BWB

CONSULTANCY | ENVIRONMENT
INFRASTRUCTURE | BUILDINGS

ENVIRONMENT - WATER

Sowden Group
Windmill Place, Loughborough

FLOOD RISK ASSESSMENT

ENVIRONMENT - WATER

Sowden Group
Windmill Place
Loughborough

FLOOD RISK ASSESSMENT

Birmingham
Livery Place, 35 Livery Street, Colmore
Business District, Birmingham, B3 2PB
T: 0121 233 3322

Leeds
Whitehall Waterfront, 2 Riverside Way, Leeds
LS1 4EH
T: 0113 233 8000

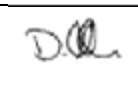
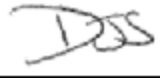
London
15 Weller Street, London, SE1 1QU
T: 020 7234 9122

Manchester
4th Floor Carvers Warehouse, 77 Dale Street
Manchester, M1 2HG
T: 0161 233 4260

Nottingham
Waterfront House, Station Street,
Nottingham NG2 3DQ
T: 0115 924 1100

E – FloodRisk@bwbconsulting.com

Date: March 2013

AUTHOR:	**Darren Harvey BEng (Hons)**	
CHECKED:	**Daniel Allum BSc (Hons)**	
APPROVED:	**Darren Stewart BSc (Hons)**	
REPORT REF:	**NTT/2147/FRA**	
STATUS:	**Rev B**	

REVISION STATUS

REV. NO.	DESCRIPTION:	AUTHOR	CHECKED	APPROVED	DATE
Draft	First Internal Draft	DIH	DA	DJS	28/09/12
A	First External Issue	DIH	DA	DJS	28/09/12
B	Updated following consultation with Environment Agency	DIH	DA	DJS	08/03/13

EXECUTIVE SUMMARY

This Flood Risk Assessment (FRA) has been produced on behalf of the Sowden Group in respect of a proposed residential and community centre development at Windmill Place, Loughborough (approximate grid reference: 454650, 319345). The existing site is located to the east of Windmill Road in Loughborough, covering a total area of approximately 4.3ha. The site currently houses a recycling operation and generally comprises sheds, scrap metal heaps and storage of spoil associated with the current and former land uses. The development proposals are for a residential led development in the south-west and south-east quadrants. The north-east quadrant is allocated for a community centre to be developed by others.

The Flood Zone maps from the Environment Agency show that the south-west quadrant is generally within Flood Zone 1 (Low Probability), the south-east quadrant affected by Flood Zone 2 (Medium Probability) and the north-east quadrant affected by both Flood Zone 2 and 3a (High Probability).

Based on detailed modelled levels provided by the Environment Agency, the south-west quadrant is unaffected by flooding, however in the 100-year and 100-year plus climate change events there is an existing floodplain encroachment in the north-east and south-east quadrants. It is considered that mitigation measures including appropriate arrangement of development, raising of floor levels and design of external levels can be implemented in order to provide a safe development and ensure there is no adverse impact on flood risk elsewhere.

Other sources of flood risk such as canals, reservoirs and waterbodies, sewer flooding and pluvial run-off have been considered and there is no significant flood risk posed to the site from any other source.

The majority of the existing site currently comprises impermeable surfaces, and the proposed development is likely to lead to a reduction in impermeable area on site and subsequently a reduction in surface water run-off rates. Typically, the recommended surface water drainage hierarchy should be to soakaway or infiltration in the first instance. From an initial review of available soil information it is unlikely the site would be suitable for the use of soakaways. Furthermore, the use of infiltration systems would not be recommended due to the potential contamination risk associated with the current and former site uses.

Following the recommended drainage hierarchy it is therefore proposed that surface water drainage is directed to the Hermitage Brook and existing sewers to mimic existing arrangements. It is also understood that the site previously had an outfall to the Grand Union Canal. To provide some betterment to the current situation it is proposed to limit the discharge to the existing estimated run-off rate less a 20% reduction. An initial assessment estimates that a total maximum storage volume of approximately 385m^3 with an appropriate allowance for the potential effects of climate change will be required across the site, subject to detailed design at the appropriate juncture.

In compliance with the requirements of National Planning Policy Framework, and subject to the mitigation measures proposed, the development may proceed without being subject to significant flood risk. Moreover, the development will not increase flood risk to the wider catchment area as a result of suitable management of surface water runoff discharging from the site.

CONTENTS PAGE

TABLES

FIGURES

APPENDICES

1.0 INTRODUCTION

Summary Information

1.1 This Flood Risk Assessment (FRA) is compliant with the requirements set out in the National Planning Policy Framework (NPPF) and the associated Technical Guidance (March, 2012). The FRA has been produced on behalf of the Sowden Group in respect of a proposed residential and community centre development at Windmill Place, Loughborough.

Site Name	Windmill Place, Loughborough
Location	East of Windmill Road, Loughborough
NGR (approx.)	454650, 319345
Application Site Area (Ha)	Approx. 4.3
Development Type	Residential and Community Centre
NPPF Vulnerability	More Vulnerable and Less Vulnerable
EA Flood Zone	Flood Zones 1, 2 and 3a
EA Office	Midlands Region, East Area Office
Local Planning Authority	Charnwood Borough Council

Table 1.1 – Site Summary

Sources of Data

1.2 The report is based on the following information:

(i) OS Explorer Series mapping
(ii) Environment Agency consultation
(iii) Severn Trent Water consultation and asset plans
(iv) Charnwood Borough Council Strategic Flood Risk Assessment
(v) National Soil Resources Institute Soilscapes™ Mapping
(vi) Topographical Survey by Oakes Survey Services, reference 500.1/2046
(vii) Proposed Site Layout by Franklin Ellis Architects

Existing Site

1.3 The existing site is located to the east of Windmill Road in Loughborough as shown in Figure 1.1 overleaf.

1.4 The total application boundary covers an area of approximately 4.3ha and comprises three quadrants separated by Moor Lane which runs west to east and the Grand Union Canal which runs north to south. The site currently houses a recycling operation and comprises sheds, scrap metal heaps and storage of spoil associated with the current and former land uses.

1.5 **The town of Loughborough, and associated existing buildings, is located on the west of the site. Land to the east of the site generally comprises farmland and the Loughborough Moors.**

1.6 **The Hermitage Brook is located off the eastern and northern site boundaries with the River Soar located approximately 1.1km to the east. Both watercourses are classified as Main River in this location.**

1.7 **Existing ground levels vary across the site. In the south-west quadrant the site levels generally range between 39.0 and 43.8m AOD with levels in the south-east quadrant between 39.0 and 41.1m AOD. The north-east quadrant has levels recorded in the region of 37.5 and 39.1m AOD. A topographical survey of the study site area is included for reference as Appendix A.**

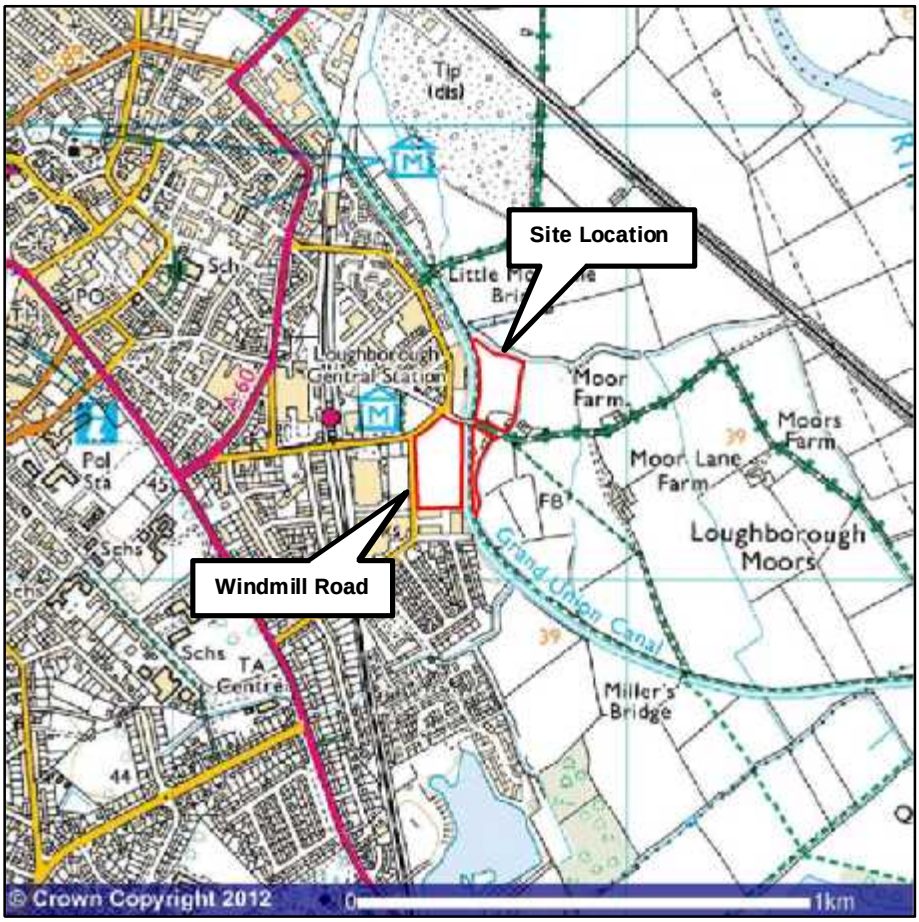


Figure 1.1 – Site Location

Proposed Development

1.8 **The development proposals are for a residential led development in the south-west and south-east quadrants. The north-east quadrant is allocated for a community centre to be developed by others.**

1.9 **A proposed masterplan is included for information as Appendix B.**

Flood Risk Planning Policy

National Planning Policy Framework

1.10 **The NPPF[1] sets out the Government's national policies on different aspects of land use planning in England in relation to flood risk. A supporting Technical Guidance document is also available[2].**

1.11 **The NPPF Technical Guide sets out the vulnerability to flooding of different land uses. It encourages development to be located in areas of lower flood risk where possible, and stresses the importance of preventing increases in flood risk off site to the wider catchment area.**

1.12 **The Technical Guidance also states that alternative sources of flooding, other than fluvial (river flooding), should also be considered when preparing a Flood Risk Assessment. This Flood Risk Assessment is written in accordance with the NPPF.**

Environment Agency Flood Zones

1.13 **Flood Zone mapping prepared by the Environment Agency identifies areas potentially at risk of flooding from fluvial or tidal sources without taking into account the presence of flood defences or structures such as culverts or minor watercourses. An extract from the mapping is included as Figure 1.2.**

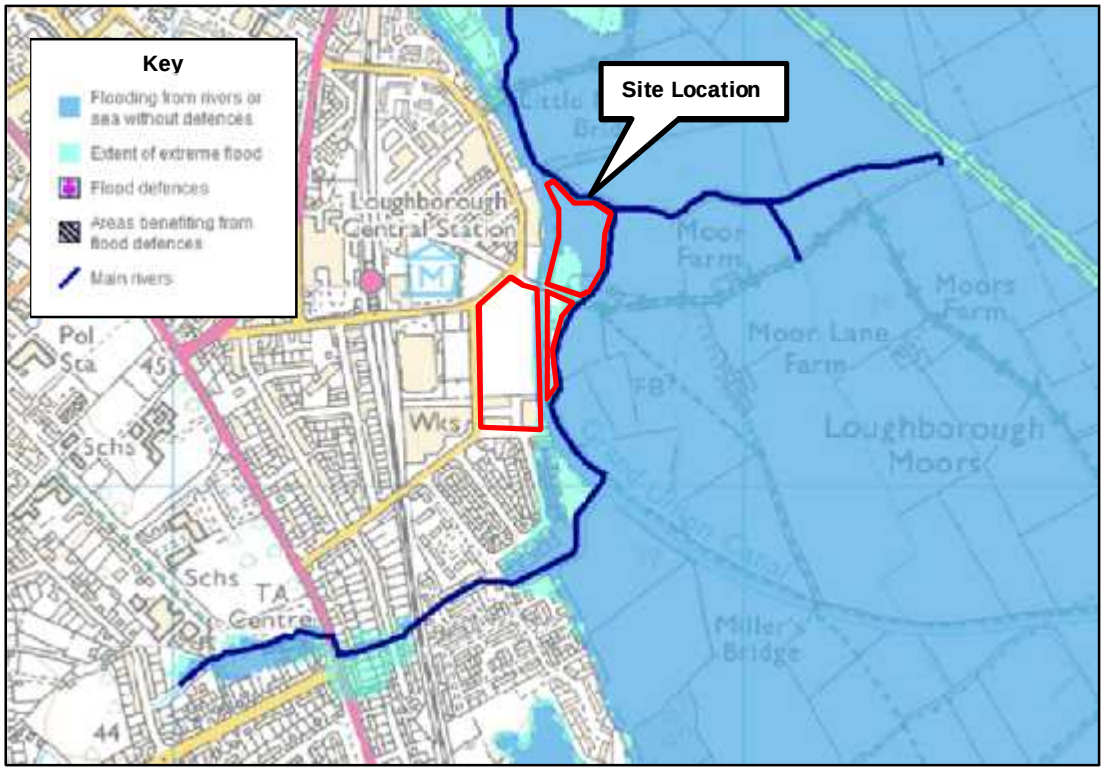


Figure 1.2 – Environment Agency Flood Zones

[1] National Planning Policy Framework, DCLG, March 2012
[2] Technical Guidance to the National Planning Policy Framework, DCLG, March 2012

1.14 **The Flood Zone maps from the Environment Agency show that the development quadrants are located within distinct Flood Zone classifications. The south-west quadrant is generally within Flood Zone 1 (Low Probability), the south-east quadrant partially affected by Flood Zone 2 (Medium Probability) and the north-east quadrant affected by both Flood Zones 2 and 3a (High Probability).**

1.15 **Table 2 of the NPPF classifies land use. Under these classifications, residential would be considered as "More Vulnerable" use and it is assumed the community uses would be "Less Vulnerable".**

Other Relevant Policy and Guidance

Charnwood Borough Council Strategic Flood Risk Assessment

1.16 **The Charnwood Borough SFRA[3] was released in April 2008, and was undertaken to assess flood risks throughout Charnwood Borough, and in particular provide the flood risks associated with areas being considered for future development.**

1.17 **The SFRA was undertaken in line with guidance outlined in the now superseded PPS25, but the general principles of the study remain valid alongside the NPPF.**

[3] Charnwood Borough Council Strategic Flood Risk Assessment Final Report, Entec, April 2008

2.0 SOURCES OF FLOOD RISK

2.1 The table below identifies the potential sources of flood risk to the site and the proposed development, as well as the impacts which the development could have in the wider catchment. These are discussed in greater detail in the forthcoming section, and Section 3.0 explains the mitigation measures proposed to address flood risk and ensure the development is appropriate for its location.

