

Harrison Wood

Land to the rear of The Bulrushes, East Grinstead

Hydraulic Modelling Report

**REPORT REF.
2408600_A-ACE-XX-XX-RP-C-0501**

June 2026

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Document Control Sheet

REV	ISSUE PURPOSE	AUTHOR	CHECKED	APPROVED	DATE
-	DRAFT	GA	BC	DRAFT	June 2026
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1. Introduction

1.1. Ardent Consulting Engineers (hereafter referred to as Ardent) has been instructed by Harrison Wood to undertake a Technical Note to support a proposed residential development at Land to the rear of The Bulrushes, East Grinstead, West Sussex.

1.2. The Site location is shown in **Figure 1-1**. The Environment Agency (EA) Risk of Flooding from Surface Water (RoFSW) shows that site is predominantly within very low risk of flooding from surface water. The northern part of the site is located within higher risk.

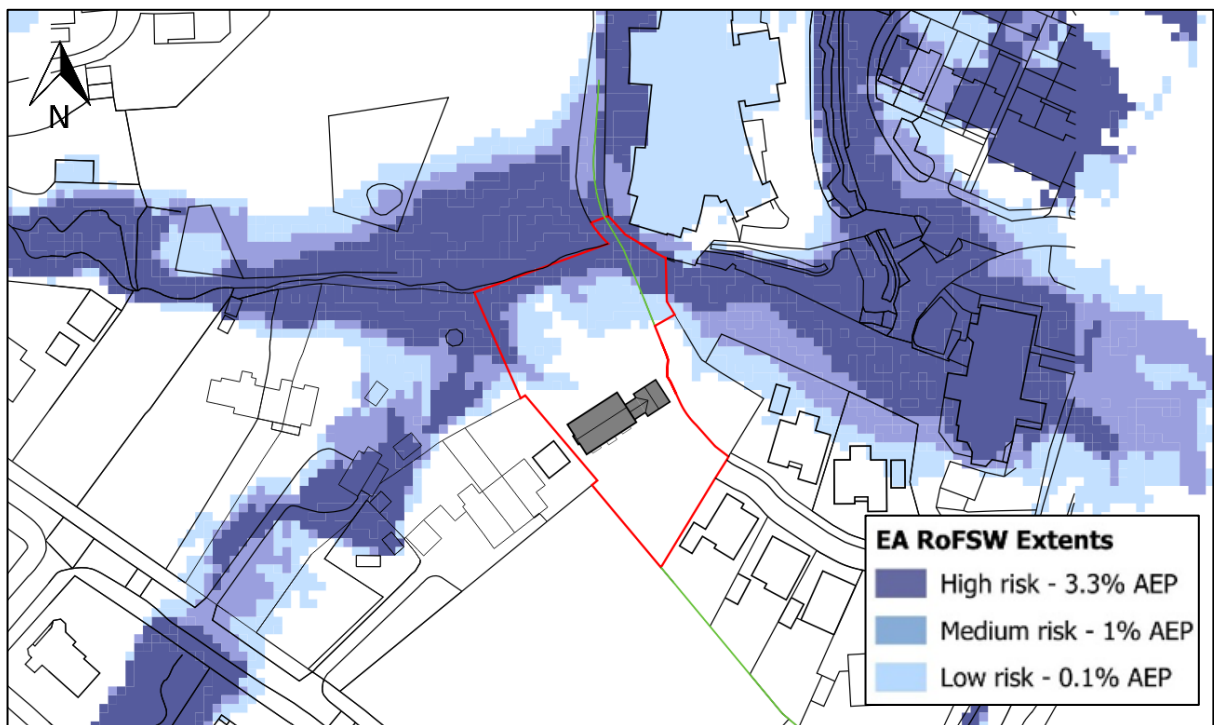


Figure 1-1: Site location plan and EA surface water flood mapping

1.3. The EA mapping is carried out at a national scale and does not represent local drainage features such as the culverts under the private road.

1.4. A detailed 1D-2D linked direct rainfall-runoff model has been developed using TUFLOW software to refine the understanding of surface water flood risk as part of the planning application submitted for the adjacent Site to the west (Report Ref. **2408600-ACE-XX-XX-RP-C-0501-1.0** included in **Appendix A**).

1.5. The model has been approved by the LLFA in 17/12/2025. Refer to **Appendix B** for the LLFA letter.

1.6. Model outputs were used to assess flood risk at the site of interest.

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2. Model Summary

- 2.1. A summary of the key model parameters is presented below. For more information refer to **Appendix A**.
- 2.2. A hydrological analysis has been undertaken to derive rainfall hyetographs for the study catchment area for the 3.3%, 3.3% plus 35% climate change, 1%, 1% plus 45% climate change uplift and 0.1% Annual Exceedance Probability Events. Flow hydrographs for these events were also derived for a larger watercourse located downstream of the site. The catchment also includes the site of interest and therefore this is fit for purpose.
- 2.3. A baseline hydraulic model has been built using a combination of LIDAR data, topographical survey data, Ordnance Survey land use data, and information provided by the client.
- 2.4. The baseline model has been built using the hydraulic modelling software TUFLOW. All scenarios have been run using TufLOW build version 2025.0.0-iSP-w64.
- 2.5. A 4m cell size has been applied across the model with Quadtree used to refine this to a 2m grid size along watercourses across the catchment and a 1m grid size within the vicinity of the Site. Sub-grid sampling has been enabled within TUFLOW, ensuring surface water flow paths were adequately represented.
- 2.6. No losses were applied to account for the presence of surface water sewers within the catchment as it is assumed any of these would drain to the study watercourse and not be lost from the catchment.
- 2.7. Sensitivity testing of the application of rainfall and flows to the model was undertaken and demonstrates the model has a low sensitivity to the approach used.

3. Baseline modelling results

3.1. The model has been run using the TUFLOW HPC solver with adaptive timestepping.

The model is run for a total duration of 5 hours to allow the full storm event to pass through the Site. Model results have been filtered to remove areas with a hazard rating below 0.575.

3.2. Peak flood extents for the modelled storm events are shown in **Figure 3-1**.

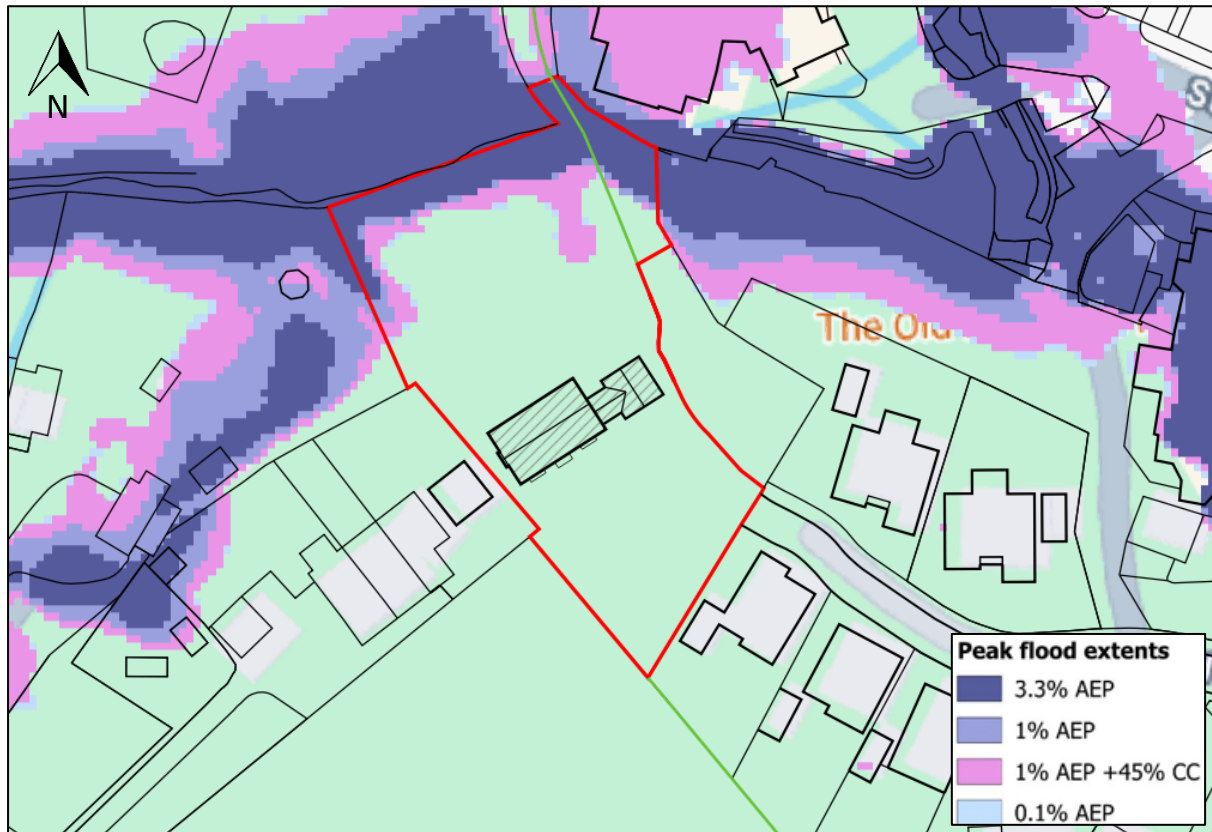


Figure 3-1: Baseline model flood extents

3.3. The proposed development is not affected by any of the events simulated.

3.4. The peak modelled flood hazard rating during the 1% AEP plus 45% climate change event is shown in **Figure 3-2**.

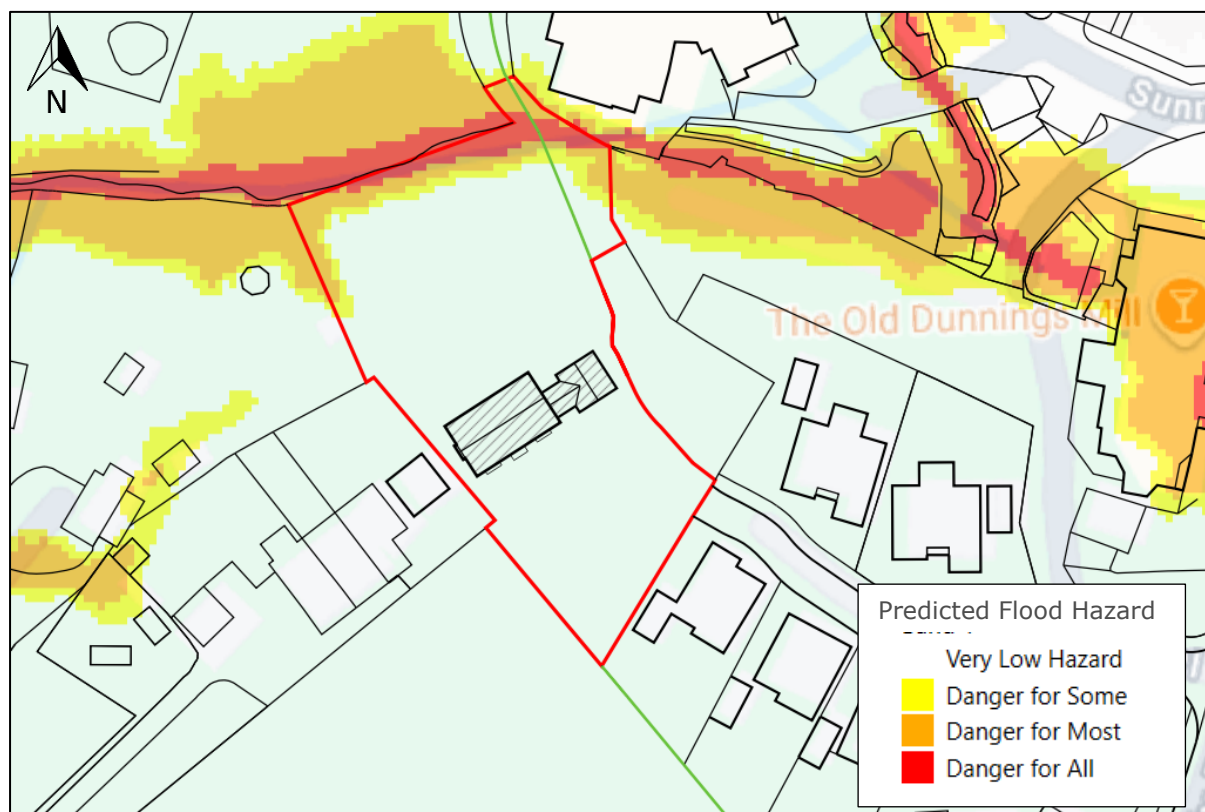


Figure 3-2: Peak modelled depths and levels – 1% AEP +45% climate change

3.5. The modelled flood hazard rating is predicted to be low across most of the site during the 1% AEP plus 45% climate change event, though within the deepest and fastest areas hazard ratings within the danger for some or danger for most bandings are predicted.

4. Summary

- 4.1. Ardent Consulting Engineers has been instructed by Harrison Wood to undertake a Technical Note to support a proposed residential development at Land to the rear of The Bulrushes, East Grinstead, West Sussex.
- 4.2. A detailed 1D-2D linked direct rainfall-runoff model has been developed using TUFLOW software to refine the understanding of surface water flood risk as part of the planning application submitted for the adjacent Site to the west. The model has been approved by the LLFA.
- 4.3. Model outputs were used to assess flood risk at the site of interest and show that the proposed development is not affected by any of the events simulated.
- 4.4. The proposed residential development is compliant with national and local policy in terms of surface water flood risk and will not exacerbate flooding off Site. Therefore, there are no surface water flood risk issues to prevent the development from being implemented.

Appendix A

Harrison Wood

The Bulrushes, East Grinstead

Hydraulic Modelling Report

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May 2025

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1. Introduction

1.1. Ardent Consulting Engineers (hereafter referred to as Ardent) has been instructed by Harrison Wood to undertake surface water hydraulic modelling to support a proposed residential development at The Bulrushes, East Grinstead, West Sussex.

1.2. The Site location is shown in **Figure 1-1**. An ordinary watercourse is culverted under the site from south to north, with the culvert starting immediately south of a private road adjoining the site. The culvert discharges to another ordinary watercourse along the northern site boundary. This then flows northeast joining a larger watercourse just west of Dunning's Road.

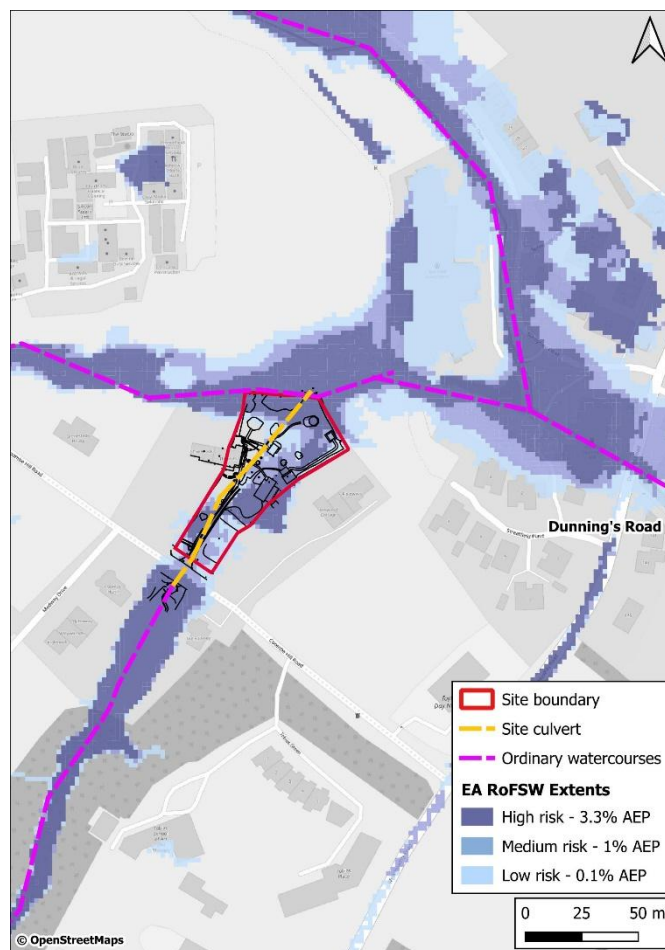


Figure 1-1: Site location plan and EA surface water flood mapping

1.3. The Environment Agency (EA) Risk of Flooding from Surface Water (RoFSW) shows parts of the Site are predicted to be at a high to low risk of surface water flooding (see **Figure 1-1**). However, the EA mapping is carried out a national scale and does not represent local drainage features such as the culverts under the private road.

1.4. Therefore, a detailed 1D-2D linked direct rainfall-runoff model has been developed using TUFLOW software to refine the understanding of surface water flood risk to the Site and inform the development proposals.

2. Hydrological Assessment

2.1. To inform the hydraulic modelling and assess surface water flood risk to the Site, rainfall hyetographs were derived to input to the hydraulic model.

2.2. FEH22 catchment descriptor data was obtained from the Flood Estimation Handbook (FEH) Web Service for the catchment draining via the ordinary watercourse culverted under the site and the ordinary watercourse that this connects in to (see **Figure 2-1**). The catchments are almost entirely rural with limited urbanisation. Descriptors for the catchment of the larger watercourse to the east of the site were also obtained.

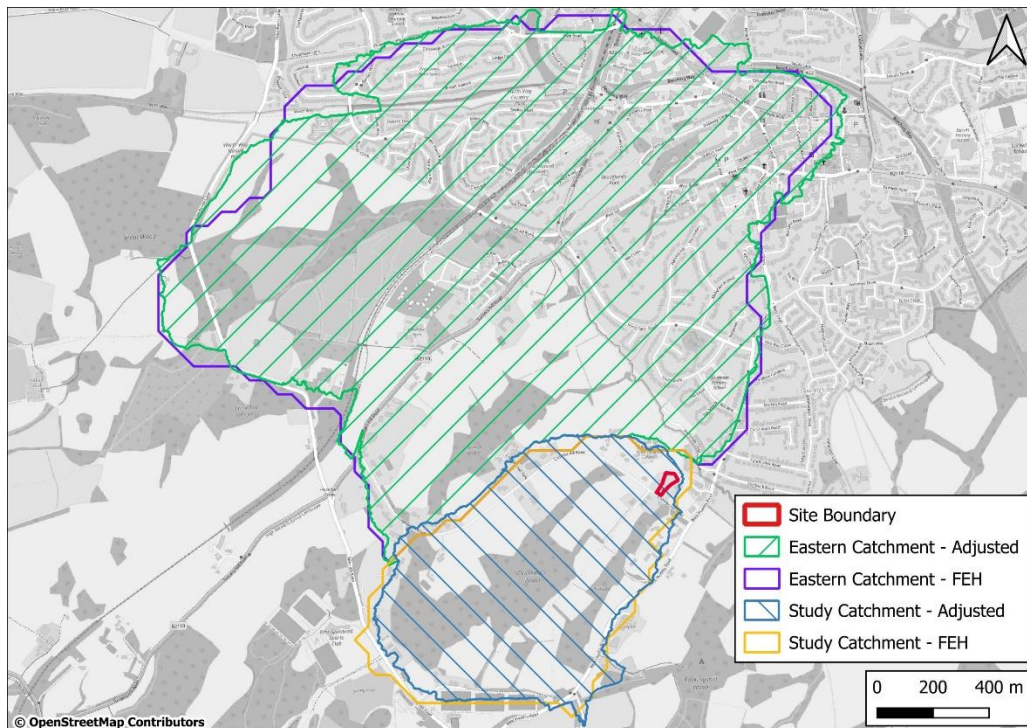


Figure 2-1: Estimated catchment boundary

2.3. A catchment analysis was undertaken using catchment delineation tools within QGIS to determine the catchment areas based on the 1m EA LIDAR Composite DTM, with the LIDAR data last collected in 2021. The updated catchment areas are shown in **Figure 2-1**. The adjusted study catchment has an area of 0.735km², compared to the value of 0.745km² for the FEH catchment. The wider eastern catchment has an area of 2.848km² adjusted from 2.865km² for the FEH catchment.

2.4. The catchment descriptors used to derive design rainfall and net rainfall for rural areas (SPRHOST, BFIHOST, SAAR, DPLBAR etc.) were assessed against available data, such as British Geological Society geology mapping and LANDIS SoilScapes mapping. Due to the negligible changes in catchment area the FEH catchment

descriptors were considered appropriate and as a result only the catchment area was updated, along with updating the URBEXT values to 2025 values in line with available guidance.

- 2.5. The revised FEH22 data for the study catchment was inputted to the Revitalised Flood Hydrograph 2 (ReFH2) software to derive rainfall hyetographs for the 3.3%, 1%, and 0.1% Annual Exceedance Probability (AEP) events.
- 2.6. Rainfall hyetographs were also derived for the 3.3% AEP event uplifted by 35% and the 1% AEP event uplifted by 45% to account for the potential impacts of climate change, in line with the latest EA guidance for the 2070s epoch upper end allowance in the Medway Management Catchment¹.
- 2.7. A winter storm profile was used to derive the hyetographs due to the rural nature of the catchment (URBEXT2000 = 0.3132).
- 2.8. The default storm duration for the study catchment is 2.25 hours. Hyetographs were also derived for a 1.25, 3.25-hour, 4.25-hour and 5.25-hour storm duration. All five durations were tested within the model for the 1% AEP plus 45% climate change event in the baseline model. The duration testing found the 1.25-hour storm event resulted in the highest peak flood depths at key locations in the Site, with this therefore used as the final design storm duration.
- 2.9. ReFH2 was also used to derive flow hydrographs for the catchment of the watercourse to the east of the site using the revised FEH22 data to account for potential impacts on the development site and study catchment. Given the proximity to the study catchment, it was considered appropriate to apply the same design rainfall event (winter seasonality and 1.25-hour storm duration) to derive the flow hydrographs. Losses within ReFH2 were applied using default values.
- 2.10. The design and net rainfall hyetographs were exported from ReFH2 for the study catchment, and river flow hydrographs for the eastern catchment. The application of the hyetographs and hydrographs to the model is detailed in **Section 3**. Example ReFH2 reports for the 1% AEP plus 45% climate change event for each catchment are provided in **Appendix B**, including details of the descriptor data.

¹ Medway Management Catchment peak rainfall allowances, Environment Agency. Available: <https://environment.data.gov.uk/hydrology/climate-change-allowances/rainfall?mgmtcatid=3055>

3. Baseline model build

3.1. The baseline model has been built using the hydraulic modelling software TUFLOW.

All scenarios have been run using TufLOW build version 2025.0.0-iSP-w64.

2D build

3.2. A 2D model schematic is shown in **Figure 3-1**.

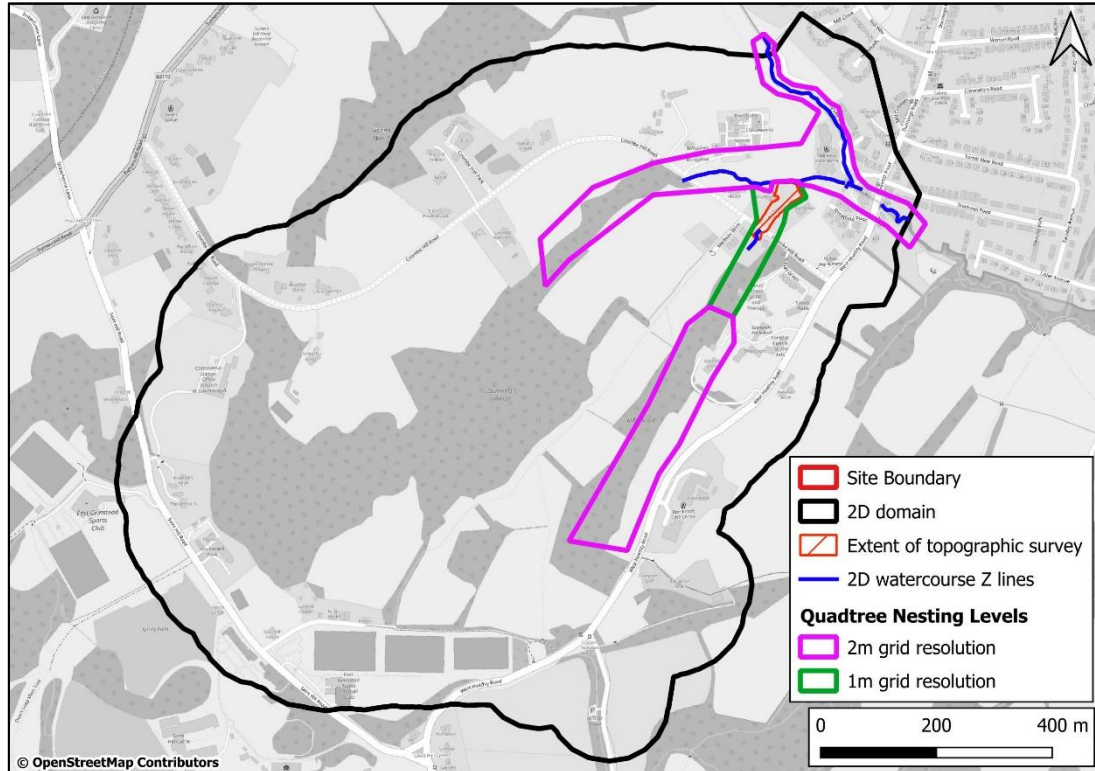


Figure 3-1: 2D Model schematic

3.3. Watercourses and the wider catchment are represented in the 2D domain, which covers an area of 1.175km², including the entire study catchment derived and an approximately 425m reach of the eastern watercourse.

3.4. Ground levels at the Site have been informed by a 3D ground model derived from topographic survey collected in 2024 by Foresight Geomatics (see **Appendix C**).

