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Wygate Park, Spalding

FLOOD RISK ASSESSMENT AND DRAINAGE STRATEGY

October 2018

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REPORT REFERENCE 18277/FRA

REVISION HISTORY

Revision	Amendments	Prepared By	Reviewed By	Date
First Issue	N/A	GBR	GBR	23/10/2018

1.0 INTRODUCTION

1.1 This Flood Risk Assessment (FRA) and Drainage Strategy has been prepared by Woods Hardwick Infrastructure LLP on behalf of Kier Living in support of a Hybrid Planning Application for the development of a site comprising approximately 2.416ha within the recently constructed Wygate Park development in Spalding, Lincolnshire. A Site Location Plan is included within **Appendix A.**

1.2 The proposal is for the development of a currently undeveloped area of the site to provide 34 residential units with a community facility, open space and related infrastructure. The application for the residential element of the proposal is in detail while the community use proposed on the site is in outline form.

1.3 According to the latest Environment Agency (EA) Mapping the site lies within Flood Zone 3 and therefore has an annual probability of flooding of greater than 1 in 100. It is therefore proposed that a minimum floor level is set above the flood level as previously agreed in relation to the wider development.

1.4 The document has been written in accordance with the guidance contained within the Flood Risk and Coastal Change section of the Government's Planning Practice Guidance.

1.5 The document also includes a Surface Water Drainage Strategy that identifies a suitable sustainable strategy for the disposal of surface water from the developed site that accords with the guidance contained within CIRIA C357 SuDS Manual 2015.

1.6 A foul water drainage strategy also included within this document.

2.0 EXISTING SITE AND PROPOSED DEVELOPMENT

2.1 Spalding is located within Lincolnshire, midway between Boston and Peterborough, which lie approximately 20km to the north and south respectively.

2.2 Wygate Park is a recently developed area within the west of Spalding. The site itself is located within the Wygate Park development on an area of land that was set aside for community use.

2.3 It is now proposed that part of this land is developed for residential use with the remainder being left undeveloped for community use. The details of the community facilities will be provided within a subsequent Reserved Matters Application. A Site Layout Plan is included within **Appendix B.**

2.4 A Flood Risk Assessment (2002) was prepared by Wormald Burrows Partnership and approved as part of the wider development which has now been constructed. Where appropriate, this document follows the principles established within the approved document. For reference, the front cover of the Wormald Burrows report is included within **Appendix C.**

2.5 Vehicular access to the site will be provided by a priority junction off the recently constructed spine road within the Wygate Park development.

3.0 FLOOD RISK

3.1 The purpose of this section is to identify whether or not there are any flood risks associated with the development which might affect the proposals or might have some impact on the surrounding environment. All aspects of flood risk have been considered as outlined below.

3.2 Following the increased frequency of flooding during recent years, much work has been undertaken at a national level to assess the relationship between new development and flood risk. This work resulted in the publication of Planning Policy Statement 25 (PPS25) in early 2007 with an update being released in March 2010.

3.3 Alongside the release of the National Planning Policy Framework (NPPF) in March 2012 the Technical Guidance to the NPPF (TGNPPF) was released serving as a flood risk based addendum to the national planning guidance. These documents replaced PPS25; however, many of the principles set out in PPS25 remain relevant. The TGNPPF has since been replaced by the Planning Practice Guidance which continues to follow the same principles.

3.4 Table 1 of the Flood Risk and Coastal Change section of the Planning Policy Guidance seeks to define different flood risk Zones where: Zone 1 is considered to be low risk since it is outside of the area which is likely to suffer inundation from a 0.1% probability rainfall event; Zone 2 is considered to be medium risk lying between the 0.1% probability flood contour and the 1% or 100 year flood area; Zone 3 is divided into 2 categories with Zone 3A having a >1% annual probability of river flooding or a >0.5% probability of flooding from the sea and Zone 3B being the functional floodplain. This guidance reaffirms the guidance and categorisation included within PPS25 and TGNPPF.

3.5 A copy of the EA's Indicative Flood Map relevant to the site is included in **Appendix D**.

Risk of Flooding to the Development from Known Sources

3.6 Notwithstanding the above, presented below is a summary and analysis of the potential for the site to flood from known sources.

Flooding from Rivers

3.7 The nearest River to the site is the River Welland, which runs through the centre of Spalding approximately 1.5km to the east of the site.

3.8 As confirmed by the EA flood mapping the site is shown as lying in the Flood Zone 3 and therefore being at risk of flooding during a 1 in 100 year storm event. As can be appreciated from the policy review above, residential development would not normally be considered appropriate within this Flood Zone. However, it is proposed that a minimum floor level of 3.20 AOD is provided for the dwellings across the site, in order to provide mitigation. The minimum level of 3.20 was agreed as part of the approved FRA for the wider site and the principle is therefore well established.

Flooding from the Sea

3.9 The EA flood mapping shows the Flood Zone extending from the sea to the site. The site is therefore potentially at risk of flooding from this source. However, the setting of the minimum floor level of 3.20m AOD as per the wider development is considered to offer suitable mitigation.

Flooding from Land

3.10 The potential for overland flows needs to be considered to ensure that neither the development nor adjacent property is placed at an unacceptable risk of flooding.

3.11 The existing topography of the site's surroundings means that the site lies at a slightly elevated position compared to its surroundings, the site is therefore not considered to be at risk of flooding from this source. The EA's indicative surface water flood mapping shows a small area of the site as being at risk of flooding from this source, however, no flow route is shown as passing through the site and the area at risk is therefore likely to correspond with the low spot. Given that the site will be positively drained this will not occur post development. A copy of the topographical survey is included within **Appendix E** and a copy of the EA's Indicative Surface Water Flood Map is included in **Appendix D**.

Flooding from Groundwater

3.12 Based upon investigations undertaken in relation to previous phases of the development a minimum floor level of 3.20 is proposed across the site in order to mitigate against the risk of flooding, it is therefore anticipated that at peak times shallow groundwater lies beneath the site meaning that the conditions would be unsuitable for drainage via infiltration.

3.13 A Site Investigation is currently being undertaken and the findings will confirm the underlying conditions including the resting groundwater level.

Flooding from Sewers

3.14 The nearest surface and foul water sewers are those located within the site and those constructed as part of the development of the wider site. From the topographical survey included within **Appendix E,** it can be appreciated that a foul water pumping station is located within the south western area of the site. A gravity foul water sewer discharges from the spine road and into the pumping station, while a foul water rising main exits the pumping station in an eastbound direction. Gravity foul water sewers enter the site from the north and east combining centrally within the site before continuing south bound to the southern boundary.

3.15 Surface water land drains are currently located within the site boundary connecting to a 300mm sewer located towards the south western boundary.

3.16 There is no known evidence of any of the sewers described above flooding.

Flooding from Reservoirs, Canals and Other Artificial Sources

3.17 According to the EA's Risk of Flooding from Reservoirs maps, the site is at risk of flooding from this source, it should however be noted that flooding from reservoirs is extremely rare with the last recorded incident resulting in loss of life occurring in 1925. The minimum floor level that has been set for dwellings on the site will assist in mitigating against such incidents.

Risk of Flooding from the Development

3.18 Presented below is a summary and analysis of the potential for the site to exacerbate the risk of flooding to third parties both upstream and downstream.

Contribution to Flood Flows by Development Drainage

3.19 The site is currently a greenfield site, however following its development it will comprise of 34 residential dwellings and a community facility and will include associated infrastructure including highways and other hard paved areas. These elements will all contribute to the development's surface water discharge.

3.20 The surface water disposal strategy for the site is described in greater detail in the Surface Water Drainage Strategy included within Section 4 of this document. Surface water will be attenuated on site in order to ensure that the post development runoff rate does not exceed the existing.

Climate Change

3.21 There is an increasing body of scientific evidence that suggests that the global climate is changing as a result of human activity. Past, present and future emissions of greenhouse gases are expected to cause significant climate change during this century.

3.22 The nature of climate change will vary: for the UK, projections of future climate change indicate that more frequent short-duration, high-intensity rainfall and more frequent periods of long-duration rainfall can be expected. These kinds of changes will have implications on river-flooding and also localised flash flooding.

3.23 The Planning Practice Guidance requires developments to consider the potential impacts of climate change. In February 2016 the EA released new guidance titled 'Flood risk assessments: climate change allowances' in which the peak rainfall intensity allowance in small and urban catchments is assessed. As such this assessment has made a 40% allowance for climate change. If necessary this allowance will be reduced at the detailed design stage to suit the specific requirements in the locality of the site.

4.0 SURFACE WATER DRAINAGE STRATEGY

4.1 In addition to ensuring that the development is not at risk of flooding from external sources, it is also important to ensure that the scheme itself does not exacerbate flood risk for others. It is therefore essential that the arrangements for storm water disposal are fully assessed to guarantee that the effects are mitigated and that there will be no impact on the existing land drainage regime.

4.2 All of the recent guidance on the arrangements for storm water disposal from new developments has encouraged the application of a hierarchy for surface water disposal. This has now been formalised in the Building Regulations Part H.

4.3 The first choice for surface water disposal which should be pursued is via infiltration and only where it has been determined that the ground conditions are not suitable should the second choice of disposal to ditch/watercourse be considered. If there is no alternative the third and last choice of disposal to public sewer can be considered.

Method of Surface Water Discharge

Infiltration

4.4 Due to the relatively shallow groundwater that is anticipated on the site, it is not considered that drainage via infiltration will be a feasible option. If, however in the unlikely event that the Site Investigation that is currently being undertaken suggests differently, then the strategy will be adjusted to facilitate an infiltration-base.

Ditch/Watercourse

4.5 The drainage strategy that has been designed and implemented in relation to the wider site comprises a piped network that discharges to the Pennygate Drain in the vicinity of Monks House Lane. The proposed drainage strategy is therefore to discharge to the surface water sewer within the highway that forms the southern boundary of the site, through which flows will be conveyed to the ditch network.

