



Proposed Residential Development
Land off Cork Lane
Glen Parva
Leicestershire

Flood Risk Assessment

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Proposed Residential Development
Land off Cork Lane
Glen Parva
Leicestershire

Flood Risk Assessment

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Report Reference R-FRA-R6711PP-01

Date February 2014

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1.0 Executive summary

1.1 National Planning Policy Framework Summary

1.1.1 The following table is based on National Planning Policy Framework (NPPF) and serves as an executive summary. This executive summary shall not be read in isolation to the main report that follows

NPPF Summary Table		
Item	Summary statement	Report ref
1 Development description and location		
1a	What type of development is proposed and where will it be located? Include whether it is new development, an extension to existing development or change of use.	Residential development on green field site. Section 3.4
1b	What is its vulnerability classification?	Residential – More vulnerable Section 3.4.2
1c	Is the proposed development consistent with the local development documents?	Yes
1d	Please provide evidence that the sequential test and where necessary the exception test has been applied.	Site in flood zone 1 and classified as more vulnerable, thus sequential test and exception test need not be applied. Section 4.1.1 4.1.2 and 4.6
2 Definition of the flood hazard		
2a	What sources of flooding could affect the site?	None identified Sections 4.1 to 4.4
2b	For each identified source, describe how flooding would occur, with reference to any historic records wherever these are available.	Not applicable Sections 4.1 to 4.5
2c	What are the existing surface water drainage arrangements for the site?	No formal drainage on site Section 5.1
3 Probability		
3a	Which flood zone is the site within?	Flood zone 1 Section 4.1
3b	If there is a Strategic Flood Risk Assessment covering the site what does it show?	Flood zone 1
3c	What is the probability of the site flooding taking account of the contents of the SFRA and of any further site-specific assessment	Site in flood zone 1 and no other sources of flood sources considered present a risk have been identified
3d	What are the existing rates and volumes of runoff generated by the site?	Green field run off rates and volumes Section 5.1.1

Item	Summary statement	Report ref
4 Climate Change		
4a	How is flood risk at the site likely to be affected by climate change?	Development with life likely to be in excess of 60 years, thus storm water drainage designed for increase in storm intensities of 23%
5 Detailed development proposals		
5a	Please provide details of the development layout, referring to the relevant drawings.	Appendix B
5b	Where appropriate, demonstrate how land uses most sensitive to flood damage have been placed in areas within the site that are at least risk of flooding.	Not appropriate
6 Flood risk management measures		
6a	How will the site be protected from flooding, including the potential impacts of climate change, over the developments lifetime?	Site in flood zone 1, climate change not likely to affect zone classification during the lifetime of the development.
7 Off site impacts		
7a	How will you ensure that your proposed development and the measures to protect your site from flooding will not increase flood risk elsewhere?	On site flood protection provided to cater for 1 in 100 year storm events plus an allowance of 30% for climate change, levels designed to convey overland flows away from buildings.
7b	How will you prevent run-off from the completed development causing impact elsewhere?	Exceedance contained on site where possible overland flows directed towards the watercourse.
8 Residual risks		
8a	What flood related risks will remain after you have implemented the measures to protect the site from flooding?	Overland flows in storm design, and maintenance / management of the storm water drainage system
8b	How and by whom will these risks be managed over the lifetime of the development?	Development in part to be offered for adoption.. Maintenance regime to be established and implemented for the lifetime of the development.

Table 1.1

1.2 Site location plan

- 1.2.1 The proposed residential development is located to the south of Leicester and north of Blaby at land off Cork Lane, Leicester as shown on the location plan below in Figure 1 and enclosed in Appendix A. The proposed development is bound by residential developments to the north and south, Cork Lane to the east and agricultural land to the west.

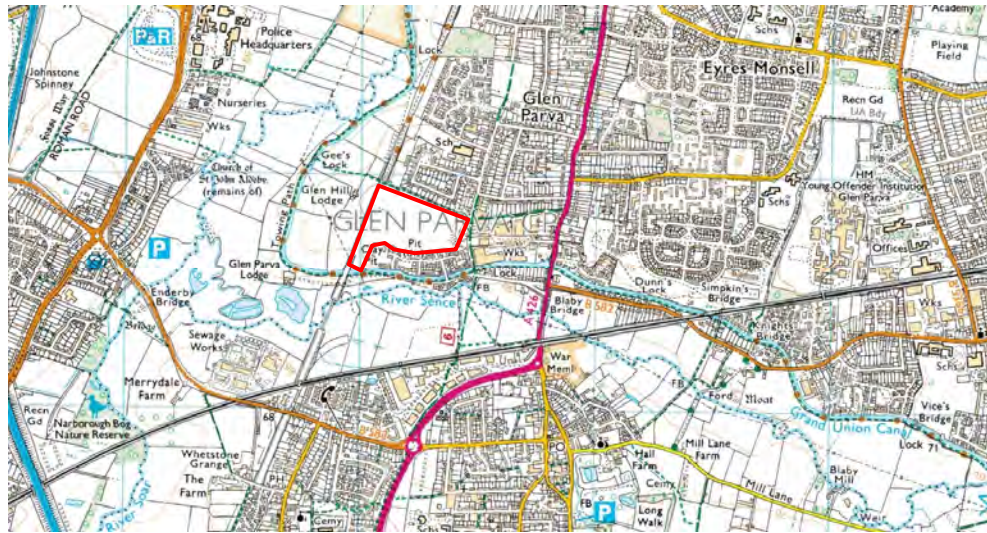


Figure 1.1 Site location plan.

2.0 Introduction

2.1 Instructions

2.1.1 This report is a Flood Risk Assessment for a proposed residential development located at land off Cork Lane, Glen Parva, Leicestershire. The proposed development has a total development area of 10.55ha (105,500m²) of which it is 3.361ha (33,612m²) will be positively drained impermeable areas. The National Grid reference for the site is E456278, N298804. This report has been prepared by JPP Consulting Limited acting on instructions received from Manor Oak Homes.

2.2 Objectives

2.2.1 The objective of this report is to advise interested parties in the development to the potential risk of flooding and management of surface water from a drainage perspective. The report both assesses flood risk and describes a strategy to drain the site in respect of surface water drainage.

2.2.2 This report has been prepared to support an application for an outline planning permission.

2.3 Reference documents

2.3.1 This report has been prepared with reference to the following publications:-

- Department for Communities and Local Government (March 2012), *National Planning Policy Framework*
- Department for Communities and Local Government (March 2012) *Technical Guidance to the National Planning Policy Framework*
- HM Government (2010), *The Building Regulations (2010), Drainage and Waste Disposal, Approved Document H, The NBS, Newcastle Upon Tyne*
- Wilson, Bray, Cooper (2004), *Sustainable drainage systems: Hydraulic, structural and water quality advise*, C609, CIRIA, London
- Woods-Ballard et al (2007), *The SUDS Manual*, C697, CIRIA, London
- CIRIA Report C624 *Development and flood risk*
- National SUDS Working Group (2004), *Interim Code of Practise for Sustainable Drainage Systems*,
- Institute of Hydrology (1999), *Flood Estimation Handbook*, Institute of Hydrology, Wallingford
- BS EN 752:2008 *Drain and sewer systems outside buildings. Hydraulic design and environmental considerations*
- BS 8533:2011 *Assessing and managing flood risk in development – Code of Practice*
- CIRIA Report C635 *Designing for exceedence in urban drainage – good practice*

2.4 Status of this Report

2.4.1 This report is considered final based on the information made available at the time.

2.5 Report distribution

2.5.1 This report has been prepared to assist in the design and planning process of the development and normally will require distribution to the following parties in table 2.1, although this list may not be exhaustive:

Report Distribution	
Party	Reason
Client	For information / reference
Developer/Contractor/Project Manager	To ensure strategic information on drainage design are implemented and programmed
Planning department	Potentially to discharge planning conditions
Independent inspectors such as Building Control and Assessors	For compliance with building regulations
Project design team	To progress the design by taking into consideration strategic information contained in this report

Table 2.5

3.0 Description and history of the site and development proposals

3.1 Location and description of the site

3.1.1 The proposed residential development is located to the south of Leicester and north of Blaby at land off Cork Lane, Leicester as shown on the location plan below in Figure 1 and enclosed in Appendix A. The proposed development is bound by residential developments to the north and south, Cork Lane to the east and agricultural land to the west.

3.1.2 The proposed development will comprise 165 residential dwellings with associated highway infrastructure and public open space. The proposed development layout is shown on the plan enclosed in Appendix B.

3.2 History of the Site

3.2.1 We are not aware of any previous development on the application site which is currently utilised as agricultural land.

3.3 Geology of the site and ground investigation data

3.3.1 The site has previously been used as a landfill and is therefore located on made ground. As such the use of infiltration techniques is not considered viable.

3.4 Development proposals and flood risk vulnerability

3.4.1 With reference to Table 2 of Technical Guidance to the National Planning Policy Framework, the proposed development for a residential development would be classified as More Vulnerable.

3.4.2 A copy of Table 2 from the NPPF is replicated below in table 3.2 with the proposed development type highlighted.

Flood Risk Vulnerability Classification	
Vulnerability	Development types
More vulnerable	Hospitals. Residential institutions such as residential care homes, children's homes, social services homes, prisons and hostels Buildings used for: dwelling houses , student halls of residence, drinking establishments, night clubs, and hotels Non-residential uses for health services, nurseries and educational establishments Landfill and sites used for waste management facilities for hazardous waste. Sites used for holiday or short-let caravans and camping, <i>subject to a specific warning and evacuation plan.</i>

Table 3.4 – Source National Planning Policy Framework - 2012

4.0 Flood risk

4.1 Fluvial / Tidal flooding

4.1.1 An extract of the Environment Agency flood risk map for Rivers and Sea is provided below in Figure 4.1. The flood map was extracted from the Environment Agency web site on the 2nd January 2013. The approximate application site boundary is shown in red. The map indicates that the development site is located within Flood Zone 1 (Low Probability) and as such, the report considers the development to be in Flood Zone 1 and at a low risk of flooding from rivers or the sea.

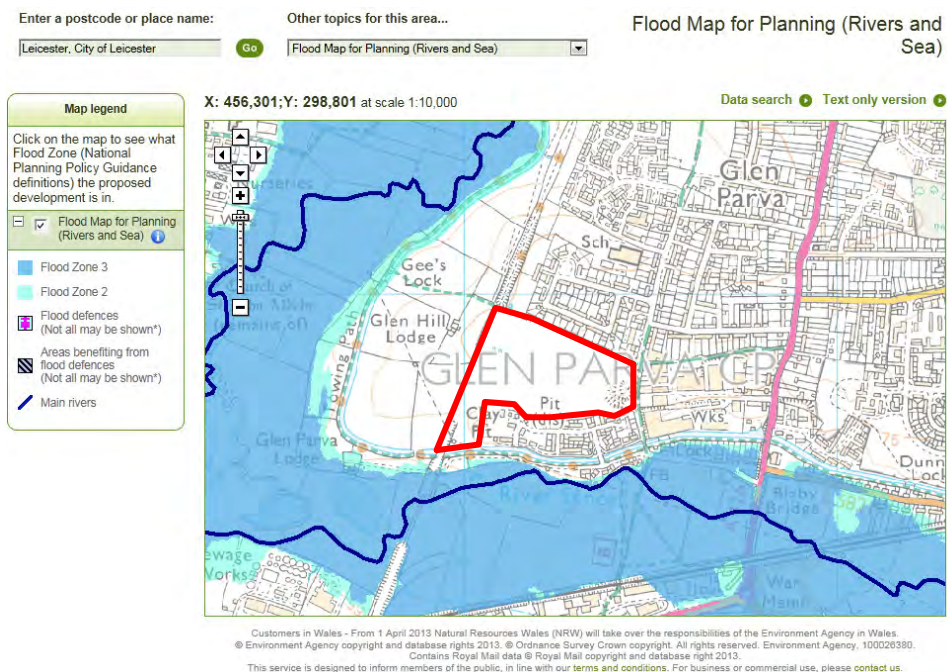


Figure 4.1 – Risk of Flooding from Sea and Rivers
Source: Environment Agency web site – 2nd January 2013

4.1.2 Table 4.1 is an extract from Technical Guidance to the National Planning Policy Framework that defines Flood Zones. The proposed development which is located within Flood Zone 1 is assessed as having a less than 1 in 1,000 annual probability of river or sea flooding in any year (<0.1%).

