



Resilience and
Flood Risk

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Countesthorpe Cemetery Flood Risk Assessment

26th February 2015

Version 1.0

RAB: 1022

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Revision history

Version	Date	Amendments	Issued to
1.0	26.02.15	First issue	Alix Bates

Quality control

Action	Signature	Date
Prepared	G.M. Wilson	26.02.2015
Checked	P. Batty	26.02.2015
Approved	R.A. Burton	26.02.2015

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RAB Office

Lichfield office

Lichfield Business Village
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Lichfield
Staffordshire WS13 6QG



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1.0 Introduction

This Flood Risk Assessment has been prepared by RAB Consultants, in support of a change of use planning proposal to extend Countesthorpe Cemetery.

The Planning Practice Guidance that supports the National Planning Policy Framework (NPPF) requires a Flood Risk Assessment to be carried out to ensure that new development is safe from flooding and will not increase the risk of flooding elsewhere.

2.0 Site Location

The proposed site is located at Countesthorpe Cemetery, Foston Road, Leicester LE8 5Q; NGR: SP 5911 9584 (Figure 2 and Appendix A).

Access to the site is direct from Foston Road.

3.0 Site History and Development Proposals

The development site is approximately 1.9ha of undeveloped agricultural land, which lies adjacent to and east of Countesthorpe Cemetery.

It is proposed to utilise the land to extend the existing Countesthorpe Cemetery. This will involve a change of use of the land and does not include the construction of any structures or roads.



FIGURE 1 VIEW OF THE PROPOSED SITE LOOKING TOWARDS THE SOUTH-EAST CORNER

4.0 Flood Risk

4.1 Sequential test

According to the Environment Agency's online flood map the site lies in Flood Zone 2 (land having between a 1 in 100 and 1 in 1,000 annual probability (a.p.) of river flooding).

While not specifically identified in Table 2 Flood Risk Vulnerability Classification of the National Planning Policy Framework (NPPF), the proposed development is expected to be classed as 'more vulnerable' due to pollution potential of watercourses and groundwater. The proposal is a change of use and as such the sequential test does not need to be applied (NPPF paragraph: 033 reference ID: 7-033-20140306).

4.2 Fluvial Flood Risk

The site is adjacent to a small ordinary watercourse Countesthorpe Brook that flows from the south. Countesthorpe Brook passes the extreme south-east corner of the site, heading north-east below Foston Road, before travelling north and joining the River Sence

The Environment Agency has a detailed computer model of the River Sence. This includes Countesthorpe Brook as a 1D tributary, with modelled (in channel) data available as far as the south face of Foston Road bridge. The flood map is shown in Figure 2 with a summary of the modelled results in Table 1. All data provided by the Environment Agency is included in Appendix B.

