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FLOOD RISK ASSESSMENT

ON

LAND NORTH OF BARNSLEY ROAD, DENBY DALE

FOR

NEWETT HOMES

E25/8361/FR01D
Rev D June 2026

OCTOBER 2025

Haigh Huddleston Associates is the trading name of Haigh Huddleston Associates Limited
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1.0 INTRODUCTION

1.1 This report is commissioned to investigate and report on the Flood Risk for this site in accordance Planning Practise Guidance- Flood Risk and Coastal Change September 2025 and the proposals for drainage of this site when redeveloped as residential land. The report is based on information supplied by the client and from relevant authorities in both written and verbal format. Some of this information is in verbal form only. No liability can be accepted for information supplied by third parties which is subsequently found to be inaccurate or incorrect.

2.0 THE SITE

2.1 The site is located in open grassland to the north of Barnsley Road, Denby Dale and is situated around OS Grid reference SE230082.

2.2 The southern boundary is formed By Barnsley Road, and to the north and west are residential developments. To the east is woodland containing Haley Well Beck which flows south to north. A public footpath is located within the western boundary running south to north. The site area is approximately 2.3 ha.

2.3 The site itself is predominantly grassed, with little undergrowth. It falls from south to north at an average grade of 1 in 13 from a high point of 183m AOD on the southern boundary with Barnsley Road to a low point of 169m AOD in the north eastern corner where the site then falls approximately 7m to the base of Haley Well Beck. Barnsley Road on the southern boundary is approximately 2m higher than the site, with gully outfalls through the wall to Barnsley Road outfalling onto the site.

3.0 PROPOSED DEVELOPMENT AND DRAINAGE CONSTRAINTS

3.1 It is understood that the proposed development is for a series of detached and semi-detached, houses (totalling 40 units) with associated car parking and access roads. An engineering feasibility layout is included in the appendices.

3.2 There is no positive drainage recorded serving the existing fields, and surface water run-off would have generally flowed from south west to north east, towards the open watercourse located adjacent the eastern boundary.

3.3 There are no recorded adopted surface water sewers located immediately adjacent the site. The nearest adopted surface water sewers are located in the residential development approximately 50m to the north of the site and at 150-225mm diameter will not have capacity to accept surface water discharge from the site. A 225mm diameter combined sewer is shown crossing the site from south to north near the western boundary of the site.

3.4 Site investigation works have previously been undertaken by Lithos and are detailed in their report ref: 4112/1 dated August 2021. The intrusive investigation works generally proved up to 0.7m of clayey sands overlying a gravelly clay with mudstone/siltstone bedrock encountered at 0.3-1.8m depth, usually from 1.7m depth.

3.5 The site investigation works have proved very low infiltration rates into the underlying clayey sands and gravelly clays. The site investigation report concludes that in this instance that infiltration methods would not be a suitable form of surface water disposal in the long term. Additionally, due to the steep nature of the site, and the existing residential development to the north lying at a lower elevation, there is the possibility for re-emergence.

3.6 It is therefore proposed to have a restricted discharge to Haley Well Beck located to the north east of the site. Due to the relative levels of the site to the beck, it will be possible to achieve a gravity connection to the beck. The final outfall connection to Haley Well Beck through the woodland in the north east should be via a stone channel to minimize the disturbance to the existing trees. The final alignment will need to be agreed on site.

3.7 The proposed foul sewer will need to connect to the existing 225mm combined sewer shown running south to north within the western boundary of the site. Due to this being located elevated above the low point of the site, a pumping station will be required in the lower north eastern corner of the site. A minimum pumped rate of 4.75 l/s will be required to achieve self cleansing velocity within the rising main, with a final gravity discharge to the existing combined system.

3.8 During the construction of the site, it is recommended that temporary works are established to prevent surface water run-off affecting the existing properties located at a lower level to the north of the site and from possible pollution entering the watercourse. As part of the final development of the site, it is recommended that a wall extending 600mm above proposed ground levels is constructed to the northern boundary to prevent exceedance flows leaving the site and affecting the properties, with land drainage guiding the flows towards the watercourse in the north east.

4.0 FLOOD RISK

4.1 On reviewing the Environment Agency websites flood risk maps, the area of site to be developed currently falls within flood zone 1: which is designated as low probability of flooding from sea or rivers less than 0.1% (ie 1 in 1000 year) probability of flooding see Fig 2. Only the very eastern boundary of the site is shown to encroach on Flood Zone 2 associated with the existing watercourse, which is approximately 1.2m lower than the site boundary at this point.

The hierarchy of flood zones are described as:

Flood Zone 1: Low Probability. Land assessed as having a less than 1 in 1000 chance of river and sea flooding in any year (<0.1%).

Flood Zone 2: Medium Probability. Land assessed as having between a 1 in 100 and 1 in 1000 chance of river flooding (1% 0.1%) and between a 1 in 200 and 1 in 1000 chance of sea flooding (0.5% 0.1%) in any year.

Flood Zone 3: High Probability. Land assessed as having a 1 in 100 or greater chance of river flooding (>1%) and 1 in 200 or greater chance of sea flooding (>0.5%) in any year.

The site is therefore considered not to be at risk from fluvial flooding from rivers or sea for the 1 in 100 or 1 in 1000 year flood event. The proposed use of the site would be classified as More Vulnerable in Table 2: Flood Risk Vulnerability Classification in the Planning Practise Guidance- Flood Risk and Coastal Change September 2025. In accordance with that table the proposed development would be considered to be appropriate for the site.

4.2 The available EA plans indicate that there is a line of surface water flooding indicated on site (Fig 2) following the slope of the land from the southern boundary with Barnsley Road heading to the watercourse in the north east. However, none of this is indicated on the EA plans showing the risk of flooding up to 20cm (Fig 3), indicating the flooding is of negligible severity and risk. This is likely from a gulley serving Barnsley Road discharging directly onto the site.

4.3 The site does not appear to fall within an area subject to flooding from reservoirs according to the EA maps. We consider the risk of such a source of flooding would be low. The site does not fall within a flood warning zone.

4.4 Due to the size of the development being in excess of 1Ha, it would be necessary to prepare a site specific Flood Risk Assessment for the site.

