

High Road Weston

Ashwood Homes Ltd

Flood Risk Assessment

MA11414/FRA/R03

August 2021



REVISION

Reference	Revision	Author	Date
MA11414-FRA-R01	Initial Issue	JMcK	11 June 2021
MA11414-FRA-R02	IDB ditch upgrade reference added drainage strategy updated to offline pond	JMcK	14.June 2021
MA11414-FRA-R03	Site layout updated and drainage strategies updated	JMcK	06 Aug 2021

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1. INTRODUCTION

- 1.1 Millward have been appointed to undertake a Flood Risk Assessment (FRA) for a proposed residential development for 68 dwellings at a site to the north of High Road in Weston.
- 1.2 This FRA is undertaken in accordance with the National Planning Policy Framework and associated climate change allowances last updated 22 July 2020.
- 1.3 Environment Agency Data and the South East Lincolnshire SRFA have been reviewed to assist in the assessment of flood risk for the development site.
- 1.4 This FRA discusses and provides both a qualitative assessment and quantitative assessment for the development in terms of flood risk, future flood risk over the anticipated lifetime of the development and reference to the sequential and exception test using a precautionary and risk-based approach.

2 THE SITE

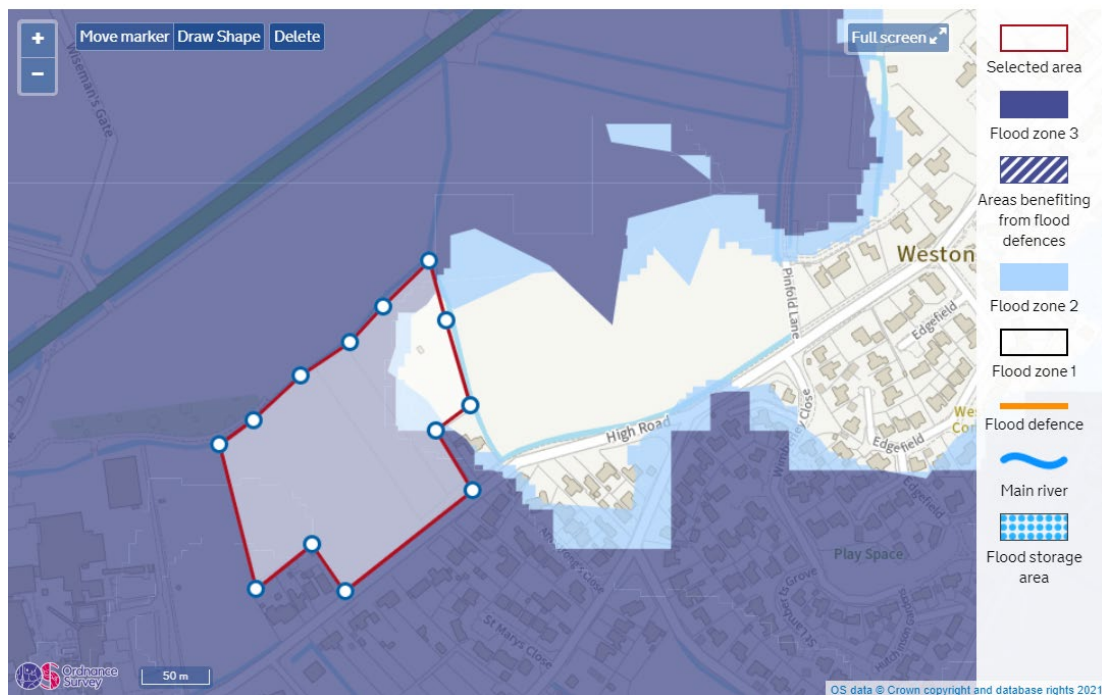
- 2.1 The site is located to the northern extents of the village of Weston. Weston is situated 4 miles north east of Spalding.
- 2.2 The site is currently an open field and classed as Greenfield and is 2.90Ha in area.
- 2.3 Vehicular access will be directly from High Road to the south of the site. An existing watercourse abuts the northern boundary of the site.
- 2.4 Site levels vary between 3.64m AOD to the southern development boundary to circa 2.6m AOD to the north eastern corner of the site.
- 2.5 The development layout is shown on drawing 1253-003 Rev B contained within Appendix A.

3 CONSULTATIONS

3.1 Environment Agency

3.1.1 The Environment Agency national flood risk maps available on their web site have been interrogated firstly to define in terms of planning what flood zone the site is contained within.

3.1.2 The development site is shown to be partially contained within Flood Zone 3 which is defined as High Probability having greater than a 1 in 100 chance (1%) of flooding from rivers in any one year (excluding the presence of flood defences). The flood map for planning is contained within Appendix B.

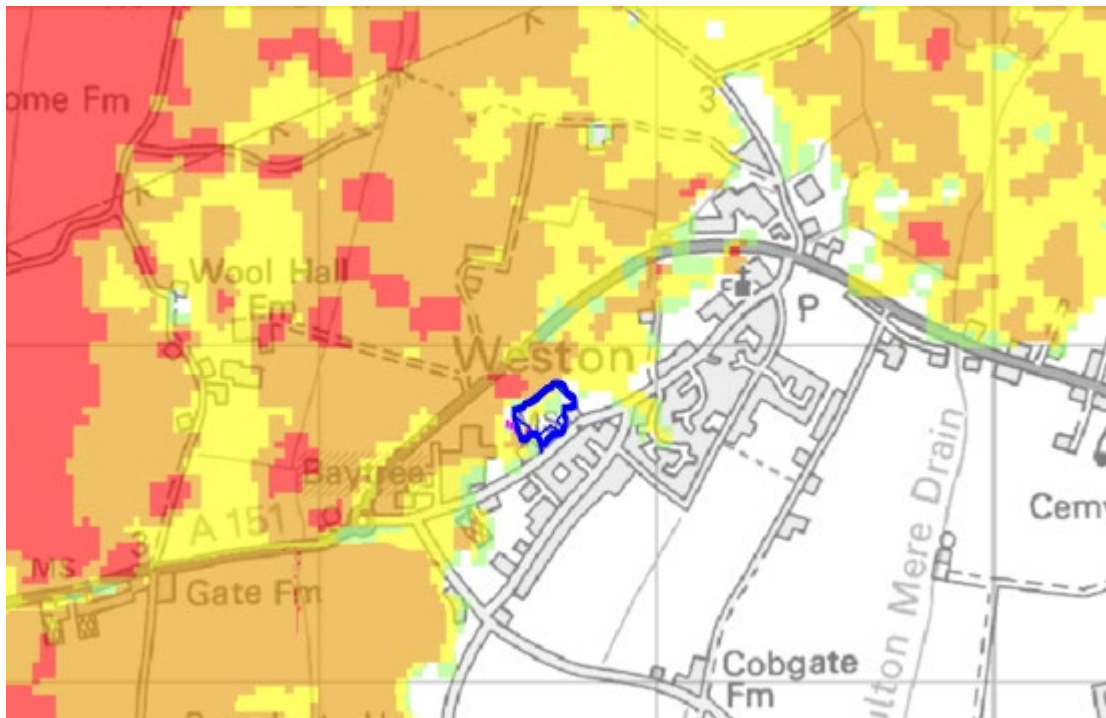


3.1.3 Therefore, the SFRA has been reviewed to assist in the further assessment of flood risk to this area.

3.2 South East Lincolnshire SFRA

3.2.1 In summary, the site lies within an area of flood zone 1,2 and 3. In terms of assessing residual flood risk to this development site, the SFRA hazard mapping has been reviewed to establish what hazard rating the site is contained within.

3.2.2 The SFRA has hazard mapping for the area as shown below;

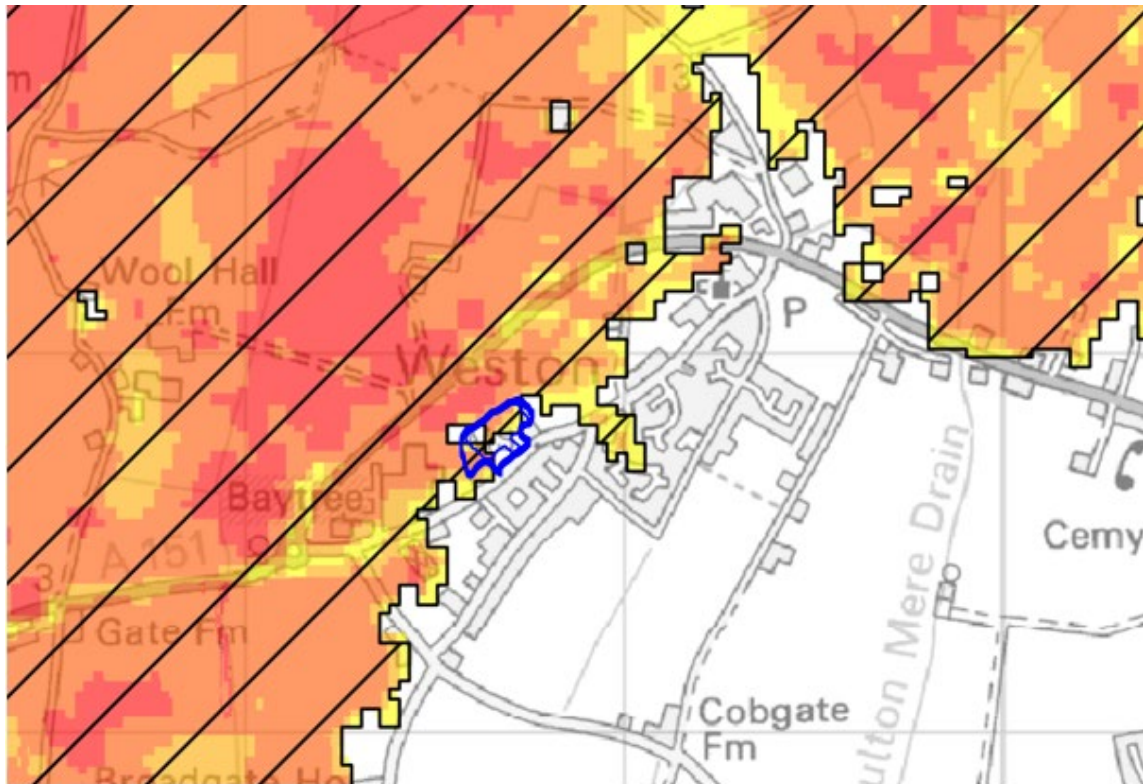


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3.2.3 The above hazard mapping extract shows the development site to be within 'Danger For Some' and 'Low Hazard' Ratings. (Extract from plan Residual Flood Hazard Year 2115 1% Fluvial / 0.5% Tidal Event Probability) February 2017.

3.2.4 The SFRA Appendix C has a matrix for Standing Advice and the development site is classed as 'Danger For Some' and is a Major – more vulnerable use. This matrix confirms that the finished floor levels must be informed by the predicted flood depth maps (year 2115) with single storey proposals must use the 0.1% event 2115 scenario for setting the FFL. Two storey dwellings must use (Depths 0.25 to 0.50m FFL must be set 500mm above ground level with flood resilient construction to a height 300mm above the predicted flood depth. Depths 0 – 0.25 must be set 300mm above ground level.