Flood Source	Potential Risk				Description
	High	Medium	Low	None	
Fluvial		X			Main Rivers – River Soar and Hermitage Brook
			X		Minor drains in vicinity
Tidal				X	No coastal risk
				X	No tidal influence
Canals			X		Grand Union Canal
Groundwater				X	None recorded
Reservoirs and Waterbodies			X		Reservoirs in wider area
Sewers			X		Within adjacent roads and through site
Pluvial runoff			X		No steeply sloping land in vicinity
Effect of Development on Wider Catchment			X		Development not anticipated to result in impedance of flood flows or loss of fluvial floodplain
			X		Development unlikely to result in increase of impermeable surfaces or runoff

Table 2.1 – Potential Sources of Flood Risk

Fluvial Flood Risk

River Soar and Hermitage Brook

2.2 The River Soar is located approximately 1.1km east of the site and is understood to contribute the majority of the fluvial Flood Zones in this area.

2.3 **The Hermitage Brook is located adjacent to the eastern and northern site boundaries and flows in a generally northerly direction before reaching a confluence with the River Soar approximately 1.8km north of the site.**

2.4 **The watercourses have been assessed as part of the recent Lower Soar and Tributaries SFRM[4] Study which includes detailed 2D modelling outputs for the local area.**

2.5 **The Environment Agency were consulted and provided outputs from the study specific to the site. The data provided includes channel flood levels for a series of nodes and 2D height outputs. Their correspondence is included as Appendix C.**

2.6 **The 2D heights are considered to be most appropriate to assess the risk to the site as these represent the appropriate flood levels in the floodplain. Based on these SFRM outputs, the modelled levels and extents provided demonstrate that that there would be a floodplain encroachment on the south-east and north-east quadrants of the site in the 100-year (39.49m AOD) and 100-year plus climate change (39.78m AOD) return periods. It is also understood that the 20-year return period flood level applicable to the site is approximately 38.7m AOD and encroaches within the north-east quadrant.**

2.7 **The south-western quadrant is completely unaffected by the flood extents, even when considering up to the 1000-year return period.**

2.8 **The 2D floodplain heights have been superimposed on the topographical survey and are depicted within Appendix D.**

2.9 **Based on this, only areas outside of the 100-year plus climate change floodplain would be considered suitable for development. The area affected by the 20-year return period is considered to be equivalent to Flood Zone 3b (Functional Floodplain) and no elements of development should be located here.**

2.10 **Mitigation measures such as a sequential arrangement of development within the boundary, raising finished floor levels/building thresholds and appropriate design of external levels would be considered appropriate to address the risk from these fluvial sources.**

Minor Watercourses

2.11 **There are minor unnamed drains and in the vicinity of the site, generally within the adjacent farmland and Loughborough Moors to the east, which appear to contribute to the catchment of the Hermitage Brook.**

2.12 **In isolation, these drains are generally remote from the site and would have limited catchments associated with them. There is not considered to be a significant direct risk of flooding posed to the site by the minor watercourses in the vicinity.**

[4] Lower Soar and Tributaries Strategic Hazard Mapping Study, JBA, January 2012

Flood Risk from Canals

2.13 The Grand Union Canal is orientated north to south past the site and separates the western and eastern quadrants. The Canal and River Trust were consulted with regard to the potential flood risk from this source and their correspondence is included as Appendix E.

2.14 They state that in this area the navigation is protected from flooding by using a flood lock approximately 2.4km to the south of the site. The Environment Agency also operates a radial gate in this location to ease any problems.

2.15 In the canalised navigation past the site, the crest height of the towpath level is generally 300mm above the normal water level and the site sits higher than the embankment.

2.16 The Canal and River Trust have no records of past events in this location and flooding from the canal in isolation is not considered to be an issue in this area.

2.17 Based on the available information and presence of infrastructure and operations to prevent flooding, there is not considered to be a significant risk of direct flooding posed to the site from the Grand Union Canal.

Flood Risk from Reservoirs/Waterbodies

2.18 Swithland Reservoir and Cropston Reservoir are located remote from the site in the wider area to the south of Loughborough. Reservoir failure flood risk mapping has been prepared by the Environment Agency, this shows the largest area that might be flooded if a reservoir were to fail and release the water it holds. An extract from the mapping is included as Figure 2.2 below.

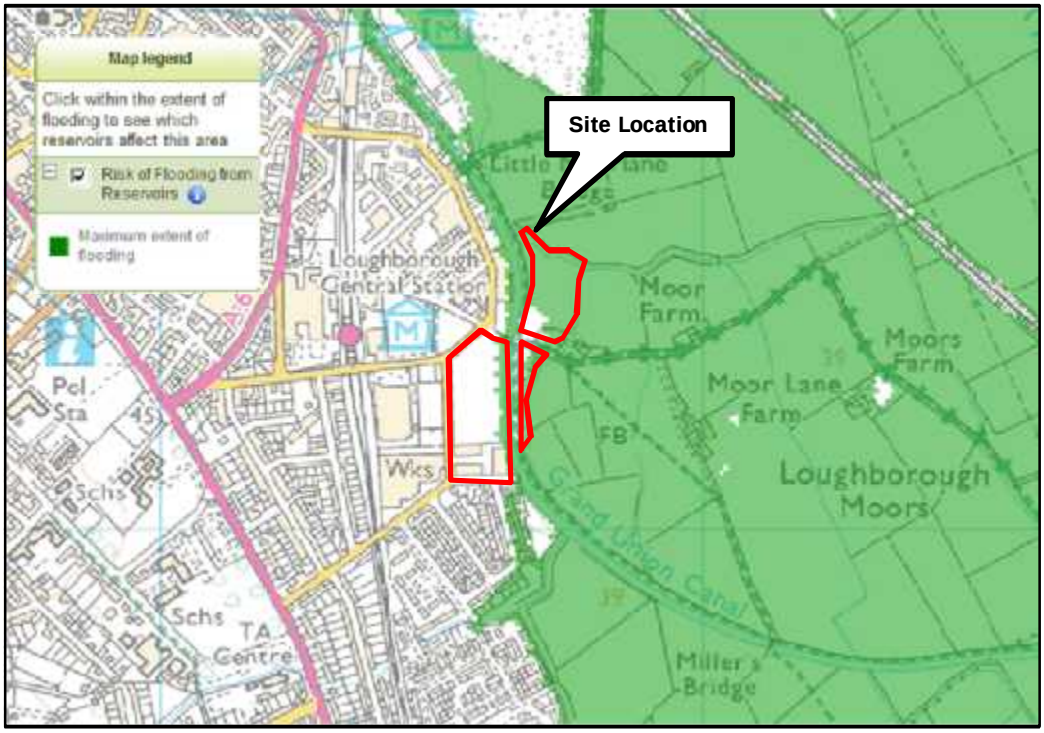


Figure 2.1 – EA Reservoir Failure Flood Risk Map

2.19 **The mapping shows that the eastern quadrants of the site are affected by the potential reservoir breach outlines attributed to Swithland and Cropston Reservoirs.**

2.20 **However, it should be noted that the mapping is described as representing the worst case scenario and it is unlikely that any actual flood would be this large.**

2.21 **The Environment Agency also state that there has been no loss of life in the UK from reservoir flooding since 1925. Subsequent reservoir safety legislation acts to ensure that reservoirs are well maintained and the reservoir owners would manage this responsibility.**

2.22 **Both reservoirs are owned and maintained by Severn Trent Water who have ultimate responsibility for the safety of their reservoir assets.**

2.23 **Regular safety inspections would be carried out and any necessary design or repairs would be undertaken where required in accordance with the operation and maintenance regime.**

2.24 **Based on the safety legislation in place and inspection and repair responsibilities of Severn Trent Water, alongside the general low probability of reservoir failure, then there is not actually considered to be a significant risk posed to the site from any reservoir in spite of the risk mapping.**

Flood Risk from Sewers

2.25 **Due to the developed nature of the land to the west of the site, there may be local sewers in the vicinity which have potential to flood in heavy storm events.**

2.26 **With reference to Severn Trent Water asset plans, there are shown to be existing foul and surface water sewers adjacent to and within the site. A copy of the asset plans is included for reference as Appendix F.**

2.27 **The existing public foul and surface water sewers serving the adjacent roads and developed areas to the west, north and south generally have limited catchments and small diameters less than 300mm. These would therefore not be anticipated to carry significant flow or present a significant risk of flooding to the site.**

2.28 **There is shown to be a 975mm combined sewer running north to south through the south-west quadrant of the site which may carry a more significant flow. However, there are no manholes associated with this sewer within or immediately adjacent to the site, therefore the risk of surcharging or flooding is considered to be low.**

2.29 **There is not considered to be a significant risk of flooding posed to the site from existing sewers and simple mitigation measures can be incorporated within the development to address any low residual risk. The route of the 975mm sewer will also need to be considered within the layout of development in the south-west quadrant.**

Pluvial Flood Risk

2.30 There may be a risk of flooding posed to the site from overland flows associated with pluvial (rainfall) events in the area.

2.31 With reference to OS mapping and the topographical survey, there is no steeply sloping ground in the vicinity and the site generally sits above surrounding land. Significant pluvial flows would therefore not be generated in the wider area and any overland flow routes would not tend to be directed towards the site in any case.

2.32 Leicestershire County Council were consulted and they had no recorded instances of flooding to the highway on Windmill Road or the adjacent roads. Their brief correspondence is included as Appendix G.

2.33 There is not considered to be a significant risk of flooding posed from pluvial run-off and simple mitigation measures can be implemented within the development to address any low residual risk.

Effect of Development on Wider Catchment

Flood Flows and Fluvial Floodplain

2.34 Based on a comparison of the modelled flood levels provided and topographical survey, the eastern quadrants of the site are shown to be affected by the flood level outputs of the River Soar and Hermitage Brook in the design 100-year and 100-year plus climate change flood events. There is also an encroachment of the 20-year return period flood levels in the north-eastern quadrant. This existing floodplain is considered to be land where water has to flow or be stored in times of flood and development should be steered away from these areas.

2.35 This has been considered within the masterplan, with the proposed community centre building in the north-east quadrant and the residential buildings in the south-east quadrant being limited to areas of the site unaffected by the existing 100-year and 100-year plus climate change floodplain extents. No elements of the development are located within or close to the Flood Zone 3b extents.

2.36 To ensure that there is no impact on existing flood flow routes or floodplain storage and no adverse impact elsewhere in the catchment, appropriate levels design would be required and would be considered appropriate mitigation.

Development Drainage

2.37 There is potential for the proposed development to introduce an increased impermeable area on site, which could in turn lead to an increase in run-off rates from the site with potential impacts elsewhere.

2.38 However, with reference to the existing extent of impermeable area on site and the proposed layout then it is likely the development will actually reduce the total impermeable area on site with the introduction of residential gardens and landscaping. Therefore there would be no increase in surface water run-off compared to the current situation.

2.39 The run-off from development drainage is not considered to have an adverse effect on flood risk in the immediate area, however restriction of run-off rates should be considered with flows routed through flow attenuation devices and/or storage features to provide betterment to the existing situation.

2.40 Outline surface water arrangements have been prepared and are discussed in Section 4.0 of this document.

3.0 FLOOD RISK MITIGATION

3.1 Section 2.0 has identified the sources of flooding which could potentially pose a risk to the site and the proposed development. This section of the FRA sets out the mitigation measures which are to be incorporated within the proposed development to address and reduce the risk of flooding to within acceptable levels.

Site Arrangements

Sequential Arrangement

3.2 Based on available mapping and modelled flood levels, parts of the site boundary are considered to lie within Flood Zone 1, with areas of fluvial Flood Zones 2 and 3a related to the River Soar and Hermitage Brook present within the eastern quadrants based on flood levels provided by the Environment Agency. A limited area of Flood Zone 3b is also present within the north-eastern quadrant. To mitigate the residual risk from this source, the development should be arranged to remain outside of these extents as far as practicable.

