
10461 Hook Lane, Pagham

Technical Note 4 Rv01: Response to LLFA Comments on RMA

31st March 2021

1 Introduction

Purpose of this Note

- 1.1 Brookbanks is appointed by Hallam Land Management Ltd to provide engineering consultancy services for a proposed residential and mixed-use development at Land at Hook Lane, Pagham.
- 1.2 This note seeks to provide a response (in red) and address the comments made by Arun District Council acting in their role as the Lead Local Flood Authority (LLFA) following a reserved matters application for the overall site layout.
- 1.3 Comments were received on the 5th March 2021 within which the LLFA has raised a holding objection subject to the receipt of further information.
- 1.4 Brookbanks and Bellway Homes met with the LLFA on the 16th March 2021 during which all points were discussed and a solution proposed to each.
- 1.5 It should be noted that a separate report is yet to be submitted to discharge the drainage planning condition covering a number of detailed drainage aspects.
- 1.6 *This note has been updated following comments received from the LLFA on 15th April 2021. Additional comments have been shown in italics with our response in **bold***

2 Response to LLFA Comments

LLFA Comments and Brookbanks Response

- 2.1 The proposed site layout includes the infilling of a watercourse which runs through the site. We do not support infilling or culverting of watercourses. Unless it is demonstrated that this watercourse is currently redundant we will not support proposals to infill it.
- 2.1.1 The proposed diversion of the watercourse as shown on the development masterplan (and infilling of the existing route) has been a fundamental part of the development proposals since the outline planning application. We understand that ADC and the LLFA would have been a statutory consultee at this stage. The proposed diverted route will materially improve the existing situation by offering a watercourse that has significantly shallower side slopes (1:3), a more natural meandering route through the landscape and an overall increase in the available capacity.
- 2.1.1.1 The layout was not being agreed at outline design. You are trying to agree a layout at this stage, hence our

comments. Please see comments below where concerns with the proposals are detailed.

Noted

Item 2

2.2 It is noted that a series of swales are proposed in close proximity to the existing watercourse mentioned in point 1 above. If it is proposed to bring the existing watercourse through the proposed drainage for the site it will be very difficult to evidence that the development is not increasing downstream flood risk unless controls are provided upstream of all connections into this swale. It is not clear from the drainage strategy plan provided if this is the current proposal. Please can the applicant confirm if the proposed swale are for storage or are proposed to replace the existing watercourse and if flow controls will be in place upstream of all connections into this wale from the development.

2.2.1 The diverted watercourse route is not being used for storage. All attenuation for the development site is being provided in the three SUDS ponds located as shown on the drainage strategy plan. All ponds have a flow control upstream of the outfall connection to the watercourse.

2.2.1.1 *Okay, thank you for confirming.*

No further comment

Item 3

2.3 We note that there are a lack of levels provided for many of the existing watercourses. These levels must be provided to evidence if the proposed invert levels of structures and connections are achievable.

2.3.1 Please refer to the topographical survey appended to this note for further details of the existing watercourse.

2.3.1.1 *There are large areas of watercourse which have not been surveyed due to overgrown vegetation. Of the areas that have been surveyed no pipe invert levels have been provided. Please can further survey information be supplied. It would also be beneficial to get the topo in .dwg format if possible, as it isn't the easiest zooming in so far on a pdf, and then waiting for it to load when trying to move across the drawing. If not, as a minimum a key plan should be provided on all sheets to identify which parts of the site are covered by each topographic survey drawing sheet.*

CAD file supplied.

Item 4

2.4 A buffer plan should be provided evidence that all proposed buildings / features which will restrict access are at least 3m away from the top of bank of the ordinary watercourse.

2.4.1 We can confirm that all buildings are at least 3m from the top of bank of the diverted watercourse as shown on the drainage strategy plan.

2.4.1.1 *Please include a layer which shows the 3m buffer.*

3m buffer added to drainage plan.

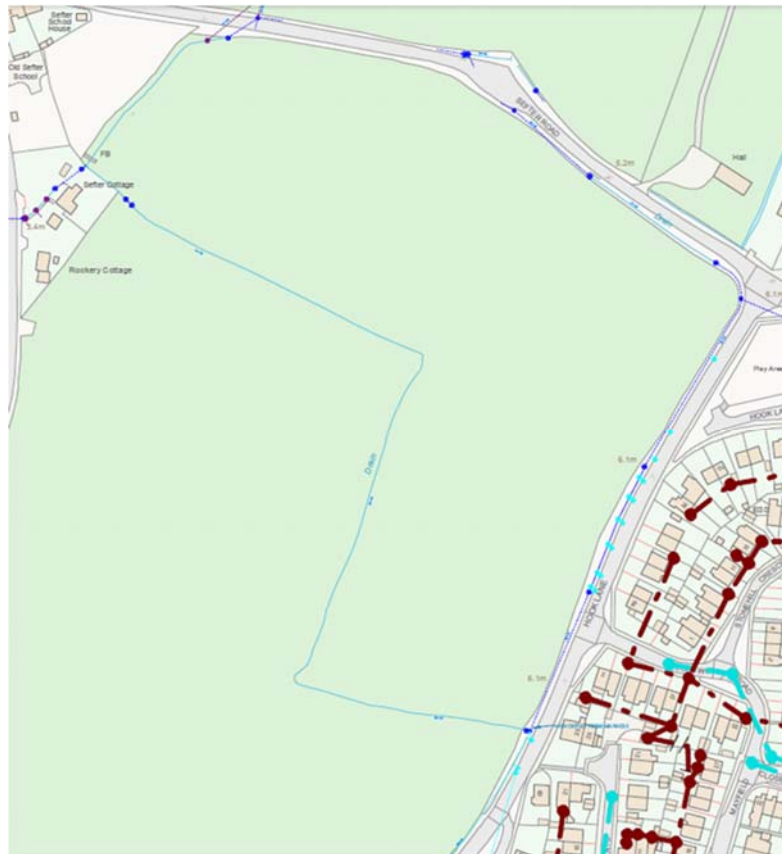
Item 5

2.5 If the proposed swale referenced in point 2 above is proposed to replace the watercourse we will require a long section of the proposed swale to be provided to evidence if the proposals to divert the watercourse are acceptable, and therefore if the proposed site layout is acceptable. Levels of upstream and downstream watercourses must be provided

2.5.1 Please refer to the appendix for a long section of the diverted watercourse. We have endeavoured to mirror the existing longitudinal profile as far as reasonably practicable.

2.5.1.1 *Your proposals for the swale show a downstream invert level of 3.29. But on the topographic survey levels are currently 3.78-3.66 in this area. Without knowing the culvert invert levels in the area and the downstream watercourse levels it is not possible to know whether this is achievable in practice*

We are trying to replicate the existing situation as closely as possible and the existing information we have suggests this is the case. It has also been noted that the outfall to the east eventually flows north along Hook Lane and Sefter Road back to Sefter Cottage, therefore ultimately outfalls to the same point. As shown on the Extract from ADC Mapping dated 02 November 2020.



3

These are small check dams to replicate the existing long fall. If the dams are omitted the bed would be steepened and change the rate of discharge at this end of the site.

- 2.5.1.4** *It would be useful to have a long section of the existing watercourse. So that comparisons of length of watercourse and falls can be completed more easily.*

Long section prepared and appended.

Item 6

- 2.6** We note that the conveyance swale close to Pagham Road is proposed to have one side formed of a bagwork retaining wall. The proposed site layout should be sufficient to facilitate natural slopes at 1 in 4 for all basins and swales. The layout should be adjusted to achieve this and remove the requirement for the retaining structure.

- 2.6.1** *As discussed, this swale has now been removed from the layout with additional attenuation provided further downstream in the open space area. A piped network has been shown in its place for conveyance purposes.*

- 2.6.1.1** *In principle this is okay, however will require input from others. Drainage features must not be included within useable open space area calculations.*

Noted

Item 7

- 2.7** The proposed drainage strategy shows all water discharge to one location the surface water drainage strategy must follow existing natural catchments.

- 2.7.1** *We have sought as far as reasonably practicable to mimic the status quo found on site and direct proposed discharge points to suitable locations. Please refer to the exceedance plan in the appendix for further details.*

- 2.7.1.1** *The exceedance plan does not accurately represent the natural catchments at this site. Land to the south is believed to drain to the watercourse which runs near to Windmill Barn. This connection should be investigated and utilised. If it is not we will expect discharge rates to be restricted, i.e. the flow restriction for catchment 1 will need to be reduced down to ensure that flows to the Seftor Cottage area are not increased.*

The site layout is proposed to mimic the existing situation as closely as possible however the flat nature of the site present challenges with placement of SuDS for treatment and attenuation upstream of an outfall. The proposal is to restrict the flow to below Qbar thereby greatly reducing the existing flood risk at Seftor Cottage. The existing connection is proposed to be retained and will therefore provide another outfall in exceedance events.

Item 8

- 2.8** No calculations supporting the proposed discharge rates have been submitted to support the storage areas and high-level strategy. Please can the applicant submit their greenfield run off rate calculations. It should be noted that discharge should be restricted to greenfield Qbar, with the contributing area reflecting the area which will be positively drained and not the entire site area.

- 2.8.1** *Please refer to the appendix for the drainage calculations. Note, further details are to be provided in due course to support the discharge or the relevant drainage planning condition.*

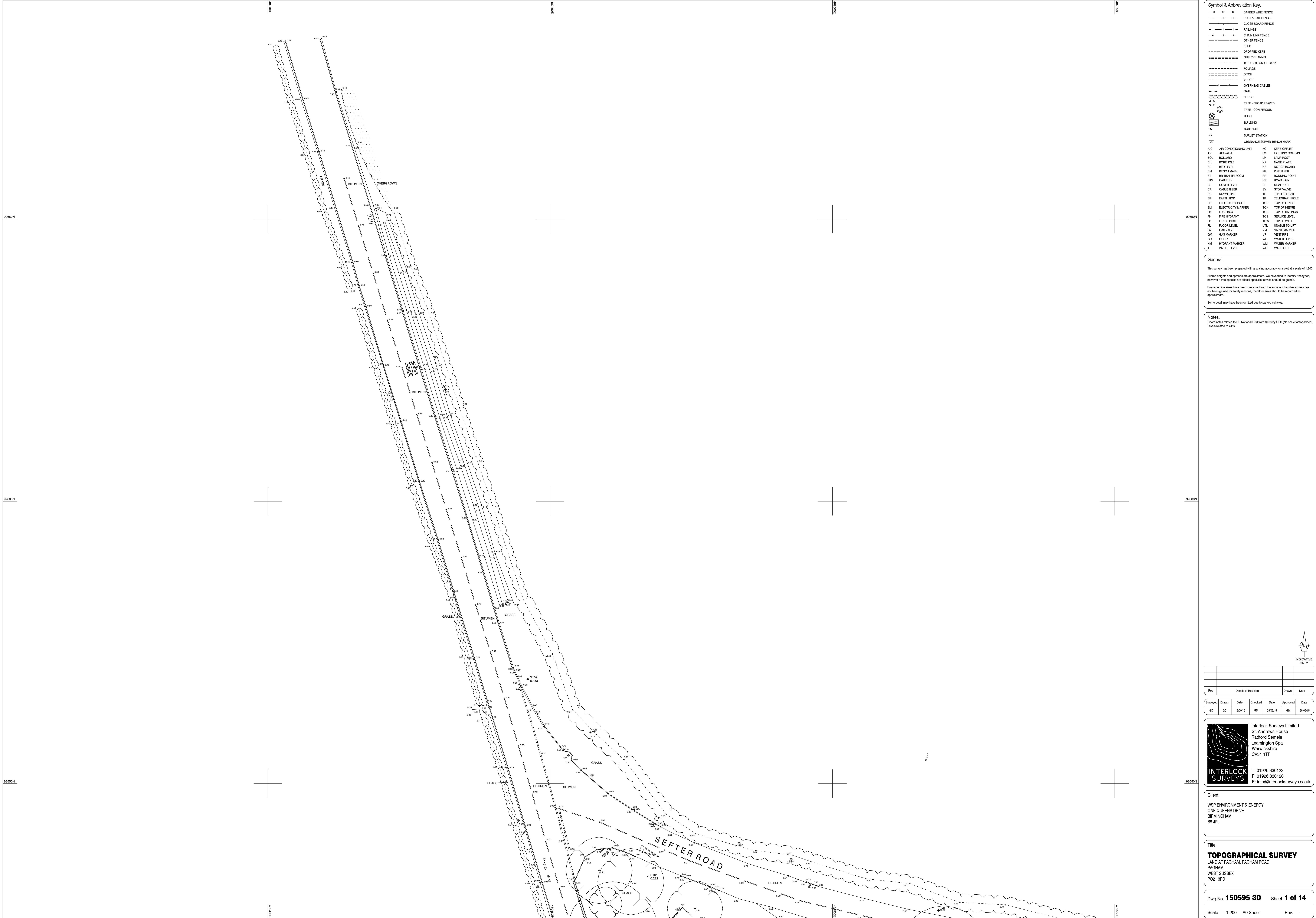
- 2.8.1.1** *There are discrepancies between the surface water drainage layout plan and the calculations supplied. I.e. areas and discharge rates are different. Please can the discrepancies be rectified or at the very least commented upon. Calculations should include a surcharged outfall, with surcharged levels set to top of bank levels.*

The calcs were based on a previous version of the DS. There have been some minor tweaks. Updated calculations are attached with minor amendments to the attached drainage strategy drawing



Appendix A – Topographical Survey (CAD file also supplied)

| Appendix A – Topographical Survey



Symbol & Abbreviation Key.			
	BARBED WIRE FENCE		KERB
	POST & RAIL FENCE		DROPPED KERB
	CLOSE BOARD FENCE		GULLY CHANNEL
	RAILINGS		TOP OF BANK
	CHAIN LINK FENCE		FOLIAGE
	OTHER FENCE		DITCH
	KERB		VERGE
	DROPPED KERB		OVERHEAD CABLES
	GULLY CHANNEL		GATE
	TOP OF BANK		HEDGE
	FOLIAGE		TREE - BROAD LEAVED
	DITCH		TREE - CONIFEROUS
	VERGE		BUSH
	OVERHEAD CABLES		BUILDING
	GATE		BOREHOLE
	HEDGE		SURVEY STATION
	TREE - BROAD LEAVED		ORDNANCE SURVEY BENCH MARK
	TREE - CONIFEROUS		
	BUSH		
	BUILDING		
	BOREHOLE		
	SURVEY STATION		
	ORDNANCE SURVEY BENCH MARK		
A/C	AIR CONDITIONING UNIT	KO	KERB OFFSET
AV	AIR VALVE	LC	LIGHTING COLUMN
BOL	BOLLARD	LP	LAMP POST
BH	BORERHOLE	NP	NAME PLATE
BL	BED LEVEL	NB	NOTICE BOARD
BM	BENCH MARK	PR	PIPE RISER
BT	BRITISH TELECOM	RP	ROAD SIGN
CTV	CABLE TV	RS	ROAD SIGN
CL	COVER LEVEL	SP	SIGN POST
CR	CABLE RISER	SV	STOP VALVE
DP	DOWN PIPE	TL	TRAFFIC LIGHT
ER	EARTH ROD	TP	TELEGRAPH POLE
EP	ELECTRICITY POLE	TOF	TOP OF FENCE
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FB	FUSE BOX	TOR	TOP OF RAILINGS
FI	FIRE HYDRANT	TOS	SERVICE LEVEL
FP	FENCE POST	TOW	TOP OF WALL
FL	FLOOR LEVEL	UTL	UNABLE TO LIFT
GV	GAS VALVE	VM	VALVE MARKER
GM	GAS MARKER	VP	VENT PIPE
GU	GULLY	WL	WATER LEVEL
HM	HYDRANT MARKER	WM	WATER MARKER
L	INVERT LEVEL	WO	WASH OUT

General.

This survey has been prepared with a scaling accuracy for a plot at a scale of 1:200.

All tree heights and spreads are approximate. We have tried to identify tree types, however if tree species are critical specialist advice should be gained.

Drainage pipe sizes have been measured from the surface. Chamber access has not been gained for safety reasons, therefore size should be regarded as approximate.

Some detail may have been omitted due to parked vehicles.

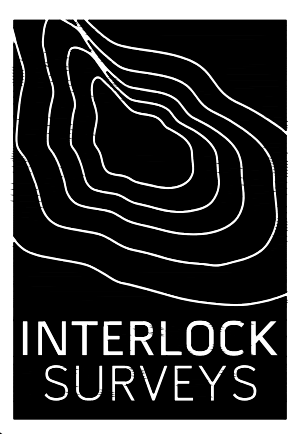
Notes.