3.2.5 The extract below is from the SFRA, Residual Peak Depth, Extent of Fluvial and Tidal Domination Year 2115, 1% Fluvial, 0.5% Tidal Event Probability

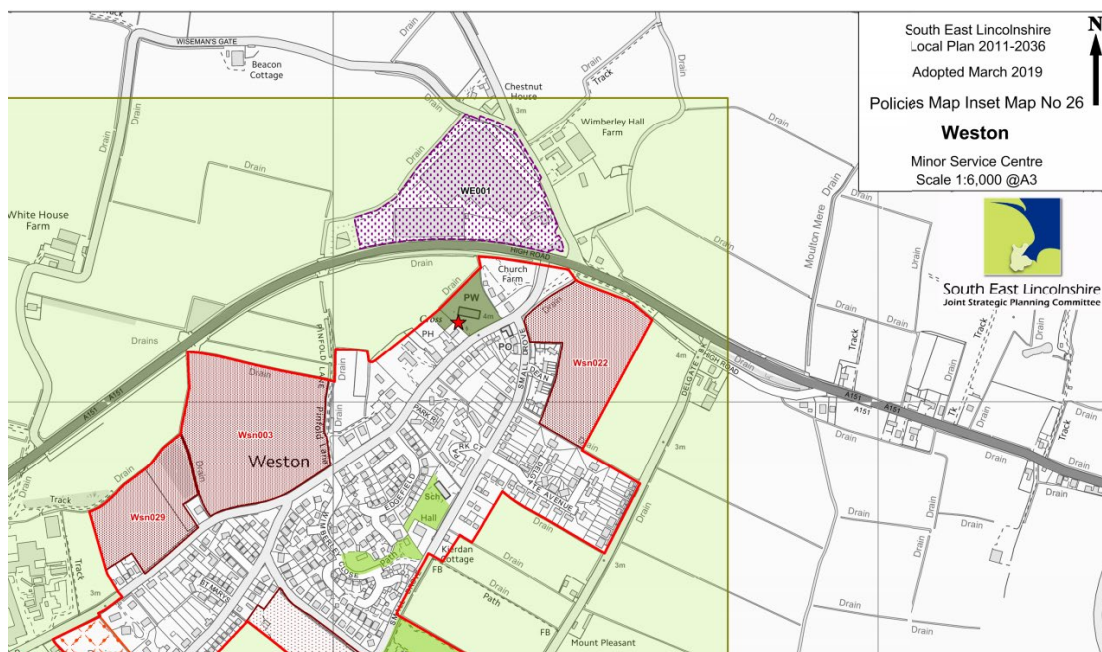


3.2.6 The above extract shows depths 0.25m 0.5m range which the proposed finished floor levels must be set 0.5m above ground level with flood resilient construction 300mm above the predicted flood depth.

4 SEQUENTIAL AND EXCEPTION TESTS

4.1 Sequential Test

- 4.1.1 The site has been assessed in line with the NPPF and the South East Lincolnshire SFRA with regard to assessment of which flood zone the site is contained within.
- 4.1.2 The site is located partially within Flood Zone 3 High Probability
- 4.1.3 The site is identified and allocated for residential development in the local plan Policies Map Inset Map 26 Weston. The reference of the land is Wsn029.



- 4.1.4 As the land is identified as an allocated site in the adopted local plan, it is deemed that the Sequential Test is passed and requires no further assessment in terms of the Sequential Test.

4.2 Exception Test

- 4.2.1 The Exception Test is applied as the development site partially sits within the flood map for planning Flood Zone 3.
- 4.2.2 Mitigation measures applied to this site to pass the exception test are in line with the Environment Agency Standing advice with regards to finished floor levels of the proposed dwellings.

- 4.2.3 The main access to the development site from High Road to the south of the development area is outside the limits of hazard and anticipated flood depths and therefore safe access and egress is available for the development site.
- 4.2.4 With the proposed mitigation measures proposed it is considered that the development is safe and passes the exception test.

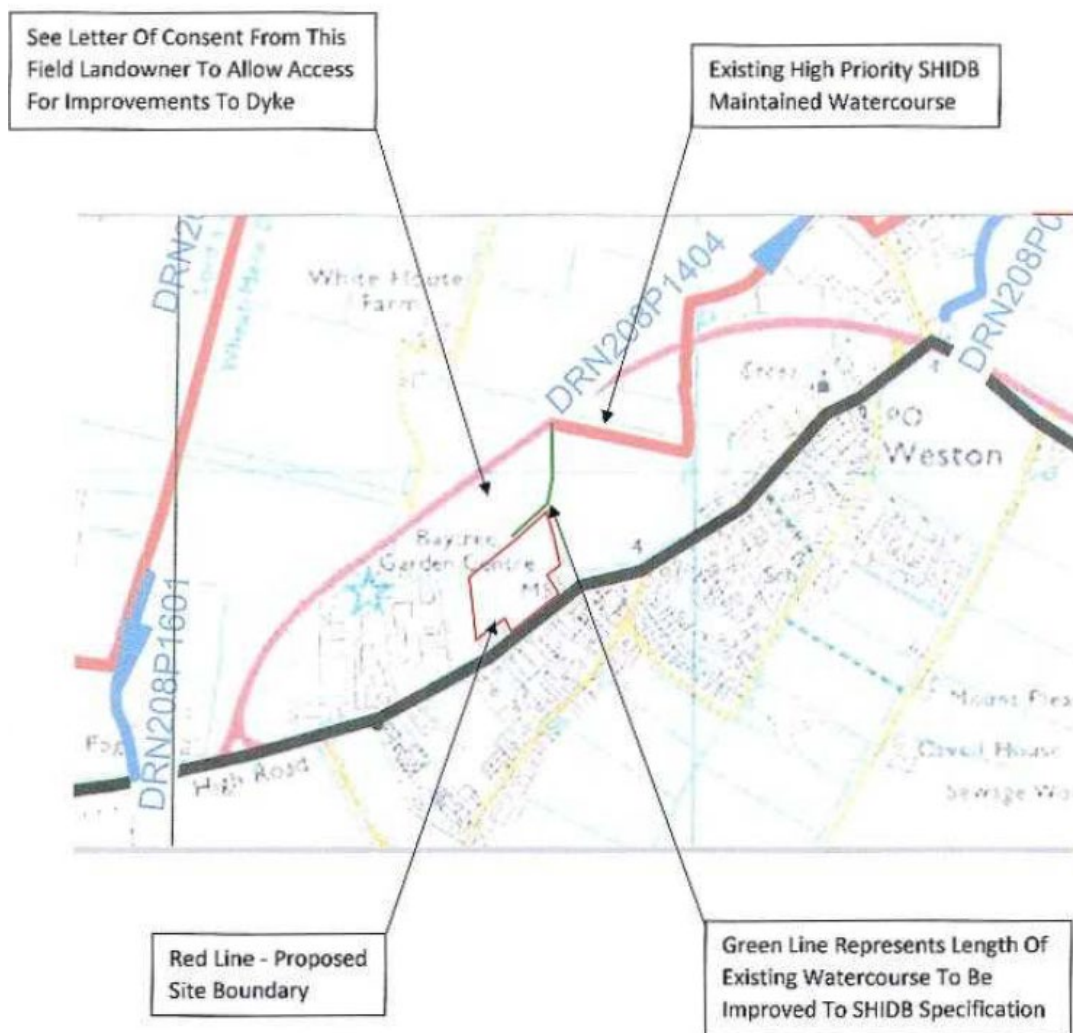
5 PROPOSED DEVELOPMENT

5.1 Summary of proposals

- 5.1.1 The development proposals consist of 68 new dwellings with associated highway, footways, sustainable drainage, attenuation pond and landscaping.
- 5.1.2 The development will increase impermeable areas approximately by 12,720m² (1.272Ha) based upon the site layout contained in Appendix A.
- 5.1.3 The proposals for the development apply the sustainable drainage standards for the adopted highways for the development by utilising a roadside filter strip to collect the water from the adopted highway into an underdrain (filter material and pipework to be adopted and maintained by Anglian Water through a S104 approval process). The carriageway area and the filter drain grass would be adopted and maintained by Lincolnshire County Council through a S38 adoption process.
- 5.1.4 The surface water will be collected via driveway gullies and linear drainage, roof water via down pipes and adopted roads via the filter drains. The surface water is then conveyed to the flow control with an offline attenuation pond where flows are proposed to be restricted to 5 l/s which is the minimum viable discharge rate, or other discharge rate agreed with the Internal Drainage Board. To enable the developments design to comply with adoptable criteria for flow control devices. As the proposed drainage system has an open pond area the minimum diameter outlet spigot for a flow control is 100mm.
- 5.1.5 There is potential for the use of infiltration on this site subject to further testing and groundwater monitoring. Therefore, if feasible soakaways will be utilised for the private roof areas where infiltration rates and offset distances allow. There is also potential for the filter drains to utilise infiltration subject to the necessary testing in accordance with LCC requirements.
- 5.1.6 However, for the purpose of the drainage strategy we have assumed no infiltration to be robust with the flow and attenuation proposals.

5.1.7 As part of the previous drainage strategy for this site drawing MA11414-200B shows the extent of upgrade works to be proposed to the existing watercourse. The existing ditch from the proposed development outfall to the existing SHIDB maintained watercourse is to be upgraded to SHIDB specification and offered for their maintenance.

Proposed Watercourse Improvements Plan



- 5.1.8 Foul drainage will connect into the existing adopted sewer network in High Road at an agreed location with Anglian Water. A pre development enquiry confirms that the approved connection point for this site is to be MH 7701. The original report stated 6601, however after further liaison with Anglian Water MH 7701 was agreed as a suitable connection point.
- 5.1.9 Due to site levels, the foul drainage will require to be pumped from the site to the approved connection point in High Road.
- 5.1.10 Finished floor levels of the development are to be set at 500mm above ground level with 300mm of flood resilient construction as detailed in Section 8.

6 FLOOD RISK

6.1 Flooding From Watercourses

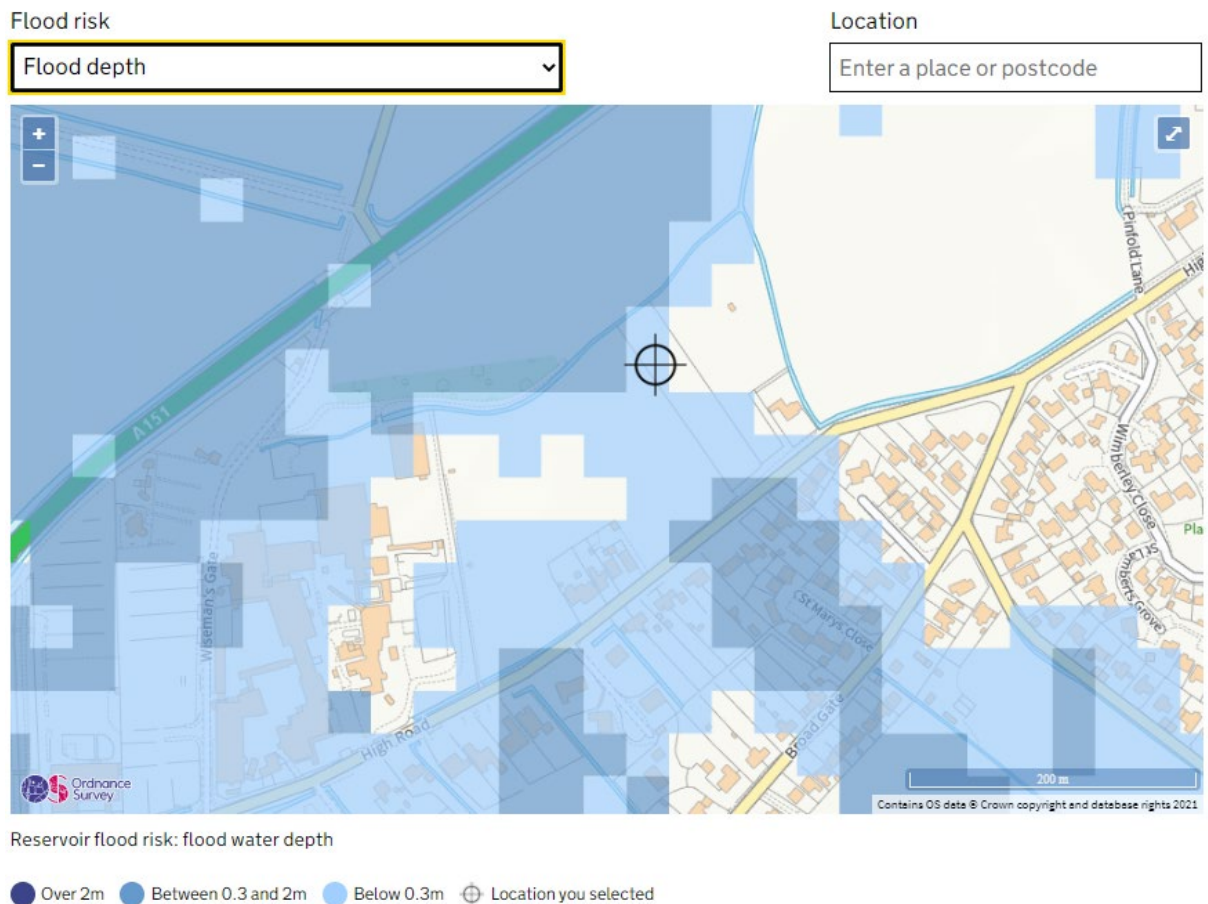
- 6.1.1 The development area is shown within Flood Zone 3 following detailed review of the EA and SFRA maps.
- 6.1.2 As the proposed development location is in the high probability designated flood zone for planning the residual risk is considered **HIGH**.
- 6.1.3 There are mitigation measures proposed which are outlined in Section 7, (including the finished floor levels set 500mm above existing ground level) of this assessment to reduce the residual risk of flooding from this source.

