Ashwood Homes Ltd.

Holbeach Meadows Phase 3

Flood Risk Assessment & Drainage Strategy

FINAL
July 2024

Revision Schedule

Holbeach Meadows Phase 3

Flood Risk Assessment & Drainage Strategy

July 2024

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Inspire Design & Development Ltd
Unit 2A
Church View Business Park
Coney Green Road
Chesterfield
Derbyshire
S45 9HA

Tel: 01246 864467

www.inspiredesigngroup.co.uk

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APPENDICES

1.0 INTRODUCTION

Instructions

1.1 This report is prepared with instructions from Ashwood Homes Ltd. to support a planning application to South Holland District Council for a residential development known as Holbeach Meadows, on land off Daisy Road, Holbeach, PE12 7LA.

1.2 The purpose of the report is to assess flood risk in accordance with the National Planning Policy Framework (NPPF) and other current guidelines and determine a drainage strategy for the site. It does not purport to set out drainage design for construction purposes.

Planning Background

1.3 The site has a long planning history, however, the main applications which are relevant to this document include:

- Application H09-0521-14 sought outline planning permission for a residential development of up to 900 dwellings, with access off Hall Gate and Fen Road, including public open space, drainage infrastructure, landscaping, including demolition of two buildings and agricultural buildings. Condition 16 of the outline permission references the Flood Risk Assessment (ref 13401 Rev B) and sets the Finished Floor Levels (FFLs) to be set no lower than +3.33m AOD, with flood resilient measures incorporated up to +3.78m AOD.

- Application H09-0331-17 sought reserved matters permission for the proposed development of 330 dwellings, with associated highways and drainage infrastructure, landscaping, and appearance.

- Application H09-0782-18 sought to discharge planning conditions for both H09-0521-14 and H09-0331-17. Included in this application was condition 16 of the outline permission. The Flood Risk Assessment prepared by BSP Consulting dated 10th July 2014, was approved by South Holland District Council. This FRA recommended a minimum FFL to be set +3.33m AOD, with flood resilient construction up to +3.7m AOD.

1.4 The above permissions and its associated conditions are particularly relevant to this current planning application. The granting of the above planning permissions demonstrates the acceptability of raising flood levels in line with the flood depths shown

on the SFRA 2115 map. Therefore, a similar approach has been taken in preparation of this FRA.

Technical Information

1.5 The National Planning Policy Framework and associated Planning Practice Guidance explains how flood risk should be taken into consideration during the planning and development process. It categorises flood risk by *flood zone* and defines the types of development *appropriate* to each flood zone according to *vulnerability*. The flood zones are defined as:

- Zone 1: Areas with a Low Probability of flooding (annual probability less than 0.1% or 1 in 1000 years).
- Zone 2: Areas with a Medium Probability of flooding (annual probability between 0.1% (1 in 1000 years) and 1.0% (1in 100 years) for rivers, 0.1 – 0.5% (1 in 1000 to 1 in 200 years) for coastal areas.
- Zone 3a: Areas with a High Probability of flooding (annual probability greater than 1.0% (1 in 100 years) for rivers, 0.5% (1 in 200 years) for coastal areas).
- Zone 3b: The Functional Floodplain (probability as Zone 3a).

1.6 The Environment Agency (EA) predicts the likelihood of flooding via a national series of indicative flood maps, available from the GOV.UK website.

1.7 The *Flood Map for Planning* shows the flood zones, described above, coloured in different shades of blue. In areas protected by flood defences, this flood map deliberately neglects their presence so as to present a worst-case scenario. Although it does not represent realistic risk, the *Flood Map for Planning* is the authoritative guidance on flood risk for use in the preparation of flood risk assessments for planning applications.

1.8 The *Long-Term Flood Risk* maps cover the following topics:

- *Flood Risk from Rivers and the Sea*. This map (previously known as the NaFRA map) shows the risk of fluvial and tidal flooding in a similar manner to the *Flood Map for Planning*, except that, where they exist, defences are recognised. The resulting realistic risk prevention provides useful data for insurance assessors.

- *Flood Risk from Surface Water*. This map shows potential overland flow routes and accumulation of runoff resulting from rainstorm events based on topography, divided into low, medium, and high-risk scenarios.

- *Flood Risk from Reservoirs*. This map shows areas which may be subject to flooding from the failure of reservoirs and other water retaining infrastructure, the risk of which is very low.

South East Lincolnshire Strategic Flood Risk Assessment

1.9 Local Planning Authorities are required to produce a Strategic Flood Risk Assessment (SFRA) which sets the scene for flood risk in their areas. The South East Lincolnshire SFRA is a joint publication between South Holland District Council and Boston Borough Council, published in March 2017.

South East Lincolnshire Local Plan

1.10 The South East Lincolnshire Local Plan, prepared by South Holland District Council and Boston Borough Council, was adopted in March 2019.

Lincolnshire County Council Preliminary Flood Risk Assessment

1.11 Lead Local Flood Authorities (LLFAs) are required to produce a Preliminary Flood Risk Assessment (PFRA) to identify areas where there is significant flood risk from ordinary watercourses and surface water run-off, but not from main rivers or the sea, or from sewers. Lincolnshire County Council, as LLFA, published its PFRA in June 2011.

South Holland Internal Drainage Board

1.12 Drainage of the site and surrounding area is administered by the South Holland IDB. The site is within the Little Holland West catchment area. The Old River Drain is an IDB ordinary watercourse which is located on the eastern boundary of the development site.

2.0 SITE INFORMATION

Existing Site

2.1 The site comprises of agricultural land on the west side of Fen Road, Holbeach, PE12 8QA. The first phase of residential development of 330no. dwellings, permitted under outline application H09-0331-17 lies immediately 500m to the west of Fen Road, taking access of a new roundabout off Hall Gate. The site is bounded to the east by existing properties along Fen Road. The Old River Drain is situated on the western boundary of the site, with Holbeach Town Centre located 770m to the north of the site. The site location is shown on the drawing AHL-1636-01-GA-004 *Location Plan and Phasing Boundaries*.

2.2 The nearest substantial watercourse to the site is the Old River Drain, a major drainage channel which flows through a culvert under the town of Holbeach, joining the Holbeach River, 1.7km north of the development site, before discharging to the River Welland 9.7km to the north of the development site.

2.3 The River Welland, a main river, flows between flood banks from the west to east. The River Welland is tidal and outflows to The Wash about 15.6km to the east of the site.

2.4 The site comprises of a generally level field with levels ranging from +2.7m AOD to +3.4m AOD. Topographic details within Appendix B of this report.

2.5 According to Anglian Water sewer records, there is an existing public foul sewer in Fen Road.

2.6 Data from the British Geological Survey shows the site is located on Tidal Flat Deposits with superficial deposits of Clay and Silt, overlying Clay Mudstone and Siltstone.

Proposed Development

2.7 The site seeks permission for 273no. dwellings, split over two plots of land:

- North Site – 172no. dwellings
- South Site – 101no. dwellings.

2.8 The finished floor level (FFL) of the new dwelling houses will be set as shown on the drawings AHL-1636-03-PL-003 *Phase 3 North Flood Risk Areas* and AHL-1636-03-PL-004 *Phase 3 South Flood Risk Areas* (see Appendix B). These drawings have been prepared in accordance with the South East Lincolnshire SFRA Appendix C guidance and the drawing *Residual Peak Depth South Holland 2115 1% Fluvial/0.5% Tidal Event*

Probability. Ground levels around the buildings will be set 0.15m below FFLs with access roads and public open space set at lower levels to achieve adequate falls for drainage.

2.9 About 40% of the total site area will comprise of impermeable roofs, drives and access roads. The remaining 60% of the total site area will comprise of private gardens and soft landscaped public open space with sustainable urban drainage (SUDS) features.

3.0 FLOODING INFORMATION

Flood Data

3.1 The *Flood Map for Planning* (see Appendix A) shows the Flood Zone 3 extends for several kilometres in all directions around the site, with some small areas of Flood Zone 1, including Holbeach Town Centre.

3.2 *Long Term Flood Risk Map*, including *Flood Risk from Rivers or the Sea, Flood Risk from Surface Water,* and *Flood Risk from Reservoirs* have also been examined (see Appendix A).

3.3 The *Residual Peak Depth South Holland 2115 1% Fluvial/0.5% Tidal Event Probability* map prepared for South Holland District Council and the Appendix C guidance of the South Lincolnshire SFRA has been examined.

3.4 According to the web-based EA *Historic Flood Map*, there have been no flood events recorded at the site, or in the immediate vicinity of Holbeach.

3.5 Neither the South Lincolnshire SFRA, nor the Lincolnshire County Council PFRA, make any reference to flood history at the site.

Potential for Tidal or Fluvial Flooding

3.6 The *Flood Map for Planning* (see Appendix A), which assumes that no flood defences exist, shows the site to be entirely located in Flood Zone 3 (high probability) associated with the potential failure of tidal defences.

3.7 The *Flood Risk from Rivers and Sea* map (see Appendix A), which acknowledge the presence of flood defences, shows the site to be located to be wholly located in an area of 'Low' flood risk, the equivalent of Flood Zone 2.

3.8 The nearest Flood Zone 1 (low probability) is Holbeach Town Centre, 625m north of the site.

3.9 As can be seen from the attached *Flood Map for Planning*, almost the entire area of South Holland is within Flood Zone 3. Strict adherence to the guidelines would consequently result in no development being permitted across a very large area, which is clearly impracticable. The South East Lincolnshire SFRA has therefore been developed to ensure that there is a consistent evidence base against which to take development decisions, particularly with respect to mitigation requirements.

3.10 The guidance on FFLs is provided by Appendix C of the SFRA, and is as follows:

Table 1 - South East Lincolnshire SFRA Appendix C Guidance

Flood Depth	Appendix C Guidance
0m – 0.25m	+0.3m above GL
0.25m – 0.5m	+0.5m above GL
0.5m – 1.0m	+1.0m above GL with flood resilient construction to a height of 300mm above GL.
1.0m – 1.6m	+1.0m above GL with 300mm flood resilient construction above flood depth and 600mm demountable defences.
>1.6m	Minimum of two storeys with no ground flood habitable rooms. First floor living accommodation must be above highest flood depth.

South Holland SFRA 2016 Update Maps

3.11 Whereas the *Flood Map for Planning* in Appendix A simply assumes that defences are non-existent, the SFRA 2016 update maps are based on modelling a theoretical series of breaches in the tidal defences. The relevant map for assessing development applications is the *Residual Peak Depth South Holland 2115 1% Fluvial/0.5% Tidal Event Probability* map which not only forecasts the consequences of a defences breach but also the effect of climate change over the next 100 years. This map shows various flood depths in the ranges 0m (White), 0m-0.25m (yellow), 0.25m-0.5m (light orange) across the site for this estimated event – See Appendix B.

Potential for Surface Water Flooding

3.12 The EA *Flood Risk from Surface Water* map shows there are some small areas of low-risk surface water flooding. Therefore, it is considered there is no significant risk of surface water flooding at the site.

3.13 The area is well drained by a system of drains and ditches connected to the South Holland IDB maintained drains, thereby preventing surface water flooding.

Potential for Flooding from Reservoirs

3.14 The EA *Flood Risk from Reservoirs* map shows no risk of reservoir flooding affecting the site.

Potential for Flooding from Groundwater or Sewers

3.15 Flood risk from other sources such as groundwater or sewers is considered to be negligible in comparison with that for tidal at this site. It is considered that raising proposed FFLs will address flood risk from these sources which, consequently, are not addressed further in this assessment.

4.0 FLOOD RISK ASSESSMENT

Approach to Development

4.1 As can be seen from the *Flood Map for Planning* in Appendix A, the urban area of Holbeach is entirely situation within Flood Zone 3, save for the Town Centre which is located in Flood Zone 1. This means that the town can only expand by permitting development in Flood Zone 3, as supported by the Appendix C guidance of the SFRA.

4.2 Such development has been in progress during the past several years; planning permission (ref: Application H09-0521-14 and H09-0331-17), as described in Section 1, being a typical example. In permitting residential development on such sites, the authorities generally consider the contingency scenario represented by the Residual Peak Depth South Holland 2115 1% Fluvial/0.5% Tidal Event Probability to be an appropriate guideline and typically required that FFLs be set in accordance with the guidance provided by Appendix C of the SFRA.

4.3 In terms of existing ground levels and flood risk, the proposed development of this site, is very similar to that permitted by the planning application H09-0521-14.

Tidal Flooding

4.4 The EA *Long Term Flood Risk from Rivers or the Sea* map, represents the current defended state of the site and is used by insurers to assess the actual likelihood of a flood occurring. This map shows all of the site to be at 'Low' flood risk, the equivalent of Flood Zone 2. It recognises the value of coastal defences in reducing flood risk to a more realistic level than the blanket Flood Zone 3 status of the *Flood Map for Planning*.

4.5 The reference SFRA map, *Residual Peak Depth South Holland 2115 1% Fluvial/0.5% Tidal Event Probability is* based on the theoretical modelling of a breach of the tidal defences shows outer areas of the site to have a flood depth of 0m (white).

4.6 As shown on the Topographic Survey (see Appendix C), the levels of the site vary from +2.7m AOD to +3.4m AOD. By thorough interrogation of the surveyed site levels, and the *Flood Hazard Map*, Appendix C guidance of the SFRA is applied to ascertain FFLs.

4.7 As the majority of the Phase 3 North site is within the 'white' area of the Residual Peak Depth South Holland 2115 1% Fluvial/0.5% Tidal Event Probability drawing yet remain within Flood Zone 1; FFLs in this area will be raised 300mm above existing ground level in accordance with EA Standing Advice, as shown on the drawing AHL-1636-03-PL-003 *Phase 3 North Flood Risk Areas*. Thus, the finished floor level (FFL) of the new

dwelling houses will be set as shown on the drawings AHL-1636-03-PL-003 *Phase 3 North Flood Risk Areas* (see Appendix B).

4.8 The proposed FFLs for the South Site are shown on the drawing AHL-1636-03-PL-004 *Phase 3 South Flood Risk Areas* (see Appendix B). The drawing has been prepared in accordance with the South East Lincolnshire SFRA Appendix C guidance and the drawing *Residual Peak Depth South Holland 2115 1% Fluvial/0.5% Tidal Event Probability*. FFLs will be set at a minimum of +3.0m AOD and will be increased where necessary to achieve adequate falls for drainage.

4.9 As the Flood Zone 3 area indicated at the site extends as far as the coast without a break, raising ground levels at the site will not occupy flood storage volume. Consequently, no floodplain compensation is required and there will be no increase in flood risk elsewhere as a result of the development. As it would remain possible that some areas between the buildings might flood, it would be prudent for the occupants of the buildings to operate a flood management plan so as to assure their safety in an extreme event.

Surface Water Flooding

4.10 As stated in 3.12 above, there is no significant risk to surface water flooding at the site. This is because the site is surrounded by deep open drains which collect runoff from the site and discharge to the IDB drains.

4.11 Although the impermeable area of the proposed development will be increased by the introduction of roofs, roads, and driveways; the corresponding increase in surface water flood risk will be fully mitigated by the SUDS-based surface water drainage system as described in Section 6, below.

Proposed Levels & Exceedance Flows

4.12 In order to protect against the risk of flooding, it will be necessary to raise the ground levels over most of the site area. As shown by the finished flood levels on the drawings AHL-1636-03-DR-001 *Phase 3 North Drainage Strategy* and AHL-1636-03-DR-002 *Phase 3 South Drainage Strategy* (see Appendix E), the depth of fill will vary between zero and 0.5m. These levels will be sufficient to cater for the predicted residual flood risk with breach conditions in 2115 and will also create adequate falls to facilitate surface water drainage.

4.13 FFLs will be set 150-200mm above finished ground levels to reduce the risk of surface water flooding at the dwellinghouses. Any exceedance flows in an extreme rainfall event will be directed away from the properties along the access roads.

5.0 FLOOD MANAGEMENT

5.1 As the site is at risk of flooding in a residual risk breach event, even though there is a very low risk of floodwater entering the buildings, a Flood Management Plan containing the following robust flood management provisions will be prepared and implemented. A copy of the Flood Management Plan, is available in Appendix F.

Warnings and Evacuation

5.2 The occupants of the dwellings will register for the EA's *Floodline Warnings Direct* service which is available for the site. Should a flood warning be received, or a flood event be otherwise predicted, occupants will evacuate in good time before any local flooding occurs to dry ground at Holbeach Town Centre, 600m to the north of the site.

5.3 Should occupants choose not, or fail to evacuate early, but then need to leave the site during flood conditions they would still be able to wade safely through floodwater with shallow depths to dry ground. As the site is located at the edge of any potential area of flooding, there would be low flow velocity and consequently a low level of danger assessed by Table 13.1 of FD2320/TR2.

5.4 Alternatively, residents might remain in their houses and ascend to safe refuge on the upper floors so as to remain well clear of flooding outside the buildings or even of any floodwater entering at ground level. In the event of a need for evacuation of any personnel, e.g., for medical reasons, attendance by the emergency services would not be precluded by the depths of the floodwater in the access roads.

5.5 In neither case would the occupants be exposed to any danger.

Sequential Test

5.6 The FFLs of the new buildings will be set in accordance with the Appendix C guidance as shown in the drawing AHL-1636-02-GA-001 *Flood Risk Areas*. This will effectively place the development within Flood Zone 1 where the Sequential Test is not required to be addressed.

5.7 Additionally, the site is allocated for residential development within the South East Lincolnshire Local Plan as a committed residential allocation. Therefore, the sequential test has been satisfied.

Exception Test

5.8 Notwithstanding the above, in order to ensure the safety of the occupants it is necessary to satisfy the NPPF Exception Test. The following points are relevant.

5.9 The development is allocated as a committed site in the South East Lincolnshire Local Plan for residential development. The new housing will have easy access to the existing urban facilities of Holbeach.

5.10 The proposed buildings will be made safe by raising the ground floor levels above the residual risk flood levels and adopting of the Flood Management Plan (see Appendix F), which includes early warning from the EA *Floodline Warnings Direct Service* and the options of evacuation, to dry ground in Holbeach Town Centre. Attendance by the emergency services would not be precluded by the presence of floodwater.

5.11 As the Flood Zone 3 area indicated at the site extends as far as the coast without a break, raising ground levels at the site will not occupy flood storage volume. Consequently, no floodplain compensation is required and there will be no increase in tidal or fluvial flood risk elsewhere as a result of the development.

5.12 Similarly, as a result of the SUDS-based runoff attenuation, there will be no increase in surface water flood risk elsewhere as a result of the development. As a result, the Exception Test is considered to be satisfied.

Flood Resilience

5.13 Appendix C of the SFRA requires *Flood Resilient Construction to a height of 300mm above the predicted flood depth* which is the equivalent to the FFL at the lowest areas of the site.

5.14 In line with this requirement, flood resilient construction will be incorporated up to a minimum level of 300mm above the FFL throughout the development. Flood resilient construction includes measures such as:

- Structurally robust superstructure using masonry or concrete.
- Water resilient cavity insulation.
- Raised services, such as electrical fittings.

6.0 DRAINAGE STRATEGY

Surface Water Drainage

6.1 At present, the site drains directly to Old River Drain, which runs directly through the site.

6.2 The proposed drainage system will be based on SUDS techniques for the disposal of surface water run-off, as described below.

6.3 The first consideration in the SUDS hierarchy is infiltration to ground. As the site mainly comprised of Tidal Flat Deposits, superficial deposits of Clay and Silt, it is considered unlikely that infiltration to the ground could be effective. Furthermore, in view of the need to lift the site levels by up to 0.8m by filling and as the water table is likely to be shallow, infiltration may not be practicable in any case. The situation may be confirmed, if required, by BRE 365 soakaway testing at the site investigation stage.

6.4 The second consideration in the SUDS hierarchy is discharge to a watercourse. as the nearest receiving watercourses, the IDB maintained Old River Drain runs directly through this site, discharge to watercourse is the most feasible option.

6.5 The presence of the watercourses which receive the current runoff, make the third consideration in the SUDS hierarchy, discharge to sewer, unnecessary.

Proposed Site Drainage

North Site

6.6 The drainage system will be based on SUDS principles for the attenuation and treatment of the surface water run-off, as shown on drawing nos. AHL-1636-03-DR-001 *Phase 3 North Drainage Strategy* (see Appendix E).

6.7 The proposed surface water drainage system will collect future surface water runoff from the site, as shown on the Drawings AHL-1636-03-DR-001 *Phase 3 North Drainage Strategy*. Surface water will be discharged via a hydrobrake to the IDB maintained Old River Drain. Two offline attenuation ponds will provide a combined storage capacity of 1,630m^3. Additional storage capacity and attenuation will be provided by the use of crates located under private driveways, and the use of filter strips.

6.8 The proposed system will collect runoff from the roofs, access roads and driveways and convey it via underground pipes to the open attenuation storage ponds. The attenuated flow will be discharged over multiple connection points. Each outflow has a discharge

rate identified on the drawing AHL-1636-03-DR-001 *Phase 3 North Drainage Strategy* Appendix E).

6.9 The outfalls to the Old River Drain will be constructed with an invert level of the 1 in 10-year rainfall event level of +1.53m AOD.

6.10 As shown in the hydraulic calculations (Appendix D), the proposed storage volume will be sufficient to cater for the 1 in 100-year rainfall event with 40% climate change allowances.

6.11 The proposed surface water drainage system will be sufficient to accommodate the 1 in 100-year rainfall event with 40% allowance for climate change in accordance with the EA Guidance *Flood Risk Assessments: Climate Change Allowances*, May 2022.

South Site

6.12 The drainage system will be based on SUDS principles for the attenuation and treatment of the surface water run-off, as shown on drawing nos. AHL-1636-03-DR-002 *Phase 3 South Drainage Strategy* (see Appendix E).

6.13 The proposed surface water drainage system will collect future surface water runoff from the site via a ditch, as shown on the Drawings AHL-1636-03-DR-002 *Phase 3 South Drainage Strategy.* Surface water will be discharged to a swale located on the southern boundary of Phase 3 South, before outfalling to an existing field drain at a discharge rate of 2.5l/s.

6.14 The proposed system will collect runoff from the roofs, access roads and driveways and convey it via underground pipes to attenuation lagoon. The attenuated flow will be discharged at the greenfield run off rate (Q_{BAR}) at 2.5l/s to the IDB maintained Old River Drain, as per the greenfield runoff calculations (see Appendix D). The proposed drainage system seeks to make use of filter strips where appropriate to provide additional attenuation.

