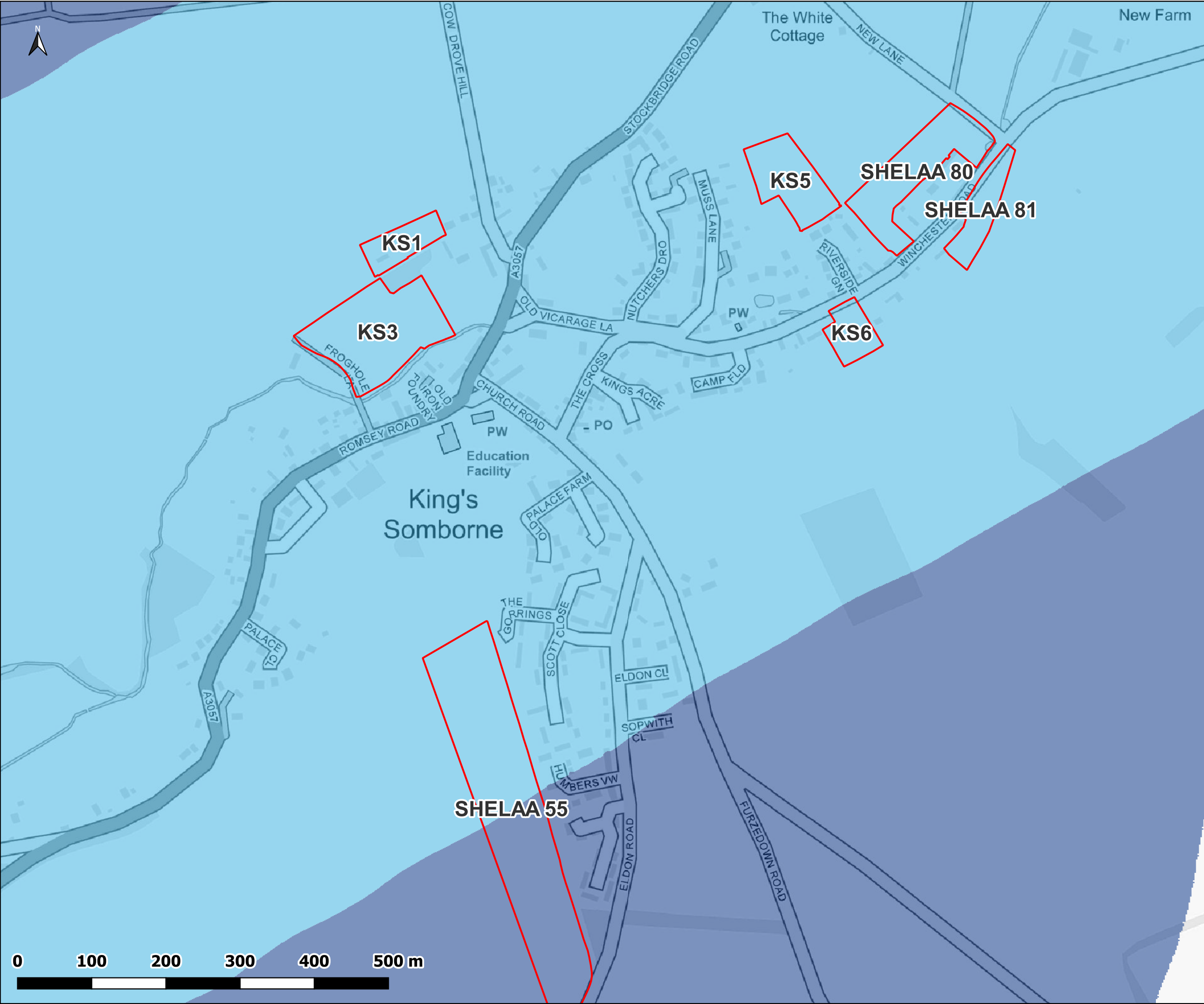
LEGEND

Proposed Development Sites



CLIENT: King's Somborne Parish Council			
 www.waterco.co.uk			
SCHEME: King's Somborne - Drainage Note			
PLOT TITLE: Aerial Plan			
PLOT STATUS: FINAL		DATE: 29-10-2021	
DRAWN: DH	CHECKED: SB	APPROVED: AW	PLOT SCALE AT A3: 1:10000
PLOT NAME: 14083-Aerial_Plan			REVISION: -

Appendix B LiDAR Extract




Notes:
1) All dimensions are in metres and all levels in metres above Ordnance Datum unless stated otherwise

LEGEND

- Proposed Development Sites
- EA LiDAR Coverage (1m Resolution)
- EA LiDAR Coverage (2m Resolution)

CLIENT:

King's Somborne Parish Council


www.waterco.co.uk

SCHEME:

King's Somborne - Drainage Note

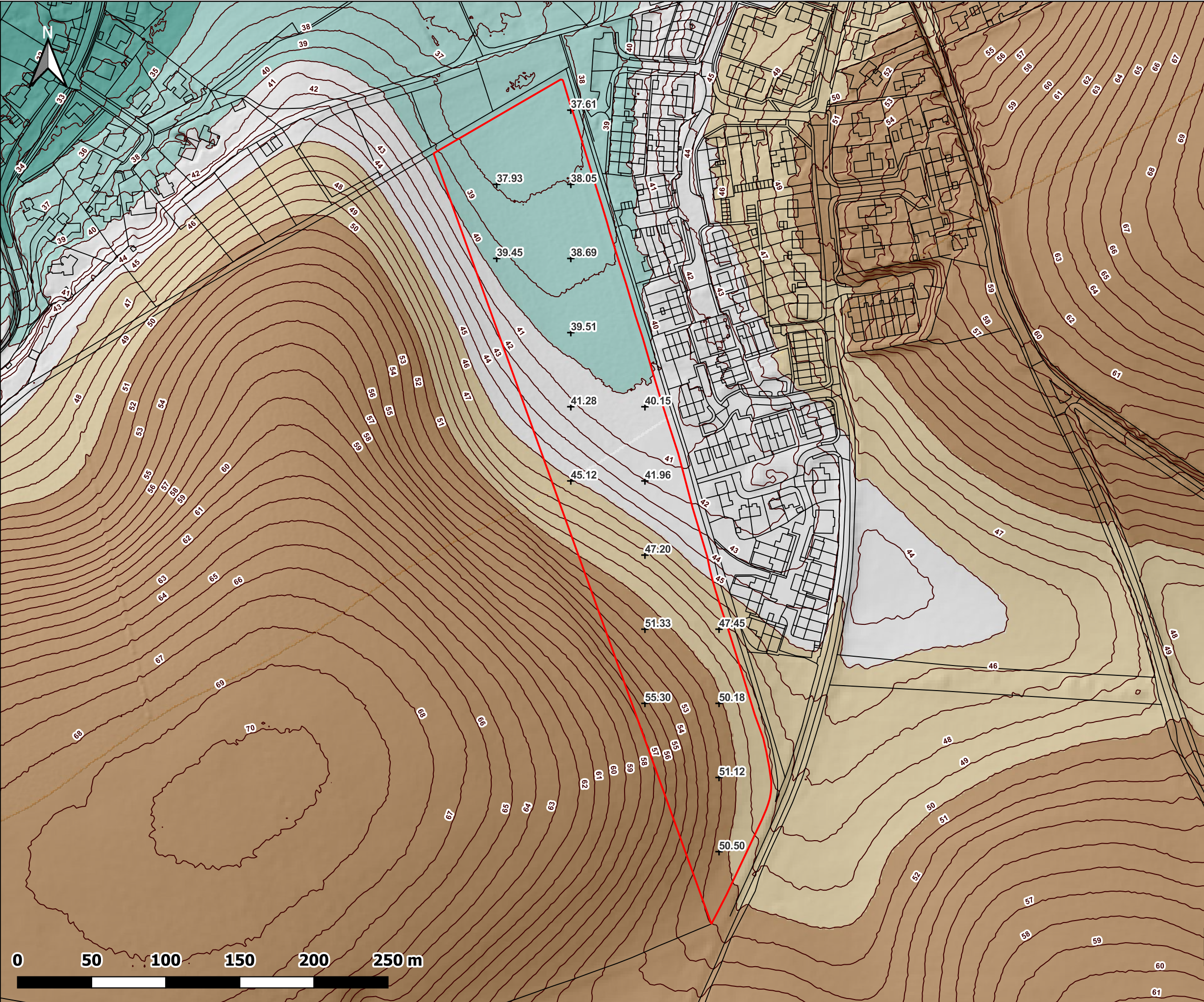
PLOT TITLE:

