



**FLOOD RISK ASSESSMENT
ON LAND OFF
LEE LANE
ROYSTON**



**ON BEHALF OF
BDW YORKSHIRE WEST**

JULY 2017

ARP ASSOCIATES

CHARTERED CONSULTING ENGINEERS



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Flood Risk Assessment on Land off Lee Lane, Royston

1048/88r1a

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1.0 INTRODUCTION

- 1.1 BDW Yorkshire West are considering developing a greenfield site located off Lee Lane, Royston for new residential dwellings. As part of the appraisal and to supplement a planning application, a Flood Risk Assessment Report was required.
- 1.2 It is within the general development strategy of the country for development in areas where there is a risk of flooding to be assessed to avoid unnecessary increase in the requirement for flood defence. Under the National Planning Policy Framework (NPPF) and the Planning Practice Guidance (PPG), consultation is required with the Environment Agency, Land Drainage Authority and Water Authority and a Flood Risk Assessment Report should be prepared considering the development proposals and make recommendations for any flood mitigation measures.
- 1.3 ARP Associates have been appointed to carry out an assessment of the site, implement appropriate consultations and prepare a Flood Risk Assessment Report, in accordance with NPPF, to satisfy the requirements of the Planning Authority.
- 1.4 The consultations and walkover survey have been undertaken between October and November 2016. The report was updated in June 2017 to include the latest consultation responses and proposed layout.
- 1.5 The report has been initially prepared for the use and reliance of the Client only. The report shall not be relied upon or transferred to any other parties without the written agreement of ARP Associates. For the avoidance of any doubt, where ARP Associates enters into a letter of reliance for the benefit of a third party, that third party will be permitted to rely on the report. No responsibility will be accepted where this report is used, either in its entirety or in part, by any other party without ARP Associates consent.





2.0 WALKOVER SURVEY

General

- 2.1 The site is basically a rectangular area of land equating to an area of approximately 5.6ha and is situated on the western edge of Royston village. The Ordnance Survey Grid Reference is SE 349 114.
- 2.2 A site location plan is presented in Appendix A.

Current Use

- 2.3 The site is currently a greenfield and used for arable purposes.

Boundaries

- 2.4 The northern and southern boundaries are formed by a timber post and rail fence with arable/agricultural fields to the west and horse riding stables to the north. The southern boundary is formed by a fence and hedge with a grass verge and Lee Lane beyond. The majority of the eastern boundary is formed by various fences, hedges and walls to rear gardens of properties on Applehaigh View.

Topography and Vegetation

- 2.5 The site is relatively flat with a perceived fall from west to east towards a culverted watercourse on the eastern boundary. The culvert outfalls into a traditional open channel in the northeastern corner. A topographical survey is presented in Appendix B.
- 2.6 There are no trees or vegetation in the main part of the site, although some hedgerows and trees are present on the boundaries.



Drainage

- 2.7 There is no positive drainage system on the site, although land drainage may be present. It is clear that overland water will run to the watercourse in the northern corner.
- 2.8 In order to assess the existing drainage and possible outfall points, an investigation of the existing drainage system was undertaken by Jet Aire Drain Care Ltd, under instruction of ARP Associates on the 2nd November 2016. A copy of the Jet Aire Drain Care Ltd Report is presented in Appendix C.
- 2.9 The investigation identified a 750mm diameter culvert running from a manhole in the verge to Lee Lane, along the eastern boundary to a manhole adjacent to Applehaigh View before continuing to an open section of the watercourse in the northeastern corner of the site. This culverted watercourse was seen to be receiving surface water from the Applehaigh estate to the east of the development and possibly surface water in a land drainage system from the field.
- 2.10 The open watercourse to the northeast was seen to have a significant amount of silt in the bottom of the pipe and it will be necessary for this to be flushed out and cleaned for any future development.



3.0 ENVIRONMENT AGENCY CONSULTATION

- 3.1 A consultation was requested from the Environment Agency and a copy of their response, reference RFI/2016/24990 dated 18th October 2016 is presented in Appendix D for reference.
- 3.2 The Environment Agency Flood Map shows that the site falls within an area which has less than a 1 in 1000 (0.1%) chance of flooding in any year.
- 3.3 The Environment Agency has no known flood history for the site, but flooding in the locality did occur in June 2007. Whilst this confirms that there was no flooding on the site at this date, the Environment Agency has stated that some information may be missing and, therefore, the information should be viewed as a draft output.
- 3.4 There are no flood defences in the vicinity and there is no flood modelling information at this location. This is because the watercourse forming the eastern boundary is not a designated main river and is classed as an ordinary watercourse. Therefore, the Environment Agency does not have any information available in regard to current flood risk.
- 3.5 The risk of flooding can come from several sources and the Environment Agency has provided the risk of flooding from surface water maps as part of the consultation. This shows that the site has a high risk of flooding from surface water, greater than a 1 in 30 year flood extent. This will need to be assessed and considered in the design of the site to reduce flood risk.
- 3.6 Surface water discharge from the new development should ideally "mimic" the pre-development situation, using a sustainable drainage system so that the flow and volume of water in the watercourses is not increased. Guidance should also be sought in respect of climate change from the Environment Agency guidelines.
- 3.7 The site is not located within a Flood Warning Zone.



4.0 WATER AUTHORITY CONSULTATION

- 4.1 A consultation was requested from Yorkshire Water, who is the Water Authority for this area, and a copy of the response, dated 14th October 2016 under reference S015357, is presented in Appendix E for reference purposes.
- 4.2 There is an existing 450mm diameter public surface water sewer within the site. No buildings or other obstructions are to be erected within 3.5m, nor trees planted within 5m of this public sewer. Existing ground levels should not be raised or lowered over the sewer or any access to manholes restricted. The sewer can be diverted under a Section 185 Agreement of the Water Industry Act 1991, subject to an Application in writing. Furthermore, there is an outfall to a watercourse, under the control of Yorkshire Water, located within the site. Vehicular access, including large tankers, could be required at any time, and the development should reflect this requirement.
- 4.3 Foul water can discharge to the 225mm diameter public foul sewer recorded in Parkhead Close approximately 40m from the site. It should be noted that this sewer is not shown on the sewer maps, but it has been transferred as a public asset under the private to public sewer transfer. If a sewerage pumping station is required to facilitate the connection, then the discharge must not exceed 5l/s.
- 4.4 In respect of surface water, the local public sewer network does not have capacity to accept any surface water disposal from the site. Reference is made to requirement H3 of Building Regulation 2000 and Sustainable Drainage Systems.
- 4.5 Yorkshire Water have identified that the watercourse located through the site appears to be the obvious place for surface water disposal.
- 4.6 Due to the confirmed outfall of foul water being across third party land or down approximately 360m of existing public highway, further consultation took place with Yorkshire Water. It was confirmed that a connection into Applehaigh View or Lee Lane was



not preferable as these systems outfall into an existing pumping station that have limited capacity. A copy of the response is included in Appendix E.

- 4.7 Following the above, it was decided that the best course of action would be to undertake a requisition feasibility study so that Yorkshire Water can assess possible connections into Applehaigh View, Lee Lane or Parkhead Close. Yorkshire Water acknowledge receipt of the Requisition application on the 30th June 2017, and at the time of updating the Flood Risk Assessment, the study is still to be received as it takes approximately 12 - 14 weeks to complete.



5.0 LAND DRAINAGE AUTHORITY CONSULTATION

- 5.1 A consultation was requested from Barnsley Metropolitan District Council, who is the Land Drainage Authority for this area, and a copy of their response, dated 13th March 2017 is presented in Appendix F.
- 5.2 It was confirmed that a maximum discharge rate of 23.8l/s is acceptable into the existing watercourse. The discharge rate is based on an existing greenfield run-off rate of 5l/s/ha.
- 5.3 Any discharge would need to ensure that there is no greater run-off into the system than exists at the present time.



6.0 MATERIAL CONSIDERATION IN RESPECT OF NPPF AND PPG

Flood Classification

- 6.1 The consultation with the Environment Agency has identified that the main area of the site falls within land assessed as having less than a 1 in 1000 annual probability of river or sea flooding in any year (less than 0.1%). In accordance with Table 1 of the PPG, the site falls within Flood Zone 1 "low probability".
- 6.2 Therefore, all uses of the land are appropriate within this zone, but an assessment of the effect of surface water run-off will need to be incorporated in any Flood Risk Assessment.

End Use

- 6.3 The development proposal is for the construction of residential dwellings on the site, and a copy of the indicative proposed layout is presented in Appendix F for reference purposes.
- 6.4 When applying Table 2 of the PPG, the flood risk vulnerability classification shows that the end use will fall into a "more vulnerable" classification.

Sequential Test

- 6.5 As set out in the NPPF, the aim of the Sequential Test is to steer new development to areas with the lowest probability of flooding (Zone 1).
- 6.6 When the site is evaluated in accordance with Table 3 of the PPG, the development shows that the Sequential Test is satisfied.



Flood Sources

- 6.7 Flooding from Rivers - There are no rivers maintained by the Environment Agency within the vicinity of the site and the Environment Agency Consultation confirms there is no flooding from this source.
- 6.8 Flooding from Local Watercourses - There is a culverted watercourse along the eastern boundary which opens out towards the northeastern corner. Whilst there is no historical flooding recorded from the watercourse and flooding is considered to be low risk, the proposed development will need to consider the potential effects of flooding in the event of blockage of the watercourse.
- 6.9 Flooding from the Sea - The site is not located near enough to the sea to cause a problem of flooding from this source.
- 6.10 Flooding from Land - The surface water Flood Maps show that, during times of storm, surface water ponds on the site, probably due to impermeable strata at the surface. It will be necessary, therefore, to consider levels on the development to ensure that surface water flooding is controlled as part of the development criteria.
- 6.11 Flooding from Groundwater - The presence of the watercourse along the eastern boundary and others in the vicinity, together with the noted problem of flooding from surface water run-off, indicates that the surface ground conditions are likely to be impermeable. A Geo-Environmental Site Investigation has been undertaken on the site by Resource and Environmental Consultants Ltd, under reference 4553784P1R0 dated 24th April 2014. The report identified Glacial Till to the west and Glacial Fluvial sands and gravels to the east. Infiltration testing was undertaken as part of the investigation and rates of 1×10^{-3} m/s and 1×10^{-5} m/s, indicating a medium degree of permeability, were recorded. Furthermore, groundwater levels were encountered at approximately 2m below ground level. Therefore, flooding from groundwater issues may occur in certain conditions and the development will need to address this possible situation.



- 6.12 Flooding from Sewer - A new drainage system will need to be introduced onto the site, and it is possible that any blockage will result in flooding from the lowest cover level of manholes or gullies. This will need to be considered as part of any proposed development.
- 6.13 Flooding from Reservoirs, Canals or Artificial Sources - A review of the Environment Agency website shows that there are no reservoirs, canals or artificial sources within the vicinity of the site, and flooding from this source is considered to be low risk.