6.2 Flooding from Land / Adjacent Development

- 6.2.1 The main risk of flooding to this site from this source is from adjacent highways and land to the south. High Road surface levels are set generally higher than the site levels. However, the vertical longitudinal alignment of the road falls east to west. Therefore, any overland flow from the carriageway would be contained within the carriageway itself with flood flow routes away from the site. There is a low chance of the water flowing onto the site, but this water would be shallow and velocity slow if it did enter the site.
- 6.2.2 Any overland flow from adjacent land is likely to be shallow and there are no low points proposed within the site which would create a localised depression in the ground which would be at risk of ponding / pooling water from this source.
- 6.2.3 Therefore, the overall the risk of flooding from this source is considered to be **LOW**.

6.3 Flooding From Infrastructure Failure

- 6.3.1 The site is within an area deemed to be at risk of flooding from reservoirs (according to the data on the EA website). This is the maximum extent of flooding.



- 6.3.2 The chances of a reservoir failure are remote, and flood depths below 300mm when compared to existing site levels. As the finished floor levels of the site are to be raised a minimum of 500mm above the existing ground as part of the proposals for the site, the risk of flooding to the site considered **LOW**.

6.4 Flooding From Groundwater

- 6.4.1 There are no confirmed records of groundwater flooding in the vicinity of the site in the SFRA. Groundwater levels could be relatively shallow in this area as its close to a watercourse. However, as site levels are due to be raised the residual risk from flooding from this source is considered **LOW**.

6.5 Flooding From Sewers

- 6.5.1 There are existing adopted sewers in High Road to the south which if they were to flood would initially be constrained within the carriageway areas.
- 6.5.2 If any gullies were to flood, the water flow routes would be along the existing highway and would be considered to be shallow in depth. The flow routes would be away from the proposed development site as described in section 6.2.
- 6.5.3 Overall, the risk of flooding from this source is considered to be **LOW**.

6.6 Flooding From Climate Change

- 6.6.1 The site is within the Anglian river basin district and the development is classed as more vulnerable. The higher central and upper end allowances should be used in accordance with the latest climate change guidance.
- 6.6.2 Using the table 2 in the latest government guidance for climate change for the Anglian river basin district a maximum climate change allowance is 40% for peak rainfall intensity. This would apply to the proposed surface water drainage system.
- 6.6.3 Flooding from watercourses or the sea is already taken into account with the raised finished floor levels of the dwellings based upon the 2115 forecast of flood extents and depth in the South East Lincolnshire SFRA.
- 6.6.4 Overall, the residual risk of flooding from this source is considered to be **LOW** bearing in mind the raised finished floor levels of the proposed dwellings and the proposed surface water drainage designed to accommodate the 1 in 100 year plus 40% climate change events.

6.7 Off-Site Flood Risks

6.7.1 The site proposals increase the impermeable areas within the site; therefore, the proposals for the surface water drainage for the site will be designed to accommodate the 1 in 100 year plus 40% climate change event.

6.7.2 With regard to flood risk to adjacent areas, the residual risk is considered to be **LOW**.

7 MITIGATION MEASURES

7.1 Essential Mitigation Measures

- 7.1.1 The assessment of flood risk in Section 6 of this assessment confirms a **HIGH** risk of flooding from watercourses and / or the sea. All other sources are **LOW** risk.
- 7.1.2 Finished floor levels of the dwellings are to be set 500mm higher than the existing ground level with flood resilient construction 300mm above the anticipated maximum flood level. Where any finished floor levels of dwellings are 800mm or above existing ground then flood resilient measures are not required.
- 7.1.3 Surface water drainage for the site must be designed to accommodate the 1 in 100 year event storm scenarios including a 40% allowance for climate change without any flood waters leaving the development site and no flood waters leave the site boundary.

7.2 Recommended Mitigation Measures

- 7.2.1 All dwellings should have concrete ground floors with damp proof membranes as they are regarded as the most flood resilient floor types with effective connections between the dpc and dpm and shall be constructed to a height of 150mm above the predicted flood level. The dpm should be between the surface screed and the concrete slab as this enables the concrete floor to dry out quickly and would also protect against any rising groundwater should flood risk from this source increase over the lifetime of the development.
- 7.2.2 The site is within the Environment Agency Flood Warning area and the properties should be signed up to this warning service;

<https://www.gov.uk/sign-up-to-flood-warnings>
- 7.2.3 It is recommended that FFL to properties should be above any adjacent roads levels where possible.
- 7.2.4 Where external gradients are flat or towards the dwelling entrances, provision of linear drainage should be provided to the level threshold access points only.

7.2.5 Plaster work at ground floor to be laid with the boarding horizontal which allows for easy replacement at the lower level without excessive breaking out or cutting of plasterboard.

7.3 Safe Access / Egress

7.3.1 The development will have raised levels to accommodate the essential mitigation measure relating to finished floor levels. High Road is outside the extents of any flooding; therefore, it is considered that the development has a safe access and egress.

8 CONCLUSIONS

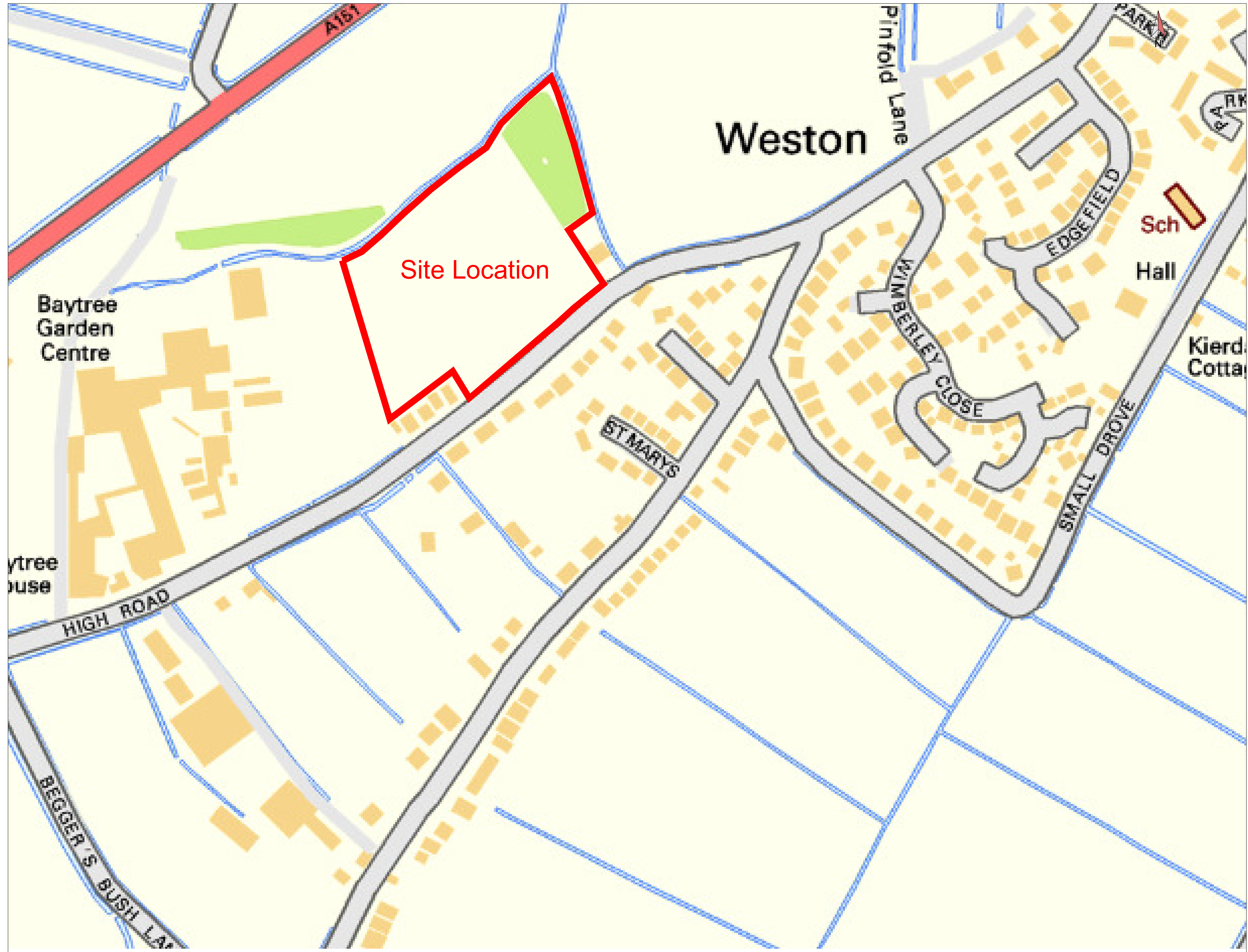
- 8.1 This Flood Risk Assessment serves to review, assess and quantify (where applicable) the sources, or any potential flooding, the pathways of this flooding and potential receptors within the vicinity of the site.
- 8.2 Due to the mitigation measures put in place the assessment of flood risk in Section 7 of this assessment confirms a **HIGH** risk of flooding from Fluvial / Tidal sources. There is a **LOW** risk of flooding from all other sources.
- 8.3 The mitigation measures will provide further protection to the development and reduce any residual risk (however low) as far as practicable. It is recommended that compliance with the recommendations of this FRA are conditioned as part of any planning permission.
- 8.4 This assessment concludes that the site is suitable for development for residential use without unacceptable risk of flooding from all sources to the site itself and elsewhere for the lifetime of the development.

Appendix A – Drawings

MA11414/100A: Site Location Plan

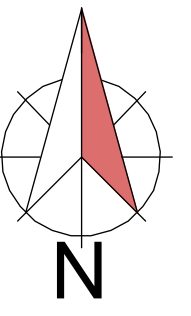
MA11414/200B: Proposed Drainage Strategy

1253-003-RevB: Architects Layout



ASSOCIATED DRAWINGS	
No.	TITLE

NOTES



A	06.08.21	JMcK	Site boundary amended	JMcK
REV	DATE	BY	DETAILS	CHK'D

AMENDMENTS	
CLIENT	

PROJECT

High Road Weston

TITLE																			
Site Location Plan																			
DRAWING No: MA11414-100												DRAWING STATUS PLANNING							
A																			
SCALE NTS				DRAWN JMCK				ENGINEER JMCK											
DATE June 2021				CHECKED JMCK				APPROVED BY JMCK											

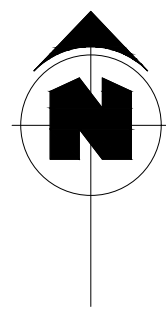
1 Malin Hill, Nottingham, NG1 1JQ.
t: 0115 941 4560
w: www.millward.co.uk
e: info@millward.co.uk


Millward
consulting engineers


Different through Design

528500E

528800E



KEY:

SITE BOUNDARY:

1800mm Facing Brick wall:
(brick to match adjacent property)

Bin Collection Areas:

Front boundaries to High Rd:
900mm Post and rail fence.