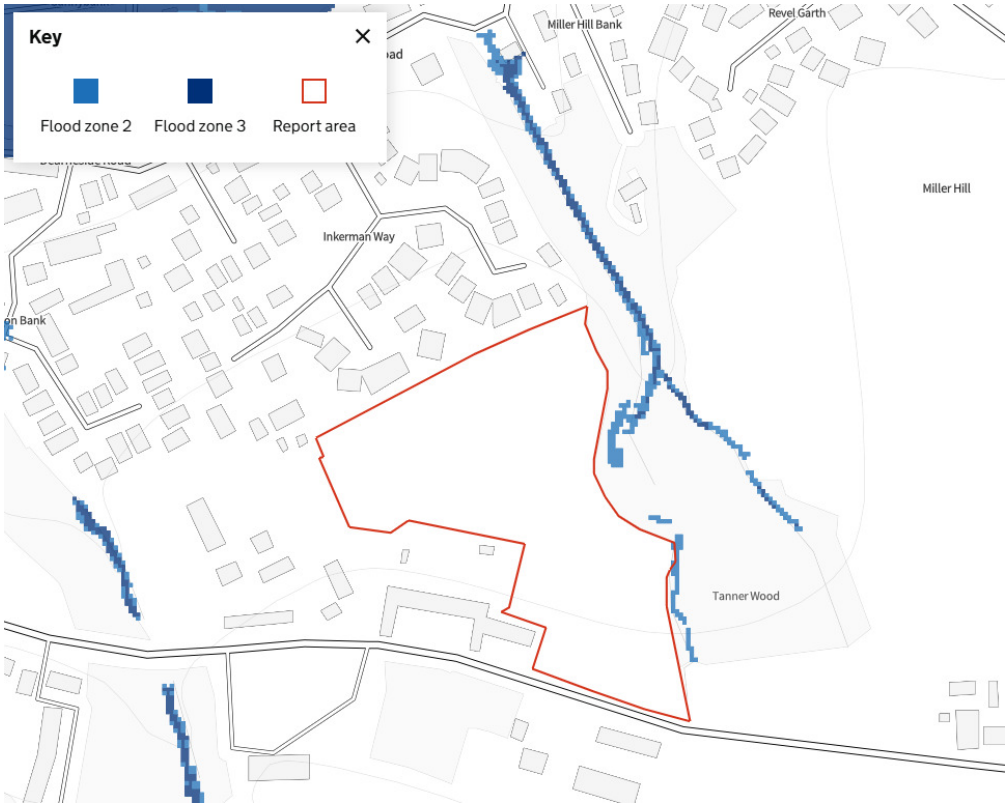

Fig 1 Flood Risk Map – Environment Agency Plan

Fig 2 Surface Water Flood Risk Map – Fluvial Flow

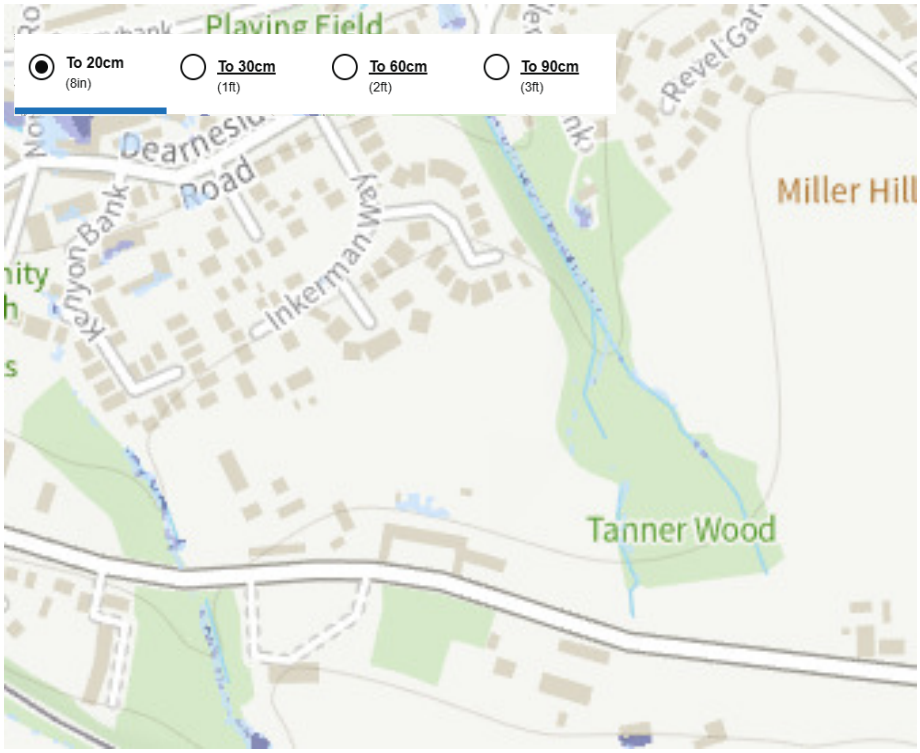

Fig 3 A copy of the Environment Agency overland Surface Water Plan – Risk of Flooding up to 20cm

4.5 There are a number of potential flooding mechanisms that the Planning Practise Guidance- Flood Risk and Coastal Change September 2025 now requires to be evaluated for each proposed development site. Each method of flooding requires an assessment to be made on its probability relative to the site development. The normal requirement of the document is for no flooding of properties for storms up to a 1% probability or a once in a 100 years storm. The risk assessment also includes for flooding both on site and off site, and the effects of the development on the downstream catchment or the flow regime of the watercourse. NPPG also requires that the effects of severe storms above the normal 1% probability are reviewed together with the effects of climatic change relating to the design life of the development.

4.6 It also requires that the effects of climate change are taken into account together with the impacts of extreme events and flood defence failures. Prior to this the Sequential Test, and where necessary, the Exception test as outlined in Planning Practise Guidance- Flood Risk and Coastal Change September 2025, must also be applied to each development site. These aspects are not covered in this report but the proposed site being in Flood Zone 1, would mean these requirements are already met and do not apply.

4.7 The Planning Practise Guidance- Flood Risk and Coastal Change September 2025 requires that each flooding mechanism is addressed and levels of risk evaluated. We consider there are three main risks of flooding to the site. The alternative mechanisms are not applicable to this site.

- Inundation from floodwaters leaving watercourses or rivers entering the site. This can include the effects on culverted watercourses and where the risk of blockage can occur and from breach scenarios.
- Rainwater falling on the site and not being able to leave the site at sufficient rate to prevent flooding on the site.
- Overland flows from adjacent land sites due to surcharging of sewerage systems or other watercourses.
- The impact of the developed site on the existing drainage systems and off-site surface water systems must also be assessed as part of this flood risk assessment.

5.0 DISCUSSION OF FLOOD RISKS

5.1 Flood Risk from Watercourses, River & Tidal

5.1.1 The proposed development area does not fall within the 0.1% or the 1% probability Flood Risk Maps (Zone 2 and 3) as published by the Environment Agency. The site is therefore considered not to be at risk from fluvial flooding for the once in 100 year flood event. We therefore consider the risk of flooding of the site from River and Sea is acceptable for this type of development on this site.

