

LAND OFF DUMERS LANE, RADCLIFFE

FLOOD RISK ASSESSMENT & DRAINAGE STRATEGY



Client: **Westchurch Homes**

Site Address: **Land off Dumers Lane
Radcliffe
M26 2BD**

Project Number: **24344**

Report Reference (Revision): **24344-DCE-XX-XX-T-C-001-P03 Flood Risk Assessment and Drainage Strategy**

Date: **22 November 2024**



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Revision	Date	Author	Checked by;	Comments
P01	25/10/24	Jonathan Allchin	Chris Brady	DRAFT for review
P02	05/11/24	Jonathan Allchin	Chris Brady	Issued to Client
P03	22/11/24	Chris Brady	Chris Brady	Masterplan updated to 87 units

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1.0 INTRODUCTION

- 1.1 Dudleys Consulting Engineers have prepared this Site-specific Flood Risk Assessment (FRA) for a residential development at Bealey Industrial Estate, Dumers Lane, Radcliffe, M26 2BD.
- 1.2 The Assessment investigates the potential flood risk impacts of the proposed development in accordance with the National Planning Policy Framework (NPPF) and supporting Planning Practice Guidance. This FRA is considered proportionate to the degree of flood risk and to the scale, nature, and location of the development.
- 1.3 This Flood Risk Assessment has been carried out generally in accordance with:
 - National Planning Policy Framework (December 2023)
 - Planning Practice Guidance: Flood Risk and Coastal Change (August 2022)
 - BS 8533:2017 “Assessing and managing flood risk in development, Code of Practice”
 - CIRIA Report C753” The SUDS Manual”
 - Environment Agency Report SC030219 Rainfall Runoff Management for Developments
 - Building Regulations Part H
 - Non-statutory technical standards for sustainable drainage systems (March 2015)



2.0 CONSULTATION AND EVIDENCE

- 2.1 The Site is located in Radcliffe. Bury Council are the Lead Local Flood Authority (LLFA) and the Local Planning Authority (LPA). Comments relating to Flood Risk were received as part of pre-Application advice; however, no comments were received regarding the design of proposed drainage systems. Further advice has been sought from the LLFA, but at the time of this Report being issued, a response was still awaited.
- 2.2 United Utilities (UU) are the Local Sewerage Authority. A copy of their adopted sewer records is included in Appendix C. A pre-development enquiry has been sent to United Utilities and their response is included in Appendix G. United Utilities have agreed an unrestricted foul water (FW) discharge to the existing combined sewer in Dumers Lane and a restricted surface water (SW) discharge to the same sewer at a restricted rate of 5 litres/sec.
- 2.3 The Site does not fall within an Internal Drainage Board area.
- 2.4 The Environment Agency (EA) data for the Site has been included within Appendix D for reference purposes. Further advice has been sought from the EA and their response is included in Appendix G.
- 2.5 Planning Policy requires that the Site be developed in accordance with NPPF requirements in terms of flood risk management, climate change allowances and reduced run-off from the development.
- 2.6 SuDS design guidance requires sustainable drainage systems to be provided for the management of the surface water run-off for redeveloped areas.



3.0 EXISTING SITE DESCRIPTION

- 3.1 The Site is located off Dumers Lane and Wild Street, with residential dwellings to the north-east and south-east, and an industrial estate to the south-west. There is open space to the north-west. Part of the Site is a mixture of industrial units, storage compounds and a car wash.
- 3.2 The Site is situated approximately 100m west of the River Irwell and the majority of the Site is shown to be located within Flood Zone 1, with small areas within Flood Zones 2 and 3. The Site is in an area benefitting from flood defences, provided by the Radcliffe and Redvales Flood Alleviation Scheme, which protect the Site from flooding during a 1:100 year (1% AEP - Annual Exceedance Probability) + climate change fluvial flood event, and the 1:1000 year (0.1% AEP) fluvial flood event.
- 3.3 The existing Site topographical survey is provided in Appendix A. The Site generally falls from the north-west to the south-east, with levels between 71.5m AOD and 66.7m AOD. There is a mound to the northern extent of the Site that varies in levels from 70.5m AOD to 74.5m AOD.
- 3.4 The approximate grid reference of the Site is E379783, N408108
- 3.5 The Site extends to an area of approx. 1.94ha, with existing impermeable areas comprising approx. 0.53ha.



Figure 1 - Site Location Plan & Approximate Boundary



4.0 DEVELOPMENT PROPOSALS

- 4.1 The proposed layout for the scheme is shown in Figure 2 below and in Appendix B. The proposed works comprise the demolition of the existing buildings, and the construction of 87 new dwellings, with associated infrastructure.

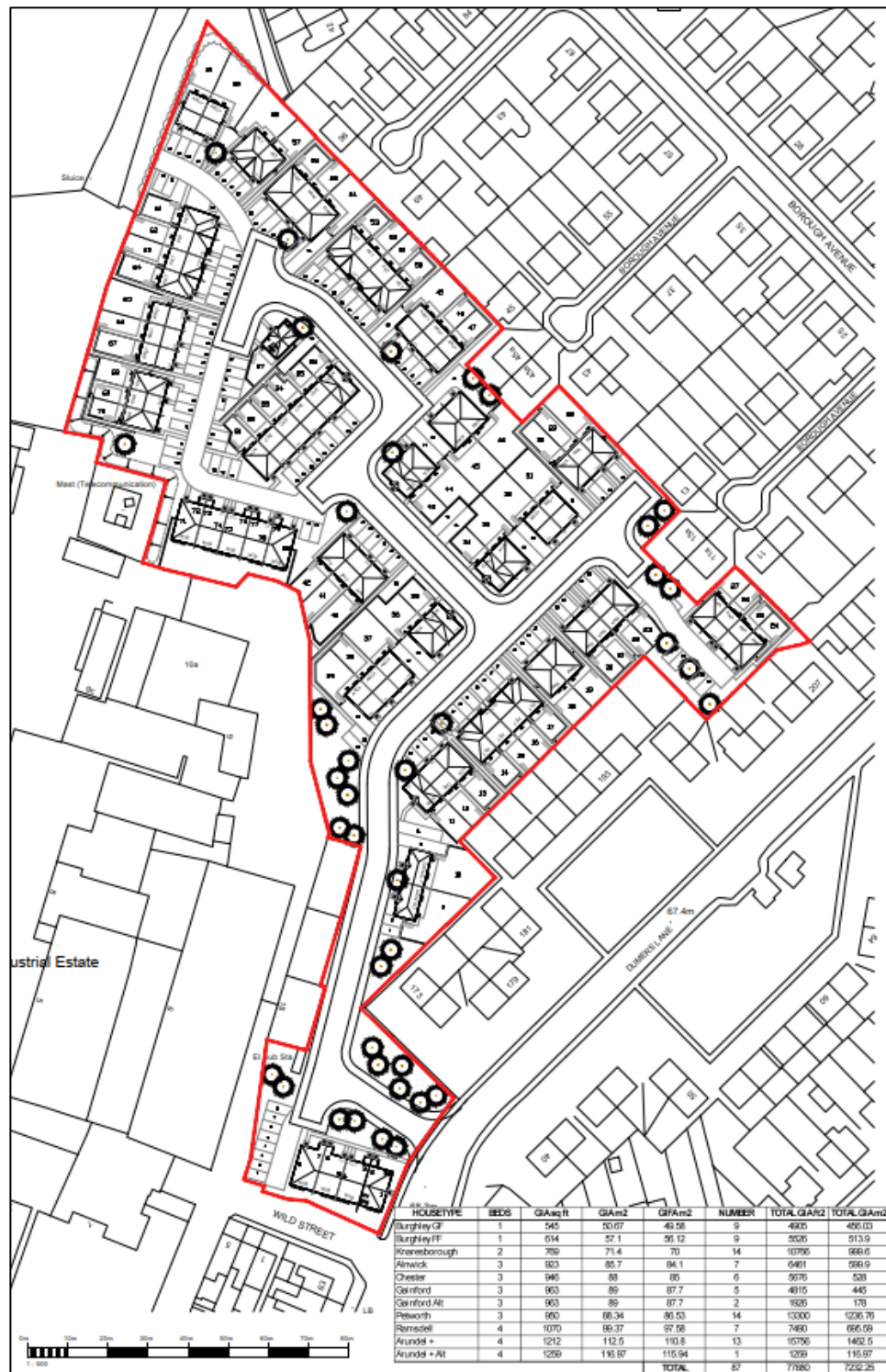


Figure 2 – Proposed Site Plan



5.0 FLOOD ZONE COMPATIBILITY

- 5.1 The Flood Risk Vulnerability Classification has been determined in accordance with Planning Practice Guidance, Flood Risk and Coastal Change. The Flood Risk Vulnerability Classification is “More Vulnerable”. This classification is in accordance with National Planning Policy Framework, Annex 3.
- 5.2 The majority of the Site is shown to be located within Flood Zone 1, however isolated areas are located in Flood Zones 2 and 3 respectively as indicated on the Environment Agency Flood Zone map in Appendix D and in Figure 3 below.

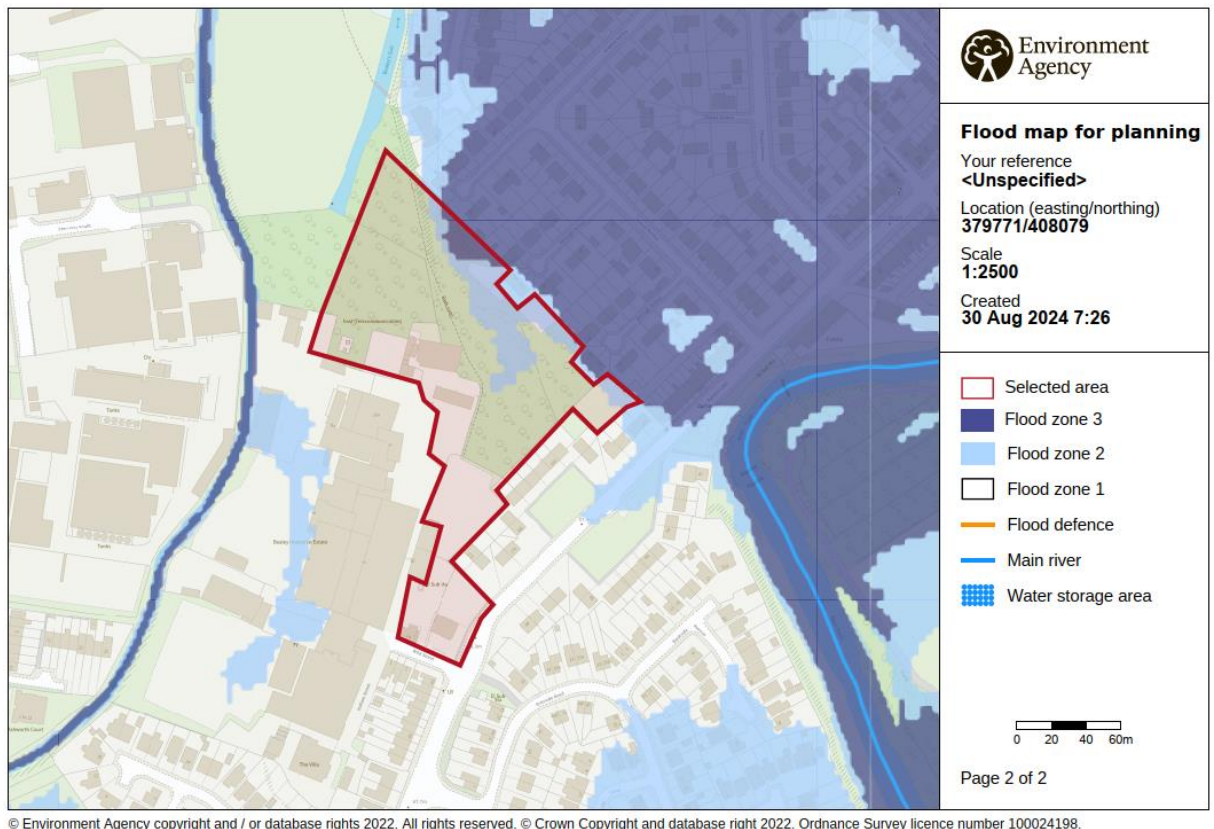


Figure 3 - Flood Map for Planning (EA)

- 5.3 However, when comparing the modelled flood levels provided by the EA, against the topographical survey data, it is evident that the Site is not at risk of flooding during the 1:100 year (1% AEP) or 1:200 year (0.5% AEP) scenarios, but is at risk of flooding in the 1:1000 year (0.1% AEP) event. Consequently, the Site should be classified as lying within Flood Zone 2 and should be assessed as such.
- 5.4 The Flood Zone Compatibility has been reviewed in accordance with Planning Practice Guidance, Flood Risk and Coastal Change, paragraph 078 Table 2. This compatibility is summarised in Table 1 below.



Table 1: Flood Risk Vulnerability Classification (NPPF)

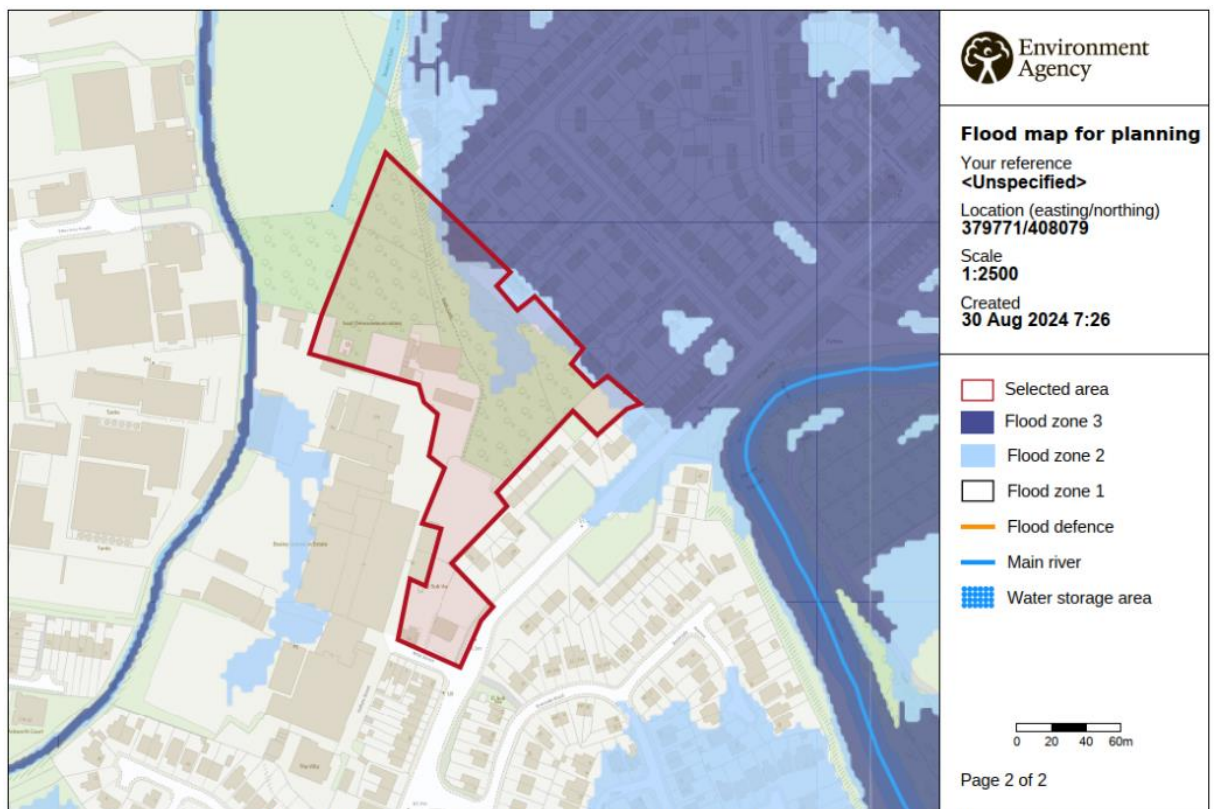
Flood Zones	Flood Risk Vulnerability Classification				
	Essential infrastructure	Highly vulnerable	More vulnerable	Less vulnerable	Water compatible
Zone 1	✓	✓	✓	✓	✓
Zone 2	✓	Exception Test required	✓	✓	✓
Zone 3a †	Exception Test required †	X	Exception Test required	✓	✓
Zone 3b *	Exception Test required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

- 5.5 In Table 1 above, ✓ is permitted and X is not permitted.
- 5.6 As mentioned above, and as demonstrated further in this document, data indicates that the Site should be classified as Flood Zone 2, and hence the development is acceptable without an Exception Test. As the Site is within Flood Zone 2, a Sequential Test may be required for the development, subject to confirmation by the LLFA / LPA.
- 5.7 Advice from the EA has been sought regarding the revision of the flood maps, and a copy of their correspondence is included in Appendix G. The EA are not progressing any updates to flood maps until Spring 2025, due to the new National Flood Risk Assessment (NaFRA2) expected in 2024/25.



6.0 FLUVIAL FLOODING (FLOODING FROM RIVERS AND THE SEA)

- 6.1 Fluvial flooding occurs when high flows exceed the capacity of the river channel and spill out onto the floodplain, usually after a period of prolonged or heavy rainfall.
- 6.2 The Environment Agency Flood Map (rivers and sea) below shows that the majority of the Site is within Flood Zone 1, with isolated parts of the Site within Flood Zones 2 and 3 respectively.
- 6.3 Figure 4 below shows an output from the Environment Agency Fluvial Flood Risk mapping.



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Figure 4 - Fluvial Flooding (EA)



- 6.4 Historical flood mapping received from the Environment Agency shows that a small part of the Site flooded in December 2015.

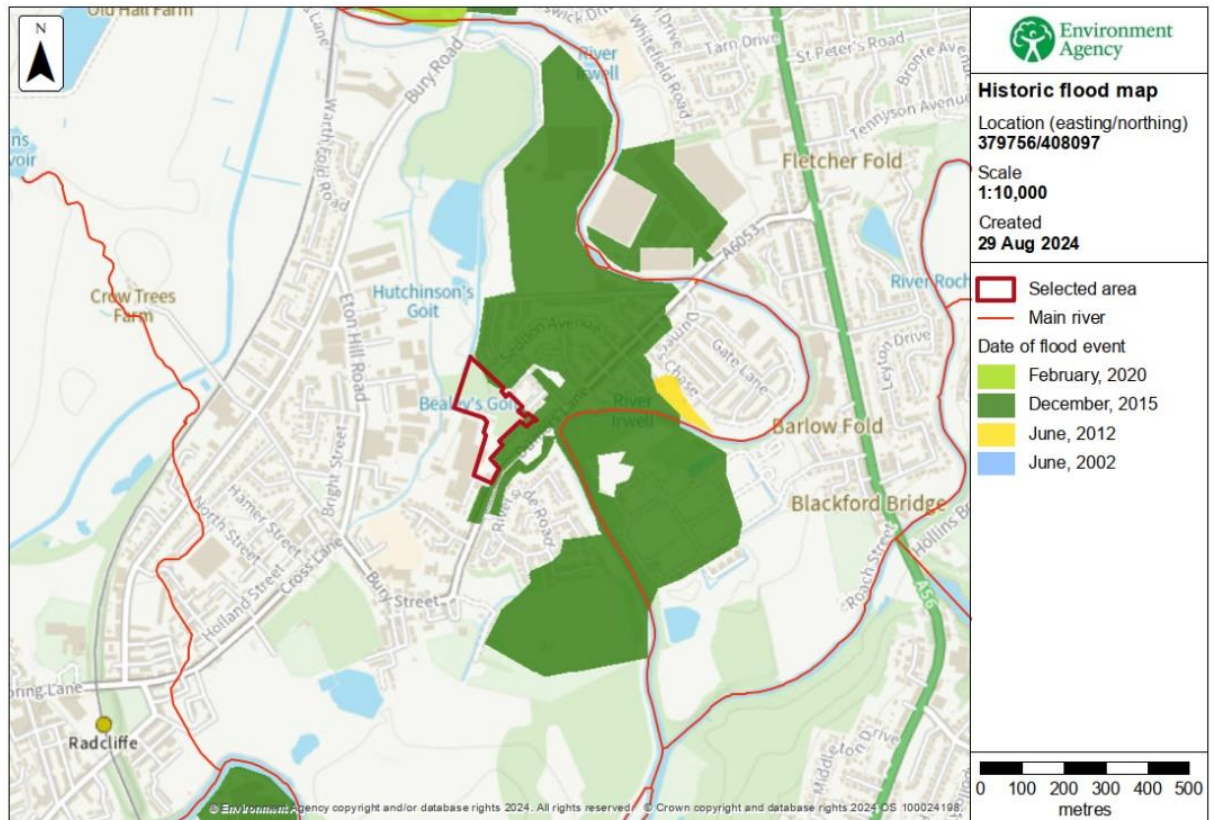


Figure 5 - Historical Flooding (EA)



- 6.5 The EA have provided their 'Product 4 data', attached in Appendix D which shows modelled flood levels along the River Irwell, both with and without flood defences. Node 6 is the closest and most relevant to the Site.