Climate Change

- 6.14 The NPPF and PPG has indicated that the Global sea level will continue to rise, depending on greenhouse gas emissions, and the sensitivity of the climate system and there will be an increase in rainfall across the country. Climate change parameters were changed in February 2016 with peak river flows expected to increase by up to 50% in certain areas, and an increase of rainfall of up to 40% in land areas.
- 6.15 The land to the east of the site is a built-up residential area with positive drainage, whilst other boundaries are generally level with the site. Therefore, any run-off from outside the site will be relatively insignificant and, on this basis, only rainfall falling within the site boundaries will need to be considered in respect of climate change.
- 6.16 In accordance with the revised climate change figures, for an expected life of greater than 50 years for any new development, the anticipated increase in rainfall will be 40% and the drainage system should be designed in accordance with this requirement.

Flood Mitigation

- 6.17 As the site falls within Flood Zone 1, the Sequential Test is satisfied and there is no flooding anticipated from the local watercourse. However, in the event of a catastrophic storm, blockage of the watercourse or blockage of the proposed drainage system, it would be necessary to consider some precautionary flood mitigation measures, as follows:-



- 6.17.1 Floor levels to the properties shall be raised above external levels by a minimum of 150mm.
- 6.17.2 Properties shall be designed without any basements and ground floors shall comprise solid concrete slabs or beam and block with screed construction.
- 6.17.3 Incoming electricity supplies shall be raised above ground floor level and ground floor electric sockets shall be served by loops from first floor level.
- 6.17.4 In order to accommodate the potential problem of surface water flooding and groundwater issues, finished levels will need to be raised and designed to ensure there is route for flood water through the site to the watercourse to non-sensitive areas such as Public Open Space to avoid flooding of buildings.

Sustainable Drainage

- 6.18 In order to comply with the requirements of NPPF, it will be necessary to consider aspects of Sustainable Drainage techniques for the new development. A Geo-Environmental Site Investigation has been undertaken on the site by Resource and Environmental Consultants Ltd, under reference 4553784P1R0 dated 24th April 2014. This identified that Glacial Till was present to the west of the site, whilst Glacial Fluvial sands and gravels were to the east. Infiltration tests were undertaken for the granular deposits over the eastern part of the site and rates of 1×10^{-3} m/s and 1×10^{-5} m/s were recorded indicating a medium degree of permeability. However, as groundwater levels were encountered at approximately 2m below existing ground level, it was considered unlikely that the soakaways would be located above this level on detailed design and would, therefore, be ineffective. Therefore, for the purposes of this report, a positive drainage system will be required with surface water discharge to the watercourse.



Drainage

- 6.19 It is a requirement to ensure that surface water run-off from any proposed development has negligible consequence on downstream areas either in sewer capacity or discharge to watercourse.

Existing Surface Water Run-Off

- 6.20 There is no development on the site and agreement has been reached with the Land Drainage Authority to a greenfield run-off rate to the watercourse. The total site area is 5.6ha, but the development area, after removing any Public Open Space and other green areas, is 4.75ha. Therefore, the greenfield run-off from the site will be 23.8l/s.

Proposed Surface Water Drainage

- 6.21 The proposed planning layout presented in Appendix G, has been assessed as having an impermeable area of approximately 50% of the development area, (2.38ha). Indicative calculations have been carried out using the WinDES Source Control Computer Program to assess the likely attenuation. Making an allowance for 40% increase in rainfall for climate change and restricting the discharge to no greater than 23.8l/s, on-site storage of 1247.2m³ will need to be provided for a 1 in 100 year storm. This can be achieved by several methods, including oversized pipes, underground tanks or balance ponds. One possible option is to provide an underground concrete tank 10m x 44m x 3m deep. The indicative calculations are presented in Appendix H for reference, but detailed calculations and proposals will need to be prepared and submitted to the Planning Authority for approval prior to construction.

Watercourse Conditions

- 6.22 The discharge of surface water to the watercourse will require the introduction of headwalls or work to the watercourse. This will need the consent of the Land Drainage Authority by submitting an Application for "Consent to Work Within the Watercourse".



Foul Drainage

- 6.23 Yorkshire Water have identified that there is a 225mm diameter foul sewer in Parkhead Close, which is suitable to receive foul water from the development site. However, it is noted that there is also a foul sewer in Applehaigh View and consultations are in hand with Yorkshire Water to determine the most suitable outfall location. A foul pump station will be required for discharge to these locations and the proposed development scheme will need to accommodate an adoptable pumping station to be located in an area to meet Yorkshire Water requirements.

Emergency Egress During Times of Flood

- 6.24 It is a requirement under the PPG that occupants should be able to egress any building during times of flood, without being trapped by flood conditions.
- 6.25 As the site falls within Flood Zone 1, no special mitigation measures are required for emergency egress during times of flood.



7.0 COMMENTS

- 7.1 The site falls within Flood Zone 1 and the Sequential Test is satisfied. However, in order to accommodate the possibilities of flood from extreme storm, blocked watercourse or blocked sewers, the following precautionary flood mitigation measures are recommended:-
- 7.1.1 Ground floors to the properties shall be set above external levels by a minimum of 150mm.
- 7.1.2 The properties shall be designed without any basements and ground floors shall comprise solid concrete slabs or beam and block with screed construction.
- 7.1.3 Incoming electricity supplies shall be raised above ground floor level and ground floor electric sockets shall be served by loops from first floor level.
- 7.1.4 The external alignment of the road and hard paved areas shall be raised to avoid surface water flooding and designed to direct any flood water through the site to either the northeastern corner with overflow into the watercourse, or to non-sensitive areas such as Public Open Space to allow ponding with no flooding to buildings.
- 7.2 A 40% increase in rainfall shall be incorporated into any new positive drainage system to satisfy the requirements of climate change.
- 7.3 Sustainable Drainage Systems of infiltration techniques are considered to be unsuitable on this particular site, due to the high water table.
- 7.4 The proposed surface water drainage system shall be restricted to the agreed discharge rate with appropriate attenuation for a 1 in 100 year storm plus climate change incorporated into the design, prior to discharge into the watercourse. The detailed design and calculations shall be submitted to the Planning Authority for approval prior to construction on the development site.

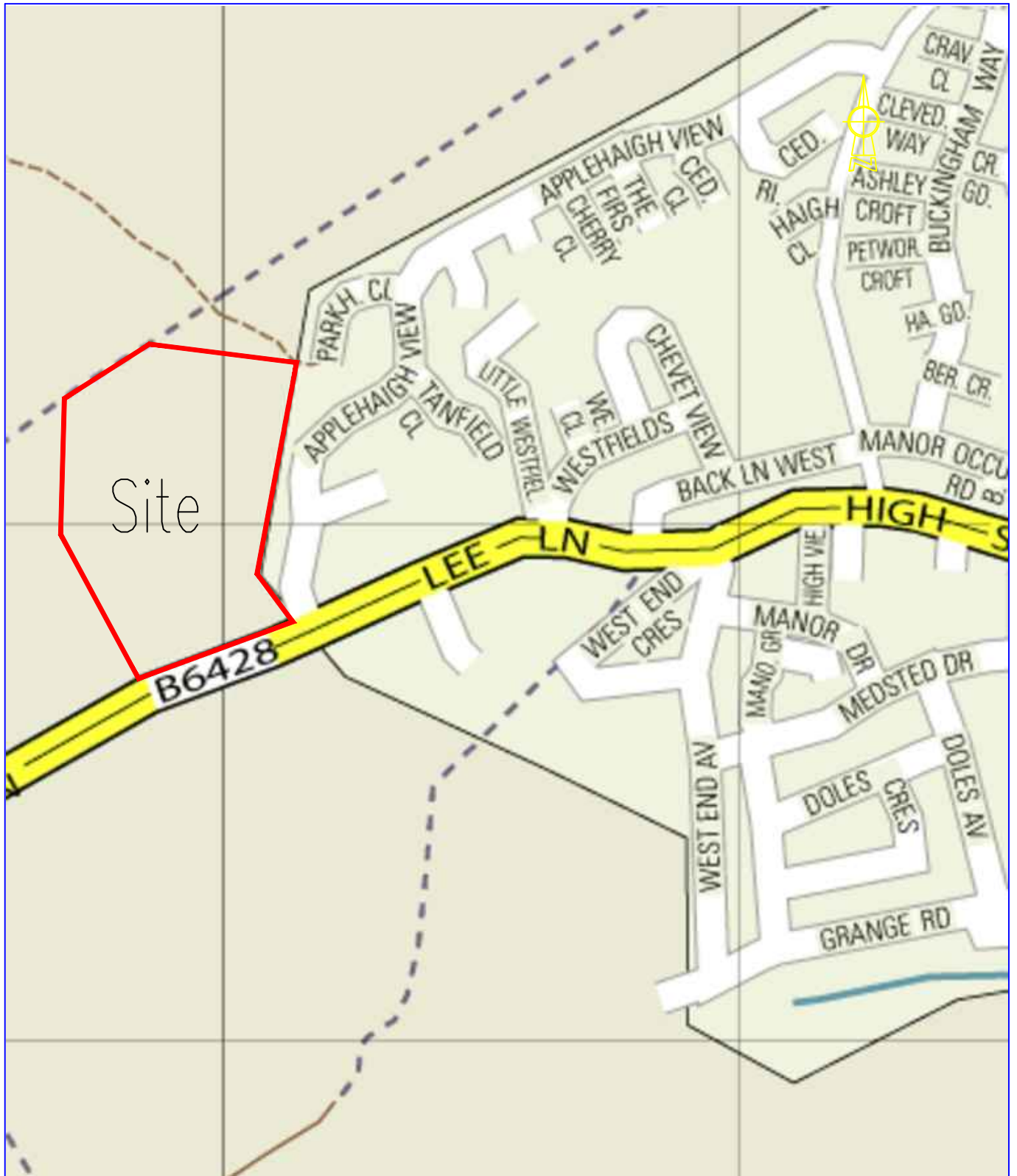


- 7.5 Surface water shall be restricted to the agreed greenfield run-off rate of 23.8l/s. An adopted surface water pumping station will need to be incorporated into the design.
- 7.6 Any requirements for culverting of the open watercourse, the construction of headwalls, or regrading of the watercourse will require the consent of the Land Drainage Authority prior to construction on site.
- 7.7 Yorkshire Water have control of a surface water outfall to the watercourse on the eastern boundary and vehicular access for large tankers should be maintained if necessary as part of the scheme.
- 7.8 Foul drainage shall discharge to the existing foul sewer in Parkhead Close or alternative location, to be confirmed by Yorkshire Water as part of the Requisition Feasibility Study. An adoptable foul water pumping station will need to be incorporated on the site.
- 7.9 No special mitigation measures are required for emergency egress during times of flood.
- 7.10 If any ground water issues are encountered during the works operations, then a land drainage system may need to be introduced to direct surface water through to the watercourse in a separate system to the curtilage water.
- 7.11 Subject to compliance with the above, the proposed development can satisfy the requirements of the National Planning Policy Framework and the Planning Practice Guidance in relation to flood risk.