Rear boundary wall 1800mm
Facing brick to match adjacent property:

Frontage walls to High Road:
900mm facing brick:

Affordable Housing
Affordable Rent:

Shared Ownership:

SCHEDULE:

Unit	Beds	Storey	SqFt	Parking	No
Market					
Dee	2	2	732	ps	8
Clyde	3	2	783	sg	2
Aire	3	2	870	sg	2
Avon	3	2	910	sg	4
Nene	3	2	1,077	sg	4
Mere	3	2	1,079	sg	7
Lock	3	2	1,079	sg	12
Ribble	4	2	1,283	dg	2
Severn	4	2	1,339	sig	2
Stamford	4	2	1,546	dg	2
Tay	4	2	1,770	dg	4
Ouse	4	2	1,814	dg	2
Sub-Total					51
Affordable Housing 25%					
A516	1	2	516	ps	4
A732	2	2	732	ps	10
A902	3	2	902	ps	3
Sub-Total					17
Total					68

REVISIONS:

Rev A: Survey data added, easement lines adjusted. 11.5.21

Rev B: Affordable provision adjusted, frontage plots added. 19.7.21

NKW DESIGN

41 York Road
Widlington
Hampshire
NG27 7SG
Tel: 01462 444130
Email: info@nkwdesign.co.uk

PROJECT HIGH ROAD, WESTON SPALDING

TITLE PRELIMINARY PLANNING LAYOUT

CLIENT
ASHWOOD HOMES
1 GADSDEN ROAD, LINCS GATEWAY BUSINESS PARK
SPALDING, LINCOLNSHIRE
PE12 6 FY 01406 490590

SCALE 1:500 @ A1 DATE APRIL 2021 DRAWN NKW
DRAWING NUMBER 1253-003 REVISION B

Appendix B – Consultations

Environment Agency Flood Map For Planning Anglian Water Pre Development Enquiry Report

Flood map for planning

Your reference
MA11414

Location (easting/northing)
528655/324814

Created
5 Aug 2021 17:01

Your selected location is in flood zone 3, an area with a high probability of flooding.

This means:

- you must complete a flood risk assessment for development in this area
- you should follow the Environment Agency's standing advice for carrying out a flood risk assessment (see www.gov.uk/guidance/flood-risk-assessment-standing-advice)

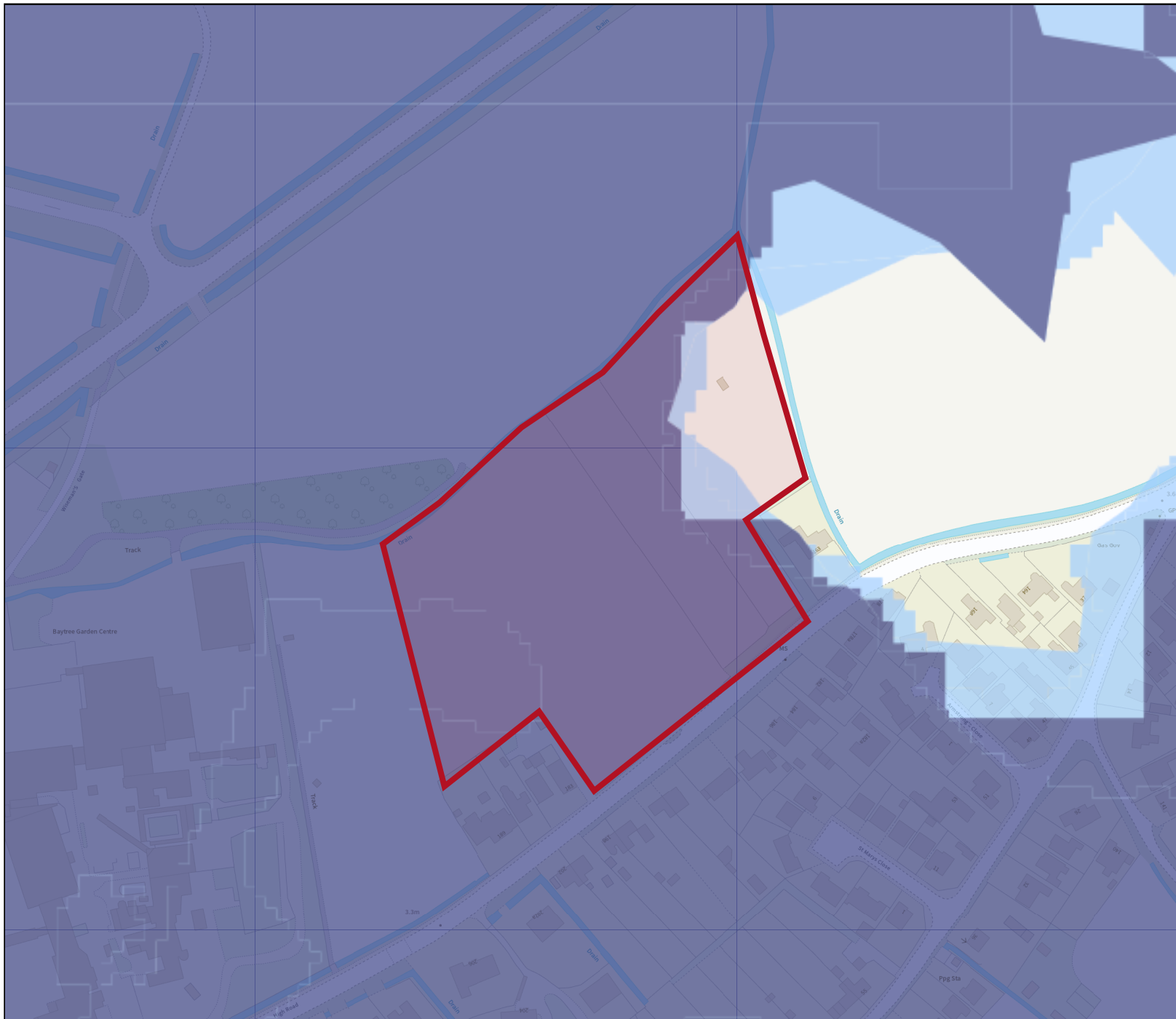
Notes

The flood map for planning shows river and sea flooding data only. It doesn't include other sources of flooding. It is for use in development planning and flood risk assessments.

This information relates to the selected location and is not specific to any property within it. The map is updated regularly and is correct at the time of printing.

Flood risk data is covered by the Open Government Licence which sets out the terms and conditions for using government data. <https://www.nationalarchives.gov.uk/doc/open-government-licence/version/3/>

Use of the address and mapping data is subject to Ordnance Survey public viewing terms under Crown copyright and database rights 2021 OS 100024198. <https://flood-map-for-planning.service.gov.uk/os-terms>



Flood map for planning

Your reference
MA11414

Location (easting/northing)
528655/324814

Scale
1:2500

Created
5 Aug 2021 17:01

-  Selected area
-  Flood zone 3
-  Flood zone 3: areas benefitting from flood defences
-  Flood zone 2
-  Flood zone 1
-  Flood defence
-  Main river
-  Flood storage area

0 20 40 60m



Pre-Planning Assessment Report

High Road Weston

InFlow Reference: PPE-0123071

Assessment Type: Water

Report published: 07/06/2021



Thank you for submitting a pre-planning enquiry.

This has been produced for Millward.

Your reference number is **PPE-0123071**.

If you have any questions upon receipt of this report, you can submit a further question via InFlow. Alternatively, please contact the Planning & Capacity team on **07929 786 955** or email planningliaison@anglianwater.co.uk

Section 1 - Proposed development

The response within this report has been based on the following information which was submitted as part of your application:

List of planned developments	
Type of development	No. Of units
Dwellings	60

The anticipated residential build rate is:

Year	Y1	Y2
Build rate	50	10

Development type: Greenfield
Planning application status: Unknown
Site grid reference number: TF2865324812

The comments contained within this report relate to the public water mains and sewers indicated on our records. Your attention is drawn to the disclaimer in the useful information section of this report.

Section 2 - Assets affected

Our records indicate that we have the following types of assets within or overlapping the boundary of your development site as listed in the table below.

Additionally, it is highly recommended that you carry out a thorough investigation of your proposed working area to establish whether any unmapped public or private sewers and lateral drains are in existence. We are unable to permit development either over or within the easement strip without our prior consent. The extent of the easement is provided in the table below. Please be aware that the existing water mains/public sewers should be located in highway or open space and not in private gardens. This is to ensure available access for any future maintenance and repair and this should be taken into consideration when planning your site layout.

Water and Used water easement information		
Asset type	Pipe size (mm)	Total easement required (m)
Water mains	234	6.00 m either side of the centre line

If it is not possible to avoid our assets then these may need to be diverted in accordance with Section 185 of the Water Industry Act (1991). You will need to make a formal application if you would like a diversion to be considered.

Due to the private sewer transfer in October 2011 many newly adopted public used water assets and their history are not indicated on our records. You also need to be aware that your development site may contain private water mains, drains or other assets not shown on our records. These are private assets and not the responsibility of Anglian Water but that of the landowner.

Section 3 - Water supply

In examining the available capacity for your development site we assess the capacity and costs for two categories of water main. These are:

Strategic

Offsite potable water mains which deliver water within an area to a large number of development sites often across a number of towns. The strategic provision of these water mains enables us to provide the cheapest solution across a large geographical area.

Local reinforcement

Localised reinforcement mains to enable us to provide water to your development site. On most sites we also have two categories of water mains the Spine Mains and Housing Estate Mains (HEMs). To support your budgeting arrangements we have also examined the estimated cost for delivering the onsite water mains needed for a site of your size.

Water supply network

The water supply to the proposed development site can be provided from the existing mains. Anglian Water cannot reserve capacity and therefore you are recommended to formally apply for a connection at your earliest convenience. Please note that available capacity in our network can be reduced at any time due to increased requirements from existing businesses and houses as well as from new housing and new commercial developments.

Connection point(s)

Connection Point	Address	National Grid Reference (NGR)
CP-4056	High Road	TF2870724731

Water infrastructure and costs

Your development site will be required to pay an **infrastructure charge** for each new property connecting to the public water network that benefits from Full planning permission. The infrastructure charge replaces the zonal charge as previously identified.

You will be required to pay an infrastructure charge upon connection for each new plot on your development site. The infrastructure charge are types of charges set out in Section 146(2) of the Water Industry Act 1991

The charge should be paid by anyone who wishes to build or develop a property and is payable upon request of connection.

Payment of the infrastructure charge must be made before premises are connected to the water network.

Infrastructure charge for water	
Anglian Water supply	£ 342.00

The **infrastructure discount** is a new element, introduced to reflect the changes in Ofwat's charging rules.

The discount is £402.00 for each connection to the water supply network in the Anglian Water area. The discount is only applicable to water connections and not sewer connections.

Due to the changes in the charging rules, any discount must now be applied to the infrastructure charge rather than the requisition charge. This has provided us the opportunity to offer the discount (via the infrastructure charge) not just to water main requisitioners, but to those seeking water connections too.

Infrastructure charges are raised on a standard basis of one charge per new connection (one for water and one for sewerage). However, if the new connection is to non-household premises, the Infrastructure charges is calculated according to the number and type of water fittings in the premises. This is called the "relevant multiplier" method of calculating the charge.

Details of the relevant multiplier for each fitting can be found at our [website](#).

The Water Infrastructure charge for your dwellings is:

Infrastructure charge	Number of units	Total
£ 342.00	60	£ 20520.00

The Infrastructure discount for your dwellings is:

Infrastructure discount	Number of units	Total
-£ 402.00	60	-£ 24120.00

The estimated cost for the onsite water main for your development is:

Onsite water main	£
Estimated cost of delivery	£ 36,000.00

Please note, a detailed cost breakdown will be provided on receipt of a formal application for a new water main.

Alternatively, you may wish to have the onsite main delivered by a Self-lay Provider under terms set out in a self-lay agreement.

For more information on water mains and self-lay of water mains, please visit our [website](#)

Section 4 - Map of Proposed Connection Points



Figure 1: Showing your water point of connection

Section 5 - Useful information

Water Industry Act – Key water sections

Section 41:

This provides you with the right to requisition a new water main for domestic purposes to connect your site to the public water network.

Section 45:

This provides you with the right to have a connection for domestic purposes from a building or part of a building to the public water main.

Section 51A - E:

This provides you with the right to provide the water main or service connection yourself and for us to vest them into our company.

Section 55:

This applies where you request a supply of water for non-domestic purposes.

Section 185:

This provides you with the right to make a reasonable request to have a public water main, sewer or public lateral drain removed or altered, at your expense.