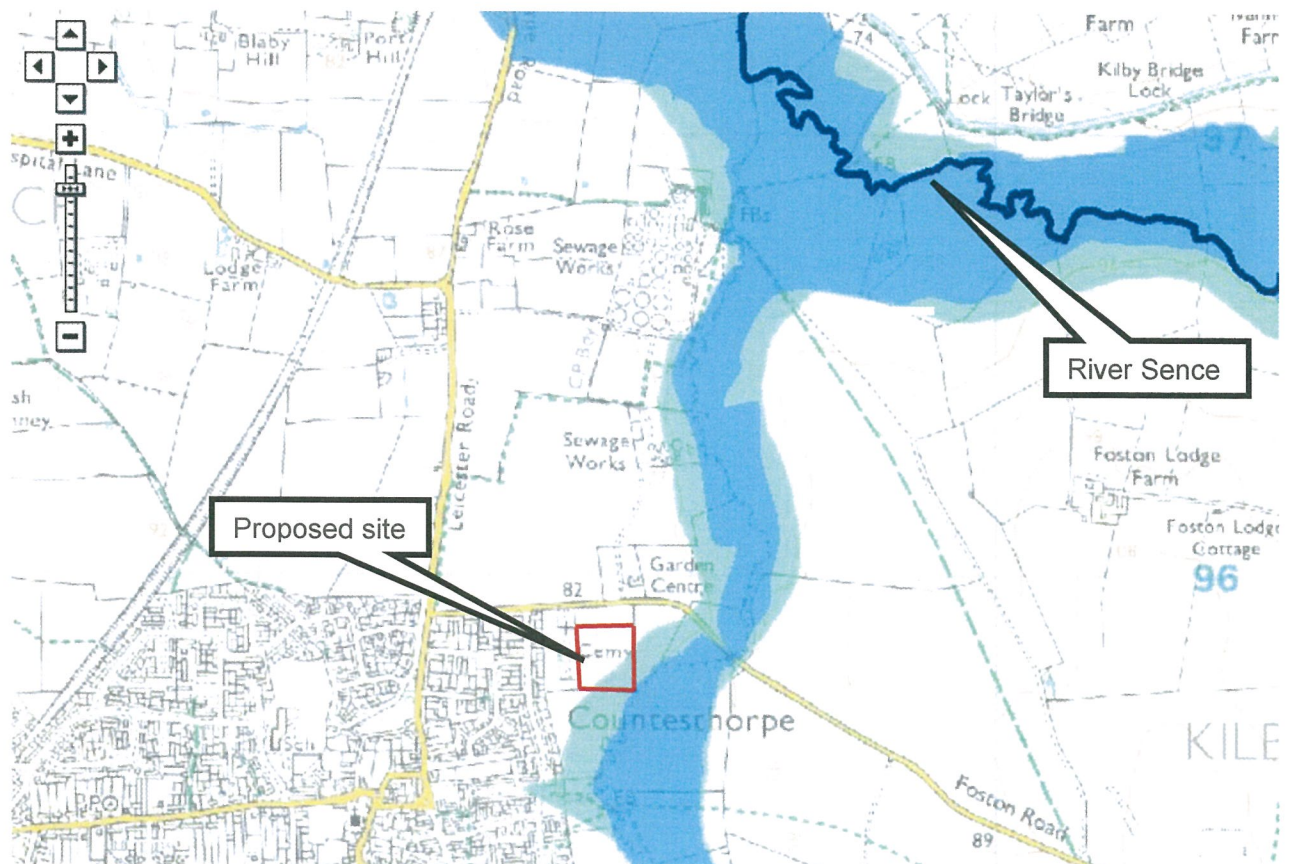


FIGURE 2 SCREEN SHOT TAKEN FROM THE ENVIRONMENT AGENCY'S FLOOD MAP ON 04.02.2015.

Table 1 – Summary of modelled flood levels for Countesthorpe Brook

Annual exceedance probability	Node 22C U/stream of Foston Road Peak flow (m3/s)	Node 22C U/stream of Foston Road Peak flood level (mAOD)	Node 19C D/stream of Foston Road Peak flow (m3/s)	Node 19C D/stream of Foston Road Peak flood level (mAOD)
20%	9.78	74.88	9.77	74.44
10%	11.72	74.97	11.71	74.50
4%	14.52	75.10	14.51	74.57
2%	16.87	75.20	16.86	74.63
1%	19.16	75.29	19.14	74.67
0.67%	20.66	75.34	20.64	74.71
Estimated 1%+CC*	N/A	75.38*	N/A	N/A

*This is the 0.5% flood level which has been extrapolated from the modelled flood level data using a power law fit (Appendix C).

Ground level measurements were taken during a site visit on 16th February 2015. The results are given in Figure 3.

