HEYNE TILLETT STEEL

Appendix A

Topographical Survey

Equipment Information

Equipment	Manufactur	Model	Serial Number	IWGS REF	Date of Calibration
EML Tx /Transmitter	SPX Radiodetection	RD TX10	107TX-10th-7796	RD13	31/10/2019
EML Rx /Receiver	SPX Radiodetection	RD8100	10/81PDL-471	RD13	31/10/2019
GPR	IDS Georadar	Aveva DS2600	SN 010-16-080159	GPR11	03/11/2020

DETECTION SURVEY REPORT

GENERAL
This survey was carried out in accordance with PAS 128:2014 (Publicly Available Specification from BSI). After a pre-survey consultation with the client it was agreed to carry out the detection survey using methodology M1 as per Table 2 of the PAS 128:2014. The survey boundary has been shown on the drawing; please see linestyle section of the key for reference.

DESKTOP UTILITY REPORT
Prior to the survey commencing record information was gathered and compiled in a separate desktop utility report. This report should be read in conjunction with the information contained in this utility detection survey. Record information was at the time of the survey less than 90 days old in accordance with the requirements of the PAS 128:2014. For a full list of the providers searched, records received and the dates the information was obtained, please refer to the attachments page of the desktop utility report.

DETECTION SURVEY
DRAINAGE
Drainage was lifted with pipe sizes and invert levels recorded. Wherever possible the chamber sizes have been recorded and positioned on the drawing. All connections from gullies, external rainwater pipes and external soil stacks have been proven wherever possible into manholes and sewer runs by radio sonde location and/or GPR. Where a saddle connection is present the position is assumed only until proven to QB2 or above. In instances where other detection methods were unsuccessful connections between manholes have been assumed to be straight and labelled as QB4. All drainage should be cross checked in critical areas by CCTV survey or verification survey type A.

WATER
Water utilities are non-metallic and have been located using GPR techniques with radar derived depths recorded to the crown to quality level QB2. Private supplies to properties have been located using GPR techniques where possible with depths recorded to quality level QB2. Water utilities which could not be located have been obtained from Thames Water asset records or assumed through the nearest WM/SV but are indicative only to quality level QB4.

GAS
Gas utilities are metallic and non-metallic. Metallic utilities have been located using passive EML techniques with electronically derived depths recorded to quality level QB2. Non-metallic utilities have been located using GPR techniques only with radar derived depths recorded to the crown to quality level QB2. Private supplies have been assumed through the nearest GV or riser but are indicative only to quality level QB4. Routes which could not be located have been obtained from Cadent asset records but are indicative only to quality level QB4.

ELECTRICITY
LV cables have been located using EML techniques via lamp posts, feeder pillars and within inspection covers with electronically derived depths recorded to quality level QB2. HV cables have been located using passive EML techniques with electronically derived depths recorded via induction to quality level QB2. LV and HV routes which could not be located have been obtained from UK Power Network records but are indicative only to quality level QB4. Where possible GPR techniques have been used to confirm their position raising the quality level to QB1.

TELECOM
Telecom ducts have been traced with depths recorded. Due to laws protecting British Telecom apparatus all ducts have been located using remote detection techniques only and compared with record information. Chamber sizes have been recorded using GPR techniques wherever possible. For further information regarding BT apparatus please contact Openreach directly.

CATV
CATV covers have been lifted with depths recorded to both the base of the chamber and the crown of the ducts. Duct routes have been located using EML techniques with electronically derived depths recorded to quality level QB2. Where possible GPR techniques have been used to confirm their position raising the quality level to QB1. CATV/Data routes which could not be located have been obtained from record information but are indicative only to quality level QB4.

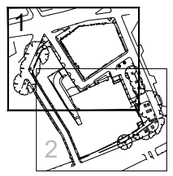
UNKNOWNS
Unknown utilities have been located using EML and GPR techniques with depths recorded to quality level QB2/QB1. Trial excavations are recommended to confirm their position, depth and identity in critical areas. Some unknown targets identified on the drawing using GPR are classified as "non-linear targets". These are not consistent with what we expect to see when identifying a buried utility, and appear on the drawing as single targets with depths (i.e. not linking two or more depth readings). This does not mean they are not utilities, we are just unable to positively identify them as a utility. We would strongly recommend that further verification surveys (PAS 128:2014 survey type A) are carried out to identify these targets in critical areas.

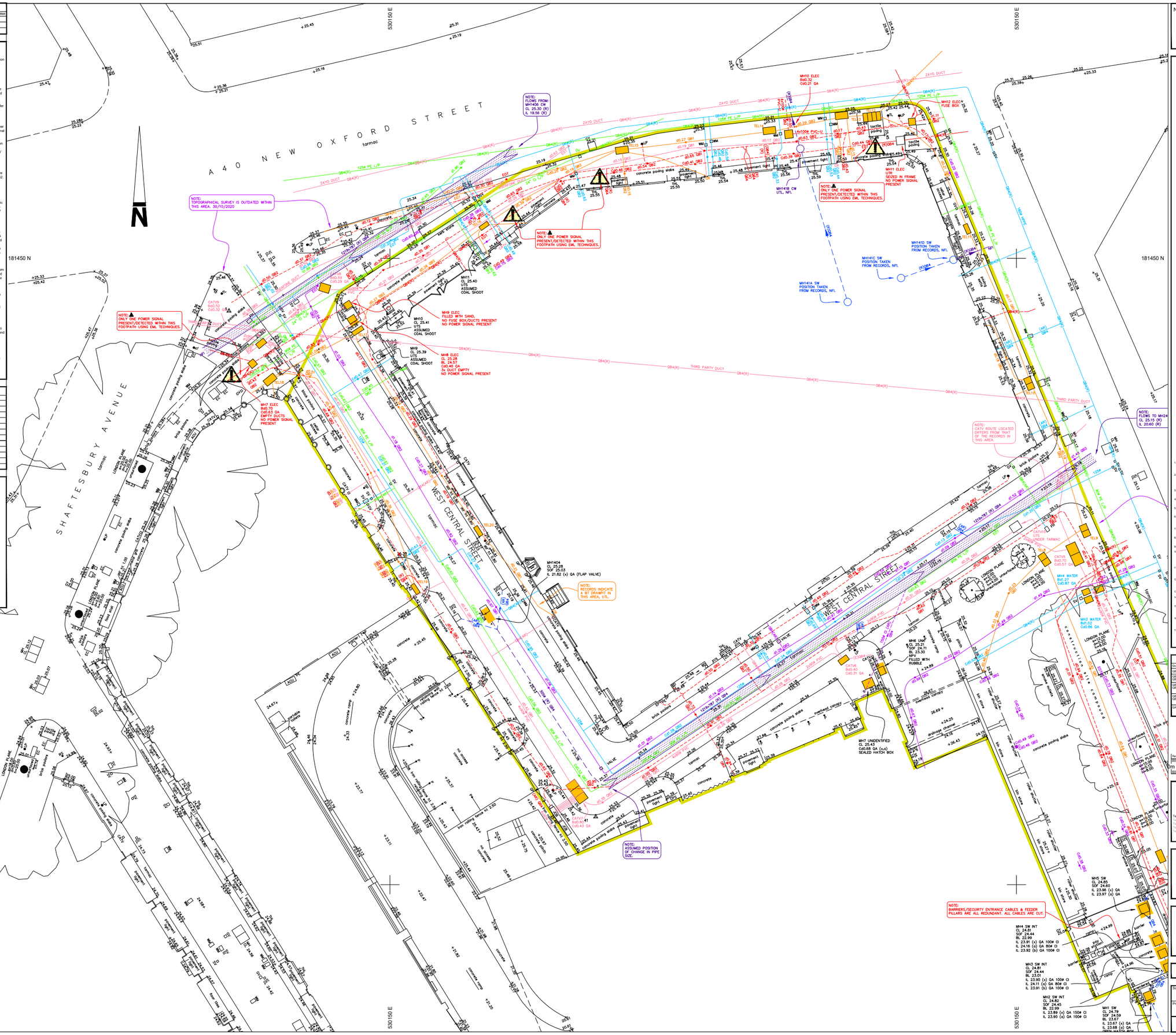
SEE CAUTIONARY NOTES WITHIN THE UTILITY KEY

Desktop Utility Records

Utility Type	Provider Details	Date Acquired
Drainage	Thames Water	15/10/2020
Water	Thames Water	15/10/2020
Gas	Cadent	15/10/2020
Electricity	UKPN	15/10/2020
Telecom	Openreach	15/10/2020
CATV	Virgin Media	15/10/2020
Data	Vodafone	16/10/2020
Data	Zayo	15/10/2020
Telecom	SSE Telecoms	15/10/2020
Tunnels & Pipelines	LSBUD	**15/10/2020**
Data	GTT	**15/10/2020**
Data	Instalcom	21/10/2020

Sheet Layout: (Not to Scale)





Notes :

1. UTILITY AND SERVICE INFORMATION ADDED TO TOPOGRAPHICAL SURVEY PRODUCED BY CLS SURVEYS. JOB No. 210175. DATE MARCH 2019. NO SITE VERIFICATION CARRIED OUT BY MK SURVEYS.
2. THIS SURVEY SHOULD ALWAYS BE READ IN CONJUNCTION WITH THE DESKTOP UTILITY REPORT. THAT WAS CARRIED OUT AS A PREREQUISITE TO THE DETECTION SURVEY.

KEY

GENERAL

Av.	AVERAGE
COW	CABLE ON WALL
CW	COMBINED WATER
DIS	DISUSED
DK	DROP KERB
EC	ELECTROMAGNETIC LOCATOR
EOT	END OF TRACE
FO	FIBRE OPTIC
FP	FOOTPATH
FW	FOUL WATER
GP	GATE POST
GPR	GROUND PENETRATING RADAR
HB	HAND BED
HP	HIGH PRESSURE
HV	HIGH VOLTAGE
KV	KILO VOLT
IP	INTERMEDIATE PRESSURE
LP	LOW PRESSURE
LV	LOW VOLTAGE
MP	MEDIUM PRESSURE
ND	NO DEPTH INFORMATION
NDI	NO DEPTH INFORMATION
NDV	NO DUCTS VISIBLE
NPV	NO PIPES VISIBLE
OSBM	ORDNANCE SURVEY BENCHMARK
POW	PIPE ON WALL
PBOX	POST BOX
RED	REDUNDANT SERVICE
SW	SOFT WALL
SB	SOFT BED
SNP	STREET NAME PLATE
SW	SURFACE WATER
TAC	TACTILE PAVING
TOW	TOP OF WALL
TW	TRADE EFFLUENT WATER
UTL	UNABLE TO LOCATE
UTR	UNABLE TO RARE
UTS	UNABLE TO SURVEY

APPARATUS

ACU	AIR CONDITIONING UNIT
AV	AIR VALVE
BB	BELISHA BEACON
BH	BOLLARD
BOL	BOLLARD LIGHT
BS	BUS STOP
CATV	CABLE TELEVISION
CB	CONTROL BOX
CCB	CROSSING CONTROL BUTTON
CP	CATCH PIT
CR	CONTROL RISER
DCH	DRAINAGE CHANNEL
EB	ELECTRIC CONTROL BOX
EP	ELECTRIC POLE
ER	EARTH ROD
FD	FILTER DRAIN
FFP	FUEL TANK FILL POINT
GI	GAS GOVERNOR
GR	GAS RISER
GV	GAS VALVE
GY	GULLY
IC	INSPECTION COVER
INT	INTERCEPTOR
IT	INLET
LO	LAMP OUTLET
LD	LOOP DETECTOR
LH	LAMP HOLE
LP	LAMP POST
MH	MANHOLE
MK	MARKER POST / PLATE
MT	METER
MW	MONITORING WELL
OU	OUTLET
PO	POST
PTG	PIPE TO GROUND
PTS	PIPE TO SURFACE
PU	PUMP
RE	RODDING EYE
RS	ROAD SIGN
RSJ	RAIL SECTION
RWP	RAIN WATER PIPE
SC	STOP COCK
SO	SOAKAWAY
SP	SOIL PIPE
ST	STAY CABLE
SV	STOP / SLUICE VALVE
TB	TELEPHONE BOX
TCB	TELEPHONE CALL BOX
TEL	TELECOM INSPECTION COVER
TL	TRAFFIC LIGHT
TLC	TRAFFIC LIGHT COVER
TM	TICKET MACHINE
TP	TELECOM POLE
VP	VENT PIPE
WM	WATER METER
WO	WASH OUT
WR	WATER RISER
WT	WATER TAP
WW	WET WELL

DEPTHS

e	ELECTRONICALLY DERIVED
Pd	PASSIVELY DERIVED
Bd	BASE DEPTH
Cd	DEPTH TO CROWN
Id	DEPTH TO INVERT
So	DEPTH TO SOFFIT

PIPE MATERIALS

AC	ASBESTOS CEMENT
ALK	ALKATHENE
BK	BRICK
CI	CAST IRON
CO	CONCRETE
DI	DUCTILE IRON
HDPE	HIGH DENSITY PE
MDPE	MEDIUM DENSITY PE
PE	POLYETHYLENE
PF	PITCH FIBRE
PP	POLYPROPYLENE
PVC	POLYVINYL CHLORIDE
UPVC	ULTRA RIB (PVC)
VC	VITRIFIED CLAY

FENCES

BW	BARBED WIRE FENCE
CB	CLOSED BOARDED FENCE
CPL	CONCRETE PANEL FENCE
CPO	CONCRETE POST AND WIRE FENCE
CNP	CHESTNUT PALING
CYL	CHAIN LINK FENCE
IRR	IRON RAILINGS
LL	LARCH LAP FENCE
PW	POST AND RAIL FENCE
PWW	POST AND WIRE FENCE
WIM	WIRE MESH FENCE

LEVELS

BD	BACKDROP LEVEL
BL	BASE LEVEL
CL	COVER LEVEL
CWL	CROWN LEVEL
DPC	DAMP PROOF COURSE
FL	FLOOR LEVEL
TL	TOP LEVEL
PT	P TRAP LEVEL
RL	ROOF LEVEL
SL	SILT LEVEL
SOF	SOFFIT LEVEL
THL	THRESHOLD LEVEL
WL	WATER LEVEL

LINESTYLE

INTERNAL METER — (M)
POT ENDED SERVICE
SEWER CAPPED RUN — (CAP)
SURVEY ABANDONED — (SA)
INTERNAL VALVE — (V)
UNKNOWN UNDERGROUND ANOMALY — (UA)
UNDERGROUND CHAMBERS
POST PROCESSING AREA
VERIFICATION TRIAL HOLE/EXCAVATION — (TH)
ABOVE GROUND — (AG)
ASSUMED ROUTE — (AR)
EMPTY DUCTS — (E)
OVERHEAD — (OH)
BACK DROP
P TRAP
UTILITY CROSSCOVER — (X)
SURVEY BOUNDARY
VERBAL INFORMATION — (VI)
RECORD INFORMATION — (R)
REDUNDANT SERVICE — (RED)
RISING MAIN
CCTV SECTION A AND 5 FAULTS ARE SHOWN IN RED

SERVICE TYPE

CATV / DATA
ELECTRICITY (HV)
ELECTRICITY (LV)
FUEL
GAS
HEATING
OVERHEAD ELECTRIC
OVERHEAD TELECOM
TRADE EFFLUENT
COMBINED SEWER
FOUL SEWER
SURFACE SEWER
UNIDENTIFIED SEWER
TELECOM
UNKNOWN SERVICE
WATER
SERVICES SURVEY WARNING

CAUTIONARY NOTES

1. EML techniques have been used in the detection of underground utilities as outlined in Table 2 of PAS 128:2014, the results are not infallible and trial excavations must be carried out in order to confirm identification, position and in particular depth of the utility.
2. GPR techniques has been used in the detection of non-metallic utilities as outlined in Table 2 of PAS 128:2014. The interpretation of these results is not infallible and success will depend on a number of factors including soil type, ground water levels and surface conditions, hence trial excavations must be carried out in order to confirm identification, position and in particular depth of the utility.
3. Depths derived via EML are taken to the centre of the conductor (cable, metallic pipe) and those derived via GPR are usually to the crown of the utility unless otherwise indicated.
4. Where cables cannot be detected individually an average depth has been obtained and trial excavations are recommended to confirm number and depths of cables banded together.
5. 'Pot-ended' cables are often difficult to detect and although we have made all reasonable efforts to locate or transpose this information from records, we cannot guarantee that all 'pot-ended' cables have been located.
6. Fibre optic cables are often difficult to detect, and commonly access chambers can be locked and thereby made inaccessible by the utility provider. All reasonable efforts have been made to locate these ducts using GPR. Cables not located have been transposed from records.
7. Within close proximity of electric substations and similar structures results using EML may become distorted. All reasonable efforts have been made to verify our results using GPR wherever conditions permitted.
8. Underneath overhead power lines results using EML may become distorted. All reasonable efforts have been made to verify our results using GPR wherever conditions permitted.
9. Drainage information has been obtained without man entry into the chamber.
10. Wherever possible we have attempted to locate the route of the sewer, issues such as blockages, surcharging, flooding, sedimentation, sewer collapse, root ingress, excessive depth, obstructions or heavy traffic flow may have affected our ability to obtain meaningful results. In these cases recommendations have been made for further survey or maintenance work.
11. Pipe / duct sizes have been recorded from surface inspection or taken from record information. Pipe sizes have been recorded in millimetres and depths in metres, except in instances where sizes are indicated in imperial units on the record information.
12. Water and Gas utilities to individual properties are often of a size that cannot be detected using EML or GPR investigation, wherever possible the route has been added from surface evidence (pipe risers, valves, etc), but this should be viewed as a guide only.
13. All utilities detected by MK Surveys should be considered live unless confirmed otherwise by client or service provider.
14. MK Surveys cannot confirm when utilities are redundant unless there is visual or record evidence to indicate this. In addition MK Surveys cannot guarantee being able to detect all redundant utilities.
15. Wherever available the results of our investigations have been cross referenced with record information. If a utility shown on the records cannot be detected on site, the information has been added to the drawing and indicated as QB4 (R). However it should be noted that the completeness and accuracy of the records cannot be guaranteed.
16. The utility information has been obtained from non-intrusive survey techniques; it always remains possible that there are additional utilities within the survey boundary that we have not been able to detect. We recommend that care is taken on site and that all utility records are used in conjunction with this survey.
17. The responsibility for avoiding damage to assets and utilities on site shall be that of the persons proposing to excavate within the surveyed area, who shall be liable to the asset owner and any third party who may be affected in any way for any loss or damage.