Coordinates related to OS National Grid from ST03 by GPS (No scale factor added). Levels related to GPS.



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TOPOGRAPHICAL SURVEY
LAND AT PAGHAM, PAGHAM ROAD
PAGHAM
WEST SUSSEX
PO21 3PD



Symbol & Abbreviation Key	
[Symbol]	BARBED WIRE FENCE
[Symbol]	POST & RAIL FENCE
[Symbol]	CLOSE BOARD FENCE
[Symbol]	RAILINGS
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HM	HYDRANT MARKER
L	INVERT LEVEL
KO	KERB OFFLET
LC	LIGHTING COLUMN
LP	LAMP POST
NP	NAME PLATE
NB	NOTICE BOARD
PR	PIPE RISER
RP	RODDING POINT
RS	ROAD SIGN
SP	SIGN POST
SV	STOP VALVE
TL	TRAFFIC LIGHT
TP	TELEGRAPH POLE
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TOH	TOP OF HEDGE
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Notes.

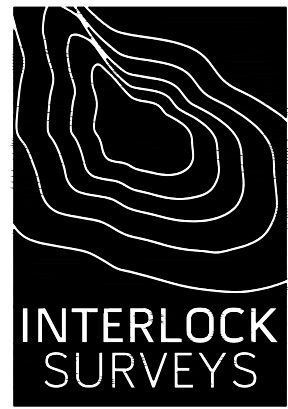
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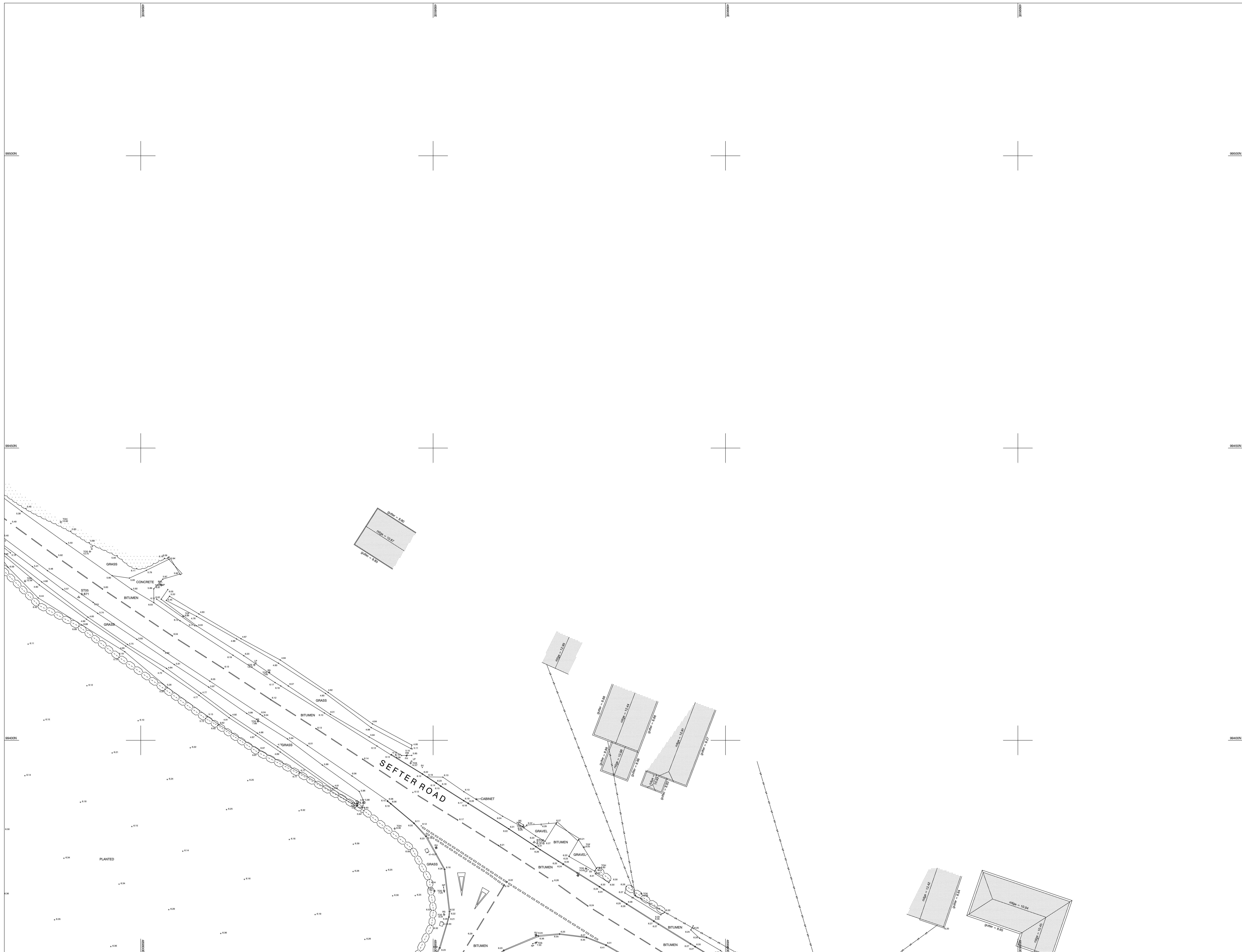
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Symbol & Abbreviation Key.

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	FOLIAGE		DITCH
	OVERHEAD CABLES		GATE
	HEDGE		TREE (ROAD LEVEL)
	TREE (CONFISCIOUS)		BUILDING
	BOREHOLE		SURVEY STATION
	ORDNANCE SURVEY BENCHMARK		KERB OFFSET
A/C	AIR CONDITIONING UNIT	ND	NEIGHBHOOD
AV	AR VALVE	LC	LIGHTING COLUMN
BOX	BOULDER	LP	LAMP POST
BM	BENCHMARK	NP	NAMES PLATE
BL	BEL	NB	NOTICE BOARD
BT	BENCH MARK	PR	PIPE RISER
TD	BENTH TELECOM	RP	ROADSIDE POST
CTV	CABLE TV	RS	ROAD SIGN
CL	COVER LEVEL	SP	SIGN POST
CR	CABLE READER	SV	STOP VALVE
DP	DISPATCH	TL	TRAFFIC LIGHT
ER	EXHAUST	TP	TELEGRAPH POLE
EP	ELECTRICITY POLE	TO	TOP OF FENCE
EP	ELECTRICITY METER	TOH	TOP OF HEDGE
FB	FUSE BOX	TR	TOP OF RAILINGS
FR	FIRE HYDRANT	TOS	SERVICE LEVEL
FP	FENCE POST	TOH	TOP OF WALL
FL	FLOOR LEVEL	UTL	UNABLE TO LIFT
GV	GV GAS VALVE	VM	VALVE MARKER
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General.

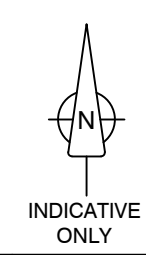
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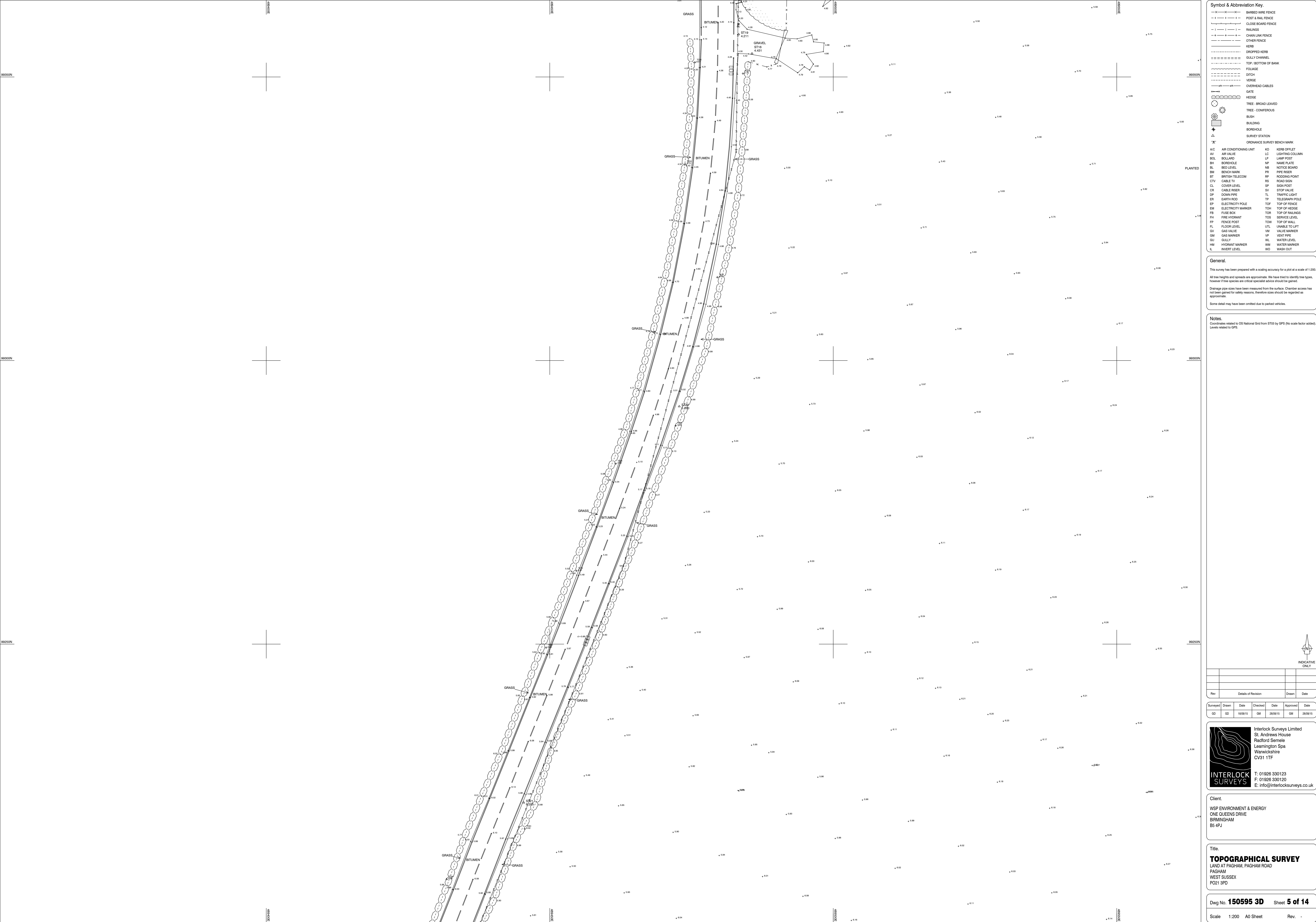
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LAND AT PAGHAM, PAGHAM ROAD
PAGHAM
WEST SUSSEX
PO21 3PD

Dwg No. 150595 3D	Sheet 4 of 14
Scale 1:200 A0 Sheet	Rev. -



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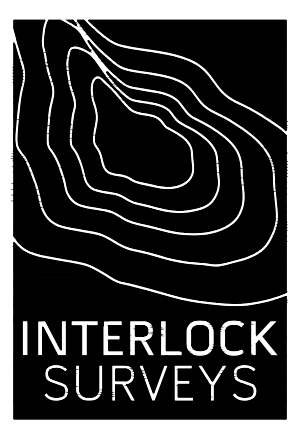
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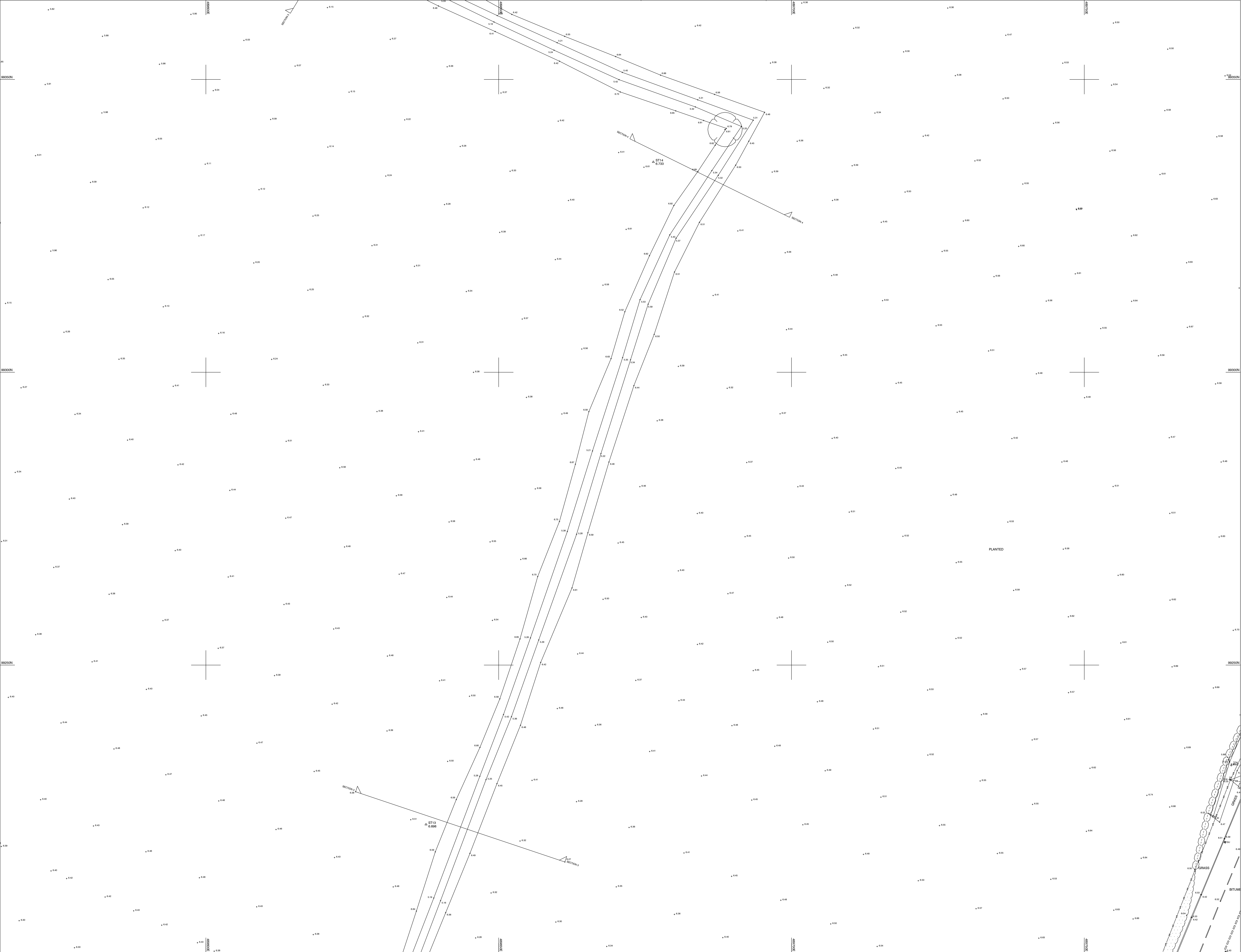
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Dwg No. **150595 3D** Sheet **5 of 14**

