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Moorthorpe Way, Mosborough

Avant Homes (Central)

Flood Risk Assessment and Drainage Strategy

February 2019

P2741

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Revision History			
Initial Issue	8 February 2019		
Prepared By:		Checked:	
	Timothy Davis Director		Graham Helme Director

Rev No	Date	Description	By	Checked
0	08.02.19	Initial Issue	TD	GH

Contents

1 INTRODUCTION

Avie Consulting Ltd has been commissioned by Avant Homes to carry out a STAGE 1 Flood Risk Assessment and Drainage Strategy report in order to support a Full Planning Application for a New Residential development served off Moothorpe Way , Mosborough

The aim of this report is to allow Council to assess the site in accordance with the National Planning Policy Framework published by the Department of Communities and Local Government.

2 PROPOSED DEVELOPMENT

The site is a Greenfield Development with a proposed end use of residential, the total site area is 2.82 Hectares, please refer Appendix A for Site Development Proposals.

The site is located 7.5km South East of Sheffield City Centre at Ordnance Survey grid reference SK416 826, with the nearest post code being S20 6PD

The site is bounded as follows:

To the North – woodland and watercourse beyond (Ochre Dyke)

To the East – Further Development land which is below the site in level terms

To the South – Woodland and Residential Development

To the West – Woodland/ open land

The site falls steeply South to North with an average gradient of 1 in 12

Site location plan is shown in Figure 1

Figure 1

3 FLOOD RISK ASSESSMENT CRITERIA

The EA flood data was obtained, the site under consideration is within Flood Zone 1 according to the latest version of the Indicative Floodplain Map (IFM) produced by the Environment Agency.

EA Indicative Floodplain Map is enclosed in Appendix B.

As the site lies within Flood Zone 1 the flood risk assessment needs to consider the following:

- Flooding from other sources such as rivers ,tidal, sewers and overland flooding
- The potential for the development to increase flooding elsewhere through the addition of hard surfaces
- The effect of the new development on surface water run-off
- EA data set accuracy

4 HISTORICAL FLOODING

The historical flood map was obtained from Envirocheck, which has confirmed that the site does not have a history of flooding.

The Historical flood map is enclosed in Appendix C

5 EXISTING FLOOD DEFENCES

The site does not benefit from any flood defences.

6 SOURCES OF FLOODING

As part of the flood risk assessment consideration should be given to the following sources of flooding and what effect these could have on the development.

6.1 Flooding from Rivers / Watercourses

Ochre Dyke is present to the North of the site, approximately 40m from the site boundary.

Please refer to Appendix D for the Watercourse network map.

The risk of flooding from this source is considered to be **LOW.**

6.2 Flooding from the Sea

The site is approximately 107Km from the sea, as such the risk of flooding from this source is considered to be **LOW**.

6.3 Flooding from Land

The effect of intense rainfall needs to be considered and the local Topography of the land assessed.
The development area falls south to north however the boundaries on the high side (South and West) of the development have little ability to create overland flows and or intercepted by infrastructure.

As such the risk of flooding from this source is considered to be **LOW**.

6.4 Flooding from Groundwater

Groundwater flooding occurs when water levels in the ground rise above surface elevations, particularly in low lying areas. The Enviro check data sheet classifies the site as having negligible potential for Groundwater Flooding , the risk of groundwater flooding is **LOW** Please refer to Appendix E.

6.5 Flooding From Sewers

Sewer records have been obtained from Yorkshire Water, NO sewers cross the site.
Please refer to Appendix F.

We consider the risk of flooding from this source is considered to be **LOW**.

7 FLOOD RISK SUMMARY

Sources of Flooding	Risk			Control Measures
	High	Medium	Low	
Rivers:			X	Ensure flood routes are maintained.
Sea			X	None
Land			X	Ensure flood routes are maintained and plot FFL to be 150mm above
Groundwater			X	Ensure flood routes are maintained and plot FFL to be 150mm above
Existing sewers			X	Ensure flood routes are maintained and plot FFL to be 150mm above

8 INCREASE TO OFFSITE FLOODING

The development should be designed to limit the surface water run-off to existing surface water discharge flows rates or better.

The site is classified as Greenfield Development therefore offsite flows should be limited to match current discharges.

9 FLOOD RISK VULNERABILITY

The vulnerability of the proposed development is assessed in accordance with the Technical Guidance to the National Planning Policy Framework published by the Department for Communities and Local Government in March 2012.

The report should consider if the development is acceptable for the Flood Zone Classification in accordance with Table 3 within the NPPF.

The proposed development is Residential and is classified as **"More vulnerable"** according to the NPPF.

The site is indicated on the flood maps to be in Flood Zone 1.

Table 3: Flood Risk Vulnerability and Flood Zone 'Compatibility'

Flood Risk Vulnerability Classification (from Table 2)		**Essential Infrastructure**	**Water compatible**	**Highly Vulnerable**	**More Vulnerable**	**Less Vulnerable**
Flood Zone	Zone 1	✓	✓	✓	✓	✓
	Zone 2	✓	✓	Exception Test required	✓	✓
	Zone 3a	Exception Test required	✓	×	Exception Test required	✓
	Zone 3b	Exception Test required	✓	×	×	×

✓ Development is appropriate
× Development should not be permitted

Utilising the Flood Zone Compatibility Table above, the development is deemed appropriate for the site and flood risk classification Flood Zone 1

As part of the assessment the following development constraints require consideration and recommendation made as to how to mitigate any flood risk appropriately

9.1 Finished Floor Levels

The EA flood mapping indicates that Surface water flooding does enter /collect on the site and around the boundaries,please refer to Fig 2.

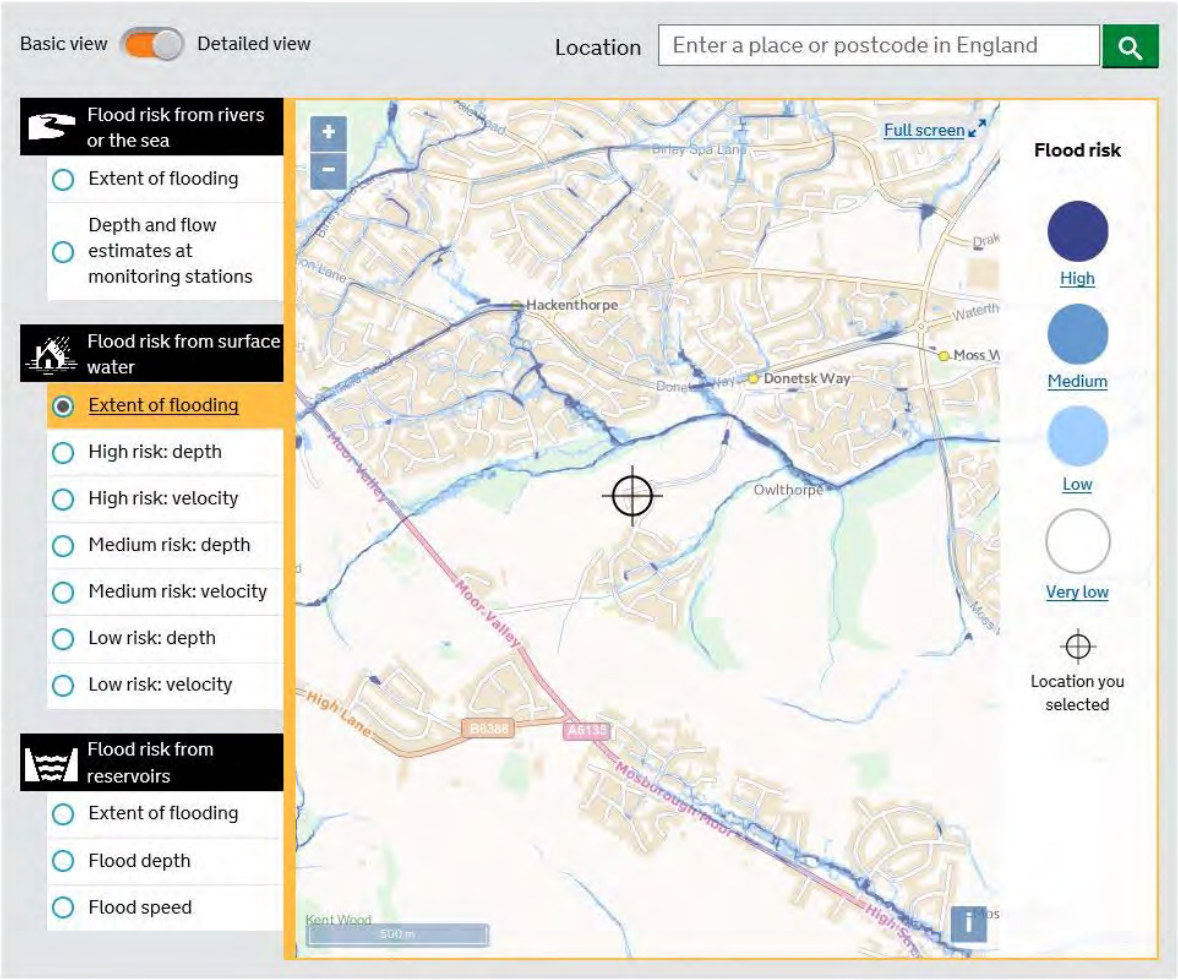


Fig 2

We recommend to mitigate against localised flooding caused by heavy / intense rainfall events, that the internal ground floor level of the plots are to be set at a minimum of 150mm above the lowest Existing ground level.

9.2 Existing Flood Volumes

No loss of existing flood volume will be experienced due to the redevelopment of the site is within

flood zone 1 .

9.3 Flood Routing

Flood Routing paths are to be maintained on site by keeping the raising of levels to a minimum.

9.4 Emergency Access

The site is in flood zone 1 according to the level information reviewed and as such emergency access is not an issue and no specific route requires to be delineated.

9.5 Flooding Risk from Reservoirs

The Site is NOT in an area that is of Risk from flooding due to reservoir failure, please refer to fig 3. As such we consider the risk of this occurrence is **LOW**.

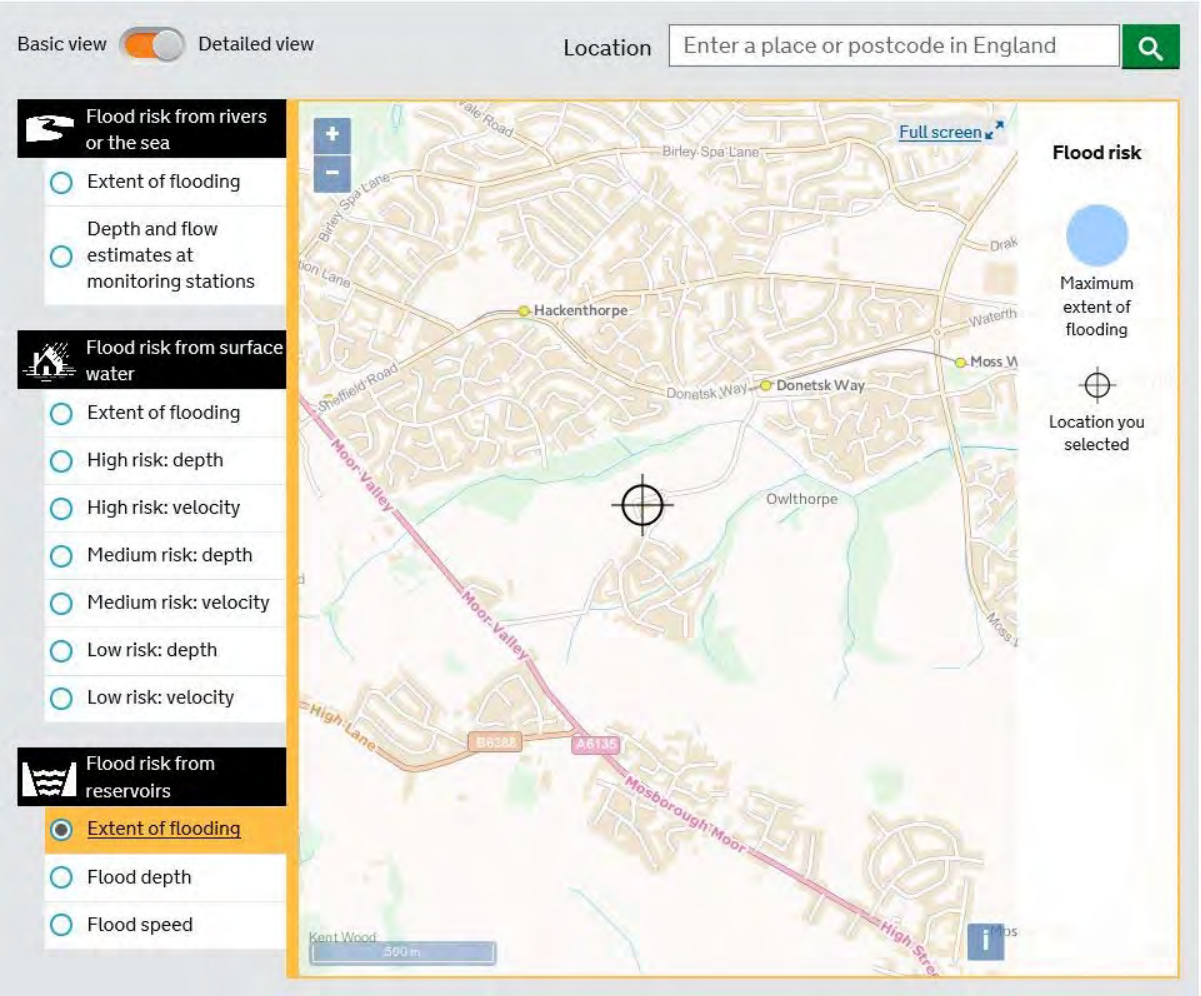


Fig 3

10 CLIMATE CHANGE ALLOWANCES

The EA have published revised climate change allowances rainfall intensity, such the climate change allowance are as follows in table2.