Discharge Strategy

Rainfall Data

4.6 The Flood Studies Report (FSR) methodology has been used within the modelling of the proposed drainage strategy, this being a requirement of Anglian Water who will be the adopting body.

Runoff Rate

4.7 The drainage strategy has been developed to ensure that the post development rate of runoff from the site does not exceed the greenfield rate. To ensure that this is not the case, the greenfield rate has been calculated based upon the area of impermeable surfacing proposed on the site using the ICP SUDS feature of the Micro drainage Software. The resultant rate of runoff is 3.2 l/s. A copy of the relevant calculation is included within **Appendix F.**

Drainage Strategy

4.8 Included within **Appendix G** is a copy of the Proposed Levels and Drainage Strategy drawing for the site. From the drawing it can be appreciated that the proposal is for surface water runoff from the impermeable areas of the site to be conveyed via a traditional piped network to an attenuation basin located within the south eastern area of the site.

4.9 The network has been modelled for a 1 in 100 year storm with an additional 40% allowance for climate change, using the industry standard Microdrainge Software. The modelling results are included within **Appendix H** and confirms that 493m³ of surface water storage will be required to accommodate a 1 in 100 year + 40% climate change storm, the attenuation basin has therefore been designed to provide this volume of storage.

4.10 Surface water will then discharge from the attenuation basin into the existing ditch within the site at a rate of 3.21 l/s. From the ditch the flows will discharge via the existing network prior to ultimately discharging to the Pennygate Drain to the east.

4.11 The attenuation basin has been designed with side slopes of generally 1:3 with a gradient of 1:5 being provided at its northern extent to facilitate emergency access/egress.

4.12 As can be appreciated from the Proposed Levels and Drainage Strategy drawing, it is proposed that as part of the works the existing ditch within the site will be reprofiled to provide 1:5 side slopes on the site side in order to allow for ease of maintenance and access/egress during an emergency. The proposed adjustments will not impact upon the existing storage capacity of the ditch.

Maintenance

4.13 The arrangements for further maintenance of the surface water drainage system needs to be fully considered and, in that respect, it is anticipated that the piped drainage network would be adopted by Anglian Water Services Ltd. The basin will be offered for adoption to Lincolnshire County Council in their role as Lead Local Flood Authority. However, if they do not wish to adopt, the basin will be maintained by a Developer funded Management Company.

5.0 FOUL WATER DRAINAGE STRATEGY

5.1 As alluded to previously within this report and as shown on the topographical survey included within **Appendix E,** it can be appreciated that existing adopted foul water gravity sewers cross the development parcel.

5.2 The sewers that cross the site gravitate to the on-site pumping station prior to onward discharge towards the treatment works.

5.3 The proposal is therefore to discharge to the sewers within the site.

5.4 The water Industry Act obliges Water Authorities to ensure that the sewerage treatments works have capacity to accommodate foul water flows from developments with the benefit of planning consent. The Water Authority is also obliged to ensure that there is sufficient capacity within the sewer network.

5.5 Anglian Water currently apply a 'Zonal Charge' to new developments which funds any reinforcement works that may be required. No problems are therefore anticipated in terms of capacity within the receiving network.

5.6 The new onsite sewers will be offered to Anglian Water for adoption under Section 104 of the Water Industry Act.

6.0 SUMMARY AND CONCLUSIONS

6.1 This FRA and Drainage Strategy has been prepared by Woods Hardwick Infrastructure LLP in support of a Hybrid Planning Application for the development of a parcel of land within a wider site known as Wygate Park, Spalding, Lincolnshire.

6.2 The site is shown on the EA's Indicative Flood Mapping as lying within Flood Zone 3 and therefore having an annual probability of flooding of greater than 1 in 100. Given that the surrounding land has the same flood risk classification and has recently been developed the development of this additional land is considered to be acceptable on the basis that the same minimum floor level will be set as within the wider development.

6.3 It has also been demonstrated that the proposed development will not exacerbate the risk of flooding to third parties either upstream or downstream from the site.

6.4 The drainage strategy has been developed in accordance with the hierarchy for sustainable surface water disposal. The underlying conditions are such that the use of infiltration techniques is not feasible, it is therefore proposed that surface water is attenuated on site prior to discharge to the wider site's drainage network at the greenfield rate prior to discharge to the ditch network to the west.

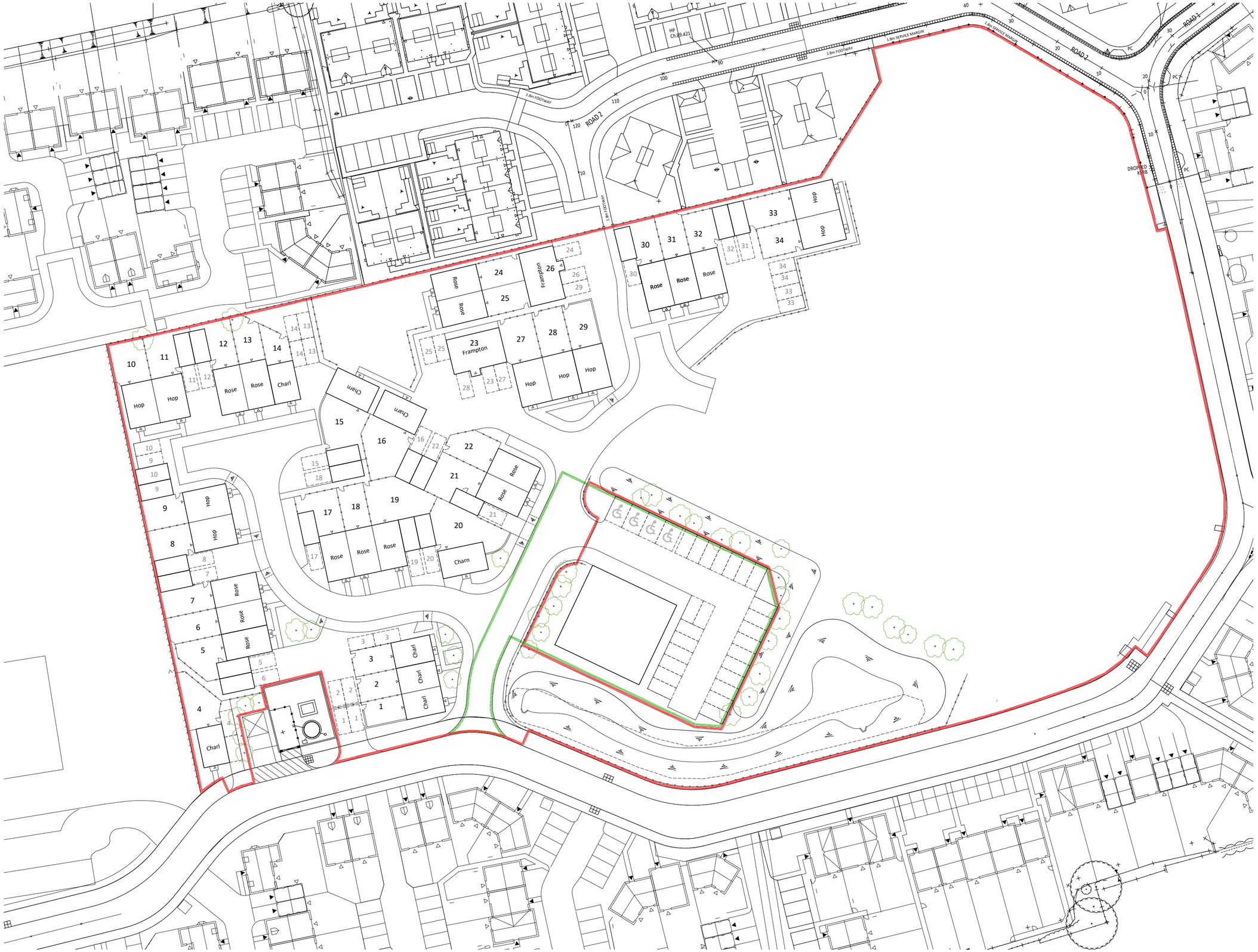
6.5 The drainage strategy has been designed to accommodate a 1 in 100 year storm with an additional 40% allowance for climate change.

6.6 It is anticipated that Anglian Water Services Ltd will maintain the piped drainage network. The attenuation basin will be offered for adoption to Lincolnshire County Council in their role as Lead Local Flood Authority, however in the event that they do not wish to adopt the basin they will be maintained by a developer funded management company.

6.7 The document also includes a foul water drainage strategy that proposes to discharge via gravity to the existing foul water sewers within the site.

6.8 **It can therefore be concluded that in terms of flood risk and drainage the additional residential development proposed within Wygate Park should be fully supported through the planning process.**

Appendix A
Site Location Plan



N

0 5 10 15 20 25m

Notes

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CDM 2015
This drawing is for illustrative purposes and/or obtaining the relevant planning permission only. It should not be used for construction and accordingly, risk identification under the Construction (Design & Management) Regulations 2015 has not been undertaken.