Scale 1:200 A0 Sheet Rev. -



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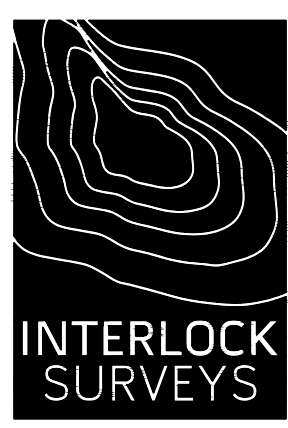
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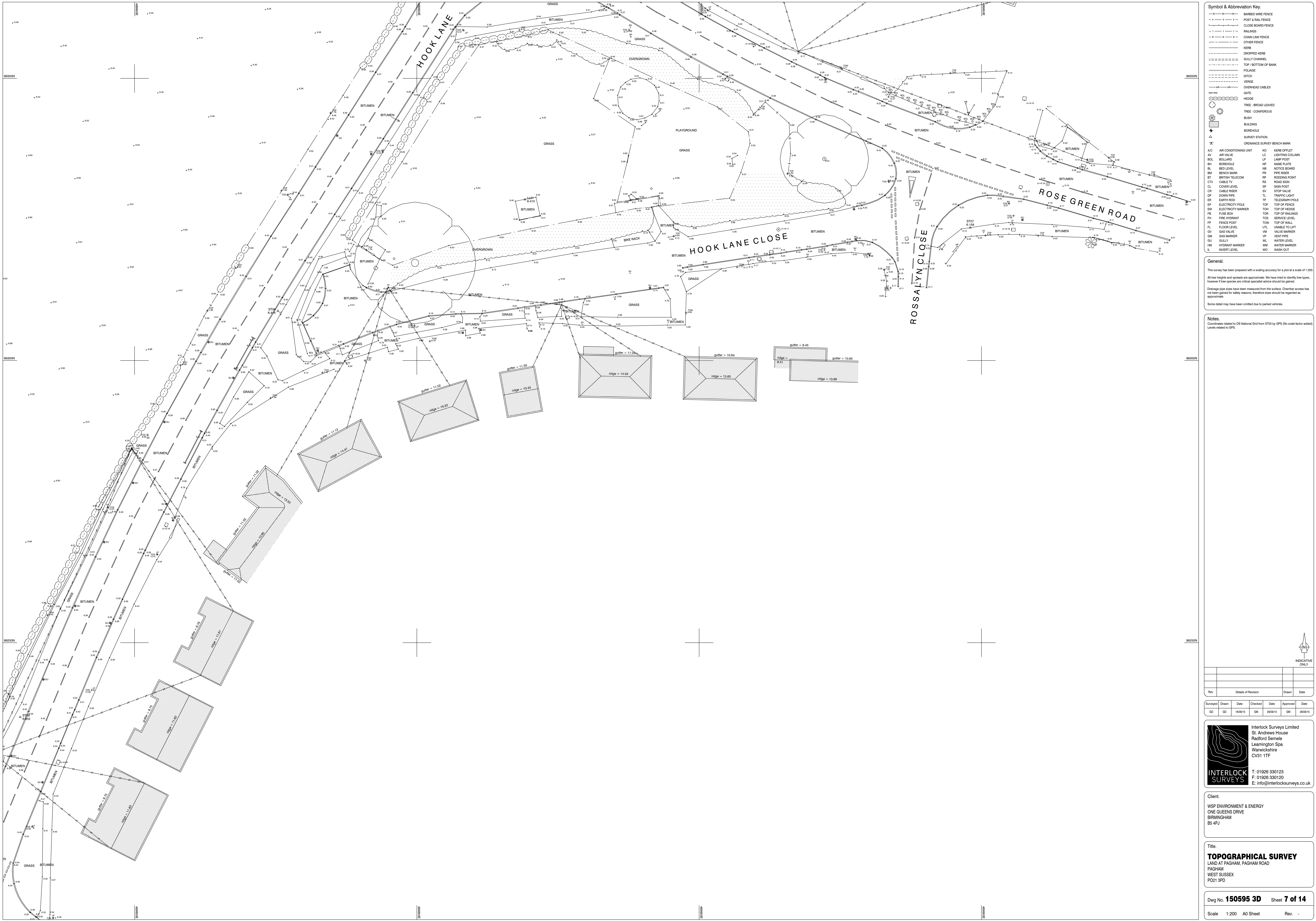
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Dwg No. **150595 3D** Sheet **1 of 14**

Scale 1:200 A0 Sheet Rev. -



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TP	TELEGRAPH POLE
TOF	TOP OF FENCE
TOH	TOP OF HEDGE
TOR	TOP OF RAILINGS
TOS	SERVICE LEVEL
TOW	TOP OF WALL
U/L	UNABLE TO LIFT
VM	VALVE MARKER
VP	VENT PIPE
WM	WATER MARKER
WO	WASH OUT

General.
This survey has been prepared with a scaling accuracy for a plot at a scale of 1:200.
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Levels related to GPS.

Rev		Details of Revision		Drawn	Date

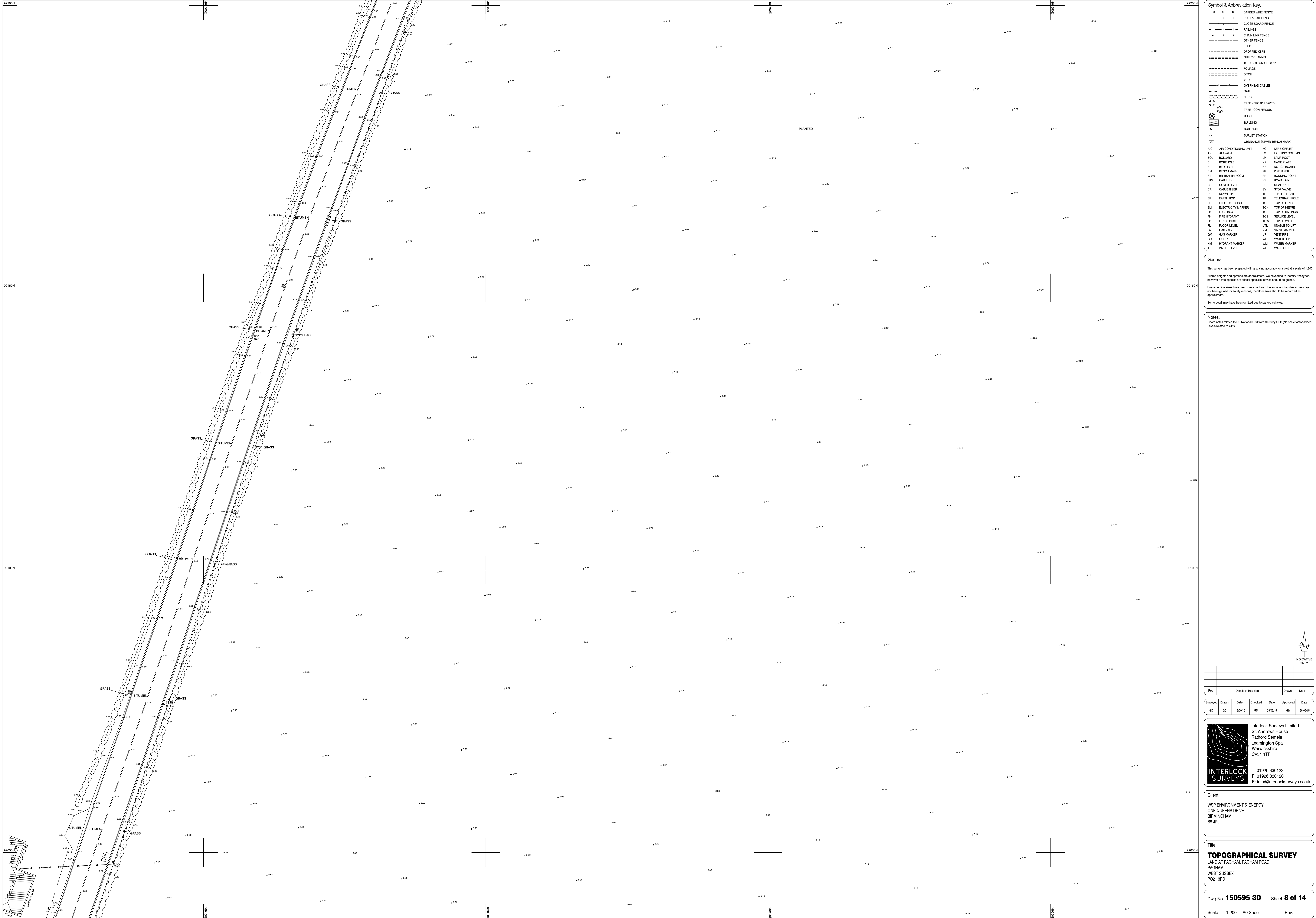
Surveyed	Drawn	Date	Checked	Date	Approved	Date
ED	GD	18/08/15	GM	26/08/15	GM	26/08/15

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Client.
WSP ENVIRONMENT & ENERGY
ONE QUEENS DRIVE
BIRMINGHAM
B5 4PJ

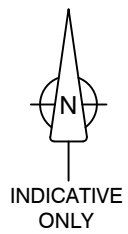
Title.
TOPOGRAPHICAL SURVEY
LAND AT PAGHAM, PAGHAM ROAD
PAGHAM
WEST SUSSEX
PO21 3PD



Symbol & Abbreviation Key			
	BARBED WIRE FENCE		CLOSE BOARD FENCE
	CHAIN LINK FENCE		OTHER FENCE
	KERB		DROPPED KERB
	GULLY CHANNEL		TOP - BOTTOM OF BANK
	FOLAGE		DITCH
	VERGE		OVERHEAD CABLES
	GATE		HEDGE
	TREE - BROAD LEAVED		TREE - CONIFEROUS
	BUSH		BUILDING
	BOREHOLE		SURVEY STATION
	ORDNANCE SURVEY BENCH MARK		
A/C	AIR CONDITIONING UNIT	KO	KERB OFFSET
AV	AIR VALVE	LC	LIGHTING COLUMN
BOL	BOLLARD	LP	LAMP POST
BH	BOREHOLE	NP	NAME PLATE
BL	BED LEVEL	NB	NOTICE BOARD
BM	BENCH MARK	PR	PIPE RISER
BT	BRITISH TELECOM	RP	ROAD SIGN
CL	CABLE LEVEL	RS	ROAD SIGN
CR	CABLE RISER	SP	SIGN POST
CTV	CABLE TV	SV	STOP VALVE
DL	DOWN PIPE	TL	TRAFFIC LIGHT
DN	DOWN PIPE	TP	TELEGRAPH POLE
EP	ELECTRICITY POLE	TOF	TOP OF FENCE
EM	ELECTRICITY MARKER	TOH	TOP OF HEDGE
FB	FUSE BOX	TOR	TOP OF RAILINGS
FI	FIRE HYDRANT	TOS	SERVICE LEVEL
FP	FENCE POST	TOW	TOP OF WALL
FL	FLOOR LEVEL	UTL	UNABLE TO LIFT
GV	GAS VALVE	VM	VALVE MARKER
GM	GAS MARKER	VP	VENT PIPE
GU	GULLY	WL	WATER LEVEL
HM	HYDRANT MARKER	WM	WATER MARKER
L	INVERT LEVEL	WO	WASH OUT

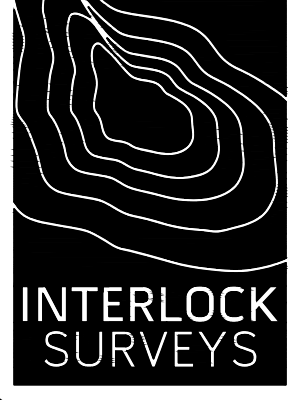
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Levels related to GPS.



Rev	Details of Revision			Drawn	Date

Surveyed	Drawn	Date	Checked	Date	Approved	Date
ED	ED	18/08/15	GM	28/08/15	GM	28/08/15



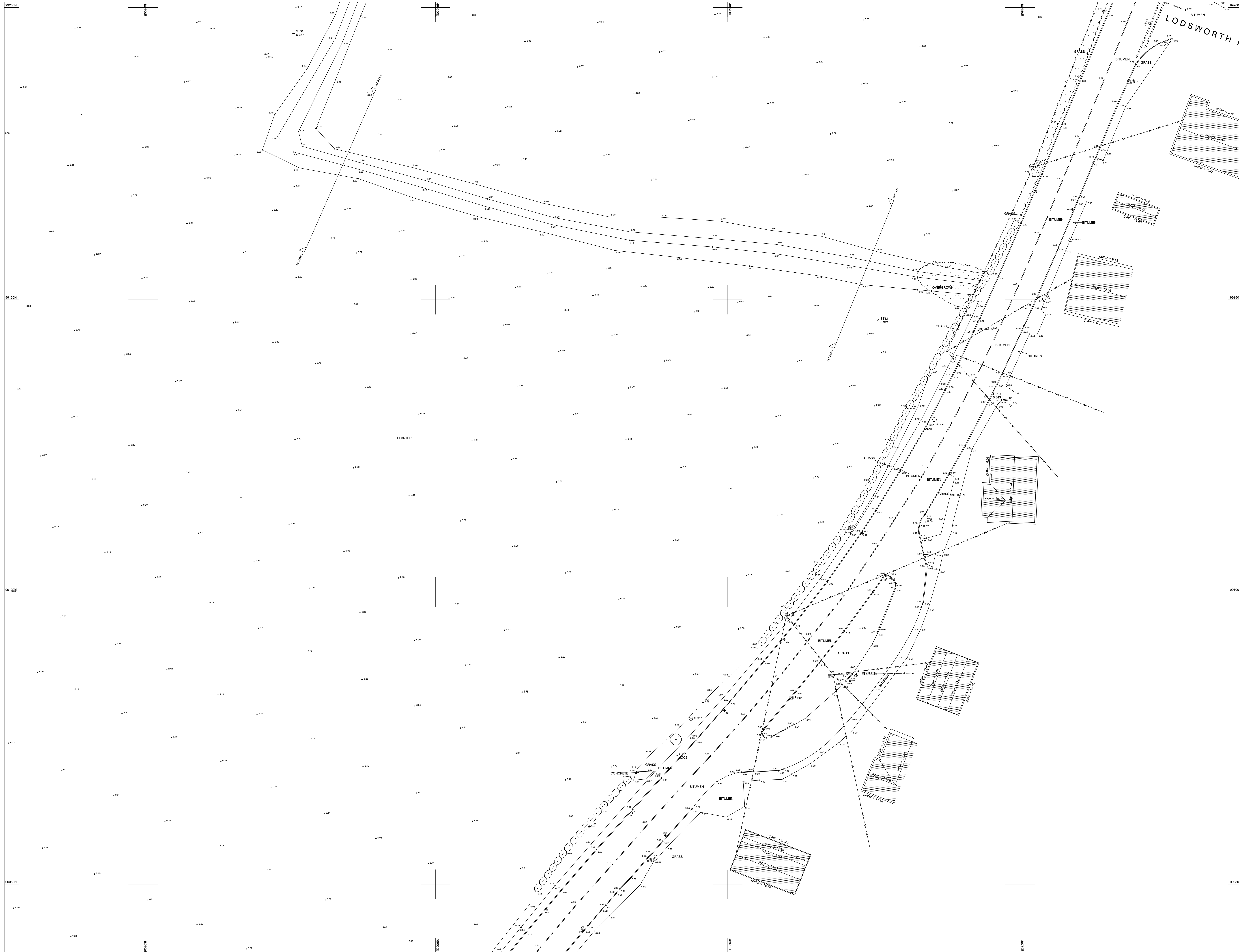
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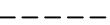
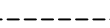
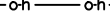
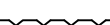
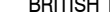
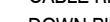
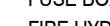
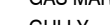
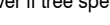
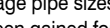
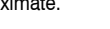
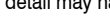
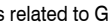
Client.
WSP ENVIRONMENT & ENERGY
ONE QUEENS DRIVE
BIRMINGHAM
B5 4PJ

Title.
TOPOGRAPHICAL SURVEY
LAND AT PAGHAM, PAGHAM ROAD
PAGHAM
WEST SUSSEX
PO21 3PD

Dwg No. **150595 3D** Sheet **8 of 14**
Scale 1:200 A0 Sheet Rev. -



Symbols & Abbreviation Key.

	BARRED WIRE FENCE		LIGHTING COLUMN
	POST & RAIL FENCE		LAMP POST
	CLOSE BOARD FENCE		MALE PLATE
	MAULED		NOTICE BOARD
	CHAIN LINK FENCE		PIPE RISER
	OTHER FENCE		ROODING POST
	KERB		ROAD SIGN
	DROPPED KERB		SIGN POST
	GULLY CHANNEL		STEP VALVE
	MANHOLES		TRAFFIC LIGHT
	FOULAGE		TELEGRAPH POLE
	DITCH		TOP OF FENCE
	VERGE		TOP OF HEDGE
	OVERHEAD CABLES		TOP OF RAILINGS
	GATE		10M SERVICE LEVEL
	HEDGE		UP TO WALL
	TREE, BROAD LEAVED		UNABLE TO MAP
	TREE, CONIFEROUS		SEW PIPE
	BUSH		SEW PIPE
	BUILDING		SEW PIPE
	DOREHOLE		SEW PIPE
	SURVEY STATION		SEW PIPE
	ORDNANCE SURVEY BENCH MARK		SEW PIPE
AC	AIR CONDITONING UNIT	KO	KERB OFFSET
AV	AVENUE	LC	LIGHTING COLUMN
BOL	BOL	LP	LAMP POST
BH	BOROHOLE	MP	MALE PLATE
BL	BLOCK	NB	NOTICE BOARD
BM	BENCH MARK	NR	PIPE RISER
BT	BRITISH TELECOM	PO	ROODING POST
CTV	CABLEITY	RD	ROAD SIGN
CL	COVER LEVEL	SP	SIGN POST
CR	CABLE RISER	SV	STEP VALVE
DP	DOWN PIPE	TL	TRAFFIC LIGHT
ER	ERATH ROAD	TP	TELEGRAPH POLE
EE	ELECTRICITY POLE	TOP	TOP OF FENCE
EM	ELECTRICITY MARKER	TOP	TOP OF HEDGE
FB	FUSE BOX	TOP	TOP OF RAILINGS
FR	FIRE HYDRANT	TS	10M SERVICE LEVEL
FP	FENCE POST	TOW	UP TO WALL
FL	FLOOR LEVEL	UTL	UNABLE TO MAP
GV	GRAVEL	VP	SEW PIPE
GM	GRASS MANNER	W	WATER MARKER
GU	GULLY	WL	WATER LEVEL
HM	HOT TAP	WM	WATER MARKER
IL	INVERT LEVEL	WSH	WASH OUT

General.