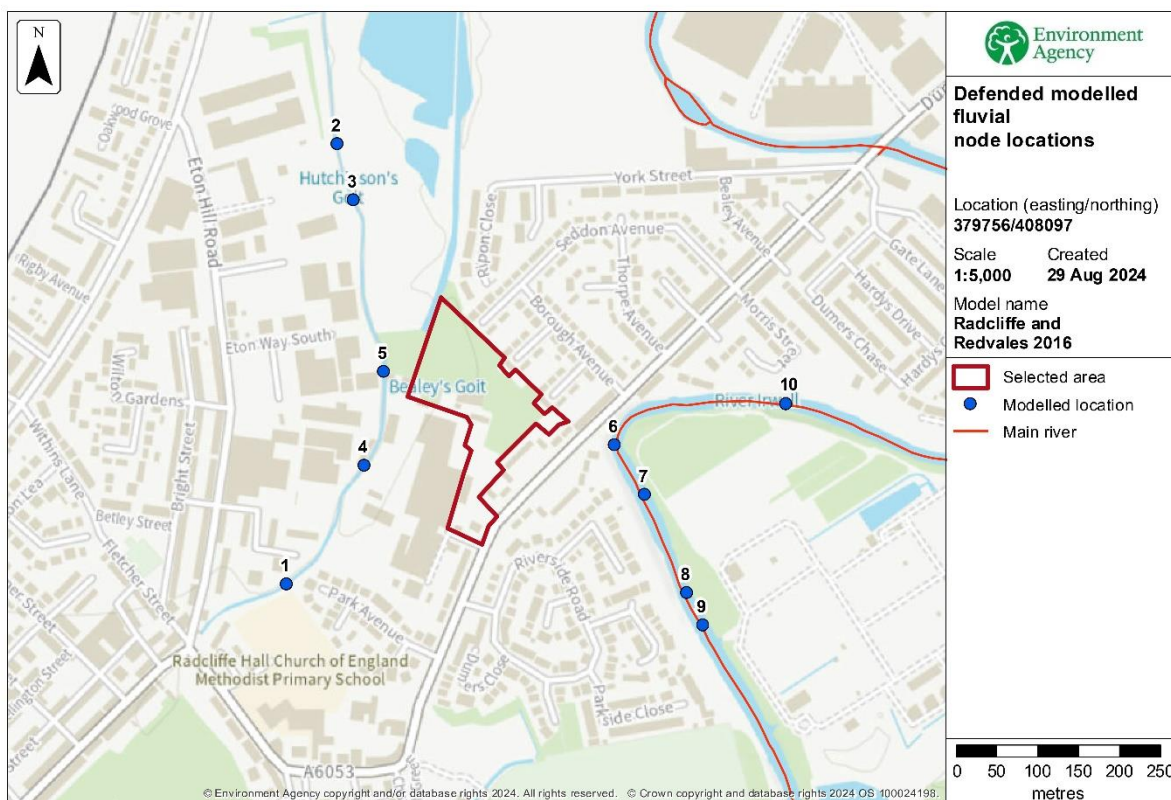


Figure 6 – Modelled Flood Nodes (EA)

- 6.6 Modelled flood levels for Node 6 have been provided by the Environment Agency and are included in Appendix D and summarised below.

Table 2: Modelled Flood Levels at Node 6 (EA)

Flood Event	Climate Change	Flood Height (m AOD) - Defended	Flood Height (m AOD) – Defences Removed
1:20 year (5% AEP)	0%	65.46	65.44
1:50 year (2% AEP)	0%	65.86	65.83
1:75 year (1.33% AEP)	0%	66.06	66.04
1:100 year (1% AEP)	0%	66.23	66.18
1:200 year (0.5% AEP)	0%	66.55	66.47
1:1000 year (0.1% AEP)	0%	67.47	67.45

- 6.7 There are model Nodes indicated along Hutchinson’s Goit (Nodes 1-5 inc. on Figure 6). However, Hutchinson’s Goit is located approximately 50m to the north-west of the Site boundary and is set within higher land than the Site. Data supplied by the EA indicates that Hutchinson’s Goit is not



classified as Main River and that the risk of flooding emanates from the River Irwell and not Hutchinson's Goit, with flood flows retained in the Goit channel during all but the 1:1000 year (0.1% AEP) event, which even then do not pose a risk to the Site itself.

- 6.8 For that reason, the model Nodes 1-5 inc. along Hutchinson's Goit have been excluded from this Assessment.
- 6.9 In line with Planning Practice Guidance for a more vulnerable development, the central peak river flow climate change allowance should be used to assess a site's fluvial flood risk. The Site is within the Irwell Management Catchment, which has an associated climate change allowance of 35% for the 2080s epoch.
- 6.10 As the 1% AEP + 35% climate change data has not been supplied by the EA, the 0.5% AEP will be used as a guide for the estimated flood level. Estimated flood levels for the climate change scenarios have been requested from the EA, however they have confirmed they do not have climate change scenarios for this location.
- 6.11 The topographical survey in Appendix A, shows that the lowest point within the Site boundary has a level of 66.69m AOD (near the south-west corner). As this is above the estimated flood height in both the 0.5% AEP defended and undefended scenario (66.55m AOD and 66.47m AOD respectively), it is evident that no fluvial flooding currently occurs within the Site boundary in the design scenario. Furthermore, only a small part of the Site is lower than the 0.1% AEP modelled flood level of 67.47m AOD in the defended scenario.
- 6.12 The information provided by the EA also includes the crest level of the flood defences along the River Irwell. At the nearest locations, the defences have a crest level between 67.57m AOD and 67.77m AOD. Thus, the Site is protected up to and above the 0.1% AEP modelled flood level by the flood defences.
- 6.13 As demonstrated above, the Site is not at risk of flooding in the 0.5% AEP event, and hence should not be classified as Flood Zone 3. As the Site is at risk of flooding in the 1% AEP, if the flood defences were to fail, parts of the site should be classified as Flood Zone 2, and hence these parts of the Site will need to follow the standing advice for vulnerable developments.
- 6.14 The minimum floor level for the plots in Flood Zone 2 should be set at 600mm above the 1% AEP +35% modelled flood level. In the absence of the climate change model, the 0.5% AEP will be used, and hence the minimum FFL of properties in Flood Zone 2 should be 67.15m AOD.
- 6.15 As there is currently no flooding within the Site boundary, there is no need to provide any flood compensation storage.
- 6.16 On this basis, the risk of flooding from rivers and the sea is considered low.



7.0 PLUVIAL FLOODING (FLOODING FROM SURFACE WATER)

- 7.1 The Environment Agency Flood Map showing Risk of Flooding from Surface Water is shown below. This type of flooding can be difficult to predict, much more so than river or sea flooding as it is hard to forecast exactly where or how much rain will fall in any storm.
- 7.2 Figure 7 below shows that isolated parts of the Site have a low to medium risk of surface water flooding.
- 7.3 This is likely due to the existing topography of the Site. As part of the proposals, the surface water will be directed towards the proposed roads and hardstanding areas and will eventually fall towards Dumers Lane.
- 7.4 Surface water overland flows will be directed away from buildings, with surface water flooding managed within the proposed development, via the implementation of a new surface water drainage system.
- 7.5 On this basis, the risk of flooding from surface water is considered low.

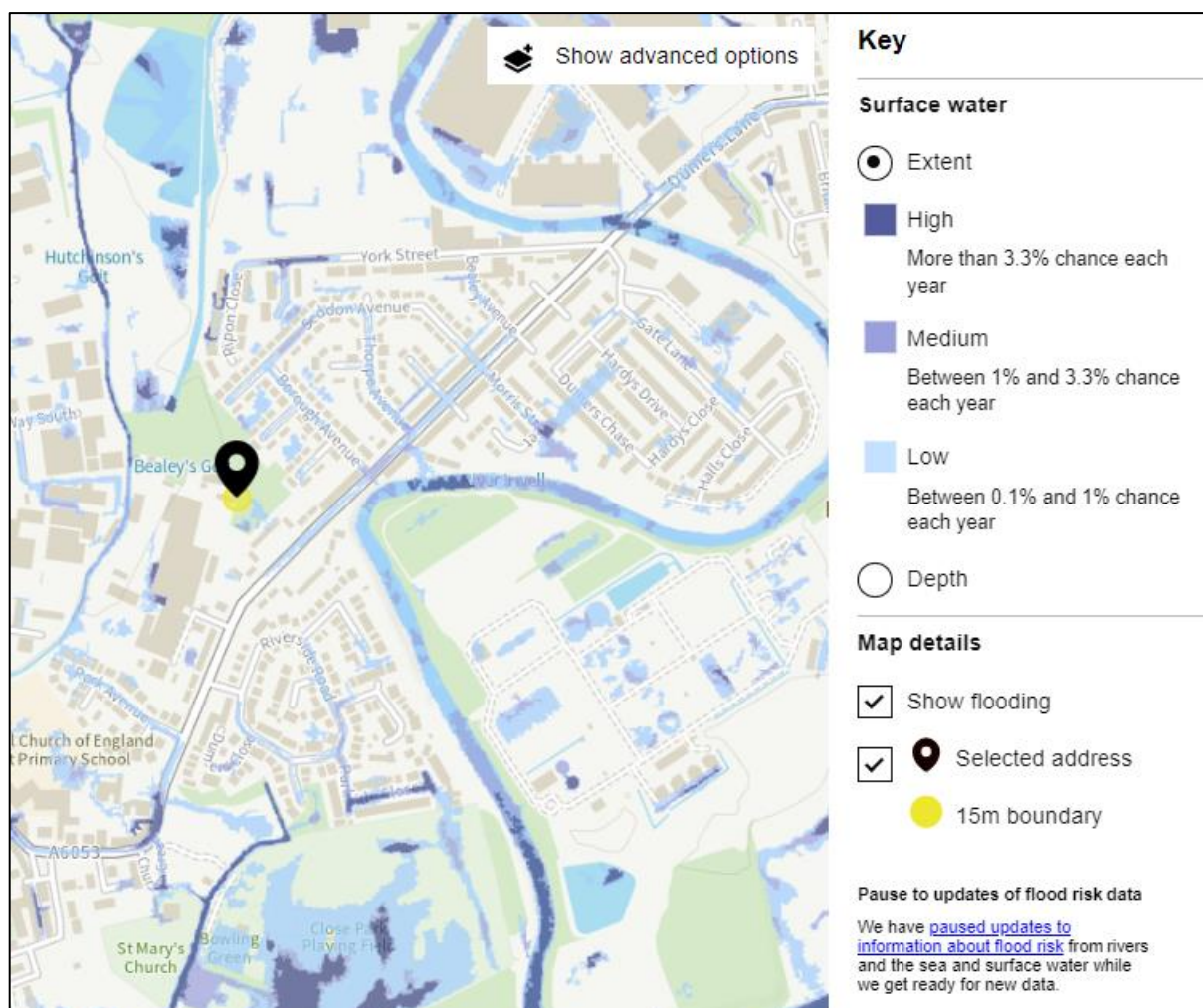


Figure 7 – Pluvial Flooding (EA)



8.0 GROUNDWATER FLOODING

- 8.1 Groundwater flooding occurs when water levels in the ground rise above surface levels this is more likely to occur in low lying areas.
- 8.2 An Infiltration SuDS GeoReport has been produced by the British Geological Survey for the Site, attached at Appendix E, which shows there is a very high likelihood of persistent or seasonably shallow groundwater.
- 8.3 The Site Investigation also encountered groundwater at depths of between 0.6m to 3.0m within exploratory holes.
- 8.4 On this basis it is assumed that the groundwater flooding risk is likely to be medium to high.
- 8.5 In order to mitigate the risk of groundwater flooding, infiltration techniques will not be used on the Site, and levels will grade away from buildings.



9.0 EXISTING INFRASTRUCTURE FLOODING

- 9.1 Flooding caused by the existing infrastructure network occurs when the network is over capacity or there is a blockage or failure in the existing system.
- 9.2 Maps from the United Utilities are shown in Appendix C.
- 9.3 As the Site is set above Dumers Lane, it is assumed that the existing infrastructure flooding risk is likely to be low.



10.0 RESERVOIR AND OTHER ARTIFICIAL SOURCES OF FLOODING

- 10.1 Reservoir flooding is unlikely to happen. There has been no loss of life in the UK from reservoir flooding since 1925 and even with recent events, measures are in place to monitor and protect reservoirs in the event of an unlikely catastrophic event. All large reservoirs must be inspected and supervised by reservoir panel engineers.
- 10.2 As the enforcement authority for the Reservoirs Act 1975 in England, the Environment Agency ensure that reservoirs are inspected regularly, and essential safety work is carried out. These laws are being currently reviewed and it is expected that the requirements for monitoring and maintenance will become more stringent.
- 10.3 However, in the unlikely event that a reservoir dam failed, a large volume of water would escape at once and flooding could happen with little or no warning.
- 10.4 The Environment Agency Map showing Risk of Flooding from Reservoirs is shown below.

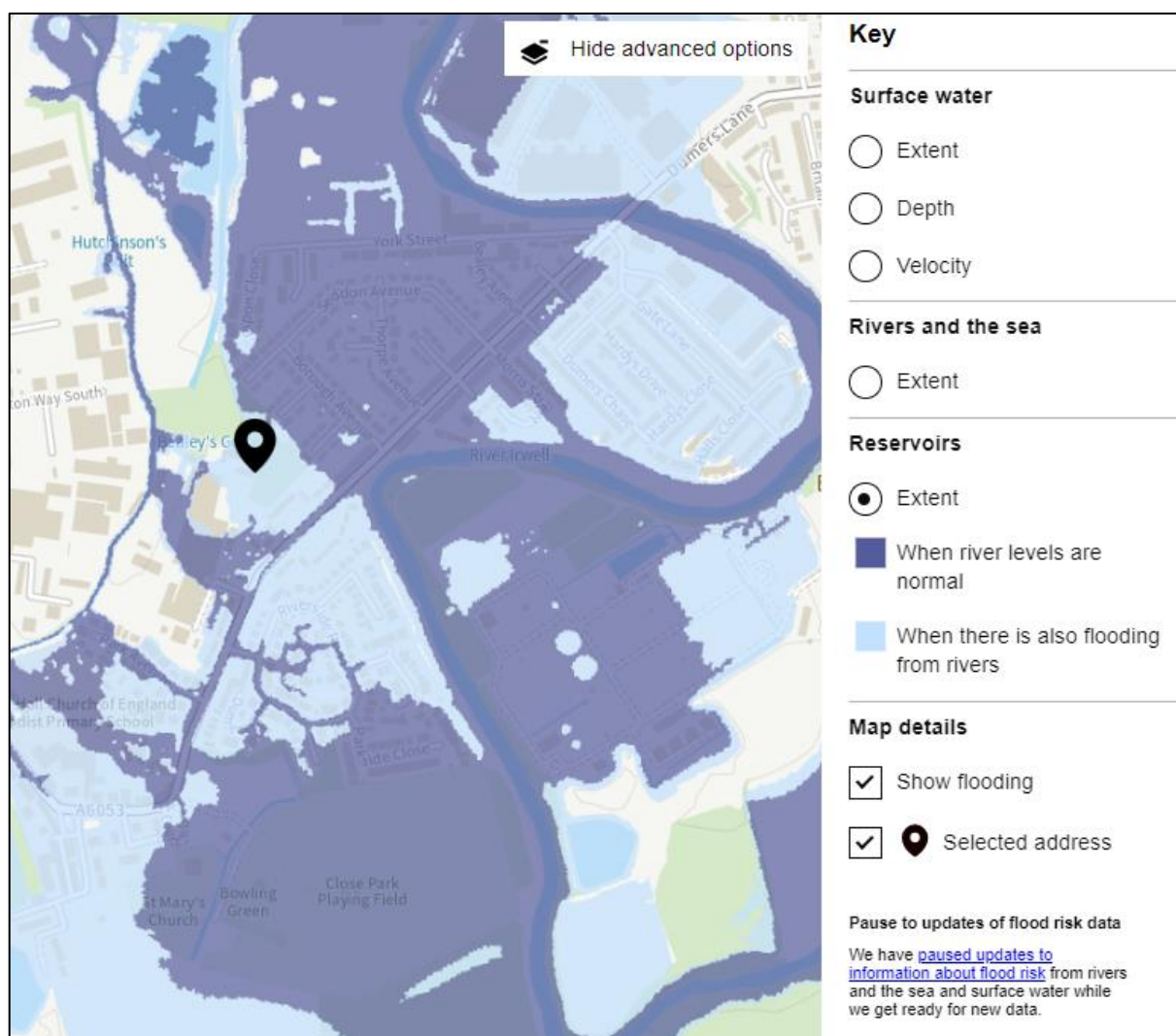


Figure 8 – Reservoir Flooding (EA)



- 10.5 The Site, and the surrounding area, has a risk of flooding while there is otherwise high water levels in the River Irwell.
- 10.6 On this basis, the risk of flooding from reservoirs and other artificial sources is low.
- 10.7 In order to mitigate this risk further, levels will grade away from buildings, with flooding managed within the proposed development.



11.0 FOUL WATER DRAINAGE STRATEGY

- 11.1 The foul water will be collected from the proposed dwellings and will discharge to the existing United Utilities combined sewer in Dumers Lane. The foul water sewers within the new development will be Adopted under a Section 104 Agreement [Water Industry Act 1991].
- 11.2 In accordance with Appendix C of the Sewerage Sector Guidance, the peak design rate will be 0.05 litres/sec. per dwelling, which equates to 4.35 l/sec. for the whole development (87 dwellings).



12.0 SURFACE WATER DRAINAGE STRATEGY

- 12.1 A utilities survey has been undertaken, which shows there are existing drainage facilities within the Site boundary. However, as the existing facilities are not being re-used within the proposed design, the surface water design will treat the site as greenfield.
- 12.2 In line with the Building Regulations, Planning Policy and the SuDS Manual, the hierarchy for surface water disposal has been followed in the design process.
- 12.3 The use of infiltration techniques was initially considered, however due to the risk of groundwater flooding, and the potential for contamination given the Site's previous usage, infiltration is considered unfeasible for the development. This is confirmed in the Infiltration SuDS GeoReport included in Appendix E. Infiltration has therefore been discounted.
- 12.4 Discharge to a watercourse was then considered. The River Irwell is approximately 100m to the east of the Site, and there is a significant amount of infrastructure outside of the control of the Applicant between the Site and the River which would prevent a direct connection. This option has therefore been discounted.
- 12.5 Bealey Goit is situated towards the north-west of the Site boundary, however this flows from north to south, and hence terminates at this location close to the Site boundary. It is understood that the Goit was previously culverted under the Site, however we believe this is no longer present or functional, and hence this is not a feasible discharge option and has been discounted.
- 12.6 Hutchinson's Goit is located approximately 50m to the north-west of the Site boundary. However, as this is set higher than the Site, the drainage design would require a pumping station to pump the surface water to the Goit, which is not preferable. Also, as there is no existing discharge from the Site to the Goit, either via a direct connection, or via greenfield runoff, it is unclear what effect a new discharge would have on the performance of the Goit. Hence, this is not seen as a feasible discharge option and has been discounted.
- 12.7 Discharge to a surface water sewer was then considered, and there are United Utilities surface water sewers present to the north-east of the Site boundary, in Seddon Avenue and Borough Avenue. However, as these are small diameter sewers, it is anticipated that they will not have the required capacity to accommodate additional surface water discharge. Access to these sewers would also require crossing private land outside of the control of the Applicant. This option has therefore been discounted.
- 12.8 Hence, the proposed surface water discharge point is the existing Combined sewer in Dumers Lane, near the Site entrance. This has been accepted and agreed with United Utilities.
- 12.9 The application of the SuDS hierarchy has been discussed with United Utilities and they have agreed with the assessment made of each possible option and the proposed discharge of surface water runoff into the existing Combined sewer in Dumers Lane.
- 12.10 The following table shows the greenfield runoff rates for the site, taken from the UK SuDS website.