3.3 The design 100-year and 100-year plus climate change flood extents, roughly representing Flood Zone 3a now and in the future, have been considered within the masterplan and proposed buildings have been located in areas outside of the existing floodplain extents. There are no elements of the development within or close to the Flood Zone 3b extents.

3.4 The south-west quadrant of the site is entirely within Flood Zone 1 and the residential development here is considered appropriate.

Finished Levels

3.5 Typically, finished floor levels are set with a freeboard of 300mm above the 100-year plus climate change flood level.

3.6 The residential and community centre plots in the south-east and north-east quadrants of the site should have finished floor levels set in relation to the River Soar and Hermitage Brook flood levels. With reference to the 2D height outputs, floor levels should therefore be set at a minimum of 40.09m AOD in the south-east quadrant and 40.07m AOD in the north-east quadrant. Based on the location of the eastern development areas within the existing topography, the plots would need to be raised above existing ground levels.

3.7 Topography in the south-western site quadrant limits the impact of the modelled flood levels within the remaining residential development plots, with existing site levels a minimum of approximately 1.70m above the adjacent 100-year plus climate change flood level outputs. Finished floor levels in this area should therefore generally be set to suit construction and access constraints.

3.8 It is also recommended that the finished floor levels and/or threshold levels of the proposed buildings across the development are set a nominal 150mm above finished external ground levels.

3.9 External levels within the development should also be designed in such a way as to direct any potential overland flows away from proposed or existing buildings.

3.10 There is no floodplain encroachment in the south-west quadrant of the site section of the site and this falls wholly within Flood Zone 1. For the north-east and south east development quadrants, the proposed buildings have been arranged to avoid the 100-year and 100-year climate change floodplain extents to ensure there are no impacts on existing floodplain storage due to ground raising to achieve recommended minimum floor levels.

3.11 The access roads and car parking for these quadrants could be affected by shallow depths in the 100-year climate change event and to address potential impacts elsewhere, finished levels would be set to ensure floodplain storage would not be displaced. Formal floodplain compensation should therefore not be required and any minor re-arrangement to fully avoid buildings as part of the development is considered feasible to achieve in the space available and would have no impact on flood risk elsewhere.

3.12 This would ensure there would be no adverse impacts elsewhere in the catchment as a result of the development and any minor localised floodplain re-arrangement would be confirmed at detailed design stage in conjunction with external levels design.

Flood Warning

3.13 Whilst there is not considered to be a significant risk of flooding posed to south-west quadrant, it is recommended that the new dwellings/residents and community building within the development are registered with the Environment Agency Floodline Warnings Direct scheme to inform residents or site users of the potential risk of flooding from the local watercourses. This is a free service which can be set up to produce automated flood warnings direct to telephone, mobile, e-mail or fax.

3.14 With reference to the Environment Agency website, the east of site is within the "River Soar at Cotes and Loughborough Moors" flood warning area. Flood warning updates are also shown to be available on local radio and TV stations.

3.15 The area also lies within the larger geographical catchment of "Lower River Soar in Leicestershire" for early alert to possible flooding elsewhere.

Safe Access and Egress

3.16 To the west of the canal, the south-west site quadrant and surrounding area are unaffected by existing floodplain and modelled flood levels. Therefore safe access and egress will be available for pedestrians and emergency vehicles to Windmill Road and the adjacent roads to the west of the site.

3.17 Based on modelled flood level information provided from the River Soar and Tributaries SFRM the design 100-year return period floodplain height at the site is approximately 39.49m AOD rising to approximately 39.78m AOD when considering potential climate change.

3.18 **With reference to the topographical survey, the deck of Moor Lane Bridge as it crosses the canal is raised between 41.17m AOD and 41.93m AOD, allowing a considerable freeboard when comparing the peak flood levels and lowest deck level.**

3.19 **The remainder of Moor Lane as it passes the site is also generally raised above the modelled flood levels, although the freeboard decreases as it heads to the east. The proposed site entrances for the south-east and north-east development quadrants join Moor Lane at levels of approximately 40.64m AOD and 39.81m AOD respectively and above the peak 100-year climate change flood level. This again demonstrates safe (and dry) access is achievable from these site entrances.**

3.20 **Within the south-east quadrant, there is a section where the proposed access road is bisected by the 100-year plus climate change flood extent. In this location, the existing flood depth is approximately 200-230mm when comparing the modelled flood levels with the lowest spot level in this area.**

3.21 **To ensure there is no loss in floodplain storage post-development, the finished levels of this access road will be designed to remain commensurate with existing levels in this location and therefore the flood depth in the proposed scenario will be no deeper than existing. Given the location of this floodplain extent remote from the watercourses, velocities would be low and therefore the hazard would not be considered to be significant. It is therefore considered that safe (but not dry) access will be available from the section of the south-east development quadrant south of the 100-year climate change floodplain encroachment.**

3.22 **Within the proposed development, routes should be maintained to the section of Moor Lane Bridge outside of the floodplain to allow safe access and egress across the canal to the west. Based on the existing bridge and site levels, this is considered to be feasible and has been considered in the masterplan. This would allow safe access and egress for pedestrians and emergency vehicles to/from the east of the site. Routes to wider areas in Flood Zone 1 are then available from here.**

4.0 OUTLINE SURFACE WATER DRAINAGE ASSESSMENT

Existing Site Runoff

4.1 **As the site is currently given over to a recycling operation and redundant scrap metal works and generally comprises impermeable a surfaces, it is considered to be brownfield in nature. With reference to the topographical survey, site extents and aerial photography of the site, it has been estimated that the total existing impermeable area present is approximately 2.73ha across the three quadrants.**

4.2 **There is evidence of existing surface water drainage infrastructure recorded on site with manholes and sewer lines shown on the topographical survey.**

4.3 **Using the Modified Rational methodology and assuming a rainfall intensity of 50mm/hr then the total existing run-off from the site can be estimated to be 379.4 l/s and broken down across the quadrants as shown in Table 4.1 below.**

Development Plot	Impermeable Area (ha)	Run-Off Rate (l/s)
North-East Quadrant	0.30	41.7
South-East Quadrant	0.56	77.8
South-West Quadrant	1.87	259.9
Total	**2.73**	**379.4**

Table 4.1 – Existing Surface Water Run-Off Rates

4.4 **A calculation sheet is also included for reference as Appendix H.**

Proposed Site Runoff

4.5 **Based on the current masterplan, the proposed development will reduce the impermeable area on site to a total of approximately 1.72 ha which would lead to an overall reduction in the surface water run-off rate compared to the existing situation when applying the Modified Rational methodology. A strategy is required to manage and dispose of this run-off and ensure there are no adverse impacts on flood risk elsewhere.**

4.6 **Typically, the recommended surface water drainage hierarchy should be to soakaway or infiltration in the first instance.**

4.7 **An initial review of soil information from online based resources suggests the underlying bedrock geology would comprise Edwalton Member mudstone formations with superficial alluvium deposits. Soil in this location may be loamy and clayey floodplain soils which are naturally wet, suggesting that the site would not be suitable for the use of soakaways.**

4.8 **Furthermore, the use of infiltration systems would not be recommended due to the presence of the potential contamination risk associated with the current and previous land uses.**

4.9 **Future surface water drainage arrangements for the development have been considered assuming that infiltration systems would not be suitable to represent a worst case scenario.**

4.10 **Following the recommended drainage hierarchy, the next surface water receptor to be considered would be to existing watercourse, followed by sewer. The Hermitage Brook is adjacent to the south-east and north-east quadrants and it is considered feasible that run-off from these areas is directed here. There also appears to be an outfall to the canal recorded on the topographical survey.**

4.11 **As the south-west quadrant is isolated from the Hermitage Brook, run-off from this development plot would need to be directed to existing sewer or the Grand Union Canal, subject to appropriate agreement with Severn Trent Water or the Canal and River Trust.**

4.12 **To provide some betterment to the current situation it is proposed to limit the development discharge to the existing estimated run-off rates less a 20% reduction.**

4.13 **This results in a total proposed discharge rate of 303.5 l/s, broken down across the three development quadrants as shown in Table 4.2 below.**

Development Plot	Allowable Discharge Rate (l/s)
North-East Quadrant	33.4
South-East Quadrant	62.2
South-West Quadrant	207.9
Total	**303.5**

Table 4.2 – Proposed Surface Run-Off Rates

4.14 **Attenuation volumes would be required to store surface water on site when restricting to this rate and assessing appropriate return periods. An allowance for climate change should also be provided.**

Attenuation Volumes

4.15 **The Quick Storage Estimate module within WinDes Source Control software was utilised to calculate the potential attenuation storage volumes required on site. These volumes were estimated for the 100-year return period with an appropriate allowance for climate change. A 30% allowance has been applied for residential plots with a 20% allowance applied to the community use in the north-east quadrant.**

4.16 **The potential impermeable area as a result of the development has been estimated based on the coverage of impermeable surfaces attributed to roofs, highways and external areas indicated on the current proposed masterplan.**

4.17 **Calculation sheets are included as Appendix I and a summary of the allowable discharge rates, impermeable areas and resulting estimated attenuation storage volumes is shown in Table 4.3 below.**

Development Plot	Allowable Discharge Rate (l/s)	Contributing Area (ha)	Maximum Attenuation Volume (m^3)
North-East Quadrant	33.4	0.15	26
South-East Quadrant	62.2	0.27	50
South-West Quadrant	207.9	1.30	309
Total	**303.5**	**1.72**	**385**

Table 4.3 – Potential Surface Water Attenuation Volumes

4.18 **Based on this, a maximum attenuation volume of approximately 385m^3 would be required across the development in the 100-year plus climate change event.**

4.19 **Actual flow rates, storage volumes and points of discharge for surface water drainage would need to be agreed at detailed design stage, however the principle of restricting run-off and providing attenuation storage to cater up to the 100-year plus climate change return period event on-site is considered to be feasible and would ensure no increase in risk elsewhere as a result of development drainage.**

Sustainable Drainage Systems

4.20 **Sustainable Drainage Systems (SuDS) should be incorporated to manage surface water run-off as near to its source as possible and provide treatment prior to discharge.**

4.21 **Filter drains (which can be vegetated at ground level) and permeable paving systems are proposed to provide the treatment and storage required. These features will allow at least two stages of treatment for run-off, and roof water can also be passed through this system. There is considered to be sufficient area/volume available for storage in permeable paving systems below the proposed parking areas across the development to contain the 100-year plus climate change volumes estimated. Supplementary storage can be provided in limited open features. A sketch plan is included for reference as Appendix J.**

4.22 **Other simple elements such as water butts would bring further benefits in terms of surface water run-off and promote a more sustainable use of water.**

4.23 **In the future, it would be necessary to fully assess, formalise and confirm the drainage arrangements with the appropriate approval body.**

5.0 CONCLUSIONS AND RECOMMENDATIONS

5.1 This Flood Risk Assessment (FRA) has been prepared in accordance with the National Planning Policy Framework (NPPF) and the associated Technical Guidance in respect of a proposed development of land at Windmill Road, Loughborough.

5.2 There is not considered to be a significant risk of flooding from fluvial or other sources and the proposed development is considered to be appropriate subject to the implementation of relevant mitigation measures to address the low residual risk of flooding. The identified risks and mitigation measures are summarised within Table 5.1:

Flood Source	Risk	Proposed Mitigation Measure
Fluvial	Medium	Finished floor levels to be set with 300mm freeboard above 100-year plus climates change flood level outputs. Finished floor levels and/or thresholds of proposed buildings to also be nominally raised 150mm above surrounding ground. Appropriate external level design to ensure no loss of floodplain storage. New buildings to register with FloodLine Warnings Direct service. Safe access to raised parts of Moor Lane Bridge provided.
Sewers	Low	External levels to be arranged to direct potential overland flows away from existing and proposed buildings.
Pluvial runoff	Low	External levels to be arranged to direct potential overland flows away from existing and proposed buildings.
Impact of the Development	Low	Surface water run-off rate from the development to be restricted with appropriate attenuation volume provided up to the 100-year design event including an appropriate allowance for climate change. Sustainable drainage systems in the form of filter strips and permeable paving are to be incorporated as appropriate to allow storage and treatment of run-off prior to discharge.

Table 5.1 - Summary of FRA

5.3 In compliance with the requirements of National Planning Policy Framework, and subject to the mitigation measures proposed, the development may proceed without being subject to significant flood risk. Moreover, the development will not increase flood risk to the wider catchment area as a result of suitable management of surface water run-off discharging from the site.

APPENDIX A

Topographical Survey

05.12.2005 Additional MH and Main Sewer Adde

CLIENT	BWB CONSULTING
PROJECT	WINDMILL ROAD LOUGHBOROUGH
TITLE	DETAIL SURVEY
SCALE	1:500
DATE	06/05/04
Dwg No	500.1
Surveyor	CM
Checked by	AB
Comp ref.	2046

NOTES

Levels relative to..... Ordnance Survey

Grid orientated to.... Ordnance Survey

Comments.

The plan and digital data should only be used for its original intended purpose.