Full application
2.242ha

Outline application
0.174ha

Rev	Description	Date

rdc
Robert Doughty Consultancy

32 High Street, Helpringham
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Tel: 01529 421646
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Client
Kier Living Ltd

Project
Central Open Space
Wygate Park, Spalding

Drawing
Areas Plan

Scale @ A2	Date
1: 500	22/10/18

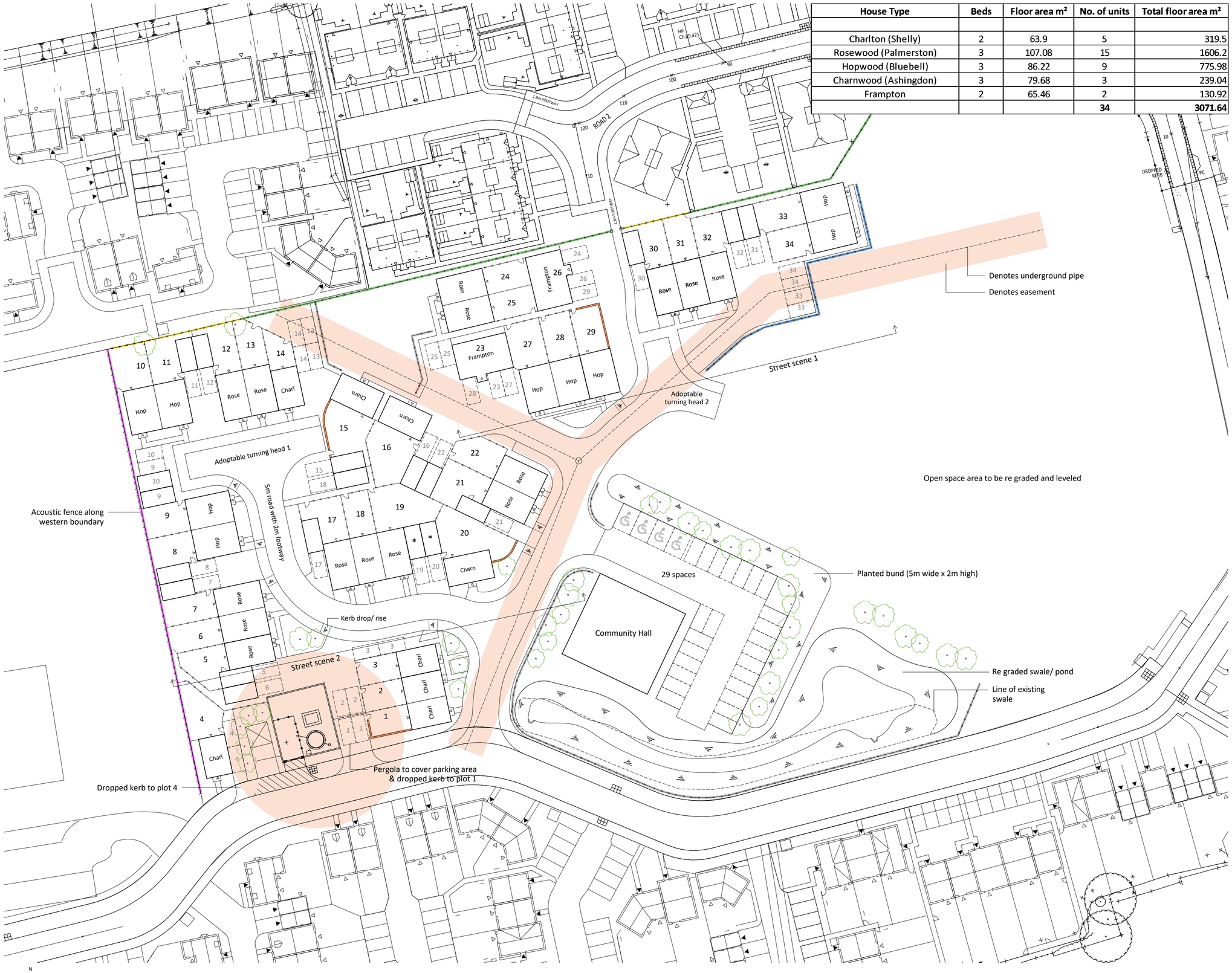
Drawn By	Checked By
WW	RJCD

Job Number	Status	Purpose of Issue
520-247	PL	Planning

Drawing No.	Rev
520-247_PL_SP103	-

Appendix B
Planning Layout

House Type	Beds	Floor area m²	No. of units	Total floor area m²
Charlton (Shelly)	2	63.9	5	319.5
Rosewood (Palmerston)	3	107.08	15	1606.2
Hopwood (Bluebell)	3	86.22	9	775.98
Charnwood (Ashingdon)	3	79.68	3	239.04
Frampton	2	65.46	2	130.92
			34	**3071.64**



Notes

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* Denotes garage

Boundary Treatments Key

- 1.8m high close boarded fence
- 1.8m high acoustic fence
- 1.2m high post & rail fence
- 0.5m high knee rail fence
- 1.8m high garden wall
- Existing metal fence
- Existing metal fence to be replaced or retained with the addition of a 1.8m high close boarded fence

Rev	Description	Date

rdc
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32 High Street, Helpringham
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Tel: 01529 421646
Email: admin@rdc-landplan.co.uk
Web: www.rdc-landplan.co.uk

Client
Kier Living Ltd

Project
Central Open Space
Wygate Park, Spalding

Drawing
Site Plan

Scale @ A2	Date
1: 500	22/10/18

Drawn By	Checked By
WW	RJCD

Job Number	Status	Purpose of Issue
520-247	PL	Planning

Drawing No.	Rev
520-247_PL_SP101	-

Appendix C

Wormald Burrows Approved FRA

PROPOSED DEVELOPMENT AT WYGATE PARK, SPALDING, LINCOLNSHIRE

FLOOD RISK ASSESSMENT

for

ALLISON HOMES EASTERN LIMITED

Wormald Burrows Partnership
12a-14a Hitchin Street
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Bedfordshire
SG18 8AX

Tel. 01767 317244
Fax. 01767 315434
e-mail: engineer@wormburp.com
web: http://www.wormburp.com

Ref: REF: E1081/WD/sm/reportFRA
Revision No. 0

January 2002

Appendix D

Environment Agency Indicative Flood Map

Flood map for planning

Your reference	Location (easting/northing)	Created
Wygate Park	**523804/323072**	**22 Oct 2018 9:44**

Your selected location is in flood zone 3, an area with a high probability of flooding.

This means:

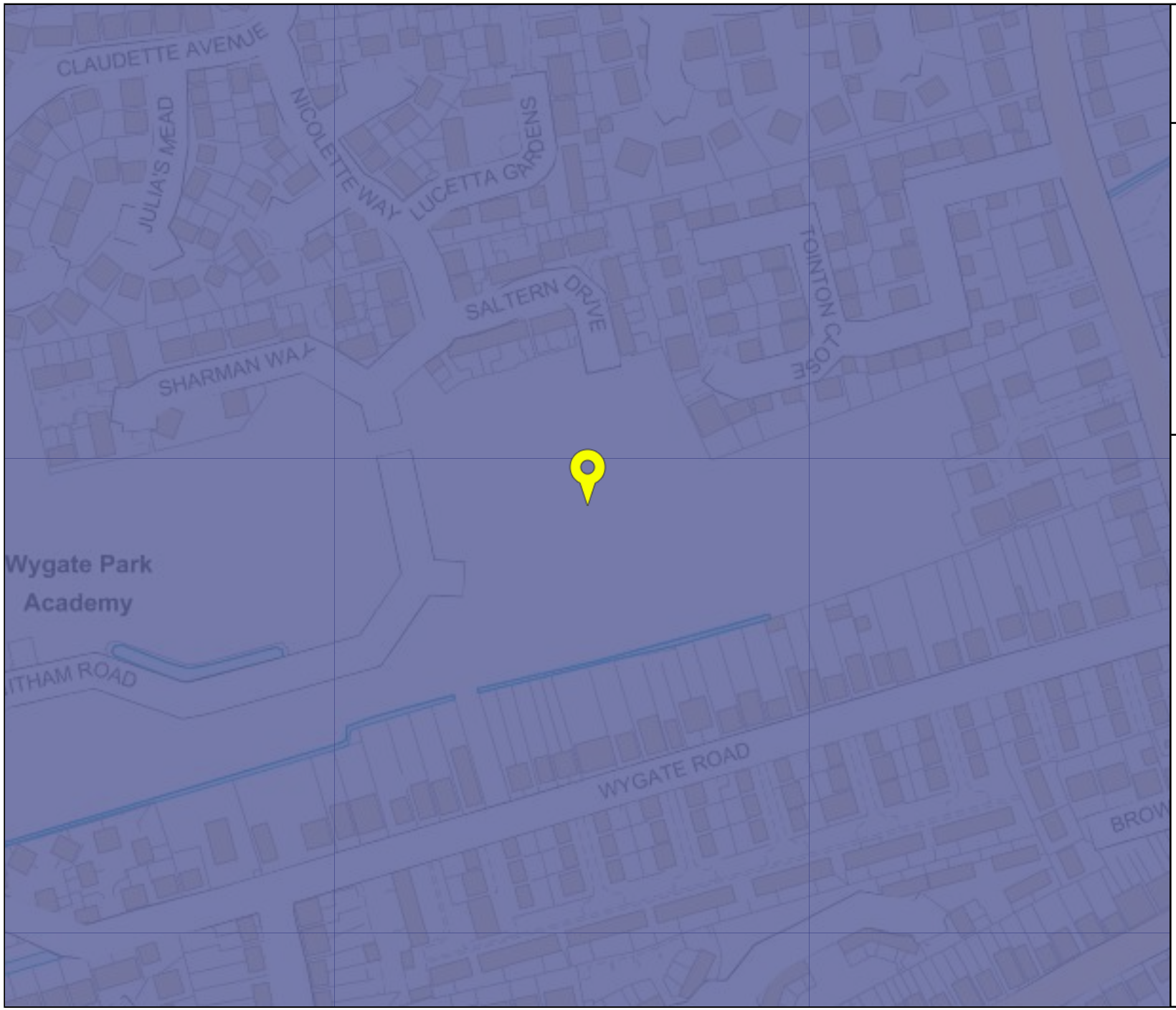
- you must complete a flood risk assessment for development in this area
- you should follow the Environment Agency's standing advice for carrying out a flood risk assessment (see www.gov.uk/guidance/flood-risk-assessment-standing-advice)

Notes

The flood map for planning shows river and sea flooding data only. It doesn't include other sources of flooding. It is for use in development planning and flood risk assessments.