Details on how you can make a formal application for a new water main, new connection or diversion are available on from our Development Services team on **0345 60 66 087** or via our [website](#)

If you have any other queries on the rights to requisition or connect your housing to the public water and sewerage infrastructure then please contact our Development Services team at:

Anglian Water
PO Box 495
Huntingdon
PE29 6YY

Telephone: 0345 60 66 087

Email: developmentsservices@anglianwater.co.uk

Water pressure and flow rate

The water pressure and consistency that we must meet for your site is laid out in the Water Industry Act (1991). This states that we must supply a flow rate of 9 litres per minute at a pressure of 10 metres of head to the external stop tap. If your water pressure requirements exceed this then you will need to provide and maintain any booster requirements to the development site.

Self-lay of water mains

A list of accredited self-lay provider organisations can be found on the Lloyds Registrar [website](#)

Locating our assets

Maps detailing the location of our water and used water infrastructure including both underground assets and above ground assets such as pumping stations and recycling centres are available from [digdat](#)

All requests from members of the public or non-statutory bodies for maps showing the location of our assets will be subject to an appropriate administrative charge.

We have more information on our [website](#)

Charging arrangements

Our charging arrangements and summary for this year's water and used water connection and infrastructure charges can be found on our [website](#)

Section 6 - Disclaimer

The information provided in this report is based on data currently held by Anglian Water Services Limited ('Anglian Water') or provided by a third party. Accordingly, the information in this report is provided with no guarantee of accuracy, timeliness, completeness and is without indemnity or warranty of any kind (express or implied).

This report should not be considered in isolation and does not nullify the need for the enquirer to make additional appropriate searches, inspections and enquiries. Anglian Water supports the plan led approach to sustainable development that is set out in the National Planning Policy Framework ('NPPF') and any infrastructure needs identified in this report must be considered in the context of current, adopted and/or emerging local plans. Where local plans are absent, silent or have expired these needs should be considered against the definition of sustainability holistically as set out in the NPPF.

Whilst the information in this report is based on the presumption that proposed development obtains planning permission, nothing in this report confirms that planning permission will be granted or that Anglian Water will be bound to carry out the works/proposals contained within this report.

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This report is valid for the date printed and the enquirer is advised to resubmit their request for an up to date report should there be a delay in submitting any subsequent application for water supply/sewer connection(s).



PPE-0122682

Pre-Planning Enquiry

LOS date 08/06/2021

Status of Application

Response Completed

- ✓ APPLICATION

 - ✓ Application Draft
 - ✓ Application Submitted
- ✓ VERIFICATION

 - ✓ Verification In-Progress
- ✓ ASSESSMENT

 - ✓ Assessment In-Progress
 - Complex
 - ✓ Assessment Completed
- ✓ REPORTING

 - ✓ Report Published
- ✓ FURTHER QUESTIONS

 - ✓ Query Raised
 - ✓ Query Acknowledged
 - ✓ Response Inprogress
 - ✓ Response Completed

HIDE DETAILS

- Application
- Report
- Further Question

- Contact
- Message
- Attachments
- History

Please select a category which best suits your question
Enquiry Type

-Select-

Upload supporting documents

Additional Document (Optional)

UPLOAD

SUBMIT

Further Questions List

Further Question no 1

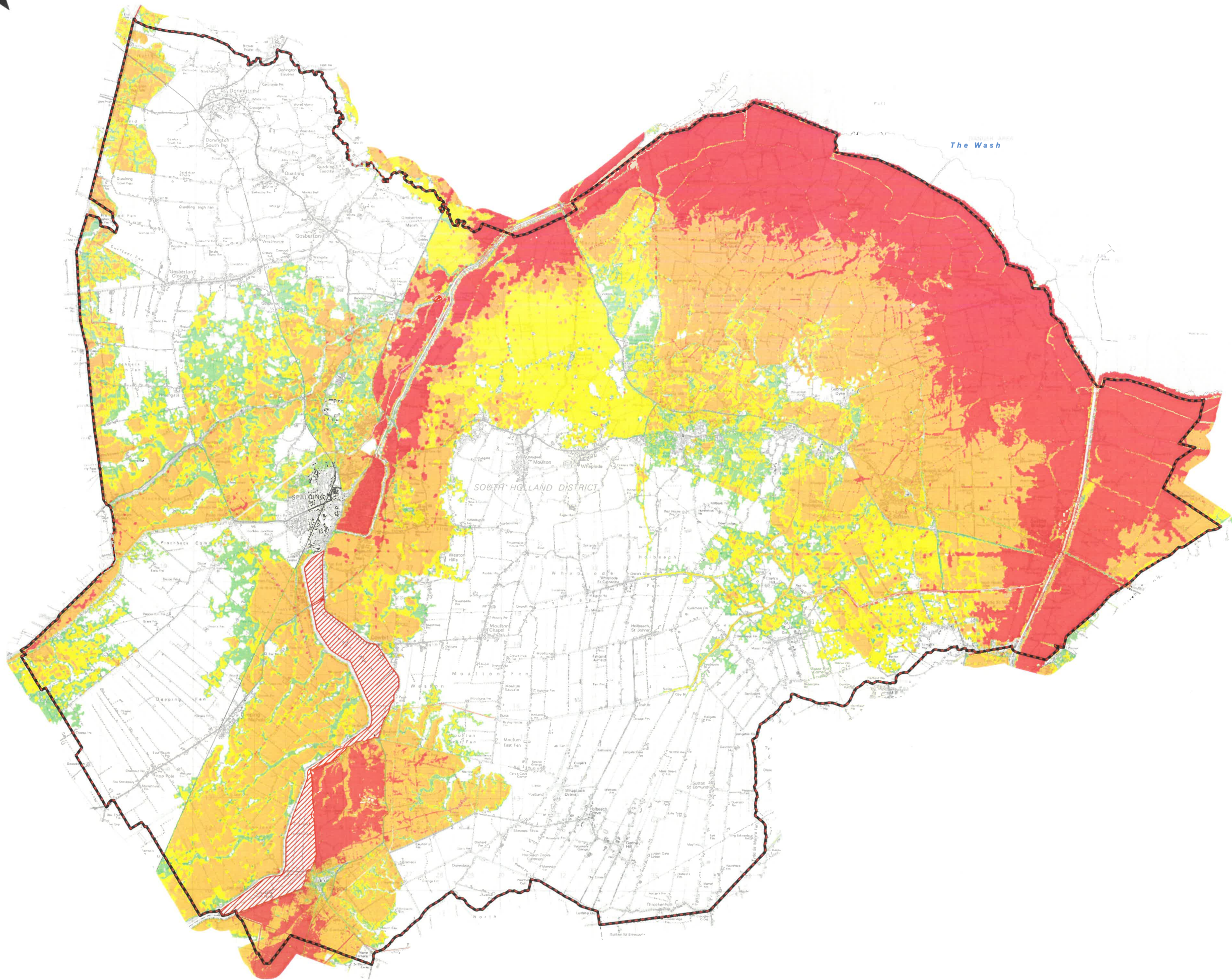
LOS date 03 Jun 2021

Enquiry Type	Used Water Category	Additional Document
Used Water	Point of connection	Developer Request Jason McKellar , 5/27/2021 11:03:06 AM Used Water Query Can the engineers review manhole 7701 as a point of connection for this development rather then 6601 in the report? Response Good afternoon Jason Connection can be made at Manhole 7701 rather than 6601 as requested. Please don't hesitate to contact us should you have any further queries. kind regards



Appendix C – South East Lincolnshire SFRA

Plan Extracts



- NOTES**
1. The potential flooding consequences shown on this map primarily relate to flooding from the sea and main rivers taking into account the presence of current flood risk management measures such as flood defences.
 2. This update only included new flood risk information from River Welland (Fluvial), River Glen (Fluvial) and Tidal hazard mapping (River Welland, River Nene and the Wash sea defences). No new information from the Internal Drainage Boards and associated systems was used for this update.
 3. In addition to the potential flood extents shown on this map, there may be shallow flooding in low-lying rural areas
 4. The consequences designated as being a Residual Risk arise from direct overtopping of defences, where this would occur, together with breach failure which is assumed could occur at any point along the defences.
 5. Functional Floodplain encompasses areas where water is intended to flow or be stored in times of flood.
 6. Land outside South Holland District is not considered.
 7. This map shows the extents only of the flooding probability bands relevant to the map title

Map Legend

Max Hazard
(Flood Risk to People : FD2320)

- Less than 0.75 (Low Hazard)
- Between 0.75 and 1.25 (Danger for Some)
- Between 1.25 and 2.0 (Danger for Most)
- Greater than 2.0 (Danger for All)

Functional Floodplain

South Holland District Boundary

REV	DATE	REMARKS
2	Feb 17	Modelling and Mapping Update
1	Dec 16	Modelling and Mapping Update

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SOUTH HOLLAND DISTRICT COUNCIL
COUNCIL OFFICES
PRIORY ROAD
SPALDING
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PE11 2XE

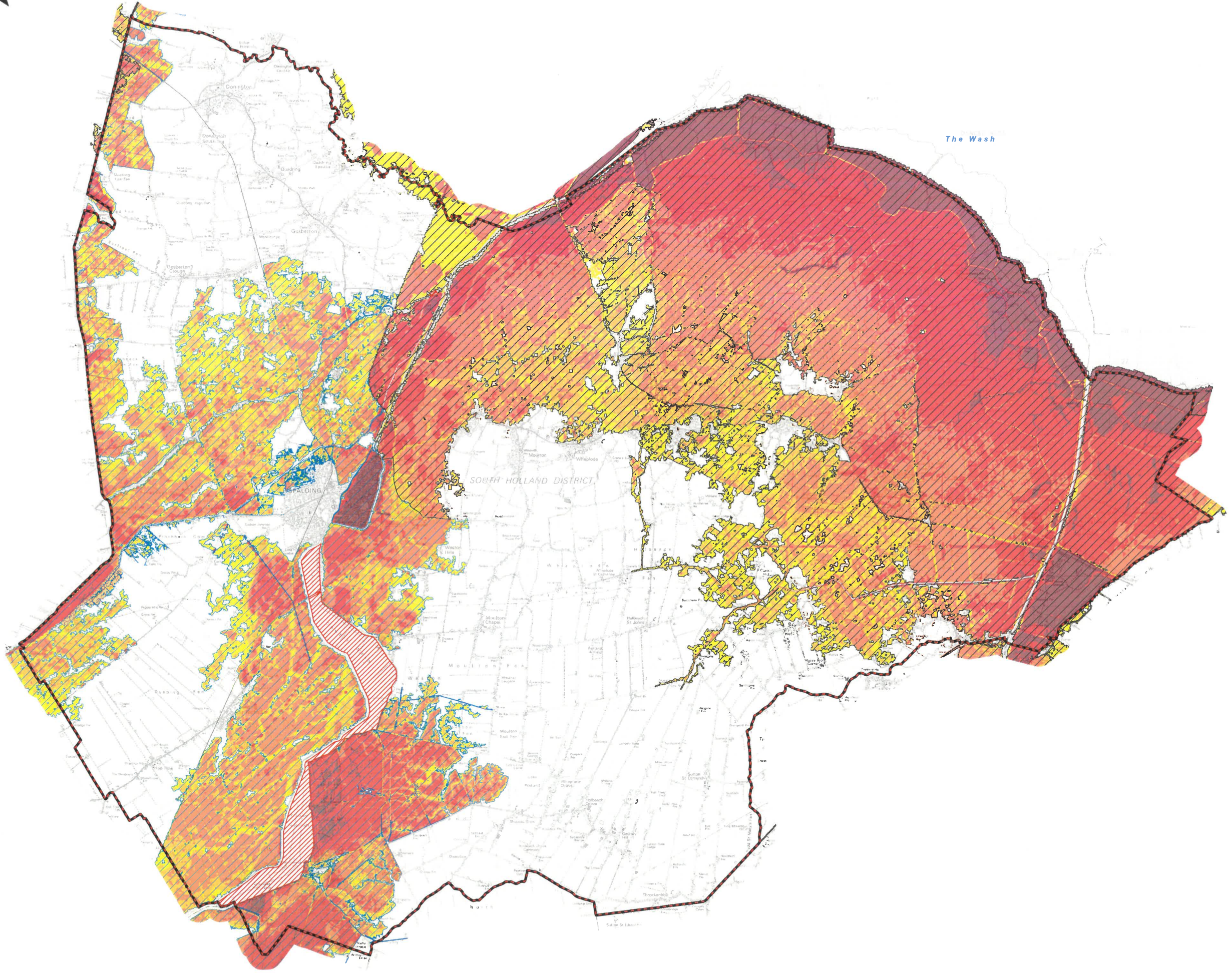
**UPDATE OF STRATEGIC
FLOOD RISK ASSESSMENT**