5.2 Risk of Flooding from overland flows from adjacent land.

5.2.1 The site lies on an area land sloping from south west to north east. The land to the west generally falls to the north, and the land to the north falls away from the site to the north. The land to the east falls steeply to Haley Well Beck to the east of the site, which flows to the north.

5.2.2 The flood maps generally indicate a small band of flooding from the centre of the southern boundary with Barnsley Road flowing to the north east where it meets Haley Well Beck. This is potentially from a limited amount of run-off from the gullies serving Barnsley Road and will be picked up by the on-site sewer systems serving the proposed highway. There is therefore considered to be little risk of flooding from overland flows from adjacent land.

5.3 Risk of Flooding from Rainwater Falling on Site

5.3.1 The existing risk of flooding from water falling on site is shown to be low with no areas of localised flooding over 20cm in depth. This would be removed through the new drainage system on site. The impermeable area of the site will increase significantly due to the development, and this would increase the run off from the site. This would increase the flood risk to down stream properties unless attenuation measures and restriction of flows took place.

5.3.2 The normal hierarchy for surface water discharge in accordance with current planning and SUDS policies is as follows:

1. The use of infiltration systems such as Soakaways.
2. Discharge to nearby rivers or watercourses with the use of attenuation.
3. Discharge to existing public sewer network with the use of attenuation.

5.3.3 Due to the low infiltration rate and underlying clays encountered during the intrusive investigation works by Lithos, the site investigation report concludes that in this instance that infiltration methods would not be a suitable form of surface water disposal in the long term.

5.3.4 There are no significant existing buildings or paved areas on site, therefore the discharge rate from the site should be reduced to greenfield run-off rates. The 1 in 1 year run-off rate for the developed site area of 1.7ha is calculated as 8.6 l/s using IH124, with the calculations included in Appendix C. However, it is understood that KMBC work to a greenfield run-off rate of 5 l/s/ha of developed site area which equates to 8.5 l/s. Therefore, this lower rate has been considered as the design option for the treatment of the discharge of surface water and storage volumes calculated based upon this discharge rate.

5.3.5 Therefore the development should drain to the open watercourse located to the north east of the site via a gravity connection at a maximum discharge rate of 8.5 l/s with storage provided for the 1 in 100 year + 45% climate change allowance in accordance with KMBC policies.

5.3.6 With attenuation of flows there would have to be a storm-water storage facility. The use of above storage systems such as swales, detention basins or ponds, would provide the most sustainable urban drainage system. However due to the level topography of the site, a detention basin would need significant land uptake to achieve the required banking to the base of the basin for a relatively small development, and potentially large commuted sums. With the recent implementation of the Codes for Adoption, there is greater scope for a regulatory body to adopt and maintain the above ground storage facilities than previously. However there is detailed criteria to be met to able this to take place. For the onsite sewerage system to be adopted there would still be a need for underground tanks to provide sufficient attenuation storage for the site so that pipework does not surcharge for the 1 in 2 year event. Based on this criteria, the estimated volumes of storage required are shown in the attached

calculation sheets. For this run off the storage volumes require 185 cu.m for the 30 year storm, and 420 cu.m for the 100 year storm when 45% extra for climatic change is allowed.

5.3.7 The use of below ground storage facilities on their own, may not provide a suitable level of treatment of the run off from the site and biological systems, at source, may be needed to ensure contaminants are dealt with prior to discharge of site. The use of open swales and ponds would allow the use of reed beds and other organic systems to be employed. However due to the steep nature of the of the existing site the use of open water features is not considered feasible for the main development due to the large land uptake that would be required. However, an outfall swale from the flow control manhole through the existing woodland to Haley Well Beck should be considered as this provide additional treatment to the surface water run-off as well as being less intrusive within the woodland.

5.3.8 Primary treatment for the roads would therefore be the use of trapped gullies for all hard standings. The use of filter drains adjacent to private drives or permeable paving on private drives would also provide a first stage treatment of run off from drives and allow a discharge into the top soils on site. However, due to the more onerous maintenance regime required for permeable driveways and filter drains, it is likely that the permeable nature of the driveway will deteriorate where maintenance is left to a single individual. Rainwater butts may also be provided to enable some recycling of run off from the roofs and paved areas. The use of green roofs is not considered appropriate in this development. Please note that Yorkshire Water, or similar approved body, will require an easement and access for future maintenance as part of the Section 104 Agreement.

5.3.9 The size of the storm water storage facilities would need to be determined accurately in the final detailed designs. These should be all in accordance with the current PPG. The volumes of storage can include flooding to roads and designated areas such as carpark areas or public open space for the 100 year storm with 45% allowance for climate change, but must ensure that no buildings are flooded.

5.3.10 The position and levels of the attenuation has been considered to ensure that any failure or blockage of the outfall will not affect any of the new or existing properties. The final discharge

rate will be reduced to a maximum of 8.5 l/s. Finally, the position of the attenuation tank has been determined to allow accessibility for future maintenance.

5.3.11 In addition to reducing the surface water discharge from site and providing attenuation, as part of the final development of the site, it is recommended that wall extending 600mm above proposed ground levels is constructed to the northern boundary to prevent exceedance flows leaving the site and affecting the properties, with land drainage guiding the flows towards the watercourse in the north east.

5.4 **Impact on existing drainage systems.**

5.4.1 Attenuation has been provided for a significantly increased return period of 1 in 100 years plus 45% climate change with the discharge rate reduced to below the run-off rate for the 1 in 1 year storm events, in real terms this would lead to a reduced flood risk offsite due to the restricted flows off-site for these storm events. This will ensure that there should be no increase in the flood risk to properties off site or in the drainage networks downstream of the site.

6.0 FUTURE MAINTENANCE

6.1 It is proposed for the surface water system serving the development to be adopted by Yorkshire Water or similar approved body under a Section 104 Agreement, this will include the attenuation tanks, flow controls, pumping stations and outfall sewer. In particular, there will be a telemetry system installed within the dual pumping station to monitor it is operating correctly.

6.2 The maintenance of the attenuation tank should be in line with the SUDS manual (CIRIA C753, 2015) as detailed in table 21.3 below.