3.5. Elevations across the wider catchment were derived from the 2022 EA 1m LIDAR Composite DTM.

3.6. A 4m cell size has been applied across the model with Quadtree used to refine this to a 2m grid size along watercourses across the catchment and a 1m grid size within the vicinity of the Site. Sub-grid sampling has been enabled within TUFLOW, ensuring surface water flow paths were adequately represented.

3.7. Different land uses derived from topographic survey and OS VectorMapping have been assigned roughness values within the 2D domain. A general roughness value of 0.055 was applied to the model domain representing pasture and light vegetation. '2D_mat' files were then used to specify roughnesses for different land uses (see **Figure 3-1**). The values applied are shown in **Table 3-1**.

Table 3-1: 2D Manning's 'n' roughness values

Land use	Manning's 'n' roughness value
Open areas / Grassland	0.045
Pasture / light vegetation	0.055
Roads / Hardstanding	0.02
Buildings	0.3
Woodland / Dense vegetation	0.1
2D Watercourses	0.04
Open water / Ponds	0.03

3.8. Ordinary watercourses were represented in the 2D domain. In the absence of channel survey a 'Z-line' was used to stamp in channel levels taken from the LIDAR data used to inform the ground model (see **Figure 3-1**), with site topographic survey used where available. This approach is considered conservative as LIDAR data only captures the water surface and not the channel bed levels, therefore underestimating the channel capacity.

3.9. Ponds / open water have had an initial water level applied inferred from LIDAR, with 'Z-shapes' used to set the bed level 0.5m below the inferred initial water level.

1D build

3.10. The culvert running under the site is shown within the site topographic survey to start as a 600mm pipe south of the private road and becomes a 300mm pipe where it discharges into the adjacent watercourse north of the site. The culvert inlet upstream of the site is shown in **Figure 3-2**.



Figure 3-2: Culvert inlet

3.11. The culvert was represented within the 1D domain using the ESTRY solver within TUFLOW. As a conservative assumption the pipe was represented as 600mm circular pipe for the width of the private road, becoming a 300mm circular pipe within the site boundary. The invert levels and spill levels were represented in the 2D domain from topographic survey data. A 1D model schematic is shown in **Figure 3-3**.

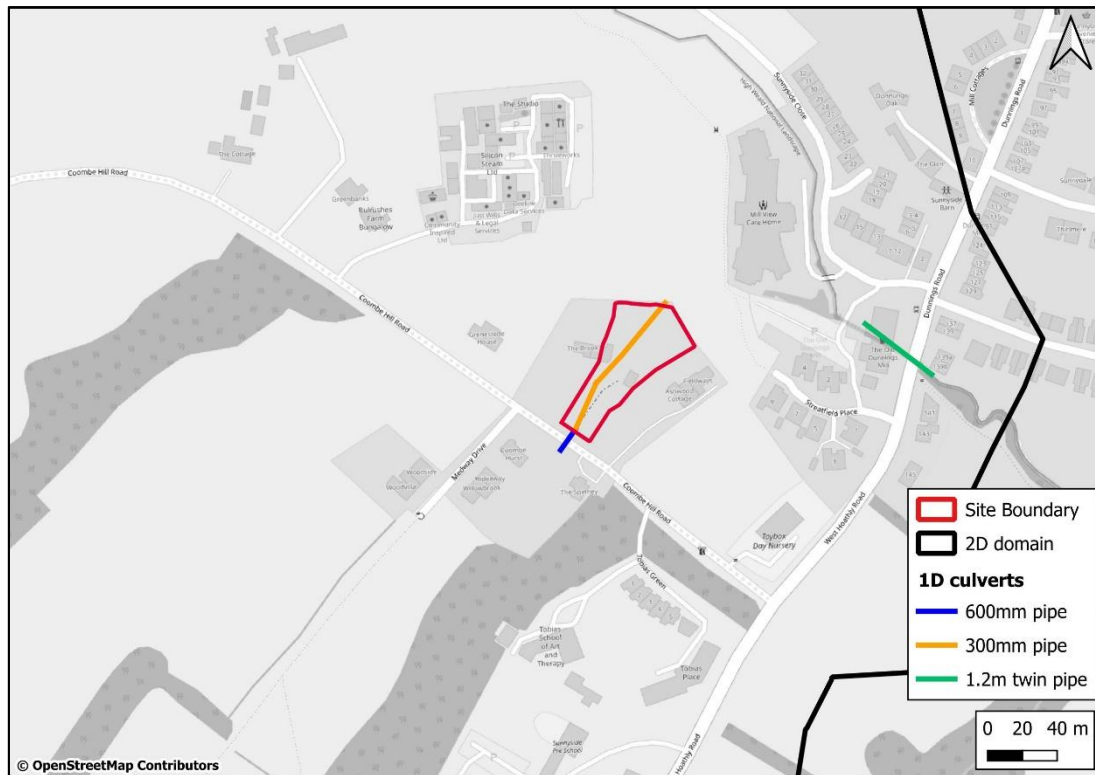


Figure 3-3: 1D Model schematic

3.12. A series of structures were identified on the eastern watercourse upstream of Dunning's Road. Limited information was available for the purposes of this study and therefore it was decided to take a conservative approach to the representation of these features. Structures upstream of the confluence with the study watercourse were represented with Z-lines used to allow flows to be conveyed downstream unrestricted.

3.13. At the culvert under Dunning's Road photographs obtained from the internet showed a large twin pipe (see **Figure 3-4**). A conservative dimension of each pipe of 1.2m was estimated, with LIDAR used to inform invert levels. A blockage analysis of the twin culvert was undertaken to assess the impact of the representation of this structure on flooding at the Site. The blockage analysis found a negligible impact on flood depths within the Site boundary meaning the representation of the culvert was considered appropriate (see **Appendix A** for further details).



Figure 3-4: Dunning's Road culvert. Source: Google Maps

3.14. Pipe roughnesses were applied in line with available guidance (i.e. Chow, 1959) based on observations of the culvert materials and condition. All culverts had a Manning's 'n' value of 0.013 applied. Standard entry and exit losses were applied in line with TUFLOW guidance.

Boundary conditions

3.15. A '2d_rf' layer was used to apply rainfall directly to the 2D model domain. The total net rainfall profile from ReFH2 was applied to the model domain incorporating rural and urban losses. The net rainfall hyetograph was applied to the area shown in **Figure 3-5**, with the catchment of the eastern watercourse excluded to avoid double counting of the inflows.

3.16. A QT boundary was applied to the upstream extent of the eastern watercourse within the model domain to apply the estimated flow hydrographs.

3.17. No losses were applied to account for the presence of surface water sewers within the catchment as it is assumed any of these would drain to the study watercourse and not be lost from the catchment.

3.18. Sensitivity testing of the application of rainfall and flows to the model was undertaken and demonstrates the model has a low sensitivity to the approach used (see **Appendix A**).

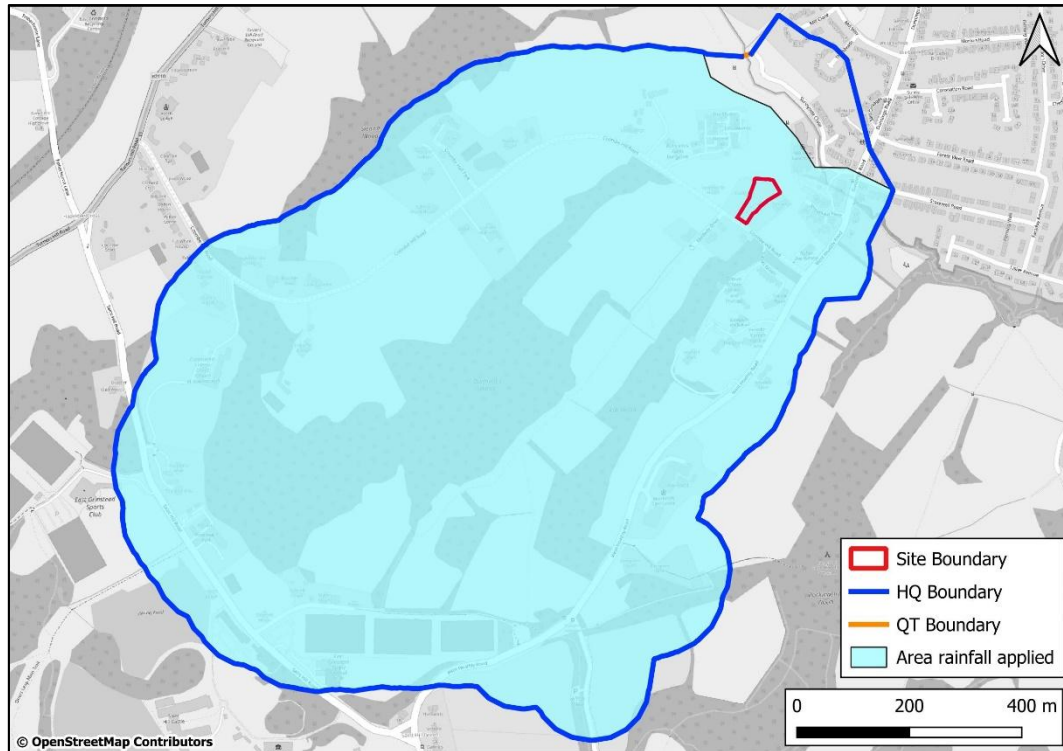


Figure 3-5: Model boundaries

3.19. To allow runoff to pass out of the 2D domain an HQ boundary was applied at the downstream extent of the eastern watercourse in the model domain, with a gradient derived from the EA LIDAR DTM. HQ boundaries with general slope values were applied to the rest of 2D domain to prevent glass-walling (see **Figure 3-5**).

3.20. 2D_bc 'SX' lines have been used to link the 1D culverts to the 2D domain.

Assumptions / limitations

3.21. The representation of any complex system by a model requires a number of assumptions to be made. In the case of the 1D and 2D elements of the model, the following assumptions have been made:

- Model parameters, such as roughness and structure coefficients, are representative of the general conditions;
- The units used to represent hydraulic structures within the model represent the situation accurately using the available information, including assumptions made to simplify representations where necessary;
- Culvert dimensions and inverts have been estimated where data is not available;
- The model hydrology accurately represents flows in the models given there was no flow / level data available for the catchment to calibrate flows in the model;

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- Watercourses are modelled to be dry at the beginning of the simulation, with inflows solely from rainfall;
- The LIDAR and OS mapping are representative of the land surface and are an up to date reflection of current ground levels and land uses.

4. Baseline modelling results

4.1. The model has been run using the TUFLOW HPC solver with adaptive timestepping.

The model is run for a total duration of 5 hours to allow the full storm event to pass through the Site. Model results have been filtered to remove areas with a hazard rating below 0.575.

4.2. Peak flood extents for the modelled storm events are shown in **Figure 4-1**.

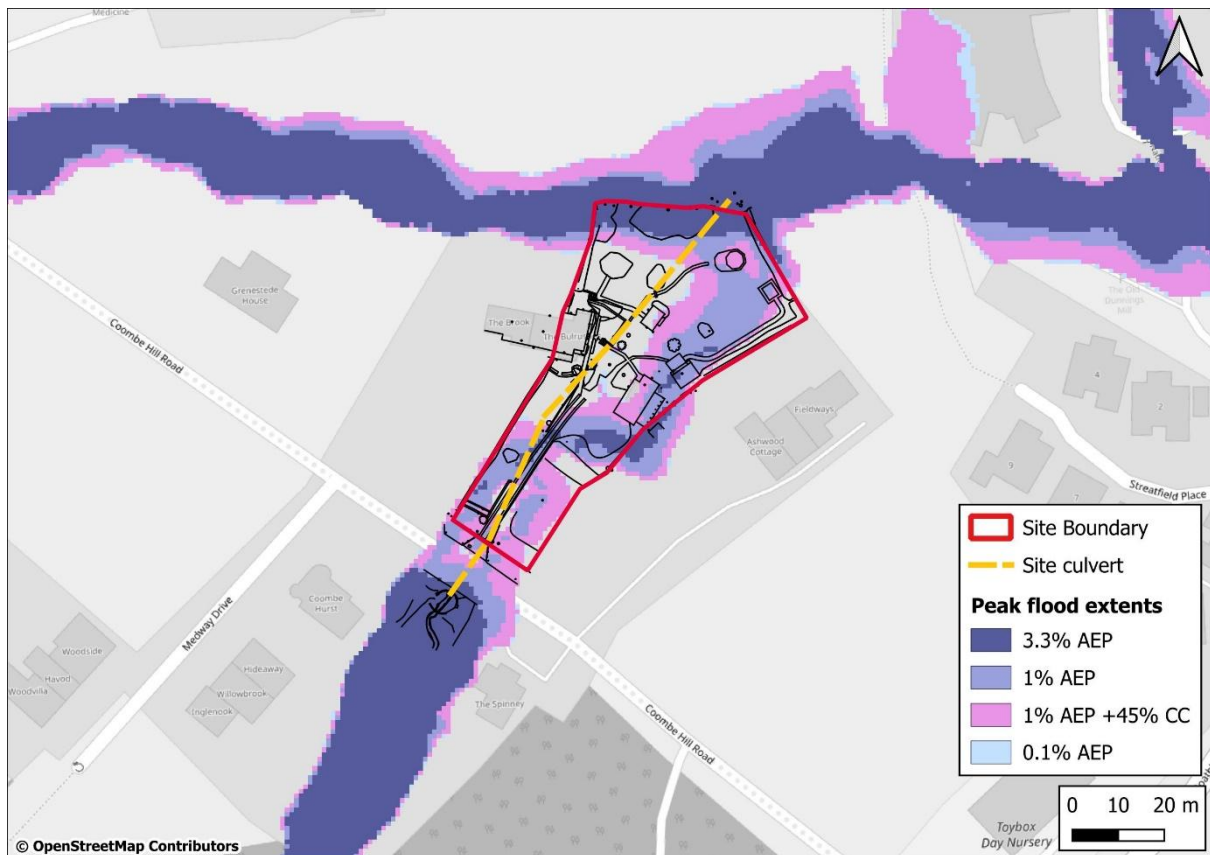


Figure 4-1: Baseline model flood extents

4.3. During the 3.3% AEP event there is only small areas of flooding predicted within the site boundary. During the 1% AEP event the larger volume of flows conveyed down the study watercourse result in surcharging of the culvert under the site, with flows overtopping the private road and running northeast through the site following the site topography. A small area of ponding is predicted south of the existing garage in the east of the site where a topographic depression exists.

4.4. The 1% AEP plus 45% climate change event and 0.1% AEP event have very similar peak flood extents predicted, with the flow path through the site becoming more widespread and defined.

4.5. Peak modelled flood depths during the 1% AEP plus 45% climate change event are presented in **Figure 4-2**, with the peak flood levels also shown.

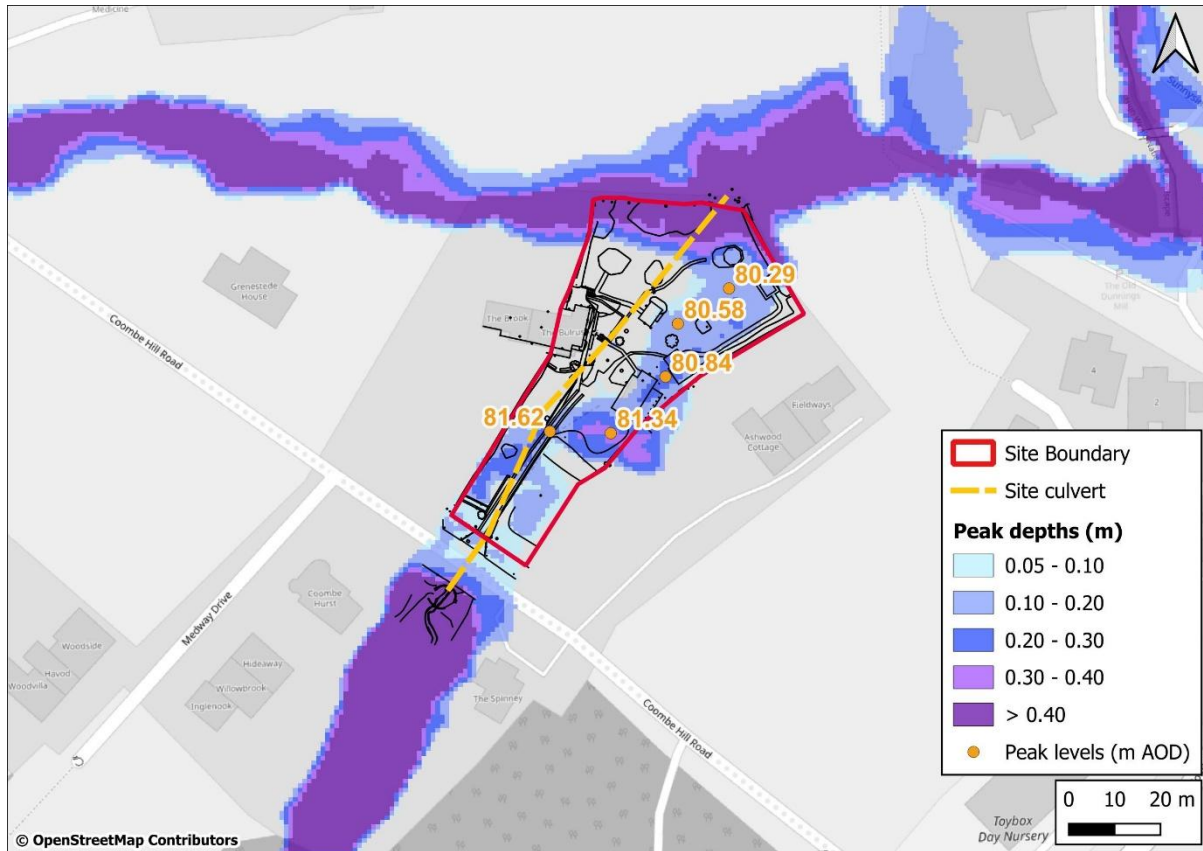


Figure 4-2: Peak modelled depths and levels – 1% AEP +45% climate change

4.6. Peak modelled flood depths within the site during the 1% AEP plus 45% climate change event are generally relatively shallow below 200mm as flows are conveyed through the site. Depths of up to 250mm are predicted along the existing site access, with the greatest depths of up to 330mm in the topographic depression in the east of the site.

4.7. Peak modelled levels around the existing garage building range from 81.34m AOD to the south to 80.84m AOD to the north.

4.8. The peak modelled flood hazard rating during the 1% AEP plus 45% climate change event is shown in **Figure 4-3**.

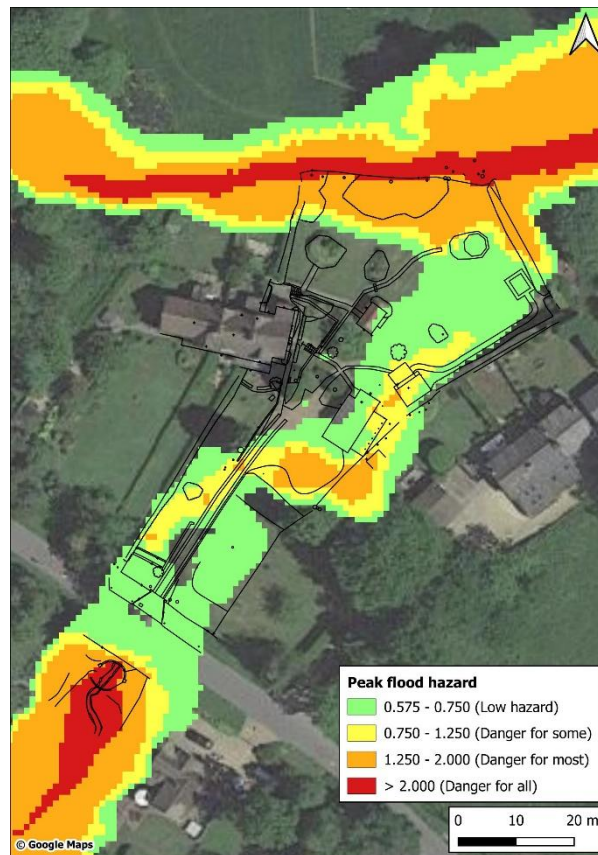


Figure 4-3: Peak modelled depths and levels – 1% AEP +45% climate change

4.9. The modelled flood hazard rating is predicted to be low across most of the site during the 1% AEP plus 45% climate change event, though within the deepest and fastest areas hazard ratings within the danger for some or danger for most bandings are predicted. The existing access road has a hazard rating within the danger for some banding predicted.

Model Validation

4.10. No gauging data of flows or levels was available to inform the model validation. As a result, the model outputs have been compared to the EA RoFSW mapping (see **Figure 1-1** and **Figure 4-1**).

4.11. During the 0.1% AEP event the model results show a good fit with the EA outputs, indicating the model is appropriately representing the flood risk to the site. There is a large difference between the modelled and EA outputs for the 3.3% AEP event. This is due to the inclusion of the onsite culvert which is not represented within the EA model, and therefore shows less overtopping of the private road from the south once included in the model.

4.12. The maximum uncertainty associated with the model outputs is approximately +/-40mm (see **Appendix A**).

Model stability

4.13. A review of the model outputs indicates the model is stable for the duration of the event, with total mass errors of 0% and timestep efficiency above 99% after the model initialisation. The model runs have no negative depths or repeated timesteps.

5. Post-development modelling

Model Updates

5.1. The indicative development proposals (see **Appendix D**) were represented within the hydraulic model to assess the potential impacts of the development on flood risk offsite. The updates to the baseline model are shown in **Figure 5-1**.



Figure 5-1: Proposed mitigation measures

5.2. The proposed residential building was raised using a Z-shape to be flood proof, with rainfall removed from the building as it is assumed this will be managed through the use of SuDS features. The roughness file was updated to remove the garage and other outbuildings in the east of the site as these will be demolished as part of the development proposals.

5.3. Additionally, minor ground level modifications around the access road and proposed building were represented using Z-shapes to divert flood waters away from the residential unit.

Post-Development Model Results

5.4. Peak flood depths and levels for the 1% AEP plus 45% climate change event during the post-development scenario are shown in **Figure 5-2**.

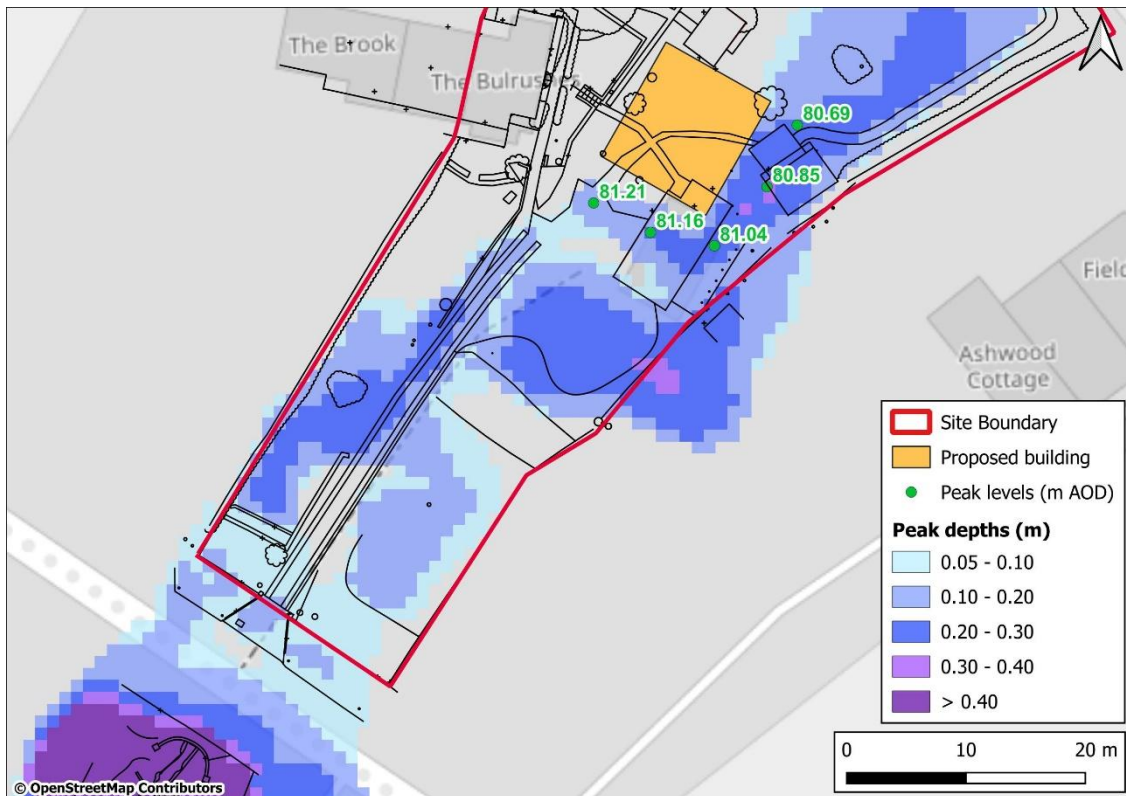


Figure 5-2: Peak modelled depths and levels – 1% AEP plus 45% climate change event – Post-development scenario

5.5. The indicative development proposals show the flow path is routed around the east of the residential building, as per the existing scenario, with the proposed building to be set above the peak flood levels.

5.6. Peak flood levels during the 1% AEP plus 45% climate change event are predicted to range from 81.21m AOD at the southwest of the proposed building to 80.69m AOD to the northeast. Peak depths along the flow path of between approximately 150mm-300mm are predicted around the building. It is recommended that the model outputs are used to inform finished floor levels of the proposed residential unit with an appropriate freeboard.

5.7. Peak depths of up to approximately 200-250mm are predicted along the access road linking the proposed building to the private road to the south.

5.8. A comparison of the peak flood depths between the baseline and post-development scenarios is shown in **Figure 5-3**. The model results demonstrate the proposals are not predicted to have a detrimental impact on flood risk to third party land, with all increases in peak depths contained within the site boundary.