APPENDIX A

SITE LOCATION PLAN



OS Grid Reference: SE 349 115

Title
SITE LOCATION PLAN

Project/Client
LEE LANE, ROYSTON
BDW YORKSHIRE WEST

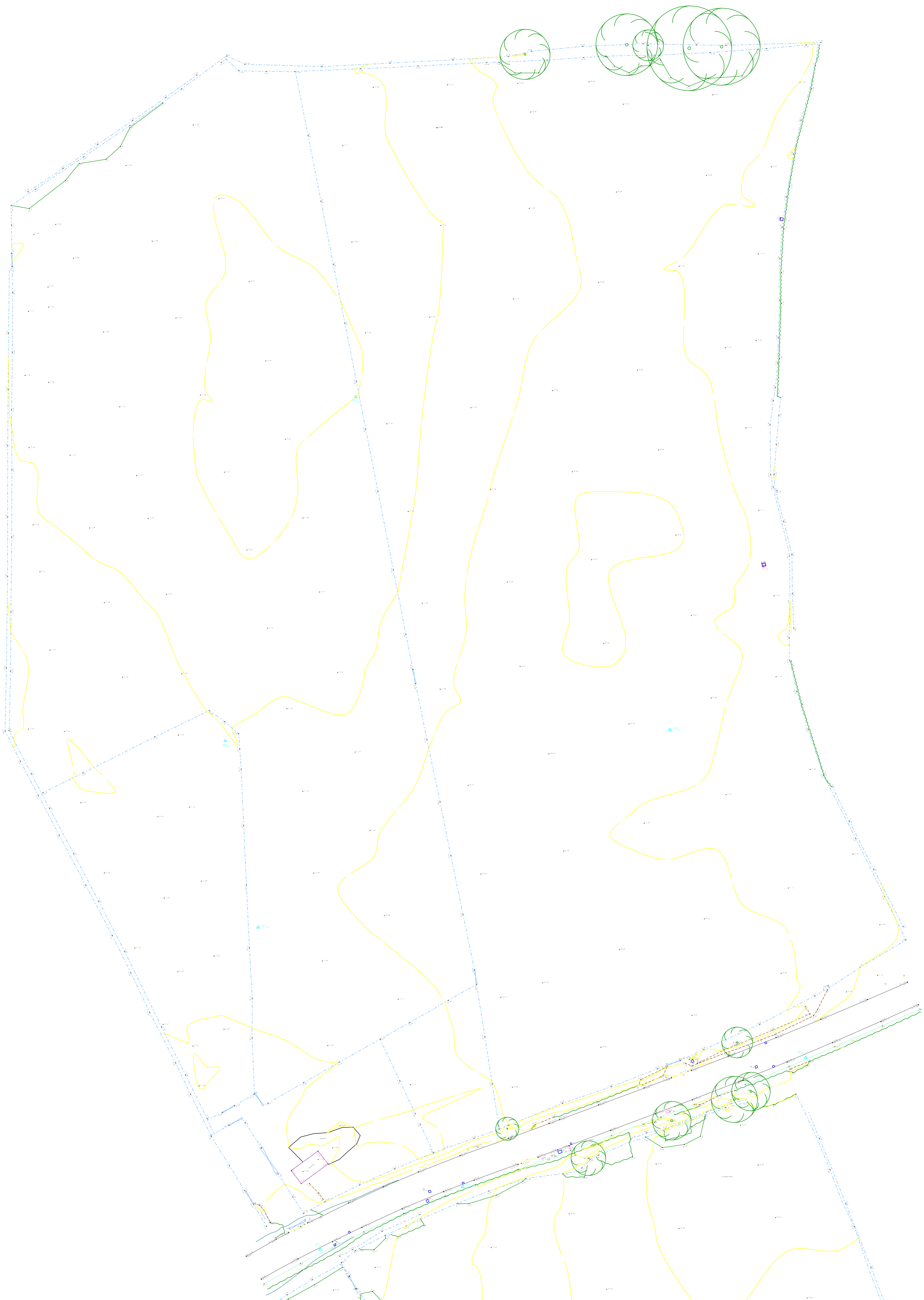
Rev	By	Date	Issued for approval	MGS
/	DJG	28.09.16		
			Amendment	Chk
			Scale 1:5000 @ A4	Drawn DJG
			Date SEP 16	Chk. MGS
			Drng. No. 1048/88/NA	Rev /



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APPENDIX B

TOPOGRAPHICAL SURVEY



APPENDIX C

JET AIRE DRAIN CARE REPORT

JET AIRE
DRAIN CARE

50075 ARP GEOTECHNICAL LTD
LEE LANE

Jet Aire (DC) Ltd

TOTAL DRAINAGE SOLUTIONS
www.jetaire.co.uk



Jet Aire (DC) Ltd, Northways Court, Great North Road, Aberford, Leeds, West Yorkshire LS25 3AU

Table of contents

Project Name: 50075 LEE LANE	Project number: 50075	Date: 03/11/2016	Contact:	
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Inspection: 1

Project Information	1
Legend of Classification	2
Section: 1, MH 1 -- OUTFALL	3

Project-informationProject name :
50075 LEE LANEProject Number :
50075

Contact :

Date :
02/11/2016

Client: **ARP GEOTECHNICAL LTD**
Contact Name: **MATTHEW STOKES**
Department:
Road: **SERVIA HILL**
Town: **LEEDS**
County: **WEST YORKSHIRE**
Telephone: **0113 245 8498**
Fax:
Mobile:
E-mail:

Site: **LEE LANE**
Contact Name:
Department:
Road: **LEE LANE**
Town: **ROYSTON**
County:
Telephone:
Fax:
Mobile:
E-mail:

Contractor **JET AIRE DRAIN CARE**
Contact Name: **LEE CLAYTON**
Department:
Road: **GREAT NORTH ROAD**
Town: **ABERFORD**
County: **WEST YORKSHIRE**
Telephone: **0113 393 5500**
Fax:
Mobile:
E-mail:

Defect Grade Description

Project Name :
50075 LEE LANE

Project number :
50075

Contact :

Date :
03/11/2016

1:

Brick: No Structural Defects
Pipe: No Structural Defects

Acceptable Structural Condition

2:

Brick: Minor cracking, Surface mortar loss, Spalling slight, wear slight
Pipe: Circumfrential crack, Moderate joint defects, Spalling slight, Wear slight

Minor collapse risk in short term but potential for further deterioration

3:

Brick: Total mortarloss without other defects, single brick displaced, Deformation up to 5%, Spalling medium, Wear medium
Pipe: Fractures with deformation up tp 5%, Longitudinal cracking or mulitpe cracking, Minor loss of level, More severe joint defects, Spalling medium, Wear medium

! Collapse unlikely in near future but future deterioration likely !

4:

Brick: Total mortarloss with deformation greater than 10%, Deformation up to 10% and fractured, Displaced/hanging brickwork, Small number of missing bricks
Pipe: Broken, Deformation up to 10% and broken,, Fractured with deformation 5 - 10%, Multiple fractures, Serious loss of level, spalling large, wear large

!! Collapse likely in foreseeable future !!

5:

Brick: Already Collapsed, Missing invert, Deformation over 10% and fractured, Displaced/hanging brickwork and deformation over 10%, Extensive missing bricks
Pipe: Already collapsed, Deformation over 10% and broken, Extensive areas of fabric missing, Fractured with deformation over 10%

!!! Collapsed or collapse imminent !!!

Inspection report

Date : 02/11/2016	Job number : 50075	Weather : no rain or snow	Operator : DC	Section number : 1	PLR SUFFIX: X
Type of Drain: Gravity drain/sewer	Vehicle : BJ11 NMZ	Camera : CRAWLER	Flow Control: No flow control	Cleaned : no	Client Job Number:

Place : Road : Location Inspection	ROYSTON, BARNESLEY LEE LANE Verge MH 1 (D/S) OUTFALL	Location details: Catchment: Tape number : Pipe Length	U/S MH : U/S Depth : D/S MH : D/S Depth :	MH 1 2.23 OUTFALL
---	---	---	--	-------------------------

Use: Year laid : Purpose : Total length :	Surface water Z Routine inspection of condition 81.79 m	Pipe shape : Pipe size : Pipe material : Lining :	Circular 750 mm Concrete segments
--	--	--	---

Comment :

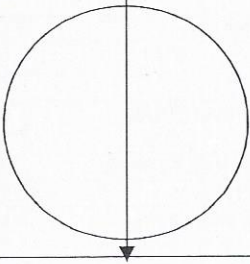
1:522 Position	Observation	Grade
Depth: 2.23		
0.00	Start node type, manhole reference number: MH 1	0
0.00	Water level, 10% of the vertical dimension	0
8.50 S01	Settled deposits, fine, 5% cross-sectional area loss, Start	2
10.04	Water level, 5% of the vertical dimension	0
13.73 F01	Settled deposits, fine, 5% cross-sectional area loss, End	2
23.91	Settled deposits, fine, 5% cross-sectional area loss	2
28.79	Settled deposits, fine, 5% cross-sectional area loss	2
31.42	Water level, 10% of the vertical dimension	0
31.42 S02	Settled deposits, fine, 5% cross-sectional area loss, Start	2
38.37	Settled deposits, fine, 10% cross-sectional area loss	3
41.25	Water level, 5% of the vertical dimension	0
41.25 F02	Settled deposits, fine, 5% cross-sectional area loss, End	2
41.25	General remark Remarks: MH 4	0
48.08	Roots, fine at joint	2
64.60	Settled deposits, fine, 5% cross-sectional area loss	2

Inspection Report

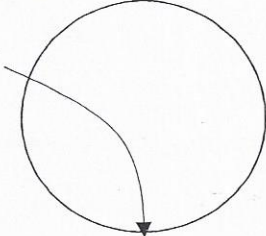
Date : 02/11/2016	Job number : 50075	Weather : no rain or snow	Operator : DC	Section number : 1	PLR : X
Weather no rain or snow	Vehicle : BJ11 NMZ	Camera : CRAWLER	Preset :	Cleaned : no	Grade:

1:522	Position	Observation	Grade
	76.99	Settled deposits, coarse, 5% cross-sectional area loss	3
	79.91	Settled deposits, coarse, 10% cross-sectional area loss	3
	81.79	Survey abandoned LOSS OF TRACTION Remarks: LOSS OF TRACTION, DUE TO DEBRIS	0

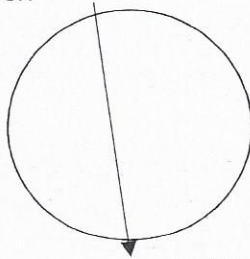
STR no def	STR peak	STR mean	STR total	STR grade	SER no def	SER peak	SER mean	SER total	SER grade
0	0	0	0	1	8	3	0.29	24	3

SITE: LEE LANE, ROYSTON, BARNSELEY				DATE: 02/11/2016	
				JOB NO: 50075	
MH NAME	FUNCTION		COVER		SKETCH 
MH1	SURFACE	<input checked="" type="checkbox"/>	SQUARE	<input checked="" type="checkbox"/>	
	FOUL		TRIANGLE		
PIPE MATERIAL CONC & VC	COMBINED		RECTANGLE		
	TRADE EFFLUENT		CIRCULAR		
COVER SIZE (mm):	660				
DEPTH (m):	2.32				
PIPE SIZE(mm):	INLET	375 Ø	OUTLET	375 Ø	
NO. OF STEPS:	4				
LANDINGS:					
MANHOLE CHAMBER SIZE (mm):			1800		

MANHOLE CHAMBER SHAPE		MANHOLE CHAMBER CONSTRUCTION		COMMENTS
SQUARE		BRICK		
RECTANGLE		CONCRETE	<input checked="" type="checkbox"/>	
CIRCULAR	<input checked="" type="checkbox"/>	PLASTIC		
OTHER		OTHER		