It is for the use only of the party to whom it has been addressed and no responsibility is accepted to any third party for the whole or part of its contents. This survey has been prepared on the basis that all information and facts, which may affect the survey, have been disclosed to us by the parties concerned and no liability nor responsibility can be accepted, unless full disclosure has been made.

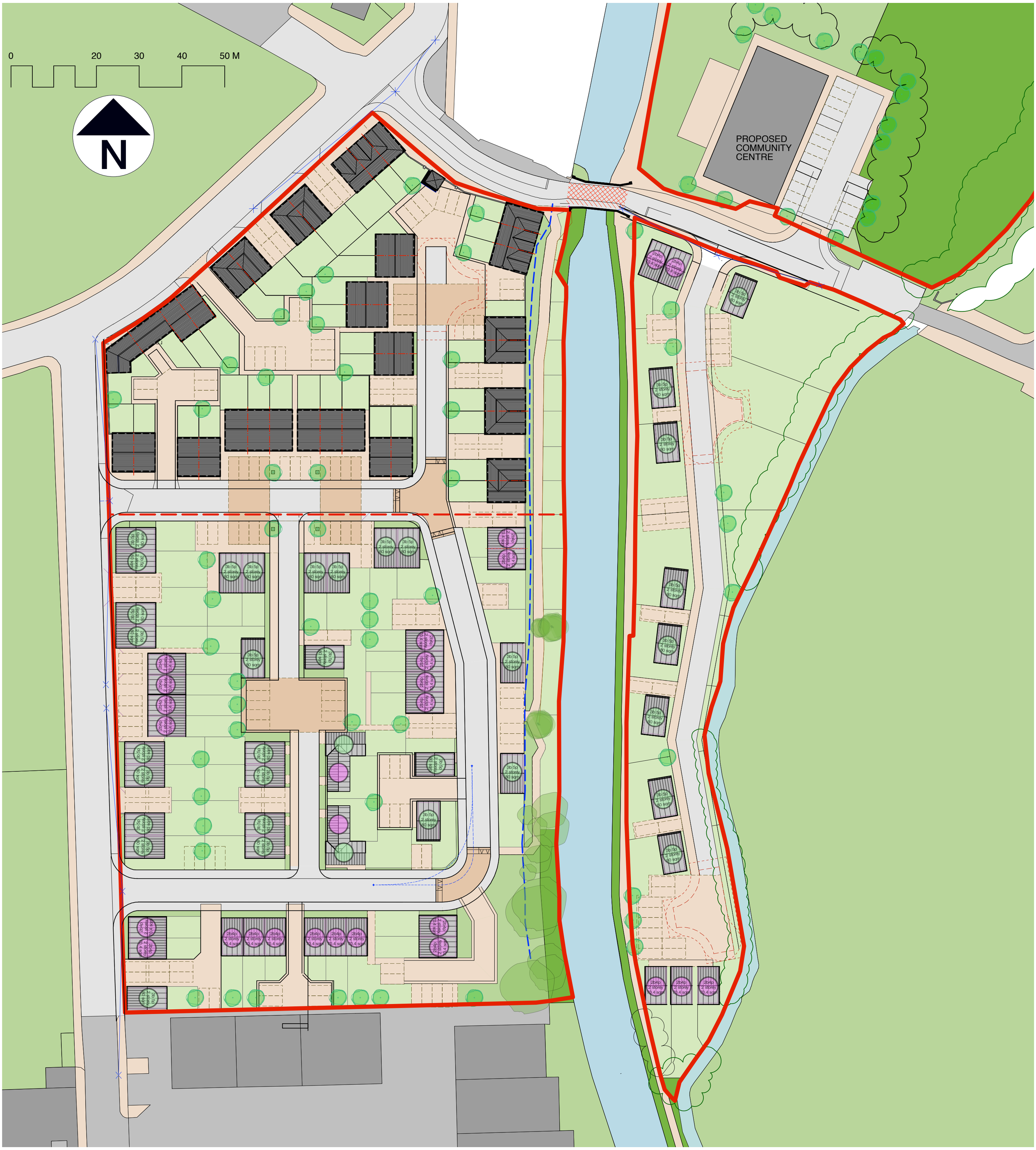
All data remains the ownership of Oakes Survey Services until full payment has been received.

Pipe sizes and flow direction have been visually assessed from the surface and should be considered as approximate only (where applicable).

OAKES SURVEY SERVICES
LAND & BUILDING SURVEYORS
19 Derby Road
RIPLEY
Derbyshire
DE5 3HR
01773 747537 T
01773 749404 F
sales@oakessurveys.com E
www.oakessurveys.com W

APPENDIX B

Proposed Layout


0
20
30
40
50 M
N
PROPOSED
COMMUNITY
CENTRE
2b4p
2 storey
70.4 sqm
3b 5p
2 storey
80 sqm

APPENDIX C

Environment Agency Data

Jack Pickering
BWB Consulting
5th Floor, Waterfront house
Station Street
Nottingham
NG2 3DQ

Our Ref: ER/E/EC/3169/MJD

Your Ref: NTT2147

Date: 20 September 2012

Dear Jack

Provision of Product 4 for FRA/FCA/SFRA – Windmill Lane, Loughborough

Thank you for your request of 8 August 2012 to use Environment Agency data, Product 4, in the development of the FRA/FCA/SFRA – Windmill Lane, Loughborough 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 / Flood Consequence Assessments.

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

Yours sincerely

Matthew Darby
External Relations Officer

For further information please contact External Relations on 0115 846 3691/3696
Direct e-mail:- **midseast@environment-agency.gov.uk**

Enc. Detailed FRA/FCA Map
Standard Notice

ER3169

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)
GRAM01_0655	SK 54266 18733	41.07	1.00	41.20
GRAM01_0396	SK 54484 18796	39.49	1.00	39.57
GRAM01_0170	SK 54688 18872	38.87	1.00	38.98

Source: Lower Soar and Tributaries SFRM Study, JBA, January 2012 (Grammar School Brook)

Node point reference	Location	10% (1 in 10 year) modelled flow (m^3/s)	5% (1 in 20 year) modelled level (mAOD)	5% (1 in 20 year) modelled flow (m^3/s)
GRAM01_0655	SK 54266 18733	1.20	41.27	1.30
GRAM01_0396	SK 54484 18796	1.20	39.62	1.30
GRAM01_0170	SK 54688 18872	1.20	39.04	1.29

Source: Lower Soar and Tributaries SFRM Study, JBA, January 2012 (Grammar School Brook)

Node point reference	Location	2% (1 in 50 year) modelled level (mAOD)	2% (1 in 50 year) modelled flow (m^3/s)	1.33% (1 in 75 year) modelled level (mAOD)
GRAM01_0655	SK 54266 18733	41.41	1.52	41.44
GRAM01_0396	SK 54484 18796	39.72	1.52	39.74
GRAM01_0170	SK 54688 18872	39.45	1.52	39.52

Source: Lower Soar and Tributaries SFRM Study, JBA, January 2012 (Grammar School Brook)

Node point reference	Location	1.33% (1 in 75 year) modelled flow (m^3/s)	1% (1 in 100 year) modelled level (mAOD)	1% (1 in 100 year) modelled flow (m^3/s)
GRAM01_0655	SK 54266 18733	1.57	41.47	1.61
GRAM01_0396	SK 54484 18796	1.57	39.76	1.61
GRAM01_0170	SK 54688 18872	1.57	39.59	1.58

Source: Lower Soar and Tributaries SFRM Study, JBA, January 2012 (Grammar School Brook)

Node point reference	Location	0.5% (1 in 200 year) modelled level (mAOD)	0.5% (1 in 200 year) modelled flow (m^3/s)	0.1% (1 in 1000 year) modelled level (mAOD)
GRAM01_0655	SK 54266 18733	41.51	1.68	41.73
GRAM01_0396	SK 54484 18796	39.83	1.67	39.97
GRAM01_0170	SK 54688 18872	39.73	0.97	39.95

Source: Lower Soar and Tributaries SFRM Study, JBA, January 2012 (Grammar School Brook)

Node point reference	Location	0.1% (1 in 1000 year) modelled flow (m^3/s)	1% + 20% flow (1 in 100 year plus climate change) modelled level (mAOD)	1% + 20% flow (1 in 100 year plus climate change) modelled flow (m^3/s)
GRAM01_0655	SK 54266 18733	2.03	41.54	1.72
GRAM01_0396	SK 54484 18796	2.16	39.86	1.73
GRAM01_0170	SK 54688 18872	2.10	39.83	1.73

Source: Lower Soar and Tributaries SFRM Study, JBA, January 2012 (Grammar School Brook)

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)
SOAR01i006C	SK 54976 18844	39.11	1.14	39.16
SOAR01_006AD	SK 54743 19005	39.10	1.00	39.15
SOAR01i006DD	SK 54649 19140	39.10	0.98	39.15
SOAR01i006E	SK 54644 19340	39.10	0.94	39.14
SOAR01i006FD	SK 54629 19547	39.09	0.91	39.13
SOAR01i006GD	SK 54559 19670	39.09	0.89	39.13

Source: Lower Soar and Tributaries SFRM Study, JBA, January 2012

Node point reference	Location	10% (1 in 10 year) modelled flow (m^3/s)	5% (1 in 20 year) modelled level (mAOD)	5% (1 in 20 year) modelled flow (m^3/s)
SOAR01i006C	SK 54976 18844	1.30	39.19	1.32
SOAR01_006AD	SK 54743 19005	1.42	39.18	1.70
SOAR01i006DD	SK 54649 19140	1.43	39.17	1.66
SOAR01i006E	SK 54644 19340	1.40	39.16	1.71
SOAR01i006FD	SK 54629 19547	1.43	39.15	1.65
SOAR01i006GD	SK 54559 19670	1.40	39.14	1.68

Source: Lower Soar and Tributaries SFRM Study, JBA, January 2012

Node point reference	Location	2% (1 in 50 year) modelled level (mAOD)	2% (1 in 50 year) modelled flow (m^3/s)	1.33% (1 in 75 year) modelled level (mAOD)
SOAR01i006C	SK 54976 18844	39.38	3.00	39.47
SOAR01_006AD	SK 54743 19005	39.35	3.26	39.43
SOAR01i006DD	SK 54649 19140	39.32	3.25	39.41
SOAR01i006E	SK 54644 19340	39.28	3.24	39.37
SOAR01i006FD	SK 54629 19547	39.25	2.93	39.32
SOAR01i006GD	SK 54559 19670	39.23	2.94	39.29

Source: Lower Soar and Tributaries SFRM Study, JBA, January 2012

Node point reference	Location	1.33% (1 in 75 year) modelled flow (m^3/s)	1% (1 in 100 year) modelled level (mAOD)	1% (1 in 100 year) modelled flow (m^3/s)
SOAR01i006C	SK 54976 18844	3.25	39.54	3.37
SOAR01_006AD	SK 54743 19005	3.78	39.53	3.93
SOAR01i006DD	SK 54649 19140	3.78	39.51	3.93
SOAR01i006E	SK 54644 19340	3.78	39.49	3.92
SOAR01i006FD	SK 54629 19547	3.88	39.43	4.98
SOAR01i006GD	SK 54559 19670	3.88	39.37	4.98