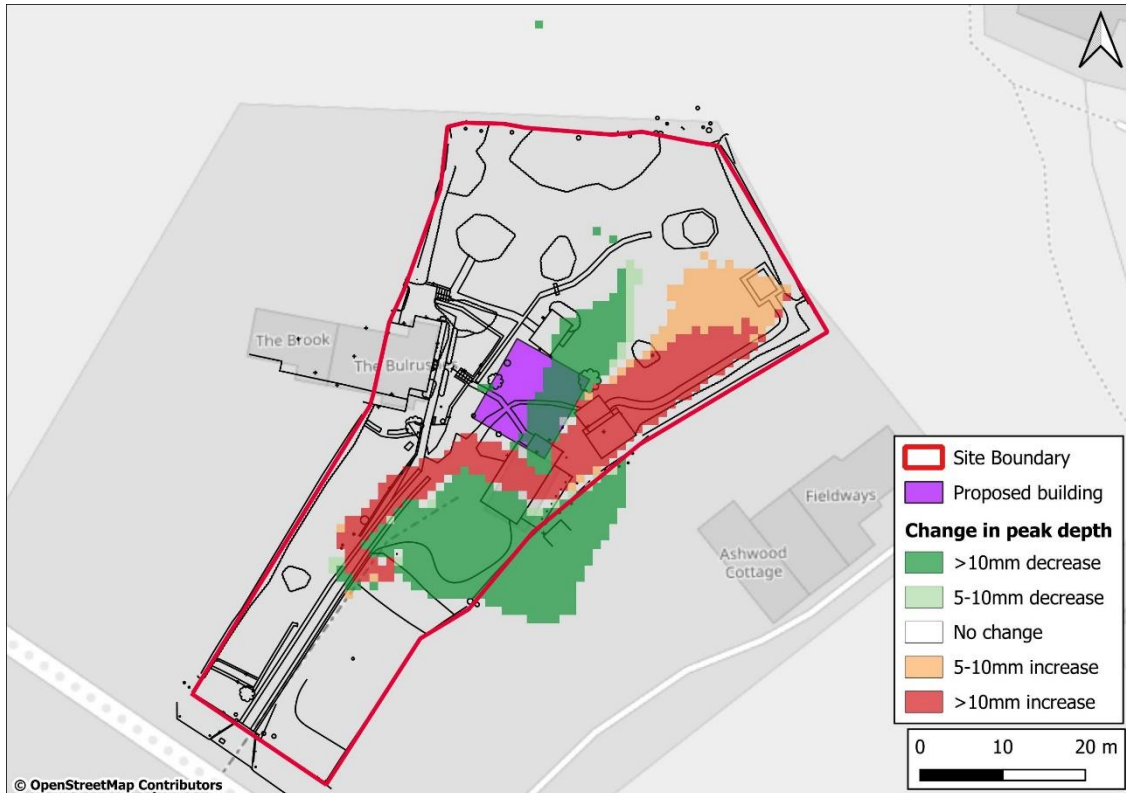


Figure 5-3: Change in peak modelled depths – 1% AEP plus 45% climate change event

5.9. The removal of the garage in the east of the site and reprofiling allows the overland flow path to pass more freely along the site's eastern boundary, reducing the flood depths immediately offsite to the east by up to approximately 33mm. The increased depths along the flow path are then negligible by the time it leaves the site boundary to the north.

5.10. The peak modelled flood hazard rating during the post-development scenario for the 1% AEP plus 45% climate change event is shown in **Figure 5-4**, with a graph showing the duration of flooding to the access road shown in **Figure 5-5**.

5.11. Due to the proposed ground level modifications there is a route to the private highway south of the site entirely via an area designated as very low hazard, enabling safe access in the event of a flood.

5.12. Furthermore, the flooding to the access road is predicted to be very short in duration, with depths only predicted to be above 0.05m for less than 45 minutes. During a flood event residents would be advised to remain within the property outside of the area of flood risk until the flow path has passed through the site.

5.13. Additionally, depths along the access road of up to approximately 0.20-0.25m are predicted during the 1% AEP plus 45% climate change event meaning the residential property is still accessible to emergency vehicles at the peak of the flood event.

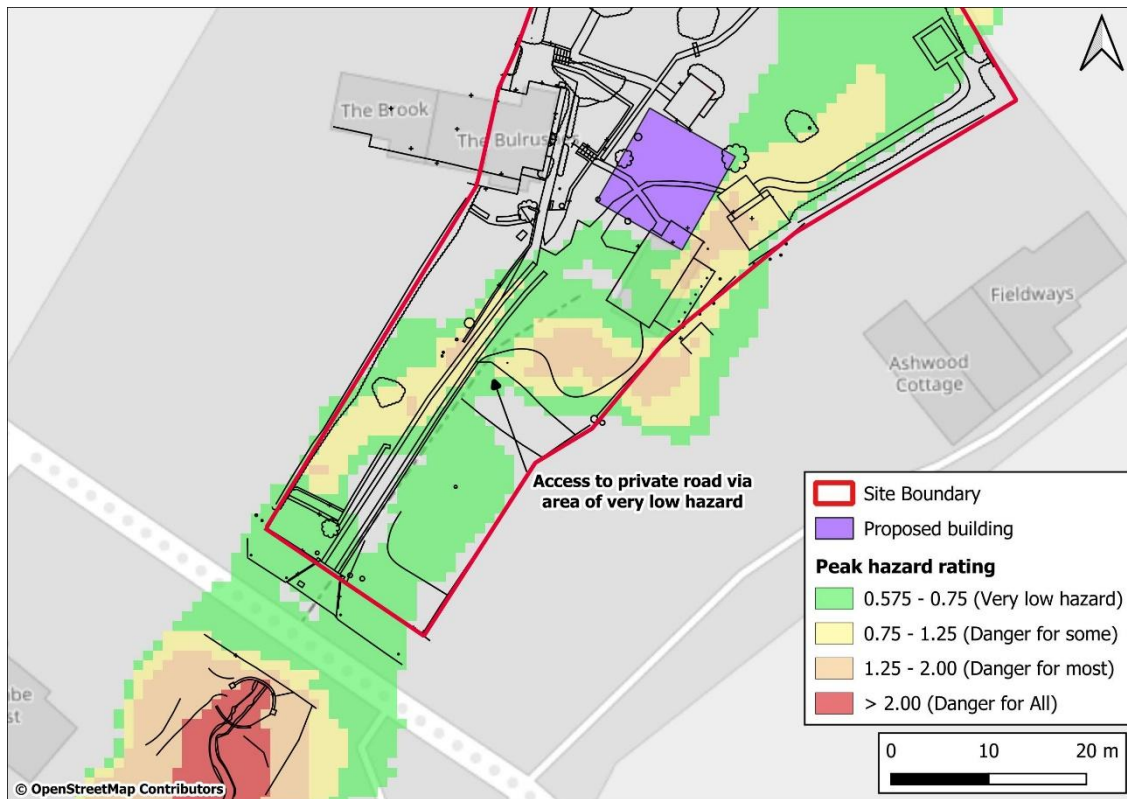


Figure 5-4: Peak modelled hazard rating – 1% AEP +45% climate change event

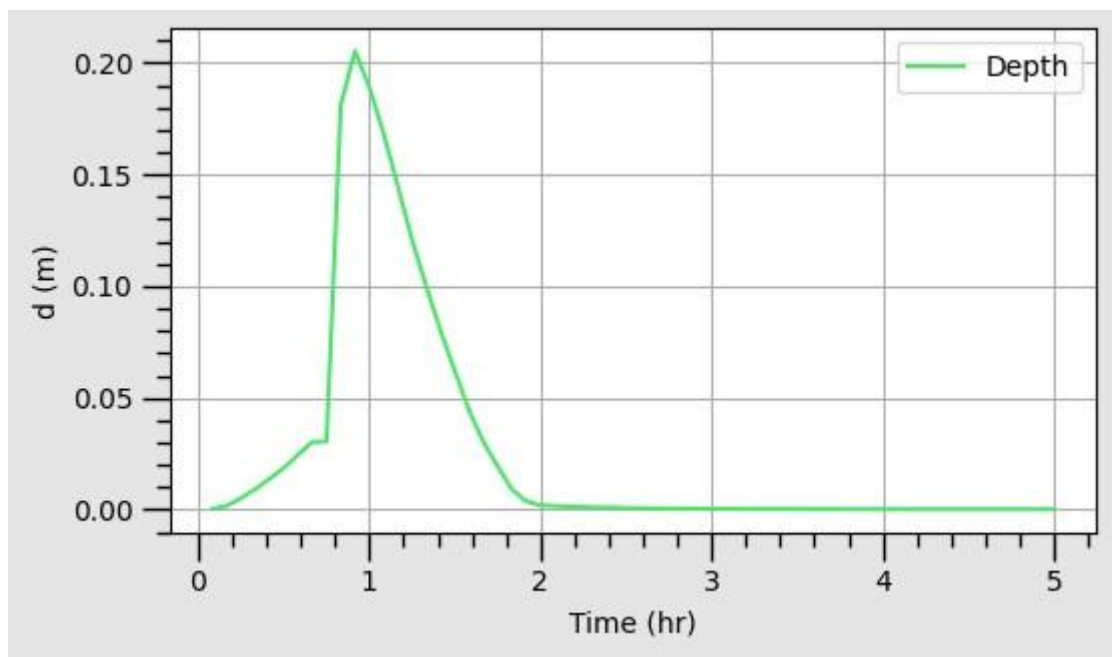


Figure 5-5: Depths along access road – 1% AEP plus 45% climate change event

6. Summary

- 6.1. Ardent Consulting Engineers has been instructed by Harrison Wood to undertake surface water hydraulic modelling to support a proposed residential development at The Bulrushes, East Grinstead, West Sussex.
- 6.2. A detailed 1D-2D linked direct rainfall-runoff model has been developed using TUFLOW software to refine the understanding of surface water flood risk to the Site from an ordinary watercourse that is culverted under the Site.
- 6.3. A hydrological analysis has been undertaken to derive rainfall hyetographs for the study catchment area for the 3.3%, 3.3% plus 35% climate change, 1%, 1% plus 45% climate change uplift and 0.1% Annual Exceedance Probability Events. Flow hydrographs for these events were also derived for a larger watercourse located downstream of the site.
- 6.4. A baseline hydraulic model has been built using a combination of LIDAR data, topographical survey data, Ordnance Survey land use data, and information provided by the client.
- 6.5. The model results show limited flooding is predicted within the site during the 3.3% AEP event, though during the 1% AEP event an overland flow path forms running through the site, largely along the eastern boundary. During the 1% AEP plus 45% climate change event a wider flow path is modelled to occur, with depths largely below 200mm, though peaking at 330mm in a topographic depression.
- 6.6. Post-development modelling was undertaken to assess the potential impacts of the proposed residential development and associated minor ground level reprofiling. The model outputs show the flow path through the site is routed around the proposed building.
- 6.7. Peak flood levels during the 1% AEP plus 45% climate change event are predicted to range from 81.21m AOD at the southwest of the proposed building to 80.69m AOD to the northeast. Peak depths along the flow path of between approximately 150mm-300mm are predicted around the building. It is recommended that the model outputs are used to inform finished floor levels of the proposed residential unit with an appropriate freeboard.
- 6.8. The model outputs demonstrate the proposals are not predicted to have a detrimental impact on flood risk offsite, with all increases contained within the site

boundary. The removal of the existing garage allows flows to pass more freely along the eastern boundary, resulting in decreases in peak flood depths offsite to the east of up to approximately 33mm.

- 6.9. Due to the proposed ground level modifications there is a route to the private highway south of the site entirely via an area designated as very low hazard, enabling safe access in the event of a flood. The road is only predicted to flood for 45 minutes and therefore it is safe for residents to remain within the property for the duration of the flood event beyond the predicted flood extents. However, if required the site is accessible to emergency vehicles with depths of up to 200-250mm predicted along the access road.
- 6.10. Sensitivity testing of Manning's 'n' roughness values, critical storm duration, 1D representations, and blockage has been carried out. The results of the analysis show that the model is not overly sensitive to changes in these parameters.
- 6.11. The proposed residential development is compliant with national and local policy in terms of surface water flood risk and will not exacerbate flooding off Site. Therefore, there are no surface water flood risk issues to prevent the development from being implemented.

Appendices

Appendix A – Sensitivity Testing

A. It is standard hydraulic modelling practice to undertake a sensitivity analysis of key model parameters to consider any uncertainty attached to the adopted values and understand how sensitive the model is to changes in these parameters.

B. In the absence of any gauged data / recorded flood events / observable historic information, Ardent have undertaken a sensitivity test of key parameters in order to improve confidence in the model outputs and to ensure the model is robust to changes in these parameters. All sensitivity runs have been undertaken on the 1% AEP plus 45% climate change event.

C. Ardent have undertaken a sensitivity analysis on the following parameters for the baseline scenario:

- Manning's 'n' roughness values +/- 20%;
- Inflows + 20% ; and
- Blockage analysis;

Manning's 'n' roughness

D. Manning's 'n' roughness values have been adjusted by +/- 20% in the 1D and 2D domains during post-development scenario. The peak modelled extents from the sensitivity testing are shown in **Figure A.1**.

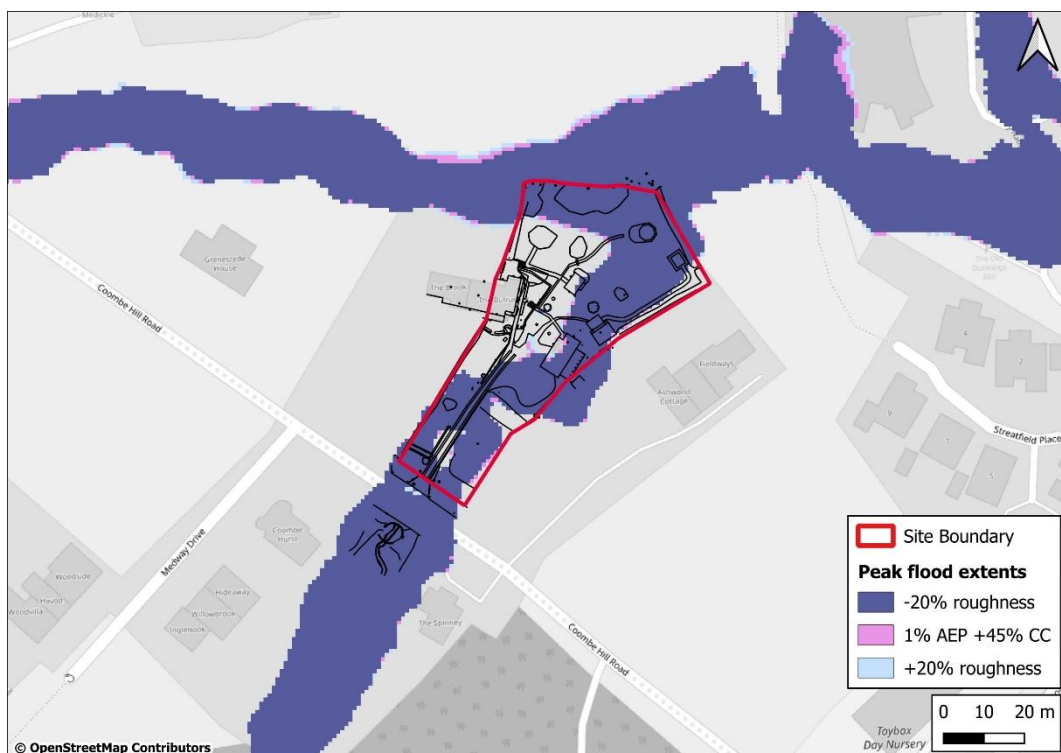


Figure A.1: Roughness sensitivity extents – 1% AEP plus 45% climate change

E. The results show the model has a negligible sensitivity to the roughness values applied to the model domain, with only minor changes in the peak flood extents and negligible differences in peak flood depths (<+/- up to 12mm) across the Site.

Model inflows

F. The sensitivity to the model hydrology has been assessed by increasing the rainfall profile by 20% and by increasing the QT flow boundary by 20%. Peak modelled extents in the sensitivity scenario are shown in **Figure A.2**

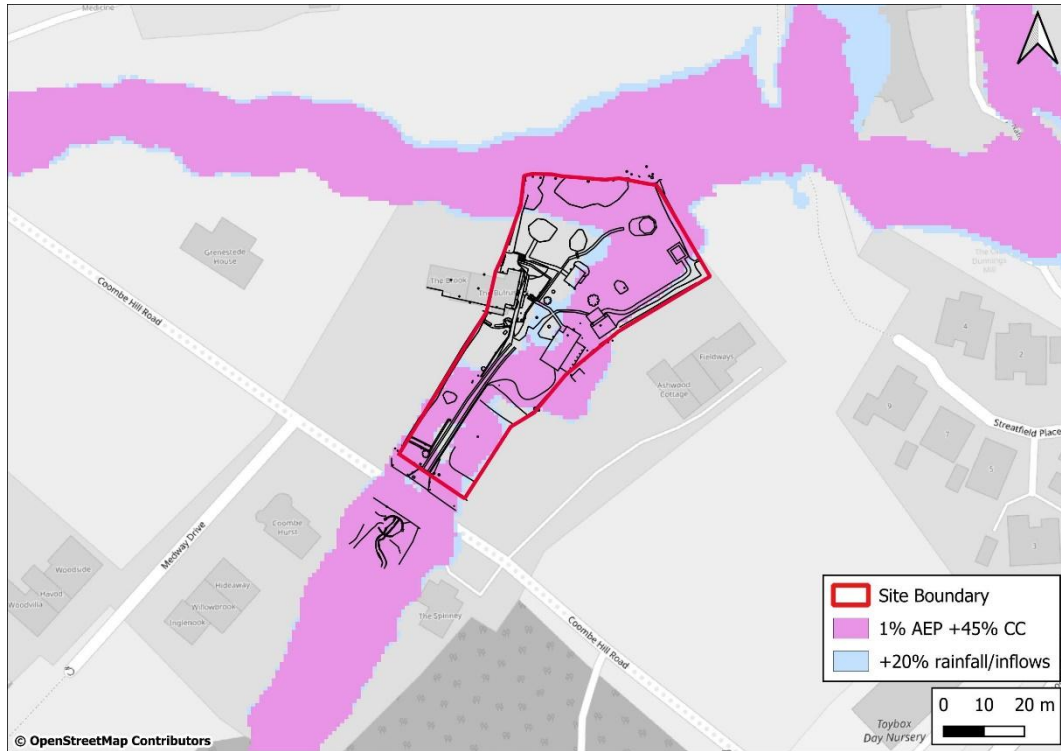


Figure A.2: Soil sensitivity extents – 1% AEP plus 45% climate change

G. The results show the model has a low sensitivity to the rainfall intensity and peak flows applied within the model, with only slight increases in the peak flood extents in the site and increases in peak depths of up to 40mm.

Blockage Analysis

H. Blockage analysis has undertaken on the culvert under Dunning's Road to assess the impact on results on the site and determine if the assumptions made about the representation of the culvert are appropriate. As this culvert is at the downstream of the model extent the blockage analysis is also considered to be a test of the downstream boundary conditions. A 90% blockage was applied to the 1.2m twin culvert in the model to assess the impacts on flood risk at the site.

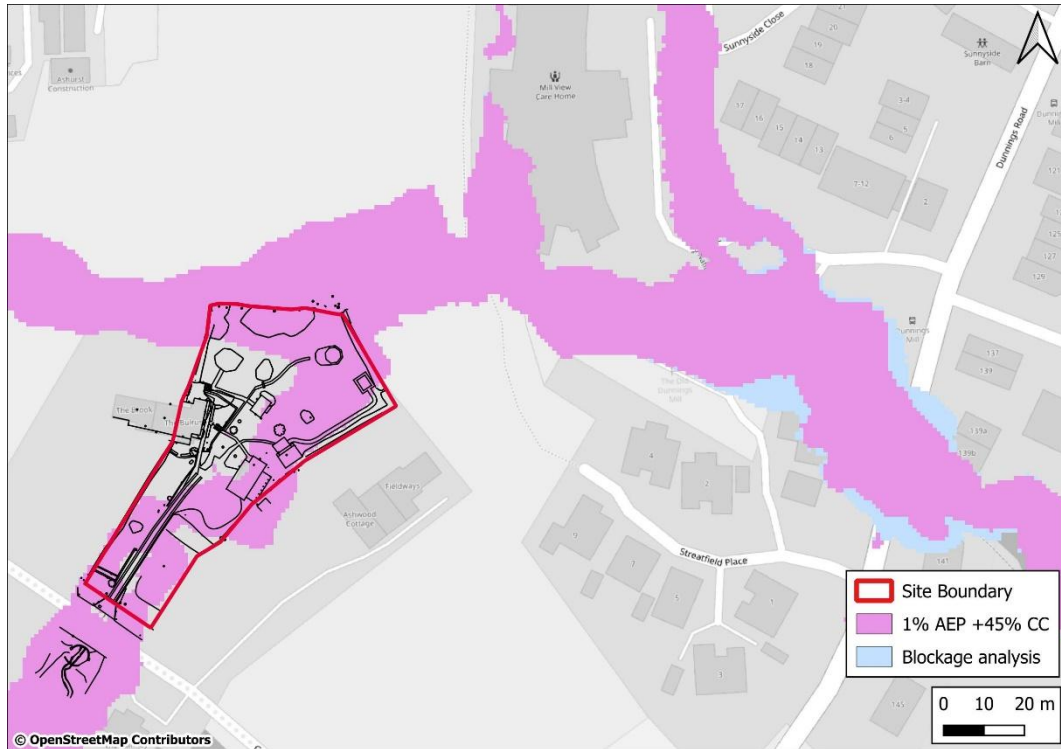


Figure B.3: Blockage sensitivity extents – 1% AEP plus 45% climate change

I. The blockage sensitivity analysis shows that the modelled blockages have no impact on the peak flood depths and extents within the site boundary. The assumptions made regarding structures downstream of the site are therefore considered appropriate, as is the representation of the downstream boundary, with both located far enough away from the site that there is no impact on the model outputs.

Sensitivity test conclusions

J. Ardent have carried out a range of sensitivity tests on key parameters for the hydraulic model in order to test the validity of the model outputs and ensure that the assumptions made in the modelling are appropriate. The review of the sensitivity test outlined above suggests that the adopted model parameters are appropriate. The maximum uncertainty associated with the model outputs is approximately +/-40mm.