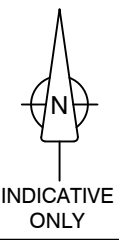
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Rev	Details of Revision	Drawn	Date

Surveyed	Drawn	Date	Checked	Date	Approved	Date
GD	GD	18/09/15	GM	28/09/15	GM	28/09/15



Client.

WSP ENVIRONMENT & ENERGY
ONE QUEENS DRIVE
BIRMINGHAM
B5 4PJ

Title.

TOPOGRAPHICAL SURVEY

LAND AT PAGHAM, PAGHAM ROAD

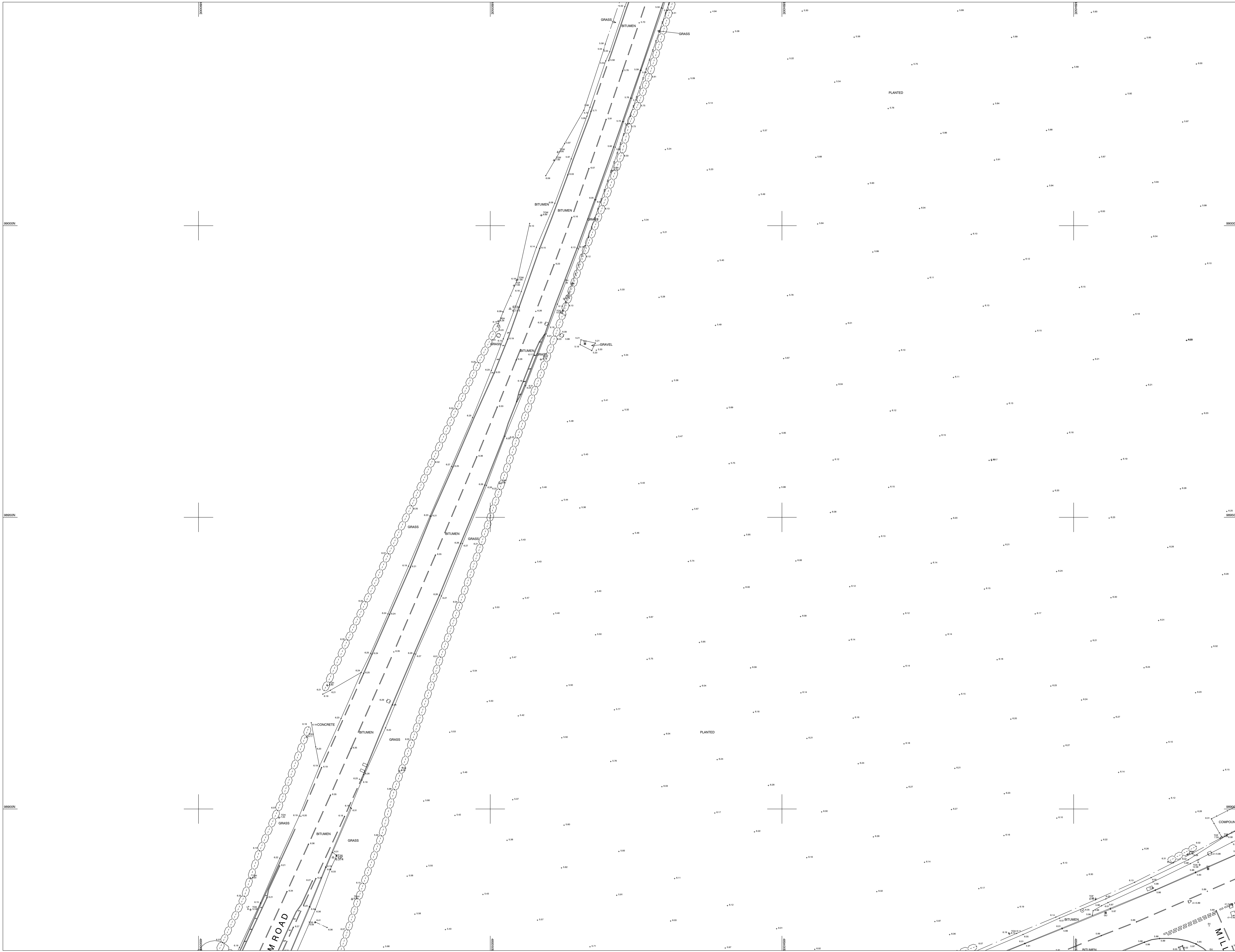
PAGHAM

WEST SUSSEX

PO21 3PD

Dwg No. **150595 3D** Sheet **9 of 14**

Scale 1:200 A0 Sheet Rev. -



Symbol & Abbreviation Key			
	BARBED WIRE FENCE		KERB
	POST & RAIL FENCE		DROPPED KERB
	CLOSE BOARD FENCE		GULLY CHANNEL
	RAILINGS		TOP - BOTTOM OF BANK
	CHAIN LINK FENCE		FOULAGE
	OTHER FENCE		DITCH
	KERB		VERGE
	DROPPED KERB		OVERHEAD CABLES
	GULLY CHANNEL		GATE
	TOP - BOTTOM OF BANK		HEDGE
	FOULAGE		TREE - BROAD LEAVED
	DITCH		TREE - CONIFEROUS
	VERGE		BUSH
	OVERHEAD CABLES		BUILDING
	GATE		BOREHOLE
	HEDGE		SURVEY STATION
	TREE - BROAD LEAVED		ORDNANCE SURVEY BENCH MARK
	TREE - CONIFEROUS		
	BUSH		
	BUILDING		
	BOREHOLE		
	SURVEY STATION		
	ORDNANCE SURVEY BENCH MARK		
A/C	AIR CONDITIONING UNIT	KO	KERB OFFLET
AV	AIR VALVE	LC	LIGHTING COLUMN
BOL	BOLLARD	LP	LAMP POST
BH	BORSHOLE	NP	NAME PLATE
BL	BED LEVEL	NB	NOTICE BOARD
BM	BENCH MARK	PR	PIPE RISER
BT	BRITISH TELECOM	RP	ROAD SIGN
CTV	CABLE TV	RS	ROAD SIGN
CL	COVER LEVEL	SP	SIGN POST
CR	CABLE RISER	SV	STOP VALVE
DP	DOWN PIPE	TL	TRAFFIC LIGHT
EN	EARTH ROD	TP	TELEGRAPH POLE
EP	ELECTRICITY POLE	TOF	TOP OF FENCE
EM	ELECTRICITY MARKER	TOH	TOP OF HEDGE
FB	FUSE BOX	TOR	TOP OF RAILINGS
FI	FIRE HYDRANT	TOS	SERVICE LEVEL
FP	FENCE POST	TOW	TOP OF WALL
FL	FLOOR LEVEL	UTL	UNABLE TO LIFT
GV	GAS VALVE	VM	VALVE MARKER
GM	GAS MARKER	VP	VENT PIPE
GU	GULLY	WL	WATER LEVEL
HM	HYDRANT MARKER	WM	WATER MARKER
L	INVERT LEVEL	WO	WASH OUT

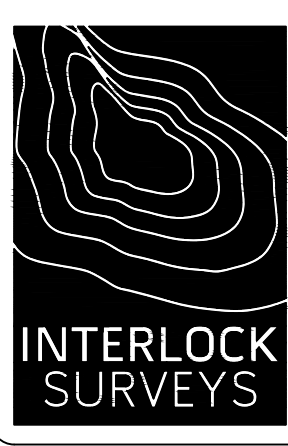
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ED	ED	18/08/15	GM	28/08/15	GM	28/08/15



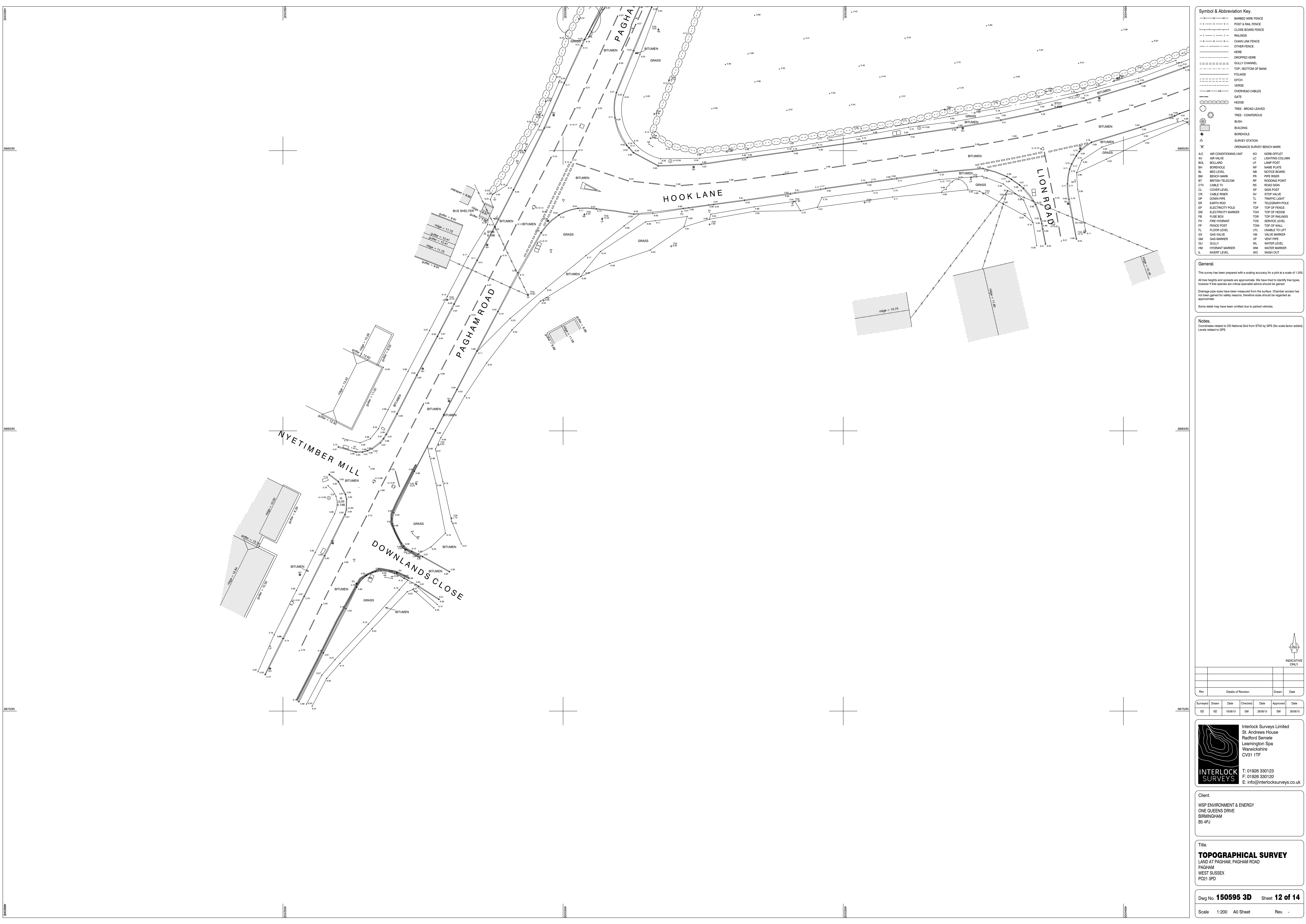
Interlock Surveys Limited
St. Andrews House
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Client.
WSP ENVIRONMENT & ENERGY
ONE QUEENS DRIVE
BIRMINGHAM
B5 4PJ

Title.
TOPOGRAPHICAL SURVEY
LAND AT PAGHAM, PAGHAM ROAD
PAGHAM
WEST SUSSEX
PO21 3PD

Dwg No. **150595 3D** Sheet **10 of 14**
Scale 1:200 A0 Sheet Rev. -



Symbol & Abbreviation Key	
	BARBED WIRE FENCE
	POST & RAIL FENCE
	CLOSE BOARD FENCE
	RAILINGS
	CHAIN LINK FENCE
	OTHER FENCE
	KERB
	DROPPED KERB
	GULLY CHANNEL
	TOP / BOTTOM OF BANK
	FOULAGE
	DITCH
	VERGE
	OVERHEAD CABLES
	GATE
	HEDGE
	TREE - BROAD LEAVED
	TREE - CONIFEROUS
	BUSH
	BUILDING
	BOREHOLE
	SURVEY STATION
	ORDNANCE SURVEY BENCH MARK
A/C	AIR CONDITIONING UNIT
AV	AIR VALVE
BOL	BOLLARD
BH	BOREROLE
BL	BED LEVEL
BM	BENCH MARK
BT	BRITISH TELECOM
CTV	CABLE TV
CL	COVER LEVEL
CR	CABLE RISER
DP	DOWN PIPE
ER	EARTH ROD
EP	ELECTRICITY POLE
EM	ELECTRICITY MARKER
FB	FUSE BOX
FH	FIRE HYDRANT
FP	FENCE POST
FL	FLOOR LEVEL
GV	GAS VALVE
GM	GAS MARKER
GU	GULLY
HM	HYDRANT MARKER
L	INVERT LEVEL
KO	KERB OFFLET
LC	LIGHTING COLUMN
LP	LAMP POST
NP	NAME PLATE
NB	NOTICE BOARD
PR	PIPE RISER
RP	RODING POINT
RS	ROAD SIGN
SP	SIGN POST
SV	STOP VALVE
TL	TRAFFIC LIGHT
TP	TELEGRAPH POLE
TOF	TOP OF FENCE
TOH	TOP OF HEDGE
TOR	TOP OF RAILINGS
TOS	SERVICE LEVEL
TOW	TOP OF WALL
UTL	UNABLE TO LIFT
VM	VALVE MARKER
VP	VENT PIPE
WM	WATER MARKER
WO	WASH OUT

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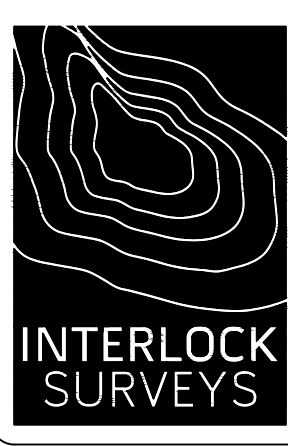
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Coordinates related to OS National Grid from ST03 by GPS (No scale factor added). Levels related to GPS.