6.15 The permeable area of the site will comprise of private gardens and soft landscaping in the public open space and therefore offer a measure of bioretention through shallow infiltration into topsoil and the evapotranspiration of the vegetation.

Treatment

6.16 Treatment of the runoff will be provided as follows:

- Runoff from the access roads and driveways will connect to the drainage system via trapped road gullies and channel drains with traps.
- Runoff will be stored in open ponds where it will be effectively treated by natural aeration and aquatic vegetation.

6.17 In calculating the impermeable areas to be drained, suitable allowance for urban creep will be made in accordance with BS 8582:2013 *Code of practice for surface water management for development sites*.

Long Term Maintenance

6.18 The drainage system and SUDS features will be maintained in the long term by public authorities where adoption is feasible and by individual householders and/or private management company where it is not.

6.19 An operation and maintenance manual for the SUDS elements will be prepared and administered.

Surface Water Approval

6.20 The proposed drainage system is illustrated in drawing AHL-1636-03-DR-001 *Drainage Strategy Phase 3 North* and AHL-1636-03-DR-002 *Drainage Strategy Phase 3 South* with hydraulic calculations attached in Appendix D. Discharge to the IDB maintained drains will be subject to approval by the South Holland IDB.

6.21 All relevant authorities will be kept fully informed regarding the detailed design of the surface water drainage system. It is normal practice for detailed surface water drainage design to be subject to the approval of the Local Planning Authority subsequent to the grant of planning permission and this will be sought from South Holland District Council at the appropriate time.

Foul Sewerage

6.22 There is no sewerage currently serving the site. As shown on AHL-1636-03-DR-001 *Phase 3 North Drainage Strategy* and AHL-1636-03-DR-002 *Phase 3 South Drainage Strategy* the foul sewage from the proposed development will be drained via the following methods:

- North Site (see AHL-1636-03-DR-001)

  Foul sewage for all plots to the west of the Old River Drain will be collected by a new foul sewer, which will discharge freely to the existing Pump Station, within the Phase 1 drainage system at grid reference TF3546124159. The pump station was approved in the previous S104 application (ref: S104/10532425). Plots on the east side of the Old River Drain will have foul sewerage collected by a new foul sewer, which will connect to the existing Anglian Water sewers under Tudor Way and Fen Road.

- South Site (see AHL-1636-03-DR-002)

  Foul sewage will be collected by a new foul sewer, which will discharge freely to the existing Pump Station, within the Phase 1 drainage system at grid reference TF3546124159. The pump station was approved in the previous S104 application (ref: S104/10532425).

6.23 At the detailed design stage, an application will be made to Anglian Water under the Water Industry Act 1991 for consent to discharge foul sewage from the proposed development into the public sewer system.

6.24 All relevant authorities will be kept fully informed of the detailed design of the foul sewage system. It is normal practice for detailed foul water drainage design to be subject to the approval of the Local Planning Authority subsequent to the granting of planning permission and this will be sought from South Holland District Council at the appropriate time.

7.0 CONCLUSIONS

7.1 The EA *Flood Map for Planning* shows the site to be located in Flood Zone 3 (high probability).

7.2 The SFRA map *Residual Peak Depth Spalding 2115 1% Fluvial/0.5% Tidal Event Probability* map forecasts the consequences of a defences breach and the effect of climate change over the next 100-years. The map shows depths of 0m (white) at the application site. However, the site is fully within Flood Zone 3.

7.3 Consequently, in accordance with Appendix C guidance of the SFRA and EA Standing Advice, FFLs will be set at the minimum +3.0m AOD as shown on the drawings AHL-1636-03-PL-003 *Flood Risk Areas Phase 3 North* and AHL-1636-03-PL-004 *Flood Risk Areas Phase 3 South*, with 300mm of flood resilient construction. The ground levels around the buildings will be set 0.15m lower to achieve adequate falls for drainage.

7.4 As the Flood Zone 3 area indicated at the site extends as far as the coast without a break, raising ground levels at the site will not occupy flood storage volume.

7.5 The EA *Flood Risk from Surface Water* map shows no significant risk of surface water flooding at the site. Surface water run-off will continue to discharge to the adjacent IDB drainage system. The new impermeable areas of the site will be drained using SUDS techniques which will provide flow attenuation to reduce flood risk and treatment to improve water quality.

7.6 Climate change allowance will be made in accordance with the latest EA guidance.

7.7 In order to address the risk of flooding, a Flood Management Plan has been prepared to ensure safety of the occupants, involving early warning and either evacuation to dry ground or refuge on an upper floor, as required.

7.8 As the raising of levels effectively places the development within Flood Zone 1, and that the site is allocated for development within the South East Lincolnshire Local Plan, the NPPF Sequential Test is considered to be satisfied.

7.9 As the proposed buildings will be made safe by raising the FFLs to the residual flood risk level and adoption of a Flood Management Plan which includes early warning mechanisms from the EA and the option of evacuation, the NPPF Exception Text is considered to be satisfied.

7.10 With regard to flood risk and drainage, therefore, the site is suitable for the proposed use. The development occupied safely and adequately drained without increasing flood risk elsewhere.

APPENDIX A FLOOD MAP FOR PLANNING

Flood map for planning

Your reference	Location (easting/northing)	Created
Holbeach Meadows	**535256/324152**	**7 Jul 2022 15:41**

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

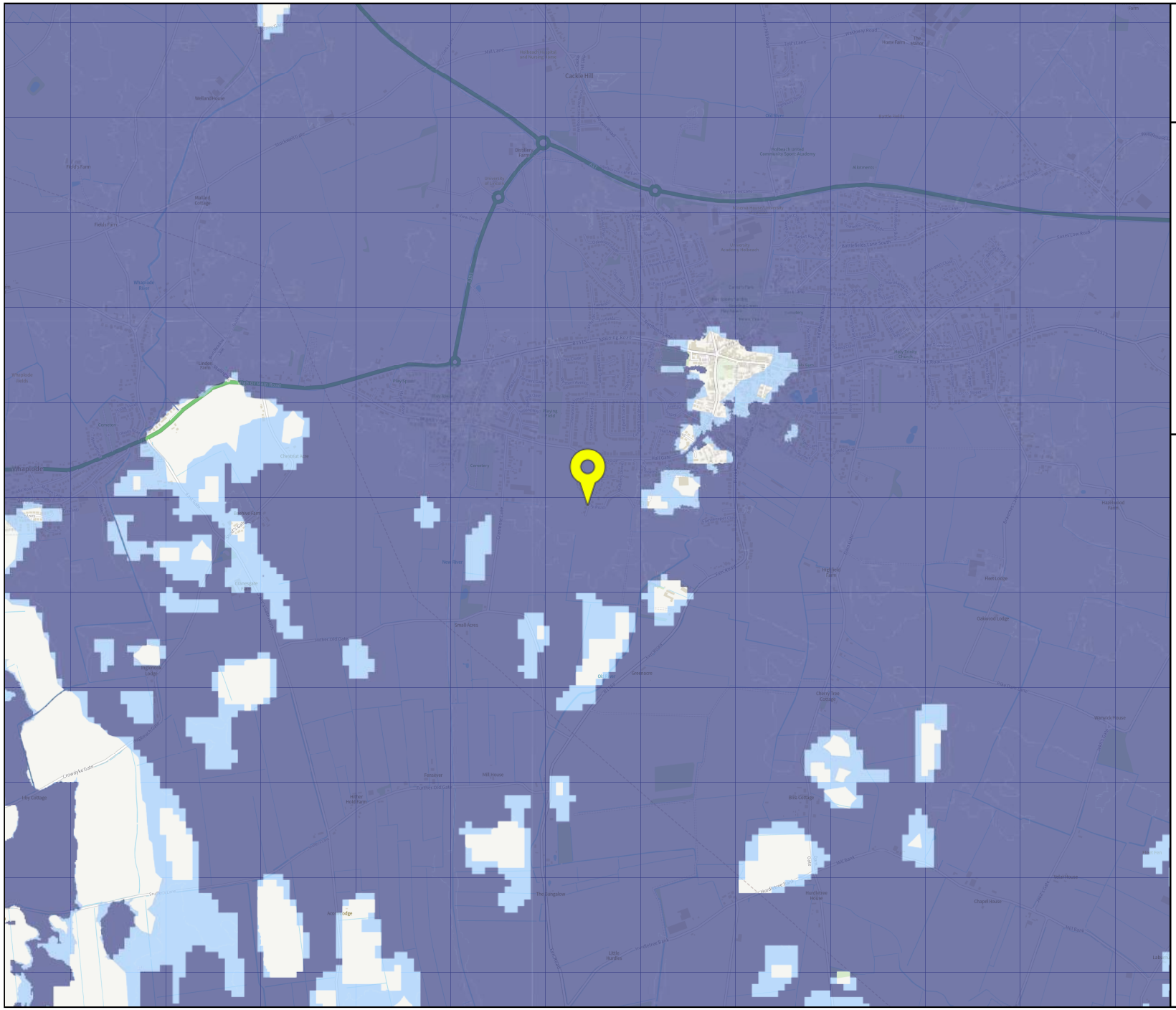
This means:

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

Notes

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

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



Environment Agency

Flood map for planning

Your reference
Holbeach Meadows

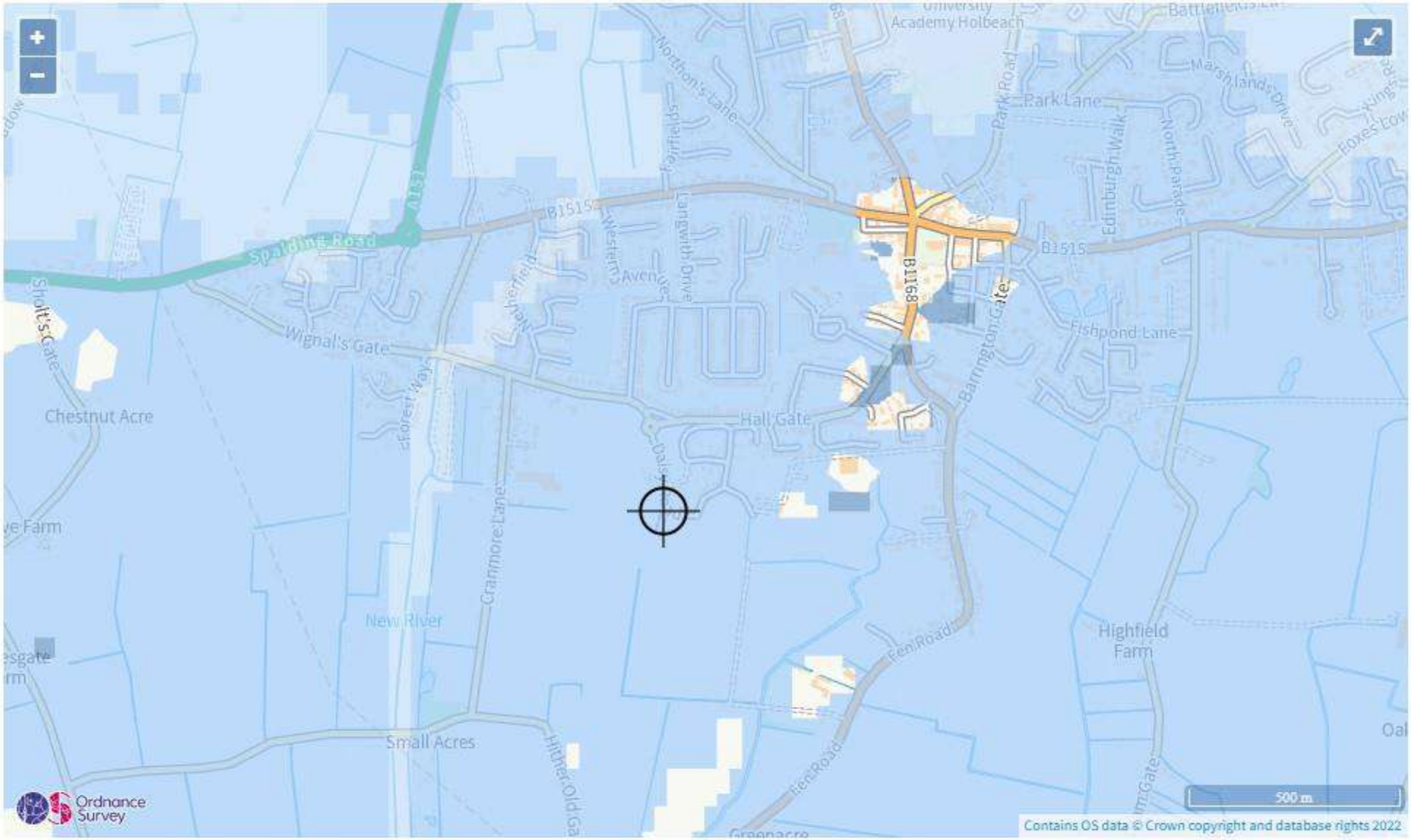
Location (easting/northing)
535256/324152

Scale
1:25000

Created
7 Jul 2022 15:41

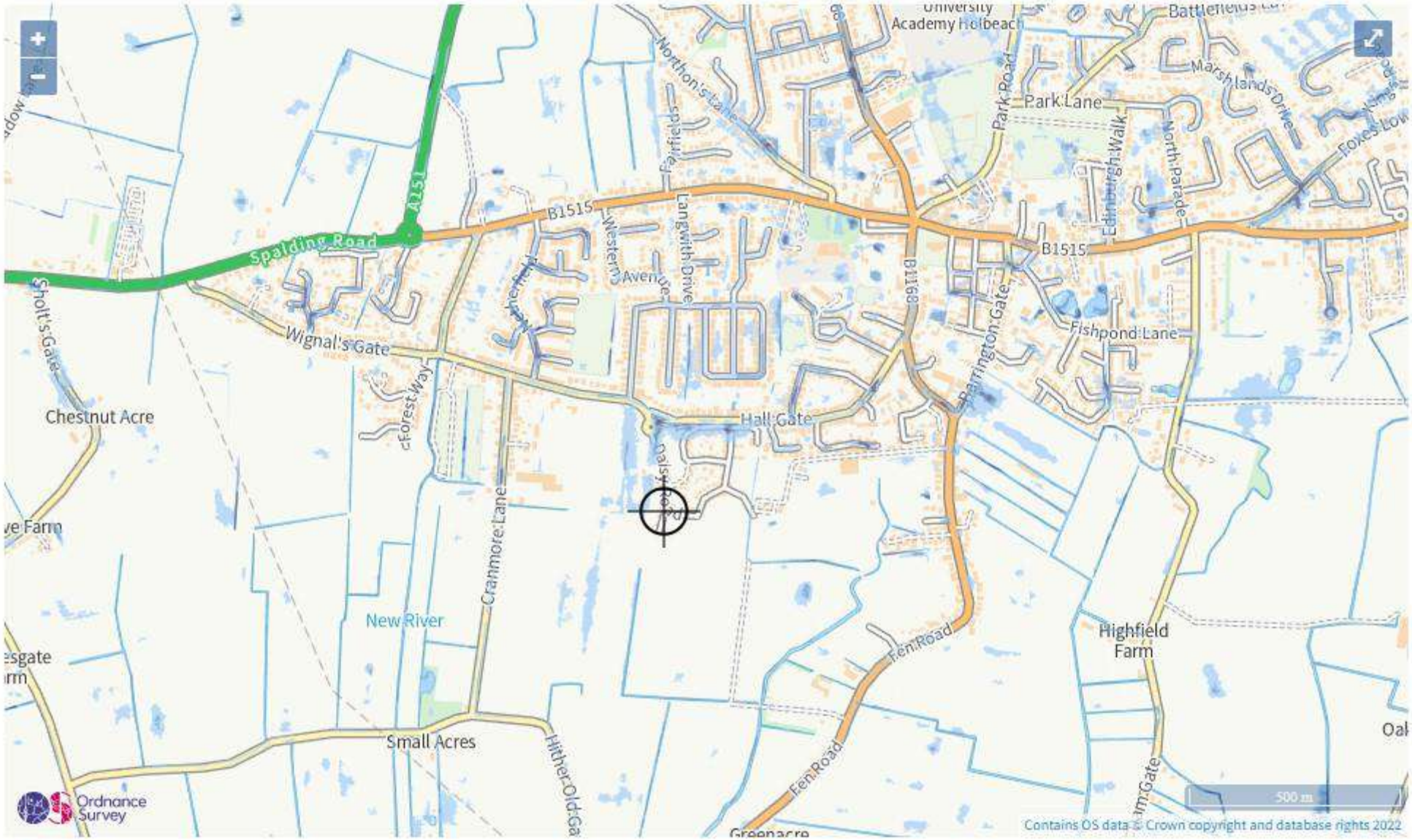
- Selected point
- Flood zone 3
- Flood zone 3: areas benefitting from flood defences
- Flood zone 2
- Flood zone 1
- Flood defence
- Main river
- Water storage area

0 200 400 600m



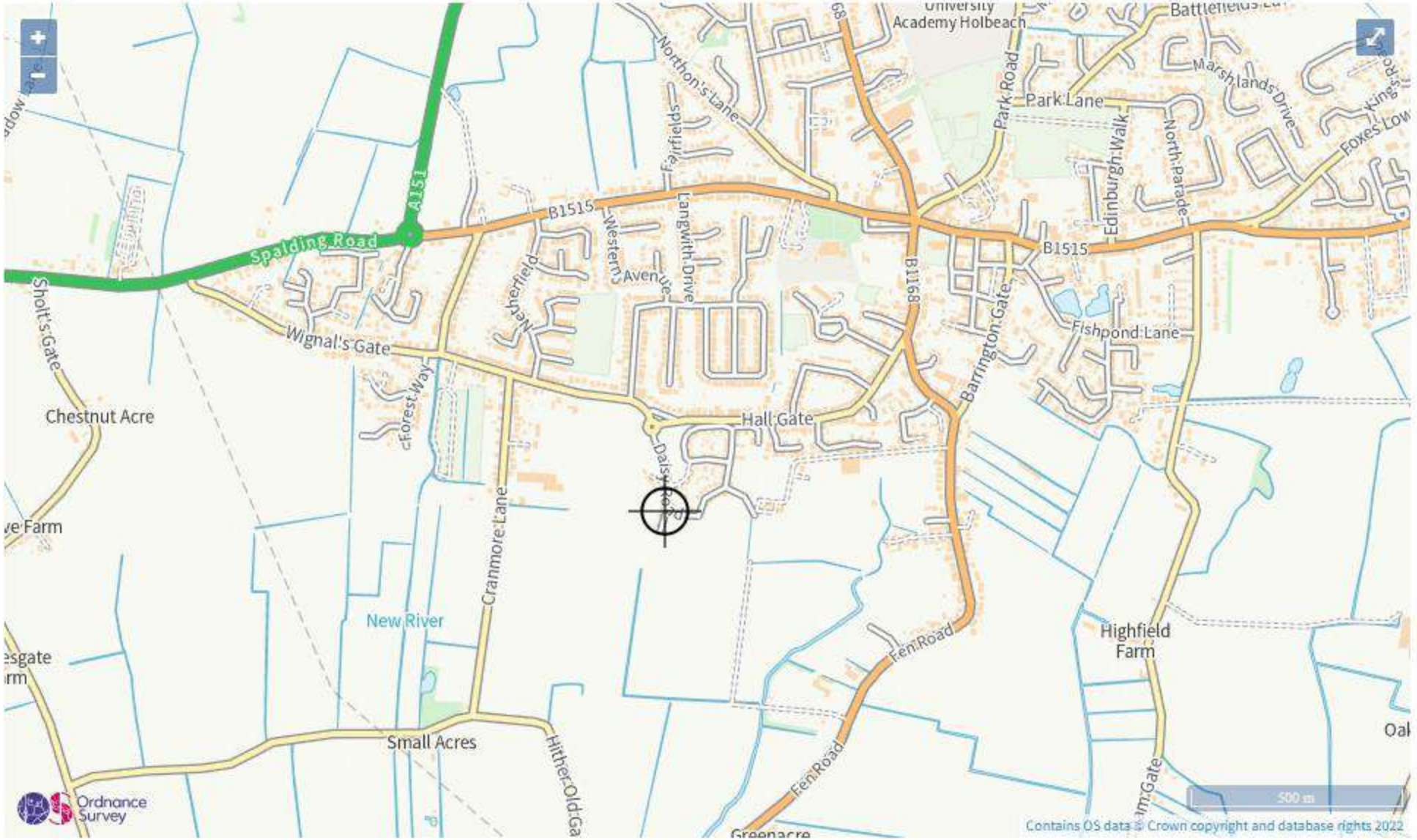
Extent of flooding from rivers or the sea

High Medium Low Very low Location you selected



Extent of flooding from surface water

High Medium Low Very low Location you selected



Maximum extent of flooding from reservoirs:

when river levels are normal | when there is also flooding from rivers | Location you selected

APPENDIX B SFRA RESIDUAL PEAK DEPTH MAP

NOTES:

1. DO NOT SCALE FROM THIS DRAWING.
2. ALL MEASUREMENTS ARE IN METERS UNLESS OTHERWISE STATED.
3. DRAWING NOT ISSUED FOR CONSTRUCTION.

KEY:

- 0.00m - 0.25m = GL + 0.3m
- 0.25m - 0.50m = GL + 0.5m
- 0.50m - 1.00m = GL + 1.0m
- 1.00m - 2.00m = GL + 2.0m
- 2.8 GROUND LEVEL
- 3.1 PROPOSED LEVEL
- 0.3 LEVEL CHANGE

REV	DATE	NAME	CHECK	NOTE
P2	16/07/24	NGP	CR	SITE LAYOUT AMENDED
P1	08/12/23	NGP	CR	AFFORDABLE VILLAGE MERGED WITH PHASE 3 NORTH

DRAWING STATUS:

FOR APPROVAL

CLIENT

ASHWOOD HOMES LTD

inspire DESIGN & DEVELOPMENT

PROJECT

HOLBEACH MEADOWS, PHASE 3 NORTH

DRAWING TITLE

FLOOD RISK AREAS

DRAWN	CHECKED	APPROVED
AJS	CR	CR

DATE	SCALE @ A1
27 October 2022	1:500

DRAWING No.	REVISION No.
AHL-1636-03-PL-003	P2

NOTES:

1. DO NOT SCALE FROM THIS DRAWING.
2. ALL MEASUREMENTS ARE IN METERS UNLESS OTHERWISE STATED.
3. DRAWING NOT ISSUED FOR CONSTRUCTION.