Flood Zone	
Flood Zones	Definition
Zone 1: Low Probability	This zone comprises land assessed as having a less than 1 in 1,000 annual probability of river or sea flooding in any year (<0.1%)
Zone 2: Medium Probability	This zone comprises land assessed as having between a 1 in 100 and 1 in 1000 annual probability of river flooding (1% - 0.1%) or between a 1 in 200 and 1 in 1000 annual probability of sea flooding (0.5% - 0.1%) in any year
Zone 3a High Probability	This zone comprises land assessed as having a 1 in 100 or greater annual probability of river flooding (>1%) or a 1 in 200 or greater annual probability of flooding from the sea (>0.5%) in any year
Zone 3b The Functional Flood plain	This zone comprises land where water has to flow or be stored in times of flood. SFRAs should identify this Flood Zone (land which would flood with an annual probability of 1 in 20 (5%) or greater in any year, or is designed to flood in an extreme (0.1%) flood, or at another probability to be agreed between the LPA and the Environment Agency, including water conveyance routes

Table 4.1

4.2 Flooding from groundwater

4.2.1 The site has been previously used as a quarry and landfill. We do not anticipate groundwater within close proximity of the surface. We would therefore consider the probability of flooding on the site from groundwater as low.

4.3 Flooding from sewers

4.3.1 There are no sewers located within the site application boundary. We do not have any records of sewer flooding within the vicinity of the proposed development.

4.3.2 We therefore do not consider the risk of flooding from sewers to be a significant risk to the proposed development.

4.4 Flooding from reservoirs, canals and other artificial sources

4.4.1 We are not aware of any canals or artificial water sources that may result in flooding of this site.

4.4.2 An extract of the Environment Agency map 'Risk of Flooding from Reservoirs' is provided below in Figure 4.3. It can be seen that the proposed development site, shown in red, is not at a risk of flooding from reservoirs.

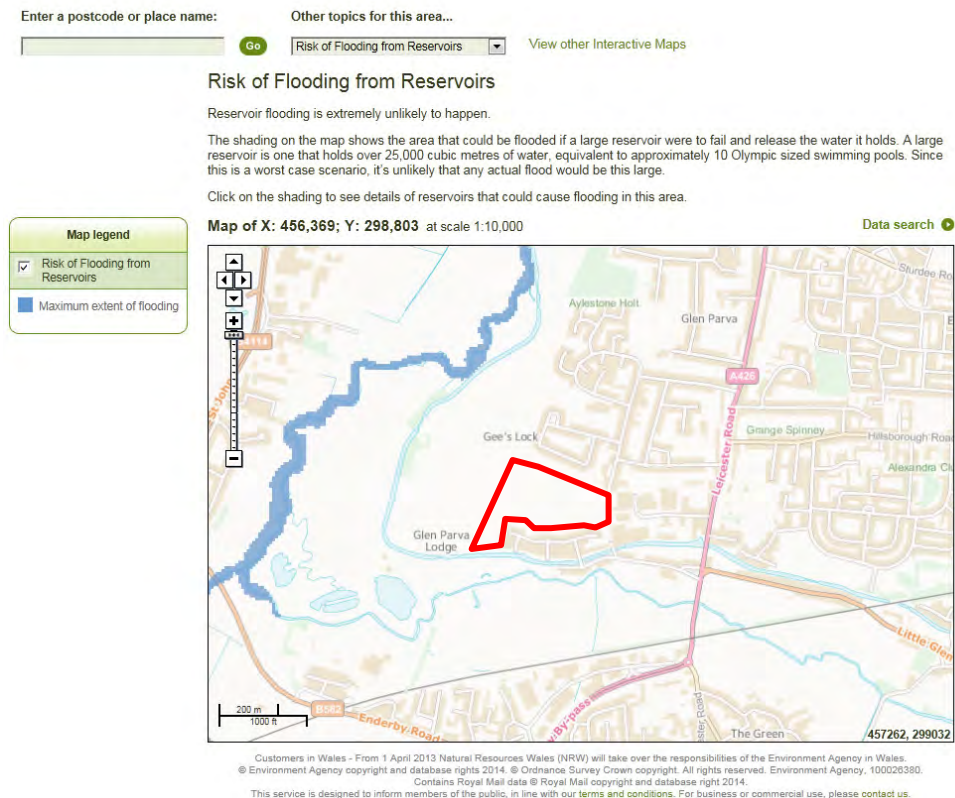


Figure 4.3 – Risk of Flooding from Reservoirs
Source: Environment Agency web site – 2nd January 2013

4.5 Historic flooding

4.5.1 We do not have any records showing historic flood events within the vicinity of the site.

4.6 Flood risk vulnerability and flood zone compatibility

4.6.1 Based on the above assessment of the site being located within Flood Zone 1 and classified as a More Vulnerable development and with reference to Table 4.2 (Technical Guidance to the National Planning Policy Framework, Table 3) the proposed development of this site would be considered "appropriate". A copy of Table D3 is presented below highlighting the above. No sequential or exception test will be required.

Table D3 - Flood Risk Vulnerability and Flood Zone Compatibility					
Flood risk Vulnerability classification	Essential Infrastructure	Water compatibility	Highly Vulnerable	More Vulnerable	Less Vulnerable
Zone 1	✓	✓	✓	✓	✓
Zone 2	✓	✓	Exception Test required	✓	✓
Zone 3a	Exception Test required	✓	X	Exception Test required	✓
Zone 3b	Exception Test required	✓	X	X	X

✓ = Development is appropriate X = Development should not be permitted

Table 4.6

4.7 Access and egress

4.7.1 Access and egress to and from this site in the event of flooding will be via the proposed development's access road which will allow residents of the development to move to higher ground.

5.0 Management of surface water

5.1 Current conditions

5.1.1 The site is currently open and is fully permeable and therefore considered a greenfield site with no existing drainage for the purpose of drainage calculations. Therefore greenfield run calculations shall be used to derive the allowable run off rate from the site.

5.2 Storm water drainage outfalls

5.2.1 It is a requirement of the The Building Regulations (2010), Drainage and Waste Disposal, Approved Document H, to dispose of surface water collected by a development in the following list of priorities:-

1. Infiltration systems where ground condition permit
2. To watercourses
3. To sewers

Each of these is considered separately below:

5.2.2 Infiltration systems

5.2.2.1 The site has previously been used as a landfill and is therefore located on made ground. As such the use of infiltration techniques is not considered viable.

5.2.3 Watercourses/ Main river

5.2.3.1 The site does not have any watercourse located within or adjacent to the development's site boundary. There are also no watercourses within close proximity which can be reached via the development. Hence, discharge to a watercourse is not considered viable.

5.2.4 Sewers

5.2.4.1 The proposed development will discharge to S104 sewers located within Navigation Drive. The proposed development has a right of discharge agreement with the neighbouring developer to allow the discharge of surface water. The S104 sewer ultimately connects to the River Sence.

5.3 Storm water drainage strategy

- 5.3.1 Surface water will be attenuated to greenfield runoff rates to ensure that the rate of surface water runoff from the site does not increase as a result of the proposed development.
- 5.3.2 An indicative surface water drainage strategy plan is enclosed in Appendix C. The drawing shows that surface water attenuation can be accommodated on the site. The detail design parameters of the drainage are described in detail in section 5.4.
- 5.3.3 The detail surface water design will accommodate the use SUDS techniques where possible. Techniques that could be implemented include tanked permeable paving to private areas. It should be noted that the use of swales has been advised against by the Geotechnical Engineer for the site due its backfilled nature.

5.4 Storm water drainage design and management

- 5.4.1 Proposals are to design the storm water drainage system to accommodate storms up to the 1 in 100 year event and allow for increase in storm intensities up to 30% (design life of the development assumed at greater than 60 years). Table 5.4 is a copy of from Technical Guidance to the National Planning Policy Framework, Table 5 and is presented below.

National precautionary sensitivity ranges for peak rainfall intensities, peak river flows, offshore wind speeds and wave heights				
Parameter	1990 to 2025	2025 to 2055	2055 to 2085	2085 to 2115
Peak rainfall Intensity	+5%	+10%	+20%	+30%
Peak river flow	+10%	+20%	+20%	+20%
Offshore wind speed	+5%	+5%	+10%	+10%
Extreme wave height	+5%	+5%	+10%	+10%

Table 5.4

- 5.4.3 In addition to the above and where required further surface water management shall be provided to ensure that protection against flooding is provided for a 1 in 100 year storm event plus an allowance of 30% for climate change, in the form of an off line detention basin or similar.

5.5 Existing run off rates

- 5.5.1 To reflect the changes in the near surface geology across the site the Greenfield runoff rates have been calculated. The method used to calculate the green field run off rates is the ICP SUDS and the calculations are presented in Appendix D. As this is an outline application and the final impermeable area is subject to detailed design the runoff rates are stated as a per hectare impermeable area.

- 5.5.2 The green field run off rate, for the application site is:
- | | |
|-------------------|---|
| Soil type | = 0.431 – determined from underlying strata |
| SAAR | = 641 mm – obtained from the FEH parameters |
| Urban | = 0.000 |
| Region number | = 4 |
| Proposed Imp Area | = 3.361ha |
| Q_1 | =10.1 l/s/ |
| Q_{bar} | = 12.1 l/s |
| Q_{30} | =23.8 l/s/ |
| Q_{100} | = 31.2 l/s/ |

- 5.5.3 Surface water runoff from the proposed development will be limited to the greenfield equivalent rate of 12.1 l/s via a vortex flow control device.

5.6 Attenuation requirements

5.6.1 Sewers requirements

5.6.1.1 Surface water will discharge into the sewer located in Navigation Drive and will be attenuated to a Q_{bar} greenfield runoff rate of 12.1 l/s. To achieve this surface water will be attenuated via a detention basin in the south western corner to accommodate a 1 in 100 year event plus an allowance of 30% for climate change.

5.6.1.2 The proposed impermeable area of the development is 3.361 ha as shown on the plan enclosed in Appendix E. Based on the proposed impermeable area and allowable discharge rate of 12.1 l/s the storage requirement for the 1 in 100 year plus climate change event has been calculated utilising the following parameters. Full calculations are enclosed in Appendix F.