ALWAYS EXERCISE CAUTION WHEN EXCAVATING.

PAS 128:2014 Quality Level Guide

Quality Level	Description	Accuracy
QB4	A utility is expected to exist but cannot be detected - (API), (R), (VI)	Undefined
QB3	Horizontal location only using one geophysical technique.	+/- 500mm Horizontal
QB3P	No depth information - NDI.	Undefined Vertical
QB2	Horizontal and vertical location only using one geophysical technique.	+/- 250mm or +/- 40% of depth whichever is greater
QB1	Horizontal and vertical location only using two geophysical techniques.	+/- 150mm or +/- 15% of depth whichever is greater
QB1/P		
QA	Service verified in an open excavation, inside an inspection chamber / draw pit, or at the point the service enters / exits the ground.	+/- 50mm Horizontal +/- 25mm Vertical

Revision	Description	Surv. by	Chk. by	Appr. by	Date

mksurveys
Tel 01908 565561
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Tel 01384 404203
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Milton Keynes
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East Midlands
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enquiries@mksurveys.co.uk
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westmidlands@mksurveys.co.uk
horsham@mksurveys.co.uk
www.mksurveys.com
www.surveys4bim.co.uk

Sollidon Ltd
&
Lab Selkirk House Ltd

Museum Street
Holborn
London

PAS 128:2014 Utility Survey

Scale	Sheet Size:	Sheet Number:	Date:
1:100	A0	1	November 2020
Project Number:	Rev:	Surveyed By:	Checked By: / Approved By:
29159	-	GW	-

Equipment Information

Equipment	Manufacturer	Model	Serial Number	MKS REF	Date of Calibration
EML Tx /Transmitter	SPX Radiodetection	RD TX10	10/TX-10B-7796	RD13	31/10/2019
EML Rx /Receiver	SPX Radiodetection	RD8100	10/81/PDL-471	RD13	31/10/2019
GPR	IDS Georadar	Ivera DS2000	SN 010-16-080159	GPR11	03/11/2020

DETECTION SURVEY REPORT

GENERAL
This survey was carried out in accordance with PAS 128:2014 (Publicly Available Specification from BSI). After a pre-survey consultation with the client it was agreed to carry out the detection survey using methodology M1 as per Table 2 of the PAS 128:2014. The survey boundary has been shown on the drawing; please see linestyle section of the key for reference.

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WATER
Water utilities are non-metallic and have been located using GPR techniques with radar derived depths recorded to the crown to quality level QB2. Private supplies to properties have been located using GPR techniques where possible with depths recorded to quality level QB2. Water utilities which could not be located have been obtained from Thames Water asset records or assumed through the nearest MW/SV but are indicative only to quality level QB4.

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ELECTRICITY
LV cables have been located using EML techniques via lamp posts, feeder pillars and within inspection covers with electronically derived depths recorded to quality level QB2. HV cables have been located using passive EML techniques with electronically derived depths recorded via induction to quality level QB2. LV and HV routes which could not be located have been obtained from UK Power Network records but are indicative only to quality level QB4. Where possible GPR techniques have been used to confirm their position raising the quality level to QB1.

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Telecom ducts have been traced with depths recorded. Due to laws protecting British Telecom apparatus all ducts have been located using remote detection techniques only and compared with record information. Chamber sizes have been recorded using GPR techniques wherever possible. For further information regarding BT apparatus please contact Openreach directly.

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CATV covers have been lifted with depths recorded to both the base of the chamber and the crown of the ducts. Duct routes have been located using EML techniques with electronically derived depths recorded to quality level QB2. Where possible GPR techniques have been used to confirm their position raising the quality level to QB1. CATV/Data routes which could not be located have been obtained from record information but are indicative only to quality level QB4.

UNKNOWNS
Unknown utilities have been located using EML and GPR techniques with depths recorded to quality level QB2/QB1. Trial excavations are recommended to confirm their position, depth and identity in critical areas. Some unknown targets identified on the drawing using GPR are classified as "non-linear targets". These are not consistent with what we expect to see when identifying a buried utility, and appear on the drawing as single targets with depths (i.e. not linking two or more depth readings). This does not mean they are not utilities, we are just unable to positively identify them as a utility. We would strongly recommend that further verification surveys (PAS 128:2014 survey type A) are carried out to identify these targets in critical areas.

SEE CAUTIONARY NOTES WITHIN THE UTILITY KEY

Desktop Utility Records

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Drainage	Thames Water	15/10/2020
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Gas	Cadent	15/10/2020
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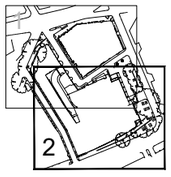
Telecom	Openreach	15/10/2020
CATV	Virgin Media	15/10/2020
Data	Vodafone	16/10/2020
Data	Zayo	15/10/2020
Telecom	BSE Telecoms	15/10/2020
Tunnels & Pipelines	LSBUD	**15/10/2020**
Data	GTT	**15/10/2020**
Data	Instalcom	21/10/2020

Sheet Layout: (Not to Scale)



KEY

GENERAL

Av.	AVERAGE
COW	CABLE ON WALL
CW	COMBINED WATER
DIS	DISUSED
DK	DROP KERB
EML	ELECTROMAGNETIC LOCATOR
EOT	END OF TRACE
FO	FIBRE OPTIC
FP	FOOTPATH
FW	FOUL WATER
GP	GATE POST
GPR	GROUND PENETRATING RADAR
HB	HAND BED
HP	HIGH PRESSURE
HV	HIGH VOLTAGE
KV	KILO VOLT
IP	INTERMEDIATE PRESSURE
LP	LOW PRESSURE
LV	LOW VOLTAGE
MP	MEDIUM PRESSURE
ND	NO DEPTH INFORMATION
NDI	NO DEPTH INFORMATION
NDV	NO DUCTS VISIBLE
NPV	NO PIPES VISIBLE
OSBM	ORDNANCE SURVEY BENCHMARK
POW	PIPE ON WALL
P BOX	POST BOX
RED	REDUNDANT SERVICE
RW	RETAINING WALL
SB	SOFT BED
SNP	STREET NAME PLATE
SW	SURFACE WATER
TAC	TACTILE PAVING
TOW	TOP OF WALL
TW	TRADE EFFLUENT WATER
UTL	UNABLE TO LOCATE
UTR	UNABLE TO RAISE
UTS	UNABLE TO SURVEY

APPARATUS

ACU	AIR CONDITIONING UNIT
AV	AIR VALVE
BB	BELISHA BEACON
BO	BOLLARD
BOL	BOLLARD LIGHT
BS	BUS STOP
CATV	CABLE TELEVISION
CB	CONTROL BOX
CCB	CROSSING CONTROL BUTTON
CP	CATCH PIT
CR	CAMERA RISER
DCH	DRAINAGE CHANNEL
EB	ELECTRIC CONTROL BOX
EP	ELECTRIC POLE
ER	EARTH ROD
FD	FILTER DRAIN
FFP	FUEL TANK FILL POINT
GO	GAS GOVERNOR
GR	GAS RISER
GV	GAS VALVE
GY	GULLY
IC	INSPECTION COVER
INT	INTERCEPTOR
II	INLET
IO	INSPECTION OUTLET
LD	LOOP DETECTOR
LH	LAMP HOLE
LP	LAMP POST
MH	MANHOLE
MK	MARKER POST / PLATE
MT	METER
MW	MONITORING WELL
OU	OUTLET
OU	OUTFALL
PO	POST
PTG	PIPE TO GROUND
PTS	PIPE TO SURFACE
PU	PUMP
RE	RODDING EYE
RS	ROAD SIGN
RWH	RAIN WATER HEAD
RWP	RAIN WATER PIPE
SC	STOP COCK
SO	SOAKAWAY
SP	SOIL PIPE
ST	STAY CABLE
SV	STOP / SLUICE VALVE
SVP	SOIL VENT PIPE
TCB	TELEPHONE CALL BOX
TEL	TELECOM INSPECTION COVER
TL	TRAFFIC LIGHT
TLC	TRAFFIC LIGHT COVER
TM	TICKET MACHINE
TP	TELECOM POLE
VP	VENT PIPE
WM	WATER METER
WO	WASTE OUTLET
WR	WATER RISER
WT	WATER TAP
WW	WET WELL

DEPTHS

e	ELECTRONICALLY DERIVED
Pd	PASSIVELY DERIVED
Bd	BASE DEPTH
Cd	DEPTH TO CROWN
Id	DEPTH TO INVERT
So	DEPTH TO SOFFIT

PIPE MATERIALS

AC	ASBESTOS CEMENT
ALK	ALKATHENE
BK	BRICK
CI	CAST IRON
CO	CONCRETE
CP	CLAY PIPE TEN
HDPE	HIGH DENSITY PE
MDPE	MEDIUM DENSITY PE
PE	POLYETHYLENE
PF	PITCH FIBRE
PP	POLYPROPYLENE
PVC	POLYVINYL CHLORIDE
PVC-U	ULTRA RIB PVC
SI	SLIM IRON
ST	STEEL
VC	VITRIFIED CLAY

FENCES

B/W	BARBED WIRE FENCE
C/B	CLOSED BOARDED FENCE
C/PL	CONCRETE PANEL FENCE
C/R	CHESTNUT RAILING FENCE
CNP	CHESTNUT PALING
CYL	CHAIN LINK FENCE
I/R	IRON RAILINGS
L/L	LARCH LAP FENCE
P/R	POST AND RAIL FENCE
P/W	POST AND WIRE FENCE
W/M	WIRE MESH FENCE

LEVELS

BD	BACKDROP LEVEL
BL	BASE LEVEL
CL	COVER LEVEL
CWL	CROWN LEVEL
DPC	DAMP PROOF COURSE
FL	FLOOR LEVEL
P	P TRAP LEVEL
PT	P TRAP LEVEL
RL	ROOF LEVEL
SL	SILT LEVEL
SOF	SOFFIT LEVEL
THL	THRESHOLD LEVEL
WL	WATER LEVEL

LINESTYLE

INTERNAL METER	
POT ENDED SERVICE	
SEWER CAPPED RUN	
SURVEY ABANDONED	
INTERNAL VALVE	
UNKNOWN UNDERGROUND ANOMALY	
UNDERGROUND CHAMBERS	
POST PROCESSING AREA	
VERIFICATION TRIAL HOLE/EXCAVATION	
ABOVE GROUND	(AG)
ASSUMED ROUTE	(AR)
EMPTY DUCTS	(E)
OVERHEAD	(OV)
BACK DROP	
P TRAP	
UTILITY CROSSOVER	
SURVEY BOUNDARY	
VERBAL INFORMATION	(V)
RECORD INFORMATION	(R)
REDUNDANT SERVICE	
RISING MAIN	

CCTV SECTION 4 AND 5 FAULTS ARE SHOWN IN RED

SERVICE TYPE

CATV / DATA
ELECTRICITY (HV)
ELECTRICITY (LV)
FUEL
GAS
HEATING
OVERHEAD ELECTRIC
OVERHEAD TELECOM
TRADE EFFLUENT
COMBINED SEWER
FOUL SEWER
SURFACE SEWER
UNIDENTIFIED SEWER
TELECOM
UNKNOWN SERVICE
WATER
SERVICES SURVEY WARNING

CAUTIONARY NOTES

1. EML techniques have been used in the detection of underground utilities as outlined in Table 2 of PAS 128:2014, the results are not infallible and trial excavations must be carried out in order to confirm identification, position and in particular depth of the utility.
2. GPR techniques has been used in the detection of non-metallic utilities as outlined in Table 2 of PAS 128:2014. The interpretation of these results is not infallible and success will depend on a number of factors including soil type, ground water levels and surface conditions, hence trial excavations must be carried out in order to confirm identification, position and in particular depth of the utility.
3. Depths derived via EML are taken to the centre of the conductor (cable, metallic pipe) and those derived via GPR are usually to the crown of the utility unless otherwise indicated.
4. Where cables cannot be detected individually an average depth has been obtained and trial excavations are recommended to confirm number and depths of cables banded together.
5. 'Pot-ended' cables are often difficult to detect and although we have made all reasonable efforts to locate or transpose this information from records, we cannot guarantee that all 'pot-ended' cables have been located.
6. Fibre optic cables are often difficult to detect, and commonly access chambers can be locked and thereby made inaccessible by the utility provider. All reasonable efforts have been made to locate these ducts using GPR. Cables not located have been transposed from records.
7. Within close proximity of electric substations and similar structures results using EML may become distorted. All reasonable efforts have been made to verify our results using GPR wherever conditions permitted.
8. Underneath overhead power lines results using EML may become distorted. All reasonable efforts have been made to verify our results using GPR wherever conditions permitted.
9. Drainage information has been obtained without man entry into the chamber.
10. Wherever possible we have attempted to locate the route of the sewer. Issues such as blockages, surcharging, flooding, sedimentation, sewer collapse, root ingress, excessive depth, obstructions or heavy traffic flow may have affected our ability to obtain meaningful results. In these cases recommendations have been made for further survey or maintenance work.
11. Pipe / duct sizes have been recorded from surface inspection or taken from record information. Pipe sizes have been recorded in millimetres and depths in inches, except in instances where sizes are indicated in imperial units on the record information.
12. Water and Gas utilities to individual properties are often of a size that cannot be detected using EML or GPR. Investigation, wherever possible the route has been added from surface evidence (pipe risers, valves, etc), but this should be viewed as a guide only.
13. All utilities detected by MK Surveys should be considered live unless confirmed otherwise by client or service provider.
14. MK Surveys cannot confirm when utilities are redundant unless there is visual or record evidence to indicate this. In addition MK Surveys cannot guarantee being able to detect all redundant utilities.
15. Wherever available the results of our investigations have been cross referenced with record information. If a utility shown on the records cannot be detected on site, the information has been added to the drawing and indicated as QB4 (R). However it should be noted that the completeness and accuracy of the records cannot be guaranteed.
16. The utility information has been obtained from non-intrusive survey techniques, it always remains possible that there are additional utilities within the survey boundary that we have not been able to detect. We recommend that care is taken on site and that all utility records are used in conjunction with this survey.
17. The responsibility for avoiding damage to assets and utilities on site shall be that of the persons proposing to excavate within the surveyed area, who shall be liable to the asset owner and any third party who may be affected in any way for any loss or damage.

ALWAYS EXERCISE CAUTION WHEN EXCAVATING.