KEY:

- 0.00m - 0.25m = GL + 0.3m
- 0.25m - 0.50m = GL + 0.5m
- 0.50m - 1.00m = GL + 1.0m
- 1.00m - 2.00m = GL + 2.0m
- 2.8 GROUND LEVEL
- 3.1 PROPOSED LEVEL
- 0.3 LEVEL CHANGE

REV	DATE	NAME	CHECK	NOTE
P2	16/07/24	NGP	CR	SITE LAYOUT AMENDED
P1	1/01/24	NGP	CR	SITE LAYOUT AMENDED

DRAWING STATUS:
FOR APPROVAL

CLIENT:
ASHWOOD HOMES LTD

PROJECT:
HOLBEACH MEADOWS, PHASE 3 SOUTH

DRAWING TITLE:
FLOOD RISK AREAS

DRAWN:	CHECKED:	APPROVED:
AJS	CR	CR

DATE: 27 October 2022
SCALE @ A0: 1:500

DRAWING No: AHL-1636-03-PL-004
REVISION No: P2

APPENDIX C SITE CONTEXT PLANS

Architects · Project Managers · Quantity Surveyors
130 New Walk
Leicester, LE1 7JA
Tel: 0116 204 5800. Fax: 0116 204 5801
email: design@rg-p.co.uk. www.rg-p.co.uk

Project: Land South of Hall Gate, Hobsbarn, Lincolnshire

Client: Astley King Developments

Sheet title: TOPO Survey

Ref: 7884 017

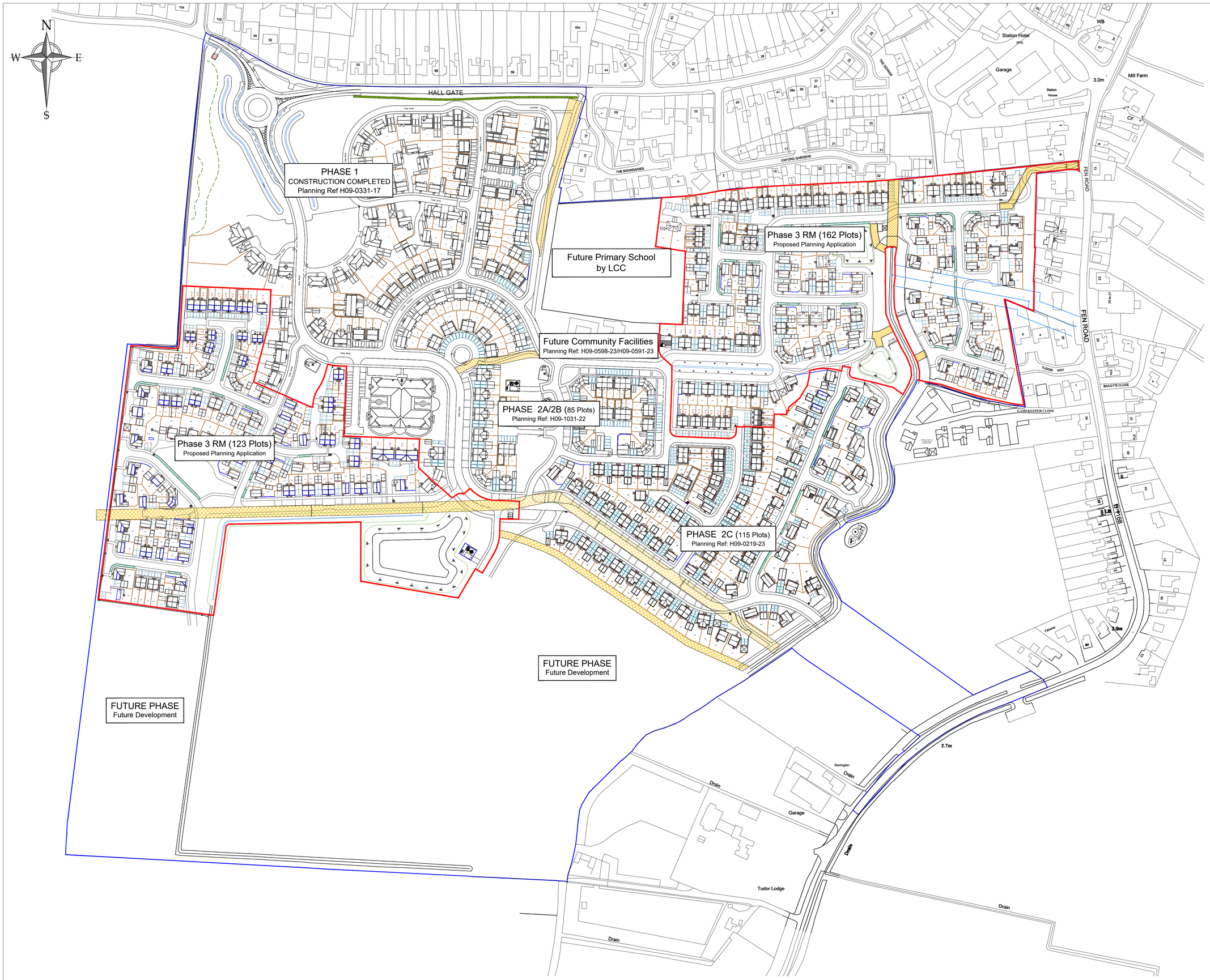
Scale: 1:1000 @ A0

Date: May 2014

Drawn: PK Checked:

Revision: Date:

Fen Road
Tudor Way
Queen Road
Grampian Gate
Queen Road
Hall Gate
Hall Hill Road
The Boundaries
Hall Gate
Beaumont Avenue



Rev.	Date	Description

ASHWOOD HOMES

1 Goodison Road, Lincs Gateway Business Park,
Spalding, Lincs, PE12 6FY **T: 01406 490590**

PROJECT:
Proposed Residential Development at Holbeach Meadows (Phase 3)

DRAWING:
Context Plan (Phases 1-3)

SCALE: 1:1500@A1 DRAWN: GB

DATE: NOVEMBER.2023 REVISION: C

DRAWING No: 137-CP-20

APPENDIX D HYDRAULIC CALCULATIONS

Print | Close Report

Greenfield runoff rate estimation for sites

www.uksuds.com | Greenfield runoff tool

Calculated by:	Calum Reford
Site name:	Phase 3 North Site
Site location:	Holbeach Meadows

This is an estimation of the greenfield runoff rates that are used to meet normal best practice criteria in line with Environment Agency guidance "Rainfall runoff management for developments", SC030219 (2013) , the SuDS Manual C753 (Ciria, 2015) and the non-statutory standards for SuDS (Defra, 2015). This information on greenfield runoff rates may be the basis for setting consents for the drainage of surface water runoff from sites.

Site Details

Latitude:	52.79651° N
Longitude:	0.00472° E
Reference:	2295096714
Date:	Oct 31 2022 12:33

Runoff estimation approach IH124

Site characteristics

Total site area (ha): 2.8

Methodology

Q_{BAR} estimation method:	Calculate from SPR and SAAR
SPR estimation method:	Calculate from SOIL type

Soil characteristics	Default	Edited
SOIL type:	2	2
HOST class:	N/A	N/A
SPR/SPRHOST:	0.3	0.3

Hydrological characteristics	Default	Edited
SAAR (mm):	571	571
Hydrological region:	5	5
Growth curve factor 1 year:	0.87	0.87
Growth curve factor 30 years:	2.45	2.45
Growth curve factor 100 years:	3.56	3.56
Growth curve factor 200 years:	4.21	4.21

Notes

(1) Is Q_{BAR} < 2.0 l/s/ha?

When Q_{BAR} is < 2.0 l/s/ha then limiting discharge rates are set at 2.0 l/s/ha.

(2) Are flow rates < 5.0 l/s?

Where flow rates are less than 5.0 l/s consent for discharge is usually set at 5.0 l/s if blockage from vegetation and other materials is possible. Lower consent flow rates may be set where the blockage risk is addressed by using appropriate drainage elements.

(3) Is SPR/SPRHOST ≤ 0.3?

Where groundwater levels are low enough the use of soakaways to avoid discharge offsite would normally be preferred for disposal of surface water runoff.

Greenfield runoff rates	Default	Edited
Q_{BAR} (l/s):	4.02	4.02
1 in 1 year (l/s):	3.5	3.5
1 in 30 years (l/s):	9.85	9.85
1 in 100 year (l/s):	14.31	14.31
1 in 200 years (l/s):	16.93	16.93

Greenfield runoff rate estimation for sites

www.uksuds.com | Greenfield runoff tool

Calculated by:	Calum Reford
Site name:	Phase 3 South Site
Site location:	Holbeach Meadows

This is an estimation of the greenfield runoff rates that are used to meet normal best practice criteria in line with Environment Agency guidance "Rainfall runoff management for developments", SC030219 (2013) , the SuDS Manual C753 (Ciria, 2015) and the non-statutory standards for SuDS (Defra, 2015). This information on greenfield runoff rates may be the basis for setting consents for the drainage of surface water runoff from sites.

Site Details

Latitude:	52.79651° N
Longitude:	0.00472° E
Reference:	2130180998
Date:	Oct 31 2022 12:35

Runoff estimation approach IH124

Site characteristics

Total site area (ha): 3.7

Methodology

Q_{BAR} estimation method:	Calculate from SPR and SAAR
SPR estimation method:	Calculate from SOIL type

Soil characteristics	Default	Edited
SOIL type:	2	2
HOST class:	N/A	N/A
SPR/SPRHOST:	0.3	0.3

Hydrological characteristics	Default	Edited
SAAR (mm):	571	571
Hydrological region:	5	5
Growth curve factor 1 year:	0.87	0.87
Growth curve factor 30 years:	2.45	2.45
Growth curve factor 100 years:	3.56	3.56
Growth curve factor 200 years:	4.21	4.21

Notes

(1) Is Q_{BAR} < 2.0 l/s/ha?

When Q_{BAR} is < 2.0 l/s/ha then limiting discharge rates are set at 2.0 l/s/ha.

(2) Are flow rates < 5.0 l/s?

Where flow rates are less than 5.0 l/s consent for discharge is usually set at 5.0 l/s if blockage from vegetation and other materials is possible. Lower consent flow rates may be set where the blockage risk is addressed by using appropriate drainage elements.

(3) Is SPR/SPRHOST ≤ 0.3?

Where groundwater levels are low enough the use of soakaways to avoid discharge offsite would normally be preferred for disposal of surface water runoff.

Greenfield runoff rates	Default	Edited
Q_{BAR} (l/s):	5.31	5.31
1 in 1 year (l/s):	4.62	4.62
1 in 30 years (l/s):	13.02	13.02
1 in 100 year (l/s):	18.91	18.91
1 in 200 years (l/s):	22.37	22.37

Design Settings

Rainfall Methodology	FSR	Maximum Time of Concentration (mins)	30.00
Return Period (years)	100	Maximum Rainfall (mm/hr)	50.0
Additional Flow (%)	40	Minimum Velocity (m/s)	1.00
FSR Region	England and Wales	Connection Type	Level Soffits
M5-60 (mm)	20.000	Minimum Backdrop Height (m)	2.000
Ratio-R	0.400	Preferred Cover Depth (m)	1.200
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	0.049	5.00	3.900	1500	535589.844	324137.303	1.758
J1	0.000		3.770		535640.240	324135.339	1.737
2	0.115	5.00	3.770	1500	535639.723	324122.061	1.708
3	0.087	5.00	3.740	1500	535670.526	324128.964	1.749
4	0.134	5.00	3.720	1800	535666.411	324134.319	1.744
5	0.037	5.00	3.600	1500	535667.733	324150.288	1.659
6	0.040	5.00	3.600	1500	535666.824	324167.757	1.698
7	0.075	5.00	3.500	1500	535666.991	324179.315	1.623
8	0.000		3.500	1500	535668.671	324183.698	1.634
9	0.026	5.00	3.500	1500	535672.157	324185.024	1.643
10	0.142	5.00	3.600	1500	535719.289	324184.114	1.845
11	0.073	5.00	3.600	1500	535748.940	324185.002	1.909
12	0.109	5.00	3.700	1500	535750.548	324157.914	2.068
13	0.000		3.600	1500	535756.603	324157.737	2.032
14	0.000		3.560	1500	535761.587	324158.138	2.003
HW1	0.000		2.650	1500	535772.426	324163.538	1.120

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
1.000	1	J1	50.434	0.600	2.142	2.033	0.109	462.7	500	5.84	50.0
1.001	J1	4	26.191	0.600	2.033	1.976	0.057	459.5	500	6.27	50.0
1.002	4	5	16.024	0.600	1.976	1.941	0.035	457.8	500	6.50	50.0
1.003	5	6	17.493	0.600	1.941	1.902	0.039	448.5	500	6.82	50.0
1.004	6	7	11.559	0.600	1.902	1.877	0.025	462.4	500	7.02	50.0
1.005	7	8	4.694	0.600	1.877	1.866	0.011	426.7	500	7.09	50.0
1.006	8	9	3.730	0.600	1.866	1.857	0.009	414.4	500	7.15	50.0
1.007	9	10	47.141	0.600	1.857	1.755	0.102	462.2	500	7.94	50.0

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
1.000	1.003	197.0	9.3	1.258	1.237	0.049	0.0	73	0.521
1.001	1.007	197.6	31.1	1.237	1.244	0.164	0.0	133	0.742
1.002	1.008	198.0	73.0	1.244	1.159	0.385	0.0	209	0.934
1.003	1.019	200.1	80.1	1.159	1.198	0.422	0.0	219	0.964
1.004	1.003	197.0	87.7	1.198	1.123	0.462	0.0	234	0.976
1.005	1.045	205.2	101.9	1.123	1.134	0.537	0.0	249	1.043
1.006	1.061	208.2	101.9	1.134	1.143	0.537	0.0	247	1.055
1.007	1.004	197.1	106.8	1.143	1.345	0.563	0.0	262	1.023

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
1.008	10	11	29.664	0.600	1.755	1.691	0.064	463.5	500	8.43	50.0
1.009	11	12	27.136	0.600	1.691	1.632	0.059	459.9	500	8.88	50.0
1.010	12	13	6.058	0.600	1.632	1.618	0.014	432.7	500	8.98	50.0
1.011	13	14	5.000	0.600	1.568	1.557	0.011	454.5	500	9.06	50.0
1.012	14	HW1	12.110	0.600	1.557	1.530	0.027	448.5	500	9.26	50.0
2.000	2	J1	13.288	0.600	2.062	2.033	0.029	458.2	500	5.22	50.0
3.000	3	4	6.753	0.600	1.991	1.976	0.015	450.2	500	5.11	50.0

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
1.008	1.002	196.8	133.8	1.345	1.409	0.705	0.0	303	1.074
1.009	1.006	197.5	147.6	1.409	1.568	0.778	0.0	324	1.099
1.010	1.038	203.7	168.3	1.568	1.482	0.887	0.0	348	1.154
1.011	1.012	198.7	168.3	1.532	1.503	0.887	0.0	355	1.130
1.012	1.019	200.1	168.3	1.503	0.620	0.887	0.0	353	1.136
2.000	1.008	197.9	21.8	1.208	1.237	0.115	0.0	111	0.671
3.000	1.017	199.7	16.5	1.249	1.244	0.087	0.0	96	0.624

Pipeline Schedule

Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
1.000	50.434	462.7	500	Circular	3.900	2.142	1.258	3.770	2.033	1.237
1.001	26.191	459.5	500	Circular	3.770	2.033	1.237	3.720	1.976	1.244
1.002	16.024	457.8	500	Circular	3.720	1.976	1.244	3.600	1.941	1.159
1.003	17.493	448.5	500	Circular	3.600	1.941	1.159	3.600	1.902	1.198
1.004	11.559	462.4	500	Circular	3.600	1.902	1.198	3.500	1.877	1.123
1.005	4.694	426.7	500	Circular	3.500	1.877	1.123	3.500	1.866	1.134
1.006	3.730	414.4	500	Circular	3.500	1.866	1.134	3.500	1.857	1.143
1.007	47.141	462.2	500	Circular	3.500	1.857	1.143	3.600	1.755	1.345
1.008	29.664	463.5	500	Circular	3.600	1.755	1.345	3.600	1.691	1.409
1.009	27.136	459.9	500	Circular	3.600	1.691	1.409	3.700	1.632	1.568
1.010	6.058	432.7	500	Circular	3.700	1.632	1.568	3.600	1.618	1.482
1.011	5.000	454.5	500	Circular	3.600	1.568	1.532	3.560	1.557	1.503
1.012	12.110	448.5	500	Circular	3.560	1.557	1.503	2.650	1.530	0.620

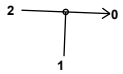
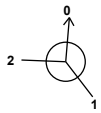
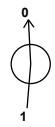
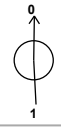
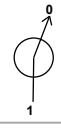
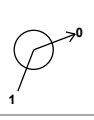
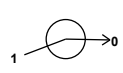
Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
1.000	1	1500	Manhole	Adoptable	J1		Junction	
1.001	J1		Junction		4	1800	Manhole	Adoptable
1.002	4	1800	Manhole	Adoptable	5	1500	Manhole	Adoptable
1.003	5	1500	Manhole	Adoptable	6	1500	Manhole	Adoptable
1.004	6	1500	Manhole	Adoptable	7	1500	Manhole	Adoptable
1.005	7	1500	Manhole	Adoptable	8	1500	Manhole	Adoptable
1.006	8	1500	Manhole	Adoptable	9	1500	Manhole	Adoptable
1.007	9	1500	Manhole	Adoptable	10	1500	Manhole	Adoptable
1.008	10	1500	Manhole	Adoptable	11	1500	Manhole	Adoptable
1.009	11	1500	Manhole	Adoptable	12	1500	Manhole	Adoptable
1.010	12	1500	Manhole	Adoptable	13	1500	Manhole	Adoptable
1.011	13	1500	Manhole	Adoptable	14	1500	Manhole	Adoptable
1.012	14	1500	Manhole	Adoptable	HW1	1500	Manhole	Adoptable

Pipeline Schedule

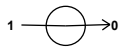
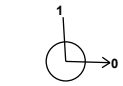
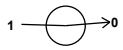
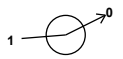
Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
2.000	13.288	458.2	500	Circular	3.770	2.062	1.208	3.770	2.033	1.237
3.000	6.753	450.2	500	Circular	3.740	1.991	1.249	3.720	1.976	1.244

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
2.000	2	1500	Manhole	Adoptable	J1		Junction	
3.000	3	1500	Manhole	Adoptable	4	1800	Manhole	Adoptable

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
1	535589.844	324137.303	3.900	1.758	1500				
						0	1.000	2.142	500
J1	535640.240	324135.339	3.770	1.737		1	2.000	2.033	500
						 2	1.000	2.033	500
						0	1.001	2.033	500
2	535639.723	324122.061	3.770	1.708	1500				
						0	2.000	2.062	500
3	535670.526	324128.964	3.740	1.749	1500				
						0	3.000	1.991	500
4	535666.411	324134.319	3.720	1.744	1800	 1	3.000	1.976	500
						2	1.001	1.976	500
						0	1.002	1.976	500
5	535667.733	324150.288	3.600	1.659	1500	 1	1.002	1.941	500
						0	1.003	1.941	500
6	535666.824	324167.757	3.600	1.698	1500	 1	1.003	1.902	500
						0	1.004	1.902	500
7	535666.991	324179.315	3.500	1.623	1500	 1	1.004	1.877	500
						0	1.005	1.877	500
8	535668.671	324183.698	3.500	1.634	1500	 1	1.005	1.866	500
						0	1.006	1.866	500
9	535672.157	324185.024	3.500	1.643	1500	 1	1.006	1.857	500
						0	1.007	1.857	500

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
10	535719.289	324184.114	3.600	1.845	1500	1	1.007	1.755	500
									
						0	1.008	1.755	500
11	535748.940	324185.002	3.600	1.909	1500	1	1.008	1.691	500
									
						0	1.009	1.691	500
12	535750.548	324157.914	3.700	2.068	1500		1.009	1.632	500
						0	1.010	1.632	500
13	535756.603	324157.737	3.600	2.032	1500	1	1.010	1.618	500
									
						0	1.011	1.568	500
14	535761.587	324158.138	3.560	2.003	1500	1	1.011	1.557	500
									
						0	1.012	1.557	500
HW1	535772.426	324163.538	2.650	1.120	1500	1	1.012	1.530	500
									

Simulation Settings

Rainfall Methodology	FSR	Analysis Speed	Detailed
FSR Region	England and Wales	Skip Steady State	x
M5-60 (mm)	20.000	Drain Down Time (mins)	240
Ratio-R	0.400	Additional Storage (m³/ha)	0.0
Summer CV	0.750	Check Discharge Rate(s)	x
Winter CV	0.840	Check Discharge Volume	x

Storm Durations

15	30	60	120	180	240	360	480	600	720	960	1440

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
1	0	0	0
30	0	0	0
100	0	0	0
100	40	10	0

Node 13 Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	✓	Sump Available	✓
Invert Level (m)	1.568	Product Number	CTL-SHE-0103-5000-1200-5000
Design Depth (m)	1.200	Min Outlet Diameter (m)	0.150
Design Flow (l/s)	5.0	Min Node Diameter (mm)	1200

Node 13 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	1.755
Side Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Time to half empty (mins)	

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	530.0	0.0	1.100	530.0	0.0	1.101	0.0	0.0

Node 5 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	2.280
Side Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Time to half empty (mins)	7

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	57.0	0.0	0.400	57.0	0.0	0.401	0.0	0.0