MH NAME	FUNCTION		COVER		SKETCH 
MH2	SURFACE	<input checked="" type="checkbox"/>	SQUARE	<input checked="" type="checkbox"/>	
	FOUL		TRIANGLE		
PIPE MATERIAL CONC	COMBINED		RECTANGLE		
	TRADE EFFLUENT		CIRCULAR		
COVER SIZE (mm):	600				
DEPTH (m):	1.775				
PIPE SIZE(mm):	INLET	450 Ø	OUTLET	450 Ø	
NO. OF STEPS:	2				
LANDINGS:					
MANHOLE CHAMBER SIZE (mm):			1500		

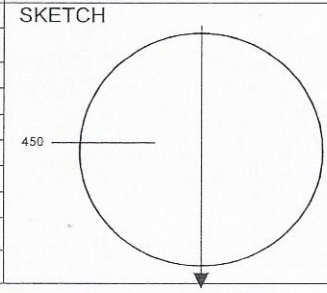
MANHOLE CHAMBER SHAPE		MANHOLE CHAMBER CONSTRUCTION		COMMENTS
SQUARE		BRICK		
RECTANGLE		CONCRETE	<input checked="" type="checkbox"/>	
CIRCULAR	<input checked="" type="checkbox"/>	PLASTIC		
OTHER		OTHER		

MH NAME	FUNCTION		COVER		SKETCH 
MH3	SURFACE		SQUARE	<input checked="" type="checkbox"/>	
	FOUL	<input checked="" type="checkbox"/>	TRIANGLE		
PIPE MATERIAL VC	COMBINED		RECTANGLE		
	TRADE EFFLUENT		CIRCULAR		
COVER SIZE (mm):	600				
DEPTH (m):	2.21				
PIPE SIZE(mm):	INLET	225 Ø	OUTLET	225 Ø	
NO. OF STEPS:	4				
LANDINGS:					
MANHOLE CHAMBER SIZE (mm):			1200		

MANHOLE CHAMBER SHAPE		MANHOLE CHAMBER CONSTRUCTION		COMMENTS
SQUARE		BRICK		
RECTANGLE		CONCRETE	<input checked="" type="checkbox"/>	
CIRCULAR	<input checked="" type="checkbox"/>	PLASTIC		
OTHER		OTHER		

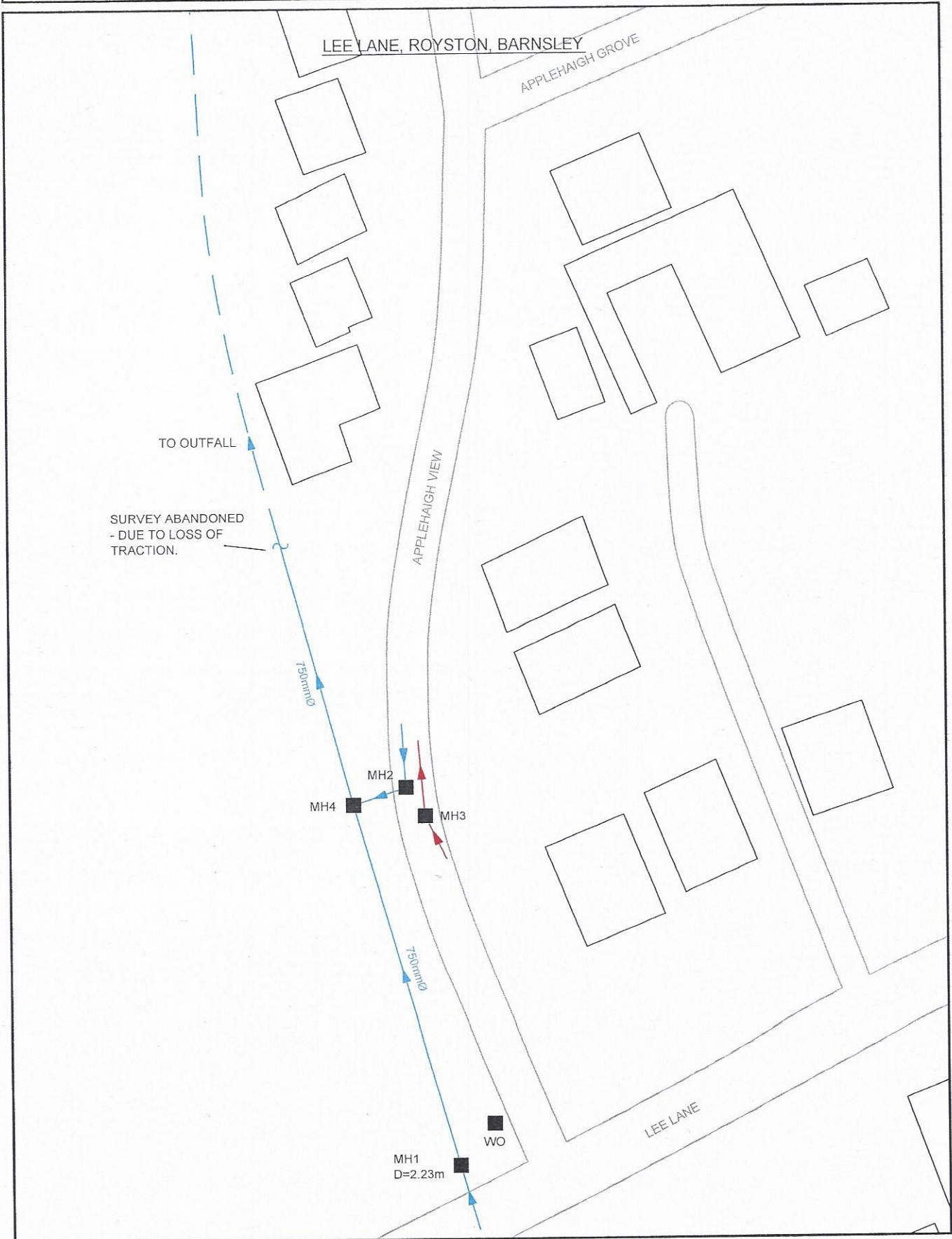
Our assessment of the drainage system is based upon our visual inspection and on information collated at the time of the survey. Where assumptions have been made these are based upon our experience and do not constitute any form of guarantee, nor do we guarantee that further deterioration will not occur following this survey. The CCTV CD/DVD will be forwarded with the report.

SITE: LEE LANE, ROYSTON, BARNSELEY			DATE: 02/11/2016	
			JOB NO: 50075	
MH NAME	FUNCTION		COVER	
MH4	SURFACE	√	SQUARE	√
	FOUL		TRIANGLE	
PIPE MATERIAL	COMBINED		RECTANGLE	
CONC	TRADE EFFLUENT		CIRCULAR	
COVER SIZE (mm):	660			
DEPTH (m):	1.95			
PIPE SIZE(mm):	INLET	750 Ø	OUTLET	750 Ø
NO. OF STEPS:	3			
LANDINGS:				
MANHOLE CHAMBER SIZE (mm):		1800		



MANHOLE CHAMBER SHAPE		MANHOLE CHAMBER CONSTRUCTION		COMMENTS
SQUARE		BRICK		
RECTANGLE		CONCRETE	√	
CIRCULAR	√	PLASTIC		
OTHER		OTHER		

Our assessment of the drainage system is based upon our visual inspection and on information collated at the time of the survey. Where assumptions have been made these are based upon our experience and do not constitute any form of guarantee, nor do we guarantee that further deterioration will not occur following this survey. The CCTV CD/DVD will be forwarded with the report.



Our assessment of the drainage system is based upon our visual inspection and on information collated at the time of the survey. Where assumptions have been made these are based upon our experience and do not constitute any form of guarantee, nor do we guarantee that further deterioration will not occur following this survey. The CCTV CD/DVD will be forwarded with the report.

Survey Notes: 50075 – Lee Lane, Royston, Barnsley, S71 4RT.

We were requested to attend site and undertake a CCTV survey and drain trace of the culverted watercourses on site, as instructed and directed by Alan on site.

- The following defects were noted.

Recommendations

Report Section	Start Node	End Node	Pipe size (mm)	Recommendation
1	MH 1	OUTFALL	750	The survey was abandoned at 81.79 metres due to debris. We recommend returning to site with a Jet-vac unit and CCTV van pack to cleanse the line and re-survey. Cost: £700.00+VAT.

The total cost for the recommended works mentioned above is **£700.00 + VAT**

Our assessment of the drainage system is based upon our visual inspection and on information collated at the time of the survey. Where assumptions have been made these are based upon our experience and do not constitute any form of guarantee, nor do we guarantee that further deterioration will not occur following this survey. The CCTV CD/DVD will be forwarded with the report.

APPENDIX D

ENVIRONMENT AGENCY CONSULTATION

Allan Poyser

From: Beech, Cheryl <Cheryl.Beech@environment-agency.gov.uk>
Sent: Tuesday 18 October, 2016 1:06 pm
To: Matthew Stokes
Subject: Your Enquiry: RFI/2016/24990
Attachments: flood risk & flood consequence assessments.pdf; Flood History Information.pdf; Flood History Map.pdf; Flood Map for Planning.pdf; Surface Water Map 1.pdf; Surface Water Map 2.pdf

Our Ref: RFI/2016/24990

Your Ref:

Dear Matthew

Provision of Product 4 for Lee Lane, Royston

Thank you for your request of 30 September 2016 to use Environment Agency data, in the development of the above site. The information is attached.

If you have requested this information to help inform a development proposal, then you should note the detail in the attached advisory text on the use of Environment Agency Information for Flood Risk Assessments.

Supporting Information

The Flood Map for Planning

The Environment Agency provides the Flood Map (see enclosed extract).

What is the Flood Map for Planning?

The Flood Map for Planning provides information on flooding from rivers and the sea for England and Wales. The Flood Map also has information on flood defences and the areas benefiting from those flood defences.

The Flood Map for Planning shows the following:

1. Flood Zone 3 (dark blue area on the enclosed map): natural flood plain area that could be affected by flooding from rivers and/or the sea – not taking into account the presence of any flood defences
 - For flooding from rivers the map indicates the extent of a flood with a 1% (1 in 100) chance of happening each year;
 - For flooding from the sea the map shows the extent of a flood with a 0.5% (1 in 200) chance of happening each year.
2. Flood Zone 2 (light blue area): natural flood plain area that could be affected by flooding from rivers and/or the sea – not taking into account the presence of any flood defences. Flood Zone 2:
 - indicates the extent of a flood with a 0.1% (1 in 1000) chance of happening each year.
 - and/or indicates the greatest recorded historic flood, whichever is greater.

Flood History

To the best of our knowledge there is no known flood history for this site. However, in close proximity to this location we do have some flood history available (see enclosed map).

Please note that this record now includes the 2015 flood levels and [DRAFT] extents. For Yorkshire as a whole there are some areas that are missing, this is because of a lack of data or low confidence. We will continue to review data and evidence throughout the summer, with a deadline of the end of September to upload the extents for a November publication date. These extents should therefore still be viewed as a draft output.