**Residual Flood Hazard
District - Year 2115**

1% Fluvial / 0.5% Tidal Event Probability

DATE OF ISSUE: Feb 2017 REV NO: 2

SCALE: 1 : 60,000 @ A1 MAP NO:



- NOTES**
1. The potential flooding consequences shown on this map primarily relate to flooding from the sea and main rivers taking into account the presence of current flood risk management measures such as flood defences.
 2. This update only included new flood risk information from River Welland (Fluvial), River Glen (Fluvial) and Tidal hazard mapping (River Welland, River Nene and the Wash sea defences). No new information from the Internal Drainage Boards and associated systems was used for this update.
 3. In addition to the potential flood extents shown on this map, there may be shallow flooding in low-lying rural areas
 4. The consequences designated as being a Residual Risk arise from direct overtopping of defences, where this would occur, together with breach failure which is assumed could occur at any point along the defences.
 5. Functional Floodplain encompasses areas where water is intended to flow or be stored in times of flood.
 6. Land outside South Holland District is not considered.
 7. This map shows the extents only of the flooding probability bands relevant to the map title

Map Legend

Peak Depth

- 0m - 0.25m
- 0.25m - 0.5m
- 0.5m - 1m
- 1m - 2m
- 2m +

Fluvially dominated extent

Tidally dominated extent

Functional Floodplain

South Holland District Boundary

2	Feb 17	Modelling and Mapping Update
1	Dec 16	Modelling and Mapping Update
REV	DATE	REMARKS

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COUNCIL OFFICES
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**UPDATE OF STRATEGIC
FLOOD RISK ASSESSMENT**
Residual Peak Depth
Extent of Fluvial and Tidal Domination
District - Year 2115
1% Fluvial / 0.5% Tidal Event Probability

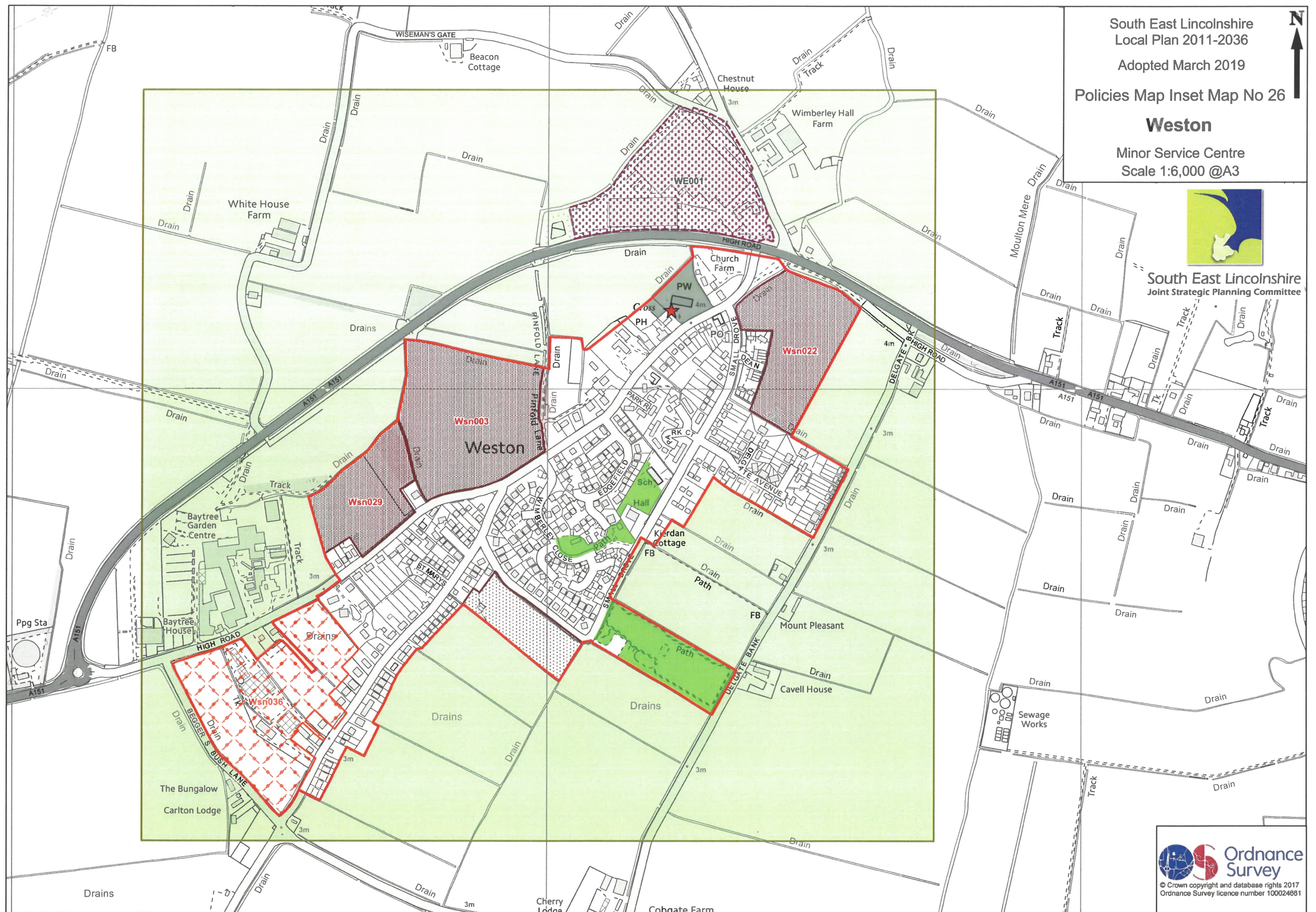
DATE OF ISSUE: Feb 2017	REV NO: 2
SCALE: 1 : 60,000 @ A1	MAP NO:

Weston

Minor Service Centre
Scale 1:6,000 @A3



South East Lincolnshire
Joint Strategic Planning Committee



Appendix D – Calculations

Preliminary hydraulic model

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XP Solutions	Network 2017.1.2	

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm

Pipe Sizes STANDARD Manhole Sizes STANDARD

FSR Rainfall Model - England and Wales

Return Period (years)	2	PIMP (%)	100
M5-60 (mm)	19.000	Add Flow / Climate Change (%)	6
Ratio R	0.400	Minimum Backdrop Height (m)	0.000
Maximum Rainfall (mm/hr)	0	Maximum Backdrop Height (m)	20.000
Maximum Time of Concentration (mins)	30	Min Design Depth for Optimisation (m)	1.200
Foul Sewage (l/s/ha)	0.000	Min Vel for Auto Design only (m/s)	1.00
Volumetric Runoff Coeff.	0.750	Min Slope for Optimisation (1:X)	500

Designed with Level Soffits

Time Area Diagram for Storm

Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.481	4-8	0.756	8-12	0.035

Total Area Contributing (ha) = 1.272

Total Pipe Volume (m³) = 100.023

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S1.000	40.390	0.081	498.6	0.151	5.00	0.0	0.600	o	600	Pipe/Conduit	
S1.001	11.912	0.024	496.3	0.029	0.00	0.0	0.600	o	600	Pipe/Conduit	
S1.002	21.350	0.043	496.5	0.053	0.00	0.0	0.600	o	600	Pipe/Conduit	
S1.003	24.670	0.050	493.4	0.099	0.00	0.0	0.600	o	600	Pipe/Conduit	
S2.000	36.142	0.073	495.1	0.283	5.00	0.0	0.600	o	600	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	I.Area (ha)	Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S1.000	0.00	5.62	1.695	0.151	0.0	0.0	0.0	1.08	306.4	0.0
S1.001	0.00	5.80	1.614	0.180	0.0	0.0	0.0	1.09	307.1	0.0
S1.002	0.00	6.13	1.590	0.232	0.0	0.0	0.0	1.09	307.1	0.0
S1.003	0.00	6.51	1.547	0.331	0.0	0.0	0.0	1.09	308.0	0.0
S2.000	0.00	5.55	1.570	0.283	0.0	0.0	0.0	1.09	307.5	0.0

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XP Solutions	Network 2017.1.2	

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S1.004	24.352	0.049	497.0	0.049	0.00	0.0	0.600	o	600	Pipe/Conduit	
S1.005	9.144	0.019	481.3	0.029	0.00	0.0	0.600	o	600	Pipe/Conduit	
S1.006	44.040	0.089	494.8	0.104	0.00	0.0	0.600	o	600	Pipe/Conduit	
S1.007	7.161	0.015	477.4	0.043	0.00	0.0	0.600	o	600	Pipe/Conduit	
S3.000	15.371	0.255	60.3	0.052	5.00	0.0	0.600	o	225	Pipe/Conduit	
S3.001	4.603	0.105	44.0	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
S4.000	34.365	0.405	84.9	0.064	5.00	0.0	0.600	o	225	Pipe/Conduit	
S3.002	13.074	0.027	484.2	0.014	0.00	0.0	0.600	o	600	Pipe/Conduit	
S3.003	21.346	0.043	496.4	0.036	0.00	0.0	0.600	o	600	Pipe/Conduit	
S1.008	29.190	0.059	494.7	0.108	0.00	0.0	0.600	o	600	Pipe/Conduit	
S1.009	12.026	0.028	429.5	0.000	0.00	0.0	0.600	o	600	Pipe/Conduit	
S5.000	16.028	0.033	485.7	0.064	5.00	0.0	0.600	o	600	Pipe/Conduit	
S1.010	22.031	0.103	213.0	0.030	0.00	0.0	0.600	o	600	Pipe/Conduit	
S6.000	10.051	0.065	154.0	0.000	5.00	0.0	0.600	o	600	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S1.004	0.00	6.88	1.497	0.663	0.0	0.0	0.0	1.09	306.9	0.0
S1.005	0.00	7.02	1.448	0.691	0.0	0.0	0.0	1.10	312.0	0.0
S1.006	0.00	7.70	1.429	0.796	0.0	0.0	0.0	1.09	307.6	0.0
S1.007	0.00	7.80	1.340	0.839	0.0	0.0	0.0	1.11	313.2	0.0
S3.000	0.00	5.15	2.130	0.052	0.0	0.0	0.0	1.69	67.1	0.0
S3.001	0.00	5.19	1.875	0.052	0.0	0.0	0.0	1.98	78.6	0.0
S4.000	0.00	5.40	2.175	0.064	0.0	0.0	0.0	1.42	56.5	0.0
S3.002	0.00	5.60	1.395	0.131	0.0	0.0	0.0	1.10	311.0	0.0
S3.003	0.00	5.93	1.368	0.166	0.0	0.0	0.0	1.09	307.1	0.0
S1.008	0.00	8.25	1.325	1.114	0.0	0.0	0.0	1.09	307.6	0.0
S1.009	0.00	8.42	1.266	1.114	0.0	0.0	0.0	1.17	330.4	0.0
S5.000	0.00	5.24	1.271	0.064	0.0	0.0	0.0	1.10	310.5	0.0
S1.010	0.00	8.64	1.238	1.208	0.0	0.0	0.0	1.66	470.7	0.0
S6.000	0.00	5.09	1.200	0.000	0.0	0.0	0.0	1.96	554.2	0.0

MA11414
Weston 68 Plots
Drainage Strategy Planning B

Designed by JMcK
Checked by



Network 2017.1.2

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S1.011	22.828	0.134	170.0	0.063	0.00	0.0	0.600	o	225	Pipe/Conduit	

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S1.011	0.00	9.02	1.135	1.272	0.0	0.0	0.0	1.00	39.8	0.0