This information relates to the selected location and is not specific to any property within it. The map is updated regularly and is correct at the time of printing.

The Open Government Licence sets out the terms and conditions for using government data. https://www.nationalarchives.gov.uk/doc/open-government-licence/version/3/



Environment Agency

Flood map for planning

Your reference
Wygate Park

Location (easting/northing)
523804/323072

Scale
1:2500

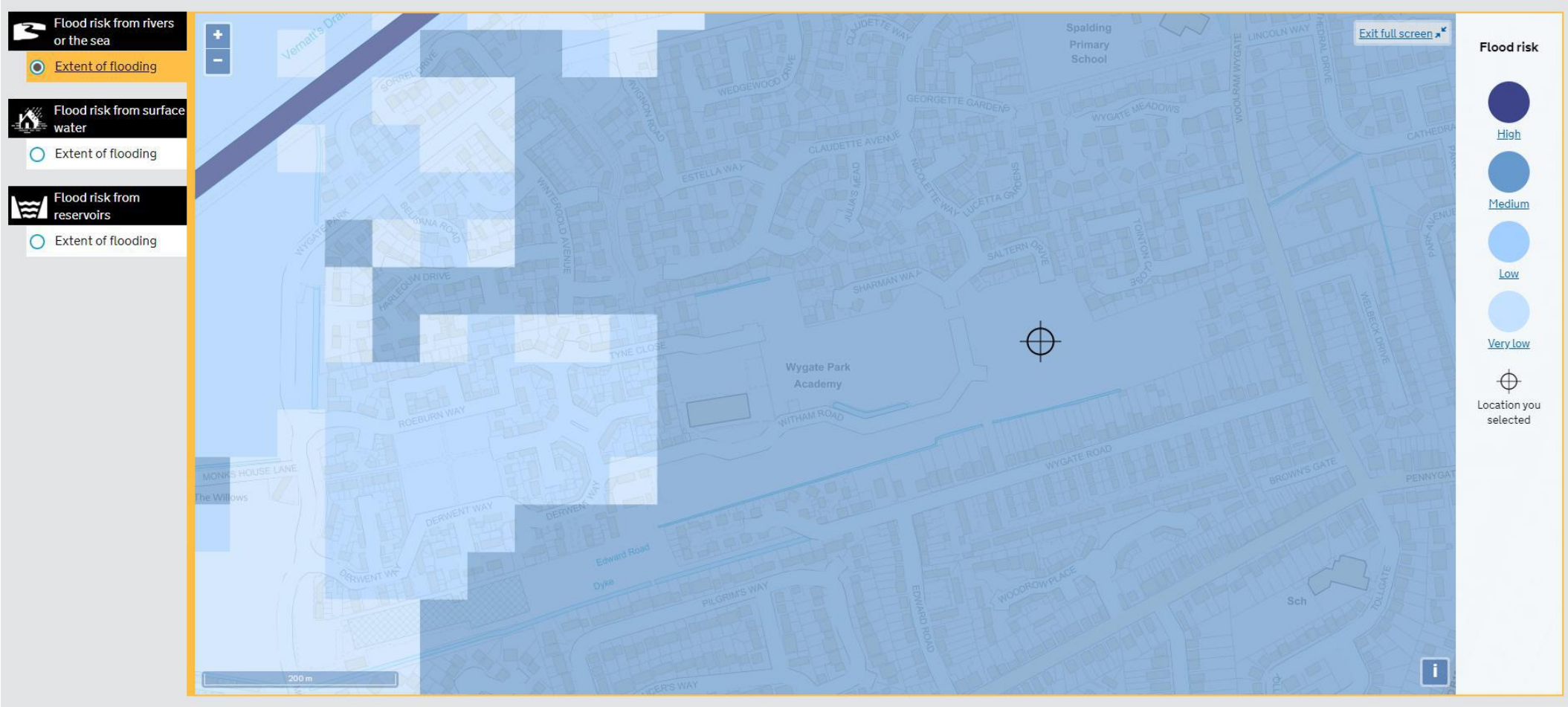
Created
22 Oct 2018 9:44

- Selected point
- Flood zone 3
- Flood zone 3: areas benefitting from flood defences
- Flood zone 2
- Flood zone 1
- Flood defence
- Main river
- Flood storage area

0 20 40 60m

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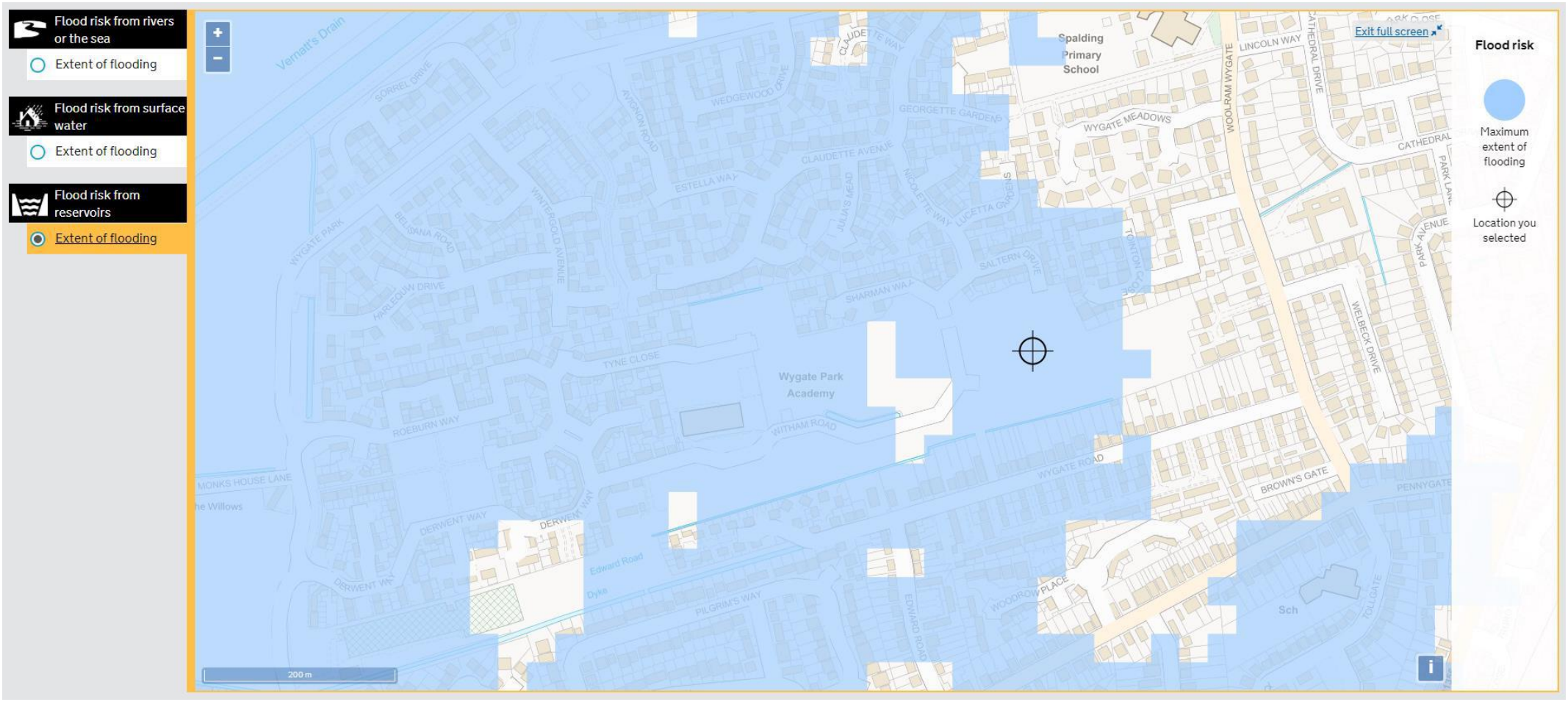
Flood Risk from Rivers or the Sea



Flood Risk from Surface Water



Flood Risk from Reservoirs



Appendix E
Topographical Survey

KEY

TOPOGRAPHICAL KEY

SURVEY STATION 5

BANKING TOP / BOTTOM

HEDGE SPREADS

WOODLAND CANOPY

ARROW ON STEPS / RAMPS INDICATES DIRECTION UP/AMIDS

TREES SPREAD & GIRTH SHOWN TO SCALE

GATE

KERB CHANNEL

ROAD UNKERBED

FENCE

WALL

BUILDING

OPEN SIDED BUILDING

OVERHANG / CANOPY

GLASSHOUSE

CONTOUR 25.00

SPOT LEVEL + 127.13 SONAR LEVEL ⊙ 127.13

BORE HOLE BH

TRIAL HOLE TH

FOOTPATH

CHANGE IN SURFACE

GENERAL

Av	AVERAGE
(ACP)	ASSUMED CONNECTION POINT
COW	CABLE ON WALL
CW	COMBINED WATER
D	DROP
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	HARD 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
NFI	NO FURTHER INFORMATION
NOV	NO DUCTS VISIBLE
NPV	NO PIPES VISIBLE
OSBM	ORDNANCE SURVEY BENCHMARK
POW	PIPE ON WALL
RDOS	ROAD OUTLET
RED	REDUNDANT SERVICE
RW	RETAINING WALL
SB	SOFT BED
SNP	STREET NAME PLATE
SW	SURFACE WATER
TAC	TACTILE PAVING
TBM	TEMP BENCH
TW	TRADE EFFLUENT WATER
UTL	UNABLE TO LOCATE
UTR	UNABLE TO RAISE
UTS	UNABLE TO SURVEY