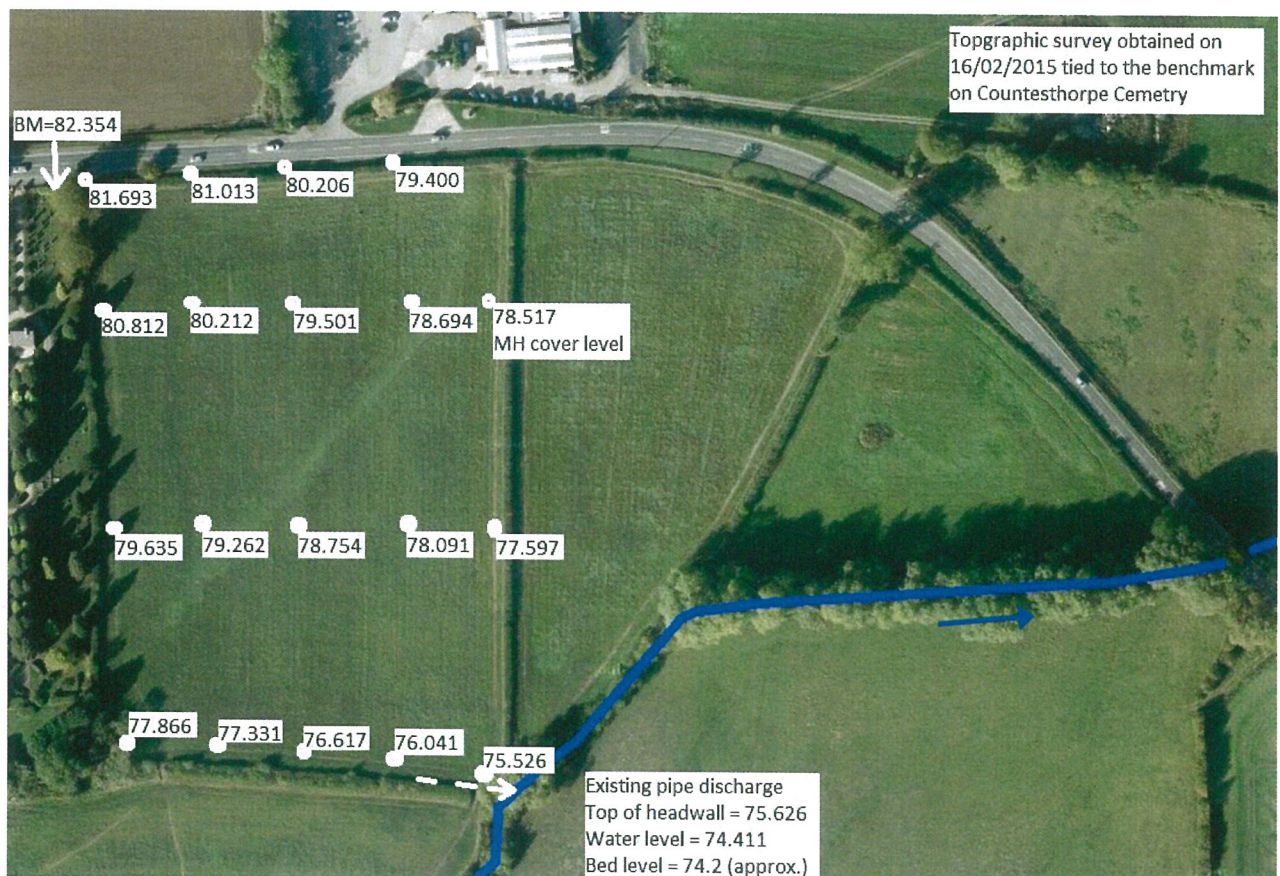


FIGURE 3 GROUND LEVEL MEASUREMENTS TAKEN ON 16.02.2015 TIED TO A BENCHMARK ON THE CEMETERY WALL



It can be seen that the whole site is above the estimated 1% a.p. plus climate change flood level. The lowest part of the site is at the south-east corner, where the ground level is 75.53mAOD which is 0.15m higher than the estimated 1% a.p. plus climate change flood level.

4.3 Risk of Flood Defence Breach or Overtopping

There are no formal flood defences protecting the proposed site.

4.4 Coastal Flood Risk

The development is not in close proximity to the sea, therefore is not at risk of flooding from this source.

4.5 Surface Water Flooding

The Environment Agency flood mapping indicates that the site generally falls within a 'very low' classification of surface water flood risk. The map does reveal a natural flow route along the southern boundary that ties in with a slight valley shape in the ground, visible in the contour lines in Figure 2. It would be prudent to set aside a strip of land along this flow route (approx. 15m from the south boundary) where no burials are made. This will also provide an easement for access to the banks of Countesthorpe Brook at the south-east corner of the site.