Table 3: Greenfield Runoff Rates

Scenario	Rate (l/s)
QBAR	14.9
1 in 1 year	13.0
1 in 2 year*	13.9*
1 in 30 year	25.4
1 in 100 year	31.0
1 in 200 year	35.4

*1 in 2 year rate calculated using Causeway Flow software

- 12.11 United Utilities have confirmed that they will accept a surface water discharge rate of 5 l/sec. to the existing Combined sewer, see Appendix G. Hence, the SW discharge rate from the Site will be restricted to 5 l/sec. using a flow control device.
- 12.12 The proposed impermeable area of the Site is 1.08 ha, which includes a 10% allowance for future urban creep within the private impermeable areas. In order to contain the 1 in 100 year + 45% climate change rainfall scenario within the Site, approx. 817m³ of storage volume is required to accommodate attenuated flows. The 45% climate change allowance is the Irwell Management Catchment peak rainfall upper end allowance for the 2070s epoch.
- 12.13 It is proposed to provide the attenuation in the form of box culverts within the proposed roads. It is proposed to use 2.1m wide x 1.8m deep box culverts, with one section of 2.1m wide x 2.1m deep box culvert. It is also proposed to have short lengths of 600mm diameter pipes to connect the box culverts to manholes throughout the development.
- 12.14 The hydraulic calculations in Appendix E demonstrate there is no surcharge of the drainage system in the 1 in 2 year storm event, other than in the flow control manhole, and no surface water flooding in the 1 in 30 year +40% climate change rainfall scenario nor in the 1 in 100 year + 45% climate change rainfall scenario, in line with local and national policies.
- 12.15 Furthermore, the hydraulic calculations show the discharge rates are restricted to 5 l/sec., in all the modelled scenarios. Therefore, the design adheres to the Non-Statutory Technical Standards for Sustainable Drainage Systems.
- 12.16 Permeable paving will be used in private driveways and shared drives to provide water treatment. The use of permeable paving also contributes to Interception, as per Chapter 24 of the SuDS Manual.
- 12.17 Under Chapter 26 of the SuDS Manual, the runoff from the proposed roofs would be classified as a very low risk and would not require any mitigation measures. The runoff from the driveways and cul-de-sac roads would be classed as a low risk and hence the Simple Index Approach should be used for assessing the level of water treatment required.
- 12.18 The following table shows the pollution hazard indices and mitigation indices for the Site.



Table 4: Simple Index Approach

Existing Pollution Risk				
	Hazard Level	TSS	Metals	Hydrocarbons
Driveways, low traffic roads, cul-de-sacs	<i>Low</i>	<i>0.5</i>	<i>0.4</i>	<i>0.4</i>
Proposed Pollution Mitigation				
Permeable Paving	X 1.0	0.7	0.6	0.7
<i>Mitigation Index Achieved</i>		<i>0.7</i>	<i>0.6</i>	<i>0.7</i>
<i>Mitigation Index Required</i>		<i>0.5</i>	<i>0.4</i>	<i>0.4</i>
		OK	OK	OK

12.19 The table shows the proposed level of water treatment is suitable for the proposed development.

12.20 A drainage strategy drawing has been produced on the above basis and can be found in Appendix E.



13.0 FLOOD RISK MITIGATION MEASURES

- 13.1 The proposed development is Flood Zone 2 and the Site is at risk of flooding from fluvial flooding, pluvial flooding, reservoir flooding and groundwater flooding.
- 13.2 The FFL's for dwellings within Flood Zone 2 should be set at or above 67.15m AOD.
- 13.3 In order to mitigate this risk of reservoir and groundwater flooding, levels will grade away from buildings, with flooding managed within the proposed development, and no infiltration techniques will be used on the Site.



14.0 MAINTENANCE OF DRAINAGE SYSTEMS

- 14.1 The system has been designed so that the drainage system is fully accessible and maintainable with flooding easily visible if it occurs. The maintenance schedule for the individual elements of the scheme is as per manufacturer's recommendations and as follows.

Pipe Network	
Operation	Frequency
Inspect and identify any areas that are not operating correctly, if required, take remedial actions.	Monthly for 3 months as a part of normal post completion monitoring, then biannually. If flooding is identified, take immediate action.
Debris removal from manholes (where may cause risk performance)	As required, but at least twice a year
Where rainfall into network from above, check surface or filter for blockage or silt, algae or other matter by jetting	As required, but at least twice a year
Remove sediment from pipework by jetting.	Annually or as required
Inspect/check all inlets, outlets, and overflow pipes to ensure that they are in good condition and operating as designed	Annually, or as required and after large storms

Flow Control	
Operation	Frequency
Inspect and identify any areas that are not operating correctly, if required, take remedial actions.	Monthly for 3 months as a part of normal post completion monitoring, then biannually
Debris removal from manholes (where may cause risk performance)	Monthly
Where rainfall into network from above, check surface or filter for blockage or silt, algae or other matter by jetting	As required, but at least twice a year
Remove sediment from pipework by jetting.	Annually or as required
Repair/check all inlets, outlets and overflow pipes	As required
Inspect/check all inlets, outlets, and overflow pipes to ensure that they are in good condition and operating as designed	Annually and after large storms

Permeable / Porous Paving	
Operation	Frequency
Brushing and Vacuuming (standard cosmetic sweep over whole surface)	Once a year, after autumn leaf fall, or reduced frequency as required, based on site-specific observations of clogging or manufacturers recommendations.
Removal of weeds or management using glyphosate applied directly into the weeds by an applicator rather than spraying	As required – once per year on less frequently used pavements



Permeable / Porous Paving	
Operation	Frequency
Remedial work to any depressions or cracks in the tarmac / block paviers considered detrimental to the structural performance or a hazard to users and replace lost jointing material.	As required.
Rehabilitation of surface and upper substructure by remedial sweeping	As required
Inspect for evidence of poor operation	Three-monthly, 48 hours after large storms in first six months
Inspect filter media and establish appropriate replacement frequencies	Six monthly or as required by the Manufacturer.
Inspect sediment accumulation rates and establish appropriate removal frequencies.	Monthly for first half year of operation, then every six months, or as required by the Manufacturer.
Note – All Permeable / Porous Paving should be maintained and monitored under a Service Plan which is compatible with the Manufacturer's warranty.	

- 14.2 The maintenance of the drainage network and SuDS features are to be linked with the wider Site maintenance.
- 14.3 A log of all maintenance activities is to be kept and made available to the Local Planning Authority and / or the Lead Local Flood Authority on request.



15.0 CONCLUSIONS & RECOMMENDATIONS

- 15.1 The majority of the Site is in Flood Zone 1 with some areas within Flood Zones 2 and 3 respectively. However, the information received from the EA demonstrate the Site should be classified as Flood Zone 2.
- 15.2 The Site is protected against flooding up to the 1:1000 year (0.1% AEP) fluvial flood event by virtue of existing flood defences along the River Irwell.
- 15.3 The Site is at risk from fluvial flooding, pluvial flooding, reservoir flooding and groundwater flooding. To mitigate these risks, the finished floor levels of dwellings will be set at least 600mm above the modelled flood level. Finished floor levels will be set above surrounding ground levels, and levels will grade away from entrances to ensure that localised flood risk is managed.
- 15.4 The FFL's for dwellings within Flood Zone 2 should be set at or above 67.15m AOD.
- 15.5 The surface water drainage system has been designed in accordance with planning policy, building regulations, and industry guidance and will discharge to the existing United Utilities Combined sewer in Dumers Lane, at the restricted SW run-off rate of 5 l/sec. via a flow control device.
- 15.6 The foul water drainage system has been designed in accordance with planning policy, building regulations, and industry guidance and will connect to the existing United Utilities Combined sewer in Dumers Lane.
- 15.7 The proposed development is wholly suitable for the proposed Site on the basis of National and Local Planning Policy and will not have any implications on neighbouring properties in terms of flood risk.



APPENDIX A – EXISTING SITE INFORMATION



COORDINATED STATIONS			
STATION	EASTING	NORTHING	LEVEL (m)
A	379779.276	407965.286	68.395
B	379762.094	407904.536	68.248
C	379717.099	407943.741	68.893

ABBREVIATIONS

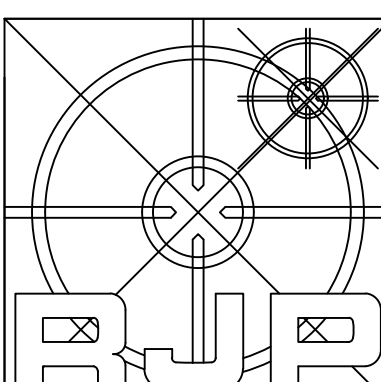
AV	AIR VALVE/VENT	IC	INSPECT CHAMBER
BOL	BOLLARD	IL	INVERT LEVEL
BB	BELISHA BEACON	JKW	JAPANESE KNOTT WEED
BM	BENCH MARK	LH	LAMP HOLE
BL	BED LEVEL	LP	LAMP POST
BS	BUS STOP	NP	NAME PLATE
BT	BRITISH TELECOM	MH	MANHOLE
CL	COVER LEVEL	PS	POST/SIGN POST
DI	DIAPHRAGM	PB	POST BOX
Dis	DISUSED	PX	UNKNOWN SERVICE
EL	EAVES LEVEL	RE	RODDING EYE
ELE	ELEC JUNCT. BOX	RL	RIDGE LEVEL
EP	ELECTRICITY POLE	RS	ROAD SIGN
FH	FIRE HYDRANT	ST	STOP TAP
FL	FLOOR LEVEL	TH	TRIAL HOLE
FOS	FULL OF SEDIMENT	TL	TRAFFIC LIGHT
FP	FLAG POLE	TP	TELEGRAPH POLE
G	GULLY	TV	CABLE TV BOX
GM	GAS METER	UH	UNABLE TO LIFT
GV	GAS VALVE	WM	WATER METER

SYMBOLS

	SURVEY STATION		TREE
	O/H ELEC CABLE		BENCH MARK
	O/H PHONE LINE		TRIAL PIT
	CANOPY/HEDGE		BOREHOLE

NOTES

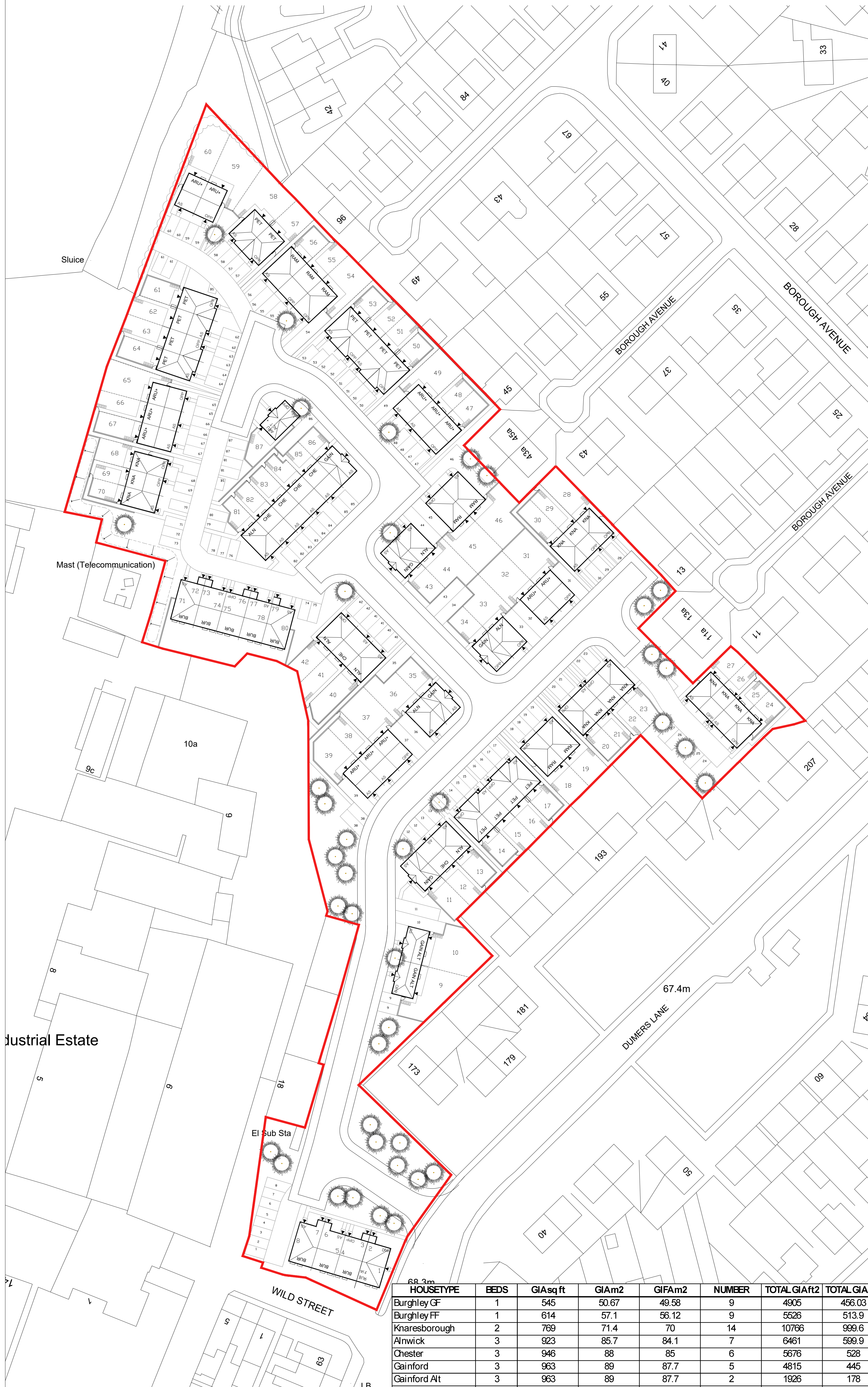
- A) ONLY MANHOLES AND SERVICES VISIBLE AT TIME OF SURVEY SHOWN
- B) O/S USED AND ORIENTATED TO TRUE NORTH
- C) LEVELS IN METRES RELATED TO G.P.S.
- D) DRAINAGE INFORMATION TAKEN FROM LOCAL AUTHORITY RECORDS. INFORMATION MUST BE CHECKED PRIOR TO WORK COMMENCING

Rev	Description	Date
PROPOSED DEVELOPMENT AT DUMMERS LANE, RADCLIFFE		
WESTCHURCH HOMES		
TOPOGRAPHICAL SURVEY		
WH062/T00	Surveyed	IG/SP
	Drawn	SF/IG
	Date	JANUARY 2024
	Scale	1:500 @ A1
 RJP Surveying Consultants Ltd LAND SURVEYORS & SITE ENGINEERS AYREFIELD COTTAGE AYREFIELD ROAD ROBY MILL UPHOLLAND LANCASHIRE WN8 0QP TEL: 01257 251554 MOBILE: 07710 308709 WEBSITE : www.rjpsurveyors.co.uk E-MAIL: mail@rjpsurveyors.co.uk		



APPENDIX B – PROPOSED SITE LAYOUT

general notes:
do not scale the drawing.
all dimensions to be checked on site prior to commencement of work and any discrepancy shall be immediately reported and resolved prior to work commencing.
this drawing is to be read in conjunction with all relevant drawings and specifications relating to the job whether or not indicated on the drawing.
copyright reserved to mck associates ltd. and this drawing may not be used or reproduced without prior written consent.



HOUSETYPE	BEDS	GLAsq ft	GLAm2	GIFAm2	NUMBER	TOTAL GLAft2	TOTAL GLAm2
Burghley GF	1	545	50.67	49.58	9	4905	456.03
Burghley FF	1	614	57.1	56.12	9	5526	513.9
Knaresborough	2	769	71.4	70	14	10766	999.6
Alnwick	3	923	85.7	84.1	7	6461	599.9
Chester	3	946	88	85	6	5676	528
Gainford	3	963	89	87.7	5	4815	445
Gainford Alt	3	963	89	87.7	2	1926	178
Petworth	3	950	88.34	86.53	14	13300	1236.76
Ramsdell	4	1070	99.37	97.58	7	7490	695.59
Arundel +	4	1212	112.5	110.8	13	15756	1462.5
Arundel + Alt	4	1259	116.97	115.94	1	1259	116.97
				TOTAL	87	77880	7232.25

C	21.10.24	KLW	Plots around the acoustic bund reconfigured.
B	03.10.24	KLW	Plots 61-79 adjusted and private drive amended to allow for acoustic bund.
A	13.09.24	KLW	Access road relocated and plots 1-8 adjusted to suit.
Rev.	Date	By	Description



Project:
BEALEY IND EST
RADCLIFFE

Drawing Title:
PROPOSED SITE LAYOUT

Drawn: KW	Checked:	Scale: 1:500	Date: AUG 2024
Job No: 1025		Drawing No: SL01	Rev: C



APPENDIX C – UNITED UTILITIES RECORDS



The position of the underground apparatus shown on this plan is approximate only and is given in accordance with the best information currently available. United Utilities Water will not accept liability for any loss or damage caused by the actual position being different from those shown.