APPARATUS

ACU	AIR CONDITIONING UNIT
AV	AIR VALVE
BCN	BEACON / BEACON
BO	BOLLARD
BOL	BOLLARD LIGHT
BS	BUS STOP
CATV	CABLE TELEVISION
CB	CONTROL BOX
CCB	CROSSING CONTROL BUTTON
CH	CHAMBER
CR	CABLE RISER
DCH	DRAINAGE CHANNEL
EB	ELECTRIC CONTROL BOX
EP	ELECTRIC POLE
ER	EARTH ROD
FD	FILTER DRAIN
FFP	FUEL TANK FILL POINT
FH	GAS HYDRANT
GM	GAS METER
GV	GAS VALVE
GY	GULLY
IC	INSPECTION COVER
INT	INTERCEPTOR
IT	INLET
KO	KERB OUTLET
LA	LIGHTING ACTUATOR
LH	LAMP HOLE
LP	LAMP POST
MH	MANHOLE
MK	MARKER POST / PLATE
MT	METER
MW	MONITORING WELL
OG	OIL GAS
OU	OUTFALL
PO	POST
PTG	PIPE TO GROUND
PTS	PIPE TO SURFACE
PU	PUMP
RE	RODDING EYE
RG	RODDING GULLY
RM	RISING MAIN
RWP	RAIN WATER PIPE
SC	STOP COCK
SP	SOIL PIPE
ST	STAY CABLE
SV	STOP / SLUICE VALVE
SVP	SOIL VENT PIPE
TCB	TELEPHONE CALL BOX
TE	TELEPHONE JUNCTION COVER
TL	TRAFFIC LIGHT
TLC	TRAFFIC LIGHT COVER
TM	TICKET MACHINE
TP	TELECOM POLE
VP	VENT PIPE
WM	WATER METER
WO	WATER OUTLET
WR	WATER RISER
WT	WATER TAP
WW	WET WELL

DEPTHS

d	ELECTRONICALLY DERIVED
Pd	PASSIVELY DERIVED
Gd	BASE OF GULLY
Cd	DEPTH TO CROWN
Id	DEPTH TO INVERT
Sd	DEPTH TO SOFFIT

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 Q64 (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.

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
PVC-U	ULTRA RIB (PVC)
SI	SPUN IRON
ST	STEEL
VC	VITRIFIED CLAY

FENCES

BW	BARBED WIRE FENCE
CB	CLOSED BOARDED FENCE
CF	CHAIN LINK FENCE
CI	CORRUGATED IRON FENCE
CNP	CHESTNUT PAILING
CL	CHAIN LINK FENCE
IR	IRON RAILINGS
LIL	LARCH LAP FENCE
PIR	POST AND RAIL FENCE
PW	POST AND WIRE FENCE
WM	WIRE MESH FENCE

LEVELS

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

LINESTYLE

INTERNAL METER (MT)

POT ENDED SERVICE

SEWER CAPPED RUN (CR)

SURVEY ABANDONED

INTERNAL VALVE (IV)

UNKNOWN UNDERGROUND ANOMALY (UU)

UNDERGROUND CHAMBERS (UC)

POST PROCESSING AREA (PPA)

ABOVE GROUND (AG)

ASSUMED ROUTE (AR)

EMPTY DUCTS (E)

OVERHEAD (OH)

BACK DROP

P TRAP

UTILITY CROSSOVER

SURVEY BOUNDARY

VERBAL INFORMATION (VI)

RECORD INFORMATION (R)

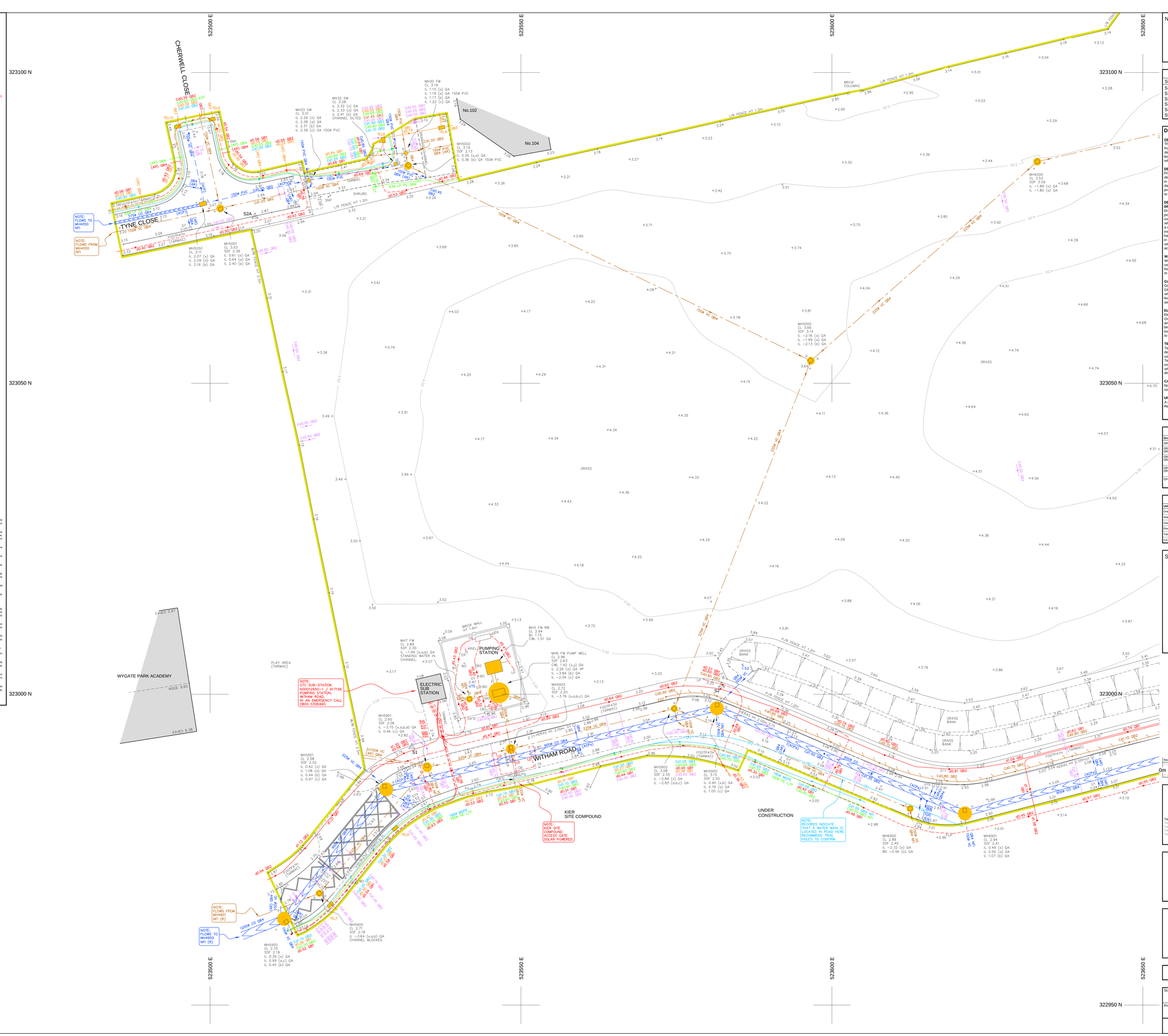
REDUNDANT SERVICE

RISING MAIN

CCTV SECTION 4 AND 5 FAULTS ARE SHOWN IN RED

SERVICE TYPE

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	



Notes :

1. GRID AND LEVELS BASED ON ORDNANCE DATUM, DERIVED FROM THE NATIONAL GNSS NETWORK. LOCAL SCALE FACTOR APPLIED (0.999979).
2. TREE AND HEDGE SPECIES HAVE BEEN IDENTIFIED AS ACCURATELY AS POSSIBLE BUT SHOULD BE CROSS CHECKED IN CRITICAL AREAS.
3. THIS SURVEY SHOULD ALWAYS BE READ IN CONJUNCTION WITH THE DESKTOP UTILITY REPORT THAT WAS CARRIED OUT AS A PREREQUISITE TO THIS DETECTION SURVEY.

Coordinate Table

Station	Description	Easting	Northing	Level
S1	Road Nail	523522.661	322991.542	2.738
S2	Road Nail	523582.240	323001.426	3.297
S2A	Road Nail	523507.224	323076.842	3.082
S3	Road Nail	523666.601	322999.401	3.434
S4	Road Nail	523720.617	323049.315	3.107
S5	Road Nail	523706.071	323112.236	3.200

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 tifted where possible 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 otherwise. In instances where other detection methods were unsuccessful connections between manholes have been assumed to be straight and labelled as Q64. All drainage should be cross checked in critical areas by CCTV survey or verification survey type A. Possible Land Drains present within open grass area in the centre of the survey area. Unknown GPR anomalies located across this area.

WATER

Water mains located within the survey area are plastic and have therefore been positioned using GPR methods with derived depths recorded to quality level Q82. Property connections located where possible. Where this has not been possible assumed routes have been added to quality level Q64

GAS

Gas mains located within the survey area are plastic and have therefore been located using GPR methods with derived depths recorded to quality level Q82. Property connections located where possible. Where this has not been possible assumed routes have been added to quality level Q64. Unable to locate a section of pipe line along Tyne Close and Sharman Way. These sections have been added from records to quality level Q64.

ELECTRICITY

Electric cables within the survey area have been initially located using EML passive sweeps. Once located EML signal induction and direct connection methods were used to locate routes and obtain electronically derived depths to quality level Q82. Where possible routes have also been located using GPR methods to increase the quality level to Q81. Property connections located where possible. Where this has not been possible assumed routes have been added to quality level Q64

TELECOM

Telecom ducts have been located using EML signal induction methods with electronically derived depths recorded to quality level Q82. Where possible ducts have also been located using GPR methods to increase the quality level to Q81. 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

No evidence of CATV ducts located within the survey area. Available record information confirms this.