LiDAR Coverage

PLOT STATUS:		DATE:	
FINAL		03-11-2021	

DRAWN:	CHECKED:	APPROVED:	PLOT SCALE AT A3:
DH	AW	VG	1:5000

PLOT NAME:	REVISION:
14083-LiDAR_Coverage	-



Notes:
1) All dimensions are in metres and all levels in metres above Ordnance Datum unless stated otherwise

LEGEND

- Proposed Development Sites
- Spot Levels
- 1m Contour Lines

LiDAR Levels (EA 2020 DTM)

- <= 35.00
- 35.00 - 40.00
- 40.00 - 45.00
- 45.00 - 50.00
- > 50.00

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waterco
www.waterco.co.uk

SCHEME:

King's Somborne - Drainage Note

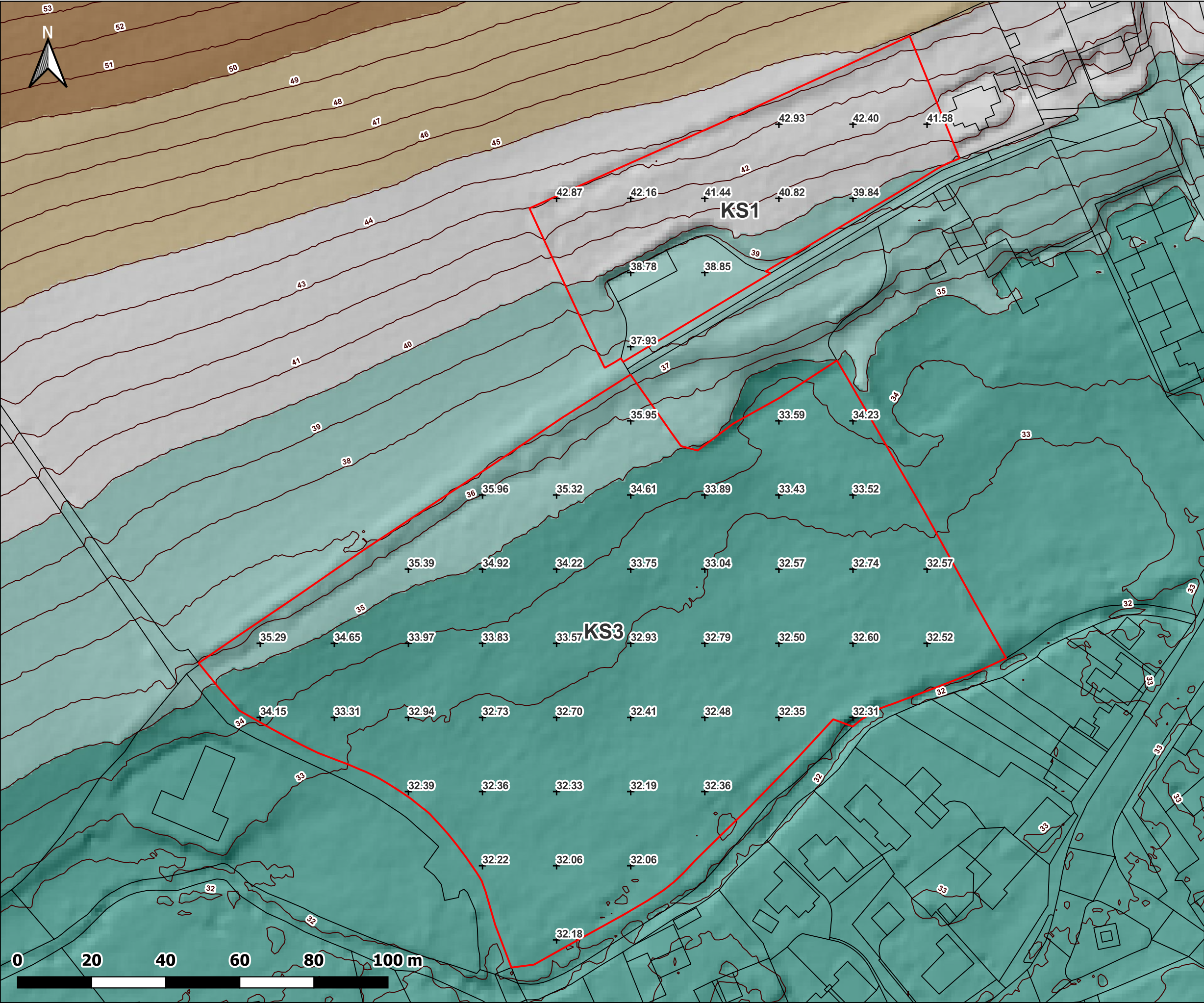
PLOT TITLE:

LiDAR Levels
Site SHELAA55

PLOT STATUS:		DATE:	
FINAL		03-11-2021	

DRAWN:	CHECKED:	APPROVED:	PLOT SCALE AT A3:
DH	AW	VG	1:2500

PLOT NAME:	REVISION:
14083-LIDAR_SHELAA55	-



Notes:
1) All dimensions are in metres and all levels in metres above Ordnance Datum unless stated otherwise