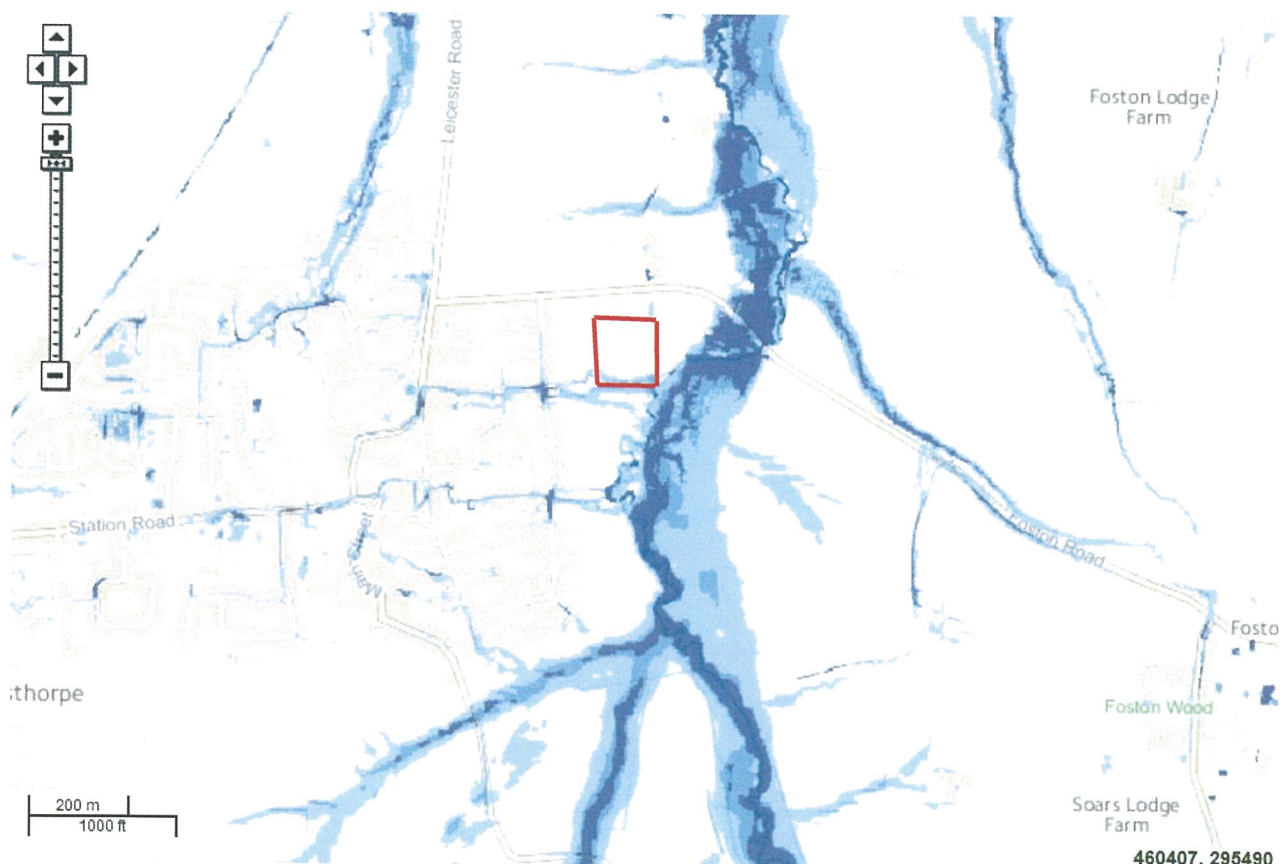


FIGURE 4 SCREEN SHOT TAKEN FROM THE ENVIRONMENT AGENCY SURFACE WATER FLOOD MAP ON 23.02.2015



4.6 Groundwater Flooding

According to the Environment Agency's groundwater map, there are no groundwater source protection zones identified at the site or anywhere around Leicester. A minor aquifer is located below the south part of the site, which is associated with the adjacent watercourse (and River Sence). The groundwater vulnerability zone of this aquifer is classed as 'low'.

Hinckley & Bosworth Borough Council, Blaby District Council and Oadby & Wigston Borough Council published a joint Strategic Flood Risk Assessment in October 2014.

The reports says:

'Due to the moderate or slowly permeable geology of the area, it is more likely that there will be higher percentages of runoff and therefore limited potential for ground water flood risk problems.'

The report includes outputs from the Areas Susceptible to Ground Water Flooding (AStGWf) map. This data shows the proportion of each 1km grid square where geological and hydrogeological condition show that groundwater might emerge. The map does not show the likelihood of groundwater flooding occurring.

The development site is identified as being in the highest risk category $\geq 75\%$.

Given the site slopes quite steeply (approx. 1 in 33 gradient) down to Countesthorpe Brook which is on the south-east boundary, groundwater flooding will be directly associated with flooding in the brook at this location. This risk from Countesthorpe Brook has been assessed in Section 4.2 of this report.

4.7 Sewer Flooding

Severn Trent Water hold records of surface water sewer flooding between 180 and 205m south-west of the site, and an incident of foul flooding about 320m south-west of the site (Appendix D). This is likely to be connected with reports of sewer flooding on Rosebank Road (location shown in Figure 5) in Leicestershire County Council's Preliminary Flood Risk Assessment, June 2011. It is not expected that this issue poses a risk to the proposed site which is approximately 2m higher than Rosebank Road (based on OS contour lines).

A manhole was identified towards the north-east corner of the site during a site visit on 16th February 2015. This is connected to a sewer that passes through the site. The approximate location of the pipe is indicated in Figure 5 and also Appendix E.

A Protection Strip should be observed along the route of the sewer (normally a width of 5m is required for sewer pipe sizes below 300mm and 8m for sewer pipes between 300mm and 1000mm) to enable access for inspection and maintenance.



FIGURE 5 SCREENSHOT TAKEN FROM GOOGLE MAPS ON 23.02.2015 WHICH SHOWS THE APPROXIMATE LOCATION OF A SEWER PIPE (RED DOTTED LINES)

4.8 Flooding from Reservoirs, Canals and Other Artificial Sources

The site is not shown to be at risk of reservoir flooding on the Environment Agency's reservoir flood map.

There are no canals within the vicinity of the site.

4.9 Previous Flood History

The current owner of the site has no knowledge of the land flooding.

The Environment Agency hold one record of flooding at the site, during January 1947, as a result of the channel capacity of the River Sence being exceeded. A flood level of approximately 77.5mAOD has been estimated for this event by comparing the historic flood outline (Appendix B) with measured ground levels at the site (Figure 3). This flood extent has been used to define the extreme flood outline on the flood map. It is expected to represent a worst case scenario, such as complete blockage of the culvert below Foston Road during a major flood.



5.0 Mitigation measures

5.1 Recommended Finished Floor Levels

The proposal is for a change of use for an existing agricultural site to be used to extend Countesthorpe Cemetery. No buildings, roads, structures are proposed therefore it is not appropriate to recommend finished floor levels.

5.2 Safe Access and Exit

It is expected that Foston Road to the east of the site will flood and become impassable during a 1% a.p. plus climate change event, where Countesthorpe Brook passes below the road. However, dry access west along Foston Road will be maintained, even during an extreme event such as 1947.

This planning proposal is for an extension to an existing cemetery and so no increase of flood risk will result from the change.

5.3 Loss of floodplain

The whole site is above the 1% a.p. plus climate change flood level and so any changes of ground level as a result of proposed use will not impact on floodplain storage.

6.0 Surface Water Runoff

The proposal will involve a change of use from agricultural land to a cemetery use. No impermeable surfaces will be created and no formal drainage will be employed. Any memorial structures will simply runoff onto adjacent landscaped ground with no overall impact on runoff characteristic expected from the site (given small individual memorials will be distributed widely across a large grassed area).