Results for 1 year Critical Storm Duration. Lowest mass balance: 99.79%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	1	11	2.204	0.062	6.9	0.1087	0.0000	OK
15 minute winter	J1	12	2.174	0.141	21.7	0.0000	0.0000	OK
15 minute winter	2	12	2.177	0.115	16.2	0.2041	0.0000	OK
15 minute winter	3	12	2.169	0.178	12.3	0.3139	0.0000	OK
15 minute winter	4	12	2.168	0.192	47.6	0.4891	0.0000	OK
15 minute winter	5	12	2.147	0.206	50.8	0.3643	0.0000	OK
15 minute winter	6	12	2.128	0.226	54.5	0.3986	0.0000	OK
15 minute winter	7	12	2.110	0.233	62.8	0.4118	0.0000	OK
15 minute winter	8	12	2.089	0.223	62.7	0.3941	0.0000	OK
15 minute winter	9	12	2.064	0.207	65.6	0.3662	0.0000	OK
15 minute winter	10	12	1.998	0.243	80.9	0.4296	0.0000	OK
15 minute winter	11	12	1.943	0.252	87.5	0.4450	0.0000	OK
180 minute winter	12	172	1.903	0.271	30.1	0.4781	0.0000	OK
180 minute winter	13	172	1.903	0.335	29.6	79.0355	0.0000	OK
180 minute winter	14	172	1.612	0.055	5.0	0.0978	0.0000	OK
180 minute winter	HW1	172	1.576	0.046	5.0	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)
15 minute winter	1	1.000	J1	6.6	0.271	0.033	1.4725	
15 minute winter	J1	1.001	4	20.1	0.394	0.102	1.5017	
15 minute winter	2	2.000	J1	15.3	0.549	0.077	0.5286	
15 minute winter	3	3.000	4	11.2	0.242	0.056	0.4441	
15 minute winter	4	1.002	5	45.9	0.653	0.232	1.1644	
15 minute winter	5	1.003	6	49.8	0.625	0.249	1.4145	
15 minute winter	6	1.004	7	54.4	0.621	0.276	1.0115	
15 minute winter	7	1.005	8	62.7	0.733	0.306	0.4078	
15 minute winter	8	1.006	9	62.7	0.788	0.301	0.3003	
15 minute winter	9	1.007	10	65.3	0.764	0.331	4.0301	
15 minute winter	10	1.008	11	79.5	0.823	0.404	2.8641	
15 minute winter	11	1.009	12	86.5	0.892	0.438	2.6498	
180 minute winter	12	1.010	13	29.6	0.415	0.145	0.6755	
180 minute winter	13	Hydro-Brake®	14	5.0				
180 minute winter	14	1.012	HW1	5.0	0.482	0.025	0.1248	115.1

Results for 30 year Critical Storm Duration. Lowest mass balance: 99.79%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	1	11	2.346	0.204	17.0	0.3607	0.0000	OK
15 minute winter	J1	12	2.341	0.308	50.0	0.0000	0.0000	OK
15 minute winter	2	12	2.342	0.280	39.8	0.4940	0.0000	OK
15 minute winter	3	12	2.339	0.348	30.1	0.6142	0.0000	OK
15 minute winter	4	12	2.338	0.362	111.5	0.9220	0.0000	OK
15 minute winter	5	13	2.322	0.381	117.2	3.1163	0.0000	OK
15 minute winter	6	13	2.303	0.401	113.0	0.7077	0.0000	OK
15 minute winter	7	12	2.284	0.407	129.7	0.7186	0.0000	OK
15 minute winter	8	12	2.263	0.397	130.4	0.7020	0.0000	OK
15 minute winter	9	12	2.242	0.385	136.3	0.6809	0.0000	OK
15 minute winter	10	12	2.186	0.431	171.9	0.7612	0.0000	OK
240 minute winter	11	236	2.182	0.491	47.2	0.8667	0.0000	OK
240 minute winter	12	236	2.182	0.550	52.9	0.9711	0.0000	SURCHARGED
240 minute winter	13	236	2.182	0.614	52.1	227.4178	0.0000	SURCHARGED
60 minute summer	14	282	1.612	0.055	5.0	0.0981	0.0000	OK
60 minute summer	HW1	282	1.576	0.046	5.0	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)
15 minute winter	1	1.000	J1	16.0	0.282	0.081	4.9909	
15 minute winter	J1	1.001	4	49.2	0.451	0.249	3.6444	
15 minute winter	2	2.000	J1	36.9	0.634	0.186	1.5876	
15 minute winter	3	3.000	4	28.2	0.274	0.141	1.0031	
15 minute winter	4	1.002	5	107.2	0.706	0.541	2.4923	
15 minute winter	5	1.003	6	105.1	0.677	0.525	2.8707	
15 minute winter	6	1.004	7	114.5	0.706	0.581	1.9551	
15 minute winter	7	1.005	8	130.4	0.840	0.635	0.7915	
15 minute winter	8	1.006	9	131.1	0.876	0.630	0.6129	
15 minute winter	9	1.007	10	139.0	0.856	0.705	8.0418	
15 minute winter	10	1.008	11	171.6	0.975	0.872	5.3081	
240 minute winter	11	1.009	12	45.9	0.433	0.233	5.2961	
240 minute winter	12	1.010	13	52.1	0.418	0.256	1.1850	
240 minute winter	13	Hydro-Brake®	14	5.0				
60 minute summer	14	1.012	HW1	5.0	0.483	0.025	0.1253	87.2

Results for 100 year Critical Storm Duration. Lowest mass balance: 99.79%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	1	13	2.451	0.309	23.1	0.5458	0.0000	OK
15 minute winter	J1	13	2.444	0.411	63.9	0.0000	0.0000	OK
15 minute winter	2	13	2.444	0.382	51.6	0.6750	0.0000	OK
15 minute winter	3	13	2.437	0.446	39.1	0.7883	0.0000	OK
15 minute winter	4	13	2.437	0.461	148.5	1.1731	0.0000	OK
15 minute winter	5	13	2.420	0.479	155.8	8.8781	0.0000	OK
15 minute winter	6	12	2.400	0.498	139.3	0.8798	0.0000	OK
15 minute winter	7	12	2.382	0.505	154.8	0.8921	0.0000	SURCHARGED
15 minute winter	8	12	2.364	0.498	156.3	0.8792	0.0000	OK
360 minute winter	9	352	2.347	0.490	32.3	0.8650	0.0000	OK
360 minute winter	10	352	2.347	0.592	40.0	1.0453	0.0000	SURCHARGED
360 minute winter	11	352	2.347	0.656	42.9	1.1584	0.0000	SURCHARGED
360 minute winter	12	352	2.347	0.715	48.5	1.2627	0.0000	SURCHARGED
360 minute winter	13	352	2.347	0.779	47.8	315.1877	0.0000	SURCHARGED
15 minute summer	14	140	1.612	0.055	5.0	0.0981	0.0000	OK
15 minute summer	HW1	140	1.576	0.046	5.0	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)
15 minute winter	1	1.000	J1	20.0	0.282	0.102	7.5418	
15 minute winter	J1	1.001	4	57.4	0.474	0.290	4.7248	
15 minute winter	2	2.000	J1	48.0	0.662	0.242	2.2100	
15 minute winter	3	3.000	4	35.6	0.300	0.178	1.2593	
15 minute winter	4	1.002	5	140.2	0.786	0.708	3.0569	
15 minute winter	5	1.003	6	132.1	0.712	0.660	3.3947	
15 minute winter	6	1.004	7	141.4	0.750	0.718	2.2598	
15 minute winter	7	1.005	8	156.3	0.853	0.762	0.9176	
15 minute winter	8	1.006	9	157.6	0.888	0.757	0.7273	
360 minute winter	9	1.007	10	31.3	0.550	0.159	9.1973	
360 minute winter	10	1.008	11	38.4	0.464	0.195	5.8026	
360 minute winter	11	1.009	12	41.8	0.334	0.211	5.3081	
360 minute winter	12	1.010	13	47.8	0.355	0.235	1.1850	
360 minute winter	13	Hydro-Brake®	14	5.0				
15 minute summer	14	1.012	HW1	5.0	0.483	0.025	0.1253	75.0

Results for 100 year +40% CC +10% A Critical Storm Duration. Lowest mass balance: 99.79%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	1	12	3.410	1.268	71.6	2.2408	0.0000	SURCHARGED
15 minute winter	J1	12	3.415	1.382	89.7	0.0000	0.0000	SURCHARGED
15 minute winter	2	12	3.409	1.347	79.5	2.3797	0.0000	SURCHARGED
15 minute winter	3	13	3.350	1.359	60.2	2.4021	0.0000	SURCHARGED
15 minute winter	4	12	3.356	1.380	188.3	3.5131	0.0000	SURCHARGED
15 minute winter	5	12	3.309	1.368	205.3	25.2735	0.0000	FLOOD RISK
15 minute winter	6	12	3.256	1.354	220.0	2.3919	0.0000	SURCHARGED
15 minute winter	7	12	3.209	1.332	255.8	2.3531	0.0000	FLOOD RISK
15 minute winter	8	12	3.155	1.289	259.1	2.2770	0.0000	SURCHARGED
15 minute winter	9	12	3.101	1.244	272.7	2.1987	0.0000	SURCHARGED
15 minute winter	10	12	2.851	1.096	339.0	1.9359	0.0000	SURCHARGED
720 minute winter	11	705	2.773	1.082	35.0	1.9123	0.0000	SURCHARGED
720 minute winter	12	705	2.773	1.141	40.8	2.0165	0.0000	SURCHARGED
720 minute winter	13	705	2.773	1.205	40.7	542.0400	0.0000	SURCHARGED
1440 minute winter	14	600	1.612	0.055	5.0	0.0981	0.0000	OK
1440 minute winter	HW1	600	1.576	0.046	5.0	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)
15 minute winter	1	1.000	J1	-37.7	0.291	-0.192	9.8654	
15 minute winter	J1	1.001	4	74.5	0.420	0.377	5.1232	
15 minute winter	2	2.000	J1	77.0	0.787	0.389	2.5993	
15 minute winter	3	3.000	4	71.9	0.368	0.360	1.3209	
15 minute winter	4	1.002	5	183.4	0.937	0.926	3.1344	
15 minute winter	5	1.003	6	204.1	1.044	1.020	3.4218	
15 minute winter	6	1.004	7	225.6	1.154	1.145	2.2610	
15 minute winter	7	1.005	8	259.1	1.325	1.263	0.9182	
15 minute winter	8	1.006	9	262.4	1.341	1.260	0.7296	
15 minute winter	9	1.007	10	276.0	1.411	1.401	9.2212	
15 minute winter	10	1.008	11	336.8	1.722	1.712	5.8026	
720 minute winter	11	1.009	12	34.9	0.332	0.177	5.3081	
720 minute winter	12	1.010	13	40.7	0.302	0.200	1.1850	
720 minute winter	13	Hydro-Brake®	14	5.0				
1440 minute winter	14	1.012	HW1	5.0	0.483	0.025	0.1253	445.2

Design Settings

Rainfall Methodology	FSR	Maximum Time of Concentration (mins)	30.00
Return Period (years)	100	Maximum Rainfall (mm/hr)	50.0
Additional Flow (%)	40	Minimum Velocity (m/s)	1.00
FSR Region	England and Wales	Connection Type	Level Soffits
M5-60 (mm)	20.000	Minimum Backdrop Height (m)	2.000
Ratio-R	0.400	Preferred Cover Depth (m)	1.200
CV	0.750	Include Intermediate Ground	✓
Time of Entry (mins)	5.00	Enforce best practice design rules	✓

Circular Link Type

Shape	Circular	Auto Increment (mm)	75
Barrels	1	Follow Ground	x

Available Diameters (mm)

100 | 150

Swale Link Type

Shape	Trapezoidal	Side Slope (1:X)	3.0	Follow Ground	✓
Barrels	1	Auto Increment (mm)	50	Velocity	Manning
Width (mm)	9500	Preferred Cover (m)	0.300	ks (mm) / n	0.030

Available Diameters (mm)

1200

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
HW1	0.000	5.00	3.350		535364.636	324003.934	1.330
1	0.127	5.00	3.900	1500	535201.616	324166.964	1.460
2	0.095	5.00	3.900	1500	535200.932	324150.854	1.496
3	0.000	5.00	3.900	1200	535199.902	324145.220	1.509
4	0.080	5.00	3.800	1500	535192.284	324119.300	1.469
5	0.036	5.00	3.900	1500	535118.182	324114.248	1.437
6	0.037	5.00	3.900	1500	535121.494	324116.614	1.446
7	0.000	5.00	3.900	1500	535135.768	324115.016	1.478
8	0.113	5.00	3.800	1500	535169.012	324111.310	1.454
9	0.055	5.00	3.800	1800	535189.172	324106.347	1.499
10	0.154	5.00	3.650	1500	535236.390	324086.309	1.463
11	0.058	5.00	3.650	1500	535227.851	324066.256	1.511
12	0.033	5.00	3.700	1500	535282.330	324054.782	1.459
13	0.000	5.00	3.650	1500	535258.999	324052.993	1.461
14	0.088	5.00	3.650	1500	535243.220	324054.301	1.496
15	0.000	5.00	3.600	1500	535232.563	324058.528	1.471
16	0.000	5.00	3.600	1800	535229.671	324058.678	1.478
17	0.000	5.00	3.600	1500	535226.761	324056.828	1.486
18	0.111	5.00	3.500	1500	535210.248	324018.269	1.580
19	0.110	5.00	3.600	1500	535111.496	324056.374	1.410
20	0.085	5.00	3.600	1500	535135.750	324053.077	1.464
21	0.000	5.00	3.570	1500	535139.904	324049.771	1.446
22	0.081	5.00	3.500	1500	535172.234	324017.280	1.578
24	0.084	5.00	3.350	1800	535192.820	324012.261	1.470

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
25	0.044	5.00	3.500	1500	535098.389	323997.472	1.375
26	0.098	5.00	3.500	1500	535093.213	323960.507	1.459
27	0.218	5.00	3.350	1800	535169.125	323949.878	1.481
28	0.106	5.00	3.400	1500	535174.424	323988.567	1.443
29	0.045	5.00	3.350	1500	535166.964	323933.942	1.445
S31	0.067	5.00	3.605	1500	535279.969	324012.530	1.400
S32	0.000		3.500	1500	535213.589	324010.525	1.459
S33	0.141	5.00	3.600	1350	535297.504	324013.054	1.256
S34	0.000		3.300	1350	535364.241	324015.071	1.234
HW3	0.000	5.00	3.300		535197.122	323998.705	1.448
HW4	0.000		3.100		535185.389	323947.587	1.302
HW5	0.000	5.00	3.100		535184.272	323927.970	1.323
30	0.000	5.00	3.350		535183.587	323922.812	1.650
HW6	0.000		3.100		535182.928	323917.850	1.485

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
9.000_1	1	2	16.125	0.600	2.440	2.404	0.036	447.9	500	5.16	50.0
9.001	2	3	5.727	0.600	2.404	2.391	0.013	440.6	500	5.23	50.0
9.002	3	4	27.016	0.600	2.391	2.331	0.060	450.3	500	5.55	50.0
9.003	4	9	13.322	0.600	2.331	2.301	0.030	444.1	500	5.61	50.0
8.004	9	10	51.294	0.600	2.301	2.187	0.114	449.9	500	6.32	50.0
8.005	10	11	21.795	0.600	2.187	2.139	0.048	454.1	500	6.62	50.0
8.006	11	16	7.793	0.600	2.139	2.122	0.017	458.4	500	6.68	50.0
8.007	16	17	3.448	0.600	2.122	2.114	0.008	431.0	500	6.74	50.0
1.008_1	17	18	41.946	0.600	2.114	2.020	0.094	446.2	500	7.44	50.0
1.009_1	18	24	18.435	0.600	1.920	1.880	0.040	460.9	600	7.48	50.0
1.011_1	24	HW3	14.222	0.600	1.880	1.852	0.028	507.9	600	7.77	50.0
1.000	5	6	4.070	0.600	2.463	2.454	0.009	452.3	500	5.02	50.0
1.001	6	7	14.363	0.600	2.454	2.422	0.032	448.8	500	5.13	50.0
1.002	7	8	33.450	0.600	2.422	2.346	0.076	440.1	500	5.39	50.0

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
9.000_1	1.020	200.2	24.1	0.960	0.996	0.127	0.0	116	0.695
9.001	1.028	201.9	42.1	0.996	1.009	0.222	0.0	154	0.818
9.002	1.017	199.7	42.1	1.009	0.969	0.222	0.0	155	0.812
9.003	1.024	201.1	57.3	0.969	0.999	0.302	0.0	182	0.888
8.004	1.017	199.8	103.0	0.999	0.963	0.543	0.0	254	1.024
8.005	1.013	198.8	132.2	0.963	1.011	0.697	0.0	298	1.080
8.006	1.008	197.9	143.2	1.011	0.978	0.755	0.0	316	1.094
8.007	1.040	204.1	166.2	0.978	0.986	0.876	0.0	344	1.153
1.008_1	1.022	200.6	166.2	0.986	0.980	0.876	0.0	349	1.136
1.009_1	1.127	318.8	200.0	0.980	0.870	1.054	0.0	345	1.188
1.011_1	1.073	303.5	268.3	0.870	0.848	1.414	0.0	441	1.204
1.000	1.015	199.2	6.8	0.937	0.946	0.036	0.0	63	0.482
1.001	1.019	200.0	13.9	0.946	0.978	0.073	0.0	88	0.594
1.002	1.029	202.0	13.9	0.978	0.954	0.073	0.0	87	0.596

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
1.003	8	9	20.762	0.600	2.346	2.301	0.045	461.4	500	5.60	50.0
3.000	12	13	23.399	0.600	2.241	2.189	0.052	450.0	500	5.14	50.0
3.001	13	14	15.833	0.600	2.189	2.154	0.035	452.4	500	5.23	50.0
3.002	14	15	11.465	0.600	2.154	2.129	0.025	458.6	500	5.35	50.0
3.003	15	16	2.896	0.600	2.129	2.122	0.007	413.7	500	5.37	50.0
4.000	19	20	24.477	0.600	2.190	2.136	0.054	453.3	500	5.14	50.0
4.001	20	21	5.309	0.600	2.136	2.124	0.012	442.4	500	5.18	50.0
4.002	21	22	45.836	0.600	2.124	2.022	0.102	449.4	500	5.45	50.0
4.003	22	24	21.189	0.600	1.922	1.880	0.042	504.5	600	5.56	50.0
6.000_1	25	26	37.326	0.600	2.125	2.041	0.084	444.4	500	5.22	50.0
6.001	26	27	76.653	0.600	2.041	1.869	0.172	445.7	500	5.67	50.0
6.002	27	HW4	16.425	0.600	1.869	1.798	0.071	231.3	500	5.70	50.0
7.000_1	28	27	39.050	0.600	1.957	1.869	0.088	443.8	500	5.14	50.0
8.000_1	29	27	16.082	0.600	1.905	1.869	0.036	446.7	500	5.04	50.0
5.000	S31	S32	66.410	0.600	2.205	2.041	0.164	404.9	500	6.11	50.0
5.001	S32	18	8.434	0.600	2.041	2.020	0.021	401.6	500	6.25	50.0
1.000_1	S33	S34	66.767	0.600	2.344	2.066	0.278	240.2	300	6.11	50.0
1.001_1	S34	HW1	11.144	0.600	2.066	2.020	0.046	242.3	300	6.30	50.0
6.000	HW1	HW3	167.596	0.600	2.020	1.852	0.168	997.6	1200	7.75	50.0
1.007	HW3	HW4	52.447	0.030	1.852	1.798	0.054	971.2	1200	7.94	50.0
1.008	HW4	HW5	19.649	0.030	1.798	1.777	0.021	935.7	1200	8.15	50.0
1.012	HW5	30	5.203	0.030	1.777	1.750	0.027	192.7	600	8.82	50.0
1.013	30	HW6	5.006	0.030	1.700	1.615	0.085	58.9	600	8.87	50.0

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
1.003	1.005	197.2	35.3	0.954	0.999	0.186	0.0	142	0.766
3.000	1.017	199.7	6.3	0.959	0.961	0.033	0.0	60	0.469
3.001	1.015	199.2	6.3	0.961	0.996	0.033	0.0	60	0.468
3.002	1.008	197.8	23.0	0.996	0.971	0.121	0.0	114	0.680
3.003	1.062	208.4	23.0	0.971	0.978	0.121	0.0	111	0.706
4.000	1.014	199.0	20.9	0.910	0.964	0.110	0.0	108	0.664
4.001	1.026	201.5	37.0	0.964	0.946	0.195	0.0	144	0.789
4.002	1.018	199.9	37.0	0.946	0.978	0.195	0.0	145	0.785
4.003	1.077	304.5	52.4	0.978	0.870	0.276	0.0	167	0.815
6.000_1	1.024	201.0	8.3	0.875	0.959	0.044	0.0	69	0.514
6.001	1.022	200.7	26.9	0.959	0.981	0.142	0.0	123	0.720
6.002	1.424	279.5	97.0	0.981	0.802	0.511	0.0	203	1.299
7.000_1	1.025	201.2	20.1	0.943	0.981	0.106	0.0	106	0.664
8.000_1	1.021	200.5	8.5	0.945	0.981	0.045	0.0	70	0.517
5.000	1.073	210.7	12.7	0.900	0.959	0.067	0.0	83	0.601
5.001	1.078	211.6	12.7	0.959	0.980	0.067	0.0	83	0.604
1.000_1	1.010	71.4	26.8	0.956	0.934	0.141	0.0	127	0.939
1.001_1	1.005	71.1	26.8	0.934	1.030	0.141	0.0	127	0.937
6.000	2.330	36627.4	26.8	0.130	0.248	0.141	0.0	16	0.173
1.007	1.012	15903.1	295.0	0.248	0.102	1.555	0.0	119	0.252
1.008	1.031	16202.8	392.0	0.102	0.123	2.066	0.0	139	0.284
1.012	1.533	10391.7	392.0	0.723	1.000	2.066	0.0	87	0.462
1.013	2.773	18798.6	392.0	1.050	0.885	2.066	0.0	61	0.666