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Reho	Cover	Func	Invert	Size x	Size y	Shape	Matl	Length	Grad
8903	66.88	SW	65.27	150		VC	60.02897	12.04159	1 in 85
9123	67.23	CO	64.93	225		VC	68.0215	1 in 85	
9705		SW		300		VC	56.76744	1 in	
9203		SW	0	225		VC	37.348484	1 in	
7305		SW		100		VC	8.164212	1 in	
8801		SW		300		VC	36.1914	1 in 185	
8001	67.52	CO	64.54	300		CI	62.93648	1 in 185	
4707		CO		100		VC	10.345	1 in	
5908		CO		100		VC	24.23728	1 in	
9109	66.01	CO	63.91	300		VC	22.2978	1 in	
7701		SW		225		VC	61.49604	1 in	
7203		SW		150		VC	46.00741	1 in	
4201	72.27	SW	68.92	525		VC	55.0117	1 in	
7807		SW		225		VC	10.76265	1 in	
7708		FO		150		VC	70.31628	1 in	
9102	66.04	CO	63.49	300		VC	36.117	1 in	
8902		SW		300		VC	38.49652	1 in	
9806		FO		150		VC	6.848015	1 in 17	
9504		CO		100		VC	55.6903	1 in	
5108	70.96	SW	69.84	150		VC	30.74518	1 in	
4904		CO		375		VC	5.152274	1 in	
8002	66.83	CO	64.2	300		CI	43.41658	1 in	
9108	66.08	CO	64.03	300		VC	65.46204	1 in 86	
9111	65.97	CO	0	300		CI	10.31462	1 in	
8801		SW		225		VC	2.828427	1 in	
8704		SW		375		VC	23.83216	1 in	
5906		CO		100		VC	25.00706	1 in	
9104	65.99	CO	62.52	600		PE	4.830745	1 in 120	
9103	66.02	SW		450		VC	4.830745	1 in	
8104		SW		150		VC	56.59854	1 in	
9305	67.42	SW	68.87	225		VC	70.11419	1 in 106	
7319		SW		100		VC	24.88753	1 in	
5907		CO		100		VC	30.08146	1 in	
7801	66.69	CO	65.15	500		CI	15.3275	1 in 168	
9204		CO		100		VC	19.12568	1 in 71	
4910		CO		150		VC	19.89972	1 in	
8003	67.38	CO	66.23	225		VC	33.37664	1 in 371	
7703		SW		150		VC	56.89227	1 in 282	
8705		FO		300		VC	69.90462	1 in 291	
9105	65.96	CO	0	300		VC	29.80267	1 in	
4106	71.73	CO	66.31	525		VC	9.912245	1 in	
9116	66.22	SW	64.52	300		VC	28.68915	1 in	
9802		FO		450		VC	25.23354	1 in 83	
4202	72.3	CO	68.31	300		VC	14.69957	1 in 83	
8103		CO		150		VC	9.637654	1 in	
7800	68.24	CO	64.8	300		VC	63.4339	1 in 703	
8805	67.71	CO	65.08	300		VC	11.31371	1 in	
4709		CO		150		VC	37.49363	1 in 83	
9106		FO		150		VC	18.56365	1 in	
8905		FO		150		VC	29.97427	1 in 28	
9131	66.51	SW	64.21	600		CO	22.03945	1 in	
7805	68.11	CO	64.63	300		VC	15.70201	1 in	
9120	66.75	SW	67.34	150		VC	23.75028	1 in	
7903	68.67	CO	65.36	300		VC	14.53217	1 in	
9708		FO		150		VC	32.60244	1 in 109	
8703		FO		150		VC	64.68831	1 in	
9110	65.03	CO	63.32	600		VC	18.24829	1 in 261	
9127	66.08	SW	64.24	300		VC	46.64441	1 in	
9701		SW		150		VC	7.165773	1 in 85	
9124		CO		300		VC	0.8022244	1 in	
4703	68.44	CO	66.9	225		VC	23.5372	1 in 101	
7804		FO		150		VC	15.41381	1 in	
5105	71.04	SW	70.01	225		VC	60.10204	1 in	
7706		FO		150		VC	13.36202	1 in	
7705		FO		150		VC	18.3782	1 in	
0303		CO		300		VC	12.43443	1 in	
7309		FO		100		VC	31.86964	1 in	
7806		SW		150		VC	3.32972	1 in	
8802		SW		450		VC	10.87561	1 in	
9202	66.44	SW	65.35	150		VC	27.73739	1 in	
4000	71.63	CO	68.13	500		VC	6.543769	1 in	
8308	67.28	SW	66.53	150		PE	42.34625	1 in 151	
9201	66.68	SW	65.2	225		VC	53.49495	1 in	
4901		CO		375		VC	9.219544	1 in 40	
7202		SW		225		VC	46.65154	1 in	
9702		SW		150		VC	17.94659	1 in	
7811		SW		150		VC	24.71986	1 in	
9805		SW		375		VC	10.04569	1 in 136	
4107	71.82	CO	69.31	150		VC	42.89616	1 in 153	
9703		SW		100		VC	28.97881	1 in	
8201	67.31	SW	65.37	225		VC	9.61215	1 in	
8806		FO		150		VC	11.18034	1 in	
4100	71.2	CO	69.96	150		VC	24.6999	1 in	
4900	70.42	CO	68.34	300		VC	33.87381	1 in	
7801	68.14	CO	64.74	450		VC	38.10489	1 in	
7814		SW		100		VC	4.68304	1 in	
7252	68.38	SW	67.09	300		VC	56.60067	1 in 120	
7902		CO		300		VC	20.66119	1 in	
4105	71.57	CO	0	525		VC	19.79889	1 in 180	
7902	68.91	CO	65.75	300		VC	5.1017	1 in 101	
4710		CO		150		VC	23.76973	1 in	
7702		SW		300		VC	18.75156	1 in	
9716		FO		100		VC	35.36016	1 in	
7812		CO		100		VC	21.1914	1 in	
7704		SW		150		VC	12.80225	1 in 56	
8701		SW		375		VC	51.38784	1 in	
9205		CO		100		VC	24.69916	1 in 130	
9715		FO		100		VC	32.34291	1 in	
8702		SW		150		VC	28.39427	1 in 283	
9104	71.02	SW	69.94	150		VC	45.9059	1 in	
9902		CO		150		VC	5.45842	1 in 148	
4712	67.17	SW	65.8	225		VC	62.24147	1 in	
8203	67.13	SW	65.8	225		VC	61.61169	1 in	
4701	68.3	CO	65.52	300		VC	34.56568	1 in 344	
7252	68.12	SW	66.9	300		VC	65.09913	1 in 99	
7801	67.67	CO	66.87	225		ST	28.79993	1 in 28	
7700	66.96	CO	66.21	300		VC	42.71462	1 in	
5901		SW		300		VC	31.3476	1 in	
0701		SW		450		VC	62.84639	1 in	
9803		SW		300		VC	22.53841	1 in	
8707		FO		150		VC	38.47318	1 in	
8804		FO		150		VC	19.10497	1 in 637	
4002	71.89	CO	68.16	610		BR	16.64208	1 in	
4006		SW		150		VC	7.551756	1 in 95	
9129		CO		100		VC	13.23714	1 in	
9101	66.12	CO	63.77	300		VC	15.39423	1 in 382	
8200		SW		150		VC	11.77602	1 in 54	
7251	68.24	SW	66.99	300		VC	9.782507	1 in 382	
9117	65.95	SW	63.45	225		VC	17.41323	1 in	
9706		FO		100		VC	37.45393	1 in 76	
9717		FO		100		VC	49.87694	1 in	
7800	68.35	CO	65.33	450		VC	56.10135	1 in	
8801		SW		400		VC	55.51971	1 in	
7906	68.13	CO	67.53	225		ST	56.10135	1 in	
9804		FO		150		VC	60.89369	1 in	
9304		CO		300		VC	8.49031	1 in	
7707		FO		150		VC	26.24881	1 in	
4009		CO		225		VC	14.15358	1 in	
9153	65.91	SW	0	225		VC	15.29111	1 in	
7709		FO		150		VC	44.04543	1 in 629	
8355	67.68	SW	66.53	300		VC	29.45284	1 in	
8703		SW		375		VC	2.828427	1 in	
9118	66.61	SW	65.4	150		VC	6.841191	1 in	
7813		CO		100		VC	10.11952	1 in	
9711		FO		150		VC	23.02353	1 in	
5103	71.01	CO	69.44	100		VC	39.62323	1 in 117	
4108	71.78	SW	70.5	150		VC	12.04159	1 in	
5700		SW		300		VC	60.46687	1 in	
9209		CO		150		VC	8.39678	1 in	
9152	65.89	SW	62.63	600		CO	64.65112	1 in	
8215		CO		150		VC	20.16765	1 in 382	
5201	71.72	CO	69.51	300		VC	17.77692	1 in 54	
8803		FO		100		VC	12.27864	1 in	
7817		FO		150		VC	18.79968	1 in	
8812		FO		100		VC	33.45248	1 in	
8208		CO		150		VC	30.28862	1 in	
7703		FO		150		VC	30.80253	1 in	
9721		FO		100		VC	11.8068	1 in	
7816		SW		225		VC	14.86966	1 in	
9001	66.31	SW	63.04	150		VC	20.76857	1 in	
8208		CO		150		VC	67.70148	1 in	
4205		CO		150		VC	21.57571	1 in	
7204		SW		150		VC	6.28387	1 in	
8805		CO		100		VC	120.2862	1 in	
8811		FO		100		VC	12.12763	1 in	
5102	71.04	SW	69.84	300		VC	4.16083	1 in 164	
9723		FO		150		VC	3.947118	1 in	
8813									



APPENDIX D – EA FLOOD MODELLING DATA

Flood risk assessment data

Location of site: 379756 / 408097 (shown as easting and northing coordinates)

Document created on: 29 August 2024

This information was previously known as a product 4.

Customer reference number: TD9KXRCJJFCE

Map showing the location that flood risk assessment data has been requested for.



How to use this information

You can use this information as part of a flood risk assessment for a planning application. To do this, you should include it in the appendix of your flood risk assessment.

We recommend that you work with a flood risk consultant to get your flood risk assessment.

Included in this document

In this document you'll find:

- how to find information about surface water and other sources of flooding
- information on the models used
- definitions for the terminology used throughout
- flood map for planning (rivers and the sea)
- historic flooding
- flood defences and attributes
- information to help you assess if there is a reduced flood risk from rivers and the sea because of defences
- modelled data
- climate change modelled data
- information about strategic flood risk assessments
- information about this data
- information about flood risk activity permits
- help and advice

Surface water and other sources of flooding

Use the [long term flood risk service](#) to find out about the risk of flooding from:

- surface water
- ordinary watercourses
- reservoirs

Or you can contact your Lead Local Flood Authority for further information.

Your Lead Local Flood Authority is Bury.

For information about sewer flooding, contact the relevant water company for the area.

About the models used

Model name: Radcliffe and Redvales 2016

Scenario(s): Defended fluvial, defences removed fluvial

Date: 29 April 2019

These models contain the most relevant data for your area of interest.

Terminology used

Annual exceedance probability (AEP)

This refers to the probability of a flood event occurring in any year. The probability is expressed as a percentage. For example, a large flood which is calculated to have a 1% chance of occurring in any one year, is described as 1% AEP.

Metres above ordnance datum (mAOD)

All flood levels are given in metres above ordnance datum which is defined as the mean sea level at Newlyn, Cornwall.

Flood map for planning (rivers and the sea)

Your selected location is in flood zone 3.

Flood zone 3 shows the area at risk of flooding for an undefended flood event with a:

- 0.5% or greater probability of occurring in any year for flooding from the sea
- 1% or greater probability of occurring in any year for fluvial (river) flooding

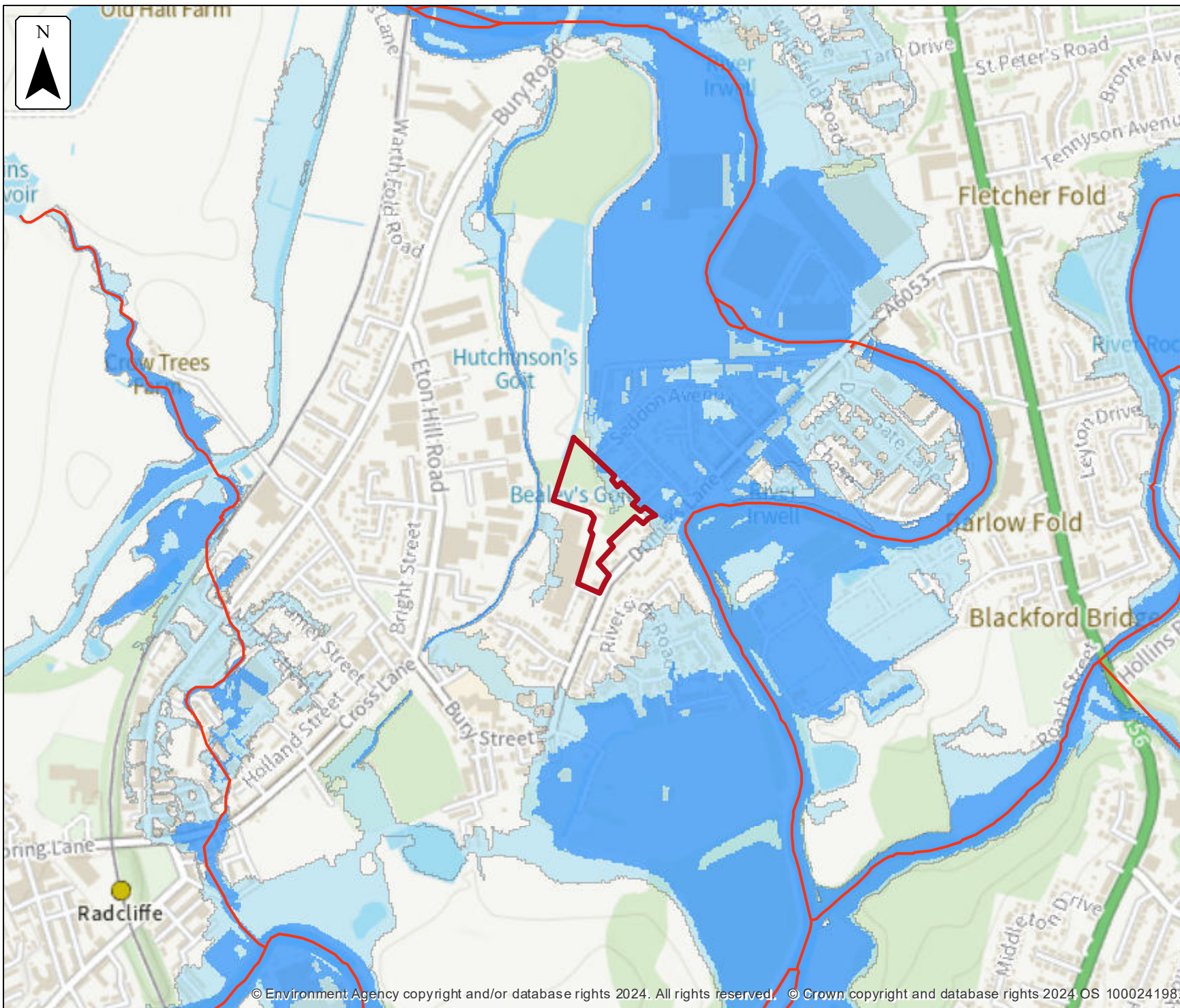
Flood zone 2 shows the area at risk of flooding for an undefended flood event with:

- between a 0.1% and 0.5% probability of occurring in any year for flooding from the sea
- between a 0.1% and 1% probability of occurring in any year for fluvial (river) flooding

It's important to remember that the flood zones on this map:

- refer to the land at risk of flooding and do not refer to individual properties
- refer to the probability of river and sea flooding, ignoring the presence of defences
- do not take into account potential impacts of climate change

The flood zones are not currently being updated. The last update was in November 2023. Some of the flood zones may have changed, however all source data is included in the models below.



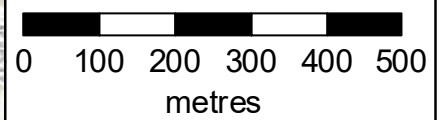
Flood map for planning

Location (easting/northing)
379756/408097

Scale
1:10,000

Created
29 Aug 2024

- Selected area
- Main river
- Flood zone 3
- Flood zone 2



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Historic flooding

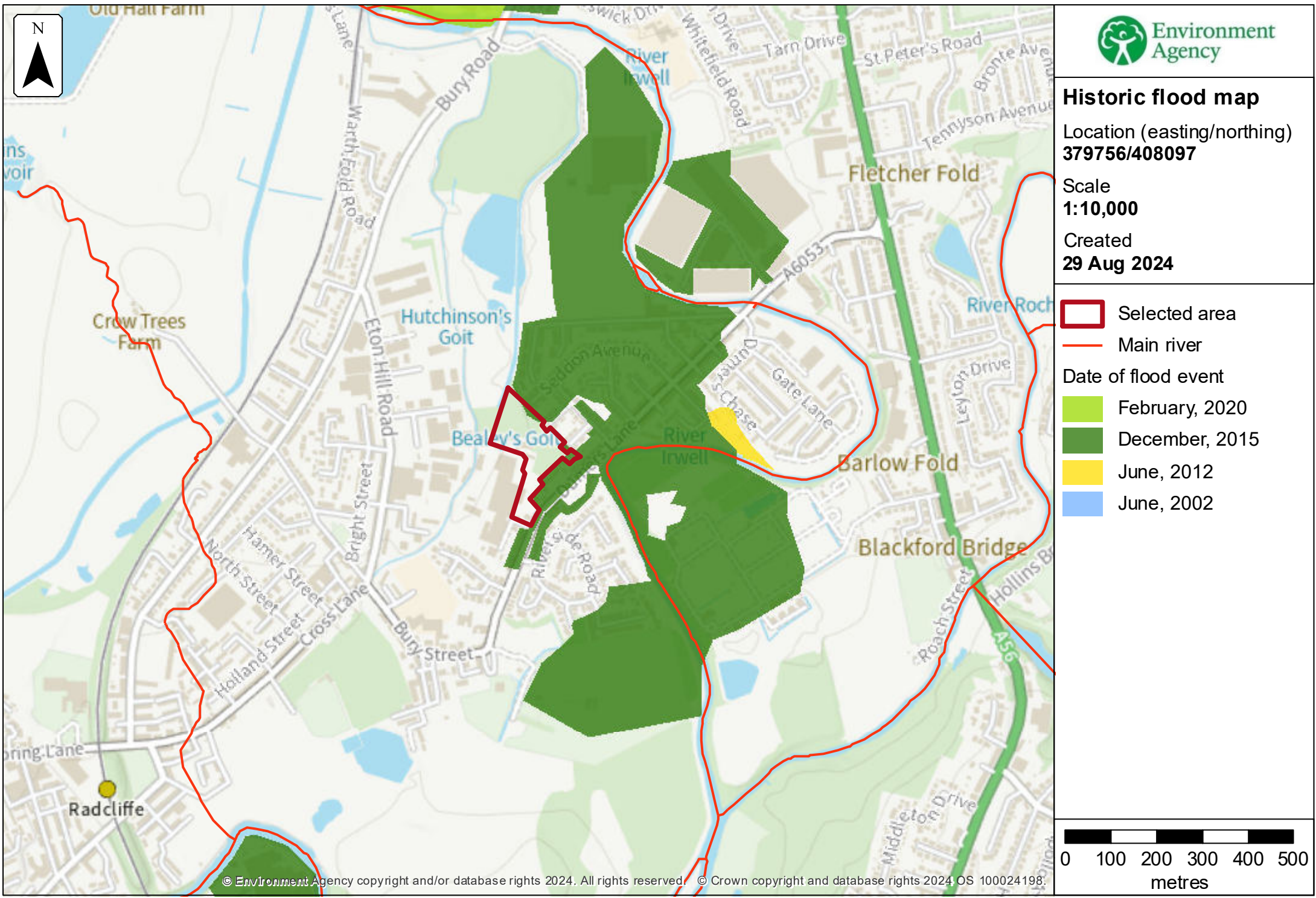
This map is an indicative outline of areas that have previously flooded. Remember that:

- our records are incomplete, so the information here is based on the best available data
- it is possible not all properties within this area will have flooded
- other flooding may have occurred that we do not have records for
- flooding can come from a range of different sources - we can only supply flood risk data relating to flooding from rivers or the sea

You can also contact your Lead Local Flood Authority or Internal Drainage Board to see if they have other relevant local flood information. Please note that some areas do not have an Internal Drainage Board.

Your Lead Local Flood Authority is Bury.

[Download recorded flood outlines in GIS format](#)



Historic flood event data

Start date	End date	Source of flood	Cause of flood	Affects location
9 February 2020	9 February 2020	main river	channel capacity exceeded (no raised defences)	No
26 December 2015	26 December 2015	main river	channel capacity exceeded (no raised defences)	Yes
22 June 2012	22 June 2012	main river	channel capacity exceeded (no raised defences)	No
14 June 2002	15 June 2002	main river	channel capacity exceeded (no raised defences)	No

Flood defences and attributes

The flood defences map shows the location of the flood defences present.

The flood defences data table shows the type of defences, their condition and the standard of protection. It shows the height above sea level of the top of the flood defence (crest level). The height is in mAOD which is the metres above the mean sea level at Newlyn, Cornwall.

It's important to remember that flood defence data may not be updated on a regular basis. The information here is based on the best available data.

Use this information:

- to help you assess if there is a reduced flood risk for this location because of defences
- with any information in the modelled data section to find out the impact of defences on flood risk



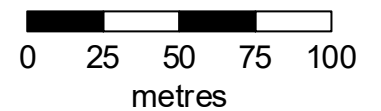
Flood defences

Location (easting/northing)
379756/408097

Scale
1:2,500

Created
29 Aug 2024

-  Selected area
-  Main river
-  Flood defence



Flood defences data

Label	Asset ID	Asset Type	Standard of protection (years)	Current condition	Downstream actual crest level (mAOD)	Upstream actual crest level (mAOD)	Effective crest level (mAOD)
1	749893	Wall	100		67.57	67.57	
2	749898	Embankment	100		67.77	67.77	
3	749889	Wall	100		67.66	67.66	
4	601083	Embankment			66.25	67.16	65.02
5	65256	Embankment			67.65	66.61	
6	94107	Embankment			64.96	65.73	64.96
7	749884	Wall	100		67.66	67.77	67.66
8	520200	Engineered High Ground			65.40	65.61	

Any blank cells show where a particular value has not been recorded for an asset.

Modelled data

This section provides details of different scenarios we have modelled and includes the following (where available):

- outline maps showing the area at risk from flooding in different modelled scenarios
- modelled node point map(s) showing the points used to get the data to model the scenarios and table(s) providing details of the flood risk for different return periods
- map(s) showing the approximate water levels for the return period with the largest flood extent for a scenario and table(s) of sample points providing details of the flood risk for different return periods

Climate change

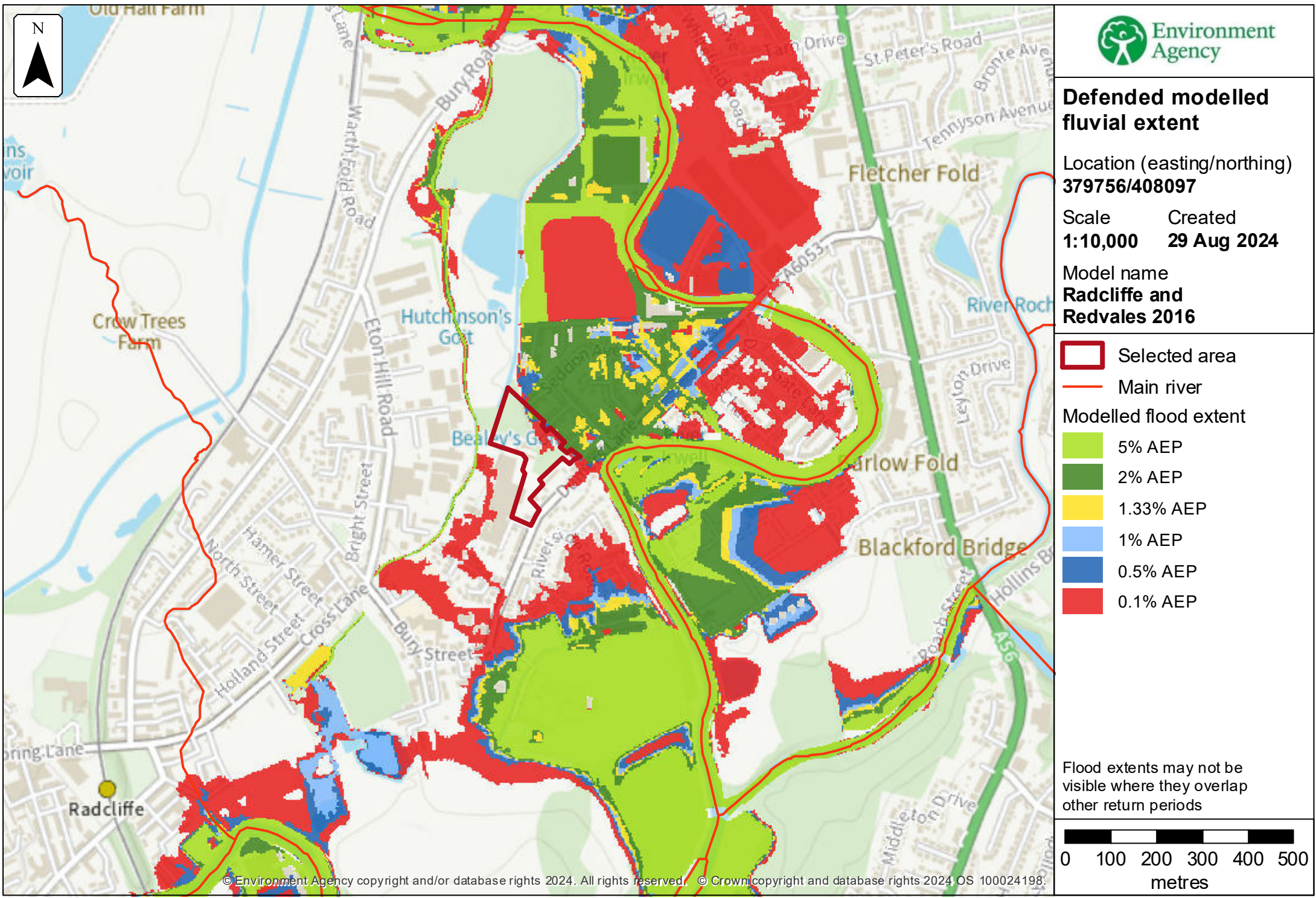
The climate change data included in the models may not include the latest [flood risk assessment climate change allowances](#). Where the new allowances are not available you will need to consider this data and factor in the new allowances to demonstrate the development will be safe from flooding.