UNKNOWNS

A number of unknown anomalies located across the survey area using GPR methods. Recommend trial excavations in critical areas.

SEE CAUTIONARY NOTES WITHIN THE UTILITY KEY

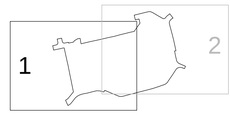
PAS 128:2014 Quality Level Guide

Quality Level	Description	Accuracy
Q84	A utility is expected to exist but cannot be detected - (AR), (R), (VI)	Undefined
Q83 Q83P	Horizontal location only using one geophysical technique. No depth information - NDI.	+/- 500mm Horizontal Undefined Vertical
Q82 Q82P	Horizontal and vertical location only using one geophysical technique.	+/- 250mm or +/- 40% of depth whichever is greater
Q81 Q81P	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

Desktop Utility Records

Utility Type	Provider Details	Date Acquired
Drainage	Anglian Water	16/05/2018
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Gas	Cadent Gas Limited + GTC Plant	16/05/2018
Electricity	Western Power Distribution + GTC Plant	16/05/2018
Telecom	Openreach	16/05/2018
CATV	Virgin Media	10/05/2018

Sheet Layout: (Not to Scale)



Revision	Description	Surv. by	Appr. by	Date

0m 2 4 6 8 10 12 14 16 18 20 22

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West Midlands — westmidlands@mksurveys.co.uk
Horsham — horsham@mksurveys.co.uk

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

KIER

Wygate
Spalding
Lincolnshire

Topographical and PAS 128:2014 Utility Survey

Scale	Sheet Size:	Sheet Number:	Date:
1:200	A0	1	May 2018
Project Number:	Rev:	Surveyed By:	Approved By:
25466	-	LMS / DSR	AJ / TW

KEY

TOPOGRAPHICAL KEY

SURVEY STATION 5

BANKING (TOP / BOTTOM)

HEDGE SPREADS

WOODLAND CANOPY

ARROW ON STEPS / RAMPS INDICATES DIRECTION UP/AMIDS

TREES (SPREAD & GIRTH SHOWN TO SCALE)

GATE

KERB CHANNEL

ROAD UNKERBED

FENCE

WALL

BUILDING

OPEN SIDED BUILDING

OVERHANG / CANOPY

GLASSHOUSE

CONTOUR 25.00

SPOT LEVEL + 127.13 SONAR LEVEL ⊙ 127.13

BORE HOLE BH

TRIAL HOLE TH

FOOTPATH

CHANGE IN SURFACE

GENERAL

Av	AVERAGE
(ACP)	ASSUMED CONNECTION POINT
COW	CABLE ON WALL
CW	COMBINED WATER
D	DRAIN
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
HER	HERITAGE
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
NFI	NO FURTHER INFORMATION
NDV	NO DUCTS VISIBLE
NPV	NO PIPES VISIBLE
OSBM	ORDNANCE SURVEY BENCHMARK
POW	PIPE ON WALL
RWDX	RAIN WATER
RED	REDUNDANT SERVICE
RW	RETAINING WALL
SB	SOFT BED
SNP	STREET NAME PLATE
SW	SURFACE WATER
TAC	TACTILE PAVING
TBM	TEMP BENCH
TW	TRADE EFFLUENT WATER
UTL	UNABLE TO LOCATE
UTR	UNABLE TO RAISE
UTS	UNABLE TO SURVEY

APPARATUS

ACU	AIR CONDITIONING UNIT
AV	AIR VALVE
BCN	BEACON / BEACON
BO	BOLLARD
BOL	BOLLARD LIGHT
BS	BUS STOP
CATV	CABLE TELEVISION
CB	CONTROL BOX
CCB	CROSSING CONTROL BUTTON
CH	CABLE HOLE
CR	CABLE RISER
DCH	DRAINAGE CHANNEL
EB	ELECTRIC CONTROL BOX
EP	ELECTRIC POLE
ER	EARTH ROD
FD	FILTER DRAIN
FFP	FUEL TANK FILL POINT
FH	FIRE HYDRANT
GM	GAS METER
GV	GAS VALVE
GY	GULLY
IC	INSPECTION COVER
INT	INTERCEPTOR
IT	INLET
KO	KERB OUTLET
LC	LAMP COLLECTOR
LH	LAMP HOLE
LP	LAMP POST
MH	MANHOLE
MK	MARKER POST / PLATE
MT	METER
MW	MONITORING WELL
OG	OUTFALL
OU	OUTFALL
PO	POST
PTG	PIPE TO GROUND
PTS	PIPE TO SURFACE
PU	PUMP
RE	RODDING EYE
RG	ROOF GULLY
RM	RISING MAIN
RWP	RAIN WATER PIPE
SC	STOP COCK
SP	SOIL PIPE
ST	STAY CABLE
SV	STOP / SLUICE VALVE
SVP	SOIL VENT PIPE
TCB	TELEPHONE CALL BOX
TCI	TELEPHONE INSPECTION COVER
TL	TRAFFIC LIGHT
TLC	TRAFFIC LIGHT COVER
TM	TICKET MACHINE
TP	TELECOM POLE
VP	VENT PIPE
WM	WATER METER
WO	WATER OUTLET
WR	WATER RISER
WT	WATER TAP
WW	WET WELL

DEPTHS

d	ELECTRONICALLY DERIVED
Pd	PASSIVELY DERIVED
Gd	BASE DEPTH
Sd	DEPTH TO CROWN
Id	DEPTH TO INVERT
Sd	DEPTH TO SOFFIT

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 prevented us from being able 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, where it is 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.
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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 Q64 (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.
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PT	P TRAP LEVEL
RL	ROOF LEVEL
SOF	SOFFIT LEVEL
THL	THRESHOLD LEVEL
WL	WATER LEVEL

LINESTYLE

INTERNAL METER (MT)

POT ENDED SERVICE

SEWER CAPPED RUN

SURVEY ABANDONED

INTERNAL VALVE

UNKNOWN UNDERGROUND ANOMALY

UNDERGROUND CHAMBERS

POST PROCESSING AREA (PINK/YELLOW)

ABOVE GROUND (AG)

ASSUMED ROUTE (AR)

EMPTY DUCTS (E)

OVERHEAD (OH)

BACK DROP

P TRAP

UTILITY CROSSOVER

SURVEY BOUNDARY

VERBAL INFORMATION (VI)

RECORD INFORMATION (R)

REDUNDANT SERVICE

RISING MAIN

CCTV SECTION 4 AND 5 FAULTS ARE SHOWN IN RED

SERVICE TYPE

ELECTRICITY (HV)

ELECTRICITY (LV)

FUEL

GAS

HEATING

OVERHEAD ELECTRIC

OVERHEAD TELECOM

TRADE EFFLUENT

COMBINED SEWER

FOUL SEWER

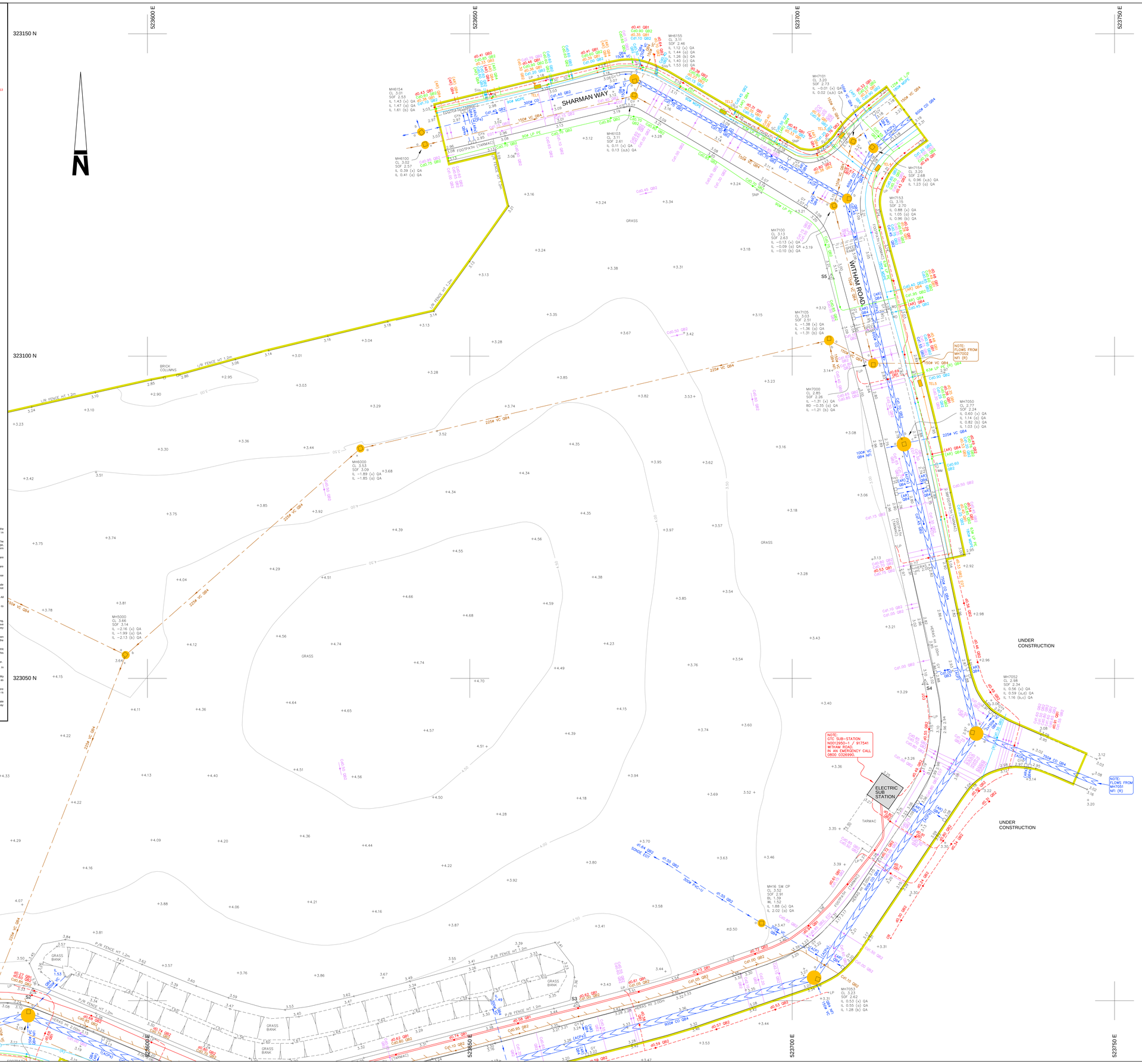
SURFACE SEWER

UNIDENTIFIED SEWER

TELECOM

UNKNOWN SERVICE

WATER



Notes :