Table 2 peak rainfall intensity allowance in small and urban catchments (use 1961 to 1990 baseline)

Applies across all of England	Total potential change anticipated for the '2020s' (2015 to 2039)	Total potential change anticipated for the '2050s' (2040 to 2069)	Total potential change anticipated for the '2080s' (2070 to 2115)
Upper end	10%	20%	40%
Central	5%	10%	20%

Table 2.

Therefore the site drainage design should be checked utilising Climate Change Allowance of 40% and 20%

11 EXISTING SITE DRAINAGE

The existing site is classed as Greenfield, sites E and D are to be combined to utilise the same attenuation basin therefore the total site area for purposes of the Greenfield discharge rate is 4.72 ha which generates a Qbar flow of 13.72l/s according to the UKSuDS website (http://www.uksuds.com)

Please refer to Appendix G for the Site Topographical survey and Micro Drainage Greenfield runoff calculations.

12 DRAINAGE CONSULTATION

Yorkshire Water records are enclosed in Appendix F, YW have been consulted with respect to foul flows and connection locations, once received the report will be updated

13 PROPOSED DRAINAGE STRATERGY

13.1 Surface Water

In accordance with good practice and council polices new offsite surface water flows should be reduced by the introduction of an attenuation system following the hierarchy as laid out in the approved document H of Building Regulations with respect to Sustainable Urban Drainage Systems (SuDS).

The following destinations must be considered for surface runoff in order of preference:

- Discharge into the ground
- Discharge to a surface water body
- Discharge to a surface water sewer
- Discharge to a combined sewer

Discharge to Ground
The Geotechnical report undertaken by Lithos Consulting indicates the site is underlain by Weathered Coal Measures (CLAY), as such Infiltration Drainage techniques will not be viable, please refer to Appendix H.

Discharge to a Surface Water Body
The nearest Surface Water body is adjacent to the Northern site boundary, therefore this seems a reasonable place to discharge the sites generated SW flows.

Discharge to Surface Water Sewer
Public surface Water Sewers are available however they have been discounted as a watercourse discharge for SW flows is available

Discharge to Combined Sewer
No Combined Sewers are present near to the site near to the site as such connection would be possible

13.2 Foul Water

It is proposed Foul Drainage flows should connect to the Public Foul Sewer in Moorthorpe Way, confirmation to be provided by Yorkshire Water.

14 PROPOSED DRAINAGE SCHEME

The use of Sustainable Urban Drainage Systems (SUDS) allow the following benefits to be achieved when appropriate.

1. Reduced Water Quantity
2. Improved Water quality,
3. Increased amenity
4. Improved biodiversity.

The sites discharge is proposed to connect to the adjacent watercourse at Greenfield discharges rates, we consider in order to meet SuDS requirements and to limit oversized pipe network within the site a surface level storage basin with a restricted outfall to the existing would be the most appropriate attenuation system to the serve the development.
It is proposed that the attenuation basin will be sized to accommodate both sites D and E to ensure economic land usage.

Please refer to Appendix J for Proposed Drainage Strategy and associated calculations.

15 DRAINAGE IMPACT

Utilising Discharge rate of 13.72 l/s for all storms up to 1 in 100 yr plus CC event by the use of a single vortex flow control outfall will little to NO impact on the downstream system

16 GENERAL REMARKS

This report is for the sole use of Avant Homes and their immediate advisors in connection with the development of the subject site for residential use. It shall not be reproduced in whole or in part or relied upon by third parties for any use whatsoever without the express permission of Avie Consulting Ltd. Avie Consulting Ltd shall have no liability for any use of this report other than for the purposes for which it was originally prepared.

17 RECOMMENDATIONS

- The site under consideration is located in Zone 1 according latest version of the Indicative Floodplain Map (IFM) produced by the Environment Agency, **as such in Flood Risk terms the proposed development is appropriate for the site.**

- There are NO recorded historical flooding events directly affecting the site. The risk of flooding to the site is considered to be **LOW**.

- Infiltration drainage is not viable due to underlying ground conditions being Weather Coal Measures

- Residential Development is classified as "More Vulnerable" and is appropriate under the National Planning Policy Framework on this redevelopment site in terms of Flood Risk in flood zone 1.

- We recommend to mitigate against localised flooding caused by heavy / intense rainfall events, that the internal ground floor level of the plots are to be set at a minimum of 150mm above existing ground levels would suffice.

- Utilising Discharge rate of 13.72l/s for all storms up to 1 in 100 yr plus CC event by the use of a single vortex flow control outfall will have little to NO impact on the downstream system will be experienced.

- The proposed development will not affect flood routing, and as such flows/ flood routing will be maintained as per the pre-development scenario.

- Foul water discharge should connect to the existing gravity system located in Moorthorpe Way, subject to YW approval

- The sites discharge is proposed to connect to the adjacent watercourse at Greenfield discharges rates, we consider in order to meet SuDS requirements and to limit oversized pipe network within the site a surface level storage basin with a restricted outfall to the existing would be the most appropriate attenuation system to the serve the development.

- It is proposed that the attenuation basin will be sized to accommodate both sites D and E to ensure economic land usage.

APPENDIX A

Site Development Proposal

Schedule

House Type Name		Sq Ft	Beds	No. of Plots	Total Sq Ft	Total by Beds	
Affordable Housing							
Helmsdale	Ter	745	2	7	5,215	7	
Nithsdale	Ter	903	3	9	8,127		
Weydale	Ter	950	4	2	1,900	2	
				18	15,242	9	
Market Housing							
Easton	Det	880	3	4	3,520	19	30%
Melton	Det	1,026	3	7	7,182		
Paignton	Semi	1,227	3	8	9,816		
Holbury	Det	1,226	4	5	6,130	40	63%
Kintbury	Det	1,297	4	7	9,079		
Lathbury	Det	1,355	4	8	10,840		
Prestbury	Det	1,486	4	6	8,916		
Sudbury	Det	1,503	4	9	13,527		
Ramsbury	Det	1,502	4	5	7,510		
Chesham	Det	1,759	5	5	8,795	5	8%
				64	85,315	64	
				Total 82	100,557		

Net Developable Area	6.271	acres
Coverage	16,035	sq ft per acre

Sales Area			
Melton	7	24	38%
Lathbury	8		
Sudbury	9		

AVANT homes

nineteen47
CHARTERED TOWN PLANNERS & URBAN DESIGNERS

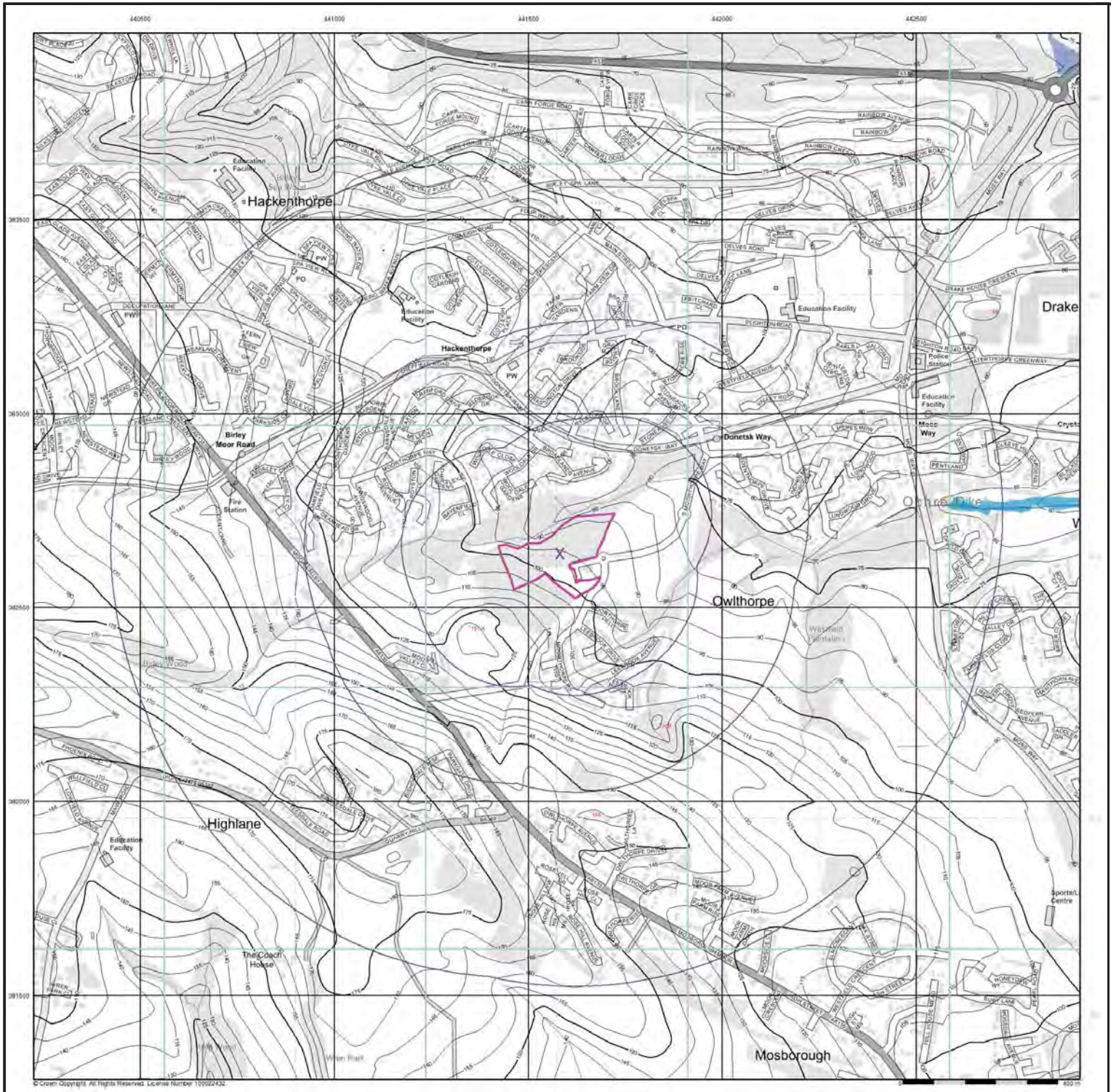
Project
Moorthorpe Way
Mosborough

Drawing Title
Presentation Layout

Project Code	Drawing Nr	Rev	Drawing Scale
n1171-007 009		A	1:500 @ A1

APPENDIX B

EA Flood Zone Map



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EA/NRW Flood Data Map (1:10,000)

General

- Specified Site
- Specified Buffer(s)
- Bearing Reference Point

Flood Data

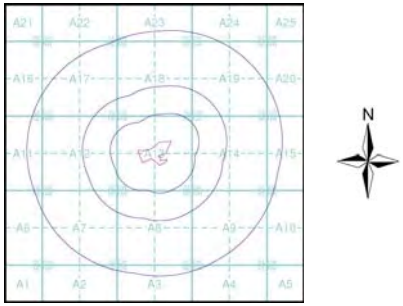
- Extreme Flooding from Rivers or Sea without Defences (Zone 2)
- Flooding from Rivers or Sea without Defences (Zone 3)
- Area Benefiting from Flood Defence
- Flood Water Storage Areas
- Flood Defence

Contours (height in metres)

Standard Contour 105
Master Contour 100 95
Spot Height 167.8

MLW Mean Low Water
MHW Mean High Water

EA/NRW Flood Data Map - Slice A



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National Grid Reference:	441580, 382640
Slice:	A
Site Area (Ha):	3.2
Search Buffer (m):	1000

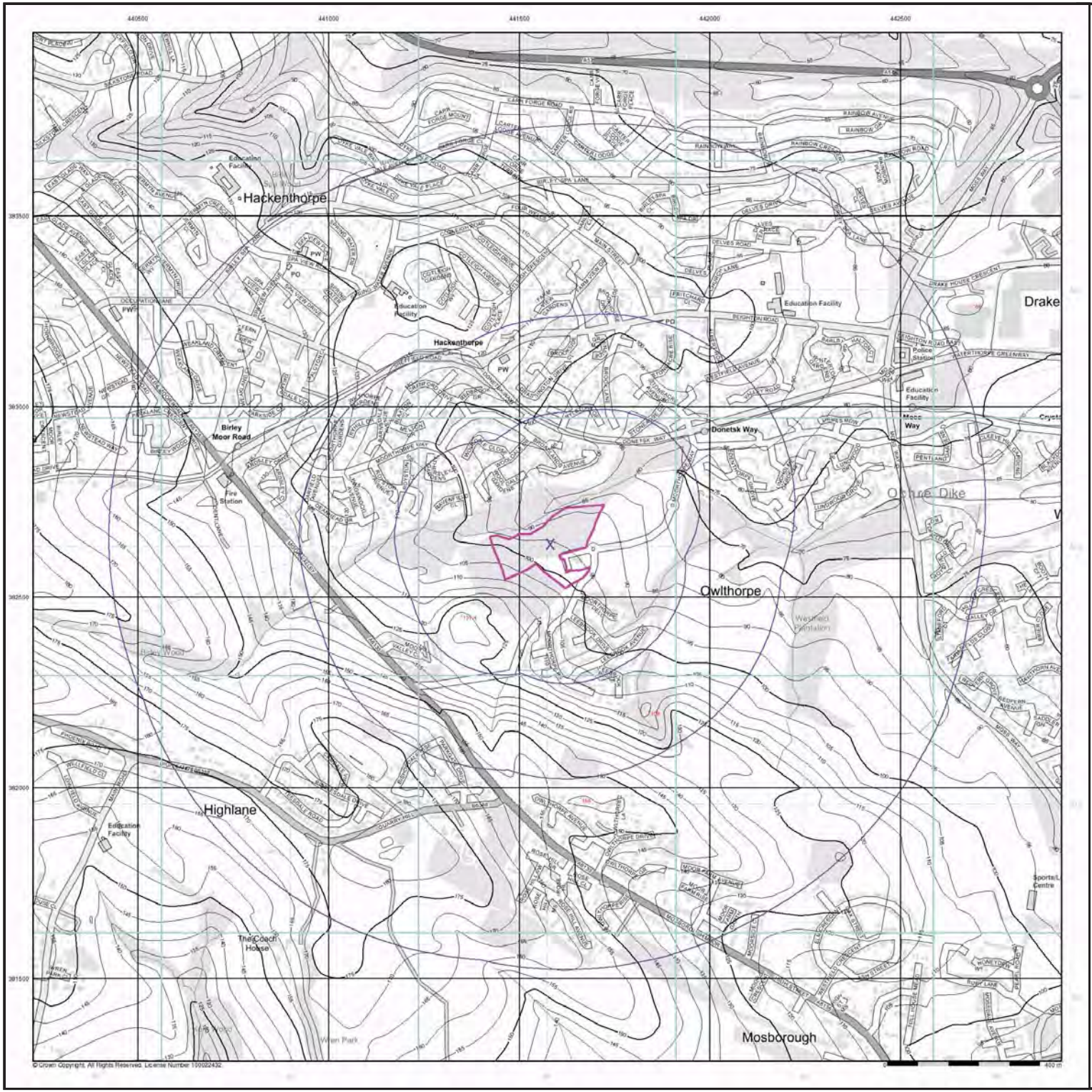
Site Details

Moorthorpe Way, Mosborough, S20 6PD

Landmark INFORMATION GROUP
Tel: 0844 844 9952
Fax: 0844 844 9951
Web: www.envirocheck.co.uk