Operation and Maintenance Requirements for Attenuation Storage Tanks		
Maintenance schedule	**Required action**	**Typical frequency**
Regular maintenance	Inspect and identify any areas that are not operating correctly. If required, take remedial action	Monthly for 3 months, then annually
	Remove debris from the catchment surface (where it may cause risks to performance)	Monthly
	For systems where rainfall infiltrates into the tank from above, check surface of filter for blockage by sediment, algae or other matter; remove and replace surface infiltration medium as necessary.	Annually
	Remove sediment from pre-treatment structures and/ or internal forebays	Annually, or as required
Remedial actions	Repair/rehabilitate inlets, outlet, overflows and vents	As required
Monitoring	Inspect/check all inlets, outlets, vents and overflows to ensure that they are in good condition and operating as designed	Annually
	Survey inside of tank for sediment build-up and remove if necessary	Every 5 years or as required

6.3 The developer will be responsible to maintain the drainage systems on site until final adoption by the relevant authority ensuring that they are working effectively in the intervening period between construction and adoption.

7.0 CONCLUSIONS

7.1 The area of the site to be developed for residential use currently falls within Flood Zone 1 as defined by the EA Flood maps. The area of the site to be developed is not at risk of flooding from river or tidal water up to a 1% return period. The flood risk is considered to be acceptable for residential development.

7.2 It is considered that the underlying geology and steep nature of the site means that infiltration methods would be an unsuitable form of surface water disposal. The use of attenuation systems to reduce the run-off from the site to will be required to ensure there is no increase in flood risk to the downstream catchment. In addition to this, it is proposed to construct a 600mm dwarf wall to the north boundary of the site with land drainage directing flows to the existing watercourse in the north east to prevent overland flows affecting the residential development to the north.

7.3 The risk of overland flows entering the site is considered to be low due to the topography of the area around the site. The floor levels of the proposed houses should be a minimum of 300mm above the adjacent road levels or existing ground level, with flood routing provided through the site to the north east.

7.4 If the recommendations within this report are adopted for providing attenuation up to and including the 1 in 100 year + 45% climate change storm events and the flow from site restricted to a maximum of 8.5 l/s, there will be a reduction in the flood risk both to the proposed properties on site, as well as the existing properties downstream of the site.

MARTIN HUDDLESTON. MEng

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APPENDIX A

LOCATION PLAN

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Unit 4
Midgley Business Park
Bar Lane
Midgely
WF4 4JJ

Client : NEWETT HOMES

Job Title: Barnsley Road, Denby Dale

Job Number : E25/8362

LOCATION PLAN

OS Grid Reference : SE230082
Easting : 423050
Northing : 408217

Topographical Survey carried out using GPS.

N

APPENDIX B

EA FLOOD MAP

Flood map for planning

Your reference	Location (easting/northing)	Created
8362 Denby Dale	**423062/408191**	**21 October 2025 11:40**

Your selected location is in flood zone 2, an area with a medium 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 https://www.gov.uk/guidance/flood-risk-assessment-standing-advice)

Notes

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

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

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

Use of the address and mapping data is subject to Ordnance Survey public viewing terms under Crown copyright and database rights 2025 AC0000807064. https://flood-map-for-planning.service.gov.uk/os-terms

Environment Agency

Flood map for planning

Your reference
8362 Denby Dale

Location (easting/northing)
423062/408191

Scale
1:2,500

Created
21 Oct 2025 11:40

- Selected area
- Flood zone 3
- Flood zone 2
- Flood zone 1
- Flood defence
- Main river
- Water storage area

0 20 40 60 m

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APPENDIX C

GREENFIELD RUN-OFF ESTIMATION

Greenfield runoff rate estimation tool

www.uksuds.com | Greenfield runoff rate estimation tool (https://www.uksuds.com/)

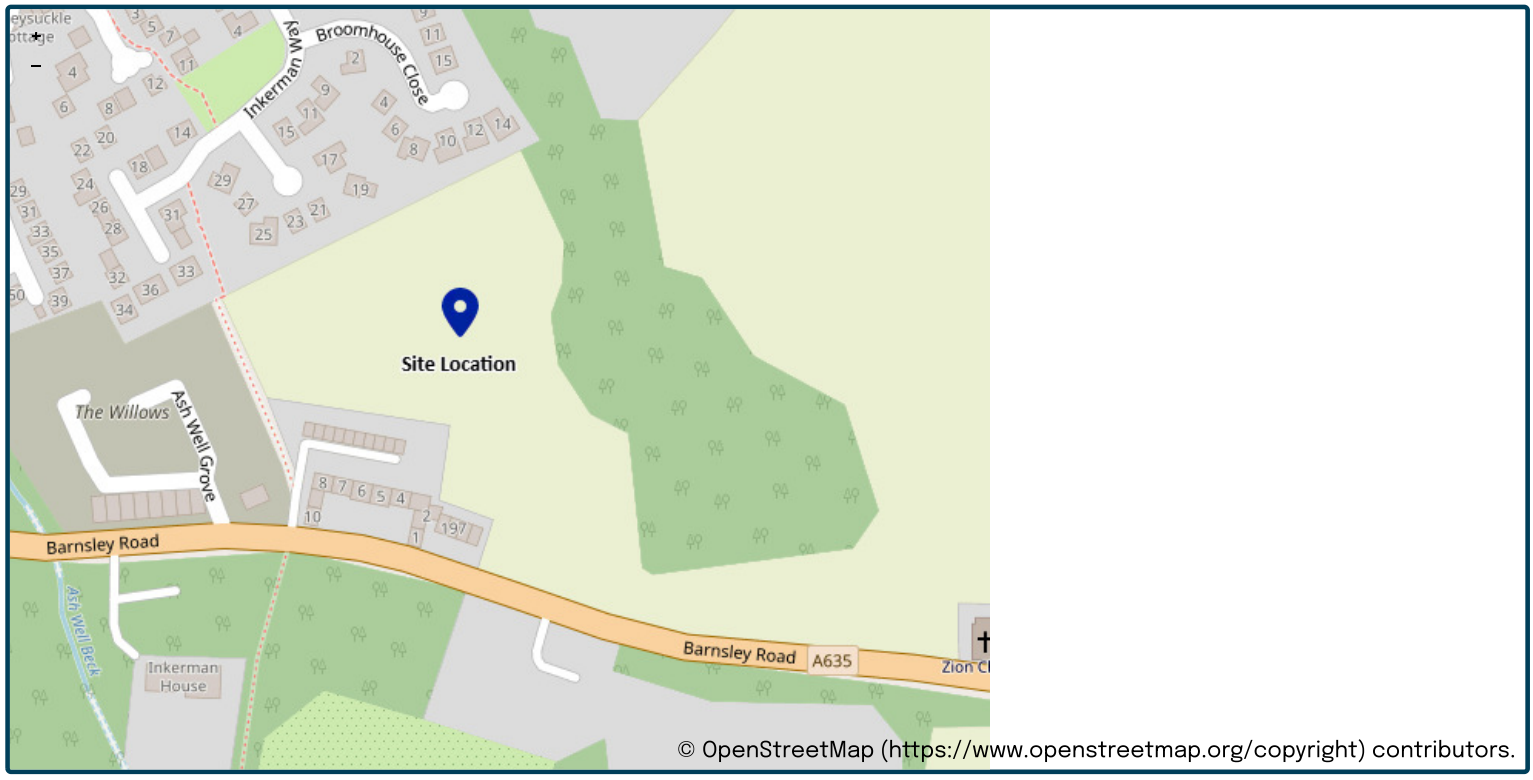
This is an estimation of the greenfield runoff rates that are used to meet normal best practice criteria in line with Environment Agency guidance “Rainfall runoff management for developments”, SC030219 (2013), the SuDS Manual C753 (CIRIA, 2015) and the non-statutory standards for SuDS (Defra, 2015).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