Water causing flooding can come from different places, for example from rivers or the sea; surface water (i.e. rainwater flowing over or accumulating on the ground before it is able to enter rivers or the drainage system); overflowing or backing up of sewers or drainage systems which have been overwhelmed or from groundwater rising up from underground aquifers.

Currently the Environment Agency can only supply flood risk data relating to the risk of flooding from rivers or the sea. However you should be aware that in recent years, there has been an increase in flood damage caused by surface water flooding or drainage systems that have been overwhelmed. Local Authorities and/or Water Companies may be able to provide some knowledge on the risk of flooding from sources other than rivers and the sea and we are working with these organisations to improve knowledge and understanding of surface water flooding.

Assets

There are no flood defences helping to reduce flood risk in your area of interest.

Modelling

We do not have any modelling information at this location.

Climate Change

Please note that new guidance on climate change allowances for Flood Risk Assessments has been published in February 2016.

The new guidelines are available from:

<https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances>

River

Non Main River

The watercourse at this location is not designated as Main River. It is classed as an Ordinary Watercourse. The local authority holds responsibility for the maintenance of this river. The Environment Agency does not have any more information available in regard to past flooding issues or current flood risk. For any information on any past flooding and for any record of the impact of local drainage on that watercourse we suggest you speak to your City Council Drainage Section and to Yorkshire Water.

Other

Surface Water Map

Risk of flooding from surface water information.

Thank you for the enquiry regarding your site.

Attached is a map of showing the risk of flooding from surface water for this area, produced in partnership with Local Authorities.

Surface water flood risk is widely distributed and can happen far from rivers and the sea. It's sometimes hard to say whether you're in an area at risk of flooding from surface water because surface water flooding can follow many more paths and can be affected by very small features such as kerb height and even speed bumps. We recommend you consider not only whether your property is shown in or near an area at risk, but also the broader scale and pattern of surface water flooding shown in your area. You may also wish to view this and other flood risk maps on our website.

Whether your property is at risk will depend on the accuracy of the mapping in this area, and on the details of your property – for example, how waterproof the structure is, the levels of doors and airbricks, and whether you have installed any flood resilience measures such as airbrick covers and flood boards.

Information Warning

Please note:

It is not possible to say for certain what the flood risk is but we use the best information available to provide an indication so that people can make informed choices about living with or managing the risks. The information we supply does not provide an indicator of flood risk at an individual property / site level.

The flood risk information provided on the attached map does not cover other sources of flooding such as from rivers and sea.

Surface Water Drainage

The Lead Local Flood Authority is the statutory consultee for planning matters relating to surface water drainage, therefore it is recommended they should be consulted separately regarding this.

Surface water discharge from new development should ideally 'mimic' the pre-development situation using a sustainable drainage system so that the flow and volume of water in watercourses is not increased.

A permit may be required, under the Environmental Permitting Regulations 2010 from the Environment Agency for any proposed works or structures in, under, over or within eight metres of a 'main river' (e.g. a new outfall). A permit is separate to and in addition to any planning permission granted. Further details and guidance are available on the GOV.UK website: <https://www.gov.uk/guidance/flood-risk-activities-environmental-permits>

Risk of Flooding from Reservoirs Map

Outlines and simplified depth and velocity maps can be viewed on our website:

<http://watermaps.environment-agency.gov.uk/wiyby/wiyby.aspx?topic=reservoir&scale=1&textonly=off&ep=map&layerGroups=default&lang=e&y=355134&x=357683#x=438988&y=406600&scale=2>

Please, zoom into the location of interest, and then click on the inundated location for details. As a result a list of reservoirs will be provided with supporting information and a links to other data, such as estimated depths and speed of flooding, at the bottom of the result page.

A map of showing the outlines can also be provided on request.

Flood Warning

The site is not covered by a Flood Warning.

LIDAR Data

Please note that our LiDAR data is now available free of charge (Open Data) from <http://environment.data.gov.uk/ds/survey/index.jsp#/survey> (once zoomed to the relevant location the available LiDAR products will be listed below the map).

Two LIDAR products are available:

1. Tiled LIDAR data - The full tiled dataset consists of historic LIDAR data which has been gathered since 1998. For some areas we have carried out repeat surveys and data is available in a range of resolutions.
2. Composite LIDAR data - The composite dataset is derived from a combination of our full tiled dataset which has been merged and re-sampled to give the best possible spatial coverage.

Light Detection and Ranging (LIDAR) is an airborne mapping technique, which uses a laser to measure the distance between the aircraft and the ground. This technique results in the production of an accurate, cost-effective terrain model suitable for assessing flood risk and other environmental applications.

The Environment Agency owns two LIDAR systems, which are installed in a survey aircraft along with its other operational remote sensing instruments.

The aircraft is positioned and navigated using Global Positioning System (GPS) corrected to known ground reference points. The aircraft typically flies at a height of about 800 metres above ground level and a scanning mirror allows a swath width of about 600 metres to be surveyed during a flight.

The Rights & Responsibilities of a Riverside Owner

The owner of property adjacent to a watercourse is usually deemed to be the riparian owner and, as such, has both riparian rights and responsibilities with regard to the watercourse within their ownership.

The responsibility for general maintenance and repair of the watercourse and its banks rests with the riparian owner. For more information on Rights and Responsibilities of a riverside owner, you can visit our website at: <https://www.gov.uk/government/organisations/environment-agency> go to the Flooding and coastal change section and

click on 'Riverside ownership: rights and responsibilities ('living on the edge') under the River maintenance section and download the 'Living on the Edge' booklet.

Alternatively type the following address into your web browser:

<https://www.gov.uk/government/publications/riverside-ownership-rights-and-responsibilities>

Ordnance Survey Data

Under the terms of our licence agreement with the Ordnance Survey, we are unable to supply the OS data. Under this agreement we can only supply OS data to consultants/contractors carrying out work on our behalf.

Flood Portal

It's a new 'one-stop shop' web portal providing guidance and information on flood risk management in the UK. Arup have written and designed the site, in conjunction with CIRIA, the Local Government Association, the EA and Defra, primarily as a resource for local authority officers, flood risk management professionals, and others with an interest in flood risk. It's a part of the Capacity Building Strategy.

<http://www.local.gov.uk/floodportal>

This information is provided subject to the Open Government Licence ([here](#)) - please read for details of permitted use.

If you have any queries or would like to discuss the content of this letter further please contact us on the telephone number below.

We would be really grateful if you could spare five minutes to help us improve our service. Please click on the link below and fill in our survey – we use every piece of feedback we receive:

<http://www.smartsurvey.co.uk/s/EnvironmentAgencyCustomerSurvey/?a=Y>

Yours sincerely

Cheryl Beech

Customers and Engagement Team

✉ **Environment Agency, Lateral, 8 City Walk, Leeds. LS11 9AT**

☎ **General Enquiries Team 020 847 48174**

☎ **Direct 020 3025 6412 (internal 56412)**

📧 neyorkshire@environment-agency.gov.uk

Please note my working days are Tuesday, Wednesday and Thursday

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Use of Environment Agency Information for Flood Risk / Flood Consequence Assessments

Important

If you have requested this information to help inform a development proposal, then we recommend that you undertake a formal pre-application enquiry using the form available from our website:-

<http://www.environment-agency.gov.uk/research/planning/33580.aspx>

Depending on the enquiry, we may also provide advice on other issues related to our responsibilities including flooding, waste, land contamination, water quality, biodiversity, navigation, pollution, water resources, foul drainage or Environmental Impact Assessment.

In **England**, you should refer to the Environment Agency's Flood Risk Standing Advice, the technical guidance to the National Planning Policy Framework and the existing PPS25 Practice Guide for information about what flood risk assessment is needed for new development in the different Flood Zones. These documents can be accessed via:

<http://www.environment-agency.gov.uk/research/planning/82587.aspx>

<http://www.communities.gov.uk/publications/planningandbuilding/nppftechnicalguidance>

<http://www.communities.gov.uk/publications/planningandbuilding/pps25guideupdate>

You should also consult the Strategic Flood Risk Assessment produced by your local planning authority.

In **Wales**, you should refer to TAN15 for information about what flood consequence assessment is needed for new development in the different flood zones

<http://new.wales.gov.uk/splash;jsessionid=8ylGTfGZthmB0t2vhp6hS1GcB1LXvZzB3Ylczf20Xn7LK3zk0nMk!981825250?orig=/topics/planning/policy/tans/tan15/>

You should also consult the Strategic Flood Consequence Assessment if one has been produced by your local planning authority.

In both **England and Wales** you should note that:

1. Information supplied by the Environment Agency may be used to assist in producing a Flood Risk / Consequence Assessment (FRA / FCA) where one is required, but does not constitute such an assessment on its own.
2. This information covers flood risk from main rivers and the sea, and you will need to consider other potential sources of flooding, such as groundwater or overland runoff. The information produced by the local planning authority referred to above may assist here.
3. Where a planning application requires a FRA / FCA and this is not submitted or deficient, the Environment Agency may well raise an objection.
4. For more significant proposals in higher flood risk areas, we would be pleased to discuss details with you ahead of making any planning application, and you should also discuss the matter with your local planning authority.

Flood History Information - RFI: 24990

Name	Start Date	End Date	Source of Flooding	Cause of Flooding	Source of Boundary
June 2007 Surface Water Flooding Yorkshire	15/06/2007	25/06/2007	Other	Unknown	Aerial Photography

Flood History Map for Land off Lee Lane, Royston

RFI: 10286 Date Created: 22/06/16



www.environment-agency.gov.uk

Scale: 1:10,000

when reproduced @ A3



Historical Flood Extents and Levels

LEGEND

Detailed River Network CDS_CONTEXT.DRN.RIVERTYPE

- Primary River
- Secondary River
- Tertiary River
- D/S of High Water Mark
- D/S of Seaward Extension
- Lake / Reservoir
- Canal
- Extended Culvert (greater than 50m)
- Canal Tunnel
- Underground River (inferred)
- Underground River (local knowledge)
- ▨ 2007 Flood Event Surface Water Flood Extent

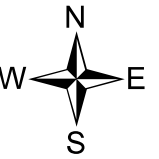
Flood Map for Planning for Land off Lee Lane, Royston