APPENDIX C

Historical Flooding Map



AVIE CONSULTING LTD

EA/NRW Historic Flood Map (1:10,000)

General

- Specified Site
- Specified Buffer(s)
- Bearing Reference Point
- Map ID

Historic Flood Events Data

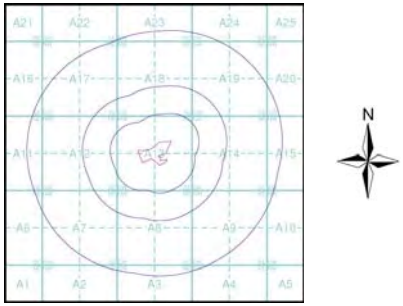
- Channel Capacity Exceeded (no raised defences)
- Channel Capacity Exceeded /Surface Water
- Groundwater/High Water Table
- Local Drainage/Surface Water
- Mechanical Failure
- Obstruction/Blockage - Bridge
- Obstruction/Blockage - Channel
- Historical Flood Liabilities
- Obstruction/Blockage - Culvert
- Obstruction/Blockage - Debris Screen
- Operational Failure/ Breach of Defence
- Other
- Overtopping of Defences
- Surface Water
- Unknown

Contours (height in metres)

Standard Contour 105
Master Contour 100
Spot Height *157.8

MLW Mean Low Water
MHW Mean High Water

EA/NRW Historic Flood Map - Slice A



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National Grid Reference:	441580, 382640
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Search Buffer (m):	1000

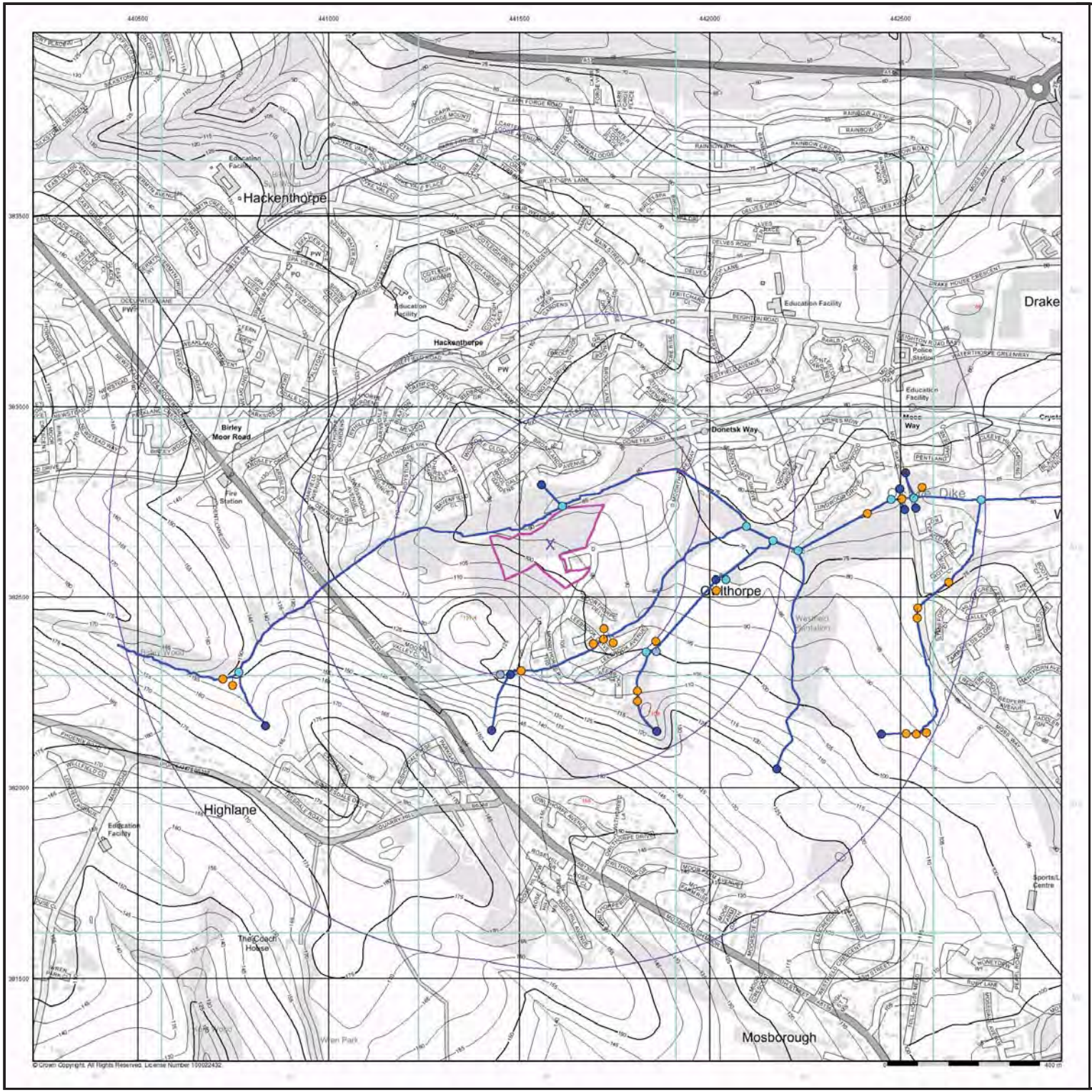
Site Details

Moorthorpe Way, Mosborough, S20 6PD

Landmark INFORMATION GROUP
Tel: 0844 844 9952
Fax: 0844 844 9951
Web: www.envirocheck.co.uk

APPENDIX D

Watercourse Network Map



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OS Water Network Lines Map (1:10,000)

General

- Specified Site
- Specified Buffer(s)
- Bearing Reference Point

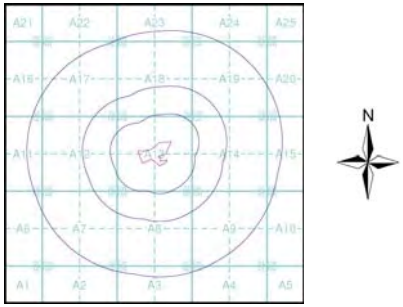
OS Water Network Data

- Canal
- Reservoir
- Foreshore
- Marsh
- Tidal River
- Inland River
- Drain
- Other
- Lake
- Transfer
- Lock Or Flight Of Locks
- Sea
- Junction
- Outlet
- Pseudo
- Source
- Other

Contours (height in meters)

- Standard Contour
- Master Contour
- Spot Height 167.3
- MLW Mean Low Water
- MHW Mean High Water

OS Water Network Map - Slice A



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National Grid Reference:	441580, 382640
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Site Area (Ha):	3.2
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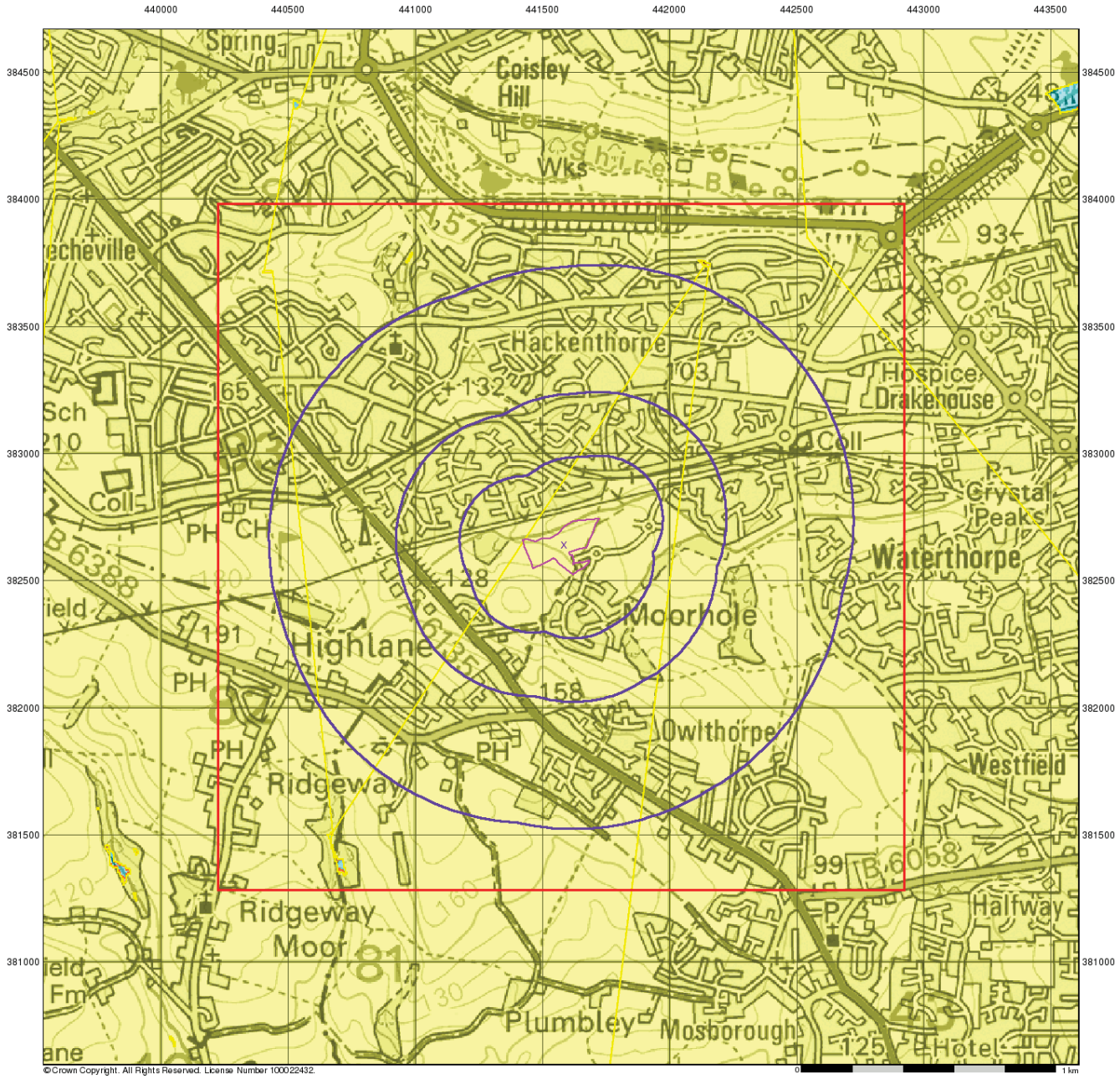
Site Details

Moorthorpe Way, Mosborough, S20 6PD

Landmark INFORMATION GROUP
Tel: 0844 844 9952
Fax: 0844 844 9951
Web: www.envirocheck.co.uk

APPENDIX E

Groundwater Flooding



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GeoSmart Information Groundwater Flood Map (1:50,000)

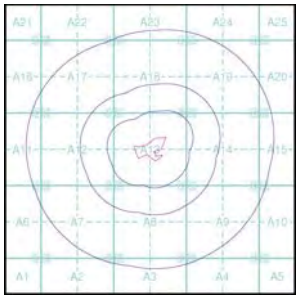
General

Specified Site | Specified Buffer(s) | Bearing Reference Point | Slice

GeoSmart Information Groundwater Flooding Risk

- High Risk
- Moderate Risk
- Low Risk
- Negligible Risk

GeoSmart Information Groundwater Flood Map - Slice A



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Customer Ref:	P2741
National Grid Reference:	441580, 382640
Slice:	A
Site Area (Ha):	3.2
Search Buffer (m):	1000

Site Details

Moorthorpe Way, Mosborough, S20 6PD

APPENDIX F

Sewer Records

YORKSHIRE WATER

PROTECTION OF MAINS AND SERVICES

1. The position of Yorkshire Water Services Ltd (YWS) apparatus shown on the existing mains record drawing(s) indicates the ***general*** position and nature of our apparatus and the accuracy of this information cannot be guaranteed. Any damage to YWS apparatus as a result of your works may have serious consequences and you will be held responsible for all costs incurred. Prior to commencing major works, the exact location of apparatus must be determined on site, if necessary by excavating trial holes. The actual position of such apparatus and that of service pipes which have not been indicated must be established on site by contacting the Customer Helpline (0845 124 24 24) for water and (0845 124 24 29) for sewerage.

2. The public sewer network is lawfully retained in its existing position and the sewerage undertaker is entitled to have it remain so without any disturbance. The provisions of section 159 of the Water Industry Act 1991 provides that the sewerage undertaker may "inspect, maintain, adjust, repair or alter" the network. Those rights are given to enable the sewerage undertaker to perform its statutory duties. Any development of the land or any other action that unacceptably hindered the exercise of those rights would be unlawful.