LEGEND

- Proposed Development Sites
- Spot Levels
- 1m Contour Lines

LiDAR Levels (EA 2020 DTM)

- <= 35.00
- 35.00 - 40.00
- 40.00 - 45.00
- 45.00 - 50.00
- > 50.00

CLIENT:

King's Somborne Parish Council

www.waterco.co.uk

SCHEME:

King's Somborne - Drainage Note

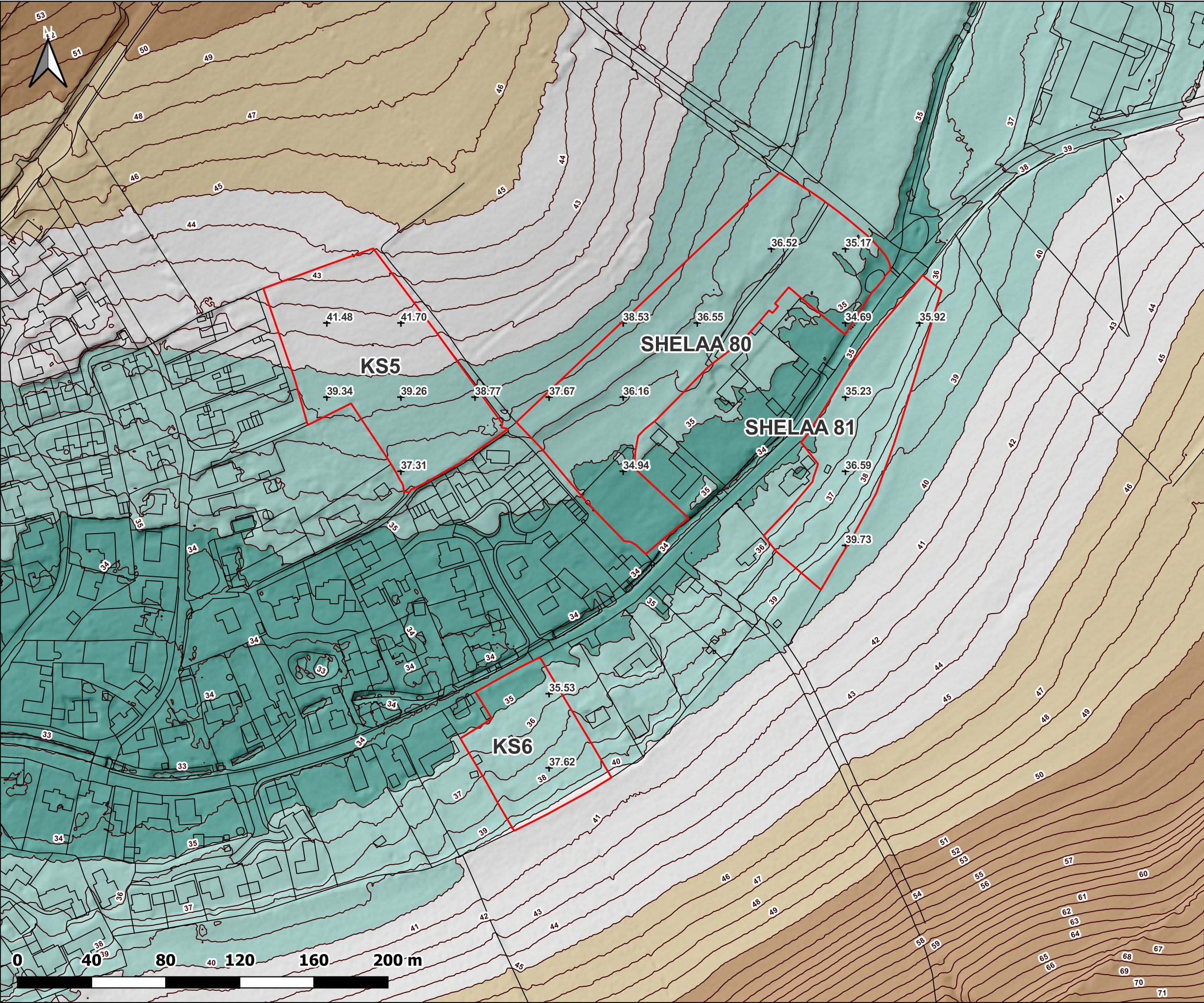
PLOT TITLE:

LiDAR Levels
Sites KS1 and KS3

PLOT STATUS:			DATE:
FINAL			03-11-2021

DRAWN:	CHECKED:	APPROVED:	PLOT SCALE AT A3:
DH	AW	VG	1:1000

PLOT NAME:	REVISION:
14083-LIDAR_KS1_KS3	-



Notes:
1) All dimensions are in metres and all levels in metres above Ordnance Datum unless stated otherwise

LEGEND

- Proposed Development Sites
- Spot Levels
- 1m Contour Lines

LiDAR Levels (EA 2020 DTM)

- <= 35.00
- 35.00 - 40.00
- 40.00 - 45.00
- 45.00 - 50.00
- > 50.00

CLIENT:
King's Somborne Parish Council

waterco
www.waterco.co.uk

SCHEME:
King's Somborne - Drainage Note

PLOT TITLE:
LiDAR Levels
Sites KS5, KS6, SHELAA80-81

PLOT STATUS: FINAL		DATE: 03-11-2021	
DRAWN: DH	CHECKED: AW	APPROVED: VG	PLOT SCALE AT A3: 1:2000
PLOT NAME: 14083-LIDAR_KS5_KS6_SHELAA80-81			REVISION: -

Appendix C BGS Borehole Records



British
Geological
Survey

Version 2.0.6.4

BGS ID: 406969 : BGS Reference: SU33SE9

British National Grid (27700) : 436690,131230

[Report an issue with this borehole](#)