Rev	Details of Revision	Drawn	Date

Surveyed	Drawn	Date	Checked	Date	Approved	Date
ED	ED	18/08/15	GM	28/08/15	GM	28/08/15



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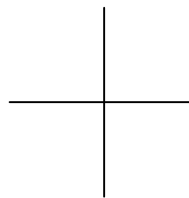
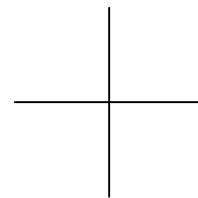
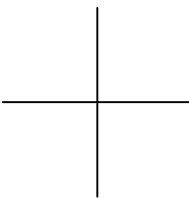
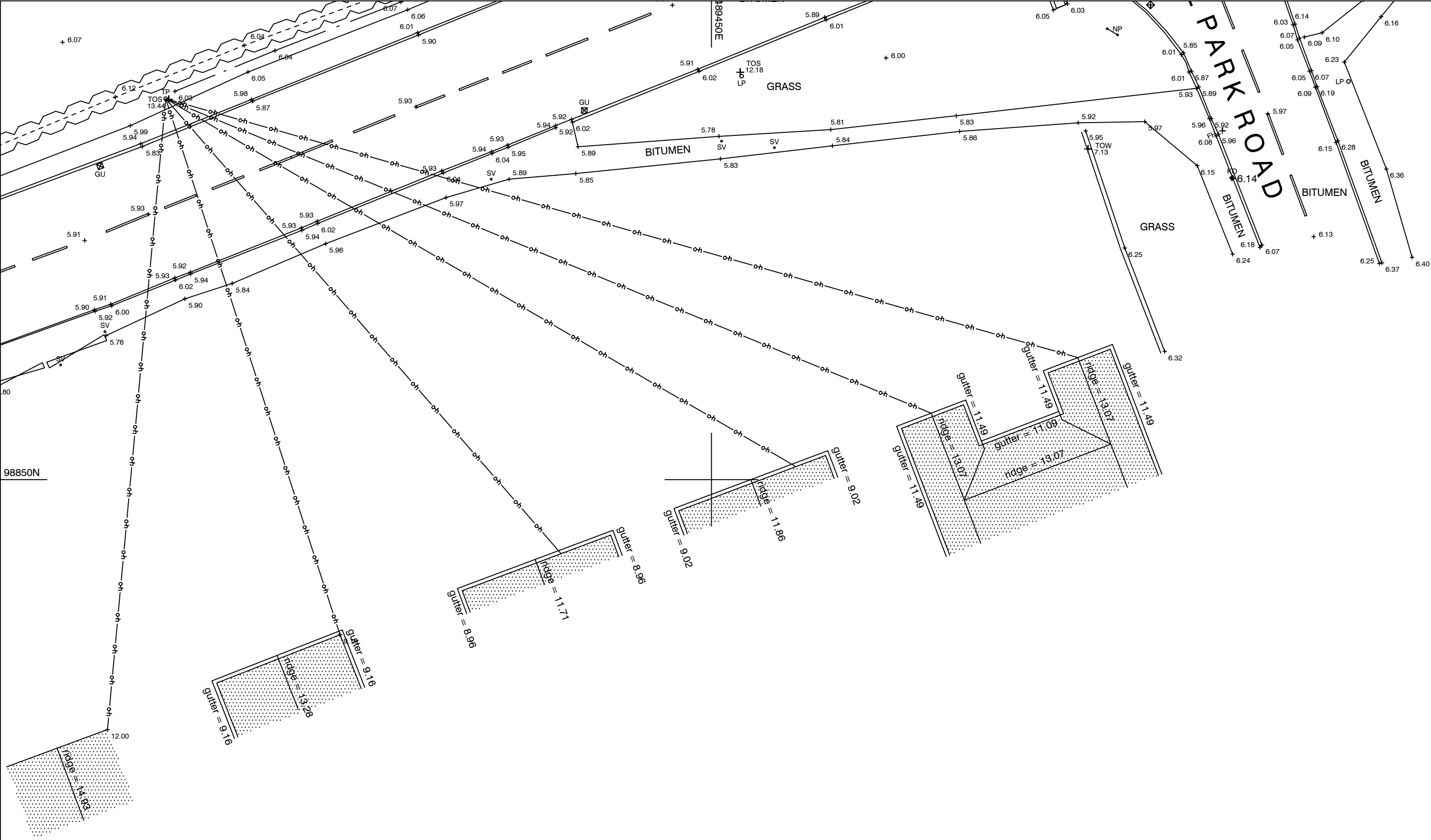
WSP ENVIRONMENT & ENERGY
ONE QUEENS DRIVE
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B5 4PJ

Title.

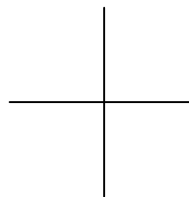
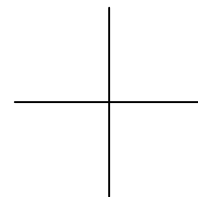
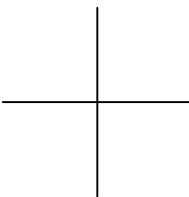
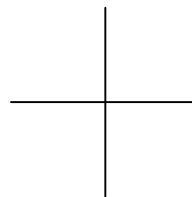
TOPOGRAPHICAL SURVEY
LAND AT PAGHAM, PAGHAM ROAD
PAGHAM
WEST SUSSEX
PO21 3PD

Dwg No. **150595 3D** Sheet **12 of 14**

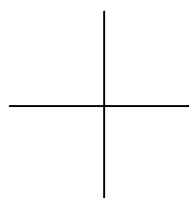
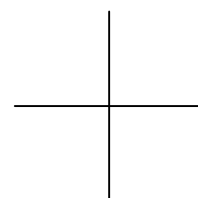
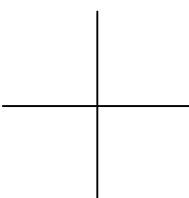
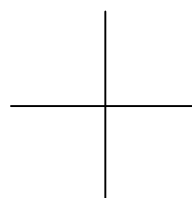
Scale 1:200 A0 Sheet Rev. -



08850N



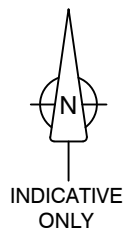
08750N



Symbol & Abbreviation Key.			
	BARBED WIRE FENCE		KERB
	POST & RAIL FENCE		DROPPED KERB
	CLOSE BOARD FENCE		GULLY CHANNEL
	RAILINGS		TOP - BOTTOM OF BANK
	CHAIN LINK FENCE		FOLIAGE
	OTHER FENCE		DITCH
	VERGE		OVERHEAD CABLES
	GATE		HEDGE
	TREE - BROAD LEAVED		TREE - CONIFEROUS
	BUSH		BUILDING
	BOREHOLE		SURVEY STATION
	ORDNANCE SURVEY BENCH MARK		
A/C	AIR CONDITIONING UNIT	KO	KERB OFFLET
AV	AIR VALVE	LC	LIGHTING COLUMN
BOL	BOLLARD	LP	LAMP POST
BH	BORERHOLE	NP	NAME PLATE
BL	BED LEVEL	NB	NOTICE BOARD
BM	BENCH MARK	PR	PIPE RISER
BT	BRITISH TELECOM	RP	ROAD SIGN
CTV	CABLE TV	RS	ROAD SIGN
CL	COVER LEVEL	SP	SIGN POST
CR	CABLE RISER	SV	STOP VALVE
DP	DOWN PIPE	TL	TRAFFIC LIGHT
ER	EARTH ROD	TP	TELEGRAPH POLE
EP	ELECTRICITY POLE	TOF	TOP OF FENCE
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FI	FIRE HYDRANT	TOS	SERVICE LEVEL
FP	FENCE POST	TOW	TOP OF WALL
FL	FLOOR LEVEL	UTL	UNABLE TO LIFT
GV	GAS VALVE	VM	VALVE MARKER
GM	GAS MARKER	VP	VENT PIPE
GU	GULLY	WL	WATER LEVEL
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Levels related to GPS.



Rev	Details of Revision			Drawn Date

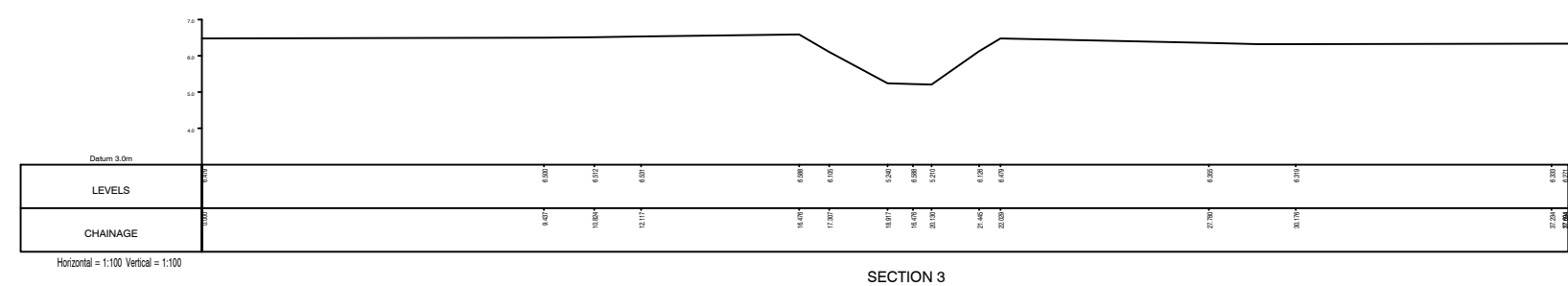
Surveyed	Drawn	Date	Checked	Date	Approved	Date
ED	GD	18/08/15	GM	26/08/15	GM	26/08/15

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Warwickshire
CV31 1TF

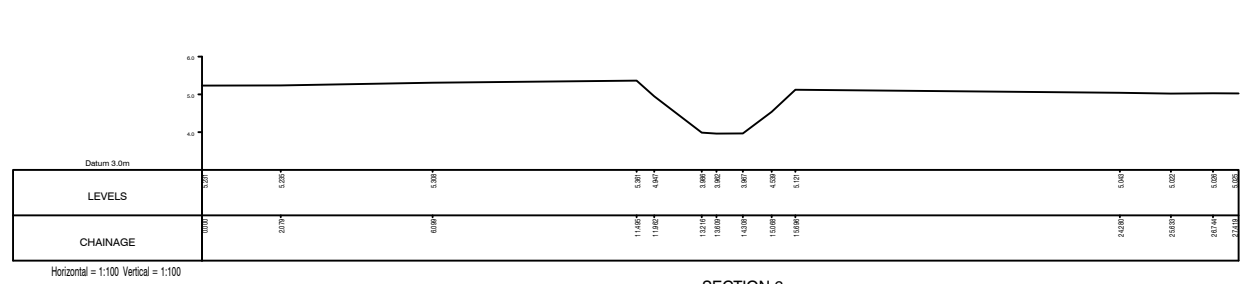
T: 01926 330123
F: 01926 330120
E: info@interlocksurveys.co.uk

Client.
WSP ENVIRONMENT & ENERGY
ONE QUEENS DRIVE
BIRMINGHAM
B5 4PJ

Title.
TOPOGRAPHICAL SURVEY
LAND AT PAGHAM, PAGHAM ROAD
PAGHAM
WEST SUSSEX
PO21 3PD



11.485	5.361	480548.443	90408.420	Top-of bank
11.082	4.947	480548.730	90408.700	Ground level
13.215	3.066	480549.405	90409.700	Bottom of bank
13.039	3.862	480548.720	90410.100	Bed level
14.308	3.987	480550.143	90410.800	Bottom of bank
15.069	4.539	480550.800	90411.200	Ground level
15.080	5.121	480550.980	90411.700	Top-of bank
24.280	5.043	480556.100	90418.810	Ground level
29.833	5.022	480556.380	90418.800	Ground level
28.744	5.026	480557.850	90420.570	Ground level
27.419	5.025	480558.960	90421.110	End



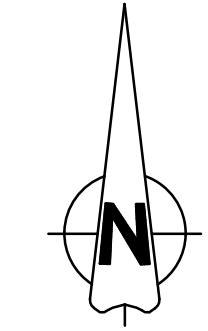
Notes.
Coordinates related to OS National Grid from ST03 by GPS (No scale factor added).
Levels related to GPS.


INDICATIVE
ONLY

Dwg No. **150595 3D** Sheet **14 of 14**

Scale 1:200 A1 Sheet Rev. -

| Appendix B – Drainage Strategy



KEY:

- Site Boundary
- Existing Foul Water Sewers
- Proposed SW Catchment Areas
- Proposed Surface Water Sewers
- Proposed Foul Water Sewers
- Proposed foul pumping main
- Proposed surface water control chamber
- Proposed headwall
- 3m Watercourse buffer zone

Surface Water Catchment 1B
Development Area (ha): 0.56
Impermeable Area 60% (ha): 0.34
Detention Feature: Pond 1B

Pond 1B
Downstream Control: Hydrobrake
Total Storage Volume (m3): 296
Min top of bank level: 5.13mAOD
Bed level: 3.75mAOD
Side Slopes: 1 in 4
Discharge rate (litres/sec): 11.76 (Qbar)
Outfall: Watercourse

Surface Water Catchment 1A+1B
Development Area (ha): 5.22
Impermeable Area 60% (ha): 3.13
Care Home Impermeable Area (ha): 0.23
Total Catchment Area (ha): 3.36
Detention Feature: Ponds 1A+1B

Surface Water Catchment 2
Development Area (ha): 1.98
Impermeable Area 60% (ha): 1.19
Detention Feature: Pond 2

Pond 2
Downstream Control: Hydrobrake
Total Storage Volume (m3): 951
Min top of bank level: 6.4mAOD
Bed level: 5.1mAOD
Side Slopes: 1 in 4
Discharge rate (litres/sec): 4.17
Outfall: Watercourse

Surface Water Catchment 1A
Development Area (ha): 4.66
Impermeable Area 60% (ha): 2.79
Care Home Impermeable Area (ha): 0.23
Total Catchment Area (ha): 3.02
Detention Feature: Pond 1A

Pond 1A
Downstream Control: Hydrobrake
Total Storage Volume (m3): 2,359
Min top of bank level: 5.8mAOD
Bed level: 4.0mAOD
Side Slopes: 1 in 4
Discharge rate (litres/sec): 10.57 (Qbar)
Outfall: Pond 1B

Surface Water Catchment 3
Development Area (ha): 3.00
Impermeable Area 60% (ha): 1.80
Detention Feature: Pond 3

Pond 3
Downstream Control: Hydrobrake
Total Storage Volume (m3): 1,421
Min top of bank level: 5.0mAOD
Bed level: 3.7mAOD
Side Slopes: 1 in 4
Discharge rate (litres/sec): 6.30 (Qbar)
Outfall: Watercourse

FW PS 1
CL 6.00mAOD
IL 1.33mAOD
95 Dwellings
Emergency Storage Requirement:
TBC cu m
Emergency Storage Proposal: 15.2 cu m
Provide within 3m wet well chamber & upstream network up to lowest incoming lateral

NOTES:

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- This drawing has been prepared for planning purposes only it is not for tender of construction.
- All finished floor levels shown are indicative and are subject to refinement following completion of the detailed design.
- All drainage details are indicative and subject to refinement following completion of the detailed design.