Rainfall profile	= Flood Estimation Handbook
Return Period	= 100 year
Durations	= 15 to 10080 minutes
Climate change	= 30%
Drained area	= 3.361 ha
Limiting flow to SW Sewer	= 12.1 l/s
Control	= Vortex flow control
Total Storage required	= 2733m ³

5.6.1.3 The indicative surface water drainage layout incorporating the attenuation is shown on the plan enclosed in Appendix C.

5.7 Flood compensation

5.7.1 Flood compensation measures will not be required for this site as it is located within Flood Zone 1.

5.8 Overland flows

5.8.1 Proposals are to design the storm water drainage to accommodate the 1 in 100 year storm event taking into account the predicted future effects of climate change (30% increase in intensity). Clearly there is a risk of this storm event being exceeded, albeit this risk is considered very low. In such an event the proposed drainage systems will become overwhelmed and overland flows could occur. Overland flows will be directed to follow the path that overland flows currently follow.

5.9 Foul water drainage strategy

- 5.9.1 Foul water will discharge to Severn Trent Water's sewer network located in Navigation Drive. Severn Trent has confirmed that foul water flows from the site can be accommodated. A copy of Severn Trent Water's correspondence is enclosed in Appendix G.

6.0 Maintenance

6.1 Storm drainage maintenance

- 6.1.1 The drainage system will be designed to minimise maintenance requirements, however, a full maintenance scheme will be established for those elements not being offered for adoption.


6.2 Foul Drainage maintenance

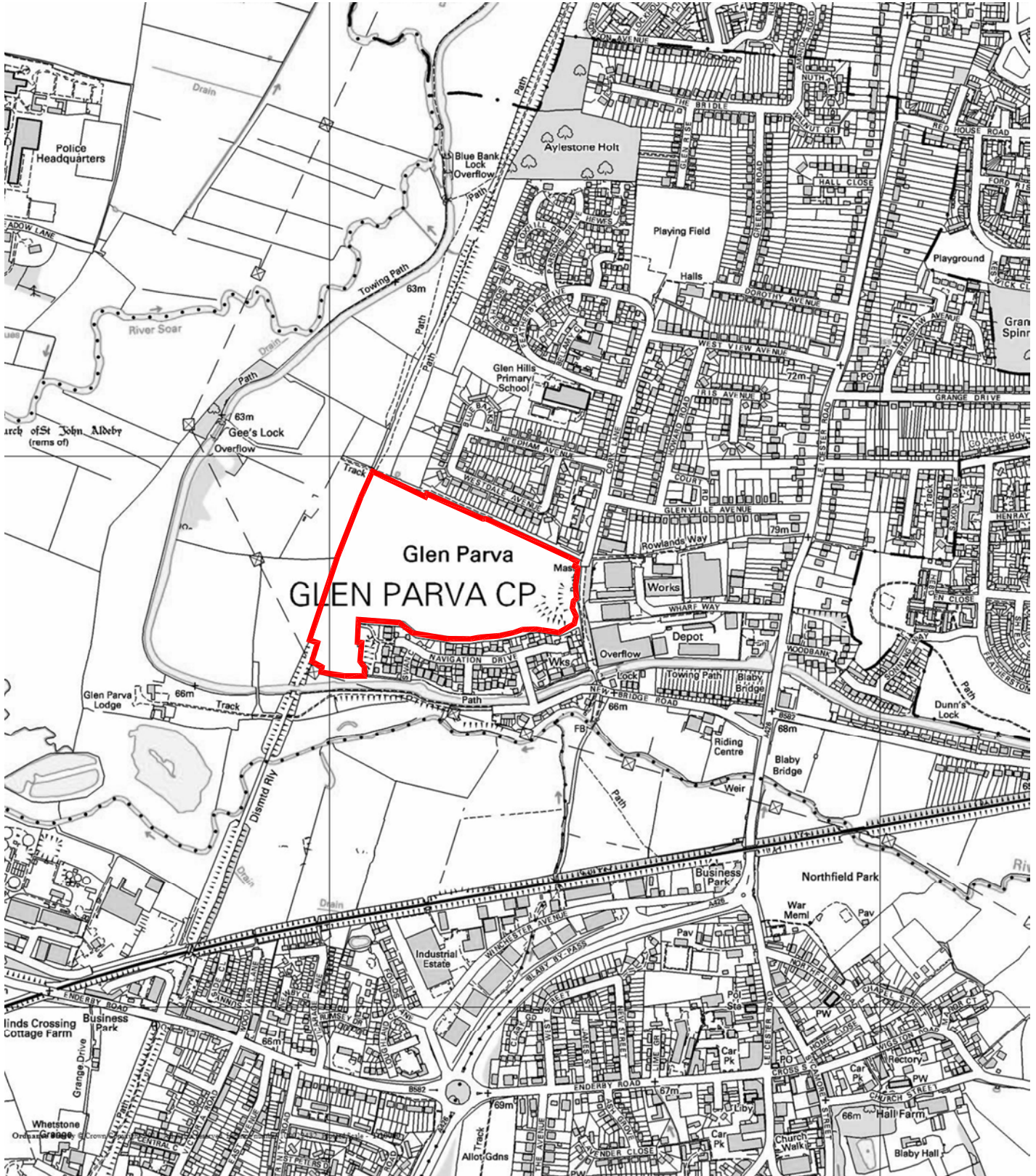
- 6.2.1 The drainage system will be designed to minimise maintenance requirements, however a full maintenance scheme will be established for those elements not being offered for adoption.

7.0 Conclusions and flood risk from site drainage proposals

- 7.1 The surface water drainage from this site, post development, is such that the surface water will be managed and disposed of within the site boundary, thus complying with the Technical Guidance to the National Planning Policy Framework. Based on the above, providing the above strategies are adopted the developed site will not contribute further to flood risk thus satisfying the principles of the National Planning Policy Framework.

Appendix A
Site Location Plan
JPP drawing no. R6711PP-FRA01

Client	MANOR OAK HOMES		Date	OCTOBER 2013	 Civil & Structural Engineers
Project	Residential Development Glen Parva, Leicester		Drawn by	MJA	
Title	Location Plan		Checked by		
Project ref	R6711/PP	Drawing no.	FRA01	Revision	Scale at A4 1:10000
					T: (01604) 781811 E: mail@jppuk.net F: (01604) 781999 W: www.jppuk.net

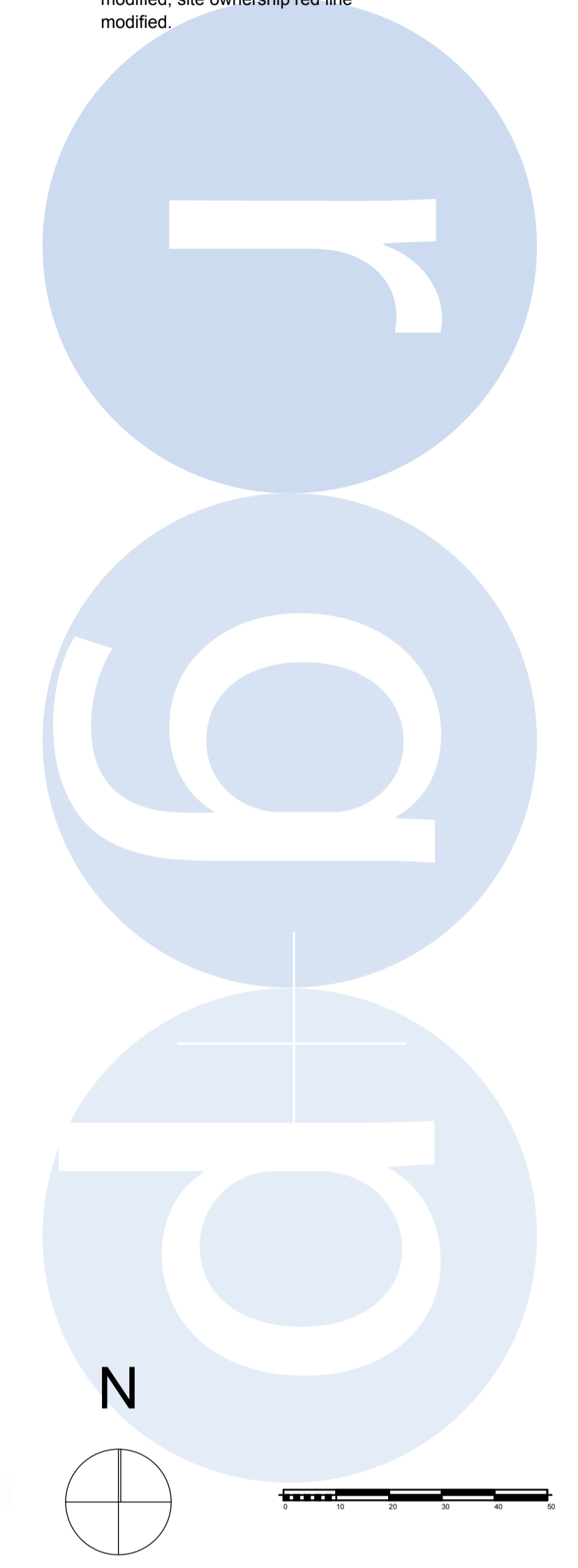


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Appendix B
Proposed Masterplan
RG+P drawing no. 7779/005 C

Site Area = 10.55 ha
 Development Area = 6.09 ha
 POS & Area of Natural Open Space = 4.46 ha
 Total Number of Dwellings = 165 units
 Site Density = 27 p/ha

- A Layout modified to reduce development area following comments from engineers & client SA 11.10.13
- B Focal routes introduced to west side of development SA 17.10.13
- C Property against the eastern boundary removed for pedestrian link to Cork Lane; private drives on south and east broken with green space. Additional planting and boundary treatment around car park areas. Play area location modified; site ownership red line modified. SA 26.02.14