7.0 Conclusion

It is proposed to change the use of an agricultural field off Foston Road, Countesthorpe to provide an extension to the adjacent cemetery.

The site is nominally within Flood Zone 2 of the Environment Agency's indicative flood map.

Comparing ground levels with 1D modelled river levels confirms the flood risk classification.

There is a natural surface water flow route that passes close to the southern hedge line, which will be protected by setting aside a strip of land where no burials will be made.

A visual inspection indicates that a sewer crosses the site, which should be investigated and protected with an easement.

Safe dry access will be available, even in the event of an extreme flood. Any changes to ground levels at the site will not impact on floodplain storage.

The proposal will not create any impermeable surfaces or formal drainage, with no overall impact on runoff characteristic expected from the site.

It can be concluded therefore that the proposed development is appropriate for the flood risk and is not expected to increase the risk of flooding elsewhere.



8.0 Recommendations

- Protect a strip of land along the southern hedge line (15m) to prevent interaction with the natural surface water flow route and provide access to the banks of Countesthorpe Brook.
- Trace the route of any sewers that pass the site and provide a suitable protection zone.



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Appendix A – Site location plan



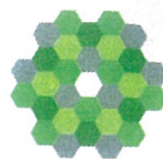
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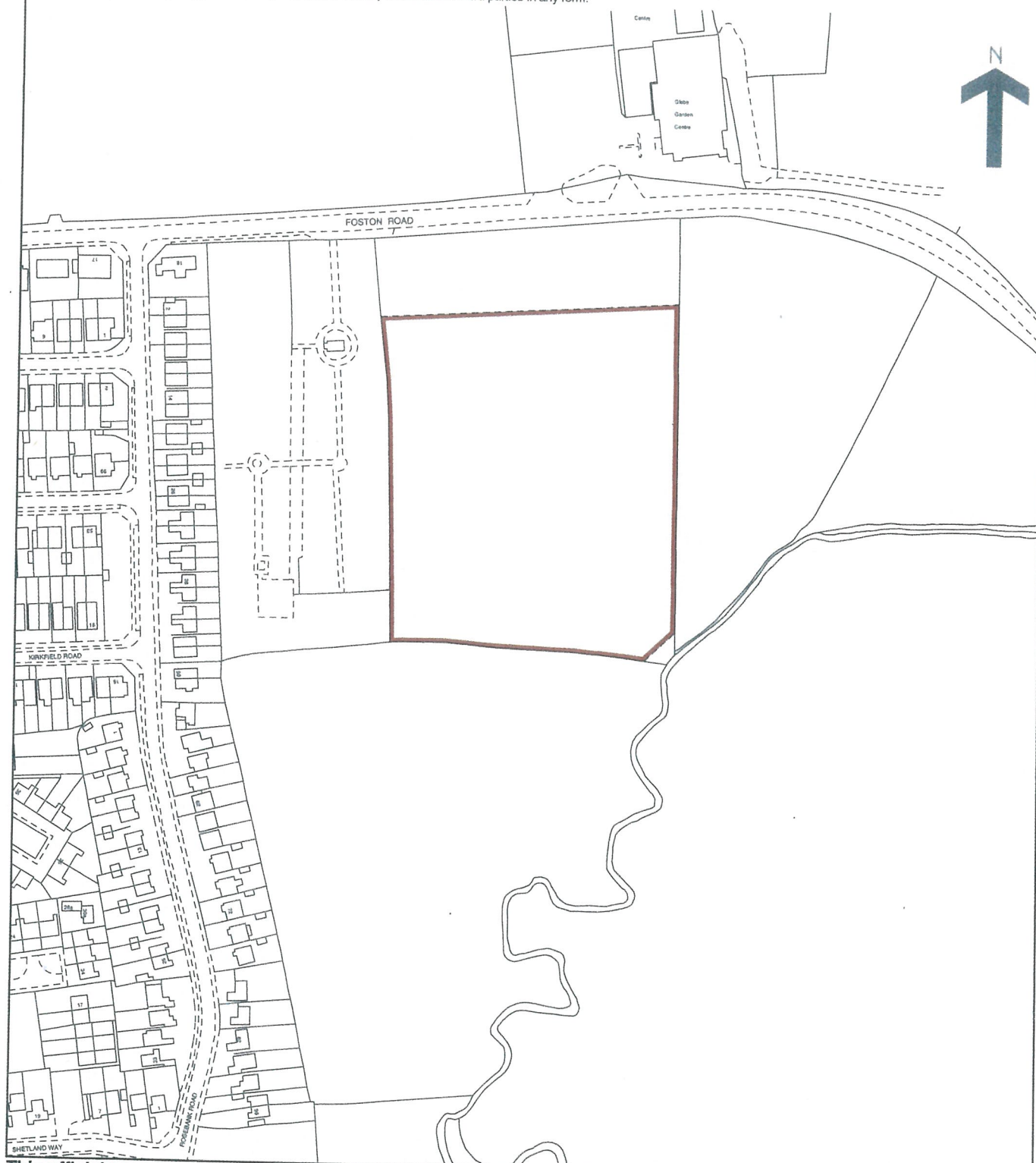
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Land Registry
Official copy of
title plan

