



Flood Risk Assessment

**Proposed Residential Development
High Road, Weston, Lincolnshire
AMA790 Revision B
November 2021**

Prepared for: Persimmon Homes

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Prepared by Leigh Parratt
BEng (Hons) CEng MICE CWEM MCIWEM PCHEP FHEA
- Revision B 26 November 2021

1 Introduction

- 1.1 Amazi Consulting Ltd has been instructed by Persimmon Homes (East Midlands) Ltd to prepare this Flood Risk Assessment (FRA) associated with the proposed residential development at land north of High Road, Weston, Spalding, Lincolnshire PE12.
- 1.2 This FRA has been prepared in accordance with National Planning Policy Framework (NPPF), June 2019, and its accompanying gov.uk Planning Practice Guidance (PPG): *Flood Risk and Coastal Change* (2016). It is expected that this report will be reviewed by the relevant flood risk authorities as part of the documentation submitted for full planning permission, and the reader will have some understanding of the technical issues relating to development and flood risk.
- 1.3 This FRA report has been prepared for the sole use of Persimmon Homes (East Midlands) Ltd and its contents cannot be copied or relied upon by others except as noted above, without the written authority of Amazi Consulting Ltd. Revision A of this report has been prepared based upon a new proposed site layout, but the fundamental principles of the flood and drainage matters remains unchanged.
- 1.4 This report does not attempt to comment upon the Sequential Test, insurance or for flood events other than as stipulated by planning policy.

2 Site Description

2.1 Existing

- 2.1.1 The development site is centred at approximate Ordnance Survey (OS) national grid reference 528860 mE, 324945 mN. The boundary of the development site and its location in relation to the surroundings is shown in Appendix A and on Figure 2.1.



Figure 2.1 - Site Location

- 2.1.2 This **6.13 hectare** (ha) site comprises arable farmland. The south of the site is bounded by High Road.
- 2.1.2 The existing site levels are given on the site topographical survey in Appendix B and Figure 2.2. The levels shown on the site survey relate to OS GPS datum (mAOD). The highest level on site is 3.52 mAOD at the south west point of the site. The lowest ground elevation on site is 2.12 mAOD at the centre of the north of the site.
- 2.1.3 Figure 2.3 shows lidar survey data at the site and in surrounding areas. This shows that, as its name suggests, High Road is a local high area and land to the west of the site is the lowest in the local area.

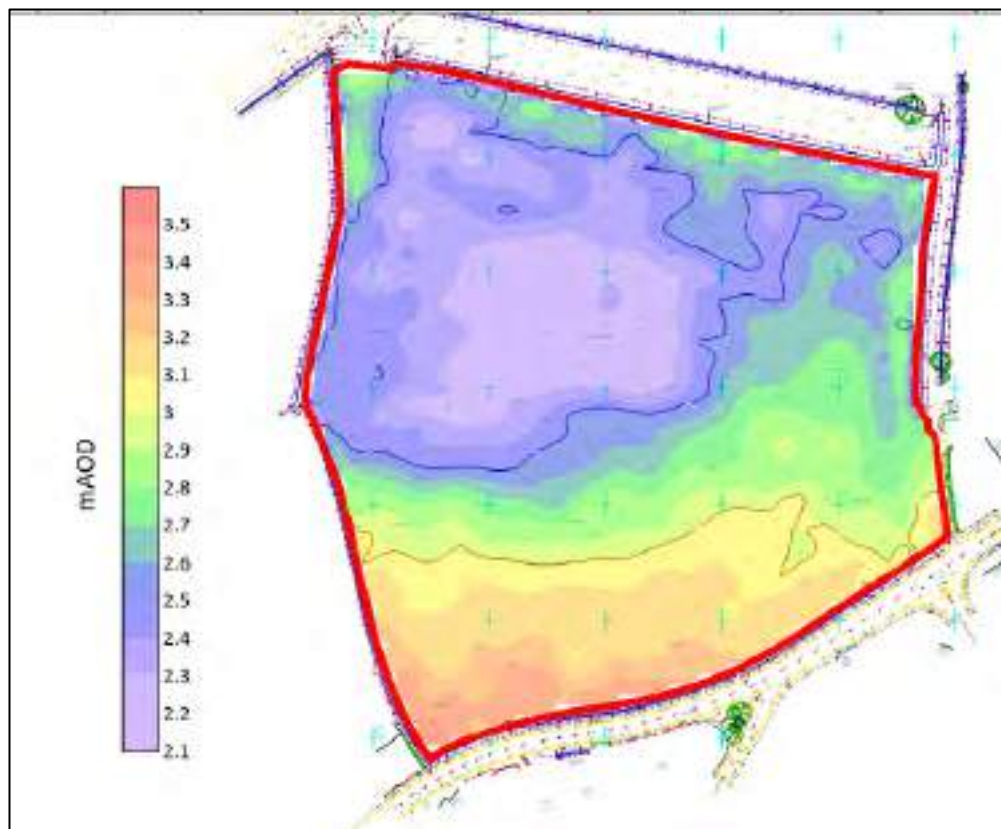


Figure 2.2 - Site survey contours

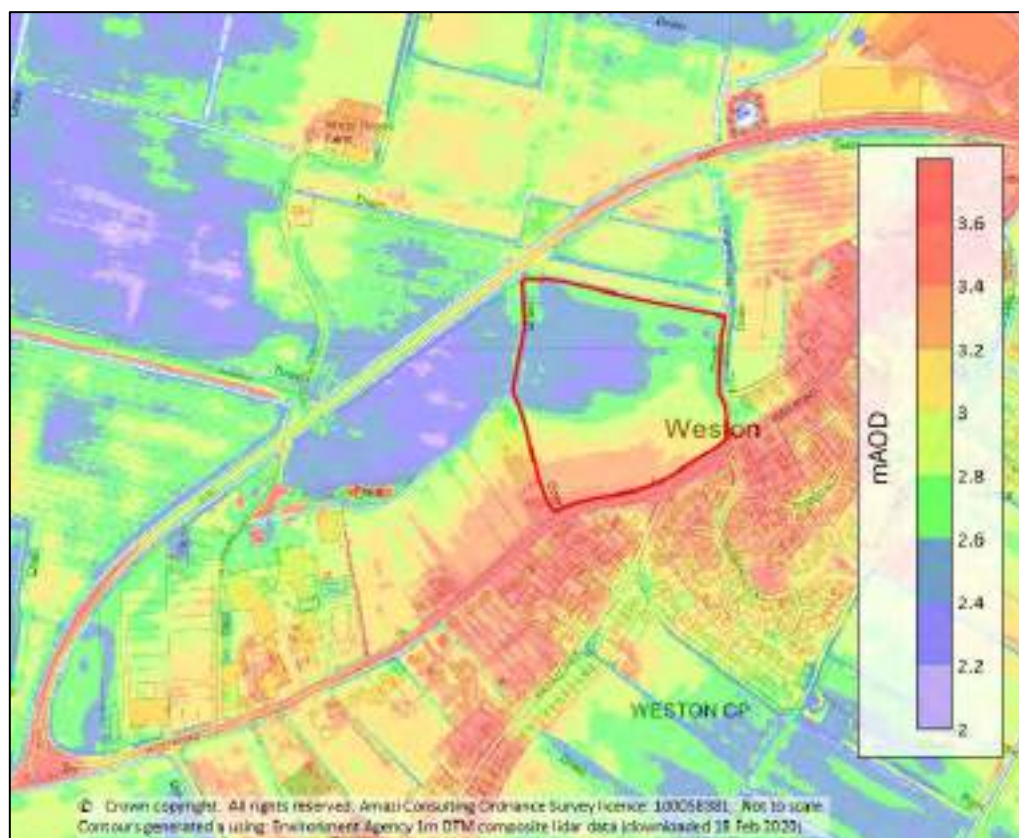


Figure 2.3 - Lidar survey data – surroundings

2.1.4 The site is in the jurisdiction of South Holland District Council and Lincolnshire County Council.

2.1.5 The existing site use is either unclassified or classified as *less vulnerable* in accordance with Table 2 of the NPPF Planning Practice Guidance (Reference ID: 7-066-20140306).

2.2 Proposed

2.2.1 The planning application is for the construction of 150 residential units including private and social housing with 1 to 5 bedrooms. The proposed layout is given on the plan in Appendix C.

2.2.2 Proposed site levels are shown on the drawing in Appendix H. The minimum finished floor level of the proposed dwellings is 3.6 mAOD.

2.2.3 Outline planning permission has been granted by South Holland District Council for residential development at the site (Ref: H22-0101-16, 23 July 2018).

2.2.4 The design life of the development is 100 years. So the year 2120 is appropriate in assessing the possible impacts of climate change upon flood risk.

2.2.5 The vulnerability classification of the proposed site use is *more vulnerable* in accordance with Table 2 of the Planning Practice Guidance (Reference ID: 7-066-20140306).

2.2.6 An extract from Table 3 of the Planning Practice Guidance (Reference ID: 7-067-20140306) is given below and indicated in red is the site's classification and flood zone, confirming the appropriate nature of the proposed development. (For flood zone refer to section 3.2.)

Flood Risk Vulnerability Classification					
Flood Zones	Essential infrastructure	Highly vulnerable	More vulnerable	Less vulnerable	Water compatible
Zone 1	✓	✓	✓	✓	✓
Zone 2	✓	Exception Test required	✓	✓	✓
Zone 3a †	Exception Test required	X	Exception Test required	✓	✓
Zone 3b *	Exception Test required	X	X	X	✓*

Key:
✓ Development is appropriate
X Development should not be permitted.

3 Main River/Tidal Flooding

3.1 General

- 3.1.1 The nearest Main River to the site is the River Welland, situated over 2.5km to the west at Spalding. North of Spalding this river is tidally influenced. The coastline of The Wash is located over 15 km north east of the site.

3.2 Flood Zones

- 3.2.1 As shown within Figure 3.1, and the flood Map in Appendix E, approximately half of the site (north) lies within flood zones 2 and 3*. The remainder of the site (the south) is within flood zone 1*. The Environment Agency letter in Appendix E clarifies that *'the Flood Map indicates the area at risk of flooding, assuming no flood defences exist'* so it does not consider the protection provided by raised flood defences.

*Refer to Appendix D.



Figure 3.1 - Flood Zones

- 3.2.2 It is noted that, particularly the extent of flood zone 3, does not tie in with the site topography. Figure 3.2 shows how the extent of flood zone 3 coinciding with site ground levels varying from 2.2 to 2.88 mAOD. Appendix E concurs by stating *'In some locations, such as around the fens and the large coastal floodplains, showing the area at risk of flooding assuming no defences may give a slightly misleading picture in that if there were no*

flood defences, water would spread out across these large floodplains. This flooding could cover large areas of land but to relatively shallow depths...’.



3.3 Defences

- 3.3.1 Appendix E confirms that *‘the tidal defences protecting this site consist of earth embankments. They are in fair condition and reduce the risk of flooding (at the defence) to a 1% (1 in 100) chance of occurring in any year. We inspect these defences routinely to ensure potential defects are identified.’* Since the site is far from the defences it would therefore be expected that the defences reduce the risk of flooding at the site to much rarer event than 1:100.
- 3.3.2 We have obtained and reviewed data from the national defence database. Figure 3.3 shows the defences nearest the site. And Figure 3.4 shows the line of the defences in the wider area in relation to the site.
- 3.3.3 In relation to the coastal defences, The Wash Shoreline Management Plan (SMP) places the site within SM4 (Gibraltar Point to Hunstanton). The SMP sets out that the intention for this Policy Development Zone is to sustain the current level of flood risk for the communities and their hinterland, with an increase of management as required in the face of climate change.



(Source: Spatial_Flood_Defences_Including_Standardised_Attributes.shp, downloaded 19 March 2020)



(Source: Spatial_Flood_Defences_Including_Standardised_Attributes.shp, downloaded 19 March 2020)

3.4 Flood Levels/Residual Risk

- 3.4.1 The Fluvial and Tidal Source mapping in Appendix G confirms that the flood risks at the site would result from tidal source.

- 3.4.2 The Environment Agency has provided estimated tide levels (Appendix E). The site is protected from tidal flooding by raised defences though, so these tide levels cannot be applied to the site.
- 3.4.3 The Tide Level Location Map in Appendix E identifies the nearest tidal node point to the site as Marsh Road (Welland Tidal). The associated predicted surge tide data is given in Table 3.1. By comparing the tide levels in Table 3.1 with the defence crest levels in Figure 3.3, it is clear that practically all the defences are above the predicated tide levels at this location. (Defence in orange believed to be upstream of tidal extent.)

Table 3.1 - 2020 in channel predicted tide levels at Marsh Road, Spalding

Return period (1:x)	1	10	50	100	200	1000
Peak tide level (mAOD)	5.14	5.54	5.83	5.95	6.08	~

Base year 2006, so have added an extra 7 mm/year x 14 years = 98 mm to the tide levels given in Appendix E in accordance with the Government guidance: *Flood risk assessments: climate change allowances* (December 2019).
No 1:1,00 year data supplied.

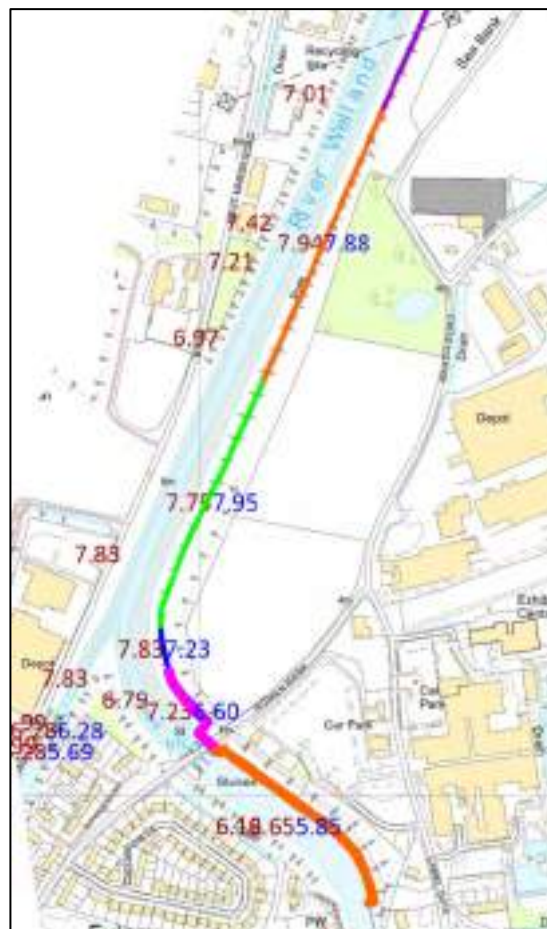


Figure 3.5 - Defence crest levels at Marsh Road, Spalding

x.xx = upstream crest level (mAOD)
x.xx = downstream crest level (mAOD)

- 3.4.4 Given the SMP policy to maintain defences into the future, it should be unlikely that defences fail. However unlikely there is still a need to consider the possible effects of defence failure. There may still be a risk of flooding to the site from Main River/tidal sources if the raised defences were to fail. This is often referred to as a residual risk of flooding.
- 3.4.5 The Environment Agency has undertaken hydraulic modelling of various defence breaches (see map in Appendix E for locations). Each breach has been modelled individually and the results combined to create the resulting mapping in Appendix E. We have requested this mapping in an electronic format to be used within GIS software, but the Environment Agency will not provide, so we have had to take a very approximate and time consuming approach and create our own image of these maps and overly onto the site by eye only.
- 3.4.6 The key scenarios considered are:

1:200 & 1:1,000 current day

Figure 3.6 shows that in the residual event a small area at the north west of the site may be at risk. This relates to a depth of up to 0.5 m. In accordance with planning guidance this will need to be increased by 0.098 m (see note to Table 3.1) to account for climate change to 2020. So the possible depth in this event is up to 0.6 m.

The flood outlines do not correspond well with site contours, but the maximum ground level under the light orange shaded area is c 2.5 mAOD. So resulting very localised flood level could be $2.5 + 0.6 = 3.1 \text{ mAOD}$.

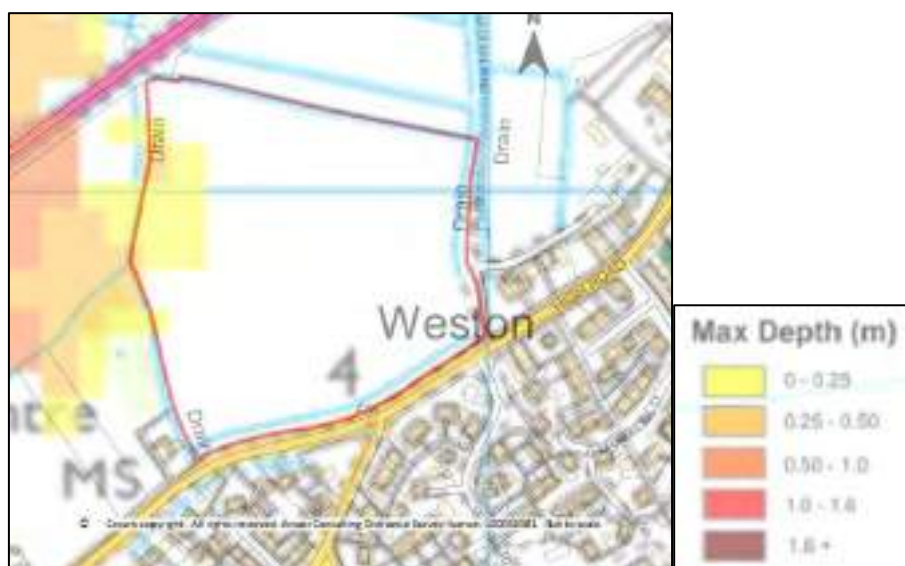


Figure 3.6 - Breach scenario: 1:200 & 1:1,000, 2006, flood depths

1:200 & 1:1,000 future

Figure 3.7 shows that in the residual event a small area at the north west of the site may be at risk. This relates to a depth of between 0.5 and 1 m. In accordance with planning guidance

this will need to be increased by 90.5 mm* to account for climate change from 2115 to 2120. So the possible depth in this event is up to 1.09 m.

The flood outlines do not correspond well with site contours, but the minimum ground level under the light orange shaded area is c 2.2 mAOD. So resulting very localised flood level could be $2.2 + 1.09 = \underline{3.29 \text{ mAOD}}$. The maximum ground level at the extent of the orange shading is c2.7 mAOD. Plus the minimum 0.5m depth also equals an estimate flood level of 3.29 mAOD.

*18.1 mm/year from 2115 to 2120.

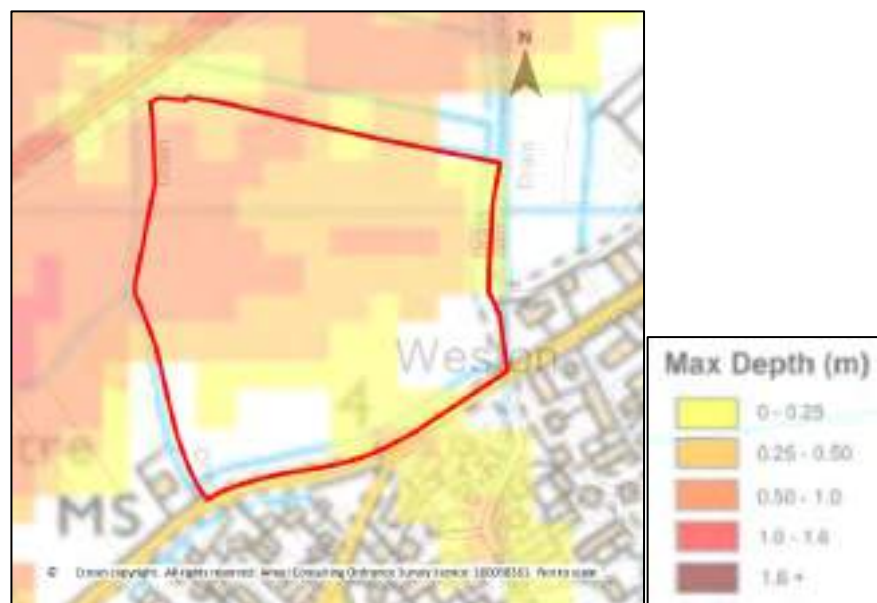


Figure 3.7 - Breach scenario: 1:200 & 1:1,000, 2115, flood depths

- 3.4.7 The minimum finished floor level of the proposed dwellings is 3.6 mAOD, providing an estimated 300 mm freeboard to predicted 1:100 year plus climate change flood level during the defence failure event. The minimum garage floor level 3.45 mAOD. It is understood that all properties are two storeys, or have access to stairs to a higher storey.
- 3.4.8 Ground levels are proposed to be raised in some areas to enable floor levels to be raised and to enable the site surface water drainage system to drain by gravity. The minimum proposed site ground levels, proposed road and floor levels are given on the drawing in Appendix H. The minimum site footpath, i.e. access, level is 3.3 mAOD. This is just above the predicted 1:100 + climate change flood level, so safe access should be possible at all times.
- 3.4.9 The existing outline planning permission included condition No 12:
The development hereby permitted shall be carried out in accordance with the approved Flood Risk Assessment (FRA) and in particular the following mitigation measures:*
i) Finished floor levels are set at 3.2m above Ordnance Datum (AOD);
ii) The dwellings shall be two storey;
iii) The eventual occupiers will sign on to the Environment Agency's Floodline Warnings Direct Service.
Reason: To reduce the risk of flooding to the proposed development and future occupants'.

The flood mitigation measures outlined in this FRA clearly comply with, or provide betterment to, this previously stipulated criteria.

*The approved FRA relates to proposed residential development of 134 dwellings (prepared by S M Hemmings, 26 January 2016).

- 3.4.10 This report has been undertaken as a desk study and relies upon flood data supplied by the Environment Agency. The hydraulic modelling this is based upon includes assumptions in design parameters and inaccuracies in input data and the modelling methodologies. The flood data has been provided by the Environment Agency and is currently the best available data for assessing flood risks at the site. We have assessed the design events currently stipulated by national planning policy and Environment Agency guidelines. There is always the risk, however small, that flooding could be different to the design events assessed.

3.5 Strategic Flood Risk Assessment

- 3.5.1 The South Holland Strategic Flood Risk Assessment (SFRA) seems to show the same flood mapping as that has been supplied by the Environment Agency.

3.6 Flood Storage

- 3.6.1 It is understood that there is no requirement to provide compensatory flood storage for the raised ground levels at this site - the flood risks at the site are from unlikely residual flooding only.

3.7 Flood Management

- 3.7.1 Although the site is defended and designed to remain safe from residual flood events considered in this report, it is still important for both the occupants and site management to sign up to receive Environment Agency flood warnings. Since the site is remote from the defences, warnings may be given in advance of a flood event, although this should never be assumed because defence failure can occur suddenly. The site is not within a rapid inundation zone. It is at the very edge of any anticipated flood extent and connects with High Road to the south boundary. As shown on Figure 2.3, High Road is a local high point and should be used for any evacuation from the site.
- 3.7.2 Under no circumstances is it safe to walk, swim, cycle or drive through flood water as it may be fast flowing, contain debris, be contaminated or hide unseen dangers.
- 3.7.3 Other advice and information on preparing for flooding is available from the following websites:

- ◆ Environment Agency Floodline: 0345 988 1188 and

- <https://www.gov.uk/prepare-for-a-flood>
GOV.UK prepare for flooding:
<https://www.gov.uk/prepare-for-flooding/future-flooding>
- Lincolnshire County Council:
<https://www.lincolnshire.gov.uk/emergency-advice/prepare-emergency>

3.7.4 Although there is not a high probability of significant flooding at the site, and the dwellings should remain safe. The proposed roads will be offered to the County Council for adoption, but some parts of the site may remain the responsibility of a private management company. This site management company should prepare a flood management plan as part of their usual site emergency management procedures. Refer to guidance in above website link. This plan should include clear guidance and set out responsibilities and lines of communication of site management and occupants regarding; flood preparation, warning and evacuation if necessary.

3.8 Flood Resilience

3.8.1 The key measure proposed for flood resilience is the raising of floor levels.

4 Internal Drainage Board/Local Watercourses

- 4.1 There are several watercourses near to the site, including watercourses at the four site boundaries. The watercourses mainly have limited gradient and Figure 4.1 attempts to show the most likely direction of flow. Figure 4.2 shows the theoretical watersheds and flow paths based upon topography only. However the ground levels are very flat and this map could therefore be inaccurate.
- 4.2 The site is located within South Holland drainage district, at the south of the Lords catchment. The Internal Drainage Board (IDB) map in Appendix F shows that the watercourse along the site's north boundary is IDB Pinfold Drain (DRN208P1404), which flows northwards through the district towards Lord pumping station.
- 4.3 The IDB requires a 9 m clear easement to Pinfold Drain and this has been accommodated within the proposed site layout. This easement is required under the Board's Bylaws and is necessary to enable the Board's operatives to carry out their routine maintenance duties. Any works within 9 metres of the edge of drainage or flood risk management infrastructure (e.g. construction of drainage outfall, or temporary works) would require prior consent from the IDB and may require a Deed of Indemnity to be entered into with the Board.
- 4.4 We have not been able to obtain any information on the likelihood of flooding from the IDB drainage system or surrounding watercourses. Refer to section 6 for further information relating to surface water (and local watercourse) flooding.

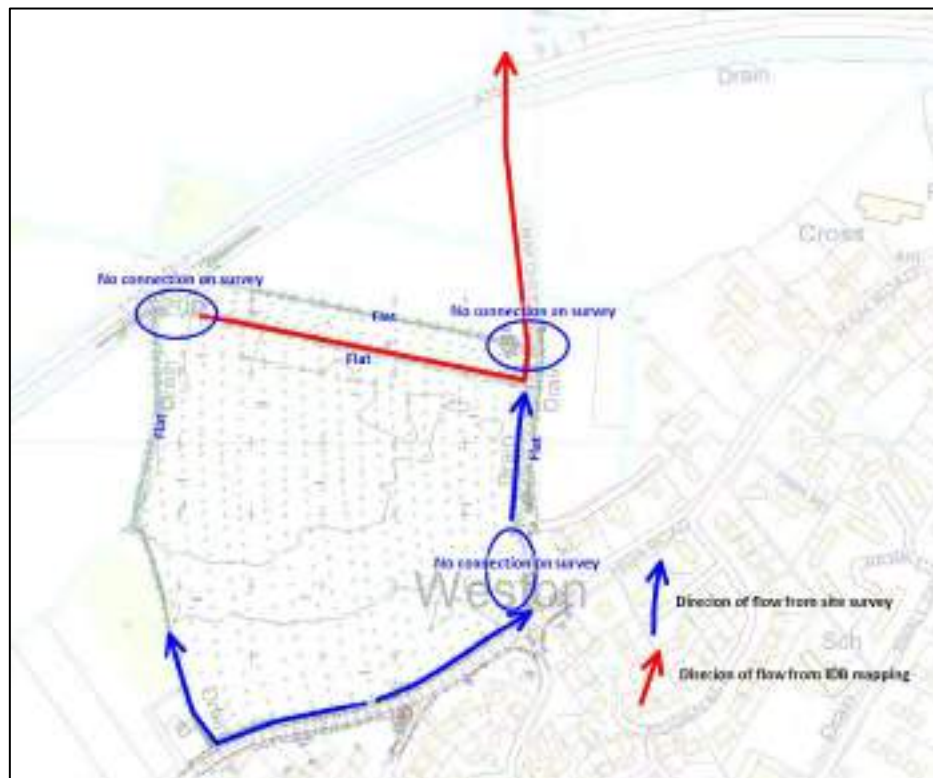


Figure 4.1 - Watercourses at site

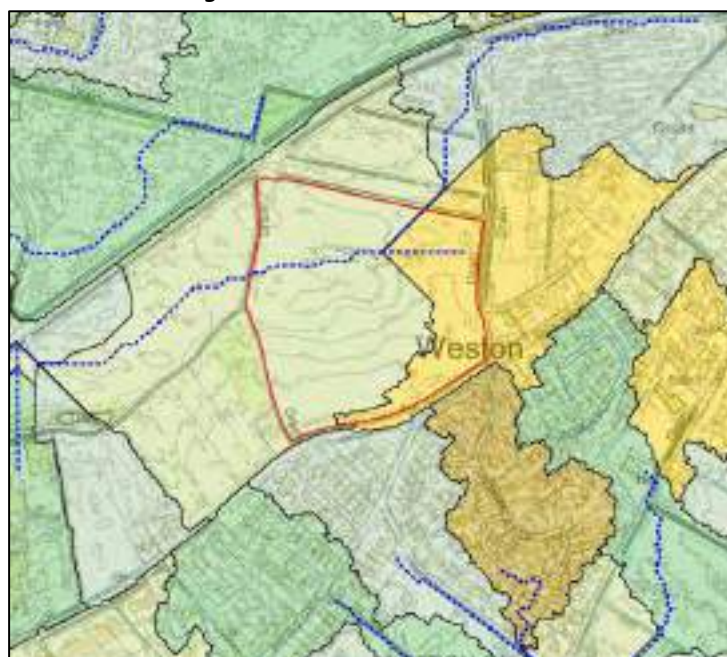


Figure 4.2 - Watersheds

Contours at 0.2 m c-c

Blue dashed line theoretical flow paths, not necessarily reflect actual flow paths/drainage systems

5 Groundwater Flooding

- 5.1 The South Holland District Council Strategic Flood Risk Assessment (2017) does not include information relating to the risk of groundwater flooding at the site and refers to the British Geological Survey (BGS) groundwater susceptibility data. Instead of using this BGS data we have used other data that is a bit more refined to produce Figure 5.1. Figure 5.1 identifies the site to be in lowest class, 4: negligible risk, meaning there is a negligible risk of groundwater flooding in this area and any groundwater flooding incidence has a chance of less than 1% annual probability of occurrence.



Figure 5.1 - Groundwater flood risk

(Source: Geosmart GW5 (v2.1), 27 March 2020)

5.2 The RSK site specific Phase I Desk Study (252234-01 (00), November 2019) states in Table 7:

Depth to groundwater and flow	The anticipated depth to the groundwater table is in the order of less than 1-2m below ground level estimated from BGS logs. Shallow groundwater in the site area is anticipated to flow in a north westerly direction, i.e. towards the Lord's Drain and River Welland.
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5.3 The RSK site specific Phase 2 Geo-environmental and Geotechnical Site Investigation (252234-02 (00), March 2020) confirms that:

- *'The exploratory holes identified a soil profile comprising a limited thickness of agricultural topsoil over Tidal Flat Deposits.'*
- *'Superficial Tidal Flat Deposits were encountered beneath the agricultural topsoil layer across the entirety of the site and were proven to the full depth of investigation (5.45m bgl). Based on the site descriptions and laboratory and in-situ tests carried out this layer can generally be described as normally consolidated sandy clayey silt and silty fine sand, with subordinate sandy silty clay layers.'* (s 4.1.2)
- shallow groundwater is present on site. This RSK report confirms that *'the results of the groundwater monitoring programme indicate standing water at a depth of between 0.00m and 2.39m bgl; and the presence of a high groundwater table will therefore need to be considered within the design and construction'*.

The following are extracted from this RSK Phase 2 report:

Table 8 Summary of groundwater monitoring results

Monitoring well	Response zone stratum	Depth to water (m BGL)
WS02	TFD	0.05 – 1.83
WS03A	TFD	0.00 – 1.77
WS04A	TFD	0.89 – 2.39
WS05	TFD	0.10 – 1.88
WS06	TFD	0.25 – 1.26

Initial strike from logs:

2m bgl

GW not encountered

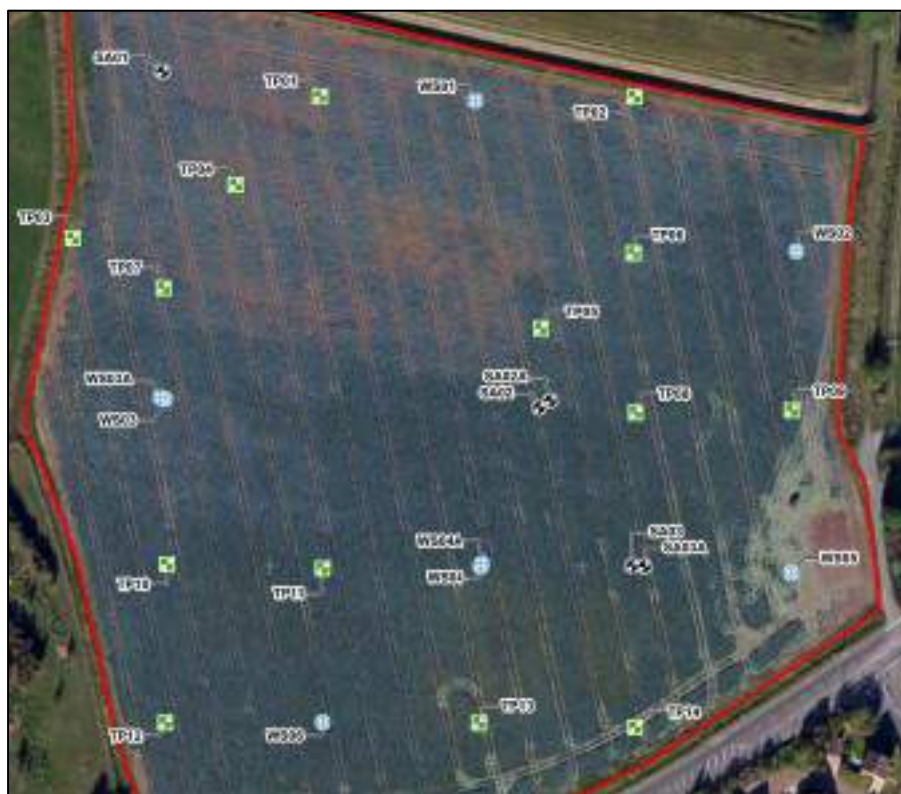
GW not encountered

1.2 m bgl

GW not encountered

It should be noted that groundwater levels might fluctuate for a number of reasons including seasonal variations. On-going monitoring would be required to establish both the full range of conditions and any trends in groundwater levels.