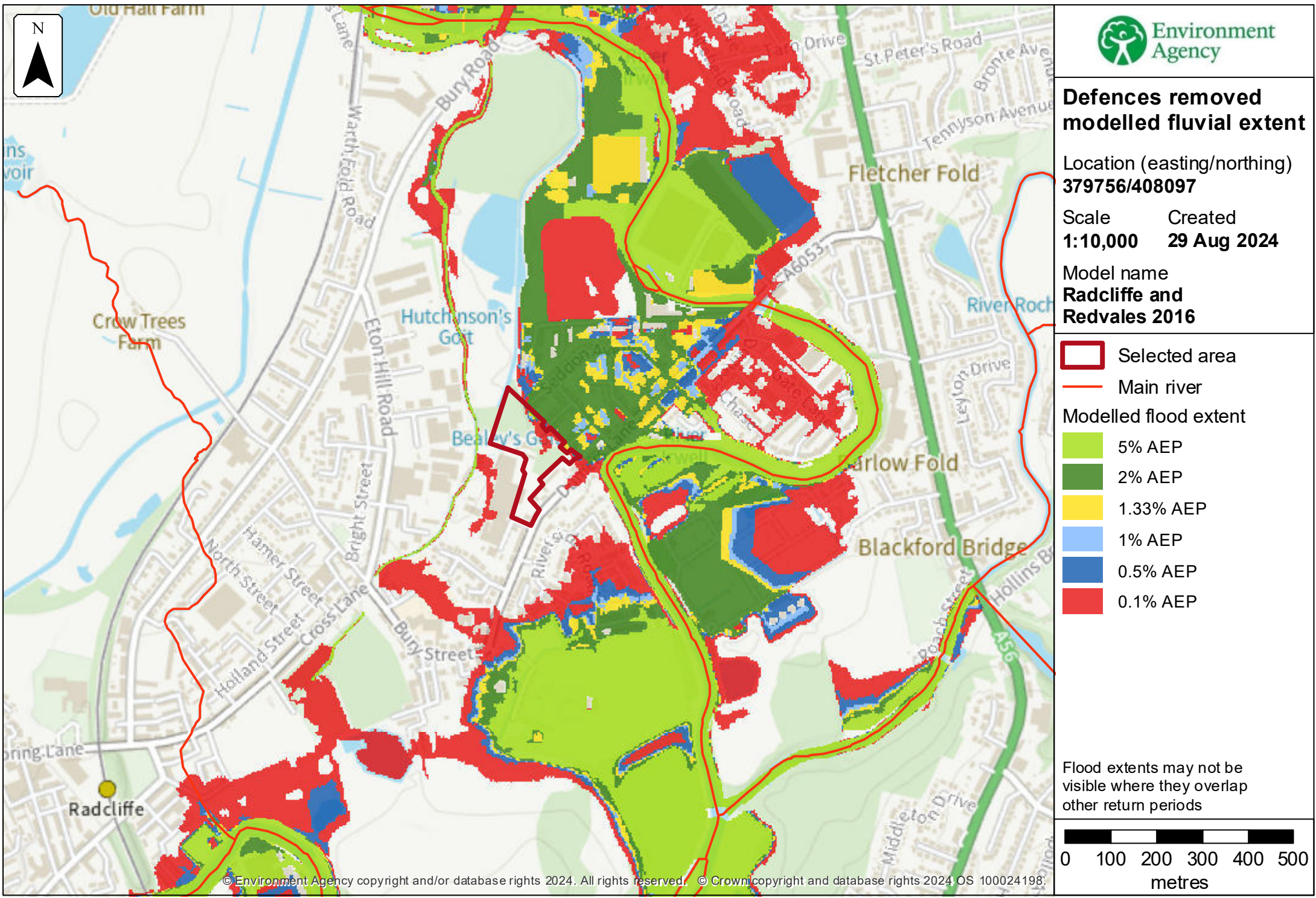
The Environment Agency will incorporate the new allowances into future modelling studies. For now, it's your responsibility to demonstrate that new developments will be safe in flood risk terms for their lifetime.

Modelled scenarios

The following scenarios are included:

- Defended modelled fluvial: risk of flooding from rivers where there are flood defences
- Defences removed modelled fluvial: risk of flooding from rivers where flood defences have been removed
- No defences exist modelled fluvial: risk of flooding from rivers where there are no flood defences
- Defended climate change modelled fluvial: risk of flooding from rivers where there are flood defences, including estimated impact of climate change
- Defences removed climate change modelled fluvial: risk of flooding from rivers where flood defences have been removed, including estimated impact of climate change
- No defences exist climate change modelled fluvial: risk of flooding from rivers where there are no flood defences, including estimated impact of climate change







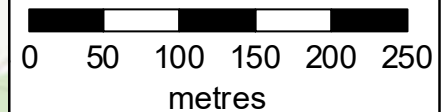
Defended modelled fluvial node locations

Location (easting/northing)
379756/408097

Scale Created
1:5,000 29 Aug 2024

Model name
**Radcliffe and
Redvales 2016**

-  Selected area
-  Modelled location
-  Main river



Modelled node locations data

Defended

Label	Modelled location ID	Easting	Northing	5% AEP	2% AEP	1.33% AEP	1% AEP	0.5% AEP	0.1% AEP
				Level	Level	Level	Level	Level	Level
1	977097	379523	407882	69.35	69.53	69.58	69.60	69.60	69.82
2	977165	379585	408422	69.51	69.81	69.92	69.95	69.94	70.39
3	977196	379605	408353	69.49	69.77	69.87	69.90	69.89	70.32
4	977174	379619	408027	69.43	69.66	69.74	69.76	69.76	70.09
5	977220	379642	408143	69.46	69.72	69.81	69.83	69.82	70.20
6	977198	379924	408052	65.46	65.86	66.06	66.23	66.55	67.47
7	977087	379962	407992	65.25	65.61	65.80	65.95	66.24	67.18
8	977230	380013	407872	65.14	65.49	65.68	65.83	66.12	67.04
9	977154	380033	407832	65.0	65.33	65.53	65.70	66.01	67.04
10	977099	380135	408104	65.92	66.25	66.43	66.55	66.80	67.49

Data in this table comes from the Radcliffe and Redvales 2016 model.

Level values are shown in mAOD, and flow values are shown in cubic metres per second.

Any blank cells show where a particular scenario has not been modelled for this location.

If no level or flow data is available for a scenario, no table will be shown.

Defended

Label	Modelled location ID	Easting	Northing	5% AEP	2% AEP	1.33% AEP	1% AEP	0.5% AEP	0.1% AEP
				Flow	Flow	Flow	Flow	Flow	Flow
1	977097	379523	407882	0.38	0.92	1.16	1.23	1.22	2.60
2	977165	379585	408422	0.40	0.93	1.17	1.23	1.22	2.68
3	977196	379605	408353	0.40	0.92	1.17	1.23	1.22	2.68
4	977174	379619	408027	0.38	0.92	1.16	1.23	1.22	2.60
5	977220	379642	408143	0.39	0.92	1.16	1.23	1.22	2.68
6	977198	379924	408052	204.72	230.71	240.78	249.51	255.0	270.63
7	977087	379962	407992	205.26	236.92	253.22	265.56	281.25	354.10
8	977230	380013	407872	205.17	239.18	253.85	269.93	288.28	390.24
9	977154	380033	407832	205.15	240.52	257.78	271.02	290.91	409.26
10	977099	380135	408104	204.38	226.64	237.37	244.37	254.20	307.69

Data in this table comes from the Radcliffe and Redvales 2016 model.

Level values are shown in mAOD, and flow values are shown in cubic metres per second.

Any blank cells show where a particular scenario has not been modelled for this location.

If no level or flow data is available for a scenario, no table will be shown.



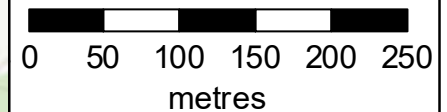
Defences removed modelled fluvial node locations

Location (easting/northing)
379756/408097

Scale Created
1:5,000 29 Aug 2024

Model name
**Radcliffe and
Redvales 2016**

-  Selected area
-  Modelled location
-  Main river



Modelled node locations data

Defences removed

Label	Modelled location ID	Easting	Northing	5% AEP	2% AEP	1.33% AEP	1% AEP	0.5% AEP	0.1% AEP
				Level	Level	Level	Level	Level	Level
1	977097	379523	407882	69.40	69.44	69.44	69.45	69.46	69.81
2	977165	379585	408422	69.61	69.68	69.68	69.69	69.71	70.36
3	977196	379605	408353	69.58	69.65	69.65	69.66	69.68	70.29
4	977174	379619	408027	69.50	69.56	69.56	69.56	69.58	70.07
5	977220	379642	408143	69.55	69.60	69.60	69.61	69.63	70.17
6	977198	379924	408052	65.44	65.83	66.04	66.18	66.47	67.45
7	977087	379962	407992	65.22	65.59	65.78	65.90	66.18	67.20
8	977230	380013	407872	65.12	65.47	65.66	65.78	66.06	67.10
9	977154	380033	407832	64.98	65.31	65.50	65.63	65.94	67.09
10	977099	380135	408104	65.89	66.22	66.41	66.51	66.71	67.40

Data in this table comes from the Radcliffe and Redvales 2016 model.

Level values are shown in mAOD, and flow values are shown in cubic metres per second.

Any blank cells show where a particular scenario has not been modelled for this location.

If no level or flow data is available for a scenario, no table will be shown.

Defences removed

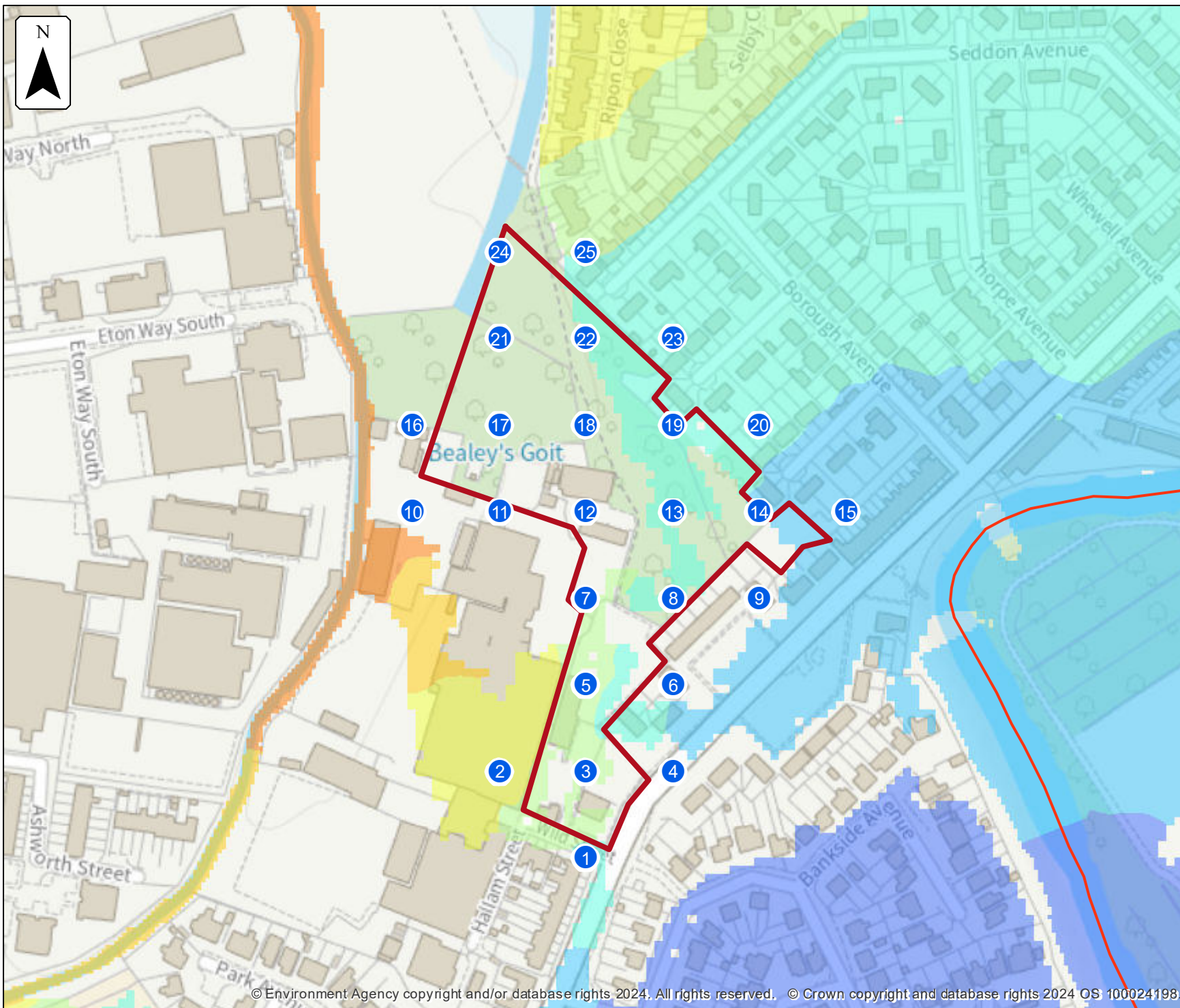
Label	Modelled location ID	Easting	Northing	5% AEP	2% AEP	1.33% AEP	1% AEP	0.5% AEP	0.1% AEP
				Flow	Flow	Flow	Flow	Flow	Flow
1	977097	379523	407882	0.55	0.66	0.66	0.68	0.72	2.50
2	977165	379585	408422	0.56	0.66	0.66	0.68	0.72	2.54
3	977196	379605	408353	0.55	0.66	0.66	0.68	0.72	2.54
4	977174	379619	408027	0.55	0.66	0.66	0.68	0.72	2.50
5	977220	379642	408143	0.55	0.66	0.66	0.68	0.72	2.53
6	977198	379924	408052	201.61	228.19	238.04	244.32	251.99	264.01
7	977087	379962	407992	202.01	233.68	249.31	259.81	276.97	323.98
8	977230	380013	407872	201.93	235.89	251.59	262.64	281.79	354.88
9	977154	380033	407832	201.90	237.33	254.89	265.77	285.27	374.65
10	977099	380135	408104	201.50	226.50	235.66	240.93	246.05	270.32

Data in this table comes from the Radcliffe and Redvales 2016 model.

Level values are shown in mAOD, and flow values are shown in cubic metres per second.

Any blank cells show where a particular scenario has not been modelled for this location.

If no level or flow data is available for a scenario, no table will be shown.



Defended modelled fluvial extent and height

Location (easting/northing)
379756/408097

Scale Created
1:2,500 29 Aug 2024

Model name
**Radcliffe and
Redvales 2016**

 Selected area
 Main river

Modelled 2D grid
Water level in mAOD

 0 - 67.0
 67.0 - 67.5
 67.5 - 68.0
 68.0 - 68.5
 68.5 - 69.0
 69.0 - 69.5
 69.5 - 70.0
 70.0 - 70.5
 70.5 - 71.0

This map shows the
0.1% AEP height data


0 25 50 75 100
metres

Sample point data

Defended

Label	Easting	Northing	1.33% AEP	1% AEP	0.5% AEP	0.1% AEP
			Depth	Depth	Depth	Depth
1	379750	407928	NoData	NoData	NoData	NoData
2	379708	407970	NoData	NoData	NoData	0.09
3	379750	407970	NoData	NoData	NoData	0.09
4	379792	407970	NoData	NoData	NoData	NoData
5	379750	408012	NoData	NoData	NoData	0.02
6	379792	408012	NoData	NoData	NoData	NoData
7	379750	408054	NoData	NoData	NoData	NoData
8	379792	408054	NoData	NoData	NoData	NoData
9	379834	408054	NoData	NoData	NoData	NoData
10	379666	408096	NoData	NoData	NoData	NoData
11	379708	408096	NoData	NoData	NoData	NoData
12	379750	408096	NoData	NoData	NoData	NoData
13	379792	408096	NoData	NoData	NoData	0.12
14	379834	408096	NoData	NoData	NoData	NoData
15	379876	408096	0.51	0.55	0.66	1.18
16	379666	408138	NoData	NoData	NoData	NoData

Label	Easting	Northing	1.33% AEP	1% AEP	0.5% AEP	0.1% AEP
			Depth	Depth	Depth	Depth
17	379708	408138	NoData	NoData	NoData	NoData
18	379750	408138	NoData	NoData	NoData	NoData
19	379792	408138	NoData	NoData	NoData	0.06
20	379834	408138	0.61	0.66	0.78	1.05
21	379708	408180	NoData	NoData	NoData	NoData
22	379750	408180	NoData	NoData	0.18	0.42
23	379792	408180	0.59	0.64	0.77	1.06
24	379708	408222	NoData	NoData	NoData	NoData
25	379750	408222	0.05	0.06	0.15	0.50
Max value in selected area:			0.51	0.55	0.69	0.98

Data in this table comes from the Radcliffe and Redvales 2016 model.

Height values are shown in mAOD, and depth values are shown in metres.

Any blank cells show where a particular scenario has not been modelled for this location.

Cells which contain text 'NoData' for a scenario show that return period has been modelled but there is no flood risk for that return period for that location.

If no height or depth data is available for a scenario, no table will be shown.

'Max value in selected area' is the deepest depth or highest height at any location within your drawn boundary.

Defended

Label	Easting	Northing	1.33% AEP	1% AEP	0.5% AEP	0.1% AEP
			Height	Height	Height	Height
1	379750	407928	NoData	NoData	NoData	NoData
2	379708	407970	NoData	NoData	NoData	69.13
3	379750	407970	NoData	NoData	NoData	68.55
4	379792	407970	NoData	NoData	NoData	NoData
5	379750	408012	NoData	NoData	NoData	68.75
6	379792	408012	NoData	NoData	NoData	NoData
7	379750	408054	NoData	NoData	NoData	NoData
8	379792	408054	NoData	NoData	NoData	NoData
9	379834	408054	NoData	NoData	NoData	NoData
10	379666	408096	NoData	NoData	NoData	NoData
11	379708	408096	NoData	NoData	NoData	NoData
12	379750	408096	NoData	NoData	NoData	NoData
13	379792	408096	NoData	NoData	NoData	68.29
14	379834	408096	NoData	NoData	NoData	NoData
15	379876	408096	67.25	67.30	67.41	67.92
16	379666	408138	NoData	NoData	NoData	NoData
17	379708	408138	NoData	NoData	NoData	NoData
18	379750	408138	NoData	NoData	NoData	NoData

Label	Easting	Northing	1.33% AEP	1% AEP	0.5% AEP	0.1% AEP
			Height	Height	Height	Height
19	379792	408138	NoData	NoData	NoData	68.27
20	379834	408138	67.63	67.68	67.80	68.08
21	379708	408180	NoData	NoData	NoData	NoData
22	379750	408180	NoData	NoData	68.04	68.34
23	379792	408180	67.84	67.89	68.02	68.32
24	379708	408222	NoData	NoData	NoData	NoData
25	379750	408222	68.04	68.05	68.16	68.51
Max value in selected area:			67.86	67.91	68.05	69.01

Data in this table comes from the Radcliffe and Redvales 2016 model.