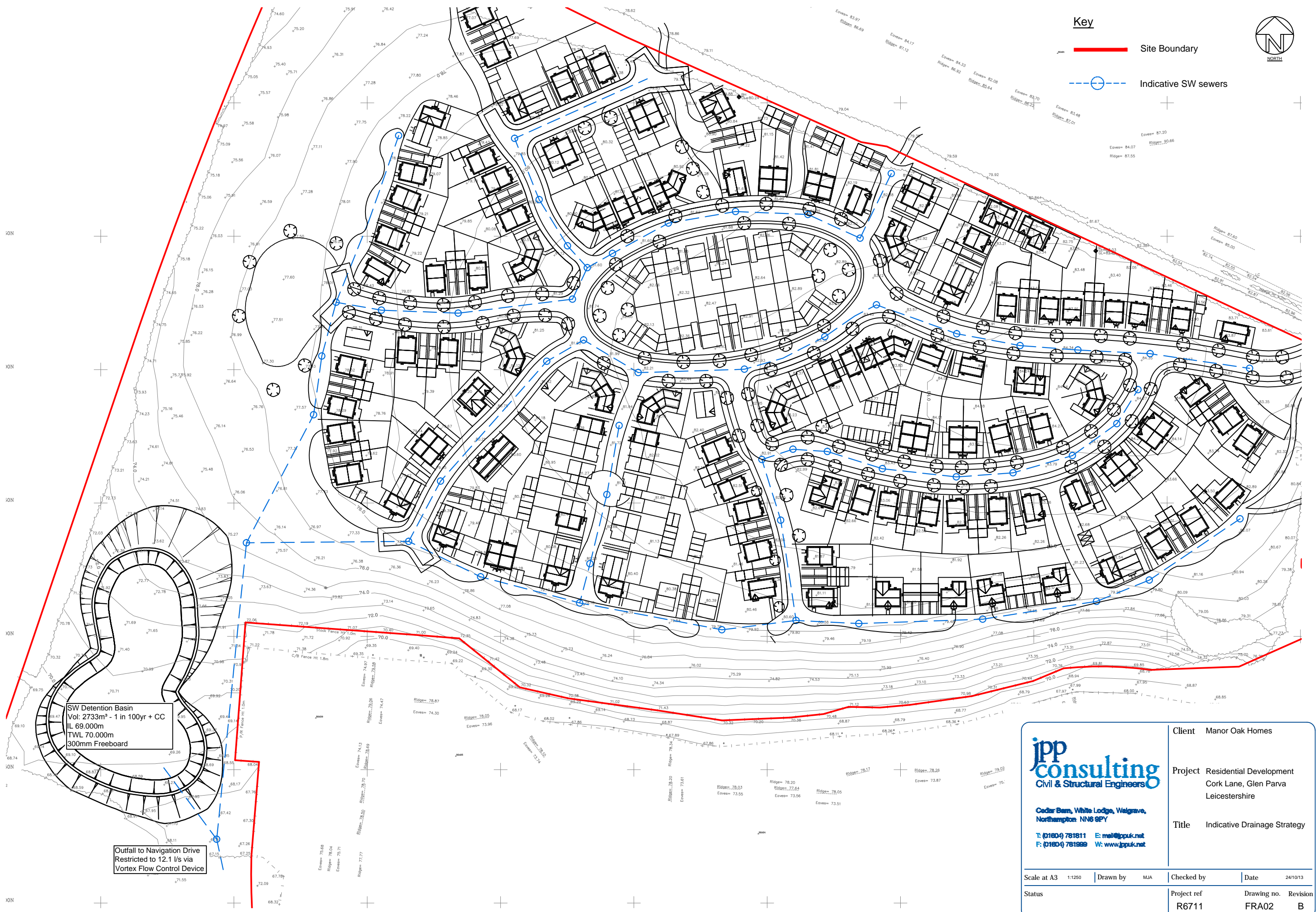


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Project:	Residential Development Cork Lane, Glen Pava
Client:	Manor Oak Homes
Sheet title:	Proposed Masterplan
Ref:	7779 / 005 C
Scale:	1:1000 @ A1
Date:	27/09/13
Drawn:	SA
Checked:	RAW

All dimensions to be checked on site. This drawing is the copyright of the Architect, and not to be reproduced without their permission. Ordnance Survey map information reproduced with permission of HMSO Crown Copyright reserved. rg-p Ltd. Trading as rg-p.

Appendix C
Indicative Drainage Strategy
JPP drawing no. R6711PP-FRA02B



Key

— Site Boundary

— Indicative SW sewers

NORTH

SW Detention Basin
 Vol: 2733m³ - 1 in 100yr + CC
 IL 69.000m
 TWL 70.000m
 300mm Freeboard

Outfall to Navigation Drive
 Restricted to 12.1 l/s via
 Vortex Flow Control Device

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Client	Manor Oak Homes		
Project	Residential Development Cork Lane, Glen Parva Leicestershire		
Title	Indicative Drainage Strategy		
Scale at A3	1:1250	Drawn by	MJA
Status	Project ref	Checked by	Date
	R6711		24/10/13
	Drawing no.	Revision	
	FRA02	B	

Appendix D
Greenfield run off calculations

Cedar Barn
White Lodge
Northampton NN6 9PY



Date 27/02/2014 09:00
File Attenuation calc...

Designed by MartinA
Checked by

Micro Drainage

Source Control 2013.1

ICP SUDS Mean Annual Flood

Input

Return Period (years)	100	Soil	0.431
Area (ha)	3.361	Urban	0.000
SAAR (mm)	641	Region Number	Region 4

Results 1/s

QBAR Rural	12.1
QBAR Urban	12.1
Q100 years	31.2
Q1 year	10.1
Q30 years	23.8
Q100 years	31.2

Appendix E
Attenuation Calculations



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1.0 Executive summary

1.1 National Planning Policy Framework Summary

1.1.1 The following table is based on National Planning Policy Framework (NPPF) and serves as an executive summary. This executive summary shall not be read in isolation to the main report that follows

NPPF Summary Table		
Item	Summary statement	Report ref
1 Development description and location		
1a	What type of development is proposed and where will it be located? Include whether it is new development, an extension to existing development or change of use.	Residential development on green field site. Section 3.4
1b	What is its vulnerability classification?	Residential – More vulnerable Section 3.4.2
1c	Is the proposed development consistent with the local development documents?	Yes
1d	Please provide evidence that the sequential test and where necessary the exception test has been applied.	Site in flood zone 1 and classified as more vulnerable, thus sequential test and exception test need not be applied. Section 4.1.1 4.1.2 and 4.6
2 Definition of the flood hazard		
2a	What sources of flooding could affect the site?	None identified Sections 4.1 to 4.4
2b	For each identified source, describe how flooding would occur, with reference to any historic records wherever these are available.	Not applicable Sections 4.1 to 4.5
2c	What are the existing surface water drainage arrangements for the site?	No formal drainage on site Section 5.1
3 Probability		
3a	Which flood zone is the site within?	Flood zone 1 Section 4.1
3b	If there is a Strategic Flood Risk Assessment covering the site what does it show?	Flood zone 1
3c	What is the probability of the site flooding taking account of the contents of the SFRA and of any further site-specific assessment	Site in flood zone 1 and no other sources of flood sources considered present a risk have been identified
3d	What are the existing rates and volumes of runoff generated by the site?	Green field run off rates and volumes Section 5.1.1

Item	Summary statement	Report ref
4 Climate Change		
4a	How is flood risk at the site likely to be affected by climate change?	Development with life likely to be in excess of 60 years, thus storm water drainage designed for increase in storm intensities of 23%
5 Detailed development proposals		
5a	Please provide details of the development layout, referring to the relevant drawings.	Appendix B
5b	Where appropriate, demonstrate how land uses most sensitive to flood damage have been placed in areas within the site that are at least risk of flooding.	Not appropriate
6 Flood risk management measures		
6a	How will the site be protected from flooding, including the potential impacts of climate change, over the developments lifetime?	Site in flood zone 1, climate change not likely to affect zone classification during the lifetime of the development.
7 Off site impacts		
7a	How will you ensure that your proposed development and the measures to protect your site from flooding will not increase flood risk elsewhere?	On site flood protection provided to cater for 1 in 100 year storm events plus an allowance of 30% for climate change, levels designed to convey overland flows away from buildings.
7b	How will you prevent run-off from the completed development causing impact elsewhere?	Exceedance contained on site where possible overland flows directed towards the watercourse.
8 Residual risks		
8a	What flood related risks will remain after you have implemented the measures to protect the site from flooding?	Overland flows in storm design, and maintenance / management of the storm water drainage system
8b	How and by whom will these risks be managed over the lifetime of the development?	Development in part to be offered for adoption.. Maintenance regime to be established and implemented for the lifetime of the development.

Table 1.1

1.2 Site location plan

- 1.2.1 The proposed residential development is located to the south of Leicester and north of Blaby at land off Cork Lane, Leicester as shown on the location plan below in Figure 1 and enclosed in Appendix A. The proposed development is bound by residential developments to the north and south, Cork Lane to the east and agricultural land to the west.

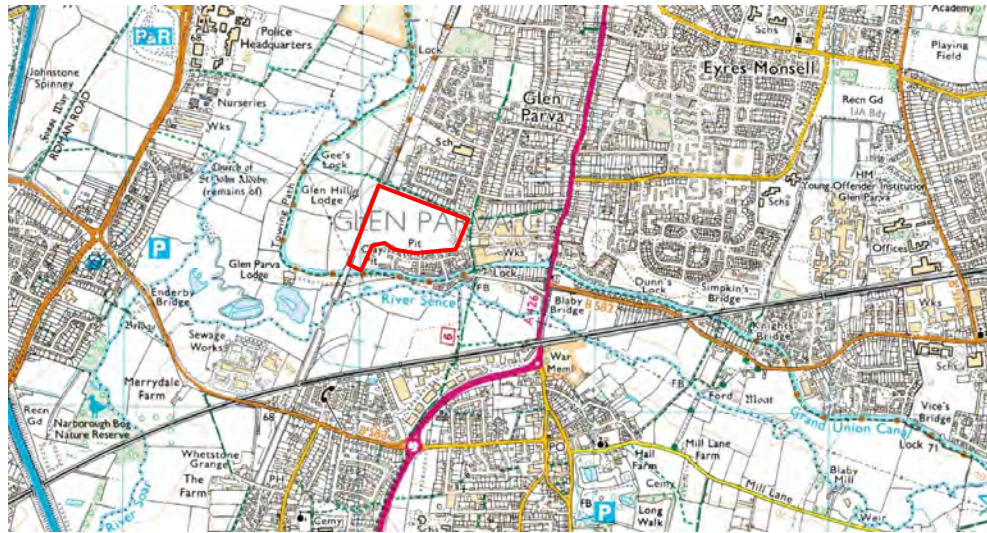


Figure 1.1 Site location plan.

2.0 Introduction

2.1 Instructions

2.1.1 This report is a Flood Risk Assessment for a proposed residential development located at land off Cork Lane, Glen Parva, Leicestershire. The proposed development has a total development area of 10.55ha (105,500m²) of which it is 3.361ha (33,612m²) will be positively drained impermeable areas. The National Grid reference for the site is E456278, N298804. This report has been prepared by JPP Consulting Limited acting on instructions received from Manor Oak Homes.

2.2 Objectives

2.2.1 The objective of this report is to advise interested parties in the development to the potential risk of flooding and management of surface water from a drainage perspective. The report both assesses flood risk and describes a strategy to drain the site in respect of surface water drainage.

2.2.2 This report has been prepared to support an application for an outline planning permission.

2.3 Reference documents

2.3.1 This report has been prepared with reference to the following publications:-

- Department for Communities and Local Government (March 2012), *National Planning Policy Framework*
- Department for Communities and Local Government (March 2012) *Technical Guidance to the National Planning Policy Framework*
- HM Government (2010), *The Building Regulations (2010), Drainage and Waste Disposal, Approved Document H*, The NBS, Newcastle Upon Tyne
- Wilson, Bray, Cooper (2004), *Sustainable drainage systems: Hydraulic, structural and water quality advise*, C609, CIRIA, London
- Woods-Ballard et al (2007), *The SUDS Manual*, C697, CIRIA, London
- CIRIA Report C624 *Development and flood risk*
- National SUDS Working Group (2004), *Interim Code of Practise for Sustainable Drainage Systems*,
- Institute of Hydrology (1999), *Flood Estimation Handbook*, Institute of Hydrology, Wallingford
- BS EN 752:2008 *Drain and sewer systems outside buildings. Hydraulic design and environmental considerations*
- BS 8533:2011 *Assessing and managing flood risk in development – Code of Practice*
- CIRIA Report C635 *Designing for exceedence in urban drainage – good practice*

2.4 Status of this Report

2.4.1 This report is considered final based on the information made available at the time.

2.5 Report distribution

2.5.1 This report has been prepared to assist in the design and planning process of the development and normally will require distribution to the following parties in table 2.1, although this list may not be exhaustive:

Report Distribution	
Party	Reason
Client	For information / reference
Developer/Contractor/Project Manager	To ensure strategic information on drainage design are implemented and programmed
Planning department	Potentially to discharge planning conditions
Independent inspectors such as Building Control and Assessors	For compliance with building regulations
Project design team	To progress the design by taking into consideration strategic information contained in this report

Table 2.5

3.0 Description and history of the site and development proposals

3.1 Location and description of the site

3.1.1 The proposed residential development is located to the south of Leicester and north of Blaby at land off Cork Lane, Leicester as shown on the location plan below in Figure 1 and enclosed in Appendix A. The proposed development is bound by residential developments to the north and south, Cork Lane to the east and agricultural land to the west.