Project details

Date	22/10/2025
Calculated by	M DEAN
Reference	8362
Model version	2.2.1

Location

Site name	Denby Dale
Site location	Barnsley Road



Site easting (British National Grid)	423058
Site northing (British National Grid)	408199

Site details

Total site area (ha)	1.7 ha

Greenfield runoff

Method

Method	IH124

IH124

	My value		Map value
SAAR (mm)	829 mm		829
How should SPR be derived?	WRAP soil type		
WRAP soil type	4		4
SPR	0.47		
QBar (IH124) (l/s)	10 l/s		

Growth curve factors

	My value		Map value
Hydrological region	3		3
1 year growth factor	0.86		
2 year growth factor	0.94		
10 year growth factor	1.45		
30 year growth factor	1.75		
100 year growth factor	2.08		
200 year growth factor	2.37		

Results

Method	IH124
Flow rate 1 year (l/s)	8.6 l/s
Flow rate 2 year (l/s)	9.4 l/s
Flow rate 10 years (l/s)	14.5 l/s
Flow rate 30 years (l/s)	17.5 l/s
Flow rate 100 years (l/s)	20.8 l/s
Flow rate 200 years (l/s)	23.7 l/s

Please note runoff estimation is subject to significant uncertainty. Results are therefore normally reported to only 1 decimal place. Where 2 decimal places are provided, this does not indicate accuracy to this level, it has been adopted to prevent 'zero' figures from being reported. Outputs less than 0.01 l/s are reported as 0.01 l/s.

Disclaimer

This report was produced using the Greenfield runoff rate estimation tool (2.2.1) developed by HR Wallingford and available at uksuds.com (https://www.uksuds.com/). The use of this tool is subject to the UK SuDS terms and conditions and licence agreement, which can both be found at uksuds.com/terms-conditions (https://www.uksuds.com/terms-conditions). The outputs from this tool have been used to estimate Greenfield runoff rates. The use of these results is the responsibility of the users of this tool. No liability will be accepted by HR Wallingford, the Environment Agency, Centre for Ecology and Hydrology, Wallingford Hydrosolutions or any other organisation for the use of these data in the design or operational characteristics of any drainage scheme.

APPENDIX D

ENGINEERING FEASIBILITY PLAN

YORKSHIRE WATER
Section 104 Ref: H-X-XXX-XXX

RISK ASSESSMENT: SIGNIFICANT RISKS THAT CANNOT BE DESIGNED OUT		
RISK	LEVEL OF RISK (H/M)	SUGGESTED ACTION
DEEP EXCAVATIONS ASSOCIATED WITH NEW DRAINAGE WORKS	HIGH	ENSURE ALL EXCAVATIONS HAVE ADEQUATE TRENCH SUPPORTS
HANDLING LARGE DIAMETER MANHOLE RINGS AND CIRCULAR PIPES	HIGH	USE CORRECT LIFTING EQUIPMENT AND ENSURE OPERATIVES WEAR APPROPRIATE PROTECTIVE CLOTHING/HARD HATS/CORRECT PPE
CONTACT WITH SEWAGE	MED	OPERATIVES TO USE CORRECT BREATHING EQUIPMENT/CORRECT PPE
NOISE	MED	OPERATIVES TO USE CORRECT EAR PROTECTION/CORRECT PPE
DRAINAGE EXCAVATIONS ADJACENT EXISTING BOUNDARY STRUCTURES	HIGH	ENSURE CORRECT SUPPORTS ARE PROVIDED TO TRENCHES AND BUILDINGS WHERE REQUIRED
DRAINAGE EXCAVATION IN PUBLIC HIGHWAY	HIGH	ENSURE CORRECT USE OF TRENCH SUPPORTS IN EXCAVATION AND SCREEN BARRIERS TO PROTECT MEMBERS OF THE PUBLIC
MAINTAIN ACCESS TO ADJACENT PROPERTIES AND OCCUPIERS	HIGH	ENSURE WORKS ARE PROTECTED WITH BARRIERS AND SIGNS TO GUIDE THE PUBLIC AWAY FROM THE WORKS
DRAINAGE EXCAVATIONS NEAR TO EXISTING SERVICES	HIGH	ENSURE WORKS ARE PROTECTED WITH BARRIERS AND SIGNS TO GUIDE MEMBERS OF THE PUBLIC AWAY FROM THE AREA
WORKING IN CONFINED SPACES. WORKING IN DRAINS AND MANHOLES	HIGH	CONFINED SPACES WORKING TRAINED PERSONNEL ONLY TO CARRY OUT WORKS UNDER A PERMIT TO WORK SCHEME IMPLEMENTED BY CONTRACTOR. GAS TESTING TO TAKE PLACE BEFORE ALL ENTRIES TO CONFINED SPACES.
WORKING IN HIGHWAYS / RISKS FROM VEHICLE AND PLANT	HIGH	ALL WORKS TO BE SIGNED AND FENCED FROM NORMAL VEHICULAR TRAFFIC. ALL WORKERS TO WEAR HIGH VISIBILITY CLOTHING. ALL PLANT TO HAVE VISUAL AND AUDIBLE WARNING SYSTEMS.
ROAD AND DRAINAGE CONSTRUCTION	HIGH	ALL EXCAVATIONS TO BE ADEQUATELY FENCED OFF AND SUPPORTED DURING CONSTRUCTION. ALL OPERATIVES TO BE TRAINED IN CORRECT METHODS OF LIFTING AND WORK IN ACCORDANCE WITH LOLER REGS
IT IS ASSUMED THAT WORKS ASSOCIATED WITH THIS DESIGN WILL BE UNDERTAKEN BY A PERSON OR PERSONS WHO ARE COMPETANT AND HAVE THE REQUIRED LEVEL OF EXPERIENCE AND EXPERTISE		

1. All adoptable sewer works and material to be in accordance with "Code for Adoption 2.0 published 10th March 2020". The Relevant British/European and Yorkshire Water's Standards/Requirements/Addendum to the Mechanical and Electrical Specification and Kitemarked.