Source: Lower Soar and Tributaries SFRM Study, JBA, January 2012

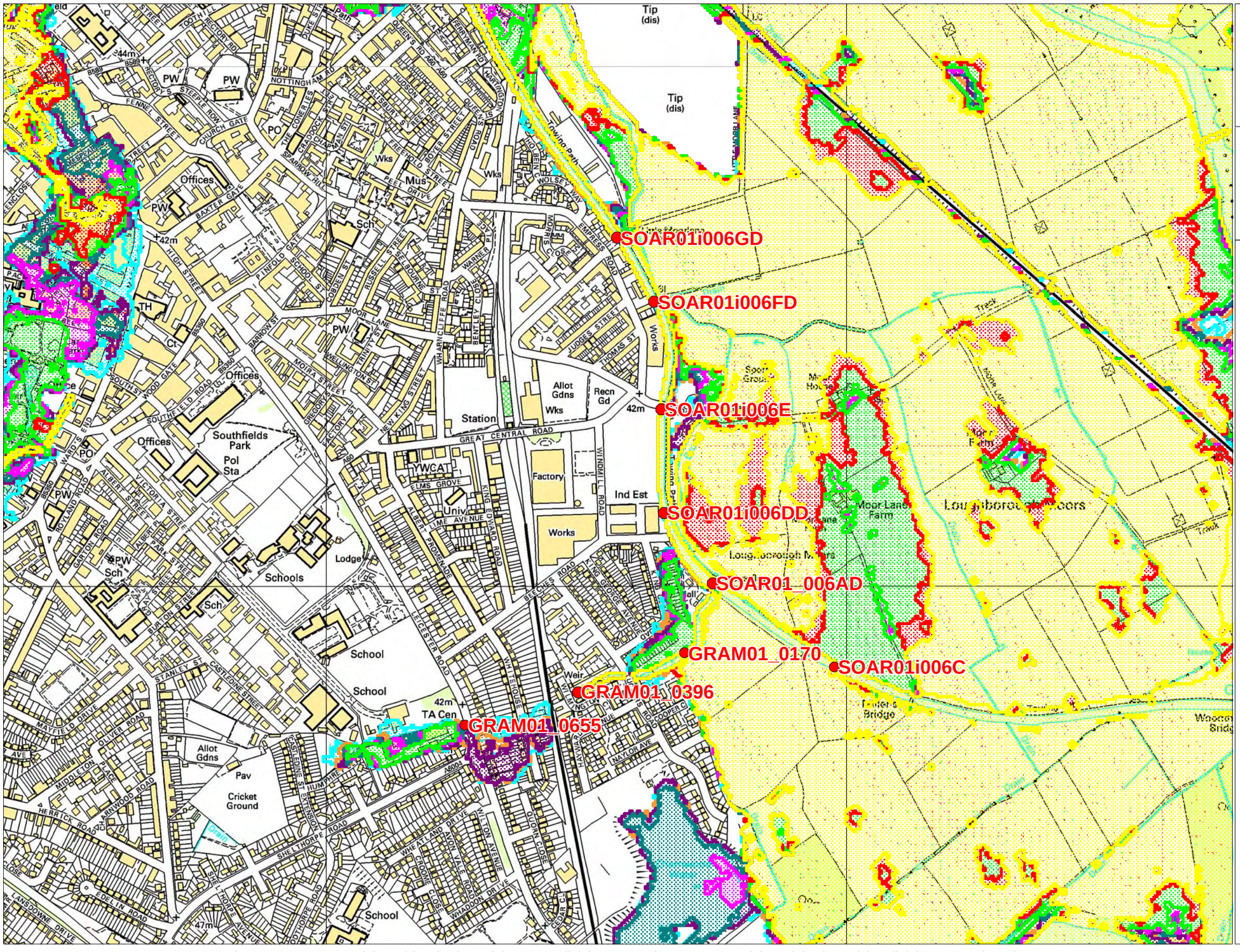
Node point reference	Location	0.5% (1 in 200 year) modelled level (mAOD)	0.5% (1 in 200 year) modelled flow (m^3/s)	0.1% (1 in 1000 year) modelled level (mAOD)
SOAR01i006C	SK 54976 18844	39.69	3.39	39.91
SOAR01_006AD	SK 54743 19005	39.69	4.12	39.91
SOAR01i006DD	SK 54649 19140	39.69	4.11	39.90
SOAR01i006E	SK 54644 19340	39.68	4.10	39.89
SOAR01i006FD	SK 54629 19547	39.61	5.60	39.83
SOAR01i006GD	SK 54559 19670	39.54	5.60	39.78

Source: Lower Soar and Tributaries SFRM Study, JBA, January 2012

Node point reference	Location	0.1% (1 in 1000 year) modelled flow (m^3/s)	1% + 20% flow (1 in 100 year plus climate change) modelled level (mAOD)	1% + 20% flow (1 in 100 year plus climate change) modelled flow (m^3/s)
SOAR01i006C	SK 54976 18844	3.77	39.80	3.42
SOAR01_006AD	SK 54743 19005	4.49	39.80	4.21
SOAR01i006DD	SK 54649 19140	4.47	39.79	4.20
SOAR01i006E	SK 54644 19340	4.47	39.78	4.19
SOAR01i006FD	SK 54629 19547	6.15	39.72	5.79
SOAR01i006GD	SK 54559 19670	6.14	39.66	5.80

Source: Lower Soar and Tributaries SFRM Study, JBA, January 2012

Modelled Extents Map centred on Windmill Road, Loughborough - created 19 September 2012
Ref: [ER3169]



Environment Agency

Scale 1:7,500

N
W E
S

Legend

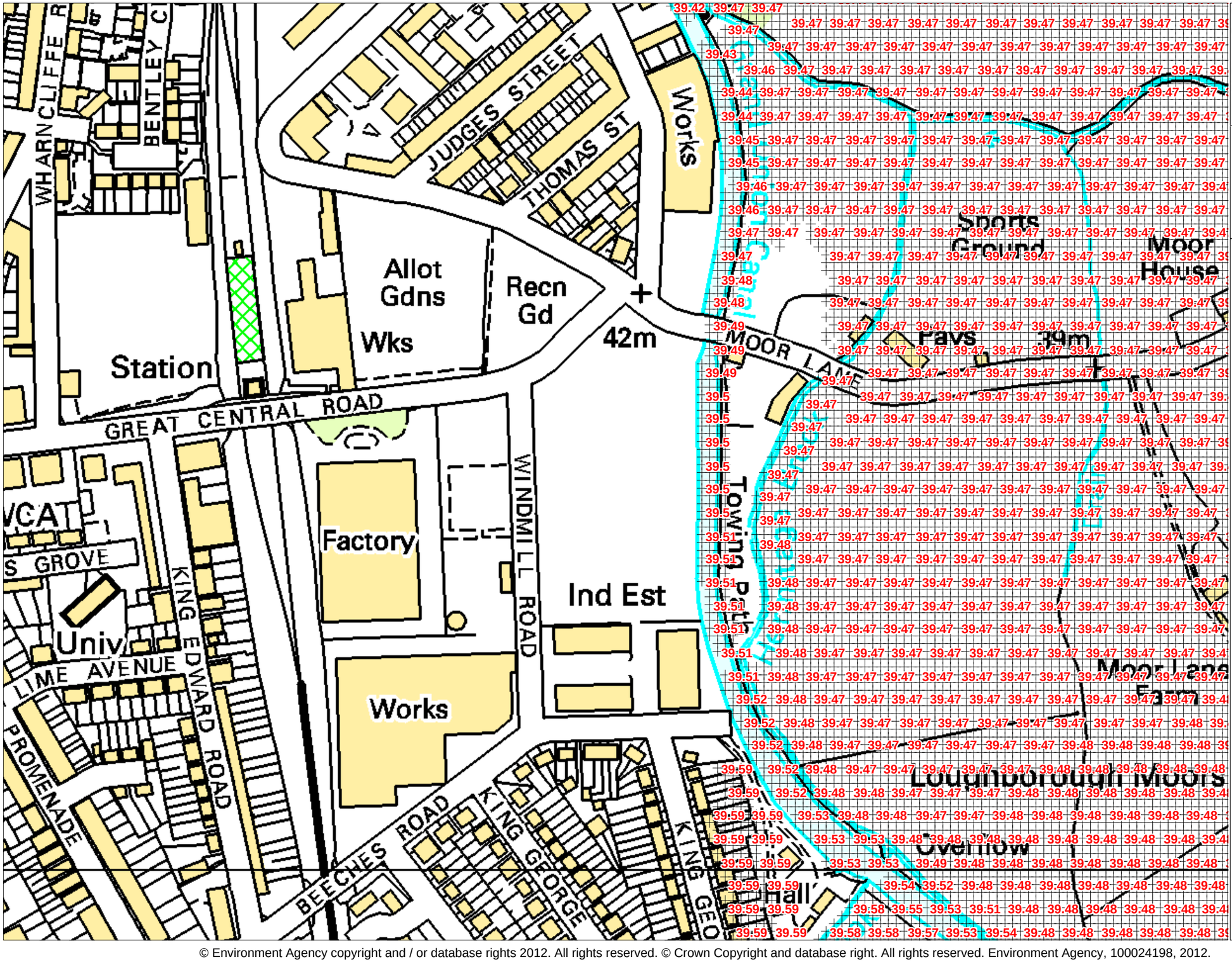
- Modelled Node Location and Reference
- 1 in 10 year Modelled Extent
- 1 in 20 year Modelled Extent
- 1 in 50 year Modelled Extent
- 1 in 75 year Modelled Extent
- 1 in 100 year Modelled Extent
- 1 in 100 year Modelled Extent (including climate change forecast)
- 1 in 200 year Modelled Extent
- 1 in 1000 year Modelled Extent

Source: Lower Soar and Tributaries SFRM, JBA, January 2012

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 1BY. Tel: 03708 506 506 (Mon-Fri 8-6). Email: enquiries@environment-agency.gov.uk

Floodplain Heights Map centred on Windmill Road, Loughborough - created 19 September 2012 Ref: [ER3169]



Environment Agency

Scale 1:2,500

N
W E
S

Legend

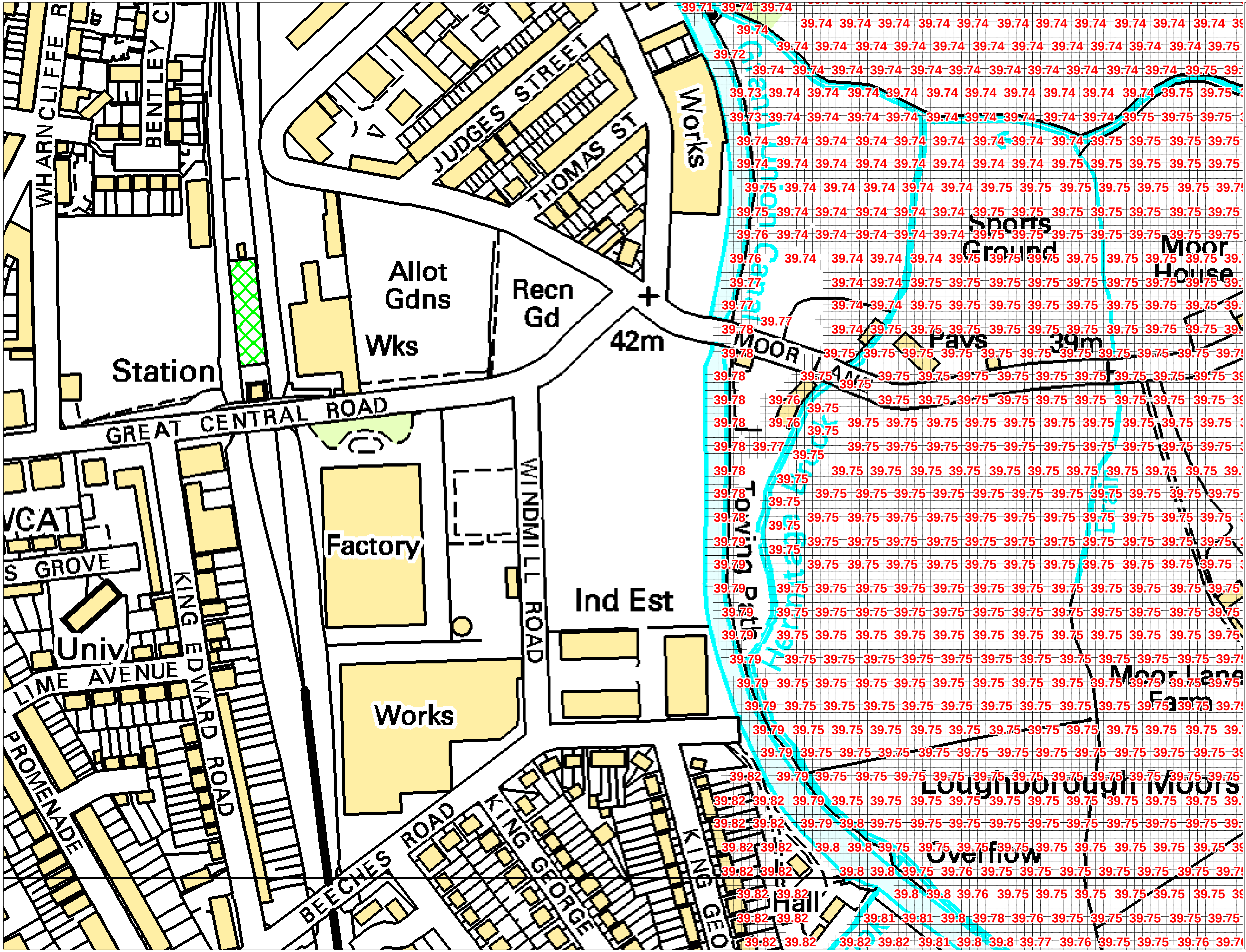
x.xx — 1 in 100 year Floodplain Level (mAOD)

Source: Lower Soar and Tributaries SFRM, JBA, January 2012

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 1BY. Tel: 03708 506 506 (Mon-Fri 8-6). Email: enquiries@environment-agency.gov.uk

Floodplain Heights Map centred on Windmill Road, Loughborough - created 19 September 2012 Ref: [ER3169]