Pipeline Schedule

Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
9.000_1	16.125	447.9	500	Circular	3.900	2.440	0.960	3.900	2.404	0.996
9.001	5.727	440.6	500	Circular	3.900	2.404	0.996	3.900	2.391	1.009
9.002	27.016	450.3	500	Circular	3.900	2.391	1.009	3.800	2.331	0.969
9.003	13.322	444.1	500	Circular	3.800	2.331	0.969	3.800	2.301	0.999
8.004	51.294	449.9	500	Circular	3.800	2.301	0.999	3.650	2.187	0.963
8.005	21.795	454.1	500	Circular	3.650	2.187	0.963	3.650	2.139	1.011
8.006	7.793	458.4	500	Circular	3.650	2.139	1.011	3.600	2.122	0.978
8.007	3.448	431.0	500	Circular	3.600	2.122	0.978	3.600	2.114	0.986
1.008_1	41.946	446.2	500	Circular	3.600	2.114	0.986	3.500	2.020	0.980
1.009_1	18.435	460.9	600	Circular	3.500	1.920	0.980	3.350	1.880	0.870
1.011_1	14.222	507.9	600	Circular	3.350	1.880	0.870	3.300	1.852	0.848
1.000	4.070	452.3	500	Circular	3.900	2.463	0.937	3.900	2.454	0.946
1.001	14.363	448.8	500	Circular	3.900	2.454	0.946	3.900	2.422	0.978
1.002	33.450	440.1	500	Circular	3.900	2.422	0.978	3.800	2.346	0.954
1.003	20.762	461.4	500	Circular	3.800	2.346	0.954	3.800	2.301	0.999
3.000	23.399	450.0	500	Circular	3.700	2.241	0.959	3.650	2.189	0.961
3.001	15.833	452.4	500	Circular	3.650	2.189	0.961	3.650	2.154	0.996
3.002	11.465	458.6	500	Circular	3.650	2.154	0.996	3.600	2.129	0.971
3.003	2.896	413.7	500	Circular	3.600	2.129	0.971	3.600	2.122	0.978
4.000	24.477	453.3	500	Circular	3.600	2.190	0.910	3.600	2.136	0.964
4.001	5.309	442.4	500	Circular	3.600	2.136	0.964	3.570	2.124	0.946
4.002	45.836	449.4	500	Circular	3.570	2.124	0.946	3.500	2.022	0.978
4.003	21.189	504.5	600	Circular	3.500	1.922	0.978	3.350	1.880	0.870
6.000_1	37.326	444.4	500	Circular	3.500	2.125	0.875	3.500	2.041	0.959
6.001	76.653	445.7	500	Circular	3.500	2.041	0.959	3.350	1.869	0.981

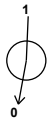
Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
9.000_1	1	1500	Manhole	Adoptable	2	1500	Manhole	Adoptable
9.001	2	1500	Manhole	Adoptable	3	1200	Manhole	Adoptable
9.002	3	1200	Manhole	Adoptable	4	1500	Manhole	Adoptable
9.003	4	1500	Manhole	Adoptable	9	1800	Manhole	Adoptable
8.004	9	1800	Manhole	Adoptable	10	1500	Manhole	Adoptable
8.005	10	1500	Manhole	Adoptable	11	1500	Manhole	Adoptable
8.006	11	1500	Manhole	Adoptable	16	1800	Manhole	Adoptable
8.007	16	1800	Manhole	Adoptable	17	1500	Manhole	Adoptable
1.008_1	17	1500	Manhole	Adoptable	18	1500	Manhole	Adoptable
1.009_1	18	1500	Manhole	Adoptable	24	1800	Manhole	Adoptable
1.011_1	24	1800	Manhole	Adoptable	HW3		Junction	
1.000	5	1500	Manhole	Adoptable	6	1500	Manhole	Adoptable
1.001	6	1500	Manhole	Adoptable	7	1500	Manhole	Adoptable
1.002	7	1500	Manhole	Adoptable	8	1500	Manhole	Adoptable
1.003	8	1500	Manhole	Adoptable	9	1800	Manhole	Adoptable
3.000	12	1500	Manhole	Adoptable	13	1500	Manhole	Adoptable
3.001	13	1500	Manhole	Adoptable	14	1500	Manhole	Adoptable
3.002	14	1500	Manhole	Adoptable	15	1500	Manhole	Adoptable
3.003	15	1500	Manhole	Adoptable	16	1800	Manhole	Adoptable
4.000	19	1500	Manhole	Adoptable	20	1500	Manhole	Adoptable
4.001	20	1500	Manhole	Adoptable	21	1500	Manhole	Adoptable
4.002	21	1500	Manhole	Adoptable	22	1500	Manhole	Adoptable
4.003	22	1500	Manhole	Adoptable	24	1800	Manhole	Adoptable
6.000_1	25	1500	Manhole	Adoptable	26	1500	Manhole	Adoptable
6.001	26	1500	Manhole	Adoptable	27	1800	Manhole	Adoptable

Pipeline Schedule

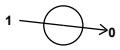
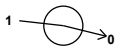
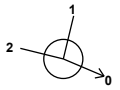
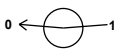
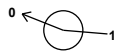
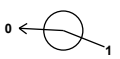
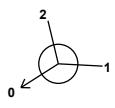
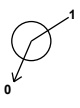
Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
6.002	16.425	231.3	500	Circular	3.350	1.869	0.981	3.100	1.798	0.802
7.000_1	39.050	443.8	500	Circular	3.400	1.957	0.943	3.350	1.869	0.981
8.000_1	16.082	446.7	500	Circular	3.350	1.905	0.945	3.350	1.869	0.981
5.000	66.410	404.9	500	Circular	3.605	2.205	0.900	3.500	2.041	0.959
5.001	8.434	401.6	500	Circular	3.500	2.041	0.959	3.500	2.020	0.980
1.000_1	66.767	240.2	300	Circular	3.600	2.344	0.956	3.300	2.066	0.934
1.001_1	11.144	242.3	300	Circular	3.300	2.066	0.934	3.350	2.020	1.030
6.000	167.596	997.6	1200	Swale	3.350	2.020	0.130	3.300	1.852	0.248
1.007	52.447	971.2	1200	Swale	3.300	1.852	0.248	3.100	1.798	0.102
1.008	19.649	935.7	1200	Swale	3.100	1.798	0.102	3.100	1.777	0.123
1.012	5.203	192.7	600	Swale	3.100	1.777	0.723	3.350	1.750	1.000
1.013	5.006	58.9	600	Swale	3.350	1.700	1.050	3.100	1.615	0.885

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
6.002	27	1800	Manhole	Adoptable	HW4		Junction	
7.000_1	28	1500	Manhole	Adoptable	27	1800	Manhole	Adoptable
8.000_1	29	1500	Manhole	Adoptable	27	1800	Manhole	Adoptable
5.000	S31	1500	Manhole	Adoptable	S32	1500	Manhole	Adoptable
5.001	S32	1500	Manhole	Adoptable	18	1500	Manhole	Adoptable
1.000_1	S33	1350	Manhole	Adoptable	S34	1350	Manhole	Adoptable
1.001_1	S34	1350	Manhole	Adoptable	HW1		Junction	
6.000	HW1		Junction		HW3		Junction	
1.007	HW3		Junction		HW4		Junction	
1.008	HW4		Junction		HW5		Junction	
1.012	HW5		Junction		30		Junction	
1.013	30		Junction		HW6		Junction	

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections		Link	IL (m)	Dia (mm)
HW1	535364.636	324003.934	3.350	1.330			1	1.001_1	2.020	300
							0	6.000	2.020	1200
1	535201.616	324166.964	3.900	1.460	1500		0	9.000_1	2.440	500
2	535200.932	324150.854	3.900	1.496	1500		1	9.000_1	2.404	500
							0	9.001	2.404	500
3	535199.902	324145.220	3.900	1.509	1200		1	9.001	2.391	500
							0	9.002	2.391	500
4	535192.284	324119.300	3.800	1.469	1500		1	9.002	2.331	500
							0	9.003	2.331	500

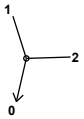
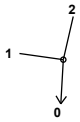
Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
5	535118.182	324114.248	3.900	1.437	1500				
						0	1.000	2.463	500
6	535121.494	324116.614	3.900	1.446	1500	1	1.000	2.454	500
									
						0	1.001	2.454	500
7	535135.768	324115.016	3.900	1.478	1500	1	1.001	2.422	500
									
						0	1.002	2.422	500
8	535169.012	324111.310	3.800	1.454	1500	1	1.002	2.346	500
									
						0	1.003	2.346	500
9	535189.172	324106.347	3.800	1.499	1800	1	9.003	2.301	500
						2	1.003	2.301	500
									
						0	8.004	2.301	500
10	535236.390	324086.309	3.650	1.463	1500	1	8.004	2.187	500
									
						0	8.005	2.187	500
11	535227.851	324066.256	3.650	1.511	1500	1	8.005	2.139	500
									
						0	8.006	2.139	500
12	535282.330	324054.782	3.700	1.459	1500				
						0	3.000	2.241	500
13	535258.999	324052.993	3.650	1.461	1500	1	3.000	2.189	500
									
						0	3.001	2.189	500
14	535243.220	324054.301	3.650	1.496	1500	1	3.001	2.154	500
									
						0	3.002	2.154	500
15	535232.563	324058.528	3.600	1.471	1500	1	3.002	2.129	500
									
						0	3.003	2.129	500
16	535229.671	324058.678	3.600	1.478	1800	1	3.003	2.122	500
						2	8.006	2.122	500
									
						0	8.007	2.122	500
17	535226.761	324056.828	3.600	1.486	1500	1	8.007	2.114	500
									
						0	1.008_1	2.114	500

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
18	535210.248	324018.269	3.500	1.580	1500	1	5.001	2.020	500
						2	1.008_1	2.020	500
						0	1.009_1	1.920	600
19	535111.496	324056.374	3.600	1.410	1500	0	4.000	2.190	500
20	535135.750	324053.077	3.600	1.464	1500	1	4.000	2.136	500
						0	4.001	2.136	500
21	535139.904	324049.771	3.570	1.446	1500	1	4.001	2.124	500
						0	4.002	2.124	500
22	535172.234	324017.280	3.500	1.578	1500	1	4.002	2.022	500
						0	4.003	1.922	600
24	535192.820	324012.261	3.350	1.470	1800	1	4.003	1.880	600
						2	1.009_1	1.880	600
						0	1.011_1	1.880	600
25	535098.389	323997.472	3.500	1.375	1500	0	6.000_1	2.125	500
26	535093.213	323960.507	3.500	1.459	1500	1	6.000_1	2.041	500
						0	6.001	2.041	500
27	535169.125	323949.878	3.350	1.481	1800	1	8.000_1	1.869	500
						2	7.000_1	1.869	500
						3	6.001	1.869	500
						0	6.002	1.869	500
28	535174.424	323988.567	3.400	1.443	1500	0	7.000_1	1.957	500
29	535166.964	323933.942	3.350	1.445	1500	0	8.000_1	1.905	500
S31	535279.969	324012.530	3.605	1.400	1500	0	5.000	2.205	500
S32	535213.589	324010.525	3.500	1.459	1500	1	5.000	2.041	500
						0	5.001	2.041	500

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
S33	535297.504	324013.054	3.600	1.256	1350				
						0	1.000_1	2.344	300
S34	535364.241	324015.071	3.300	1.234	1350	1	1.000_1	2.066	300
									
						0	1.001_1	2.066	300
HW3	535197.122	323998.705	3.300	1.448					
						1	1.011_1	1.852	600
						2	6.000	1.852	1200
						0	1.007	1.852	1200
HW4	535185.389	323947.587	3.100	1.302					
						1	6.002	1.798	500
						2	1.007	1.798	1200
						0	1.008	1.798	1200
HW5	535184.272	323927.970	3.100	1.323					
						1	1.008	1.777	1200
						0	1.012	1.777	600
30	535183.587	323922.812	3.350	1.650					
						1	1.012	1.750	600
						0	1.013	1.700	600
HW6	535182.928	323917.850	3.100	1.485					
						1	1.013	1.615	600

Simulation Settings

Rainfall Methodology	FSR	Analysis Speed	Detailed
FSR Region	England and Wales	Skip Steady State	x
M5-60 (mm)	20.000	Drain Down Time (mins)	240
Ratio-R	0.400	Additional Storage (m³/ha)	0.0
Summer CV	0.750	Check Discharge Rate(s)	x
Winter CV	0.840	Check Discharge Volume	x

Storm Durations

15	30	60	120	180	240	360	480	600	720	960	1440

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
1	0	0	0
30	0	0	0
100	0	0	0
100	40	10	0

Node 30 Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	x	Sump Available	✓
Invert Level (m)	1.700	Product Number	CTL-SHE-0077-2500-0900-2500
Design Depth (m)	0.900	Min Outlet Diameter (m)	0.100
Design Flow (l/s)	2.5	Min Node Diameter (mm)	1200

Node 1 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	2.480
Side Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Time to half empty (mins)	6

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	36.0	0.0	0.800	36.0	0.0	0.801	0.0	0.0

Approval Settings

Node Size	✓	Minimum Full Bore Velocity (m/s)	1.000
Node Losses	✓	Maximum Full Bore Velocity (m/s)	3.000
Link Size	✓	Proportional Velocity	✓
Minimum Diameter (mm)	150	Return Period (years)	100
Link Length	✓	Minimum Proportional Velocity (m/s)	0.750
Maximum Length (m)	100.000	Maximum Proportional Velocity (m/s)	3.000
Coordinates	✓	Surcharged Depth	✓
Accuracy (m)	1.000	Return Period (years)	100
Crossings	✓	Maximum Surcharged Depth (m)	0.300
Cover Depth	✓	Flooding	✓
Minimum Cover Depth (m)	1.200	Return Period (years)	30
Maximum Cover Depth (m)	3.000	Time to Half Empty	x
Backdrops	✓	Discharge Rates	✓
Minimum Backdrop Height (m)	2.000	Discharge Volume	✓
Maximum Backdrop Height (m)	1.500	100 year 360 minute (m³)	
Full Bore Velocity	✓		

Results for 1 year Critical Storm Duration. Lowest mass balance: 99.53%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
960 minute winter	HW1	930	2.043	0.023	4.1	0.0000	0.0000	OK
15 minute winter	1	12	2.546	0.106	17.9	2.5852	0.0000	OK
15 minute winter	2	12	2.537	0.133	24.3	0.2353	0.0000	OK
15 minute winter	3	12	2.521	0.130	23.7	0.1466	0.0000	OK
15 minute winter	4	12	2.504	0.173	32.7	0.3056	0.0000	OK
15 minute winter	5	10	2.535	0.072	5.1	0.1280	0.0000	OK
15 minute winter	6	10	2.532	0.078	10.2	0.1382	0.0000	OK
15 minute winter	7	12	2.503	0.081	9.9	0.1427	0.0000	OK
15 minute winter	8	12	2.498	0.152	25.0	0.2678	0.0000	OK
15 minute winter	9	12	2.492	0.191	60.3	0.4860	0.0000	OK
15 minute winter	10	12	2.435	0.248	77.0	0.4377	0.0000	OK
15 minute winter	11	13	2.405	0.266	80.8	0.4705	0.0000	OK
15 minute winter	12	13	2.386	0.145	5.4	0.2554	0.0000	OK
15 minute winter	13	13	2.382	0.193	6.8	0.3413	0.0000	OK
15 minute winter	14	13	2.382	0.228	12.4	0.4022	0.0000	OK
15 minute winter	15	13	2.382	0.253	11.5	0.4468	0.0000	OK
15 minute winter	16	13	2.382	0.260	86.6	0.6610	0.0000	OK
15 minute winter	17	13	2.349	0.235	87.0	0.4157	0.0000	OK
15 minute winter	18	13	2.183	0.263	102.4	0.4643	0.0000	OK
15 minute winter	19	11	2.285	0.095	15.5	0.1686	0.0000	OK
15 minute winter	20	11	2.269	0.133	27.0	0.2359	0.0000	OK
15 minute winter	21	11	2.247	0.123	26.1	0.2181	0.0000	OK
15 minute winter	22	13	2.137	0.215	36.2	0.3797	0.0000	OK
15 minute winter	24	13	2.135	0.255	138.1	0.6497	0.0000	OK
15 minute winter	25	11	2.183	0.058	6.2	0.1026	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	HW1	6.000	HW3	-3.5	0.009	0.000	179.4540	
15 minute winter	1	9.000_1	2	13.7	0.431	0.069	0.5804	
15 minute winter	2	9.001	3	23.7	0.624	0.117	0.2346	
15 minute winter	3	9.002	4	23.5	0.483	0.118	1.3534	
15 minute winter	4	9.003	9	32.3	0.503	0.161	0.8571	
15 minute winter	5	1.000	6	5.0	0.270	0.025	0.0751	
15 minute winter	6	1.001	7	9.9	0.546	0.050	0.2743	
15 minute winter	7	1.002	8	9.1	0.310	0.045	1.1780	
15 minute winter	8	1.003	9	22.2	0.414	0.112	1.2319	
15 minute winter	9	8.004	10	59.2	0.717	0.296	4.2405	
15 minute winter	10	8.005	11	74.4	0.763	0.374	2.2018	
15 minute winter	11	8.006	16	79.7	0.817	0.403	0.8129	
15 minute winter	12	3.000	13	3.9	0.375	0.019	1.3632	
15 minute winter	13	3.001	14	5.9	0.141	0.030	1.2379	
15 minute winter	14	3.002	15	11.5	0.389	0.058	1.0657	
15 minute winter	15	3.003	16	12.2	0.206	0.059	0.2924	
15 minute winter	16	8.007	17	87.0	0.911	0.426	0.3330	
15 minute winter	17	1.008_1	18	87.0	1.073	0.434	3.4116	
15 minute winter	18	1.009_1	24	102.3	0.892	0.321	2.1464	
15 minute winter	19	4.000	20	15.0	0.457	0.075	0.8305	
15 minute winter	20	4.001	21	26.1	0.697	0.130	0.2107	
15 minute winter	21	4.002	22	25.4	0.757	0.127	1.5779	
15 minute winter	22	4.003	24	33.5	0.390	0.110	2.1701	
15 minute winter	24	1.011_1	HW3	137.8	2.764	0.454	0.8509	
15 minute winter	25	6.000_1	26	5.9	0.310	0.030	0.7514	

Results for 1 year Critical Storm Duration. Lowest mass balance: 99.53%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	26	11	2.141	0.100	19.6	0.1762	0.0000	OK
960 minute winter	27	945	2.043	0.174	5.4	0.4425	0.0000	OK
15 minute winter	28	10	2.046	0.089	14.9	0.1571	0.0000	OK
960 minute winter	29	945	2.043	0.138	0.5	0.2436	0.0000	OK
15 minute winter	S31	10	2.275	0.070	9.4	0.1243	0.0000	OK
15 minute winter	S32	13	2.184	0.143	10.5	0.2520	0.0000	OK
15 minute winter	S33	10	2.452	0.108	19.9	0.1552	0.0000	OK
15 minute winter	S34	11	2.171	0.105	19.4	0.1506	0.0000	OK
960 minute winter	HW3	945	2.043	0.191	16.2	0.0000	0.0000	OK
960 minute winter	HW4	945	2.043	0.245	8.6	0.0000	0.0000	OK
960 minute winter	HW5	945	2.043	0.266	4.3	0.0000	0.0000	OK
960 minute winter	30	945	2.043	0.343	2.8	0.0000	0.0000	OK
120 minute winter	HW6	98	1.617	0.002	2.5	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	26	6.001	27	18.2	0.448	0.091	3.1489	
960 minute winter	27	6.002	HW4	5.0	0.620	0.018	1.2788	
15 minute winter	28	7.000_1	27	14.4	0.394	0.072	1.5213	
960 minute winter	29	8.000_1	27	0.5	0.086	0.002	0.8386	
15 minute winter	S31	5.000	S32	9.3	0.546	0.044	1.9777	
15 minute winter	S32	5.001	18	8.1	0.386	0.038	0.4266	
15 minute winter	S33	1.000_1	S34	19.4	0.881	0.272	1.4883	
15 minute winter	S34	1.001_1	HW1	19.2	2.185	0.270	0.1238	
960 minute winter	HW3	1.007	HW4	5.3	0.037	0.000	116.1471	
960 minute winter	HW4	1.008	HW5	4.3	0.046	0.000	51.5251	
960 minute winter	HW5	1.012	30	2.8	0.021	0.000	15.0316	
960 minute winter	30	1.013	HW6	2.5	0.000	0.000	0.1356	161.1

Results for 30 year Critical Storm Duration. Lowest mass balance: 99.53%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
1440 minute winter	HW1	1440	2.240	0.220	12.7	0.0000	0.0000	OK
15 minute winter	1	13	2.696	0.256	43.9	8.2479	0.0000	OK
15 minute winter	2	13	2.693	0.289	52.7	0.5107	0.0000	OK
15 minute winter	3	13	2.689	0.298	48.7	0.3366	0.0000	OK
15 minute winter	4	13	2.682	0.351	70.2	0.6196	0.0000	OK
15 minute winter	5	13	2.682	0.219	12.5	0.3873	0.0000	OK
15 minute winter	6	13	2.682	0.228	23.5	0.4028	0.0000	OK
15 minute winter	7	13	2.680	0.258	20.7	0.4566	0.0000	OK
15 minute winter	8	13	2.678	0.332	49.1	0.5874	0.0000	OK
15 minute winter	9	13	2.675	0.374	118.9	0.9510	0.0000	OK
15 minute winter	10	12	2.631	0.444	157.0	0.7848	0.0000	OK
15 minute winter	11	12	2.593	0.454	168.4	0.8028	0.0000	OK
15 minute winter	12	12	2.566	0.325	11.5	0.5737	0.0000	OK
15 minute winter	13	13	2.561	0.372	13.5	0.6577	0.0000	OK
15 minute winter	14	12	2.561	0.407	30.9	0.7196	0.0000	OK
15 minute winter	15	12	2.561	0.432	28.8	0.7637	0.0000	OK
15 minute winter	16	12	2.561	0.439	195.2	1.1163	0.0000	OK
15 minute winter	17	13	2.513	0.399	194.6	0.7048	0.0000	OK
15 minute winter	18	13	2.358	0.438	231.6	0.7732	0.0000	OK
15 minute winter	19	11	2.369	0.179	38.1	0.3164	0.0000	OK
15 minute winter	20	11	2.356	0.220	66.2	0.3884	0.0000	OK
15 minute winter	21	11	2.327	0.203	64.6	0.3582	0.0000	OK
15 minute winter	22	12	2.303	0.381	90.0	0.6734	0.0000	OK
15 minute winter	24	12	2.296	0.416	328.1	1.0586	0.0000	OK
1440 minute winter	25	1440	2.240	0.115	0.7	0.2039	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)
1440 minute winter	HW1	6.000	HW3	-10.5	-0.010	0.000	534.8120	
15 minute winter	1	9.000_1	2	30.8	0.468	0.154	1.7579	
15 minute winter	2	9.001	3	48.7	0.661	0.241	0.6832	
15 minute winter	3	9.002	4	48.2	0.479	0.241	3.6207	
15 minute winter	4	9.003	9	64.5	0.535	0.321	2.0218	
15 minute winter	5	1.000	6	10.8	0.312	0.054	0.3446	
15 minute winter	6	1.001	7	20.7	0.612	0.104	1.3563	
15 minute winter	7	1.002	8	18.6	0.314	0.092	4.0171	
15 minute winter	8	1.003	9	41.8	0.448	0.212	3.0630	
15 minute winter	9	8.004	10	118.5	0.743	0.593	8.7293	
15 minute winter	10	8.005	11	151.9	0.863	0.764	4.0374	
15 minute winter	11	8.006	16	166.9	0.962	0.843	1.4368	
15 minute winter	12	3.000	13	8.7	0.410	0.043	3.4005	
15 minute winter	13	3.001	14	-13.5	-0.197	-0.068	2.5877	
15 minute winter	14	3.002	15	28.8	0.442	0.145	2.0092	
15 minute winter	15	3.003	16	28.3	0.255	0.136	0.5238	
15 minute winter	16	8.007	17	194.6	1.112	0.953	0.6020	
15 minute winter	17	1.008_1	18	195.0	1.285	0.972	6.4592	
15 minute winter	18	1.009_1	24	232.6	1.117	0.730	3.9431	
15 minute winter	19	4.000	20	36.8	0.520	0.185	1.7835	
15 minute winter	20	4.001	21	64.6	0.843	0.320	0.4172	
15 minute winter	21	4.002	22	63.5	0.818	0.318	4.2847	
15 minute winter	22	4.003	24	84.5	0.475	0.278	4.2088	
15 minute winter	24	1.011_1	HW3	297.9	3.398	0.981	1.6240	
1440 minute winter	25	6.000_1	26	0.7	0.155	0.003	1.9939	