Title number **LT453119**
Ordnance Survey map reference **SP5995NW**
Scale **1:2500**
Administrative area **Leicestershire: Blaby**



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This official copy issued on 10 October 2013 shows the state of this title plan on 10 October 2013 at 15:49:41. It is admissible in evidence to the same extent as the original (s.67 Land Registration Act 2002). This title plan shows the general position, not the exact line, of the boundaries. It may be subject to distortions in scale. Measurements scaled from this plan may not match measurements between the same points on the ground. See Land Registry Public Guide 19 - Title Plans and Boundaries.

This title is dealt with by Land Registry, Leicester Office.



Appendix B – Environment Agency data



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Gavin Wilson
RAB Consultants

Our Ref: DNL-9893

Your Ref:

Date: 09/02/2015

Dear Gavin

Provision of Product-4 for Land adj to Countesthorpe Cemetry, Foson Road, Leicester, LE8 5Q

Thank you for your request of 16/01/2015 to use Environment Agency data, Product 4, in the development of the Land adj to Countesthorpe Cemetry, Foson Road, Leicester, LE8 5Q.

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.

This information is provided subject to the enclosed Standard Notice, which you should read.

If you have any queries or would like to discuss the content of this letter further please contact us at the e-mail address below.

Yours sincerely



Customers & Engagement Officer
Derbyshire, Nottinghamshire & Leicestershire

For further information please contact the Customers & Engagement Team on 0115 846 3691/3696

Fax:- 0115 982 8319

Direct e-mail:- DNLenquiries@environment-agency.gov.uk

Enc Detailed FRA Map
Standard Notice

DNL9893

The following information, including the modelled extents mapping, has been produced including the effect of any local defences.

Node point reference	Location	20% (1 in 5 year) modelled level (mAOD)	20% (1 in 5 year) modelled flow (m ³ /s)	10% (1 in 10 year) modelled level (mAOD)
22C	SP 59360 95800	74.88	9.78	74.97
19C	SP 59420 95920	74.44	9.77	74.50
16C	SP 59430 96120	73.72	9.77	73.77
13C	SP 59310 96350	72.96	9.76	73.02
6C	SP 59380 96770	71.65	9.74	71.70

Source: River Sence Hydraulic Model and Floodplain Mapping, JBA, April 2000

Node point reference	Location	10% (1 in 10 year) modelled flow (m ³ /s)	4% (1 in 25 year) modelled level (mAOD)	4% (1 in 25 year) modelled flow (m ³ /s)
22C	SP 59360 95800	11.72	75.10	14.52
19C	SP 59420 95920	11.71	74.57	14.51
16C	SP 59430 96120	11.71	73.84	14.50
13C	SP 59310 96350	11.70	73.11	14.49
6C	SP 59380 96770	11.68	71.76	14.47

Source: River Sence Hydraulic Model and Floodplain Mapping, JBA, April 2000

Node point reference	Location	2% (1 in 50 year) modelled level (mAOD)	2% (1 in 50 year) modelled flow (m ³ /s)	1% (1 in 100 year) modelled level (mAOD)
22C	SP 59360 95800	75.20	16.87	75.29
19C	SP 59420 95920	74.63	16.86	74.67
16C	SP 59430 96120	73.90	16.84	73.96
13C	SP 59310 96350	73.17	16.83	73.23
6C	SP 59380 96770	71.81	16.81	71.85

Source: River Sence Hydraulic Model and Floodplain Mapping, JBA, April 2000

Node point reference	Location	1% (1 in 100 year) modelled flow (m ³ /s)	0.67% (1 in 150 year) modelled level (mAOD)	0.67% (1 in 150 year) modelled flow (m ³ /s)
22C	SP 59360 95800	19.16	75.34	20.66
19C	SP 59420 95920	19.14	74.71	20.64
16C	SP 59430 96120	19.13	73.99	20.63
13C	SP 59310 96350	19.12	73.26	20.61
6C	SP 59380 96770	19.09	71.88	20.59

Source: River Sence Hydraulic Model and Floodplain Mapping, JBA, April 2000

Please note: The flows provided represent **in channel flow only** and do not take into account flow on the floodplain.

The map displays the Countesthorpe CP boundary in blue. Key features include:

- Leicester Road** running horizontally across the middle.
- Toston Road** running diagonally from the top right towards the center.
- Residential Streets** in the bottom right, including Regent Rd, Wigston Street, and several others.
- Landmarks** such as the Glebe Garden Centre, Sewage Works, and a Playing Field.
- Infrastructure** like a Track and a Drain.
- Distances** marked along roads: 84m, 82m, and 86m.