3. Ground levels over existing YWS apparatus are to be maintained. Sewers in highways will ***generally*** be laid to give 1200mm of cover from finished ground level working to kerb races, other permanent identification of the limits of the road or to an agreed line and level. Substantial increases or decreases to this 1200mm depth of cover will result in the sewer being re-laid at your expense.

4. If surface levels are to be decreased / increased significantly the effects on existing water supply apparatus will be carefully considered and if any alterations are necessary, the costs of the alterations will be recharged to you in full. Outlets on fire hydrants must be no more than 300mm below the new levels and all surface boxes must be adjusted as part of the scheme.

5. To enable future repair works to be carried out without hindrance; any pipe, cable, duct, etc. installed parallel to a water main or service pipe should not be installed directly over or within 300mm of a water main or service pipe or 1000mm of a waste water asset. Where a pipe, cable, duct, etc. crosses a main or service it should preferably cross perpendicular or at an angle of no less than 45° and with a minimum clearance of 150mm. These requirements apply to activities within an existing highway and are relevant to the installation of pipes, cables, ducts, etc. up to and including 250mm in diameter. Necessary protection measures for installations greater than 250mm in diameter and/or in private land will need to be agreed on an individual basis. Installations within a new development site must comply with the National Joint Utilities Group publication Volume 2: NJUG Guidelines On The Positioning Of Underground Utilities Apparatus For New Development Sites.

6. All excavation works near to YW apparatus should be by hand digging only.

7. Backfilling with a suitable material to a minimum 300mm above YW apparatus is required.

8. Adequate support must be provided where any works pass under YW apparatus.

9. Jointing chambers, lighting columns and other structures must be installed in such a way that future repair or maintenance works to YW apparatus will not be hindered.

10. Apparatus such as; railings, sign posts, etc. must not be placed in such a way that they prevent access to or full operation of controlling valves, hydrants or similar apparatus. YWS surface boxes must not be covered or buried. Any adjustment, alteration or replacement of manhole covers must be agreed on site prior to the commencement of the works with a YWS Inspector who may be contacted via our Call Centre on 0845 124 24 29.

11. Explosives shall not be used within 100 metres of any Yorkshire Water Services apparatus or installations.

12. Vibrating plant should not be used directly over any apparatus. Movement or operation by vehicles or heavy plant is not to be permitted in the immediate vicinity of YWS plant or apparatus unless there has been prior consultation and, if necessary, adequate protection provided without cost to YWS.

13. ***Under no circumstances*** should thrust boring or similar trenchless techniques commence until the actual position of the Company's mains/services along the proposed route have been confirmed by trial holes.

14. Any alterations to the highway should be notified following the procedures outlined in the New Road and Street Works Act 1991 Code of Practice; Measures Necessary Where Apparatus Is Affected By Major Works (Diversionary Works).

15. You will be held responsible for any damage or loss to YWS apparatus during and after completion of work, caused by yourselves, your servant or agent. Any damage caused or observed to YWS plant or apparatus should be immediately reported to YWS. Should YW incur any costs as a result of non-compliance with the above, all costs will be rechargeable in full.

16. You should ensure that nothing is done on the site to prejudice the safety or operation of YWS employees, plant or apparatus.

17. In accordance with the New Roads and Street Works Act 1991, Chapter 22, Part 3, Section 80. The location of any identified YW asset "*which is not marked, or is wrongly marked, on the records made available* " should be communicated back to Yorkshire Water. The location of the apparatus should be identified on copies of the supplied plans which should be returned to Yorkshire Water (Asset Records Team) with photographic supporting evidence where possible.

18. The Government has decided that responsibility for private sewers serving two or more properties and lateral drains (the

section of pipe beyond the boundary of a single property, connecting it to the public sewer) will be transferred to the water companies on Oct 1 2011. Private pumping stations will also transfer during the period 1 October 2011 – 1 Oct 2016. Records of these assets may not yet be shown on the existing mains record drawing(s). If you encounter any of these assets you must inform Yorkshire Water Services Ltd (YWS).

19. Please note that the information supplied on the enclosed plans is reproduced from Ordnance Survey material with the permission of the Ordnance Survey on behalf of the Controller of Her Majesty's Stationery Office, © Crown Copyright. Unauthorised reproduction infringes Crown Copyright and may lead to prosecution or civil proceedings. Licence Number 1000019559.

Sewer Legend


Combined Sewer


S24 Combined Sewer


Surface Water Sewer


S24 Surface Water Sewer


Foul Sewer


S24 Foul Sewer


Section 104 Sewer

Public Rising Main


Pumping Station


Abandoned Sewer

Public Sewage
Treatment Works


Syphon Sewer &
Vacuum Sewer

\+ Property Identifier

Water Legend

Water Main 4" and below

Water Main 4" and above

Raw Water Main

Private Water Main


Fire Hydrant


Pumping Station

Safe-Move
DX 723020 BRADFORD 20
or
PO Box 99 Bradford BD3 7YB

Tel: 0800 1 385 385
Fax: 01274 253502

Your Ref: Moorthorpe Way, Owlthorpe
Our Ref: LNXX-9EBM4P

Lithos Consulting
45 High Street
South Milford
North Yorkshire
LS255AF

13 December 2013

Dear Sirs,

Re:

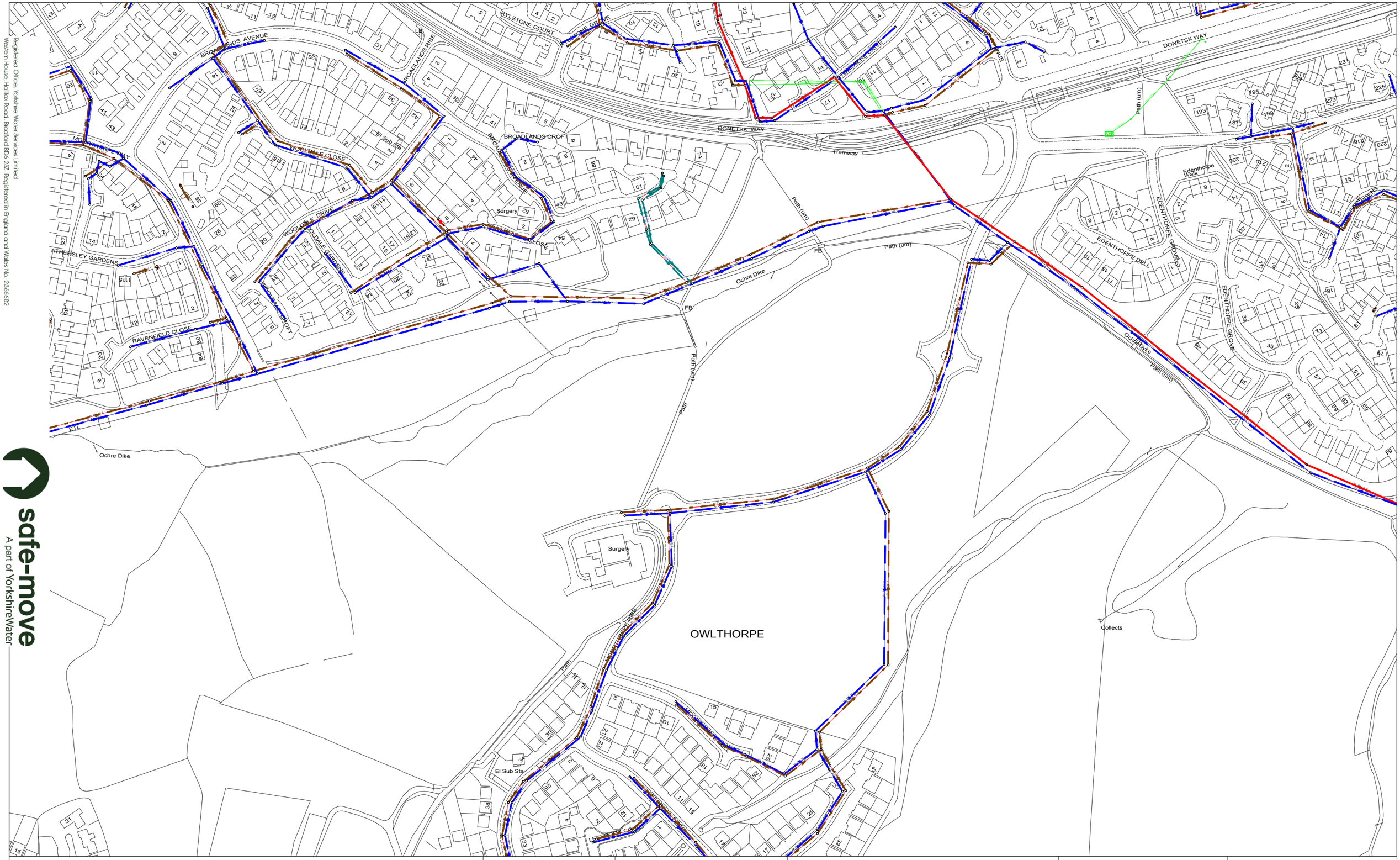
We thank you for your enquiry and attach the Sewage plan. Unfortunately we are unable to provide the Mains Water plan which should be obtained from Severn Trent Water who is the undertaker for this location.

If you have any queries please do not hesitate to contact us.

Yours faithfully,

Heather Webster
Searches Advisor

safe-move
A part of YorkshireWater



441271 : 382409	Map Name : SK4182SW	Title	Partial Key
	Yorkshire Water, PO Box 500, Halifax Road, Bradford BD6 2LZ Contact Name : Ms H Webster Contact Tel :	Notes	Foul Sewer = F Combined Sewer = C Surface Water Sewer = SW Trade Sewer = TD Partially Separate = PS
		(Ody) COPYRIGHT STATEMENTS: Reproduced by permission of Ordnance Survey on behalf of HMSO © Crown copyright and database 2004. All rights reserved Ordnance Survey Licence number 100019559	This plan is furnished as a general guide only and no warranty as to its correctness is given or implied. This plan must not be relied upon in the event of excavations or other works made in the vicinity of public sewers. No house or property connections are shown.
		Date Req : 13/12/2013, 10:44:46	Date Gen : 13/12/2013, 10:44:48
		Source : Sewer Network Enquiry	

UPN: Undefined Originator: H Webster, Safe Move,

APPENDIX G

Topographical Survey and Greenfield Runoff Calculations

North

Notes-

All dimensions are in millimetres unless noted otherwise

DO NOT SCALE THIS DRAWING - IF IN DOUBT ASK

1. All dimensions & levels to be checked by the contractor prior to commencement of work, any discrepancy shall be reported immediately to Avie Consulting Ltd
2. All work shall be carried out in accordance with Local Authority, statutory authority, health & safety requirements and regulations.
3. The drawings shall be read in accordance with all other contract documents relevant at that time of issue and during the period of the contract.
4. The contractor must ensure the overall stability of the works is adequate at all stages of the construction.
5. No allowance has been made for cutouts, holes, notches, etc. for services. All of these are to be agreed prior to the start of the works.

Rev	Details	By	Chk	Date
Ø	Initial issue	S.T.P.	J.J.B.	11.02.2019

AVANT homes

AVIE CONSULTING LTD
6 Killingbeck Court,
Killingbeck Office Village,
Killingbeck Drive,
Leeds LS14 6FD.
Tel: 0113 249 7416
www.avie-consulting.co.uk

Client:

Avant Homes

Project:

Mosborough

Title:

Total Site Areas

Drawn:	Checked:	Date:	Scale:	Original dwg size
P.A.S.	P.A.S.	Feb 2019	1:1000	A1

Drawing Number: P2741-07 Rev: Ø

HR Wallingford
Working with water

Greenfield runoff estimation for sites

www.uksuds.com | Greenfield runoff tool

Calculated by:	Tim Davis
Site name:	Moorthorpe Way
Site location:	Mosborough

This is an estimation of the greenfield runoff rate limits that are needed to meet normal best practice criteria in line with Environment Agency guidance "Preliminary rainfall runoff management for developments", W5-074/A/TR1/1 rev. E (2012) and the SuDS Manual, C753 (Ciria, 2015). This information on greenfield runoff rates may be the basis for setting consents for the drainage of surface water runoff from sites.