Date Created: 13.10.16 RFI: 24990

www.environment-agency.gov.uk














Scale: 1:10,000

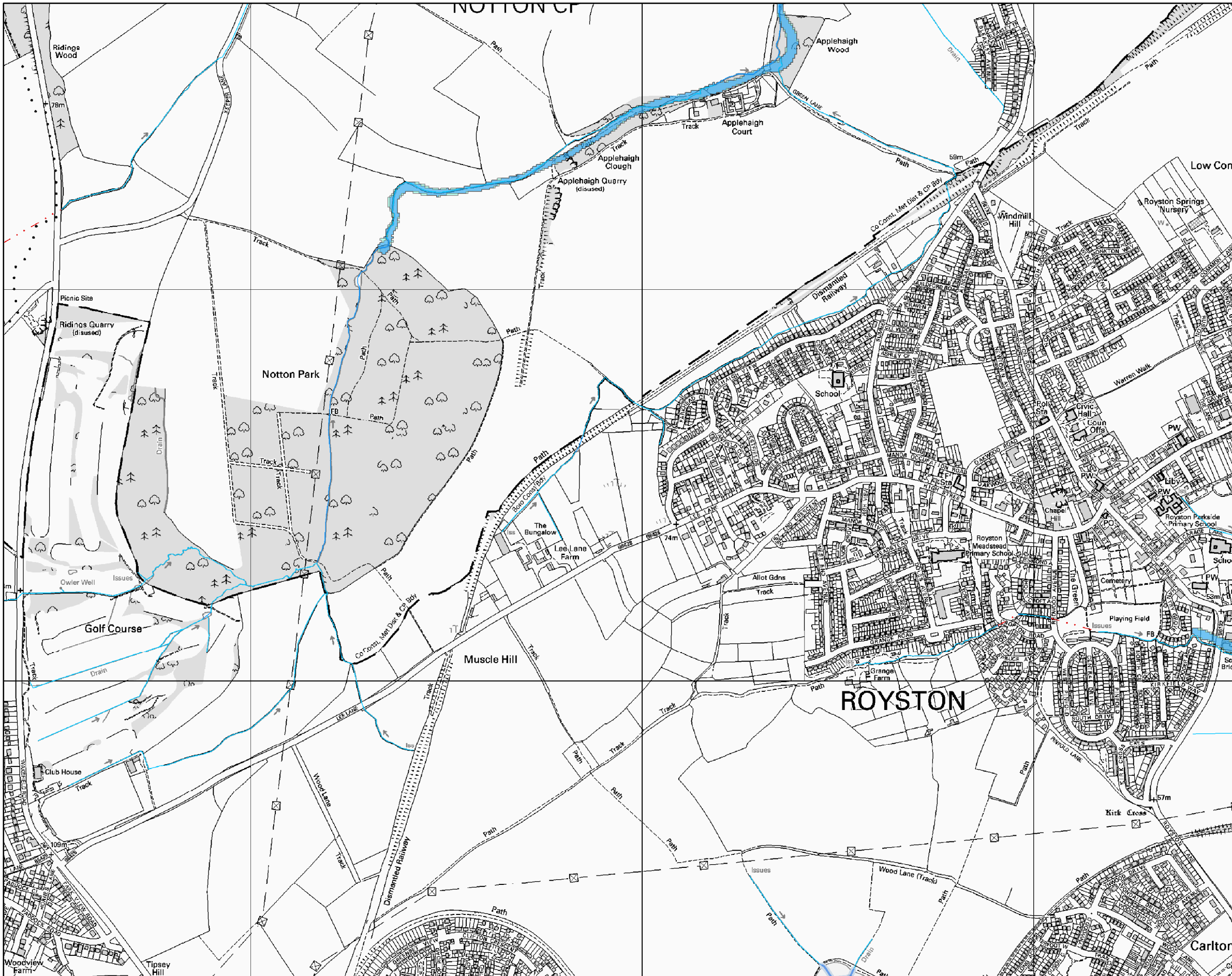
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LEGEND




Detailed River Network
CDS_CONTEXT.DRN.RIVERTYPE

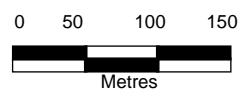
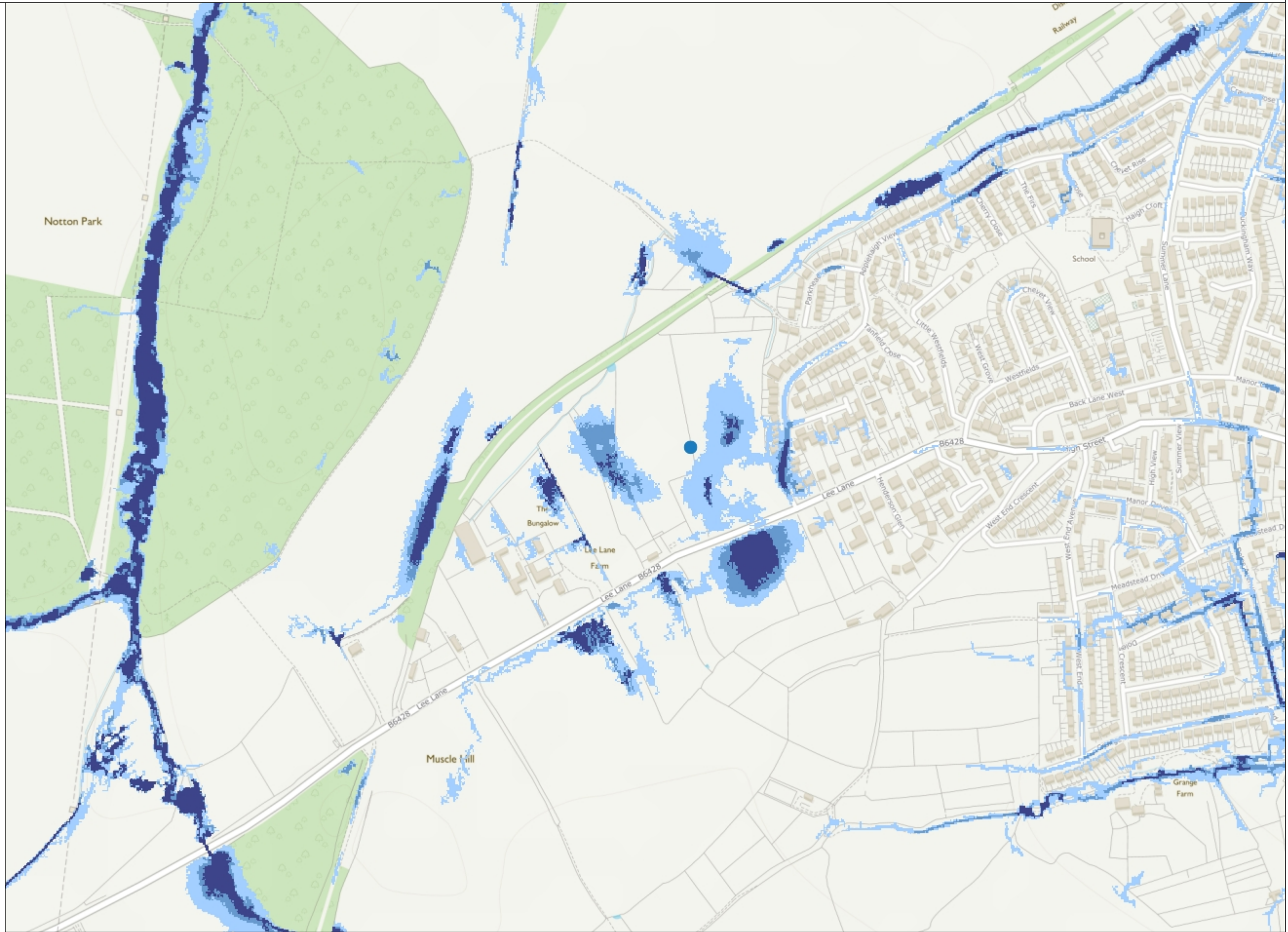
-  Primary River
-  Secondary River
-  Tertiary River
-  D/S of High Water Mark
-  D/S of Seaward Extension
-  Lake / Reservoir
-  Canal
-  Extended Culvert (greater than 50m)
-  Canal Tunnel
-  Underground River (inferred)
-  Underground River (local knowledge)
-  Flood Zone 2 (FZ2)
-  Flood Zone 3 (FZ3)



Risk of Flooding by Surface Water for Land off Lee Lane, Royston




Legend

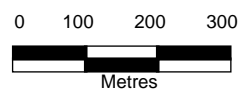
-  Flood Extent 1 in 30
-  Flood Extent 1 in 100
-  Flood Extent 1 in 1000



Risk of Flooding by Surface Water for Land off Lee Lane, Royston

Legend

-  Flood Extent 1 in 30
-  Flood Extent 1 in 100
-  Flood Extent 1 in 1000



APPENDIX E

WATER AUTHORITY CONSULTATION



YorkshireWater

**Mr M Stokes
Arp Associates
Unit 5/6 Northwest Business Pk
1ST FLR Servia Hill
Woodhouse
Leeds
LS6 2QH**

**Yorkshire Water Services
Developer Services
Sewerage Technical Team
PO BOX 52
Bradford
BD3 7AY**

**Tel: 0345 120 8482
Fax: (01274) 372 834**

**Your Ref:
Our Ref: S015357**

**Email:
Technical.Sewerage@yorkshirewater.co.uk**

**For telephone enquiries ring:
Chris Roberts on 0345 120 8482**

14th October 2016

Dear Mr Stokes,

Lee Lane, Royston - Pre-planning sewerage enquiry on R322541 - Residential

Thank you for your recent enquiry. Our charge of £152.00 (plus VAT) will be added to your account with us, reference ARP013. You will receive an invoice for your account in due course.

Please find enclosed a complimentary extract from the Statutory Sewer Map which indicates the recorded position of the public sewers. Please note that as of October 2011 and the private to public sewer transfer, there are many uncharted Yorkshire Water assets currently not shown on our records. The following comments reflect our view, with regard to the public sewer network only, based on a 'desk top' study of the site and are valid for a maximum period of twelve months.

Existing Infrastructure

There is a 450mm diameter public surface water sewer recorded within the site. No buildings, or other obstructions, are to be erected within 3.5 (three point five) metres, nor trees planted within 5 (five) metres of this public sewer. It may not be acceptable to raise or lower ground levels over the sewer, nor to restrict access to the manholes on the sewer. If you wish to have this sewer diverted under Section 185 of the Water Industry Act 1991 an application should be made in writing. To discuss this matter, please telephone 0345 120 84 82.

There is an outfall to a watercourse, under the control of Yorkshire Water, located within the site. Vehicular access, including with large tankers, could be required at any time.

(Please note:- due to the change in legislation on 01/10/2011 there may be public sewers within the site boundary which is not recorded on the Statutory Sewer Map the presence of which should be taken into account in the design of the scheme)

Foul Water

Development of the site should take place with separate systems for foul and surface water drainage. The separate systems should extend to the points of discharge to be agreed.

Foul water domestic waste should discharge to the 225 mm diameter public foul water sewer recorded in Parkhead Close, at a point approximately 40 metres from the site. Although this sewer is not shown on the attached sewer map, it has transferred as a public asset under the Private to Public sewer transfer.



From the information supplied, it is not possible to determine if the whole site will drain by gravity to the public sewer network. If the site, or part of it, will not drain by gravity, then it is likely that a sewage pumping station will be required to facilitate connection to the public sewer network. If sewage pumping is required foul water discharge must not exceed 5 (Five) litres per second.

Surface Water

The developer's attention is drawn to Requirement H3 of the Building Regulations 2000. This establishes a preferred hierarchy for surface water disposal. Consideration should firstly be given to discharge to soakaway, infiltration system and watercourse in that priority order.

Sustainable Drainage Systems (SuDS), for example the use of soakaways and/or permeable hardstanding etc, may be a suitable solution for surface water disposal appropriate in this situation. You are advised to seek comments on the suitability of SuDS in this instance from the appropriate authorities.

The local public sewer network does not have capacity to accept any discharge of surface water from the proposal site. If SuDS are not viable, the developer is advised to contact the Environment Agency/local Land Drainage Authority with a view to establishing a suitable watercourse for discharge.

It is understood that a watercourse is located through the site. This appears to be the obvious place for surface water disposal (if SuDS are not viable).