PAS 128:2014 Quality Level Guide

Quality Level	Description	Accuracy
QB4	A utility is expected to exist but cannot be detected - (AR), (R), (V)	Undefined
QB3 QB3P	Horizontal location only using one geophysical technique. No depth information - N/D.	+/- 500mm Horizontal Undefined Vertical
QB2 QB2P	Horizontal and vertical location only using one geophysical technique.	+/- 250mm or +/- 40% of depth whichever is greater
QB1 QB1P	Horizontal and vertical location only using two geophysical techniques.	+/- 150mm or +/- 15% of depth whichever is greater
QA	Service verified in an open excavation, inside an inspection chamber / draw pit, or at the point the service enters / exits the ground.	+/- 50mm Horizontal +/- 25mm Vertical

Revision	Description	Surv. by	Chk. by	Appr. by	Date

0m 1 2 3 4 5 6 7 8 9 10 11

mksurveys

Tel 01908 565561 — Milton Keynes — enquiries@mksurveys.co.uk
Tel 01865 594979 — Oxford — oxford@mksurveys.co.uk
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Tel 01384 404323 — West Midlands — westmidlands@mksurveys.co.uk
Tel 01403 243162 — Horsham — horsham@mksurveys.co.uk

www.mksurveys.com — www.surveys4bim.co.uk

Sollidon Ltd
&
Lab Selkirk House Ltd

Museum Street
Holborn
London

PAS 128:2014 Utility Survey

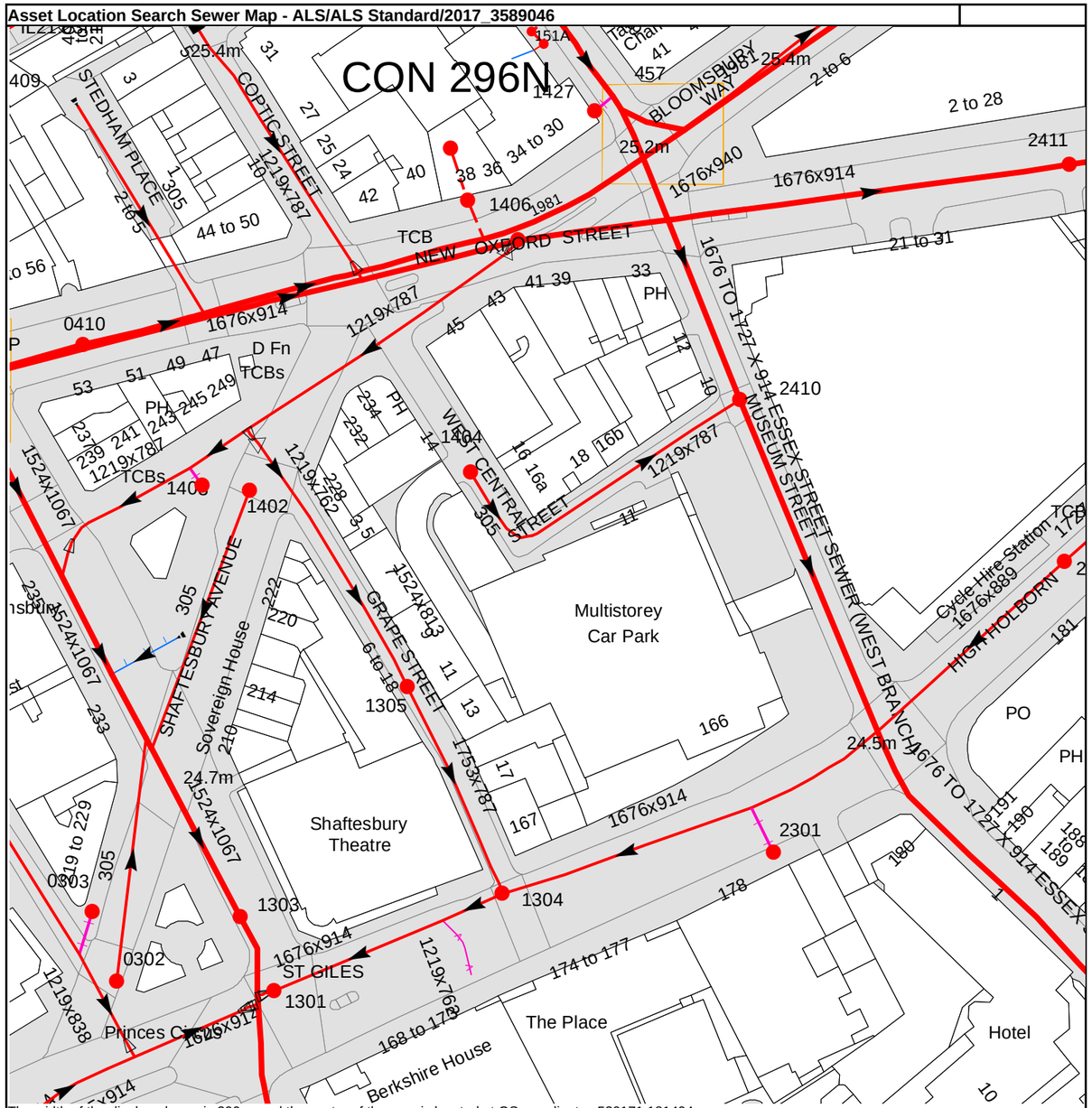
Scale	Sheet Size:	Sheet Number:	Date:
1:100	A0	2	November 2020
Project Number:	Rev.	Surveyed By:	Checked By:
29159	-	GW	-

DRAFT

Appendix B

Thames Water Asset Map

Asset Location Search Sewer Map - ALS/ALS Standard/2017_3589046



The width of the displayed area is 200 m and the centre of the map is located at OS coordinates 530171,181404

The position of the apparatus shown on this plan is given without obligation and warranty, and the accuracy cannot be guaranteed. Service pipes are not shown but their presence should be anticipated. No liability of any kind whatsoever is accepted by Thames Water for any error or omission. The actual position of mains and services must be verified and established on site before any works are undertaken.

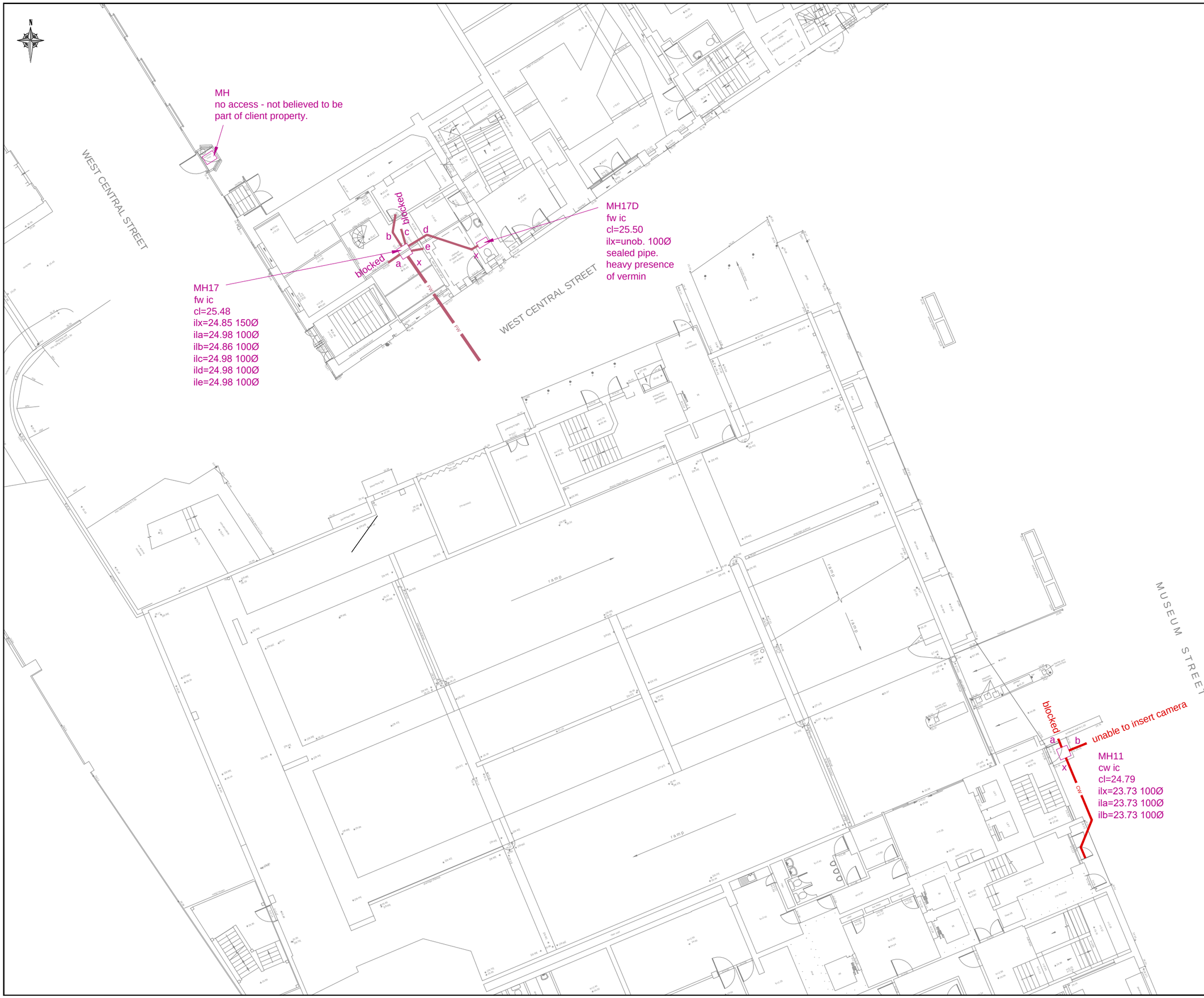
Based on the Ordnance Survey Map with the Sanction of the controller of H.M. Stationery Office, License no. 100019345 Crown Copyright Reserved.

NB. Levels quoted in metres Ordnance Newlyn Datum. The value -9999.00 indicates that no survey information is available

Manhole Reference	Manhole Cover Level	Manhole Invert Level
1406	25.3	19.56
1430	n/a	n/a
2411	24.78	19.35
1429	n/a	n/a
1427	n/a	n/a
151A	n/a	n/a
151B	n/a	n/a
1301	23.34	19.14
1305	24.15	20.1
1404	25.2	21.73
1304	23.52	19.43
2410	25.15	20.6
2301	n/a	n/a
2401	24.14	19.87
0302	23.34	18.84
1303	23.59	17.34
0303	n/a	n/a
1402	25.13	21.01
1403	n/a	n/a
0410	25.36	9.49

Appendix C

CCTV Survey Drawings



LEGEND:

UTILITIES

ELECTRIC	ELE	LHP GAS MAINS	LHP
EXTRA HIGH VOLTAGE ELECTRIC	EHV	MHP GAS MAINS	MHP
HIGH VOLTAGE ELECTRIC	HV	WATER MAIN	W
LOW VOLTAGE ELECTRIC	LV	WATER TRUNK MAIN	TRUNK
STREET LIGHTING CABLES	SL	BT	BT
11KV ELECTRIC	11KV	BT TRUNK	BTT
33KV ELECTRIC	33KV	COMMUNICATIONS	C
66KV ELECTRIC	66KV	FIBRE OPTIC	FO
132KV ELECTRIC	132KV	FOUL DRAINAGE	FOUL
LV HV ELECTRIC	LV / HV	GPR TARGET	GPR
LP GAS MAINS	LP	SURFACE DRAINAGE	SURF
MP GAS MAINS	MP	OIL PIPELINE	OIL
IP GAS MAINS	IP	HEATING UTILITY	H
		UNKNOWN UTILITY	U
		EOS	END OF SIGNAL
		EOT	END OF TRACE

UTILITIES FROM RECORDS

Utilities from records are shown with (R)

ELECTRIC FROM RECORDS	ELE(R)
WATER MAIN FROM RECORDS	WM(R)

OVERHEAD CABLES

OVERHEAD ELECTRIC	ELEC
OVERHEAD BT	BTEC

SURVEY ABBREVIATIONS

av	AIR VALVE	lc	LAMP COLOMN
bb	BELISHA BEACON	mkr	MARKER
bh	BOREHOLE	nb	NAME BOARD
bol.	BOLLARD	rs	ROAD SIGN
bm	BENCH MARK	rwp	RAIN WATER PIPE
cd	CABLE DUCT	sl	SUMP LEVEL
cpl	COPING LEVEL	sp	SIGN POST
dc	DRAINAGE CHANNEL	sv	SLUICE VALVE
dk	DROP KERB	svp	SOIL VENT PIPE
dp	DOWN PIPE	tcp	TACTILE PAVING
eos	END OF SIGNAL	tl	TRAFFIC LIGHT
ep	ELECTRIC POLE	tp	TELEGRAPH POLE
fh	FIRE HYDRANT	tpl	TOP OF PIPE LEVEL
fp	FEEDER PILLAR	ts	TRAFFIC SIGNAL
gv	GAS VALVE	ufl	UNABLE TO LIFT
gul	GULLY	vp	VENT PIPE
ic	INSPECTION CHAMBER	wl	WATER LEVEL
il	INVERT LEVEL	wo	WASHOUT VALVE
jb	JUNCTION BOX		

TOPOGRAPHICAL LINETYPES

SURFACE CHANGE		Fences are shown thus:	
BUILDING LINE			
TOP OF KERB		3 Bar	3 BAR FENCE
BOTTOM OF KERB		biw	BARBED WIRE FENCE
DROP KERB		cbb	CLOSE BOARDED FENCE
CANOPY		chl	CHAIN LINK
EDGE OF VERGE		chp	CHESTNUT PALING
RAILINGS		ckw	CHICKEN WIRE
TOP OF BANK		elf	ELECTRIC FENCE
BOTTOM OF BANK		hrf	HERRAS FENCE
		pif	PALISADE FENCE
		slf	SECURITY FENCE

SYMBOLS

SURVEY STATION
TOP/BOTTOM OF BANK
GATE
RIDGE/EAVE HEIGHT
TREE

The contractor must check and verify all site and building dimensions, levels, utilities, drainage details and connections prior to commencing work.
The accuracy of the digital data is the same as the plotting scale implies. All dimensions are in metres unless otherwise stated, Do not scale from this drawing.
All below ground details including drainage, voids and services have been identified from above ground and therefore all details relating to these features including; sizes, depth, description etc will be approximate only. All critical dimensions and connections should be checked and verified prior to starting work by means of open excavations.

REV:	DESCRIPTION:	BY:	CKD:	APP:	DATE:

SITE ADDRESS:
HOLBORN CAR PARK
MUSEUM STREET, HOLBORN WC1A

TITLE:
DRAINAGE SURVEY

DATE:	SURVEYED:	DRAWN:	CHECKED:	APPROVED:
05/11/2020	BR	BR	MH	MA

SCALE AT A1:	DRAWING NO:	REVISION:
1:100	DW2021-396 GF	

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Wakes Colne, Colchester, Essex, CO6 2BY
T 01787 698 014 E info@survatec.com

LEGEND:

UTILITIES

ELECTRIC	E	LHP GAS MAINS	LHP
EXTRA HIGH VOLTAGE ELECTRIC	EHV	MHP GAS MAINS	MHP
HIGH VOLTAGE ELECTRIC	HV	WATER MAIN	W
LOW VOLTAGE ELECTRIC	LV	WATER TRUNK MAIN	TRUNK
STREET LIGHTING CABLES	SL	BT	BT
11KV ELECTRIC	11KV	BT TRUNK	BTT
33KV ELECTRIC	33KV	COMMUNICATIONS	C
66KV ELECTRIC	66KV	FIBRE OPTIC	FO
132KV ELECTRIC	132KV	FOUL DRAINAGE	FW
LV HV ELECTRIC	LV HV	GPR TARGET	GPR
LP GAS MAINS	LP	SURFACE DRAINAGE	SW
MP GAS MAINS	MP	OIL PIPELINE	OIL
IP GAS MAINS	IP	HEATING UTILITY	H
		UNKNOWN UTILITY	U
		EOS	END OF SIGNAL
		EOT	END OF TRACE

UTILITIES FROM RECORDS

Utilities from records are shown with (R)

ELECTRIC FROM RECORDS	E(R)
WATER MAIN FROM RECORDS	WM(R)

OVERHEAD CABLES

OVERHEAD ELECTRIC	OHE
OVERHEAD BT	BTO

SURVEY ABBREVIATIONS

av	AIR VALVE	lc	LAMP COLOMN
bb	BELISHA BEACON	mkr	MARKER
bh	BOREHOLE	nb	NAME BOARD
bol.	BOLLARD	rs	ROAD SIGN
bm	BENCH MARK	rwp	RAIN WATER PIPE
cd	CABLE DUCT	sll	SUMP LEVEL
cpl	COPING LEVEL	sp	SIGN POST
dc	DRAINAGE CHANNEL	sv	SLUICE VALVE
dk	DROP KERB	svp	SOIL VENT PIPE
dp	DOWN PIPE	tcp	TACTILE PAVING
eos	END OF SIGNAL	tl	TRAFFIC LIGHT
ep	ELECTRIC POLE	tp	TELEGRAPH POLE
fh	FIRE HYDRANT	tpl	TOP OF PIPE LEVEL
fp	FEEDER PILLAR	ts	TRAFFIC SIGNAL
gv	GAS VALVE	ull	UNABLE TO LIFT
gul	GULLY	vp	VENT PIPE
ic	INSPECTION CHAMBER	wl	WATER LEVEL
il	INVERT LEVEL	wo	WASHOUT VALVE
jb	JUNCTION BOX		