K	3m buffer zone indicated. Catchments & basins updated.	DC	SM	RM	29.04.21
J	Update to suit LL FA comments	LF	SM	RM	31.03.21
H	Latest site layout added.	LF	SM	RM	10.12.20
G	Latest site layout added.	NJO	SM	RM	08.12.20
F	Latest site layout added.	NJO	SM	RM	02.12.20
E	Basin details amended.	NJO	SM	RM	26.11.20
D	Western swale profile amended, culvert crossings added	RM	SM	RM	28.10.20
C	Western swale profile amended	RM	SM	RM	20.10.20
B	Amended as per Urban Wilderness comments	BP	SM	RM	01.10.20
A	Watercourse diversion amended	LF	RM	RM	18.08.20
-	First Issue	LF	RM	RM	08.06.20



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Hook Lane

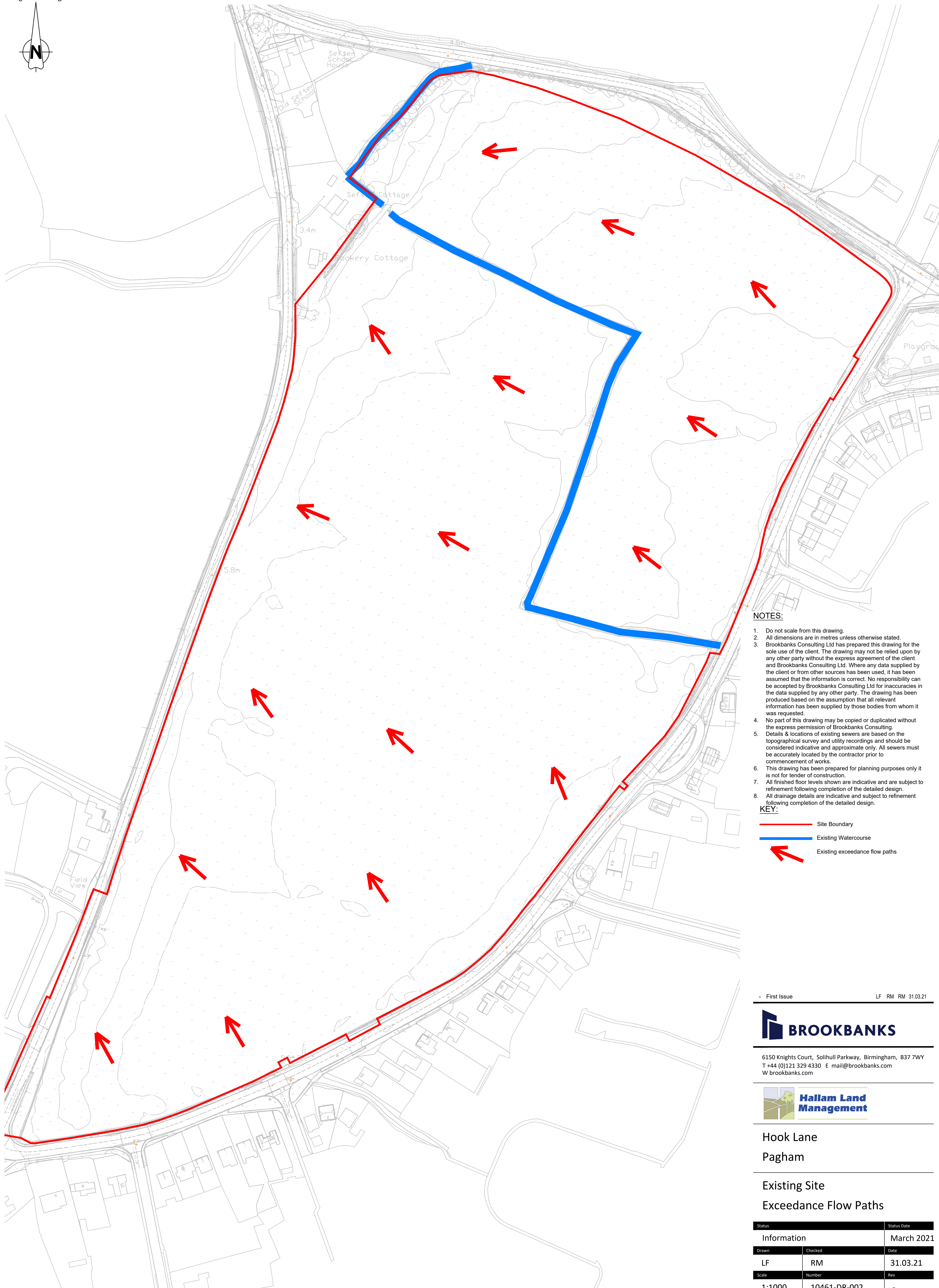
Pagham

Surface & Foul Water
Drainage Strategy

Status		Status Date
Information		June 2020
Drawn	Checked	Date
LF	RM	10.06.20
Scale	Number	Rev
1:1000	10461-DR-001	K
0 20 40 60 80 100		
METRES		

UNTIL TECHNICAL APPROVAL HAS BEEN OBTAINED FROM THE RELEVANT LOCAL AUTHORITIES, IT SHOULD BE UNDERSTOOD THAT ALL DRAWINGS ARE ISSUED AS PRELIMINARY AND NOT FOR CONSTRUCTION. SHOULD THE CONTRACTOR COMMENCE SITE WORK PRIOR TO APPROVAL BEING GIVEN, IT IS ENTIRELY AT HIS OWN RISK.

| Appendix C – Existing Exceedance Flow Plan



NOTES:

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2. All dimensions are in metres unless otherwise stated.
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6. This drawing has been prepared for planning purposes only it is not for tender or construction.
7. All finished floor levels shown are indicative and are subject to refinement following completion of the detailed design.
8. All drainage details are indicative and subject to refinement following completion of the detailed design.

Following completion of the detailed design.

KEY:

- Site Boundary
- Existing Watercourse
- Existing exceedance flow paths

- First Issue LF RM RM 31.03.21



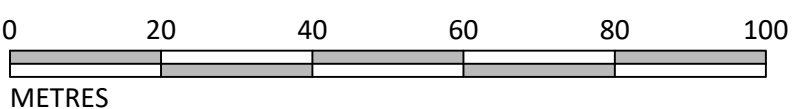
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Hook Lane
Pagham

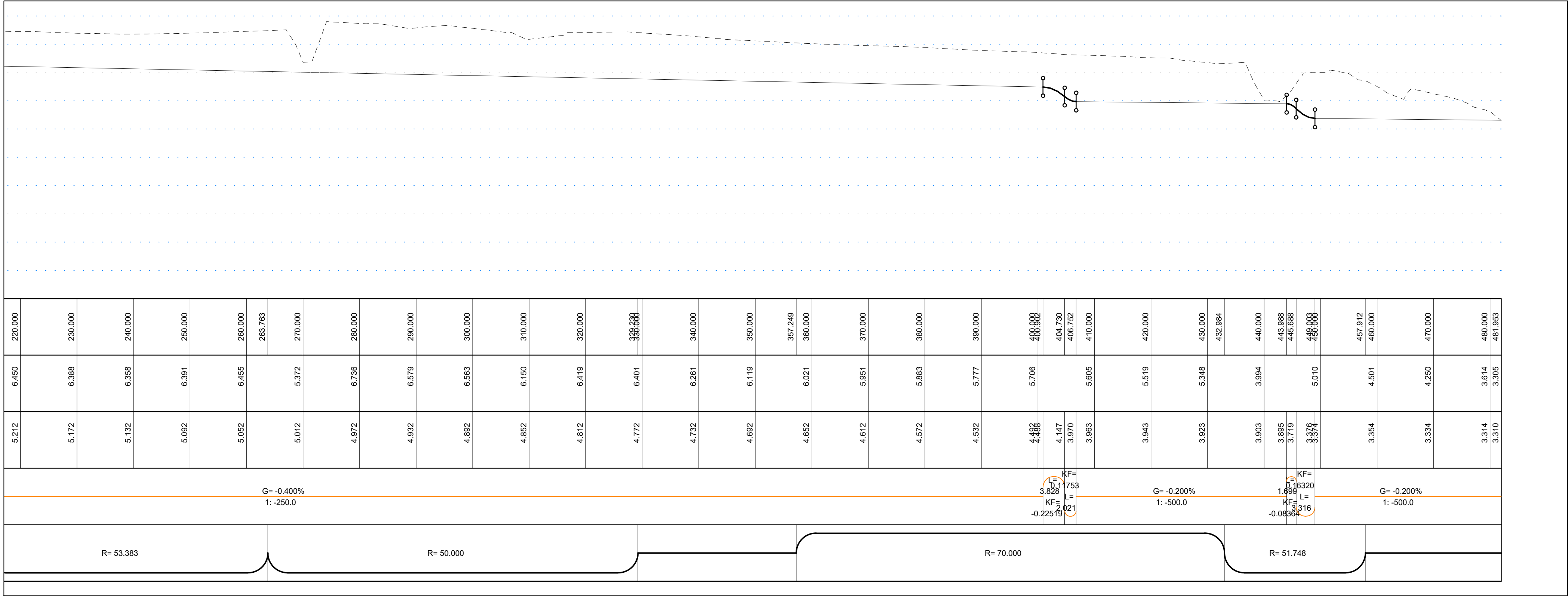
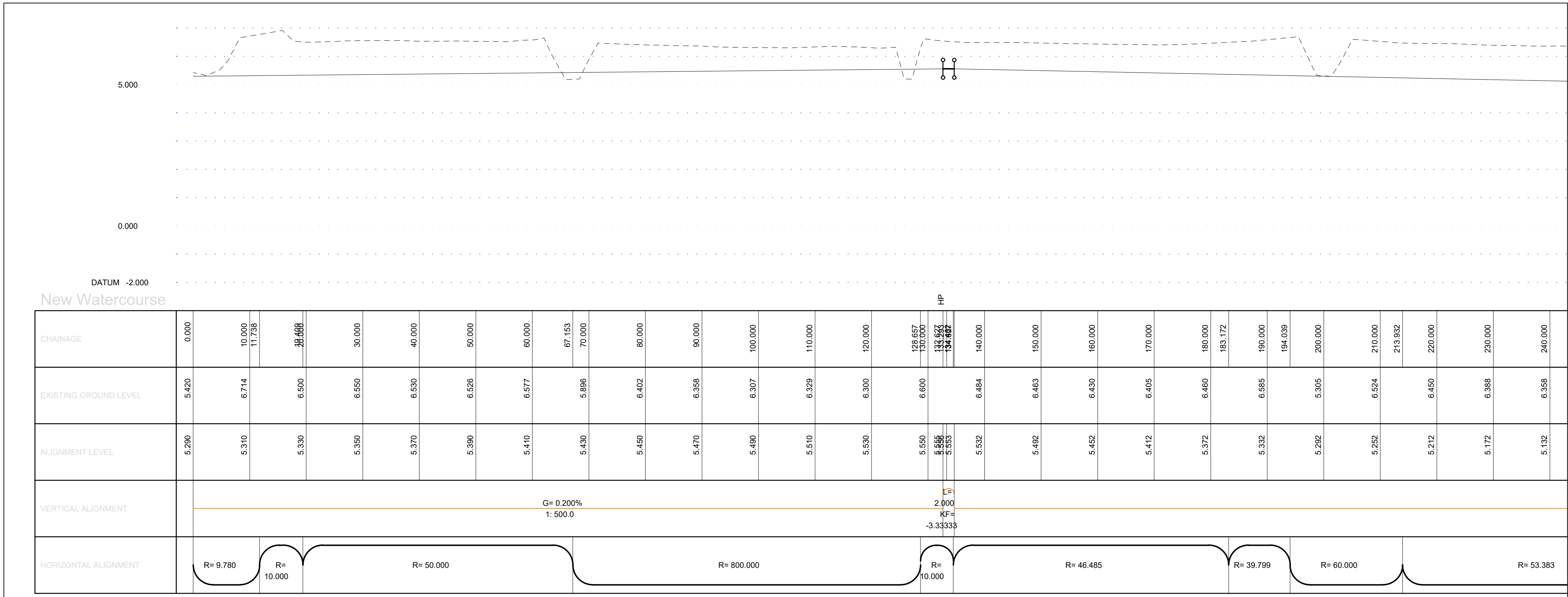
Existing Site
Exceedance Flow Paths

Status		Status Date
Information		March 2021
Drawn	Checked	Date
LF	RM	31.03.21
Scale	Number	Rev
1:1000	10461-DR-002	-

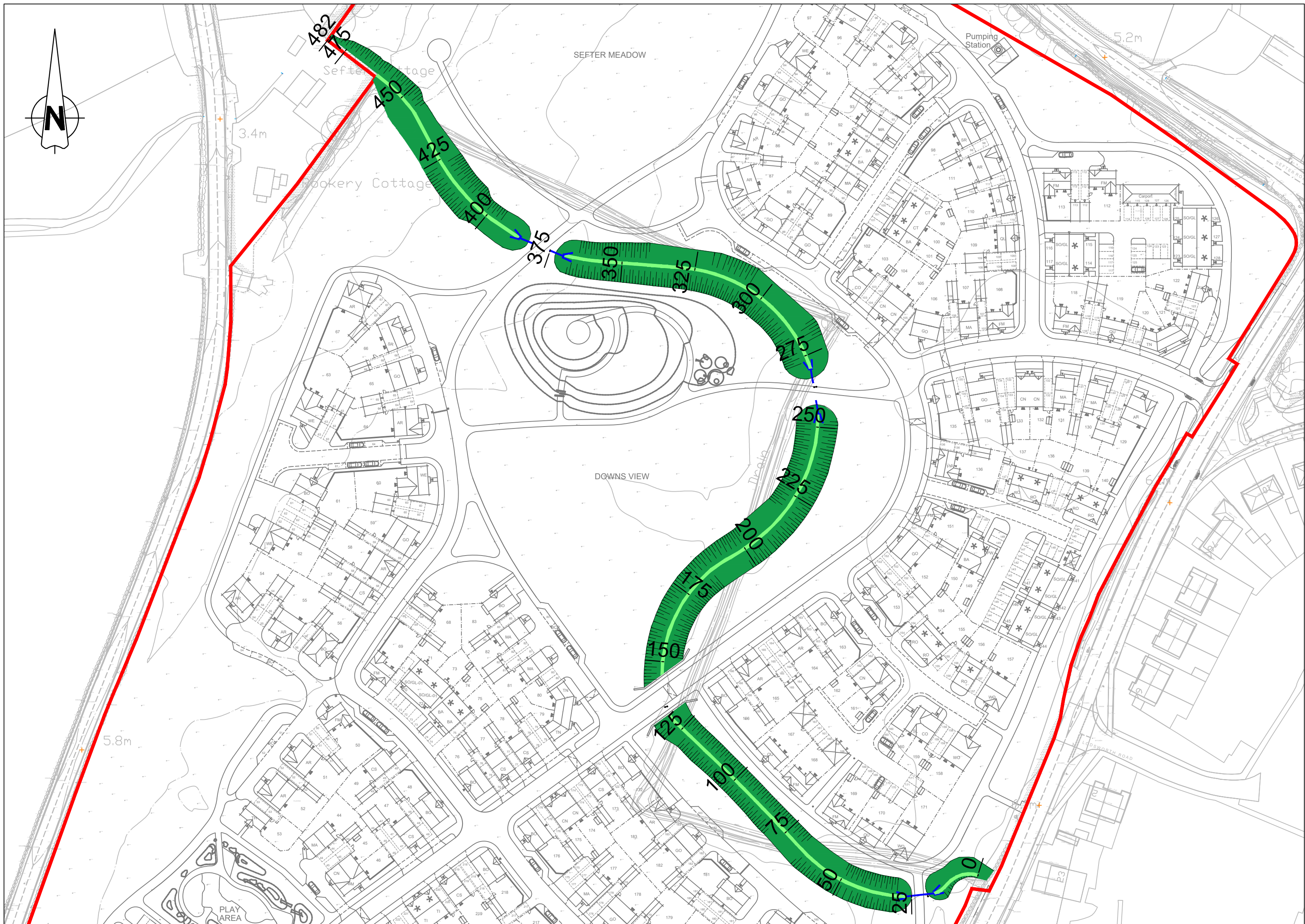


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| Appendix D – Diverted Watercourse Long Section



LONGITUDINAL SECTIONS
H 1:500 V 1:100



NOTES:

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6. This drawing has been prepared for planning purposes only it is not for tender of construction.
7. All finished floor levels shown are indicative and are subject to refinement following completion of the detailed design.
8. All drainage details are indicative and subject to refinement following completion of the detailed design.