Please note further restrictions on surface water disposal from the site may be imposed by other parties. You are strongly advised to seek advice/comments from the Environment Agency/Land Drainage Authority, with regard to surface water disposal from the site.

Other Observations

Any new connection to an existing public sewer will require the prior approval of Yorkshire Water. You may obtain an application form from our website (www.yorkshirewater.com) or by telephoning 0345 120 84 82.

An off-site foul and surface water sewer may be required which may be provided by the developer and considered for adoption under Section 104 of the Water Industry Act 1991. Please telephone 0345 120 84 82 for advice on sewer adoptions. Alternatively, the developer may in certain circumstances be able to requisition off-site sewers under Section 98 of the Water Industry Act 1991 for which an application must be made in writing. For further information, please telephone 0345 120 84 82.

Prospectively adoptable sewers and pumping stations must be designed and constructed in accordance with the WRc publication "Sewers for Adoption - a design and construction guide for developers" 6th Edition as supplemented by Yorkshire Water's requirements, pursuant to an agreement under Section 104 of the Water Industry Act 1991. An application to enter into a Section 104 agreement must be made in writing prior to any works commencing on site. Please contact our Developer Services Team (telephone 0345 120 84 82) for further information.

The public sewer network is for domestic sewage purposes. This generally means foul water for domestic purposes and, where a suitable surface water or combined sewer is available, surface water from the roofs of buildings together with surface water from paved areas of land appurtenant to those buildings. Land and highway drainage have no right of connection to the public sewer network. No land drainage to be connected/discharged to public sewer.

As a last resort, highway drainage may be accepted under certain circumstances. If it can be demonstrated, through satisfactory evidence, that SUDS are not a viable option, there are no watercourses or highway drains available and if capacity is available within the public sewer network, highway drainage discharges to the public sewer network may be permitted.



YorkshireWater

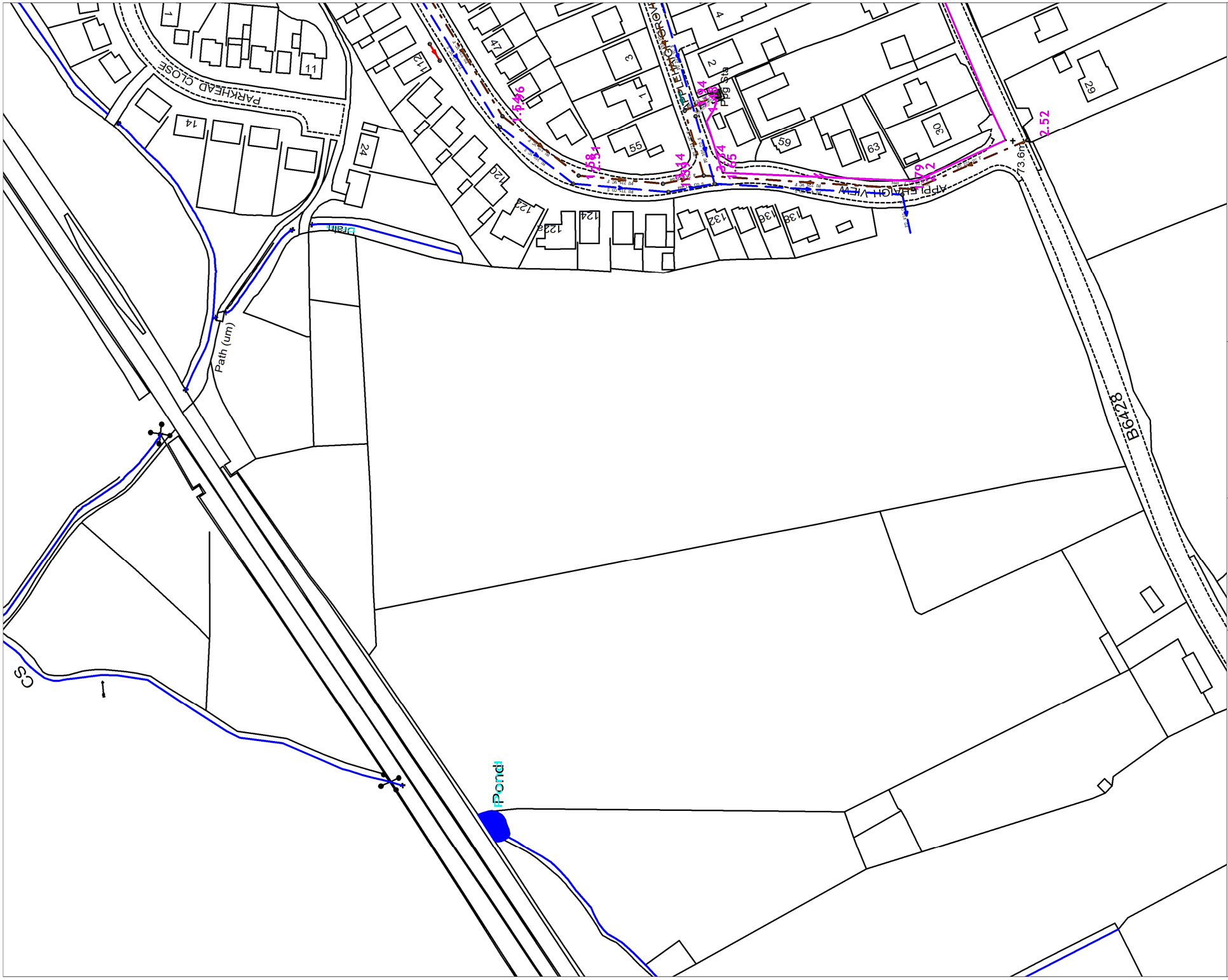
In this event, the developer may be required to enter into a formal agreement with Yorkshire Water Services under Section 115 Water Industry Act 1991 to discharge non-domestic flows into the public sewer network.


All the above comments are based upon the information and records available at the present time. The information contained in this letter together with that shown on any extract from the Statutory Sewer Map that may be enclosed is believed to be correct and is supplied in good faith. Please note that capacity in the public sewer network is not reserved for specific future development. It is used up on a 'first come, first served' basis. You should visit the site and establish the line and level of any public sewers affecting your proposals before the commencement of any design work.

Yours sincerely

A handwritten signature in black ink, appearing to read 'Chris Roberts'.

Chris Roberts
Sewerage Technician
Developer Services



434608 : 411357	Map Name : SE3411SE	Title
Yorkshire Water, PO Box 600, Halifax Road, Bradford BD6 2LZ Contact Name : YorMap Advisor C ROBERTS Contact Tel : 87 2582	Notes	
	Partial Key	This plan is furnished as a general guide only and no warranty are to be given upon the accuracy of the information shown. It is the user's responsibility to verify the accuracy of the information shown in the vicinity of public sewers. No house or property connections are shown.
	Foul Sewer = F	
	Combined Sewer = C	
	Surface Water Sewer = SW	
	Trade Sewer = TD	
	Partially Separate = PS	
	Date Req : 14/10/2016, 09:39:21	Date Gen : 14/10/2016, 09:39:32
	Source : Sewer Network Enquiry	

APPENDIX F

LAND DRAINAGE AUTHORITY CONSULTATION

Wayne Walker

From: Atkins , Wayne <WayneAtkins@barnsley.gov.uk>
Sent: Monday 13 March, 2017 12:54 pm
To: Martin Ingram
Cc: Wayne Walker
Subject: RE: 1048/88 Residential Development at Lee Lane Royston for BDW Homes

Hi Martin,

Good to hear from you, everything is OK in Wayne's world at the moment, thanks for asking. Hope you are well too.

I can confirm that a maximum discharge into the culverted watercourse of 23.8 l/s is acceptable to us as Land Drainage Authority.

I assume the site drainage is to be adopted by Yorkshire Water.

Cheers

Wayne Atkins
Principal Engineer – Highway Management
Environment & Transport
Place Directorate
Barnsley Metropolitan Borough Council

Telephone: 01226 772182

E-mail: wayneatkins@barnsley.gov.uk

From: Martin Ingram [<mailto:MartinIngram@arpassociates.co.uk>]
Sent: 08 March 2017 09:35
To: Atkins , Wayne
Cc: Wayne Walker
Subject: 1048/88 Residential Development at Lee Lane Royston for BDW Homes

Good morning Wayne

Long-time no see, I trust you are keeping well?

I understand that you may be looking after the jobs that Derek Bell was doing, as I understand he has now left the authority.

We met with Derek, Planners and Highways a couple of weeks ago to discuss the residential development site at Lee Lane, Royston for Barratt David Wilson Homes, we put forward a proposal to restrict the proposed run-off from the site, which is greenfield, to 5 l/sec/ha which equates to 23.8 l/sec with a discharge into the culverted watercourse which runs down the eastern boundary.

Due to the levels on site it is likely that we will have to pump the flows to the culverted watercourse.

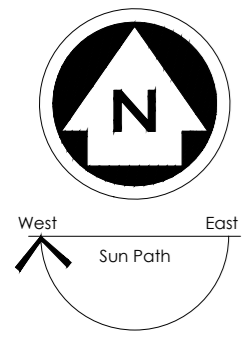
Surface water storage will be in the form of an underground concrete tank to attenuate flows up to 1 in 30 years with additional storage provided within the public open space for storms in excess of this.

I appreciate you may or may not be up to speed with this site or Derek's workload but I would appreciate it if you could confirm that these proposals are acceptable.

APPENDIX G

PLANNING LAYOUT

Lee Lane, Royston Planning Layout



Legend

- | | | | |
|--|--|--|---|
| | Existing Dwellings | | Front entrance door |
| | Proposed Dwellings | | Bin collection points on private drives |
| | Primary Street | | Affordable housing |
| | Secondary Street | | Indicative Landscaping |
| | Private Drive | | Existing trees removed / pruned |
| | Private Drive constructed to accommodate 12.5 tonne fire appliance | | Existing trees to remain. |
| | 1.8m high timber screen fence | | |
| | 0.9m high timber post and rail fence | | |

C	11.05.17	Footpath to site entrance revised
B	30.03.17	Garages removed from Woodcotes. Sub-station shown. LEAP with stand off shown
A	10.03.17	Local Authority comments incorporated

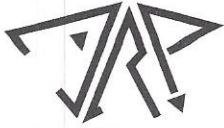
Development:	Lee Lane
Location:	Royston
Marketing Name:	
Drawing Title:	Planning Layout
Drawing Number:	LL-PL / 01
Revision:	C
Scale @ A1:	1:500
Drawn By:	KL
Date Started:	Nov 2016

**BARRATT
HOMES**

Raynham House, 2 Capitol Park, Morley, Leeds LS27 0WH
Tel: 0113 307 6850

A P P E N D I X H

INDICATIVE SURFACE WATER DRAINAGE CALCULATIONS



Client: <u>BW YORKSHIRE WEST</u>	Project No. <u>1048/88</u>	Sheet <u>1</u> of <u>7</u>
Project: <u>LEE CANE, ROYSTON</u>	Calc By. <u>ARP</u>	Date. <u>29/11/16</u>
Element: <u>SURFACE WATER DRAINAGE</u>	Chkd By.	Date.