2. Manhole covers shall/must have a clear opening of 600mm and shall be Class D400 to BS EN 124 with 150mm deep frames in highways.

3. Filled ground must be filled and consolidated under the supervision and to the satisfaction of Yorkshire Water before any sewer works are carried out.

4. Yorkshire Water is **not** obliged to accept filter drain/land drainage run-off into the public sewer network or adoptable drainage system (**directly or in-directly**). An alternative method of disposal of the land drainage run-off will therefore be required and you will have to liaise with the Local Authority, Land Drainage Section regarding the disposal of the filter drain/land drainage run-off.

5. The adoptable sewers should be a minimum of 1m and manholes 0.5m from kerb faces and service margins.

6. Sewers must have 5 metres clearance from trees and hedges or the width of the canopy at mature height.

7. Sewers to be laid in Class "S" Bedding (**150mm granular bed and surround**). Where depth of cover to top of the sewer is less than 1.2m in highways and verges (**or less than 900mm in nonvehicular access areas**) then a concrete slab should be provided above granular bed and surround.

8. Bedding and backfill material to conform to the requirement of Water Industry Specification 4-08-02 (**Table A2**).

9. Yorkshire Water policy is that Type "C" brick manholes and 1050mm diameter manhole rings are not preferred. Instead, it is preferred that you use a type "B" manhole with 1200mm diameter or 1500mm diameter rings, with the opening sited over the channel where depth of cover to pipe soffit is 1 - 1.5m.

10. Adoptable plastic sewer pipes to be BSI Kitemarked (**certified to WIS 4-35-01** and BS/EN13476). Adoptable plastic sewer pipes to be laid in maximum 3 metre lengths unless there is a specific operational need to lay longer lengths. Plastic channel sections in manholes are not acceptable and Yorkshire Water would require clay ware channel in manholes.

11. The minimum crushing strength for clay pipes should be as follows: 100mm dia. 40KN/m, 150mm dia. 40KN/m, 225mm dia. 45KN/m and 300mm dia. 72KN/m. The minimum crushing strength for concrete pipes should be - (Class 120 to EN 1916/BS5911-1 2002). Plastic pipes should conform to WIS 4-35-01 and BS EN13476.

12. Where a B125 cover and frame has been approved, this **must not** be coated in plastic and must have lifting eyes suitably sized to accommodate standard lifting keys. Screw down covers are not acceptable.

13. There must be enough clearance at crossovers to accommodate bedding to both pipes, approx. 300mm : if crossover is near the rocker then the clearance needed may need to be increased.

14. Cover slabs must carry the BSI kitemark and British Standard number or will be rejected by Yorkshire Water inspector. Where the clear opening of the kitemarked product is different to that of the cover and frame, a loading bearing slab should be fitted above the cover slab to bring the size down to 600x600mm for the yorkshire water specified cover size. Please refer to concrete pipe systems association (cpsa), 'technical bulletin' issued autumn 2004 for kitemarked cover slab opening sizes.

15. All highway works and material to conform with Kirklees MDC specification.

16. Gully cover and frames shall be D400 ductile iron and comply with European standard BS EN 124. Those sighted in accessways and mews courts must be suitable for use in pedestrian areas.

17. Precast concrete manhole units and their components shall comply with the relevant provisions of BS EN 1917 and BS 5911-3 and shall be manufactured from concrete with a Design Chemical Class DC-4 unless satisfactory evidence through soil analysis can be provided that a lower class will resist attack from soils and ground water.

18. Precast concrete manhole components shall comply with the relevant provisions of BS EN 1917 and BS 5911-3.

19. Corbel slabs shall comply with the requirements of BS 5911-3:2010+A1:2014 Table 5 and Figure 8.

20. Cover slabs should be installed with a minimum 300mm cover to finished levels to comply with National Specifications.

Rev	Description	Date	Initials
D	Feasibility design updated to suit planning layout Rev J	27.07.26	MD
C	Feasibility design updated to suit planning layout Rev H	18.06.26	HH
B	Plot 40 and red line boundary updated to suit Planning Layout F	30.01.26	MD
A	Land drain added to northern boundary, outfall design amended	13.11.25	MD

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Client
NEWETT HOMES

Project
BARNSLEY ROAD, DENBY DALE

Detail
ENGINEERING FEASIBILITY - DRAINAGE

Dwn	Chkd	Date	Scale	Dwg No.
JM	MH	OCT'2025	1/500 @A1	E25/8361/001_01D

PRELIMINARY

APPENDIX E

PRELIMINARY DRAINAGE CALCULATIONS

Design Settings

Rainfall Methodology	FSR	Maximum Time of Concentration (mins)	30.00
Return Period (years)	2	Maximum Rainfall (mm/hr)	75.0
Additional Flow (%)	0	Minimum Velocity (m/s)	1.00
FSR Region	England and Wales	Connection Type	Level Soffits
M5-60 (mm)	19.000	Minimum Backdrop Height (m)	0.200
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	x

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)	Invert Level (m)
1	0.048	5.00	182.643	1200	423103.468	408112.047	1.443	181.200
2	0.155	5.00	179.648	1500	423100.144	408148.424	1.492	178.156
3	0.081	5.00	178.120	1200	423087.498	408170.661	1.744	176.376
10	0.012	5.00	176.414	1200	422965.514	408208.240	1.514	174.900
11	0.036	5.00	176.965	1200	422970.286	408198.330	2.175	174.790
12	0.250	5.00	176.174	1500	422997.604	408211.552	1.661	174.513
13	0.027	5.00	176.592	1500	423056.802	408199.876	2.556	174.036
4	0.145	5.00	176.297	1500	423074.033	408204.522	2.380	173.917
5	0.000		174.829	1500	423070.854	408233.347	1.900	172.929
6	0.000		173.900	2100	423068.992	408259.071	3.600	170.300
7	0.000		173.000	1200	423066.068	408275.397	3.115	169.885
8	0.000		171.375	1200	423087.483	408284.476	2.072	169.303
9	0.000		169.812	1200	423100.244	408285.741	1.312	168.500