RSK Figure 4:



- 5.4 We have added a table above of the initial groundwater strike levels recorded on the RSK window sample logs. We expect these are more likely to reflect depths to groundwater, rather than the monitored levels whereby the boreholes have filled over time (this can sometimes occur during wet weather too). The depth to standing water may vary depending upon the ground level where the test was undertaken.
- 5.5 So although Figure 5.1 indicates negligible risk of groundwater flooding, the insitu site soil testing has confirmed that standing water is present , potentially to ground level. The existing site may be drained by sub-surface field drains. The proposed development ground

levels will in places be higher than existing. So the post development depths standing water may vary.

6 Surface Water Flooding

- 6.1 Figure 6.1 shows the national Risk of Flooding from Surface Water mapping in the vicinity of the site. This indicates that none of the site is at risk of flooding from surface water.



Figure 6.1 - Risk of Flooding from Surface Water

(Source: <https://flood-warning-information.service.gov.uk/long-term-flood-risk/map>, 18 February 2020)

- 6.2 There are watercourses adjacent to the site though so the proposed site levels have been set considering that there may be surcharging of these drainage features. The watercourses should be suitably maintained to ensure they maintain their conveyance function in the future.

7 Existing Site Surface Water Drainage

7.1 Soil conditions

- 7.1.1 Section 5 sets out the general site soil conditions. The RSK phase 2 intrusive soil investigations did include BRE365 infiltration testing. The tests showed insufficient drop in water level over the course of the test to enable an infiltration rate to be calculated.

7.2 Greenfield Runoff

- 7.2.1 The existing site greenfield runoff rates are given in Table 7.1, which are based upon the rates per unit area given in Appendix J. These have been calculated in accordance with the methodology in the Environment Agency/DEFRA report SC030219, *Rainfall runoff management for development*, 2013. Soil conditions are of low permeability, and groundwater is high, so a soil (SPR) value of 0.47 has been used (soil type 2). The Standard Average Annual Rainfall (SAAR) value of 564 mm has been taken from Flood Estimation Handbook (FEH) Web service point data at the site.

Table 7.1 – Existing Site Peak Greenfield Runoff rates

Area (ha)	6.13
Q 1 year (l/s)	20
Q bar (l/s)	23
Q 30 year (l/s)	55.2
Q 100 year (l/s)	81.8

8 Proposed Site Surface Water Drainage

8.1 Overview

8.1.1 The development of the existing site results in an increase in hard surfacing so would therefore inevitably result in the generation of additional surface water runoff if measures are not taken to mitigate against the impact of introducing hard surfaces. The proposed site surface water drainage strategy therefore includes sustainable drainage systems (SuDS) to control runoff rates and mitigate against the impact of increased runoff volumes. The site layout has been designed to ensure that there is space throughout the site for the required surface water attenuation and other SuDS features.

8.1.2 The key principles of the proposed surface water drainage strategy are:

- ✓ For the 1:1 year rainfall events the proposed peak runoff rate will not exceed the peak greenfield runoff rate for the same return period event in accordance with clause S2 of the *Non-Statutory Technical Standards for Sustainable Drainage*, March 2015.
- ✓ For the 1:100 year rainfall events including future climate change the proposed peak runoff rate will not exceed the existing site 1:1 year rate to satisfy clause S6 of the *Non-Statutory Technical Standards for Sustainable Drainage*, March 2015, and provide betterment in accordance with clause S2.
- ✓ Provide treatment in accordance with the simple index method outlined in Ciria report C753: The SuDS Manual, 2015.
- ✓ Allowances for climate change have been included in accordance with the Environment Agency's *Flood risk assessment: climate change allowances*, December 2019.
- ✓ The preliminary road and pipe network design demonstrates that there is no above ground flowing during the worst case duration 1:30 year storm event. This complies with requirement S7 of the *Non-Statutory Technical Standards for Sustainable Drainage* (March 2015) and is proposed in order to ensure no overland runoff off site.

8.2 The Strategy

- 8.2.1 The SuDS hierarchy requires that infiltration drainage is used unless it is proven to not be possible. As noted in section 7.1.1, infiltration rates could not be established during insitu soil testing, so infiltration drainage is not feasible at this site. Also, groundwater levels are high, so it would be unlikely that the required 1 m clearance between groundwater and the base of any infiltration features could be achieved.
- 8.2.2 The proposed site surface water strategy therefore relies upon a piped outfall into the IDB watercourse at the north site boundary.
- 8.2.3 The proposed maximum outflow rate is 8.8 l/s. This is significantly lower than the exiting site 1:1 year outflow rate given in Table 7.1. The proposed outflow has been based upon using the lower rate of 1.4 l/s/ha, which was stipulated in condition 17 of the outline planning permission granted by South Holland District Council (Ref: H22-0101-16, 23 July 2018).
- 8.2.4 Preliminary design of the proposed site surface water network and the preliminary road/building levels surface water system has been undertaken. This is beneficial because it provides good level of detail to demonstrate how the proposed surface water strategy will be physically achievable and how the proposed site levels assist with flood risk mitigation. Proposed levels are shown on the drawing in Appendix H.
- 8.2.5 The proposed surface water strategy design has been prepared by Infrastructure Design Ltd is shown on the drawings in Appendix K. The accompanying calculations are in Appendix L. Table 8.1 presents the worst case duration results. The following design parameters have been used:
- 40% additional rainfall allowance added to the 1:100 year return period events to account for future climate change.
 - Check on effects of applying urban creep on top of 1:100 plus 40% climate change event, i.e. including an additional contributing impermeable area of 10% across all the site.
 - FSR rainfall for storm durations <60 mins
 - FEH rainfall for durations ≥ 60 mins
 - Worst case scenario re modelled based on Surcharged outfall (assume worst case 2.35mAOD as per IDB 1in200 year event model for the outfall R14 Pinfold drain)

Table 8.1 - Key features of proposed attenuation basin

	FSR (15 – 30 min)	FEH (60 min+)	FEH (60min+) With 10% creep	FEH (60min+) With surcharged outfall
1:100 + CC peak outflow (l/s)	8.6	8.6	8.8	8.6
1:100 + CC max storage volume^ (m ³)	889	2456	2692	2596
1:100 + CC peak depth* (m)	0.932	1.714	1.808	1.772
1:2 year peak outflow (l/s)	8.6	8.6	-	0.7
1:2 max storage volume^ (m ³)	242	361	-	848
1:2 peak depth* (m)	0.465	0.558	-	0.905
Storage type/ flow control	Open attenuation basin (no infiltration)/ vortex flow control			
Minimum invert level (mAOD)	1.4 (crest 3.3) With 2 m wide plateau at 2.5 mAOD			
Invert at flow control (mAOD)	1.38			
Plan area (m ²)	2,540 (crest) (1:4 side slope)			
Effective contributing impermeable area (ha)	2.604	2.604	2.864	

*depths at node 100

^Volume is greatest from link 16-100, or 39-100

- 8.2.6 The plan in Appendix H shows the proposed road contours and the direction of fall of the proposed site levels (blue arrows). This shows that the exceedance flow paths direct runoff along the roads away from properties and towards the attenuation basin or swales.
- 8.2.7 During the worst case duration 1:100 year plus climate change event (FSR), only localised minor flooding occurs (<2m³). These areas will be directed along the exceedance routes into areas of POS, swales or the attenuation pond itself.
- 8.2.8 So in the worst case duration 1:100 year plus climate change rainfall event, the site peak runoff flow rate will be reduced for all rainfall events. As with any site where infiltration drainage is not possible, there is no option but to accept an increase in total runoff volumes. The measures taken to minimise impact upon flood risk downstream is the very significant reduction in runoff rate, to comply with clause S6 of the *Non-Statutory Technical Standards for Sustainable Drainage*, March 2015.

8.2.9 Climate change has been accounted for in accordance with the published Government guidance: *Flood risk assessments: climate change allowances* (March 2020). The site drainage design should use 20% increase in rainfall and the upper end allowance of 40% to check no increase in flood risk elsewhere and site safety during the 1:100 year events. In order to demonstrate at this early planning stage that the development can manage the site runoff, the calculations have been run using the higher 40% climate change allowance. The results summarised in this report demonstrate that even during the upper (40%) climate change analysis, surface water would be adequately managed in accordance with Government's flood management requirements.

8.2.10 In summary, the proposed strategy ensures that there is a significant reduction in runoff, even when considering an increase in rainfall due to predicted future climate change and future additional hard surfaces due to urban creep. The proposed site drainage details given in this FRA have been based upon the information and designs prepared by Infrastructure Design Ltd, as suitable for planning application stage. The strategy that is presented in this FRA is intended to demonstrate the feasibility of managing site runoff and it should form the basis of future detailed design. The detailed site infrastructure design will also need to be undertaken in accordance with contemporary industry best practice, with regard to hydraulic, ground conditions, architectural, landscaping, maintenance and health and safety considerations.

8.3 Treatment

8.3.1 Table 8.2 summarises the proposed treatment for the site. Runoff from some parts of the site also flow through a series of swales which will provide additional treatment.

Table 8.2 Proposed runoff treatment – Roads and hardstandings

Roof & parking/access road		Treatment Required ¹	Proposed Treatment individual indices ²
Pollution Hazard ¹	Low		
	Total suspended solids indices	0.5	0.5
	Metals indices	0.4	0.5
	Hydrocarbons indices	0.4	0.6

Notes:

1 - C753 table 26.2

2 - C753 table 26.3

8.4 Maintenance

8.4.1 There will need to be a detailed SuDS maintenance plan prepared once the site designs are progressed in more detail. In principle this will need to include instructions on the site infrastructure maintenance tasks including those necessary to ensure ongoing functioning of the site surface water drainage systems as per the designs in perpetuity. A draft surface water maintenance plan is given in Appendix M.

- 8.4.2 It is proposed that the main site access roads (and associated gulleys/ pipe connections) will be adopted by Lincolnshire County Council and the main site piped drainage systems adopted by Anglian Water. The attenuation basin will be offered to the district or parish council for adoption. If it is not adopted, then the attenuation basin is likely to remain under private ownership: being maintained by a private contract management company.
- 8.4.3 Signage at the attenuation basin will be necessary to confirm the public of the function of this drainage feature and provide health and safety advice.

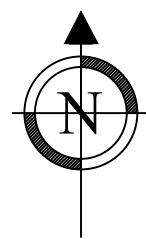
9 Foul Water

- 9.1 The proposed development foul water strategy is shown on drawing 1003-00-03A in Appendix K. This confirms that some of the site can drain by gravity and connect to the existing public foul water system south of the site (see Anglian Water map in Appendix J). The remainder of the site will drain by gravity to a pumping station at the north of the site that will convey flows via a rising main to the existing public foul water system south of the site.

10 Summary

- 10.1 The planning application is for proposed residential development of 150 residential units, over the 6.13 ha greenfield site.
- 10.2 The site is located partially within flood zones 1, 2 and 3, which relate to flood sources several kilometres from the site. The site is protected from these sources by flood defences and, therefore, it is only in the event of defence failure that there could be flooding at the site from Main River or tidal sources.
- 10.3 The proposed development has been designed to ensure that floor levels are at least 0.3 m above the predicted 1:1,000 year plus climate change flood level in the defence failure event. The proposed site ground levels enable dry escape from all dwellings during the 1:100 plus climate change defence failure event.
- 10.4 The site is not at notable risk of flooding from surface water or groundwater. Although groundwater levels are high and there are local watercourse bounding the site.
- 10.5 The proposed site runoff is to be restricted to 1.4 l/s/ha. The proposed site surface water will be attenuated within an attenuation basin and swales and the outflow discharge into the IDB watercourse at the north site boundary.
- 10.6 The proposed surface water drainage strategy ensures compliance with the *Non-Statutory Technical Standards for Sustainable Drainage*, 2015.
- 10.7 Foul water is proposed to outflow into the existing public foul water networks south of the site, either via gravity systems, or via the proposed on-site pumping station.

A
Location Plan



NOTE:
THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL
RELEVANT DETAIL SHEETS AND WITH THE GENERAL
SPECIFICATION AVAILABLE FROM PERSIMMON HOMES
(EAST MIDLANDS) LTD.

REV	COMMENT	DATE	BY
-----	---------	------	----

PERSIMMON
PERSIMMON HOMES (EAST MIDLANDS) LTD
Persimmon House
19 Commerce Road
Peterborough Business Park
Lynch Wood
Peterborough
PE2 6LR
Tel: 01733 397200
Fax: 01733 397255

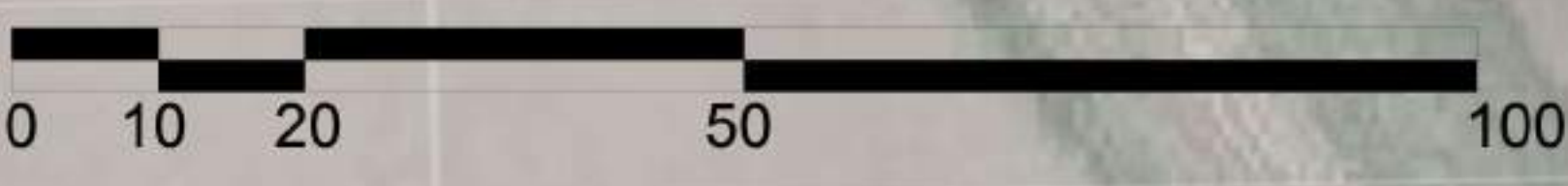
DRAWING TYPE:
Location Plan

PROJECT :
Weston
Spalding

Scale: 1:1000 @ A1 Date: 25/03/2020 Drawn by: AT	Dwg No: SPAL/WEST/LP/100 Rev: A1
--	---

B
Survey

C
Proposed Site



P	Layout amended in line with planning comments	11.10.21	AT
O	Highways amended	05.10.21	AT
N	Highways amended	06.09.21	AT
M	BCPs amended	22.07.21	AT
L	Single garages amended	24.03.21	AT
K	House type blocks drainage updated, roads & SUDS updated in line with engineering	03.02.21	AT
J			
I	Parking space added to plot 147	30.09.20	AT
H	Bin collection points moved	04.09.20	AT
G	Road adjacent to Pinfild Lane amended	03.09.20	AT
F	Layout amended in line with planning comments	25.08.20	AT
E	House types amended	17.08.20	AT
D	Staircase and footpaths updated	17.08.20	AT
C	Layout amended	13.08.20	AT
B	Integral units updated	14.04.20	BP
A	Pool & swales updated, pumping station added	01.04.20	BP

**PERSIMMON**

Persimmon Homes Ltd.
Persimmon House
29 Commerce Road
Lynwood Business Park
Plymouth
PL2 6LH
Tel: 01783 307200

Site Name:
**Weston
Spalding**

Drawing:
**Proposed
Planning
Layout**

Scale@A0:	Drawn By:	Date:
1:500	AT	17/08/2020
Version:	Drawing No:	Rev:
--	SPAL/WEST/PPL/100	P

D

NPPF Planning Practice Guidance Flood Risk and Coastal Change, Table 1

Table 1: Flood Zones

These Flood Zones refer to the probability of river and sea flooding, ignoring the presence of defences. They are shown on the Environment Agency's [Flood Map for Planning \(Rivers and Sea\)](#), available on the Environment Agency's web site, as indicated in the table below.

Flood Zone	Definition
Zone 1 Low Probability	Land having a less than 1 in 1,000 annual probability of river or sea flooding. (Shown as 'clear' on the Flood Map – all land outside Zones 2 and 3)
Zone 2 Medium Probability	Land having between a 1 in 100 and 1 in 1,000 annual probability of river flooding; or land having between a 1 in 200 and 1 in 1,000 annual probability of sea flooding. (Land shown in light blue on the Flood Map)
Zone 3a High Probability	Land having a 1 in 100 or greater annual probability of river flooding; or Land having a 1 in 200 or greater annual probability of sea flooding. (Land shown in dark blue on the Flood Map)
Zone 3b The Functional Floodplain	This zone comprises land where water has to flow or be stored in times of flood. Local planning authorities should identify in their Strategic Flood Risk Assessments areas of functional floodplain and its boundaries accordingly, in agreement with the Environment Agency. (Not separately distinguished from Zone 3a on the Flood Map)

Note: The Flood Zones shown on the Environment Agency's Flood Map for Planning (Rivers and Sea) do not take account of the possible impacts of climate change and consequent changes in the future probability of flooding. Reference should therefore also be made to the [Strategic Flood Risk Assessment](#) when considering location and potential future flood risks to developments and land uses.

Paragraph: 065 Reference ID: 7-065-20140306

Revision date: 06 03 2014

E

Environment Agency Product 4 flood data (Ref: CCN/20250/161818, 12 March 2020)

leigh@amazi.co.uk

Our ref: CCN/2020/161818

Date: 12/03/2020

Dear Leigh

Provision of Flood Risk Information for land at Weston, Lincolnshire, PE12 (TF 28870 24940).

Thank you for your request to use our flood risk information in the development of the Flood Risk Assessment (FRA) for the above site. The information is set out below and attached. It is important you read any contextual notes on the maps provided.

We aim to review our information on a regular basis, so if you are using this data more than twelve months from the date of this letter, please contact us again to check it is still valid.

Flood Map

The attached map includes the current Flood Map for your area. The Flood Map indicates the area at risk of flooding, **assuming no flood defences exist**, for a flood with a 0.5% chance of occurring in any year for flooding from the sea, or a 1% chance of occurring for fluvial (river) flooding. It also shows the extent of the Extreme Flood Outline which represents the extent of a flood with a 0.1% chance of occurring in any year, or the highest recorded historic extent if greater.

In some locations, such as around the fens and the large coastal floodplains, showing the area at risk of flooding assuming no defences may give a slightly misleading picture in that if there were no flood defences, water would spread out across these large floodplains. This flooding could cover large areas of land but to relatively shallow depths and could leave pockets of locally slightly higher land as isolated dry islands. It is important to understand the actual risk of the flooding to these dry islands, particularly in the event of defence failure.

The Flood Map also shows the location of formal raised flood defences and flood storage reservoirs. It represents areas at risk of flooding for present day only and does not take account of climate change.

The Flood Map only indicates the extent and likelihood of flooding from rivers or the sea. It should also be remembered flooding may occur from other sources such as surface water sewers, road drainage, etc.

History of Flooding

With regards to the history of flooding I can advise we do not have any records of flooding in this area. It is possible recent flooding may have occurred which we are currently investigating, therefore this information may be subject to change. It is possible other flooding may have occurred which other organisations, such as the Lead Local Flood Authority (ie top tier council), Local Authority or Internal Drainage Board (where they exist), may have records.

Tidal Flood Risk Information

Tidal Defence Information

The tidal defences protecting this site consist of earth embankments.

They are in fair condition and reduce the risk of flooding (at the defence) to a 1% (1 in 100) chance of occurring in any year. We inspect these defences routinely to ensure potential defects are identified.

Tidal Flood Levels

The attached table shows our current best estimate for extreme tide levels.

Levels for the Humber Estuary have an assessment date of 2014, with others having an assessment date of 2006, which should be used in any consideration of future increases due to climate change.

Modelled Hazard Mapping

For certain locations we have carried out modelling to map the maximum values of flood depth, velocity and hazard rating (danger to people) resulting from overtopping and / or breaching of defences at specific locations for a number of scenarios.

At present this information is available along the full coastal / tidal floodplain, except the tidal Witham Haven in Boston (upstream of Hobhole) where only breaching and not overtopping has been modelled and the tidal River Welland upstream of Fosdyke Bridge where neither breaching nor overtopping are available. Hazard mapping is also available for fluvial flood risk in Northampton, Lincoln, Wainfleet and some isolated rural locations.

The number of locations we have this information for is expected to increase in time.

Hazard Mapping – Breaching

The attached maps show the maximum values of flood depth, velocity and hazard rating (danger to people) resulting from breaching of the defences at specific locations for the scenarios below. For some locations the breach mapping also includes flooding from overtopping if this is expected in that scenario. The location of modelled tidal breaches is shown on a separate attached map.

- Year 2006 0.5% (1 in 200) chance
- Year 2006 0.1% (1 in 1000) chance
- Year 2115 0.5% (1 in 200) chance
- Year 2115 0.1% (1 in 1000) chance

Hazard Mapping – Overtopping

Your site is not affected by overtopping of the defences for the present day (2006) scenarios.

Development Planning

If you would like local guidance on preparing a flood risk assessment for a planning application, please contact our Sustainable Places team at lnplanning@environment-agency.gov.uk. It will help if you mention this data request and attach your site location plan.

We provide free preliminary advice; additional/detailed advice, review of draft FRAs and meetings are chargeable at a rate set to cover our costs, currently £100 (plus VAT) per hour of staff time. Further details are available on our website at <https://www.gov.uk/guidance/developers-get-environmental-advice-on-your-planning-proposals>.

General advice on flood risk assessment for planning applications can be found on GOV.UK at <https://www.gov.uk/guidance/flood-risk-assessment-for-planning-applications>

Climate change will increase flood risk due to overtopping of defences. Please note the climate change data included has an allowance for 20% increase in flow. Updated guidance on how climate change could affect flood risk to new development - 'Flood risk assessments: climate change allowances' was published on GOV.UK in February 2016. The appropriate updated climate change allowance should be applied in a Flood Risk Assessment.

You should also consult the Strategic Flood Risk Assessment produced by your local planning authority.

Supporting Information

Please see the Standard Notice or licence for details of permitted use. The Standard Notice can be found at the link below.

<http://www.nationalarchives.gov.uk/doc/open-government-licence/version/3/>

We respond to requests for recorded information we hold under the Freedom of Information Act 2000 (FOIA) and the associated Environmental Information Regulations 2004 (EIR).

Further information on flood risk can be found on the GOV.UK website at:

<https://www.gov.uk/browse/environment-countryside/flooding-extreme-weather>

Other Flood Risk Management Authorities

The information provided with this letter relates to flood risk from main river or the sea. Additional information may be available from your Lead Local Flood Authority (ie county council or unitary authority) or, where they exist, the Internal Drainage Board.

Further Contact

I hope we have correctly interpreted your request. If you are not satisfied with our response to your request for information, you can contact us within two calendar months to ask for our decision to be reviewed.

If you have any queries or would like to discuss the content of this letter further please contact Heather Tysoe using the details below.

Yours sincerely,



p.p.

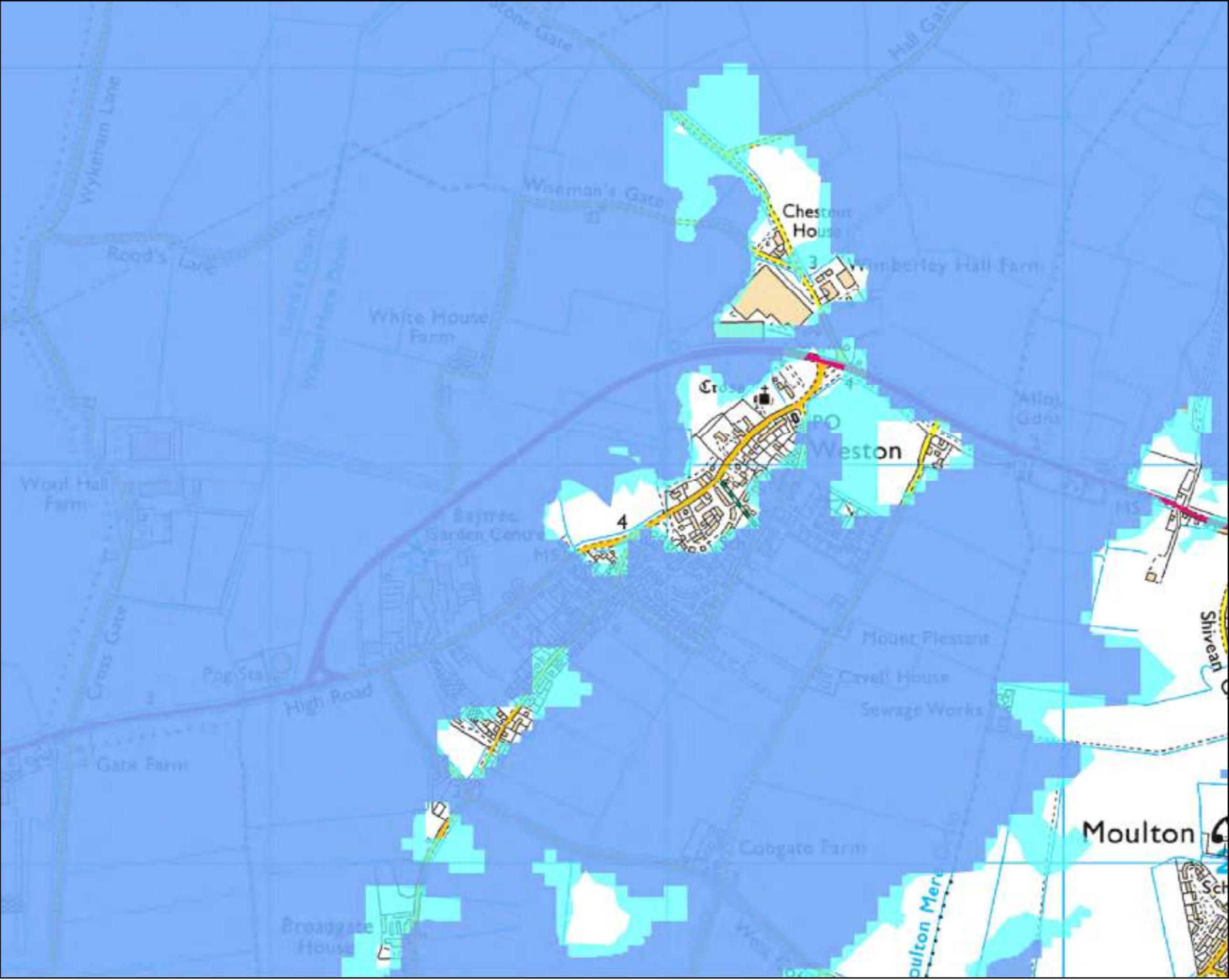
Alastair Windler
Partnerships and Strategic Overview Team Leader Welland and Nene

Direct dial 02030253535

Direct e-mail PSOWN@environment-agency.gov.uk

Enc.
Flood Map
Estimated Tide Levels
Tidal Breach Locations Map
Hazard Mapping – Breaching (4 maps)

Flood Map centred on TF28870 24940 - created March 2020 [Ref: CCN-2020-161818]



Scale 1:10,000



- Legend**
- Raised Defences
 - Flood Storage Areas
 - Area at Risk of Flooding from Rivers or The Sea
 - Extreme Flood Outline

Dark blue shows the area that could be affected by flooding, either from rivers or the sea, if there were no flood defences. This area could be flooded:

- from the sea by a flood that has a 0.5% (1 in 200) or greater chance of happening each year.
- or from a river by a flood that has a 1% (1 in 100) or greater chance of happening each year.

Light blue shows the extent of the Extreme Flood Outline, which represents the extent of a flood event with a 0.1% chance of occurring in any year, or the highest recorded historic extent if greater.

These two colours show the extent of the natural floodplain if there were no flood defences or certain other manmade structures and channel improvements. Sites outside the two extents, but behind raised defences, may be affected by flooding if the defences are overtopped or fail.

Created by the Partnerships and Strategic Overview Team, Kettering

Lincolnshire & Northamptonshire Area



Tidal Water Levels for the South Humber, East Coast and The Wash

The table below shows still water levels for locations, from the above location map, around the South Humber Estuary, East Coast and The Wash. It is important to note the following:

- The base date for the data is 2014 for the South Humber and 2006 for the East Coast and The Wash.
- The data are still water levels. Depending on the use of the data it may be necessary to consider wave heights and / or joint probability analysis of water level and other variables.
- The water level quoted is the 'Best Estimate' water level. Depending on the use of the data it may be necessary to carry out sensitivity testing. Upper and Lower 95% confidence bandings are available upon request.
- Levels for other annual chance scenarios are available if required.

Ref	Location	Easting	Northing	Annual Chance (1 in x) of Tide Level					
				metres ODN					
				1	10	50	100	200	1000
HUMBER									
H030	Tetney	535420	403180	3.94	4.29	4.56	4.69	4.82	5.15
H050	Buck Beck	532700	406580	4.03	4.36	4.62	4.74	4.87	5.18
H060	Grimsby	527878	411346	4.10	4.43	4.70	4.82	4.95	5.27
H080	Haborough Marsh	520790	415740	4.26	4.61	4.88	5.01	5.14	5.47
H090	Immingham	519141	417449	4.26	4.61	4.88	5.01	5.14	5.47
H100	South Killingholme	518700	417120	4.41	4.77	5.05	5.18	5.32	5.66
H130	North Killingholme	516530	420000	4.51	4.87	5.15	5.28	5.42	5.77
H150	East Halton	514450	422870	4.59	4.96	5.25	5.39	5.53	5.89
H170	Goxhill	511970	425440	4.67	5.04	5.34	5.47	5.61	5.95
H200	New Holland	508020	424330	4.87	5.26	5.55	5.68	5.81	6.12
H210	Barrow Haven	506380	422620	4.92	5.31	5.60	5.73	5.86	6.17
H220	Ferriby	497550	421150	5.04	5.42	5.67	5.77	5.86	6.04
H230	Winterton	493420	422830	5.14	5.51	5.74	5.83	5.90	6.02
H250	Blacktoft	484247	424190	5.25	5.62	5.83	5.90	5.96	6.04
H270	Goole	474857	422960	5.46	5.85	6.07	6.15	6.21	6.29
East Coast									
~	Great Eau	545500	393800	3.80	4.19	4.46	4.57	4.69	4.96
~	Boygrift	553300	379800	3.84	4.24	4.53	4.65	4.77	5.05
~	Burgh Sluice	555190	358620	4.26	4.45	4.76	4.90	5.03	5.34
Wash									
~	Hobhole	536610	339940	4.82	5.30	5.64	5.78	5.93	6.27
~	Lawyers Sluice	540750	334550	4.84	5.32	5.66	5.80	5.95	6.29
~	West Lighthouse	549150	325750	4.88	5.37	5.71	5.86	6.01	6.35
~	Grand Sluice	532400	344500	4.88	5.33	5.65	5.78	5.93	~
~	Fosdyke Bridge	531700	332200	4.91	5.38	5.71	5.85	5.99	~
~	Marsh Road	526000	324000	5.04	5.44	5.73	5.85	5.98	~
~	Wisbech	546100	310000	4.83	5.25	5.53	5.66	5.78	~
~	Dog In Doublet	527300	299300	3.67	4.00	4.22	4.32	4.42	~



^ Modelled Breach Locations



This map indicates the location of where we have modelled the consequence of breaches in the defences along the coastline and tidal rivers. We have mapped the the maximum values of Hazard Rating (Danger to People), Depth and Velocity.

We have not assumed that all breaches occur at the same time, but have modelled each breach individually and overlaid the results to find the maximum values.

Our modelling only considers the consequences of a breach, it does not make any assumption about the likelihood of a breach occurring. Our defences generally provide a good standard of flood defence but a risk of breaching remains.

Please contact the Environment Agency for information on how these maps are used in the management of flood risk.

General Enquiries No: 03708 506 506.