Environment Agency

Scale 1:2,500

N W E S

Legend

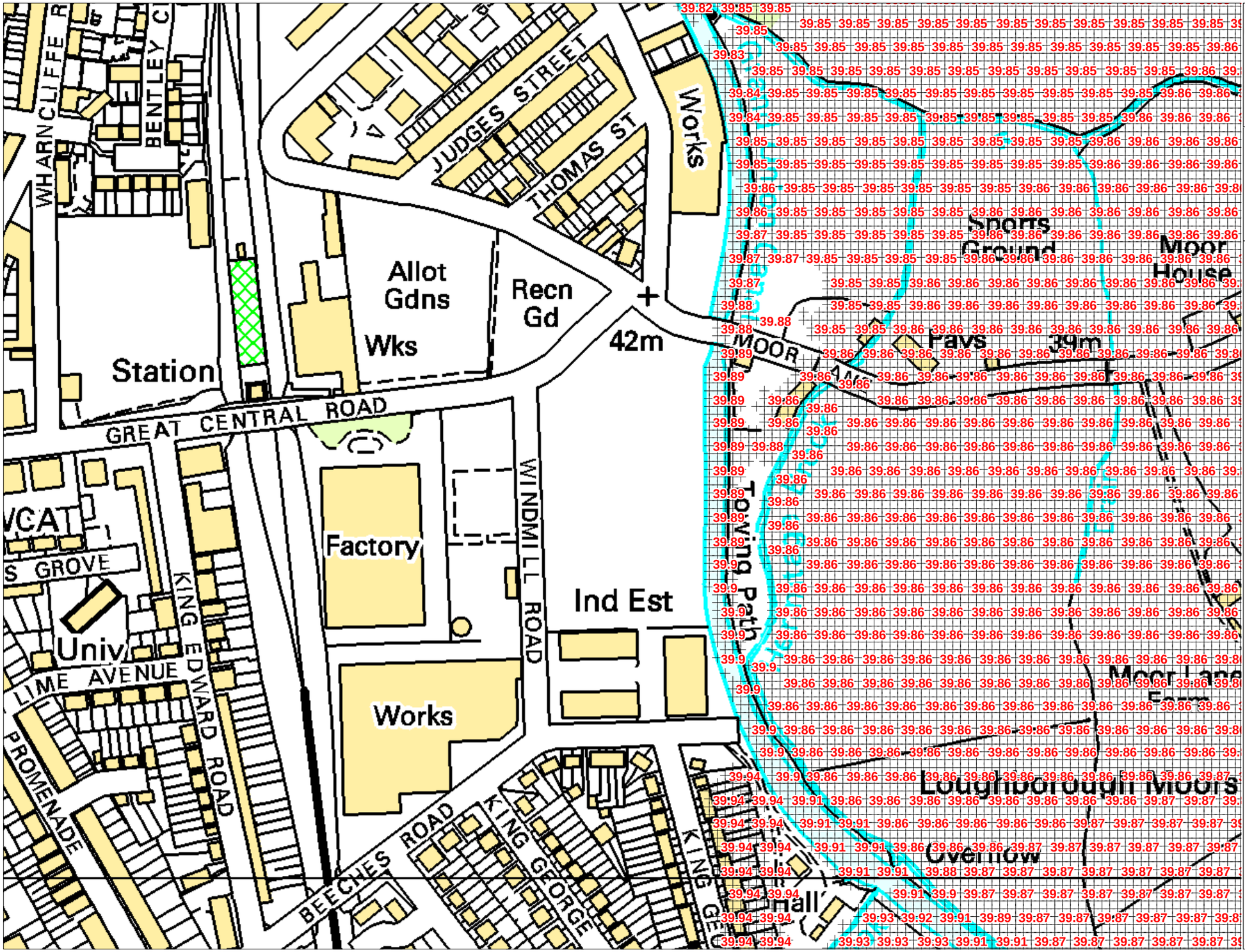
x.xx 1 in 100 year (including climate change forecast) Floodplain Level (mAOD)

Source: Lower Soar and Tributaries SFRM, JBA, January 2012

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 1BY. Tel: 03708 506 506 (Mon-Fri 8-6). Email: enquiries@environment-agency.gov.uk

Floodplain Heights Map centred on Windmill Road, Loughborough - created 19 September 2012 Ref: [ER3169]



Environment Agency

Scale 1:2,500

N
W E
S

Legend

x.xx — 1 in 1000 year Floodplain Level (mAOD)

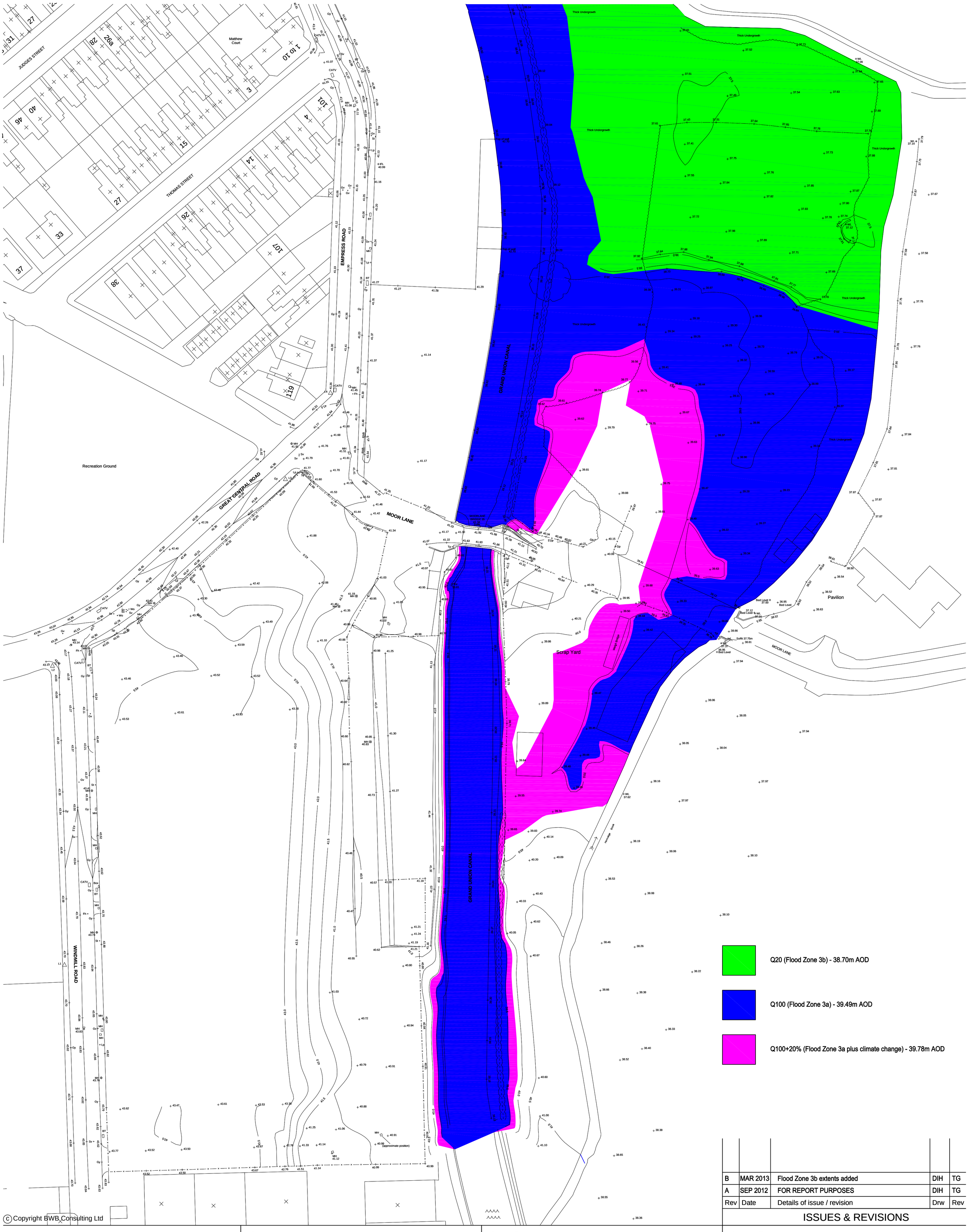
Source: Lower Soar and Tributaries SFRM, JBA, January 2012

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 1BY. Tel: 03708 506 506 (Mon-Fri 8-6). Email: enquiries@environment-agency.gov.uk

APPENDIX D

Modelled Flood Extents



Rev	Date	Details of issue / revision	Drw	Rev
B	MAR 2013	Flood Zone 3b extents added	DIH	TG
A	SEP 2012	FOR REPORT PURPOSES	DIH	TG

ISSUES & REVISIONS

BWB
CONSULTANCY | ENVIRONMENT
INFRASTRUCTURE | BUILDINGS

- Birmingham | 0121 233 3322
- Leeds | 0113 233 8000
- London | 020 7234 9122
- Manchester | 0161 233 4260
- Nottingham | 0115 924 1100

www.bwbconsulting.com

Client
SOWDEN GROUP

Project Title
WINDMILL PLACE, LOUGHBOROUGH

Drawing Title
EXISTING FLOODPLAIN

Scale	1:500	Drawn	D. Harvey
Size	A1	Reviewed	T. Goodchild

Drawing Status
FOR REPORT PURPOSES

Drawing No.
NTT2147/APPENDIX D

Revision
B

APPENDIX E

Canal and River Trust Correspondence

Darren Harvey

From:	David Fern <David.Fern@canalrivertrust.org.uk>
Sent:	12 September 2012 14:08
To:	Darren Harvey
Cc:	Enquiries centralshires; enquiries southeast
Subject:	RFI - Windmill Lane - NTT2147

Darren

Thanks for your enquiry and I apologise for the late response. In this area the navigation is protected by using a flood lock 2.4km upstream (south) of your site. In flood events or throughout the winter boating season the lock gates are closed whereas during the quieter summer months all gates are opened. Therefore the pound length can be either 5.2km long in the winter months or 6.5km long in the summer months.

The crest height from normal water level to towpath level is generally 300mm on a canalised navigation which exists outside of your development. Upstream of the flood lock can vary depending on the river flow but this doesn't affect your site. From memory I believe your site is higher than the water level and therefore does not get affected by embankments supporting the canal.

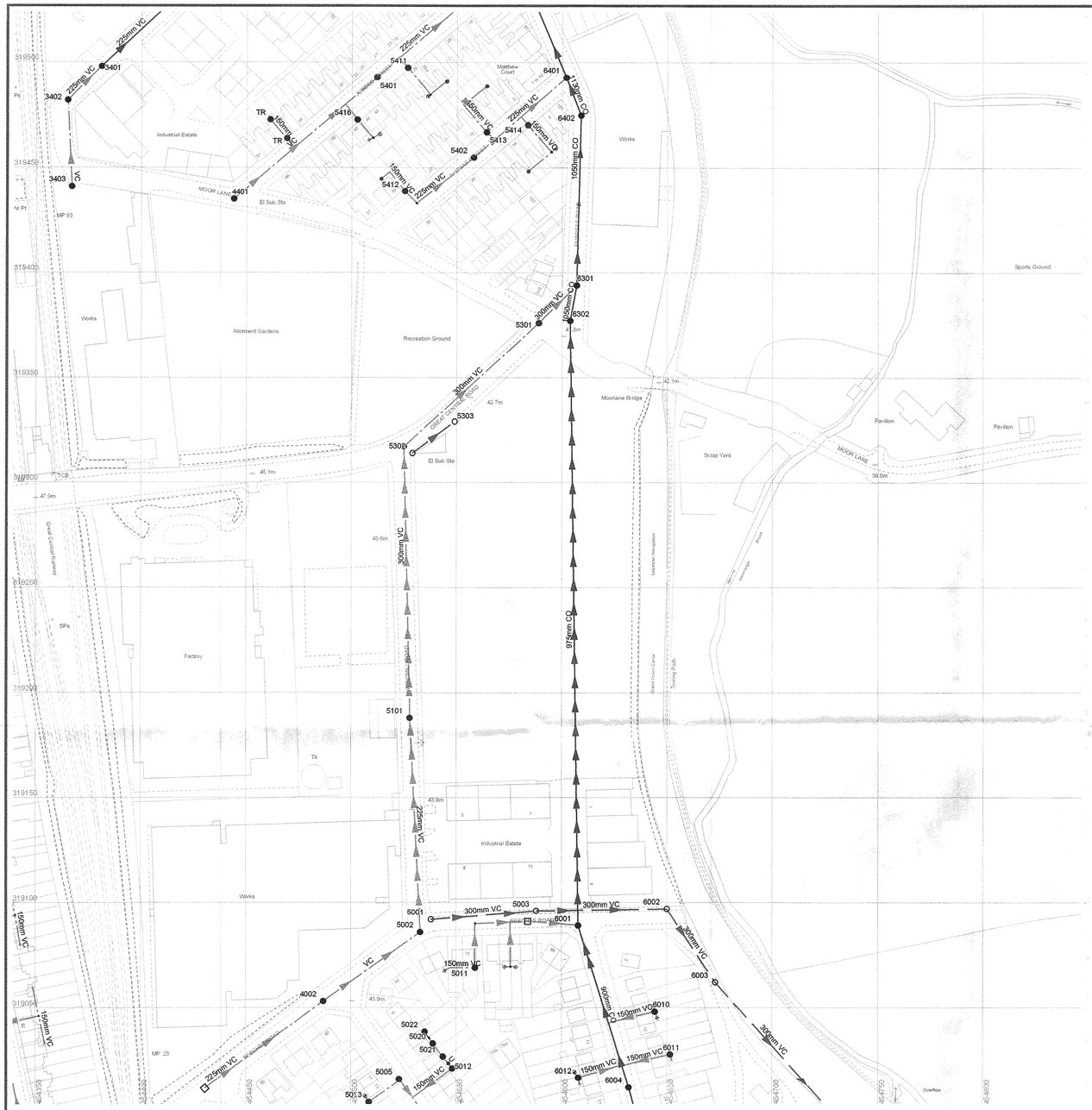
From our records flooding is not an issue at this location although it is in an area that is affected by river flows from the River Soar. The flood lock is manually operated and whilst there have not been any past events in living memory we cannot state that this could not happen. In extreme events the Environment Agency have a radial gate just above (to the south) of our flood lock which will ease most of the problems.
Regards

David Fern
Principal Waterway Engineer, Central Shires Waterway

Canal & River Trust, Central Shires Waterway, Peels Wharf, Lichfield Street, Fazeley, Tamworth, Staffordshire, B78 3QZ
T: 01827 252 000 | M: 07717 691 388 | F: 01827 252 062 | E: david.fern@canalrivertrust.org.uk
Please visit our website to find out more about the Canal & River Trust and download our 'Shaping our Future document' on the **About Us** page.