Results for 30 year Critical Storm Duration. Lowest mass balance: 99.53%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
1440 minute winter	26	1440	2.240	0.199	2.3	0.3523	0.0000	OK
1440 minute winter	27	1440	2.240	0.371	8.0	0.9452	0.0000	OK
1440 minute winter	28	1440	2.240	0.283	1.7	0.5007	0.0000	OK
1440 minute winter	29	1440	2.240	0.335	0.7	0.5926	0.0000	OK
15 minute winter	S31	13	2.375	0.170	23.2	0.3013	0.0000	OK
15 minute winter	S32	13	2.360	0.319	21.9	0.5638	0.0000	OK
15 minute winter	S33	10	2.529	0.185	48.8	0.2646	0.0000	OK
1440 minute winter	S34	1440	2.240	0.174	2.2	0.2495	0.0000	OK
1440 minute winter	HW3	1440	2.240	0.388	22.1	0.0000	0.0000	OK
1440 minute winter	HW4	1440	2.240	0.442	10.3	0.0000	0.0000	OK
1440 minute winter	HW5	1440	2.240	0.463	4.8	0.0000	0.0000	OK
1440 minute winter	30	1440	2.240	0.540	2.9	0.0000	0.0000	OK
240 minute winter	HW6	112	1.617	0.002	2.5	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)
1440 minute winter	26	6.001	27	2.3	0.184	0.011	8.7626	
1440 minute winter	27	6.002	HW4	7.6	0.649	0.027	2.7844	
1440 minute winter	28	7.000_1	27	1.6	0.139	0.008	5.2773	
1440 minute winter	29	8.000_1	27	0.7	0.080	0.003	2.3756	
15 minute winter	S31	5.000	S32	21.9	0.591	0.104	6.3307	
15 minute winter	S32	5.001	18	25.0	0.380	0.118	1.1487	
15 minute winter	S33	1.000_1	S34	47.5	1.101	0.665	2.9001	
1440 minute winter	S34	1.001_1	HW1	2.2	0.962	0.031	0.5458	
1440 minute winter	HW3	1.007	HW4	4.4	0.036	0.000	234.2511	
1440 minute winter	HW4	1.008	HW5	4.8	0.048	0.000	96.6449	
1440 minute winter	HW5	1.012	30	2.9	0.036	0.000	27.1272	
1440 minute winter	30	1.013	HW6	2.5	0.000	0.000	0.1356	219.3

Results for 100 year Critical Storm Duration. Lowest mass balance: 99.53%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
1440 minute winter	HW1	1440	2.336	0.316	17.0	0.0000	0.0000	OK
15 minute winter	1	13	2.838	0.398	57.0	13.6105	0.0000	OK
15 minute winter	2	13	2.834	0.430	63.4	0.7599	0.0000	OK
15 minute winter	3	13	2.830	0.439	66.7	0.4968	0.0000	OK
15 minute winter	4	13	2.820	0.489	84.6	0.8636	0.0000	OK
15 minute winter	5	13	2.815	0.352	16.2	0.6212	0.0000	OK
15 minute winter	6	13	2.814	0.360	29.2	0.6370	0.0000	OK
15 minute winter	7	13	2.814	0.392	22.5	0.6923	0.0000	OK
15 minute winter	8	13	2.815	0.469	58.1	0.8282	0.0000	OK
15 minute winter	9	13	2.812	0.511	146.1	1.2995	0.0000	SURCHARGED
15 minute winter	10	12	2.739	0.552	179.7	0.9759	0.0000	SURCHARGED
15 minute winter	11	12	2.682	0.543	194.6	0.9590	0.0000	SURCHARGED
15 minute winter	12	12	2.643	0.402	14.8	0.7112	0.0000	OK
15 minute winter	13	12	2.644	0.455	22.3	0.8037	0.0000	OK
15 minute winter	14	12	2.643	0.489	41.2	0.8638	0.0000	OK
15 minute winter	15	12	2.642	0.513	40.7	0.9060	0.0000	SURCHARGED
15 minute winter	16	12	2.641	0.519	234.8	1.3200	0.0000	SURCHARGED
15 minute winter	17	12	2.593	0.479	234.8	0.8456	0.0000	OK
15 minute winter	18	13	2.430	0.510	292.0	0.9005	0.0000	OK
15 minute winter	19	11	2.410	0.220	49.4	0.3893	0.0000	OK
15 minute winter	20	11	2.401	0.265	85.6	0.4686	0.0000	OK
15 minute winter	21	12	2.380	0.256	83.1	0.4529	0.0000	OK
15 minute winter	22	12	2.358	0.436	114.8	0.7700	0.0000	OK
15 minute winter	24	13	2.352	0.472	425.1	1.2006	0.0000	OK
1440 minute winter	25	1440	2.336	0.211	0.9	0.3732	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)
1440 minute winter	HW1	6.000	HW3	-14.8	-0.017	0.000	721.3893	
15 minute winter	1	9.000_1	2	47.8	0.473	0.239	2.7905	
15 minute winter	2	9.001	3	66.7	0.667	0.330	1.0344	
15 minute winter	3	9.002	4	70.7	0.481	0.354	5.0879	
15 minute winter	4	9.003	9	88.6	0.542	0.441	2.5984	
15 minute winter	5	1.000	6	12.7	0.320	0.064	0.6066	
15 minute winter	6	1.001	7	22.5	0.635	0.113	2.2664	
15 minute winter	7	1.002	8	25.2	0.310	0.125	5.9391	
15 minute winter	8	1.003	9	52.9	0.464	0.268	4.0089	
15 minute winter	9	8.004	10	153.3	0.805	0.767	10.0336	
15 minute winter	10	8.005	11	179.5	0.918	0.903	4.2633	
15 minute winter	11	8.006	16	194.7	1.004	0.984	1.5244	
15 minute winter	12	3.000	13	12.9	0.434	0.064	4.1620	
15 minute winter	13	3.001	14	-15.9	-0.166	-0.080	3.0195	
15 minute winter	14	3.002	15	40.7	0.469	0.206	2.2363	
15 minute winter	15	3.003	16	40.7	0.258	0.195	0.5665	
15 minute winter	16	8.007	17	234.8	1.202	1.150	0.6695	
15 minute winter	17	1.008_1	18	234.8	1.335	1.171	7.6342	
15 minute winter	18	1.009_1	24	297.1	1.204	0.932	4.5425	
15 minute winter	19	4.000	20	47.4	0.531	0.238	2.3064	
15 minute winter	20	4.001	21	83.1	0.885	0.412	0.5443	
15 minute winter	21	4.002	22	78.4	0.835	0.392	5.5163	
15 minute winter	22	4.003	24	107.0	0.478	0.351	4.8355	
15 minute winter	24	1.011_1	HW3	350.6	3.086	1.155	1.9194	
1440 minute winter	25	6.000_1	26	0.9	0.160	0.004	3.7104	

Results for 100 year Critical Storm Duration. Lowest mass balance: 99.53%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
1440 minute winter	26	1440	2.336	0.295	2.9	0.5217	0.0000	OK
1440 minute winter	27	1440	2.336	0.467	9.9	1.1891	0.0000	OK
1440 minute winter	28	1440	2.336	0.379	2.1	0.6701	0.0000	OK
1440 minute winter	29	1440	2.336	0.431	0.9	0.7620	0.0000	OK
15 minute winter	S31	12	2.453	0.248	30.1	0.4389	0.0000	OK
15 minute winter	S32	12	2.433	0.392	33.9	0.6918	0.0000	OK
15 minute winter	S33	10	2.568	0.224	63.3	0.3210	0.0000	OK
1440 minute winter	S34	1440	2.336	0.270	2.9	0.3867	0.0000	OK
1440 minute winter	HW3	1440	2.336	0.484	27.7	0.0000	0.0000	OK
1440 minute winter	HW4	1440	2.336	0.538	11.2	0.0000	0.0000	OK
1440 minute winter	HW5	1440	2.336	0.559	5.1	0.0000	0.0000	OK
1440 minute winter	30	1440	2.336	0.636	2.9	0.0000	0.0000	SURCHARGED
240 minute summer	HW6	112	1.617	0.002	2.5	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)
1440 minute winter	26	6.001	27	2.7	0.170	0.013	11.8987	
1440 minute winter	27	6.002	HW4	9.5	0.666	0.034	3.1686	
1440 minute winter	28	7.000_1	27	2.0	0.145	0.010	6.8235	
1440 minute winter	29	8.000_1	27	0.8	0.073	0.004	2.9726	
15 minute winter	S31	5.000	S32	27.1	0.605	0.129	8.6801	
15 minute winter	S32	5.001	18	32.1	0.369	0.152	1.4142	
15 minute winter	S33	1.000_1	S34	61.5	1.164	0.861	3.5325	
1440 minute winter	S34	1.001_1	HW1	2.7	0.962	0.038	0.7648	
1440 minute winter	HW3	1.007	HW4	5.4	0.041	0.000	295.9859	
1440 minute winter	HW4	1.008	HW5	5.1	0.037	0.000	120.1972	
1440 minute winter	HW5	1.012	30	2.9	0.020	0.000	33.4356	
1440 minute winter	30	1.013	HW6	2.5	0.000	0.000	0.1356	214.9

Results for 100 year +40% CC +10% A Critical Storm Duration. Lowest mass balance: 99.53%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
1440 minute winter	HW1	1440	2.559	0.539	19.4	0.0000	0.0000	OK
15 minute winter	1	13	3.769	1.329	182.3	31.1837	0.0000	FLOOD RISK
15 minute winter	2	13	3.755	1.351	136.4	2.3877	0.0000	FLOOD RISK
15 minute winter	3	13	3.746	1.355	142.3	1.5320	0.0000	FLOOD RISK
15 minute winter	4	12	3.739	1.408	155.6	2.4884	0.0000	FLOOD RISK
15 minute winter	5	12	3.882	1.419	24.9	2.5073	0.0000	FLOOD RISK
15 minute winter	6	12	3.866	1.412	43.1	2.4958	0.0000	FLOOD RISK
15 minute winter	7	13	3.776	1.354	44.7	2.3931	0.0000	FLOOD RISK
15 minute winter	8	12	3.745	1.399	116.5	2.4714	0.0000	FLOOD RISK
15 minute winter	9	12	3.737	1.436	261.5	3.6558	0.0000	FLOOD RISK
15 minute winter	10	13	3.523	1.336	318.4	2.3606	0.0000	FLOOD RISK
15 minute winter	11	13	3.345	1.206	334.2	2.1305	0.0000	SURCHARGED
15 minute winter	12	12	3.208	0.967	22.8	1.7083	0.0000	SURCHARGED
15 minute winter	13	13	3.213	1.024	26.9	1.8095	0.0000	SURCHARGED
15 minute winter	14	13	3.218	1.064	80.0	1.8808	0.0000	SURCHARGED
15 minute winter	15	13	3.223	1.094	78.4	1.9323	0.0000	SURCHARGED
15 minute winter	16	13	3.221	1.099	391.5	2.7978	0.0000	SURCHARGED
15 minute winter	17	13	3.087	0.973	396.8	1.7187	0.0000	SURCHARGED
15 minute winter	18	12	2.639	0.719	477.2	1.2707	0.0000	SURCHARGED
1440 minute winter	19	1440	2.559	0.369	3.4	0.6520	0.0000	OK
1440 minute winter	20	1440	2.559	0.423	5.9	0.7474	0.0000	OK
1440 minute winter	21	1440	2.559	0.435	5.7	0.7686	0.0000	OK
1440 minute winter	22	1440	2.559	0.637	8.0	1.1255	0.0000	SURCHARGED
1440 minute winter	24	1440	2.559	0.679	41.3	1.7280	0.0000	SURCHARGED
1440 minute winter	25	1440	2.559	0.434	1.4	0.7668	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)
1440 minute winter	HW1	6.000	HW3	-15.3	0.010	0.000	1190.7158	
15 minute winter	1	9.000_1	2	125.0	0.639	0.624	3.1542	
15 minute winter	2	9.001	3	142.3	0.743	0.705	1.1203	
15 minute winter	3	9.002	4	146.0	0.746	0.731	5.2846	
15 minute winter	4	9.003	9	158.4	0.810	0.788	2.6059	
15 minute winter	5	1.000	6	22.2	0.329	0.111	0.7961	
15 minute winter	6	1.001	7	44.7	0.651	0.223	2.8095	
15 minute winter	7	1.002	8	51.6	0.311	0.255	6.5431	
15 minute winter	8	1.003	9	104.4	0.534	0.529	4.0612	
15 minute winter	9	8.004	10	246.8	1.262	1.235	10.0336	
15 minute winter	10	8.005	11	309.8	1.584	1.558	4.2633	
15 minute winter	11	8.006	16	335.4	1.715	1.695	1.5244	
15 minute winter	12	3.000	13	23.3	0.449	0.117	4.5771	
15 minute winter	13	3.001	14	22.7	-0.236	0.114	3.0971	
15 minute winter	14	3.002	15	78.4	0.532	0.396	2.2427	
15 minute winter	15	3.003	16	74.1	0.379	0.356	0.5665	
15 minute winter	16	8.007	17	396.8	2.029	1.944	0.6745	
15 minute winter	17	1.008_1	18	401.5	2.053	2.001	8.2050	
15 minute winter	18	1.009_1	24	484.9	1.722	1.521	5.1913	
1440 minute winter	19	4.000	20	3.3	0.294	0.017	4.0556	
1440 minute winter	20	4.001	21	5.7	0.436	0.028	0.9484	
1440 minute winter	21	4.002	22	5.5	0.438	0.027	8.6248	
1440 minute winter	22	4.003	24	7.6	0.160	0.025	5.9685	
1440 minute winter	24	1.011_1	HW3	40.9	1.064	0.135	4.0060	
1440 minute winter	25	6.000_1	26	1.2	0.168	0.006	7.0173	

Results for 100 year +40% CC +10% A Critical Storm Duration. Lowest mass balance: 99.53%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
1440 minute winter	26	1440	2.559	0.518	4.3	0.9153	0.0000	SURCHARGED
1440 minute winter	27	1440	2.559	0.690	15.0	1.7560	0.0000	SURCHARGED
1440 minute winter	28	1440	2.559	0.602	3.3	1.0637	0.0000	SURCHARGED
1440 minute winter	29	1440	2.559	0.654	1.4	1.1556	0.0000	SURCHARGED
15 minute winter	S31	13	2.621	0.416	46.8	0.7358	0.0000	OK
15 minute winter	S32	12	2.633	0.592	53.0	1.0460	0.0000	SURCHARGED
15 minute winter	S33	10	2.795	0.451	97.5	0.6457	0.0000	SURCHARGED
1440 minute winter	S34	1440	2.559	0.493	4.4	0.7055	0.0000	SURCHARGED
1440 minute winter	HW3	1440	2.559	0.707	40.9	0.0000	0.0000	OK
1440 minute winter	HW4	1440	2.559	0.761	14.7	0.0000	0.0000	OK
1440 minute winter	HW5	1440	2.559	0.782	6.0	0.0000	0.0000	SURCHARGED
1440 minute winter	30	1440	2.559	0.859	3.0	0.0000	0.0000	SURCHARGED
480 minute summer	HW6	176	1.617	0.002	2.5	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)
1440 minute winter	26	6.001	27	3.8	0.174	0.019	14.9940	
1440 minute winter	27	6.002	HW4	14.3	0.741	0.051	3.2129	
1440 minute winter	28	7.000_1	27	3.1	0.145	0.015	7.6385	
1440 minute winter	29	8.000_1	27	1.3	0.083	0.006	3.1458	
15 minute winter	S31	5.000	S32	53.0	0.639	0.252	12.2790	
15 minute winter	S32	5.001	18	45.5	0.348	0.215	1.6498	
15 minute winter	S33	1.000_1	S34	94.0	1.344	1.317	4.4820	
1440 minute winter	S34	1.001_1	HW1	4.2	0.962	0.059	0.7848	
1440 minute winter	HW3	1.007	HW4	7.7	0.038	0.000	450.6364	
1440 minute winter	HW4	1.008	HW5	6.0	0.052	0.000	179.1210	
1440 minute winter	HW5	1.012	30	3.0	0.011	0.000	49.2054	
1440 minute winter	30	1.013	HW6	2.5	0.000	0.000	0.1356	228.3

Design Settings

Rainfall Methodology	FSR	Maximum Time of Concentration (mins)	30.00
Return Period (years)	100	Maximum Rainfall (mm/hr)	50.0
Additional Flow (%)	40	Minimum Velocity (m/s)	1.00
FSR Region	England and Wales	Connection Type	Level Soffits
M5-60 (mm)	20.000	Minimum Backdrop Height (m)	2.000
Ratio-R	0.400	Preferred Cover Depth (m)	1.200
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)
HW3	0.000		2.800		535791.642	324137.419	1.270
17	0.008	5.00	3.600	1500	535826.197	324187.653	1.843
18	0.039	5.00	3.540	1800	535826.679	324177.744	1.805
19	0.012	5.00	3.440	1800	535829.618	324164.049	1.736
20	0.017	5.00	3.400	1800	535829.880	324159.712	1.706
21	0.000	5.00	3.240	1800	535826.318	324147.658	1.574
22	0.056	5.00	3.180	1800	535850.985	324137.071	1.459
23	0.000	5.00	3.160	1800	535831.230	324142.726	1.484
24	0.053	5.00	3.380	1800	535822.182	324145.489	1.725
25	0.025	5.00	3.420	1500	535815.295	324147.158	1.781
26	0.068	5.00	3.200	2100	535805.084	324143.999	1.635
27	0.000	5.00	3.270	1500	535802.045	324143.059	1.712

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
1.000	17	18	9.921	0.600	1.757	1.735	0.022	450.9	500	5.16	50.0
1.001	18	19	14.007	0.600	1.735	1.704	0.031	451.8	500	5.39	50.0
1.002	19	20	4.345	0.600	1.704	1.694	0.010	434.5	500	5.46	50.0
1.003	20	21	12.569	0.600	1.694	1.666	0.028	448.9	500	5.67	50.0
1.004	21	24	4.670	0.600	1.666	1.655	0.011	424.6	500	5.74	50.0
1.005	24	25	7.086	0.600	1.655	1.639	0.016	442.9	500	5.86	50.0
1.006	25	26	10.688	0.600	1.639	1.615	0.024	445.3	500	6.02	50.0
1.007	26	27	3.181	0.600	1.565	1.558	0.007	454.4	500	6.16	50.0
1.008	27	HW3	11.834	0.600	1.558	1.530	0.028	422.6	500	6.24	50.0
2.000	22	23	20.548	0.600	1.721	1.676	0.045	456.6	500	5.34	50.0

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
1.000	1.016	199.5	1.5	1.343	1.305	0.008	0.0	31	0.305
1.001	1.015	199.3	8.9	1.305	1.236	0.047	0.0	71	0.518
1.002	1.035	203.3	11.2	1.236	1.206	0.059	0.0	79	0.564
1.003	1.019	200.0	14.4	1.206	1.074	0.076	0.0	90	0.602
1.004	1.048	205.7	14.4	1.074	1.225	0.076	0.0	88	0.611
1.005	1.026	201.4	35.1	1.225	1.281	0.185	0.0	140	0.777
1.006	1.023	200.8	39.8	1.281	1.085	0.210	0.0	150	0.803
1.007	1.012	198.8	52.7	1.135	1.212	0.278	0.0	175	0.861
1.008	1.050	206.2	52.7	1.212	0.770	0.278	0.0	171	0.883
2.000	1.010	198.3	10.6	0.959	0.984	0.056	0.0	78	0.545

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
2.001	23	24	9.460	0.600	1.676	1.655	0.021	450.5	500	5.49	50.0

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
2.001	1.017	199.6	10.6	0.984	1.225	0.056	0.0	78	0.549

Pipeline Schedule

Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
1.000	9.921	450.9	500	Circular	3.600	1.757	1.343	3.540	1.735	1.305
1.001	14.007	451.8	500	Circular	3.540	1.735	1.305	3.440	1.704	1.236
1.002	4.345	434.5	500	Circular	3.440	1.704	1.236	3.400	1.694	1.206
1.003	12.569	448.9	500	Circular	3.400	1.694	1.206	3.240	1.666	1.074
1.004	4.670	424.6	500	Circular	3.240	1.666	1.074	3.380	1.655	1.225
1.005	7.086	442.9	500	Circular	3.380	1.655	1.225	3.420	1.639	1.281
1.006	10.688	445.3	500	Circular	3.420	1.639	1.281	3.200	1.615	1.085
1.007	3.181	454.4	500	Circular	3.200	1.565	1.135	3.270	1.558	1.212
1.008	11.834	422.6	500	Circular	3.270	1.558	1.212	2.800	1.530	0.770
2.000	20.548	456.6	500	Circular	3.180	1.721	0.959	3.160	1.676	0.984
2.001	9.460	450.5	500	Circular	3.160	1.676	0.984	3.380	1.655	1.225