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	2	36.529	0.600	181.200	178.156	3.044	12.0	225	5.16	65.9
1.001	2	3	25.581	0.600	178.156	176.451	1.705	15.0	225	5.29	65.2
1.002	3	4	36.440	0.600	176.376	173.992	2.384	15.3	300	5.44	64.4
2.000	10	11	10.999	0.600	174.900	174.790	0.110	100.0	225	5.14	66.0
2.001	11	12	30.350	0.600	174.790	174.588	0.202	150.0	225	5.62	63.5
2.002	12	13	60.338	0.600	174.513	174.111	0.402	150.0	300	6.40	59.8
2.003	13	4	17.846	0.600	174.036	173.917	0.119	150.0	375	6.60	58.9
1.003	4	5	29.000	0.600	173.917	172.929	0.988	29.4	375	6.75	58.3
1.004	5	6	25.791	0.600	172.929	170.350	2.579	10.0	375	6.82	58.0

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	3.798	151.0	8.6	1.218	1.267	0.048	0.0	36	2.088
1.001	3.395	135.0	35.9	1.267	1.444	0.203	0.0	79	2.878
1.002	4.041	285.6	49.6	1.444	2.005	0.284	0.0	84	3.057
2.000	1.307	52.0	2.1	1.289	1.950	0.012	0.0	31	0.649
2.001	1.065	42.3	8.3	1.950	1.361	0.048	0.0	67	0.830
2.002	1.281	90.6	48.3	1.361	2.181	0.298	0.0	156	1.302
2.003	1.477	163.1	51.9	2.181	2.005	0.325	0.0	145	1.316
1.003	3.355	370.5	119.2	2.005	1.525	0.754	0.0	146	3.005
1.004	5.757	635.8	118.6	1.525	3.175	0.754	0.0	109	4.444

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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	6	7	16.586	0.600	170.300	169.885	0.415	40.0	225	6.95	57.5
1.006	7	8	23.260	0.600	169.885	169.303	0.582	40.0	225	7.14	56.7
1.007	8	9	12.824	0.600	169.303	168.500	0.803	16.0	225	7.21	56.5

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	2.074	82.5	117.5	3.375	2.890	0.754	0.0	225	2.112
1.006	2.074	82.5	116.0	2.890	1.847	0.754	0.0	225	2.112
1.007	3.290	130.8	115.5	1.847	1.087	0.754	0.0	165	3.697

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	36.529	12.0	225	Circular_Default Sewer Type	182.643	181.200	1.218	179.648	178.156	1.267
1.001	25.581	15.0	225	Circular_Default Sewer Type	179.648	178.156	1.267	178.120	176.451	1.444
1.002	36.440	15.3	300	Circular_Default Sewer Type	178.120	176.376	1.444	176.297	173.992	2.005
2.000	10.999	100.0	225	Circular_Default Sewer Type	176.414	174.900	1.289	176.965	174.790	1.950
2.001	30.350	150.0	225	Circular_Default Sewer Type	176.965	174.790	1.950	176.174	174.588	1.361
2.002	60.338	150.0	300	Circular_Default Sewer Type	176.174	174.513	1.361	176.592	174.111	2.181
2.003	17.846	150.0	375	Circular_Default Sewer Type	176.592	174.036	2.181	176.297	173.917	2.005
1.003	29.000	29.4	375	Circular_Default Sewer Type	176.297	173.917	2.005	174.829	172.929	1.525
1.004	25.791	10.0	375	Circular_Default Sewer Type	174.829	172.929	1.525	173.900	170.350	3.175
1.005	16.586	40.0	225	Circular_Default Sewer Type	173.900	170.300	3.375	173.000	169.885	2.890
1.006	23.260	40.0	225	Circular_Default Sewer Type	173.000	169.885	2.890	171.375	169.303	1.847
1.007	12.824	16.0	225	Circular_Default Sewer Type	171.375	169.303	1.847	169.812	168.500	1.087

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
1.000	1	1200	Manhole	Adoptable	2	1500	Manhole	Adoptable
1.001	2	1500	Manhole	Adoptable	3	1200	Manhole	Adoptable
1.002	3	1200	Manhole	Adoptable	4	1500	Manhole	Adoptable
2.000	10	1200	Manhole	Adoptable	11	1200	Manhole	Adoptable
2.001	11	1200	Manhole	Adoptable	12	1500	Manhole	Adoptable
2.002	12	1500	Manhole	Adoptable	13	1500	Manhole	Adoptable
2.003	13	1500	Manhole	Adoptable	4	1500	Manhole	Adoptable
1.003	4	1500	Manhole	Adoptable	5	1500	Manhole	Adoptable
1.004	5	1500	Manhole	Adoptable	6	2100	Manhole	Adoptable
1.005	6	2100	Manhole	Adoptable	7	1200	Manhole	Adoptable
1.006	7	1200	Manhole	Adoptable	8	1200	Manhole	Adoptable
1.007	8	1200	Manhole	Adoptable	9	1200	Manhole	Adoptable

Simulation Settings

Rainfall Methodology	FSR	Skip Steady State	✓
Rainfall Events	Singular	Drain Down Time (mins)	240
FSR Region	England and Wales	Additional Storage (m³/ha)	20.0
M5-60 (mm)	19.000	Starting Level (m)	
Ratio-R	0.400	Check Discharge Rate(s)	✓
Summer CV	0.750	Check Discharge Volume	✓
Winter CV	0.840	100 year 360 minute (m³)	
Analysis Speed	Detailed		

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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 %)
2	0	0	0
30	0	0	0
100	45	0	0

Pre-development Discharge Rate

Site Makeup	Greenfield	Growth Factor 30 year	1.95
Greenfield Method	IH124	Growth Factor 100 year	2.48
Positively Drained Area (ha)		Betterment (%)	0
SAAR (mm)		QBar	
Soil Index	1	Q 1 year (l/s)	
SPR	0.10	Q 30 year (l/s)	
Region	1	Q 100 year (l/s)	
Growth Factor 1 year	0.85		

Pre-development Discharge Volume

Site Makeup	Greenfield	Return Period (years)	100
Greenfield Method	FSR/FEH	Climate Change (%)	0
Positively Drained Area (ha)		Storm Duration (mins)	360
Soil Index	1	Betterment (%)	0
SPR	0.10	PR	
CWI		Runoff Volume (m^3)	

Node 6 Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	x	Sump Available	✓
Invert Level (m)	170.300	Product Number	CTL-SHE-0114-8500-2500-8500
Design Depth (m)	2.500	Min Outlet Diameter (m)	0.150
Design Flow (l/s)	8.5	Min Node Diameter (mm)	1500

Node 6 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	170.500
Side Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Time to half empty (mins)	

Depth (m)	Area (m^2)	Inf Area (m^2)	Depth (m)	Area (m^2)	Inf Area (m^2)	Depth (m)	Area (m^2)	Inf Area (m^2)
0.000	168.5	0.0	2.500	168.5	0.0	2.550	0.0	0.0