TOPOGRAPHICAL LINETYPES

SURFACE CHANGE		Fences are shown thus:	
BUILDING LINE			
TOP OF KERB		3 Bar	3 BAR FENCE
BOTTOM OF KERB		b/w	BARBED WIRE FENCE
DROP KERB		cb	CLOSE BOARDED FENCE
CANOPY		ch	CHAIN LINK
EDGE OF VERGE		ch	CHESTNUT PALING
RAILINGS		ck	CHICKEN WIRE
TOP OF BANK		ef	ELECTRIC FENCE
BOTTOM OF BANK		hf	HERRAS FENCE
		pf	PALISADE FENCE
		sf	SECURITY FENCE

SYMBOLS

SURVEY STATION
TOP/BOTTOM OF BANK
GATE
RIDGE/EAVE HEIGHT
TREE

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TITLE:
DRAINAGE SURVEY

DATE:	SURVEYED:	DRAWN:	CHECKED:	APPROVED:
05/11/2020	BR	BR	MH	MA

SCALE AT A1:	DRAWING NO:	REVISION:
1:200	DW2021-396 B1	

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LEGEND:

UTILITIES

ELECTRIC	E	LHP GAS MAINS	LHP
EXTRA HIGH VOLTAGE ELECTRIC	EHV	MHP GAS MAINS	MHP
HIGH VOLTAGE ELECTRIC	HV	WATER MAIN	W
LOW VOLTAGE ELECTRIC	LV	WATER TRUNK MAIN	TRUNK
STREET LIGHTING CABLES	SL	BT	BT
11KV ELECTRIC	11KV	BT TRUNK	BTT
33KV ELECTRIC	33KV	COMMUNICATIONS	C
66KV ELECTRIC	66KV	FIBRE OPTIC	FO
132KV ELECTRIC	132KV	FOUL DRAINAGE	FOUL
LV HV ELECTRIC	LV / HV	GPR TARGET	GPR
LP GAS MAINS	LP	SURFACE DRAINAGE	SURF
MP GAS MAINS	MP	OIL PIPELINE	OIL
IP GAS MAINS	IP	HEATING UTILITY	H
		UNKNOWN UTILITY	U
		EOS	END OF SIGNAL
		EOT	END OF TRACE

UTILITIES FROM RECORDS

Utilities from records are shown with (R)

ELECTRIC FROM RECORDS	E(R)
WATER MAIN FROM RECORDS	WM(R)

OVERHEAD CABLES

OVERHEAD ELECTRIC	OHE
OVERHEAD BT	BTO

SURVEY ABBREVIATIONS

av	AIR VALVE	lc	LAMP COLOMN
bb	BELISHA BEACON	mkr	MARKER
bh	BOREHOLE	nb	NAME BOARD
bol.	BOLLARD	rs	ROAD SIGN
bm	BENCH MARK	rwp	RAIN WATER PIPE
cd	CABLE DUCT	sl	SUMP LEVEL
cpl	COPING LEVEL	sp	SIGN POST
dc	DRAINAGE CHANNEL	sv	SLUICE VALVE
dk	DROP KERB	svp	SOIL VENT PIPE
dp	DOWN PIPE	tcp	TACTILE PAVING
eos	END OF SIGNAL	tl	TRAFFIC LIGHT
ep	ELECTRIC POLE	tp	TELEGRAPH POLE
fh	FIRE HYDRANT	tpl	TOP OF PIPE LEVEL
fp	FEEDER PILLAR	ts	TRAFFIC SIGNAL
gv	GAS VALVE	utl	UNABLE TO LIFT
gul	GULLY	vp	VENT PIPE
ic	INSPECTION CHAMBER	wl	WATER LEVEL
il	INVERT LEVEL	wo	WASHOUT VALVE
jb	JUNCTION BOX		

TOPOGRAPHICAL LINETYPES

SURFACE CHANGE		Fences are shown thus:	
BUILDING LINE			
TOP OF KERB		3 Bar	3 BAR FENCE
BOTTOM OF KERB		b/w	BARBED WIRE FENCE
DROP KERB		cb	CLOSE BOARDED FENCE
CANOPY		ch	CHAIN LINK
EDGE OF VERGE		cp	CHESTNUT PALING
RAILINGS		cw	CHICKEN WIRE
TOP OF BANK		ef	ELECTRIC FENCE
BOTTOM OF BANK		hf	HERRAS FENCE
		pf	PALISADE FENCE
		sf	SECURITY FENCE

SYMBOLS

SURVEY STATION
TOP/BOTTOM OF BANK
GATE
RIDGE/EAVE HEIGHT
TREE

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MUSEUM STREET, HOLBORN WC1A

TITLE:
DRAINAGE SURVEY

DATE:	SURVEYED:	DRAWN:	CHECKED:	APPROVED:
05/11/2020	BR	BR	MH	MA

SCALE AT A1:	DRAWING NO:	REVISION:
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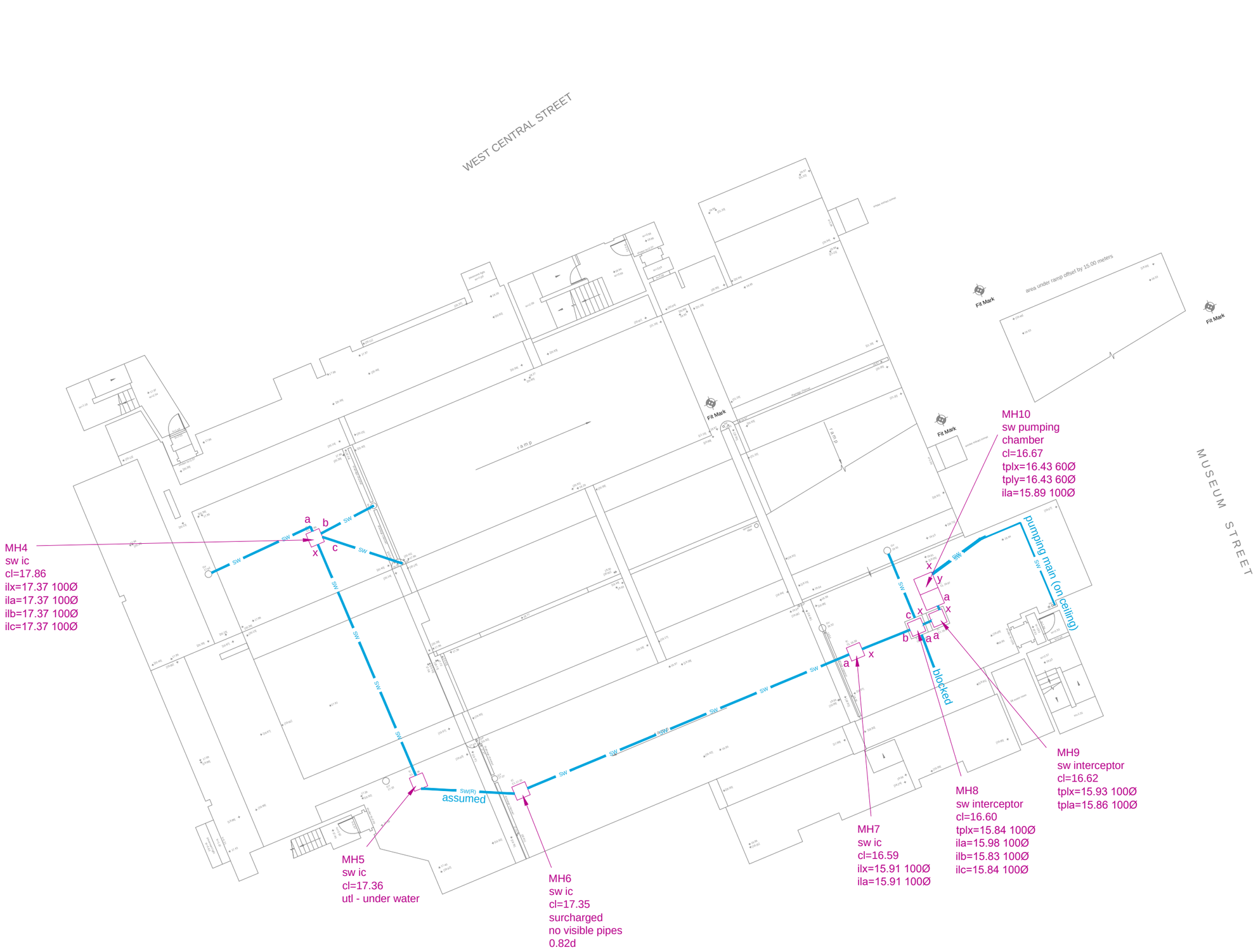

LEGEND:

UTILITIES

ELECTRIC	ELE	LHP GAS MAINS	LHP
EXTRA HIGH VOLTAGE ELECTRIC	EHV	IMP GAS MAINS	IMP
HIGH VOLTAGE ELECTRIC	HV	WATER MAIN	W
LOW VOLTAGE ELECTRIC	LV	WATER TRUNK MAIN	TRUNK
STREET LIGHTING CABLES	SL	BT	BT
11KV ELECTRIC	11KV	BT TRUNK	BTT
33KV ELECTRIC	33KV	COMMUNICATIONS	C
66KV ELECTRIC	66KV	FIBRE OPTIC	FO
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LV HV ELECTRIC	LV HV	GPR TARGET	GPR
LP GAS MAINS	LP	SURFACE DRAINAGE	SURF
MP GAS MAINS	MP	OIL PIPELINE	OIL
IP GAS MAINS	IP	HEATING UTILITY	H
		UNKNOWN UTILITY	U
		EOS	END OF SIGNAL
		EOT	END OF TRACE

UTILITIES FROM RECORDS

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WATER MAIN FROM RECORDS	WMR

OVERHEAD CABLES

OVERHEAD ELECTRIC	OHE
OVERHEAD BT	BTO

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cd	CABLE DUCT	sll	SUMP LEVEL
cpl	COPING LEVEL	sp	SIGN POST
dc	DRAINAGE CHANNEL	sv	SLUICE VALVE
dk	DROP KERB	svp	SOIL VENT PIPE
dp	DOWN PIPE	tcp	TACTILE PAVING
eos	END OF SIGNAL	tl	TRAFFIC LIGHT
ep	ELECTRIC POLE	tp	TELEGRAPH POLE
fh	FIRE HYDRANT	tpl	TOP OF PIPE LEVEL
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gul	GULLY	vp	VENT PIPE
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il	INVERT LEVEL	wo	WASHOUT VALVE
jb	JUNCTION BOX		

TOPOGRAPHICAL LINETYPES

SURFACE CHANGE		Fences are shown thus:	
BUILDING LINE		3 Bar	3 BAR FENCE
TOP OF KERB		bw	BARBED WIRE FENCE
BOTTOM OF KERB		cb	CLOSE BOARDED FENCE
DROP KERB		ch	CHAIN LINK
CANOPY		cp	CHESTNUT PALING
EDGE OF VERGE		cw	CHICKEN WIRE
RAILINGS		ef	ELECTRIC FENCE
TOP OF BANK		hf	HERRAS FENCE
BOTTOM OF BANK		pf	PALISADE FENCE
		sf	SECURITY FENCE

SYMBOLS

SURVEY STATION
TOP/BOTTOM OF BANK
GATE
RIDGE/EAVE HEIGHT
TREE

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MUSEUM STREET, HOLBORN WC1A

TITLE:
DRAINAGE SURVEY

DATE:	SURVEYED:	DRAWN:	CHECKED:	APPROVED:
05/11/2020	BR	BR	MH	MA

SCALE AT A1:	DRAWING NO:	REVISION:
1:100	DW2021-396 B3	

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Equipment Information

Equipment	Manufactur	Model	Serial Number	IWGS REF	Date of Calibration
EML Tx /Transmitter	SPX Radiodetection	RD TX10	107TX-10th-7796	RD13	31/10/2019
EML Rx /Receiver	SPX Radiodetection	RD8100	10/81PDL-471	RD13	31/10/2019
GPR	IDS Georadar	Aveva DS2600	SN 010-16-080159	GPR11	03/11/2020

DETECTION SURVEY REPORT

GENERAL
This survey was carried out in accordance with PAS 128:2014 (Publicly Available Specification from BSI). After a pre-survey consultation with the client it was agreed to carry out the detection survey using methodology M1 as per Table 2 of the PAS 128:2014. The survey boundary has been shown on the drawing; please see linestyle section of the key for reference.

DESKTOP UTILITY REPORT
Prior to the survey commencing record information was gathered and compiled in a separate desktop utility report. This report should be read in conjunction with the information contained in this utility detection survey. Record information was at the time of the survey less than 90 days old in accordance with the requirements of the PAS 128:2014. For a full list of the providers searched, records received and the dates the information was obtained, please refer to the attachments page of the desktop utility report.

DETECTION SURVEY
DRAINAGE
Drainage was lifted with pipe sizes and invert levels recorded. Wherever possible the chamber sizes have been recorded and positioned on the drawing. All connections from gullies, external rainwater pipes and external soil stacks have been proven wherever possible into manholes and sewer runs by radio sonde location and/or GPR. Where a saddle connection is present the position is assumed only until proven to QB2 or above. In instances where other detection methods were unsuccessful connections between manholes have been assumed to be straight and labelled as QB4. All drainage should be cross checked in critical areas by CCTV survey or verification survey type A.

WATER
Water utilities are non-metallic and have been located using GPR techniques with radar derived depths recorded to the crown to quality level QB2. Private supplies to properties have been located using GPR techniques where possible with depths recorded to quality level QB2. Water utilities which could not be located have been obtained from Thames Water asset records or assumed through the nearest WM/SV but are indicative only to quality level QB4.

GAS
Gas utilities are metallic and non-metallic. Metallic utilities have been located using passive EML techniques with electronically derived depths recorded to quality level QB2. Non-metallic utilities have been located using GPR techniques only with radar derived depths recorded to the crown to quality level QB2. Private supplies have been assumed through the nearest GV or riser but are indicative only to quality level QB4. Routes which could not be located have been obtained from Cadent asset records but are indicative only to quality level QB4.

ELECTRICITY
LV cables have been located using EML techniques via lamp posts, feeder pillars and within inspection covers with electronically derived depths recorded to quality level QB2. HV cables have been located using passive EML techniques with electronically derived depths recorded via induction to quality level QB2. LV and HV routes which could not be located have been obtained from UK Power Network records but are indicative only to quality level QB4. Where possible GPR techniques have been used to confirm their position raising the quality level to QB1.

TELECOM
Telecom ducts have been traced with depths recorded. Due to laws protecting British Telecom apparatus all ducts have been located using remote detection techniques only and compared with record information. Chamber sizes have been recorded using GPR techniques wherever possible. For further information regarding BT apparatus please contact Openreach directly.

CATV
CATV covers have been lifted with depths recorded to both the base of the chamber and the crown of the ducts. Duct routes have been located using EML techniques with electronically derived depths recorded to quality level QB2. Where possible GPR techniques have been used to confirm their position raising the quality level to QB1. CATV/Data routes which could not be located have been obtained from record information but are indicative only to quality level QB4.

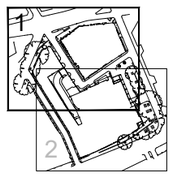
UNKNOWNS
Unknown utilities have been located using EML and GPR techniques with depths recorded to quality level QB2/QB1. Trial excavations are recommended to confirm their position, depth and identity in critical areas. Some unknown targets identified on the drawing using GPR are classified as "non-linear targets". These are not consistent with what we expect to see when identifying a buried utility, and appear on the drawing as single targets with depths (i.e. not linking two or more depth readings). This does not mean they are not utilities, we are just unable to positively identify them as a utility. We would strongly recommend that further verification surveys (PAS 128:2014 survey type A) are carried out to identify these targets in critical areas.