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Manhole Schedules for Storm

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam., L*W (mm)	PN	Pipe Out Invert Level (m)	Diameter (mm)	PN	Pipes In Invert Level (m)	Diameter (mm)	Backdrop (mm)
S1	3.800	2.105	Open Manhole	1500	S1.000	1.695	600				
S2	3.750	2.136	Open Manhole	1500	S1.001	1.614	600	S1.000	1.614	600	
S3	3.700	2.110	Open Manhole	1500	S1.002	1.590	600	S1.001	1.590	600	
S4	3.700	2.153	Open Manhole	1500	S1.003	1.547	600	S1.002	1.547	600	
S5	3.800	2.230	Open Manhole	1500	S2.000	1.570	600				
S6	3.600	2.103	Open Manhole	1500	S1.004	1.497	600	S1.003	1.497	600	
								S2.000	1.497	600	
S7	3.600	2.152	Open Manhole	1500	S1.005	1.448	600	S1.004	1.448	600	
S8	3.530	2.101	Open Manhole	1500	S1.006	1.429	600	S1.005	1.429	600	
S9	3.500	2.160	Open Manhole	1500	S1.007	1.340	600	S1.006	1.340	600	
S10	3.650	1.520	Open Manhole	1200	S3.000	2.130	225				
S11	3.600	1.725	Open Manhole	1200	S3.001	1.875	225	S3.000	1.875	225	
S12	3.900	1.725	Open Manhole	1200	S4.000	2.175	225				
S13	3.800	2.405	Open Manhole	1500	S3.002	1.395	600	S3.001	1.770	225	
								S4.000	1.770	225	
S14	3.500	2.132	Open Manhole	1500	S3.003	1.368	600	S3.002	1.368	600	
S15	3.430	2.105	Open Manhole	1500	S1.008	1.325	600	S1.007	1.325	600	
								S3.003	1.325	600	
S16	3.400	2.134	Open Manhole	1500	S1.009	1.266	600	S1.008	1.266	600	
S17	3.380	2.109	Open Manhole	1500	S5.000	1.271	600				
S18	3.350	2.112	Open Manhole	1500	S1.010	1.238	600	S1.009	1.238	600	
								S5.000	1.238	600	
S19	3.200	2.000	Open Manhole	1500	S6.000	1.200	600				
S20	3.380	2.245	Open Manhole	1500	S1.011	1.135	225	S1.010	1.135	600	
								S6.000	1.135	600	
S21	2.600	1.600	Open Manhole	0		OUTFALL		S1.011	1.000	225	

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PIPELINE SCHEDULES for Storm

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S1.000	o	600	S1	3.800	1.695	1.505	Open Manhole	1500
S1.001	o	600	S2	3.750	1.614	1.536	Open Manhole	1500
S1.002	o	600	S3	3.700	1.590	1.510	Open Manhole	1500
S1.003	o	600	S4	3.700	1.547	1.553	Open Manhole	1500
S2.000	o	600	S5	3.800	1.570	1.630	Open Manhole	1500
S1.004	o	600	S6	3.600	1.497	1.503	Open Manhole	1500
S1.005	o	600	S7	3.600	1.448	1.552	Open Manhole	1500
S1.006	o	600	S8	3.530	1.429	1.501	Open Manhole	1500
S1.007	o	600	S9	3.500	1.340	1.560	Open Manhole	1500
S3.000	o	225	S10	3.650	2.130	1.295	Open Manhole	1200
S3.001	o	225	S11	3.600	1.875	1.500	Open Manhole	1200
S4.000	o	225	S12	3.900	2.175	1.500	Open Manhole	1200
S3.002	o	600	S13	3.800	1.395	1.805	Open Manhole	1500
S3.003	o	600	S14	3.500	1.368	1.532	Open Manhole	1500
S1.008	o	600	S15	3.430	1.325	1.505	Open Manhole	1500

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S1.000	40.390	498.6	S2	3.750	1.614	1.536	Open Manhole	1500
S1.001	11.912	496.3	S3	3.700	1.590	1.510	Open Manhole	1500
S1.002	21.350	496.5	S4	3.700	1.547	1.553	Open Manhole	1500
S1.003	24.670	493.4	S6	3.600	1.497	1.503	Open Manhole	1500
S2.000	36.142	495.1	S6	3.600	1.497	1.503	Open Manhole	1500
S1.004	24.352	497.0	S7	3.600	1.448	1.552	Open Manhole	1500
S1.005	9.144	481.3	S8	3.530	1.429	1.501	Open Manhole	1500
S1.006	44.040	494.8	S9	3.500	1.340	1.560	Open Manhole	1500
S1.007	7.161	477.4	S15	3.430	1.325	1.505	Open Manhole	1500
S3.000	15.371	60.3	S11	3.600	1.875	1.500	Open Manhole	1200
S3.001	4.603	44.0	S13	3.800	1.770	1.805	Open Manhole	1500
S4.000	34.365	84.9	S13	3.800	1.770	1.805	Open Manhole	1500
S3.002	13.074	484.2	S14	3.500	1.368	1.532	Open Manhole	1500
S3.003	21.346	496.4	S15	3.430	1.325	1.505	Open Manhole	1500
S1.008	29.190	494.7	S16	3.400	1.266	1.534	Open Manhole	1500

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XP Solutions	Network 2017.1.2	

PIPELINE SCHEDULES for Storm

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S1.009	o	600	S16	3.400	1.266	1.534	Open Manhole	1500
S5.000	o	600	S17	3.380	1.271	1.509	Open Manhole	1500
S1.010	o	600	S18	3.350	1.238	1.512	Open Manhole	1500
S6.000	o	600	S19	3.200	1.200	1.400	Open Manhole	1500
S1.011	o	225	S20	3.380	1.135	2.020	Open Manhole	1500

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S1.009	12.026	429.5	S18	3.350	1.238	1.512	Open Manhole	1500
S5.000	16.028	485.7	S18	3.350	1.238	1.512	Open Manhole	1500
S1.010	22.031	213.0	S20	3.380	1.135	1.645	Open Manhole	1500
S6.000	10.051	154.0	S20	3.380	1.135	1.645	Open Manhole	1500
S1.011	22.828	170.0	S21	2.600	1.000	1.375	Open Manhole	0

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XP Solutions	Network 2017.1.2	

Setting Out Information - Site Coordinates (Storm)

PN	USMH Name	Dia/Len (mm)	Width (mm)	US Easting (m)	US Northing (m)	Layout (North)
S1.000	S1	1500		528601.973	324729.772	
S1.001	S2	1500		528587.774	324767.584	
S1.002	S3	1500		528583.682	324778.772	
S1.003	S4	1500		528600.980	324791.286	
S2.000	S5	1500		528642.793	324778.492	
S1.004	S6	1500		528620.225	324806.722	
S1.005	S7	1500		528639.221	324821.959	
S1.006	S8	1500		528648.258	324823.353	
S1.007	S9	1500		528692.058	324818.756	
S3.000	S10	1200		528726.709	324783.305	
S3.001	S11	1200		528718.522	324796.314	
S4.000	S12	1200		528734.624	324765.517	
S3.002	S13	1500		528714.809	324793.593	
S3.003	S14	1500		528707.307	324804.300	
S1.008	S15	1500		528697.588	324823.305	
S1.009	S16	1500		528700.853	324852.312	

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Setting Out Information - Site Coordinates (Storm)

PN	USMH Name	Dia/Len (mm)	Width (mm)	US Easting (m)	US Northing (m)	Layout (North)
S5.000	S17	1500		528719.679	324860.316	
S1.010	S18	1500		528704.058	324863.903	
S6.000	S19	1500		528692.290	324880.808	
S1.011	S20	1500		528684.632	324874.297	

PN	DSMH Name	Dia/Len (mm)	Width (mm)	DS Easting (m)	DS Northing (m)	Layout (North)
S1.011	S21	0		528669.607	324891.483	

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Area Summary for Storm

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
	User	-	100	0.013	0.013	0.025
	User	-	100	0.027	0.027	0.052
3.001	-	-	100	0.000	0.000	0.000
4.000	User	-	100	0.016	0.016	0.016
	User	-	100	0.009	0.009	0.024
	User	-	100	0.019	0.019	0.043
	User	-	100	0.009	0.009	0.053
	User	-	100	0.012	0.012	0.064
3.002	User	-	100	0.014	0.014	0.014
3.003	User	-	100	0.004	0.004	0.004
	User	-	100	0.002	0.002	0.006
	User	-	100	0.006	0.006	0.012
	User	-	100	0.008	0.008	0.020
	User	-	100	0.004	0.004	0.024
	User	-	100	0.006	0.006	0.030
	User	-	100	0.006	0.006	0.036
1.008	User	-	100	0.011	0.011	0.011
	User	-	100	0.007	0.007	0.017
	User	-	100	0.014	0.014	0.032
	User	-	100	0.004	0.004	0.036
	User	-	100	0.002	0.002	0.038
	User	-	100	0.006	0.006	0.044
	User	-	100	0.002	0.002	0.046
	User	-	100	0.006	0.006	0.052
	User	-	100	0.030	0.030	0.082
	User	-	100	0.027	0.027	0.108
1.009	-	-	100	0.000	0.000	0.000
5.000	User	-	100	0.013	0.013	0.013
	User	-	100	0.004	0.004	0.017
	User	-	100	0.009	0.009	0.026
	User	-	100	0.005	0.005	0.032
	User	-	100	0.009	0.009	0.041
	User	-	100	0.023	0.023	0.064
1.010	User	-	100	0.030	0.030	0.030
6.000	-	-	100	0.000	0.000	0.000
1.011	User	-	100	0.006	0.006	0.006
	User	-	100	0.007	0.007	0.013
	User	-	100	0.029	0.029	0.043
	User	-	100	0.008	0.008	0.051
	User	-	100	0.012	0.012	0.063
	Total			Total	Total	Total
				1.272	1.272	1.272

Free Flowing Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
S1.011	S21	2.600	1.000	1.000	0	0

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Simulation Criteria for Storm

Volumetric Runoff Coeff	0.750	Additional Flow - % of Total Flow	6.000
Areal Reduction Factor	1.000	MADD Factor * 10m³/ha Storage	0.000
Hot Start (mins)	0	Inlet Coeffiecient	0.800
Hot Start Level (mm)	0	Flow per Person per Day (l/per/day)	0.000
Manhole Headloss Coeff (Global)	0.500	Run Time (mins)	60
Foul Sewage per hectare (l/s)	0.000	Output Interval (mins)	1

Number of Input Hydrographs	0	Number of Storage Structures	1
Number of Online Controls	1	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Summer
Return Period (years)	2	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	19.000	Storm Duration (mins)	30
Ratio R	0.400		

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Online Controls for Storm

Hydro-Brake® Optimum Manhole: S20, DS/PN: S1.011, Volume (m³): 12.2

Unit Reference	MD-SHE-0103-5000-1200-5000
Design Head (m)	1.200
Design Flow (l/s)	5.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	103
Invert Level (m)	1.135
Minimum Outlet Pipe Diameter (mm)	150
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.200	5.0
Flush-Flo™	0.354	5.0
Kick-Flo®	0.745	4.0
Mean Flow over Head Range	-	4.4

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	3.4	1.200	5.0	3.000	7.7	7.000	11.5
0.200	4.7	1.400	5.4	3.500	8.3	7.500	11.8
0.300	5.0	1.600	5.7	4.000	8.8	8.000	12.2
0.400	5.0	1.800	6.0	4.500	9.3	8.500	12.6
0.500	4.9	2.000	6.3	5.000	9.8	9.000	12.9
0.600	4.7	2.200	6.6	5.500	10.2	9.500	13.3
0.800	4.1	2.400	6.9	6.000	10.7		
1.000	4.6	2.600	7.2	6.500	11.1		

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Storage Structures for Storm

Tank or Pond Manhole: S19, DS/PN: S6.000

Invert Level (m) 1.200

Depth (m)	Area (m ²)	Depth (m)	Area (m ²)	Depth (m)	Area (m ²)
0.000	815.0	1.200	1458.0	1.201	0.0

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1 year Return Period Summary of Critical Results by Maximum Level (Rank 1)
for Storm

Simulation Criteria

Areal Reduction Factor 1.000

Additional Flow - % of Total Flow 6.000

Hot Start (mins) 0

MADD Factor * 10m³/ha Storage 0.000

Hot Start Level (mm) 0

Inlet Coefficient 0.800

Manhole Headloss Coeff (Global) 0.500

Flow per Person per Day (l/per/day) 0.000

Foul Sewage per hectare (l/s) 0.000

Number of Input Hydrographs 0

Number of Storage Structures 1

Number of Online Controls 1

Number of Time/Area Diagrams 0

Number of Offline Controls 0

Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR

Ratio R 0.400

Region England and Wales Cv (Summer) 0.750

M5-60 (mm) 19.000

Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 450.0

Analysis Timestep 2.5 Second Increment (Extended)

DTS Status ON

DVD Status ON

Inertia Status ON

Profile(s) Summer and Winter

Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080

Return Period(s) (years) 1, 30, 100

Climate Change (%) 0, 0, 40

Water

Level

(m)

US/MH

PN

Name

Storm

Return Period

Climate Change

First (X) Surge

First (Y) Flood

First (Z) Overflow

Overflow Act.