Scale 1:5,000



Legend



1947 Flood Event Outline

Environment Agency

Scale 1:10,000

N
W E
S

Legend

- 1% (1 in 100 year) floodplain
- 0.1% (1 in 1000 year) floodplain
- Main River
- Bank Top ePlanning Tool

A Strategic Flood Risk Assessment may be available, providing further information for this site. Please contact your Local Planning Authority to access this information as it will need to be considered within any Flood Risk Assessment submission.

Contact Us: National Customer Contact Centre
PO Box 544 Rotherham S60 1RV Tel: 03708 506 506 (Mon-Fri 9 a.m. - 5 p.m.) Email: ncc@nationalcustomercontactcentre.co.uk
100027100, 2010.

DNL9893

Modelled Information

The Environment Agency holds no detailed hydraulic modelled information for this area.

DNL9893 Historic Information

Map Reference	Flood Event Code	Name	Start Date	End Date	Source of Flooding	Cause of Flooding
1947	EA034_FEG_4072_1947	River Sence 1947	January 1947	January 1947	river	channel capacity exceeded

DNL9893 Defence Information

There are no Environment Agency maintained raised defences in this area.

Environment Agency

Scale 1:10,000

Legend

- 1 in 5 year Modelled Extent
- 1 in 10 year Modelled Extent
- 1 in 25 year Modelled Extent
- 1 in 50 year Modelled Extent
- 1 in 100 year Modelled Extent

Modelled Node Location and Reference

Source: River Sence Hydraulic Model, JBA, April 2000

Countesthorpe CP

The map shows the River Sence flowing through Countesthorpe CP. The flood extents are modelled for different return periods. The 1 in 5 year modelled extent is shown in yellow, the 1 in 10 year in orange, the 1 in 25 year in green, the 1 in 50 year in blue, and the 1 in 100 year in purple. The map also shows the location of the Countesthorpe CP Sewage Works and the Countesthorpe CP Pumping Station. The map includes a legend, scale, north arrow, and source information.

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.

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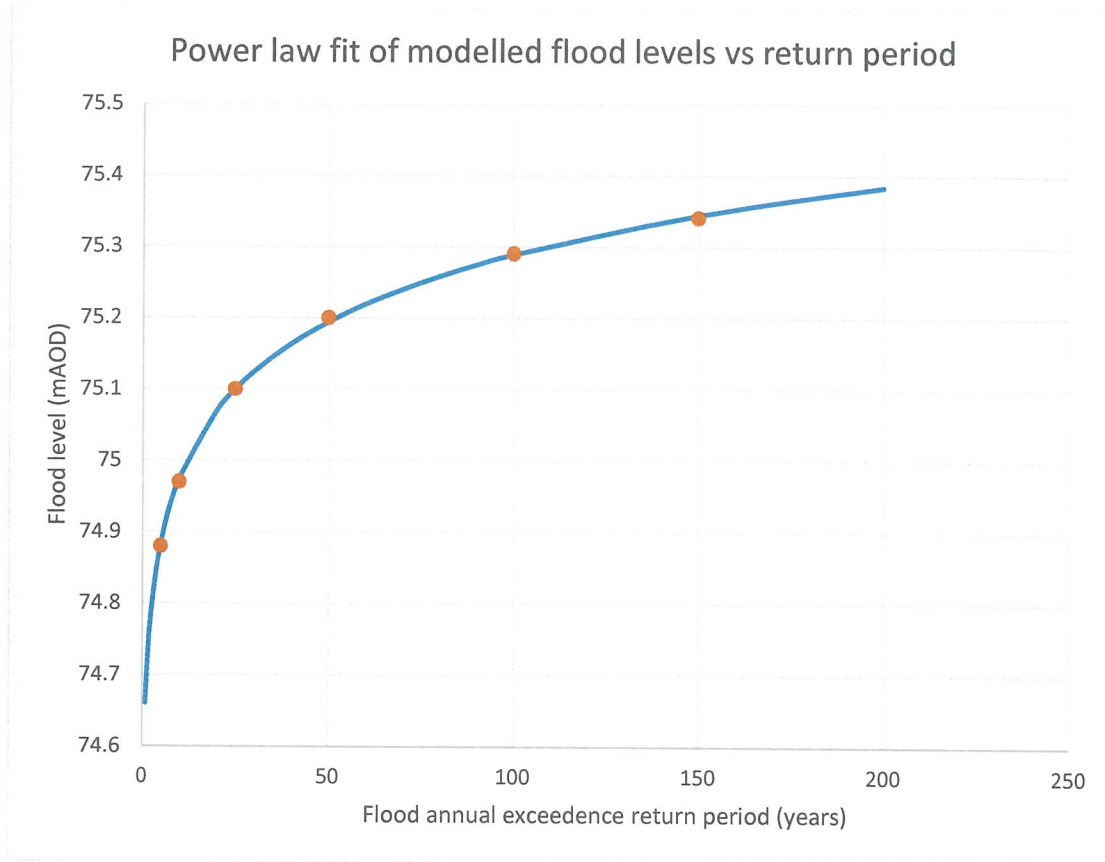
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Appendix C – Extrapolation of flood level data



The modelled flood levels at node 22C were fitted with a power law line of best fit ($L = 74.66023 \times Y^{0.001821}$) in order to extrapolate a 0.5% a.p. flood level (75.38mAOD).