Appendix B – 1% AEP plus climate change ReFH2 outputs

UK Design Flood Estimation

Generated on 14 April 2025 16:45:52 by jaxton
Printed from the ReFH2 Flood Modelling software package, version 4.1.8879.22310

Summary of estimate using the Flood Estimation Handbook revitalised flood hydrograph method (ReFH2)

Site detailsChecksum: 4ABF-A350

Site name: FEH_Catchment_Descriptors_539150_136900_v5_0_1_ADJ

Easting: 539150

Northing: 136900

Country: England, Wales or Northern Ireland

Catchment Area (km²): 0.74

Using plot scale calculations: No

Model: 2.3

Site description:None

Model run: 100 year 1.45 CC

Summary of results

Rainfall - FEH22 (mm):	94.36	Total runoff (ML):	37.42
Total Rainfall (mm):	65.85	Total flow (ML):	48.39
Peak Rainfall (mm):	3.40	Peak flow (m³/s):	3.47

Parameters

Where the user has overridden a system-generated value, this original value is shown in square brackets after the value used.
* Indicates that the user locked the duration/timestep

Rainfall parameters (Rainfall - FEH22)

Name	Value	User-defined?
Duration (hh:mm:ss)	04:15:00 [02:15:00]	Yes
Timestep (hh:mm:ss)	00:05:00 [00:15:00]	Yes
SCF (Seasonal correction factor)	0.71	No
ARF (Areal reduction factor)	0.98	No
Seasonality	Winter	No
Climate change factor	1.45	Yes

Loss model parameters

Name	Value	User-defined?
Cini (mm)	142.04	No
Cmax (mm)	225.54	No
Use alpha correction factor	No	No
Alpha correction factor	n/a	No

Routing model parameters

Name	Value	User-defined?
Tp (hr)	1.31	No
Up	0.65	No
Uk	0.8	No

Baseflow model parameters

Name	Value	User-defined?
BF0 (m ³ /s)	0.04	No
BL (hr)	21.82	No
BR	0.29	No

Urbanisation parameters

Name	Value	User-defined?
Sewer capacity (m ³ /s)	0	No
Exporting drained area (km ²)	0	No
Urban area (km ²)	0.02	No
Effective URBEXT2000	0.02	n/a
Impervious runoff factor	0.7	No
Imperviousness factor	0.4	No
Tp scaling factor	0.75	No
Depression storage depth (mm)	0.5	No

Time series data

Time (hh:mm:ss)	Rain (mm)	Sewer Loss (m³/s)	Net Rain (mm)	Runoff (m³/s)	Baseflow (m³/s)	Total Flow (m³/s)
00:00:00	0.252	0.000	0.159	0.000	0.044	0.044
00:05:00	0.282	0.000	0.178	0.001	0.044	0.044
00:10:00	0.315	0.000	0.200	0.002	0.043	0.046
00:15:00	0.352	0.000	0.224	0.005	0.043	0.048
00:20:00	0.394	0.000	0.252	0.009	0.043	0.052
00:25:00	0.440	0.000	0.282	0.015	0.043	0.058
00:30:00	0.492	0.000	0.316	0.023	0.043	0.066
00:35:00	0.549	0.000	0.354	0.032	0.043	0.075
00:40:00	0.614	0.000	0.397	0.044	0.043	0.087
00:45:00	0.685	0.000	0.446	0.058	0.043	0.101
00:50:00	0.765	0.000	0.500	0.075	0.042	0.118
00:55:00	0.854	0.000	0.561	0.095	0.042	0.138
01:00:00	0.953	0.000	0.630	0.119	0.042	0.161
01:05:00	1.062	0.000	0.707	0.146	0.042	0.189
01:10:00	1.184	0.000	0.794	0.178	0.042	0.221
01:15:00	1.319	0.000	0.892	0.215	0.043	0.257
01:20:00	1.469	0.000	1.002	0.257	0.043	0.299
01:25:00	1.635	0.000	1.126	0.304	0.043	0.347
01:30:00	1.818	0.000	1.266	0.356	0.043	0.399
01:35:00	2.020	0.000	1.424	0.413	0.044	0.457
01:40:00	2.241	0.000	1.601	0.478	0.044	0.522
01:45:00	2.482	0.000	1.799	0.549	0.045	0.594
01:50:00	2.743	0.000	2.019	0.629	0.045	0.674
01:55:00	3.018	0.000	2.260	0.718	0.046	0.764
02:00:00	3.284	0.000	2.505	0.817	0.047	0.864
02:05:00	3.404	0.000	2.646	0.928	0.048	0.976
02:10:00	3.284	0.000	2.602	1.052	0.049	1.101
02:15:00	3.018	0.000	2.432	1.187	0.051	1.237
02:20:00	2.743	0.000	2.245	1.333	0.052	1.385
02:25:00	2.482	0.000	2.029	1.487	0.054	1.541
02:30:00	2.241	0.000	1.855	1.649	0.056	1.705
02:35:00	2.020	0.000	1.691	1.814	0.058	1.873
02:40:00	1.818	0.000	1.538	1.983	0.061	2.043
02:45:00	1.635	0.000	1.395	2.151	0.063	2.215

Time (hh:mm:ss)	Rain (mm)	Sewer Loss (m ³ /s)	Net Rain (mm)	Runoff (m ³ /s)	Baseflow (m ³ /s)	Total Flow (m ³ /s)
02:50:00	1.469	0.000	1.264	2.318	0.066	2.384
02:55:00	1.319	0.000	1.143	2.481	0.069	2.550
03:00:00	1.184	0.000	1.032	2.638	0.072	2.710
03:05:00	1.062	0.000	0.931	2.785	0.075	2.861
03:10:00	0.953	0.000	0.839	2.922	0.079	3.000
03:15:00	0.854	0.000	0.756	3.043	0.082	3.126
03:20:00	0.765	0.000	0.680	3.148	0.086	3.234
03:25:00	0.685	0.000	0.611	3.233	0.089	3.323
03:30:00	0.614	0.000	0.549	3.297	0.093	3.390
03:35:00	0.549	0.000	0.493	3.339	0.097	3.436
03:40:00	0.492	0.000	0.442	3.360	0.100	3.460
03:45:00	0.440	0.000	0.397	3.362	0.104	3.466
03:50:00	0.394	0.000	0.356	3.348	0.107	3.455
03:55:00	0.352	0.000	0.319	3.318	0.111	3.428
04:00:00	0.315	0.000	0.286	3.274	0.114	3.388
04:05:00	0.282	0.000	0.256	3.219	0.117	3.336
04:10:00	0.252	0.000	0.229	3.154	0.120	3.274
04:15:00	0.000	0.000	0.000	3.080	0.123	3.203
04:20:00	0.000	0.000	0.000	2.998	0.125	3.123
04:25:00	0.000	0.000	0.000	2.908	0.128	3.036
04:30:00	0.000	0.000	0.000	2.813	0.130	2.943
04:35:00	0.000	0.000	0.000	2.713	0.133	2.846
04:40:00	0.000	0.000	0.000	2.610	0.135	2.745
04:45:00	0.000	0.000	0.000	2.505	0.137	2.642
04:50:00	0.000	0.000	0.000	2.400	0.139	2.538
04:55:00	0.000	0.000	0.000	2.294	0.140	2.435
05:00:00	0.000	0.000	0.000	2.189	0.142	2.331
05:05:00	0.000	0.000	0.000	2.084	0.143	2.228
05:10:00	0.000	0.000	0.000	1.980	0.145	2.125
05:15:00	0.000	0.000	0.000	1.877	0.146	2.023
05:20:00	0.000	0.000	0.000	1.774	0.147	1.921
05:25:00	0.000	0.000	0.000	1.672	0.148	1.821
05:30:00	0.000	0.000	0.000	1.572	0.149	1.721
05:35:00	0.000	0.000	0.000	1.472	0.150	1.623
05:40:00	0.000	0.000	0.000	1.376	0.151	1.527

Time (hh:mm:ss)	Rain (mm)	Sewer Loss (m ³ /s)	Net Rain (mm)	Runoff (m ³ /s)	Baseflow (m ³ /s)	Total Flow (m ³ /s)
05:45:00	0.000	0.000	0.000	1.283	0.152	1.434
05:50:00	0.000	0.000	0.000	1.193	0.152	1.345
05:55:00	0.000	0.000	0.000	1.106	0.153	1.258
06:00:00	0.000	0.000	0.000	1.022	0.153	1.175
06:05:00	0.000	0.000	0.000	0.941	0.153	1.094
06:10:00	0.000	0.000	0.000	0.863	0.153	1.016
06:15:00	0.000	0.000	0.000	0.788	0.154	0.941
06:20:00	0.000	0.000	0.000	0.716	0.154	0.870
06:25:00	0.000	0.000	0.000	0.648	0.154	0.801
06:30:00	0.000	0.000	0.000	0.583	0.153	0.736
06:35:00	0.000	0.000	0.000	0.521	0.153	0.675
06:40:00	0.000	0.000	0.000	0.464	0.153	0.617
06:45:00	0.000	0.000	0.000	0.411	0.153	0.564
06:50:00	0.000	0.000	0.000	0.362	0.153	0.515
06:55:00	0.000	0.000	0.000	0.319	0.152	0.471
07:00:00	0.000	0.000	0.000	0.279	0.152	0.431
07:05:00	0.000	0.000	0.000	0.244	0.151	0.395
07:10:00	0.000	0.000	0.000	0.212	0.151	0.363
07:15:00	0.000	0.000	0.000	0.184	0.151	0.334
07:20:00	0.000	0.000	0.000	0.158	0.150	0.308
07:25:00	0.000	0.000	0.000	0.136	0.150	0.285
07:30:00	0.000	0.000	0.000	0.116	0.149	0.265
07:35:00	0.000	0.000	0.000	0.098	0.149	0.247
07:40:00	0.000	0.000	0.000	0.083	0.148	0.231
07:45:00	0.000	0.000	0.000	0.069	0.148	0.217
07:50:00	0.000	0.000	0.000	0.058	0.147	0.205
07:55:00	0.000	0.000	0.000	0.047	0.147	0.194
08:00:00	0.000	0.000	0.000	0.038	0.146	0.184
08:05:00	0.000	0.000	0.000	0.031	0.145	0.176
08:10:00	0.000	0.000	0.000	0.024	0.145	0.169
08:15:00	0.000	0.000	0.000	0.019	0.144	0.163
08:20:00	0.000	0.000	0.000	0.014	0.144	0.158
08:25:00	0.000	0.000	0.000	0.010	0.143	0.153
08:30:00	0.000	0.000	0.000	0.007	0.143	0.150
08:35:00	0.000	0.000	0.000	0.005	0.142	0.147

Time (hh:mm:ss)	Rain (mm)	Sewer Loss (m ³ /s)	Net Rain (mm)	Runoff (m ³ /s)	Baseflow (m ³ /s)	Total Flow (m ³ /s)
08:40:00	0.000	0.000	0.000	0.003	0.142	0.144
08:45:00	0.000	0.000	0.000	0.001	0.141	0.142
08:50:00	0.000	0.000	0.000	0.001	0.141	0.141
08:55:00	0.000	0.000	0.000	0.000	0.140	0.140
09:00:00	0.000	0.000	0.000	0.000	0.140	0.140
09:05:00	0.000	0.000	0.000	0.000	0.139	0.139
09:10:00	0.000	0.000	0.000	0.000	0.138	0.138
09:15:00	0.000	0.000	0.000	0.000	0.138	0.138
09:20:00	0.000	0.000	0.000	0.000	0.137	0.137
09:25:00	0.000	0.000	0.000	0.000	0.137	0.137
09:30:00	0.000	0.000	0.000	0.000	0.136	0.136
09:35:00	0.000	0.000	0.000	0.000	0.136	0.136
09:40:00	0.000	0.000	0.000	0.000	0.135	0.135
09:45:00	0.000	0.000	0.000	0.000	0.135	0.135
09:50:00	0.000	0.000	0.000	0.000	0.134	0.134
09:55:00	0.000	0.000	0.000	0.000	0.134	0.134
10:00:00	0.000	0.000	0.000	0.000	0.133	0.133
10:05:00	0.000	0.000	0.000	0.000	0.133	0.133
10:10:00	0.000	0.000	0.000	0.000	0.132	0.132
10:15:00	0.000	0.000	0.000	0.000	0.132	0.132
10:20:00	0.000	0.000	0.000	0.000	0.131	0.131
10:25:00	0.000	0.000	0.000	0.000	0.131	0.131
10:30:00	0.000	0.000	0.000	0.000	0.130	0.130
10:35:00	0.000	0.000	0.000	0.000	0.130	0.130
10:40:00	0.000	0.000	0.000	0.000	0.129	0.129
10:45:00	0.000	0.000	0.000	0.000	0.129	0.129
10:50:00	0.000	0.000	0.000	0.000	0.128	0.128
10:55:00	0.000	0.000	0.000	0.000	0.128	0.128
11:00:00	0.000	0.000	0.000	0.000	0.127	0.127
11:05:00	0.000	0.000	0.000	0.000	0.127	0.127
11:10:00	0.000	0.000	0.000	0.000	0.126	0.126
11:15:00	0.000	0.000	0.000	0.000	0.126	0.126
11:20:00	0.000	0.000	0.000	0.000	0.125	0.125
11:25:00	0.000	0.000	0.000	0.000	0.125	0.125
11:30:00	0.000	0.000	0.000	0.000	0.124	0.124

Time (hh:mm:ss)	Rain (mm)	Sewer Loss (m ³ /s)	Net Rain (mm)	Runoff (m ³ /s)	Baseflow (m ³ /s)	Total Flow (m ³ /s)
11:35:00	0.000	0.000	0.000	0.000	0.124	0.124
11:40:00	0.000	0.000	0.000	0.000	0.123	0.123
11:45:00	0.000	0.000	0.000	0.000	0.123	0.123
11:50:00	0.000	0.000	0.000	0.000	0.123	0.123
11:55:00	0.000	0.000	0.000	0.000	0.122	0.122
12:00:00	0.000	0.000	0.000	0.000	0.122	0.122
12:05:00	0.000	0.000	0.000	0.000	0.121	0.121
12:10:00	0.000	0.000	0.000	0.000	0.121	0.121
12:15:00	0.000	0.000	0.000	0.000	0.120	0.120
12:20:00	0.000	0.000	0.000	0.000	0.120	0.120
12:25:00	0.000	0.000	0.000	0.000	0.119	0.119
12:30:00	0.000	0.000	0.000	0.000	0.119	0.119
12:35:00	0.000	0.000	0.000	0.000	0.118	0.118
12:40:00	0.000	0.000	0.000	0.000	0.118	0.118
12:45:00	0.000	0.000	0.000	0.000	0.117	0.117
12:50:00	0.000	0.000	0.000	0.000	0.117	0.117
12:55:00	0.000	0.000	0.000	0.000	0.117	0.117
13:00:00	0.000	0.000	0.000	0.000	0.116	0.116
13:05:00	0.000	0.000	0.000	0.000	0.116	0.116
13:10:00	0.000	0.000	0.000	0.000	0.115	0.115
13:15:00	0.000	0.000	0.000	0.000	0.115	0.115
13:20:00	0.000	0.000	0.000	0.000	0.114	0.114
13:25:00	0.000	0.000	0.000	0.000	0.114	0.114
13:30:00	0.000	0.000	0.000	0.000	0.114	0.114
13:35:00	0.000	0.000	0.000	0.000	0.113	0.113
13:40:00	0.000	0.000	0.000	0.000	0.113	0.113
13:45:00	0.000	0.000	0.000	0.000	0.112	0.112
13:50:00	0.000	0.000	0.000	0.000	0.112	0.112
13:55:00	0.000	0.000	0.000	0.000	0.111	0.111
14:00:00	0.000	0.000	0.000	0.000	0.111	0.111
14:05:00	0.000	0.000	0.000	0.000	0.111	0.111
14:10:00	0.000	0.000	0.000	0.000	0.110	0.110
14:15:00	0.000	0.000	0.000	0.000	0.110	0.110
14:20:00	0.000	0.000	0.000	0.000	0.109	0.109
14:25:00	0.000	0.000	0.000	0.000	0.109	0.109

Time (hh:mm:ss)	Rain (mm)	Sewer Loss (m ³ /s)	Net Rain (mm)	Runoff (m ³ /s)	Baseflow (m ³ /s)	Total Flow (m ³ /s)
14:30:00	0.000	0.000	0.000	0.000	0.108	0.108
14:35:00	0.000	0.000	0.000	0.000	0.108	0.108
14:40:00	0.000	0.000	0.000	0.000	0.108	0.108
14:45:00	0.000	0.000	0.000	0.000	0.107	0.107
14:50:00	0.000	0.000	0.000	0.000	0.107	0.107
14:55:00	0.000	0.000	0.000	0.000	0.106	0.106
15:00:00	0.000	0.000	0.000	0.000	0.106	0.106
15:05:00	0.000	0.000	0.000	0.000	0.106	0.106
15:10:00	0.000	0.000	0.000	0.000	0.105	0.105
15:15:00	0.000	0.000	0.000	0.000	0.105	0.105
15:20:00	0.000	0.000	0.000	0.000	0.104	0.104
15:25:00	0.000	0.000	0.000	0.000	0.104	0.104
15:30:00	0.000	0.000	0.000	0.000	0.104	0.104
15:35:00	0.000	0.000	0.000	0.000	0.103	0.103
15:40:00	0.000	0.000	0.000	0.000	0.103	0.103
15:45:00	0.000	0.000	0.000	0.000	0.102	0.102
15:50:00	0.000	0.000	0.000	0.000	0.102	0.102
15:55:00	0.000	0.000	0.000	0.000	0.102	0.102
16:00:00	0.000	0.000	0.000	0.000	0.101	0.101
16:05:00	0.000	0.000	0.000	0.000	0.101	0.101
16:10:00	0.000	0.000	0.000	0.000	0.100	0.100
16:15:00	0.000	0.000	0.000	0.000	0.100	0.100
16:20:00	0.000	0.000	0.000	0.000	0.100	0.100
16:25:00	0.000	0.000	0.000	0.000	0.099	0.099
16:30:00	0.000	0.000	0.000	0.000	0.099	0.099
16:35:00	0.000	0.000	0.000	0.000	0.099	0.099
16:40:00	0.000	0.000	0.000	0.000	0.098	0.098
16:45:00	0.000	0.000	0.000	0.000	0.098	0.098
16:50:00	0.000	0.000	0.000	0.000	0.097	0.097
16:55:00	0.000	0.000	0.000	0.000	0.097	0.097
17:00:00	0.000	0.000	0.000	0.000	0.097	0.097
17:05:00	0.000	0.000	0.000	0.000	0.096	0.096
17:10:00	0.000	0.000	0.000	0.000	0.096	0.096
17:15:00	0.000	0.000	0.000	0.000	0.096	0.096
17:20:00	0.000	0.000	0.000	0.000	0.095	0.095

Time (hh:mm:ss)	Rain (mm)	Sewer Loss (m ³ /s)	Net Rain (mm)	Runoff (m ³ /s)	Baseflow (m ³ /s)	Total Flow (m ³ /s)
17:25:00	0.000	0.000	0.000	0.000	0.095	0.095
17:30:00	0.000	0.000	0.000	0.000	0.095	0.095
17:35:00	0.000	0.000	0.000	0.000	0.094	0.094
17:40:00	0.000	0.000	0.000	0.000	0.094	0.094
17:45:00	0.000	0.000	0.000	0.000	0.093	0.093
17:50:00	0.000	0.000	0.000	0.000	0.093	0.093
17:55:00	0.000	0.000	0.000	0.000	0.093	0.093
18:00:00	0.000	0.000	0.000	0.000	0.092	0.092
18:05:00	0.000	0.000	0.000	0.000	0.092	0.092
18:10:00	0.000	0.000	0.000	0.000	0.092	0.092
18:15:00	0.000	0.000	0.000	0.000	0.091	0.091
18:20:00	0.000	0.000	0.000	0.000	0.091	0.091
18:25:00	0.000	0.000	0.000	0.000	0.091	0.091
18:30:00	0.000	0.000	0.000	0.000	0.090	0.090
18:35:00	0.000	0.000	0.000	0.000	0.090	0.090
18:40:00	0.000	0.000	0.000	0.000	0.090	0.090
18:45:00	0.000	0.000	0.000	0.000	0.089	0.089
18:50:00	0.000	0.000	0.000	0.000	0.089	0.089
18:55:00	0.000	0.000	0.000	0.000	0.089	0.089
19:00:00	0.000	0.000	0.000	0.000	0.088	0.088
19:05:00	0.000	0.000	0.000	0.000	0.088	0.088
19:10:00	0.000	0.000	0.000	0.000	0.088	0.088
19:15:00	0.000	0.000	0.000	0.000	0.087	0.087
19:20:00	0.000	0.000	0.000	0.000	0.087	0.087
19:25:00	0.000	0.000	0.000	0.000	0.087	0.087
19:30:00	0.000	0.000	0.000	0.000	0.086	0.086
19:35:00	0.000	0.000	0.000	0.000	0.086	0.086
19:40:00	0.000	0.000	0.000	0.000	0.086	0.086
19:45:00	0.000	0.000	0.000	0.000	0.085	0.085
19:50:00	0.000	0.000	0.000	0.000	0.085	0.085
19:55:00	0.000	0.000	0.000	0.000	0.085	0.085
20:00:00	0.000	0.000	0.000	0.000	0.084	0.084
20:05:00	0.000	0.000	0.000	0.000	0.084	0.084
20:10:00	0.000	0.000	0.000	0.000	0.084	0.084
20:15:00	0.000	0.000	0.000	0.000	0.083	0.083

Time (hh:mm:ss)	Rain (mm)	Sewer Loss (m ³ /s)	Net Rain (mm)	Runoff (m ³ /s)	Baseflow (m ³ /s)	Total Flow (m ³ /s)
20:20:00	0.000	0.000	0.000	0.000	0.083	0.083
20:25:00	0.000	0.000	0.000	0.000	0.083	0.083
20:30:00	0.000	0.000	0.000	0.000	0.082	0.082
20:35:00	0.000	0.000	0.000	0.000	0.082	0.082
20:40:00	0.000	0.000	0.000	0.000	0.082	0.082
20:45:00	0.000	0.000	0.000	0.000	0.081	0.081
20:50:00	0.000	0.000	0.000	0.000	0.081	0.081
20:55:00	0.000	0.000	0.000	0.000	0.081	0.081
21:00:00	0.000	0.000	0.000	0.000	0.081	0.081
21:05:00	0.000	0.000	0.000	0.000	0.080	0.080
21:10:00	0.000	0.000	0.000	0.000	0.080	0.080
21:15:00	0.000	0.000	0.000	0.000	0.080	0.080
21:20:00	0.000	0.000	0.000	0.000	0.079	0.079
21:25:00	0.000	0.000	0.000	0.000	0.079	0.079
21:30:00	0.000	0.000	0.000	0.000	0.079	0.079
21:35:00	0.000	0.000	0.000	0.000	0.078	0.078
21:40:00	0.000	0.000	0.000	0.000	0.078	0.078
21:45:00	0.000	0.000	0.000	0.000	0.078	0.078
21:50:00	0.000	0.000	0.000	0.000	0.077	0.077
21:55:00	0.000	0.000	0.000	0.000	0.077	0.077
22:00:00	0.000	0.000	0.000	0.000	0.077	0.077
22:05:00	0.000	0.000	0.000	0.000	0.077	0.077
22:10:00	0.000	0.000	0.000	0.000	0.076	0.076
22:15:00	0.000	0.000	0.000	0.000	0.076	0.076
22:20:00	0.000	0.000	0.000	0.000	0.076	0.076
22:25:00	0.000	0.000	0.000	0.000	0.075	0.075
22:30:00	0.000	0.000	0.000	0.000	0.075	0.075
22:35:00	0.000	0.000	0.000	0.000	0.075	0.075
22:40:00	0.000	0.000	0.000	0.000	0.075	0.075
22:45:00	0.000	0.000	0.000	0.000	0.074	0.074
22:50:00	0.000	0.000	0.000	0.000	0.074	0.074
22:55:00	0.000	0.000	0.000	0.000	0.074	0.074
23:00:00	0.000	0.000	0.000	0.000	0.073	0.073
23:05:00	0.000	0.000	0.000	0.000	0.073	0.073
23:10:00	0.000	0.000	0.000	0.000	0.073	0.073

Time (hh:mm:ss)	Rain (mm)	Sewer Loss (m ³ /s)	Net Rain (mm)	Runoff (m ³ /s)	Baseflow (m ³ /s)	Total Flow (m ³ /s)
23:15:00	0.000	0.000	0.000	0.000	0.073	0.073
23:20:00	0.000	0.000	0.000	0.000	0.072	0.072
23:25:00	0.000	0.000	0.000	0.000	0.072	0.072
23:30:00	0.000	0.000	0.000	0.000	0.072	0.072
23:35:00	0.000	0.000	0.000	0.000	0.072	0.072
23:40:00	0.000	0.000	0.000	0.000	0.071	0.071
23:45:00	0.000	0.000	0.000	0.000	0.071	0.071
23:50:00	0.000	0.000	0.000	0.000	0.071	0.071
23:55:00	0.000	0.000	0.000	0.000	0.070	0.070
24:00:00	0.000	0.000	0.000	0.000	0.070	0.070
24:05:00	0.000	0.000	0.000	0.000	0.070	0.070
24:10:00	0.000	0.000	0.000	0.000	0.070	0.070
24:15:00	0.000	0.000	0.000	0.000	0.069	0.069
24:20:00	0.000	0.000	0.000	0.000	0.069	0.069
24:25:00	0.000	0.000	0.000	0.000	0.069	0.069
24:30:00	0.000	0.000	0.000	0.000	0.069	0.069
24:35:00	0.000	0.000	0.000	0.000	0.068	0.068
24:40:00	0.000	0.000	0.000	0.000	0.068	0.068
24:45:00	0.000	0.000	0.000	0.000	0.068	0.068
24:50:00	0.000	0.000	0.000	0.000	0.068	0.068
24:55:00	0.000	0.000	0.000	0.000	0.067	0.067
25:00:00	0.000	0.000	0.000	0.000	0.067	0.067
25:05:00	0.000	0.000	0.000	0.000	0.067	0.067
25:10:00	0.000	0.000	0.000	0.000	0.067	0.067
25:15:00	0.000	0.000	0.000	0.000	0.066	0.066
25:20:00	0.000	0.000	0.000	0.000	0.066	0.066
25:25:00	0.000	0.000	0.000	0.000	0.066	0.066
25:30:00	0.000	0.000	0.000	0.000	0.066	0.066
25:35:00	0.000	0.000	0.000	0.000	0.065	0.065
25:40:00	0.000	0.000	0.000	0.000	0.065	0.065
25:45:00	0.000	0.000	0.000	0.000	0.065	0.065
25:50:00	0.000	0.000	0.000	0.000	0.065	0.065
25:55:00	0.000	0.000	0.000	0.000	0.064	0.064
26:00:00	0.000	0.000	0.000	0.000	0.064	0.064
26:05:00	0.000	0.000	0.000	0.000	0.064	0.064

Time (hh:mm:ss)	Rain (mm)	Sewer Loss (m ³ /s)	Net Rain (mm)	Runoff (m ³ /s)	Baseflow (m ³ /s)	Total Flow (m ³ /s)
26:10:00	0.000	0.000	0.000	0.000	0.064	0.064
26:15:00	0.000	0.000	0.000	0.000	0.063	0.063
26:20:00	0.000	0.000	0.000	0.000	0.063	0.063
26:25:00	0.000	0.000	0.000	0.000	0.063	0.063
26:30:00	0.000	0.000	0.000	0.000	0.063	0.063
26:35:00	0.000	0.000	0.000	0.000	0.062	0.062
26:40:00	0.000	0.000	0.000	0.000	0.062	0.062
26:45:00	0.000	0.000	0.000	0.000	0.062	0.062
26:50:00	0.000	0.000	0.000	0.000	0.062	0.062
26:55:00	0.000	0.000	0.000	0.000	0.061	0.061
27:00:00	0.000	0.000	0.000	0.000	0.061	0.061
27:05:00	0.000	0.000	0.000	0.000	0.061	0.061
27:10:00	0.000	0.000	0.000	0.000	0.061	0.061
27:15:00	0.000	0.000	0.000	0.000	0.060	0.060
27:20:00	0.000	0.000	0.000	0.000	0.060	0.060
27:25:00	0.000	0.000	0.000	0.000	0.060	0.060
27:30:00	0.000	0.000	0.000	0.000	0.060	0.060
27:35:00	0.000	0.000	0.000	0.000	0.060	0.060
27:40:00	0.000	0.000	0.000	0.000	0.059	0.059
27:45:00	0.000	0.000	0.000	0.000	0.059	0.059
27:50:00	0.000	0.000	0.000	0.000	0.059	0.059
27:55:00	0.000	0.000	0.000	0.000	0.059	0.059
28:00:00	0.000	0.000	0.000	0.000	0.058	0.058
28:05:00	0.000	0.000	0.000	0.000	0.058	0.058
28:10:00	0.000	0.000	0.000	0.000	0.058	0.058
28:15:00	0.000	0.000	0.000	0.000	0.058	0.058
28:20:00	0.000	0.000	0.000	0.000	0.058	0.058
28:25:00	0.000	0.000	0.000	0.000	0.057	0.057
28:30:00	0.000	0.000	0.000	0.000	0.057	0.057
28:35:00	0.000	0.000	0.000	0.000	0.057	0.057
28:40:00	0.000	0.000	0.000	0.000	0.057	0.057
28:45:00	0.000	0.000	0.000	0.000	0.056	0.056
28:50:00	0.000	0.000	0.000	0.000	0.056	0.056
28:55:00	0.000	0.000	0.000	0.000	0.056	0.056
29:00:00	0.000	0.000	0.000	0.000	0.056	0.056