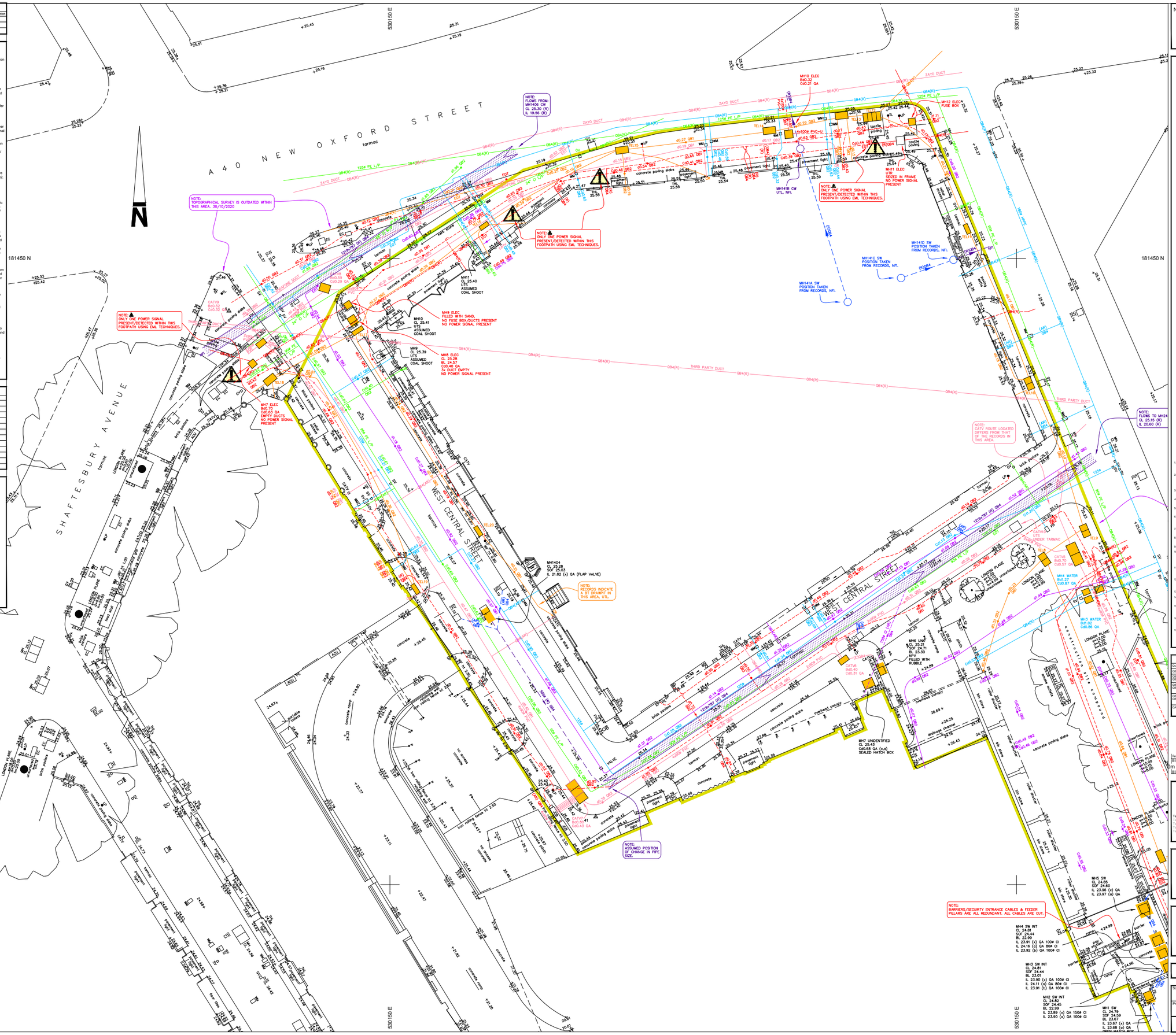
SEE CAUTIONARY NOTES WITHIN THE UTILITY KEY

Desktop Utility Records

Utility Type	Provider Details	Date Acquired
Drainage	Thames Water	15/10/2020
Water	Thames Water	15/10/2020
Gas	Cadent	15/10/2020
Electricity	UKPN	15/10/2020
Telecom	Openreach	15/10/2020
CATV	Virgin Media	15/10/2020
Data	Vodafone	16/10/2020
Data	Zayo	15/10/2020
Telecom	SSE Telecoms	15/10/2020
Tunnels & Pipelines	LSBUD	**15/10/2020**
Data	GTT	**15/10/2020**
Data	Instalcom	21/10/2020

Sheet Layout: (Not to Scale)





Notes :

1. UTILITY AND SERVICE INFORMATION ADDED TO TOPOGRAPHICAL SURVEY PRODUCED BY CLS SURVEYS. JOB No. 210175. DATE MARCH 2019. NO SITE VERIFICATION CARRIED OUT BY MK SURVEYS.
2. THIS SURVEY SHOULD ALWAYS BE READ IN CONJUNCTION WITH THE DESKTOP UTILITY REPORT. THAT WAS CARRIED OUT AS A PREREQUISITE TO THE DETECTION SURVEY.

KEY

GENERAL

Av.	AVERAGE
COW	CABLE ON WALL
CW	COMBINED WATER
DIS	DISUSED
DK	DROP KERB
EC	ELECTROMAGNETIC LOCATOR
EOT	END OF TRACE
FO	FIBRE OPTIC
FP	FOOTPATH
FW	FOUL WATER
GP	GATE POST
GPR	GROUND PENETRATING RADAR
HB	HAND BED
HP	HIGH PRESSURE
HV	HIGH VOLTAGE
KV	KILO VOLT
IP	INTERMEDIATE PRESSURE
LP	LOW PRESSURE
LV	LOW VOLTAGE
MP	MEDIUM PRESSURE
ND	NO DEPTH INFORMATION
NDI	NO DEPTH INFORMATION
NDV	NO DUCTS VISIBLE
NPV	NO PIPES VISIBLE
OSBM	ORDNANCE SURVEY BENCHMARK
POW	PIPE ON WALL
PBOX	POST BOX
RED	REDUNDANT SERVICE
SW	SOFT WALL
SB	SOFT BED
SNP	STREET NAME PLATE
SW	SURFACE WATER
TAC	TACTILE PAVING
TOW	TOP OF WALL
TW	TRADE EFFLUENT WATER
UTL	UNABLE TO LOCATE
UTR	UNABLE TO RARE
UTS	UNABLE TO SURVEY

APPARATUS

ACU	AIR CONDITIONING UNIT
AV	AIR VALVE
BB	BELISHA BEACON
BH	BOLLARD
BOL	BOLLARD LIGHT
BS	BUS STOP
CATV	CABLE TELEVISION
CB	CONTROL BOX
CCB	CROSSING CONTROL BUTTON
CP	CATCH PIT
CR	CONTROL RISER
DCH	DRAINAGE CHANNEL
EB	ELECTRIC CONTROL BOX
EP	ELECTRIC POLE
ER	EARTH ROD
FD	FILTER DRAIN
FFP	FUEL TANK FILL POINT
GI	GAS GOVERNOR
GR	GAS RISER
GV	GAS VALVE
GY	GULLY
IC	INSPECTION COVER
INT	INTERCEPTOR
IT	INLET
LO	LAMP OUTLET
LD	LOOP DETECTOR
LH	LAMP HOLE
LP	LAMP POST
MH	MANHOLE
MK	MARKER POST / PLATE
MT	METER
MW	MONITORING WELL
OU	OUTLET
PO	POST
PTG	PIPE TO GROUND
PTS	PIPE TO SURFACE
PU	PUMP
RE	RODDING EYE
RS	ROAD SIGN
RSJ	RAIL SECTION
RWP	RAIN WATER PIPE
SC	STOP COCK
SO	SOAKAWAY
SP	SOIL PIPE
ST	STAY CABLE
SV	STOP / SLUICE VALVE
TB	TELEPHONE BOX
TCB	TELEPHONE CALL BOX
TEL	TELECOM INSPECTION COVER
TL	TRAFFIC LIGHT
TLC	TRAFFIC LIGHT COVER
TM	TICKET MACHINE
TP	TELECOM POLE
VP	VENT PIPE
WM	WATER METER
WO	WASH OUT
WR	WATER RISER
WT	WATER TAP
WW	WET WELL

DEPTHS

e	ELECTRONICALLY DERIVED
Pd	PASSIVELY DERIVED
Bd	BASE DEPTH
Cd	DEPTH TO CROWN
Id	DEPTH TO INVERT
So	DEPTH TO SOFFIT

PIPE MATERIALS

AC	ASBESTOS CEMENT
ALK	ALKATHENE
BK	BRICK
CI	CAST IRON
CO	CONCRETE
DI	DUCTILE IRON
HDPE	HIGH DENSITY PE
MDPE	MEDIUM DENSITY PE
PE	POLYETHYLENE
PF	PITCH FIBRE
PP	POLYPROPYLENE
PVC	POLYVINYL CHLORIDE
UPVC	ULTRA RIB (PVC)
VC	VITRIFIED CLAY

FENCES

BW	BARBED WIRE FENCE
CB	CLOSED BOARDED FENCE
CPL	CONCRETE PANEL FENCE
CPO	CONCRETE POST AND WIRE FENCE
CNP	CHESTNUT PALING
CYL	CHAIN LINK FENCE
IRR	IRON RAILINGS
LL	LARCH LAP FENCE
PW	POST AND RAIL FENCE
PWW	POST AND WIRE FENCE
WIM	WIRE MESH FENCE

LEVELS

BD	BACKDROP LEVEL
BL	BASE LEVEL
CL	COVER LEVEL
CWL	CROWN LEVEL
DPC	DAMP PROOF COURSE
FL	FLOOR LEVEL
TL	TOP LEVEL
PT	P TRAP LEVEL
RL	ROOF LEVEL
SL	SILT LEVEL
SOF	SOFFIT LEVEL
THL	THRESHOLD LEVEL
WL	WATER LEVEL

LINESTYLE

INTERNAL METER — (M)
POT ENDED SERVICE
SEWER CAPPED RUN — (CAP)
SURVEY ABANDONED — (SA)
INTERNAL VALVE — (V)
UNKNOWN UNDERGROUND ANOMALY — (UA)
UNDERGROUND CHAMBERS
POST PROCESSING AREA
VERIFICATION TRIAL HOLE/EXCAVATION — (TH)
ABOVE GROUND — (AG)
ASSUMED ROUTE — (AR)
EMPTY DUCTS — (E)
OVERHEAD — (OH)
BACK DROP
P TRAP
UTILITY CROSSCOVER — (X)
SURVEY BOUNDARY
VERBAL INFORMATION — (VI)
RECORD INFORMATION — (R)
REDUNDANT SERVICE — (RED)
RISING MAIN
CCTV SECTION A AND 5 FAULTS ARE SHOWN IN RED

SERVICE TYPE

CATV / DATA
ELECTRICITY (HV)
ELECTRICITY (LV)
FUEL
GAS
HEATING
OVERHEAD ELECTRIC
OVERHEAD TELECOM
TRADE EFFLUENT
COMBINED SEWER
FOUL SEWER
SURFACE SEWER
UNIDENTIFIED SEWER
TELECOM
UNKNOWN SERVICE
WATER
SERVICES SURVEY WARNING

CAUTIONARY NOTES

1. EML techniques have been used in the detection of underground utilities as outlined in Table 2 of PAS 128:2014, the results are not infallible and trial excavations must be carried out in order to confirm identification, position and in particular depth of the utility.
2. GPR techniques has been used in the detection of non-metallic utilities as outlined in Table 2 of PAS 128:2014. The interpretation of these results is not infallible and success will depend on a number of factors including soil type, ground water levels and surface conditions, hence trial excavations must be carried out in order to confirm identification, position and in particular depth of the utility.
3. Depths derived via EML are taken to the centre of the conductor (cable, metallic pipe) and those derived via GPR are usually to the crown of the utility unless otherwise indicated.
4. Where cables cannot be detected individually an average depth has been obtained and trial excavations are recommended to confirm number and depths of cables banded together.
5. 'Pot-ended' cables are often difficult to detect and although we have made all reasonable efforts to locate or transpose this information from records, we cannot guarantee that all 'pot-ended' cables have been located.
6. Fibre optic cables are often difficult to detect, and commonly access chambers can be locked and thereby made inaccessible by the utility provider. All reasonable efforts have been made to locate these ducts using GPR. Cables not located have been transposed from records.
7. Within close proximity of electric substations and similar structures results using EML may become distorted. All reasonable efforts have been made to verify our results using GPR wherever conditions permitted.
8. Underneath overhead power lines results using EML may become distorted. All reasonable efforts have been made to verify our results using GPR wherever conditions permitted.
9. Drainage information has been obtained without man entry into the chamber.
10. Wherever possible we have attempted to locate the route of the sewer, issues such as blockages, surcharging, flooding, sedimentation, sewer collapse, root ingress, excessive depth, obstructions or heavy traffic flow may have affected our ability to obtain meaningful results. In these cases recommendations have been made for further survey or maintenance work.
11. Pipe / duct sizes have been recorded from surface inspection or taken from record information. Pipe sizes have been recorded in millimetres and depths in metres, except in instances where sizes are indicated in imperial units on the record information.
12. Water and Gas utilities to individual properties are often of a size that cannot be detected using EML or GPR investigation, wherever possible the route has been added from surface evidence (pipe risers, valves, etc), but this should be viewed as a guide only.
13. All utilities detected by MK Surveys should be considered live unless confirmed otherwise by client or service provider.
14. MK Surveys cannot confirm when utilities are redundant unless there is visual or record evidence to indicate this. In addition MK Surveys cannot guarantee being able to detect all redundant utilities.
15. Wherever available the results of our investigations have been cross referenced with record information. If a utility shown on the records cannot be detected on site, the information has been added to the drawing and indicated as QB4 (R). However it should be noted that the completeness and accuracy of the records cannot be guaranteed.
16. The utility information has been obtained from non-intrusive survey techniques; it always remains possible that there are additional utilities within the survey boundary that we have not been able to detect. We recommend that care is taken on site and that all utility records are used in conjunction with this survey.
17. The responsibility for avoiding damage to assets and utilities on site shall be that of the persons proposing to excavate within the surveyed area, who shall be liable to the asset owner and any third party who may be affected in any way for any loss or damage.

ALWAYS EXERCISE CAUTION WHEN EXCAVATING.

PAS 128:2014 Quality Level Guide

Quality Level	Description	Accuracy
QB4	A utility is expected to exist but cannot be detected - (API), (R), (VI)	Undefined
QB3	Horizontal location only using one geophysical technique.	+/- 500mm Horizontal
QB3P	No depth information - NDI.	Undefined Vertical
QB2	Horizontal and vertical location only using one geophysical technique.	+/- 250mm or +/- 40% of depth whichever is greater
QB1	Horizontal and vertical location only using two geophysical techniques.	+/- 150mm or +/- 15% of depth whichever is greater
QB1/P		
QA	Service verified in an open excavation, inside an inspection chamber / draw pit, or at the point the service enters / exits the ground.	+/- 50mm Horizontal +/- 25mm Vertical

Revision	Description	Surv. by	Chk. by	Appr. by	Date

mksurveys
Tel 01908 565561
Tel 01865 594979
Tel 0116 2949127
Tel 01384 404203
Tel 01403 263162
Milton Keynes
Oxford
East Midlands
West Midlands
Horsham
enquiries@mksurveys.co.uk
oxford@mksurveys.co.uk
eastmidlands@mksurveys.co.uk
westmidlands@mksurveys.co.uk
horsham@mksurveys.co.uk
www.mksurveys.com
www.surveys4bim.co.uk

Sollidon Ltd
&
Lab Selkirk House Ltd

Museum Street
Holborn
London

PAS 128:2014 Utility Survey

Scale	Sheet Size:	Sheet Number:	Date:
1:100	A0	1	November 2020
Project Number:	Rev:	Surveyed By:	Checked By: / Approved By:
29159	-	GW	-

Equipment Information

Equipment	Manufacturer	Model	Serial Number	MKS REF	Date of Calibration
EML Tx /Transmitter	SPX Radiodetection	RD TX10	10/TX-10B-7796	RD13	31/10/2019
EML Rx /Receiver	SPX Radiodetection	RD8100	10/81/PDL-471	RD13	31/10/2019
GPR	IDS Georadar	Ivera DS2000	SN 010-16-080159	GPR11	03/11/2020

DETECTION SURVEY REPORT

GENERAL
This survey was carried out in accordance with PAS 128:2014 (Publicly Available Specification from BSI). After a pre-survey consultation with the client it was agreed to carry out the detection survey using methodology M1 as per Table 2 of the PAS 128:2014. The survey boundary has been shown on the drawing; please see linestyle section of the key for reference.