Weekday daytime calls cost 5p plus up to 6ppm from BT Weekend Unlimited. Mobile and other providers charges may vary

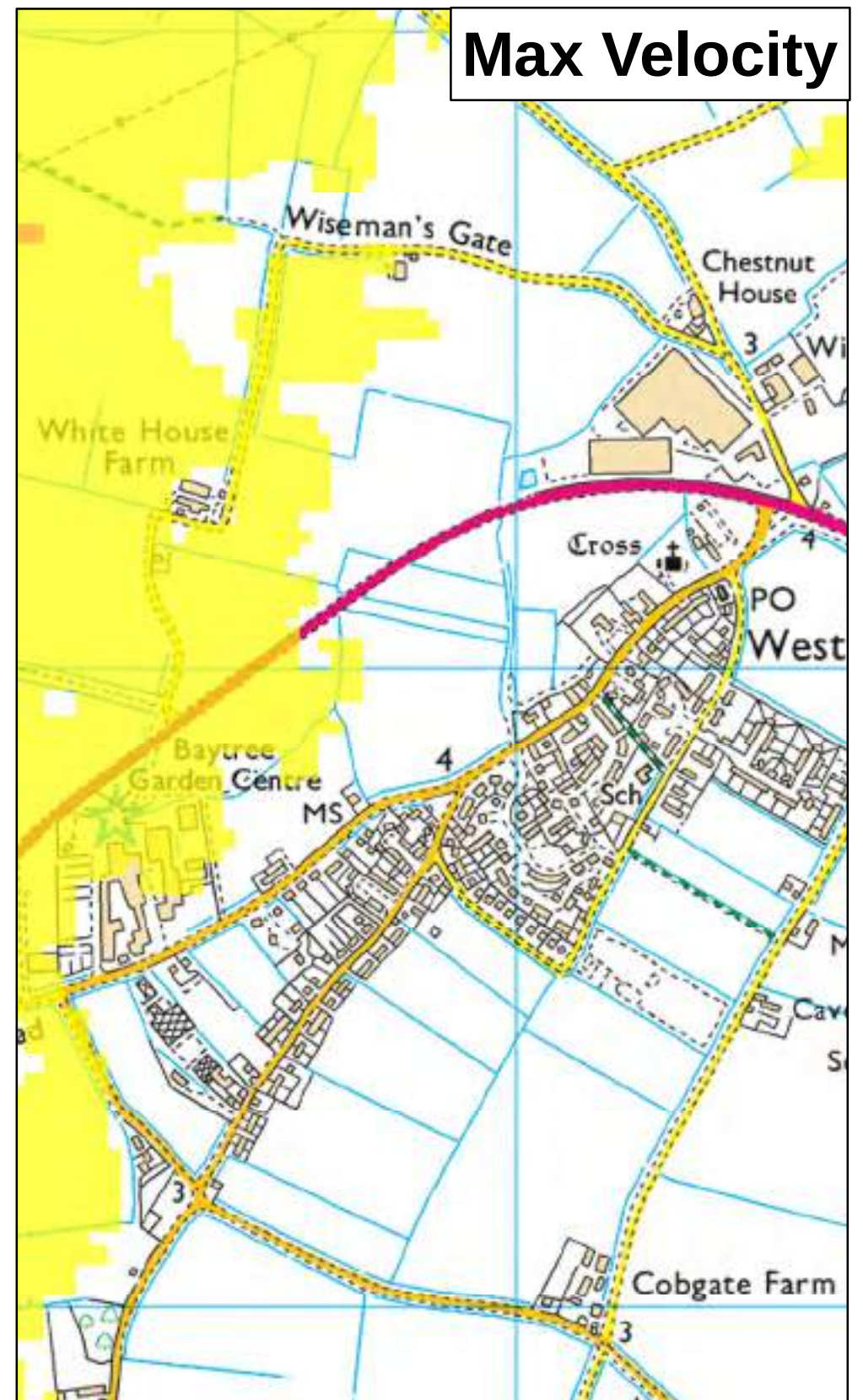


Produced by the Partnership and Strategic Overview Team, Lincoln
General Enquiries No: 03708 506 506

**Northern Area Tidal
Hazard Mapping**

Location of Modelled Breaches

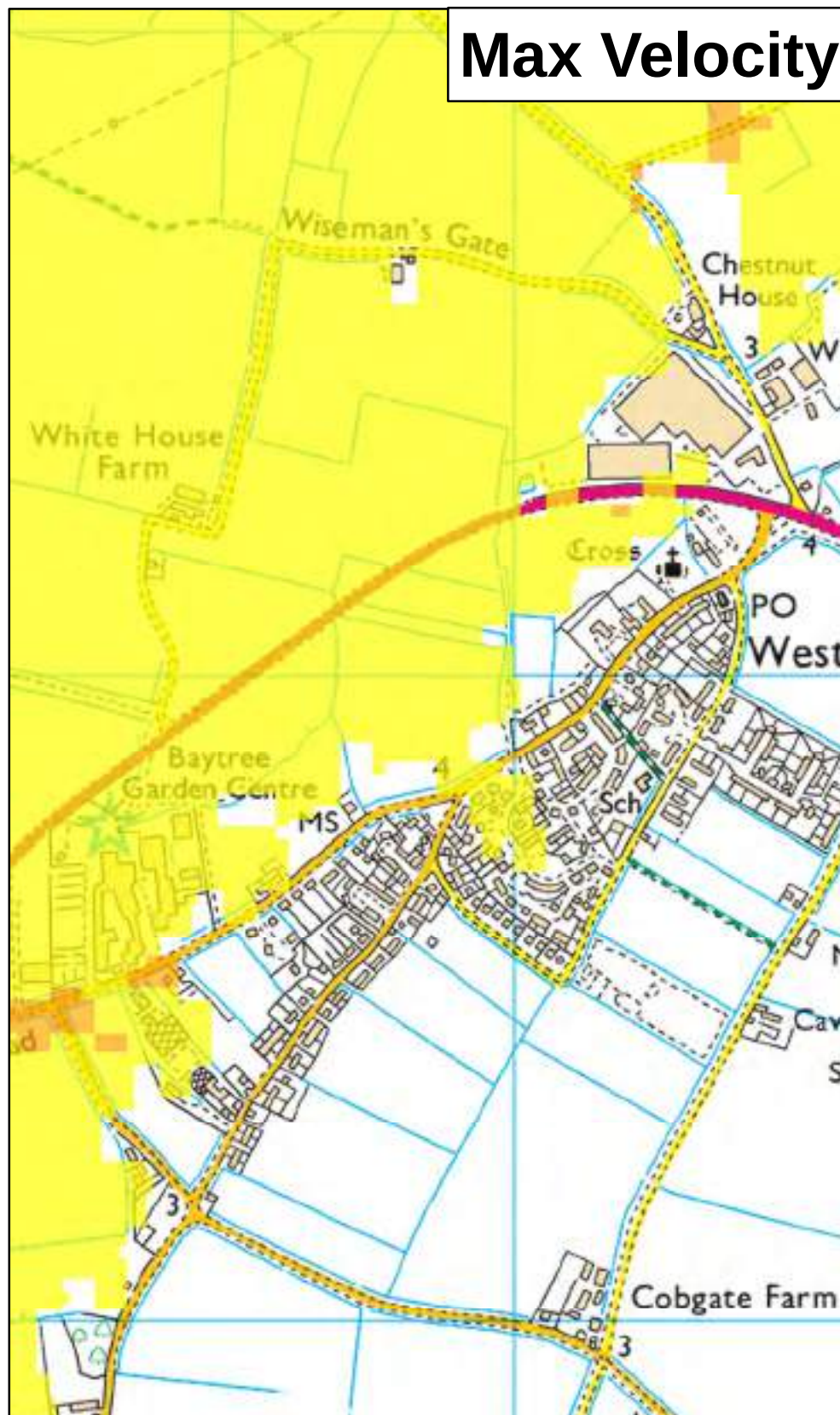
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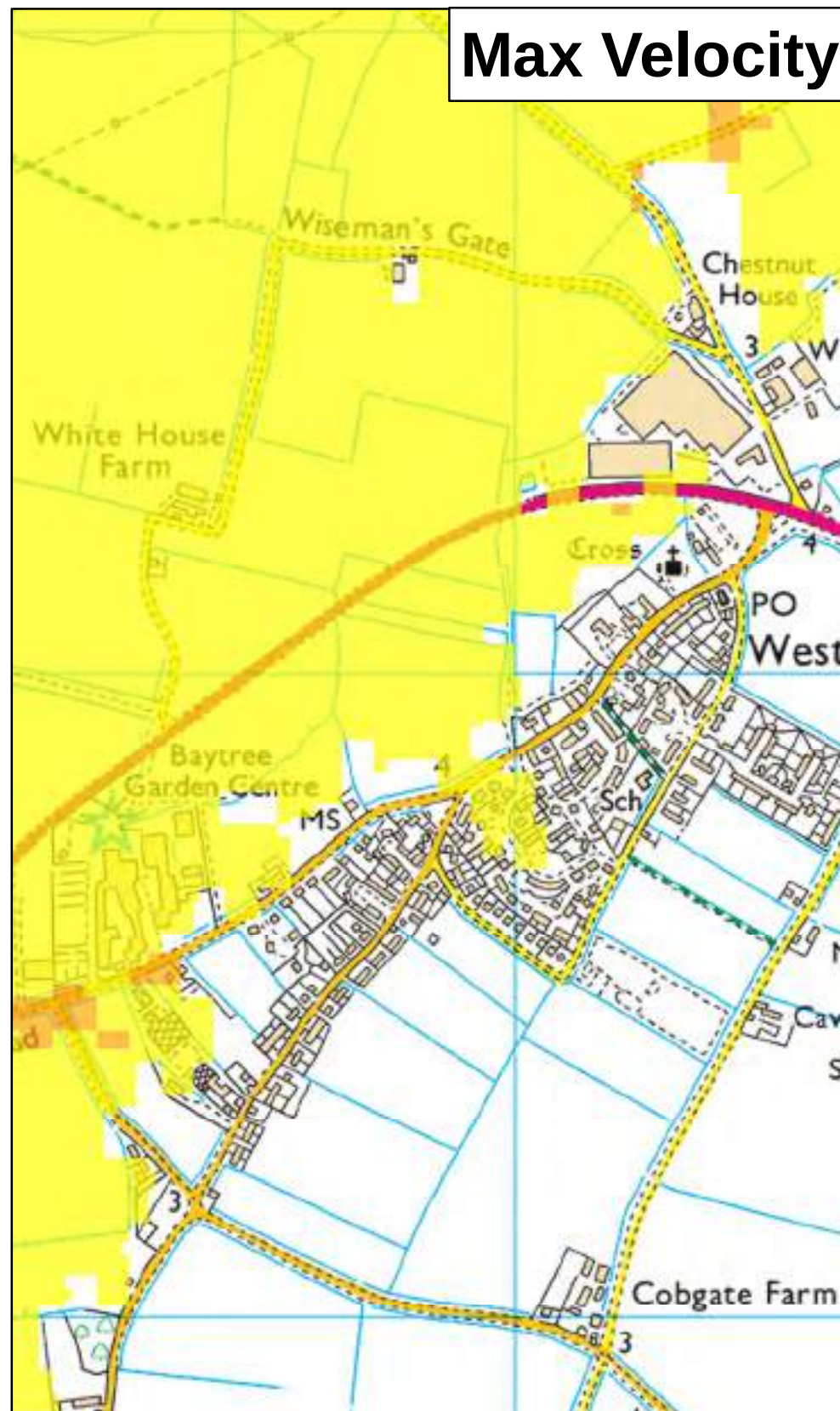
★ Modelled Breach Locations - see also the accompanying plan "Location of Modelled Breaches"								 Lincolnshire and Northamptonshire Tidal Breaching Hazard Mapping Map Centred on TF28870 24940 This map is reproduced by permission of Ordnance Survey on behalf of The Controller of Her Majesty's Stationary Office. Crown copyright. All rights reserved. Environment Agency 100026380, 2020. Unauthorised reproduction infringes Crown copyright and may lead to prosecution or civil proceedings.
Max Hazard (Flood Risk to People : FD2320)		Max Depth (m)		Max Velocity (m/s)				
Less than 0.75 (Low Hazard)		0 - 0.25		0 - 0.3				
Between 0.75 and 1.25 (Danger for Some)		0.25 - 0.50		0.3 - 1.0				
Between 1.25 and 2.0 (Danger for Most)		0.50 - 1.0		1.0 - 1.5				
Greater than 2.0 (Danger for All)		1.0 - 1.6		1.5 - 2.5				
		1.6 +		2.5 +				
Date Printed	March 2020	Scenario year	2006	Scenario Annual Chance	0.5% (1 in 200)	CCN Number	CCN-2020-161818	
General Enquiries No: 03708 506 506. Weekday Daytime calls cost 5p plus up to 6p per minute from BT Weekend Unlimited. Mobile and other providers' charges may vary								



★ Modelled Breach Locations - see also the accompanying plan "Location of Modelled Breaches"								 Lincolnshire and Northamptonshire Tidal Breaching Hazard Mapping Map Centred on TF28870 24940 This map is reproduced by permission of Ordnance Survey on behalf of The Controller of Her Majesty's Stationary Office. Crown copyright. All rights reserved. Environment Agency 100026380, 2020. Unauthorised reproduction infringes Crown copyright and may lead to prosecution or civil proceedings.
Max Hazard (Flood Risk to People : FD2320)		Max Depth (m)		Max Velocity (m/s)		This map shows the level of flood hazard to people (called a hazard rating) if our flood defences are breached at certain locations, for a range of scenarios. The hazard rating depends on the depth and velocity of floodwater, and maximum values of these are also mapped. The map is based on computer modelling of simulated breaches at specific locations. Each breach has been modelled individually and the results combined to create this map. Multiple breaches, other combinations of breaches, different sized tidal surges or flood flows may all give different results. The map only considers the consequences of a breach, it does not make any assumption about the likelihood of a breach occurring. The likelihood of a breach occurring will depend on a number of different factors, including the construction and condition of the defences in the area. A breach is less likely where defences are of a good standard, but a risk of breaching remains.		
Less than 0.75 (Low Hazard)		0 - 0.25		0 - 0.3				
Between 0.75 and 1.25 (Danger for Some)		0.25 - 0.50		0.3 - 1.0				
Between 1.25 and 2.0 (Danger for Most)		0.50 - 1.0		1.0 - 1.5				
Greater than 2.0 (Danger for All)		1.0 - 1.6		1.5 - 2.5				
		1.6 +		2.5 +				
Date Printed	March 2020	Scenario year	2006	Scenario Annual Chance	0.1% (1 in 1000)	CCN Number	CCN-2020-161818	



★ Modelled Breach Locations - see also the accompanying plan "Location of Modelled Breaches"								This map shows the level of flood hazard to people (called a hazard rating) if our flood defences are breached at certain locations, for a range of scenarios. The hazard rating depends on the depth and velocity of floodwater, and maximum values of these are also mapped. The map is based on computer modelling of simulated breaches at specific locations. Each breach has been modelled individually and the results combined to create this map. Multiple breaches, other combinations of breaches, different sized tidal surges or flood flows may all give different results. The map only considers the consequences of a breach, it does not make any assumption about the likelihood of a breach occurring. The likelihood of a breach occurring will depend on a number of different factors, including the construction and condition of the defences in the area. A breach is less likely where defences are of a good standard, but a risk of breaching remains. General Enquiries No: 03708 506 506. Weekday Daytime calls cost 5p plus up to 6p per minute from BT Weekend Unlimited. Mobile and other providers' charges may vary	Max Hazard (Flood Risk to People : FD2320)		Max Depth (m)		Max Velocity (m/s)	
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)		0 - 0.25 0.25 - 0.50 0.50 - 1.0 1.0 - 1.6 1.6 +		0 - 0.3 0.3 - 1.0 1.0 - 1.5 1.5 - 2.5 2.5 +										
Date Printed	March 2020	Scenario year	2115	Scenario Annual Chance	0.5% (1 in 200)	CCN Number	CCN-2020-161818							
Lincolnshire and Northamptonshire Tidal Breaching Hazard Mapping Map Centred on TF28870 24940 This map is reproduced by permission of Ordnance Survey on behalf of The Controller of Her Majesty's Stationary Office. Crown copyright. All rights reserved. Environment Agency 100026380, 2020. Unauthorised reproduction infringes Crown copyright and may lead to prosecution or civil proceedings.														



★ Modelled Breach Locations - see also the accompanying plan "Location of Modelled Breaches"								 Lincolnshire and Northamptonshire Tidal Breaching Hazard Mapping Map Centred on TF28870 24940 This map is reproduced by permission of Ordnance Survey on behalf of The Controller of Her Majesty's Stationary Office. Crown copyright. All rights reserved. Environment Agency 100026380, 2020. Unauthorised reproduction infringes Crown copyright and may lead to prosecution or civil proceedings.
Max Hazard (Flood Risk to People : FD2320)		Max Depth (m)		Max Velocity (m/s)		This map shows the level of flood hazard to people (called a hazard rating) if our flood defences are breached at certain locations, for a range of scenarios. The hazard rating depends on the depth and velocity of floodwater, and maximum values of these are also mapped. The map is based on computer modelling of simulated breaches at specific locations. Each breach has been modelled individually and the results combined to create this map. Multiple breaches, other combinations of breaches, different sized tidal surges or flood flows may all give different results. The map only considers the consequences of a breach, it does not make any assumption about the likelihood of a breach occurring. The likelihood of a breach occurring will depend on a number of different factors, including the construction and condition of the defences in the area. A breach is less likely where defences are of a good standard, but a risk of breaching remains.		
Less than 0.75 (Low Hazard)		0 - 0.25		0 - 0.3				
Between 0.75 and 1.25 (Danger for Some)		0.25 - 0.50		0.3 - 1.0				
Between 1.25 and 2.0 (Danger for Most)		0.50 - 1.0		1.0 - 1.5				
Greater than 2.0 (Danger for All)		1.0 - 1.6		1.5 - 2.5				
		1.6 +		2.5 +				
Date Printed	March 2020	Scenario year	2115	Scenario Annual Chance	0.1% (1 in 1000)	CCN Number	CCN-2020-161818	
General Enquiries No: 03708 506 506. Weekday Daytime calls cost 5p plus up to 6p per minute from BT Weekend Unlimited. Mobile and other providers' charges may vary								



Lincolnshire and Northamptonshire Tidal Breaching Hazard Mapping

Map Centred on TF28870 24940

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F

**South Holland Internal Drainage Board District Map (Ref: CMT208P, January 2016)
and Email re surcharged ditch levels**

From: [Charlotte Orr](#)
To: [Rob Hill](#)
Subject: RE: 21_04477_C - High Road, Weton
Date: 18 August 2021 07:29:55
Attachments: [image001.png](#)
[image004.png](#)
[image005.png](#)
[image006.png](#)
[image007.png](#)
[image008.png](#)

Good Morning Rob,

Sorry for the delay in response, as I have just returned from annual leave; thank you for your response to our questions.

Regarding question 2, for indicative purposes only, please see the anticipated water levels in the Board adopted watercourse, R14 Pinfold (DRN208P1404)

2yr storm event – 1.4m ODN
5yr storm event – 1.59m ODN
10yr storm event – 1.77m ODN
30yr storm event – 2.00m ODN
50yr flood event – 2.13m ODN
100yr flood event – 2.25m ODN
200yr flood event – 2.35m ODN

Please note that these water levels were calculated in 2013 and therefore, the climate change scenario used in the Board's modelling may not meet current standards.

Regarding question 5, yes, any ordinary watercourse proposed to be altered within the Board's Internal Drainage District, requires the Board's consent, including even a Highways ditch. Just as an example from another site I have been working on, the developer for this site did not seek the Board's approval first, before infilling a Highways ditch. Since then, Highways requested that the developer prove that they had the Board's consent to alter the watercourse, so that a footpath with road gullies could be constructed where the infilled roadside ditch once was. Consequently when the developer explained the situation to the Board and sought our consent, we were not able to consent the alteration to the watercourse, until the developer had removed the infilling. This is because the Board's Officers need to inspect any watercourse (including a Highways ditch) proposed to be altered/infilled/culverted, to first check that the proposed alteration to the watercourse will not block any connected drainage, which could increase flood risk.

Thank you and please let me know if you have any questions.



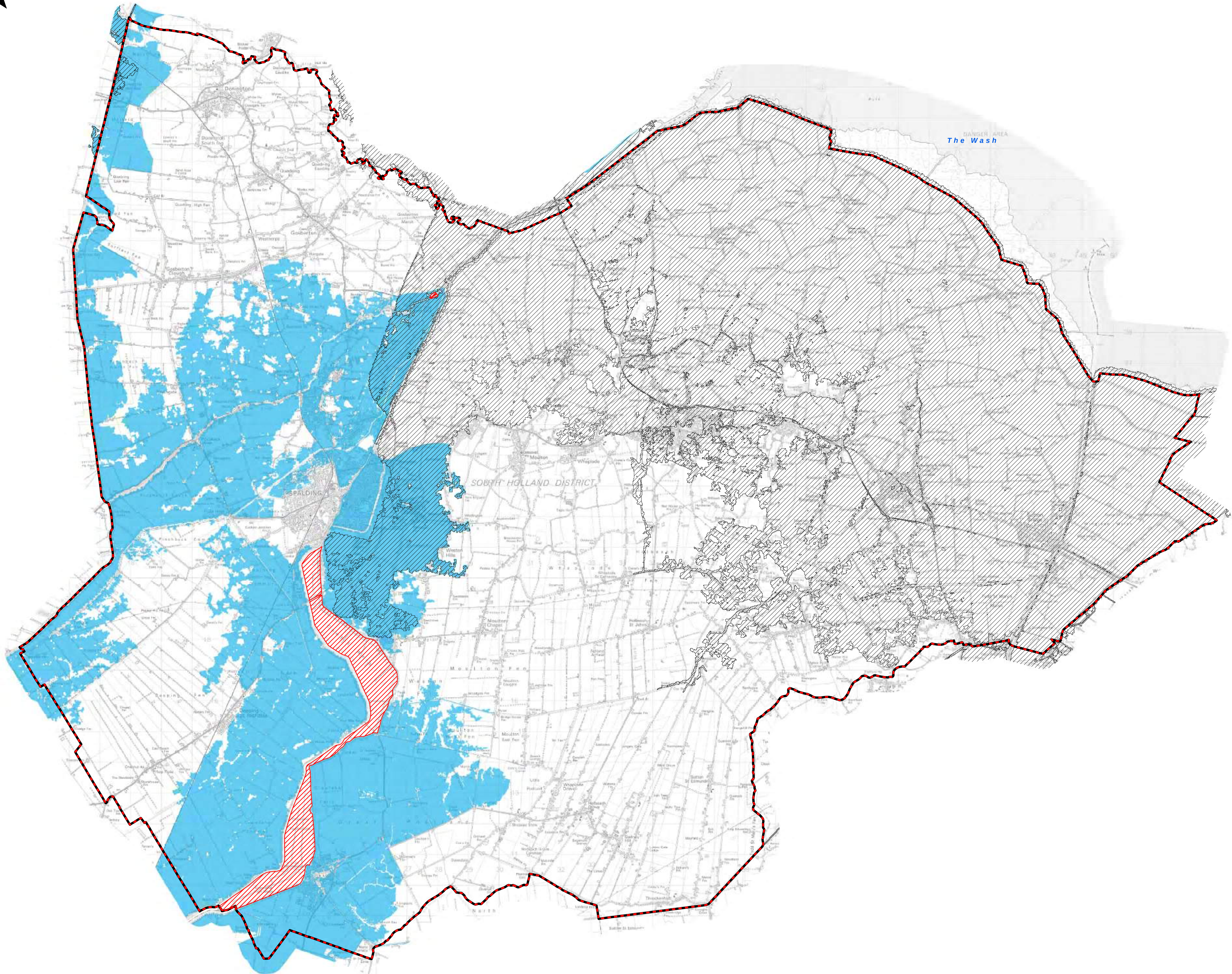
Charlotte Orr, BSc (Hons.)
Sustainable Development Officer
Water Management Alliance

Registered office: Kettlewell House, Austin Fields Industrial Estate, King's Lynn, Norfolk, PE30 1PH
t: 07341882941 | e: Charlotte.Orr@wlma.org.uk | www.wlma.org.uk

WMA members: [Broads Drainage Board](#), [East Suffolk Drainage Board](#), [King's Lynn Drainage Board](#), [Norfolk](#)

G

South Holland 2016 Update of Strategic Flood Risk Assessment



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.

Map Legend

- South Holland District Council
Fluvial Flood Mapping Extent
- Environment Agency
Tidal Flood Mapping 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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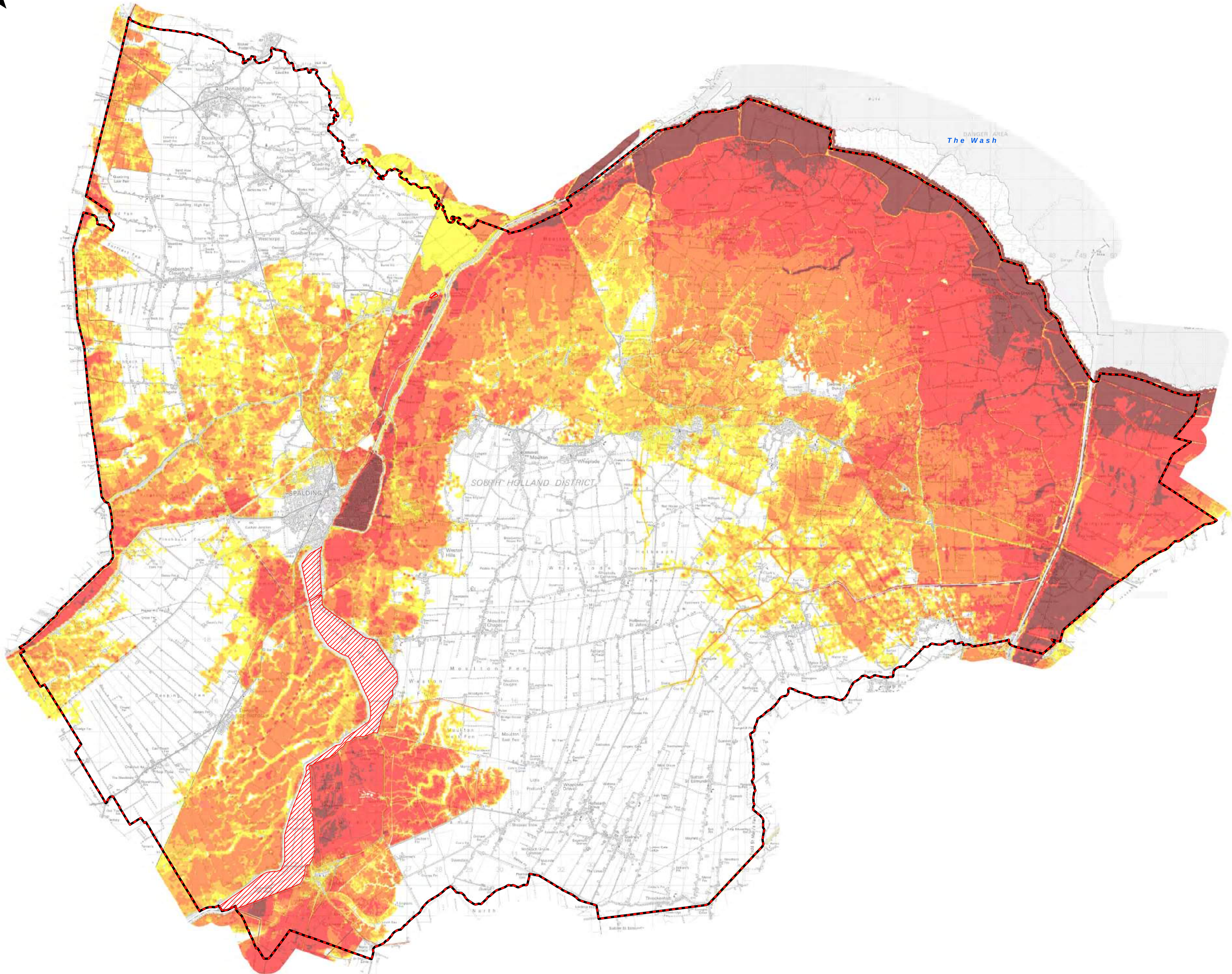
ROYAL HASKONINGDHV
RIGHTWELL HOUSE
BRETTON
PETERBOROUGH
PE3 8DW
TEL +44 (0)1733 334455
FAX +44 (0)1733 262243



SOUTH HOLLAND DISTRICT COUNCIL
COUNCIL OFFICES
PRIORITY ROAD
SPALDING
LINCOLNSHIRE
PE11 2XE

UPDATE OF STRATEGIC
FLOOD RISK ASSESSMENT
Fluvial and Tidal Source Mapping
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.
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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 +	
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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ROYAL HASKONINGDHV
RIGHTWELL HOUSE
BRETTON
PETERBOROUGH
PE3 8DW
TEL +44 (0)1733 334455
FAX +44 (0)1733 262243

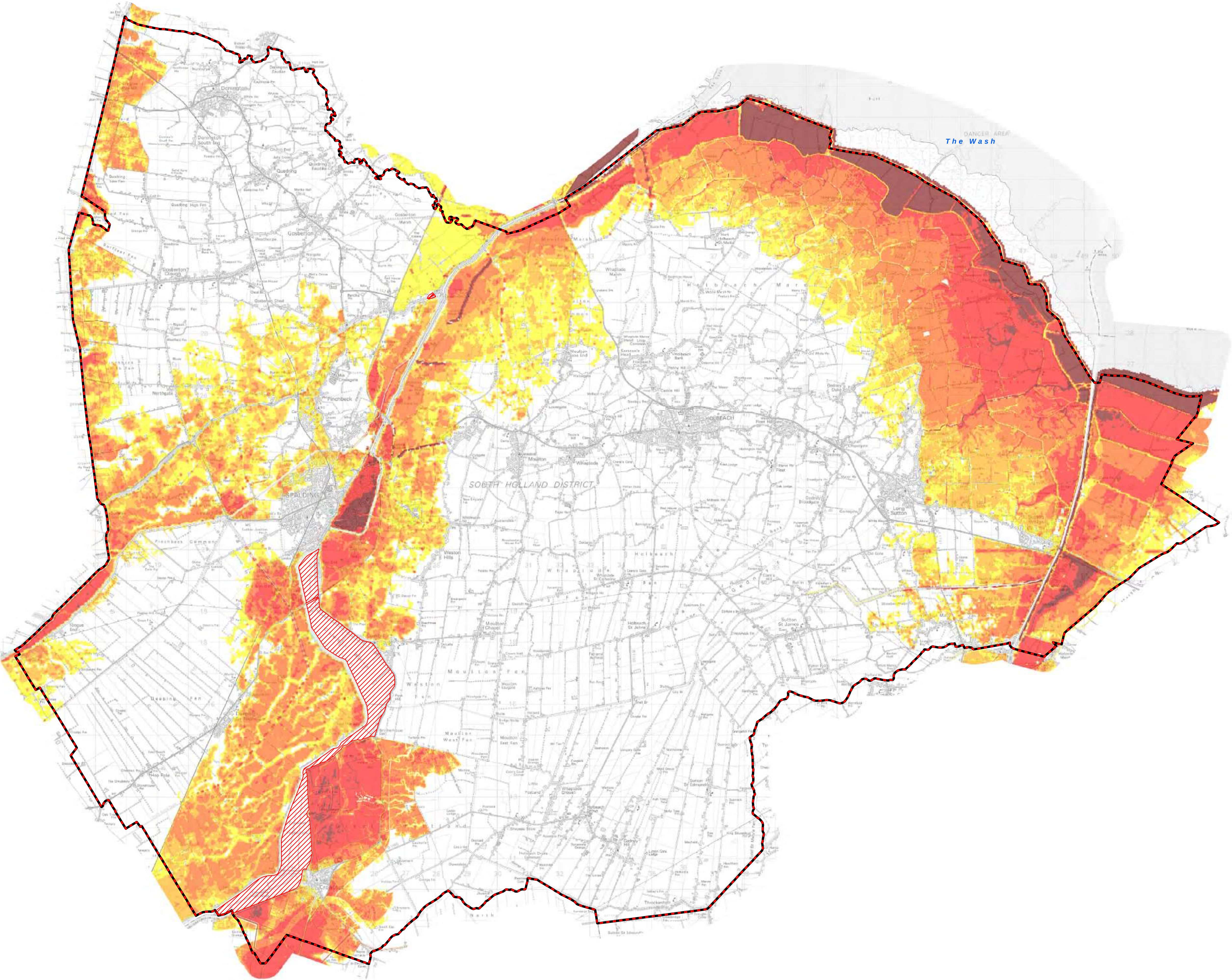


SOUTH HOLLAND DISTRICT COUNCIL
COUNCIL OFFICES
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SPALDING
LINCOLNSHIRE
PE11 2XE

UPDATE OF STRATEGIC
FLOOD RISK ASSESSMENT

Residual Peak Depth
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.
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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 +	
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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ROYAL HASKONINGDHV
RIGHTWELL HOUSE
BRETTON
PETERBOROUGH
PE3 8DW
TEL +44 (0)1733 334455
FAX +44 (0)1733 262243



SOUTH HOLLAND DISTRICT COUNCIL
COUNCIL OFFICES
PRIORITY ROAD
SPALDING
LINCOLNSHIRE
PE11 2XE

UPDATE OF STRATEGIC
FLOOD RISK ASSESSMENT

Residual Peak Depth
District - Present Day
1% Fluvial / 0.5% Tidal Event Probability

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

H
Proposed Site Levels



- Proposed Contours
- FFL:3.45 Proposed Finished Floor Levels
- Drainage Exceedance Route
- Existing Survey Information

REV	DESCRIPTION	DATE
1	Layout updated	18.11.21
2	Layout updated	30.10.20
3	SCALE: 1:500	
4	DATE: March 2020	
5	DRAWN: RAH	