APPENDIX F

Severn Trent Water Asset Plans



Sewer Node / Sewer Pipe Data

REFERENCE	COVER LEVEL	INV LEVEL UPSTR	INV LEVEL DOWNSTR	PURP	MATL	SHAPE	MAX SIZE	MIN SIZE	GRADIENT	YEAR LAID
SK54193401	42.92	38.87	38.42	C	VC	C	225	nil	240.56	nill
SK54193402	43.04	38.98	38.98	F	VC	C	225	nil	1131.50	nill
SK54193403	43.31	nil	39.00	F	VC	C	nil	nil	0.00	nill
SK54194002	43.47	nil	41.89	F	VC	C	nil	nil	0.00	nill
SK54194401	43.24	nil	40.84	F	VC	C	nil	nil	0.00	nill
SK54195001	43.99	41.44	40.35	S	VC	C	300	nil	46.02	nill
SK54195002	44.10	41.88	41.49	F	VC	C	225	nil	261.85	nill
SK54195003	41.58	39.81	39.35	S	VC	C	300	nil	134.80	nill
SK54195005	42.68	41.31	39.96	F	VC	C	225	nil	67.93	nill
SK54195011	nil	nil	nil	F	nil	nil	nil	nil	0.00	nill
SK54195012	nil	nil	nil	F	VC	C	150	nil	0.00	nill
SK54195013	nil	nil	nil	F	VC	C	150	nil	0.00	nill
SK54195020	nil	nil	nil	F	nil	U	nil	nil	0.00	nill
SK54195021	nil	nil	nil	F	U	U	nil	nil	0.00	nill
SK54195022	nil	nil	nil	F	nil	nil	nil	nil	0.00	nill
SK54195101	43.98	41.49	41.05	F	VC	C	300	nil	293.25	nill
SK54195301	42.05	39.82	37.40	F	VC	C	300	nil	10.52	nill
SK54195302	43.20	42.28	42.23	S	VC	C	225	nil	525.00	nill
SK54195304	43.29	41.04	39.84	F	VC	C	300	nil	72.54	nill
SK54195401	42.87	40.82	37.58	F	VC	C	225	nil	27.89	nill
SK54195402	42.33	40.68	nil	F	VC	C	225	nil	0.00	nill
SK54195411	nil	nil	nil	F	VC	C	150	nil	0.00	nill
SK54195412	nil	nil	nil	F	nil	nil	nil	nil	0.00	nill
SK54195413	nil	nil	nil	F	VC	C	150	nil	0.00	nill
SK54195414	nil	nil	nil	F	VC	C	150	nil	0.00	nill
SK54195416	nil	nil	nil	F	VC	C	150	nil	0.00	nill
SK54196001	40.76	37.56	37.33	C	CO	C	975	nil	1252.30	nill
SK54196002	40.80	39.35	nil	S	VC	C	300	nil	0.00	1914
SK54196003	nil	nil	38.13	S	VC	C	300	nil	0.00	1914
SK54196004	40.22	37.72	37.60	C	CO	C	900	nil	672.08	nill
SK54196010	nil	nil	nil	F	VC	C	150	nil	0.00	nill
SK54196011	nil	nil	nil	F	VC	C	150	nil	0.00	nill
SK54196012	nil	nil	nil	F	VC	C	150	nil	0.00	nill
SK54196301	41.59	37.28	37.23	C	CO	C	1050	nil	2700.67	nill
SK54196302	41.66	37.28	37.26	C	CO	C	1050	nil	883.00	nill
SK54196401	nil	nil	37.11	C	nil	nil	nil	nil	0.00	nill
SK54196402	41.23	37.18	nil	C	CO	C	1130	nil	0.00	nill
nil	nil	nil	nil	F	nil	nil	nil	nil	0.00	nill
nil	nil	nil	nil	F	nil	nil	nil	nil	0.00	nill

- Abandoned Sewer
- Private Combined Gravity Sewer
- Private Foul Gravity Sewer
- Private Surface Water Gravity Sewer
- Public Combined Gravity Sewer
- Public Foul Gravity Sewer
- Public Surface Water Gravity Sewer
- Trunk Combined Gravity Sewer
- Trunk Foul Use Gravity Sewer
- Trunk Surface Water Gravity Sewer
- Combined Use Pressurised Sewer
- Foul Use Pressurised Sewer
- Surface Water Pressurised Sewer
- Highway Drain
- Combined Lateral Drain (SS)
- Foul Lateral Drain (SS)
- Surface Water Lateral Drain (SS)

- Cable, Earthing
- Cable Junction
- Cable, Optical Fibre/Instrumentation
- Cable, Low Voltage
- Cable, High Voltage
- Cable, Other
- Housing, Building
- Housing, Kiosk
- Disposal Site
- Sewage Treatment Works
- Housing, Other
- Pipe Support Structure
- Sewage Pumping Facility
- Sewer Facility Connection Inlet / Outlet

- Blind Shaft
- Combined Use Manhole
- Flushing Chamber
- Foul Use Manhole
- Grease Trap
- Head Node
- Hydrobrake
- Lamphole
- Outfall
- Overflow
- Penstock
- Petrol Interceptor

- Sewer Chemical Injection Point
- Sewer Junction
- Sewerage Air Valve
- Sewerage Hatch Box Point
- Sewerage Isolation Valve
- Soakaway
- Surface Water Manhole
- Vent Column
- Waste Water Storage
- Culverted Watercourse
- Pre-1937 Properties

MATERIALS

AC	- ASBESTOS CEMENT
BR	- BRICK
CC	- CONCRETE BOX CULVERT
CI	- CAST IRON
CO	- CONCRETE
CSB	- CONCRETE SEGMENTS (BOLTED)
CSU	- CONCRETE SEGMENTS (UNBOLTED)
DI	- DUCTILE IRON
GRC	- GLASS REINFORCED CONCRETE
MAC	- MASONRY IN REGULAR COURSES
MAR	- MASONRY RANDOMLY COURSED
PE	- POLYETHLENE
PF	- PITCH
PP	- POLYPROPYLENE
PSC	- PLASTIC STEEL COMPOSITE
PVC	- POLYVINYL CHLORIDE
RPM	- REINFORCED PLASTIC MATRIX
SI	- SPUN (GREY) IRON
XXX	- OTHER

All Private Sewers are shown in magenta
All section 104 sewers are shown in green
All Sewers that have been transferred to Severn Trent Water after the 1st October 2011, but have not been surveyed and confirmed by Severn Trent Water are shown in orange

CATEGORIES

W	- WEIR
C	- CASCADE
DB	- DAMBOARD
SE	- SIDE ENTRY
FV	- FLAP VALVE
BD	- BACK DROP
S	- SIPHON
HD	- HIGHWAY DRAIN
S104	- SECTION 104

SHAPE

C	- CIRCULAR
E	- EGG SHAPED
O	- OTHER
R	- RECTANGLE
S	- SQUARE
T	- TRAPEZOIDAL
U	- UNKNOWN

PURPOSE

C	- COMBINED
E	- FINAL EFFLUENT
F	- FOUL
L	- SLUDGE
S	- SURFACE WATER

TABULAR KEY

A. Sewer pipe data refers to downstream sewer pipe.

B. Where the node bifurcates (splits) X and Y indicates downstream sewer pipe.

C. Gradient is stated a 1 in...

N W E S

SEVERN TRENT WATER

Severn Trent Water Limited
Asset Data Management
PO Box 5344
Coventry
CV3 9FT
Telephone: 0845 601 6616

SEWER RECORD (TABULAR)

O/S Map scale: 1:1250
Date of issue: 17.08.12
Sheet No. 1 of 1

This map is centred upon:
O / S Grid reference:
x : 454593
y : 319264

APPENDIX G

Leicestershire County Council Correspondence

Darren Harvey

From: Debbi Payne <Debbi.Payne@leics.gov.uk>
Sent: 17 August 2012 15:48
To: Jack Pickering
Subject: Flooding Enquiry - Windmill Road, Loughborough.

Categories: Red Category

Dear Jack

I refer to your recent enquiry regarding the above. I have checked our records back to 2004 and find no incidences of flooding to the highway on Windmill Road or the adjacent roads. We have had reports of blocked gullies that have been cleansed as part of our routine maintenance programmes.

Kind Regards

Debbi Payne
Charnwood Senior Engineer
Highways Management
Leicestershire County Council
Tel : 0116 305 0001
e-mail debbi.payne@leics.gov.uk

APPENDIX H

Existing Surface Water Run-off

Consultancy | Environment | Infrastructure | Buildings

BWB

Job No.	Calc. No./Sketch No.	Rev.
NTT2147	1 of 1	A

Project	Date Prepared	Prepared by
Windmill Place, Loughborough	17/09/2012	DIH

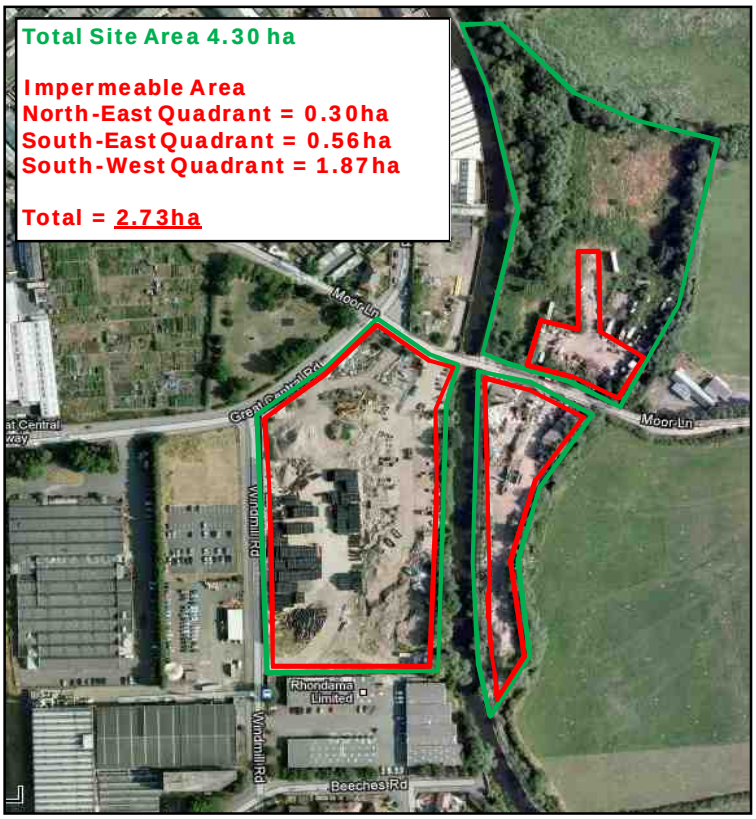
Title	Authorised by
Existing Surface Water Run-off	TG

Modified Rational method used to estimate theoretical run-off from impermeable areas on site.

Qp = 2.78 x Ap x i

where

Qp = peak discharge (l/s)
Ap = impermeable area (ha)
i = rainfall intensity (mm/hr)



Existing impermeable area coverage estimated from aerial mapping and topographical survey
Average rainfall intensity assummed to be 50 mm/hr.

Qp = 2.78 x Ap x i

Development Plot	Qp		
North-East Quadrant	2.78 x 0.30 x 50	=	41.7 l/s
South-East Quadrant	2.78 x 0.56 x 50	=	77.8 l/s
South-West Quadrant	2.78 x 1.87 x 50	=	259.9 l/s
Total			379.4 l/s

APPENDIX I

Potential Attenuation Storage Volumes

Consultancy | Environment | Infrastructure | Buildings

BWB

Job No.	Calc. No./Sketch No.	Rev.
NTT2147	1 of 2	A

Project	Date Prepared	Prepared by
Windmill Place, Loughborough	28/09/2012	DIH

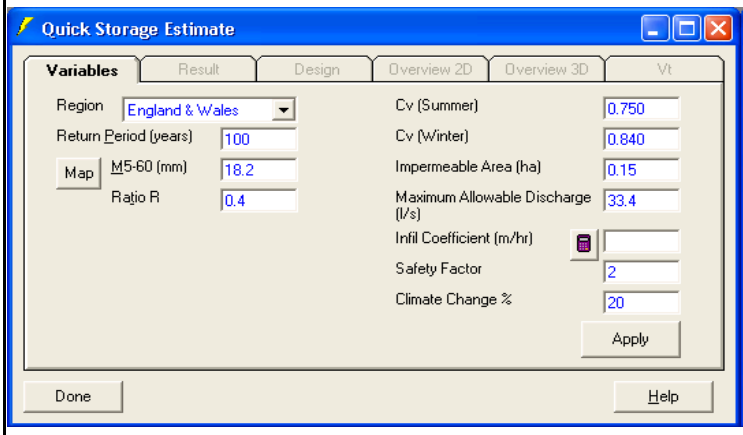
Title	Authorised by
Potential Attenuation Storage Volumes	TG

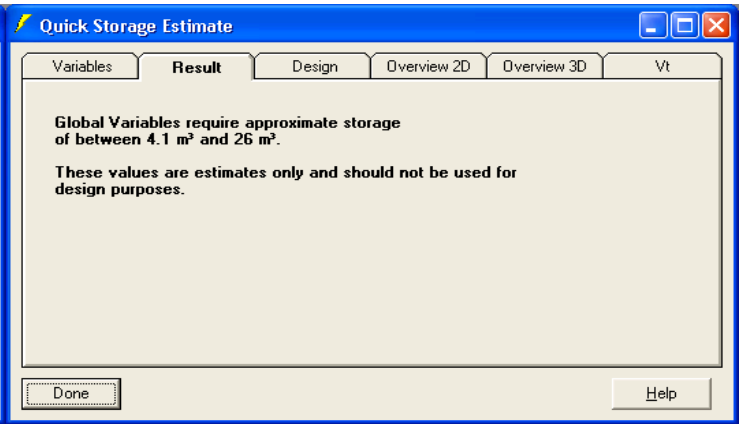
Total existing surface water run-off estimated as 379.4 l/s. A 20% reduction in flow has been recommended to provide betterment compared to the existing situation.