DESKTOP UTILITY REPORT
Prior to the survey commencing record information was gathered and compiled in a separate desktop utility report. This report should be read in conjunction with the information contained in this utility detection survey. Record information was at the time of the survey less than 90 days old in accordance with the requirements of the PAS 128:2014. For a full list of the providers searched, records received and the dates the information was obtained, please refer to the attachments page of the desktop utility report.

DETECTION SURVEY
DRAINAGE
Drainage was lifted with pipe sizes and invert levels recorded. Wherever possible the chamber sizes have been recorded and positioned on the drawing. All connections from gullies, external rainwater pipes and external soil stacks have been proven wherever possible into manholes and sewer runs by radio sonde location and/or GPR. Where a saddle connection is present the position is assumed only until proven to QB2 or above. In instances where other detection methods were unsuccessful connections between manholes have been assumed to be straight and labelled as QB4. All drainage should be cross checked in critical areas by CCTV survey or verification survey type A.

WATER
Water utilities are non-metallic and have been located using GPR techniques with radar derived depths recorded to the crown to quality level QB2. Private supplies to properties have been located using GPR techniques where possible with depths recorded to quality level QB2. Water utilities which could not be located have been obtained from Thames Water asset records or assumed through the nearest MW/SV but are indicative only to quality level QB4.

GAS
Gas utilities are metallic and non-metallic. Metallic utilities have been located using passive EML techniques with electronically derived depths recorded to quality level QB2. Non-metallic utilities have been located using GPR techniques only with radar derived depths recorded to the crown to quality level QB2. Private supplies have been assumed through the nearest GV or riser but are indicative only to quality level QB4. Routes which could not be located have been obtained from Cadent asset records but are indicative only to quality level QB4.

ELECTRICITY
LV cables have been located using EML techniques via lamp posts, feeder pillars and within inspection covers with electronically derived depths recorded to quality level QB2. HV cables have been located using passive EML techniques with electronically derived depths recorded via induction to quality level QB2. LV and HV routes which could not be located have been obtained from UK Power Network records but are indicative only to quality level QB4. Where possible GPR techniques have been used to confirm their position raising the quality level to QB1.

TELECOM
Telecom ducts have been traced with depths recorded. Due to laws protecting British Telecom apparatus all ducts have been located using remote detection techniques only and compared with record information. Chamber sizes have been recorded using GPR techniques wherever possible. For further information regarding BT apparatus please contact Openreach directly.

CATV
CATV covers have been lifted with depths recorded to both the base of the chamber and the crown of the ducts. Duct routes have been located using EML techniques with electronically derived depths recorded to quality level QB2. Where possible GPR techniques have been used to confirm their position raising the quality level to QB1. CATV/Data routes which could not be located have been obtained from record information but are indicative only to quality level QB4.

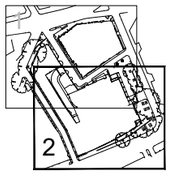
UNKNOWNS
Unknown utilities have been located using EML and GPR techniques with depths recorded to quality level QB2/QB1. Trial excavations are recommended to confirm their position, depth and identity in critical areas. Some unknown targets identified on the drawing using GPR are classified as "non-linear targets". These are not consistent with what we expect to see when identifying a buried utility, and appear on the drawing as single targets with depths (i.e. not linking two or more depth readings). This does not mean they are not utilities, we are just unable to positively identify them as a utility. We would strongly recommend that further verification surveys (PAS 128:2014 survey type A) are carried out to identify these targets in critical areas.

SEE CAUTIONARY NOTES WITHIN THE UTILITY KEY

Desktop Utility Records

Utility Type	Provider Details	Date Acquired
Drainage	Thames Water	15/10/2020
Water	Thames Water	15/10/2020
Gas	Cadent	15/10/2020
Electricity	UKPN	15/10/2020
Telecom	Openreach	15/10/2020
CATV	Virgin Media	15/10/2020
Data	Vodafone	16/10/2020
Data	Zayo	15/10/2020
Telecom	BSE Telecoms	15/10/2020
Tunnels & Pipelines	LSBUD	**15/10/2020**
Data	GTT	**15/10/2020**
Data	Instalcom	21/10/2020

Sheet Layout: (Not to Scale)



KEY

GENERAL

Av.	AVERAGE
COW	CABLE ON WALL
CW	COMBINED WATER
DIS	DISUSED
DK	DROP KERB
EML	ELECTROMAGNETIC LOCATOR
EOT	END OF TRACE
FO	FIBRE OPTIC
FP	FOOTPATH
FW	FOUL WATER
GP	GATE POST
GPR	GROUND PENETRATING RADAR
HB	HAND BED
HP	HIGH PRESSURE
HV	HIGH VOLTAGE
KV	KILO VOLT
IP	INTERMEDIATE PRESSURE
LP	LOW PRESSURE
LV	LOW VOLTAGE
MP	MEDIUM PRESSURE
ND	NO DEPTH INFORMATION
NDI	NO DEPTH INFORMATION
NDV	NO DUCTS VISIBLE
NPV	NO PIPES VISIBLE
OSBM	ORDNANCE SURVEY BENCHMARK
POW	PIPE ON WALL
P BOX	POST BOX
RED	REDUNDANT SERVICE
RW	RETAINING WALL
SB	SOFT BED
SNP	STREET NAME PLATE
SW	SURFACE WATER
TAC	TACTILE PAVING
TOW	TOP OF WALL
TW	TRADE EFFLUENT WATER
UTL	UNABLE TO LOCATE
UTR	UNABLE TO RAISE
UTS	UNABLE TO SURVEY

APPARATUS

ACU	AIR CONDITIONING UNIT
AV	AIR VALVE
BB	BELISHA BEACON
BO	BOLLARD
BOL	BOLLARD LIGHT
BS	BUS STOP
CATV	CABLE TELEVISION
CB	CONTROL BOX
CCB	CROSSING CONTROL BUTTON
CP	CATCH PIT
CR	CAMERA RISER
DCH	DRAINAGE CHANNEL
EB	ELECTRIC CONTROL BOX
EP	ELECTRIC POLE
ER	EARTH ROD
FD	FILTER DRAIN
FFP	FUEL TANK FILL POINT
GO	GAS GOVERNOR
GR	GAS RISER
GV	GAS VALVE
GY	GULLY
IC	INSPECTION COVER
INT	INTERCEPTOR
II	INLET
IO	INSPECTION OUTLET
LD	LOOP DETECTOR
LH	LAMP HOLE
LP	LAMP POST
MH	MANHOLE
MK	MARKER POST / PLATE
MT	METER
MW	MONITORING WELL
OU	OUTLET
OU	OUTFALL
PO	POST
PTG	PIPE TO GROUND
PTS	PIPE TO SURFACE
PU	PUMP
RE	RODDING EYE
RS	ROAD SIGN
RWH	RAIN WATER HEAD
RWP	RAIN WATER PIPE
SC	STOP COCK
SO	SOAKAWAY
SP	SOIL PIPE
ST	STAY CABLE
SV	STOP / SLUICE VALVE
SVP	SOIL VENT PIPE
TCB	TELEPHONE CALL BOX
TEL	TELECOM INSPECTION COVER
TL	TRAFFIC LIGHT
TLC	TRAFFIC LIGHT COVER
TM	TICKET MACHINE
TP	TELECOM POLE
VP	VENT PIPE
WM	WATER METER
WO	WASTE OUTLET
WR	WATER RISER
WT	WATER TAP
WW	WET WELL

DEPTHS

e	ELECTRONICALLY DERIVED
Pd	PASSIVELY DERIVED
Bd	BASE DEPTH
Cd	DEPTH TO CROWN
Id	DEPTH TO INVERT
So	DEPTH TO SOFFIT

PIPE MATERIALS

AC	ASBESTOS CEMENT
ALK	ALKATHENE
BK	BRICK
CI	CAST IRON
CO	CONCRETE
CP	CLAY PIPE TEN
HDPE	HIGH DENSITY PE
MDPE	MEDIUM DENSITY PE
PE	POLYETHYLENE
PF	PITCH FIBRE
PP	POLYPROPYLENE
PVC	POLYVINYL CHLORIDE
PVC-U	ULTRA RIB PVC
SI	SLIM IRON
ST	STEEL
VC	VITRIFIED CLAY

FENCES

B/W	BARBED WIRE FENCE
C/B	CLOSED BOARDED FENCE
C/PL	CONCRETE PANEL FENCE
C/R	CHESTNUT RAILING FENCE
CNP	CHESTNUT PALING
CYL	CHAIN LINK FENCE
I/R	IRON RAILINGS
L/L	LARCH LAP FENCE
P/R	POST AND RAIL FENCE
P/W	POST AND WIRE FENCE
W/M	WIRE MESH FENCE

LEVELS

BD	BACKDROP LEVEL
BL	BASE LEVEL
CL	COVER LEVEL
CWL	CROWN LEVEL
DPC	DAMP PROOF COURSE
FL	FLOOR LEVEL
P	P TRAP LEVEL
PT	P TRAP LEVEL
RL	ROOF LEVEL
SL	SILT LEVEL
SOF	SOFFIT LEVEL
THL	THRESHOLD LEVEL
WL	WATER LEVEL

LINESTYLE

INTERNAL METER	
POT ENDED SERVICE	
SEWER CAPPED RUN	
SURVEY ABANDONED	
INTERNAL VALVE	
UNKNOWN UNDERGROUND ANOMALY	
UNDERGROUND CHAMBERS	
POST PROCESSING AREA	
VERIFICATION TRIAL HOLE/EXCAVATION	
ABOVE GROUND	(AG)
ASSUMED ROUTE	(AR)
EMPTY DUCTS	(E)
OVERHEAD	(OV)
BACK DROP	
P TRAP	
UTILITY CROSSOVER	
SURVEY BOUNDARY	
VERBAL INFORMATION	(V)
RECORD INFORMATION	(R)
REDUNDANT SERVICE	
RISING MAIN	

CCTV SECTION 4 AND 5 FAULTS ARE SHOWN IN RED

SERVICE TYPE

CATV / DATA
ELECTRICITY (HV)
ELECTRICITY (LV)
FUEL
GAS
HEATING
OVERHEAD ELECTRIC
OVERHEAD TELECOM
TRADE EFFLUENT
COMBINED SEWER
FOUL SEWER
SURFACE SEWER
UNIDENTIFIED SEWER
TELECOM
UNKNOWN SERVICE
WATER
SERVICES SURVEY WARNING

CAUTIONARY NOTES

1. EML techniques have been used in the detection of underground utilities as outlined in Table 2 of PAS 128:2014, the results are not infallible and trial excavations must be carried out in order to confirm identification, position and in particular depth of the utility.
2. GPR techniques has been used in the detection of non-metallic utilities as outlined in Table 2 of PAS 128:2014. The interpretation of these results is not infallible and success will depend on a number of factors including soil type, ground water levels and surface conditions, hence trial excavations must be carried out in order to confirm identification, position and in particular depth of the utility.
3. Depths derived via EML are taken to the centre of the conductor (cable, metallic pipe) and those derived via GPR are usually to the crown of the utility unless otherwise indicated.
4. Where cables cannot be detected individually an average depth has been obtained and trial excavations are recommended to confirm number and depths of cables banded together.
5. 'Pot-ended' cables are often difficult to detect and although we have made all reasonable efforts to locate or transpose this information from records, we cannot guarantee that all 'pot-ended' cables have been located.
6. Fibre optic cables are often difficult to detect, and commonly access chambers can be locked and thereby made inaccessible by the utility provider. All reasonable efforts have been made to locate these ducts using GPR. Cables not located have been transposed from records.
7. Within close proximity of electric substations and similar structures results using EML may become distorted. All reasonable efforts have been made to verify our results using GPR wherever conditions permitted.
8. Underneath overhead power lines results using EML may become distorted. All reasonable efforts have been made to verify our results using GPR wherever conditions permitted.
9. Drainage information has been obtained without man entry into the chamber.
10. Wherever possible we have attempted to locate the route of the sewer. Issues such as blockages, surcharging, flooding, sedimentation, sewer collapse, root ingress, excessive depth, obstructions or heavy traffic flow may have affected our ability to obtain meaningful results. In these cases recommendations have been made for further survey or maintenance work.
11. Pipe / duct sizes have been recorded from surface inspection or taken from record information. Pipe sizes have been recorded in millimetres and depths in inches, except in instances where sizes are indicated in imperial units on the record information.
12. Water and Gas utilities to individual properties are often of a size that cannot be detected using EML or GPR. Investigation, wherever possible the route has been added from surface evidence (pipe risers, valves, etc), but this should be viewed as a guide only.
13. All utilities detected by MK Surveys should be considered live unless confirmed otherwise by client or service provider.
14. MK Surveys cannot confirm when utilities are redundant unless there is visual or record evidence to indicate this. In addition MK Surveys cannot guarantee being able to detect all redundant utilities.
15. Wherever available the results of our investigations have been cross referenced with record information. If a utility shown on the records cannot be detected on site, the information has been added to the drawing and indicated as QB4 (R). However it should be noted that the completeness and accuracy of the records cannot be guaranteed.
16. The utility information has been obtained from non-intrusive survey techniques, it always remains possible that there are additional utilities within the survey boundary that we have not been able to detect. We recommend that care is taken on site and that all utility records are used in conjunction with this survey.
17. The responsibility for avoiding damage to assets and utilities on site shall be that of the persons proposing to excavate within the surveyed area, who shall be liable to the asset owner and any third party who may be affected in any way for any loss or damage.

ALWAYS EXERCISE CAUTION WHEN EXCAVATING.

PAS 128:2014 Quality Level Guide

Quality Level	Description	Accuracy
QB4	A utility is expected to exist but cannot be detected - (AR), (R), (V)	Undefined
QB3 QB3P	Horizontal location only using one geophysical technique. No depth information - N/D.	+/- 500mm Horizontal Undefined Vertical
QB2 QB2P	Horizontal and vertical location only using one geophysical technique.	+/- 250mm or +/- 40% of depth whichever is greater
QB1 QB1P	Horizontal and vertical location only using two geophysical techniques.	+/- 150mm or +/- 15% of depth whichever is greater
QA	Service verified in an open excavation, inside an inspection chamber / draw pit, or at the point the service enters / exits the ground.	+/- 50mm Horizontal +/- 25mm Vertical

Revision	Description	Surv. by	Chk. by	Appr. by	Date

0m 1 2 3 4 5 6 7 8 9 10 11

mksurveys

Tel 01908 565561 — Milton Keynes — enquiries@mksurveys.co.uk
Tel 01865 594979 — Oxford — oxford@mksurveys.co.uk
Tel 0116 2849127 — East Midlands — eastmidlands@mksurveys.co.uk
Tel 01384 404323 — West Midlands — westmidlands@mksurveys.co.uk
Tel 01403 243162 — Horsham — horsham@mksurveys.co.uk

www.mksurveys.com — www.surveys4bim.co.uk

Sollidon Ltd
&
Lab Selkirk House Ltd

Museum Street
Holborn
London

PAS 128:2014 Utility Survey

Scale	Sheet Size:	Sheet Number:	Date:
1:100	A0	2	November 2020
Project Number:	Rev.	Surveyed By:	Checked By:
29159	-	GW	-

DRAFT

Appendix D

LBC SuDS Proforma

Camden

GREATER**LONDON**AUTHORITY

LoDEG

1. Project & Site Details

Project / Site Name (including sub-catchment / stage / phase where appropriate)	Museum Street
Address & post code	WC1A 1JR
OS Grid ref. (Easting, Northing)	E 530186
	N 181385
LPA reference (if applicable)	
Brief description of proposed work	Partial demolition and part refurbishment to provide a mixed use scheme with offices, resi and retail.
Total site Area	4120 m^2
Total existing impervious area	4120 m^2
Total proposed impervious area	4120 m^2
Is the site in a surface water flood risk catchment (ref. local Surface Water Management Plan)?	No
Existing drainage connection type and location	To combined sewers
Designer Name	Carmel Lennon
Designer Position	Civil Engineer
Designer Company	Heyne Tillett Steel

2. Proposed Discharge Arrangements

2a. Infiltration Feasibility

Superficial geology classification	Made ground, Lynch Hill Gravels
Bedrock geology classification	London Clay
Site infiltration rate	NA m/s
Depth to groundwater level	~6 m below ground level
Is infiltration feasible?	No

2b. Drainage Hierarchy

	Feasible (Y/N)	*Proposed (Y/N)*
1 store rainwater for later use	N	N
2 use infiltration techniques, such as porous surfaces in non-clay areas	N	N
3 attenuate rainwater in ponds or open water features for gradual release	N	N
4 attenuate rainwater by storing in tanks or sealed water features for gradual release	Y	Y
5 discharge rainwater direct to a watercourse	N	N
6 discharge rainwater to a surface water sewer/drain	N	N
7 discharge rainwater to the combined sewer.	Y	Y