Height values are shown in mAOD, and depth values are shown in metres.

Any blank cells show where a particular scenario has not been modelled for this location.

Cells which contain text 'NoData' for a scenario show that return period has been modelled but there is no flood risk for that return period for that location.

If no height or depth data is available for a scenario, no table will be shown.

'Max value in selected area' is the deepest depth or highest height at any location within your drawn boundary.

Strategic flood risk assessments

We recommend that you check the relevant local authority's strategic flood risk assessment (SFRA) as part of your work to prepare a site specific flood risk assessment.

This should give you information about:

- the potential impacts of climate change in this catchment
- areas defined as functional floodplain
- flooding from other sources, such as surface water, ground water and reservoirs

Your Lead Local Flood Authority is Bury.

About this data

This data has been generated by strategic scale flood models and is not intended for use at the individual property scale. If you're intending to use this data as part of a flood risk assessment, please include an appropriate modelling tolerance as part of your assessment. The Environment Agency regularly updates its modelling. We recommend that you check the data provided is the most recent, before submitting your flood risk assessment.

Flood risk activity permits

Under the Environmental Permitting (England and Wales) Regulations 2016 some developments may require an environmental permit for flood risk activities from the Environment Agency. This includes any permanent or temporary works that are in, over, under, or nearby a designated main river or flood defence structure.

[Find out more about flood risk activity permits](#)

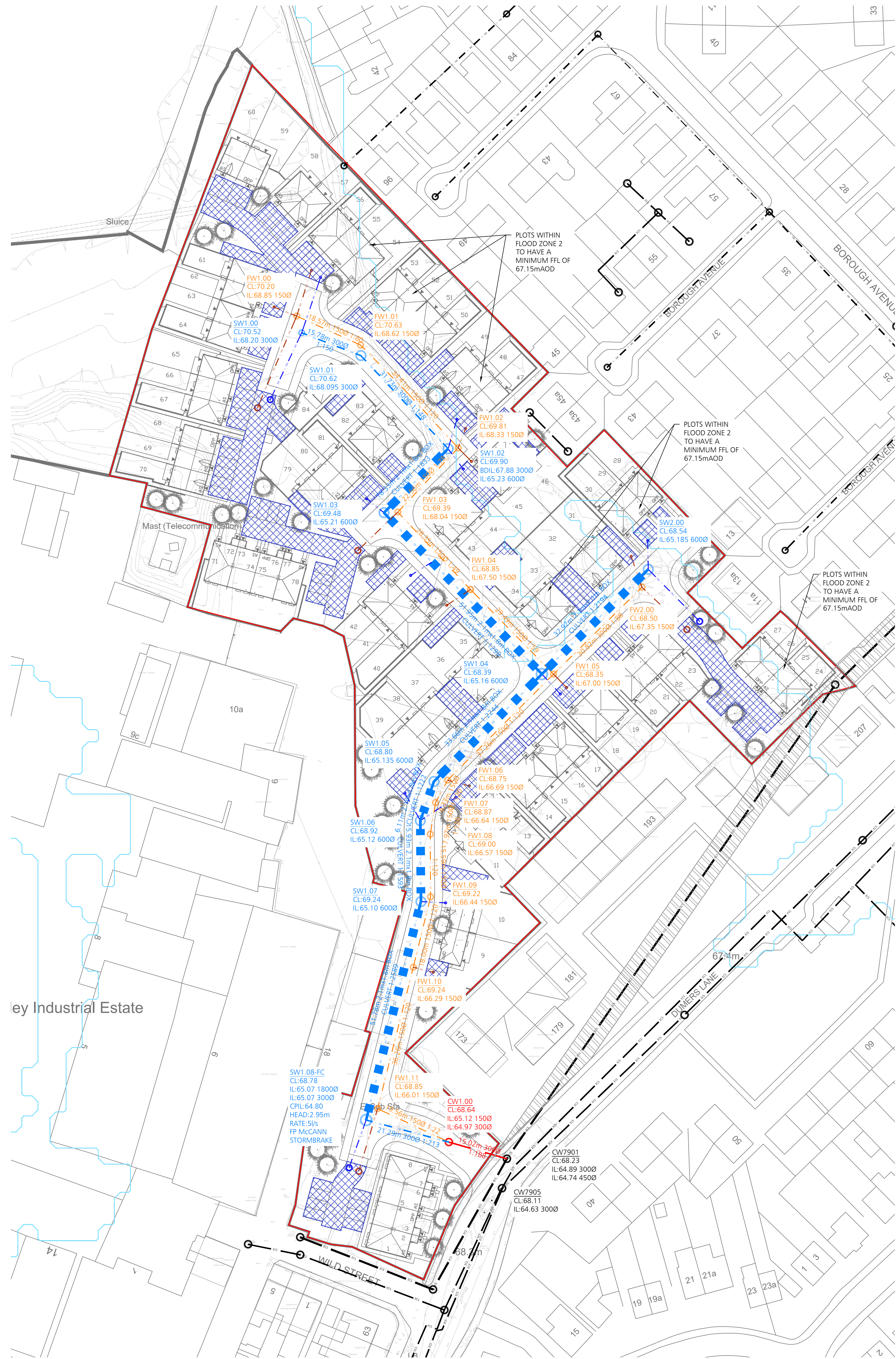
Help and advice

Contact the Greater Manchester Merseyside and Cheshire Environment Agency team at inforequests.gmmc@environment-agency.gov.uk for:

- [more information about getting a product 5, 6, 7 or 8](#)
- general help and advice about the site you're requesting data for



APPENDIX E – DRAINAGE STRATEGY & HYDRAULIC CALCULATIONS



ey Industrial Estate

DO NOT SCALE

DESIGNERS HAZARD IDENTIFICATION

IT IS ASSUMED THAT ALL WORKS WILL BE UNDERTAKEN BY A COMPETENT CONTRACTOR WORKING, WHERE APPROPRIATE, TO AN APPROVED METHOD STATEMENT. IN ADDITION TO THE HAZARDS TYPICALLY ASSOCIATED WITH THE TYPES OF CONSTRUCTION DETAILED ON THIS DRAWING, ANY KNOWN ABNORMAL HAZARDS SPECIFIC TO THIS SCHEME HAVE BEEN IDENTIFIED.



ABNORMAL
HAZARD
REFERENCE

NOTES

- DO NOT SCALE FROM THIS DRAWING.
- THIS DRAWING IS TO BE REPRODUCED IN COLOUR.
- IF ANY DISCREPANCIES ARE FOUND IN THIS DRAWING, PLEASE REPORT TO DUDLEYS CONSULTING ENGINEERS.
- THIS DRAWING HAS BEEN ORIENTATED TO OS BRITISH NATIONAL GRID (EPSG:27700 OSGB36). EXISTING SURVEY STATIONS ARE SHOWN ON THE TOPOGRAPHICAL SURVEY.
- THIS DRAWING IS BASED ON THE FOLLOWING INFORMATION:
5.1. WH062/T00 - TOPOGRAPHICAL SURVEY BY RIP DATED JANUARY 2024
5.2. BEALEY IND. EST. - SITE LAYOUT PLAN BY WESTCHURCH HOMES DATED AUGUST 2024
- ALL WORK TO BE UNDERTAKEN IN ACCORDANCE WITH THE CURRENT EDITION OF THE BUILDING REGULATIONS, SEWERAGE SECTOR CODES OF PRACTICE, AND THE RELEVANT LOCAL HIGHWAY AUTHORITY STANDARDS.
- TO BE READ IN CONJUNCTION WITH THE FLOOD RISK ASSESSMENT AND DRAINAGE STRATEGY REPORT, 24344-DCE-XX-XX-T-C-001-P01 BY DUDLEYS CONSULTING ENGINEERS DATED OCTOBER 2024.
- THE POSITION OF EXISTING SEWERS IS BASED ON RECORDS OBTAINED FROM UNITED UTILITIES, AND ARE SHOWN INDICATIVELY.
- COVER LEVELS SUBJECT TO DETAILED LEVELS DESIGN.
- LOCATION OF DEMARICATION CHAMBERS AND LATERAL CONNECTIONS SUBJECT TO DETAILED DRAINAGE DESIGN.

KEY

- SITE BOUNDARY
- PROPOSED ADOPTED S104 SURFACE WATER SEWER
- PROPOSED ADOPTED S104 FOUL WATER SEWER
- PROPOSED ADOPTED S104 SURFACE WATER MANHOLE
- PROPOSED ADOPTED S104 FOUL WATER MANHOLE
- PROPOSED ADOPTED S104 SURFACE WATER LATERAL
- PROPOSED ADOPTED S104 FOUL WATER LATERAL
- PROPOSED ADOPTED S104 SURFACE WATER DEMARICATION MANHOLE
- PROPOSED ADOPTED S104 SURFACE WATER DEMARICATION PPIC
- PROPOSED ADOPTED S104 FOUL WATER DEMARICATION MANHOLE
- PROPOSED ADOPTED S104 FOUL WATER DEMARICATION PPIC
- PROPOSED ADOPTED S104 COMBINED WATER SEWER
- PROPOSED ADOPTED S104 COMBINED WATER MANHOLE
- EXISTING ADOPTED COMBINED WATER SEWER
- EXISTING ADOPTED SURFACE WATER SEWER
- EXISTING ADOPTED COMBINED WATER PPIC
- EXISTING SEWER EASEMENT
- PROPOSED PRIVATE PERMEABLE PAVING
- EXTENTS OF FLOOD ZONE 2

25.10.24	PRELIMINARY ISSUE	JA	CB	P01
DATE	REVISION DESCRIPTION	BY	CHK.	REV.

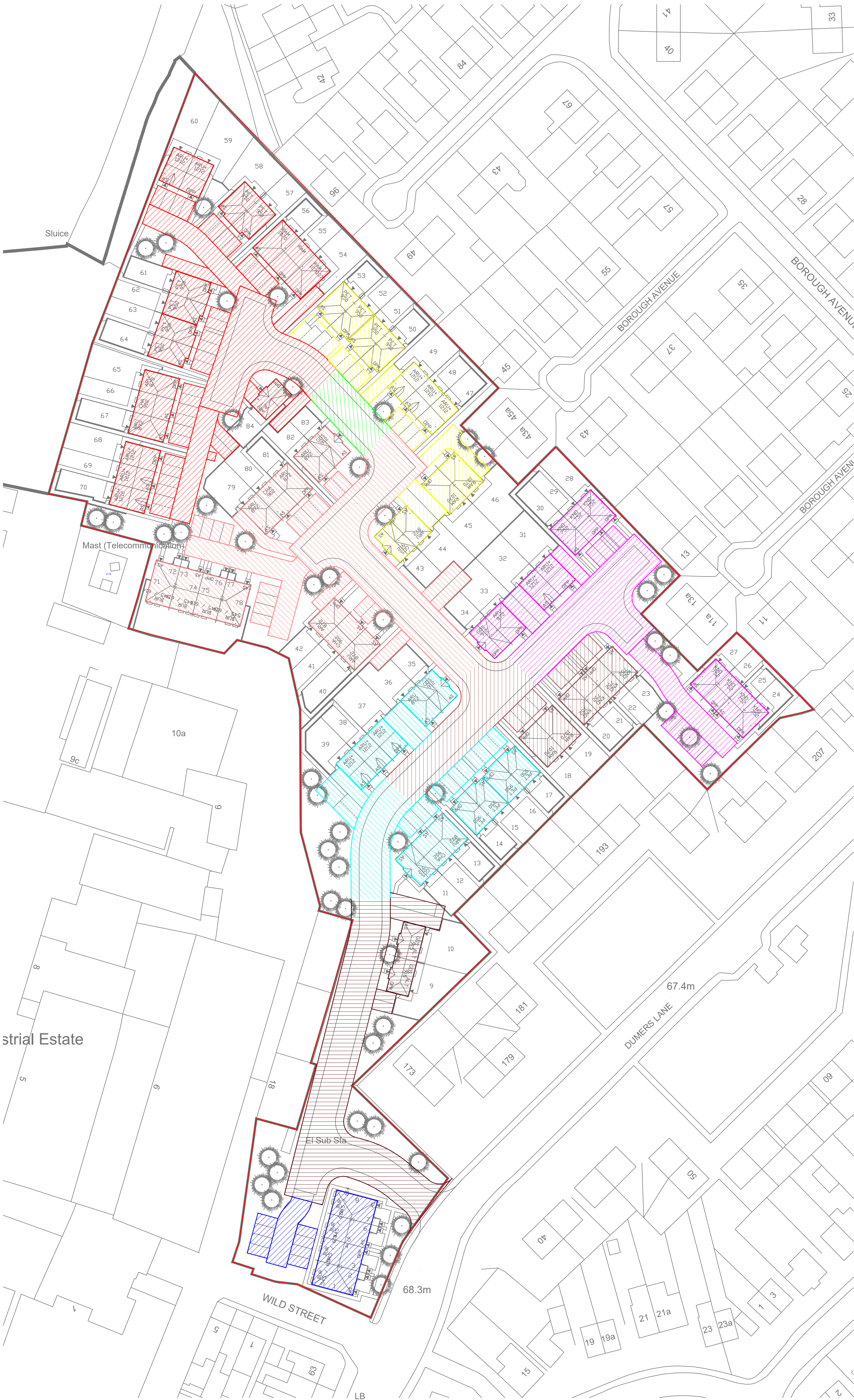


PROJECT
**LAND OFF DUMERS LANE
RADCLIFFE, BURY
M26 2BD**

TITLE
DRAINAGE STRATEGY

SCALE	PAPER	STAGE	STATUS
1:500	A1	PRELIMINARY	

DRAWING NO.	REV.
24344-DCE-XX-XX-D-C-100	P01



DO NOT SCALE

DESIGNERS HAZARD IDENTIFICATION

IT IS ASSUMED THAT ALL WORKS WILL BE UNDERTAKEN BY A COMPETENT CONTRACTOR WORKING, WHERE APPROPRIATE, TO AN APPROVED METHOD STATEMENT. IN ADDITION TO THE HAZARDS TYPICALLY ASSOCIATED WITH THE TYPES OF CONSTRUCTION DETAILED ON THIS DRAWING, ANY KNOWN ABNORMAL HAZARDS SPECIFIC TO THIS SCHEME HAVE BEEN IDENTIFIED.



NOTES

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- THIS DRAWING IS TO BE REPRODUCED IN COLOUR.
- IF ANY DISCREPANCIES ARE FOUND IN THIS DRAWING, PLEASE REPORT TO DUDLEYS CONSULTING ENGINEERS.
- THIS DRAWING HAS BEEN ORIENTATED TO OS BRITISH NATIONAL GRID (EPSG:27700 OSGB36). EXISTING SURVEY STATIONS ARE SHOWN ON THE TOPOGRAPHICAL SURVEY.
- THIS DRAWING IS BASED ON THE FOLLOWING INFORMATION:
5.1. BEALEY IND. EST. - SITE LAYOUT PLAN BY WESTCHURCH HOMES DATED AUG. 2024

KEY

- SW1.00 - PROPOSED IMPERMEABLE AREA: 0.236ha
- SW1.01 - PROPOSED IMPERMEABLE AREA: 0.019ha
- SW1.02 - PROPOSED IMPERMEABLE AREA: 0.096ha
- SW1.03 - PROPOSED IMPERMEABLE AREA: 0.215ha
- SW2.00 - PROPOSED IMPERMEABLE AREA: 0.144ha
- SW1.04 - PROPOSED IMPERMEABLE AREA: 0.088ha
- SW1.06 - PROPOSED IMPERMEABLE AREA: 0.124ha
- SW1.07 - PROPOSED IMPERMEABLE AREA: 0.121ha
- SW1.08-FC - PROPOSED IMPERMEABLE AREA: 0.047ha
- SITE BOUNDARY AREA: 1.94 ha

MH	PLOTS (ha)	PLOTS 10% URBAN CREEP (ha)	HIGHWAY (ha)	TOTALS (ha)
SW1.00	0.172	0.017	0.046	0.236
SW1.01	0.000	0.000	0.019	0.019
SW1.02	0.087	0.009	0.000	0.096
SW1.03	0.122	0.012	0.081	0.215
SW2.00	0.085	0.009	0.051	0.144
SW1.04	0.040	0.004	0.044	0.088
SW1.05	0.000	0.000	0.000	0.000
SW1.06	0.089	0.009	0.027	0.124
SW1.07	0.020	0.002	0.099	0.121
SW1.08-FC	0.043	0.004	0.000	0.047
TOTALS	0.658	0.066	0.366	1.090

strial Estate

25.10.24	PRELIMINARY ISSUE	AS	JA	P01
DATE	REVISION DESCRIPTION	BY	CHK.	REV.



76 King Street
Manchester
M2 4NH
0161 938 1908
info@dudleys.co.uk

PROJECT
**LAND OFF DUMERS LANE
RADCLIFFE, BURY
M26 2BD**

TITLE
**PROPOSED IMPERMEABLE
AREAS**

SCALE	PAPER	STAGE	STATUS
1:500	A1	PRELIMINARY	

DRAWING NO.	REV.
24344-DCE-XX-XX-D-C-103	P01



DO NOT SCALE

DESIGNERS HAZARD IDENTIFICATION

IT IS ASSUMED THAT ALL WORKS WILL BE UNDERTAKEN BY A COMPETENT CONTRACTOR WORKING, WHERE APPROPRIATE, TO AN APPROVED METHOD STATEMENT. IN ADDITION TO THE HAZARDS TYPICALLY ASSOCIATED WITH THE TYPES OF CONSTRUCTION DETAILED ON THIS DRAWING, ANY KNOWN ABNORMAL HAZARDS SPECIFIC TO THIS SCHEME HAVE BEEN IDENTIFIED.