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
1.000	17	1500	Manhole	Adoptable	18	1800	Manhole	Adoptable
1.001	18	1800	Manhole	Adoptable	19	1800	Manhole	Adoptable
1.002	19	1800	Manhole	Adoptable	20	1800	Manhole	Adoptable
1.003	20	1800	Manhole	Adoptable	21	1800	Manhole	Adoptable
1.004	21	1800	Manhole	Adoptable	24	1800	Manhole	Adoptable
1.005	24	1800	Manhole	Adoptable	25	1500	Manhole	Adoptable
1.006	25	1500	Manhole	Adoptable	26	2100	Manhole	Adoptable
1.007	26	2100	Manhole	Adoptable	27	1500	Manhole	Adoptable
1.008	27	1500	Manhole	Adoptable	HW3		Junction	
2.000	22	1800	Manhole	Adoptable	23	1800	Manhole	Adoptable
2.001	23	1800	Manhole	Adoptable	24	1800	Manhole	Adoptable

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections		Link	IL (m)	Dia (mm)
HW3	535791.642	324137.419	2.800	1.270			1	1.008	1.530	500
17	535826.197	324187.653	3.600	1.843	1500		0	1.000	1.757	500
18	535826.679	324177.744	3.540	1.805	1800		1	1.000	1.735	500
							0	1.001	1.735	500

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
19	535829.618	324164.049	3.440	1.736	1800	1	1.001	1.704	500
						0	1.002	1.704	500
20	535829.880	324159.712	3.400	1.706	1800	1	1.002	1.694	500
						0	1.003	1.694	500
21	535826.318	324147.658	3.240	1.574	1800	1	1.003	1.666	500
						0	1.004	1.666	500
22	535850.985	324137.071	3.180	1.459	1800	0	2.000	1.721	500
23	535831.230	324142.726	3.160	1.484	1800	1	2.000	1.676	500
						0	2.001	1.676	500
24	535822.182	324145.489	3.380	1.725	1800	1	2.001	1.655	500
						2	1.004	1.655	500
						0	1.005	1.655	500
25	535815.295	324147.158	3.420	1.781	1500	1	1.005	1.639	500
						0	1.006	1.639	500
26	535805.084	324143.999	3.200	1.635	2100	1	1.006	1.615	500
						0	1.007	1.565	500
27	535802.045	324143.059	3.270	1.712	1500	1	1.007	1.558	500
						0	1.008	1.558	500

Simulation Settings

Rainfall Methodology	FSR	Analysis Speed	Detailed
FSR Region	England and Wales	Skip Steady State	x
M5-60 (mm)	20.000	Drain Down Time (mins)	240
Ratio-R	0.400	Additional Storage (m³/ha)	0.0
Summer CV	0.750	Check Discharge Rate(s)	x
Winter CV	0.840	Check Discharge Volume	x

Storm Durations

15	60	180	360	600	960	2160	4320	7200	10080
30	120	240	480	720	1440	2880	5760	8640	

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

Node HW3 Surcharged Outfall

Overrides Design Area	x	Depression Storage Area (m²)	0	Evapo-transpiration (mm/day)	0
Overrides Design Additional Inflow	x	Depression Storage Depth (mm)	0		

Applies to 100yr+40% CC 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440 minute storms

Time (mins)	Depth (m)	Time (mins)	Depth (m)
0	2.010	1440	2.010

Node 26 Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	✓	Sump Available	✓
Invert Level (m)	1.565	Product Number	CTL-SHE-0050-1000-0750-1000
Design Depth (m)	0.750	Min Outlet Diameter (m)	0.075
Design Flow (l/s)	1.0	Min Node Diameter (mm)	1200

Node 18 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	2.064
Side Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Time to half empty (mins)	

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	36.0	0.0	0.400	36.0	0.0	0.401	0.0	0.0

Node 20 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	2.025
Side Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Time to half empty (mins)	

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	38.0	0.0	0.400	38.0	0.0	0.401	0.0	0.0

Node 22 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	2.039
Side Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Time to half empty (mins)	

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	70.0	0.0	0.400	70.0	0.0	0.401	0.0	0.0

Node 23 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	2.007
Side Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Time to half empty (mins)	

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	66.0	0.0	0.400	66.0	0.0	0.401	0.0	0.0

Node 26 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	1.981
Side Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Time to half empty (mins)	

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	280.0	0.0	0.400	280.0	0.0	0.401	0.0	0.0

Node 19 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	1.995
Side Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Time to half empty (mins)	

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	57.0	0.0	0.400	57.0	0.0	0.401	0.0	0.0

Node 21 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	1.953
Side Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Time to half empty (mins)	

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	57.0	0.0	0.400	57.0	0.0	0.401	0.0	0.0

Approval Settings

Node Size	✓	Minimum Full Bore Velocity (m/s)	1.000
Node Losses	✓	Maximum Full Bore Velocity (m/s)	3.000
Link Size	✓	Proportional Velocity	✓
Minimum Diameter (mm)	150	Return Period (years)	100
Link Length	✓	Minimum Proportional Velocity (m/s)	0.750
Maximum Length (m)	100.000	Maximum Proportional Velocity (m/s)	3.000
Coordinates	✓	Surcharged Depth	✓
Accuracy (m)	1.000	Return Period (years)	100
Crossings	✓	Maximum Surcharged Depth (m)	0.300
Cover Depth	✓	Flooding	✓
Minimum Cover Depth (m)	1.200	Return Period (years)	30
Maximum Cover Depth (m)	3.000	Time to Half Empty	x
Backdrops	✓	Discharge Rates	✓
Minimum Backdrop Height (m)	2.000	Discharge Volume	✓
Maximum Backdrop Height (m)	1.500	100 year 360 minute (m³)	
Full Bore Velocity	✓		

Results for 100 year +40% CC +10% A Critical Storm Duration. Lowest mass balance: 99.90%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
960 minute winter	HW3	945	1.550	0.020	1.0	0.0000	0.0000	OK
960 minute winter	17	945	2.310	0.553	0.3	0.9775	0.0000	SURCHARGED
960 minute winter	18	945	2.310	0.575	1.9	10.3415	0.0000	SURCHARGED
960 minute winter	19	945	2.310	0.606	1.8	19.5324	0.0000	SURCHARGED
960 minute winter	20	945	2.310	0.616	1.5	12.4212	0.0000	SURCHARGED
960 minute winter	21	945	2.310	0.644	1.5	22.0231	0.0000	SURCHARGED
960 minute winter	22	945	2.310	0.589	2.4	20.5119	0.0000	SURCHARGED
960 minute winter	23	945	2.310	0.634	1.5	21.6522	0.0000	SURCHARGED
960 minute winter	24	945	2.310	0.655	2.4	1.6673	0.0000	SURCHARGED
960 minute winter	25	945	2.310	0.671	2.9	1.1859	0.0000	SURCHARGED
960 minute winter	26	945	2.310	0.745	5.7	94.8719	0.0000	SURCHARGED
960 minute winter	27	945	1.584	0.026	1.0	0.0459	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	17	1.000	18	0.3	0.078	0.001	1.9406	
960 minute winter	18	1.001	19	1.4	0.156	0.007	2.7399	
960 minute winter	19	1.002	20	1.0	0.172	0.005	0.8499	
960 minute winter	20	1.003	21	1.0	0.198	0.005	2.4586	
960 minute winter	21	1.004	24	-1.1	0.133	-0.005	0.9135	
960 minute winter	22	2.000	23	1.5	0.187	0.008	4.0194	
960 minute winter	23	2.001	24	1.0	0.122	0.005	1.8505	
960 minute winter	24	1.005	25	2.1	0.229	0.010	1.3861	
960 minute winter	25	1.006	26	2.8	0.315	0.014	2.0907	
960 minute winter	26	Hydro-Brake®	27	1.0				
960 minute winter	27	1.008	HW3	1.0	0.322	0.005	0.0373	65.8

Design Settings

Rainfall Methodology	FSR	Maximum Time of Concentration (mins)	30.00
Return Period (years)	100	Maximum Rainfall (mm/hr)	50.0
Additional Flow (%)	40	Minimum Velocity (m/s)	1.00
FSR Region	England and Wales	Connection Type	Level Soffits
M5-60 (mm)	20.000	Minimum Backdrop Height (m)	2.000
Ratio-R	0.400	Preferred Cover Depth (m)	1.200
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)
HW1	0.000		2.800		535767.185	324231.523	1.270
1	0.076	5.00	3.680	1500	535840.670	324266.828	1.628
2	0.077	5.00	3.670	1500	535858.973	324209.511	1.470
3	0.003	5.00	3.680	1800	535826.920	324208.976	1.550
4	0.062	5.00	3.700	1800	535825.812	324237.590	1.632
5	0.025	5.00	3.620	1500	535824.962	324259.530	1.600
6	0.066	5.00	3.660	1800	535821.624	324262.695	1.650
7	0.090	5.00	3.360	1800	535776.934	324261.316	1.447
8	0.022	5.00	3.350	1500	535766.848	324255.859	1.462
9	0.093	5.00	3.740	2100	535618.780	324254.242	1.530
10	0.178	5.00	3.910	1800	535617.429	324227.473	1.758
11	0.099	5.00	3.700	1800	535669.312	324224.854	1.661
12	0.135	5.00	3.600	1500	535670.325	324242.801	1.600
13	0.079	5.00	3.500	1500	535679.037	324251.714	1.527
14	0.225	5.00	3.360	1800	535758.607	324254.887	1.660
15	0.000		3.750	1800	535759.100	324245.361	2.130
16	0.000		3.750	1500	535756.608	324233.803	2.179

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
2.000	2	3	32.057	0.600	2.200	2.130	0.070	458.0	500	5.25	50.0
2.001	3	4	28.635	0.600	2.130	2.068	0.062	461.9	500	5.75	50.0
2.002_1	4	5	21.956	0.600	2.068	2.020	0.048	457.4	500	6.10	50.0
2.002	5	6	4.600	0.600	2.020	2.010	0.010	460.0	500	5.77	50.0
2.003	6	7	44.711	0.600	2.010	1.913	0.097	460.9	500	6.51	50.0
2.004	7	8	11.468	0.600	1.913	1.888	0.025	458.7	500	6.69	50.0
2.005	8	14	8.298	0.600	1.888	1.800	0.088	94.3	500	6.89	50.0

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
2.000	1.008	198.0	14.6	0.970	1.050	0.077	0.0	91	0.600
2.001	1.004	197.1	15.2	1.050	1.132	0.080	0.0	93	0.605
2.002_1	1.009	198.1	26.9	1.132	1.100	0.142	0.0	124	0.713
2.002	1.006	197.5	31.7	1.100	1.150	0.167	0.0	134	0.744
2.003	1.005	197.3	58.6	1.150	0.947	0.309	0.0	186	0.880
2.004	1.007	197.8	75.7	0.947	0.962	0.399	0.0	214	0.943
2.005	2.237	439.3	79.9	0.962	1.060	0.421	0.0	143	1.716

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
1.005	14	15	9.539	0.600	1.700	1.670	0.030	318.0	600	7.79	50.0
1.006	15	16	11.824	0.600	1.620	1.571	0.049	241.3	500	7.86	50.0
1.007	16	HW1	10.820	0.600	1.571	1.530	0.041	263.9	500	8.10	50.0
1.000	9	10	26.803	0.600	2.210	2.152	0.058	462.1	500	5.45	50.0
1.001	10	11	51.949	0.600	2.152	2.039	0.113	459.7	500	6.07	50.0
1.002	11	12	17.976	0.600	2.039	2.000	0.039	460.9	500	6.30	50.0
1.003	12	13	12.464	0.600	2.000	1.973	0.027	461.6	500	6.46	50.0
1.004	13	14	79.633	0.600	1.973	1.800	0.173	460.3	500	6.99	50.0
3.000	1	6	19.489	0.600	2.052	2.010	0.042	464.0	500	5.24	50.0

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
1.005	1.360	384.5	233.4	1.060	1.480	1.230	0.0	338	1.422
1.006	1.394	273.7	233.4	1.630	1.679	1.230	0.0	357	1.556
1.007	1.332	261.6	233.4	1.679	0.770	1.230	0.0	371	1.497
1.000	1.004	197.1	17.6	1.030	1.258	0.093	0.0	100	0.630
1.001	1.006	197.6	51.4	1.258	1.161	0.271	0.0	173	0.851
1.002	1.005	197.3	70.2	1.161	1.100	0.370	0.0	206	0.923
1.003	1.004	197.2	95.8	1.100	1.027	0.505	0.0	246	0.997
1.004	1.006	197.5	110.8	1.027	1.060	0.584	0.0	268	1.033
3.000	1.002	196.7	14.4	1.128	1.150	0.076	0.0	90	0.592

Pipeline Schedule

Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
2.000	32.057	458.0	500	Circular	3.670	2.200	0.970	3.680	2.130	1.050
2.001	28.635	461.9	500	Circular	3.680	2.130	1.050	3.700	2.068	1.132
2.002_1	21.956	457.4	500	Circular	3.700	2.068	1.132	3.620	2.020	1.100
2.002	4.600	460.0	500	Circular	3.620	2.020	1.100	3.660	2.010	1.150
2.003	44.711	460.9	500	Circular	3.660	2.010	1.150	3.360	1.913	0.947
2.004	11.468	458.7	500	Circular	3.360	1.913	0.947	3.350	1.888	0.962
2.005	8.298	94.3	500	Circular	3.350	1.888	0.962	3.360	1.800	1.060
1.005	9.539	318.0	600	Circular	3.360	1.700	1.060	3.750	1.670	1.480
1.006	11.824	241.3	500	Circular	3.750	1.620	1.630	3.750	1.571	1.679
1.007	10.820	263.9	500	Circular	3.750	1.571	1.679	2.800	1.530	0.770
1.000	26.803	462.1	500	Circular	3.740	2.210	1.030	3.910	2.152	1.258

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
2.000	2	1500	Manhole	Adoptable	3	1800	Manhole	Adoptable
2.001	3	1800	Manhole	Adoptable	4	1800	Manhole	Adoptable
2.002_1	4	1800	Manhole	Adoptable	5	1500	Manhole	Adoptable
2.002	5	1500	Manhole	Adoptable	6	1800	Manhole	Adoptable
2.003	6	1800	Manhole	Adoptable	7	1800	Manhole	Adoptable
2.004	7	1800	Manhole	Adoptable	8	1500	Manhole	Adoptable
2.005	8	1500	Manhole	Adoptable	14	1800	Manhole	Adoptable
1.005	14	1800	Manhole	Adoptable	15	1800	Manhole	Adoptable
1.006	15	1800	Manhole	Adoptable	16	1500	Manhole	Adoptable
1.007	16	1500	Manhole	Adoptable	HW1		Junction	
1.000	9	2100	Manhole	Adoptable	10	1800	Manhole	Adoptable

Pipeline Schedule

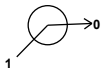
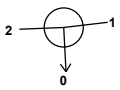
Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
1.001	51.949	459.7	500	Circular	3.910	2.152	1.258	3.700	2.039	1.161
1.002	17.976	460.9	500	Circular	3.700	2.039	1.161	3.600	2.000	1.100
1.003	12.464	461.6	500	Circular	3.600	2.000	1.100	3.500	1.973	1.027
1.004	79.633	460.3	500	Circular	3.500	1.973	1.027	3.360	1.800	1.060
3.000	19.489	464.0	500	Circular	3.680	2.052	1.128	3.660	2.010	1.150

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
1.001	10	1800	Manhole	Adoptable	11	1800	Manhole	Adoptable
1.002	11	1800	Manhole	Adoptable	12	1500	Manhole	Adoptable
1.003	12	1500	Manhole	Adoptable	13	1500	Manhole	Adoptable
1.004	13	1500	Manhole	Adoptable	14	1800	Manhole	Adoptable
3.000	1	1500	Manhole	Adoptable	6	1800	Manhole	Adoptable

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
HW1	535767.185	324231.523	2.800	1.270		1	1.007	1.530	500
1	535840.670	324266.828	3.680	1.628	1500	0	3.000	2.052	500
2	535858.973	324209.511	3.670	1.470	1500	0	2.000	2.200	500
3	535826.920	324208.976	3.680	1.550	1800	1 0	2.000 2.001	2.130 2.130	500 500
4	535825.812	324237.590	3.700	1.632	1800	1 0	2.001 2.002_1	2.068 2.068	500 500
5	535824.962	324259.530	3.620	1.600	1500	1 0	2.002_1 2.002	2.020 2.020	500 500
6	535821.624	324262.695	3.660	1.650	1800	1 2 0	3.000 2.002 2.003	2.010 2.010 2.010	500 500 500
7	535776.934	324261.316	3.360	1.447	1800	1 0	2.003 2.004	1.913 1.913	500 500

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
8	535766.848	324255.859	3.350	1.462	1500		1	2.004	1.888	500
							0	2.005	1.888	500
9	535618.780	324254.242	3.740	1.530	2100		0	1.000	2.210	500
10	535617.429	324227.473	3.910	1.758	1800		1	1.000	2.152	500
							0	1.001	2.152	500
11	535669.312	324224.854	3.700	1.661	1800		1	1.001	2.039	500
							0	1.002	2.039	500
12	535670.325	324242.801	3.600	1.600	1500		1	1.002	2.000	500
							0	1.003	2.000	500
13	535679.037	324251.714	3.500	1.527	1500		1	1.003	1.973	500
							0	1.004	1.973	500
14	535758.607	324254.887	3.360	1.660	1800		1	2.005	1.800	500
							2	1.004	1.800	500
							0	1.005	1.700	600
15	535759.100	324245.361	3.750	2.130	1800		1	1.005	1.670	600
							0	1.006	1.620	500
16	535756.608	324233.803	3.750	2.179	1500		1	1.006	1.571	500
							0	1.007	1.571	500

Simulation Settings

Rainfall Methodology	FSR	Analysis Speed	Normal
FSR Region	England and Wales	Skip Steady State	x
M5-60 (mm)	20.000	Drain Down Time (mins)	240
Ratio-R	0.400	Additional Storage (m³/ha)	0.0
Summer CV	0.750	Check Discharge Rate(s)	x
Winter CV	0.840	Check Discharge Volume	x

Storm Durations

15	30	60	120	180	240	360	480	600	720	960	1440

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

Node HW1 Surcharged Outfall

Overrides Design Area	x	Depression Storage Area (m²)	0	Evapo-transpiration (mm/day)	0
Overrides Design Additional Inflow	x	Depression Storage Depth (mm)	0		

Applies to 100yr+40% CC+10% A 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440 minute storms

Time (mins)	Depth (m)	Time (mins)	Depth (m)
0	2.010	1440	2.010

Node 15 Online Hydro-Brake® Control

Flap Valve	✓	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	✓	Sump Available	✓
Invert Level (m)	1.620	Product Number	CTL-SHE-0067-2500-1700-2500
Design Depth (m)	1.700	Min Outlet Diameter (m)	0.100
Design Flow (l/s)	2.5	Min Node Diameter (mm)	1200

Node 15 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	1.685
Side Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Time to half empty (mins)	

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	680.0	0.0	1.600	680.0	0.0	1.601	0.0	0.0

Node 3 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	2.511
Side Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Time to half empty (mins)	

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	16.0	0.0	0.400	16.0	0.0	0.401	0.0	0.0

Node 4 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	2.412
Side Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Time to half empty (mins)	

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	48.0	0.0	0.400	48.0	0.0	0.401	0.0	0.0

Node 7 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	2.352
Side Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Time to half empty (mins)	

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	91.0	0.0	0.400	91.0	0.0	0.401	0.0	0.0

Node 9 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	2.202
Side Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Time to half empty (mins)	

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	105.0	0.0	0.400	105.0	0.0	0.401	0.0	0.0