EXISTING DEVELOPMENT AREA (I_{ex})

Using the proposed development layout (Appendix F)

$$\begin{aligned} I_{ex} &= \text{Total Site area} - \text{green areas} \\ &= 56000 - (95 \times 40) - (100 \times 20) \\ &\quad - (170 \times 15) \\ &= 47500 \text{ m}^2 = \underline{\underline{4.75 \text{ ha}}} \end{aligned}$$

GREENFIELD DISCHARGE RATE (Q_{ex})

Consultations with Barnsley MDC

$$\text{Rate} = \underline{\underline{5 \text{ l/s/ha}}}$$

PROPOSED DISCHARGE RATE (Q_{prop})

$$\text{Development Area} = 4.75 \text{ ha}$$

$$\text{Discharge Rate} = 5 \text{ l/s/ha}$$

$$\begin{aligned} \therefore Q_{prop} &= 4.75 \times 5 \\ &= \underline{\underline{23.8 \text{ l/s}}} \end{aligned}$$

PROPOSED IMPERMEABLE AREA (I_{prop})

Make assumption that 50% of development area becomes impermeable

$$Q_{prop} = 4.75 \times 0.5$$

$$Q_{prop} = \underline{\underline{2.38 \text{ ha}}}$$



ARP ASSOCIATES
AND GEOTECHNICAL LTD
CHARTERED CONSULTING ENGINEERS

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Client: <u>BDW YORKSHIRE WEST</u>	Project No. <u>1048/88</u>	Sheet <u>2</u> of <u>7</u>
Project: <u>LEE LAKE, ROYSTON</u>	Calc By. <u>ARP</u>	Date. <u>29/11/16</u>
Element: <u>SURFACE WATER DRAINAGE</u>	Chkd By.	Date.

ATTENUATION

Using the WIDES Source Control Computer Program with the following parameters

$$Q_{PROP} = 23.8 \text{ l/s.}$$

$$I_{PROP} = 2.38 \text{ ha.}$$

$$\text{Storm Intensity} = 1 \text{ in } 100 \text{ year.}$$


$$\text{Climate Change} = + 40\%$$

$$\therefore \text{Attenuation} = \underline{\underline{1247.2 \text{ m}^3}}$$

This can be accommodated by a detention pond with a net area of 1248 m^2 at 1m deep.

If side slopes are 1 in 6, then the top surface area will be 1914 m^2 ($43.75 \text{ m} \times 43.75 \text{ m}$) or equivalent.


Computer output sheets are presented on pages 3 -

ARP Associates		Page 3
Northwest House Servia Hill Leeds LS6 2QH	BDW Yorkshire West Lee Lane, Royston 1048/88Prelim100yr+CC@23.8l/s	
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Elstree Computing Ltd		Source Control 2016.1

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

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Overflow (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	100.431	0.431	23.8	0.0	23.8	537.4	O K
30 min Summer	100.565	0.565	23.8	0.0	23.8	705.4	O K
60 min Summer	100.696	0.696	23.8	0.0	23.8	869.0	O K
120 min Summer	100.808	0.808	23.8	0.0	23.8	1007.8	O K
180 min Summer	100.848	0.848	23.8	0.0	23.8	1057.7	O K
240 min Summer	100.855	0.855	23.8	0.0	23.8	1067.6	O K
360 min Summer	100.831	0.831	23.8	0.0	23.8	1037.4	O K
480 min Summer	100.801	0.801	23.8	0.0	23.8	1000.2	O K
600 min Summer	100.777	0.777	23.8	0.0	23.8	969.7	O K
720 min Summer	100.755	0.755	23.8	0.0	23.8	942.0	O K
960 min Summer	100.713	0.713	23.8	0.0	23.8	890.2	O K
1440 min Summer	100.631	0.631	23.8	0.0	23.8	787.0	O K
2160 min Summer	100.510	0.510	23.8	0.0	23.8	637.0	O K
2880 min Summer	100.400	0.400	23.8	0.0	23.8	499.0	O K
4320 min Summer	100.219	0.219	23.8	0.0	23.8	272.7	O K
5760 min Summer	100.096	0.096	23.8	0.0	23.8	119.2	O K
7200 min Summer	100.025	0.025	23.8	0.0	23.8	30.9	O K
8640 min Summer	100.000	0.000	23.1	0.0	23.1	0.0	O K
10080 min Summer	100.000	0.000	20.4	0.0	20.4	0.0	O K
15 min Winter	100.485	0.485	23.8	0.0	23.8	604.7	O K
30 min Winter	100.639	0.639	23.8	0.0	23.8	797.1	O K


Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Overflow Volume (m³)	Time-Peak (mins)
15 min Summer	126.356	0.0	539.5	0.0	23
30 min Summer	84.383	0.0	725.6	0.0	37
60 min Summer	53.779	0.0	946.1	0.0	66
120 min Summer	33.118	0.0	1168.5	0.0	126
180 min Summer	24.591	0.0	1302.6	0.0	186
240 min Summer	19.777	0.0	1396.8	0.0	246
360 min Summer	14.482	0.0	1535.6	0.0	358
480 min Summer	11.611	0.0	1641.8	0.0	410
600 min Summer	9.774	0.0	1727.7	0.0	470
720 min Summer	8.487	0.0	1800.1	0.0	534
960 min Summer	6.785	0.0	1918.7	0.0	668
1440 min Summer	4.942	0.0	2094.1	0.0	942
2160 min Summer	3.592	0.0	2300.0	0.0	1344
2880 min Summer	2.861	0.0	2441.2	0.0	1732
4320 min Summer	2.072	0.0	2645.9	0.0	2428
5760 min Summer	1.646	0.0	2816.4	0.0	3120
7200 min Summer	1.377	0.0	2942.7	0.0	5904
8640 min Summer	1.189	0.0	3055.5	0.0	0
10080 min Summer	1.051	0.0	3151.0	0.0	0
15 min Winter	126.356	0.0	605.7	0.0	22
30 min Winter	84.383	0.0	814.6	0.0	37

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Elstree Computing Ltd		Source Control 2016.1

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

Storm Event	Max Level (m)	Max Depth (m)	Max Control (1/s)	Max Overflow (1/s)	Max Σ Outflow (1/s)	Max Volume (m³)	Status
60 min Winter	100.791	0.791	23.8	0.0	23.8	987.2	O K
120 min Winter	100.925	0.925	23.8	0.0	23.8	1153.9	Flood Risk
180 min Winter	100.980	0.980	23.8	0.0	23.8	1222.4	Flood Risk
240 min Winter	100.999	0.999	23.8	0.0	23.8	1247.2	Flood Risk
360 min Winter	100.995	0.995	23.8	0.0	23.8	1241.7	Flood Risk
480 min Winter	100.965	0.965	23.8	0.0	23.8	1204.5	Flood Risk
600 min Winter	100.923	0.923	23.8	0.0	23.8	1151.3	Flood Risk
720 min Winter	100.893	0.893	23.8	0.0	23.8	1114.3	O K
960 min Winter	100.835	0.835	23.8	0.0	23.8	1041.9	O K
1440 min Winter	100.709	0.709	23.8	0.0	23.8	885.2	O K
2160 min Winter	100.523	0.523	23.8	0.0	23.8	652.2	O K
2880 min Winter	100.355	0.355	23.8	0.0	23.8	442.6	O K
4320 min Winter	100.100	0.100	23.8	0.0	23.8	125.3	O K
5760 min Winter	100.000	0.000	23.1	0.0	23.1	0.0	O K
7200 min Winter	100.000	0.000	19.3	0.0	19.3	0.0	O K
8640 min Winter	100.000	0.000	16.7	0.0	16.7	0.0	O K
10080 min Winter	100.000	0.000	14.8	0.0	14.8	0.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Overflow Volume (m³)	Time-Peak (mins)
60 min Winter	53.779	0.0	1062.0	0.0	66
120 min Winter	33.118	0.0	1309.8	0.0	124
180 min Winter	24.591	0.0	1459.6	0.0	182
240 min Winter	19.777	0.0	1565.8	0.0	240
360 min Winter	14.482	0.0	1720.5	0.0	352
480 min Winter	11.611	0.0	1839.5	0.0	460
600 min Winter	9.774	0.0	1935.7	0.0	552
720 min Winter	8.487	0.0	2016.7	0.0	574
960 min Winter	6.785	0.0	2149.3	0.0	726
1440 min Winter	4.942	0.0	2345.6	0.0	1028
2160 min Winter	3.592	0.0	2576.8	0.0	1452
2880 min Winter	2.861	0.0	2735.4	0.0	1824
4320 min Winter	2.072	0.0	2965.9	0.0	2684
5760 min Winter	1.646	0.0	3159.9	0.0	0
7200 min Winter	1.377	0.0	3302.4	0.0	0
8640 min Winter	1.189	0.0	3422.1	0.0	0
10080 min Winter	1.051	0.0	3529.1	0.0	0

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Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	19.000	Shortest Storm (mins)	15
Ratio R	0.364	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 2.380

Time (mins) Area			Time (mins) Area		
From:	To:	(ha)	From:	To:	(ha)
0	4	0.000	4	8	2.380

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Model Details

Storage is Offline Dividing Weir Level (m) 101.000
Cover Level (m) 101.200

Tank or Pond Structure

Invert Level (m) 100.000

Depth (m)	Area (m ²)	Depth (m)	Area (m ²)	Depth (m)	Area (m ²)	Depth (m)	Area (m ²)
0.000	1248.0	0.700	1248.0	1.400	0.0	2.100	0.0
0.100	1248.0	0.800	1248.0	1.500	0.0	2.200	0.0
0.200	1248.0	0.900	1248.0	1.600	0.0	2.300	0.0
0.300	1248.0	1.000	1248.0	1.700	0.0	2.400	0.0
0.400	1248.0	1.100	0.0	1.800	0.0	2.500	0.0
0.500	1248.0	1.200	0.0	1.900	0.0		
0.600	1248.0	1.300	0.0	2.000	0.0		


Hydro-Brake Optimum® Outflow Control

Unit Reference MD-SHE-0214-2380-1000-2380
Design Head (m) 1.000
Design Flow (l/s) 23.8
Flush-Flo™ Calculated
Objective Minimise upstream storage
Application Surface
Sump Available Yes
Diameter (mm) 214
Invert Level (m) 100.000
Minimum Outlet Pipe Diameter (mm) 300
Suggested Manhole Diameter (mm) 1500

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.000	23.8
Flush-Flo™	0.356	23.8
Kick-Flo®	0.732	20.5
Mean Flow over Head Range	-	19.9

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	7.3	1.000	23.8	2.400	36.2	5.500	54.1
0.200	20.9	1.200	26.0	2.600	37.6	6.000	56.4
0.300	23.7	1.400	28.0	3.000	40.3	6.500	58.6
0.400	23.7	1.600	29.8	3.500	43.4	7.000	60.8
0.500	23.4	1.800	31.5	4.000	46.3	7.500	62.8
0.600	22.7	2.000	33.2	4.500	49.0	8.000	64.9
0.800	21.4	2.200	34.7	5.000	51.6	8.500	66.8

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Hydro-Brake Optimum® Outflow Control

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
9.000	68.7	9.500	70.5				

Weir Overflow Control

Discharge Coef 0.544 Width (m) 1.500 Invert Level (m) 101.000