Time (hh:mm:ss)	Rain (mm)	Sewer Loss (m ³ /s)	Net Rain (mm)	Runoff (m ³ /s)	Baseflow (m ³ /s)	Total Flow (m ³ /s)
29:05:00	0.000	0.000	0.000	0.000	0.056	0.056
29:10:00	0.000	0.000	0.000	0.000	0.055	0.055
29:15:00	0.000	0.000	0.000	0.000	0.055	0.055
29:20:00	0.000	0.000	0.000	0.000	0.055	0.055
29:25:00	0.000	0.000	0.000	0.000	0.055	0.055
29:30:00	0.000	0.000	0.000	0.000	0.055	0.055
29:35:00	0.000	0.000	0.000	0.000	0.054	0.054
29:40:00	0.000	0.000	0.000	0.000	0.054	0.054
29:45:00	0.000	0.000	0.000	0.000	0.054	0.054
29:50:00	0.000	0.000	0.000	0.000	0.054	0.054
29:55:00	0.000	0.000	0.000	0.000	0.054	0.054
30:00:00	0.000	0.000	0.000	0.000	0.053	0.053
30:05:00	0.000	0.000	0.000	0.000	0.053	0.053
30:10:00	0.000	0.000	0.000	0.000	0.053	0.053
30:15:00	0.000	0.000	0.000	0.000	0.053	0.053
30:20:00	0.000	0.000	0.000	0.000	0.052	0.052
30:25:00	0.000	0.000	0.000	0.000	0.052	0.052
30:30:00	0.000	0.000	0.000	0.000	0.052	0.052
30:35:00	0.000	0.000	0.000	0.000	0.052	0.052
30:40:00	0.000	0.000	0.000	0.000	0.052	0.052
30:45:00	0.000	0.000	0.000	0.000	0.051	0.051
30:50:00	0.000	0.000	0.000	0.000	0.051	0.051
30:55:00	0.000	0.000	0.000	0.000	0.051	0.051
31:00:00	0.000	0.000	0.000	0.000	0.051	0.051
31:05:00	0.000	0.000	0.000	0.000	0.051	0.051
31:10:00	0.000	0.000	0.000	0.000	0.051	0.051
31:15:00	0.000	0.000	0.000	0.000	0.050	0.050
31:20:00	0.000	0.000	0.000	0.000	0.050	0.050
31:25:00	0.000	0.000	0.000	0.000	0.050	0.050
31:30:00	0.000	0.000	0.000	0.000	0.050	0.050
31:35:00	0.000	0.000	0.000	0.000	0.050	0.050
31:40:00	0.000	0.000	0.000	0.000	0.049	0.049
31:45:00	0.000	0.000	0.000	0.000	0.049	0.049
31:50:00	0.000	0.000	0.000	0.000	0.049	0.049
31:55:00	0.000	0.000	0.000	0.000	0.049	0.049

Time (hh:mm:ss)	Rain (mm)	Sewer Loss (m ³ /s)	Net Rain (mm)	Runoff (m ³ /s)	Baseflow (m ³ /s)	Total Flow (m ³ /s)
32:00:00	0.000	0.000	0.000	0.000	0.049	0.049
32:05:00	0.000	0.000	0.000	0.000	0.048	0.048
32:10:00	0.000	0.000	0.000	0.000	0.048	0.048
32:15:00	0.000	0.000	0.000	0.000	0.048	0.048
32:20:00	0.000	0.000	0.000	0.000	0.048	0.048
32:25:00	0.000	0.000	0.000	0.000	0.048	0.048
32:30:00	0.000	0.000	0.000	0.000	0.048	0.048
32:35:00	0.000	0.000	0.000	0.000	0.047	0.047
32:40:00	0.000	0.000	0.000	0.000	0.047	0.047
32:45:00	0.000	0.000	0.000	0.000	0.047	0.047
32:50:00	0.000	0.000	0.000	0.000	0.047	0.047
32:55:00	0.000	0.000	0.000	0.000	0.047	0.047
33:00:00	0.000	0.000	0.000	0.000	0.046	0.046
33:05:00	0.000	0.000	0.000	0.000	0.046	0.046
33:10:00	0.000	0.000	0.000	0.000	0.046	0.046
33:15:00	0.000	0.000	0.000	0.000	0.046	0.046
33:20:00	0.000	0.000	0.000	0.000	0.046	0.046
33:25:00	0.000	0.000	0.000	0.000	0.046	0.046
33:30:00	0.000	0.000	0.000	0.000	0.045	0.045
33:35:00	0.000	0.000	0.000	0.000	0.045	0.045
33:40:00	0.000	0.000	0.000	0.000	0.045	0.045
33:45:00	0.000	0.000	0.000	0.000	0.045	0.045
33:50:00	0.000	0.000	0.000	0.000	0.045	0.045
33:55:00	0.000	0.000	0.000	0.000	0.045	0.045
34:00:00	0.000	0.000	0.000	0.000	0.044	0.044
34:05:00	0.000	0.000	0.000	0.000	0.044	0.044
34:10:00	0.000	0.000	0.000	0.000	0.044	0.044

Appendix

Catchment descriptors

Name	Value	User-defined value used?
Area (km ²)	0.74	No
ALTBAR	108	No
ASPBAR	44	No
ASPVAR	0.49	No
BFIHOST	0.3	No
BFIHOST19	0.28	No
DPLBAR (km)	0.84	No
DPSBAR (mkm ⁻¹)	94.2	No
FARL	1	No
LDP	1.46	No
PROPWET	0.36	No
RMED1H	12	No
RMED1D	36.1	No
RMED2D	49.9	No
SAAR (mm)	843	No
SAAR4170 (mm)	836	No
SPRHOST	47.32	No
URBEXT2000	0.02	No
URBEXT1990	0.01	No
URBCONC	0.33	No
URBLOC	0.9	No
DDF parameter C	-0.03	No
DDF parameter D1	0.35	No
DDF parameter D2	0.37	No
DDF parameter D3	0.34	No
DDF parameter E	0.32	No
DDF parameter F	2.52	No
DDF parameter C (1km grid value)	-0.03	No
DDF parameter D1 (1km grid value)	0.35	No
DDF parameter D2 (1km grid value)	0.37	No
DDF parameter D3 (1km grid value)	0.34	No
DDF parameter E (1km grid value)	0.32	No
DDF parameter F (1km grid value)	2.52	No

UK Design Flood Estimation

Generated on 14 April 2025 16:47:05 by jaxton
Printed from the ReFH2 Flood Modelling software package, version 4.1.8879.22310

Summary of estimate using the Flood Estimation Handbook revitalised flood hydrograph method (ReFH2)

Site details

Checksum: 603D-DAA8

Site name: FEH_Catchment_Descriptors_539200_136950_v5_0_1_ADJ

Easting: 539200

Northing: 136950

Country: England, Wales or Northern Ireland

Catchment Area (km²): 2.85

Using plot scale calculations: No

Model: 2.3

Site description: None

Model run: 100 year 1.45 CC

Summary of results

Rainfall - FEH22 (mm):	94.66	Total runoff (ML):	116.89
Total Rainfall (mm):	64.76	Total flow (ML):	184.32
Peak Rainfall (mm):	3.35	Peak flow (m ³ /s):	9.14

Parameters

Where the user has overridden a system-generated value, this original value is shown in square brackets after the value used.

** Indicates that the user locked the duration/timestep*

Rainfall parameters (Rainfall - FEH22)

Name	Value	User-defined?
Duration (hh:mm:ss)	04:15:00 [03:45:00]	Yes
Timestep (hh:mm:ss)	00:05:00 [00:15:00]	Yes
SCF (Seasonal correction factor)	0.71	No
ARF (Areal reduction factor)	0.97	No
Seasonality	Winter	No
Climate change factor	1.45	Yes

Loss model parameters

Name	Value	User-defined?
Cini (mm)	125.9	No
Cmax (mm)	271.22	No
Use alpha correction factor	No	No
Alpha correction factor	n/a	No

Routing model parameters

Name	Value	User-defined?
Tp (hr)	1.94	No
Up	0.65	No
Uk	0.8	No

Baseflow model parameters

Name	Value	User-defined?
BF0 (m ³ /s)	0.14	No
BL (hr)	28.41	No
BR	0.71	No

Urbanisation parameters

Name	Value	User-defined?
Sewer capacity (m ³ /s)	0	No
Exporting drained area (km ²)	0	No
Urban area (km ²)	1.24	No
Effective URBEXT2000	0.28	n/a
Impervious runoff factor	0.7	No
Imperviousness factor	0.4	No
Tp scaling factor	0.75	No
Depression storage depth (mm)	0.5	No

Time series data

Time (hh:mm:ss)	Rain (mm)	Sewer Loss (m³/s)	Net Rain (mm)	Runoff (m³/s)	Baseflow (m³/s)	Total Flow (m³/s)
00:00:00	0.248	0.000	0.125	0.000	0.115	0.115
00:05:00	0.277	0.000	0.141	0.001	0.115	0.116
00:10:00	0.310	0.000	0.165	0.004	0.115	0.119
00:15:00	0.346	0.000	0.185	0.010	0.114	0.124
00:20:00	0.387	0.000	0.207	0.018	0.114	0.132
00:25:00	0.433	0.000	0.232	0.029	0.114	0.143
00:30:00	0.484	0.000	0.260	0.044	0.113	0.157
00:35:00	0.540	0.000	0.291	0.063	0.113	0.176
00:40:00	0.604	0.000	0.326	0.086	0.113	0.199
00:45:00	0.674	0.000	0.366	0.114	0.113	0.226
00:50:00	0.752	0.000	0.410	0.147	0.112	0.260
00:55:00	0.840	0.000	0.459	0.187	0.112	0.299
01:00:00	0.937	0.000	0.515	0.234	0.112	0.346
01:05:00	1.045	0.000	0.578	0.288	0.112	0.400
01:10:00	1.165	0.000	0.648	0.351	0.112	0.463
01:15:00	1.297	0.000	0.728	0.424	0.112	0.536
01:20:00	1.445	0.000	0.817	0.507	0.113	0.620
01:25:00	1.608	0.000	0.917	0.603	0.113	0.716
01:30:00	1.788	0.000	1.029	0.712	0.113	0.826
01:35:00	1.986	0.000	1.156	0.835	0.114	0.949
01:40:00	2.204	0.000	1.297	0.973	0.115	1.087
01:45:00	2.441	0.000	1.455	1.127	0.116	1.243
01:50:00	2.697	0.000	1.630	1.300	0.117	1.417
01:55:00	2.968	0.000	1.821	1.494	0.118	1.613
02:00:00	3.230	0.000	2.014	1.711	0.120	1.831
02:05:00	3.347	0.000	2.123	1.953	0.122	2.075
02:10:00	3.230	0.000	2.083	2.221	0.124	2.345
02:15:00	2.968	0.000	1.944	2.516	0.127	2.642
02:20:00	2.697	0.000	1.791	2.834	0.130	2.964
02:25:00	2.441	0.000	1.642	3.173	0.133	3.306
02:30:00	2.204	0.000	1.499	3.529	0.137	3.666
02:35:00	1.986	0.000	1.364	3.899	0.141	4.040
02:40:00	1.788	0.000	1.239	4.279	0.146	4.425
02:45:00	1.608	0.000	1.123	4.665	0.152	4.817

Time (hh:mm:ss)	Rain (mm)	Sewer Loss (m ³ /s)	Net Rain (mm)	Runoff (m ³ /s)	Baseflow (m ³ /s)	Total Flow (m ³ /s)
02:50:00	1.445	0.000	1.016	5.056	0.158	5.213
02:55:00	1.297	0.000	0.918	5.445	0.164	5.610
03:00:00	1.165	0.000	0.829	5.832	0.171	6.003
03:05:00	1.045	0.000	0.747	6.210	0.179	6.389
03:10:00	0.937	0.000	0.673	6.578	0.187	6.765
03:15:00	0.840	0.000	0.606	6.931	0.196	7.127
03:20:00	0.752	0.000	0.545	7.264	0.205	7.469
03:25:00	0.674	0.000	0.490	7.574	0.215	7.789
03:30:00	0.604	0.000	0.440	7.855	0.225	8.080
03:35:00	0.540	0.000	0.391	8.104	0.236	8.339
03:40:00	0.484	0.000	0.351	8.316	0.247	8.563
03:45:00	0.433	0.000	0.315	8.491	0.258	8.749
03:50:00	0.387	0.000	0.282	8.629	0.270	8.899
03:55:00	0.346	0.000	0.253	8.730	0.283	9.013
04:00:00	0.310	0.000	0.226	8.795	0.295	9.091
04:05:00	0.277	0.000	0.203	8.825	0.308	9.132
04:10:00	0.248	0.000	0.181	8.819	0.321	9.140
04:15:00	0.000	0.000	0.000	8.781	0.334	9.115
04:20:00	0.000	0.000	0.000	8.712	0.347	9.059
04:25:00	0.000	0.000	0.000	8.615	0.360	8.975
04:30:00	0.000	0.000	0.000	8.493	0.373	8.866
04:35:00	0.000	0.000	0.000	8.348	0.386	8.734
04:40:00	0.000	0.000	0.000	8.184	0.399	8.582
04:45:00	0.000	0.000	0.000	8.003	0.411	8.414
04:50:00	0.000	0.000	0.000	7.809	0.424	8.232
04:55:00	0.000	0.000	0.000	7.603	0.436	8.039
05:00:00	0.000	0.000	0.000	7.389	0.447	7.837
05:05:00	0.000	0.000	0.000	7.168	0.459	7.627
05:10:00	0.000	0.000	0.000	6.943	0.470	7.412
05:15:00	0.000	0.000	0.000	6.713	0.481	7.193
05:20:00	0.000	0.000	0.000	6.480	0.491	6.971
05:25:00	0.000	0.000	0.000	6.246	0.501	6.747
05:30:00	0.000	0.000	0.000	6.010	0.511	6.521
05:35:00	0.000	0.000	0.000	5.774	0.520	6.294
05:40:00	0.000	0.000	0.000	5.538	0.529	6.067

Time (hh:mm:ss)	Rain (mm)	Sewer Loss (m ³ /s)	Net Rain (mm)	Runoff (m ³ /s)	Baseflow (m ³ /s)	Total Flow (m ³ /s)
05:45:00	0.000	0.000	0.000	5.304	0.537	5.841
05:50:00	0.000	0.000	0.000	5.073	0.545	5.618
05:55:00	0.000	0.000	0.000	4.847	0.553	5.400
06:00:00	0.000	0.000	0.000	4.626	0.560	5.186
06:05:00	0.000	0.000	0.000	4.410	0.567	4.977
06:10:00	0.000	0.000	0.000	4.199	0.574	4.774
06:15:00	0.000	0.000	0.000	3.995	0.580	4.575
06:20:00	0.000	0.000	0.000	3.796	0.586	4.383
06:25:00	0.000	0.000	0.000	3.604	0.592	4.196
06:30:00	0.000	0.000	0.000	3.418	0.597	4.015
06:35:00	0.000	0.000	0.000	3.238	0.603	3.840
06:40:00	0.000	0.000	0.000	3.063	0.607	3.670
06:45:00	0.000	0.000	0.000	2.894	0.612	3.506
06:50:00	0.000	0.000	0.000	2.730	0.616	3.347
06:55:00	0.000	0.000	0.000	2.573	0.620	3.193
07:00:00	0.000	0.000	0.000	2.420	0.624	3.044
07:05:00	0.000	0.000	0.000	2.274	0.627	2.901
07:10:00	0.000	0.000	0.000	2.134	0.631	2.764
07:15:00	0.000	0.000	0.000	2.000	0.634	2.633
07:20:00	0.000	0.000	0.000	1.872	0.636	2.509
07:25:00	0.000	0.000	0.000	1.751	0.639	2.390
07:30:00	0.000	0.000	0.000	1.637	0.641	2.278
07:35:00	0.000	0.000	0.000	1.529	0.643	2.172
07:40:00	0.000	0.000	0.000	1.426	0.645	2.071
07:45:00	0.000	0.000	0.000	1.329	0.647	1.976
07:50:00	0.000	0.000	0.000	1.236	0.649	1.885
07:55:00	0.000	0.000	0.000	1.148	0.650	1.798
08:00:00	0.000	0.000	0.000	1.065	0.651	1.716
08:05:00	0.000	0.000	0.000	0.985	0.652	1.637
08:10:00	0.000	0.000	0.000	0.909	0.653	1.562
08:15:00	0.000	0.000	0.000	0.836	0.653	1.490
08:20:00	0.000	0.000	0.000	0.767	0.654	1.421
08:25:00	0.000	0.000	0.000	0.701	0.654	1.354
08:30:00	0.000	0.000	0.000	0.637	0.654	1.291
08:35:00	0.000	0.000	0.000	0.577	0.654	1.231

Time (hh:mm:ss)	Rain (mm)	Sewer Loss (m ³ /s)	Net Rain (mm)	Runoff (m ³ /s)	Baseflow (m ³ /s)	Total Flow (m ³ /s)
08:40:00	0.000	0.000	0.000	0.520	0.653	1.173
08:45:00	0.000	0.000	0.000	0.466	0.653	1.119
08:50:00	0.000	0.000	0.000	0.415	0.652	1.068
08:55:00	0.000	0.000	0.000	0.368	0.651	1.020
09:00:00	0.000	0.000	0.000	0.325	0.651	0.975
09:05:00	0.000	0.000	0.000	0.285	0.650	0.934
09:10:00	0.000	0.000	0.000	0.249	0.648	0.898
09:15:00	0.000	0.000	0.000	0.217	0.647	0.864
09:20:00	0.000	0.000	0.000	0.189	0.646	0.835
09:25:00	0.000	0.000	0.000	0.164	0.644	0.808
09:30:00	0.000	0.000	0.000	0.142	0.643	0.785
09:35:00	0.000	0.000	0.000	0.122	0.642	0.764
09:40:00	0.000	0.000	0.000	0.105	0.640	0.745
09:45:00	0.000	0.000	0.000	0.090	0.638	0.728
09:50:00	0.000	0.000	0.000	0.076	0.637	0.713
09:55:00	0.000	0.000	0.000	0.064	0.635	0.699
10:00:00	0.000	0.000	0.000	0.054	0.633	0.687
10:05:00	0.000	0.000	0.000	0.044	0.632	0.676
10:10:00	0.000	0.000	0.000	0.036	0.630	0.666
10:15:00	0.000	0.000	0.000	0.029	0.628	0.658
10:20:00	0.000	0.000	0.000	0.024	0.626	0.650
10:25:00	0.000	0.000	0.000	0.018	0.624	0.643
10:30:00	0.000	0.000	0.000	0.014	0.623	0.637
10:35:00	0.000	0.000	0.000	0.011	0.621	0.632
10:40:00	0.000	0.000	0.000	0.008	0.619	0.627
10:45:00	0.000	0.000	0.000	0.005	0.617	0.623
10:50:00	0.000	0.000	0.000	0.003	0.615	0.619
10:55:00	0.000	0.000	0.000	0.002	0.614	0.616
11:00:00	0.000	0.000	0.000	0.001	0.612	0.613
11:05:00	0.000	0.000	0.000	0.000	0.610	0.610
11:10:00	0.000	0.000	0.000	0.000	0.608	0.608
11:15:00	0.000	0.000	0.000	0.000	0.607	0.607
11:20:00	0.000	0.000	0.000	0.000	0.605	0.605
11:25:00	0.000	0.000	0.000	0.000	0.603	0.603
11:30:00	0.000	0.000	0.000	0.000	0.601	0.601

Time (hh:mm:ss)	Rain (mm)	Sewer Loss (m ³ /s)	Net Rain (mm)	Runoff (m ³ /s)	Baseflow (m ³ /s)	Total Flow (m ³ /s)
11:35:00	0.000	0.000	0.000	0.000	0.599	0.599
11:40:00	0.000	0.000	0.000	0.000	0.598	0.598
11:45:00	0.000	0.000	0.000	0.000	0.596	0.596
11:50:00	0.000	0.000	0.000	0.000	0.594	0.594
11:55:00	0.000	0.000	0.000	0.000	0.592	0.592
12:00:00	0.000	0.000	0.000	0.000	0.591	0.591
12:05:00	0.000	0.000	0.000	0.000	0.589	0.589
12:10:00	0.000	0.000	0.000	0.000	0.587	0.587
12:15:00	0.000	0.000	0.000	0.000	0.586	0.586
12:20:00	0.000	0.000	0.000	0.000	0.584	0.584
12:25:00	0.000	0.000	0.000	0.000	0.582	0.582
12:30:00	0.000	0.000	0.000	0.000	0.580	0.580
12:35:00	0.000	0.000	0.000	0.000	0.579	0.579
12:40:00	0.000	0.000	0.000	0.000	0.577	0.577
12:45:00	0.000	0.000	0.000	0.000	0.575	0.575
12:50:00	0.000	0.000	0.000	0.000	0.574	0.574
12:55:00	0.000	0.000	0.000	0.000	0.572	0.572
13:00:00	0.000	0.000	0.000	0.000	0.570	0.570
13:05:00	0.000	0.000	0.000	0.000	0.569	0.569
13:10:00	0.000	0.000	0.000	0.000	0.567	0.567
13:15:00	0.000	0.000	0.000	0.000	0.565	0.565
13:20:00	0.000	0.000	0.000	0.000	0.564	0.564
13:25:00	0.000	0.000	0.000	0.000	0.562	0.562
13:30:00	0.000	0.000	0.000	0.000	0.560	0.560
13:35:00	0.000	0.000	0.000	0.000	0.559	0.559
13:40:00	0.000	0.000	0.000	0.000	0.557	0.557
13:45:00	0.000	0.000	0.000	0.000	0.555	0.555
13:50:00	0.000	0.000	0.000	0.000	0.554	0.554
13:55:00	0.000	0.000	0.000	0.000	0.552	0.552
14:00:00	0.000	0.000	0.000	0.000	0.551	0.551
14:05:00	0.000	0.000	0.000	0.000	0.549	0.549
14:10:00	0.000	0.000	0.000	0.000	0.547	0.547
14:15:00	0.000	0.000	0.000	0.000	0.546	0.546
14:20:00	0.000	0.000	0.000	0.000	0.544	0.544
14:25:00	0.000	0.000	0.000	0.000	0.543	0.543

Time (hh:mm:ss)	Rain (mm)	Sewer Loss (m ³ /s)	Net Rain (mm)	Runoff (m ³ /s)	Baseflow (m ³ /s)	Total Flow (m ³ /s)
14:30:00	0.000	0.000	0.000	0.000	0.541	0.541
14:35:00	0.000	0.000	0.000	0.000	0.539	0.539
14:40:00	0.000	0.000	0.000	0.000	0.538	0.538
14:45:00	0.000	0.000	0.000	0.000	0.536	0.536
14:50:00	0.000	0.000	0.000	0.000	0.535	0.535
14:55:00	0.000	0.000	0.000	0.000	0.533	0.533
15:00:00	0.000	0.000	0.000	0.000	0.532	0.532
15:05:00	0.000	0.000	0.000	0.000	0.530	0.530
15:10:00	0.000	0.000	0.000	0.000	0.528	0.528
15:15:00	0.000	0.000	0.000	0.000	0.527	0.527
15:20:00	0.000	0.000	0.000	0.000	0.525	0.525
15:25:00	0.000	0.000	0.000	0.000	0.524	0.524
15:30:00	0.000	0.000	0.000	0.000	0.522	0.522
15:35:00	0.000	0.000	0.000	0.000	0.521	0.521
15:40:00	0.000	0.000	0.000	0.000	0.519	0.519
15:45:00	0.000	0.000	0.000	0.000	0.518	0.518
15:50:00	0.000	0.000	0.000	0.000	0.516	0.516
15:55:00	0.000	0.000	0.000	0.000	0.515	0.515
16:00:00	0.000	0.000	0.000	0.000	0.513	0.513
16:05:00	0.000	0.000	0.000	0.000	0.512	0.512
16:10:00	0.000	0.000	0.000	0.000	0.510	0.510
16:15:00	0.000	0.000	0.000	0.000	0.509	0.509
16:20:00	0.000	0.000	0.000	0.000	0.507	0.507
16:25:00	0.000	0.000	0.000	0.000	0.506	0.506
16:30:00	0.000	0.000	0.000	0.000	0.504	0.504
16:35:00	0.000	0.000	0.000	0.000	0.503	0.503
16:40:00	0.000	0.000	0.000	0.000	0.501	0.501
16:45:00	0.000	0.000	0.000	0.000	0.500	0.500
16:50:00	0.000	0.000	0.000	0.000	0.498	0.498
16:55:00	0.000	0.000	0.000	0.000	0.497	0.497
17:00:00	0.000	0.000	0.000	0.000	0.495	0.495
17:05:00	0.000	0.000	0.000	0.000	0.494	0.494
17:10:00	0.000	0.000	0.000	0.000	0.492	0.492
17:15:00	0.000	0.000	0.000	0.000	0.491	0.491
17:20:00	0.000	0.000	0.000	0.000	0.490	0.490