TITLE: Planning Levels Layout

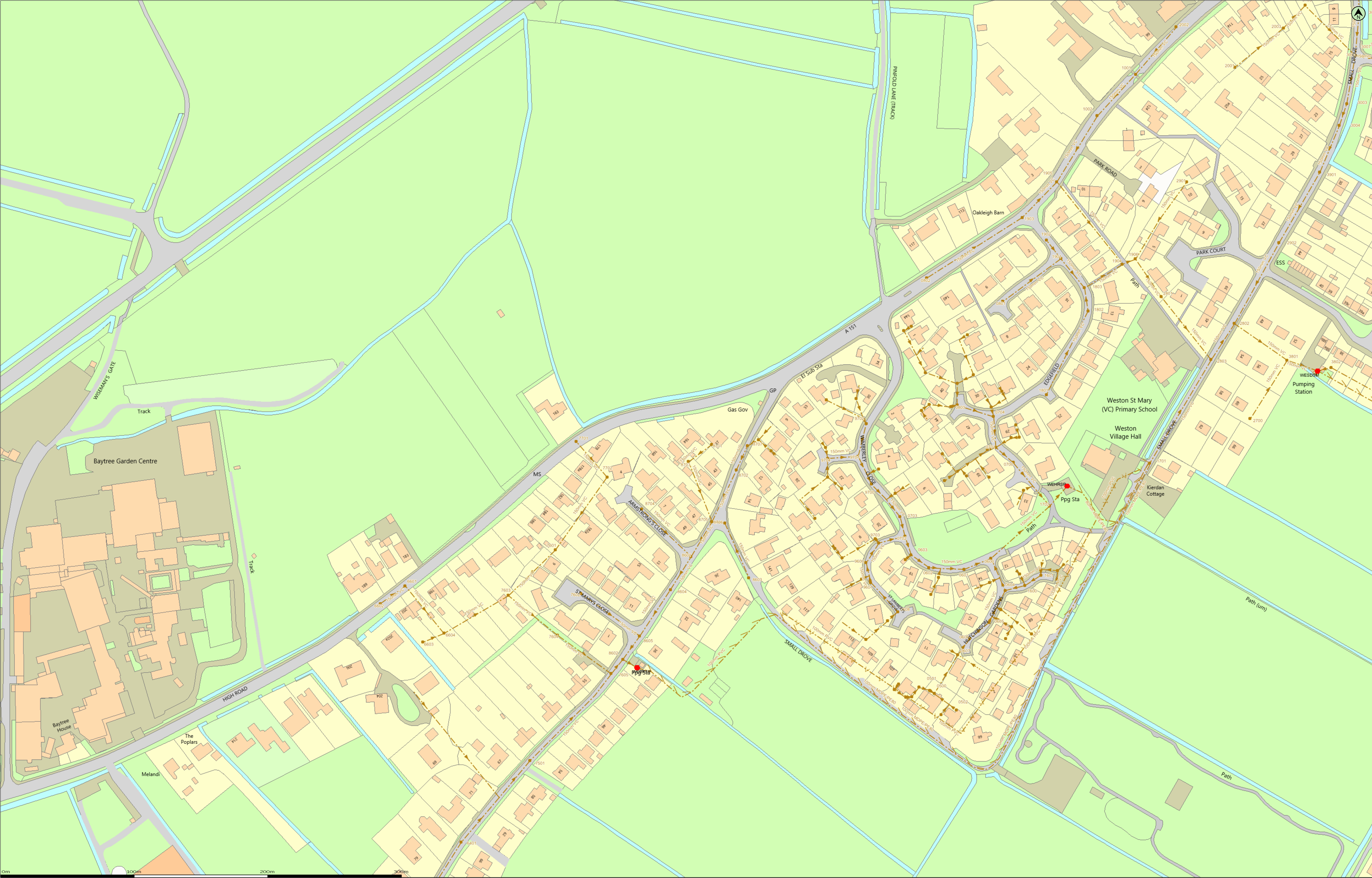
PROJECT: High Road, Weston
DRG. No: 1003-00-05 Rev B
33 The Point
Rochingham Road
Market Harborough
Leicestershire LE16 7QU
Tel: 01858 411270 Fax: 01858 411751
Email: info@infrades.co.uk URL: www.infrades.co.uk

iD LTD
INFRASTRUCTURE DESIGN LIMITED
33 The Point
Rochingham Road
Market Harborough
Leicestershire LE16 7QU
Tel: 01858 411270 Fax: 01858 411751
Email: info@infrades.co.uk URL: www.infrades.co.uk

working for
PERSIMMON
PERSIMMON HOMES (EAST MIDLANDS) LTD
Persimmon House
18 Commerce Road
Lynwood Business Park
Petersborough
PE2 6UR
Tel: 01733 397200
Fax: 01733 397205

J
Existing Runoff

Amazi Consulting Ltd		Page 1																								
13 Tovells Road Ipswich Suffolk, IP4 4DY																										
Date 24/03/2020	Designed by LeighP																									
File	Checked by																									
XP Solutions		XPDRAINAGE XPD.2019.1.1																								
<u>ICP SUDS Mean Annual Flood</u> Input <table> <tr> <td>Return Period(years)</td> <td>100</td> </tr> <tr> <td>Area (ha)</td> <td>1.000</td> </tr> <tr> <td>SAAR (mm)</td> <td>564.000</td> </tr> <tr> <td>Soil</td> <td>0.470</td> </tr> <tr> <td>Urban</td> <td>0.000</td> </tr> <tr> <td>Region</td> <td>Region 5</td> </tr> </table> Results <table> <tr> <td>QBAR Rural (L/s)</td> <td>3.7496</td> </tr> <tr> <td>QBAR Urban (L/s)</td> <td>3.7496</td> </tr> <tr> <td>Q 100 (years)</td> <td>13.3486</td> </tr> <tr> <td>Q 1 (years)</td> <td>3.2622</td> </tr> <tr> <td>Q 30 (years)</td> <td>9.0084</td> </tr> <tr> <td>Q 100 (years)</td> <td>13.3486</td> </tr> </table>			Return Period(years)	100	Area (ha)	1.000	SAAR (mm)	564.000	Soil	0.470	Urban	0.000	Region	Region 5	QBAR Rural (L/s)	3.7496	QBAR Urban (L/s)	3.7496	Q 100 (years)	13.3486	Q 1 (years)	3.2622	Q 30 (years)	9.0084	Q 100 (years)	13.3486
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Q 1 (years)	3.2622																									
Q 30 (years)	9.0084																									
Q 100 (years)	13.3486																									
Designed in XPDRAINAGE																										



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Date: 25/03/20

Scale: 1:1250

Map Centre: 528852.324779

Data updated: 06/03/20

Our Ref: 378606 - 1

Wastewater Plan A1

This plan is provided by Anglian Water pursuant to its obligations under the Water Industry Act 1991 sections 198 or 199. It must be used in conjunction with any search results attached. The information on this plan is based on data currently recorded but position must be regarded as approximate. Service pipes, private sewers and drains are generally not shown. Users of this map are strongly advised to commission their own survey of the area shown on the plan before carrying out any works. The actual position of all apparatus MUST be established by trial holes. No liability whatsoever, including liability for negligence, is accepted by Anglian Water for any error or inaccuracy or omission, including the failure to accurately record, or record at all, the location of any water main, discharge pipe, sewer or disposal main or any item of apparatus. This information is valid for the date printed. This plan is produced by Anglian Water Services Limited (c) Crown copyright and database rights 2020 Ordnance Survey 100022432. This map is to be used for the purposes of viewing the location of Anglian Water plant only. Any other users of the map data or further copies is not permitted. This notice is not intended to exclude or restrict liability for death or personal injury resulting from negligence.

- | | | |
|-----------------------|-----------|----------|
| Foul Sewer | — — — — — | Outfall* |
| Surface Sewer | — — — — — | |
| Combined Sewer | — — — — — | |
| Final Effluent | — — — — — | Inlet* |
| Rising Main* | — — — — — | |
| Private Sewer* | — — — — — | Manhole* |
| Decommissioned Sewer* | — — — — — | |

- | | |
|---|--------------------------------|
| € | Sewage Treatment Works |
| ⊕ | Public Pumping Station |
| ● | Decommissioned Pumping Station |
| | (Colour denotes effluent type) |

rob@infrades.co.uk
Weston



K

Proposed Surface Water Strategy - Drawings



Pond
Base Level 1.4m
Top Level 3.35m

Top Water Level
100year (FEH) 2.805
100year + 40% Climate Change (FEH) 3.114
100year + 40% Climate Change + 10% Urban Creep (FEH) 3.208
100year + 40% Climate Change (FSR) 2.332
30 year (FEH) 2.506
2 year (FEH) 1.958

Key

Adoptable Foul Water
F465
5.94CL
3.625IL

MH Ref
Cover Level
Invert Level

Adoptable Surface Water Drainage System
S465
5.94CL
3.625IL

Ø90mm Foul Rising Main

Private Drainage System

Surface Water SUDs System, indicating Pond Water Levels during various storm events

Pond
Base Level 1.4m
Top Level 3.35m

Top Water Level
100year (FEH) 2.805
100year + 40% Climate Change (FEH) 3.114
100year + 40% Climate Change + 10% Urban Creep (FEH) 3.208
100year + 40% Climate Change (FSR) 2.332
30 year (FEH) 2.506
2 year (FEH) 1.958

C Calculations updated 30.11.21
B Layout updated 18.11.21

REV	DESCRIPTION	DATE
1	SCALE: 1:500 DATE: February 2021 DRAWN: RAH	

TITLE: Planning Drainage Layout

PROJECT: High Road, Weston

DRG. No: 1003-00-03 Rev C

33 The Point
Rockingham Road
Market Harborough
Leicestershire LE16 7QU
Tel: 01858 411370 Fax: 01858 411751
Email: info@infraades.co.uk URL: www.infraades.co.uk

iD LTD
INFRASTRUCTURE DESIGN LIMITED

33 The Point
Rockingham Road
Market Harborough
Leicestershire LE16 7QU
Tel: 01858 411370 Fax: 01858 411751

working for
PERSIMMON
PERSIMMON HOMES (EAST MIDLANDS) LTD
Persimmon House
18 Commerce Road
Lynch Wood
Peterborough Business Park
Peterborough
PE2 6UR
Tel: 01733 397200
Fax: 01733 397205

L

Proposed Surface Water Strategy – Calculations

Design Settings

Rainfall Methodology	FSR	Maximum Time of Concentration (mins)	30.00
Return Period (years)	2	Maximum Rainfall (mm/hr)	50.0
Additional Flow (%)	0	Minimum Velocity (m/s)	1.00
FSR Region	England and Wales	Connection Type	Level Soffits
M5-60 (mm)	20.000	Minimum Backdrop Height (m)	9.000
Ratio-R	0.400	Preferred Cover Depth (m)	0.900
CV	0.750	Include Intermediate Ground	✓
Time of Entry (mins)	5.00	Enforce best practice design rules	✓

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
1	0.089	5.00	3.900		528937.718	324853.983	0.300
2	0.000		3.800		528907.657	324836.550	0.307
3	0.087	5.00	3.700		528877.030	324824.786	0.308
4	0.000		3.600		528847.537	324818.833	0.300
5	0.000		3.550		528836.335	324814.722	0.300
6	0.073	5.00	3.500		528810.529	324809.195	0.325
7	0.000		3.500		528785.290	324804.517	0.400
8	0.000		3.395	1200	528775.551	324803.232	0.345
9	0.145	5.00	3.650		528756.359	324847.710	0.800
10	0.000		3.650		528748.535	324876.104	0.875
20	0.094	5.00	3.970	1500	528784.170	324915.245	1.670
21	0.022	5.00	3.620	1500	528753.309	324908.242	1.120
11	0.000		3.300		528740.017	324905.069	0.600
12	0.095	5.00	3.300		528728.595	324948.012	0.710
13	0.000		3.300		528729.919	324963.053	0.750
14	0.000		3.300		528735.381	324980.799	0.800
15	0.071	5.00	3.300		528742.868	325011.708	0.875
16	0.000		3.300		528758.934	325025.587	1.825
100	0.254	5.00	3.300		528788.433	325064.390	1.900
101	0.000	5.00	3.300	1500	528788.250	325071.700	1.920
102			3.300		528789.772	325084.216	2.000
60	0.056	5.00	4.344	1200	528895.688	324900.522	1.569
61	0.185	5.00	4.510	1350	528873.750	324889.982	2.035
62	0.127	5.00	4.415	1350	528845.308	324881.433	2.065
70	0.061	5.00	3.983	1200	528827.829	324822.511	1.383
63	0.090	5.00	4.305	1500	528815.797	324874.567	2.155
64	0.084	5.00	4.024	1500	528804.843	324919.755	2.149
65	0.075	5.00	3.808	1500	528798.460	324949.900	2.033
66	0.089	5.00	3.601	1500	528800.941	324979.433	1.901
50	0.107	5.00	3.866	1200	528940.148	324865.911	1.191
51	0.035	5.00	4.102	1200	528924.883	324889.580	1.552
52	0.074	5.00	4.240	1350	528915.980	324908.797	1.865
53	0.064	5.00	4.430	1350	528910.106	324934.453	2.180
54	0.000	5.00	4.169	1500	528908.314	324967.861	2.044
31	0.122	5.00	3.768	1200	528971.958	324938.513	1.093
32	0.000	5.00	3.662	1200	528968.039	324959.642	1.212
40	0.036	5.00	3.500		528983.642	325005.348	0.600
41	0.000		3.400		528978.532	324982.280	0.900
33	0.139	5.00	3.547	1500	528970.071	324978.624	1.297

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
35	0.048	5.00	3.932	1200	528911.228	324990.206	1.957
36	0.163	5.00	3.664	1200	528865.038	324999.553	1.814
38	0.119	5.00	3.375	1500	528809.068	325012.620	1.825
39	0.000		3.375		528799.140	325043.253	1.900

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	Link Type	T of C (mins)
1.000	1	2	34.750	0.030	3.600	3.493	0.107	326.0	300	swale	6.02
1.001	2	3	32.809	0.030	3.493	3.392	0.101	326.0	300	swale	6.98
1.002	3	4	30.088	0.030	3.392	3.300	0.092	326.0	300	swale	7.86
1.003	4	5	11.933	0.600	3.300	3.250	0.050	238.7	300	Circular	8.05
1.004	5	6	26.391	0.030	3.250	3.175	0.075	351.9	300	swale	8.85
1.005	6	7	25.669	0.030	3.175	3.100	0.075	342.3	300	swale	9.62
1.006	7	8	9.823	0.600	3.100	3.050	0.050	196.5	300	Circular	9.77
1.007	8	9	48.442	0.600	3.050	2.850	0.200	242.2	300	Circular	10.57
1.008	9	10	29.452	0.030	2.850	2.775	0.075	392.7	450	swale	11.32
1.009	10	11	30.192	0.030	2.775	2.700	0.075	402.6	450	swale	12.09
1.010	11	12	44.436	0.030	2.700	2.590	0.110	404.0	600	swale	13.04
1.011	12	13	15.099	0.030	2.590	2.550	0.040	377.5	600	swale	13.36
1.012	13	14	18.568	0.030	2.550	2.500	0.050	371.4	600	swale	13.74
1.013	14	15	31.803	0.030	2.500	2.425	0.075	424.0	600	swale	14.44
1.014	15	16	21.231	0.600	2.425	1.700	0.725	29.3	300	Circular	14.56
2.000	31	32	21.489	0.600	2.675	2.525	0.150	143.3	225	Circular_Default Sewer Type	5.33
2.001	32	33	19.090	0.600	2.450	2.325	0.125	152.7	300	Circular_Default Sewer Type	5.58
4.000	40	41	23.627	0.030	2.900	2.500	0.400	59.1	300	swale	5.29
4.001	41	33	9.217	0.600	2.500	2.400	0.100	92.2	225	Circular_Default Sewer Type	5.41

Name	US Node	DS Node	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)
1.000	1	2	0.570	290.6	12.1	0.000	0.007	0.089
1.001	2	3	0.570	290.6	12.1	0.007	0.008	0.089
1.002	3	4	0.570	290.6	23.9	0.008	0.000	0.176
1.003	4	5	1.013	71.6	23.9	0.000	0.000	0.176
1.004	5	6	0.549	279.7	23.9	0.000	0.025	0.176
1.005	6	7	0.556	283.6	33.7	0.025	0.100	0.249
1.006	7	8	1.118	79.0	33.7	0.100	0.045	0.249
1.007	8	9	1.006	71.1	32.9	0.045	0.500	0.249
1.008	9	10	0.660	683.1	50.2	0.350	0.425	0.394
1.009	10	11	0.652	674.7	48.4	0.425	0.150	0.394
1.010	11	12	0.775	1348.4	46.4	0.000	0.110	0.394
1.011	12	13	0.802	1394.9	56.8	0.110	0.150	0.489
1.012	13	14	0.808	1406.3	55.9	0.150	0.200	0.489
1.013	14	15	0.756	1316.1	54.3	0.200	0.275	0.489
1.014	15	16	2.916	206.1	61.9	0.575	1.300	0.560
2.000	31	32	1.090	43.3	16.5	0.868	0.912	0.122
2.001	32	33	1.270	89.7	16.5	0.912	0.922	0.122
4.000	40	41	1.339	682.8	4.9	0.300	0.600	0.036
4.001	41	33	1.362	54.2	4.9	0.675	0.922	0.036

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	Link Type	T of C (mins)
2.002	33	35	59.972	0.600	2.250	2.050	0.200	299.9	375	Circular_Default Sewer Type	6.54
5.000	50	51	28.165	0.600	2.675	2.550	0.125	225.3	300	Circular	5.45
5.001	51	52	21.179	0.600	2.550	2.450	0.100	211.8	300	Circular	5.78
5.002	52	53	26.320	0.600	2.375	2.250	0.125	210.6	375	Circular	6.13
5.003	53	54	33.456	0.600	2.250	2.125	0.125	267.6	375	Circular	6.64
5.004	54	35	22.534	0.600	2.125	2.050	0.075	300.5	375	Circular	7.00
3.005	35	36	47.126	0.600	1.975	1.850	0.125	377.0	450	Circular_Default Sewer Type	7.75
2.004	36	38	57.475	0.600	1.850	1.700	0.150	383.2	450	Circular_Default Sewer Type	8.68
8.000	21	20	31.646	0.600	2.500	2.300	0.200	158.2	225	Circular	5.51
8.001	20	64	21.159	0.600	2.300	2.175	0.125	169.3	225	Circular	5.86
6.000	60	61	24.339	0.600	2.775	2.625	0.150	162.3	225	Circular	5.40
6.001	61	62	29.699	0.600	2.475	2.350	0.125	237.6	375	Circular	5.82
6.002	62	63	30.299	0.600	2.350	2.225	0.125	242.4	375	Circular	6.25
7.000	70	63	53.428	0.600	2.600	2.300	0.300	178.1	300	Circular	5.76
6.003	63	64	46.497	0.600	2.150	1.950	0.200	232.5	450	Circular	6.84
6.004	64	65	30.813	0.600	1.875	1.775	0.100	308.1	525	Circular	7.24
6.005	65	66	29.637	0.600	1.775	1.700	0.075	395.2	525	Circular	7.68
6.006	66	38	34.168	0.600	1.700	1.625	0.075	456.0	525	Circular	8.23
2.005	38	39	32.202	0.600	1.550	1.475	0.075	429.4	600	Circular_Default Sewer Type	9.14
9.000	100	101	7.312	0.600	1.400	1.380	0.020	365.6	600	Circular	5.10
9.001	101	102	12.608	0.600	1.380	1.300	0.080	157.6	225	Circular	5.30

Name	US Node	DS Node	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)
2.002	33	35	1.041	115.0	40.3	0.922	1.507	0.297
5.000	50	51	1.043	73.7	14.5	0.891	1.252	0.107
5.001	51	52	1.076	76.1	19.2	1.252	1.490	0.142
5.002	52	53	1.245	137.5	29.3	1.490	1.805	0.216
5.003	53	54	1.102	121.8	37.9	1.805	1.669	0.280
5.004	54	35	1.040	114.8	37.9	1.669	1.507	0.280
3.005	35	36	1.041	165.5	84.7	1.507	1.364	0.625
2.004	36	38	1.032	164.2	106.8	1.364	1.225	0.788
8.000	21	20	1.037	41.2	3.0	0.895	1.445	0.022
8.001	20	64	1.002	39.8	15.7	1.445	1.624	0.116
6.000	60	61	1.024	40.7	7.6	1.344	1.660	0.056
6.001	61	62	1.171	129.3	32.7	1.660	1.690	0.241
6.002	62	63	1.159	128.0	49.9	1.690	1.705	0.368
7.000	70	63	1.175	83.0	8.3	1.083	1.705	0.061
6.003	63	64	1.329	211.3	70.3	1.705	1.624	0.519
6.004	64	65	1.270	275.0	97.4	1.624	1.508	0.719
6.005	65	66	1.120	242.5	107.6	1.508	1.376	0.794
6.006	66	38	1.042	225.6	119.7	1.376	1.225	0.883
2.005	38	39	1.169	330.4	242.6	1.225	1.300	1.790
9.000	100	101	1.267	358.3	34.4	1.300	1.320	0.254
9.001	101	102	1.039	41.3	34.4	1.695	1.775	0.254

Simulation Settings

Rainfall Methodology	FSR	Analysis Speed	Detailed
FSR Region	England and Wales	Skip Steady State	✓
M5-60 (mm)	20.000	Drain Down Time (mins)	240
Ratio-R	0.400	Additional Storage (m³/ha)	20.0
Summer CV	0.750	Check Discharge Rate(s)	x
Winter CV	0.840	Check Discharge Volume	x

Storm Durations

15 | 30

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
2	0	0	0
30	0	0	0
100	0	0	0
100	40	0	0
100	40	10	0

Node 101 Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	✓	Sump Available	✓
Invert Level (m)	1.380	Product Number	CTL-SHE-0125-8600-1750-8600
Design Depth (m)	1.750	Min Outlet Diameter (m)	0.150
Design Flow (l/s)	8.6	Min Node Diameter (mm)	1200

Node 16 Online Orifice Control

Flap Valve	x	Invert Level (m)	1.475	Discharge Coefficient	1.000
Replaces Downstream Link	x	Diameter (m)	0.375		

Node 39 Online Orifice Control

Flap Valve	x	Invert Level (m)	1.475	Discharge Coefficient	1.000
Replaces Downstream Link	x	Diameter (m)	0.675		

Node 100 Flow through Pond Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Main Channel Length (m)	21.000
Side Inf Coefficient (m/hr)	0.00000	Invert Level (m)	1.400	Main Channel Slope (1:X)	280.0
Safety Factor	2.0	Time to half empty (mins)		Main Channel n	0.030

Inlets

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Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	9.0	0.0	0.400	1238.0	0.0	1.125	1988.0	0.0	1.900	2540.0	0.0
0.100	83.0	0.0	0.500	1293.0	0.0	1.600	2319.0	0.0			
0.200	167.0	0.0	0.600	1350.0	0.0	1.700	2392.0	0.0			
0.300	1203.0	0.0	1.100	1648.0	0.0	1.800	2466.0	0.0			

Results for 2 year Critical Storm Duration. Lowest mass balance: 94.97%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	1	10	3.686	0.086	16.2	0.5120	0.0000	OK
15 minute winter	2	13	3.564	0.071	16.8	0.0000	0.0000	OK
15 minute winter	3	13	3.485	0.093	26.1	0.5274	0.0000	OK
15 minute winter	4	14	3.416	0.116	24.1	0.0000	0.0000	OK
15 minute winter	5	15	3.342	0.092	23.1	0.0000	0.0000	OK
30 minute winter	6	22	3.275	0.100	27.6	0.4482	0.0000	OK
30 minute winter	7	23	3.227	0.127	26.9	0.0000	0.0000	OK
30 minute winter	8	23	3.177	0.127	26.4	0.1436	0.0000	OK
30 minute winter	9	21	2.972	0.122	38.2	0.4434	0.0000	OK
15 minute winter	10	13	2.901	0.126	35.2	0.0000	0.0000	OK
15 minute winter	20	11	2.419	0.119	20.9	0.3445	0.0000	OK
15 minute winter	21	11	2.546	0.046	4.0	0.0999	0.0000	OK
30 minute winter	11	24	2.821	0.121	37.9	0.0000	0.0000	OK
30 minute winter	12	24	2.717	0.127	42.2	0.3388	0.0000	OK
30 minute winter	13	25	2.677	0.127	41.5	0.0000	0.0000	OK
30 minute winter	14	26	2.640	0.140	41.1	0.0000	0.0000	OK
30 minute winter	15	26	2.517	0.092	43.1	0.1501	0.0000	OK
30 minute winter	16	48	1.865	0.390	43.1	0.0000	0.0000	OK
30 minute winter	100	47	1.865	0.465	163.3	1.2421	0.0000	OK
30 minute winter	101	51	1.865	0.485	22.7	0.8573	0.0000	SURCHARGED
15 minute summer	102	1	1.300	0.000	8.5	0.0000	0.0000	OK
15 minute winter	60	10	2.853	0.078	10.2	0.1434	0.0000	OK
15 minute winter	61	10	2.629	0.154	43.5	0.5007	0.0000	OK
15 minute winter	62	11	2.549	0.199	65.8	0.5300	0.0000	OK
15 minute winter	70	11	2.673	0.073	11.1	0.1468	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	1	1.000	2	16.8	0.284	0.058	2.0682	
15 minute winter	2	1.001	3	14.2	0.209	0.049	2.2520	
15 minute winter	3	1.002	4	24.1	0.268	0.083	2.8655	
15 minute winter	4	1.003	5	23.1	1.083	0.322	0.2579	
15 minute winter	5	1.004	6	22.5	0.266	0.080	2.2344	
30 minute winter	6	1.005	7	26.9	0.256	0.095	2.7738	
30 minute winter	7	1.006	8	26.4	0.934	0.335	0.2782	
30 minute winter	8	1.007	9	26.4	0.973	0.371	1.3307	
30 minute winter	9	1.008	10	37.9	0.311	0.055	3.6017	
15 minute winter	10	1.009	11	36.7	0.343	0.054	3.4562	
15 minute winter	20	8.001	64	20.4	0.988	0.511	0.4362	
15 minute winter	21	8.000	20	3.9	0.295	0.094	0.4300	
30 minute winter	11	1.010	12	36.7	0.297	0.027	5.4871	
30 minute winter	12	1.011	13	41.5	0.328	0.030	1.9277	
30 minute winter	13	1.012	14	41.1	0.306	0.029	2.5651	
30 minute winter	14	1.013	15	40.6	0.362	0.031	3.6420	
30 minute winter	15	1.014	16	43.1	2.238	0.209	0.5579	
30 minute winter	16	Flow through pond	100	133.3	0.123	0.001	241.5201	
30 minute winter	100	9.000	101	22.7	0.381	0.063	1.7483	
30 minute winter	101	Hydro-Brake®	102	8.6				134.4
15 minute winter	60	6.000	61	9.9	0.838	0.242	0.2882	
15 minute winter	61	6.001	62	42.8	0.849	0.331	1.5011	
15 minute winter	62	6.002	63	65.3	1.146	0.510	1.7269	
15 minute winter	70	7.000	63	10.6	0.814	0.128	0.6976	

Results for 2 year Critical Storm Duration. Lowest mass balance: 94.97%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	63	11	2.365	0.215	91.3	0.5593	0.0000	OK
15 minute winter	64	11	2.153	0.278	126.1	0.7091	0.0000	OK
15 minute winter	65	12	2.094	0.319	135.8	0.7982	0.0000	OK
15 minute winter	66	12	2.036	0.336	146.4	0.9077	0.0000	OK
15 minute winter	50	10	2.782	0.107	19.5	0.3122	0.0000	OK
15 minute winter	51	11	2.674	0.124	25.6	0.1967	0.0000	OK
15 minute winter	52	11	2.516	0.141	38.0	0.3128	0.0000	OK
15 minute winter	53	11	2.424	0.174	49.3	0.3517	0.0000	OK
15 minute winter	54	12	2.311	0.186	49.4	0.3282	0.0000	OK
15 minute winter	31	10	2.793	0.118	22.2	0.3972	0.0000	OK
15 minute winter	32	11	2.555	0.105	21.6	0.1186	0.0000	OK
15 minute winter	40	10	2.929	0.029	6.6	0.0345	0.0000	OK
15 minute winter	41	11	2.552	0.052	6.4	0.0000	0.0000	OK
15 minute winter	33	11	2.430	0.180	52.1	0.7041	0.0000	OK
15 minute winter	35	12	2.255	0.280	108.7	0.4537	0.0000	OK
15 minute winter	36	12	2.157	0.307	128.2	0.8985	0.0000	OK
15 minute winter	38	12	1.963	0.413	288.3	1.2692	0.0000	OK
30 minute winter	39	46	1.865	0.390	233.5	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	63	6.003	64	91.3	1.267	0.432	3.3523	
15 minute winter	64	6.004	65	123.0	0.989	0.447	3.8887	
15 minute winter	65	6.005	66	133.7	0.961	0.551	4.1927	
15 minute winter	66	6.006	38	144.5	1.020	0.641	5.0038	
15 minute winter	50	5.000	51	19.2	0.775	0.260	0.6974	
15 minute winter	51	5.001	52	25.3	0.953	0.333	0.5636	
15 minute winter	52	5.002	53	38.3	0.874	0.279	1.1551	
15 minute winter	53	5.003	54	49.4	0.952	0.406	1.7382	
15 minute winter	54	5.004	35	48.2	0.872	0.420	1.3060	
15 minute winter	31	2.000	32	21.6	1.067	0.497	0.4364	
15 minute winter	32	2.001	33	21.7	1.005	0.241	0.4188	
15 minute winter	40	4.000	41	6.4	0.250	0.009	0.6462	
15 minute winter	41	4.001	33	6.1	0.894	0.113	0.0630	
15 minute winter	33	2.002	35	52.7	0.977	0.459	3.3038	
15 minute winter	35	3.005	36	105.0	0.969	0.635	5.1531	
15 minute winter	36	2.004	38	126.9	1.198	0.773	6.0778	
15 minute winter	38	2.005	39	281.6	1.448	0.852	6.3530	
30 minute winter	39	Flow through pond	100	133.3	0.123	0.001	241.5201	

Results for 30 year Critical Storm Duration. Lowest mass balance: 94.97%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	1	10	3.714	0.114	30.8	0.6764	0.0000	OK
15 minute winter	2	12	3.594	0.101	31.6	0.0000	0.0000	OK
15 minute winter	3	12	3.526	0.134	53.7	0.7553	0.0000	OK
15 minute winter	4	13	3.472	0.172	49.8	0.0000	0.0000	OK
15 minute winter	5	14	3.382	0.132	46.1	0.0000	0.0000	OK
15 minute winter	6	14	3.325	0.150	60.1	0.6753	0.0000	OK
15 minute winter	7	15	3.299	0.199	55.5	0.0000	0.0000	OK
15 minute winter	8	15	3.245	0.195	54.0	0.2201	0.0000	OK
30 minute winter	9	21	3.022	0.172	78.4	0.6250	0.0000	OK
15 minute winter	10	13	2.948	0.173	76.2	0.0000	0.0000	OK
15 minute winter	20	12	2.558	0.258	39.9	0.7455	0.0000	SURCHARGED
15 minute winter	21	10	2.564	0.064	7.6	0.1384	0.0000	OK
30 minute winter	11	23	2.871	0.171	77.0	0.0000	0.0000	OK
30 minute winter	12	23	2.771	0.181	88.9	0.4834	0.0000	OK
30 minute winter	13	24	2.732	0.182	87.3	0.0000	0.0000	OK
30 minute winter	14	24	2.692	0.192	86.6	0.0000	0.0000	OK
30 minute winter	15	24	2.565	0.140	93.2	0.2273	0.0000	OK
30 minute winter	16	47	2.046	0.571	93.1	0.0000	0.0000	OK
30 minute winter	100	50	2.044	0.644	284.6	1.7225	0.0000	SURCHARGED
30 minute winter	101	51	2.044	0.664	11.4	1.1736	0.0000	SURCHARGED
15 minute summer	102	1	1.300	0.000	8.6	0.0000	0.0000	OK
15 minute winter	60	10	2.887	0.112	19.4	0.2074	0.0000	OK
15 minute winter	61	11	2.720	0.245	82.8	0.7965	0.0000	OK
15 minute winter	62	11	2.660	0.310	124.3	0.8251	0.0000	OK
15 minute winter	70	10	2.701	0.101	21.1	0.2024	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	1	1.000	2	31.6	0.340	0.109	3.2982	
15 minute winter	2	1.001	3	28.0	0.247	0.096	3.7581	
15 minute winter	3	1.002	4	49.8	0.314	0.171	5.1266	
15 minute winter	4	1.003	5	46.1	1.343	0.644	0.4251	
15 minute winter	5	1.004	6	47.0	0.313	0.168	3.9804	
15 minute winter	6	1.005	7	55.5	0.309	0.196	5.4201	
15 minute winter	7	1.006	8	54.0	1.104	0.684	0.4808	
15 minute winter	8	1.007	9	54.1	1.248	0.761	2.1437	
30 minute winter	9	1.008	10	77.6	0.381	0.114	6.0497	
15 minute winter	10	1.009	11	76.3	0.413	0.113	5.9977	
15 minute winter	20	8.001	64	37.4	1.128	0.939	0.8415	
15 minute winter	21	8.000	20	7.4	0.327	0.180	0.7666	
30 minute winter	11	1.010	12	75.2	0.355	0.056	9.4062	
30 minute winter	12	1.011	13	87.3	0.399	0.063	3.3482	
30 minute winter	13	1.012	14	86.6	0.378	0.062	4.3243	
30 minute winter	14	1.013	15	85.8	0.445	0.065	6.2222	
30 minute winter	15	1.014	16	93.1	2.495	0.452	1.0803	
30 minute winter	16	Flow through pond	100	228.0	0.120	0.001	475.6770	
30 minute winter	100	9.000	101	11.4	0.433	0.032	2.0596	
30 minute winter	101	Hydro-Brake®	102	8.6				134.9
15 minute winter	60	6.000	61	18.9	0.989	0.463	0.4663	
15 minute winter	61	6.001	62	80.5	0.935	0.622	2.5802	
15 minute winter	62	6.002	63	122.9	1.347	0.960	3.0419	
15 minute winter	70	7.000	63	20.5	0.798	0.247	2.2691	