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EXACT SITE OF WELL	RECORD OF WELL		For Institute use only Licence No. Su 33 (97) N.....	
	At MANOR FARM (NEW FARM)		299/451	
*DELETE AS NECESSARY	Town or Village	KINGS SOMBORNE		
	County	HAMPSHIRE		
	Six-inch County Sheet	HANTS 39 SE/E		
	Six-inch National Grid sheet and reference	SU 3669 3123 SU 33 SE		
	For	MR. CHALCROFT		
	State whether owner, tenant, builder, contractor, consultant, etc. —	OWNER		
	Address (if different from above)	NEW FARM, KINGS SOMBORNE, HANTS		
	Level of ground surface above sea level (O.D.)	ft (.....) m)		
	If well top is not at ground level, state how far	above: * ft (.....) m) below: ft (.....) m)		
	SHAFT	ft (.....) m); diameter.....ft (.....) m);		
TEST CONDITIONS	HEADINGS (please attach details—dimensions and directions)			
	BORE	100 ft (30.48 m); diameter: at top..... 8 in (203.2 mm); at bottom.....in (.....cm)		
	Full details of permanent lining tubes (position, length, diameter, plain, slotted, etc.)			
	33 ft. Lining tube 8" (10.05 m at 203.2 mm diameter)			
NORMAL CONDITIONS	Water struck at depths offt (.....) m) below well top			
	Rest level of water	8 ft (2.43 m) above below well top. Suction at.....ft (.....) m)		
	Yield on	hours* test pumping at..... 8,000 galls (10.024 m³) per..... hour with		
	depression to	ft (.....) m) below well top. Recovery to rest level in mins* hours		
	Capacity of pump	g.p.h. (.....) m³/h)		
	Date of measurements	Data Bank	
	DESCRIPTION OF PERMANENT PUMPING EQUIPMENT:			
	Make and/or type	Motive power.....	
	Capacity	galls (.....) m³) per hour. Suction at.....ft (.....) m)		
	below well top. Amount pumped	galls (.....) m³) per day. Estimated consumption.....galls (.....) m³) per week		
LOG OF STRATA OVERLEAF	Well made by	S. C. A. T. S.	Date of sinking..... 1947	
	ADDITIONAL NOTES ANALYSIS (please attach copy if available)			
	Information from S.C.A.T.S. See letter 2nd. Feb. 1978			
		Received from S.C.A.T.S. Date 2nd. Feb. 1978 Observation well		

INSTITUTE OF GEOLOGICAL SCIENCES,
WATER DEPARTMENT,
SOUTH KENSINGTON,
LONDON, S.W. 7.

British Geological Survey

Recorder.....
E.R. log
Site marked on
1" map
6" map
(use symbol)
Copy to
British Geological Survey
Date



(For Institute use only) GEOLOGICAL CLASSIFICATION		NATURE OF STRATA If measurements start below ground surface, state how far.		THICKNESS			DEPTH		
				Feet	Inches	Metres	Feet	Inches	Metre
British Geological Survey	TOP SOIL	British Geological Survey	4	-00	1.21	4	-00	1.21	
	BALLAST		5-6	-00	1.5 1.8	9-10	-00	2.7 2.3	
	GRIT		2	-00	0.6	11-12	-00	3.4 3.7	
	VERY SOFT CHALK		88-89	-00	26.8 27.1	100	-00	30.48	
British Geological Survey									
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Version 2.0.6.4

BGS ID: 407001 : BGS Reference: SU33SE41

British National Grid (27700) : 435960,131210

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RECORD OF WELL (SHAFT OR BORE)

At Fromans (Fromans Farm) (Fromans Cottage)

Town or Village King's Somborne

County Hants Six-inch quarter sheet 39 S.E./E

For Mr. Dr. Roy

Exact site of well see attached tracing SU 3396 3121

Attach a tracing from a map, or a sketch-map, if possible.

Level of ground surface above sea-level (O.D.) +c. 145 feet.

Is well-top at ground level? If not, state how far above; feet.
below; feet.

Shaft ft., diameter ft. Details of headings

Bore 60 ft.; diameter of bore: at top 6 ins.; at bottom ins.

Lengths, diameters, perforations, etc., of lining tubes 33 ft

Water struck at depths, below well-top, of (feet)

TEST DETAILS (Rest-level of water 15 ft. above well-top; Suction at ft. Yield on hours' days' pumping 500 gallons per hour (max. capacity of pump g.p.h.)
Month Nov Year 1927 with depression of feet. Recovery to in mins. hours.

WORKING CONDITIONS (Rest-level of water in (month), (year), ft. above below well-top.
Highest " in (month), (year), ft. above below "
Lowest " in (month), (year), ft. above below "
Suction at ft. Rate of pumping galls. per for hours per day.
with average depression of ft. Recovery to in mins. hours

Quality of water (attach copy of analysis if available)

Well made by Date of well 1927
Information from Southern Counties Agricultural Trading Society

ADDITIONAL NOTES.

Site and information overlaid from present occupier Miss M.F. Heathcote, Fromans 10/6/42. (9509/35). Sited on field scap. 39SE/E P.T.O.

In use for house and also the cottage. Electric pump. Water good. Visited and sited by on 6" sheet Hants 39 SE/E 18.7.57 ICHJ.

Visited. The equipment is still in position although not now used. RWH 5.3 metres. depth 11 metres. ed +c. 118 ft.

Jim A. 24/1/78

NOTE: There is also an ornamental well in the front garden
LOG OF STRATA OVERLEAF.

Date received.	G.S.M. Office File No.	1" N.S. Map No.	1" O.S. Map No.	Site marked (use symbol) on 1" Map. on 6" Map.	
April 1941		299		Date	Base

GEOLOGICAL SURVEY AND MUSEUM,
SOUTH KENSINGTON,
LONDON, S.W.7.

(17208) Wt. 42901/0377 10,000 2/41 A. & E.W. Ltd. Gp. 586



British
Geological
Survey

Version 2.0.6.4

BGS ID: 407001 : BGS Reference: SU33SE41

British National Grid (27700) : 435960,131210

[Report an issue with this borehole](#)

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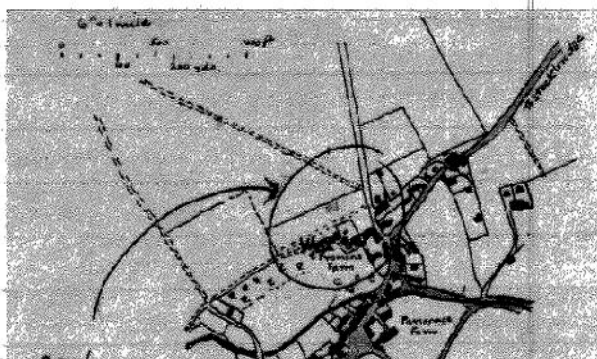
>>

(For Survey use only) GEOLOGICAL CLASSIFICATION	NATURE OF STRATA If measurements start below ground surface, state how far...	THICKNESS		DEPTH	
		Feet	Inches	Feet	Inches
U.Ck. <i>Soft chalk</i>		60	—	60	—

Copy of letter concerning soft. hole at
Tromans. Kings Somborne. Stockbridge. Hants
from Southern Counties Agricultural Trading Soc. Ltd.
Jan. 2. 1962

..... we beg to advise that the hole is
soft clay, lined at top with 33' steel tube
was bored in November 1927. The water
level is between 16' to 18' from the surface
& the hole will yield up to 500 gallons
per hour.