Time (hh:mm:ss)	Rain (mm)	Sewer Loss (m ³ /s)	Net Rain (mm)	Runoff (m ³ /s)	Baseflow (m ³ /s)	Total Flow (m ³ /s)
17:25:00	0.000	0.000	0.000	0.000	0.488	0.488
17:30:00	0.000	0.000	0.000	0.000	0.487	0.487
17:35:00	0.000	0.000	0.000	0.000	0.485	0.485
17:40:00	0.000	0.000	0.000	0.000	0.484	0.484
17:45:00	0.000	0.000	0.000	0.000	0.482	0.482
17:50:00	0.000	0.000	0.000	0.000	0.481	0.481
17:55:00	0.000	0.000	0.000	0.000	0.480	0.480
18:00:00	0.000	0.000	0.000	0.000	0.478	0.478
18:05:00	0.000	0.000	0.000	0.000	0.477	0.477
18:10:00	0.000	0.000	0.000	0.000	0.475	0.475
18:15:00	0.000	0.000	0.000	0.000	0.474	0.474
18:20:00	0.000	0.000	0.000	0.000	0.473	0.473
18:25:00	0.000	0.000	0.000	0.000	0.471	0.471
18:30:00	0.000	0.000	0.000	0.000	0.470	0.470
18:35:00	0.000	0.000	0.000	0.000	0.469	0.469
18:40:00	0.000	0.000	0.000	0.000	0.467	0.467
18:45:00	0.000	0.000	0.000	0.000	0.466	0.466
18:50:00	0.000	0.000	0.000	0.000	0.464	0.464
18:55:00	0.000	0.000	0.000	0.000	0.463	0.463
19:00:00	0.000	0.000	0.000	0.000	0.462	0.462
19:05:00	0.000	0.000	0.000	0.000	0.460	0.460
19:10:00	0.000	0.000	0.000	0.000	0.459	0.459
19:15:00	0.000	0.000	0.000	0.000	0.458	0.458
19:20:00	0.000	0.000	0.000	0.000	0.456	0.456
19:25:00	0.000	0.000	0.000	0.000	0.455	0.455
19:30:00	0.000	0.000	0.000	0.000	0.454	0.454
19:35:00	0.000	0.000	0.000	0.000	0.452	0.452
19:40:00	0.000	0.000	0.000	0.000	0.451	0.451
19:45:00	0.000	0.000	0.000	0.000	0.450	0.450
19:50:00	0.000	0.000	0.000	0.000	0.448	0.448
19:55:00	0.000	0.000	0.000	0.000	0.447	0.447
20:00:00	0.000	0.000	0.000	0.000	0.446	0.446
20:05:00	0.000	0.000	0.000	0.000	0.444	0.444
20:10:00	0.000	0.000	0.000	0.000	0.443	0.443
20:15:00	0.000	0.000	0.000	0.000	0.442	0.442

Time (hh:mm:ss)	Rain (mm)	Sewer Loss (m ³ /s)	Net Rain (mm)	Runoff (m ³ /s)	Baseflow (m ³ /s)	Total Flow (m ³ /s)
20:20:00	0.000	0.000	0.000	0.000	0.441	0.441
20:25:00	0.000	0.000	0.000	0.000	0.439	0.439
20:30:00	0.000	0.000	0.000	0.000	0.438	0.438
20:35:00	0.000	0.000	0.000	0.000	0.437	0.437
20:40:00	0.000	0.000	0.000	0.000	0.435	0.435
20:45:00	0.000	0.000	0.000	0.000	0.434	0.434
20:50:00	0.000	0.000	0.000	0.000	0.433	0.433
20:55:00	0.000	0.000	0.000	0.000	0.432	0.432
21:00:00	0.000	0.000	0.000	0.000	0.430	0.430
21:05:00	0.000	0.000	0.000	0.000	0.429	0.429
21:10:00	0.000	0.000	0.000	0.000	0.428	0.428
21:15:00	0.000	0.000	0.000	0.000	0.427	0.427
21:20:00	0.000	0.000	0.000	0.000	0.425	0.425
21:25:00	0.000	0.000	0.000	0.000	0.424	0.424
21:30:00	0.000	0.000	0.000	0.000	0.423	0.423
21:35:00	0.000	0.000	0.000	0.000	0.422	0.422
21:40:00	0.000	0.000	0.000	0.000	0.420	0.420
21:45:00	0.000	0.000	0.000	0.000	0.419	0.419
21:50:00	0.000	0.000	0.000	0.000	0.418	0.418
21:55:00	0.000	0.000	0.000	0.000	0.417	0.417
22:00:00	0.000	0.000	0.000	0.000	0.415	0.415
22:05:00	0.000	0.000	0.000	0.000	0.414	0.414
22:10:00	0.000	0.000	0.000	0.000	0.413	0.413
22:15:00	0.000	0.000	0.000	0.000	0.412	0.412
22:20:00	0.000	0.000	0.000	0.000	0.411	0.411
22:25:00	0.000	0.000	0.000	0.000	0.409	0.409
22:30:00	0.000	0.000	0.000	0.000	0.408	0.408
22:35:00	0.000	0.000	0.000	0.000	0.407	0.407
22:40:00	0.000	0.000	0.000	0.000	0.406	0.406
22:45:00	0.000	0.000	0.000	0.000	0.405	0.405
22:50:00	0.000	0.000	0.000	0.000	0.403	0.403
22:55:00	0.000	0.000	0.000	0.000	0.402	0.402
23:00:00	0.000	0.000	0.000	0.000	0.401	0.401
23:05:00	0.000	0.000	0.000	0.000	0.400	0.400
23:10:00	0.000	0.000	0.000	0.000	0.399	0.399

Time (hh:mm:ss)	Rain (mm)	Sewer Loss (m ³ /s)	Net Rain (mm)	Runoff (m ³ /s)	Baseflow (m ³ /s)	Total Flow (m ³ /s)
23:15:00	0.000	0.000	0.000	0.000	0.398	0.398
23:20:00	0.000	0.000	0.000	0.000	0.396	0.396
23:25:00	0.000	0.000	0.000	0.000	0.395	0.395
23:30:00	0.000	0.000	0.000	0.000	0.394	0.394
23:35:00	0.000	0.000	0.000	0.000	0.393	0.393
23:40:00	0.000	0.000	0.000	0.000	0.392	0.392
23:45:00	0.000	0.000	0.000	0.000	0.391	0.391
23:50:00	0.000	0.000	0.000	0.000	0.389	0.389
23:55:00	0.000	0.000	0.000	0.000	0.388	0.388
24:00:00	0.000	0.000	0.000	0.000	0.387	0.387
24:05:00	0.000	0.000	0.000	0.000	0.386	0.386
24:10:00	0.000	0.000	0.000	0.000	0.385	0.385
24:15:00	0.000	0.000	0.000	0.000	0.384	0.384
24:20:00	0.000	0.000	0.000	0.000	0.383	0.383
24:25:00	0.000	0.000	0.000	0.000	0.382	0.382
24:30:00	0.000	0.000	0.000	0.000	0.380	0.380
24:35:00	0.000	0.000	0.000	0.000	0.379	0.379
24:40:00	0.000	0.000	0.000	0.000	0.378	0.378
24:45:00	0.000	0.000	0.000	0.000	0.377	0.377
24:50:00	0.000	0.000	0.000	0.000	0.376	0.376
24:55:00	0.000	0.000	0.000	0.000	0.375	0.375
25:00:00	0.000	0.000	0.000	0.000	0.374	0.374
25:05:00	0.000	0.000	0.000	0.000	0.373	0.373
25:10:00	0.000	0.000	0.000	0.000	0.372	0.372
25:15:00	0.000	0.000	0.000	0.000	0.371	0.371
25:20:00	0.000	0.000	0.000	0.000	0.369	0.369
25:25:00	0.000	0.000	0.000	0.000	0.368	0.368
25:30:00	0.000	0.000	0.000	0.000	0.367	0.367
25:35:00	0.000	0.000	0.000	0.000	0.366	0.366
25:40:00	0.000	0.000	0.000	0.000	0.365	0.365
25:45:00	0.000	0.000	0.000	0.000	0.364	0.364
25:50:00	0.000	0.000	0.000	0.000	0.363	0.363
25:55:00	0.000	0.000	0.000	0.000	0.362	0.362
26:00:00	0.000	0.000	0.000	0.000	0.361	0.361
26:05:00	0.000	0.000	0.000	0.000	0.360	0.360

Time (hh:mm:ss)	Rain (mm)	Sewer Loss (m ³ /s)	Net Rain (mm)	Runoff (m ³ /s)	Baseflow (m ³ /s)	Total Flow (m ³ /s)
26:10:00	0.000	0.000	0.000	0.000	0.359	0.359
26:15:00	0.000	0.000	0.000	0.000	0.358	0.358
26:20:00	0.000	0.000	0.000	0.000	0.357	0.357
26:25:00	0.000	0.000	0.000	0.000	0.356	0.356
26:30:00	0.000	0.000	0.000	0.000	0.355	0.355
26:35:00	0.000	0.000	0.000	0.000	0.354	0.354
26:40:00	0.000	0.000	0.000	0.000	0.353	0.353
26:45:00	0.000	0.000	0.000	0.000	0.351	0.351
26:50:00	0.000	0.000	0.000	0.000	0.350	0.350
26:55:00	0.000	0.000	0.000	0.000	0.349	0.349
27:00:00	0.000	0.000	0.000	0.000	0.348	0.348
27:05:00	0.000	0.000	0.000	0.000	0.347	0.347
27:10:00	0.000	0.000	0.000	0.000	0.346	0.346
27:15:00	0.000	0.000	0.000	0.000	0.345	0.345
27:20:00	0.000	0.000	0.000	0.000	0.344	0.344
27:25:00	0.000	0.000	0.000	0.000	0.343	0.343
27:30:00	0.000	0.000	0.000	0.000	0.342	0.342
27:35:00	0.000	0.000	0.000	0.000	0.341	0.341
27:40:00	0.000	0.000	0.000	0.000	0.340	0.340
27:45:00	0.000	0.000	0.000	0.000	0.339	0.339
27:50:00	0.000	0.000	0.000	0.000	0.338	0.338
27:55:00	0.000	0.000	0.000	0.000	0.337	0.337
28:00:00	0.000	0.000	0.000	0.000	0.336	0.336
28:05:00	0.000	0.000	0.000	0.000	0.335	0.335
28:10:00	0.000	0.000	0.000	0.000	0.334	0.334
28:15:00	0.000	0.000	0.000	0.000	0.333	0.333
28:20:00	0.000	0.000	0.000	0.000	0.332	0.332
28:25:00	0.000	0.000	0.000	0.000	0.331	0.331
28:30:00	0.000	0.000	0.000	0.000	0.330	0.330
28:35:00	0.000	0.000	0.000	0.000	0.330	0.330
28:40:00	0.000	0.000	0.000	0.000	0.329	0.329
28:45:00	0.000	0.000	0.000	0.000	0.328	0.328
28:50:00	0.000	0.000	0.000	0.000	0.327	0.327
28:55:00	0.000	0.000	0.000	0.000	0.326	0.326
29:00:00	0.000	0.000	0.000	0.000	0.325	0.325

Time (hh:mm:ss)	Rain (mm)	Sewer Loss (m ³ /s)	Net Rain (mm)	Runoff (m ³ /s)	Baseflow (m ³ /s)	Total Flow (m ³ /s)
29:05:00	0.000	0.000	0.000	0.000	0.324	0.324
29:10:00	0.000	0.000	0.000	0.000	0.323	0.323
29:15:00	0.000	0.000	0.000	0.000	0.322	0.322
29:20:00	0.000	0.000	0.000	0.000	0.321	0.321
29:25:00	0.000	0.000	0.000	0.000	0.320	0.320
29:30:00	0.000	0.000	0.000	0.000	0.319	0.319
29:35:00	0.000	0.000	0.000	0.000	0.318	0.318
29:40:00	0.000	0.000	0.000	0.000	0.317	0.317
29:45:00	0.000	0.000	0.000	0.000	0.316	0.316
29:50:00	0.000	0.000	0.000	0.000	0.315	0.315
29:55:00	0.000	0.000	0.000	0.000	0.314	0.314
30:00:00	0.000	0.000	0.000	0.000	0.313	0.313
30:05:00	0.000	0.000	0.000	0.000	0.313	0.313
30:10:00	0.000	0.000	0.000	0.000	0.312	0.312
30:15:00	0.000	0.000	0.000	0.000	0.311	0.311
30:20:00	0.000	0.000	0.000	0.000	0.310	0.310
30:25:00	0.000	0.000	0.000	0.000	0.309	0.309
30:30:00	0.000	0.000	0.000	0.000	0.308	0.308
30:35:00	0.000	0.000	0.000	0.000	0.307	0.307
30:40:00	0.000	0.000	0.000	0.000	0.306	0.306
30:45:00	0.000	0.000	0.000	0.000	0.305	0.305
30:50:00	0.000	0.000	0.000	0.000	0.304	0.304
30:55:00	0.000	0.000	0.000	0.000	0.304	0.304
31:00:00	0.000	0.000	0.000	0.000	0.303	0.303
31:05:00	0.000	0.000	0.000	0.000	0.302	0.302
31:10:00	0.000	0.000	0.000	0.000	0.301	0.301
31:15:00	0.000	0.000	0.000	0.000	0.300	0.300
31:20:00	0.000	0.000	0.000	0.000	0.299	0.299
31:25:00	0.000	0.000	0.000	0.000	0.298	0.298
31:30:00	0.000	0.000	0.000	0.000	0.297	0.297
31:35:00	0.000	0.000	0.000	0.000	0.297	0.297
31:40:00	0.000	0.000	0.000	0.000	0.296	0.296
31:45:00	0.000	0.000	0.000	0.000	0.295	0.295
31:50:00	0.000	0.000	0.000	0.000	0.294	0.294
31:55:00	0.000	0.000	0.000	0.000	0.293	0.293

Time (hh:mm:ss)	Rain (mm)	Sewer Loss (m ³ /s)	Net Rain (mm)	Runoff (m ³ /s)	Baseflow (m ³ /s)	Total Flow (m ³ /s)
32:00:00	0.000	0.000	0.000	0.000	0.292	0.292
32:05:00	0.000	0.000	0.000	0.000	0.291	0.291
32:10:00	0.000	0.000	0.000	0.000	0.290	0.290
32:15:00	0.000	0.000	0.000	0.000	0.290	0.290
32:20:00	0.000	0.000	0.000	0.000	0.289	0.289
32:25:00	0.000	0.000	0.000	0.000	0.288	0.288
32:30:00	0.000	0.000	0.000	0.000	0.287	0.287
32:35:00	0.000	0.000	0.000	0.000	0.286	0.286
32:40:00	0.000	0.000	0.000	0.000	0.285	0.285
32:45:00	0.000	0.000	0.000	0.000	0.285	0.285
32:50:00	0.000	0.000	0.000	0.000	0.284	0.284
32:55:00	0.000	0.000	0.000	0.000	0.283	0.283
33:00:00	0.000	0.000	0.000	0.000	0.282	0.282
33:05:00	0.000	0.000	0.000	0.000	0.281	0.281
33:10:00	0.000	0.000	0.000	0.000	0.280	0.280
33:15:00	0.000	0.000	0.000	0.000	0.280	0.280
33:20:00	0.000	0.000	0.000	0.000	0.279	0.279
33:25:00	0.000	0.000	0.000	0.000	0.278	0.278
33:30:00	0.000	0.000	0.000	0.000	0.277	0.277
33:35:00	0.000	0.000	0.000	0.000	0.276	0.276
33:40:00	0.000	0.000	0.000	0.000	0.276	0.276
33:45:00	0.000	0.000	0.000	0.000	0.275	0.275
33:50:00	0.000	0.000	0.000	0.000	0.274	0.274
33:55:00	0.000	0.000	0.000	0.000	0.273	0.273
34:00:00	0.000	0.000	0.000	0.000	0.272	0.272
34:05:00	0.000	0.000	0.000	0.000	0.272	0.272
34:10:00	0.000	0.000	0.000	0.000	0.271	0.271
34:15:00	0.000	0.000	0.000	0.000	0.270	0.270
34:20:00	0.000	0.000	0.000	0.000	0.269	0.269
34:25:00	0.000	0.000	0.000	0.000	0.268	0.268
34:30:00	0.000	0.000	0.000	0.000	0.268	0.268
34:35:00	0.000	0.000	0.000	0.000	0.267	0.267
34:40:00	0.000	0.000	0.000	0.000	0.266	0.266
34:45:00	0.000	0.000	0.000	0.000	0.265	0.265
34:50:00	0.000	0.000	0.000	0.000	0.264	0.264

Time (hh:mm:ss)	Rain (mm)	Sewer Loss (m ³ /s)	Net Rain (mm)	Runoff (m ³ /s)	Baseflow (m ³ /s)	Total Flow (m ³ /s)
34:55:00	0.000	0.000	0.000	0.000	0.264	0.264
35:00:00	0.000	0.000	0.000	0.000	0.263	0.263
35:05:00	0.000	0.000	0.000	0.000	0.262	0.262
35:10:00	0.000	0.000	0.000	0.000	0.261	0.261
35:15:00	0.000	0.000	0.000	0.000	0.261	0.261
35:20:00	0.000	0.000	0.000	0.000	0.260	0.260
35:25:00	0.000	0.000	0.000	0.000	0.259	0.259
35:30:00	0.000	0.000	0.000	0.000	0.258	0.258
35:35:00	0.000	0.000	0.000	0.000	0.258	0.258
35:40:00	0.000	0.000	0.000	0.000	0.257	0.257
35:45:00	0.000	0.000	0.000	0.000	0.256	0.256
35:50:00	0.000	0.000	0.000	0.000	0.255	0.255
35:55:00	0.000	0.000	0.000	0.000	0.255	0.255
36:00:00	0.000	0.000	0.000	0.000	0.254	0.254
36:05:00	0.000	0.000	0.000	0.000	0.253	0.253
36:10:00	0.000	0.000	0.000	0.000	0.252	0.252
36:15:00	0.000	0.000	0.000	0.000	0.252	0.252
36:20:00	0.000	0.000	0.000	0.000	0.251	0.251
36:25:00	0.000	0.000	0.000	0.000	0.250	0.250
36:30:00	0.000	0.000	0.000	0.000	0.249	0.249
36:35:00	0.000	0.000	0.000	0.000	0.249	0.249
36:40:00	0.000	0.000	0.000	0.000	0.248	0.248
36:45:00	0.000	0.000	0.000	0.000	0.247	0.247
36:50:00	0.000	0.000	0.000	0.000	0.246	0.246
36:55:00	0.000	0.000	0.000	0.000	0.246	0.246
37:00:00	0.000	0.000	0.000	0.000	0.245	0.245
37:05:00	0.000	0.000	0.000	0.000	0.244	0.244
37:10:00	0.000	0.000	0.000	0.000	0.244	0.244
37:15:00	0.000	0.000	0.000	0.000	0.243	0.243
37:20:00	0.000	0.000	0.000	0.000	0.242	0.242
37:25:00	0.000	0.000	0.000	0.000	0.241	0.241
37:30:00	0.000	0.000	0.000	0.000	0.241	0.241
37:35:00	0.000	0.000	0.000	0.000	0.240	0.240
37:40:00	0.000	0.000	0.000	0.000	0.239	0.239
37:45:00	0.000	0.000	0.000	0.000	0.239	0.239

Time (hh:mm:ss)	Rain (mm)	Sewer Loss (m ³ /s)	Net Rain (mm)	Runoff (m ³ /s)	Baseflow (m ³ /s)	Total Flow (m ³ /s)
37:50:00	0.000	0.000	0.000	0.000	0.238	0.238
37:55:00	0.000	0.000	0.000	0.000	0.237	0.237
38:00:00	0.000	0.000	0.000	0.000	0.237	0.237
38:05:00	0.000	0.000	0.000	0.000	0.236	0.236
38:10:00	0.000	0.000	0.000	0.000	0.235	0.235
38:15:00	0.000	0.000	0.000	0.000	0.234	0.234
38:20:00	0.000	0.000	0.000	0.000	0.234	0.234
38:25:00	0.000	0.000	0.000	0.000	0.233	0.233
38:30:00	0.000	0.000	0.000	0.000	0.232	0.232
38:35:00	0.000	0.000	0.000	0.000	0.232	0.232
38:40:00	0.000	0.000	0.000	0.000	0.231	0.231
38:45:00	0.000	0.000	0.000	0.000	0.230	0.230
38:50:00	0.000	0.000	0.000	0.000	0.230	0.230
38:55:00	0.000	0.000	0.000	0.000	0.229	0.229
39:00:00	0.000	0.000	0.000	0.000	0.228	0.228
39:05:00	0.000	0.000	0.000	0.000	0.228	0.228
39:10:00	0.000	0.000	0.000	0.000	0.227	0.227
39:15:00	0.000	0.000	0.000	0.000	0.226	0.226
39:20:00	0.000	0.000	0.000	0.000	0.226	0.226
39:25:00	0.000	0.000	0.000	0.000	0.225	0.225
39:30:00	0.000	0.000	0.000	0.000	0.224	0.224
39:35:00	0.000	0.000	0.000	0.000	0.224	0.224
39:40:00	0.000	0.000	0.000	0.000	0.223	0.223
39:45:00	0.000	0.000	0.000	0.000	0.222	0.222
39:50:00	0.000	0.000	0.000	0.000	0.222	0.222
39:55:00	0.000	0.000	0.000	0.000	0.221	0.221
40:00:00	0.000	0.000	0.000	0.000	0.220	0.220
40:05:00	0.000	0.000	0.000	0.000	0.220	0.220
40:10:00	0.000	0.000	0.000	0.000	0.219	0.219
40:15:00	0.000	0.000	0.000	0.000	0.219	0.219
40:20:00	0.000	0.000	0.000	0.000	0.218	0.218
40:25:00	0.000	0.000	0.000	0.000	0.217	0.217
40:30:00	0.000	0.000	0.000	0.000	0.217	0.217
40:35:00	0.000	0.000	0.000	0.000	0.216	0.216
40:40:00	0.000	0.000	0.000	0.000	0.215	0.215

Time (hh:mm:ss)	Rain (mm)	Sewer Loss (m ³ /s)	Net Rain (mm)	Runoff (m ³ /s)	Baseflow (m ³ /s)	Total Flow (m ³ /s)
40:45:00	0.000	0.000	0.000	0.000	0.215	0.215
40:50:00	0.000	0.000	0.000	0.000	0.214	0.214
40:55:00	0.000	0.000	0.000	0.000	0.213	0.213
41:00:00	0.000	0.000	0.000	0.000	0.213	0.213
41:05:00	0.000	0.000	0.000	0.000	0.212	0.212
41:10:00	0.000	0.000	0.000	0.000	0.212	0.212
41:15:00	0.000	0.000	0.000	0.000	0.211	0.211
41:20:00	0.000	0.000	0.000	0.000	0.210	0.210
41:25:00	0.000	0.000	0.000	0.000	0.210	0.210
41:30:00	0.000	0.000	0.000	0.000	0.209	0.209
41:35:00	0.000	0.000	0.000	0.000	0.209	0.209
41:40:00	0.000	0.000	0.000	0.000	0.208	0.208
41:45:00	0.000	0.000	0.000	0.000	0.207	0.207
41:50:00	0.000	0.000	0.000	0.000	0.207	0.207
41:55:00	0.000	0.000	0.000	0.000	0.206	0.206
42:00:00	0.000	0.000	0.000	0.000	0.205	0.205
42:05:00	0.000	0.000	0.000	0.000	0.205	0.205
42:10:00	0.000	0.000	0.000	0.000	0.204	0.204
42:15:00	0.000	0.000	0.000	0.000	0.204	0.204
42:20:00	0.000	0.000	0.000	0.000	0.203	0.203
42:25:00	0.000	0.000	0.000	0.000	0.203	0.203
42:30:00	0.000	0.000	0.000	0.000	0.202	0.202
42:35:00	0.000	0.000	0.000	0.000	0.201	0.201
42:40:00	0.000	0.000	0.000	0.000	0.201	0.201
42:45:00	0.000	0.000	0.000	0.000	0.200	0.200
42:50:00	0.000	0.000	0.000	0.000	0.200	0.200
42:55:00	0.000	0.000	0.000	0.000	0.199	0.199
43:00:00	0.000	0.000	0.000	0.000	0.198	0.198
43:05:00	0.000	0.000	0.000	0.000	0.198	0.198
43:10:00	0.000	0.000	0.000	0.000	0.197	0.197
43:15:00	0.000	0.000	0.000	0.000	0.197	0.197
43:20:00	0.000	0.000	0.000	0.000	0.196	0.196
43:25:00	0.000	0.000	0.000	0.000	0.196	0.196
43:30:00	0.000	0.000	0.000	0.000	0.195	0.195
43:35:00	0.000	0.000	0.000	0.000	0.194	0.194