Results for 30 year Critical Storm Duration. Lowest mass balance: 94.97%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	63	12	2.567	0.417	172.5	1.0854	0.0000	OK
15 minute winter	64	11	2.470	0.595	227.0	1.5169	0.0000	SURCHARGED
15 minute winter	65	11	2.403	0.628	229.5	1.5743	0.0000	SURCHARGED
15 minute winter	66	11	2.290	0.590	251.2	1.5960	0.0000	SURCHARGED
15 minute winter	50	10	2.831	0.156	37.0	0.4582	0.0000	OK
15 minute winter	51	11	2.734	0.184	48.4	0.2913	0.0000	OK
15 minute winter	52	12	2.691	0.316	72.1	0.7041	0.0000	OK
15 minute winter	53	12	2.673	0.423	92.6	0.8535	0.0000	SURCHARGED
15 minute winter	54	12	2.610	0.485	87.8	0.8575	0.0000	SURCHARGED
15 minute winter	31	10	2.864	0.189	42.2	0.6369	0.0000	OK
15 minute winter	32	13	2.654	0.204	40.8	0.2307	0.0000	OK
15 minute winter	40	10	2.941	0.041	12.5	0.0496	0.0000	OK
15 minute winter	41	13	2.647	0.147	17.0	0.0000	0.0000	OK
15 minute winter	33	13	2.642	0.392	99.7	1.5326	0.0000	SURCHARGED
15 minute winter	35	12	2.563	0.588	183.2	0.9530	0.0000	SURCHARGED
15 minute winter	36	11	2.424	0.574	207.9	1.6814	0.0000	SURCHARGED
15 minute winter	38	12	2.168	0.618	475.0	1.8978	0.0000	SURCHARGED
30 minute winter	39	50	2.047	0.572	421.5	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	63	6.003	64	160.5	1.284	0.760	7.2482	
15 minute winter	64	6.004	65	204.5	1.050	0.744	6.6566	
15 minute winter	65	6.005	66	222.2	1.029	0.916	6.4026	
15 minute winter	66	6.006	38	245.7	1.138	1.089	7.3814	
15 minute winter	50	5.000	51	36.3	0.886	0.493	1.1541	
15 minute winter	51	5.001	52	48.0	1.110	0.631	1.0954	
15 minute winter	52	5.002	53	70.5	0.970	0.513	2.7575	
15 minute winter	53	5.003	54	87.8	1.046	0.721	3.6901	
15 minute winter	54	5.004	35	76.5	0.881	0.666	2.4854	
15 minute winter	31	2.000	32	40.8	1.206	0.942	0.7272	
15 minute winter	32	2.001	33	41.5	0.980	0.463	1.1591	
15 minute winter	40	4.000	41	12.2	0.302	0.018	2.1434	
15 minute winter	41	4.001	33	22.1	0.878	0.408	0.3101	
15 minute winter	33	2.002	35	94.0	1.041	0.818	6.6147	
15 minute winter	35	3.005	36	160.3	1.012	0.968	7.4668	
15 minute winter	36	2.004	38	197.0	1.244	1.200	9.1065	
15 minute winter	38	2.005	39	473.8	1.737	1.434	8.6788	
30 minute winter	39	Flow through pond	100	228.0	0.120	0.001	475.6770	

Results for 100 year Critical Storm Duration. Lowest mass balance: 94.97%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	1	10	3.727	0.127	40.0	0.7543	0.0000	OK
15 minute winter	2	12	3.608	0.115	40.5	0.0000	0.0000	OK
15 minute winter	3	12	3.546	0.154	71.1	0.8678	0.0000	OK
15 minute winter	4	13	3.503	0.203	66.6	0.0000	0.0000	OK
15 minute winter	5	14	3.402	0.152	63.2	0.0000	0.0000	OK
15 minute winter	6	15	3.358	0.183	80.7	0.8239	0.0000	OK
15 minute winter	7	15	3.341	0.241	71.7	0.0000	0.0000	OK
15 minute winter	8	15	3.283	0.233	68.8	0.2638	0.0000	OK
15 minute winter	9	12	3.045	0.195	103.4	0.7084	0.0000	OK
15 minute winter	10	13	2.971	0.196	101.7	0.0000	0.0000	OK
15 minute winter	20	12	2.928	0.628	48.3	1.8164	0.0000	SURCHARGED
15 minute winter	21	12	2.930	0.430	13.9	0.9286	0.0000	SURCHARGED
30 minute winter	11	23	2.894	0.194	100.6	0.0000	0.0000	OK
30 minute winter	12	22	2.796	0.206	118.7	0.5513	0.0000	OK
30 minute winter	13	23	2.757	0.207	116.4	0.0000	0.0000	OK
30 minute winter	14	24	2.715	0.215	115.6	0.0000	0.0000	OK
30 minute winter	15	23	2.593	0.168	126.2	0.2723	0.0000	OK
30 minute winter	16	48	2.157	0.682	126.0	0.0000	0.0000	OK
30 minute winter	100	49	2.154	0.754	356.9	2.0172	0.0000	SURCHARGED
30 minute winter	101	49	2.154	0.774	14.2	1.3682	0.0000	SURCHARGED
15 minute summer	102	1	1.300	0.000	8.6	0.0000	0.0000	OK
15 minute winter	60	12	3.241	0.466	25.1	0.8591	0.0000	SURCHARGED
15 minute winter	61	12	3.204	0.729	108.8	2.3705	0.0000	SURCHARGED
15 minute winter	62	12	3.138	0.788	145.7	2.0972	0.0000	SURCHARGED
15 minute winter	70	12	2.993	0.393	27.9	0.7914	0.0000	SURCHARGED

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	1	1.000	2	40.5	0.363	0.139	3.9782	
15 minute winter	2	1.001	3	36.8	0.264	0.127	4.6236	
15 minute winter	3	1.002	4	66.6	0.333	0.229	6.5046	
15 minute winter	4	1.003	5	63.2	1.484	0.882	0.5143	
15 minute winter	5	1.004	6	61.4	0.325	0.219	5.1898	
15 minute winter	6	1.005	7	71.7	0.324	0.253	7.4328	
15 minute winter	7	1.006	8	68.8	1.157	0.870	0.5866	
15 minute winter	8	1.007	9	69.0	1.350	0.971	2.5534	
15 minute winter	9	1.008	10	101.7	0.408	0.149	7.3747	
15 minute winter	10	1.009	11	101.4	0.442	0.150	7.3931	
15 minute winter	20	8.001	64	41.4	1.145	1.040	0.8415	
15 minute winter	21	8.000	20	13.3	0.421	0.323	1.2586	
30 minute winter	11	1.010	12	98.3	0.379	0.073	11.5345	
30 minute winter	12	1.011	13	116.4	0.430	0.083	4.1364	
30 minute winter	13	1.012	14	115.6	0.413	0.082	5.2642	
30 minute winter	14	1.013	15	114.4	0.475	0.087	7.7602	
30 minute winter	15	1.014	16	126.0	2.583	0.612	1.1776	
30 minute winter	16	Flow through pond	100	282.0	0.127	0.001	628.5099	
30 minute winter	100	9.000	101	14.2	0.435	0.040	2.0596	
30 minute winter	101	Hydro-Brake®	102	8.6				132.8
15 minute winter	60	6.000	61	25.7	0.962	0.632	0.9680	
15 minute winter	61	6.001	62	92.1	0.950	0.712	3.2757	
15 minute winter	62	6.002	63	131.5	1.373	1.027	3.3419	
15 minute winter	70	7.000	63	33.1	0.813	0.399	3.7624	

Results for 100 year Critical Storm Duration. Lowest mass balance: 94.97%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	63	12	2.977	0.827	193.0	2.1528	0.0000	SURCHARGED
15 minute winter	64	12	2.787	0.912	254.1	2.3246	0.0000	SURCHARGED
15 minute winter	65	12	2.668	0.893	279.8	2.2359	0.0000	SURCHARGED
15 minute winter	66	12	2.526	0.826	310.1	2.2329	0.0000	SURCHARGED
15 minute winter	50	12	3.162	0.487	48.0	1.4247	0.0000	SURCHARGED
15 minute winter	51	12	3.129	0.579	62.6	0.9155	0.0000	SURCHARGED
15 minute winter	52	12	3.067	0.692	96.4	1.5387	0.0000	SURCHARGED
15 minute winter	53	12	3.015	0.765	106.0	1.5450	0.0000	SURCHARGED
15 minute winter	54	12	2.916	0.791	98.3	1.3973	0.0000	SURCHARGED
15 minute winter	31	12	3.123	0.448	54.8	1.5070	0.0000	SURCHARGED
15 minute winter	32	12	2.941	0.491	48.0	0.5557	0.0000	SURCHARGED
15 minute winter	40	10	2.948	0.048	16.2	0.0572	0.0000	OK
15 minute winter	41	13	2.923	0.423	54.4	0.0000	0.0000	SURCHARGED
15 minute winter	33	13	2.907	0.657	115.6	2.5683	0.0000	SURCHARGED
15 minute winter	35	12	2.842	0.867	198.6	1.4066	0.0000	SURCHARGED
15 minute winter	36	12	2.678	0.828	227.9	2.4233	0.0000	SURCHARGED
15 minute winter	38	12	2.331	0.781	579.7	2.3988	0.0000	SURCHARGED
30 minute winter	39	34	2.177	0.702	502.8	0.0000	0.0000	OK
Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	63	6.003	64	187.4	1.282	0.887	7.3671	
15 minute winter	64	6.004	65	253.5	1.174	0.922	6.6566	
15 minute winter	65	6.005	66	278.9	1.291	1.150	6.4026	
15 minute winter	66	6.006	38	309.3	1.432	1.371	7.3814	
15 minute winter	50	5.000	51	46.9	0.927	0.636	1.9834	
15 minute winter	51	5.001	52	63.2	1.121	0.830	1.4914	
15 minute winter	52	5.002	53	79.0	0.990	0.575	2.9030	
15 minute winter	53	5.003	54	98.3	1.061	0.807	3.6901	
15 minute winter	54	5.004	35	96.8	0.878	0.843	2.4854	
15 minute winter	31	2.000	32	48.0	1.208	1.108	0.8546	
15 minute winter	32	2.001	33	45.3	1.006	0.505	1.3443	
15 minute winter	40	4.000	41	15.8	0.330	0.023	11.2413	
15 minute winter	41	4.001	33	49.5	1.390	0.914	0.3666	
15 minute winter	33	2.002	35	102.6	1.054	0.893	6.6147	
15 minute winter	35	3.005	36	180.7	1.140	1.091	7.4668	
15 minute winter	36	2.004	38	228.6	1.443	1.393	9.1065	
15 minute winter	38	2.005	39	579.1	2.056	1.753	9.0354	
30 minute winter	39	Flow through pond	100	282.0	0.127	0.001	628.5099	

Results for 100 year +40% CC Critical Storm Duration. Lowest mass balance: 94.97%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	1	10	3.746	0.146	55.9	0.8685	0.0000	OK
15 minute winter	2	12	3.629	0.136	55.9	0.0000	0.0000	OK
15 minute winter	3	12	3.578	0.186	101.3	1.0487	0.0000	OK
15 minute winter	4	13	3.542	0.242	91.1	0.0000	0.0000	OK
15 minute winter	5	15	3.443	0.193	93.5	0.0000	0.0000	OK
15 minute winter	6	15	3.425	0.250	115.7	1.1241	0.0000	OK
15 minute winter	7	16	3.419	0.319	93.5	0.0000	0.0000	FLOOD RISK
15 minute winter	8	16	3.349	0.299	82.0	0.3386	0.0000	OK
15 minute winter	9	12	3.078	0.228	145.6	0.8276	0.0000	OK
15 minute winter	10	12	3.002	0.227	143.7	0.0000	0.0000	OK
15 minute winter	20	11	3.636	1.336	59.7	3.8660	0.0000	SURCHARGED
15 minute winter	21	11	3.620	1.120	33.2	2.4192	1.8792	FLOOD
15 minute winter	11	14	2.923	0.223	140.2	0.0000	0.0000	OK
30 minute winter	12	22	2.829	0.239	165.4	0.6402	0.0000	OK
30 minute winter	13	22	2.790	0.240	162.7	0.0000	0.0000	OK
30 minute winter	14	23	2.743	0.243	161.9	0.0000	0.0000	OK
30 minute winter	15	24	2.670	0.245	181.1	0.3968	0.0000	OK
30 minute winter	16	34	2.346	0.871	172.6	0.0000	0.0000	OK
30 minute winter	100	53	2.332	0.932	479.9	2.4914	0.0000	SURCHARGED
30 minute winter	101	53	2.332	0.952	14.7	1.6817	0.0000	SURCHARGED
15 minute summer	102	1	1.300	0.000	8.6	0.0000	0.0000	OK
15 minute winter	60	12	4.344	1.569	35.2	2.8948	0.6484	FLOOD
15 minute winter	61	12	4.304	1.829	133.9	5.9452	0.0000	FLOOD RISK
15 minute winter	62	12	4.182	1.832	191.4	4.8740	0.0000	FLOOD RISK
15 minute winter	70	12	3.929	1.329	38.3	2.6760	0.0000	FLOOD RISK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	1	1.000	2	55.9	0.394	0.192	5.0705	
15 minute winter	2	1.001	3	51.8	0.283	0.178	6.1133	
15 minute winter	3	1.002	4	91.1	0.355	0.313	8.7575	
15 minute winter	4	1.003	5	93.5	1.793	1.306	0.6375	
15 minute winter	5	1.004	6	85.3	0.326	0.305	8.1907	
15 minute winter	6	1.005	7	93.5	0.341	0.330	12.0819	
15 minute winter	7	1.006	8	82.0	1.183	1.038	0.6914	
15 minute winter	8	1.007	9	82.9	1.458	1.166	3.0199	
15 minute winter	9	1.008	10	143.7	0.450	0.210	9.4441	
15 minute winter	10	1.009	11	140.2	0.479	0.208	9.4135	
15 minute winter	20	8.001	64	52.9	1.331	1.329	0.8415	
15 minute winter	21	8.000	20	-20.2	-0.508	-0.490	1.2586	
15 minute winter	11	1.010	12	133.9	0.410	0.099	14.5094	
30 minute winter	12	1.011	13	162.7	0.471	0.117	5.2721	
30 minute winter	13	1.012	14	161.9	0.460	0.115	6.5711	
30 minute winter	14	1.013	15	160.5	0.481	0.122	11.3658	
30 minute winter	15	1.014	16	172.6	2.617	0.837	1.4003	
30 minute winter	16	Flow through pond	100	377.7	0.123	0.002	889.0583	
30 minute winter	100	9.000	101	14.7	0.414	0.041	2.0596	
30 minute winter	101	Hydro-Brake®	102	8.6				124.6
15 minute winter	60	6.000	61	30.9	0.951	0.759	0.9680	
15 minute winter	61	6.001	62	116.4	1.055	0.900	3.2757	
15 minute winter	62	6.002	63	180.1	1.633	1.407	3.3419	
15 minute winter	70	7.000	63	37.0	0.805	0.446	3.7624	

Results for 100 year +40% CC Critical Storm Duration. Lowest mass balance: 94.97%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	63	12	3.865	1.715	256.8	4.4632	0.0000	SURCHARGED
15 minute winter	64	12	3.487	1.612	339.0	4.1091	0.0000	SURCHARGED
15 minute winter	65	12	3.269	1.494	379.3	3.7430	0.0000	SURCHARGED
15 minute winter	66	12	3.006	1.306	426.2	3.5292	0.0000	SURCHARGED
15 minute winter	50	11	3.866	1.191	67.3	3.4872	2.0010	FLOOD
15 minute winter	51	11	3.827	1.277	69.9	2.0204	0.0000	FLOOD RISK
15 minute winter	52	12	3.745	1.370	107.1	3.0484	0.0000	SURCHARGED
15 minute winter	53	12	3.667	1.417	136.6	2.8614	0.0000	SURCHARGED
15 minute winter	54	12	3.496	1.371	129.6	2.4232	0.0000	SURCHARGED
15 minute winter	31	11	3.768	1.093	76.7	3.6758	1.1404	FLOOD
15 minute winter	32	12	3.472	1.022	58.6	1.1556	0.0000	FLOOD RISK
15 minute winter	40	15	3.182	0.282	78.3	0.3387	0.0000	OK
15 minute winter	41	15	3.183	0.683	96.9	0.0000	0.0000	FLOOD RISK
15 minute winter	33	12	3.405	1.155	138.9	4.5155	0.0000	FLOOD RISK
15 minute winter	35	12	3.365	1.390	209.9	2.2549	0.0000	SURCHARGED
15 minute winter	36	12	3.148	1.298	281.9	3.8009	0.0000	SURCHARGED
15 minute winter	38	12	2.640	1.090	766.6	3.3460	0.0000	SURCHARGED
30 minute winter	39	52	2.341	0.866	675.5	0.0000	0.0000	OK
Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	63	6.003	64	260.7	1.645	1.233	7.3671	
15 minute winter	64	6.004	65	342.5	1.586	1.246	6.6566	
15 minute winter	65	6.005	66	382.5	1.771	1.577	6.4026	
15 minute winter	66	6.006	38	429.2	1.987	1.902	7.3814	
15 minute winter	50	5.000	51	49.2	0.948	0.667	1.9834	
15 minute winter	51	5.001	52	65.4	1.139	0.860	1.4914	
15 minute winter	52	5.002	53	98.7	1.002	0.718	2.9030	
15 minute winter	53	5.003	54	129.6	1.175	1.064	3.6901	
15 minute winter	54	5.004	35	129.7	1.176	1.130	2.4854	
15 minute winter	31	2.000	32	58.6	1.473	1.352	0.8546	
15 minute winter	32	2.001	33	58.1	1.022	0.647	1.3443	
15 minute winter	40	4.000	41	-57.0	0.351	-0.083	31.5286	
15 minute winter	41	4.001	33	-90.2	-2.269	-1.666	0.3666	
15 minute winter	33	2.002	35	111.4	1.056	0.969	6.6147	
15 minute winter	35	3.005	36	201.5	1.272	1.217	7.4668	
15 minute winter	36	2.004	38	279.0	1.761	1.699	9.1065	
15 minute winter	38	2.005	39	768.7	2.729	2.327	9.0706	
30 minute winter	39	Flow through pond	100	377.7	0.123	0.002	889.0583	

Results for 100 year +40% CC +10% A Critical Storm Duration. Lowest mass balance: 94.97%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	1	10	3.752	0.152	61.5	0.9950	0.0000	OK
15 minute winter	2	12	3.635	0.142	61.3	0.0000	0.0000	OK
15 minute winter	3	12	3.588	0.196	111.7	1.2188	0.0000	OK
15 minute winter	4	12	3.549	0.249	100.6	0.0000	0.0000	OK
15 minute winter	5	15	3.462	0.212	103.5	0.0000	0.0000	OK
15 minute winter	6	15	3.451	0.276	130.3	1.3622	0.0000	OK
15 minute winter	7	16	3.446	0.346	99.7	0.0000	0.0000	FLOOD RISK
15 minute winter	8	16	3.370	0.320	84.6	0.3616	0.0000	FLOOD RISK
15 minute winter	9	12	3.087	0.237	159.4	0.9448	0.0000	OK
15 minute winter	10	12	3.011	0.236	156.2	0.0000	0.0000	OK
15 minute winter	20	11	3.731	1.431	65.0	4.3012	0.0000	FLOOD RISK
15 minute winter	21	11	3.620	1.120	40.0	2.4629	4.8575	FLOOD
15 minute winter	11	14	2.931	0.231	153.2	0.0000	0.0000	OK
30 minute winter	12	21	2.839	0.249	181.1	0.7323	0.0000	OK
30 minute winter	13	22	2.799	0.249	177.9	0.0000	0.0000	OK
30 minute winter	14	25	2.764	0.264	175.8	0.0000	0.0000	OK
30 minute winter	15	26	2.737	0.312	197.5	0.5562	0.0000	SURCHARGED
30 minute winter	16	32	2.415	0.940	181.3	0.0000	0.0000	OK
30 minute winter	100	54	2.390	0.990	524.8	2.9126	0.0000	SURCHARGED
30 minute winter	101	55	2.390	1.010	13.7	1.7853	0.0000	SURCHARGED
15 minute summer	102	1	1.300	0.000	8.6	0.0000	0.0000	OK
15 minute winter	60	11	4.344	1.569	51.6	3.0062	5.2150	FLOOD
15 minute winter	61	11	4.439	1.964	139.4	6.7386	0.0000	FLOOD RISK
15 minute winter	62	11	4.351	2.001	190.7	5.5699	0.0000	FLOOD RISK
15 minute winter	70	11	3.983	1.383	68.4	2.9057	1.6009	FLOOD

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	1	1.000	2	61.3	0.404	0.211	5.4315	
15 minute winter	2	1.001	3	57.0	0.289	0.196	6.6313	
15 minute winter	3	1.002	4	100.6	0.360	0.346	9.4081	
15 minute winter	4	1.003	5	103.5	1.874	1.446	0.6742	
15 minute winter	5	1.004	6	94.5	0.329	0.338	9.6064	
15 minute winter	6	1.005	7	99.7	0.343	0.351	14.0448	
15 minute winter	7	1.006	8	84.6	1.202	1.071	0.6917	
15 minute winter	8	1.007	9	84.6	1.476	1.190	3.1085	
15 minute winter	9	1.008	10	156.2	0.462	0.229	10.0561	
15 minute winter	10	1.009	11	153.2	0.489	0.227	10.0289	
15 minute winter	20	8.001	64	52.1	1.310	1.308	0.8415	
15 minute winter	21	8.000	20	-25.7	-0.647	-0.624	1.2586	
15 minute winter	11	1.010	12	144.9	0.416	0.107	15.4700	
30 minute winter	12	1.011	13	177.9	0.482	0.128	5.6100	
30 minute winter	13	1.012	14	175.8	0.473	0.125	7.1397	
30 minute winter	14	1.013	15	172.5	0.476	0.131	15.1757	
30 minute winter	15	1.014	16	181.3	2.652	0.880	1.4951	
30 minute winter	16	Flow through pond	100	399.4	0.120	0.002	979.3746	
30 minute winter	100	9.000	101	13.7	0.423	0.038	2.0596	
30 minute winter	101	Hydro-Brake®	102	8.6				119.6
15 minute winter	60	6.000	61	30.5	0.974	0.749	0.9680	
15 minute winter	61	6.001	62	116.3	1.055	0.899	3.2757	
15 minute winter	62	6.002	63	186.2	1.688	1.454	3.3419	
15 minute winter	70	7.000	63	32.1	0.822	0.386	3.7624	

Results for 100 year +40% CC +10% A Critical Storm Duration. Lowest mass balance: 94.97%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	63	11	4.007	1.857	264.0	4.9892	0.0000	FLOOD RISK
15 minute winter	64	11	3.624	1.749	352.7	4.5938	0.0000	SURCHARGED
15 minute winter	65	11	3.397	1.622	397.0	4.1820	0.0000	SURCHARGED
15 minute winter	66	11	3.114	1.414	449.3	3.9537	0.0000	SURCHARGED
15 minute winter	50	11	3.866	1.191	74.0	3.7004	5.2632	FLOOD
15 minute winter	51	11	3.876	1.326	71.9	2.1572	0.0000	FLOOD RISK
15 minute winter	52	11	3.848	1.473	109.2	3.3930	0.0000	SURCHARGED
15 minute winter	53	11	3.785	1.535	141.0	3.1891	0.0000	SURCHARGED
15 minute winter	54	11	3.610	1.485	130.2	2.6237	0.0000	SURCHARGED
15 minute winter	31	11	3.768	1.093	84.4	3.9206	2.8602	FLOOD
15 minute winter	32	11	3.538	1.088	60.7	1.2308	0.0000	FLOOD RISK
30 minute winter	40	23	3.242	0.342	59.0	0.4518	0.0000	FLOOD RISK
30 minute winter	41	24	3.241	0.741	80.3	0.0000	0.0000	FLOOD RISK
15 minute winter	33	11	3.495	1.245	150.3	5.1342	0.0000	FLOOD RISK
15 minute winter	35	11	3.479	1.504	198.3	2.5132	0.0000	SURCHARGED
15 minute winter	36	11	3.278	1.428	295.9	4.4393	0.0000	SURCHARGED
15 minute winter	38	11	2.709	1.159	813.7	3.7118	0.0000	SURCHARGED
30 minute winter	39	142	2.408	0.933	725.9	0.0000	0.0000	OK
Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	63	6.003	64	262.2	1.655	1.241	7.3671	
15 minute winter	64	6.004	65	348.2	1.612	1.266	6.6566	
15 minute winter	65	6.005	66	391.4	1.812	1.614	6.4026	
15 minute winter	66	6.006	38	444.2	2.056	1.969	7.3814	
15 minute winter	50	5.000	51	52.6	0.963	0.713	1.9834	
15 minute winter	51	5.001	52	62.0	1.171	0.815	1.4914	
15 minute winter	52	5.002	53	96.7	1.008	0.704	2.9030	
15 minute winter	53	5.003	54	130.2	1.180	1.069	3.6901	
15 minute winter	54	5.004	35	129.5	1.174	1.128	2.4854	
15 minute winter	31	2.000	32	60.7	1.527	1.401	0.8546	
15 minute winter	32	2.001	33	56.9	1.016	0.634	1.3443	
30 minute winter	40	4.000	41	44.9	0.314	0.066	37.8155	
30 minute winter	41	4.001	33	-78.5	-1.974	-1.449	0.3666	
15 minute winter	33	2.002	35	114.0	1.068	0.991	6.6147	
15 minute winter	35	3.005	36	202.9	1.281	1.226	7.4668	
15 minute winter	36	2.004	38	292.0	1.843	1.779	9.1065	
15 minute winter	38	2.005	39	810.5	2.878	2.453	9.0706	
30 minute winter	39	Flow through pond	100	399.4	0.120	0.002	979.3746	

Design Settings

Rainfall Methodology	FSR	Maximum Time of Concentration (mins)	30.00
Return Period (years)	2	Maximum Rainfall (mm/hr)	50.0
Additional Flow (%)	0	Minimum Velocity (m/s)	1.00
FSR Region	England and Wales	Connection Type	Level Soffits
M5-60 (mm)	20.000	Minimum Backdrop Height (m)	9.000
Ratio-R	0.400	Preferred Cover Depth (m)	0.900
CV	0.750	Include Intermediate Ground	✓
Time of Entry (mins)	5.00	Enforce best practice design rules	✓

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
1	0.089	5.00	3.900		528937.718	324853.983	0.300
2	0.000		3.800		528907.657	324836.550	0.307
3	0.087	5.00	3.700		528877.030	324824.786	0.308
4	0.000		3.600		528847.537	324818.833	0.300
5	0.000		3.550		528836.335	324814.722	0.300
6	0.073	5.00	3.500		528810.529	324809.195	0.325
7	0.000		3.500		528785.290	324804.517	0.400
8	0.000		3.395	1200	528775.551	324803.232	0.345
9	0.145	5.00	3.650		528756.359	324847.710	0.800
10	0.000		3.650		528748.535	324876.104	0.875
20	0.094	5.00	3.970	1500	528784.170	324915.245	1.670
21	0.022	5.00	3.620	1500	528753.309	324908.242	1.120
11	0.000		3.300		528740.017	324905.069	0.600
12	0.095	5.00	3.300		528728.595	324948.012	0.710
13	0.000		3.300		528729.919	324963.053	0.750
14	0.000		3.300		528735.381	324980.799	0.800
15	0.071	5.00	3.300		528742.868	325011.708	0.875
16	0.000		3.300		528758.934	325025.587	1.825
100	0.254	5.00	3.300		528788.433	325064.390	1.900
101	0.000	5.00	3.300	1500	528788.250	325071.700	1.920
102			3.300		528789.772	325084.216	2.000
60	0.056	5.00	4.344	1200	528895.688	324900.522	1.569
61	0.185	5.00	4.510	1350	528873.750	324889.982	2.035
62	0.127	5.00	4.415	1350	528845.308	324881.433	2.065
70	0.061	5.00	3.983	1200	528827.829	324822.511	1.383
63	0.090	5.00	4.305	1500	528815.797	324874.567	2.155
64	0.084	5.00	4.024	1500	528804.843	324919.755	2.149
65	0.075	5.00	3.808	1500	528798.460	324949.900	2.033
66	0.089	5.00	3.601	1500	528800.941	324979.433	1.901
50	0.107	5.00	3.866	1200	528940.148	324865.911	1.191
51	0.035	5.00	4.102	1200	528924.883	324889.580	1.552
52	0.074	5.00	4.240	1350	528915.980	324908.797	1.865
53	0.064	5.00	4.430	1350	528910.106	324934.453	2.180
54	0.000	5.00	4.169	1500	528908.314	324967.861	2.044
31	0.122	5.00	3.768	1200	528971.958	324938.513	1.093
32	0.000	5.00	3.662	1200	528968.039	324959.642	1.212
40	0.036	5.00	3.500		528983.642	325005.348	0.600
41	0.000		3.400		528978.532	324982.280	0.900
33	0.139	5.00	3.547	1500	528970.071	324978.624	1.297

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
35	0.048	5.00	3.932	1200	528911.228	324990.206	1.957
36	0.163	5.00	3.664	1200	528865.038	324999.553	1.814
38	0.119	5.00	3.375	1500	528809.068	325012.620	1.825
39	0.000		3.375		528799.140	325043.253	1.900

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	Link Type	T of C (mins)
1.000	1	2	34.750	0.030	3.600	3.493	0.107	326.0	300	swale	6.02
1.001	2	3	32.809	0.030	3.493	3.392	0.101	326.0	300	swale	6.98
1.002	3	4	30.088	0.030	3.392	3.300	0.092	326.0	300	swale	7.86
1.003	4	5	11.933	0.600	3.300	3.250	0.050	238.7	300	Circular	8.05
1.004	5	6	26.391	0.030	3.250	3.175	0.075	351.9	300	swale	8.85
1.005	6	7	25.669	0.030	3.175	3.100	0.075	342.3	300	swale	9.62
1.006	7	8	9.823	0.600	3.100	3.050	0.050	196.5	300	Circular	9.77
1.007	8	9	48.442	0.600	3.050	2.850	0.200	242.2	300	Circular	10.57
1.008	9	10	29.452	0.030	2.850	2.775	0.075	392.7	450	swale	11.32
1.009	10	11	30.192	0.030	2.775	2.700	0.075	402.6	450	swale	12.09
1.010	11	12	44.436	0.030	2.700	2.590	0.110	404.0	600	swale	13.04
1.011	12	13	15.099	0.030	2.590	2.550	0.040	377.5	600	swale	13.36
1.012	13	14	18.568	0.030	2.550	2.500	0.050	371.4	600	swale	13.74
1.013	14	15	31.803	0.030	2.500	2.425	0.075	424.0	600	swale	14.44
1.014	15	16	21.231	0.600	2.425	1.700	0.725	29.3	300	Circular	14.56
2.000	31	32	21.489	0.600	2.675	2.525	0.150	143.3	225	Circular_Default Sewer Type	5.33
2.001	32	33	19.090	0.600	2.450	2.325	0.125	152.7	300	Circular_Default Sewer Type	5.58
4.000	40	41	23.627	0.030	2.900	2.500	0.400	59.1	300	swale	5.29
4.001	41	33	9.217	0.600	2.500	2.400	0.100	92.2	225	Circular_Default Sewer Type	5.41

Name	US Node	DS Node	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)
1.000	1	2	0.570	290.6	12.1	0.000	0.007	0.089
1.001	2	3	0.570	290.6	12.1	0.007	0.008	0.089
1.002	3	4	0.570	290.6	23.9	0.008	0.000	0.176
1.003	4	5	1.013	71.6	23.9	0.000	0.000	0.176
1.004	5	6	0.549	279.7	23.9	0.000	0.025	0.176
1.005	6	7	0.556	283.6	33.7	0.025	0.100	0.249
1.006	7	8	1.118	79.0	33.7	0.100	0.045	0.249
1.007	8	9	1.006	71.1	32.9	0.045	0.500	0.249
1.008	9	10	0.660	683.1	50.2	0.350	0.425	0.394
1.009	10	11	0.652	674.7	48.4	0.425	0.150	0.394
1.010	11	12	0.775	1348.4	46.4	0.000	0.110	0.394
1.011	12	13	0.802	1394.9	56.8	0.110	0.150	0.489
1.012	13	14	0.808	1406.3	55.9	0.150	0.200	0.489
1.013	14	15	0.756	1316.1	54.3	0.200	0.275	0.489
1.014	15	16	2.916	206.1	61.9	0.575	1.300	0.560
2.000	31	32	1.090	43.3	16.5	0.868	0.912	0.122
2.001	32	33	1.270	89.7	16.5	0.912	0.922	0.122
4.000	40	41	1.339	682.8	4.9	0.300	0.600	0.036
4.001	41	33	1.362	54.2	4.9	0.675	0.922	0.036