Appendix D ReFH2 Greenfield Runoff Rates


DOCUMENT VERIFICATION RECORD	
Project:	King's Somborne
Client:	King's Somborne Parish Council
Report Title:	14083-Drainage Note-01
Date:	3 rd November 2021


DOCUMENT REVIEW & APPROVAL	
Author:	Aled Williams BSc (Hons) MCIWEM
Checker:	David Hughes Meng (Hons) GMICE
Approver:	Victoria Griffin BSc (Hons) MSc MEnvSc CEnv


ReFH2 RUNOFF RATES (l/s) *					
Return Period (Years)	KS3	KS5 (SHELAA 148b)	KS7 (SHELAA 80)	SHELAA 81	KS6
1	0.17	0.16	0.08	0.08	0.046
2	0.19	0.18	0.09	0.09	0.05
5	0.28	0.26	0.13	0.13	0.075
10	0.34	0.32	0.16	0.16	0.09
30	0.44	0.42	0.21	0.21	0.12
50	0.50	0.47	0.24	0.24	0.14
75	0.54	0.51	0.26	0.26	0.15
100	0.58	0.54	0.28	0.28	0.16
200	0.67	0.63	0.33	0.33	0.18
1000	1.02	0.96	0.49	0.49	0.28

*Runoff Rates printed from the ReFH Flood Modelling software package

Appendix E Attenuation Storage Estimate

Waterco Ltd					Page 1
Eden Court		14083 - Kings Somborne			
Lon Parcwr Business Park					
Denbighshire LL15 1NJ		1 in 100 year plus 40% CC			
Date 28/09/2021 10:56		Designed by JW			
File		Checked by AW			
XP Solutions		Source Control 2020.1.3			
Summary of Results for 100 year Return Period (+40%)					
Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	9.499	0.499	1.9	29.9	O K
30 min Summer	9.658	0.658	1.9	39.5	O K
60 min Summer	9.807	0.807	1.9	48.4	Flood Risk
120 min Summer	9.841	0.841	1.9	50.4	Flood Risk
180 min Summer	9.832	0.832	1.9	49.9	Flood Risk
240 min Summer	9.810	0.810	1.9	48.6	Flood Risk
360 min Summer	9.771	0.771	1.9	46.2	Flood Risk
480 min Summer	9.735	0.735	1.9	44.1	Flood Risk
600 min Summer	9.701	0.701	1.9	42.1	Flood Risk
720 min Summer	9.668	0.668	1.9	40.1	O K
960 min Summer	9.602	0.602	1.9	36.1	O K
1440 min Summer	9.469	0.469	1.9	28.1	O K
2160 min Summer	9.325	0.325	1.9	19.5	O K
2880 min Summer	9.229	0.229	1.9	13.8	O K
4320 min Summer	9.132	0.132	1.8	7.9	O K
5760 min Summer	9.091	0.091	1.6	5.4	O K
7200 min Summer	9.076	0.076	1.4	4.6	O K
8640 min Summer	9.067	0.067	1.3	4.0	O K
10080 min Summer	9.061	0.061	1.2	3.6	O K
15 min Winter	9.561	0.561	1.9	33.7	O K
30 min Winter	9.740	0.740	1.9	44.4	Flood Risk
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)	
15 min Summer	134.448	0.0	31.2	16	
30 min Summer	90.446	0.0	42.0	31	
60 min Summer	57.968	0.0	53.9	62	
120 min Summer	33.050	0.0	61.4	120	
180 min Summer	23.801	0.0	66.4	180	
240 min Summer	18.869	0.0	70.2	216	
360 min Summer	13.629	0.0	76.0	278	
480 min Summer	10.841	0.0	80.6	342	
600 min Summer	9.089	0.0	84.5	410	
720 min Summer	7.875	0.0	87.9	482	
960 min Summer	6.289	0.0	93.5	624	
1440 min Summer	4.601	0.0	102.7	866	
2160 min Summer	3.378	0.0	113.1	1232	
2880 min Summer	2.723	0.0	121.5	1560	
4320 min Summer	2.029	0.0	135.8	2248	
5760 min Summer	1.662	0.0	148.3	2944	
7200 min Summer	1.435	0.0	160.1	3672	
8640 min Summer	1.280	0.0	171.4	4400	
10080 min Summer	1.169	0.0	182.5	5136	
15 min Winter	134.448	0.0	35.0	16	
30 min Winter	90.446	0.0	47.1	31	
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Eden Court		14083 - Kings Somborne			
Lon Parcwr Business Park					
Denbighshire LL15 1NJ		1 in 100 year plus 40% CC			
Date 28/09/2021 10:56		Designed by JW			
File		Checked by AW			
XP Solutions		Source Control 2020.1.3			
Summary of Results for 100 year Return Period (+40%)					
Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
60 min Winter	9.913	0.913	1.9	54.8	Flood Risk
120 min Winter	9.960	0.960	2.0	57.6	Flood Risk
180 min Winter	9.959	0.959	2.0	57.5	Flood Risk
240 min Winter	9.940	0.940	1.9	56.4	Flood Risk
360 min Winter	9.888	0.888	1.9	53.3	Flood Risk
480 min Winter	9.843	0.843	1.9	50.6	Flood Risk
600 min Winter	9.796	0.796	1.9	47.7	Flood Risk
720 min Winter	9.749	0.749	1.9	44.9	Flood Risk
960 min Winter	9.654	0.654	1.9	39.2	O K
1440 min Winter	9.444	0.444	1.9	26.7	O K
2160 min Winter	9.244	0.244	1.9	14.6	O K
2880 min Winter	9.144	0.144	1.8	8.6	O K
4320 min Winter	9.078	0.078	1.5	4.7	O K
5760 min Winter	9.062	0.062	1.2	3.7	O K
7200 min Winter	9.054	0.054	1.1	3.2	O K
8640 min Winter	9.049	0.049	0.9	2.9	O K
10080 min Winter	9.046	0.046	0.9	2.7	O K
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)	
60 min Winter	57.968	0.0	60.3	60	
120 min Winter	33.050	0.0	68.8	118	
180 min Winter	23.801	0.0	74.3	174	
240 min Winter	18.869	0.0	78.6	228	
360 min Winter	13.629	0.0	85.1	288	
480 min Winter	10.841	0.0	90.3	366	
600 min Winter	9.089	0.0	94.6	444	
720 min Winter	7.875	0.0	98.4	520	
960 min Winter	6.289	0.0	104.8	674	
1440 min Winter	4.601	0.0	115.0	924	
2160 min Winter	3.378	0.0	126.6	1256	
2880 min Winter	2.723	0.0	136.1	1584	
4320 min Winter	2.029	0.0	152.1	2208	
5760 min Winter	1.662	0.0	166.1	2944	
7200 min Winter	1.435	0.0	179.3	3648	
8640 min Winter	1.280	0.0	192.0	4408	
10080 min Winter	1.169	0.0	204.4	5104	
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Eden Court Lon Parcwr Business Park Denbighshire LL15 1NJ	14083 - Kings Somborne 1 in 100 year plus 40% CC	
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XP Solutions Source Control 2020.1.3		