S1.000

S1 15

Winter

1

+0%

100/15

Summer

1.840

S1.001

S2 15

Winter

1

+0%

30/15

Winter

1.804

S1.002

S3 15

Winter

1

+0%

100/15

Summer

1.792

S1.003

S4 15

Winter

1

+0%

100/15

Summer

1.779

S2.000

S5 15

Winter

1

+0%

100/15

Summer

1.782

S1.004

S6 15

Winter

1

+0%

30/15

Winter

1.762

S1.005

S7 30

Winter

1

+0%

30/15

Winter

1.740

S1.006

S8 30

Winter

1

+0%

30/15

Winter

1.732

S1.007

S9 30

Winter

1

+0%

30/15

Summer

1.697

S3.000

S10 15

Winter

1

+0%

100/15

Summer

2.182

S3.001

S11 15

Winter

1

+0%

100/15

Summer

1.935

S4.000

S12 15

Winter

1

+0%

100/15

Summer

2.237

S3.002

S13 30

Winter

1

+0%

30/15

Winter

1.694

S3.003

S14 30

Winter

1

+0%

30/15

Winter

1.694

S1.008

S15 30

Winter

1

+0%

30/15

Summer

1.692

S1.009

S16 30

Winter

1

+0%

30/15

Summer

1.661

S5.000

S17 30

Winter

1

+0%

30/15

Summer

1.650

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1 year Return Period Summary of Critical Results by Maximum Level (Rank 1)
for Storm

PN	US/MH Name	Surcharged Flooded		Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
		Depth (m)	Volume (m³)					
S1.000	S1	-0.455	0.000	0.08		20.4	OK	
S1.001	S2	-0.410	0.000	0.13		20.3	OK	
S1.002	S3	-0.398	0.000	0.11		24.5	OK	
S1.003	S4	-0.368	0.000	0.14		32.9	OK	
S2.000	S5	-0.388	0.000	0.15		38.1	OK	
S1.004	S6	-0.335	0.000	0.27		65.0	OK	
S1.005	S7	-0.308	0.000	0.36		57.1	OK	
S1.006	S8	-0.297	0.000	0.24		64.5	OK	
S1.007	S9	-0.243	0.000	0.32		60.1	OK	
S3.000	S10	-0.173	0.000	0.12		7.3	OK	
S3.001	S11	-0.165	0.000	0.16		7.2	OK	
S4.000	S12	-0.163	0.000	0.17		8.8	OK	
S3.002	S13	-0.301	0.000	0.08		13.4	OK	
S3.003	S14	-0.274	0.000	0.06		13.8	OK	
S1.008	S15	-0.233	0.000	0.30		75.4	OK	
S1.009	S16	-0.205	0.000	0.38		70.0	OK	
S5.000	S17	-0.221	0.000	0.03		6.1	OK	

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1 year Return Period Summary of Critical Results by Maximum Level (Rank 1)
for Storm

	US/MH		Return	Climate	First (X)	First (Y)	First (Z)	Overflow	Water
PN	Name	Storm	Period	Change	Surcharge	Flood	Overflow	Act.	Level (m)
S1.010	S18	30 Winter	1	+0%	30/15 Summer				1.649
S6.000	S19	240 Winter	1	+0%	100/120 Winter				1.363
S1.011	S20	30 Winter	1	+0%	1/15 Summer				1.611

		Surcharged Flooded			Pipe			
PN	US/MH Name	Depth (m)	Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
S1.010	S18	-0.189	0.000	0.21		72.4	OK	
S6.000	S19	-0.437	0.000	0.02		6.5	OK	
S1.011	S20	0.252	0.000	0.14		5.0	SURCHARGED	

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30 year Return Period Summary of Critical Results by Maximum Level (Rank 1)
for Storm

PN	US/MH Name	Surcharged Flooded		Pipe		Status	Level Exceeded
		Depth (m)	Volume (m³)	Flow / Cap.	Overflow (l/s)		
S1.000	S1	0.000	0.000	0.12	30.5	OK	
S1.001	S2	0.002	0.000	0.24	38.2	SURCHARGED	
S1.002	S3	0.000	0.000	0.25	54.5	OK	
S1.003	S4	0.000	0.000	0.25	61.2	OK	
S2.000	S5	0.000	0.000	0.34	87.7	OK	
S1.004	S6	0.009	0.000	0.52	124.2	SURCHARGED	
S1.005	S7	0.026	0.000	0.82	130.1	SURCHARGED	
S1.006	S8	0.029	0.000	0.54	142.8	SURCHARGED	
S1.007	S9	0.080	0.000	0.79	148.2	SURCHARGED	
S3.000	S10	-0.140	0.000	0.30	17.8	OK	
S3.001	S11	-0.074	0.000	0.39	17.6	OK	
S4.000	S12	-0.124	0.000	0.41	21.7	OK	
S3.002	S13	0.022	0.000	0.24	40.1	SURCHARGED	
S3.003	S14	0.044	0.000	0.18	39.6	SURCHARGED	
S1.008	S15	0.080	0.000	0.72	180.2	SURCHARGED	
S1.009	S16	0.098	0.000	0.99	181.6	SURCHARGED	
S5.000	S17	0.067	0.000	0.10	18.0	SURCHARGED	

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30 year Return Period Summary of Critical Results by Maximum Level (Rank 1)
for Storm

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
S1.010	S18	15 Winter	30	+0%	30/15 Summer				1.934
S6.000	S19	480 Winter	30	+0%	100/120 Winter				1.627
S1.011	S20	15 Winter	30	+0%	1/15 Summer				1.834

		Surcharged		Flooded		Pipe		Level	
PN	US/MH Name	Depth (m)	Volume (m³)	Flow / Cap.	Overflow (l/s)	Flow (l/s)	Status	Exceeded	
S1.010	S18	0.096	0.000	0.57		196.4	SURCHARGED		
S6.000	S19	-0.173	0.000	0.02		6.9	OK		
S1.011	S20	0.475	0.000	0.14		5.0	SURCHARGED		

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<u>100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm</u>									
<u>Simulation Criteria</u>									
Areal Reduction Factor		1.000		Additional Flow - % of Total Flow		6.000			
Hot Start (mins)		0		MADD Factor * 10m³/ha Storage		0.000			
Hot Start Level (mm)		0		Inlet Coefficient		0.800			
Manhole Headloss Coeff (Global)		0.500		Flow per Person per Day (l/per/day)		0.000			
Foul Sewage per hectare (l/s)		0.000							
Number of Input Hydrographs		0		Number of Storage Structures		1			
Number of Online Controls		1		Number of Time/Area Diagrams		0			
Number of Offline Controls		0		Number of Real Time Controls		0			
<u>Synthetic Rainfall Details</u>									
Rainfall Model		FSR		Ratio R		0.400			
Region England and Wales		Cv (Summer)		0.750					
M5-60 (mm)		19.000		Cv (Winter)		0.840			
Margin for Flood Risk Warning (mm)						450.0			
Analysis Timestep		2.5 Second Increment (Extended)							
DTS Status						ON			
DVD Status						ON			
Inertia Status						ON			
Profile(s)						Summer and Winter			
Duration(s) (mins)		15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080							
Return Period(s) (years)		1, 30, 100							
Climate Change (%)		0, 0, 40							
									Water
PN	US/MH Name	Storm	Return Period	Climate Change	First (X) SurchARGE	First (Y) Flood	First (Z) Overflow	Overflow Act.	Level (m)
S1.000	S1	15 Winter	100	+40%	100/15 Summer				3.142
S1.001	S2	15 Winter	100	+40%	30/15 Winter				3.118
S1.002	S3	15 Winter	100	+40%	100/15 Summer				3.105
S1.003	S4	15 Winter	100	+40%	100/15 Summer				3.084
S2.000	S5	15 Winter	100	+40%	100/15 Summer				3.087
S1.004	S6	15 Winter	100	+40%	30/15 Winter				3.055
S1.005	S7	15 Winter	100	+40%	30/15 Winter				2.981
S1.006	S8	15 Winter	100	+40%	30/15 Winter				2.933
S1.007	S9	15 Winter	100	+40%	30/15 Summer				2.781
S3.000	S10	15 Winter	100	+40%	100/15 Summer				2.774
S3.001	S11	15 Winter	100	+40%	100/15 Summer				2.724
S4.000	S12	15 Winter	100	+40%	100/15 Summer				2.804
S3.002	S13	15 Winter	100	+40%	30/15 Winter				2.674
S3.003	S14	15 Winter	100	+40%	30/15 Winter				2.670
S1.008	S15	15 Winter	100	+40%	30/15 Summer				2.660
S1.009	S16	15 Winter	100	+40%	30/15 Summer				2.452
S5.000	S17	15 Winter	100	+40%	30/15 Summer				2.268
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100 year Return Period Summary of Critical Results by Maximum Level (Rank
1) for Storm

PN	US/MH Name	Surcharged	Flooded	Flow / Cap.	Overflow (l/s)	Pipe	Status	Level Exceeded
		Depth (m)	Volume (m³)			Flow (l/s)		
S1.000	S1	0.847	0.000	0.31		80.6	SURCHARGED	
S1.001	S2	0.904	0.000	0.56		87.9	SURCHARGED	
S1.002	S3	0.915	0.000	0.48		103.5	SURCHARGED	
S1.003	S4	0.937	0.000	0.59		142.9	SURCHARGED	
S2.000	S5	0.917	0.000	0.61		158.4	SURCHARGED	
S1.004	S6	0.958	0.000	1.29		307.1	SURCHARGED	
S1.005	S7	0.933	0.000	1.98		313.8	SURCHARGED	
S1.006	S8	0.904	0.000	1.29		341.3	SURCHARGED	
S1.007	S9	0.841	0.000	1.90		355.1	SURCHARGED	
S3.000	S10	0.419	0.000	0.50		29.8	SURCHARGED	
S3.001	S11	0.624	0.000	0.52		23.5	SURCHARGED	
S4.000	S12	0.404	0.000	0.68		36.4	SURCHARGED	
S3.002	S13	0.679	0.000	0.35		59.0	SURCHARGED	
S3.003	S14	0.702	0.000	0.33		70.8	SURCHARGED	
S1.008	S15	0.735	0.000	1.81		451.7	SURCHARGED	
S1.009	S16	0.586	0.000	2.46		450.4	SURCHARGED	
S5.000	S17	0.397	0.000	0.20		36.2	SURCHARGED	

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XP Solutions	Network 2017.1.2	

100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
S1.010	S18	15 Winter	100	+40%	30/15 Summer				2.263
S6.000	S19	960 Winter	100	+40%	100/120 Winter				2.004
S1.011	S20	15 Winter	100	+40%	1/15 Summer				2.042

		Surcharged Flooded		Pipe		Level	
PN	US/MH Name	Depth (m)	Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status
S1.010	S18	0.425	0.000	1.39		480.9	SURCHARGED
S6.000	S19	0.204	0.000	0.01		4.8	SURCHARGED
S1.011	S20	0.683	0.000	0.14		5.0	SURCHARGED