Applying 20% reduction results in total allowable discharge rate of 303.5 l/s apportioned over three development quadrants. Allowable run-off rates above used to estimate potential attenuation storage volumes on site.

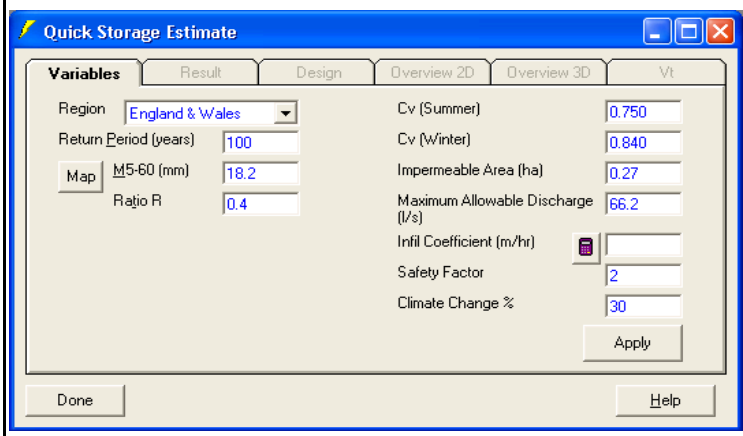
Proposed impermeable area on site estimated from Proposed Site Layout by Franklin Ellis Architects. Potential attenuation storage volumes estimated using WinDes Source Control Module for 100-year return period, including 20% allowance for climate change for community centre in north-east quadrant and 30% allowance for residential plots on south-east and south-west quadrants.

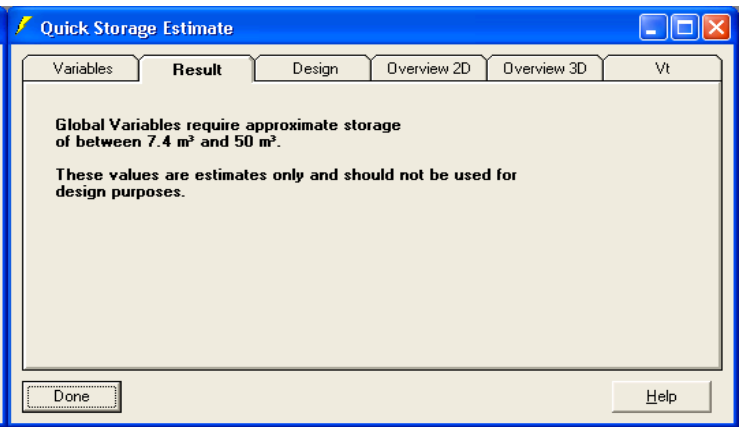
North-East Quadrant





South-East Quadrant





Continued on Sheet 2

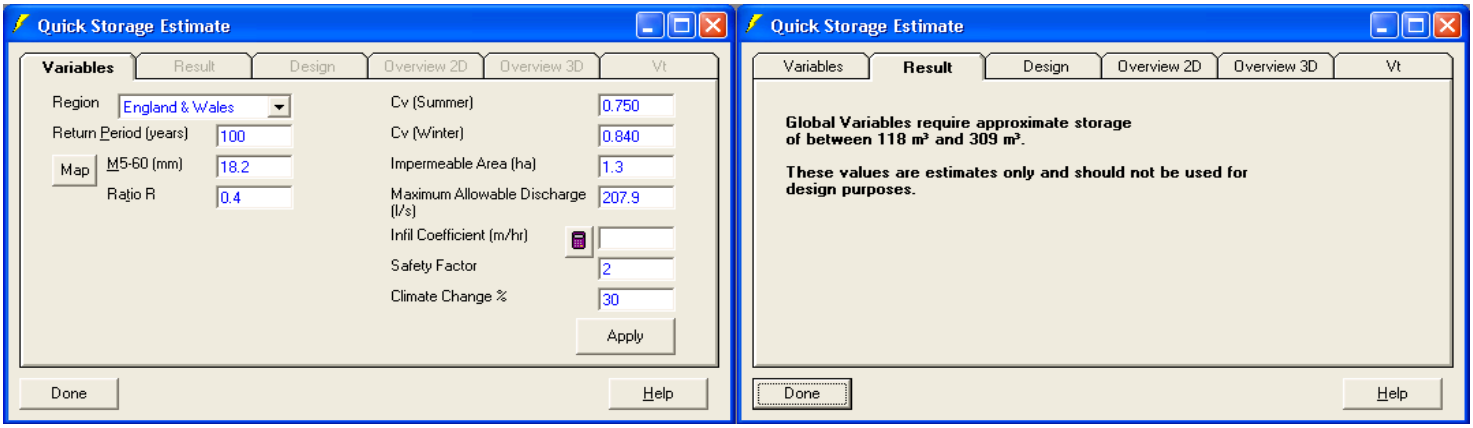
Job No.	Calc. No./Sketch No.	Rev.
NTT2147	2 of 2	A

Project	Date Prepared	Prepared by
Windmill Place, Loughborough	28/09/2012	DIH

Title	Authorised by
Potential Attenuation Storage Volumes	TG

Continuation from Sheet 1

South-West Quadrant



Summary

100-year return period plus climate change allowance

Development Plot	Run-Off Rate	Contributing Area	Storage Volume
North-East Quadrant	33.4 l/s	0.15 ha	4.1 - 26 m^3
South-East Quadrant	66.2 l/s	0.27 ha	7.4 - 50 m^3
South-West Quadrant	207.9 l/s	1.30 ha	118 - 309 m^3
Total	303.5 l/s	1.72 ha	129.5 -385 m^3

APPENDIX J

Indicative Surface Water Drainage

TOTAL HOUSING SITE AREA: 2.50 ha.

TOTAL HOUSES: 100

OVER ALL DENSITY: 25units per ha.

SW Quadrant Phase 1

Area: **0.73 ha.**

House Numbers: **38**

Mix : 3 Bed (18) 47%
2 Bed (20) 53%

Density : **52** units per ha.

SW Quadrant Phase 2

Area: **1.20 ha.**

House Numbers: **49**

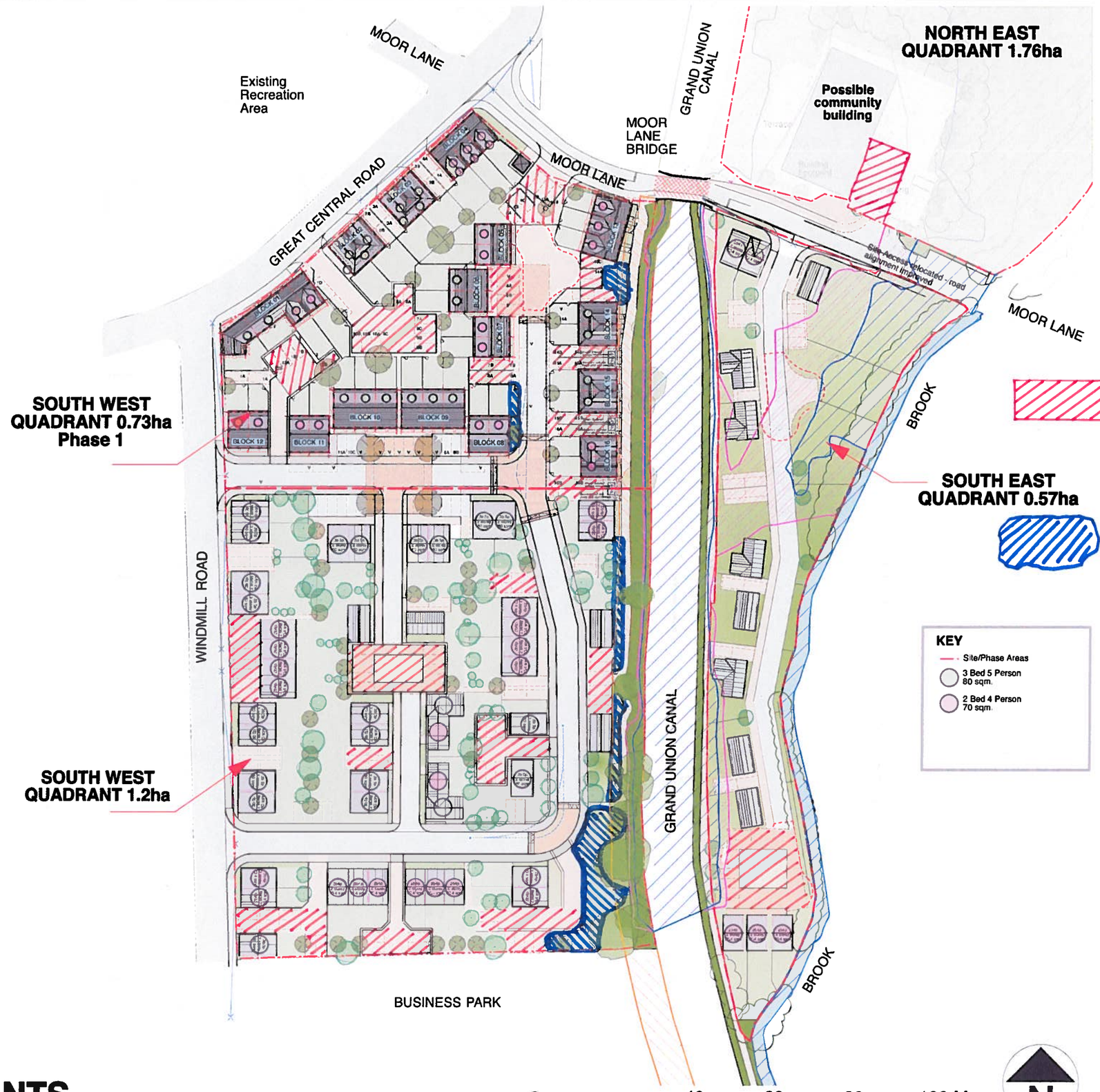
Density : **43** units per ha.

SE Quadrant

Area: **0.57** ha.

House Numbers: **13**

Density : **23** units per ha.



KEY

- Site/Phase Areas
- 3 Bed 5 Person 80 sqm.
- 2 Bed 4 Person 70 sqm.

POSSIBLE LOCATION FOR PERMEABLE PAVING SUBJECT TO DETAILED CALCULATIONS OF STORAGE VOLUMES.

ABOVE GROUND SUDS FEATURES

General Notes

1. Do not scale off this drawing unless a scale bar is provided
2. Any ambiguities, omissions and errors on this drawing should be notified immediately to the Architect before the commencement of works on site
3. All dimensions are in millimetres unless otherwise stated
4. All dimensions, unless otherwise indicated, are to the face of unfinished block walls or to the finished plaster face of stud partitions
5. All dimensions are to be checked on site. Any discrepancies are to be notified immediately to the Architect before the commencement of works on site
6. All levels are in meters unless otherwise stated
7. This drawing is to be read in conjunction with all other relevant drawings and specifications for this project

CDM Regulations

Denotes a significant Hazard or difficult to manage procedure. Please refer to Designer Hazard Register for further information regarding mitigation of hazards

Issue Notes

Rev	Issue Date	Issue / Revision Notes	Issued by	Checked by
A	2012.10.01	First Issue PLANNING ISSUE	JA	BD

FRANKLIN ELLIS ARCHITECTS
Architecture / Landscape / Interiors / Graphics / Project Management
The Old Pumphouse
5 The Ropewalk, Nottingham, NG1 5DU
T 0115 941 8475
E enquiry@franklinellis.co.uk
W www.franklinellis.co.uk

Job title
Residential Development
Windmill Road
Loughborough

Drawing title
PROPOSED SITE LAYOUT
SOUTH-EAST & SOUTH-WEST
QUADRANTS

Associate/Partner: Matthew Brenton
Job Runner: Ben Dudley

Drawing Scale: 1:500 Sheet Size: A1

Issue Status: PLANNING

JOB NO	DRAWING NO	REV NO
2120	PL07	A

SITE PLAN
S-E & S-W QUADRANTS

Scale 1:500

BWB

CONSULTANCY | ENVIRONMENT
INFRASTRUCTURE | BUILDINGS

BIRMINGHAM | LEEDS | LONDON | MANCHESTER | NOTTINGHAM

www.bwbconsulting.com