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	Link Type	T of C (mins)
2.002	33	35	59.972	0.600	2.250	2.050	0.200	299.9	375	Circular_Default Sewer Type	6.54
5.000	50	51	28.165	0.600	2.675	2.550	0.125	225.3	300	Circular	5.45
5.001	51	52	21.179	0.600	2.550	2.450	0.100	211.8	300	Circular	5.78
5.002	52	53	26.320	0.600	2.375	2.250	0.125	210.6	375	Circular	6.13
5.003	53	54	33.456	0.600	2.250	2.125	0.125	267.6	375	Circular	6.64
5.004	54	35	22.534	0.600	2.125	2.050	0.075	300.5	375	Circular	7.00
3.005	35	36	47.126	0.600	1.975	1.850	0.125	377.0	450	Circular_Default Sewer Type	7.75
2.004	36	38	57.475	0.600	1.850	1.700	0.150	383.2	450	Circular_Default Sewer Type	8.68
8.000	21	20	31.646	0.600	2.500	2.300	0.200	158.2	225	Circular	5.51
8.001	20	64	21.159	0.600	2.300	2.175	0.125	169.3	225	Circular	5.86
6.000	60	61	24.339	0.600	2.775	2.625	0.150	162.3	225	Circular	5.40
6.001	61	62	29.699	0.600	2.475	2.350	0.125	237.6	375	Circular	5.82
6.002	62	63	30.299	0.600	2.350	2.225	0.125	242.4	375	Circular	6.25
7.000	70	63	53.428	0.600	2.600	2.300	0.300	178.1	300	Circular	5.76
6.003	63	64	46.497	0.600	2.150	1.950	0.200	232.5	450	Circular	6.84
6.004	64	65	30.813	0.600	1.875	1.775	0.100	308.1	525	Circular	7.24
6.005	65	66	29.637	0.600	1.775	1.700	0.075	395.2	525	Circular	7.68
6.006	66	38	34.168	0.600	1.700	1.625	0.075	456.0	525	Circular	8.23
2.005	38	39	32.202	0.600	1.550	1.475	0.075	429.4	600	Circular_Default Sewer Type	9.14
9.000	100	101	7.312	0.600	1.400	1.380	0.020	365.6	600	Circular	5.10
9.001	101	102	12.608	0.600	1.380	1.300	0.080	157.6	225	Circular	5.30

Name	US Node	DS Node	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)
2.002	33	35	1.041	115.0	40.3	0.922	1.507	0.297
5.000	50	51	1.043	73.7	14.5	0.891	1.252	0.107
5.001	51	52	1.076	76.1	19.2	1.252	1.490	0.142
5.002	52	53	1.245	137.5	29.3	1.490	1.805	0.216
5.003	53	54	1.102	121.8	37.9	1.805	1.669	0.280
5.004	54	35	1.040	114.8	37.9	1.669	1.507	0.280
3.005	35	36	1.041	165.5	84.7	1.507	1.364	0.625
2.004	36	38	1.032	164.2	106.8	1.364	1.225	0.788
8.000	21	20	1.037	41.2	3.0	0.895	1.445	0.022
8.001	20	64	1.002	39.8	15.7	1.445	1.624	0.116
6.000	60	61	1.024	40.7	7.6	1.344	1.660	0.056
6.001	61	62	1.171	129.3	32.7	1.660	1.690	0.241
6.002	62	63	1.159	128.0	49.9	1.690	1.705	0.368
7.000	70	63	1.175	83.0	8.3	1.083	1.705	0.061
6.003	63	64	1.329	211.3	70.3	1.705	1.624	0.519
6.004	64	65	1.270	275.0	97.4	1.624	1.508	0.719
6.005	65	66	1.120	242.5	107.6	1.508	1.376	0.794
6.006	66	38	1.042	225.6	119.7	1.376	1.225	0.883
2.005	38	39	1.169	330.4	242.6	1.225	1.300	1.790
9.000	100	101	1.267	358.3	34.4	1.300	1.320	0.254
9.001	101	102	1.039	41.3	34.4	1.695	1.775	0.254

Simulation Settings

Rainfall Methodology	FEH-13	Analysis Speed	Detailed	Additional Storage (m³/ha)	20.0
Summer CV	0.750	Skip Steady State	✓	Check Discharge Rate(s)	x
Winter CV	0.840	Drain Down Time (mins)	240	Check Discharge Volume	x

Storm Durations

60	180	360	600	960	2160	5760	10080
120	240	480	720	1440	2880	7200	

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
2	0	0	0
30	0	0	0
100	0	0	0
100	40	0	0
100	40	10	0

Node 102 Surcharged Outfall

Overrides Design Area	x	Depression Storage Area (m ²)	0	Evapo-transpiration (mm/day)	0
Overrides Design Additional Inflow	x	Depression Storage Depth (mm)	0		
Applies to All storms					

Time (mins)	Depth (m)	Time (mins)	Depth (m)
0	0.970	10080	0.970

Node 101 Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	✓	Sump Available	✓
Invert Level (m)	1.380	Product Number	CTL-SHE-0125-8600-1750-8600
Design Depth (m)	1.750	Min Outlet Diameter (m)	0.150
Design Flow (l/s)	8.6	Min Node Diameter (mm)	1200

Node 16 Online Orifice Control

Flap Valve	x	Invert Level (m)	1.475	Discharge Coefficient	1.000
Replaces Downstream Link	x	Diameter (m)	0.375		

Node 39 Online Orifice Control

Flap Valve	x	Invert Level (m)	1.475	Discharge Coefficient	1.000
Replaces Downstream Link	x	Diameter (m)	0.675		

Node 100 Flow through Pond Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Main Channel Length (m)	21.000
Side Inf Coefficient (m/hr)	0.00000	Invert Level (m)	1.400	Main Channel Slope (1:X)	280.0
Safety Factor	2.0	Time to half empty (mins)		Main Channel n	0.030

Inlets

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Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)
0.000	9.0	0.0	0.400	1238.0	0.0	1.125	1988.0	0.0	1.900	2540.0	0.0
0.100	83.0	0.0	0.500	1293.0	0.0	1.600	2319.0	0.0			
0.200	167.0	0.0	0.600	1350.0	0.0	1.700	2392.0	0.0			
0.300	1203.0	0.0	1.100	1648.0	0.0	1.800	2466.0	0.0			

Results for 2 year Critical Storm Duration. Lowest mass balance: 56.75%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
60 minute summer	1	33	3.655	0.055	7.8	0.3268	0.0000	OK
60 minute summer	2	36	3.542	0.049	7.9	0.0000	0.0000	OK
60 minute summer	3	36	3.460	0.068	13.8	0.3842	0.0000	OK
60 minute summer	4	37	3.385	0.085	13.1	0.0000	0.0000	OK
60 minute summer	5	38	3.318	0.068	12.8	0.0000	0.0000	OK
60 minute summer	6	37	3.252	0.077	16.8	0.3477	0.0000	OK
60 minute summer	7	38	3.196	0.096	16.3	0.0000	0.0000	OK
60 minute summer	8	39	3.147	0.097	16.1	0.1101	0.0000	OK
60 minute summer	9	36	2.947	0.097	24.1	0.3522	0.0000	OK
60 minute summer	10	37	2.874	0.099	23.8	0.0000	0.0000	OK
60 minute summer	20	33	2.379	0.079	10.1	0.2285	0.0000	OK
60 minute summer	21	33	2.533	0.033	1.9	0.0703	0.0000	OK
60 minute summer	11	40	2.796	0.096	23.8	0.0000	0.0000	OK
60 minute winter	12	40	2.693	0.103	27.5	0.2754	0.0000	OK
60 minute winter	13	41	2.653	0.103	27.3	0.0000	0.0000	OK
60 minute winter	14	42	2.616	0.116	27.2	0.0000	0.0000	OK
60 minute winter	15	42	2.501	0.076	29.5	0.1236	0.0000	OK
10080 minute winter	16	7740	2.306	0.831	3.1	0.0000	0.0000	OK
10080 minute winter	100	7740	2.305	0.905	85.1	2.4187	0.0000	SURCHARGED
10080 minute winter	101	7740	2.304	0.924	0.8	1.6335	0.0000	SURCHARGED
60 minute summer	102	1	2.270	0.970	0.0	0.0000	0.0000	OK
60 minute summer	60	33	2.828	0.053	4.9	0.0987	0.0000	OK
60 minute summer	61	33	2.576	0.101	21.1	0.3290	0.0000	OK
60 minute summer	62	33	2.482	0.132	32.2	0.3499	0.0000	OK
60 minute summer	70	33	2.651	0.051	5.4	0.1030	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
60 minute summer	1	1.000	2	7.9	0.219	0.027	1.2474	
60 minute summer	2	1.001	3	7.2	0.167	0.025	1.4275	
60 minute summer	3	1.002	4	13.1	0.216	0.045	1.8521	
60 minute summer	4	1.003	5	12.8	0.912	0.178	0.1688	
60 minute summer	5	1.004	6	12.6	0.219	0.045	1.5207	
60 minute summer	6	1.005	7	16.3	0.226	0.058	1.8938	
60 minute summer	7	1.006	8	16.1	0.826	0.204	0.1926	
60 minute summer	8	1.007	9	16.2	0.838	0.227	0.9455	
60 minute summer	9	1.008	10	23.8	0.274	0.035	2.5777	
60 minute summer	10	1.009	11	23.8	0.282	0.035	2.5965	
60 minute summer	20	8.001	64	9.9	0.823	0.249	0.2558	
60 minute summer	21	8.000	20	1.9	0.246	0.046	0.2522	
60 minute summer	11	1.010	12	23.1	0.261	0.017	3.9412	
60 minute winter	12	1.011	13	27.3	0.292	0.020	1.4146	
60 minute winter	13	1.012	14	27.2	0.268	0.019	1.9019	
60 minute winter	14	1.013	15	26.9	0.317	0.020	2.7465	
60 minute winter	15	1.014	16	29.5	2.017	0.143	0.4970	
10080 minute winter	16	Flow through pond	100	84.7	0.003	0.000	848.1485	
10080 minute winter	100	9.000	101	0.8	0.003	0.002	2.0596	
10080 minute winter	101	Hydro-Brake®	102	0.7				95.6
60 minute summer	60	6.000	61	4.9	0.689	0.120	0.1725	
60 minute summer	61	6.001	62	21.1	0.726	0.163	0.8669	
60 minute summer	62	6.002	63	31.8	0.957	0.248	1.0095	
60 minute summer	70	7.000	63	5.2	0.664	0.063	0.4219	

Results for 2 year Critical Storm Duration. Lowest mass balance: 56.75%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
7200 minute winter	63	7020	2.313	0.163	5.9	0.4239	0.0000	OK
10080 minute winter	64	7920	2.310	0.435	13.3	1.1095	0.0000	OK
5760 minute winter	65	5520	2.312	0.537	7.5	1.3461	0.0000	SURCHARGED
10080 minute winter	66	8280	2.311	0.611	13.3	1.6502	0.0000	SURCHARGED
60 minute summer	50	33	2.747	0.072	9.4	0.2109	0.0000	OK
60 minute summer	51	33	2.634	0.084	12.5	0.1333	0.0000	OK
60 minute summer	52	33	2.469	0.094	18.8	0.2095	0.0000	OK
60 minute summer	53	34	2.366	0.116	24.3	0.2341	0.0000	OK
10080 minute winter	54	7860	2.320	0.195	5.1	0.3452	0.0000	OK
60 minute summer	31	33	2.753	0.078	10.7	0.2638	0.0000	OK
60 minute summer	32	33	2.522	0.072	10.7	0.0813	0.0000	OK
60 minute summer	40	33	2.919	0.019	3.2	0.0232	0.0000	OK
60 minute summer	41	34	2.537	0.037	3.2	0.0000	0.0000	OK
60 minute summer	33	34	2.371	0.121	25.8	0.4740	0.0000	OK
10080 minute winter	35	7860	2.318	0.343	11.7	0.5566	0.0000	OK
10080 minute winter	36	8940	2.315	0.465	13.7	1.3626	0.0000	SURCHARGED
10080 minute winter	38	7920	2.314	0.764	20.2	2.3462	0.0000	SURCHARGED
7200 minute winter	39	6180	2.329	0.854	117.6	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
7200 minute winter	63	6.003	64	7.7	0.371	0.036	4.3256	
10080 minute winter	64	6.004	65	-11.7	0.266	-0.042	6.2776	
5760 minute winter	65	6.005	66	10.5	0.225	0.043	6.4026	
10080 minute winter	66	6.006	38	-13.2	0.224	-0.058	7.3814	
60 minute summer	50	5.000	51	9.4	0.647	0.128	0.4108	
60 minute summer	51	5.001	52	12.3	0.787	0.162	0.3333	
60 minute summer	52	5.002	53	18.7	0.744	0.136	0.6640	
60 minute summer	53	5.003	54	24.3	0.818	0.199	0.9952	
10080 minute winter	54	5.004	35	5.4	0.289	0.047	1.6037	
60 minute summer	31	2.000	32	10.7	0.891	0.246	0.2576	
60 minute summer	32	2.001	33	10.6	0.845	0.118	0.2402	
60 minute summer	40	4.000	41	3.2	0.188	0.005	0.4120	
60 minute summer	41	4.001	33	3.1	0.736	0.057	0.0386	
60 minute summer	33	2.002	35	25.3	0.859	0.220	1.7685	
10080 minute winter	35	3.005	36	13.6	0.271	0.082	6.7897	
10080 minute winter	36	2.004	38	13.2	0.297	0.081	9.1065	
10080 minute winter	38	2.005	39	21.0	0.146	0.063	9.0706	
7200 minute winter	39	Flow through pond	100	-68.2	0.006	0.000	839.4245	

Results for 30 year Critical Storm Duration. Lowest mass balance: 56.75%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
60 minute summer	1	33	3.693	0.093	22.6	0.5532	0.0000	OK
60 minute summer	2	35	3.581	0.088	22.7	0.0000	0.0000	OK
60 minute summer	3	35	3.513	0.121	42.2	0.6851	0.0000	OK
60 minute summer	4	36	3.456	0.156	40.8	0.0000	0.0000	OK
60 minute summer	5	36	3.372	0.122	39.9	0.0000	0.0000	OK
60 minute summer	6	37	3.319	0.144	53.8	0.6480	0.0000	OK
60 minute summer	7	37	3.290	0.190	51.4	0.0000	0.0000	OK
60 minute summer	8	38	3.237	0.187	50.5	0.2120	0.0000	OK
60 minute summer	9	35	3.021	0.171	76.8	0.6200	0.0000	OK
60 minute summer	10	36	2.946	0.171	76.3	0.0000	0.0000	OK
960 minute winter	20	930	2.595	0.295	3.2	0.8525	0.0000	SURCHARGED
960 minute winter	21	930	2.595	0.095	0.9	0.2046	0.0000	OK
60 minute summer	11	38	2.870	0.170	75.6	0.0000	0.0000	OK
60 minute summer	12	38	2.771	0.181	88.5	0.4839	0.0000	OK
60 minute summer	13	38	2.732	0.182	87.3	0.0000	0.0000	OK
60 minute summer	14	39	2.692	0.192	87.0	0.0000	0.0000	OK
960 minute winter	15	930	2.598	0.173	15.5	0.2815	0.0000	OK
960 minute winter	16	930	2.601	1.126	20.6	0.0000	0.0000	OK
960 minute winter	100	930	2.598	1.198	67.8	3.2039	0.0000	SURCHARGED
960 minute winter	101	930	2.598	1.218	8.4	2.1524	0.0000	SURCHARGED
60 minute summer	102	1	2.270	0.970	0.0	0.0000	0.0000	OK
60 minute summer	60	33	2.870	0.095	14.2	0.1747	0.0000	OK
60 minute summer	61	33	2.670	0.195	61.3	0.6351	0.0000	OK
60 minute summer	62	33	2.601	0.251	93.5	0.6676	0.0000	OK
60 minute summer	70	33	2.687	0.087	15.5	0.1747	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
60 minute summer	1	1.000	2	22.7	0.299	0.078	2.6692	
60 minute summer	2	1.001	3	21.6	0.225	0.074	3.1951	
60 minute summer	3	1.002	4	40.8	0.286	0.140	4.4091	
60 minute summer	4	1.003	5	39.9	1.258	0.558	0.3808	
60 minute summer	5	1.004	6	39.6	0.290	0.141	3.6306	
60 minute summer	6	1.005	7	51.4	0.287	0.181	5.0724	
60 minute summer	7	1.006	8	50.5	1.083	0.639	0.4587	
60 minute summer	8	1.007	9	50.8	1.182	0.714	2.1129	
60 minute summer	9	1.008	10	76.3	0.379	0.112	5.9679	
60 minute summer	10	1.009	11	75.6	0.383	0.112	6.0663	
960 minute winter	20	8.001	64	3.3	0.595	0.082	0.8415	
960 minute winter	21	8.000	20	1.0	0.186	0.024	0.8801	
60 minute summer	11	1.010	12	74.2	0.352	0.055	9.3714	
60 minute summer	12	1.011	13	87.3	0.397	0.063	3.3589	
60 minute summer	13	1.012	14	87.0	0.377	0.062	4.3306	
60 minute summer	14	1.013	15	86.3	0.444	0.066	6.2636	
960 minute winter	15	1.014	16	20.6	1.027	0.100	1.1955	
960 minute winter	16	Flow through pond	100	64.4	0.052	0.000	1333.2183	
960 minute winter	100	9.000	101	8.4	0.057	0.023	2.0596	
960 minute winter	101	Hydro-Brake®	102	8.3				320.8
60 minute summer	60	6.000	61	14.2	0.920	0.349	0.3755	
60 minute summer	61	6.001	62	61.2	0.897	0.473	2.0253	
60 minute summer	62	6.002	63	92.8	1.266	0.725	2.2253	
60 minute summer	70	7.000	63	15.5	0.823	0.186	1.1580	

Results for 30 year Critical Storm Duration. Lowest mass balance: 56.75%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
960 minute winter	63	915	2.595	0.445	14.4	1.1576	0.0000	OK
960 minute winter	64	1020	2.596	0.721	19.9	1.8366	0.0000	SURCHARGED
960 minute winter	65	930	2.595	0.820	21.5	2.0531	0.0000	SURCHARGED
960 minute winter	66	930	2.595	0.895	23.7	2.4179	0.0000	SURCHARGED
60 minute summer	50	33	2.805	0.130	27.2	0.3802	0.0000	OK
60 minute summer	51	33	2.703	0.153	36.1	0.2427	0.0000	OK
960 minute winter	52	1020	2.595	0.220	6.1	0.4899	0.0000	OK
960 minute winter	53	915	2.595	0.345	7.9	0.6958	0.0000	OK
960 minute winter	54	915	2.595	0.470	7.9	0.8298	0.0000	SURCHARGED
60 minute summer	31	33	2.824	0.149	31.0	0.5015	0.0000	OK
960 minute winter	32	930	2.595	0.145	3.4	0.1638	0.0000	OK
60 minute summer	40	33	2.935	0.035	9.2	0.0424	0.0000	OK
960 minute winter	41	915	2.595	0.095	3.6	0.0000	0.0000	OK
960 minute winter	33	915	2.595	0.345	8.3	1.3477	0.0000	OK
960 minute winter	35	930	2.595	0.620	16.8	1.0051	0.0000	SURCHARGED
960 minute winter	36	915	2.595	0.745	21.2	2.1806	0.0000	SURCHARGED
960 minute winter	38	900	2.595	1.045	41.8	3.2099	0.0000	SURCHARGED
960 minute winter	39	885	2.603	1.128	84.6	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
960 minute winter	63	6.003	64	14.4	0.696	0.068	7.3603	
960 minute winter	64	6.004	65	19.4	0.507	0.070	6.6566	
960 minute winter	65	6.005	66	21.4	0.407	0.088	6.4026	
960 minute winter	66	6.006	38	21.5	0.453	0.095	7.3814	
60 minute summer	50	5.000	51	27.2	0.833	0.369	0.9216	
60 minute summer	51	5.001	52	36.0	1.037	0.473	0.7350	
960 minute winter	52	5.002	53	6.1	0.558	0.044	2.2794	
960 minute winter	53	5.003	54	7.9	0.606	0.065	3.6190	
960 minute winter	54	5.004	35	7.5	0.595	0.065	2.4854	
60 minute summer	31	2.000	32	31.0	1.154	0.715	0.5768	
960 minute winter	32	2.001	33	3.4	0.611	0.038	0.9579	
60 minute summer	40	4.000	41	9.2	0.269	0.013	0.8323	
960 minute winter	41	4.001	33	3.7	0.528	0.069	0.2414	
960 minute winter	33	2.002	35	8.3	0.608	0.072	6.4871	
960 minute winter	35	3.005	36	16.8	0.528	0.102	7.4668	
960 minute winter	36	2.004	38	18.9	0.469	0.115	9.1065	
960 minute winter	38	2.005	39	45.0	0.473	0.136	9.0706	
960 minute winter	39	Flow through pond	100	64.4	0.052	0.000	1333.2183	

Results for 100 year Critical Storm Duration. Lowest mass balance: 56.75%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
60 minute summer	1	33	3.709	0.109	31.2	0.6451	0.0000	OK
60 minute summer	2	35	3.597	0.104	31.3	0.0000	0.0000	OK
60 minute summer	3	35	3.535	0.143	58.6	0.8050	0.0000	OK
60 minute summer	4	36	3.488	0.188	56.9	0.0000	0.0000	OK
60 minute summer	5	37	3.395	0.145	57.6	0.0000	0.0000	OK
60 minute summer	6	37	3.358	0.183	75.1	0.8217	0.0000	OK
60 minute summer	7	38	3.340	0.240	69.8	0.0000	0.0000	OK
60 minute summer	8	38	3.283	0.233	68.1	0.2640	0.0000	OK
60 minute summer	9	35	3.048	0.198	105.1	0.7174	0.0000	OK
60 minute summer	10	36	2.973	0.198	104.7	0.0000	0.0000	OK
960 minute winter	20	945	2.864	0.564	4.6	1.6319	0.0000	SURCHARGED
960 minute winter	21	945	2.865	0.365	2.0	0.7873	0.0000	SURCHARGED
60 minute summer	11	37	2.897	0.197	103.6	0.0000	0.0000	OK
960 minute winter	12	945	2.869	0.279	19.5	0.7454	0.0000	OK
960 minute winter	13	945	2.869	0.319	19.5	0.0000	0.0000	OK
960 minute winter	14	945	2.869	0.369	19.5	0.0000	0.0000	OK
960 minute winter	15	945	2.869	0.444	22.2	0.7199	0.0000	SURCHARGED
960 minute winter	16	945	2.876	1.401	22.2	0.0000	0.0000	OK
960 minute winter	100	945	2.868	1.468	67.2	3.9254	0.0000	SURCHARGED
960 minute winter	101	945	2.868	1.488	8.7	2.6292	0.0000	SURCHARGED
60 minute summer	102	1	2.270	0.970	2.1	0.0000	0.0000	OK
60 minute summer	60	35	2.954	0.179	19.6	0.3299	0.0000	OK
60 minute summer	61	35	2.926	0.451	84.7	1.4642	0.0000	SURCHARGED
60 minute summer	62	35	2.873	0.523	126.5	1.3922	0.0000	SURCHARGED
960 minute winter	70	945	2.864	0.264	3.0	0.5321	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
60 minute summer	1	1.000	2	31.3	0.326	0.108	3.3647	
60 minute summer	2	1.001	3	29.9	0.245	0.103	4.0624	
60 minute summer	3	1.002	4	56.9	0.306	0.196	5.8344	
60 minute summer	4	1.003	5	57.6	1.447	0.804	0.4795	
60 minute summer	5	1.004	6	55.1	0.298	0.197	5.0458	
60 minute summer	6	1.005	7	69.8	0.294	0.246	7.3731	
60 minute summer	7	1.006	8	68.1	1.142	0.862	0.5855	
60 minute summer	8	1.007	9	68.3	1.301	0.961	2.5945	
60 minute summer	9	1.008	10	104.7	0.413	0.153	7.5073	
60 minute summer	10	1.009	11	103.6	0.415	0.154	7.6551	
960 minute winter	20	8.001	64	4.3	0.630	0.108	0.8415	
960 minute winter	21	8.000	20	-2.0	0.203	-0.049	1.2586	
60 minute summer	11	1.010	12	101.6	0.380	0.075	11.9046	
960 minute winter	12	1.011	13	19.5	0.265	0.014	7.6627	
960 minute winter	13	1.012	14	19.5	0.255	0.014	12.0068	
960 minute winter	14	1.013	15	19.4	0.284	0.015	27.6177	
960 minute winter	15	1.014	16	22.2	1.149	0.108	1.4951	
960 minute winter	16	Flow through pond	100	64.8	0.054	0.000	1901.2656	
960 minute winter	100	9.000	101	8.7	0.031	0.024	2.0596	
960 minute winter	101	Hydro-Brake®	102	8.6				374.2
60 minute summer	60	6.000	61	19.8	0.989	0.486	0.8959	
60 minute summer	61	6.001	62	82.0	0.931	0.634	3.2757	
60 minute summer	62	6.002	63	121.4	1.319	0.948	3.3419	
960 minute winter	70	7.000	63	-3.0	0.519	-0.036	3.6371	

Results for 100 year Critical Storm Duration. Lowest mass balance: 56.75%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
960 minute winter	63	945	2.864	0.714	20.4	1.8589	0.0000	SURCHARGED
960 minute winter	64	945	2.864	0.989	26.4	2.5219	0.0000	SURCHARGED
960 minute winter	65	945	2.864	1.089	29.0	2.7289	0.0000	SURCHARGED
960 minute winter	66	945	2.865	1.165	32.4	3.1479	0.0000	SURCHARGED
60 minute summer	50	35	2.943	0.268	37.5	0.7842	0.0000	OK
60 minute summer	51	35	2.921	0.371	51.6	0.5872	0.0000	SURCHARGED
60 minute summer	52	35	2.886	0.511	73.5	1.1375	0.0000	SURCHARGED
960 minute winter	53	945	2.864	0.614	11.0	1.2394	0.0000	SURCHARGED
960 minute winter	54	960	2.864	0.739	10.2	1.3056	0.0000	SURCHARGED
60 minute summer	31	35	2.962	0.287	42.8	0.9662	0.0000	SURCHARGED
960 minute winter	32	945	2.864	0.414	4.8	0.4684	0.0000	SURCHARGED
60 minute summer	40	33	2.942	0.042	12.6	0.0505	0.0000	OK
960 minute winter	41	945	2.864	0.364	5.7	0.0000	0.0000	SURCHARGED
960 minute winter	33	945	2.864	0.614	11.7	2.4017	0.0000	SURCHARGED
960 minute winter	35	960	2.864	0.889	22.3	1.4417	0.0000	SURCHARGED
960 minute winter	36	960	2.864	1.014	28.4	2.9683	0.0000	SURCHARGED
960 minute winter	38	945	2.865	1.315	65.2	4.0370	0.0000	SURCHARGED
960 minute winter	39	1035	2.882	1.407	105.3	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
960 minute winter	63	6.003	64	19.0	0.710	0.090	7.3671	
960 minute winter	64	6.004	65	26.0	0.496	0.095	6.6566	
960 minute winter	65	6.005	66	28.9	0.450	0.119	6.4026	
960 minute winter	66	6.006	38	32.3	0.483	0.143	7.3814	
60 minute summer	50	5.000	51	39.3	0.887	0.533	1.9265	
60 minute summer	51	5.001	52	47.6	1.102	0.626	1.4914	
60 minute summer	52	5.002	53	65.9	0.957	0.479	2.9030	
960 minute winter	53	5.003	54	10.2	0.631	0.084	3.6901	
960 minute winter	54	5.004	35	10.0	0.602	0.087	2.4854	
60 minute summer	31	2.000	32	42.5	1.204	0.981	0.8546	
960 minute winter	32	2.001	33	4.8	0.663	0.053	1.3443	
60 minute summer	40	4.000	41	12.6	0.300	0.018	7.7317	
960 minute winter	41	4.001	33	-5.7	0.582	-0.105	0.3666	
960 minute winter	33	2.002	35	10.9	0.617	0.095	6.6147	
960 minute winter	35	3.005	36	21.9	0.528	0.132	7.4668	
960 minute winter	36	2.004	38	28.3	0.524	0.172	9.1065	
960 minute winter	38	2.005	39	64.9	0.469	0.197	9.0706	
960 minute winter	39	Flow through pond	100	64.8	0.054	0.000	1901.2656	

Results for 100 year +40% CC Critical Storm Duration. Lowest mass balance: 56.75%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
60 minute summer	1	33	3.727	0.127	43.7	0.7561	0.0000	OK
60 minute summer	2	34	3.616	0.123	43.8	0.0000	0.0000	OK
60 minute summer	3	35	3.564	0.172	82.6	0.9716	0.0000	OK
60 minute summer	4	35	3.527	0.227	78.5	0.0000	0.0000	OK
60 minute summer	5	38	3.443	0.193	80.8	0.0000	0.0000	OK
60 minute summer	6	39	3.430	0.255	103.6	1.1450	0.0000	OK
60 minute summer	7	39	3.424	0.324	89.4	0.0000	0.0000	FLOOD RISK
60 minute summer	8	39	3.354	0.304	82.0	0.3437	0.0000	FLOOD RISK
1440 minute winter	9	1410	3.174	0.324	15.2	1.1748	0.0000	OK
1440 minute winter	10	1410	3.173	0.398	15.2	0.0000	0.0000	OK
60 minute summer	20	35	3.535	1.235	51.3	3.5716	0.0000	SURCHARGED
60 minute summer	21	35	3.549	1.049	10.8	2.2661	0.0000	FLOOD RISK
1440 minute winter	11	1410	3.172	0.472	15.2	0.0000	0.0000	OK
1440 minute winter	12	1410	3.172	0.582	18.9	1.5576	0.0000	OK
1440 minute winter	13	1410	3.172	0.622	18.2	0.0000	0.0000	FLOOD RISK
1440 minute winter	14	1410	3.173	0.673	17.7	0.0000	0.0000	FLOOD RISK
1440 minute winter	15	1410	3.173	0.748	19.7	1.2141	0.0000	FLOOD RISK
960 minute winter	16	930	3.174	1.699	26.7	0.0000	0.0000	OK
1440 minute winter	100	1410	3.172	1.772	74.3	4.7377	0.0000	FLOOD RISK
1440 minute winter	101	1410	3.172	1.792	8.7	3.1661	0.0000	FLOOD RISK
60 minute summer	102	1	2.270	0.970	8.0	0.0000	0.0000	OK
60 minute summer	60	35	3.995	1.220	27.5	2.2508	0.0000	SURCHARGED
60 minute summer	61	35	3.929	1.454	111.6	4.7264	0.0000	SURCHARGED
60 minute summer	62	35	3.827	1.477	162.1	3.9312	0.0000	SURCHARGED
60 minute summer	70	35	3.620	1.020	29.9	2.0540	0.0000	SURCHARGED

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
60 minute summer	1	1.000	2	43.8	0.357	0.151	4.2933	
60 minute summer	2	1.001	3	42.0	0.264	0.145	5.3453	
60 minute summer	3	1.002	4	78.5	0.324	0.270	7.8807	
60 minute summer	4	1.003	5	80.8	1.598	1.129	0.6129	
60 minute summer	5	1.004	6	74.7	0.295	0.267	8.3192	
60 minute summer	6	1.005	7	89.4	0.294	0.315	12.4421	
60 minute summer	7	1.006	8	82.0	1.165	1.038	0.6917	
60 minute summer	8	1.007	9	82.0	1.387	1.154	3.0453	
1440 minute winter	9	1.008	10	15.2	0.242	0.022	20.8298	
1440 minute winter	10	1.009	11	15.2	0.241	0.023	29.5629	
60 minute summer	20	8.001	64	48.4	1.217	1.215	0.8415	
60 minute summer	21	8.000	20	12.1	0.327	0.295	1.2586	
1440 minute winter	11	1.010	12	15.2	0.221	0.011	61.5989	
1440 minute winter	12	1.011	13	18.2	0.259	0.013	26.4812	
1440 minute winter	13	1.012	14	17.7	0.239	0.013	37.2180	
1440 minute winter	14	1.013	15	17.1	0.268	0.013	75.6969	
1440 minute winter	15	1.014	16	18.7	1.127	0.091	1.4951	
960 minute winter	16	Flow through pond	100	65.9	0.060	0.000	2596.9390	
1440 minute winter	100	9.000	101	8.7	0.031	0.024	2.0596	
1440 minute winter	101	Hydro-Brake®	102	8.6				520.1
60 minute summer	60	6.000	61	24.9	0.979	0.611	0.9680	
60 minute summer	61	6.001	62	103.0	0.940	0.796	3.2757	
60 minute summer	62	6.002	63	157.1	1.425	1.228	3.3419	
60 minute summer	70	7.000	63	30.2	0.823	0.363	3.7624	