2c. Proposed Discharge Details

Proposed discharge location	To the combined public sewers
Has the owner/regulator of the discharge location been consulted?	Yes

Camden GREATERLONDONAUTHORITY LoDEG

3. Drainage Strategy

3a. Discharge Rates & Required Storage

	Greenfield (GF) runoff rate (l/s)	*Existing discharge rate (l/s)*	*Required storage for GF rate (m^3)*	*Proposed discharge rate (l/s)*
Qbar	0.64			
1 in 1	0.54	47.31	93	10
1 in 30	1.47	116.21	170	10
1 in 100	2.04	151.22	218	10
1 in 100 + CC			330	10
Climate change allowance used		40%		
3b. Principal Method of Flow Control		Hydrobrake, orifice, pump		

3c. Proposed SuDS Measures

	Catchment area (m^2)	*Plan area (m^2)*	*Storage vol. (m^3)*
Rainwater harvesting	0		0
Infiltration systems	0		0
Green roofs	0	0	0
Blue roofs	1170	0	117.1
Filter strips	0	0	0
Filter drains	0	0	0
Bioretention / tree pits	0	0	0
Pervious pavements	0	0	0
Swales	0	0	0
Basins/ponds	0	0	0
Attenuation tanks	2950		158.1
Total	**4120**	**0**	**275.2**

4. Supporting Information

4a. Discharge & Drainage Strategy	*Page/section of drainage report*
Infiltration feasibility (2a) – geotechnical factual and interpretive reports, including infiltration results	No space, infiltration features must be min. 5m from a building. Site also underlain by made ground.
Drainage hierarchy (2b)	Section 4
Proposed discharge details (2c) – utility plans, correspondence / approval from owner/regulator of discharge location	Section 4 and Appendix G
Discharge rates & storage (3a) – detailed hydrologic and hydraulic calculations	Section 4 and Appendix E
Proposed SuDS measures & specifications (3b)	Section 4

4b. Other Supporting Details	*Page/section of drainage report*
Detailed Development Layout	Wider application
Detailed drainage design drawings, including exceedance flow routes	Appendix G
Detailed landscaping plans	Wider application
Maintenance strategy	Appendix H
Demonstration of how the proposed SuDS measures improve:	
a) water quality of the runoff?	Section 4
b) biodiversity?	Section 4
c) amenity?	Section 4

Appendix E

Preliminary Surface Water Drainage Calculations

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

Half Drain Time : 322 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	9.954	0.054	0.0	0.2	0.2	4.9	Flood Risk
30 min Summer	9.968	0.068	0.0	0.2	0.2	6.2	Flood Risk
60 min Summer	9.981	0.081	0.0	0.2	0.2	7.4	Flood Risk
120 min Summer	9.991	0.091	0.0	0.3	0.3	8.2	Flood Risk
180 min Summer	9.994	0.094	0.0	0.3	0.3	8.5	Flood Risk
240 min Summer	9.994	0.094	0.0	0.3	0.3	8.5	Flood Risk
360 min Summer	9.994	0.094	0.0	0.3	0.3	8.5	Flood Risk
480 min Summer	9.993	0.093	0.0	0.3	0.3	8.4	Flood Risk
600 min Summer	9.992	0.092	0.0	0.3	0.3	8.3	Flood Risk
720 min Summer	9.990	0.090	0.0	0.3	0.3	8.1	Flood Risk
960 min Summer	9.987	0.087	0.0	0.3	0.3	7.8	Flood Risk
1440 min Summer	9.979	0.079	0.0	0.2	0.2	7.1	Flood Risk
2160 min Summer	9.969	0.069	0.0	0.2	0.2	6.2	Flood Risk
2880 min Summer	9.961	0.061	0.0	0.2	0.2	5.5	Flood Risk
4320 min Summer	9.949	0.049	0.0	0.2	0.2	4.4	Flood Risk
5760 min Summer	9.941	0.041	0.0	0.2	0.2	3.7	Flood Risk
7200 min Summer	9.935	0.035	0.0	0.1	0.1	3.2	Flood Risk
8640 min Summer	9.931	0.031	0.0	0.1	0.1	2.8	Flood Risk
10080 min Summer	9.929	0.029	0.0	0.1	0.1	2.6	Flood Risk
15 min Winter	9.954	0.054	0.0	0.2	0.2	4.9	Flood Risk

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	149.324	0.0	4.5	19
30 min Summer	96.288	0.0	5.9	33
60 min Summer	59.033	0.0	7.6	62
120 min Summer	34.961	0.0	9.0	122
180 min Summer	25.405	0.0	9.9	180
240 min Summer	20.147	0.0	10.5	224
360 min Summer	14.505	0.0	11.3	280
480 min Summer	11.486	0.0	11.9	342
600 min Summer	9.578	0.0	12.4	410
720 min Summer	8.254	0.0	12.9	478
960 min Summer	6.522	0.0	13.5	616
1440 min Summer	4.674	0.0	14.5	882
2160 min Summer	3.345	0.0	15.9	1276
2880 min Summer	2.636	0.0	16.7	1648
4320 min Summer	1.882	0.0	17.7	2380
5760 min Summer	1.481	0.0	18.8	3112
7200 min Summer	1.229	0.0	19.5	3816
8640 min Summer	1.055	0.0	20.0	4496
10080 min Summer	0.927	0.0	20.5	5240
15 min Winter	149.324	0.0	4.5	18

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

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
30 min Winter	9.968	0.068	0.0	0.2	0.2	6.2	Flood Risk
60 min Winter	9.982	0.082	0.0	0.2	0.2	7.4	Flood Risk
120 min Winter	9.991	0.091	0.0	0.3	0.3	8.3	Flood Risk
180 min Winter	9.995	0.095	0.0	0.3	0.3	8.5	Flood Risk
240 min Winter	9.995	0.095	0.0	0.3	0.3	8.6	Flood Risk
360 min Winter	9.994	0.094	0.0	0.3	0.3	8.5	Flood Risk
480 min Winter	9.992	0.092	0.0	0.3	0.3	8.3	Flood Risk
600 min Winter	9.990	0.090	0.0	0.3	0.3	8.1	Flood Risk
720 min Winter	9.988	0.088	0.0	0.3	0.3	7.9	Flood Risk
960 min Winter	9.982	0.082	0.0	0.2	0.2	7.4	Flood Risk
1440 min Winter	9.972	0.072	0.0	0.2	0.2	6.5	Flood Risk
2160 min Winter	9.960	0.060	0.0	0.2	0.2	5.4	Flood Risk
2880 min Winter	9.950	0.050	0.0	0.2	0.2	4.5	Flood Risk
4320 min Winter	9.937	0.037	0.0	0.2	0.2	3.4	Flood Risk
5760 min Winter	9.930	0.030	0.0	0.1	0.1	2.7	Flood Risk
7200 min Winter	9.927	0.027	0.0	0.1	0.1	2.4	Flood Risk
8640 min Winter	9.924	0.024	0.0	0.1	0.1	2.2	Flood Risk
10080 min Winter	9.923	0.023	0.0	0.1	0.1	2.0	Flood Risk

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
30 min Winter	96.288	0.0	5.9	33
60 min Winter	59.033	0.0	7.6	62
120 min Winter	34.961	0.0	9.0	118
180 min Winter	25.405	0.0	9.9	176
240 min Winter	20.147	0.0	10.5	228
360 min Winter	14.505	0.0	11.3	286
480 min Winter	11.486	0.0	11.9	362
600 min Winter	9.578	0.0	12.4	440
720 min Winter	8.254	0.0	12.9	514
960 min Winter	6.522	0.0	13.5	662
1440 min Winter	4.674	0.0	14.5	938
2160 min Winter	3.345	0.0	15.9	1340
2880 min Winter	2.636	0.0	16.7	1704
4320 min Winter	1.882	0.0	17.7	2424
5760 min Winter	1.481	0.0	18.8	3112
7200 min Winter	1.229	0.0	19.5	3824
8640 min Winter	1.055	0.0	20.1	4584
10080 min Winter	0.927	0.0	20.5	5224

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.950
Region	England and Wales	Cv (Winter)	0.950
M5-60 (mm)	20.800	Shortest Storm (mins)	15
Ratio R	0.442	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.014

Time (mins) From:	To:	Area (ha)
0	4	0.014

Model Details

Storage is Online Cover Level (m) 10.000

Cellular Storage Structure

Invert Level (m) 9.900 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	95.0	0.0	0.101	0.0	0.0
0.100	95.0	0.0			

Orifice Outflow Control

Diameter (m) 0.021 Discharge Coefficient 0.600 Invert Level (m) 9.900

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

Half Drain Time : 306 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	9.932	0.082	0.0	0.2	0.2	4.8	Flood Risk
30 min Summer	9.954	0.104	0.0	0.2	0.2	6.1	Flood Risk
60 min Summer	9.974	0.124	0.0	0.3	0.3	7.3	Flood Risk
120 min Summer	9.988	0.138	0.0	0.3	0.3	8.1	Flood Risk
180 min Summer	9.992	0.142	0.0	0.3	0.3	8.4	Flood Risk
240 min Summer	9.992	0.142	0.0	0.3	0.3	8.4	Flood Risk
360 min Summer	9.991	0.141	0.0	0.3	0.3	8.3	Flood Risk
480 min Summer	9.989	0.139	0.0	0.3	0.3	8.2	Flood Risk
600 min Summer	9.986	0.136	0.0	0.3	0.3	8.0	Flood Risk
720 min Summer	9.983	0.133	0.0	0.3	0.3	7.8	Flood Risk
960 min Summer	9.977	0.127	0.0	0.3	0.3	7.5	Flood Risk
1440 min Summer	9.964	0.114	0.0	0.2	0.2	6.7	Flood Risk
2160 min Summer	9.948	0.098	0.0	0.2	0.2	5.7	Flood Risk
2880 min Summer	9.935	0.085	0.0	0.2	0.2	5.0	Flood Risk
4320 min Summer	9.916	0.066	0.0	0.2	0.2	3.9	Flood Risk
5760 min Summer	9.904	0.054	0.0	0.2	0.2	3.2	Flood Risk
7200 min Summer	9.895	0.045	0.0	0.1	0.1	2.7	Flood Risk
8640 min Summer	9.889	0.039	0.0	0.1	0.1	2.3	Flood Risk
10080 min Summer	9.884	0.034	0.0	0.1	0.1	2.0	Flood Risk
15 min Winter	9.932	0.082	0.0	0.2	0.2	4.8	Flood Risk

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	149.324	0.0	4.7	19
30 min Summer	96.288	0.0	6.1	33
60 min Summer	59.033	0.0	7.7	62
120 min Summer	34.961	0.0	9.2	122
180 min Summer	25.405	0.0	10.0	180
240 min Summer	20.147	0.0	10.6	218
360 min Summer	14.505	0.0	11.4	278
480 min Summer	11.486	0.0	12.1	340
600 min Summer	9.578	0.0	12.6	410
720 min Summer	8.254	0.0	13.0	478
960 min Summer	6.522	0.0	13.7	616
1440 min Summer	4.674	0.0	14.7	882
2160 min Summer	3.345	0.0	15.9	1276
2880 min Summer	2.636	0.0	16.7	1644
4320 min Summer	1.882	0.0	17.9	2380
5760 min Summer	1.481	0.0	18.9	3112
7200 min Summer	1.229	0.0	19.6	3824
8640 min Summer	1.055	0.0	20.1	4504
10080 min Summer	0.927	0.0	20.6	5240
15 min Winter	149.324	0.0	4.7	18

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

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
30 min Winter	9.954	0.104	0.0	0.2	0.2	6.2	Flood Risk
60 min Winter	9.974	0.124	0.0	0.3	0.3	7.3	Flood Risk
120 min Winter	9.989	0.139	0.0	0.3	0.3	8.2	Flood Risk
180 min Winter	9.993	0.143	0.0	0.3	0.3	8.4	Flood Risk
240 min Winter	9.993	0.143	0.0	0.3	0.3	8.4	Flood Risk
360 min Winter	9.990	0.140	0.0	0.3	0.3	8.3	Flood Risk
480 min Winter	9.987	0.137	0.0	0.3	0.3	8.1	Flood Risk
600 min Winter	9.983	0.133	0.0	0.3	0.3	7.8	Flood Risk
720 min Winter	9.979	0.129	0.0	0.3	0.3	7.6	Flood Risk
960 min Winter	9.970	0.120	0.0	0.3	0.3	7.1	Flood Risk
1440 min Winter	9.953	0.103	0.0	0.2	0.2	6.1	Flood Risk
2160 min Winter	9.933	0.083	0.0	0.2	0.2	4.9	Flood Risk
2880 min Winter	9.918	0.068	0.0	0.2	0.2	4.0	Flood Risk
4320 min Winter	9.899	0.049	0.0	0.1	0.1	2.9	Flood Risk
5760 min Winter	9.888	0.038	0.0	0.1	0.1	2.2	Flood Risk
7200 min Winter	9.880	0.030	0.0	0.1	0.1	1.8	Flood Risk
8640 min Winter	9.876	0.026	0.0	0.1	0.1	1.6	Flood Risk
10080 min Winter	9.874	0.024	0.0	0.1	0.1	1.4	Flood Risk

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
30 min Winter	96.288	0.0	6.1	33
60 min Winter	59.033	0.0	7.7	62
120 min Winter	34.961	0.0	9.2	118
180 min Winter	25.405	0.0	10.0	174
240 min Winter	20.147	0.0	10.6	228
360 min Winter	14.505	0.0	11.4	284
480 min Winter	11.486	0.0	12.1	362
600 min Winter	9.578	0.0	12.6	438
720 min Winter	8.254	0.0	13.0	512
960 min Winter	6.522	0.0	13.7	656
1440 min Winter	4.674	0.0	14.7	938
2160 min Winter	3.345	0.0	15.9	1340
2880 min Winter	2.636	0.0	16.7	1728
4320 min Winter	1.882	0.0	17.9	2460
5760 min Winter	1.481	0.0	18.9	3168
7200 min Winter	1.229	0.0	19.6	3824
8640 min Winter	1.055	0.0	20.1	4504
10080 min Winter	0.927	0.0	20.6	5240

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.950
Region	England and Wales	Cv (Winter)	0.950
M5-60 (mm)	20.800	Shortest Storm (mins)	15
Ratio R	0.442	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.014

Time (mins) From:	To:	Area (ha)
0	4	0.014

Model Details

Storage is Online Cover Level (m) 10.000

Cellular Storage Structure

Invert Level (m) 9.850 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	62.0	0.0	0.151	0.0	0.0
0.150	62.0	0.0			

Orifice Outflow Control

Diameter (m) 0.019 Discharge Coefficient 0.600 Invert Level (m) 9.850

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

Half Drain Time : 860 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	9.907	0.057	0.0	0.1	0.1	3.5	Flood Risk
30 min Summer	9.923	0.073	0.0	0.1	0.1	4.5	Flood Risk
60 min Summer	9.938	0.088	0.0	0.1	0.1	5.4	Flood Risk
120 min Summer	9.952	0.102	0.0	0.1	0.1	6.3	Flood Risk
180 min Summer	9.959	0.109	0.0	0.1	0.1	6.7	Flood Risk
240 min Summer	9.962	0.112	0.0	0.1	0.1	6.9	Flood Risk
360 min Summer	9.966	0.116	0.0	0.1	0.1	7.2	Flood Risk
480 min Summer	9.967	0.117	0.0	0.1	0.1	7.2	Flood Risk
600 min Summer	9.967	0.117	0.0	0.1	0.1	7.2	Flood Risk
720 min Summer	9.967	0.117	0.0	0.1	0.1	7.2	Flood Risk
960 min Summer	9.965	0.115	0.0	0.1	0.1	7.1	Flood Risk
1440 min Summer	9.962	0.112	0.0	0.1	0.1	6.9	Flood Risk
2160 min Summer	9.956	0.106	0.0	0.1	0.1	6.5	Flood Risk
2880 min Summer	9.950	0.100	0.0	0.1	0.1	6.2	Flood Risk
4320 min Summer	9.938	0.088	0.0	0.1	0.1	5.5	Flood Risk
5760 min Summer	9.929	0.079	0.0	0.1	0.1	4.9	Flood Risk
7200 min Summer	9.920	0.070	0.0	0.1	0.1	4.4	Flood Risk
8640 min Summer	9.914	0.064	0.0	0.1	0.1	3.9	Flood Risk
10080 min Summer	9.908	0.058	0.0	0.1	0.1	3.6	Flood Risk
15 min Winter	9.907	0.057	0.0	0.1	0.1	3.5	Flood Risk