Rainfall Details


Rainfall Model	FEH
Return Period (years)	100
FEH Rainfall Version	2013
Site Location	GB 436018 131029 SU 36018 31029
Data Type	Point
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	0.750
Cv (Winter)	0.840
Shortest Storm (mins)	15
Longest Storm (mins)	10080
Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.124

Time (mins)	Area
From:	To: (ha)
0	1 0.124

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Model Details

Storage is Online Cover Level (m) 10.000

Tank or Pond Structure

Invert Level (m) 9.000

Depth (m)	Area (m ²)	Depth (m)	Area (m ²)
0.000	60.0	1.000	60.0


Hydro-Brake® Optimum Outflow Control

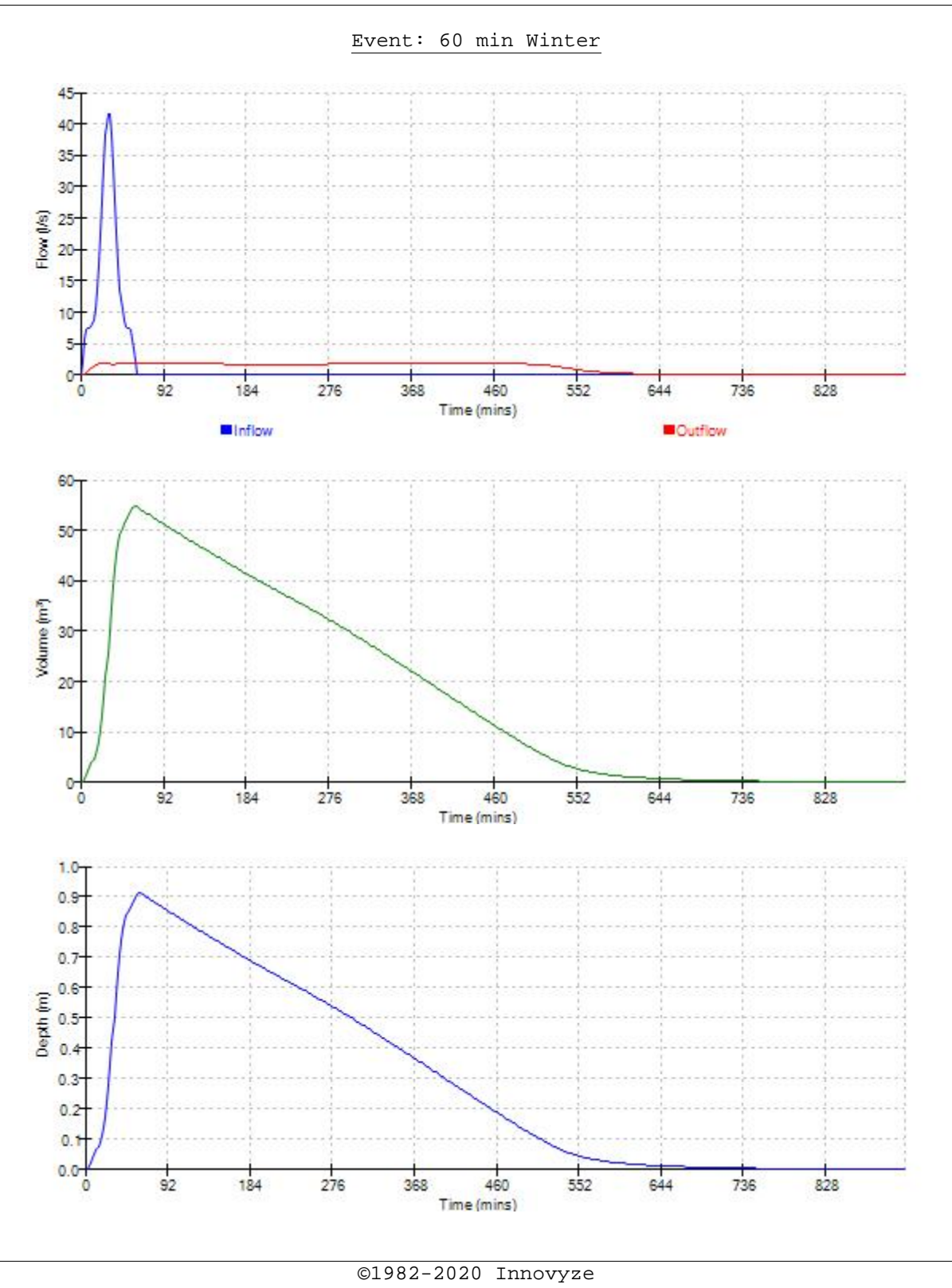
Unit Reference	MD-SHE-0067-2000-1000-2000
Design Head (m)	1.000
Design Flow (l/s)	2.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	67
Invert Level (m)	8.995
Minimum Outlet Pipe Diameter (mm)	100
Suggested Manhole Diameter (mm)	1200