Results for 100 year +40% CC Critical Storm Duration. Lowest mass balance: 56.75%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
60 minute summer	63	35	3.586	1.436	223.6	3.7359	0.0000	SURCHARGED
60 minute summer	64	35	3.316	1.441	303.4	3.6723	0.0000	SURCHARGED
960 minute winter	65	945	3.169	1.394	42.2	3.4926	0.0000	SURCHARGED
1440 minute winter	66	1410	3.169	1.469	32.4	3.9709	0.0000	SURCHARGED
60 minute summer	50	35	3.735	1.060	52.5	3.1051	0.0000	FLOOD RISK
60 minute summer	51	35	3.676	1.126	61.6	1.7816	0.0000	SURCHARGED
60 minute summer	52	35	3.592	1.217	93.7	2.7087	0.0000	SURCHARGED
60 minute summer	53	35	3.519	1.269	120.3	2.5624	0.0000	SURCHARGED
60 minute summer	54	35	3.371	1.246	118.4	2.2019	0.0000	SURCHARGED
60 minute summer	31	35	3.617	0.942	59.9	3.1668	0.0000	FLOOD RISK
60 minute summer	32	35	3.353	0.903	52.4	1.0210	0.0000	SURCHARGED
60 minute summer	40	38	3.208	0.308	58.8	0.3691	0.0000	FLOOD RISK
60 minute summer	41	39	3.205	0.705	70.3	0.0000	0.0000	FLOOD RISK
60 minute summer	33	35	3.296	1.046	116.0	4.0901	0.0000	FLOOD RISK
60 minute summer	35	35	3.261	1.286	181.5	2.0861	0.0000	SURCHARGED
1440 minute winter	36	1410	3.169	1.319	28.2	3.8614	0.0000	SURCHARGED
1440 minute winter	38	1410	3.169	1.619	64.8	4.9711	0.0000	FLOOD RISK
960 minute winter	39	930	3.176	1.701	93.8	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
60 minute summer	63	6.003	64	221.4	1.398	1.048	7.3671	
60 minute summer	64	6.004	65	303.6	1.406	1.104	6.6566	
960 minute winter	65	6.005	66	41.8	0.493	0.172	6.4026	
1440 minute winter	66	6.006	38	32.3	0.463	0.143	7.3814	
60 minute summer	50	5.000	51	45.4	0.915	0.615	1.9834	
60 minute summer	51	5.001	52	60.3	1.082	0.793	1.4914	
60 minute summer	52	5.002	53	91.5	0.963	0.666	2.9030	
60 minute summer	53	5.003	54	118.4	1.073	0.972	3.6901	
60 minute summer	54	5.004	35	118.4	1.073	1.031	2.4854	
60 minute summer	31	2.000	32	52.4	1.318	1.209	0.8546	
60 minute summer	32	2.001	33	51.7	0.987	0.576	1.3443	
60 minute summer	40	4.000	41	-42.0	0.302	-0.061	33.9081	
60 minute summer	41	4.001	33	-69.2	-1.740	-1.278	0.3666	
60 minute summer	33	2.002	35	99.1	0.977	0.862	6.6147	
60 minute summer	35	3.005	36	182.0	1.149	1.099	7.4668	
1440 minute winter	36	2.004	38	28.0	0.511	0.171	9.1065	
1440 minute winter	38	2.005	39	64.7	0.443	0.196	9.0706	
960 minute winter	39	Flow through pond	100	65.9	0.060	0.000	2596.9390	

Results for 100 year +40% CC +10% A Critical Storm Duration. Lowest mass balance: 56.75%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
60 minute summer	1	33	3.733	0.133	48.1	0.8699	0.0000	OK
60 minute summer	2	34	3.622	0.129	48.2	0.0000	0.0000	OK
60 minute summer	3	35	3.574	0.182	91.1	1.1305	0.0000	OK
60 minute summer	4	35	3.536	0.236	86.6	0.0000	0.0000	OK
60 minute summer	5	39	3.465	0.215	91.3	0.0000	0.0000	OK
60 minute summer	6	39	3.457	0.282	115.6	1.3919	0.0000	OK
60 minute summer	7	39	3.452	0.352	94.0	0.0000	0.0000	FLOOD RISK
60 minute summer	8	39	3.374	0.324	85.4	0.3660	0.0000	FLOOD RISK
1440 minute winter	9	1410	3.270	0.420	16.7	1.6760	0.0000	OK
1440 minute winter	10	1410	3.270	0.495	16.7	0.0000	0.0000	SURCHARGED
60 minute summer	20	34	3.650	1.350	53.4	4.0577	0.0000	SURCHARGED
60 minute summer	21	34	3.620	1.120	21.8	2.4629	2.9656	FLOOD
1440 minute winter	11	1410	3.270	0.570	16.7	0.0000	0.0000	OK
1440 minute winter	12	1410	3.270	0.680	20.5	2.0028	0.0000	FLOOD RISK
1440 minute winter	13	1410	3.270	0.720	19.3	0.0000	0.0000	FLOOD RISK
1440 minute winter	14	1410	3.270	0.770	18.5	0.0000	0.0000	FLOOD RISK
1440 minute winter	15	1410	3.270	0.845	19.6	1.5088	0.0000	FLOOD RISK
1440 minute winter	16	1470	3.274	1.799	23.2	0.0000	0.0000	OK
1440 minute winter	100	1440	3.269	1.869	72.8	5.4978	0.0000	FLOOD RISK
1440 minute winter	101	1440	3.269	1.889	8.7	3.3385	0.0000	FLOOD RISK
60 minute summer	102	1	2.270	0.970	8.3	0.0000	0.0000	OK
60 minute summer	60	35	4.344	1.569	30.2	3.0062	0.0069	FLOOD
60 minute summer	61	35	4.265	1.790	121.1	6.1424	0.0000	FLOOD RISK
60 minute summer	62	35	4.141	1.791	176.4	4.9863	0.0000	FLOOD RISK
60 minute summer	70	35	3.888	1.288	32.9	2.7061	0.0000	FLOOD RISK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
60 minute summer	1	1.000	2	48.2	0.366	0.166	4.6046	
60 minute summer	2	1.001	3	46.3	0.268	0.159	5.8024	
60 minute summer	3	1.002	4	86.6	0.326	0.298	8.4714	
60 minute summer	4	1.003	5	91.3	1.696	1.274	0.6612	
60 minute summer	5	1.004	6	82.2	0.294	0.294	9.8971	
60 minute summer	6	1.005	7	94.0	0.294	0.331	14.5215	
60 minute summer	7	1.006	8	85.4	1.214	1.081	0.6917	
60 minute summer	8	1.007	9	85.4	1.399	1.202	3.1177	
1440 minute winter	9	1.008	10	16.7	0.249	0.024	31.5939	
1440 minute winter	10	1.009	11	16.7	0.247	0.025	42.4915	
60 minute summer	20	8.001	64	47.7	1.199	1.197	0.8415	
60 minute summer	21	8.000	20	12.5	0.326	0.303	1.2586	
1440 minute winter	11	1.010	12	16.5	0.224	0.012	83.9305	
1440 minute winter	12	1.011	13	19.3	0.260	0.014	34.9344	
1440 minute winter	13	1.012	14	18.5	0.250	0.013	48.2270	
1440 minute winter	14	1.013	15	16.7	0.270	0.013	96.0393	
1440 minute winter	15	1.014	16	23.2	1.118	0.112	1.4951	
1440 minute winter	16	Flow through pond	100	68.5	0.015	0.000	2842.2490	
1440 minute winter	100	9.000	101	8.7	0.031	0.024	2.0596	
1440 minute winter	101	Hydro-Brake®	102	8.6				509.8
60 minute summer	60	6.000	61	27.9	0.985	0.685	0.9680	
60 minute summer	61	6.001	62	113.3	1.027	0.876	3.2757	
60 minute summer	62	6.002	63	174.1	1.579	1.360	3.3419	
60 minute summer	70	7.000	63	29.5	0.813	0.355	3.7624	

Results for 100 year +40% CC +10% A Critical Storm Duration. Lowest mass balance: 56.75%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
60 minute summer	63	35	3.844	1.694	244.8	4.5506	0.0000	SURCHARGED
60 minute summer	64	35	3.508	1.633	323.7	4.2910	0.0000	SURCHARGED
60 minute summer	65	35	3.318	1.543	359.4	3.9784	0.0000	SURCHARGED
1440 minute winter	66	1470	3.266	1.566	36.1	4.3793	0.0000	SURCHARGED
60 minute summer	50	34	3.866	1.191	57.8	3.7004	1.5836	FLOOD
60 minute summer	51	34	3.830	1.280	65.7	2.0822	0.0000	FLOOD RISK
60 minute summer	52	34	3.761	1.386	100.2	3.1943	0.0000	SURCHARGED
60 minute summer	53	34	3.688	1.438	127.6	2.9861	0.0000	SURCHARGED
60 minute summer	54	34	3.523	1.398	125.5	2.4711	0.0000	SURCHARGED
60 minute summer	31	34	3.768	1.093	65.9	3.9206	0.7094	FLOOD
60 minute summer	32	35	3.495	1.045	55.3	1.1816	0.0000	FLOOD RISK
60 minute winter	40	41	3.301	0.401	49.0	0.5300	0.0000	FLOOD RISK
60 minute winter	41	42	3.299	0.799	63.4	0.0000	0.0000	FLOOD RISK
60 minute summer	33	35	3.435	1.185	127.5	4.8879	0.0000	FLOOD RISK
60 minute summer	35	35	3.403	1.428	184.4	2.3857	0.0000	SURCHARGED
1440 minute winter	36	1410	3.267	1.417	30.8	4.4039	0.0000	SURCHARGED
1440 minute winter	38	1470	3.266	1.716	71.6	5.4948	0.0000	FLOOD RISK
1440 minute winter	39	1380	3.276	1.801	130.0	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
60 minute summer	63	6.003	64	246.8	1.558	1.168	7.3671	
60 minute summer	64	6.004	65	321.2	1.487	1.168	6.6566	
60 minute summer	65	6.005	66	356.7	1.651	1.471	6.4026	
1440 minute winter	66	6.006	38	36.0	0.470	0.159	7.3814	
60 minute summer	50	5.000	51	46.8	0.907	0.634	1.9834	
60 minute summer	51	5.001	52	60.9	1.109	0.801	1.4914	
60 minute summer	52	5.002	53	93.4	0.956	0.679	2.9030	
60 minute summer	53	5.003	54	125.5	1.138	1.031	3.6901	
60 minute summer	54	5.004	35	124.3	1.127	1.082	2.4854	
60 minute summer	31	2.000	32	55.3	1.390	1.275	0.8546	
60 minute summer	32	2.001	33	53.7	0.981	0.598	1.3443	
60 minute winter	40	4.000	41	36.4	0.296	0.053	44.8555	
60 minute winter	41	4.001	33	-58.7	-1.476	-1.084	0.3666	
60 minute summer	33	2.002	35	101.6	0.975	0.884	6.6147	
60 minute summer	35	3.005	36	184.8	1.167	1.117	7.4668	
1440 minute winter	36	2.004	38	30.6	0.528	0.187	9.1065	
1440 minute winter	38	2.005	39	71.4	0.435	0.216	9.0706	
1440 minute winter	39	Flow through pond	100	68.5	0.015	0.000	2842.2490	

Design Settings

Rainfall Methodology	FSR	Maximum Time of Concentration (mins)	30.00
Return Period (years)	2	Maximum Rainfall (mm/hr)	50.0
Additional Flow (%)	0	Minimum Velocity (m/s)	1.00
FSR Region	England and Wales	Connection Type	Level Soffits
M5-60 (mm)	20.000	Minimum Backdrop Height (m)	9.000
Ratio-R	0.400	Preferred Cover Depth (m)	0.900
CV	0.750	Include Intermediate Ground	✓
Time of Entry (mins)	5.00	Enforce best practice design rules	✓

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
1	0.089	5.00	3.900		528937.718	324853.983	0.300
2	0.000		3.800		528907.657	324836.550	0.307
3	0.087	5.00	3.700		528877.030	324824.786	0.308
4	0.000		3.600		528847.537	324818.833	0.300
5	0.000		3.550		528836.335	324814.722	0.300
6	0.073	5.00	3.500		528810.529	324809.195	0.325
7	0.000		3.500		528785.290	324804.517	0.400
8	0.000		3.395	1200	528775.551	324803.232	0.345
9	0.145	5.00	3.650		528756.359	324847.710	0.800
10	0.000		3.650		528748.535	324876.104	0.875
20	0.094	5.00	3.970	1500	528784.170	324915.245	1.670
21	0.022	5.00	3.620	1500	528753.309	324908.242	1.120
11	0.000		3.300		528740.017	324905.069	0.600
12	0.095	5.00	3.300		528728.595	324948.012	0.710
13	0.000		3.300		528729.919	324963.053	0.750
14	0.000		3.300		528735.381	324980.799	0.800
15	0.071	5.00	3.300		528742.868	325011.708	0.875
16	0.000		3.300		528758.934	325025.587	1.825
100	0.254	5.00	3.300		528788.433	325064.390	1.900
101	0.000	5.00	3.300	1500	528788.250	325071.700	1.920
102			3.300		528789.772	325084.216	2.000
60	0.056	5.00	4.344	1200	528895.688	324900.522	1.569
61	0.185	5.00	4.510	1350	528873.750	324889.982	2.035
62	0.127	5.00	4.415	1350	528845.308	324881.433	2.065
70	0.061	5.00	3.983	1200	528827.829	324822.511	1.383
63	0.090	5.00	4.305	1500	528815.797	324874.567	2.155
64	0.084	5.00	4.024	1500	528804.843	324919.755	2.149
65	0.075	5.00	3.808	1500	528798.460	324949.900	2.033
66	0.089	5.00	3.601	1500	528800.941	324979.433	1.901
50	0.107	5.00	3.866	1200	528940.148	324865.911	1.191
51	0.035	5.00	4.102	1200	528924.883	324889.580	1.552
52	0.074	5.00	4.240	1350	528915.980	324908.797	1.865
53	0.064	5.00	4.430	1350	528910.106	324934.453	2.180
54	0.000	5.00	4.169	1500	528908.314	324967.861	2.044
31	0.122	5.00	3.768	1200	528971.958	324938.513	1.093
32	0.000	5.00	3.662	1200	528968.039	324959.642	1.212
40	0.036	5.00	3.500		528983.642	325005.348	0.600
41	0.000		3.400		528978.532	324982.280	0.900
33	0.139	5.00	3.547	1500	528970.071	324978.624	1.297

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
35	0.048	5.00	3.932	1200	528911.228	324990.206	1.957
36	0.163	5.00	3.664	1200	528865.038	324999.553	1.814
38	0.119	5.00	3.375	1500	528809.068	325012.620	1.825
39	0.000		3.375		528799.140	325043.253	1.900

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	Link Type	T of C (mins)
1.000	1	2	34.750	0.030	3.600	3.493	0.107	326.0	300	swale	6.02
1.001	2	3	32.809	0.030	3.493	3.392	0.101	326.0	300	swale	6.98
1.002	3	4	30.088	0.030	3.392	3.300	0.092	326.0	300	swale	7.86
1.003	4	5	11.933	0.600	3.300	3.250	0.050	238.7	300	Circular	8.05
1.004	5	6	26.391	0.030	3.250	3.175	0.075	351.9	300	swale	8.85
1.005	6	7	25.669	0.030	3.175	3.100	0.075	342.3	300	swale	9.62
1.006	7	8	9.823	0.600	3.100	3.050	0.050	196.5	300	Circular	9.77
1.007	8	9	48.442	0.600	3.050	2.850	0.200	242.2	300	Circular	10.57
1.008	9	10	29.452	0.030	2.850	2.775	0.075	392.7	450	swale	11.32
1.009	10	11	30.192	0.030	2.775	2.700	0.075	402.6	450	swale	12.09
1.010	11	12	44.436	0.030	2.700	2.590	0.110	404.0	600	swale	13.04
1.011	12	13	15.099	0.030	2.590	2.550	0.040	377.5	600	swale	13.36
1.012	13	14	18.568	0.030	2.550	2.500	0.050	371.4	600	swale	13.74
1.013	14	15	31.803	0.030	2.500	2.425	0.075	424.0	600	swale	14.44
1.014	15	16	21.231	0.600	2.425	1.700	0.725	29.3	300	Circular	14.56
2.000	31	32	21.489	0.600	2.675	2.525	0.150	143.3	225	Circular_Default Sewer Type	5.33
2.001	32	33	19.090	0.600	2.450	2.325	0.125	152.7	300	Circular_Default Sewer Type	5.58
4.000	40	41	23.627	0.030	2.900	2.500	0.400	59.1	300	swale	5.29
4.001	41	33	9.217	0.600	2.500	2.400	0.100	92.2	225	Circular_Default Sewer Type	5.41

Name	US Node	DS Node	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)
1.000	1	2	0.570	290.6	12.1	0.000	0.007	0.089
1.001	2	3	0.570	290.6	12.1	0.007	0.008	0.089
1.002	3	4	0.570	290.6	23.9	0.008	0.000	0.176
1.003	4	5	1.013	71.6	23.9	0.000	0.000	0.176
1.004	5	6	0.549	279.7	23.9	0.000	0.025	0.176
1.005	6	7	0.556	283.6	33.7	0.025	0.100	0.249
1.006	7	8	1.118	79.0	33.7	0.100	0.045	0.249
1.007	8	9	1.006	71.1	32.9	0.045	0.500	0.249
1.008	9	10	0.660	683.1	50.2	0.350	0.425	0.394
1.009	10	11	0.652	674.7	48.4	0.425	0.150	0.394
1.010	11	12	0.775	1348.4	46.4	0.000	0.110	0.394
1.011	12	13	0.802	1394.9	56.8	0.110	0.150	0.489
1.012	13	14	0.808	1406.3	55.9	0.150	0.200	0.489
1.013	14	15	0.756	1316.1	54.3	0.200	0.275	0.489
1.014	15	16	2.916	206.1	61.9	0.575	1.300	0.560
2.000	31	32	1.090	43.3	16.5	0.868	0.912	0.122
2.001	32	33	1.270	89.7	16.5	0.912	0.922	0.122
4.000	40	41	1.339	682.8	4.9	0.300	0.600	0.036
4.001	41	33	1.362	54.2	4.9	0.675	0.922	0.036

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	Link Type	T of C (mins)
2.002	33	35	59.972	0.600	2.250	2.050	0.200	299.9	375	Circular_Default Sewer Type	6.54
5.000	50	51	28.165	0.600	2.675	2.550	0.125	225.3	300	Circular	5.45
5.001	51	52	21.179	0.600	2.550	2.450	0.100	211.8	300	Circular	5.78
5.002	52	53	26.320	0.600	2.375	2.250	0.125	210.6	375	Circular	6.13
5.003	53	54	33.456	0.600	2.250	2.125	0.125	267.6	375	Circular	6.64
5.004	54	35	22.534	0.600	2.125	2.050	0.075	300.5	375	Circular	7.00
3.005	35	36	47.126	0.600	1.975	1.850	0.125	377.0	450	Circular_Default Sewer Type	7.75
2.004	36	38	57.475	0.600	1.850	1.700	0.150	383.2	450	Circular_Default Sewer Type	8.68
8.000	21	20	31.646	0.600	2.500	2.300	0.200	158.2	225	Circular	5.51
8.001	20	64	21.159	0.600	2.300	2.175	0.125	169.3	225	Circular	5.86
6.000	60	61	24.339	0.600	2.775	2.625	0.150	162.3	225	Circular	5.40
6.001	61	62	29.699	0.600	2.475	2.350	0.125	237.6	375	Circular	5.82
6.002	62	63	30.299	0.600	2.350	2.225	0.125	242.4	375	Circular	6.25
7.000	70	63	53.428	0.600	2.600	2.300	0.300	178.1	300	Circular	5.76
6.003	63	64	46.497	0.600	2.150	1.950	0.200	232.5	450	Circular	6.84
6.004	64	65	30.813	0.600	1.875	1.775	0.100	308.1	525	Circular	7.24
6.005	65	66	29.637	0.600	1.775	1.700	0.075	395.2	525	Circular	7.68
6.006	66	38	34.168	0.600	1.700	1.625	0.075	456.0	525	Circular	8.23
2.005	38	39	32.202	0.600	1.550	1.475	0.075	429.4	600	Circular_Default Sewer Type	9.14
9.000	100	101	7.312	0.600	1.400	1.380	0.020	365.6	600	Circular	5.10
9.001	101	102	12.608	0.600	1.380	1.300	0.080	157.6	225	Circular	5.30

Name	US Node	DS Node	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)
2.002	33	35	1.041	115.0	40.3	0.922	1.507	0.297
5.000	50	51	1.043	73.7	14.5	0.891	1.252	0.107
5.001	51	52	1.076	76.1	19.2	1.252	1.490	0.142
5.002	52	53	1.245	137.5	29.3	1.490	1.805	0.216
5.003	53	54	1.102	121.8	37.9	1.805	1.669	0.280
5.004	54	35	1.040	114.8	37.9	1.669	1.507	0.280
3.005	35	36	1.041	165.5	84.7	1.507	1.364	0.625
2.004	36	38	1.032	164.2	106.8	1.364	1.225	0.788
8.000	21	20	1.037	41.2	3.0	0.895	1.445	0.022
8.001	20	64	1.002	39.8	15.7	1.445	1.624	0.116
6.000	60	61	1.024	40.7	7.6	1.344	1.660	0.056
6.001	61	62	1.171	129.3	32.7	1.660	1.690	0.241
6.002	62	63	1.159	128.0	49.9	1.690	1.705	0.368
7.000	70	63	1.175	83.0	8.3	1.083	1.705	0.061
6.003	63	64	1.329	211.3	70.3	1.705	1.624	0.519
6.004	64	65	1.270	275.0	97.4	1.624	1.508	0.719
6.005	65	66	1.120	242.5	107.6	1.508	1.376	0.794
6.006	66	38	1.042	225.6	119.7	1.376	1.225	0.883
2.005	38	39	1.169	330.4	242.6	1.225	1.300	1.790
9.000	100	101	1.267	358.3	34.4	1.300	1.320	0.254
9.001	101	102	1.039	41.3	34.4	1.695	1.775	0.254

Simulation Settings

Rainfall Methodology	FEH-13	Analysis Speed	Detailed	Additional Storage (m³/ha)	20.0
Summer CV	0.750	Skip Steady State	✓	Check Discharge Rate(s)	x
Winter CV	0.840	Drain Down Time (mins)	240	Check Discharge Volume	x

Storm Durations

60	180	360	600	960	2160	5760	10080
120	240	480	720	1440	2880	7200	

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
2	0	0	0
30	0	0	0
100	0	0	0
100	40	0	0
100	40	10	0

Node 101 Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	✓	Sump Available	✓
Invert Level (m)	1.380	Product Number	CTL-SHE-0125-8600-1750-8600
Design Depth (m)	1.750	Min Outlet Diameter (m)	0.150
Design Flow (l/s)	8.6	Min Node Diameter (mm)	1200

Node 16 Online Orifice Control

Flap Valve	x	Invert Level (m)	1.475	Discharge Coefficient	1.000
Replaces Downstream Link	x	Diameter (m)	0.375		

Node 39 Online Orifice Control

Flap Valve	x	Invert Level (m)	1.475	Discharge Coefficient	1.000
Replaces Downstream Link	x	Diameter (m)	0.675		

Node 100 Flow through Pond Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Main Channel Length (m)	21.000
Side Inf Coefficient (m/hr)	0.00000	Invert Level (m)	1.400	Main Channel Slope (1:X)	280.0
Safety Factor	2.0	Time to half empty (mins)		Main Channel n	0.030

Inlets

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Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	9.0	0.0	0.400	1238.0	0.0	1.125	1988.0	0.0	1.900	2540.0	0.0
0.100	83.0	0.0	0.500	1293.0	0.0	1.600	2319.0	0.0			
0.200	167.0	0.0	0.600	1350.0	0.0	1.700	2392.0	0.0			
0.300	1203.0	0.0	1.100	1648.0	0.0	1.800	2466.0	0.0			

Results for 2 year Critical Storm Duration. Lowest mass balance: 96.96%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
60 minute summer	1	33	3.655	0.055	7.8	0.3268	0.0000	OK
60 minute summer	2	36	3.542	0.049	7.9	0.0000	0.0000	OK
60 minute summer	3	36	3.460	0.068	13.8	0.3842	0.0000	OK
60 minute summer	4	37	3.385	0.085	13.1	0.0000	0.0000	OK
60 minute summer	5	38	3.318	0.068	12.8	0.0000	0.0000	OK
60 minute summer	6	37	3.252	0.077	16.8	0.3477	0.0000	OK
60 minute summer	7	38	3.196	0.096	16.3	0.0000	0.0000	OK
60 minute summer	8	39	3.147	0.097	16.1	0.1101	0.0000	OK
60 minute summer	9	36	2.947	0.097	24.1	0.3522	0.0000	OK
60 minute summer	10	37	2.874	0.099	23.8	0.0000	0.0000	OK
60 minute summer	20	33	2.379	0.079	10.1	0.2285	0.0000	OK
60 minute summer	21	33	2.533	0.033	1.9	0.0703	0.0000	OK
60 minute summer	11	40	2.796	0.096	23.8	0.0000	0.0000	OK
60 minute winter	12	40	2.693	0.103	27.5	0.2754	0.0000	OK
60 minute winter	13	41	2.653	0.103	27.3	0.0000	0.0000	OK
60 minute winter	14	42	2.616	0.116	27.2	0.0000	0.0000	OK
60 minute winter	15	42	2.501	0.076	29.5	0.1236	0.0000	OK
360 minute winter	16	352	1.959	0.484	16.7	0.0000	0.0000	OK
360 minute winter	100	352	1.958	0.558	35.7	1.4917	0.0000	OK
360 minute winter	101	352	1.958	0.578	8.8	1.0210	0.0000	SURCHARGED
60 minute summer	102	1	1.300	0.000	8.6	0.0000	0.0000	OK
60 minute summer	60	33	2.828	0.053	4.9	0.0987	0.0000	OK
60 minute summer	61	33	2.576	0.101	21.1	0.3290	0.0000	OK
60 minute summer	62	33	2.482	0.132	32.2	0.3499	0.0000	OK
60 minute summer	70	33	2.651	0.051	5.4	0.1030	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
60 minute summer	1	1.000	2	7.9	0.219	0.027	1.2474	
60 minute summer	2	1.001	3	7.2	0.167	0.025	1.4275	
60 minute summer	3	1.002	4	13.1	0.216	0.045	1.8521	
60 minute summer	4	1.003	5	12.8	0.912	0.178	0.1688	
60 minute summer	5	1.004	6	12.6	0.219	0.045	1.5207	
60 minute summer	6	1.005	7	16.3	0.226	0.058	1.8938	
60 minute summer	7	1.006	8	16.1	0.826	0.204	0.1926	
60 minute summer	8	1.007	9	16.2	0.838	0.227	0.9455	
60 minute summer	9	1.008	10	23.8	0.274	0.035	2.5777	
60 minute summer	10	1.009	11	23.8	0.282	0.035	2.5965	
60 minute summer	20	8.001	64	9.9	0.823	0.249	0.2558	
60 minute summer	21	8.000	20	1.9	0.246	0.046	0.2522	
60 minute summer	11	1.010	12	23.1	0.261	0.017	3.9412	
60 minute winter	12	1.011	13	27.3	0.292	0.020	1.4146	
60 minute winter	13	1.012	14	27.2	0.268	0.019	1.9019	
60 minute winter	14	1.013	15	26.9	0.317	0.020	2.7465	
60 minute winter	15	1.014	16	29.5	2.055	0.143	0.4424	
360 minute winter	16	Flow through pond	100	29.6	0.088	0.000	361.0870	
360 minute winter	100	9.000	101	8.8	0.208	0.025	2.0162	
360 minute winter	101	Hydro-Brake®	102	8.6				286.4
60 minute summer	60	6.000	61	4.9	0.689	0.120	0.1725	
60 minute summer	61	6.001	62	21.1	0.726	0.163	0.8669	
60 minute summer	62	6.002	63	31.8	0.957	0.248	1.0095	
60 minute summer	70	7.000	63	5.2	0.664	0.063	0.4219	

Results for 2 year Critical Storm Duration. Lowest mass balance: 96.96%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
60 minute summer	63	34	2.294	0.144	44.9	0.3734	0.0000	OK
60 minute summer	64	34	2.054	0.179	61.7	0.4556	0.0000	OK
60 minute summer	65	34	1.979	0.204	68.0	0.5104	0.0000	OK
360 minute winter	66	352	1.958	0.258	21.8	0.6973	0.0000	OK
60 minute summer	50	33	2.747	0.072	9.4	0.2109	0.0000	OK
60 minute summer	51	33	2.634	0.084	12.5	0.1333	0.0000	OK
60 minute summer	52	33	2.469	0.094	18.8	0.2095	0.0000	OK
60 minute summer	53	34	2.366	0.116	24.3	0.2341	0.0000	OK
60 minute summer	54	34	2.246	0.121	24.3	0.2130	0.0000	OK
60 minute summer	31	33	2.753	0.078	10.7	0.2638	0.0000	OK
60 minute summer	32	33	2.522	0.072	10.7	0.0813	0.0000	OK
60 minute summer	40	33	2.919	0.019	3.2	0.0232	0.0000	OK
60 minute summer	41	34	2.537	0.037	3.2	0.0000	0.0000	OK
60 minute summer	33	34	2.371	0.121	25.8	0.4740	0.0000	OK
60 minute summer	35	34	2.154	0.179	53.3	0.2905	0.0000	OK
60 minute summer	36	35	2.052	0.202	66.5	0.5905	0.0000	OK
360 minute winter	38	352	1.958	0.408	43.9	1.2528	0.0000	OK
360 minute winter	39	352	1.959	0.484	42.5	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
60 minute summer	63	6.003	64	44.8	1.058	0.212	1.9697	
60 minute summer	64	6.004	65	61.8	0.870	0.225	2.1905	
60 minute summer	65	6.005	66	67.4	0.834	0.278	2.3985	
360 minute winter	66	6.006	38	21.4	0.584	0.095	4.2696	
60 minute summer	50	5.000	51	9.4	0.647	0.128	0.4108	
60 minute summer	51	5.001	52	12.3	0.787	0.162	0.3333	
60 minute summer	52	5.002	53	18.7	0.744	0.136	0.6640	
60 minute summer	53	5.003	54	24.3	0.818	0.199	0.9952	
60 minute summer	54	5.004	35	24.0	0.836	0.209	0.6494	
60 minute summer	31	2.000	32	10.7	0.891	0.246	0.2576	
60 minute summer	32	2.001	33	10.6	0.845	0.118	0.2402	
60 minute summer	40	4.000	41	3.2	0.188	0.005	0.4120	
60 minute summer	41	4.001	33	3.1	0.736	0.057	0.0386	
60 minute summer	33	2.002	35	25.3	0.859	0.220	1.7685	
60 minute summer	35	3.005	36	53.1	0.838	0.321	2.9975	
60 minute summer	36	2.004	38	65.1	1.035	0.397	3.6253	
360 minute winter	38	2.005	39	42.5	0.608	0.129	7.2007	
360 minute winter	39	Flow through pond	100	29.6	0.088	0.000	361.0870	

Results for 30 year Critical Storm Duration. Lowest mass balance: 96.96%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
60 minute summer	1	33	3.693	0.093	22.6	0.5532	0.0000	OK
60 minute summer	2	35	3.581	0.088	22.7	0.0000	0.0000	OK
60 minute summer	3	35	3.513	0.121	42.2	0.6851	0.0000	OK
60 minute summer	4	36	3.456	0.156	40.8	0.0000	0.0000	OK
60 minute summer	5	36	3.372	0.122	39.9	0.0000	0.0000	OK
60 minute summer	6	37	3.319	0.144	53.8	0.6480	0.0000	OK
60 minute summer	7	37	3.290	0.190	51.4	0.0000	0.0000	OK
60 minute summer	8	38	3.237	0.187	50.5	0.2120	0.0000	OK
60 minute summer	9	35	3.021	0.171	76.8	0.6200	0.0000	OK
60 minute summer	10	36	2.946	0.171	76.3	0.0000	0.0000	OK
600 minute winter	20	630	2.507	0.207	4.7	0.5993	0.0000	OK
60 minute summer	21	33	2.556	0.056	5.6	0.1200	0.0000	OK
60 minute summer	11	38	2.870	0.170	75.6	0.0000	0.0000	OK
60 minute summer	12	38	2.771	0.181	88.5	0.4839	0.0000	OK
60 minute summer	13	38	2.732	0.182	87.3	0.0000	0.0000	OK
60 minute summer	14	39	2.692	0.192	87.0	0.0000	0.0000	OK
60 minute winter	15	39	2.566	0.141	94.8	0.2296	0.0000	OK
600 minute winter	16	600	2.506	1.031	22.8	0.0000	0.0000	OK
600 minute winter	100	600	2.506	1.106	54.5	2.9587	0.0000	SURCHARGED
600 minute winter	101	600	2.506	1.126	9.7	1.9905	0.0000	SURCHARGED
60 minute summer	102	1	1.300	0.000	8.6	0.0000	0.0000	OK
60 minute summer	60	33	2.870	0.095	14.2	0.1747	0.0000	OK
60 minute summer	61	33	2.670	0.195	61.3	0.6351	0.0000	OK
60 minute summer	62	33	2.601	0.251	93.5	0.6676	0.0000	OK
60 minute summer	70	33	2.687	0.087	15.5	0.1747	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
60 minute summer	1	1.000	2	22.7	0.299	0.078	2.6692	
60 minute summer	2	1.001	3	21.6	0.225	0.074	3.1952	
60 minute summer	3	1.002	4	40.8	0.286	0.140	4.4092	
60 minute summer	4	1.003	5	39.9	1.258	0.558	0.3808	
60 minute summer	5	1.004	6	39.6	0.290	0.141	3.6306	
60 minute summer	6	1.005	7	51.4	0.287	0.181	5.0725	
60 minute summer	7	1.006	8	50.5	1.083	0.639	0.4587	
60 minute summer	8	1.007	9	50.8	1.182	0.714	2.1129	
60 minute summer	9	1.008	10	76.3	0.379	0.112	5.9679	
60 minute summer	10	1.009	11	75.6	0.383	0.112	6.0663	
600 minute winter	20	8.001	64	4.7	0.670	0.118	0.8256	
60 minute summer	21	8.000	20	5.6	0.313	0.135	0.5722	
60 minute summer	11	1.010	12	74.2	0.352	0.055	9.3714	
60 minute summer	12	1.011	13	87.3	0.397	0.063	3.3589	
60 minute summer	13	1.012	14	87.0	0.377	0.062	4.3306	
60 minute summer	14	1.013	15	86.3	0.444	0.066	6.2636	
60 minute winter	15	1.014	16	94.7	2.289	0.460	1.0942	
600 minute winter	16	Flow through pond	100	44.1	0.089	0.000	1165.4071	
600 minute winter	100	9.000	101	9.7	0.199	0.027	2.0596	
600 minute winter	101	Hydro-Brake®	102	8.6				362.7
60 minute summer	60	6.000	61	14.2	0.920	0.349	0.3755	
60 minute summer	61	6.001	62	61.2	0.897	0.473	2.0253	
60 minute summer	62	6.002	63	92.8	1.266	0.725	2.2253	
60 minute summer	70	7.000	63	15.5	0.822	0.186	1.1583	