1. GRID AND LEVELS BASED ON ORDNANCE DATUM, DERIVED FROM THE NATIONAL GNSS NETWORK. LOCAL SCALE FACTOR APPLIED (099979).
2. TREE AND HEDGE SPECIES HAVE BEEN IDENTIFIED AS ACCURATELY AS POSSIBLE BUT SHOULD BE CROSS CHECKED IN CRITICAL AREAS.
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Coordinate Table

Station	Description	Easting	Northing	Level
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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 surveys 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 consulted, records received and dates the information was obtained, please refer to the attachments page of the desktop utility report.

DETECTION SURVEY

DRAINAGE

Drainage was tifted where possible 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 otherwise. In instances where other detection methods were unsuccessful connections between manholes have been assumed to be straight and labelled as Q84. All drainage should be cross checked in critical areas by CCTV survey or verification survey type A. Possible Land Drains present within open grass area in the centre of the survey area. Unknown GPR anomalies located across this area.

WATER

Water mains located within the survey area are plastic and have therefore been positioned using GPR methods with derived depths recorded to quality level Q82. Property connections located where possible. Where this has not been possible assumed routes have been added to quality level Q84

GAS

Gas mains located within the survey area are plastic and have therefore been located using GPR methods with derived depths recorded to quality level Q82. Property connections located where possible. Where this has not been possible assumed routes have been added to quality level Q84. Unable to locate a section of pipe line along Tyne Close and Sharman Way. These sections have been added from records to quality level Q64.

ELECTRICITY

Electric cables within the survey area have been initially located using EML passive sweeps. Once located EML signal induction and direct connection methods were used to locate routes and obtain electronically derived depths to quality level Q82. Where possible routes have also been located using GPR methods to increase the quality level to Q81. Property connections located where possible. Where this has not been possible assumed routes have been added to quality level Q84

TELECOM

Telecom ducts have been located using EML signal induction methods with electronically derived depths recorded to quality level Q82. Where possible ducts have also been located using GPR methods to increase the quality level to Q81. 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

No evidence of CATV ducts located within the survey area. Available record information confirms this.

UNKNOWNS

A number of unknown anomalies located across the survey area using GPR methods. Recommend trial excavations in critical areas.

SEE CAUTIONARY NOTES WITHIN THE UTILITY KEY

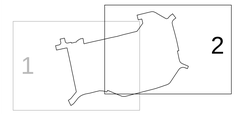
PAS 128:2014 Quality Level Guide

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Electricity	Western Power Distribution + GTC Plant	16/05/2018
Telecom	Openreach	16/05/2018
CATV	Virgin Media	10/05/2018

Sheet Layout: (Not to Scale)



Revision	Description	Surv. by	Appr. by	Date

0m 2 4 6 8 10 12 14 16 18 20 22

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Topographical and PAS 128:2014 Utility Survey

Scale	Sheet Size:	Sheet Number:	Date:
1:200	A0	2	May 2018
Project Number:	**Rev:**	**Surveyed By:**	**Approved By:**
25466	-	LMS / DSR	AJ / TW

Appendix F
Greenfield Runoff Rate Calculation

Rural Runoff Calculator

ICP SUDS

ICP SUDS Input (FSR Method)

Return Period (Years): 100
Area (ha): 0.632
SAAR (mm): 565
Soil: 0.300
Growth Curve: (None)
Map
Calculate

Partly Urbanised Catchment (QBAR)

Urban: 0.000
Region: Region 5

Results

QBAR rural (l/s): 0.9
QBAR urban (l/s): 0.9

Return Period Flood

Region	QBAR (l/s)	Q (100yrs) (l/s)	Q (1 yrs) (l/s)	Q (30 yrs) (l/s)	Q (100 yrs) (l/s)
Region 1	0.9	2.2	0.8	1.7	2.2
Region 2	0.9	2.4	0.8	1.7	2.4
Region 3	0.9	1.9	0.8	1.6	1.9
Region 4	0.9	2.3	0.7	1.8	2.3
Region 5	0.9	3.2	0.8	2.2	3.2
Region 6/Region 7	0.9	2.9	0.8	2.0	2.9
Region 8	0.9	2.2	0.7	1.7	2.2
Region 9	0.9	2.0	0.8	1.6	2.0
Region 10	0.9	1.9	0.8	1.5	1.9
Ireland National	0.9	1.6	0.8	1.4	1.6
Ireland East	0.9	1.7	0.8	1.5	1.7
Ireland South	0.9	1.6	0.8	1.4	1.6
Ireland West	0.9	1.6	0.8	1.4	1.6
Ireland Greater Dublin	0.9	2.3	0.8	1.9	2.3

IH 124
ICP SUDS
ADAS 345
FEH
Greenfield Volume

OK
Cancel
Help

Enter Return Period between 1 and 1000

Appendix G

Indicative Drainage Strategy Drawing

NOTES

1. CONTRACTORS MUST CHECK ALL DIMENSIONS ON SITE. ONLY FIGURED DIMENSIONS ARE TO BE WORKED FROM. DISCREPANCIES MUST BE REPORTED TO THE ARCHITECT OR ENGINEER BEFORE PROCEEDING. © THIS DRAWING IS COPYRIGHT.
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3. UNTIL TECHNICAL APPROVAL HAS BEEN OBTAINED FROM THE RELEVANT AUTHORITIES, ALL DRAWINGS ARE ISSUED AS PRELIMINARY AND NOT FOR CONSTRUCTION. SHOULD THE CONTRACTOR COMMENCE SITE WORK PRIOR TO APPROVAL BEING GIVEN IT IS ENTIRELY AT HIS OWN RISK.
4. PRELIMINARY FFLS ARE +/- 450MM SUBJECT TO DETAILED DESIGN.
5. LEVEL OF FOOTBALL PITCH SUBJECT TO EARTHWORKS VOLUME REVIEW.
6. SURFACE WATER DRAINAGE DESIGNED TO PREVENT FLOODING FROM ONSITE SOURCES FOR EVENTS UP TO AND INCLUDING A 1 IN 100 YEAR EVENT PLUS AN ALLOWANCE FOR 30% CLIMATE CHANGE.
7. EXTENT OF CORDON SANITAIRE TO BE CONFIRMED WITH WATER COMPANY.
8. FOUL CAPACITY WITHIN EXISTING PUMPSTATION TBC WITH WATER COMPANY.
9. ADOPTABLE ROADS SHOWN SUBJECT TO SECTION 38 DISCUSSIONS.

ADOPTABLE SEWERS

PROPOSED ADOPTABLE FOUL SEWER

PROPOSED ADOPTABLE SURFACE WATER SEWER

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

Ex MH CL 3.19 IL 0.35 (150Ø)
Blind connection IL -0.98 (150Ø)
Section of land drain to be removed
Land drain to be removed
Blind connection IL -1.09 (150Ø)
Adoptable turning head 1
F1 IL 1.83
S1 IL 2.41
Ex MH CL 3.66 IL -1.99 (150Ø) IL -2.16 (225Ø)
S8 IL 2.20
S9 IL 2.04
S10 IL 1.87
Existing land drainage to be retained
Area to be regraded to suit pitch levels
Planted bund (5m wide x 2m high)
Land drain to be removed
Adoptable drainage easement
Community Hall FFL 4.250
S11 IL 1.72
1:5 emergency access/ egress location
Attenuation Basin Min GL 3.64 IL 1.64 Vol 493
HW01
HW02
S12 (Flow Control MH) IL 1.61
HW03 With non-return valve
Existing ditch Base lv 1.570
S2 IL 2.13
S3 IL 2.09
S4 IL 2.00
S6 IL 1.96
S7 IL 1.93
F2 IL 1.51
F3 IL 1.36
F4 IL 1.06
S5 IL 2.15
Blind connection IL -2.48 (150Ø) IL -2.56 (225Ø)
Ex MH CL 3.08 IL -2.83 (225Ø)
Ditch to be steepened to suit proposed fence line
Ditch to be regraded at 1:3 with 300mm maintainence shelf 1m above the base of the ditch.Ditch base and southern bank to be retained as constructed.
Ditch to be regraded at 1:3 with 300mm maintainence shelf 1m above the base of the ditch. Ditch base and southern bank to be retained as constructed.
The 100 year greenfield rate for the impermeable area of the site is 3.2l/s. Proposed discharge for the 100 year event plus climate change will be limted to 3.2l/s
Acoustic fence along western boundary
Swingate with footway
Cherwell Close
Frampton
Rose
Hop
Chart
Charl
FFL 3.275
FFL 3.425
FFL 3.725
FFL 3.800
FFL 3.500
FFL 3.575
FFL 3.950
FFL 3.650
FFL 3.350
FFL 4.250
FFL 4.550
FFL 4.400
FFL 4.100
FFL 3.200
3.50 (e)
4.35 (e)
4.12
3.27
3.05
3.90 (e)
1:45
1:130
2250Ø
3000Ø 1:171
375Ø 1:250
375Ø 1:241
375Ø 1:264
375Ø 1:268
1500Ø 1:30
1500Ø 1:80
1500Ø 1:102
1500Ø 1:257
1500Ø 1:238
1500Ø 1:193
0 5 10 15 25 50m 75m