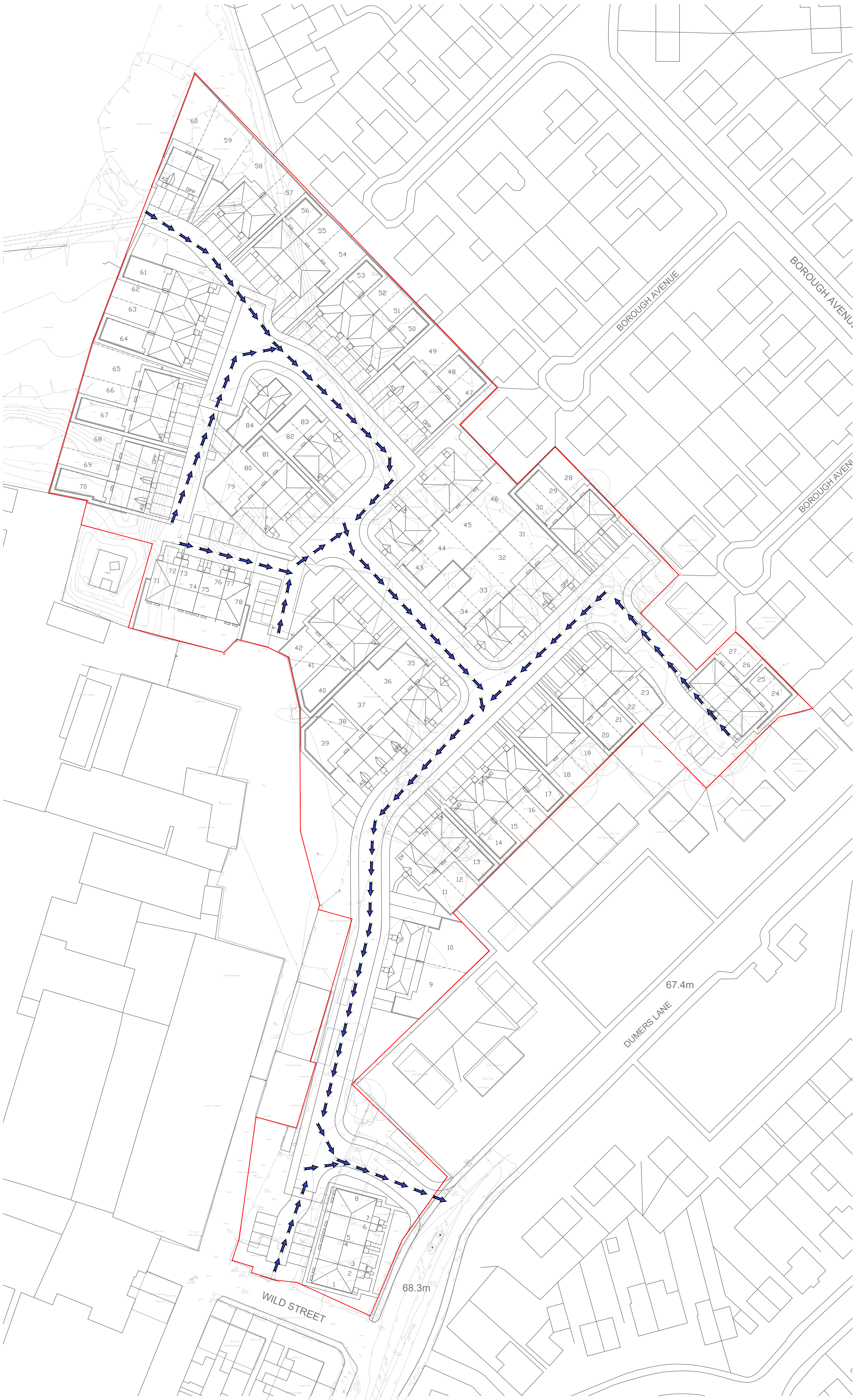


NOTES

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- IF ANY DISCREPANCIES ARE FOUND IN THIS DRAWING, PLEASE REPORT TO DUDLEYS CONSULTING ENGINEERS.
- THIS DRAWING HAS BEEN ORIENTATED TO OS BRITISH NATIONAL GRID (EPSG:27700 OSGB36). EXISTING SURVEY STATIONS ARE SHOWN ON THE TOPOGRAPHICAL SURVEY.
- THIS DRAWING IS BASED ON THE FOLLOWING INFORMATION:
5.1. BEALEY IND. EST. - SITE LAYOUT PLAN BY WESTCHURCH HOMES DATED AUG. 2024
5.2. WH062/T00 - TOPOGRAPHICAL SURVEY BY RUP DATED JANUARY 2024
- SUBJECT TO DETAILED DESIGN
- THE HYDRAULIC CALCULATIONS IN REPORT 24344-DCE-XX-XX-T-C-001-P01 DEMONSTRATE THE 1 IN 100 YEAR + 45% CLIMATE CHANGE STORM EVENT IS FULLY CONTAINED WITHIN THE PROPOSED DRAINAGE SYSTEM. THIS DRAWING SHOWS THE ROUTE THAT SURFACE WATER FLOODING WOULD TAKE IN EVENT OF A STORM EVENT EXCEEDING THE DESIGN EVENT OR IN THE EVENT OF A FAILURE OF THE PROPOSED DRAINAGE SYSTEMS. THE FLOOD EXCEEDANCE ROUTES DIRECT SURFACE WATER FLOODING TO DUMERS LANE, AND HENCE DO NOT INCREASE THE FLOOD RISK OF NEIGHBOURING PROPERTIES, IN LINE WITH LOCAL AND NATIONAL PLANNING POLICIES.

KEY

-  FLOOD EXCEEDANCE ROUTE
-  SIDE BOUNDARY AREA: 1.94 ha



25.10.24	PRELIMINARY ISSUE	AS	JA	P01
DATE	REVISION DESCRIPTION	BY	CHK.	REV.



76 King Street
Manchester
M2 4NH
0161 938 1908
info@dudleys.co.uk

PROJECT
**LAND OFF DUMERS LANE
RADCLIFFE, BURY
M26 2BD**

TITLE
FLOOD EXCEEDANCE ROUTE

SCALE	PAPER	STAGE	STATUS
1:500	A1	PRELIMINARY	

DRAWING NO.	REV.
24344-DCE-XX-XX-D-C-129	P01

Calculated by:	Jonathan Allchin
Site name:	Dumers Lane
Site location:	Bury

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

Site Details

Latitude:	53.56904° N
Longitude:	2.30735° W
Reference:	1355398360
Date:	Sep 25 2024 15:00

Runoff estimation approach

IH124

Site characteristics

Total site area (ha):	1.94
-----------------------	------

Methodology

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

Notes

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

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

Soil characteristics

	Default	Edited
SOIL type:	4	4
HOST class:	N/A	N/A
SPR/SPRHOST:	0.47	0.47

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

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

Hydrological characteristics

	Default	Edited
SAAR (mm):	1042	1042
Hydrological region:	10	10
Growth curve factor 1 year:	0.87	0.87
Growth curve factor 30 years:	1.7	1.7
Growth curve factor 100 years:	2.08	2.08
Growth curve factor 200 years:	2.37	2.37

(3) Is SPR/SPRHOST ≤ 0.3?

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

Greenfield runoff rates

Default

Edited

Q_{BAR} (l/s):	14.92	14.92
1 in 1 year (l/s):	12.98	12.98
1 in 30 years (l/s):	25.36	25.36
1 in 100 year (l/s):	31.03	31.03
1 in 200 years (l/s):	35.35	35.35

This report was produced using the greenfield runoff tool developed by HR Wallingford and available at 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 www.uksuds.com/terms-and-conditions.htm. The outputs from this tool are estimates of 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, CEH, Hydrosolutions or any other organisation for the use of this data in the design or operational characteristics of any drainage scheme.

Design Settings

Rainfall Methodology	FEH-22	Minimum Velocity (m/s)	1.00
Return Period (years)	2	Connection Type	Level Soffits
Additional Flow (%)	0	Minimum Backdrop Height (m)	0.900
CV	1.000	Preferred Cover Depth (m)	1.200
Time of Entry (mins)	5.00	Include Intermediate Ground	✓
Maximum Time of Concentration (mins)	30.00	Enforce best practice design rules	x
Maximum Rainfall (mm/hr)	50.0		

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
SW1.00	0.236	5.00	70.520	1200	379730.074	408170.150	2.320
SW1.01	0.019	5.00	70.620	1200	379744.802	408164.486	2.525
SW1.02	0.096	5.00	69.900	2100	379766.497	408141.331	4.670
J3			69.900		379765.008	408139.850	4.675
J4			69.480		379752.018	408126.921	4.265
SW1.03	0.215	5.00	69.480	2100	379750.501	408125.470	4.270
J5			69.480		379751.981	408123.922	4.275
J6			68.390		379788.334	408086.816	3.225
SW2.00	0.144	5.00	68.540	2100	379816.266	408111.357	3.355
J7			68.540		379814.769	408109.884	3.360
J8			68.390		379791.308	408086.796	3.225
SW1.04	0.088	5.00	68.390	2400	379789.811	408085.323	3.230
J9			68.390		379788.322	408083.842	3.235
J10			68.800		379764.452	408060.114	3.660
SW1.05	0.000	5.00	68.800	2100	379762.962	408058.634	3.665
J11			68.800		379762.275	408056.650	3.670
J12			68.920		379760.275	408050.879	3.795
SW1.06	0.124	5.00	68.920	2100	379759.587	408048.895	3.800
J13			68.920		379759.603	408046.795	3.805
J14			69.240		379759.719	408030.866	4.135
SW1.07	0.121	5.00	69.240	2100	379759.734	408028.766	4.140
J15			69.240		379759.223	408026.729	4.145
J16			68.780		379746.612	407976.505	3.705
SW1.08-FC	0.047	5.00	68.780	2400	379746.100	407974.468	3.980
CW1.00			68.640	1200	379766.675	407968.994	3.670
CW7901			68.110	1200	379781.107	407964.836	3.220

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
1.000	SW1.00	SW1.01	15.780	0.600	68.200	68.095	0.105	150.0	300	5.21	49.7
1.001	SW1.01	SW1.02	31.731	0.600	68.095	67.880	0.215	147.6	300	5.61	48.2
1.002	SW1.02	J3	2.100	0.600	65.230	65.225	0.005	420.0	600	5.64	48.1
1.003	J3	J4	18.328	0.600	65.225	65.215	0.010	1832.8	1800	5.91	47.2
1.004	J4	SW1.03	2.099	0.600	65.215	65.210	0.005	419.8	600	5.94	47.1
1.005	SW1.03	J5	2.142	0.600	65.210	65.205	0.005	428.3	600	5.97	47.0
1.006	J5	J6	51.946	0.600	65.205	65.165	0.040	1298.7	1800	6.59	44.9
1.007	J6	SW1.04	2.100	0.600	65.165	65.160	0.005	420.0	600	6.62	44.9
2.000	SW2.00	J7	2.100	0.600	65.185	65.180	0.005	420.0	600	5.03	50.0
2.001	J7	J8	32.916	0.600	65.180	65.165	0.015	2194.4	2100	5.52	48.5
2.002	J8	SW1.04	2.100	0.600	65.165	65.160	0.005	420.0	600	5.55	48.4
1.008	SW1.04	J9	2.100	0.600	65.160	65.155	0.005	420.0	600	6.65	44.8
1.009	J9	J10	33.657	0.600	65.155	65.140	0.015	2243.8	1800	7.19	43.1
1.010	J10	SW1.05	2.100	0.600	65.140	65.135	0.005	420.0	600	7.22	43.0
1.011	SW1.05	J11	2.100	0.600	65.135	65.130	0.005	419.9	600	7.25	43.0
1.012	J11	J12	6.108	0.600	65.130	65.125	0.005	1221.5	1800	7.32	42.8
1.013	J12	SW1.06	2.100	0.600	65.125	65.120	0.005	420.0	600	7.35	42.7
1.014	SW1.06	J13	2.100	0.600	65.120	65.115	0.005	420.0	600	7.38	42.6
1.015	J13	J14	15.929	0.600	65.115	65.105	0.010	1592.9	1800	7.59	42.0
1.016	J14	SW1.07	2.100	0.600	65.105	65.100	0.005	420.0	600	7.62	41.9
1.017	SW1.07	J15	2.100	0.600	65.100	65.095	0.005	420.0	600	7.65	41.9
1.018	J15	J16	51.783	0.600	65.095	65.075	0.020	2589.2	1800	8.53	39.6
1.019	J16	SW1.08-FC	2.100	0.600	65.075	65.070	0.005	420.1	600	8.56	39.6
1.020	SW1.08-FC	CW1.00	21.291	0.600	65.070	64.970	0.100	212.9	300	8.89	38.8

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
1.000	1.281	90.6	42.4	2.020	2.225	0.236	0.0	144	1.261
1.001	1.292	91.3	44.4	2.225	1.720	0.255	0.0	147	1.282
1.002	1.182	334.1	61.0	4.070	4.075	0.351	0.0	173	0.909
1.003	1.162	4391.4	59.8	2.875	2.465	0.351	0.0	80	0.357
1.004	1.182	334.2	59.7	3.665	3.670	0.351	0.0	170	0.902
1.005	1.170	330.8	96.1	3.670	3.675	0.566	0.0	221	1.020
1.006	1.382	5225.6	91.9	2.475	1.425	0.566	0.0	94	0.467
1.007	1.182	334.1	91.7	2.625	2.630	0.566	0.0	214	1.015
2.000	1.182	334.1	26.0	2.755	2.760	0.144	0.0	112	0.715
2.001	1.114	4912.7	25.3	1.260	1.125	0.144	0.0	50	0.242
2.002	1.182	334.1	25.2	2.625	2.630	0.144	0.0	110	0.709
1.008	1.182	334.1	129.1	2.630	2.635	0.798	0.0	258	1.108
1.009	1.049	3964.4	124.4	1.435	1.860	0.798	0.0	136	0.438
1.010	1.182	334.1	124.2	3.060	3.065	0.798	0.0	253	1.098
1.011	1.182	334.1	123.9	3.065	3.070	0.798	0.0	252	1.097
1.012	1.426	5389.4	123.3	1.870	1.995	0.798	0.0	110	0.531
1.013	1.182	334.1	123.1	3.195	3.200	0.798	0.0	252	1.096
1.014	1.182	334.1	142.0	3.200	3.205	0.922	0.0	273	1.136
1.015	1.247	4713.7	140.0	2.005	2.335	0.922	0.0	131	0.510
1.016	1.182	334.1	139.8	3.535	3.540	0.922	0.0	270	1.131
1.017	1.182	334.1	157.8	3.540	3.545	1.043	0.0	290	1.165
1.018	0.976	3687.4	149.4	2.345	1.905	1.043	0.0	160	0.446
1.019	1.182	334.1	149.1	3.105	3.110	1.043	0.0	280	1.149
1.020	1.073	75.9	152.7	3.410	3.370	1.090	0.0	300	1.087

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
1.021	CW1.00	CW7901	15.019	0.600	64.970	64.890	0.080	187.7	300	9.11	38.3

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
1.021	1.144	80.9	150.8	3.370	2.920	1.090	0.0	300	1.159

Pipeline Schedule

Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
1.000	15.780	150.0	300	Circular	70.520	68.200	2.020	70.620	68.095	2.225
1.001	31.731	147.6	300	Circular	70.620	68.095	2.225	69.900	67.880	1.720
1.002	2.100	420.0	600	Circular	69.900	65.230	4.070	69.900	65.225	4.075
1.003	18.328	1832.8	1800	ClosedR-sq	69.900	65.225	2.875	69.480	65.215	2.465
1.004	2.099	419.8	600	Circular	69.480	65.215	3.665	69.480	65.210	3.670
1.005	2.142	428.3	600	Circular	69.480	65.210	3.670	69.480	65.205	3.675
1.006	51.946	1298.7	1800	ClosedR-sq	69.480	65.205	2.475	68.390	65.165	1.425
1.007	2.100	420.0	600	Circular	68.390	65.165	2.625	68.390	65.160	2.630
2.000	2.100	420.0	600	Circular	68.540	65.185	2.755	68.540	65.180	2.760
2.001	32.916	2194.4	2100	ClosedR-sq	68.540	65.180	1.260	68.390	65.165	1.125
2.002	2.100	420.0	600	Circular	68.390	65.165	2.625	68.390	65.160	2.630
1.008	2.100	420.0	600	Circular	68.390	65.160	2.630	68.390	65.155	2.635
1.009	33.657	2243.8	1800	ClosedR-sq	68.390	65.155	1.435	68.800	65.140	1.860
1.010	2.100	420.0	600	Circular	68.800	65.140	3.060	68.800	65.135	3.065
1.011	2.100	419.9	600	Circular	68.800	65.135	3.065	68.800	65.130	3.070
1.012	6.108	1221.5	1800	ClosedR-sq	68.800	65.130	1.870	68.920	65.125	1.995
1.013	2.100	420.0	600	Circular	68.920	65.125	3.195	68.920	65.120	3.200
1.014	2.100	420.0	600	Circular	68.920	65.120	3.200	68.920	65.115	3.205
1.015	15.929	1592.9	1800	ClosedR-sq	68.920	65.115	2.005	69.240	65.105	2.335

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
1.000	SW1.00	1200	Manhole	Adoptable	SW1.01	1200	Manhole	Adoptable
1.001	SW1.01	1200	Manhole	Adoptable	SW1.02	2100	Manhole	Adoptable
1.002	SW1.02	2100	Manhole	Adoptable	J3		Junction	
1.003	J3		Junction		J4		Junction	
1.004	J4		Junction		SW1.03	2100	Manhole	Adoptable
1.005	SW1.03	2100	Manhole	Adoptable	J5		Junction	
1.006	J5		Junction		J6		Junction	
1.007	J6		Junction		SW1.04	2400	Manhole	Adoptable
2.000	SW2.00	2100	Manhole	Adoptable	J7		Junction	
2.001	J7		Junction		J8		Junction	
2.002	J8		Junction		SW1.04	2400	Manhole	Adoptable
1.008	SW1.04	2400	Manhole	Adoptable	J9		Junction	
1.009	J9		Junction		J10		Junction	
1.010	J10		Junction		SW1.05	2100	Manhole	Adoptable
1.011	SW1.05	2100	Manhole	Adoptable	J11		Junction	
1.012	J11		Junction		J12		Junction	
1.013	J12		Junction		SW1.06	2100	Manhole	Adoptable
1.014	SW1.06	2100	Manhole	Adoptable	J13		Junction	
1.015	J13		Junction		J14		Junction	

Pipeline Schedule

Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
1.016	2.100	420.0	600	Circular	69.240	65.105	3.535	69.240	65.100	3.540
1.017	2.100	420.0	600	Circular	69.240	65.100	3.540	69.240	65.095	3.545
1.018	51.783	2589.2	1800	ClosedR-sq	69.240	65.095	2.345	68.780	65.075	1.905
1.019	2.100	420.1	600	Circular	68.780	65.075	3.105	68.780	65.070	3.110
1.020	21.291	212.9	300	Circular	68.780	65.070	3.410	68.640	64.970	3.370
1.021	15.019	187.7	300	Circular	68.640	64.970	3.370	68.110	64.890	2.920

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
1.016	J14		Junction		SW1.07	2100	Manhole	Adoptable
1.017	SW1.07	2100	Manhole	Adoptable	J15		Junction	
1.018	J15		Junction		J16		Junction	
1.019	J16		Junction		SW1.08-FC	2400	Manhole	Adoptable
1.020	SW1.08-FC	2400	Manhole	Adoptable	CW1.00	1200	Manhole	Adoptable
1.021	CW1.00	1200	Manhole	Adoptable	CW7901	1200	Manhole	Adoptable

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
SW1.00	379730.074	408170.150	70.520	2.320	1200				
						0	1.000	68.200	300
SW1.01	379744.802	408164.486	70.620	2.525	1200		1	1.000	68.095
						0	1.001	68.095	300
SW1.02	379766.497	408141.331	69.900	4.670	2100		1	1.001	67.880
						0	1.002	65.230	600
J3	379765.008	408139.850	69.900	4.675			1	1.002	65.225
						0	1.003	65.225	1800
J4	379752.018	408126.921	69.480	4.265			1	1.003	65.215
						0	1.004	65.215	600
SW1.03	379750.501	408125.470	69.480	4.270	2100		1	1.004	65.210
						0	1.005	65.210	600
J5	379751.981	408123.922	69.480	4.275			1	1.005	65.205
						0	1.006	65.205	1800
J6	379788.334	408086.816	68.390	3.225			1	1.006	65.165
						0	1.007	65.165	600

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
SW2.00	379816.266	408111.357	68.540	3.355	2100				
J7	379814.769	408109.884	68.540	3.360			0 2.000	65.185	600
J8	379791.308	408086.796	68.390	3.225			0 2.001	65.180	2100
SW1.04	379789.811	408085.323	68.390	3.230	2400		1 2.002	65.165	600
J9	379788.322	408083.842	68.390	3.235			2 1.007	65.160	600
J10	379764.452	408060.114	68.800	3.660			0 1.008	65.160	600
SW1.05	379762.962	408058.634	68.800	3.665	2100		1 1.008	65.155	600
J11	379762.275	408056.650	68.800	3.670			0 1.009	65.155	1800
J12	379760.275	408050.879	68.920	3.795			1 1.009	65.140	1800
SW1.06	379759.587	408048.895	68.920	3.800	2100		0 1.010	65.140	600
J13	379759.603	408046.795	68.920	3.805			1 1.010	65.135	600
J14	379759.719	408030.866	69.240	4.135			0 1.011	65.135	600
SW1.07	379759.734	408028.766	69.240	4.140	2100		1 1.011	65.130	600
							0 1.012	65.130	1800
							1 1.012	65.125	1800
							0 1.013	65.125	600
							1 1.013	65.120	600
							0 1.014	65.120	600
							1 1.014	65.115	600
							0 1.015	65.115	1800
							1 1.015	65.105	1800
							0 1.016	65.105	600
							1 1.016	65.100	600
							0 1.017	65.100	600

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)	
J15	379759.223	408026.729	69.240	4.145			1	1.017	65.095	600
J16	379746.612	407976.505	68.780	3.705			1	1.018	65.075	1800
SW1.08-FC	379746.100	407974.468	68.780	3.980	2400		1	1.019	65.075	600
CW1.00	379766.675	407968.994	68.640	3.670	1200		1	1.020	64.970	300
CW7901	379781.107	407964.836	68.110	3.220	1200		1	1.021	64.890	300

Simulation Settings

Rainfall Methodology	FEH-22	Drain Down Time (mins)	1440	100 year (l/s)	37.0
Summer CV	1.000	Additional Storage (m³/ha)	0.0	Check Discharge Volume	✓
Winter CV	1.000	Check Discharge Rate(s)	✓	100 year 360 minute (m³)	596
Analysis Speed	Detailed	2 year (l/s)	13.9		
Skip Steady State	✓	30 year (l/s)	29.1		

Storm Durations

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

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
2	0	0	0
30	0	0	0
30	40	0	0
100	0	0	0
100	45	0	0