Site coordinates

Latitude:	53.33791° N
Longitude:	1.3793° W

Reference:	6524535
Date:	2019-02-08T12:53:13

Methodology	IH124

Site characteristics

Total site area (ha)	4.72

Methodology

Qbar estimation method	Calculate from SPR and SAAR
SPR estimation method	Calculate from SOIL type

	Default	Edited
SOIL type	3	3
HOST class	---	---
SPR/SPRHOST	0.37	0.37

Hydrological characteristics

	Default	Edited
SAAR (mm)	707	707
Hydrological region	3	3
Growth curve factor: 1 year	0.86	0.86
Growth curve factor: 30 year	1.75	1.75
Growth curve factor: 100 year	2.08	2.08

Notes:

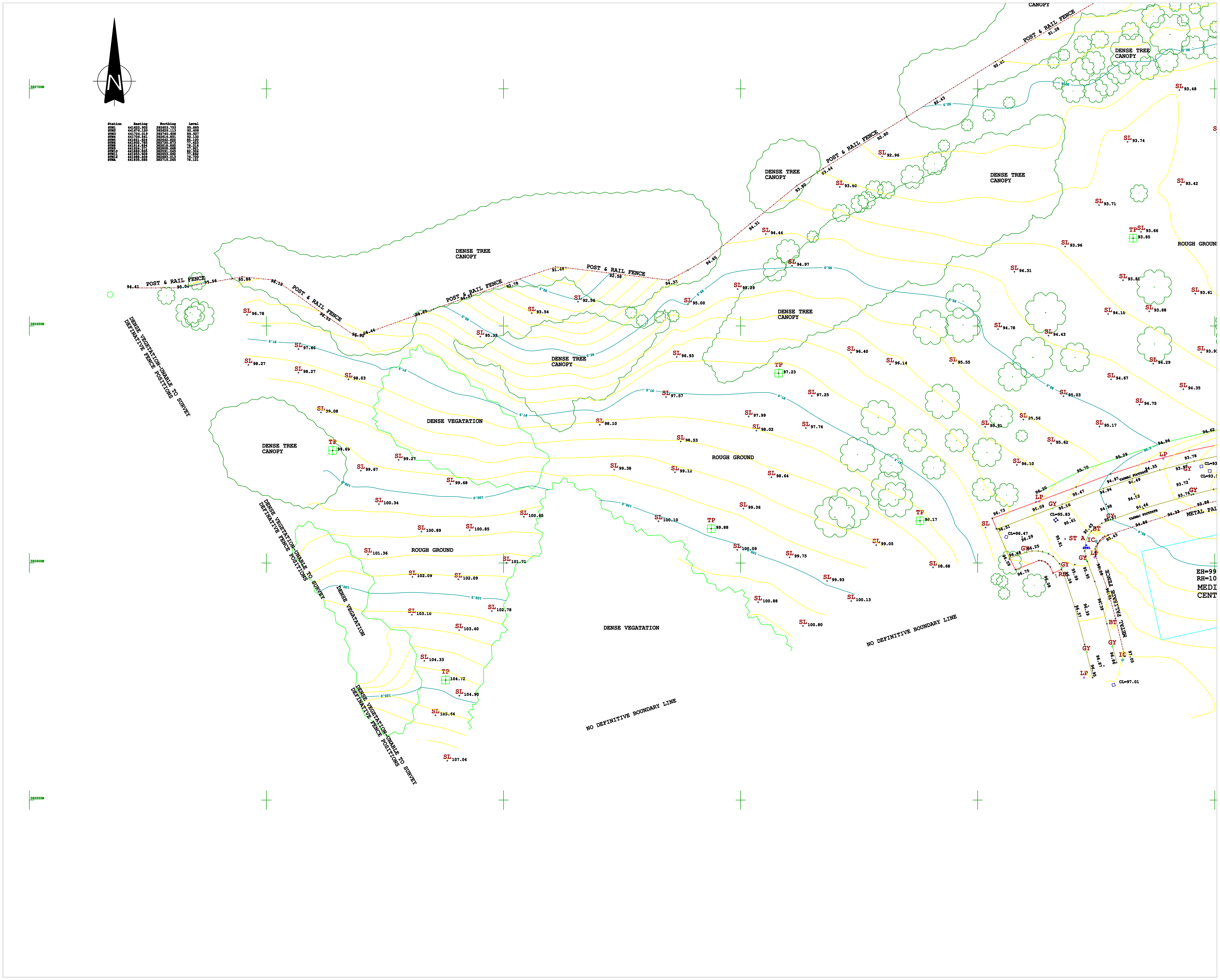
(1) Is Q_{BAR} < 2.0 l/s/ha?

(2) Are flow rates < 5.0 l/s?

(3) Is SPR/SPRHOST ≤ 0.3?

Greenfield runoff rates

	Default	Edited
Qbar (l/s)	13.72	13.72
1 in 1 year (l/s)	11.8	11.8
1 in 30 years (l/s)	24.01	24.01
1 in 100 years (l/s)	28.53	28.53



Station	Easting	Northing	Level
STN1	441622.902	382603.753	95.885
STN2	441676.120	382629.113	92.608
STN3	441724.019	382740.658	88.927
STN4	441706.541	382616.851	92.132
STN5	441821.624	382642.822	85.100
STN6	441902.785	382720.873	77.423
STN8	441914.894	382818.892	78.316
STN9	441924.371	382808.668	77.921
STN10	441889.855	382591.245	82.324
STN11	441953.909	382653.692	77.862
STN12	441988.409	382683.013	76.720
STNA	441935.585	382719.265	78.121

SYMBOL LEGEND

Borehole, Benchmark, Bollard, Bus Stop, Electric Box, Electricity Pole, Fence Post, Gas Stop Valve, Gate Post, Gas Marker, Gully Drain, Electric Inspection Cover, Kerb Outlet, Litter Bin, BT Inspection chamber, Lamp Post, Manhole Point, MH Triangular, MH Square, MH Round, Marker Post, Pylon, Rodding Eye, BT Exchange Box, Sign Post, Spot Height, Eave Level, Ridge Level, Stile, Survey Station, Traffic Camera, Telephone Box, Trial Pit, Telegraph Pole, Deciduous Tree, Road Sign, GATE, Fire Hydrant, Water Meter, Letter Box, CATV Inspection Chamber, Water Stop Valve

LINETYPE LEGEND

Bridge, Bottom of Bank, Building, Canopy Edge, Concrete Edge, Ditch, Drop Kerb, Overhead Cable, Grid, Tacktile Paver, Kerb, Path, Pipe Line, FOUL SEWER, SURFACE WATER SEWER, Chanel Line, Road Centre Line, Tarmac Edge, Top of Bank, Track, Wall, Verge, Flagstone Paving, Stone, Hedgeline, Grass Edge, Vegetation Line, Post and Rail Fence, Post and Wire Fence, Contour Normal, Contour Prominent

ABBREVIATIONS

LP.	Lamp Post
TP.	Telegraph Pole
EP.	Electricity Pole
SP.	Sign Post
TS.	Tarffic Sign
BS.	Bus Stop
GM.	Gas Marker

ABBREVIATIONS CONTINUED

MH.	Manhole
GU.	Gully
FH.	Fire Hydrant
CATV.	Cable Television Point
WM.	Water Meter
WSV.	Water Stop Valve
GSV.	Gas Stop Valve
RE.	Rodding Eye
GU.	Gully
FH.	Fire Hydrant
CATV.	Cable Television Point
WM.	Water Meter
WSV.	Water Stop Valve
GSV.	Gas Stop Valve
RE.	Rodding Eye

THIS SURVEY WAS CARRIED OUT USING GPS - SURVEY BASED ON OSGB 36 WITH LOCAL SCALE FACTOR OF 1.

PLEASE NOTE THAT EVERY EFFORT HAS BEEN MADE TO LAOCTE ALL TREES ON SITE AS PER THE BRIEF. HOWEVER, DUE TO THE VOLUME OF TREES PRESENT PSS CAN NOT BE HELD RESPONSIBLE FOR ANY TREES THAT MY HAVE BEEN MISSED WITHIN THE SURVEY PROSESS. A SUITABLE TREE SURVEY SHOULD BE UNDERTAKEN BY A SPECIALIST.

THIS SURVEY SHOWS PHYSICAL SITE BOUNDARIES ONLY. CONFIRMATION OF LEGAL OWNERSHIP BOUNDARIES SHOULD BE OBTAINED BY REFERENCE TO THE H.M. LAND REGISTRY TITLE PLAN EVERY EFFORT IS MADE TO IDENTIFY ALL VISIBLE ABOVE GROUND FEATURES. HOWEVER, IT SHOULD BE BORNE IN MIND THAT THERE MAY BE ITEMS OBSCURED AT THE TIME OF SURVEY.

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REV.	DESCRIPTION	DATE

PROFESSIONAL SITE SURVEYS LTD
The Old Coach House
High Street
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Donacster
DN10 4QP

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M - 07515 381674
E - peter@professionalsitesurveys.co.uk
W - www.professionalsitesurveys.co.uk

CLIENT

CLIENT

KIER ASSET PARTNERSHIP SERVICES Ltd

JOB TITLE

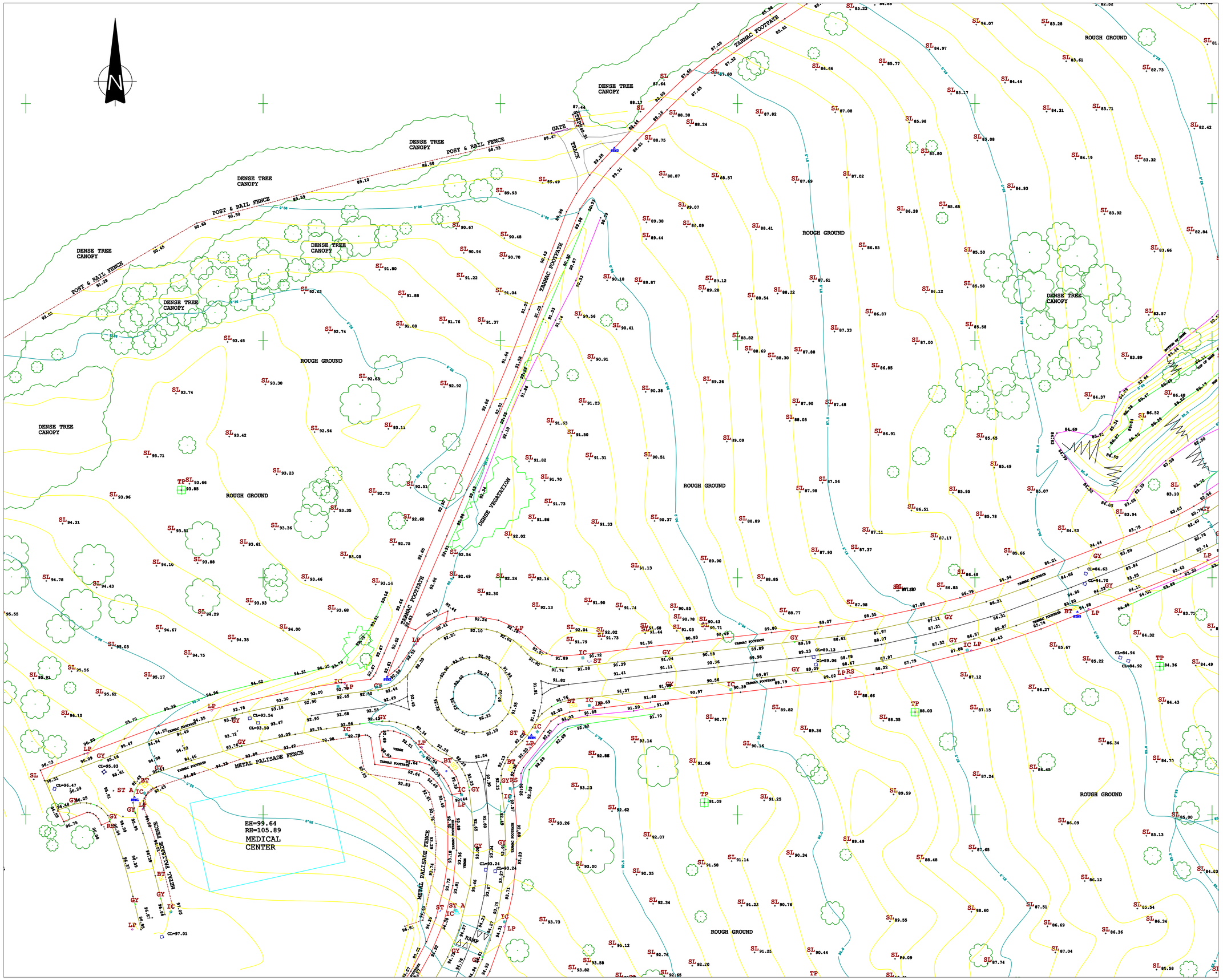
MOORTHORPE WAY, OWLTHORPE, SHEFFIELD

DRAWING TITLE

TOPOGRAPHICAL LEVEL SURVEY

DRAWN	SIGNATURE	DATE	STATUS
ND		19/12/2013	FOR COMMENT ☐ FOR APPROVAL ☐
APPROVED: PD		19/12/2013	DRAFT ☐ FINAL ■

SCALE	SHEET	DRAWING NO.	REVISION
1:250	A0	6088-001	#



SYMBOL LEGEND

- Borehole
- Benchmark
- Bollard
- Bus Stop
- Electric Box
- Electricity Pole
- Fence Post
- Gas Stop Valve
- Gate Post
- Gas Marker
- **Gully Drain**
- Electric Inspection Cover
- Kerb Outlet
- Litter Bin
- BT Inspection chamber
- Lamp Post
- Manhole Point
- MH Triangular
- MH Square
- MH Round
- Marker Post
- Pylon
- Rodding Eye
- BT Exchange Box
- Sign Post
- Spot Height
- Eave Level
- Ridge Level
- Stile
- Survey Station
- Traffic Camera
- Telephone Box
- Trial Pit
- Telegraph Pole
- Deciduous Tree
- Road Sign
- GATE
- Fire Hydrant
- Water Meter
- Letter Box
- CATV Inspection Chamber
- Water Stop Valve

ABBREVIATIONS

LP.	**Lamp Post**
TP.	**Telegraph Pole**
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LINETYPE LEGEND

- Bridge
- Bottom of Bank
- Building
- Canopy Edge
- Concrete Edge
- Ditch
- Drop Kerb
- Overhead Cable
- **Grid**
- Tactile Paver
- Kerb
- Path
- Pipe Line
- FOUL SEWER
- **SURFACE WATER SEWER**
- Chanel Line
- Road Centre Line
- Tarmac Edge
- Top of Bank
- Track
- Wall
- Verge
- Flagstone Paving
- Stone
- Hedgeline
- Grass Edge
- Vegetation Line
- **Post and Rail Fence**
- **Post and Wire Fence**
- **Contour Normal**
- **Contour Prominent**

ABBREVIATIONS CONTINUED

MH.	Manhole
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THIS SURVEY WAS CARRIED OUT USING GPS - SURVEY BASED ON OSGB 36 WITH LOCAL SCALE FACTOR OF 1.

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CLIENT

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KIER ASSET PARTNERSHIP SERVICES Ltd

JOB TITLE

MOORTHORPE WAY, OWLTHORPE, SHEFFIELD

DRAWING TITLE

TOPOGRAPHICAL LEVEL SURVEY

DRAWN	SIGNATURE	DATE	STATUS	
ND		19/12/2013	FOR COMMENT	☐
APPROVED	SIGNATURE	DATE	FOR APPROVAL	☐
PD		19/12/2013	DRAFT	☐
			FINAL	■

SCALE	SHEET	DRAWING NO.	REVISION
1:250	A0	6088-002	#

APPENDIX H

Site Investigation Extract

12.7 Designated Concrete Mixes

12.7.1 The following designated mixes in accordance with BRE Special Digest SD1 and BS 8500: Part 1: 2006 will be suitable for use on this site.