KEY:

 Site Boundary

- First Issue	LF	RM	RM	31.03.21
---------------	----	----	----	----------



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Hook Lane
Pagham

Watercourse Diversion

Plan & Section

Status		Status Date
Information		March 2021
Drawn	Checked	Date
LF	RM	31.03.21
Scale	Number	Rev
1:1000	10461-DR-003	-

020406080100

METRES

| Appendix E – Run Off Calculations

Brookbanks Consulting		Page 1
6150 Knights Court Solihull Parkway Birmingham B37 7WY	Hook Lane, Pagham SW Strategy Greenfield Run Off	
Date 26/11/2020 File	Designed by Brookbanks Checked by N.J.Onions	
Micro Drainage		Source Control 2020.1

IH 124 Mean Annual Flood

Input

Return Period (years) 100 SAAR (mm) 718 Urban 0.000
Area (ha) 50.000 Soil 0.400 Region Number Region 7

Results l/s

QBAR Rural 175.2
QBAR Urban 175.2

Q100 years 559.0

Q1 year 149.0
Q2 years 154.4
Q5 years 224.3
Q10 years 283.9
Q20 years 351.0
Q25 years 376.4
Q30 years 397.2
Q50 years 459.1
Q100 years 559.0
Q200 years 657.2
Q250 years 688.7
Q1000 years 904.3

| Appendix F – SUDS Calculations

Brookbanks Consulting		Page 1
6150 Knights Court Solihull Parkway Birmingham B37 7WY	Hook Lane, Pagham SW Strategy Basin 1A	
Date 24/04/2021 File Pond 1A.SRCX	Designed by Brookbanks Checked by N.J.Onions	
Micro Drainage	Source Control 2020.1	

Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m ³)	Status
15 min Summer	4.532	0.532	10.6	694.3	O K
30 min Summer	4.681	0.681	10.6	931.1	O K
60 min Summer	4.828	0.828	10.6	1186.5	O K
120 min Summer	4.971	0.971	10.6	1452.2	O K
180 min Summer	5.046	1.046	10.6	1601.1	O K
240 min Summer	5.093	1.093	10.6	1697.0	O K
360 min Summer	5.154	1.154	10.6	1823.5	O K
480 min Summer	5.192	1.192	10.6	1905.7	O K
600 min Summer	5.217	1.217	10.6	1960.7	O K
720 min Summer	5.234	1.234	10.6	1997.7	O K
960 min Summer	5.252	1.252	10.6	2037.0	O K
1440 min Summer	5.252	1.252	10.6	2037.6	O K
2160 min Summer	5.223	1.223	10.6	1972.8	O K
2880 min Summer	5.191	1.191	10.6	1903.5	O K
4320 min Summer	5.127	1.127	10.6	1767.8	O K
5760 min Summer	5.063	1.063	10.6	1635.0	O K
7200 min Summer	4.996	0.996	10.6	1502.1	O K
8640 min Summer	4.922	0.922	10.6	1359.9	O K
10080 min Summer	4.844	0.844	10.6	1214.3	O K
15 min Winter	4.587	0.587	10.6	778.9	O K
30 min Winter	4.748	0.748	10.6	1044.9	O K
60 min Winter	4.908	0.908	10.6	1333.3	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m ³)	Discharge Volume (m ³)	Time-Peak (mins)
15 min Summer	124.633	0.0	657.2	27
30 min Summer	83.789	0.0	842.4	41
60 min Summer	53.779	0.0	1192.7	70
120 min Summer	33.337	0.0	1464.0	130
180 min Summer	24.832	0.0	1601.3	190
240 min Summer	20.006	0.0	1649.2	250
360 min Summer	14.706	0.0	1634.4	368
480 min Summer	11.818	0.0	1610.3	488
600 min Summer	9.966	0.0	1589.3	606
720 min Summer	8.665	0.0	1571.5	726
960 min Summer	6.943	0.0	1542.7	964
1440 min Summer	5.071	0.0	1502.0	1440
2160 min Summer	3.696	0.0	2963.4	1820
2880 min Summer	2.949	0.0	3058.0	2200
4320 min Summer	2.142	0.0	2808.4	2992
5760 min Summer	1.705	0.0	3699.2	3856
7200 min Summer	1.427	0.0	3869.7	4680
8640 min Summer	1.235	0.0	4017.6	5456
10080 min Summer	1.093	0.0	4143.8	6168
15 min Winter	124.633	0.0	730.0	26
30 min Winter	83.789	0.0	880.9	41
60 min Winter	53.779	0.0	1331.8	70

Brookbanks Consulting		Page 2
6150 Knights Court Solihull Parkway Birmingham B37 7WY	Hook Lane, Pagham SW Strategy Basin 1A	
Date 24/04/2021 File Pond 1A.SRCX	Designed by Brookbanks Checked by N.J.Onions	
Micro Drainage	Source Control 2020.1	

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
120 min Winter	5.062	1.062	10.6	1633.0	O K
180 min Winter	5.143	1.143	10.6	1802.2	O K
240 min Winter	5.195	1.195	10.6	1912.6	O K
360 min Winter	5.262	1.262	10.6	2060.5	O K
480 min Winter	5.306	1.306	10.6	2159.1	O K
600 min Winter	5.335	1.335	10.6	2227.1	O K
720 min Winter	5.356	1.356	10.6	2275.0	O K
960 min Winter	5.380	1.380	10.6	2332.1	O K
1440 min Winter	5.392	1.392	10.6	2358.8	O K
2160 min Winter	5.366	1.366	10.6	2298.3	O K
2880 min Winter	5.326	1.326	10.6	2204.3	O K
4320 min Winter	5.245	1.245	10.6	2022.9	O K
5760 min Winter	5.157	1.157	10.6	1830.6	O K
7200 min Winter	5.062	1.062	10.6	1633.9	O K
8640 min Winter	4.958	0.958	10.6	1428.8	O K
10080 min Winter	4.830	0.830	10.6	1189.2	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
120 min Winter	33.337	0.0	1605.7	128
180 min Winter	24.832	0.0	1657.2	186
240 min Winter	20.006	0.0	1644.1	246
360 min Winter	14.706	0.0	1616.0	362
480 min Winter	11.818	0.0	1596.2	480
600 min Winter	9.966	0.0	1582.4	596
720 min Winter	8.665	0.0	1572.8	712
960 min Winter	6.943	0.0	1562.9	942
1440 min Winter	5.071	0.0	1563.6	1390
2160 min Winter	3.696	0.0	3203.5	2032
2880 min Winter	2.949	0.0	3123.7	2308
4320 min Winter	2.142	0.0	2897.9	3240
5760 min Winter	1.705	0.0	4143.0	4152
7200 min Winter	1.427	0.0	4333.4	5048
8640 min Winter	1.235	0.0	4498.4	5968
10080 min Winter	1.093	0.0	4642.8	6664

Brookbanks Consulting		Page 3
6150 Knights Court Solihull Parkway Birmingham B37 7WY	Hook Lane, Pagham SW Strategy Basin 1A	
Date 24/04/2021 File Pond 1A.SRCX	Designed by Brookbanks Checked by N.J.Onions	
Micro Drainage		Source Control 2020.1

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	19.000	Shortest Storm (mins)	15
Ratio R	0.350	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 3.020

Time (mins) Area			Time (mins) Area			Time (mins) Area		
From:	To:	(ha)	From:	To:	(ha)	From:	To:	(ha)
0	4	1.010	4	8	1.010	8	12	1.000

Brookbanks Consulting		Page 4
6150 Knights Court Solihull Parkway Birmingham B37 7WY	Hook Lane, Pagham SW Strategy Basin 1A	
Date 24/04/2021 File Pond 1A.SRCX	Designed by Brookbanks Checked by N.J.Onions	
Micro Drainage	Source Control 2020.1	

Model Details

Storage is Online Cover Level (m) 5.800

Tank or Pond Structure

Invert Level (m) 4.000

Depth (m)	Area (m ²)	Depth (m)	Area (m ²)
0.000	1095.0	1.800	2846.0

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0142-1060-1500-1060
Design Head (m)	1.500
Design Flow (l/s)	10.6
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	142
Invert Level (m)	4.000
Minimum Outlet Pipe Diameter (mm)	225
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.500	10.6	Kick-Flo®	0.939	8.5
Flush-Flo™	0.442	10.6	Mean Flow over Head Range	-	9.2

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

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	5.1	0.800	9.7	2.000	12.1	4.000	16.9	7.000	22.1
0.200	9.6	1.000	8.8	2.200	12.7	4.500	17.8	7.500	22.8
0.300	10.3	1.200	9.5	2.400	13.2	5.000	18.8	8.000	23.5
0.400	10.6	1.400	10.3	2.600	13.7	5.500	19.6	8.500	24.2
0.500	10.6	1.600	10.9	3.000	14.7	6.000	20.5	9.000	24.9
0.600	10.4	1.800	11.5	3.500	15.8	6.500	21.3	9.500	25.5

Brookbanks Consulting		Page 1
6150 Knights Court Solihull Parkway Birmingham B37 7WY	Hook Lane, Pagham SW Strategy Basin 1	
Date 11/12/2020 File	Designed by Brookbanks Checked by N.J.Onions	
Micro Drainage		Source Control 2020.1

Cascade Summary of Results for Pond 1B.SRCX

Upstream Outflow To Overflow To
Structures

Pond 1A.SRCX (None) (None)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	3.911	0.161	10.5	97.3	O K
30 min Summer	3.932	0.182	11.1	110.9	O K
60 min Summer	3.978	0.228	11.5	141.8	O K
120 min Summer	4.025	0.275	11.7	174.3	O K
180 min Summer	4.052	0.302	11.8	193.8	O K
240 min Summer	4.071	0.321	11.8	207.3	O K
360 min Summer	4.095	0.345	11.8	225.6	O K
480 min Summer	4.111	0.361	11.8	237.5	O K
600 min Summer	4.121	0.371	11.8	245.2	O K
720 min Summer	4.127	0.377	11.8	250.1	O K
960 min Summer	4.135	0.385	11.8	256.0	O K
1440 min Summer	4.139	0.389	11.8	258.7	O K
2160 min Summer	4.130	0.380	11.8	251.7	O K
2880 min Summer	4.115	0.365	11.8	240.3	O K
4320 min Summer	4.086	0.336	11.8	219.0	O K
5760 min Summer	4.073	0.323	11.8	208.7	O K
7200 min Summer	4.064	0.314	11.8	202.2	O K
8640 min Summer	4.056	0.306	11.8	196.5	O K
10080 min Summer	4.048	0.298	11.8	191.2	O K
15 min Winter	3.913	0.163	10.5	98.2	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	124.633	0.0	704.4	477
30 min Summer	83.789	0.0	880.6	41
60 min Summer	53.779	0.0	1313.3	70
120 min Summer	33.337	0.0	1603.4	128
180 min Summer	24.832	0.0	1734.2	186
240 min Summer	20.006	0.0	1765.8	244
360 min Summer	14.706	0.0	1761.7	364
480 min Summer	11.818	0.0	1753.1	482
600 min Summer	9.966	0.0	1746.2	600
720 min Summer	8.665	0.0	1741.0	686
960 min Summer	6.943	0.0	1733.9	794
1440 min Summer	5.071	0.0	1728.1	1038
2160 min Summer	3.696	0.0	3269.1	1432
2880 min Summer	2.949	0.0	3334.8	1820
4320 min Summer	2.142	0.0	3104.7	2516
5760 min Summer	1.705	0.0	4111.9	3200
7200 min Summer	1.427	0.0	4300.7	3992
8640 min Summer	1.235	0.0	4464.3	4808
10080 min Summer	1.093	0.0	4601.4	5640
15 min Winter	124.633	0.0	778.6	520

Brookbanks Consulting		Page 2
6150 Knights Court Solihull Parkway Birmingham B37 7WY	Hook Lane, Pagham SW Strategy Basin 1	
Date 11/12/2020 File	Designed by Brookbanks Checked by N.J.Onions	
Micro Drainage	Source Control 2020.1	

Cascade Summary of Results for Pond 1B.SRCX

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m ³)	Status
30 min Winter	3.951	0.201	11.3	123.2	O K
60 min Winter	4.000	0.250	11.6	157.0	O K
120 min Winter	4.052	0.302	11.8	193.6	O K
180 min Winter	4.082	0.332	11.8	216.0	O K
240 min Winter	4.103	0.353	11.8	231.4	O K
360 min Winter	4.131	0.381	11.8	252.7	O K
480 min Winter	4.150	0.400	11.8	267.4	O K
600 min Winter	4.163	0.413	11.8	277.7	O K
720 min Winter	4.172	0.422	11.8	285.1	O K
960 min Winter	4.183	0.433	11.8	293.8	O K
1440 min Winter	4.186	0.436	11.8	295.9	O K
2160 min Winter	4.170	0.420	11.8	282.9	O K
2880 min Winter	4.146	0.396	11.8	264.6	O K
4320 min Winter	4.095	0.345	11.8	225.8	O K
5760 min Winter	4.070	0.320	11.8	207.0	O K
7200 min Winter	4.062	0.312	11.8	200.6	O K
8640 min Winter	4.054	0.304	11.8	195.0	O K
10080 min Winter	4.046	0.296	11.8	189.4	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m ³)	Discharge Volume (m ³)	Time-Peak (mins)
30 min Winter	83.789	0.0	910.6	41
60 min Winter	53.779	0.0	1464.1	68
120 min Winter	33.337	0.0	1739.3	126
180 min Winter	24.832	0.0	1776.5	184
240 min Winter	20.006	0.0	1774.7	242
360 min Winter	14.706	0.0	1770.4	358
480 min Winter	11.818	0.0	1770.8	474
600 min Winter	9.966	0.0	1774.4	590
720 min Winter	8.665	0.0	1780.1	706
960 min Winter	6.943	0.0	1796.0	932
1440 min Winter	5.071	0.0	1803.4	1370
2160 min Winter	3.696	0.0	3494.7	1668
2880 min Winter	2.949	0.0	3429.6	2084
4320 min Winter	2.142	0.0	3247.3	2812
5760 min Winter	1.705	0.0	4605.0	3216
7200 min Winter	1.427	0.0	4815.7	4048
8640 min Winter	1.235	0.0	4997.8	4928
10080 min Winter	1.093	0.0	5156.4	5848

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Date 11/12/2020 File	Designed by Brookbanks Checked by N.J.Onions	
Micro Drainage		Source Control 2020.1

Cascade Rainfall Details for Pond 1B.SRCX

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	19.000	Shortest Storm (mins)	15
Ratio R	0.350	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.340

Time (mins)	Area	Time (mins)	Area	Time (mins)	Area
From: To: (ha)		From: To: (ha)		From: To: (ha)	
0 4 0.120		4 8 0.110		8 12 0.110	

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6150 Knights Court Solihull Parkway Birmingham B37 7WY	Hook Lane, Pagham SW Strategy Basin 1	
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Micro Drainage	Source Control 2020.1	

Cascade Model Details for Pond 1B.SRCX

Storage is Online Cover Level (m) 5.130

Tank or Pond Structure

Invert Level (m) 3.750

Depth (m)	Area (m ²)	Depth (m)	Area (m ²)
0.000	562.0	1.380	1472.0

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0156-1180-1080-1180
Design Head (m)	1.080
Design Flow (l/s)	11.8
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	156
Invert Level (m)	3.750
Minimum Outlet Pipe Diameter (mm)	225
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.080	11.8	Kick-Flo®	0.730	9.8
Flush-Flo™	0.331	11.8	Mean Flow over Head Range	-	10.1

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)	Depth (m)	Flow (l/s)
0.100	5.6	0.800	10.2	2.000	15.8	4.000	22.0	7.000	28.8
0.200	11.3	1.000	11.4	2.200	16.5	4.500	23.3	7.500	29.8
0.300	11.8	1.200	12.4	2.400	17.2	5.000	24.5	8.000	30.7
0.400	11.7	1.400	13.3	2.600	17.9	5.500	25.6	8.500	31.6
0.500	11.5	1.600	14.2	3.000	19.2	6.000	26.7	9.000	32.5
0.600	11.1	1.800	15.0	3.500	20.6	6.500	27.8	9.500	33.4

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6150 Knights Court Solihull Parkway Birmingham B37 7WY	Hook Lane, Pagham SW Strategy Basin 2	
Date 28/04/2021 File Pond 2.SRCX	Designed by Brookbanks Checked by N.J.Onions	
Micro Drainage	Source Control 2020.1	

Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m ³)	Status
15 min Summer	5.362	0.262	4.2	273.9	O K
30 min Summer	5.444	0.344	4.2	367.3	O K
60 min Summer	5.528	0.428	4.2	468.1	O K
120 min Summer	5.612	0.512	4.2	572.5	O K
180 min Summer	5.658	0.558	4.2	631.5	O K
240 min Summer	5.687	0.587	4.2	670.1	O K
360 min Summer	5.727	0.627	4.2	722.4	O K
480 min Summer	5.753	0.653	4.2	757.9	O K
600 min Summer	5.771	0.671	4.2	782.2	O K
720 min Summer	5.783	0.683	4.2	799.2	O K
960 min Summer	5.797	0.697	4.2	819.1	O K
1440 min Summer	5.803	0.703	4.2	827.0	O K
2160 min Summer	5.788	0.688	4.2	806.0	O K
2880 min Summer	5.769	0.669	4.2	780.2	O K
4320 min Summer	5.726	0.626	4.2	721.1	O K
5760 min Summer	5.679	0.579	4.2	658.9	O K
7200 min Summer	5.634	0.534	4.2	600.9	O K
8640 min Summer	5.593	0.493	4.2	548.1	O K
10080 min Summer	5.553	0.453	4.2	499.1	O K
15 min Winter	5.391	0.291	4.2	307.2	O K
30 min Winter	5.481	0.381	4.2	412.1	O K
60 min Winter	5.575	0.475	4.2	525.6	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m ³)	Discharge Volume (m ³)	Time-Peak (mins)
15 min Summer	124.633	0.0	242.7	27
30 min Summer	83.789	0.0	314.5	41
60 min Summer	53.779	0.0	459.3	70
120 min Summer	33.337	0.0	564.1	130
180 min Summer	24.832	0.0	620.6	190
240 min Summer	20.006	0.0	651.8	250
360 min Summer	14.706	0.0	666.1	368
480 min Summer	11.818	0.0	654.5	488
600 min Summer	9.966	0.0	642.0	606
720 min Summer	8.665	0.0	630.4	726
960 min Summer	6.943	0.0	610.3	964
1440 min Summer	5.071	0.0	577.8	1442
2160 min Summer	3.696	0.0	1149.1	1884
2880 min Summer	2.949	0.0	1181.0	2276
4320 min Summer	2.142	0.0	1112.9	3032
5760 min Summer	1.705	0.0	1454.1	3808
7200 min Summer	1.427	0.0	1520.7	4552
8640 min Summer	1.235	0.0	1577.9	5360
10080 min Summer	1.093	0.0	1624.8	6144
15 min Winter	124.633	0.0	270.1	26
30 min Winter	83.789	0.0	337.5	41
60 min Winter	53.779	0.0	513.0	70