REVISION	DESCRIPTION	DRAWN	CHECKED	DATE
A	UPDATED TO SUIT LATEST SITE LAYOUT	AT	JF	25.10.18

PRELIMINARY ■ INFORMATION ☐ TENDER ☐ CONSTRUCTION ☐ AS BUILT ☐

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TITLE WYGATE PARK
SPALDING

DETAILS PROPOSED LEVELS AND DRAINAGE STRATEGY
-

SCALE: 1:500 @ A2 DATE: OCTOBER 2018 DRAWN: AT CHK: GBR

Please consider the environment before printing this drawing

Filepath: F:\Engineer

18277-5-100 A

Appendix H
Microdrainage Storage Calculations

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm

Pipe Sizes STANDARD Manhole Sizes STANDARD

FSR Rainfall Model - England and Wales

Return Period (years)	2	Add Flow / Climate Change (%)	0
M5-60 (mm)	19.000	Minimum Backdrop Height (m)	0.000
Ratio R	0.400	Maximum Backdrop Height (m)	0.000
Maximum Rainfall (mm/hr)	0	Min Design Depth for Optimisation (m)	1.200
Maximum Time of Concentration (mins)	30	Min Vel for Auto Design only (m/s)	1.00
Foul Sewage (l/s/ha)	0.000	Min Slope for Optimisation (1:X)	500
Volumetric Runoff Coeff.	0.750		

Designed with Level Soffits

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Auto Design
1.000	20.974	0.205	102.3	0.073	5.00	0.0	0.600	o	300	
1.001	10.297	0.040	257.4	0.060	0.00	0.0	0.600	o	375	
1.002	21.372	0.090	237.5	0.053	0.00	0.0	0.600	o	375	
1.003	10.048	0.040	250.0	0.040	0.00	0.0	0.600	o	375	
2.000	13.643	0.165	82.7	0.031	5.00	0.0	0.600	o	150	
1.004	7.051	0.030	235.0	0.020	0.00	0.0	0.600	o	375	
1.005	14.436	0.060	240.6	0.000	0.00	0.0	0.600	o	375	
3.000	17.747	0.160	110.9	0.209	5.00	0.0	0.600	o	300	
3.001	13.738	0.095	144.6	0.000	0.00	0.0	0.600	o	300	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
1.000	0.00	5.22	2.410	0.073	0.0	0.0	0.0	1.55	109.9	0.0
1.001	0.00	5.38	2.130	0.133	0.0	0.0	0.0	1.12	124.2	0.0
1.002	0.00	5.68	2.090	0.186	0.0	0.0	0.0	1.17	129.4	0.0
1.003	0.00	5.83	2.000	0.226	0.0	0.0	0.0	1.14	126.1	0.0
2.000	0.00	5.21	2.350	0.031	0.0	0.0	0.0	1.11	19.5	0.0
1.004	0.00	5.93	1.960	0.277	0.0	0.0	0.0	1.18	130.1	0.0
1.005	0.00	6.13	1.930	0.277	0.0	0.0	0.0	1.16	128.5	0.0
3.000	0.00	5.20	2.200	0.209	0.0	0.0	0.0	1.49	105.5	0.0
3.001	0.00	5.37	2.040	0.209	0.0	0.0	0.0	1.31	92.3	0.0

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Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Auto Design
1.006	37.428	0.150	250.0	0.070	0.00	0.0	0.600	o	375	
1.007	21.046	0.080	263.1	0.076	0.00	0.0	0.600	o	375	
1.008	8.556	0.030	285.2	0.000	0.00	0.0	0.600	o	375	
1.009	4.923	0.040	123.1	0.000	0.00	0.0	0.600	o	150	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
1.006	0.00	6.68	1.870	0.556	0.0	0.0	0.0	1.14	126.1	0.0
1.007	0.00	7.00	1.720	0.632	0.0	0.0	0.0	1.11	122.9	0.0
1.008	0.00	7.13	1.640	0.632	0.0	0.0	0.0	1.07	117.9	0.0
1.009	0.00	7.22	1.610	0.632	0.0	0.0	0.0	0.90	16.0	0.0

Free Flowing Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
1.009	Ex Swale	3.260	1.570	1.570	1	0

Simulation Criteria for Storm

Volumetric Runoff Coeff	0.840	Additional Flow - % of Total Flow	0.000
Areal Reduction Factor	1.000	MADD Factor * 10m³/ha Storage	1.000
Hot Start (mins)	0	Inlet Coeffiecient	0.800
Hot Start Level (mm)	0	Flow per Person per Day (l/per/day)	0.000
Manhole Headloss Coeff (Global)	0.500	Run Time (mins)	60
Foul Sewage per hectare (l/s)	0.000	Output Interval (mins)	1

Number of Input Hydrographs	0	Number of Storage Structures	1
Number of Online Controls	1	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Winter
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	19.000	Storm Duration (mins)	15
Ratio R	0.400		

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Online Controls for Storm

Hydro-Brake Optimum® Manhole: 12 (HB), DS/PN: 1.009, Volume (m³): 6.0

Unit Reference	MD-SHE-0076-3200-1700-3200
Design Head (m)	1.700
Design Flow (l/s)	3.2
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Diameter (mm)	76
Invert Level (m)	1.610
Minimum Outlet Pipe Diameter (mm)	100
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.700	3.2
Flush-Flo™	0.331	2.6
Kick-Flo®	0.677	2.1
Mean Flow over Head Range	-	2.5

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

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	2.1	1.200	2.7	3.000	4.2	7.000	6.2
0.200	2.5	1.400	2.9	3.500	4.5	7.500	6.4
0.300	2.6	1.600	3.1	4.000	4.8	8.000	6.6
0.400	2.6	1.800	3.3	4.500	5.0	8.500	6.8
0.500	2.5	2.000	3.4	5.000	5.3	9.000	7.0
0.600	2.4	2.200	3.6	5.500	5.5	9.500	7.2
0.800	2.3	2.400	3.8	6.000	5.8		
1.000	2.5	2.600	3.9	6.500	6.0		

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Storage Structures for Storm

Tank or Pond Manhole: Pond, DS/PN: 1.008

Invert Level (m) 1.640

Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	76.6	2.000	473.0	2.001	0.0

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Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	1.000
Hot Start Level (mm)	0	Inlet Coeffiecient	0.800
Manhole Headloss Coeff (Global)	0.500	Flow per Person per Day (l/per/day)	0.000
Foul Sewage per hectare (l/s)	0.000		

Number of Input Hydrographs	0	Number of Storage Structures	1
Number of Online Controls	1	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model		FSR	Ratio R 0.400
Region	England and Wales	Cv (Summer)	0.750
M5-60 (mm)	19.000	Cv (Winter)	0.840

Margin for Flood Risk Warning (mm)	300.0
Analysis Timestep	2.5 Second Increment (Extended)
DTS Status	ON
DVD Status	ON
Inertia Status	OFF

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 240, 360, 480, 960, 1440
Return Period(s) (years)	100
Climate Change (%)	30

PN	Storm	Return Period	Climate Change	First X Surcharge	First Y Flood	First Z Overflow	O/F Act.	Lvl Exc.
1.000	15 Winter	100	+30%	100/15 Summer				
1.001	15 Winter	100	+30%	100/15 Summer				
1.002	15 Winter	100	+30%	100/15 Summer				
1.003	15 Winter	100	+30%	100/15 Summer				
2.000	15 Winter	100	+30%	100/15 Summer				
1.004	15 Winter	100	+30%	100/15 Summer				
1.005	15 Winter	100	+30%	100/15 Summer				
3.000	15 Winter	100	+30%	100/15 Summer				
3.001	15 Winter	100	+30%	100/15 Summer				
1.006	480 Winter	100	+30%	100/15 Summer				
1.007	480 Winter	100	+30%	100/15 Summer				
1.008	480 Winter	100	+30%	100/15 Summer				
1.009	480 Winter	100	+30%	100/15 Summer				

PN	US/MH Name	Water Level (m)	Surch'ed Depth (m)	Flooded Volume (m³)	Flow / Cap.	O'flow (l/s)	Pipe Flow (l/s)	Status
1.000	1	3.544	0.834	0.000	0.30	0.0	29.0	FLOOD RISK
1.001	2	3.472	0.967	0.000	0.56	0.0	51.6	FLOOD RISK
1.002	3	3.445	0.980	0.000	0.65	0.0	70.8	SURCHARGED
1.003	4	3.356	0.981	0.000	0.91	0.0	84.4	SURCHARGED

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Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Water Level (m)	Surch'ed Depth (m)	Flooded Volume (m³)	Flow / Cap.	O'flow (l/s)	Pipe Flow (l/s)	Status
2.000	5	3.368	0.868	0.000	0.68	0.0	12.1	SURCHARGED
1.004	6	3.281	0.947	0.000	1.14	0.0	100.3	SURCHARGED
1.005	7	3.245	0.941	0.000	0.97	0.0	99.1	SURCHARGED
3.000	8	3.469	0.969	0.000	1.10	0.0	99.8	FLOOD RISK
3.001	9	3.287	0.947	0.000	1.26	0.0	96.4	SURCHARGED
1.006	10	3.224	0.979	0.000	0.27	0.0	31.0	SURCHARGED
1.007	11	3.221	1.126	0.000	0.34	0.0	35.3	SURCHARGED
1.008	Pond	3.219	1.204	0.000	0.06	0.0	5.1	SURCHARGED
1.009	12 (HB)	3.236	1.476	0.000	0.25	0.0	3.1	SURCHARGED

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