Application	DS-1 conditions ACEC Class AC-1
Unreinforced strip/trench fill footings	GEN1
Reinforced strip/ trench fill footings (mesh reinforcement)	RC25/30[*1]
Unreinforced concrete floor slabs	GEN2
In situ reinforced concrete floor slabs	RC28/35

Note. [*1]Although RC25/30 is in line with BS8500, Lithos recommend the use of RC28/35 for concrete used in structurally sensitive works, to provide greater certainty of compliance with strength verification tests, enhanced durability and compliance with accepted NHBC practice.

12.8 Excavations

12.8.1 Based on the results of the investigation it is unlikely that major groundwater flows will be encountered in shallow excavations.

12.8.2 Excavations should remain stable in the short term, but if left open for any significant period of time may require shoring most notably in granular soils and made ground.

12.8.3 Bedrock was encountered in the majority of the exploratory holes across the site. Based on the exploratory hole logs, excavation greater than around 2.0m to 2.5m is likely to prove difficult across about 80% of the site. It would therefore be prudent to allow for excavation of hard rock in any deep excavations such as those that may be required for drainage etc.

12.8.4 Some excavations for foundations, services etc. may come into contact with coal, most notably along the line of conjectured outcrop of the Sitwell Coal. Care should be taken not to unnecessarily overdeepen foundations, in order to minimise the chance of encountering coal.

12.8.5 Where foundation excavations do come into contact with coal, the foundation should be taken through the coal seam, into underlying natural in-situ strata of adequate bearing. The full thickness of coal should then be sealed with concrete to create a trench fill foundation. To prevent the ingress of air, the mass concrete fill should be placed as soon as possible after exposing the seam.

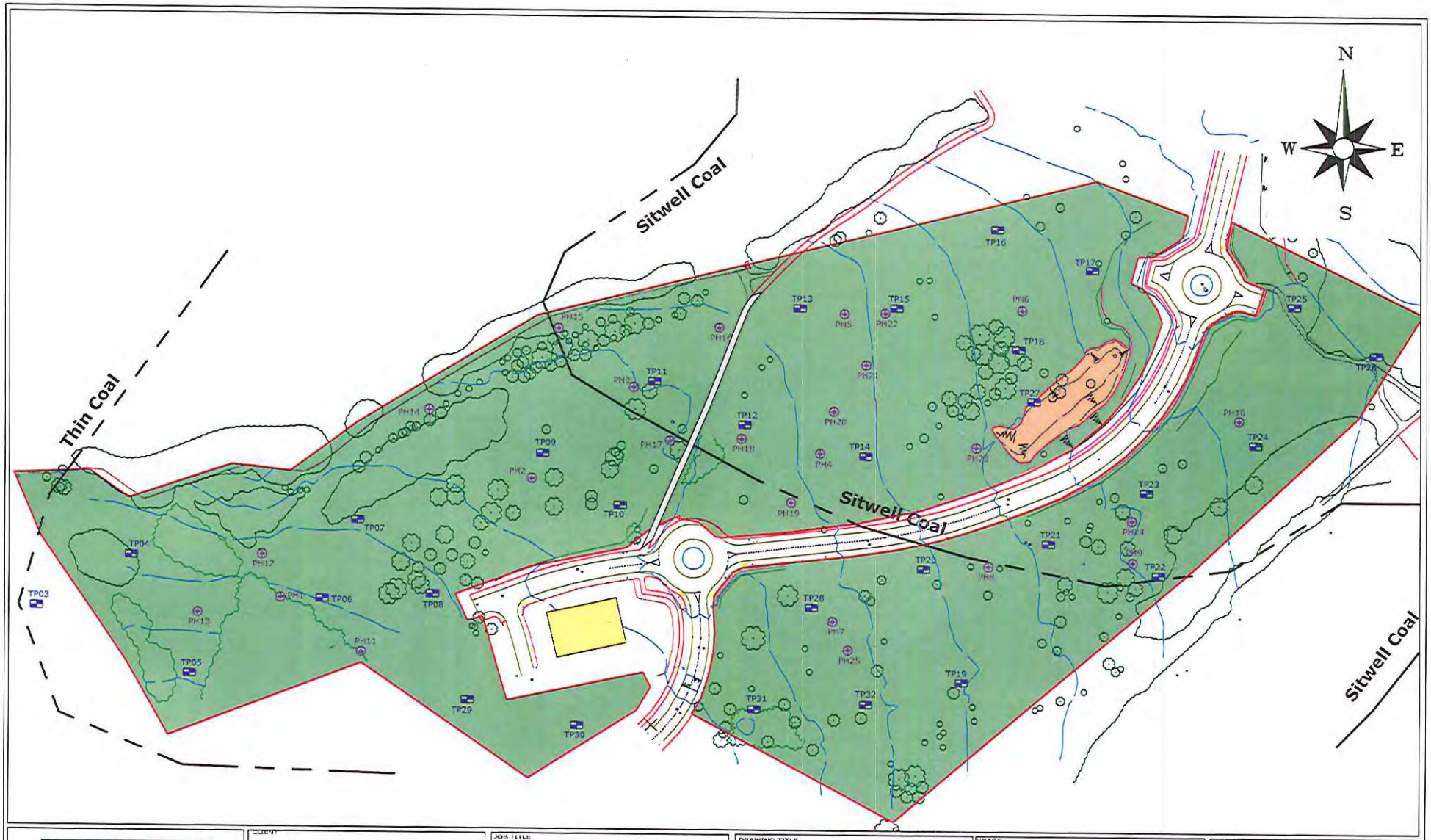
12.8.6 By virtue of the provisions of the Coal Industry Act 1994 interests in unworked coal and coal mines previously vested in the British Coal Corporation are now vested in the Coal Authority. The developer will need to contact the Coal Authority to dig or carry away such coal as they encounter in connection with redevelopment of the site (this is often referred to as incidental coal).

12.9 Drainage

12.9.1 Based on observations made during the investigation, soakaways are unlikely to provide a suitable drainage solution for surface water run-off at the site. Consequently, there is likely to be a need for surface water balancing.

12.9.2 Any damage to the existing land drainage system caused by foundation or sewer excavations should be made good; this may require diversion and re-connection.

12.9.3 It is recommended that the developer contact Yorkshire Water Services with respect to capacity in existing foul and surface water sewers in the vicinity of the development area.



LITHOS CONSULTING

info@lithos.co.uk
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Tel 0845 680 9781

CLIENT: KIER SERVICES

JOB TITLE: MOORTHORPE WAY, OWLTHORPE

DRAWING TITLE: EXPLORATORY HOLE LOCATION PLAN

NOTES

- TRIAL PIT LOCATION
- PROBEHOLE LOCATION
- APPROXIMATE SITE BOUNDARY
- APPROXIMATE OUTCROP OF COAL SEAMS

REV.	DESCRIPTION	DATE
B	ADDITIONAL PROBEHOLE LOCATIONS ADDED (PH11 TO PH25)	13 03 14

STATUS: FOR COMMENT ☐ FOR APPROVAL ☐ DRAFT ☐ FINAL ☑

DRAWN: ASw	DATE: 13 03 2014
APPROVED: REG	DATE: 24 03 2014
SCALE: 1:2,000	SHEET: A3
DRAWING NO.: 1792/6	REVISION: B

TRIAL PIT LOG

LITHOS CONSULTING

CLIENT Kier Services

SITE Moorthorpe Way, Owlthorpe

TP3

DATE 17/12/2013 Co-ords 441425E 382604N Sheet 1 of 1

Ground Level 102.6mAOD Scale 1:25

sample no & type	depth (m)	in-situ test	description	depth (m)	level (m)	ground water	legend
			Brown slightly gravelly CLAY with some rootlets. (TOPSOIL)				
				0.20	102.40		
		V = 75 kPa	Stiff orange-brown gleyed grey CLAY with occasional angular tabular fine to coarse gravel size lithorelicts of siltstone and coal. (COHESIVE COMPLETELY WEATEHRED COAL MEASURES)				
		V = 110 kPa					
			Moderately strong brown SILTSTONE. Recovered as angular tabular gravel and cobbles with occasional red-brown staining on surfaces. (WEATHERED COAL MEASURES) Difficult to excavate below 2.4m depth.	2.00	100.60		
			End of trial pit at 2.40 m	2.40	100.20		

Remarks

1. Prior to excavation a Cable Avoidance Tool (CAT) survey was carried out.
2. Groundwater was not apparent during excavation.
3. The sides of the trial pit remained stable during excavation.
4. Backfilled with materials arising upon completion.

Equipment/Methods	Logged by	JOB	FIGURE
JCB 3CX with 0.6m wide toothed bucket.	ASw	1792	

TRIAL PIT LOG

LITHOS CONSULTING

CLIENT Kier Services

SITE Moorthorpe Way, Owlthorpe

TP4

DATE 17/12/2013 Co-ords 441464E 382625N Sheet 1 of 1

Ground Level 99.5mAOD Scale 1:25

sample no & type	depth (m)	in-situ test	description	depth (m)	level (m)	ground water	legend
1JKD	0.10		Brown slightly gravelly CLAY with some rootlets. (TOPSOIL)				
				0.30	99.20		
		V = 70 kPa	Firm orange-brown occasionally gleyed grey CLAY with occasional angular tabular fine to medium gravel size lithorelicts of siltstone and coal. (COHESIVE COMPLETELY WEATEHRED COAL MEASURES)				
2D	0.80						
				1.20	98.30		
		V = 85 kPa	Stiff brown gleyed grey CLAY with occasional angular tabular fine to coarse gravel size lithorelicts of siltstone. (COHESIVE COMPLETELY WEATEHRED COAL MEASURES)				
			Difficult to excavate below 3.2m depth.				
			End of trial pit at 3.20 m	3.20	96.30		

Remarks

1. Prior to excavation a Cable Avoidance Tool (CAT) survey was carried out.
2. Groundwater was not apparent during excavation.
3. The sides of the trial pit remained stable during excavation.
4. Backfilled with materials arising upon completion.

Equipment/Methods	Logged by	JOB	FIGURE
JCB 3CX with 0.6m wide toothed bucket.	ASw	1792	

TRIAL PIT LOG

LITHOS CONSULTING

CLIENT Kier Services

SITE Moorthorpe Way, Owlthorpe

TP5

DATE 17/12/2013 Co-ords 441488E 382576N Sheet 1 of 1

Ground Level 104.7mAOD Scale 1:25

sample no & type	depth (m)	in-situ test	description	depth (m)	level (m)	ground water	legend
			Brown slightly gravelly CLAY with some rootlets. (TOPSOIL)				
			Firm orange-brown gleyed grey CLAY. (COHESIVE COMPLETELY WEATEHRED COAL MEASURES)	0.30	104.40		
		V = 70 kPa					
			Moderately weak brown SILTSTONE. Recovered as clayey angular tabular fine to coarse gravel with occasional grey staining on surfaces. (WEATHERED COAL MEASURES)	1.90	102.80		
				2.30	102.40		
			End of trial pit at 2.50 m	2.50	102.20		

Remarks

1. Prior to excavation a Cable Avoidance Tool (CAT) survey was carried out.
2. Groundwater was not apparent during excavation.
3. The sides of the trial pit remained stable during excavation.
4. Backfilled with materials arising upon completion.

Equipment/Methods	Logged by	JOB	FIGURE
JCB 3CX with 0.6m wide toothed bucket.	ASw	1792	

TRIAL PIT LOG

LITHOS CONSULTING

CLIENT Kier Services

SITE Moorthorpe Way, Owlthorpe

TP6

DATE 17/12/2013 Co-ords 441542E 382608N Sheet 1 of 1

Ground Level 100.0mAOD Scale 1:25

sample no & type	depth (m)	in-situ test	description	depth (m)	level (m)	ground water	legend
1JKD	0.10		Brown slightly gravelly CLAY with some rootlets. (TOPSOIL)				
		V = 60 kPa	Firm orange-brown gleyed grey CLAY. (COHESIVE COMPLETELY WEATEHRED COAL MEASURES)	0.30	99.70		
2D	0.90	V = 70 kPa	Firm brown gleyed grey CLAY with occasional angular tabular fine to medium gravel size lithorelicts of siltstone. (COHESIVE COMPLETELY WEATEHRED COAL MEASURES)	0.80	99.20		
			Moderately strong brown fine to medium grained SANDSTONE. Recovered as angular tabular cobbles. (WEATHERED COAL MEASURES) Unable to excavate below 1.9m depth.	1.60	98.40		
			End of trial pit at 1.90 m	1.90	98.10		

Remarks

1. Prior to excavation a Cable Avoidance Tool (CAT) survey was carried out.
2. Groundwater was not apparent during excavation.
3. The sides of the trial pit remained stable during excavation with some overbreak in the sandstone strata.
4. Backfilled with materials arising upon completion.

Equipment/Methods	Logged by	JOB	FIGURE
JCB 3CX with 0.6m wide toothed bucket.	ASw	1792	

TRIAL PIT LOG

LITHOS CONSULTING

CLIENT Kier Services

SITE Moorthorpe Way, Owlthorpe

TP7

DATE 17/12/2013 Co-ords 441557E 382640N Sheet 1 of 1

Ground Level 97.4mAOD Scale 1:25

sample no & type	depth (m)	in-situ test	description	depth (m)	level (m)	ground water	legend
			Brown slightly gravelly CLAY with some rootlets. (TOPSOIL)				
			Firm orange-brown gleyed grey CLAY. (COHESIVE COMPLETELY WEATEHRED COAL MEASURES)	0.25	97.15		
		V = 80 kPa					
		V = 120 kPa	Stiff orange-brown gleyed grey CLAY with some angular fine to medium gravel size lithorelicts of sandstone. (COHESIVE COMPLETELY WEATEHRED COAL MEASURES)	1.00	96.40		
			Weak grey MUDSTONE. Recovered as brown gleyed grey clayey angular tabular fine to coarse gravel and cobbles. (WEATHERED COAL MEASURES)	1.60	95.80		
			Strong brown and grey SILTSTONE. Recovered as angular tabular cobbles. (WEATHERED COAL MEASURES)	2.30	95.10		
			Unable to excavate below 2.5m depth.	2.50	94.90		
			End of trial pit at 2.50 m				

Remarks

1. Prior to excavation a Cable Avoidance Tool (CAT) survey was carried out.
2. Groundwater was not apparent during excavation.
3. The sides of the trial pit remained stable during excavation with some overbreak in the siltstone strata.
4. Backfilled with materials arising upon completion.