3.1.2 The proposed development will comprise 165 residential dwellings with associated highway infrastructure and public open space. The proposed development layout is shown on the plan enclosed in Appendix B.

3.2 History of the Site

3.2.1 We are not aware of any previous development on the application site which is currently utilised as agricultural land.

3.3 Geology of the site and ground investigation data

3.3.1 The site has previously been used as a landfill and is therefore located on made ground. As such the use of infiltration techniques is not considered viable.

3.4 Development proposals and flood risk vulnerability

3.4.1 With reference to Table 2 of Technical Guidance to the National Planning Policy Framework, the proposed development for a residential development would be classified as More Vulnerable.

3.4.2 A copy of Table 2 from the NPPF is replicated below in table 3.2 with the proposed development type highlighted.

Flood Risk Vulnerability Classification	
Vulnerability	Development types
More vulnerable	Hospitals. Residential institutions such as residential care homes, children's homes, social services homes, prisons and hostels Buildings used for: dwelling houses , student halls of residence, drinking establishments, night clubs, and hotels Non-residential uses for health services, nurseries and educational establishments Landfill and sites used for waste management facilities for hazardous waste. Sites used for holiday or short-let caravans and camping, <i>subject to a specific warning and evacuation plan.</i>

Table 3.4 – Source National Planning Policy Framework - 2012

4.0 Flood risk

4.1 Fluvial / Tidal flooding

4.1.1 An extract of the Environment Agency flood risk map for Rivers and Sea is provided below in Figure 4.1. The flood map was extracted from the Environment Agency web site on the 2nd January 2013. The approximate application site boundary is shown in red. The map indicates that the development site is located within Flood Zone 1 (Low Probability) and as such, the report considers the development to be in Flood Zone 1 and at a low risk of flooding from rivers or the sea.

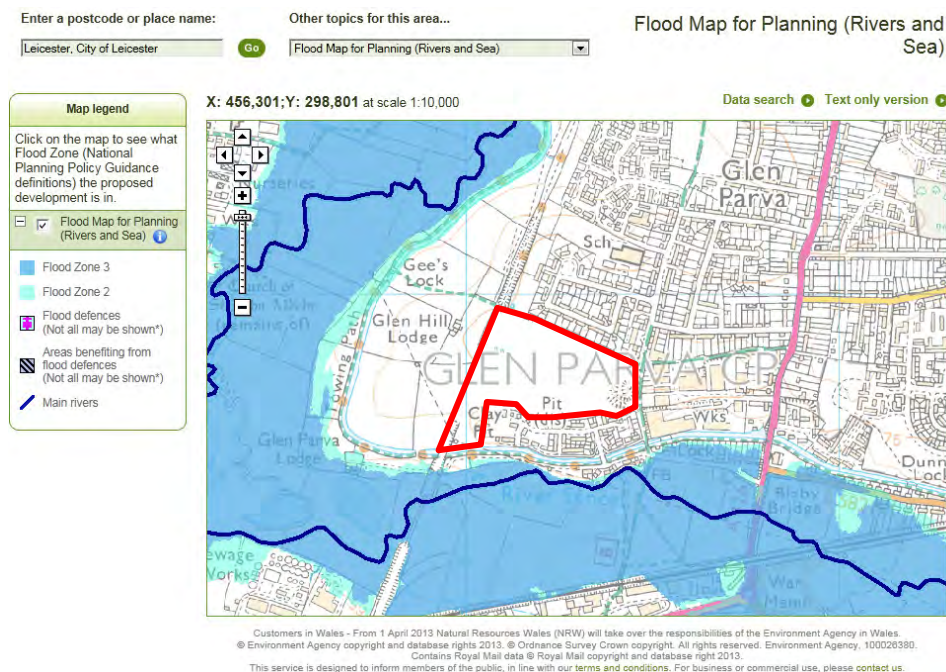


Figure 4.1 – Risk of Flooding from Sea and Rivers
Source: Environment Agency web site – 2nd January 2013

4.1.2 Table 4.1 is an extract from Technical Guidance to the National Planning Policy Framework that defines Flood Zones. The proposed development which is located within Flood Zone 1 is assessed as having a less than 1 in 1,000 annual probability of river or sea flooding in any year (<0.1%).

Flood Zone	
Flood Zones	Definition
Zone 1: Low Probability	This zone comprises land assessed as having a less than 1 in 1,000 annual probability of river or sea flooding in any year (<0.1%)
Zone 2: Medium Probability	This zone comprises land assessed as having between a 1 in 100 and 1 in 1000 annual probability of river flooding (1% - 0.1%) or between a 1 in 200 and 1 in 1000 annual probability of sea flooding (0.5% - 0.1%) in any year
Zone 3a High Probability	This zone comprises land assessed as having a 1 in 100 or greater annual probability of river flooding (>1%) or a 1 in 200 or greater annual probability of flooding from the sea (>0.5%) in any year
Zone 3b The Functional Flood plain	This zone comprises land where water has to flow or be stored in times of flood. SFRAs should identify this Flood Zone (land which would flood with an annual probability of 1 in 20 (5%) or greater in any year, or is designed to flood in an extreme (0.1%) flood, or at another probability to be agreed between the LPA and the Environment Agency, including water conveyance routes

Table 4.1

4.2 Flooding from groundwater

4.2.1 The site has been previously used as a quarry and landfill. We do not anticipate groundwater within close proximity of the surface. We would therefore consider the probability of flooding on the site from groundwater as low.

4.3 Flooding from sewers

4.3.1 There are no sewers located within the site application boundary. We do not have any records of sewer flooding within the vicinity of the proposed development.

4.3.2 We therefore do not consider the risk of flooding from sewers to be a significant risk to the proposed development.

4.4 Flooding from reservoirs, canals and other artificial sources

4.4.1 We are not aware of any canals or artificial water sources that may result in flooding of this site.

4.4.2 An extract of the Environment Agency map 'Risk of Flooding from Reservoirs' is provided below in Figure 4.3. It can be seen that the proposed development site, shown in red, is not at a risk of flooding from reservoirs.

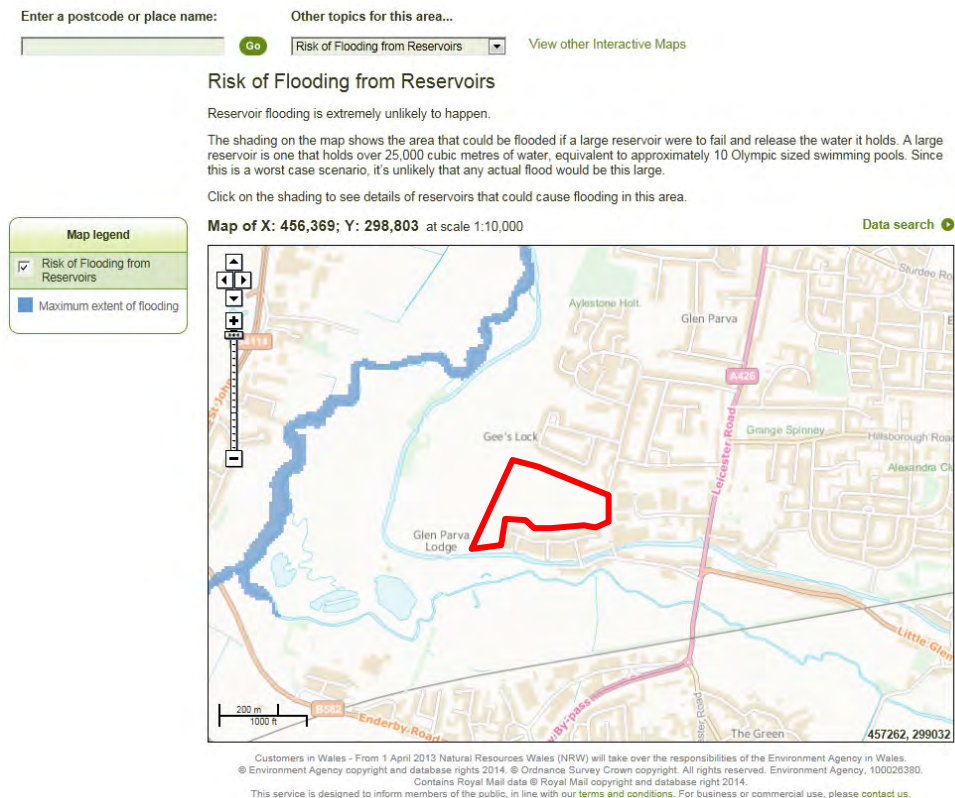


Figure 4.3 – Risk of Flooding from Reservoirs
Source: Environment Agency web site – 2nd January 2013

4.5 Historic flooding

4.5.1 We do not have any records showing historic flood events within the vicinity of the site.

4.6 Flood risk vulnerability and flood zone compatibility

4.6.1 Based on the above assessment of the site being located within Flood Zone 1 and classified as a More Vulnerable development and with reference to Table 4.2 (Technical Guidance to the National Planning Policy Framework, Table 3) the proposed development of this site would be considered "appropriate". A copy of Table D3 is presented below highlighting the above. No sequential or exception test will be required.

Table D3 - Flood Risk Vulnerability and Flood Zone Compatibility					
Flood risk Vulnerability classification	Essential Infrastructure	Water compatibility	Highly Vulnerable	More Vulnerable	Less Vulnerable
Zone 1	✓	✓	✓	✓	✓
Zone 2	✓	✓	Exception Test required	✓	✓
Zone 3a	Exception Test required	✓	X	Exception Test required	✓
Zone 3b	Exception Test required	✓	X	X	X

✓ = Development is appropriate X = Development should not be permitted

Table 4.6

4.7 Access and egress

4.7.1 Access and egress to and from this site in the event of flooding will be via the proposed development's access road which will allow residents of the development to move to higher ground.

5.0 Management of surface water

5.1 Current conditions

5.1.1 The site is currently open and is fully permeable and therefore considered a greenfield site with no existing drainage for the purpose of drainage calculations. Therefore greenfield run calculations shall be used to derive the allowable run off rate from the site.

5.2 Storm water drainage outfalls

5.2.1 It is a requirement of the The Building Regulations (2010), Drainage and Waste Disposal, Approved Document H, to dispose of surface water collected by a development in the following list of priorities:-

1. Infiltration systems where ground condition permit
2. To watercourses
3. To sewers

Each of these is considered separately below:

5.2.2 Infiltration systems

5.2.2.1 The site has previously been used as a landfill and is therefore located on made ground. As such the use of infiltration techniques is not considered viable.