Approval Settings

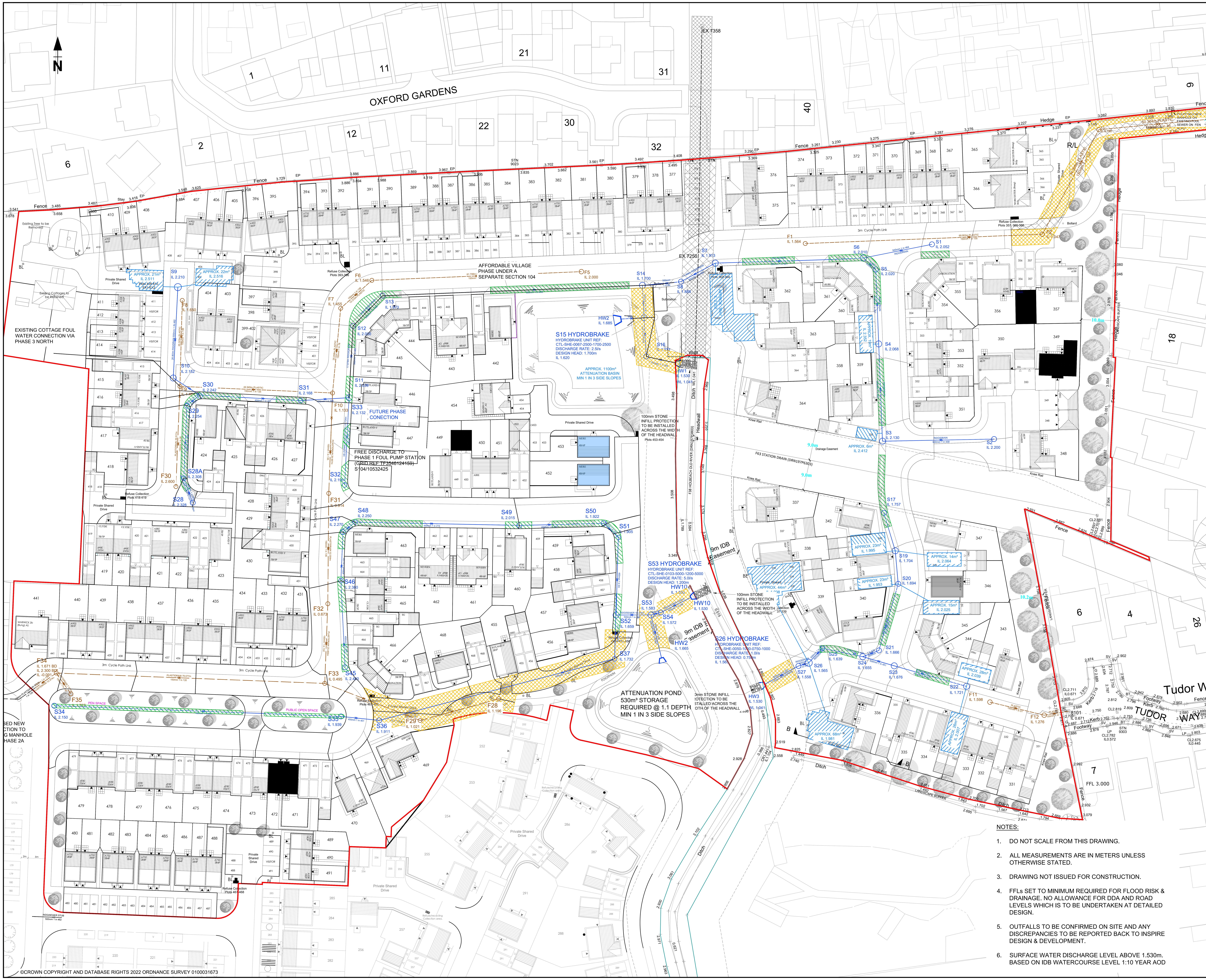
Node Size	✓	Minimum Full Bore Velocity (m/s)	1.000
Node Losses	✓	Maximum Full Bore Velocity (m/s)	3.000
Link Size	✓	Proportional Velocity	✓
Minimum Diameter (mm)	150	Return Period (years)	100
Link Length	✓	Minimum Proportional Velocity (m/s)	0.750
Maximum Length (m)	100.000	Maximum Proportional Velocity (m/s)	3.000
Coordinates	✓	Surcharged Depth	✓
Accuracy (m)	1.000	Return Period (years)	100
Crossings	✓	Maximum Surcharged Depth (m)	0.300
Cover Depth	✓	Flooding	✓
Minimum Cover Depth (m)	1.200	Return Period (years)	30
Maximum Cover Depth (m)	3.000	Time to Half Empty	x
Backdrops	✓	Discharge Rates	✓
Minimum Backdrop Height (m)	2.000	Discharge Volume	✓
Maximum Backdrop Height (m)	1.500	100 year 360 minute (m³)	
Full Bore Velocity	✓		

Results for 100 year +40% CC +10% A Critical Storm Duration. Lowest mass balance: 99.60%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	HW1	1	2.800	1.270	0.0	0.0000	0.0000	OK
1440 minute winter	1	1470	3.337	1.285	2.4	2.2708	0.0000	SURCHARGED
1440 minute winter	2	1470	3.337	1.137	2.4	2.0092	0.0000	SURCHARGED
1440 minute winter	3	1470	3.337	1.207	2.3	9.4883	0.0000	SURCHARGED
1440 minute winter	4	1470	3.337	1.269	3.5	22.4765	0.0000	SURCHARGED
1440 minute winter	5	1470	3.334	1.314	3.8	2.3220	0.0000	FLOOD RISK
1440 minute winter	6	1470	3.339	1.329	7.8	3.3811	0.0000	SURCHARGED
1440 minute winter	7	1470	3.337	1.424	9.1	40.1146	0.0000	FLOOD RISK
1440 minute winter	8	1470	3.329	1.441	11.0	2.5457	0.0000	FLOOD RISK
1440 minute winter	9	1470	3.338	1.128	4.4	45.0687	0.0000	SURCHARGED
1440 minute winter	10	1470	3.338	1.186	7.4	3.0190	0.0000	SURCHARGED
1440 minute winter	11	1470	3.339	1.300	10.0	3.3073	0.0000	SURCHARGED
1440 minute winter	12	1470	3.341	1.341	13.3	2.3692	0.0000	FLOOD RISK
1440 minute winter	13	1470	3.339	1.366	16.8	2.4146	0.0000	FLOOD RISK
1440 minute winter	14	1470	3.346	1.646	27.7	4.1885	0.0000	FLOOD RISK
1440 minute winter	15	1470	3.334	1.714	26.1	1093.0410	0.0000	SURCHARGED
1440 minute winter	16	1500	3.347	1.776	0.1	3.1390	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)
1440 minute winter	1	3.000	6	2.5	0.162	0.013	3.8122	
1440 minute winter	2	2.000	3	2.2	0.305	0.011	6.2706	
1440 minute winter	3	2.001	4	2.3	0.249	0.012	5.6013	
1440 minute winter	4	2.002_1	5	3.6	0.280	0.018	4.2948	
1440 minute winter	5	2.002	6	4.5	0.252	0.023	0.8998	
1440 minute winter	6	2.003	7	7.1	0.353	0.036	8.7459	
1440 minute winter	7	2.004	8	10.5	0.517	0.053	2.2432	
1440 minute winter	8	2.005	14	15.1	0.601	0.034	1.6232	
1440 minute winter	9	1.000	10	2.4	0.217	0.012	5.2429	
1440 minute winter	10	1.001	11	7.2	0.388	0.037	10.1617	
1440 minute winter	11	1.002	12	9.8	0.391	0.050	3.5163	
1440 minute winter	12	1.003	13	14.6	0.460	0.074	2.4381	
1440 minute winter	13	1.004	14	15.8	0.437	0.080	15.5769	
1440 minute winter	14	1.005	15	26.1	0.529	0.068	2.6869	
1440 minute winter	15	Hydro-Brake®	16	0.1				
1440 minute winter	16	1.007	HW1	0.0	0.000	0.000	2.1165	0.0

APPENDIX E DRAINAGE STRATEGY



NOTES:

1. DO NOT SCALE FROM THIS DRAWING.
2. ALL MEASUREMENTS ARE IN METERS UNLESS OTHERWISE STATED.
3. DRAWING NOT ISSUED FOR CONSTRUCTION.
4. FFLs SET TO MINIMUM REQUIRED FOR FLOOD RISK & DRAINAGE. NO ALLOWANCE FOR DDA AND ROAD LEVELS WHICH IS TO BE UNDERTAKEN AT DETAILED DESIGN.
5. OUTFALLS TO BE CONFIRMED ON SITE AND ANY DISCREPANCIES TO BE REPORTED BACK TO INSPIRE DESIGN & DEVELOPMENT.
6. SURFACE WATER DISCHARGE LEVEL ABOVE 1.530m. BASED ON IDB WATERCOURSE LEVEL 1:10 YEAR AOD

KEY:

- SITE BOUNDARY
- ADOPTED
- EXISTING FOUL MANHOLE / SEWER
- EXISTING SURFACE WATER MANHOLE / SEWER
- SURFACE MANHOLE / SEWER
- PERFORATED SURFACE MANHOLE / SEW
- FOUL MANHOLE / SEWER
- DRAINAGE EASEMENT
- FILTER DRAIN

CATCHMENTS AREAS		
KEY	MANHOLE	AREA (ha)
	S34	0.011
	S35	0.312
	S36	0.042
	S37	0.086
	S46	0.057
	S47	0.079
	S48	0.006
	S49	0.172
	S50	0.055
	S51	0.003
	S52	0.047

REV	DATE	NAME	CHECK	NOTE
P4	28/06/2024	CR	CR	REVISED LAYOUT
P3	26/04/24	CR	CR	IL & HYDROBRAKE DETAILS ADDED
P2	23/01/2024	NGP	CR	HW10 OUTFALL REFERENCED
P1	08/12/23	NGP	CR	AFFORDABLE VILLAGE MERGED WITH PHASE 3 NORTH

DRAWING STATUS:

FOR APPROVAL

CLIENT

ASHWOOD HOMES LTD

inspire DESIGN & DEVELOPMENT

PROJECT

HOLBEACH MEADOWS PHASE 3 NORTH

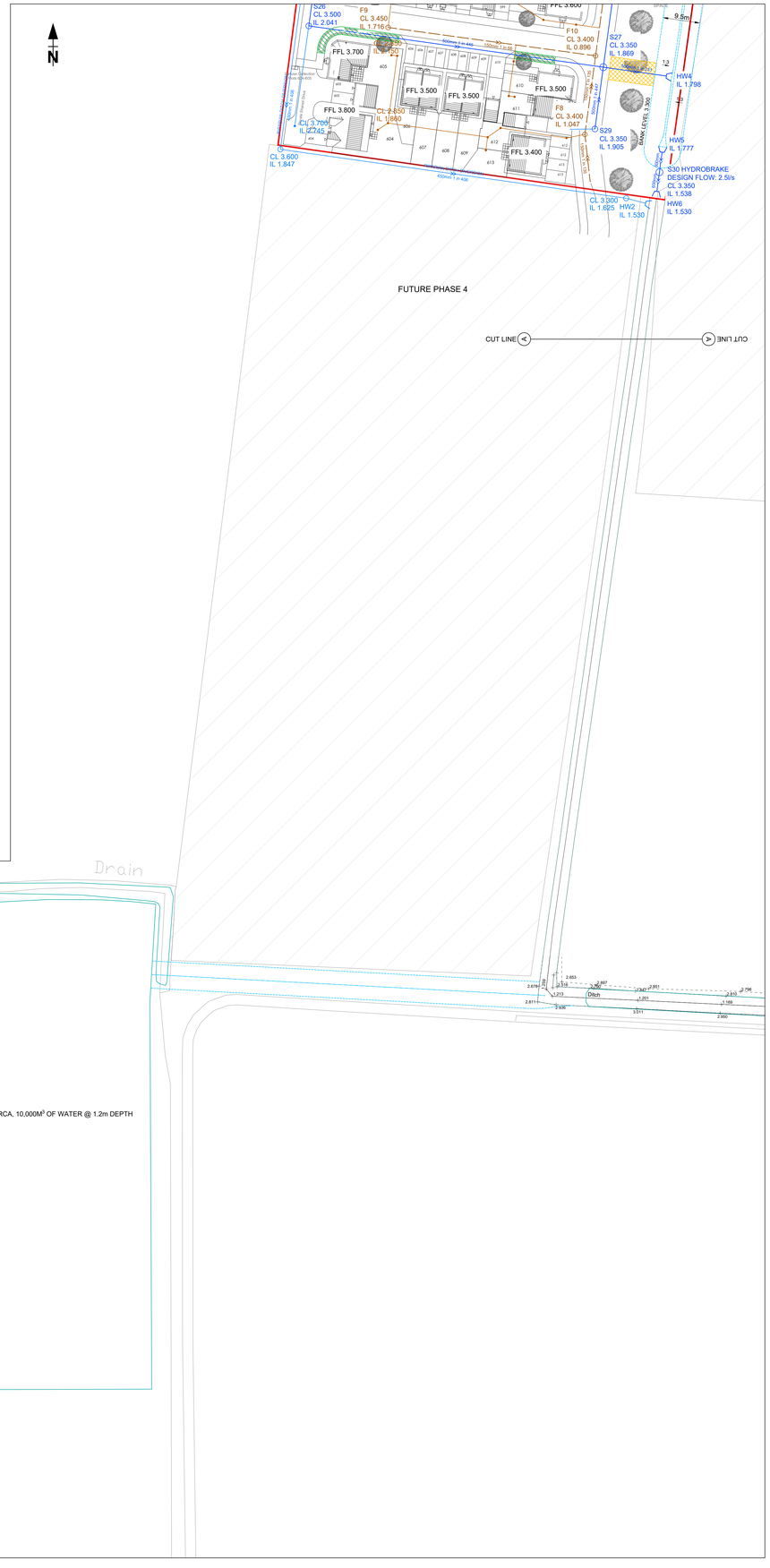
DRAWING TITLE

DRAINAGE STRATEGY

DRAWN	CHECKED	APPROVED
NGP	AJS	CR

DATE	SCALE @ A1
31 October 2022	1:500

DRAWING No.	REVISION No.
AHL-1636-03-DR-001	P4



NOTES:

1. DO NOT SCALE FROM THIS DRAWING.
2. ALL MEASUREMENTS ARE IN METERS UNLESS OTHERWISE STATED.
3. DRAWING NOT ISSUED FOR CONSTRUCTION.
4. FFLs SET TO MINIMUM REQUIRED FOR FLOOD RISK & DRAINAGE. NO ALLOWANCE FOR DDA AND ROAD LEVELS WHICH IS TO BE UNDERTAKEN AT DETAILED DESIGN.
5. OUTFALLS TO BE CONFIRMED ON SITE AND ANY DISCREPANCIES TO BE REPORTED BACK TO INSPIRE DESIGN & DEVELOPMENT.
6. SURFACE WATER DISCHARGE LEVEL ABOVE 1.530m. BASED ON IDB WATERCOURSE LEVEL 1:10 YEAR AOD

KEY:

- SITE BOUNDARY

EXISTING

- SURFACE WATER SEWER/ MANHOLE
- FOUL SEWER/ MANHOLE
- SURFACE WATER RISING MAIN
- FOUL WATER RISING MAIN
- EXISTING WATER MAIN

ADOPTED

- SURFACE WATER DRAINAGE
- PERFORATED SURFACE WATER DRAINAGE
- FILTER DRAIN
- FOUL DRAINAGE
- DRAINAGE EASEMENT

PRIVATE

- SURFACE WATER DRAINAGE
- FOUL DRAINAGE

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION
IN ADDITION TO THE HAZARDS / RISKS NORMALLY ASSOCIATED WITH THE TYPES OF WORK DETAILED ON THIS DRAWING, PLEASE NOTE THE FOLLOWING REGARDING SIGNIFICANT RISKS CONSIDERED UNUSUAL, LIKELY TO BE DIFFICULT TO MANAGE OR NOT LIKELY TO BE OBVIOUS TO A COMPETENT CONTRACTOR OR OTHER DESIGNERS.
CONSTRUCTION A. EXTENTS OF EXISTING WATER MAIN MAY CLASH WITH PROPOSED DRAINAGE
MAINTENANCE / CLEANING
DECOMMISSIONING / DEMOLITION
IT IS ASSUMED THAT ALL WORKS WILL BE CARRIED OUT BY A COMPETENT CONTRACTOR WORKING, WHERE APPROPRIATE, TO AN APPROVED METHOD STATEMENT.

REV	DATE	NAME	CHECK	NOTE
P5	13/.3/24	NGP	CR	ATTENUATION CRATES LOCATION AMENDED, POND REMOVED, SWALE UTILIZED TO ATTENUATE, S23 REMOVED & S31-S34 ADDED
P4	11/03/24	NGP	CR	OUTFALL & DISCHARGE FOR PHASE 3 SOUTH AMENDED & ALTERNATIVE ROUTE FOR RIPARIAN DITCH DIVERSION SHOWN
P3	10/01/23	NGP	CR	SITE & DRAINAGE LAYOUT AMENDED - FILTER STRIPS SHOWN & LAGOON NOT NEEDED FOR PHASE 3
P1	01/11/22	AJS	CR	DITCH AMENDED

DRAWING STATUS:

FOR APPROVAL

CLIENT:

ASHWOOD HOMES LTD

PROJECT:

HOLBEACH MEADOWS
PHASE 3 SOUTH

DRAWING TITLE:

DRAINAGE STRATEGY

DRAWN:	CHECKED:	APPROVED:
NGP	AJS	CR

DATE:	SCALE @ A0:
27 October 2022	1:500

DRAWING No:	REVISION No:
AHL-1636-03-DR-002	P5

APPENDIX F FLOOD MANAGEMENT PLAN

Holbeach Meadows

Household Flood Management Plan

July 2022

PURPOSE OF THE PLAN

When Flooding Occurs
Unlike fire events, where there is a very urgent need to evacuate the building to ensure safety, flooding happens slowly and there is likely to be a period of several hours between the first indications of risk and the actual flooding event affecting your home.

This Household Flood Plan provides you with the information you need to ensure you are ready for a flooding event in your new home.

Flood Warnings and Triggers
The Environment Agency (EA) provides a free Floodline Warnings Direct service, which you can sign up to if you live in an area at risk of coastal and river flooding. The alerts can be received via landline and mobile calls, text messages, or email by anyone signed up at a property.

Once you have received the keys to your new home, you should sign up for the EA flood alerts by visiting https://www.gov.uk/sign-up-for-flood-warnings or call *Floodline* on 0345 988 1188 to register your property to receive these flood alerts.

Protect Your Property
During your Home Demonstration, you will be shown the location for water stopcocks, gas shut off valves and electrical master switches. These are also noted on Page 5 of this plan. These will need to be shut off before you evacuate.

Make sure you have insurance to protect your home. If you have contents insurance, please check that the policy covers flood damage. If you are having trouble getting your property insured for flooding, visit the National Flood Forum at https://nationalfloodforum.org.uk/ or call 01299 403 055.

WHAT TO DO IN A FLOOD

Flood Alert	Flood Warning	Severe Flood Warning
		
PREPARE	**ACT**	**SURVIVE**
Flooding is possible. Stay vigilant and make early preparations for a potential flood.	Flooding is expected. Immediate action is required to protect yourself and your property.	Severe flooding is expected and is likely to cause significant risk to life and destruction of property.
• Monitor the situation through the Environment Agency's 'Check for Flooding' service https://www.gov.uk/check-flooding. • Locate your flood kit (see page 5), check it is complete and ready if needed. • Use the checklist on page 5 and know what to do if the situation gets worse. • Ensure that your property flood defences are in working order and ready to install.	• Continue to monitor the situation. • Move valuables, important documents, electrical equipment and furniture upstairs or to a high place. • Hang curtains over rails, roll up rugs and carpets and move upstairs. • Deploy property flood defences, e.g., air brick covers, door barriers, etc. • Ensure family, neighbours and vulnerable people have been alerted and pets moved to safety. • Move vehicles to high ground out of the flood risk area.	**PREPARE TO EVACUATE** • Check on vulnerable family, friends and neighbours. • If safe to do so, turn off utility supplies (see locations on Page 3). • Continue to monitor the situation using the 'Floodline' service. • Evacuation is likely. • Gather your flood kit and cooperate with emergency services, when they arrive. • If you are in immediate danger, dial 999.
If the alert is no longer in force, you may stand down.	If the alert is no longer in force, you may stand down.	For more information, visit: https://check-for-flooding.service.gov.uk/plan-ahead-for-flooding
If the alert is escalated, move to Flood Warning Checklist.	If the alert is escalated, move to Severe Flood Warning Checklist.	

LINCOLNSHIRE EVACUATION ROUTES

Lincolnshire County Council has identified 13 Emergency Evacuation Routes for motorists to use in case of a major flood.

The 13 routes along the east cost and in the south of the county will provide residents with a quick and safe route to higher ground in the event of a Severe Flood Warning.

The routes are marked by a red sign with white letters ***'ER'*** and are the following routes.

- From Spalding via the A16 and the A1157.
- From Spalding via the A151 towards Bourne.

FLOOD CHECKLIST & CONTACTS

FLOOD PLAN CHECKLIST

- ❑ Sign up for the Environment Agency flood alerts at https://www.gov.uk/sign-up-for-flood-warnings
- ❑ Check your home insurance is up to date.
- ❑ Investigate Flood Defence options (e.g. door barriers).
- ❑ Put important documents in a safe place (e.g. passports, insurance documents).
- ❑ Make a flood kit using the Flood Kit Checklist.

FLOOD KIT CHECKLIST

- ❑ Torch (with full battery).
- ❑ Food and Drinking Water.
- ❑ Medication and First Aid Kit.
- ❑ Toys for Children and Pets.
- ❑ Rubber Gloves and Wellington Boots.
- ❑ Mobile Phone and Charger.
- ❑ Battery Operated Radio.
- ❑ Insurance Documents
- ❑ Keys, e.g. house, car, etc.
- ❑ Purse / Wallet.

CONTACT LIST

Environment Agency / Floodline	0345 988 1188
Western Power Distribution	0800 6783 105 or dial 105
Anglian Water	03457 145 145
Lincolnshire County Council	01522 552 222
South Holland District Council	01775 761 161
In an emergency, where there is an immediate threat to life:	999
YOUR LOCAL EVACUATION POINT IS	**HOLBEACH TOWN CENTRE**

UTILITY LOCATIONS

Gas:
Gas Meter Cupboard on the external wall.

Water:
Stopcock located under kitchen sink.

Electricity:
Electricity meter cupboard on the external wall.

For more information, visit:
https://check-for-flooding.service.gov.uk/plan-ahead-for-flooding

RECOVERING FROM A FLOOD

Immediate Aftermath	Short Term	Medium Term	Long Term
• Property and Possessions may be damaged. • Vehicles may be damaged. • Contact your insurance company and begin the claims process. • Photograph all damaged property, including furniture, carpets, and electronics before disposing of these items. • There may be disruption to infrastructure such as roads, power supplies and emergency response times. • Your Local Council and the Environment Agency will be on hand to assist with the clear up.	• You may be asked to vacate your property during the recovery period to allow for remedial works. • Your home will need to be dried out. • Repairs may take several months, so be prepared to seek alternative accommodation with family, friends, or contact your insurance company to secure alternative accommodation. • You can seek advice and support from the Environment Agency and volunteer organisations.	• Most properties can be repaired within a year of a significant flood event. • Local Authorities and the Environment Agency may offer Grant Funding for those affected by flooding. • Contact tradespeople to assess your electrics, gas and water supplies as these may need repairing. • Keep your Flood Kit up-to-date, replenishing used items.	• Anniversaries of flood events can act as a trigger for stress or anxiety, so it is important to seek help if needed. • Always be prepared for future flooding events. • If future flood warnings occur, ensure you have your Flood Plan up-to-date.

Prepared by Inspire Design & Development for Ashwood Homes Ltd.

Inspire Design & Development Ltd.
Unit 2A Church View Business Park
Coney Green Road
Clay Cross
Chesterfield
Derbyshire
S45 9HA

Tel: 01246 864467
www.inspiredesigngroup.co.uk

Ashwood Homes Ltd.
1 Goodison Road
Lincs Gateway Business Park
Spalding
Lincolnshire
PE12 6FY

Tel: 01406 490590
www.ashwoodhomes.co