Equipment/Methods	Logged by	JOB	FIGURE
JCB 3CX with 0.6m wide toothed bucket.	ASw	1792	

TRIAL PIT LOG

LITHOS CONSULTING

CLIENT Kier Services

SITE Moorthorpe Way, Owlthorpe

TP8

DATE 17/12/2013 Co-ords 441588E 382610N Sheet 1 of 1

Ground Level 98.0mAOD Scale 1:25

sample no & type	depth (m)	in-situ test	description	depth (m)	level (m)	ground water	legend
1JKD	0.10		Brown slightly gravelly CLAY with some rootlets. (TOPSOIL)				
				0.20	97.80		
2JKD	0.30		Firm brown and grey slightly gravelly CLAY. Gravel is angular fine to medium of mudstone and sandstone. Possibly re-worked. (COHESIVE COMPLETELY WEATEHRED COAL MEASURES)				
				0.50	97.50		
			Stiff brown CLAY with some orange-brown gleyed rootlets. (RELICT TOPSOIL)				
				0.70	97.30		
			Stiff orange-brown slightly sandy CLAY. (COHESIVE COMPLETELY WEATEHRED COAL MEASURES)				
		V = 80 kPa					
3D	1.10						
				1.60	96.40		
			Firm orange-brown gleyed grey slightly sandy CLAY with occasional angular fine to medium gravel size lithorelicts of mudstone and sandstone. (COHESIVE COMPLETELY WEATEHRED COAL MEASURES)				
				2.30	95.70		
			Moderately strong brown fine to medium grained SANDSTONE. Recovered as angular tabular cobbles. (WEATHERED COAL MEASURES)				
			Unable to excavate below 2.6m depth.	2.60	95.40		
			End of trial pit at 2.60 m				

Remarks

1. Prior to excavation a Cable Avoidance Tool (CAT) survey was carried out.
2. Groundwater was not apparent during excavation.
3. The sides of the trial pit remained stable during excavation with some overbreak in the sandstone strata.
4. Backfilled with materials arising upon completion.

Equipment/Methods	Logged by	JOB	FIGURE
JCB 3CX with 0.6m wide toothed bucket.	ASw	1792	

TRIAL PIT LOG

LITHOS CONSULTING

CLIENT Kier Services

SITE Moorthorpe Way, Owlthorpe

TP9

DATE 17/12/2013 Co-ords 441633E 382668N Sheet 1 of 1

Ground Level 93.8mAOD Scale 1:25

sample no & type	depth (m)	in-situ test	description	depth (m)	level (m)	ground water	legend
1J&D	0.10		Brown slightly gravelly CLAY with some rootlets. (TOPSOIL)				
				0.30	93.50		
		V = 60 kPa	Firm orange-brown gleyed grey CLAY. (COHESIVE COMPLETELY WEATEHRED COAL MEASURES)				
2D	0.60			0.70	93.10		
		V = 70 kPa	Firm orange-brown occasionally gleyed grey slightly sandy slightly gravelly CLAY. Gravel is angular fine to coarse of sandstone. (COHESIVE COMPLETELY WEATEHRED COAL MEASURES)				
			Stiff brown and grey gleyed CLAY with occasional lenses of coal recovered as angular tabular fine gravel. (COHESIVE COMPLETELY WEATEHRED COAL MEASURES)	2.30	91.50		
			End of trial pit at 2.70 m	2.70	91.10		

Remarks

1. Prior to excavation a Cable Avoidance Tool (CAT) survey was carried out.
2. Groundwater was not apparent during excavation.
3. The sides of the trial pit remained stable during excavation.
4. Backfilled with materials arising upon completion.

Equipment/Methods	Logged by	JOB	FIGURE
JCB 3CX with 0.6m wide toothed bucket.	ASw	1792	

TRIAL PIT LOG

LITHOS CONSULTING

CLIENT Kier Services

SITE Moorthorpe Way, Owlthorpe

TP10

DATE 17/12/2013 Co-ords 441664E 382647N Sheet 1 of 1

Ground Level 93.3mAOD Scale 1:25

sample no & type	depth (m)	in-situ test	description	depth (m)	level (m)	ground water	legend
1J&D	0.10		Brown slightly gravelly CLAY with some rootlets. (TOPSOIL)				
		V = 130 kPa	Firm grey with occasional orange-brown mottling CLAY with occasional rootlets. (COHESIVE COMPLETELY WEATEHRED COAL MEASURES)	0.30	92.95		
		V = 80 kPa	Stiff orange-brown gleyed grey CLAY. (COHESIVE COMPLETELY WEATEHRED COAL MEASURES)	0.50	92.75		
2D	1.00						
			Stiff brown gleyed grey CLAY with occasional angular fine to coarse gravel size lithorelicts of mudstone. (COHESIVE COMPLETELY WEATEHRED COAL MEASURES)	1.40	91.85		
			Very Strong red-brown IRONSTONE. Recovered as angular to subrounded cobbles. (WEATHERED COAL MEASURES) Unable to excavate below 2.8m depth.	2.70	90.55		
			End of trial pit at 2.80 m	2.80	90.45		

Remarks

1. Prior to excavation a Cable Avoidance Tool (CAT) survey was carried out.
2. Groundwater was not apparent during excavation.
3. The sides of the trial pit remained stable during excavation.
4. Backfilled with materials arising upon completion.

Equipment/Methods	Logged by	JOB	FIGURE
JCB 3CX with 0.6m wide toothed bucket.	ASw	1792	

TRIAL PIT LOG

LITHOS CONSULTING

CLIENT Kier Services

SITE Moorthorpe Way, Owlthorpe

TP11

DATE 17/12/2013 Co-ords 441678E 382698N Sheet 1 of 1

Ground Level 92.4mAOD Scale 1:25

sample no & type	depth (m)	in-situ test	description	depth (m)	level (m)	ground water	legend
			Brown slightly gravelly CLAY with some rootlets. (TOPSOIL)				
			Firm brown very gravelly CLAY. Gravel is angular fine to coarse of sandstone. (COHESIVE COMPLETELY WEATEHRED COAL MEASURES)	0.30	92.05		
			Strong brown fine to coarse grained SANDSTONE. Recovered as angular tabular cobbles. (WEATHERED COAL MEASURES)	0.60	91.75		
			Unable to excavate below 1.0m depth. End of trial pit at 1.00 m	1.00	91.35		

Remarks

1. Prior to excavation a Cable Avoidance Tool (CAT) survey was carried out.
2. Groundwater was not apparent during excavation.
3. The sides of the trial pit remained stable during excavation with some overbreak in the sandstone strata.
4. Backfilled with materials arising upon completion.

Equipment/Methods	Logged by	JOB	FIGURE
JCB 3CX with 0.6m wide toothed bucket.	ASw	1792	

TRIAL PIT LOG

LITHOS CONSULTING

CLIENT Kier Services

SITE Moorthorpe Way, Owlthorpe

TP29

DATE 19/12/2013 Co-ords 441602E 382566N Sheet 1 of 1

Ground Level 100.3mAOD Scale 1:25

sample no & type	depth (m)	in-situ test	description	depth (m)	level (m)	ground water	legend
			Brown slightly gravelly CLAY with some rootlets. (TOPSOIL)				
			Stiff brown gleyed grey slightly gravelly CLAY. Gravel is angular to subangular fine of siltstone. Possibly re-worked. (COHESIVE COMPLETELY WEATEHRED COAL MEASURES)	0.30	100.00		
1JKD	0.60						
			Stiff orange-brown gleyed grey CLAY. (COHESIVE COMPLETELY WEATEHRED COAL MEASURES)	0.90	99.40		
			Firm grey and black very gravelly CLAY. Gravel is angular fine to medium of coal and carbonaceous mudstone. (COHESIVE COMPLETELY WEATEHRED COAL MEASURES)	1.70	98.60		
			Stiff orange-brown gleyed grey CLAY with occasional angular fine to coarse gravel size lithorelicts of siltstone. (COHESIVE COMPLETELY WEATEHRED COAL MEASURES)	2.10	98.20		
			Moderately weak brown fine to medium grained SANDSTONE. Recovered as angular tabular fine to coarse gravel with some red-brown staining on surfaces. (WEATHERED COAL MEASURES) Unable to excavate below 2.6m depth.	2.50	97.80		
			End of trial pit at 2.60 m	2.60	97.70		

Remarks

1. Prior to excavation a Cable Avoidance Tool (CAT) survey was carried out.
2. Groundwater was not apparent during excavation.
3. The sides of the trial pit remained stable during excavation.
4. Backfilled with materials arising upon completion.

Equipment/Methods	Logged by	JOB	FIGURE
JCB 3CX with 0.6m wide toothed bucket.	ASw	1792	

TRIAL PIT LOG

LITHOS CONSULTING

CLIENT Kier Services

SITE Moorthorpe Way, Owlthorpe

TP30

DATE 19/12/2013 Co-ords 441647E 382556N Sheet 1 of 1

Ground Level 98.6mAOD Scale 1:25

sample no & type	depth (m)	in-situ test	description	depth (m)	level (m)	ground water	legend
			Brown slightly gravelly CLAY with some rootlets. (REWORKED TOPSOIL)	0.10	98.45		
1JKD	0.50		MADE GROUND: Brown and grey gravelly clay. Gravel is angular fine to coarse of predominantly sandstone, occasionally brick and glass. (COHESIVE MADE GROUND)				
		V = 45 kPa	Firm orange-brown gleyed grey slightly sandy CLAY. (COHESIVE COMPLETELY WEATEHRED COAL MEASURES)	1.00	97.55		
			Stiff orange-brown gleyed grey CLAY. (COHESIVE COMPLETELY WEATEHRED COAL MEASURES)	1.60	96.95		
			End of trial pit at 2.20 m	2.20	96.35		

Remarks

1. Prior to excavation a Cable Avoidance Tool (CAT) survey was carried out.
2. Groundwater was not apparent during excavation.
3. The sides of the trial pit remained stable during excavation.
4. Backfilled with materials arising upon completion.

Equipment/Methods	Logged by	JOB	FIGURE
JCB 3CX with 0.6m wide toothed bucket.	ASw	1792	

APPENDIX J

Proposed Drainage Strategy, Calculations and Impermeable Area

Notes-

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3. The drawings shall be read in accordance with all other contract documents relevant at that time of issue and during the period of the contract.
4. The contractor must ensure the overall stability of the works is adequate at all stages of the construction.
5. No allowance has been made for cutouts, holes, notches, etc. for services. All of these are to be agreed prior to the start of the works.

North

ADOPTABLE DRAINAGE KEY-

- PROPOSED ADOPTABLE SURFACE WATER SEWER/MANHOLE
- PROPOSED ADOPTABLE FOUL WATER SEWER/MANHOLE
- PROPOSED ADOPTABLE COMBINED SEWER/MANHOLE
- SEWER WITH LESS THAN 1.2m COVER (CLASS Z BED AND SURROUND)
- EXISTING SEWER TO BE ABANDONED
- EXISTING FOUL WATER
- EXISTING SURFACE WATER
- EXISTING PRIVATE COMBINED SEWER
- PROPOSED GULLY WITH 150Ø CONNECTION PIPE
- PROPOSED SECTION 104 BOUNDARY
- 93.650 PROPOSED GROUND FLOOR SLAB LEVELS
- 3m EASEMENT EASEMENT FOR PUBLIC SEWERS

SEE MAIN DETAIL FOR CONTINUATION

DETAIL A

SEE DETAIL A FOR CONTINUATION

ATTENUATION BASIN SIZED TO ATTENUATE SITES D AND E. DUE TO LOCATION AND GRADIENT OF THE SITES IT MAY NOT BE POSSIBLE TO ATTENUATE 1 IN 2YR STORMS IN THE PIPED SYSTEM THEREFORE BASIN WILL HAVE TO BE USED FOR ALL RETURN PERIODS MEANING THAT THE BASIN WILL HAVE TO BE UNDER A MANAGEMENT COMPANY.

TWL 1in 30yr plus 30% - 474mm
TWL 1in 100 yr plus 30% - 649mm

FURTHER SITE SURVEY REQUIRED TO CONFIRM BASIN TIE-IN LEVELS

LOCATION OF EXISTING HIGHWAY AND UNDERPASS IS APPROXIMATE FURTHER SITE SURVEY SHOULD BE UNDERTAKEN TO CONFIRM EXACT LOCATION AND TIE-IN LEVELS

CONNECTION LEVEL TO WATERCOURSE REQUIRES CONFIRMATION

GREENFIELD DISCHARGE 13.7l/s FOR ALL STORMS UP TO 1 IN 100 YR PLUS 30%

LOCATION OF HYDROBRAKE TO BE DISCUSSED TO ENSURE ACCESS IS ACCEPTABLE

MH S20 CL: 79.250 IL: 76.100 HYDROBRAKE: 13.7 l/s

Connection from Site D

Gabion Retainment 2.5m

Gabion Retainment 3.5m

Gabion Retainment 1.5m

IMPERMEABLE AREA FROM SITE D APPROX 1ha

FOUL DRAINAGE TO CONNECT INTO EXISTING SYSTEM ON EXISTING ROAD IL T.B.C.

FOUL DRAINAGE FROM THESE PLOTS TO DRAIN INTO EXISTING SYSTEM ON EXISTING ROAD IL T.B.C.