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	149.324	0.0	3.0	19
30 min Summer	96.288	0.0	3.8	34
60 min Summer	59.033	0.0	5.4	64
120 min Summer	34.961	0.0	6.3	122
180 min Summer	25.405	0.0	6.9	182
240 min Summer	20.147	0.0	7.3	242
360 min Summer	14.505	0.0	7.8	362
480 min Summer	11.486	0.0	8.2	480
600 min Summer	9.578	0.0	8.5	584
720 min Summer	8.254	0.0	8.8	628
960 min Summer	6.522	0.0	9.1	750
1440 min Summer	4.674	0.0	9.2	1010
2160 min Summer	3.345	0.0	11.3	1424
2880 min Summer	2.636	0.0	11.8	1820
4320 min Summer	1.882	0.0	12.5	2636
5760 min Summer	1.481	0.0	13.4	3408
7200 min Summer	1.229	0.0	13.9	4176
8640 min Summer	1.055	0.0	14.3	4928
10080 min Summer	0.927	0.0	14.6	5648
15 min Winter	149.324	0.0	3.0	19

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

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
30 min Winter	9.923	0.073	0.0	0.1	0.1	4.5	Flood Risk
60 min Winter	9.938	0.088	0.0	0.1	0.1	5.5	Flood Risk
120 min Winter	9.952	0.102	0.0	0.1	0.1	6.3	Flood Risk
180 min Winter	9.959	0.109	0.0	0.1	0.1	6.7	Flood Risk
240 min Winter	9.963	0.113	0.0	0.1	0.1	7.0	Flood Risk
360 min Winter	9.966	0.116	0.0	0.1	0.1	7.2	Flood Risk
480 min Winter	9.968	0.118	0.0	0.1	0.1	7.3	Flood Risk
600 min Winter	9.968	0.118	0.0	0.1	0.1	7.3	Flood Risk
720 min Winter	9.967	0.117	0.0	0.1	0.1	7.2	Flood Risk
960 min Winter	9.965	0.115	0.0	0.1	0.1	7.1	Flood Risk
1440 min Winter	9.961	0.111	0.0	0.1	0.1	6.8	Flood Risk
2160 min Winter	9.952	0.102	0.0	0.1	0.1	6.3	Flood Risk
2880 min Winter	9.944	0.094	0.0	0.1	0.1	5.8	Flood Risk
4320 min Winter	9.929	0.079	0.0	0.1	0.1	4.9	Flood Risk
5760 min Winter	9.918	0.068	0.0	0.1	0.1	4.2	Flood Risk
7200 min Winter	9.908	0.058	0.0	0.1	0.1	3.6	Flood Risk
8640 min Winter	9.900	0.050	0.0	0.1	0.1	3.1	Flood Risk
10080 min Winter	9.894	0.044	0.0	0.0	0.0	2.7	Flood Risk

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
30 min Winter	96.288	0.0	3.8	33
60 min Winter	59.033	0.0	5.4	62
120 min Winter	34.961	0.0	6.3	122
180 min Winter	25.405	0.0	6.9	180
240 min Winter	20.147	0.0	7.3	238
360 min Winter	14.505	0.0	7.8	352
480 min Winter	11.486	0.0	8.2	464
600 min Winter	9.578	0.0	8.5	572
720 min Winter	8.254	0.0	8.8	678
960 min Winter	6.522	0.0	9.1	768
1440 min Winter	4.674	0.0	9.3	1068
2160 min Winter	3.345	0.0	11.3	1516
2880 min Winter	2.636	0.0	11.8	1960
4320 min Winter	1.882	0.0	12.5	2808
5760 min Winter	1.481	0.0	13.4	3576
7200 min Winter	1.229	0.0	13.9	4328
8640 min Winter	1.055	0.0	14.3	5104
10080 min Winter	0.927	0.0	14.6	5848

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.950
Region	England and Wales	Cv (Winter)	0.950
M5-60 (mm)	20.800	Shortest Storm (mins)	15
Ratio R	0.442	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.010

Time From:	(mins) To:	Area (ha)
0	4	0.010

Model Details

Storage is Online Cover Level (m) 10.000

Cellular Storage Structure

Invert Level (m) 9.850 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m²)	Inf. Area (m²)
0.000	65.0	0.0

Orifice Outflow Control

Diameter (m) 0.011 Discharge Coefficient 0.600 Invert Level (m) 9.850

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

Half Drain Time : 394 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	9.890	0.040	0.0	0.0	0.0	1.4	Flood Risk
30 min Summer	9.900	0.050	0.0	0.1	0.1	1.8	Flood Risk
60 min Summer	9.910	0.060	0.0	0.1	0.1	2.1	Flood Risk
120 min Summer	9.918	0.068	0.0	0.1	0.1	2.4	Flood Risk
180 min Summer	9.921	0.071	0.0	0.1	0.1	2.5	Flood Risk
240 min Summer	9.921	0.071	0.0	0.1	0.1	2.5	Flood Risk
360 min Summer	9.921	0.071	0.0	0.1	0.1	2.5	Flood Risk
480 min Summer	9.921	0.071	0.0	0.1	0.1	2.5	Flood Risk
600 min Summer	9.920	0.070	0.0	0.1	0.1	2.5	Flood Risk
720 min Summer	9.919	0.069	0.0	0.1	0.1	2.4	Flood Risk
960 min Summer	9.916	0.066	0.0	0.1	0.1	2.3	Flood Risk
1440 min Summer	9.911	0.061	0.0	0.1	0.1	2.2	Flood Risk
2160 min Summer	9.904	0.054	0.0	0.1	0.1	1.9	Flood Risk
2880 min Summer	9.898	0.048	0.0	0.1	0.1	1.7	Flood Risk
4320 min Summer	9.889	0.039	0.0	0.0	0.0	1.4	Flood Risk
5760 min Summer	9.882	0.032	0.0	0.0	0.0	1.1	Flood Risk
7200 min Summer	9.878	0.028	0.0	0.0	0.0	1.0	Flood Risk
8640 min Summer	9.874	0.024	0.0	0.0	0.0	0.8	Flood Risk
10080 min Summer	9.871	0.021	0.0	0.0	0.0	0.8	Flood Risk
15 min Winter	9.890	0.040	0.0	0.0	0.0	1.4	Flood Risk

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	149.324	0.0	1.3	19
30 min Summer	96.288	0.0	1.7	33
60 min Summer	59.033	0.0	2.2	62
120 min Summer	34.961	0.0	2.6	122
180 min Summer	25.405	0.0	2.8	182
240 min Summer	20.147	0.0	3.0	240
360 min Summer	14.505	0.0	3.2	302
480 min Summer	11.486	0.0	3.4	362
600 min Summer	9.578	0.0	3.6	426
720 min Summer	8.254	0.0	3.7	494
960 min Summer	6.522	0.0	3.9	634
1440 min Summer	4.674	0.0	4.2	908
2160 min Summer	3.345	0.0	4.5	1300
2880 min Summer	2.636	0.0	4.8	1696
4320 min Summer	1.882	0.0	5.1	2424
5760 min Summer	1.481	0.0	5.4	3168
7200 min Summer	1.229	0.0	5.6	3888
8640 min Summer	1.055	0.0	5.7	4584
10080 min Summer	0.927	0.0	5.9	5344
15 min Winter	149.324	0.0	1.3	19

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

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
30 min Winter	9.900	0.050	0.0	0.1	0.1	1.8	Flood Risk
60 min Winter	9.910	0.060	0.0	0.1	0.1	2.1	Flood Risk
120 min Winter	9.918	0.068	0.0	0.1	0.1	2.4	Flood Risk
180 min Winter	9.921	0.071	0.0	0.1	0.1	2.5	Flood Risk
240 min Winter	9.922	0.072	0.0	0.1	0.1	2.5	Flood Risk
360 min Winter	9.921	0.071	0.0	0.1	0.1	2.5	Flood Risk
480 min Winter	9.920	0.070	0.0	0.1	0.1	2.5	Flood Risk
600 min Winter	9.919	0.069	0.0	0.1	0.1	2.4	Flood Risk
720 min Winter	9.917	0.067	0.0	0.1	0.1	2.4	Flood Risk
960 min Winter	9.914	0.064	0.0	0.1	0.1	2.3	Flood Risk
1440 min Winter	9.907	0.057	0.0	0.1	0.1	2.0	Flood Risk
2160 min Winter	9.898	0.048	0.0	0.1	0.1	1.7	Flood Risk
2880 min Winter	9.891	0.041	0.0	0.0	0.0	1.4	Flood Risk
4320 min Winter	9.881	0.031	0.0	0.0	0.0	1.1	Flood Risk
5760 min Winter	9.874	0.024	0.0	0.0	0.0	0.8	Flood Risk
7200 min Winter	9.870	0.020	0.0	0.0	0.0	0.7	Flood Risk
8640 min Winter	9.867	0.017	0.0	0.0	0.0	0.6	Flood Risk
10080 min Winter	9.865	0.015	0.0	0.0	0.0	0.5	Flood Risk

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
30 min Winter	96.288	0.0	1.7	33
60 min Winter	59.033	0.0	2.2	62
120 min Winter	34.961	0.0	2.6	120
180 min Winter	25.405	0.0	2.8	176
240 min Winter	20.147	0.0	3.0	232
360 min Winter	14.505	0.0	3.2	332
480 min Winter	11.486	0.0	3.4	376
600 min Winter	9.578	0.0	3.6	452
720 min Winter	8.254	0.0	3.7	528
960 min Winter	6.522	0.0	3.9	676
1440 min Winter	4.674	0.0	4.2	966
2160 min Winter	3.345	0.0	4.5	1380
2880 min Winter	2.636	0.0	4.8	1760
4320 min Winter	1.882	0.0	5.1	2508
5760 min Winter	1.481	0.0	5.4	3232
7200 min Winter	1.229	0.0	5.6	3896
8640 min Winter	1.055	0.0	5.7	4584
10080 min Winter	0.927	0.0	5.9	5152

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.950
Region	England and Wales	Cv (Winter)	0.950
M5-60 (mm)	20.800	Shortest Storm (mins)	15
Ratio R	0.442	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.004

Time (mins) From:	To:	Area (ha)
0	4	0.004

Model Details

Storage is Online Cover Level (m) 10.000

Cellular Storage Structure

Invert Level (m) 9.850 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m²)	Inf. Area (m²)
0.000	37.0	0.0

Orifice Outflow Control

Diameter (m) 0.011 Discharge Coefficient 0.600 Invert Level (m) 9.850

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

Half Drain Time : 1429 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	9.895	0.045	0.0	0.1	0.1	4.9	Flood Risk
30 min Summer	9.908	0.058	0.0	0.1	0.1	6.3	Flood Risk
60 min Summer	9.920	0.070	0.0	0.1	0.1	7.7	Flood Risk
120 min Summer	9.932	0.082	0.0	0.1	0.1	9.0	Flood Risk
180 min Summer	9.938	0.088	0.0	0.1	0.1	9.7	Flood Risk
240 min Summer	9.942	0.092	0.0	0.1	0.1	10.1	Flood Risk
360 min Summer	9.946	0.096	0.0	0.1	0.1	10.6	Flood Risk
480 min Summer	9.949	0.099	0.0	0.1	0.1	10.9	Flood Risk
600 min Summer	9.950	0.100	0.0	0.1	0.1	11.1	Flood Risk
720 min Summer	9.951	0.101	0.0	0.1	0.1	11.1	Flood Risk
960 min Summer	9.951	0.101	0.0	0.1	0.1	11.1	Flood Risk
1440 min Summer	9.950	0.100	0.0	0.1	0.1	11.0	Flood Risk
2160 min Summer	9.947	0.097	0.0	0.1	0.1	10.7	Flood Risk
2880 min Summer	9.944	0.094	0.0	0.1	0.1	10.4	Flood Risk
4320 min Summer	9.938	0.088	0.0	0.1	0.1	9.7	Flood Risk
5760 min Summer	9.932	0.082	0.0	0.1	0.1	9.0	Flood Risk
7200 min Summer	9.926	0.076	0.0	0.1	0.1	8.4	Flood Risk
8640 min Summer	9.921	0.071	0.0	0.1	0.1	7.8	Flood Risk
10080 min Summer	9.916	0.066	0.0	0.1	0.1	7.3	Flood Risk
15 min Winter	9.895	0.045	0.0	0.1	0.1	4.9	Flood Risk

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	149.324	0.0	3.2	19
30 min Summer	96.288	0.0	3.9	34
60 min Summer	59.033	0.0	6.8	64
120 min Summer	34.961	0.0	7.9	124
180 min Summer	25.405	0.0	8.4	184
240 min Summer	20.147	0.0	8.7	242
360 min Summer	14.505	0.0	9.2	362
480 min Summer	11.486	0.0	9.4	482
600 min Summer	9.578	0.0	9.6	602
720 min Summer	8.254	0.0	9.7	720
960 min Summer	6.522	0.0	9.8	952
1440 min Summer	4.674	0.0	9.7	1166
2160 min Summer	3.345	0.0	15.1	1536
2880 min Summer	2.636	0.0	15.6	1956
4320 min Summer	1.882	0.0	15.4	2768
5760 min Summer	1.481	0.0	18.6	3576
7200 min Summer	1.229	0.0	19.3	4392
8640 min Summer	1.055	0.0	19.8	5184
10080 min Summer	0.927	0.0	20.1	5952
15 min Winter	149.324	0.0	3.2	19

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

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
30 min Winter	9.908	0.058	0.0	0.1	0.1	6.3	Flood Risk
60 min Winter	9.920	0.070	0.0	0.1	0.1	7.7	Flood Risk
120 min Winter	9.932	0.082	0.0	0.1	0.1	9.0	Flood Risk
180 min Winter	9.938	0.088	0.0	0.1	0.1	9.7	Flood Risk
240 min Winter	9.942	0.092	0.0	0.1	0.1	10.1	Flood Risk
360 min Winter	9.946	0.096	0.0	0.1	0.1	10.6	Flood Risk
480 min Winter	9.949	0.099	0.0	0.1	0.1	10.9	Flood Risk
600 min Winter	9.951	0.101	0.0	0.1	0.1	11.1	Flood Risk
720 min Winter	9.952	0.102	0.0	0.1	0.1	11.2	Flood Risk
960 min Winter	9.952	0.102	0.0	0.1	0.1	11.2	Flood Risk
1440 min Winter	9.950	0.100	0.0	0.1	0.1	11.0	Flood Risk
2160 min Winter	9.946	0.096	0.0	0.1	0.1	10.6	Flood Risk
2880 min Winter	9.942	0.092	0.0	0.1	0.1	10.2	Flood Risk
4320 min Winter	9.934	0.084	0.0	0.1	0.1	9.2	Flood Risk
5760 min Winter	9.926	0.076	0.0	0.1	0.1	8.3	Flood Risk
7200 min Winter	9.918	0.068	0.0	0.1	0.1	7.5	Flood Risk
8640 min Winter	9.912	0.062	0.0	0.1	0.1	6.8	Flood Risk
10080 min Winter	9.906	0.056	0.0	0.1	0.1	6.2	Flood Risk

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
30 min Winter	96.288	0.0	3.9	34
60 min Winter	59.033	0.0	6.8	64
120 min Winter	34.961	0.0	7.9	122
180 min Winter	25.405	0.0	8.4	180
240 min Winter	20.147	0.0	8.7	240
360 min Winter	14.505	0.0	9.2	356
480 min Winter	11.486	0.0	9.4	472
600 min Winter	9.578	0.0	9.6	586
720 min Winter	8.254	0.0	9.7	700
960 min Winter	6.522	0.0	9.8	916
1440 min Winter	4.674	0.0	9.7	1198
2160 min Winter	3.345	0.0	15.1	1624
2880 min Winter	2.636	0.0	15.6	2080
4320 min Winter	1.882	0.0	15.4	2980
5760 min Winter	1.481	0.0	18.6	3808
7200 min Winter	1.229	0.0	19.3	4616
8640 min Winter	1.055	0.0	19.8	5448
10080 min Winter	0.927	0.0	20.1	6248

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.950
Region	England and Wales	Cv (Winter)	0.950
M5-60 (mm)	20.800	Shortest Storm (mins)	15
Ratio R	0.442	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.014

Time From:	(mins) To:	Area (ha)
0	4	0.014

Model Details

Storage is Online Cover Level (m) 10.000

Cellular Storage Structure

Invert Level (m) 9.850 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m²)	Inf. Area (m²)
0.000	116.0	0.0

Orifice Outflow Control

Diameter (m) 0.011 Discharge Coefficient 0.600 Invert Level (m) 9.850