Appendix D – Severn Trent Water response

Gavin Wilson

From: [REDACTED]
Sent: 21 January 2015 08:30
To: Gavin Wilson
Subject: Re: Sewer flood data request
Attachments: Site location.pdf

Dear Mr Wilson,

Thank you for your Enquiry.

Our records show a number of incidents of surface water sewer flooding between 180 and 205m south-west of your site, and an incident of foul flooding about 320m south-west of the site.

Regards,

Asset Protection Waste Water
Tel 0116 234 3834

(reply to net.dev.east@severntrent.co.uk)

[REDACTED]

16/01/2015 10:48

To: "net.dev.east@severntrent.co.uk"
<net.dev.east@severntrent.co.uk>
cc:
Subject: Sewer flood data request



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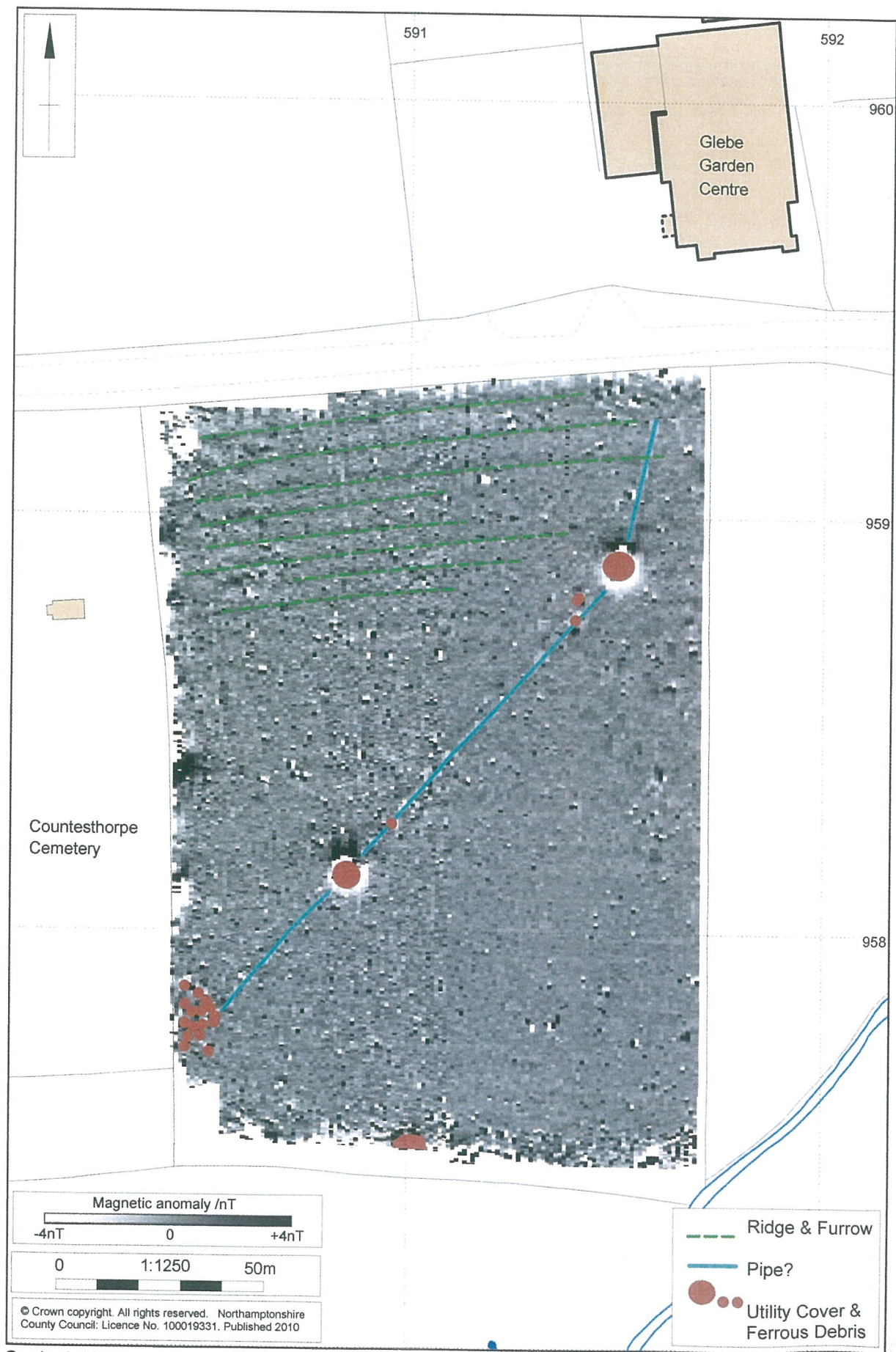
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Appendix E – Route of sewer



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Scale 1:1250

Magnetometer Survey Interpretation Fig 3



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