Feature Crescent

Existing Doctors Surgery

NO DEFINITIVE BOUNDARY LINE

ADOPTABLE SW MANHOLE SCHEDULE

NAME	COVER	INVERT	DUTY	DEPTH TO INVERT	DEPTH TO SOFFIT	Diameter	TYPE	PIPEDIA	HYDROBRAKE
MH S01	102.420	101.070	D400	1.350	1.200	1.200	Type B1/E	150	
MH S02	98.130	96.030	D400	2.100	1.875	1.200	Type B	225	
MH S03	97.200	94.750	D400	2.450	2.225	1.200	Type B	225	
MH S04	101.500	100.150	D400	1.350	1.200	1.200	Type B1/E	150	
MH S05	99.290	95.995	D400	3.295	2.995	1.500	Type B	300	
MH S06	97.640	96.215	D400	1.425	1.200	1.200	Type B1/E	225	
MH S07	97.480	95.831	D400	1.649	1.349	1.500	Type B1/E	300	
MH S08	95.650	94.000	D400	1.650	1.200	1.800	Type B1/E	450	
MH S09	95.060	93.410	D400	1.650	1.200	1.500	Type B1/E	450	
MH S10	93.000	91.275	D400	1.725	1.200	1.500	Type B1/E	525	
MH S11	94.380	92.955	D400	1.425	1.200	1.500	Type B1/E	225	
MH S12	93.750	92.325	D400	1.425	1.200	1.200	Type B1/E	225	
MH S13	93.600	91.118	D400	2.482	1.957	1.800	Type B	525	
MH S14	93.320	91.035	D400	2.285	1.760	1.500	Type B	525	
MH S15	93.000	90.280	D400	2.720	2.195	1.500	Type B	525	
MH S16	92.450	90.085	D400	2.365	1.840	1.500	Type B	525	
MH S17	90.000	88.275	D400	1.725	1.200	1.500	Type B1/E	525	
MH S18	88.300	86.575	D400	1.725	1.200	1.500	Type B1/E	525	
MH S19	83.750	80.605	D400	3.145	2.620	1.500	Type B	525	
MH S20	79.250	76.100	D400	3.150	2.625	2.400	Flow Control	525	13.7 l/s

ADOPTABLE FW MANHOLE SCHEDULE

NAME	COVER	INVERT	DUTY	DEPTH TO INVERT	DEPTH TO SOFFIT	Diameter	TYPE	PIPEDIA
MH F01	102.250	100.525	D400	1.725	1.575	1.200	Type B	150
MH F02	98.160	95.780	D400	2.380	2.230	1.200	Type B	150
MH F03	97.000	94.950	D400	2.050	1.900	1.200	Type B	150
MH F04	101.390	99.730	D400	1.660	1.510	1.200	Type B	150
MH F05	99.420	98.000	D400	1.420	1.270	1.200	Type B1/E	150
MH F06	97.500	95.531	D400	1.969	1.819	1.200	Type B	150
MH F07	95.500	93.700	D400	1.800	1.650	1.500	Type B	150
MH F08	95.050	93.600	D400	1.450	1.300	1.200	Type B1/E	150
MH F09	93.000	90.975	D400	2.025	1.875	1.200	Type B	150
MH F10	93.530	90.755	D400	2.775	2.625	1.200	Type B	150
MH F11	93.300	90.670	D400	2.630	2.480	1.200	Type B	150
MH F12	93.000	89.980	D400	3.020	2.870	1.200	Type B	150
MH F13	92.400	89.720	D400	2.680	2.530	1.200	Type B	150
MH F14	90.000	87.975	D400	2.025	1.875	1.200	Type B	150
MH F15	88.200	86.600	D400	1.600	1.450	1.200	Type B1/E	150
MH F16	83.250	81.600	D400	1.650	1.500	1.200	Type B1/E	150
MH F17	82.000	80.000	D400	2.000	1.850	1.200	Type B	150

Rev	Details	By	Chk	Date
B	Updated to amended layout	S.T.P.	J.J.B.	11.02.2019
A	Basin Attenuation added for sites D and E	T.M.D.		07.12.2018
0	Initial issue	P.A.S.	P.A.S.	19.10.2018

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Client: Avant Homes

Project: Mosborough

Title: Proposed Drainage Strategy

Drawn:	Checked:	Date:	Scale:	Original dwg size
P.A.S.	P.A.S.	Oct 2018	1:500	A1

Drawing Number: P2741-01 Rev: B

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3. The drawings shall be read in accordance with all other contract documents relevant at that time of issue and during the period of the contract.
4. The contractor must ensure the overall stability of the works is adequate at all stages of the construction.
5. No allowance has been made for cutouts, holes, notches, etc. for services. All of these are to be agreed prior to the start of the works.

IMPERMEABLE AREA

AREA M²

14655

Rev	Details	By	Chk	Date
A	Revised to updated layout	S.T.P.	J.J.B.	11.02.2019
Ø	Initial issue	P.A.S.	P.A.S.	19.10.2018

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Project: Mosborough

Title: Proposed Impermeable Areas

Drawn:	Checked:	Date:	Scale:	Original dwg size
P.A.S.	P.A.S.	Oct 2018	1:500	A1

Drawing Number: P2741-04 | Rev: A

Existing Network Details for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	k (mm)	HYD SECT	DIA (mm)	Section Type
1.000	48.140	4.965	9.7	0.086	3.00	0.600	o	150	Pipe/Conduit
1.001	43.360	1.280	33.9	0.086	0.00	0.600	o	225	Pipe/Conduit
1.002	38.916	0.525	74.1	0.086	0.00	0.600	o	225	Pipe/Conduit
2.000	38.820	3.930	9.9	0.086	3.00	0.600	o	150	Pipe/Conduit
3.000	25.315	0.145	175.0	0.086	3.00	0.600	o	225	Pipe/Conduit
2.001	28.650	0.164	175.0	0.086	0.00	0.600	o	300	Pipe/Conduit
2.002	26.905	1.682	16.0	0.086	0.00	0.600	o	300	Pipe/Conduit
1.003	8.450	0.590	14.3	0.086	0.00	0.600	o	450	Pipe/Conduit
1.004	53.000	2.060	25.7	0.086	0.00	0.600	o	450	Pipe/Conduit
1.005	31.880	0.157	203.1	0.086	0.00	0.600	o	525	Pipe/Conduit
4.000	34.920	0.630	55.4	0.086	3.00	0.600	o	225	Pipe/Conduit
4.001	12.650	0.907	13.9	0.086	0.00	0.600	o	225	Pipe/Conduit
1.006	13.405	0.083	161.5	0.086	0.00	0.600	o	525	Pipe/Conduit
1.007	19.135	0.755	25.3	0.086	0.00	0.600	o	525	Pipe/Conduit
1.008	34.305	0.195	175.9	0.086	0.00	0.600	o	525	Pipe/Conduit

PN	US/MH Name	US/CL (m)	US/IL (m)	US C.Depth (m)	DS/CL (m)	DS/IL (m)	DS C.Depth (m)	Ctrl	US/MH (mm)
1.000	1	102.420	101.070	1.200	98.130	96.105	1.875		1200
1.001	2	98.130	96.030	1.875	97.200	94.750	2.225		1200
1.002	3	97.200	94.750	2.225	95.650	94.225	1.200		1200
2.000	3	101.500	100.150	1.200	99.290	96.220	2.920		1200
3.000	4	97.640	96.215	1.200	99.290	96.070	2.995		1200
2.001	5	99.290	95.995	2.995	97.480	95.832	1.348		1200
2.002	6	97.480	95.832	1.348	95.650	94.150	1.200		1200
1.003	7	95.650	94.000	1.200	95.060	93.410	1.200		1500
1.004	9	95.060	93.410	1.200	93.000	91.350	1.200		1500
1.005	10	93.000	91.275	1.200	93.600	91.118	1.957		1500
4.000	11	94.380	92.955	1.200	93.750	92.325	1.200		1500
4.001	12	93.750	92.325	1.200	93.600	91.418	1.957		1200
1.006	13	93.600	91.118	1.957	93.320	91.035	1.760		1500
1.007	14	93.320	91.035	1.760	93.000	90.280	2.195		1500
1.008	15	93.000	90.280	2.195	92.450	90.085	1.840		1500

Existing Network Details for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	k (mm)	HYD SECT	DIA (mm)	Section Type
1.009	39.535	1.810	21.8	0.086	0.00	0.600	o	525	Pipe/Conduit
1.010	29.511	1.700	17.4	0.086	0.00	0.600	o	525	Pipe/Conduit
1.011	59.920	5.970	10.0	0.000	0.00	0.600	o	525	Pipe/Conduit
1.012	45.020	4.455	10.1	0.000	0.00	0.600	o	525	Pipe/Conduit
1.013	13.550	0.077	176.0	1.000	0.00	0.600	o	225	Pipe/Conduit

PN	US/MH Name	US/CL (m)	US/IL (m)	US C.Depth (m)	DS/CL (m)	DS/IL (m)	DS C.Depth (m)	Ctrl	US/MH (mm)
1.009	16	92.450	90.085	1.840	90.000	88.275	1.200		1500
1.010	17	90.000	88.275	1.200	88.200	86.575	1.100		1500
1.011	18	88.200	86.575	1.100	83.750	80.605	2.620		1500
1.012	19	83.750	80.605	2.620	79.250	76.150	2.575		1800
1.013	20	79.250	76.100	2.925	78.000	76.023	1.752	Hydro-Brake®	2100

Simulation Criteria for Storm

Volumetric Runoff Coeff	0.750	Additional Flow - % of Total Flow	0.000
Areal Reduction Factor	1.000	MADD Factor * 10m³/ha Storage	2.000
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	Summer
Return Period (years)	2	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	19.000	Storm Duration (mins)	30
Ratio R	0.352		

Online Controls for Storm

Hydro-Brake® Optimum Manhole: 20, DS/PN: 1.013, Volume (m³): 20.2

Unit Reference	MD-SHE-0169-1370-0900-1370
Design Head (m)	0.900
Design Flow (l/s)	13.7
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	169
Invert Level (m)	76.100
Minimum Outlet Pipe Diameter (mm)	225
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	0.900	13.7
Flush-Flo™	0.296	13.7
Kick-Flo®	0.641	11.7
Mean Flow over Head Range	-	11.6

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	6.0	1.200	15.7	3.000	24.3	7.000	36.6
0.200	13.4	1.400	16.9	3.500	26.2	7.500	37.8
0.300	13.7	1.600	18.0	4.000	27.9	8.000	39.0
0.400	13.5	1.800	19.0	4.500	29.5	8.500	40.2
0.500	13.1	2.000	20.0	5.000	31.1	9.000	41.3
0.600	12.3	2.200	21.0	5.500	32.5	9.500	42.2
0.800	13.0	2.400	21.8	6.000	33.9		
1.000	14.4	2.600	22.7	6.500	35.3		

Storage Structures for Storm

Tank or Pond Manhole: 20, DS/PN: 1.013

Invert Level (m) 76.200

Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	2161.8	0.400	2335.2	0.800	2508.0
0.200	2248.8	0.600	2421.6	1.000	2594.4

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	2.000
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 0.352
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	ON

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
Return Period(s) (years)	100
Climate Change (%)	30

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
1.000	1	15 Summer	100	+30%	100/15 Summer				101.264
1.001	2	15 Winter	100	+30%	100/15 Summer				97.738
1.002	3	15 Winter	100	+30%	100/15 Summer				96.692
2.000	3	15 Summer	100	+30%	100/15 Summer				100.335
3.000	4	15 Summer	100	+30%	100/15 Summer				96.984
2.001	5	15 Summer	100	+30%	100/15 Summer				96.728
2.002	6	15 Summer	100	+30%					96.031
1.003	7	15 Summer	100	+30%					94.309
1.004	9	15 Winter	100	+30%					93.682
1.005	10	15 Winter	100	+30%	100/15 Summer				92.688
4.000	11	15 Summer	100	+30%					93.115
4.001	12	15 Winter	100	+30%	100/15 Summer				92.707
1.006	13	15 Winter	100	+30%	100/15 Summer				92.358
1.007	14	15 Winter	100	+30%	100/15 Summer				91.881
1.008	15	15 Winter	100	+30%	100/15 Summer				91.325
1.009	16	15 Winter	100	+30%					90.412
1.010	17	15 Winter	100	+30%					88.597
1.011	18	15 Winter	100	+30%					86.832

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PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	1	0.044	0.000	0.92		51.5	SURCHARGED	
1.001	2	1.483	0.000	0.93		79.4	SURCHARGED	
1.002	3	1.717	0.000	2.04		116.8	SURCHARGED	
2.000	3	0.035	0.000	0.95		52.4	SURCHARGED	
3.000	4	0.544	0.000	1.28		46.5	SURCHARGED	
2.001	5	0.433	0.000	1.87		141.8	SURCHARGED	
2.002	6	-0.101	0.000	0.74		186.4	OK	
1.003	7	-0.141	0.000	0.79		340.3	OK	
1.004	9	-0.178	0.000	0.66		385.0	OK	
1.005	10	0.888	0.000	1.43		410.8	SURCHARGED	
4.000	11	-0.065	0.000	0.80		52.5	OK	
4.001	12	0.157	0.000	0.77		92.8	SURCHARGED	
1.006	13	0.715	0.000	2.12		526.0	SURCHARGED	
1.007	14	0.321	0.000	0.84		562.6	SURCHARGED	
1.008	15	0.520	0.000	1.92		598.3	SURCHARGED	
1.009	16	-0.198	0.000	0.70		631.1	OK	
1.010	17	-0.203	0.000	0.68		663.4	OK	
1.011	18	-0.268	0.000	0.48		664.5	OK	

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PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
1.012	19	15 Winter	100	+30%					80.866
1.013	20	720 Winter	100	+30%	100/15 Summer				76.849

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
1.012	19	-0.264	0.000	0.49		664.6	OK	
1.013	20	0.524	0.000	0.40		13.7	SURCHARGED	