5.2.3 Watercourses/ Main river

5.2.3.1 The site does not have any watercourse located within or adjacent to the development's site boundary. There are also no watercourses within close proximity which can be reached via the development. Hence, discharge to a watercourse is not considered viable.

5.2.4 Sewers

5.2.4.1 The proposed development will discharge to S104 sewers located within Navigation Drive. The proposed development has a right of discharge agreement with the neighbouring developer to allow the discharge of surface water. The S104 sewer ultimately connects to the River Sence.

5.3 Storm water drainage strategy

- 5.3.1 Surface water will be attenuated to greenfield runoff rates to ensure that the rate of surface water runoff from the site does not increase as a result of the proposed development.
- 5.3.2 An indicative surface water drainage strategy plan is enclosed in Appendix C. The drawing shows that surface water attenuation can be accommodated on the site. The detail design parameters of the drainage are described in detail in section 5.4.
- 5.3.3 The detail surface water design will accommodate the use SUDS techniques where possible. Techniques that could be implemented include tanked permeable paving to private areas. It should be noted that the use of swales has been advised against by the Geotechnical Engineer for the site due its backfilled nature.

5.4 Storm water drainage design and management

- 5.4.1 Proposals are to design the storm water drainage system to accommodate storms up to the 1 in 100 year event and allow for increase in storm intensities up to 30% (design life of the development assumed at greater than 60 years). Table 5.4 is a copy of from Technical Guidance to the National Planning Policy Framework, Table 5 and is presented below.

National precautionary sensitivity ranges for peak rainfall intensities, peak river flows, offshore wind speeds and wave heights

Parameter	1990 to 2025	2025 to 2055	2055 to 2085	2085 to 2115
Peak rainfall Intensity	+5%	+10%	+20%	+30%
Peak river flow	+10%	+20%	+20%	+20%
Offshore wind speed	+5%	+5%	+10%	+10%
Extreme wave height	+5%	+5%	+10%	+10%

Table 5.4

- 5.4.3 In addition to the above and where required further surface water management shall be provided to ensure that protection against flooding is provided for a 1 in 100 year storm event plus an allowance of 30% for climate change, in the form of an off line detention basin or similar.

5.5 Existing run off rates

- 5.5.1 To reflect the changes in the near surface geology across the site the Greenfield runoff rates have been calculated. The method used to calculate the green field run off rates is the ICP SUDS and the calculations are presented in Appendix D. As this is an outline application and the final impermeable area is subject to detailed design the runoff rates are stated as a per hectare impermeable area.

- 5.5.2 The green field run off rate, for the application site is:
- | | |
|-------------------|---|
| Soil type | = 0.431 – determined from underlying strata |
| SAAR | = 641 mm – obtained from the FEH parameters |
| Urban | = 0.000 |
| Region number | = 4 |
| Proposed Imp Area | = 3.361ha |
| Q_1 | =10.1 l/s/ |
| Q_{bar} | = 12.1 l/s |
| Q_{30} | =23.8 l/s/ |
| Q_{100} | = 31.2 l/s/ |

- 5.5.3 Surface water runoff from the proposed development will be limited to the greenfield equivalent rate of 12.1 l/s via a vortex flow control device.

5.6 Attenuation requirements

5.6.1 Sewers requirements

5.6.1.1 Surface water will discharge into the sewer located in Navigation Drive and will be attenuated to a Q_{bar} greenfield runoff rate of 12.1 l/s. To achieve this surface water will be attenuated via a detention basin in the south western corner to accommodate a 1 in 100 year event plus an allowance of 30% for climate change.

5.6.1.2 The proposed impermeable area of the development is 3.361 ha as shown on the plan enclosed in Appendix E. Based on the proposed impermeable area and allowable discharge rate of 12.1 l/s the storage requirement for the 1 in 100 year plus climate change event has been calculated utilising the following parameters. Full calculations are enclosed in Appendix F.

Rainfall profile	= Flood Estimation Handbook
Return Period	= 100 year
Durations	= 15 to 10080 minutes
Climate change	= 30%
Drained area	= 3.361 ha
Limiting flow to SW Sewer	= 12.1 l/s
Control	= Vortex flow control
Total Storage required	= 2733m ³

5.6.1.3 The indicative surface water drainage layout incorporating the attenuation is shown on the plan enclosed in Appendix C.

5.7 Flood compensation

5.7.1 Flood compensation measures will not be required for this site as it is located within Flood Zone 1.

5.8 Overland flows

5.8.1 Proposals are to design the storm water drainage to accommodate the 1 in 100 year storm event taking into account the predicted future effects of climate change (30% increase in intensity). Clearly there is a risk of this storm event being exceeded, albeit this risk is considered very low. In such an event the proposed drainage systems will become overwhelmed and overland flows could occur. Overland flows will be directed to follow the path that overland flows currently follow.

5.9 Foul water drainage strategy

- 5.9.1 Foul water will discharge to Severn Trent Water's sewer network located in Navigation Drive. Severn Trent has confirmed that foul water flows from the site can be accommodated. A copy of Severn Trent Water's correspondence is enclosed in Appendix G.

6.0 Maintenance

6.1 Storm drainage maintenance

- 6.1.1 The drainage system will be designed to minimise maintenance requirements, however, a full maintenance scheme will be established for those elements not being offered for adoption.

6.2 Foul Drainage maintenance

- 6.2.1 The drainage system will be designed to minimise maintenance requirements, however a full maintenance scheme will be established for those elements not being offered for adoption.

7.0 Conclusions and flood risk from site drainage proposals

- 7.1 The surface water drainage from this site, post development, is such that the surface water will be managed and disposed of within the site boundary, thus complying with the Technical Guidance to the National Planning Policy Framework. Based on the above, providing the above strategies are adopted the developed site will not contribute further to flood risk thus satisfying the principles of the National Planning Policy Framework.

Appendix A
Site Location Plan
JPP drawing no. R6711PP-FRA01

Appendix B
Proposed Masterplan
RG+P drawing no. 7779/005 B

Appendix C
Indicative Drainage Strategy
JPP drawing no. R6711PP-FRA02

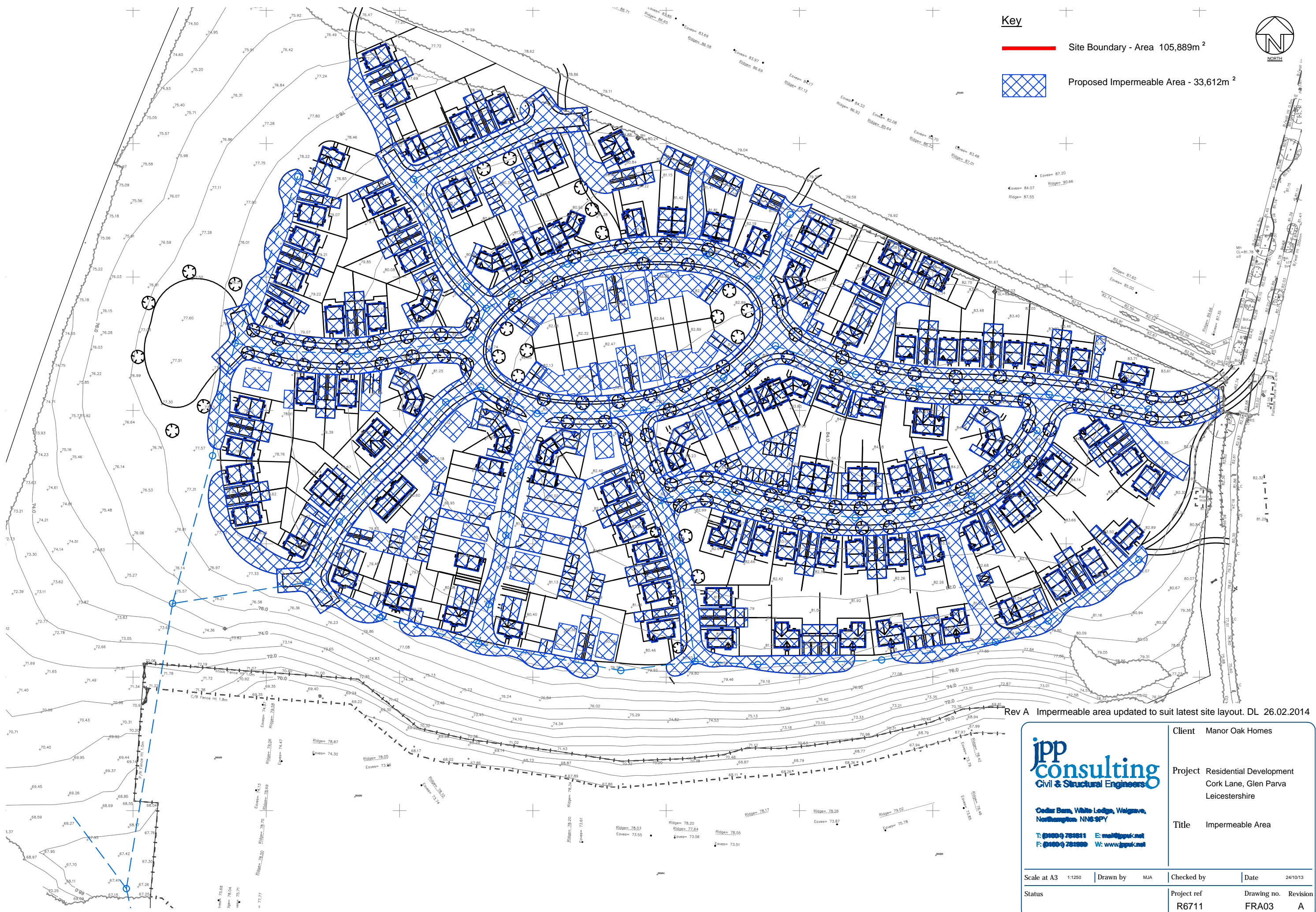
Appendix D
Greenfield run off calculations

Appendix E
Attenuation Calculations

Appendix F
Impermeable Area
JPP drawing no. R6711PP-FRA03

Appendix G
Severn Trent Water Correspondence

Appendix F
Impermeable Area
JPP drawing no. R6711PP-FRA03A



Key

- Site Boundary - Area 105,889m²
- Proposed Impermeable Area - 33,612m²



Rev A Impermeable area updated to suit latest site layout. DL 26.02.2014

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Client Manor Oak Homes

Project Residential Development
Cork Lane, Glen Parva
Leicestershire

Title Impermeable Area

Scale at A3 1:1250	Drawn by MJA	Checked by	Date 24/10/13
Status	Project ref R6711	Drawing no. FRA03	Revision A

Appendix G
Severn Trent Water Correspondence

JPP Consulting
Cedar Barn
White Lodge
Walgrave
Northamptonshire
NN6 9PY

F.A.O: Mr Martin Andrews



Severn Trent Water Ltd
Leicester Water Centre
Gorse Hill
Anstey
Leicester
LE7 7GU

Tel: 0116 234 3834
Fax: 0116 234 3035

www.stwater.co.uk
net.dev.east@severntrent.co.uk

Contact: Keith Baker
Direct line: 0116 234 3786
Mobile no: 07889 631417
Your ref:
Our ref: WT29011 / 8125872

16th October 2013

Dear Sirs,

Land off Cork Lane, Leicester
Proposed 150 dwellings (456273, 298792)

I refer to your recent Development Enquiry Request in respect of the above site. Please find a copy of the sewer records and 'Additional Guidance Notes' enclosed for your information.