Results for 30 year Critical Storm Duration. Lowest mass balance: 96.96%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
600 minute winter	63	630	2.509	0.359	21.3	0.9352	0.0000	OK
600 minute winter	64	630	2.507	0.632	29.4	1.6112	0.0000	SURCHARGED
600 minute winter	65	630	2.506	0.731	31.6	1.8319	0.0000	SURCHARGED
600 minute winter	66	630	2.507	0.807	34.5	2.1820	0.0000	SURCHARGED
60 minute summer	50	33	2.805	0.130	27.2	0.3802	0.0000	OK
60 minute summer	51	33	2.703	0.153	36.1	0.2427	0.0000	OK
60 minute summer	52	33	2.551	0.176	54.8	0.3908	0.0000	OK
600 minute winter	53	630	2.508	0.258	11.4	0.5207	0.0000	OK
600 minute winter	54	630	2.510	0.385	11.4	0.6810	0.0000	SURCHARGED
60 minute summer	31	33	2.824	0.149	31.0	0.5015	0.0000	OK
60 minute summer	32	33	2.581	0.131	31.0	0.1477	0.0000	OK
60 minute summer	40	33	2.935	0.035	9.2	0.0424	0.0000	OK
60 minute summer	41	34	2.564	0.064	9.2	0.0000	0.0000	OK
600 minute winter	33	630	2.508	0.258	12.2	1.0092	0.0000	OK
600 minute winter	35	630	2.510	0.535	25.7	0.8682	0.0000	SURCHARGED
600 minute winter	36	630	2.510	0.660	31.5	1.9320	0.0000	SURCHARGED
600 minute winter	38	585	2.509	0.959	68.0	2.9458	0.0000	SURCHARGED
720 minute winter	39	690	2.510	1.035	95.2	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
600 minute winter	63	6.003	64	21.3	0.846	0.101	6.8394	
600 minute winter	64	6.004	65	28.5	0.661	0.104	6.6566	
600 minute winter	65	6.005	66	30.9	0.561	0.127	6.4026	
600 minute winter	66	6.006	38	33.0	0.509	0.146	7.3814	
60 minute summer	50	5.000	51	27.2	0.833	0.369	0.9216	
60 minute summer	51	5.001	52	36.0	1.037	0.473	0.7350	
60 minute summer	52	5.002	53	54.6	0.930	0.397	1.5448	
600 minute winter	53	5.003	54	11.4	0.679	0.093	3.1968	
600 minute winter	54	5.004	35	11.5	0.682	0.100	2.4854	
60 minute summer	31	2.000	32	31.0	1.154	0.715	0.5768	
60 minute summer	32	2.001	33	31.0	0.988	0.345	0.6013	
60 minute summer	40	4.000	41	9.2	0.269	0.013	0.8323	
60 minute summer	41	4.001	33	9.0	0.977	0.167	0.0902	
600 minute winter	33	2.002	35	12.2	0.702	0.106	5.7319	
600 minute winter	35	3.005	36	24.8	0.658	0.150	7.4668	
600 minute winter	36	2.004	38	30.1	0.651	0.183	9.1065	
600 minute winter	38	2.005	39	65.7	0.603	0.199	9.0706	
720 minute winter	39	Flow through pond	100	-41.7	0.083	0.000	1161.1365	

Results for 100 year Critical Storm Duration. Lowest mass balance: 96.96%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
60 minute summer	1	33	3.709	0.109	31.2	0.6451	0.0000	OK
60 minute summer	2	35	3.597	0.104	31.3	0.0000	0.0000	OK
60 minute summer	3	35	3.535	0.143	58.6	0.8050	0.0000	OK
60 minute summer	4	36	3.488	0.188	56.9	0.0000	0.0000	OK
60 minute summer	5	36	3.395	0.145	57.7	0.0000	0.0000	OK
60 minute summer	6	37	3.358	0.183	75.1	0.8217	0.0000	OK
60 minute summer	7	38	3.340	0.240	69.8	0.0000	0.0000	OK
60 minute summer	8	38	3.283	0.233	68.1	0.2640	0.0000	OK
60 minute summer	9	35	3.048	0.198	105.1	0.7174	0.0000	OK
60 minute summer	10	36	2.973	0.198	104.7	0.0000	0.0000	OK
720 minute winter	20	765	2.803	0.503	5.9	1.4557	0.0000	SURCHARGED
720 minute winter	21	750	2.803	0.303	1.1	0.6537	0.0000	SURCHARGED
60 minute summer	11	37	2.897	0.197	103.6	0.0000	0.0000	OK
720 minute winter	12	720	2.806	0.216	24.8	0.5774	0.0000	OK
720 minute winter	13	720	2.806	0.256	24.8	0.0000	0.0000	OK
720 minute winter	14	720	2.806	0.306	24.7	0.0000	0.0000	OK
720 minute winter	15	720	2.806	0.381	28.3	0.6180	0.0000	SURCHARGED
720 minute winter	16	750	2.807	1.332	32.3	0.0000	0.0000	OK
720 minute winter	100	720	2.805	1.405	73.0	3.7572	0.0000	SURCHARGED
720 minute winter	101	720	2.805	1.425	9.9	2.5180	0.0000	SURCHARGED
60 minute summer	102	1	1.300	0.000	8.6	0.0000	0.0000	OK
60 minute summer	60	35	2.950	0.175	19.6	0.3232	0.0000	OK
60 minute summer	61	35	2.921	0.446	84.5	1.4511	0.0000	SURCHARGED
60 minute summer	62	35	2.869	0.519	126.5	1.3806	0.0000	SURCHARGED
720 minute winter	70	765	2.811	0.211	3.1	0.4245	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
60 minute summer	1	1.000	2	31.3	0.326	0.108	3.3647	
60 minute summer	2	1.001	3	29.9	0.245	0.103	4.0624	
60 minute summer	3	1.002	4	56.9	0.306	0.196	5.8339	
60 minute summer	4	1.003	5	57.7	1.450	0.805	0.4795	
60 minute summer	5	1.004	6	55.1	0.298	0.197	5.0452	
60 minute summer	6	1.005	7	69.8	0.294	0.246	7.3731	
60 minute summer	7	1.006	8	68.1	1.142	0.862	0.5855	
60 minute summer	8	1.007	9	68.3	1.301	0.961	2.5945	
60 minute summer	9	1.008	10	104.7	0.413	0.153	7.5074	
60 minute summer	10	1.009	11	103.6	0.415	0.154	7.6551	
720 minute winter	20	8.001	64	5.9	0.699	0.148	0.8415	
720 minute winter	21	8.000	20	1.8	0.218	0.043	1.2586	
60 minute summer	11	1.010	12	101.6	0.380	0.075	11.9046	
720 minute winter	12	1.011	13	24.8	0.283	0.018	5.1621	
720 minute winter	13	1.012	14	24.7	0.264	0.018	8.5108	
720 minute winter	14	1.013	15	24.7	0.307	0.019	20.6315	
720 minute winter	15	1.014	16	32.3	1.255	0.157	1.4951	
720 minute winter	16	Flow through pond	100	70.7	0.091	0.000	1764.3848	
720 minute winter	100	9.000	101	9.9	0.198	0.027	2.0596	
720 minute winter	101	Hydro-Brake®	102	8.6				437.4
60 minute summer	60	6.000	61	19.7	0.989	0.483	0.8877	
60 minute summer	61	6.001	62	82.0	0.931	0.634	3.2757	
60 minute summer	62	6.002	63	121.6	1.319	0.950	3.3419	
720 minute winter	70	7.000	63	3.1	0.568	0.037	3.2951	

Results for 100 year Critical Storm Duration. Lowest mass balance: 96.96%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
720 minute winter	63	765	2.804	0.654	26.3	1.7027	0.0000	SURCHARGED
720 minute winter	64	765	2.804	0.929	35.5	2.3671	0.0000	SURCHARGED
600 minute winter	65	570	2.804	1.029	42.7	2.5784	0.0000	SURCHARGED
720 minute winter	66	765	2.805	1.105	41.6	2.9856	0.0000	SURCHARGED
60 minute summer	50	35	2.938	0.263	37.5	0.7705	0.0000	OK
60 minute summer	51	35	2.918	0.368	51.5	0.5816	0.0000	SURCHARGED
60 minute summer	52	35	2.882	0.507	73.5	1.1284	0.0000	SURCHARGED
60 minute summer	53	35	2.848	0.598	87.2	1.2066	0.0000	SURCHARGED
600 minute winter	54	660	2.809	0.684	16.5	1.2091	0.0000	SURCHARGED
60 minute summer	31	35	2.959	0.284	42.8	0.9566	0.0000	SURCHARGED
60 minute summer	32	36	2.850	0.400	42.5	0.4530	0.0000	SURCHARGED
60 minute summer	40	33	2.942	0.042	12.6	0.0505	0.0000	OK
60 minute summer	41	36	2.836	0.336	36.6	0.0000	0.0000	SURCHARGED
60 minute summer	33	36	2.830	0.580	100.9	2.2690	0.0000	SURCHARGED
600 minute winter	35	660	2.808	0.833	35.7	1.3515	0.0000	SURCHARGED
600 minute winter	36	660	2.805	0.955	42.4	2.7967	0.0000	SURCHARGED
720 minute winter	38	765	2.806	1.256	83.7	3.8565	0.0000	SURCHARGED
720 minute winter	39	705	2.813	1.338	83.9	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
720 minute winter	63	6.003	64	25.3	0.833	0.120	7.3671	
720 minute winter	64	6.004	65	33.7	0.622	0.123	6.6566	
600 minute winter	65	6.005	66	43.8	0.525	0.181	6.4026	
720 minute winter	66	6.006	38	41.4	0.544	0.183	7.3814	
60 minute summer	50	5.000	51	39.2	0.887	0.531	1.9141	
60 minute summer	51	5.001	52	47.6	1.102	0.626	1.4914	
60 minute summer	52	5.002	53	65.9	0.957	0.479	2.9030	
60 minute summer	53	5.003	54	81.8	0.999	0.672	3.6901	
600 minute winter	54	5.004	35	15.5	0.702	0.135	2.4854	
60 minute summer	31	2.000	32	42.5	1.204	0.981	0.8546	
60 minute summer	32	2.001	33	41.0	0.986	0.456	1.3443	
60 minute summer	40	4.000	41	12.6	0.300	0.018	7.6110	
60 minute summer	41	4.001	33	30.6	0.916	0.565	0.3666	
60 minute summer	33	2.002	35	87.6	0.977	0.762	6.6147	
600 minute winter	35	3.005	36	32.8	0.671	0.198	7.4668	
600 minute winter	36	2.004	38	42.0	0.606	0.256	9.1065	
720 minute winter	38	2.005	39	83.4	0.586	0.253	9.0706	
720 minute winter	39	Flow through pond	100	70.7	0.091	0.000	1764.3848	

Results for 100 year +40% CC Critical Storm Duration. Lowest mass balance: 96.96%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
60 minute summer	1	33	3.727	0.127	43.7	0.7561	0.0000	OK
60 minute summer	2	34	3.616	0.123	43.8	0.0000	0.0000	OK
60 minute summer	3	35	3.564	0.172	82.6	0.9716	0.0000	OK
60 minute summer	4	35	3.527	0.227	78.6	0.0000	0.0000	OK
60 minute summer	5	38	3.443	0.193	77.9	0.0000	0.0000	OK
60 minute summer	6	39	3.430	0.255	103.6	1.1449	0.0000	OK
60 minute summer	7	39	3.424	0.324	89.4	0.0000	0.0000	FLOOD RISK
60 minute summer	8	39	3.354	0.304	81.9	0.3439	0.0000	FLOOD RISK
960 minute winter	9	960	3.115	0.265	21.9	0.9604	0.0000	OK
960 minute winter	10	960	3.115	0.340	21.9	0.0000	0.0000	OK
60 minute summer	20	35	3.527	1.227	51.2	3.5490	0.0000	SURCHARGED
60 minute summer	21	35	3.541	1.041	10.8	2.2495	0.0000	FLOOD RISK
960 minute winter	11	960	3.115	0.415	21.9	0.0000	0.0000	OK
960 minute winter	12	960	3.115	0.525	27.2	1.4051	0.0000	OK
960 minute winter	13	960	3.115	0.565	27.2	0.0000	0.0000	OK
960 minute winter	14	960	3.115	0.615	26.9	0.0000	0.0000	FLOOD RISK
960 minute winter	15	960	3.115	0.690	30.9	1.1199	0.0000	FLOOD RISK
720 minute winter	16	705	3.118	1.643	36.9	0.0000	0.0000	OK
960 minute winter	100	945	3.114	1.714	78.9	4.5835	0.0000	FLOOD RISK
960 minute winter	101	945	3.114	1.734	10.7	3.0642	0.0000	FLOOD RISK
60 minute summer	102	1	1.300	0.000	8.6	0.0000	0.0000	OK
60 minute summer	60	35	3.988	1.213	28.0	2.2371	0.0000	SURCHARGED
60 minute summer	61	35	3.922	1.447	111.5	4.7019	0.0000	SURCHARGED
60 minute summer	62	35	3.820	1.470	162.0	3.9109	0.0000	SURCHARGED
60 minute summer	70	35	3.612	1.012	29.9	2.0381	0.0000	SURCHARGED

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
60 minute summer	1	1.000	2	43.8	0.357	0.151	4.2933	
60 minute summer	2	1.001	3	42.0	0.264	0.145	5.3453	
60 minute summer	3	1.002	4	78.6	0.324	0.270	7.8894	
60 minute summer	4	1.003	5	77.9	1.522	1.087	0.6124	
60 minute summer	5	1.004	6	75.8	0.296	0.271	8.3227	
60 minute summer	6	1.005	7	89.4	0.294	0.315	12.4482	
60 minute summer	7	1.006	8	81.9	1.163	1.036	0.6917	
60 minute summer	8	1.007	9	82.0	1.387	1.154	3.0452	
960 minute winter	9	1.008	10	21.9	0.268	0.032	15.4048	
960 minute winter	10	1.009	11	21.9	0.267	0.032	23.1006	
60 minute summer	20	8.001	64	48.4	1.217	1.215	0.8415	
60 minute summer	21	8.000	20	12.2	0.327	0.295	1.2586	
960 minute winter	11	1.010	12	21.9	0.249	0.016	50.2786	
960 minute winter	12	1.011	13	27.2	0.290	0.019	22.0871	
960 minute winter	13	1.012	14	26.9	0.283	0.019	31.3929	
960 minute winter	14	1.013	15	27.0	0.311	0.020	64.7384	
960 minute winter	15	1.014	16	39.5	1.270	0.192	1.4951	
720 minute winter	16	Flow through pond	100	84.2	0.094	0.000	2456.3757	
960 minute winter	100	9.000	101	10.7	0.199	0.030	2.0596	
960 minute winter	101	Hydro-Brake®	102	8.6				578.1
60 minute summer	60	6.000	61	24.9	0.979	0.612	0.9680	
60 minute summer	61	6.001	62	103.0	0.940	0.797	3.2757	
60 minute summer	62	6.002	63	157.2	1.426	1.228	3.3419	
60 minute summer	70	7.000	63	29.9	0.823	0.361	3.7624	

Results for 100 year +40% CC Critical Storm Duration. Lowest mass balance: 96.96%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
60 minute summer	63	35	3.578	1.428	223.7	3.7155	0.0000	SURCHARGED
60 minute summer	64	35	3.308	1.433	303.5	3.6517	0.0000	SURCHARGED
60 minute summer	65	35	3.137	1.362	335.0	3.4107	0.0000	SURCHARGED
720 minute winter	66	690	3.115	1.415	59.2	3.8247	0.0000	SURCHARGED
60 minute summer	50	35	3.731	1.056	52.5	3.0907	0.0000	FLOOD RISK
60 minute summer	51	35	3.671	1.121	61.6	1.7737	0.0000	SURCHARGED
60 minute summer	52	35	3.587	1.212	93.7	2.6973	0.0000	SURCHARGED
60 minute summer	53	35	3.514	1.264	120.3	2.5520	0.0000	SURCHARGED
60 minute summer	54	35	3.366	1.241	118.5	2.1925	0.0000	SURCHARGED
60 minute summer	31	35	3.612	0.937	59.9	3.1522	0.0000	FLOOD RISK
60 minute summer	32	35	3.348	0.898	52.5	1.0161	0.0000	SURCHARGED
60 minute summer	40	39	3.205	0.305	58.0	0.3659	0.0000	FLOOD RISK
60 minute summer	41	38	3.202	0.702	70.0	0.0000	0.0000	FLOOD RISK
60 minute summer	33	35	3.291	1.041	116.0	4.0728	0.0000	FLOOD RISK
60 minute summer	35	35	3.256	1.281	182.1	2.0773	0.0000	SURCHARGED
960 minute winter	36	945	3.114	1.264	40.7	3.7011	0.0000	SURCHARGED
960 minute winter	38	945	3.111	1.561	93.4	4.7952	0.0000	FLOOD RISK
960 minute winter	39	930	3.120	1.645	100.3	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
60 minute summer	63	6.003	64	221.5	1.398	1.048	7.3671	
60 minute summer	64	6.004	65	303.8	1.406	1.105	6.6566	
60 minute summer	65	6.005	66	335.1	1.551	1.382	6.4026	
720 minute winter	66	6.006	38	58.9	0.591	0.261	7.3814	
60 minute summer	50	5.000	51	45.4	0.915	0.615	1.9834	
60 minute summer	51	5.001	52	60.3	1.082	0.793	1.4914	
60 minute summer	52	5.002	53	91.5	0.963	0.666	2.9030	
60 minute summer	53	5.003	54	118.5	1.074	0.973	3.6901	
60 minute summer	54	5.004	35	118.4	1.074	1.031	2.4854	
60 minute summer	31	2.000	32	52.5	1.319	1.210	0.8546	
60 minute summer	32	2.001	33	51.7	0.987	0.576	1.3443	
60 minute summer	40	4.000	41	-41.2	0.302	-0.060	33.6458	
60 minute summer	41	4.001	33	-68.7	-1.726	-1.268	0.3666	
60 minute summer	33	2.002	35	99.5	0.978	0.866	6.6147	
60 minute summer	35	3.005	36	182.6	1.153	1.103	7.4668	
960 minute winter	36	2.004	38	40.8	0.571	0.248	9.1065	
960 minute winter	38	2.005	39	93.6	0.615	0.283	9.0706	
960 minute winter	39	Flow through pond	100	65.7	0.089	0.000	2464.2766	

Results for 100 year +40% CC +10% A Critical Storm Duration. Lowest mass balance: 96.96%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
60 minute summer	1	33	3.733	0.133	48.1	0.8699	0.0000	OK
60 minute summer	2	34	3.622	0.129	48.2	0.0000	0.0000	OK
60 minute summer	3	35	3.574	0.182	91.1	1.1296	0.0000	OK
60 minute summer	4	35	3.535	0.235	87.2	0.0000	0.0000	OK
60 minute summer	5	39	3.465	0.215	90.2	0.0000	0.0000	OK
60 minute summer	6	39	3.457	0.282	116.4	1.3918	0.0000	OK
60 minute summer	7	39	3.452	0.352	94.8	0.0000	0.0000	FLOOD RISK
60 minute summer	8	39	3.374	0.324	85.4	0.3660	0.0000	FLOOD RISK
960 minute winter	9	960	3.209	0.359	24.1	1.4319	0.0000	OK
960 minute winter	10	960	3.209	0.434	24.1	0.0000	0.0000	OK
60 minute summer	20	34	3.652	1.352	53.4	4.0618	0.0000	SURCHARGED
60 minute summer	21	34	3.620	1.120	21.0	2.4629	2.8472	FLOOD
960 minute winter	11	960	3.209	0.509	24.1	0.0000	0.0000	OK
960 minute winter	12	960	3.209	0.619	29.9	1.8214	0.0000	FLOOD RISK
960 minute winter	13	960	3.209	0.659	29.4	0.0000	0.0000	FLOOD RISK
960 minute winter	14	960	3.209	0.709	28.9	0.0000	0.0000	FLOOD RISK
960 minute winter	15	960	3.209	0.784	32.7	1.3996	0.0000	FLOOD RISK
960 minute winter	16	945	3.215	1.740	31.0	0.0000	0.0000	OK
960 minute winter	100	945	3.208	1.808	104.3	5.3178	0.0000	FLOOD RISK
960 minute winter	101	945	3.208	1.828	9.9	3.2302	0.0000	FLOOD RISK
60 minute summer	102	1	1.300	0.000	8.6	0.0000	0.0000	OK
60 minute summer	60	35	4.343	1.568	30.2	3.0051	0.0000	FLOOD RISK
60 minute summer	61	35	4.262	1.787	121.2	6.1322	0.0000	FLOOD RISK
60 minute summer	62	35	4.137	1.787	176.4	4.9754	0.0000	FLOOD RISK
60 minute summer	70	35	3.882	1.282	32.9	2.6939	0.0000	FLOOD RISK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
60 minute summer	1	1.000	2	48.2	0.366	0.166	4.6046	
60 minute summer	2	1.001	3	46.3	0.268	0.159	5.7975	
60 minute summer	3	1.002	4	87.2	0.326	0.300	8.4410	
60 minute summer	4	1.003	5	90.2	1.669	1.259	0.6610	
60 minute summer	5	1.004	6	83.0	0.294	0.297	9.8966	
60 minute summer	6	1.005	7	94.8	0.293	0.334	14.5210	
60 minute summer	7	1.006	8	85.4	1.214	1.081	0.6917	
60 minute summer	8	1.007	9	85.4	1.399	1.202	3.1178	
960 minute winter	9	1.008	10	24.1	0.275	0.035	24.5291	
960 minute winter	10	1.009	11	24.1	0.274	0.036	34.1212	
60 minute summer	20	8.001	64	47.8	1.203	1.201	0.8415	
60 minute summer	21	8.000	20	12.5	0.326	0.304	1.2586	
960 minute winter	11	1.010	12	24.1	0.255	0.018	69.5530	
960 minute winter	12	1.011	13	29.4	0.295	0.021	29.4939	
960 minute winter	13	1.012	14	28.9	0.289	0.021	41.1472	
960 minute winter	14	1.013	15	28.5	0.315	0.022	82.9661	
960 minute winter	15	1.014	16	31.0	1.305	0.151	1.4951	
960 minute winter	16	Flow through pond	100	93.1	0.091	0.000	2691.5278	
960 minute winter	100	9.000	101	9.9	0.199	0.028	2.0596	
960 minute winter	101	Hydro-Brake®	102	8.8				586.9
60 minute summer	60	6.000	61	27.9	0.985	0.686	0.9680	
60 minute summer	61	6.001	62	113.8	1.032	0.880	3.2757	
60 minute summer	62	6.002	63	174.4	1.581	1.362	3.3419	
60 minute summer	70	7.000	63	29.5	0.813	0.355	3.7624	

Results for 100 year +40% CC +10% A Critical Storm Duration. Lowest mass balance: 96.96%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
60 minute summer	63	35	3.839	1.689	245.0	4.5366	0.0000	SURCHARGED
60 minute summer	64	35	3.503	1.628	324.4	4.2759	0.0000	SURCHARGED
60 minute summer	65	35	3.311	1.536	360.0	3.9616	0.0000	SURCHARGED
960 minute winter	66	945	3.204	1.504	51.1	4.2080	0.0000	SURCHARGED
60 minute summer	50	34	3.866	1.191	57.8	3.7004	1.5272	FLOOD
60 minute summer	51	34	3.829	1.279	65.7	2.0805	0.0000	FLOOD RISK
60 minute summer	52	34	3.759	1.384	100.2	3.1894	0.0000	SURCHARGED
60 minute summer	53	34	3.685	1.435	127.7	2.9807	0.0000	SURCHARGED
60 minute summer	54	34	3.520	1.395	125.9	2.4643	0.0000	SURCHARGED
60 minute summer	31	34	3.768	1.093	65.9	3.9206	0.6727	FLOOD
60 minute summer	32	35	3.492	1.042	55.3	1.1790	0.0000	FLOOD RISK
60 minute winter	40	41	3.298	0.398	48.0	0.5259	0.0000	FLOOD RISK
60 minute winter	41	42	3.295	0.795	63.9	0.0000	0.0000	FLOOD RISK
60 minute summer	33	35	3.432	1.182	127.5	4.8763	0.0000	FLOOD RISK
60 minute summer	35	35	3.399	1.424	185.2	2.3797	0.0000	SURCHARGED
60 minute summer	36	35	3.209	1.359	267.1	4.2225	0.0000	SURCHARGED
960 minute winter	38	945	3.204	1.654	102.9	5.2974	0.0000	FLOOD RISK
960 minute winter	39	945	3.216	1.741	102.0	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
60 minute summer	63	6.003	64	246.9	1.558	1.168	7.3671	
60 minute summer	64	6.004	65	321.8	1.490	1.170	6.6566	
60 minute summer	65	6.005	66	357.2	1.654	1.473	6.4026	
960 minute winter	66	6.006	38	51.0	0.564	0.226	7.3814	
60 minute summer	50	5.000	51	46.8	0.907	0.634	1.9834	
60 minute summer	51	5.001	52	61.2	1.109	0.804	1.4914	
60 minute summer	52	5.002	53	93.8	0.956	0.682	2.9030	
60 minute summer	53	5.003	54	125.9	1.141	1.034	3.6901	
60 minute summer	54	5.004	35	124.5	1.129	1.084	2.4854	
60 minute summer	31	2.000	32	55.3	1.391	1.276	0.8546	
60 minute summer	32	2.001	33	53.8	0.981	0.599	1.3443	
60 minute winter	40	4.000	41	36.4	0.296	0.053	44.4152	
60 minute winter	41	4.001	33	-58.2	-1.465	-1.076	0.3666	
60 minute summer	33	2.002	35	102.1	0.975	0.888	6.6147	
60 minute summer	35	3.005	36	185.6	1.171	1.121	7.4668	
60 minute summer	36	2.004	38	263.9	1.666	1.607	9.1065	
960 minute winter	38	2.005	39	102.0	0.603	0.309	9.0706	
960 minute winter	39	Flow through pond	100	93.1	0.091	0.000	2691.5278	

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Maintenance Plan

Proposed Residential Development, High Road, Weston

Surface Water Drainage

Maintenance Requirements

Responsibilities

The site surface water systems will be offered to the drainage authorities, or Parish Council, for adoption. If the systems are not adopted, or adopted in part, the remaining features will be managed by a private maintenance company. It is important that the surface water drainage is properly maintained, in accordance with usual industry best practice and manufacturer's recommendations, in order that it continues to operate as designed throughout the life of the development to manage local flood risks.

The following sets out the key surface water system maintenance requirements:

System Overview

Refer to Amazi Consulting Ltd Flood Risk Assessment and Infrastructure Design Ltd for details of the site surface water drainage system. The proposed site surface water system comprises:

Piped and swale conveyance network that outfalls into an attenuation basin. The basin attenuates all site surface water runoff before a vortex type flow control restrict outflow into the IDB drain at the north of the site.

General Piped Systems

Maintenance to be undertaken to ensure the longevity of the surface water drainage system;

Quarterly

- i) Inspect the performance of the chambers by lifting the cover of the chamber(s) and check that the outlet pipe is free of obstruction and visible (ie not submerged). If the outlet pipe is submerged then remedial action may be required. Remedial advice to be sought from a suitably qualified consulting infrastructure engineer.

Every 6 months

- i) Remove silt build up from chambers.

Annually

- i) Inspect chambers for blockages / silt build up. Remove silt and debris.

Every c5-10 years (depending on outcome of aforementioned inspections)

- i) Commission a CCTV survey and report on condition of the surface water piped drainage system upstream of the attenuation to check for structural integrity and hydraulic fluidity. Carry out promptly any remedial work as advised by CCTV company.

Attenuation Basin

Refer to section 22.12 of *The SuDS Manual* (2015). Extract:

TABLE 22.1 Operation and maintenance requirements for detention basins		
Maintenance schedule	Required action	Typical frequency
Regular maintenance	Remove litter and debris	Monthly
	Cut grass – for spillways and access routes	Monthly (during growing season), or as required
	Cut grass – meadow grass in and around basin	Half yearly (spring – before nesting season, and autumn)
	Manage other vegetation and remove nuisance plants	Monthly (at start, then as required)
	Inspect inlets, outlets and overflows for blockages, and clear if required.	Monthly
	Inspect banksides, structures, pipework etc for evidence of physical damage	Monthly
	Inspect inlets and facility surface for silt accumulation. Establish appropriate silt removal frequencies.	Monthly (for first year), then annually or as required
	Check any penstocks and other mechanical devices	Annually
	Tidy all dead growth before start of growing season	Annually
	Remove sediment from inlets, outlet and forebay	Annually (or as required)
	Manage wetland plants in outlet pool – where provided	Annually (as set out in Chapter 23)
Occasional maintenance	Reseed areas of poor vegetation growth	As required
	Prune and trim any trees and remove cuttings	Every 2 years, or as required
	Remove sediment from inlets, outlets, forebay and main basin when required	Every 5 years, or as required (likely to be minimal requirements where effective upstream source control is provided)
Remedial actions	Repair erosion or other damage by reseedling or re-turfing	As required
	Realignment of rip-rap	As required
	Repair/rehabilitation of inlets, outlets and overflows	As required
	Relevel uneven surfaces and reinstate design levels	As required

Swales

Refer to section 17.12 of *The SuDS Manual* (2015). Extract:

TABLE 17.1 Operation and maintenance requirements for swales		
Maintenance schedule	Required action	Typical frequency
Regular maintenance	Remove litter and debris	Monthly, or as required
	Cut grass – to retain grass height within specified design range	Monthly (during growing season), or as required
	Manage other vegetation and remove nuisance plants	Monthly at start, then as required
	Inspect inlets, outlets and overflows for blockages, and clear if required	Monthly
	Inspect infiltration surfaces for ponding, compaction, silt accumulation, record areas where water is ponding for > 48 hours	Monthly, or when required
	Inspect vegetation coverage	Monthly for 6 months, quarterly for 2 years, then half yearly
	Inspect inlets and facility surface for silt accumulation, establish appropriate silt removal frequencies	Half yearly
Occasional maintenance	Reseed areas of poor vegetation growth, alter plant types to better suit conditions, if required	As required or if bare soil is exposed over 10% or more of the swale treatment area
Remedial actions	Repair erosion or other damage by re-turfing or reseeded	As required
	Relevel uneven surfaces and reinstate design levels	As required
	Scarify and spike topsoil layer to improve infiltration performance, break up silt deposits and prevent compaction of the soil surface	As required
	Remove build-up of sediment on upstream gravel trench, flow spreader or at top of filter strip	As required
	Remove and dispose of oils or petrol residues using safe standard practices	As required

Additional Maintenance Requirements for Homeowners

It is also recommended that each homeowner regularly cleans and inspects gullies/linear drainage channels, where located within their plot curtilage as a preventative measure to minimise the ingress of detritus into the storm water system. It is suggested that new homeowners are informed of such responsibilities in their welcome packs or within their conveyancing.

Other

All necessary safety precautions should be taken when undertaking maintenance and it should be undertaken by an experienced contractor. There may be general hazards such as falls into chambers, heavy lifting or working at height when clearing gutters.

Any waste material generated from drainage maintenance or repairs shall be disposed of in accordance with current legislative requirements and best practice.

A final copy of this Plan should be included with other site operation and maintenance (O&M) documentation in the site Health and Safety File (as part of the requirements under the CDM Regulations, 2015).

It is important that this Plan is revisited/reviewed once final site drainage designs are prepared for construction and as built drawings are available. The final maintenance plan shall also be written alongside the landscaping maintenance requirements and once final as built materials are known. An as built drainage drawing should be included in this plan.

Consideration should be given to using the maintenance checklist in Table B.25 of *The SuDS Manual*, 2015.

If there are any concerns or queries about the site drainage systems, then advice should be sought from a Chartered Civil Engineer who specialises in drainage systems.