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

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

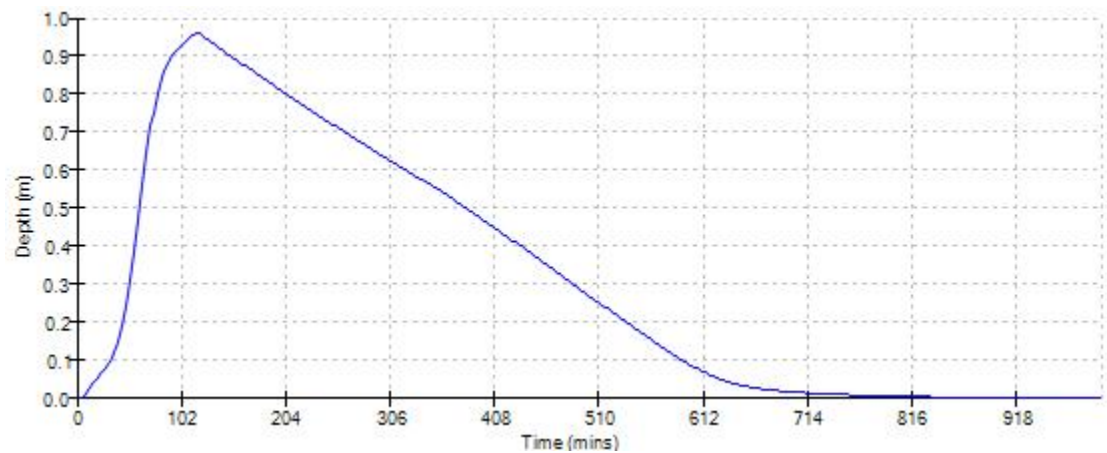
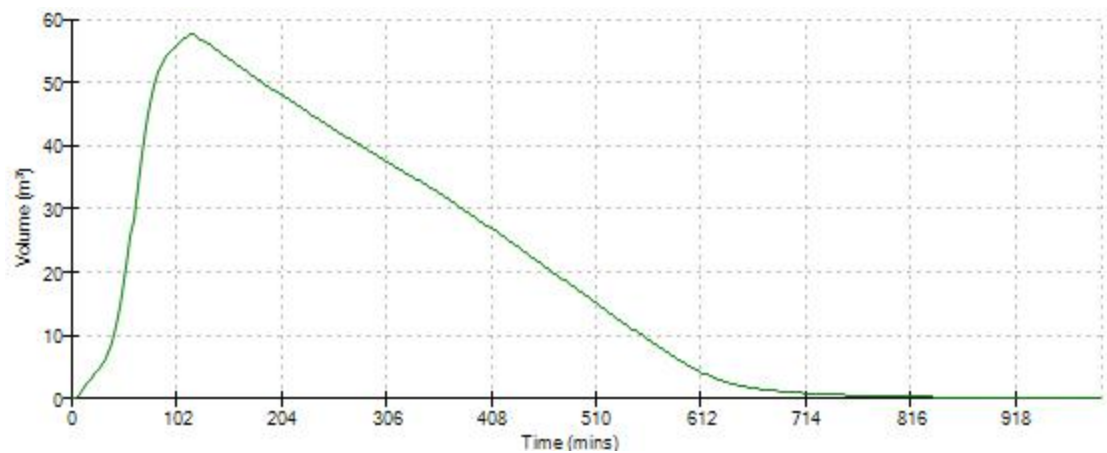
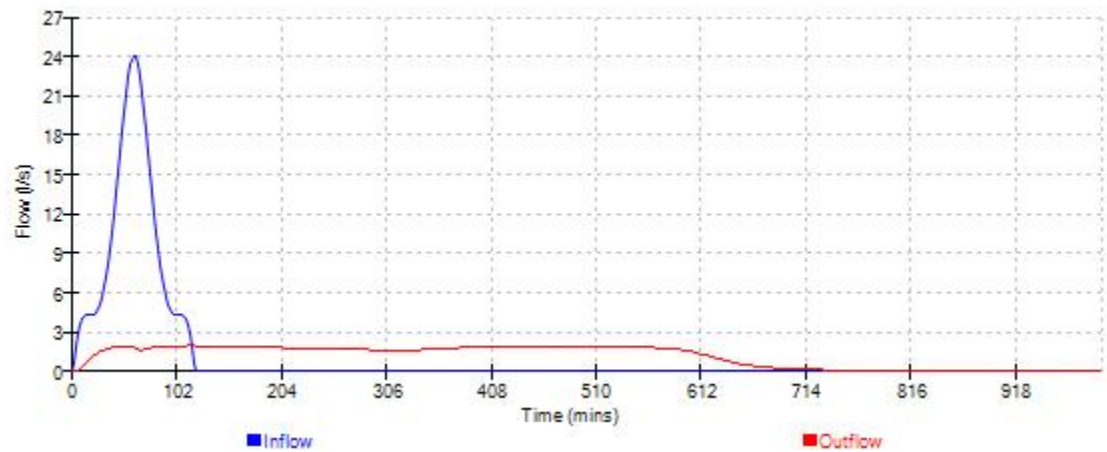
Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	1.6	1.200	2.2	3.000	3.3	7.000	4.9
0.200	1.9	1.400	2.3	3.500	3.5	7.500	5.1
0.300	1.9	1.600	2.5	4.000	3.8	8.000	5.2
0.400	1.9	1.800	2.6	4.500	4.0	8.500	5.4
0.500	1.8	2.000	2.7	5.000	4.2	9.000	5.5
0.600	1.6	2.200	2.9	5.500	4.4	9.500	5.7
0.800	1.8	2.400	3.0	6.000	4.6		
1.000	2.0	2.600	3.1	6.500	4.7		


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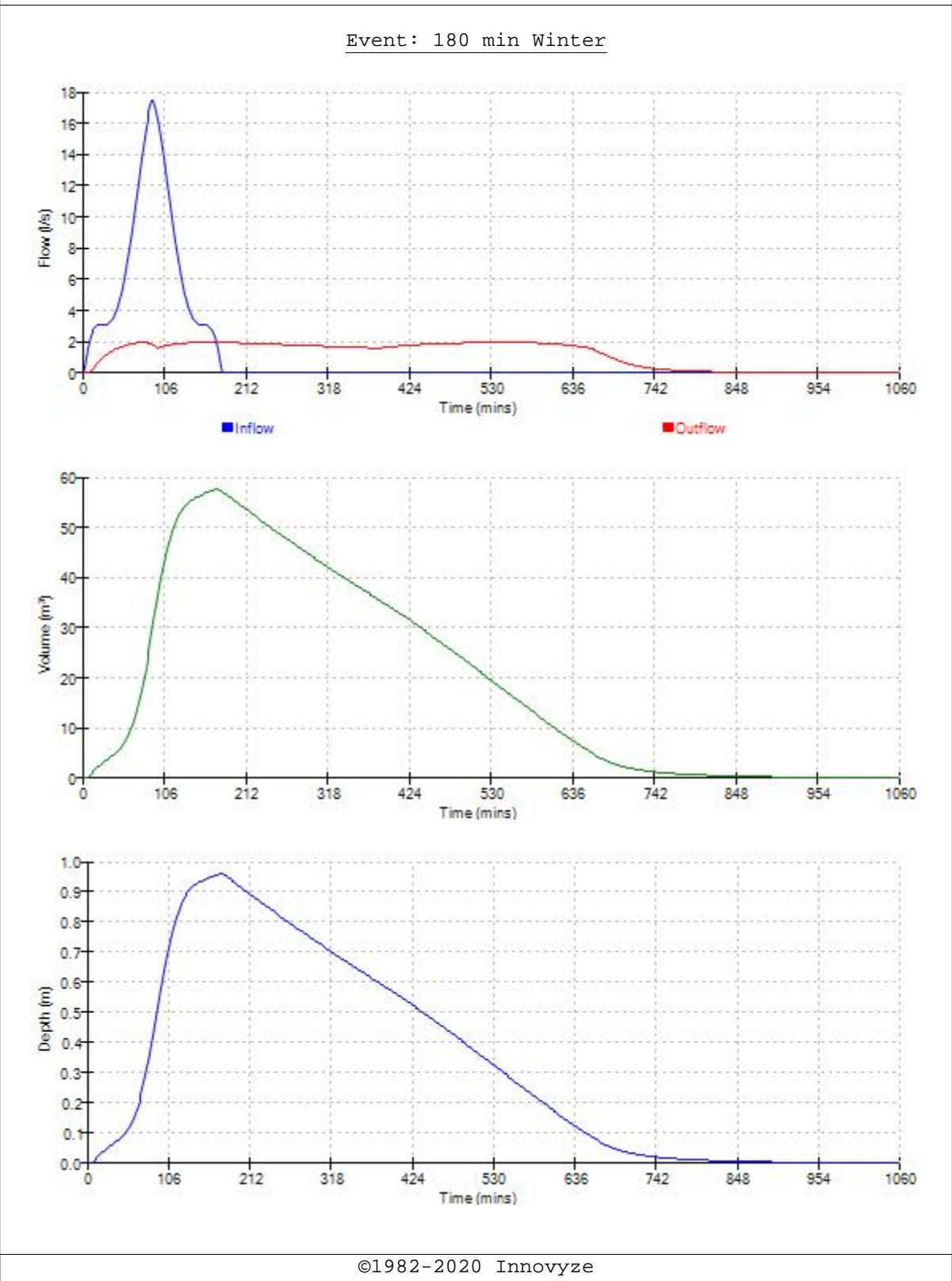