Sewer Crossing

There are no public sewers crossing the site.

Foul Water Drainage

The proposed foul discharge from 150 properties equates to approximately 1.8 l/sec. Due to topography a discharge to the small diameter public combined sewers in Cork Lane would require sewer modelling to ascertain what spare capacity is available to determine a pumped rate of discharge. Alternatively I believe that a gravity discharge could be achieved to either the public foul sewer in Blue Banks Avenue to the north of the site into manhole 2001, or to the former private sewer (now a transferred asset) located adjacent to the Navigation Drive pumping station to the south of the site.

Manhole 2001 is 3.4m deep to invert and should be sufficient to allow a gravity connection. The public foul sewer has sufficient capacity for a gravity discharge. The sewer in adjacent to Navigation Drive is approximately 4.6m deep to invert, again a

gravity discharge can be accommodated in this sewerage system and the pumping station.

Surface Water Drainage

Under the terms of Section H of the Building Regulations 2000, the disposal of surface water by means of soakaways should be considered as the primary method. If this is not practical and no watercourse is available as an alternative, the use of sewerage should be considered. In addition, other sustainable drainage methods should also be explored before a discharge to the public sewerage system is considered.

If these are found to be unsuitable, satisfactory evidence will need to be submitted. The evidence should be either percolation test results or a statement from the SI consultant (extract or a supplementary letter).

Subject to the above: to the north of the site, in Blue Bank Avenue there is a public surface water sewer that appears to stop at manhole 2002. I can only assume that there is either a length of sewer pipe missing off the records that would show it out falling into either a ditch, the canal or to the river via a culvert under the canal. This should be investigated on site to determine whether a suitable drainage system is available in this area.

To the south, there are S104 sewers that have not been transferred to Severn Trent, as they outfall into the river. To connect into these would require agreement with the developer of that site.

Discharges direct to the canal would require the agreement of the Canal and River Trust, discharges into land drainage channels will require agreement with the Environment Agency. No surface water shall be discharged to public combined or foul sewers.

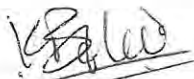
Any flows generated by the site in excess of the permitted discharge rate will have to be attenuated within the development site in agreement with the appropriate body.


For any new connection(s) into the public sewer network **or the reuse of an existing sewer connection(s)**, you will need to apply under Section 106 Water Industry Act 1991 as amended by the Water Act 2003. Our New Connections Team currently processes Section 106 applications, please contact them on 0800 707 6600 for an application pack and guidance notes (or visit

www.stwater.co.uk). For the avoidance of doubt, it is suggested that you quote the reference number above. Applications to make such connections should be made separately from any application for adoption of the related sewers under Section 104 Water Industry Act 1991 as amended by the Water Act 2003.

I must inform you that this evaluation is only valid for 6 months from the date of this letter. Please quote the reference number above, in all future correspondence.

Yours faithfully,



 **WF Walton**
Asset Protection Manager - East
Waste Water

Additional Guidance Notes

If you experience difficulty in the provision of off-site sewers to serve your proposed development, an application for requisition sewers under Section 98 Water Act 2003 may be appropriate on request to this office.

If there are existing public sewers within the curtilage of the development site that may affect the proposed development, the option to divert them under Section 185 Water Act 2003 may be available. All costs incurred would lay with the Applicant.

All potentially adoptable sewers must be designed and constructed in accordance with the guidelines in Sewers for Adoption (6th Edition), after 1st May 2006. A Severn Trent Water Addendum for Foul Sewage Pumping Stations will be available at www.wrcplc.co.uk/sfa.

If the sewers are to be offered for adoption or if the development works could affect the public sewerage system, the Developer should approach Severn Trent Water Ltd to discuss their proposals in detail. This is to ensure the Developer is aware of the Company's requirements which could affect the development design and/or programme.

In cases where the complexity of both the existing receiving sewerage system and the proposed additional sewerage necessitates the construction of a suitable computer model, Severn Trent Water can offer this service. Enquiries should be addressed to James Arkesden in our Infrastructure Strategy Team who can be contacted on 07854 405055 or email to: sewer.capacity@severntrent.co.uk.

Severn Trent Water has no knowledge of any specific land drainage issues involving this site. The Developer is to contact and seek approval of The Environment Agency, Local Authority etc. regarding any means of surface water disposal to the land drainage system, required attenuation, discharge consent etc.

All enquiries with respect to the supply of sewer records only should be directed to Severn Trent Water Limited, Asset Data Management, PO Box 5344, Coventry. CV3 9FT (Tel. 0845 601 6616).

Asset Protection
Waste Water East

SUPPLEMENTARY GUIDANCE NOTES

In 2006 the Government issued national advice in the form of "Planning Policy Statement 25: Development and Flood Risk" that seeks to reduce the impact of development on surface water runoff. This advice is generally followed by Local Authorities through both the Building Regulations (Approved Document H) and the imposition of appropriate planning conditions. Severn Trent welcomes this advice and supports such planning conditions that impose flow restrictions. It is considered that in accordance with current guidance disposal of storm runoff from the development should be dealt with as follows:

1. By soakage into the site's subsoil, subject to suitable ground soakage capacity and any contamination present. If ground soakage proves inadequate, evidence should be submitted to Severn Trent Water. The evidence should be either percolation test results or a statement from the SI consultant (extract from report or a supplementary letter) stating that soakaways would be ineffective. **A connection to public sewerage (existing or adoptable) would then be considered reasonable with flows as:**
2. Brown field development site: If storm runoff from the existing development is connected to the public sewerage system, then peak storm flows from the proposed development up to that generated from the previous connected impermeable area may be connected to the network subject to the details of the existing storm connection arrangements being submitted to Severn Trent Water.

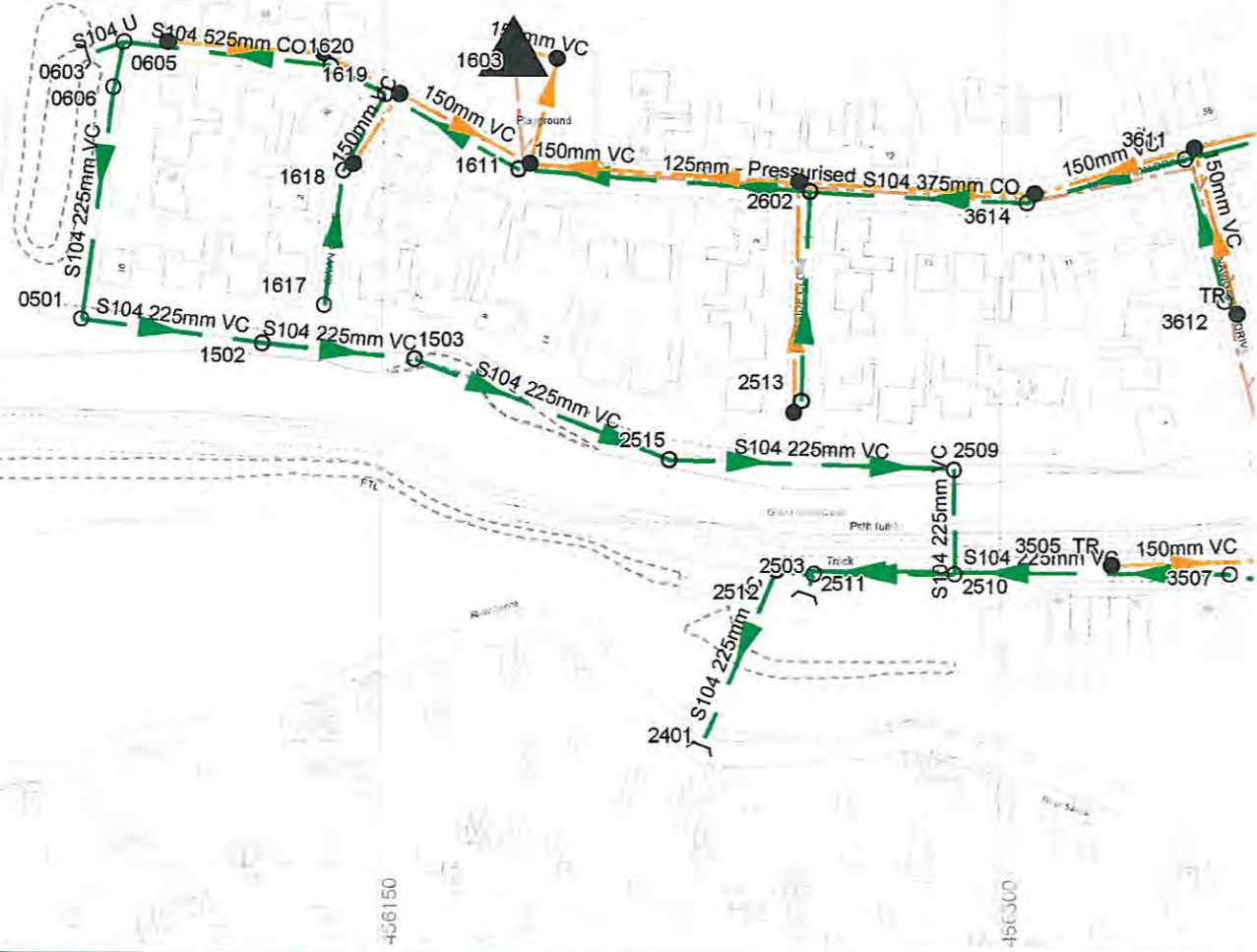
For existing storm connections to the public foul sewerage system, any new storm connection to the public storm sewerage system (if available) should be limited to 5 litres/sec/ha (option A) OR a peak flow to be determined by the Company from its developer-funded hydraulic modelling of the public storm sewerage system (option B). The developer may choose either option. Existing flows should be assessed as the lower of $Q=2.78 \times 50 \times A_{imp}$ l/s (A_{imp} ha) and the unsurcharged capacity of the outfall pipe(s).

In addition to this restriction, for Brownfield developments, the Company would also suggest a reduction in surface water flow to the public sewerage systems of 20%. It should be noted that the Company would like to see any flow attenuation based on a 30 year critical duration storm design in accordance with 'Sewers for Adoption' current edition.

3. Green field development site: If the site is a green field development i.e. not involving any demolition of buildings or paved areas connected to the public sewerage system, then the storm runoff from the proposed development may be connected to the public sewerage system subject to peak storm flows (30 year design storm) being limited to a green field runoff of 5 litres/sec/ha (subject to a minimum of 5 litres/sec), applied to the gross area of the site, subject to sufficient capacity in the network.