Time (hh:mm:ss)	Rain (mm)	Sewer Loss (m ³ /s)	Net Rain (mm)	Runoff (m ³ /s)	Baseflow (m ³ /s)	Total Flow (m ³ /s)
43:40:00	0.000	0.000	0.000	0.000	0.194	0.194
43:45:00	0.000	0.000	0.000	0.000	0.193	0.193
43:50:00	0.000	0.000	0.000	0.000	0.193	0.193
43:55:00	0.000	0.000	0.000	0.000	0.192	0.192
44:00:00	0.000	0.000	0.000	0.000	0.192	0.192
44:05:00	0.000	0.000	0.000	0.000	0.191	0.191
44:10:00	0.000	0.000	0.000	0.000	0.190	0.190
44:15:00	0.000	0.000	0.000	0.000	0.190	0.190
44:20:00	0.000	0.000	0.000	0.000	0.189	0.189
44:25:00	0.000	0.000	0.000	0.000	0.189	0.189
44:30:00	0.000	0.000	0.000	0.000	0.188	0.188
44:35:00	0.000	0.000	0.000	0.000	0.188	0.188
44:40:00	0.000	0.000	0.000	0.000	0.187	0.187
44:45:00	0.000	0.000	0.000	0.000	0.187	0.187
44:50:00	0.000	0.000	0.000	0.000	0.186	0.186
44:55:00	0.000	0.000	0.000	0.000	0.185	0.185
45:00:00	0.000	0.000	0.000	0.000	0.185	0.185
45:05:00	0.000	0.000	0.000	0.000	0.184	0.184
45:10:00	0.000	0.000	0.000	0.000	0.184	0.184
45:15:00	0.000	0.000	0.000	0.000	0.183	0.183
45:20:00	0.000	0.000	0.000	0.000	0.183	0.183
45:25:00	0.000	0.000	0.000	0.000	0.182	0.182
45:30:00	0.000	0.000	0.000	0.000	0.182	0.182
45:35:00	0.000	0.000	0.000	0.000	0.181	0.181
45:40:00	0.000	0.000	0.000	0.000	0.181	0.181
45:45:00	0.000	0.000	0.000	0.000	0.180	0.180
45:50:00	0.000	0.000	0.000	0.000	0.180	0.180
45:55:00	0.000	0.000	0.000	0.000	0.179	0.179
46:00:00	0.000	0.000	0.000	0.000	0.179	0.179
46:05:00	0.000	0.000	0.000	0.000	0.178	0.178
46:10:00	0.000	0.000	0.000	0.000	0.177	0.177
46:15:00	0.000	0.000	0.000	0.000	0.177	0.177
46:20:00	0.000	0.000	0.000	0.000	0.176	0.176
46:25:00	0.000	0.000	0.000	0.000	0.176	0.176
46:30:00	0.000	0.000	0.000	0.000	0.175	0.175

Time (hh:mm:ss)	Rain (mm)	Sewer Loss (m ³ /s)	Net Rain (mm)	Runoff (m ³ /s)	Baseflow (m ³ /s)	Total Flow (m ³ /s)
46:35:00	0.000	0.000	0.000	0.000	0.175	0.175
46:40:00	0.000	0.000	0.000	0.000	0.174	0.174
46:45:00	0.000	0.000	0.000	0.000	0.174	0.174
46:50:00	0.000	0.000	0.000	0.000	0.173	0.173
46:55:00	0.000	0.000	0.000	0.000	0.173	0.173
47:00:00	0.000	0.000	0.000	0.000	0.172	0.172
47:05:00	0.000	0.000	0.000	0.000	0.172	0.172
47:10:00	0.000	0.000	0.000	0.000	0.171	0.171
47:15:00	0.000	0.000	0.000	0.000	0.171	0.171
47:20:00	0.000	0.000	0.000	0.000	0.170	0.170
47:25:00	0.000	0.000	0.000	0.000	0.170	0.170
47:30:00	0.000	0.000	0.000	0.000	0.169	0.169
47:35:00	0.000	0.000	0.000	0.000	0.169	0.169
47:40:00	0.000	0.000	0.000	0.000	0.168	0.168
47:45:00	0.000	0.000	0.000	0.000	0.168	0.168
47:50:00	0.000	0.000	0.000	0.000	0.167	0.167
47:55:00	0.000	0.000	0.000	0.000	0.167	0.167
48:00:00	0.000	0.000	0.000	0.000	0.166	0.166
48:05:00	0.000	0.000	0.000	0.000	0.166	0.166
48:10:00	0.000	0.000	0.000	0.000	0.165	0.165
48:15:00	0.000	0.000	0.000	0.000	0.165	0.165
48:20:00	0.000	0.000	0.000	0.000	0.164	0.164
48:25:00	0.000	0.000	0.000	0.000	0.164	0.164
48:30:00	0.000	0.000	0.000	0.000	0.163	0.163
48:35:00	0.000	0.000	0.000	0.000	0.163	0.163
48:40:00	0.000	0.000	0.000	0.000	0.163	0.163
48:45:00	0.000	0.000	0.000	0.000	0.162	0.162
48:50:00	0.000	0.000	0.000	0.000	0.162	0.162
48:55:00	0.000	0.000	0.000	0.000	0.161	0.161
49:00:00	0.000	0.000	0.000	0.000	0.161	0.161
49:05:00	0.000	0.000	0.000	0.000	0.160	0.160
49:10:00	0.000	0.000	0.000	0.000	0.160	0.160
49:15:00	0.000	0.000	0.000	0.000	0.159	0.159
49:20:00	0.000	0.000	0.000	0.000	0.159	0.159
49:25:00	0.000	0.000	0.000	0.000	0.158	0.158

Time (hh:mm:ss)	Rain (mm)	Sewer Loss (m ³ /s)	Net Rain (mm)	Runoff (m ³ /s)	Baseflow (m ³ /s)	Total Flow (m ³ /s)
49:30:00	0.000	0.000	0.000	0.000	0.158	0.158
49:35:00	0.000	0.000	0.000	0.000	0.157	0.157
49:40:00	0.000	0.000	0.000	0.000	0.157	0.157
49:45:00	0.000	0.000	0.000	0.000	0.156	0.156
49:50:00	0.000	0.000	0.000	0.000	0.156	0.156
49:55:00	0.000	0.000	0.000	0.000	0.156	0.156
50:00:00	0.000	0.000	0.000	0.000	0.155	0.155
50:05:00	0.000	0.000	0.000	0.000	0.155	0.155
50:10:00	0.000	0.000	0.000	0.000	0.154	0.154
50:15:00	0.000	0.000	0.000	0.000	0.154	0.154
50:20:00	0.000	0.000	0.000	0.000	0.153	0.153
50:25:00	0.000	0.000	0.000	0.000	0.153	0.153
50:30:00	0.000	0.000	0.000	0.000	0.152	0.152
50:35:00	0.000	0.000	0.000	0.000	0.152	0.152
50:40:00	0.000	0.000	0.000	0.000	0.151	0.151
50:45:00	0.000	0.000	0.000	0.000	0.151	0.151
50:50:00	0.000	0.000	0.000	0.000	0.151	0.151
50:55:00	0.000	0.000	0.000	0.000	0.150	0.150
51:00:00	0.000	0.000	0.000	0.000	0.150	0.150
51:05:00	0.000	0.000	0.000	0.000	0.149	0.149
51:10:00	0.000	0.000	0.000	0.000	0.149	0.149
51:15:00	0.000	0.000	0.000	0.000	0.148	0.148
51:20:00	0.000	0.000	0.000	0.000	0.148	0.148
51:25:00	0.000	0.000	0.000	0.000	0.148	0.148
51:30:00	0.000	0.000	0.000	0.000	0.147	0.147
51:35:00	0.000	0.000	0.000	0.000	0.147	0.147
51:40:00	0.000	0.000	0.000	0.000	0.146	0.146
51:45:00	0.000	0.000	0.000	0.000	0.146	0.146
51:50:00	0.000	0.000	0.000	0.000	0.145	0.145
51:55:00	0.000	0.000	0.000	0.000	0.145	0.145
52:00:00	0.000	0.000	0.000	0.000	0.145	0.145
52:05:00	0.000	0.000	0.000	0.000	0.144	0.144
52:10:00	0.000	0.000	0.000	0.000	0.144	0.144
52:15:00	0.000	0.000	0.000	0.000	0.143	0.143
52:20:00	0.000	0.000	0.000	0.000	0.143	0.143

Time (hh:mm:ss)	Rain (mm)	Sewer Loss (m ³ /s)	Net Rain (mm)	Runoff (m ³ /s)	Baseflow (m ³ /s)	Total Flow (m ³ /s)
52:25:00	0.000	0.000	0.000	0.000	0.142	0.142
52:30:00	0.000	0.000	0.000	0.000	0.142	0.142
52:35:00	0.000	0.000	0.000	0.000	0.142	0.142
52:40:00	0.000	0.000	0.000	0.000	0.141	0.141
52:45:00	0.000	0.000	0.000	0.000	0.141	0.141
52:50:00	0.000	0.000	0.000	0.000	0.140	0.140
52:55:00	0.000	0.000	0.000	0.000	0.140	0.140
53:00:00	0.000	0.000	0.000	0.000	0.140	0.140
53:05:00	0.000	0.000	0.000	0.000	0.139	0.139
53:10:00	0.000	0.000	0.000	0.000	0.139	0.139
53:15:00	0.000	0.000	0.000	0.000	0.138	0.138
53:20:00	0.000	0.000	0.000	0.000	0.138	0.138
53:25:00	0.000	0.000	0.000	0.000	0.137	0.137
53:30:00	0.000	0.000	0.000	0.000	0.137	0.137
53:35:00	0.000	0.000	0.000	0.000	0.137	0.137
53:40:00	0.000	0.000	0.000	0.000	0.136	0.136
53:45:00	0.000	0.000	0.000	0.000	0.136	0.136
53:50:00	0.000	0.000	0.000	0.000	0.135	0.135
53:55:00	0.000	0.000	0.000	0.000	0.135	0.135
54:00:00	0.000	0.000	0.000	0.000	0.135	0.135
54:05:00	0.000	0.000	0.000	0.000	0.134	0.134
54:10:00	0.000	0.000	0.000	0.000	0.134	0.134
54:15:00	0.000	0.000	0.000	0.000	0.134	0.134
54:20:00	0.000	0.000	0.000	0.000	0.133	0.133
54:25:00	0.000	0.000	0.000	0.000	0.133	0.133
54:30:00	0.000	0.000	0.000	0.000	0.132	0.132
54:35:00	0.000	0.000	0.000	0.000	0.132	0.132
54:40:00	0.000	0.000	0.000	0.000	0.132	0.132
54:45:00	0.000	0.000	0.000	0.000	0.131	0.131
54:50:00	0.000	0.000	0.000	0.000	0.131	0.131
54:55:00	0.000	0.000	0.000	0.000	0.130	0.130
55:00:00	0.000	0.000	0.000	0.000	0.130	0.130
55:05:00	0.000	0.000	0.000	0.000	0.130	0.130
55:10:00	0.000	0.000	0.000	0.000	0.129	0.129
55:15:00	0.000	0.000	0.000	0.000	0.129	0.129

Time (hh:mm:ss)	Rain (mm)	Sewer Loss (m ³ /s)	Net Rain (mm)	Runoff (m ³ /s)	Baseflow (m ³ /s)	Total Flow (m ³ /s)
55:20:00	0.000	0.000	0.000	0.000	0.129	0.129
55:25:00	0.000	0.000	0.000	0.000	0.128	0.128
55:30:00	0.000	0.000	0.000	0.000	0.128	0.128
55:35:00	0.000	0.000	0.000	0.000	0.127	0.127
55:40:00	0.000	0.000	0.000	0.000	0.127	0.127
55:45:00	0.000	0.000	0.000	0.000	0.127	0.127
55:50:00	0.000	0.000	0.000	0.000	0.126	0.126
55:55:00	0.000	0.000	0.000	0.000	0.126	0.126
56:00:00	0.000	0.000	0.000	0.000	0.126	0.126
56:05:00	0.000	0.000	0.000	0.000	0.125	0.125
56:10:00	0.000	0.000	0.000	0.000	0.125	0.125
56:15:00	0.000	0.000	0.000	0.000	0.124	0.124
56:20:00	0.000	0.000	0.000	0.000	0.124	0.124
56:25:00	0.000	0.000	0.000	0.000	0.124	0.124
56:30:00	0.000	0.000	0.000	0.000	0.123	0.123
56:35:00	0.000	0.000	0.000	0.000	0.123	0.123
56:40:00	0.000	0.000	0.000	0.000	0.123	0.123
56:45:00	0.000	0.000	0.000	0.000	0.122	0.122
56:50:00	0.000	0.000	0.000	0.000	0.122	0.122
56:55:00	0.000	0.000	0.000	0.000	0.122	0.122
57:00:00	0.000	0.000	0.000	0.000	0.121	0.121
57:05:00	0.000	0.000	0.000	0.000	0.121	0.121
57:10:00	0.000	0.000	0.000	0.000	0.120	0.120
57:15:00	0.000	0.000	0.000	0.000	0.120	0.120
57:20:00	0.000	0.000	0.000	0.000	0.120	0.120
57:25:00	0.000	0.000	0.000	0.000	0.119	0.119
57:30:00	0.000	0.000	0.000	0.000	0.119	0.119
57:35:00	0.000	0.000	0.000	0.000	0.119	0.119
57:40:00	0.000	0.000	0.000	0.000	0.118	0.118
57:45:00	0.000	0.000	0.000	0.000	0.118	0.118
57:50:00	0.000	0.000	0.000	0.000	0.118	0.118
57:55:00	0.000	0.000	0.000	0.000	0.117	0.117
58:00:00	0.000	0.000	0.000	0.000	0.117	0.117
58:05:00	0.000	0.000	0.000	0.000	0.117	0.117
58:10:00	0.000	0.000	0.000	0.000	0.116	0.116

Time (hh:mm:ss)	Rain (mm)	Sewer Loss (m ³ /s)	Net Rain (mm)	Runoff (m ³ /s)	Baseflow (m ³ /s)	Total Flow (m ³ /s)
58:15:00	0.000	0.000	0.000	0.000	0.116	0.116

Appendix

Catchment descriptors

Name	Value	User-defined value used?
Area (km ²)	2.85	No
ALTBAR	116	No
ASPBAR	136	No
ASPVAR	0.22	No
BFIHOST	0.39	No
BFIHOST19	0.35	No
DPLBAR (km)	1.49	No
DPSBAR (mkm ⁻¹)	77.7	No
FARL	0.99	No
LDP	2.61	No
PROPWET	0.36	No
RMED1H	11.8	No
RMED1D	35.3	No
RMED2D	48.5	No
SAAR (mm)	825	No
SAAR4170 (mm)	828	No
SPRHOST	44.5	No
URBEXT2000	0.28	No
URBEXT1990	0.19	No
URBCONC	0.88	No
URBLOC	1.02	No
DDF parameter C	-0.03	No
DDF parameter D1	0.35	No
DDF parameter D2	0.37	No
DDF parameter D3	0.33	No
DDF parameter E	0.32	No
DDF parameter F	2.5	No
DDF parameter C (1km grid value)	-0.03	No
DDF parameter D1 (1km grid value)	0.35	No
DDF parameter D2 (1km grid value)	0.37	No
DDF parameter D3 (1km grid value)	0.34	No
DDF parameter E (1km grid value)	0.32	No
DDF parameter F (1km grid value)	2.52	No

Appendix C – Site topographic survey

Appendix D – Indicative development proposals

Appendix B

Technical Note 1: Flood Risk and Drainage Appeal Statement

Site: The Bulrushes, East Grinstead
Prepared by: Neil Jaques
Approved by: Ryan Saul
Date: 17 December 2025

motion
84 North Street
Guildford
GU1 4AU
Tel: 01483 531300
www.motion.co.uk

1.0 Introduction

- 1.1 Motion has been instructed by Mr Harrison Wood to undertake a supporting statement for the appeal associated with the proposal for one additional residential unit at the above location.
- 1.2 This Technical Note responds to the Reason for Refusal item 3, under planning application DM/24/2248, relating to Flood Risk which states:

The proposed development is a 'more vulnerable' development as defined under the National Planning Policy Framework (NPPF), Annex 3. A Sequential and Exception Test has not been submitted as part of the application and it has not been demonstrated that there are other areas with lower risk of flooding. Details have not been provided to demonstrate that the culvert has sufficient offsets, would remain free-flowing, structurally sound, and accessible during and after development works as set out in the Land Drainage Act 1991. The proposed development is therefore contrary to policy DP41 of the Mid Sussex District Plan and national policy contained within the NPPF.

2.0 The Sequential and Exception Test

- 2.1 The National Planning Policy Framework (NPPF) and associated Planning Practice Guidance (PPG), provides guidance on when a Sequential and Exception Test is required. Paragraph 173 of the NPPF states that a sequential risk-based approach should be taken for individual applications and paragraph 174 confirms that the aim of the sequential test is to steer new development to areas with the lowest risk of flooding from any source. Paragraph 175 goes on to clarify the following:

The sequential test should be used in in areas known to be at risk now or in the future from any form of flooding, except in situations where a site-specific flood risk assessment demonstrates that the no built development within the site boundary, including access or escape routes, land raising, or other potentially vulnerable elements, would be located on an area that would be at risk of flooding from any source, now and in the future.

- 2.2 The PPG was updated on the 17th September 2025, after the planning decision on 31st July 2025, which included further guidance on the application of the Sequential Test at paragraph 027 and stated the following:

In applying paragraph 175 a proportionate approach should be taken. Where a site-specific flood risk assessment demonstrates clearly that the proposed layout, design, and mitigation measures would ensure that occupiers and users would remain safe from current and future surface water flood risk for the lifetime of the development (therefore addressing the risks identified e.g. by Environment Agency flood risk mapping), without increasing flood risk elsewhere, then the sequential test need not be applied.

- 2.3 Paragraph 177 of the NPPF then states the following:

Having applied the sequential test, if it is not possible for development to be located in areas with a lower risk of flooding (taking into account wider sustainable development objectives), the exception test may have to be applied.

- 2.4 Taking the above into consideration, the Flood Risk Assessment (FRA) by Motion and the Hydraulic Modelling Report prepared by Ardent, submitted with the planning application, demonstrate that the proposed layout, design, and mitigation measures will ensure that occupants and users are protected from both current and future surface water flood risks throughout the lifetime of the development.

- 2.5 The correspondence from the MSDC's Flood Risk and Drainage Team dated 22nd July 2025 (See **Appendix A**) confirms the following:
- ▶ The Surface water modelling is acceptable.
 - ▶ The modelling demonstrates that the flood risk off-site is not increased.
 - ▶ A Finished Floor Level (FFL) set to 81.51mAOD is acceptable, which provides a 300mm freeboard over the design flood level (1 in 100 year plus climate change).
 - ▶ The proposed mitigation measures demonstrate that a safe access to and from the development can be provided in an area of 'very low hazard'.
- 2.6 Since MSDC's Flood Risk and Drainage Team has approved the modelling as sufficient to ensure user safety, and considering the current NPPF and PPG guidelines, neither a Sequential nor Exception Test are required.

3.0 The Culvert

- 3.1 The reason for refusal states the following in relation to the culvert that crosses the site:
- Details have not been provided to demonstrate that the culvert has sufficient offsets, would remain free-flowing, structurally sound, and accessible during and after development works as set out in the Land Drainage Act 1991.*
- 3.2 The plan in **Appendix B** shows the position and depth of the existing culvert that crosses the site. This shows that the clearance to the centre from the proposed house to the culvert ranges from 2.72m to 1.26m. The depth of the culvert in this location is approximately 810mm to the invert of the pipe and 510mm to the soffit.
- 3.3 Approved Document H of The Building Regulations 2010 does not preclude pipes being close to foundations. In fact paragraph 2.25a states that pipes can be within 1m of foundations if the trench is filled with concrete up to the lowest level of the foundation. However, as the culvert is relatively shallow it is proposed that the depth of the foundations for the proposed house are set below the invert of the pipe and therefore will not impact on the structural integrity of the pipe.
- 3.4 Also, as the depth of the culvert is relatively shallow, if maintenance of the culvert is required there is sufficient space for the excavation to be carried out by hand and therefore access by plant is not required.
- 3.5 The appellant also contacted West Sussex County Council (WSCC) on 8th July 2024, see **Appendix C**. WSCC confirmed that a consent would only be required if alterations to the culvert were proposed, which they are not. They also confirmed that the Appellant is simply required to not damage the culvert and maintain the flow during and post construction.
- 3.6 It is our opinion that the construction of the house can be carried out without impacting on the structural integrity of the culvert and it can be protected during the construction work.
- 3.7 As the riparian owner, Mr Harrison Wood will be responsible for the maintenance of the culvert and to ensure it is free flowing, under the provisions of the Land Drainage Act 1991.
- 3.8 A CCTV survey of the culvert will be carried out prior to the works commencing to assess the existing condition of the culvert. If any defects are identified they will be rectified during the construction of the house and in agreement with WSCC. A CCTV survey will then be carried out following completion of the work to ensure the culvert remains in a good condition. This can be adequately controlled by a planning condition.
- 3.9 The above details confirm that sufficient offsets are provided to ensure that the culvert remains structural sound, free-flowing and accessible after the proposed development is completed.

4.0 Foul and Surface Water Drainage Strategy

- 4.1 Although not a reason for refusal, the Appellant has asked Motion to set out the proposed drainage strategy for the development.
- 4.2 Motion has carried out a desktop assessment of the ground conditions and the BGS mapping shows that the bedrock geology is the Wadhurst Clay Formation-Mudstone and therefore utilising infiltration is unlikely to be feasible. An ordinary watercourse is also located on the northern boundary of the site, which would normally indicate that infiltration is unlikely to be viable due to ground conditions and/or high groundwater. With this in mind the proposed drainage strategy will utilise an outfall to the existing watercourse on the northern boundary.
- 4.3 The runoff from the site will be restricted using a flow control and attenuation will be provided in the garden to the rear of the house, in the form of an cellular storage tank.
- 4.4 The impermeable area of the site, including the parking spaces is 128m².
- 4.5 A greenfield runoff calculation has been carried out which shows that the QMed runoff rate is 0.1l/s, see **Appendix D**. As with all small developments it is not possible to practically control the runoff to such small flow rates, without the risk of blockage and therefore it is proposed to control the runoff to 1l/s. However, this is still less than the 1 in 30 year and 1 in 100 year greenfield runoff rates for the site, which are respectively 2.3l/s and 3.19l/s. Therefore, using 1l/s will not increase flood risk in extreme rainfall events.
- 4.6 A Quick Storage Estimate has been carried out using InfoDrainage (see **Appendix E**), which confirms that between 6m³ to 9m³ of storage will be required to control the runoff from the site to 1l/s for the 1 in 100 year plus climate change event.
- 4.7 With regard to the foul drainage for the site, as there are no adopted foul sewers within reasonable proximity to the site, it is proposed that the house will discharge to a sewage treatment plant, and treated effluent will either outfall to a drainage field, or the existing ordinary watercourse.
- 4.8 The above demonstrates that a drainage scheme can be successfully delivered on site and the detailed design can be adequately controlled by a planning condition.

5.0 Conclusion

- 5.1 This statement, together with the appended information and original FRA, demonstrates compliance with national and local flood risk policy requirements.

Appendix A

MSDC's Flood Risk and Drainage Team Correspondence

Planning Application Consultation Response

Application Details

Application Number	DM/24/2248
Response Date	22/07/25
Site Location	The Bulrushes Coombe Hill Road East Grinstead West Sussex RH19 4LZ
Development Description	Demolition of existing outbuildings and erection of two three-bedroom dwellings.
Recommendation¹	Objection

Thank you for reconsulting the Flood Risk and Drainage Team on the above application. Our comments are based on the review of the following documents submitted in support of this application:

- Flood Risk Assessment (dated 29th May 2025 | by Motion)
- Hydraulic Modelling Report (REPORT REF.2408600-ACE-XX-XX-RP-C-0501|dated May 2025 |by Ardent Consulting Engineers)
- Email from Harrison Wood to Rachel Richardson (dated 08 July 2025)

Flood Risk

Information

[The Planning Practice Guidance for Flood Risk and Coastal Change](#) requires all sources of flood risk to be considered consistently with how fluvial and tidal flood risk is considered within the [National Planning Policy Framework](#). This means that surface water flood risk extents should be considered comparable to flood zones when assessing a development's vulnerability to flooding and the need for a site-specific flood risk assessment.

For clarity Mid Sussex District Council's Flood Risk and Drainage Team (in line with advice from West Sussex Lead Local Flood Authority) utilise the below table when considering flood risk.

Annual exceedance	Flood Zone	Surface Water Flood Risk
Greater than 3.3% (>1:30-year)	3b	High
Between 1% and 3.3% (1:100-year and 1:30-year)	3a	Medium
Between 0.1% and 1% (1:1,000-year and 1:100-year)	2	Low
Less than 0.1% (<1:1,000-year)	1	Very Low

Application specific comment

The site-specific hydraulic model focused on the surface water flood risk of the site. This bespoke flood model is more representative of the surface water flood risk on site than the Environment Agency's national surface water flood map. The modelling is based on baseline

¹ In line with guidance from the Planning Department the Flood Risk and Drainage Team, where considered appropriate, utilise conditions to address detailed drainage design and detailed design of flood mitigation measures.

and proposed plans. This has shown the site is at increased surface water flood risk, however the extents of the flooding are reduced compared to the Environment Agency flood maps.

The Flood Risk and Drainage Team find the surface water modelling acceptable. It has demonstrated no increase in flood risk off-site.

The model includes a 1 in 100-year plus 45% allowance for climate change event which is consistent with EA guidance for the Medway catchment. The surface water flood extent from the bespoke model predicts a range from 81.21m AOD at the southwest of the proposed building to 80.69m AOD to the northeast. Peak depths along the flow path of between approximately 150mm-300mm are predicted around the building.