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Results for 2 year Critical Storm Duration. Lowest mass balance: 99.10%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	1	10	181.236	0.036	8.3	0.0639	0.0000	OK
15 minute winter	2	10	178.236	0.080	35.0	0.3085	0.0000	OK
15 minute winter	3	10	176.460	0.084	48.3	0.1726	0.0000	OK
15 minute winter	10	10	174.931	0.031	2.1	0.0394	0.0000	OK
15 minute winter	11	10	174.857	0.067	8.3	0.0974	0.0000	OK
15 minute winter	12	11	174.675	0.162	51.3	0.7734	0.0000	OK
15 minute winter	13	11	174.199	0.163	54.0	0.3222	0.0000	OK
15 minute winter	4	11	174.085	0.168	124.9	0.5022	0.0000	OK
15 minute winter	5	11	173.041	0.112	125.7	0.1975	0.0000	OK
120 minute winter	6	116	170.917	0.617	41.0	72.4853	0.0000	SURCHARGED
60 minute winter	7	42	169.932	0.047	7.1	0.0530	0.0000	OK
30 minute winter	8	46	169.340	0.036	7.1	0.0413	0.0000	OK
30 minute winter	9	46	168.535	0.035	7.1	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	2	8.2	1.018	0.054	0.3049	
15 minute winter	2	1.001	3	34.4	2.784	0.255	0.3158	
15 minute winter	3	1.002	4	48.2	2.873	0.169	0.6232	
15 minute winter	10	2.000	11	2.1	0.330	0.040	0.0716	
15 minute winter	11	2.001	12	8.2	0.725	0.193	0.3616	
15 minute winter	12	2.002	13	49.6	1.307	0.547	2.2887	
15 minute winter	13	2.003	4	54.1	1.170	0.332	0.8364	
15 minute winter	4	1.003	5	125.7	3.355	0.339	1.0925	
15 minute winter	5	1.004	6	125.9	2.309	0.198	1.7103	
120 minute winter	6	1.005	7	7.1	1.214	0.086	0.0965	
60 minute winter	7	1.006	8	7.1	1.399	0.086	0.1179	
30 minute winter	8	1.007	9	7.1	1.733	0.054	0.0523	78.0

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Results for 30 year Critical Storm Duration. Lowest mass balance: 99.24%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	1	10	181.249	0.049	15.7	0.0873	0.0000	OK
15 minute winter	2	10	178.273	0.117	66.3	0.4487	0.0000	OK
15 minute winter	3	10	176.492	0.116	91.8	0.2382	0.0000	OK
15 minute winter	10	10	174.941	0.041	3.9	0.0532	0.0000	OK
15 minute winter	11	10	174.883	0.093	15.6	0.1356	0.0000	OK
15 minute winter	12	11	174.780	0.267	97.1	1.2761	0.0000	OK
15 minute winter	13	11	174.282	0.246	100.3	0.4875	0.0000	OK
15 minute winter	4	11	174.170	0.253	234.4	0.7555	0.0000	OK
15 minute winter	5	11	173.085	0.156	235.6	0.2756	0.0000	OK
180 minute winter	6	180	171.545	1.245	57.3	180.4893	0.0000	SURCHARGED
720 minute winter	7	360	169.932	0.047	7.1	0.0530	0.0000	OK
15 minute summer	8	102	169.340	0.036	7.1	0.0413	0.0000	OK
15 minute summer	9	102	168.535	0.035	7.1	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	2	15.6	1.178	0.103	0.4945	
15 minute winter	2	1.001	3	65.3	3.266	0.484	0.5115	
15 minute winter	3	1.002	4	91.3	2.922	0.320	1.2415	
15 minute winter	10	2.000	11	3.9	0.390	0.074	0.1122	
15 minute winter	11	2.001	12	15.3	0.722	0.361	0.7800	
15 minute winter	12	2.002	13	92.0	1.465	1.016	3.7932	
15 minute winter	13	2.003	4	100.4	1.341	0.616	1.3908	
15 minute winter	4	1.003	5	235.6	3.836	0.636	1.7751	
15 minute winter	5	1.004	6	235.9	2.910	0.371	1.9810	
180 minute winter	6	1.005	7	7.1	1.214	0.086	0.0965	
720 minute winter	7	1.006	8	7.1	1.399	0.086	0.1179	
15 minute summer	8	1.007	9	7.1	1.733	0.054	0.0523	101.7

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Results for 100 year +45% CC Critical Storm Duration. Lowest mass balance: 99.35%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	1	10	181.267	0.067	29.5	0.1202	0.0000	OK
15 minute winter	2	10	178.344	0.188	124.6	0.7228	0.0000	OK
15 minute winter	3	11	176.544	0.168	171.9	0.3464	0.0000	OK
15 minute winter	10	12	176.187	1.287	26.4	1.6589	0.0000	FLOOD RISK
15 minute winter	11	12	176.199	1.409	26.0	2.0598	0.0000	SURCHARGED
15 minute winter	12	12	176.115	1.602	161.7	7.6524	0.0000	FLOOD RISK
15 minute winter	13	12	174.959	0.922	156.0	1.8246	0.0000	SURCHARGED
15 minute winter	4	11	174.795	0.878	397.8	2.6205	0.0000	SURCHARGED
15 minute winter	5	12	173.158	0.229	388.7	0.4049	0.0000	OK
240 minute winter	6	240	172.803	2.503	87.8	396.7936	0.0000	SURCHARGED
240 minute winter	7	240	169.936	0.051	8.4	0.0580	0.0000	OK
240 minute winter	8	240	169.343	0.040	8.4	0.0451	0.0000	OK
240 minute winter	9	240	168.539	0.039	8.4	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	2	29.3	1.289	0.194	0.8279	
15 minute winter	2	1.001	3	122.0	3.655	0.904	0.8549	
15 minute winter	3	1.002	4	171.2	2.948	0.599	2.0233	
15 minute winter	10	2.000	11	-19.4	-0.497	-0.373	0.4374	
15 minute winter	11	2.001	12	35.0	0.881	0.828	1.2071	
15 minute winter	12	2.002	13	145.3	2.064	1.605	4.2490	
15 minute winter	13	2.003	4	164.7	1.620	1.010	1.9684	
15 minute winter	4	1.003	5	388.7	3.886	1.049	2.6220	
15 minute winter	5	1.004	6	388.6	3.868	0.611	2.3319	
240 minute winter	6	1.005	7	8.4	1.275	0.102	0.1097	
240 minute winter	7	1.006	8	8.4	1.469	0.102	0.1340	
240 minute winter	8	1.007	9	8.4	1.821	0.064	0.0594	212.4

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