298700

298550



Sewer Node **Sewer Pipe Data**

REFERENCE	COVER LEVEL	INV LEVEL UPSTR	INV LEVEL DOWNSTR	PURP	MATL	SHAPE	MAX SIZE	MIN SIZE	GRADIENT	YEAR LAID
SP56980501	67.00	64.31	64.07	S	VC	C	225	nil	184.75	nil
SP56980605	67.91	64.64	nil	S	U	U	nil	nil	0.11	nil
SP56980605	67.91	64.64	64.62	S	CO	C	450	nil	557.00	nil
SP56980606	67.80	64.62	64.31	S	VC	C	225	nil	182.58	nil
SP56981502	66.90	64.07	63.86	S	VC	C	225	nil	176.62	nil
SP56981503	66.65	63.86	63.49	S	VC	C	225	nil	179.08	nil
SP56981611	68.08	64.90	64.81	S	CO	C	525	nil	370.30	nil
SP56981617	67.23	65.80	65.61	S	VC	C	225	nil	163.75	nil
SP56981618	67.94	65.61	65.11	S	VC	C	225	nil	42.32	nil
SP56981619	68.32	64.81	64.76	S	CO	C	525	nil	296.20	nil
SP56981620	68.26	64.76	64.64	S	CO	C	525	nil	421.08	nil
SP56982509	66.80	60.37	60.23	S	VC	nil	225	nil	169.00	nil
SP56982510	66.49	63.46	63.21	S	CO	C	525	nil	403.00	nil
SP56982511	66.49	63.21	62.71	S	CO	C	375	nil	18.22	nil
SP56982511	66.49	63.21	nil	S	VC	C	225	nil	0.04	nil
SP56982512	66.37	62.71	62.40	S	VC	C	225	nil	141.19	nil
SP56982513	67.30	65.72	65.36	S	VC	C	225	nil	141.06	nil
SP56982515	66.50	63.49	63.12	S	VC	C	225	nil	186.46	nil
SP56982602	67.71	65.06	64.90	S	CO	C	525	nil	443.13	nil
SP56983505	67.30	65.85	65.55	F	VC	C	150	nil	147.93	nil
SP56983507	68.96	62.95	62.71	S	VC	C	225	nil	180.38	nil
SP56983611	68.31	65.58	65.45	S	CO	C	375	nil	304.62	nil
SP56983612	68.48	67.08	65.81	S	VC	C	150	nil	27.86	nil
SP56983614	68.05	65.45	65.21	S	CO	C	375	nil	210.76	nil
nil	nil	64.36	64.11	F	VC	C	150	nil	151.65	nil
nil	nil	64.11	63.97	F	VC	C	150	nil	151.16	nil
nil	nil	65.16	63.97	F	VC	C	150	nil	17.00	nil
nil	nil	63.97	63.49	F	VC	C	150	nil	74.27	nil
nil	nil	63.49	63.31	F	VC	C	150	nil	150.00	nil
nil	nil	nil	nil	F	VC	C	150	nil	0.00	nil
nil	nil	65.23	63.93	F	VC	C	150	nil	42.85	nil
nil	nil	63.93	63.49	F	VC	C	150	nil	147.94	nil
nil	nil	64.31	63.93	F	VC	C	150	nil	150.66	nil
nil	nil	64.58	64.31	F	VC	C	150	nil	148.88	nil
nil	nil	65.58	64.58	F	VC	C	150	nil	41.56	nil

- Abandoned Gravity 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)

- Culverted Watercourse
- 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
- Lampole
- Outfall
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- 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
- Pre-1937 Properties

MATERIALS

- NONE
- 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
- GRP - GLASS REINFORCED PLASTIC
- MAR - MASONRY IN REGULAR COURSES
- MAR - MASONRY RANDOMLY COURSED
- PE - POLYETHYLENE
- PF - PITCH
- PP - POLYPROPYLENE
- PSC - PLASTIC STEEL COMPOSITE
- PVC - POLYVINYL CHLORIDE
- RPM - REINFORCED PLASTIC MATRIX
- SI - SPUN (GREY) IRON
- ST - STEEL
- U - UNKNOWN
- VC - VITRIFIED CLAY
- XXX - OTHER

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

CATEGORIES

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

SEVERN TRENT WATER

Sewer Trent Water Limited
Asset Data Management
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Coventry
CV3 9FT
Telephone: 0845 601 6616

SEWER RECORD (Tabular)

O/S Map scale: 1:1750
Date of issue: 16.10.13
Sheet No. 1 of 1

This map is centred upon:
O / S Grid reference:
x : 456191
y : 298622

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All Private Sewers are shown in magenta
All section 104 sewers are shown in green
All Sewerage Isolation Valves are shown in blue
This map is for information only. It does not constitute an offer of any service or product. It is not to be used for any other purpose without the prior written consent of Severn Trent Water.



Sewer Node		Sewer Pipe Data									
REFERENCE	COVER LEVEL	INV LEVEL UPSTR	INV LEVEL DOWNSTR	PURP	MATL	SHAPE	MAX SIZE	MIN SIZE	GRADIENT	YEAR LAID	
SP56982901	78.65	76.10	73.70	F	VC	C	225	nil	34.82	nil	
SP56982902	78.79	77.32	76.13	F	VC	C	225	nil	65.23	nil	
SP56983901	80.13	78.76	77.37	F	VC	C	225	nil	26.08	nil	
SP56983930	nil	nil	nil	F	VC	C	150	nil	0.00	nil	
SP56983931	nil	nil	nil	F	VC	C	150	nil	0.00	nil	
SP56983932	nil	nil	nil	F	VC	C	150	nil	0.00	nil	
SP56984930	nil	nil	nil	F	VC	C	100	nil	0.00	nil	
SP56984931	nil	nil	nil	F	VC	C	100	nil	0.00	nil	
SP56984932	nil	nil	nil	F	nil	nil	nil	nil	0.00	nil	
SP56985901	79.88	78.52	73.87	C	VC	C	150	nil	25.18	nil	
SP56992001	77.06	73.65	nil	F	VC	C	225	nil	0.00	nil	
SP56993000	nil	nil	nil	F	VC	U	100	nil	0.00	nil	
SP56993001	76.42	74.68	73.67	F	VC	C	225	nil	86.23	nil	
SP56993002	76.25	74.73	74.33	S	VC	C	225	nil	230.45	nil	
SP56993101	nil	nil	66.77	F	nil	nil	nil	nil	0.00	nil	
SP56994001	77.62	75.52	74.69	F	VC	C	225	nil	101.45	nil	
SP56994002	77.38	75.94	74.70	S	VC	C	225	nil	63.77	nil	
SP56995001	75.32	73.83	68.46	C	VC	C	150	nil	26.38	nil	
nil	nil	nil	nil	F	VC	nil	nil	nil	0.00	nil	
nil	nil	nil	nil	F	VC	nil	nil	nil	0.00	nil	
nil	nil	nil	nil	F	VC	nil	nil	nil	0.00	nil	

Legend

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- Cable Junction
- Cable, Optical Fibre/Instrumentation
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SEWER RECORD (Tabular)

O/S Map scale: 1:1750

Date of issue: 16.10.13

Sheet No. 1 of 1

This map is centred upon:

O / S Grid reference:

x : 456357

y : 298950

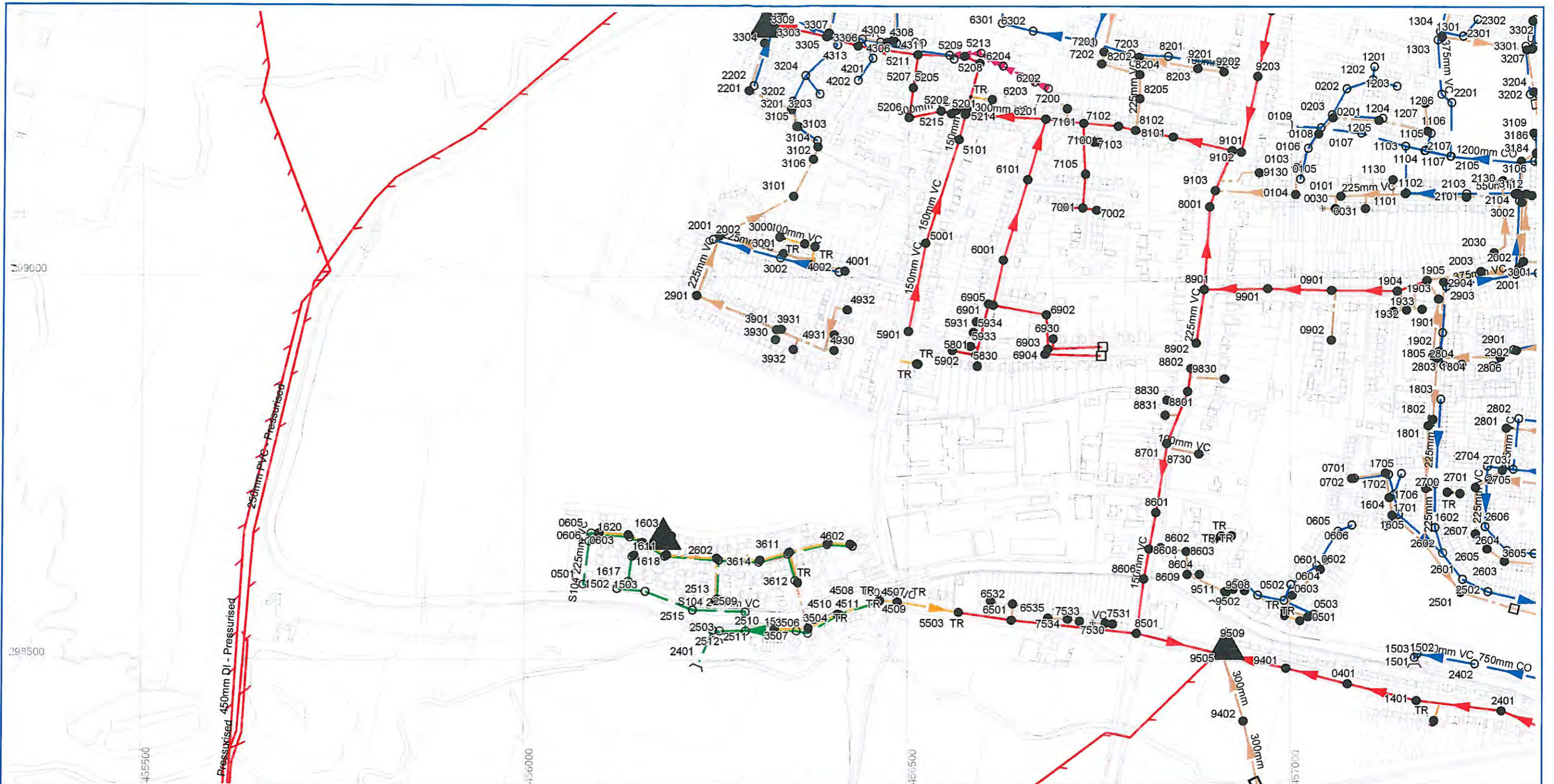
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<ul style="list-style-type: none"> Abandoned Gravity Sewer Private Combined Gravity Sewer Private Foul Gravity Sewer Private Surface Water Gravity Sewer Public Combined Gravity Sewer Public Foul Gravity Sewer Public Surface Water Gravity Sewer Trunk 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) 	<ul style="list-style-type: none"> Culverted Watercourse 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 	<ul style="list-style-type: none"> Blind Shaft Combined Use Manhole Flushing Chamber Foul Use Manhole Grease Trap Head Node Hydrobrake Lampole Outfall Overflow Penstock Petrol Interceptor 	<ul style="list-style-type: none"> 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 Pre-1937 Properties
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SEWER RECORD

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