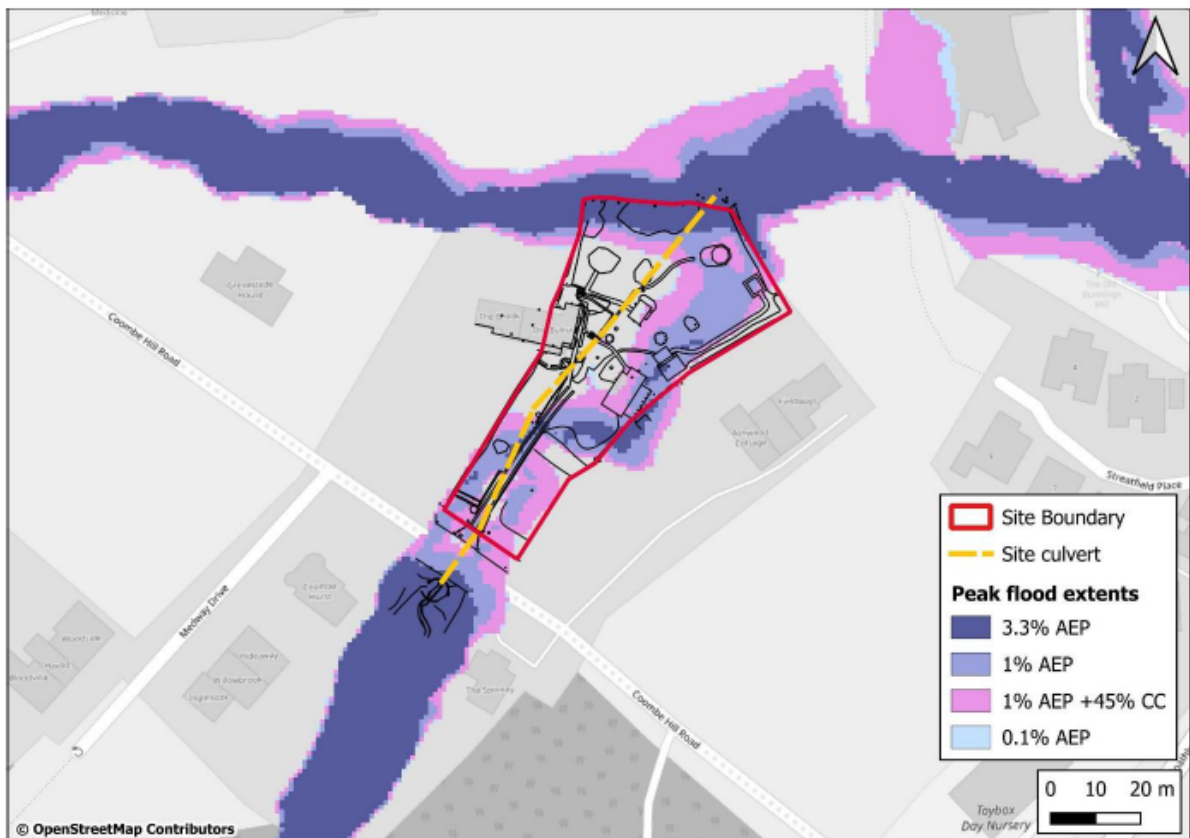


Figure 4-1: Baseline model flood extents

Based on the surface water modelling provided, the site is still shown to be partially within the High, Medium and Low surface water flood extents, so based on MSDC SFRA definitions, the site is still partially within Flood Zones 3b, 3a and 2 for surface water.

The proposed development is a 'more vulnerable' development (NPPF, Annex 3).

Utilising the 'Flood risk vulnerability and flood zone 'incompatibility' table (PPG, Para. 079 and Figure 1) more vulnerable development should not be permitted in Flood Zone 3b.

Flood Resistance and Resilience

A Finished Floor Level (FFL) of 81.51m AOD is proposed, which provides a 300mm freeboard above the modelled 1 in 100-year plus climate change flood level of 81.21m AOD which is acceptable. The Planning Practice Guidance (PPG) acknowledges that in certain circumstances where there is high confidence in the modelling, a reduced freeboard of 300mm may be acceptable.

However, as the building will be located adjacent to an overland flow route flood resistance and resilience measures should be incorporated to at least 600mm above ground level

Safe Escape

Evidence has been provided in the Hydraulic Modelling Report through Flood hazard mapping, that safe access can be provided. In the post-development scenario, ground re-profiling measures are proposed to divert overland flows away from the building and access road. Due to the proposed ground level modifications there is a route to the private highway south of the site entirely via an area designated as very low hazard, enabling safe access in the event of a flood.

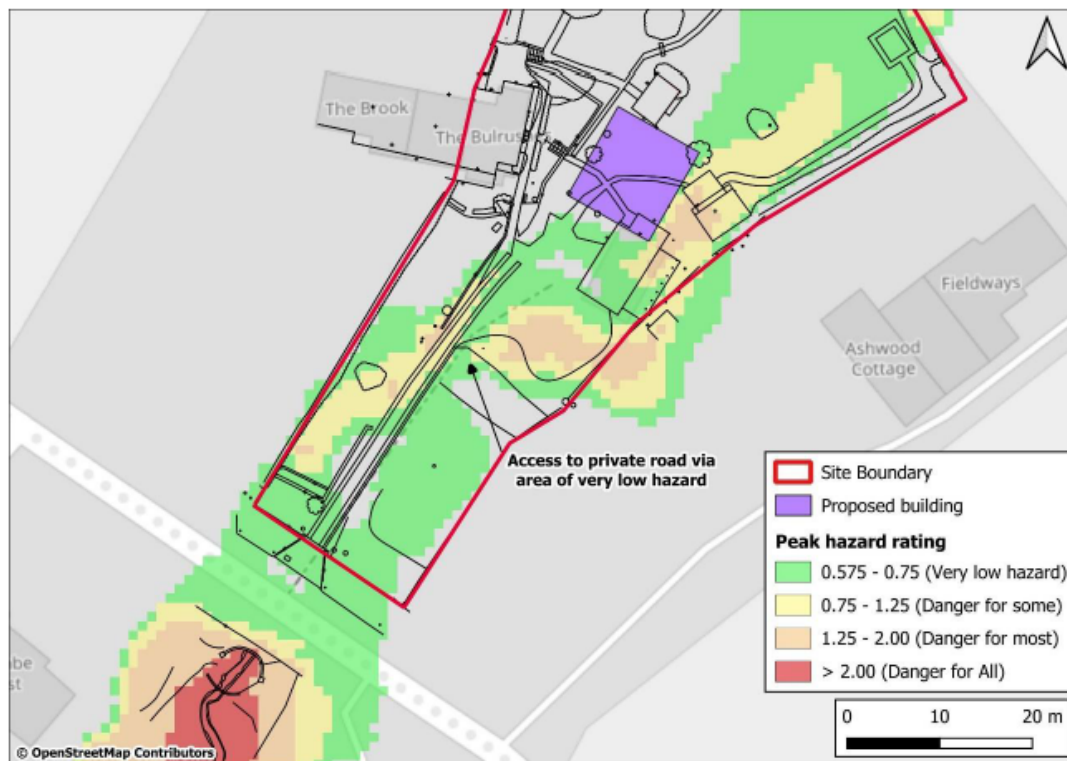


Figure 5-4: Peak modelled hazard rating – 1% AEP +45% climate change event

Historical Flood Risk

Mid Sussex District Council's records do not contain records of the site flooding. Our records also contain no records of flooding within the area immediately surrounding the site.

Mid Sussex District Council's records are not complete, and flooding may have occurred which is not recorded. A site having never flooded in the past does not mean it won't flood in the future.

Sewers on Site

The Southern Water public sewer map does not show any public sewers located within the redline boundary of the site.

There may be sewers located on the site not shown on the plan which are now considered public sewers. Any drain which serves more than one property, or crosses into the site from a separate site may be considered a public sewer. Advice in relation to this situation can be found on the relevant water authority's website.

Surface Water Drainage

Information

Surface water drainage will ultimately need to be designed to meet the latest national and local planning and drainage policies and guidance. The drainage system will need to consider climate change, the allowances for which should be based on the climate change guidance from the Environment Agency at the time of detailed design.

Detailed drainage design should consider the impact a flooded outfall could have on the proposed drainage system.

The recommendation for a drainage condition to be utilised for an application does not preclude the need for updated calculations or alterations to a drainage strategy. Recommendation for a drainage condition shows that the Flood Risk and Drainage Team are of the opinion that the development has shown that, in principle, drainage could successfully be provided on the site.

Application specific comment

The BGS infiltration potential map shows the site to be in an area with high to low infiltration potential. Therefore, the use of infiltration drainage such as permeable paving or soakaways may be possible on site. To ensure the drainage hierarchy is followed this will need to be confirmed through infiltration testing on site as part of detailed drainage design.

Limited information has been provided in relation surface water drainage. The strategy is based on either a soakaway or discharging to the adjacent watercourse. The information submitted doesn't meet the minimum requirements as set out in our Flood Risk and Drainage Information Check List.

The detailed drainage design will need to be based on the latest national and local drainage and climate change guidance (at time of detailed design). We would also advise the applicant that the surface water drainage system for the proposed development should remain separate to any flood management structures utilised to manage the surface water flow pathways on site.

Foul Water Drainage

Limited information has been provided in relation to foul water drainage. It is proposed that the development will utilise a package treatment plant to manage foul water drainage with treated effluent discharging into the adjacent watercourse.

This approach is considered acceptable in principle, subject to design. We would advise the applicant that non-main foul drainage should meet with the Environment Agency's General Binding Rules. Where these rules cannot be met then an Environmental Permit will be required.

Information into our general requirements for detailed foul water drainage design is included within our 'General Drainage Information Guide'. This level of information will be required to address the recommended drainage condition.

To ensure the final drainage design meets with the latest design requirements we would advise the applicant to confirm the design parameters required prior to undertaking detailed design.

Sequential & Exception Test

Paragraph 168 of the Framework explains the aim of the sequential test (ST) to steer new development to areas with the lowest risk of flooding from any source. Development should not be permitted if there are reasonably available sites appropriate for the proposal in areas with a lower risk of flooding. The Planning Practice Guidance (PPG) reiterates the aim to avoid as far as possible development in medium and high flood risk areas including those at risk of surface water flooding.

Following application of the Sequential Test, to pass the Exception Test it should be demonstrated that:

- a) the development would provide wider sustainability benefits to the community that outweigh the flood risk; and
- b) the development will be safe for its lifetime taking account of the vulnerability of its users, without increasing flood risk elsewhere, and, where possible, will reduce flood risk overall.

The NPPF states that both elements of the Exception Test should be satisfied for development to be allocated or permitted.

For clarity Mid Sussex District Council's Flood Risk and Drainage Team (in line with advice from West Sussex Lead Local Flood Authority) are adhering to The Planning Practice Guidance (PPG).

The proposed development is considered 'more vulnerable' in terms of flood risk and the site is located within an area of existing and future medium and high surface water flood risk from a watercourse / overland flow located within the redline boundary of the site.

The policy and guidance is clear that flood management and mitigation measures (such as the applicant's proposed management method of sequentially locating the dwelling at lowest risk within the site) should not be considered unless the Sequential and Exception Test has been undertaken and no alternative sites are available.

For the Sequential Test to be passed the applicant needs to prove that there are no 'reasonably available' sites at lower flood risk for this development to take place on. We would expect this to be applied to the whole borough.

The application has not been supported by a Sequential & Exception test.

The Flood Risk and Drainage Team object to this development due to the lack of a supporting Sequential and Exception Test.

Ordinary Watercourse Consent (OWC)

Following the review of the Flood Risk Assessment report and the Hydraulic Modelling Report it has been confirmed that a culverted ordinary watercourse crosses Coombe Hill Road in a buried 600mm diameter pipe, before running under the curtilage of the site in a 300mm diameter pipe to an outfall at the northern site boundary. It is assumed that the existing surface water site drainage for the Bulrushes outfalls to this culverted pipe.

The applicant has provided correspondence with West Sussex County Council (WSCC), the Lead Local Flood Authority (LLFA), who advise that the culvert is unlikely to be adopted as it does not convey highway water. They further confirm that Ordinary Watercourse Consent (OWC) would only be required if alterations to the culvert are proposed.

While we acknowledge that no alterations to the culvert are currently proposed, we must emphasise that the applicant, as riparian owner, remains legally responsible for ensuring the culvert remains free-flowing, structurally sound, and accessible during and after development works. This duty is set out in the Land Drainage Act 1991.

Furthermore, the exact location, depth, alignment, and condition of the culvert remains unconfirmed. This is a critical constraint, as the proximity of the culvert to the proposed building footprint raises concern regarding long-term maintenance access, structural load impacts, and compliance with relevant policy. The WSCC LLFA Culvert Policy clearly states that:

- Buildings should not be sited within 5 metres of a culvert's outer edge.
- Culverts should not be built over due to access, flooding and structural risk.
- Any structures proposed near or over a culvert may require consent, even if not altering flow characteristics.

At this stage, it remains unclear whether the development is achievable and if it encroaches within this 5m offset. This should be cross-checked against building foundation depths and any other below-ground infrastructure to ensure compliance with LLFA and Planning Practice Guidance.

OBJECTION WORDING

The Flood Risk and Drainage Team object to application DM/24/2248 on the following grounds. The reasons for this objection are summarised below.

- The site is located within the modelled 1:30 surface water flood extent.
- The proposed development is a 'more vulnerable' development as defined under the National Planning Policy Framework (NPPF), Annex 3.

- The Planning Practice Guidance for Flood Risk and Coastal Change (PPG), updated in August 2022, requires flood risk from all sources to be assessed consistently with the approach utilised for river and tidal flooding (Paragraph 023).
- The site is therefore considered to be located within the equivalent of Flood Zone 3b.
- Utilisation of the Flood Risk Vulnerability and Flood Zone Incompatibility Table (PPG, paragraph 079) shows that this development should not be permitted on flood risk grounds.
- The NPPF, paragraph 159 states that inappropriate development in areas at risk of flooding should be avoided by directing development away from areas at highest risk.
- A Sequential and Exception Test has not been submitted as part of the application.
- The surface water drainage information submitted doesn't meet the minimum requirements as set out in the MSDC Flood Risk and Drainage Information Check List.
- Details have not been provided to demonstrate that the culvert has sufficient offsets, would remain free-flowing, structurally sound, and accessible during and after development works as set out in the Land Drainage Act 1991.

For and on behalf of the Flood Risk and Drainage Team

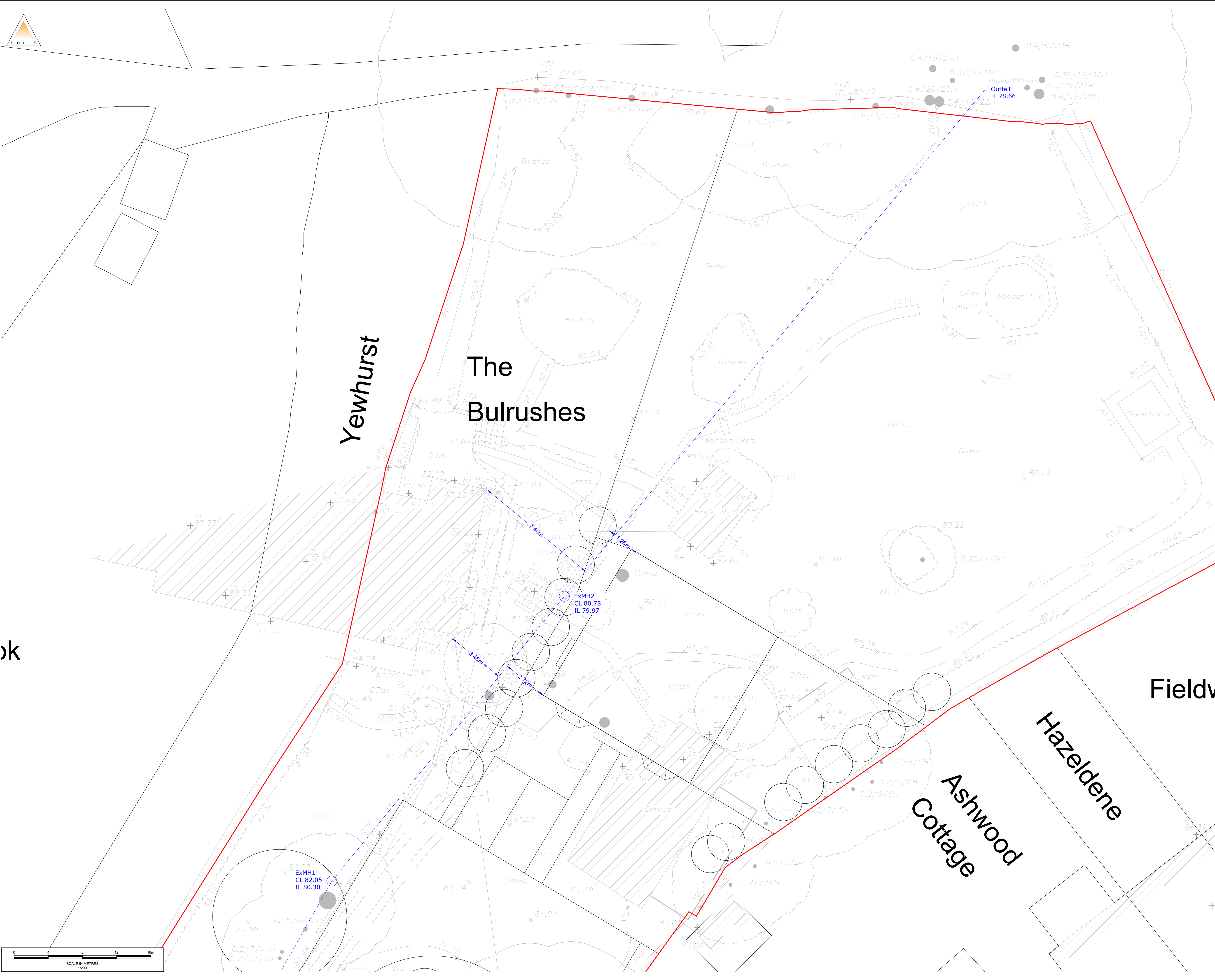
Mid Sussex District Council

Telephone: 01444 477577 Option 3

drainage@midsussex.gov.uk

Appendix B

Drawing 2503030-9001-P01



Notes

1. All levels and dimensions to be checked on site before any work commences. All dimensions in metres unless stated otherwise.
2. This drawing is based on survey information supplied by Foresite Geomatics, and Motion cannot guarantee the accuracy of the data provided.
3. This drawing is based on OS mapping and Motion cannot guarantee the accuracy of the data.

Legend

- Site Boundary
- Existing Culvert
- Existing Manhole

P01	First Issue	ST	NJ	NJ	11/12/2025
Rev.	Description	Drm	Chk	App	Date

Drawing Status:

FOR PLANNING
NOT FOR CONSTRUCTION

motion

Guildford - Reading - London
www.motion.co.uk

Client:

Harrison Wood

Project:

The Bulrushes, East Grinstead

Title:

Existing Culvert

Scale: 1:100 (@ A1)

Drawing:

2503030-9001

Revision:

P01

C:\Users\jag\Documents\StaffSite - Issues 2503030\Drawings\2503030-9001-P01 [Existing Culvert].dwg

Appendix C

WSCC Correspondence



Flood Risk Management <FloodRiskManagement@westsussex.gov.uk>
to me ▾

Mon, Jul 8, 2024, 12:38 PM



Hi Harrison

Apologies for the delay in coming back to you,

Consent will be required should there be any proposed alterations to the culverted watercourse (except maintenance works), such as were you to divert the culvert. Otherwise, you are simply required to not damage it, and maintain the flow of water during and post construction.

It is unlikely that this asset is owned by **WSSC** (unless you believe it is only highways drainage?) and instead most likely to be the responsibility of the landowner, who has a legal responsibility to ensure the free flow of water is maintained at all times. You may wish to survey this culvert during your development, and consider the need for any required works while you're on-site.

Regards

Dominic Henly

Flood Risk Management Team | Planning Services

West Sussex County Council, Ground Floor, Northleigh, County Hall, Chichester PO19 1RH

Phone: 0330 2225676 Mobile: 07354 165932

Email: dominic.henly@westsussex.gov.uk | Web: www.westsussex.gov.uk

Appendix D

Greenfield Runoff Calculation

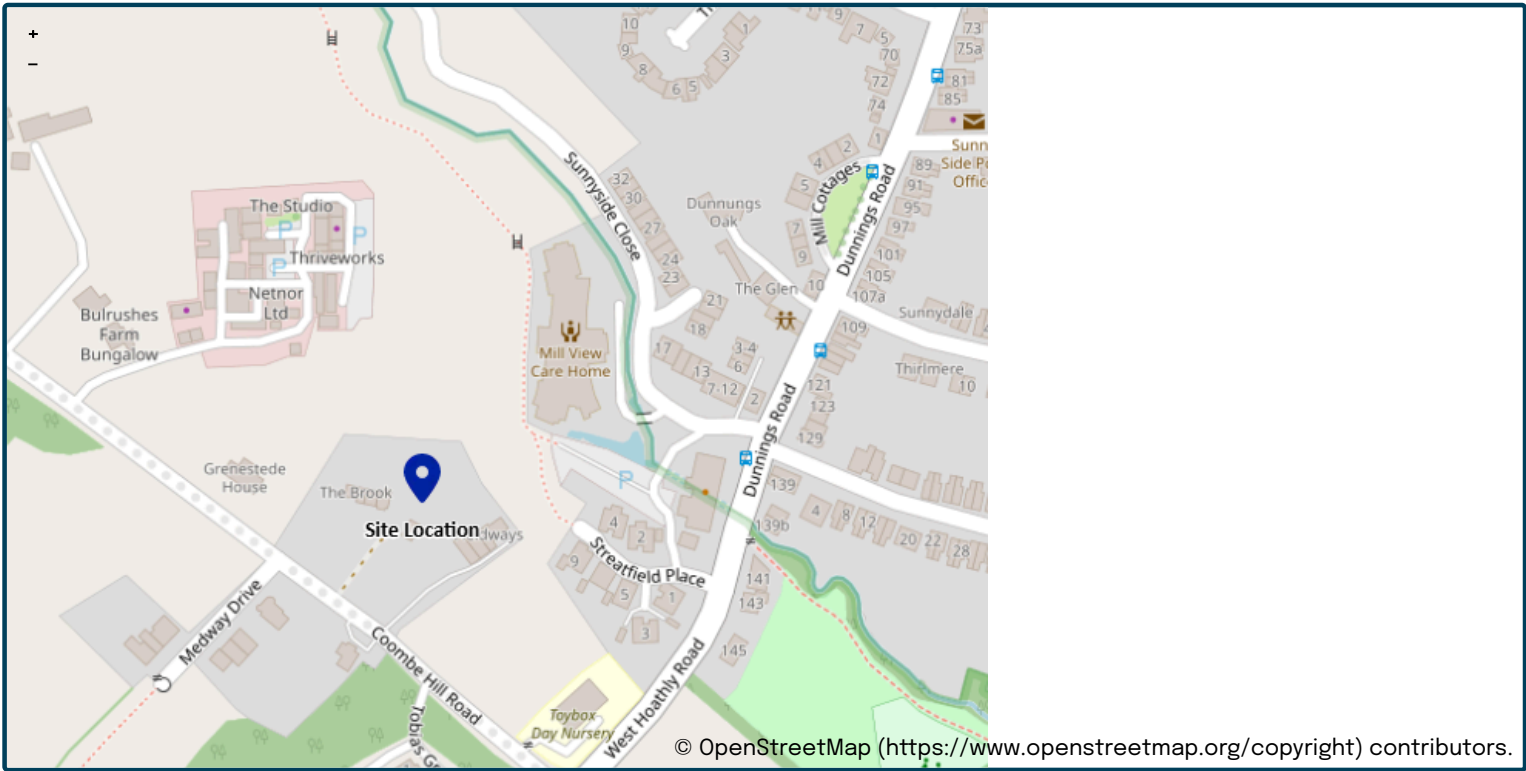
This is an estimation of the greenfield runoff rates that are used to meet normal best practice criteria in line with Environment Agency guidance “Rainfall runoff management for developments”, SC030219 (2013), the SuDS Manual C753 (CIRIA, 2015) and the non-statutory standards for SuDS (Defra, 2015). 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	12/12/2025
Calculated by	CC
Reference	1hweas
Model version	2.2.2

Location

Site name	The Bulrushes
Site location	East Grinstead



Site easting (British National Grid)	539099
Site northing (British National Grid)	136853

Site details

Total site area (ha)	0.0128	ha
----------------------	--------	----

Greenfield runoff

Method

Method	FEH statistical (2025)
--------	-----------------------------------

FEH statistical (2025)

	<u>My value</u>	<u>Map value</u>
SAAR9120 (mm)	868 mm	
BFIHOST19scaled	0.282	
QMed-QBar conversion	1.136	1.136
QMed (l/s)	0.1 l/s	
QBar (FEH statistical 2025) (l/s)	0.1 l/s	

Growth curve factors

	<u>My value</u>	<u>Map value</u>
Hydrological region	7	7
1 year growth factor	0.85	
2 year growth factor	0.88	
10 year growth factor	1.62	
30 year growth factor	2.3	
100 year growth factor	3.19	
200 year growth factor	3.74	

Results

Method	FEH statistical (2025)
Flow rate 1 year (l/s)	0.1 l/s
Flow rate 2 year (l/s)	0.1 l/s
Flow rate 10 years (l/s)	0.2 l/s
Flow rate 30 years (l/s)	0.3 l/s
Flow rate 100 years (l/s)	0.4 l/s
Flow rate 200 years (l/s)	0.4 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 (2.2.2) 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 E

InfoDrainage Quick Storage Estimate

Quick Storage Estimate

Input

Input Type

User Input

Area (ha)

0.013

Volumetric Runoff Coefficient

1.000

Discharge Rate (L/s)

1.0

Infiltration Rate (m/hr)

0.0

Safety Factor

2.0

Quick

Calculate

Create New

From Library

All

FEH 22

...

Method

FEH

Number of Storms

54

Max. Run Time (mins)

2880

Input

Results

2D Graph

OK

Cancel

Help

Quick Storage Estimate

Results

Quick Storage Estimate variables require approximate storage of between 6m³ - 9m³.

These values are estimates only and should not be used for final design purposes.

Input

Results

2D Graph

OK

Cancel

Create New

Help