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File		
XP Solutions	Source Control 2020.1.3	

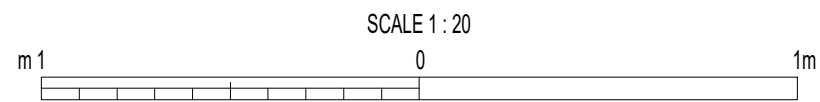
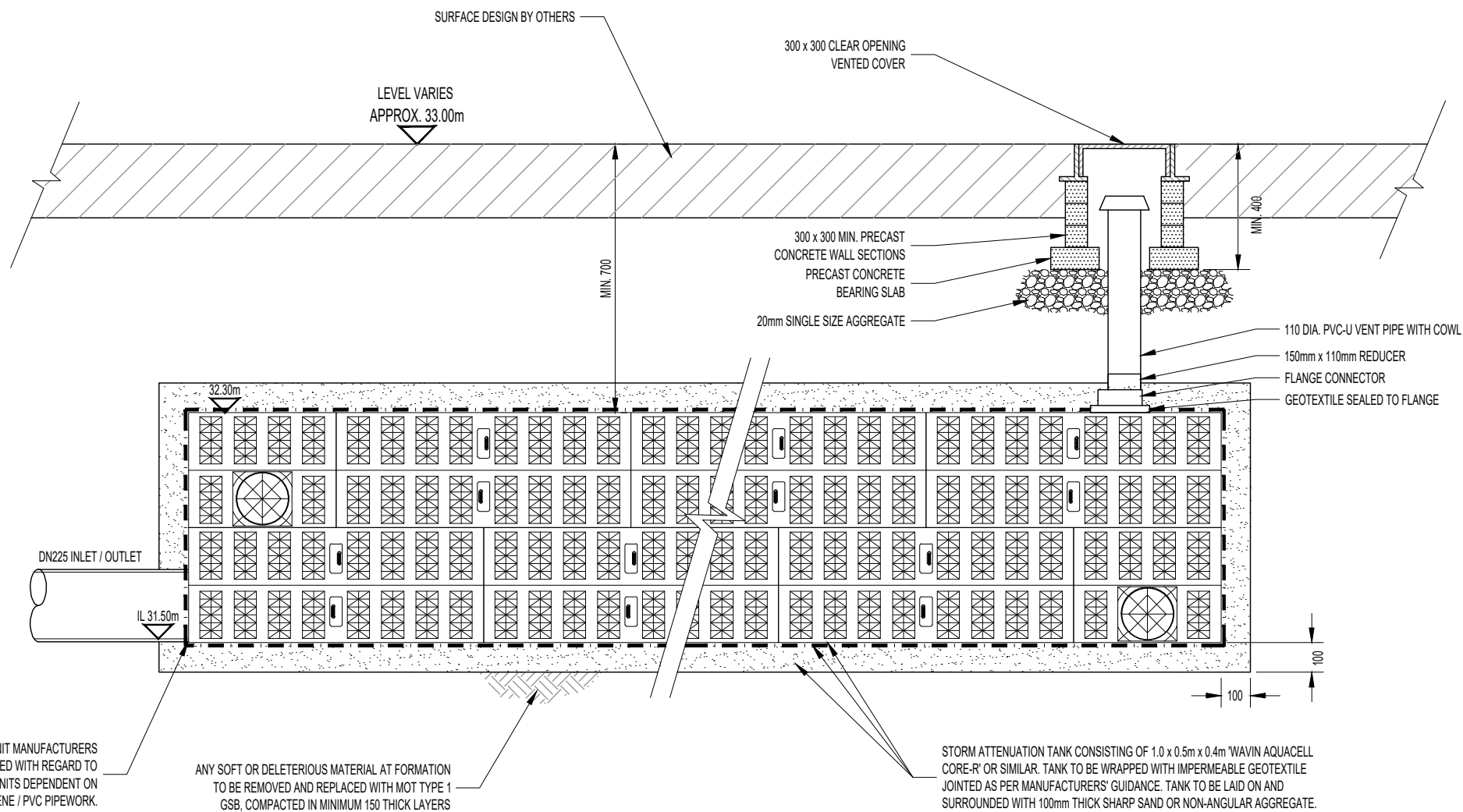
Event: 120 min Winter



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Denbighshire LL15 1NJ	Designed by JW	
Date 28/09/2021 10:56	Checked by AW	
File		
XP Solutions	Source Control 2020.1.3	



Appendix F Typical Attenuation Tank Cross Section



NOTES

- ALL DIMENSIONS IN MILLIMETRES AND ALL LEVELS IN METRES ABOVE ORDNANCE DATUM UNLESS SHOWN OTHERWISE.
- THIS DRAWING PROVIDES A TYPICAL GEO-CELLULAR ATTENUATION TANK SPECIFICATION AND IS NOT INTENDED FOR DETAILED DESIGN. SITE SPECIFIC ARRANGEMENTS MAY VARY.
- ALL LEVELS / DIMENSIONS ARE PROVIDED FOR EXAMPLE PURPOSES ONLY.

100	01-11-20	FIRST ISSUE	VJ	AW	VG
REV.	DATE	DESCRIPTION	DSGND	CHKD	APP'D

CLIENT
KING'S SOMBORNE PARISH COUNCIL

PRINCIPAL DESIGNER
-

	
Waterco Ltd., Eden Court, Lon Parcwr Business Park, Ruthin LL15 1NJ	tel (+44) 1824 702220 www.waterco.co.uk

SCHEME
KING'S SOMBORNE DRAINAGE NOTE

TITLE
TYPICAL ATTENUATION TANK DETAILS

STATUS INFORMATION				
DESIGNED VJ	CHECKED AW	APPROVED VG	SCALE / SHEET SIZE 1 : 20 / A3	
DRAWING NO. 14083-2401				REV 100