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6150 Knights Court Solihull Parkway Birmingham B37 7WY	Hook Lane, Pagham SW Strategy Basin 2	
Date 28/04/2021 File Pond 2.SRCX	Designed by Brookbanks Checked by N.J.Onions	
Micro Drainage	Source Control 2020.1	

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
120 min Winter	5.667	0.567	4.2	643.8	O K
180 min Winter	5.719	0.619	4.2	711.5	O K
240 min Winter	5.752	0.652	4.2	756.5	O K
360 min Winter	5.796	0.696	4.2	817.1	O K
480 min Winter	5.825	0.725	4.2	858.0	O K
600 min Winter	5.846	0.746	4.2	886.8	O K
720 min Winter	5.860	0.760	4.2	907.5	O K
960 min Winter	5.878	0.778	4.2	933.6	O K
1440 min Winter	5.890	0.790	4.2	950.5	O K
2160 min Winter	5.879	0.779	4.2	934.6	O K
2880 min Winter	5.854	0.754	4.2	898.6	O K
4320 min Winter	5.804	0.704	4.2	828.0	O K
5760 min Winter	5.744	0.644	4.2	745.5	O K
7200 min Winter	5.672	0.572	4.2	649.6	O K
8640 min Winter	5.606	0.506	4.2	564.7	O K
10080 min Winter	5.545	0.445	4.2	488.3	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
120 min Winter	33.337	0.0	622.6	128
180 min Winter	24.832	0.0	666.3	186
240 min Winter	20.006	0.0	668.9	246
360 min Winter	14.706	0.0	654.0	362
480 min Winter	11.818	0.0	639.9	480
600 min Winter	9.966	0.0	628.4	596
720 min Winter	8.665	0.0	618.7	714
960 min Winter	6.943	0.0	603.1	944
1440 min Winter	5.071	0.0	580.7	1398
2160 min Winter	3.696	0.0	1237.4	2044
2880 min Winter	2.949	0.0	1207.3	2396
4320 min Winter	2.142	0.0	1115.3	3284
5760 min Winter	1.705	0.0	1628.1	4216
7200 min Winter	1.427	0.0	1702.8	5040
8640 min Winter	1.235	0.0	1766.9	5792
10080 min Winter	1.093	0.0	1821.1	6560

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6150 Knights Court Solihull Parkway Birmingham B37 7WY	Hook Lane, Pagham SW Strategy Basin 2	
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Micro Drainage	Source Control 2020.1	

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	19.000	Shortest Storm (mins)	15
Ratio R	0.350	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 1.190

Time (mins)	Area	Time (mins)	Area	Time (mins)	Area
From:	To:	From:	To:	From:	To:
(ha)	(ha)	(ha)	(ha)	(ha)	(ha)
0	4 0.396	4	8 0.396	8	12 0.398

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6150 Knights Court Solihull Parkway Birmingham B37 7WY	Hook Lane, Pagham SW Strategy Basin 2	
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Micro Drainage	Source Control 2020.1	

Model Details

Storage is Online Cover Level (m) 6.400

Tank or Pond Structure

Invert Level (m) 5.100

Depth (m)	Area (m ²)	Depth (m)	Area (m ²)
0.000	973.0	1.300	1806.0

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0097-4200-1000-4200
Design Head (m)	1.000
Design Flow (l/s)	4.2
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	97
Invert Level (m)	5.100
Minimum Outlet Pipe Diameter (mm)	150
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.000	4.2	Kick-Flo®	0.635	3.4
Flush-Flo™	0.299	4.2	Mean Flow over Head Range	-	3.7

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)	Depth (m)	Flow (l/s)
0.100	3.2	0.800	3.8	2.000	5.8	4.000	8.0	7.000	10.4
0.200	4.1	1.000	4.2	2.200	6.0	4.500	8.5	7.500	10.8
0.300	4.2	1.200	4.6	2.400	6.3	5.000	8.9	8.000	11.1
0.400	4.1	1.400	4.9	2.600	6.5	5.500	9.3	8.500	11.5
0.500	4.0	1.600	5.2	3.000	7.0	6.000	9.7	9.000	11.8
0.600	3.6	1.800	5.5	3.500	7.5	6.500	10.1	9.500	12.1

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6150 Knights Court Solihull Parkway Birmingham B37 7WY	Hook Lane, Pagham SW Strategy Basin 3	
Date 28/04/2020 File Pond 3.SRCX	Designed by Brookbanks Checked by N.J.Onions	
Micro Drainage	Source Control 2020.1	

Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m ³)	Status
15 min Summer	4.025	0.325	6.3	414.2	O K
30 min Summer	4.125	0.425	6.3	555.5	O K
60 min Summer	4.228	0.528	6.3	708.1	O K
120 min Summer	4.331	0.631	6.3	866.8	O K
180 min Summer	4.387	0.687	6.3	957.0	O K
240 min Summer	4.422	0.722	6.3	1015.4	O K
360 min Summer	4.469	0.769	6.3	1092.7	O K
480 min Summer	4.499	0.799	6.3	1143.5	O K
600 min Summer	4.519	0.819	6.3	1177.8	O K
720 min Summer	4.532	0.832	6.3	1201.4	O K
960 min Summer	4.547	0.847	6.3	1227.6	O K
1440 min Summer	4.550	0.850	6.3	1232.8	O K
2160 min Summer	4.532	0.832	6.3	1200.5	O K
2880 min Summer	4.510	0.810	6.3	1163.1	O K
4320 min Summer	4.464	0.764	6.3	1085.0	O K
5760 min Summer	4.416	0.716	6.3	1005.4	O K
7200 min Summer	4.366	0.666	6.3	923.9	O K
8640 min Summer	4.311	0.611	6.3	835.0	O K
10080 min Summer	4.258	0.558	6.3	754.1	O K
15 min Winter	4.061	0.361	6.3	464.6	O K
30 min Winter	4.172	0.472	6.3	623.3	O K
60 min Winter	4.285	0.585	6.3	795.2	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m ³)	Discharge Volume (m ³)	Time-Peak (mins)
15 min Summer	124.633	0.0	373.0	27
30 min Summer	83.789	0.0	482.5	41
60 min Summer	53.779	0.0	698.2	70
120 min Summer	33.337	0.0	856.2	130
180 min Summer	24.832	0.0	937.3	190
240 min Summer	20.006	0.0	975.8	250
360 min Summer	14.706	0.0	979.4	368
480 min Summer	11.818	0.0	964.9	488
600 min Summer	9.966	0.0	951.1	606
720 min Summer	8.665	0.0	938.9	726
960 min Summer	6.943	0.0	918.0	964
1440 min Summer	5.071	0.0	884.1	1440
2160 min Summer	3.696	0.0	1745.4	1820
2880 min Summer	2.949	0.0	1798.3	2196
4320 min Summer	2.142	0.0	1653.9	2988
5760 min Summer	1.705	0.0	2200.3	3824
7200 min Summer	1.427	0.0	2301.1	4680
8640 min Summer	1.235	0.0	2388.2	5448
10080 min Summer	1.093	0.0	2460.3	6160
15 min Winter	124.633	0.0	415.0	26
30 min Winter	83.789	0.0	515.2	41
60 min Winter	53.779	0.0	779.4	70

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Micro Drainage	Source Control 2020.1	

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
120 min Winter	4.398	0.698	6.3	975.0	O K
180 min Winter	4.459	0.759	6.3	1076.7	O K
240 min Winter	4.499	0.799	6.3	1143.4	O K
360 min Winter	4.551	0.851	6.3	1233.0	O K
480 min Winter	4.585	0.885	6.3	1293.0	O K
600 min Winter	4.608	0.908	6.3	1334.8	O K
720 min Winter	4.625	0.925	6.3	1364.5	O K
960 min Winter	4.645	0.945	6.3	1400.7	O K
1440 min Winter	4.656	0.956	6.3	1420.6	O K
2160 min Winter	4.639	0.939	6.3	1389.7	O K
2880 min Winter	4.610	0.910	6.3	1338.8	O K
4320 min Winter	4.552	0.852	6.3	1234.8	O K
5760 min Winter	4.486	0.786	6.3	1121.1	O K
7200 min Winter	4.415	0.715	6.3	1003.2	O K
8640 min Winter	4.334	0.634	6.3	871.8	O K
10080 min Winter	4.249	0.549	6.3	739.6	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
120 min Winter	33.337	0.0	940.2	128
180 min Winter	24.832	0.0	991.3	186
240 min Winter	20.006	0.0	988.1	246
360 min Winter	14.706	0.0	971.8	362
480 min Winter	11.818	0.0	958.7	480
600 min Winter	9.966	0.0	948.8	596
720 min Winter	8.665	0.0	940.8	712
960 min Winter	6.943	0.0	929.0	942
1440 min Winter	5.071	0.0	918.3	1390
2160 min Winter	3.696	0.0	1893.8	2024
2880 min Winter	2.949	0.0	1850.7	2304
4320 min Winter	2.142	0.0	1710.8	3212
5760 min Winter	1.705	0.0	2464.1	4152
7200 min Winter	1.427	0.0	2576.4	5048
8640 min Winter	1.235	0.0	2673.7	5960
10080 min Winter	1.093	0.0	2757.1	6656

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6150 Knights Court Solihull Parkway Birmingham B37 7WY	Hook Lane, Pagham SW Strategy Basin 3	
Date 28/04/2020 File Pond 3.SRCX	Designed by Brookbanks Checked by N.J.Onions	
Micro Drainage		Source Control 2020.1

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	19.000	Shortest Storm (mins)	15
Ratio R	0.350	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 1.800

Time (mins) Area			Time (mins) Area			Time (mins) Area		
From:	To:	(ha)	From:	To:	(ha)	From:	To:	(ha)
0	4	0.600	4	8	0.600	8	12	0.600

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6150 Knights Court Solihull Parkway Birmingham B37 7WY	Hook Lane, Pagham SW Strategy Basin 3	
Date 28/04/2020 File Pond 3.SRCX	Designed by Brookbanks Checked by N.J.Onions	
Micro Drainage	Source Control 2020.1	

Model Details

Storage is Online Cover Level (m) 5.000

Tank or Pond Structure

Invert Level (m) 3.700

Depth (m)	Area (m ²)	Depth (m)	Area (m ²)
0.000	1173.0	1.300	2093.0

Hydro-Brake® Optimum Outflow Control

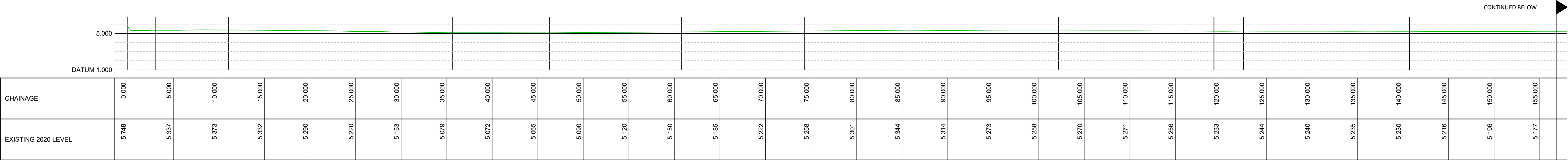
Unit Reference	MD-SHE-0118-6300-1000-6300
Design Head (m)	1.000
Design Flow (l/s)	6.3
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	118
Invert Level (m)	3.700
Minimum Outlet Pipe Diameter (mm)	150
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.000	6.3	Kick-Flo®	0.652	5.2
Flush-Flo™	0.299	6.3	Mean Flow over Head Range	-	5.4

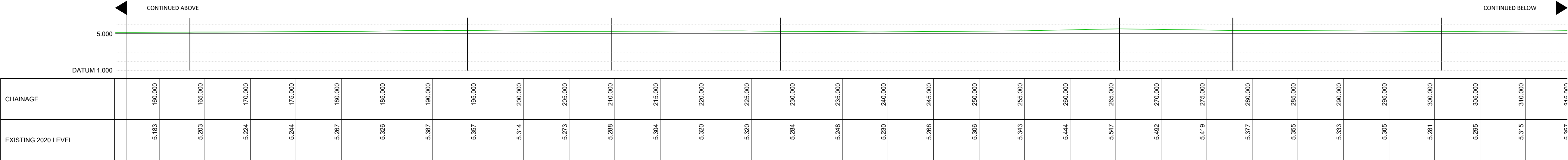
The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	4.2	0.800	5.7	2.000	8.7	4.000	12.1	7.000	15.8
0.200	6.1	1.000	6.3	2.200	9.1	4.500	12.8	7.500	16.3
0.300	6.3	1.200	6.8	2.400	9.5	5.000	13.4	8.000	16.8
0.400	6.2	1.400	7.4	2.600	9.8	5.500	14.1	8.500	17.3
0.500	6.0	1.600	7.8	3.000	10.5	6.000	14.7	9.000	17.8
0.600	5.6	1.800	8.3	3.500	11.3	6.500	15.2	9.500	18.3

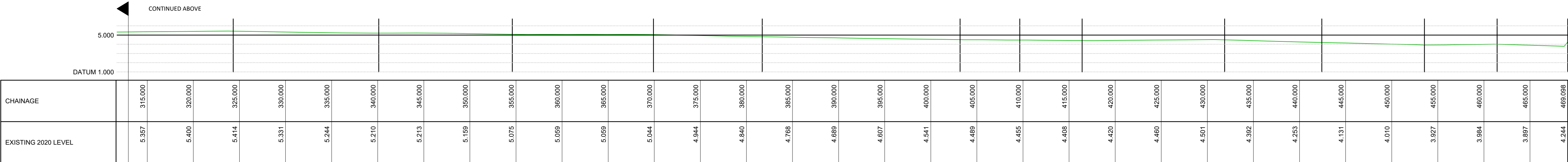
| Appendix G – Existing Watercourse Long Section



Existing Ditch



Existing Ditch



Existing Ditch

Construction Design and Management (CDM)

Key Residual Risks

Contractors entering the site should gain permission from the relevant land owners and/or principle contractor working on site at the time of entry. Contractors shall be responsible for carrying out their own risk assessments and for liaising with the relevant services companies and authorities. Listed below are Site Specific key risks associated with the project.

- 1) Overhead and underground services
- 2) Street Lighting Cables
- 3) Working adjacent to water courses and flood plain
- 4) Soft ground conditions
- 5) Working adjacent to live highways and railway line
- 6) Unchartered services
- 7) Existing buildings with potential asbestos hazards

- NOTES:**
1. Do not scale from this drawing.
 2. All dimensions are in metres unless otherwise stated.
 3. Brookbanks Consulting Ltd has prepared this drawing for the sole use of the client. The drawing may not be relied upon by any other party without the express agreement of the client and Brookbanks Consulting Ltd. Where any data supplied by the client or from other sources has been used, it has been assumed that the information is correct. No responsibility can be accepted by Brookbanks Consulting Ltd for inaccuracies in the data supplied by any other party. The drawing has been produced based on the assumption that all relevant information has been supplied by those bodies from whom it was requested.
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Hallam Land Management

Hook Lane Pagham

Existing Ditch Longsection

Status		Status Date
Information		April 2021
Drawn	Checked	Date
DC	SM	27.04.2021
Scale	Number	Rev
1:250	10461-SK-002	-
0 5 10 15 20 25		
METRES		

UNTIL TECHNICAL APPROVAL HAS BEEN OBTAINED FROM THE RELEVANT LOCAL AUTHORITIES, IT SHOULD BE UNDERSTOOD THAT ALL DRAWINGS ARE ISSUED AS PRELIMINARY AND NOT FOR CONSTRUCTION. SHOULD THE CONTRACTOR COMMENCE SITE WORK PRIOR TO APPROVAL BEING GIVEN, IT IS ENTIRELY AT HIS OWN RISK.