Pre-development Discharge Rate

Site Makeup	Greenfield	Growth Factor 30 year	1.95
Greenfield Method	IH124	Growth Factor 100 year	2.48
Positively Drained Area (ha)	1.940	Betterment (%)	0
SAAR (mm)	1042	QBar	14.9
Soil Index	5	Q 2 year (l/s)	13.9
SPR	0.47	Q 30 year (l/s)	29.1
Region	10	Q 100 year (l/s)	37.0
Growth Factor 2 year	0.93		

Pre-development Discharge Volume

Site Makeup	Greenfield	Return Period (years)	100
Greenfield Method	FSR/FEH	Climate Change (%)	0
Positively Drained Area (ha)	1.940	Storm Duration (mins)	360
Soil Index	5	Betterment (%)	0
SPR	0.47	PR	0.508
CWI	125.105	Runoff Volume (m³)	596

Node SW1.08-FC Online StormBrake™ Control

Flap Valve	x	Design Flow (l/s)	5.0
Downstream Link	1.020	Product Code	FPM-SB1-02950-00500-1100
Replaces Downstream Link	✓	Min Outlet Diameter (m)	0.150
Invert Level (m)	65.070	Min Node Diameter (mm)	1200
Design Depth (m)	2.950		

Rainfall

Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)	Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)
2 year 15 minute summer	102.787	29.085	30 year 240 minute winter	27.936	11.112
2 year 15 minute winter	72.131	29.085	30 year 360 minute summer	31.785	8.179
2 year 30 minute summer	67.650	19.143	30 year 360 minute winter	20.661	8.179
2 year 30 minute winter	47.473	19.143	30 year 480 minute summer	24.902	6.581
2 year 60 minute summer	46.345	12.248	30 year 480 minute winter	16.544	6.581
2 year 60 minute winter	30.790	12.248	30 year 600 minute summer	20.344	5.564
2 year 120 minute summer	31.651	8.364	30 year 600 minute winter	13.900	5.564
2 year 120 minute winter	21.028	8.364	30 year 720 minute summer	18.119	4.856
2 year 180 minute summer	25.444	6.548	30 year 720 minute winter	12.177	4.856
2 year 180 minute winter	16.539	6.548	30 year 960 minute summer	14.918	3.928
2 year 240 minute summer	20.680	5.465	30 year 960 minute winter	9.882	3.928
2 year 240 minute winter	13.739	5.465	30 year 1440 minute summer	10.931	2.930
2 year 360 minute summer	16.334	4.203	30 year 1440 minute winter	7.346	2.930
2 year 360 minute winter	10.618	4.203	30 year +40% CC 15 minute summer	358.149	101.344
2 year 480 minute summer	13.121	3.468	30 year +40% CC 15 minute winter	251.333	101.344
2 year 480 minute winter	8.718	3.468	30 year +40% CC 30 minute summer	240.928	68.174
2 year 600 minute summer	10.895	2.980	30 year +40% CC 30 minute winter	169.072	68.174
2 year 600 minute winter	7.444	2.980	30 year +40% CC 60 minute summer	166.062	43.885
2 year 720 minute summer	9.814	2.630	30 year +40% CC 60 minute winter	110.327	43.885
2 year 720 minute winter	6.595	2.630	30 year +40% CC 120 minute summer	99.190	26.213
2 year 960 minute summer	8.192	2.157	30 year +40% CC 120 minute winter	65.899	26.213
2 year 960 minute winter	5.427	2.157	30 year +40% CC 180 minute summer	75.109	19.328
2 year 1440 minute summer	6.108	1.637	30 year +40% CC 180 minute winter	48.823	19.328
2 year 1440 minute winter	4.105	1.637	30 year +40% CC 240 minute summer	58.868	15.557
30 year 15 minute summer	255.821	72.388	30 year +40% CC 240 minute winter	39.110	15.557
30 year 15 minute winter	179.523	72.388	30 year +40% CC 360 minute summer	44.499	11.451
30 year 30 minute summer	172.091	48.696	30 year +40% CC 360 minute winter	28.925	11.451
30 year 30 minute winter	120.766	48.696	30 year +40% CC 480 minute summer	34.863	9.213
30 year 60 minute summer	118.615	31.347	30 year +40% CC 480 minute winter	23.162	9.213
30 year 60 minute winter	78.805	31.347	30 year +40% CC 600 minute summer	28.481	7.790
30 year 120 minute summer	70.850	18.724	30 year +40% CC 600 minute winter	19.460	7.790
30 year 120 minute winter	47.071	18.724	30 year +40% CC 720 minute summer	25.366	6.798
30 year 180 minute summer	53.650	13.806	30 year +40% CC 720 minute winter	17.048	6.798
30 year 180 minute winter	34.874	13.806	30 year +40% CC 960 minute summer	20.886	5.500
30 year 240 minute summer	42.049	11.112	30 year +40% CC 960 minute winter	13.835	5.500

Rainfall

Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)	Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)
30 year +40% CC 1440 minute summer	15.304	4.102	100 year 1440 minute winter	9.263	3.694
30 year +40% CC 1440 minute winter	10.285	4.102	100 year +45% CC 15 minute summer	464.439	131.420
100 year 15 minute summer	320.303	90.635	100 year +45% CC 15 minute winter	325.922	131.420
100 year 15 minute winter	224.774	90.635	100 year +45% CC 30 minute summer	316.925	89.679
100 year 30 minute summer	218.569	61.847	100 year +45% CC 30 minute winter	222.403	89.679
100 year 30 minute winter	153.382	61.847	100 year +45% CC 60 minute summer	220.397	58.244
100 year 60 minute summer	151.998	40.169	100 year +45% CC 60 minute winter	146.426	58.244
100 year 60 minute winter	100.984	40.169	100 year +45% CC 120 minute summer	128.932	34.073
100 year 120 minute summer	88.919	23.499	100 year +45% CC 120 minute winter	85.660	34.073
100 year 120 minute winter	59.076	23.499	100 year +45% CC 180 minute summer	96.857	24.925
100 year 180 minute summer	66.798	17.189	100 year +45% CC 180 minute winter	62.960	24.925
100 year 180 minute winter	43.421	17.189	100 year +45% CC 240 minute summer	75.594	19.977
100 year 240 minute summer	52.134	13.777	100 year +45% CC 240 minute winter	50.223	19.977
100 year 240 minute winter	34.637	13.777	100 year +45% CC 360 minute summer	56.882	14.638
100 year 360 minute summer	39.229	10.095	100 year +45% CC 360 minute winter	36.975	14.638
100 year 360 minute winter	25.500	10.095	100 year +45% CC 480 minute summer	44.618	11.791
100 year 480 minute summer	30.771	8.132	100 year +45% CC 480 minute winter	29.643	11.791
100 year 480 minute winter	20.444	8.132	100 year +45% CC 600 minute summer	36.547	9.997
100 year 600 minute summer	25.205	6.894	100 year +45% CC 600 minute winter	24.971	9.997
100 year 600 minute winter	17.222	6.894	100 year +45% CC 720 minute summer	32.651	8.751
100 year 720 minute summer	22.518	6.035	100 year +45% CC 720 minute winter	21.943	8.751
100 year 720 minute winter	15.133	6.035	100 year +45% CC 960 minute summer	27.029	7.117
100 year 960 minute summer	18.641	4.909	100 year +45% CC 960 minute winter	17.904	7.117
100 year 960 minute winter	12.348	4.909	100 year +45% CC 1440 minute summer	19.985	5.356
100 year 1440 minute summer	13.783	3.694	100 year +45% CC 1440 minute winter	13.431	5.356

Results for 2 year Critical Storm Duration. Lowest mass balance: 86.38%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	SW1.00	10	68.351	0.151	39.6	0.1711	0.0000	OK
15 minute summer	SW1.01	10	68.244	0.149	42.5	0.1682	0.0000	OK
720 minute summer	SW1.02	570	65.596	0.366	9.5	1.2672	0.0000	OK
720 minute summer	J3	570	65.596	0.371	9.3	0.0000	0.0000	OK
720 minute summer	J4	570	65.596	0.381	8.2	0.0000	0.0000	OK
720 minute summer	SW1.03	570	65.596	0.386	13.1	1.3365	0.0000	OK
720 minute summer	J5	570	65.596	0.391	12.8	0.0000	0.0000	OK
720 minute summer	J6	600	65.596	0.431	9.9	0.0000	0.0000	OK
720 minute summer	SW2.00	600	65.596	0.411	3.9	1.4231	0.0000	OK
720 minute summer	J7	600	65.596	0.416	3.7	0.0000	0.0000	OK
720 minute summer	J8	600	65.596	0.431	1.9	0.0000	0.0000	OK
720 minute summer	SW1.04	600	65.596	0.436	9.4	1.9717	0.0000	OK
720 minute summer	J9	600	65.596	0.441	9.1	0.0000	0.0000	OK
720 minute summer	J10	600	65.596	0.456	7.2	0.0000	0.0000	OK
720 minute summer	SW1.05	600	65.596	0.461	5.3	1.5963	0.0000	OK
720 minute summer	J11	600	65.596	0.466	5.0	0.0000	0.0000	OK
720 minute summer	J12	600	65.596	0.471	4.6	0.0000	0.0000	OK
720 minute summer	SW1.06	600	65.596	0.476	7.6	1.6483	0.0000	OK
720 minute summer	J13	600	65.596	0.481	7.4	0.0000	0.0000	OK
720 minute summer	J14	600	65.596	0.491	6.4	0.0000	0.0000	OK
720 minute summer	SW1.07	600	65.596	0.496	8.8	1.7175	0.0000	OK
720 minute summer	J15	570	65.596	0.501	8.5	0.0000	0.0000	OK
720 minute summer	J16	570	65.596	0.521	5.7	0.0000	0.0000	OK
720 minute summer	SW1.08-FC	570	65.596	0.526	4.1	2.3788	0.0000	SURCHARGED
180 minute winter	CW1.00	364	65.015	0.045	3.8	0.0512	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	SW1.00	1.000	SW1.01	39.3	1.118	0.434	0.5556	
15 minute summer	SW1.01	1.001	SW1.02	41.9	1.247	0.459	1.0659	
720 minute summer	SW1.02	1.002	J3	9.3	0.552	0.028	0.3809	
720 minute summer	J3	1.003	J4	8.2	0.042	0.002	14.4721	
720 minute summer	J4	1.004	SW1.03	7.2	0.339	0.021	0.3989	
720 minute summer	SW1.03	1.005	J5	12.8	0.880	0.039	0.4132	
720 minute summer	J5	1.006	J6	9.9	0.064	0.002	44.8374	
720 minute summer	J6	1.007	SW1.04	7.0	0.321	0.021	0.4577	
720 minute summer	SW2.00	2.000	J7	3.7	0.469	0.011	0.4348	
720 minute summer	J7	2.001	J8	1.8	0.049	0.000	29.2629	
720 minute summer	J8	2.002	SW1.04	0.6	0.119	0.002	0.4577	
720 minute summer	SW1.04	1.008	J9	9.1	0.722	0.027	0.4633	
720 minute summer	J9	1.009	J10	7.2	0.044	0.002	31.7033	
720 minute summer	J10	1.010	SW1.05	5.3	0.343	0.016	0.4851	
720 minute summer	SW1.05	1.011	J11	5.0	0.407	0.015	0.4904	
720 minute summer	J11	1.012	J12	4.6	0.032	0.001	6.0100	
720 minute summer	J12	1.013	SW1.06	4.2	0.338	0.013	0.5008	
720 minute summer	SW1.06	1.014	J13	7.4	0.522	0.022	0.5059	
720 minute summer	J13	1.015	J14	6.4	0.037	0.001	16.2590	
720 minute summer	J14	1.016	SW1.07	5.5	0.370	0.016	0.5206	
720 minute summer	SW1.07	1.017	J15	8.5	0.728	0.026	0.5254	
720 minute summer	J15	1.018	J16	5.7	0.051	0.002	55.5747	
720 minute summer	J16	1.019	SW1.08-FC	3.8	0.186	0.011	0.5476	
720 minute summer	SW1.08-FC	StormBrake™	CW1.00	3.8				
180 minute winter	CW1.00	1.021	CW7901	3.8	0.586	0.047	0.0980	213.7

Results for 2 year Critical Storm Duration. Lowest mass balance: 86.38%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
180 minute winter	CW7901	364	64.934	0.044	3.8	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
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Results for 30 year Critical Storm Duration. Lowest mass balance: 86.38%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	SW1.00	10	68.621	0.421	98.6	0.4758	0.0000	SURCHARGED
15 minute summer	SW1.01	11	68.449	0.354	104.9	0.4001	0.0000	SURCHARGED
960 minute winter	SW1.02	930	66.193	0.963	9.6	3.3358	0.0000	SURCHARGED
960 minute winter	J3	930	66.193	0.968	9.4	0.0000	0.0000	OK
960 minute winter	J4	930	66.193	0.978	8.3	0.0000	0.0000	SURCHARGED
960 minute winter	SW1.03	930	66.193	0.983	13.1	3.4050	0.0000	SURCHARGED
960 minute winter	J5	930	66.193	0.988	12.8	0.0000	0.0000	OK
960 minute winter	J6	930	66.193	1.028	9.9	0.0000	0.0000	SURCHARGED
960 minute winter	SW2.00	930	66.193	1.008	4.0	3.4916	0.0000	SURCHARGED
960 minute winter	J7	930	66.193	1.013	3.8	0.0000	0.0000	OK
960 minute winter	J8	930	66.193	1.028	1.9	0.0000	0.0000	SURCHARGED
960 minute winter	SW1.04	930	66.193	1.033	9.3	4.6732	0.0000	SURCHARGED
960 minute winter	J9	930	66.193	1.038	9.0	0.0000	0.0000	OK
960 minute winter	J10	930	66.193	1.053	7.1	0.0000	0.0000	SURCHARGED
960 minute winter	SW1.05	930	66.193	1.058	5.2	3.6648	0.0000	SURCHARGED
960 minute winter	J11	930	66.193	1.063	5.0	0.0000	0.0000	OK
960 minute winter	J12	930	66.193	1.068	4.5	0.0000	0.0000	SURCHARGED
960 minute winter	SW1.06	930	66.193	1.073	7.4	3.7168	0.0000	SURCHARGED
960 minute winter	J13	930	66.193	1.078	7.2	0.0000	0.0000	OK
960 minute winter	J14	930	66.193	1.088	6.3	0.0000	0.0000	SURCHARGED
960 minute winter	SW1.07	930	66.193	1.093	8.6	3.7861	0.0000	SURCHARGED
960 minute winter	J15	930	66.193	1.098	8.4	0.0000	0.0000	OK
960 minute winter	J16	930	66.193	1.118	5.5	0.0000	0.0000	SURCHARGED
960 minute winter	SW1.08-FC	930	66.193	1.123	4.0	5.0803	0.0000	SURCHARGED
15 minute winter	CW1.00	241	65.015	0.045	3.8	0.0512	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	SW1.00	1.000	SW1.01	97.0	1.378	1.071	1.1112	
15 minute summer	SW1.01	1.001	SW1.02	103.8	1.489	1.137	2.1102	
960 minute winter	SW1.02	1.002	J3	9.4	0.576	0.028	0.5915	
960 minute winter	J3	1.003	J4	8.3	0.034	0.002	37.4669	
960 minute winter	J4	1.004	SW1.03	7.2	0.291	0.021	0.5912	
960 minute winter	SW1.03	1.005	J5	12.8	0.783	0.039	0.6034	
960 minute winter	J5	1.006	J6	9.9	0.061	0.002	110.0102	
960 minute winter	J6	1.007	SW1.04	6.9	0.340	0.021	0.5915	
960 minute winter	SW2.00	2.000	J7	3.8	0.515	0.011	0.5915	
960 minute winter	J7	2.001	J8	1.9	0.029	0.000	70.5401	
960 minute winter	J8	2.002	SW1.04	0.7	0.102	0.002	0.5915	
960 minute winter	SW1.04	1.008	J9	9.0	0.657	0.027	0.5915	
960 minute winter	J9	1.009	J10	7.1	0.048	0.002	73.9298	
960 minute winter	J10	1.010	SW1.05	5.2	0.380	0.016	0.5915	
960 minute winter	SW1.05	1.011	J11	5.0	0.418	0.015	0.5915	
960 minute winter	J11	1.012	J12	4.5	0.038	0.001	13.6732	
960 minute winter	J12	1.013	SW1.06	4.1	0.372	0.012	0.5915	
960 minute winter	SW1.06	1.014	J13	7.2	0.531	0.022	0.5915	
960 minute winter	J13	1.015	J14	6.3	0.042	0.001	36.2439	
960 minute winter	J14	1.016	SW1.07	5.3	0.352	0.016	0.5915	
960 minute winter	SW1.07	1.017	J15	8.4	0.782	0.025	0.5915	
960 minute winter	J15	1.018	J16	5.5	0.050	0.001	120.5435	
960 minute winter	J16	1.019	SW1.08-FC	3.6	0.149	0.011	0.5915	
960 minute winter	SW1.08-FC	StormBrake™	CW1.00	3.8				
15 minute winter	CW1.00	1.021	CW7901	3.8	0.586	0.047	0.0980	196.4

Results for 30 year Critical Storm Duration. Lowest mass balance: 86.38%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	CW7901	241	64.934	0.044	3.8	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
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Results for 30 year +40% CC Critical Storm Duration. Lowest mass balance: 86.38%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	SW1.00	10	69.163	0.963	138.0	1.0895	0.0000	SURCHARGED
15 minute summer	SW1.01	10	68.819	0.724	146.9	0.8193	0.0000	SURCHARGED
1440 minute winter	SW1.02	1380	66.750	1.520	9.9	5.2659	0.0000	SURCHARGED
1440 minute winter	J3	1380	66.750	1.525	9.7	0.0000	0.0000	OK
1440 minute winter	J4	1380	66.750	1.535	8.5	0.0000	0.0000	SURCHARGED
1440 minute winter	SW1.03	1380	66.750	1.540	13.5	5.3352	0.0000	SURCHARGED
1440 minute winter	J5	1380	66.750	1.545	13.3	0.0000	0.0000	OK
1440 minute winter	J6	1380	66.750	1.585	10.1	0.0000	0.0000	SURCHARGED
1440 minute winter	SW2.00	1380	66.750	1.565	4.1	5.4218	0.0000	SURCHARGED
1440 minute winter	J7	1380	66.750	1.570	3.9	0.0000	0.0000	OK
1440 minute winter	J8	1380	66.750	1.585	2.0	0.0000	0.0000	SURCHARGED
1440 minute winter	SW1.04	1380	66.750	1.590	9.5	7.1940	0.0000	SURCHARGED
1440 minute winter	J9	1380	66.750	1.595	9.0	0.0000	0.0000	OK
1440 minute winter	J10	1380	66.750	1.610	7.0	0.0000	0.0000	SURCHARGED
1440 minute winter	SW1.05	1380	66.750	1.615	4.9	5.5950	0.0000	SURCHARGED
1440 minute winter	J11	1380	66.750	1.620	4.7	0.0000	0.0000	OK
1440 minute winter	J12	1380	66.750	1.625	4.3	0.0000	0.0000	SURCHARGED
1440 minute winter	SW1.06	1380	66.750	1.630	7.3	5.6469	0.0000	SURCHARGED
1440 minute winter	J13	1380	66.750	1.635	7.1	0.0000	0.0000	OK
1440 minute winter	J14	1380	66.750	1.645	6.2	0.0000	0.0000	SURCHARGED
1440 minute winter	SW1.07	1380	66.750	1.650	8.6	5.7162	0.0000	SURCHARGED
1440 minute winter	J15	1380	66.750	1.655	8.4	0.0000	0.0000	OK
1440 minute winter	J16	1380	66.750	1.675	5.3	0.0000	0.0000	SURCHARGED
1440 minute winter	SW1.08-FC	1380	66.750	1.680	4.0	7.6010	0.0000	SURCHARGED
1440 minute winter	CW1.00	1380	65.016	0.046	4.0	0.0525	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	SW1.00	1.000	SW1.01	135.8	1.929	1.500	1.1112	
15 minute summer	SW1.01	1.001	SW1.02	145.5	2.066	1.593	2.2011	
1440 minute winter	SW1.02	1.002	J3	9.7	0.495	0.029	0.5915	
1440 minute winter	J3	1.003	J4	8.5	0.029	0.002	58.9232	
1440 minute winter	J4	1.004	SW1.03	7.4	0.291	0.022	0.5912	
1440 minute winter	SW1.03	1.005	J5	13.3	0.868	0.040	0.6034	
1440 minute winter	J5	1.006	J6	10.1	0.062	0.002	170.8224	
1440 minute winter	J6	1.007	SW1.04	7.0	0.345	0.021	0.5915	
1440 minute winter	SW2.00	2.000	J7	3.9	0.472	0.012	0.5915	
1440 minute winter	J7	2.001	J8	1.9	0.029	0.000	109.0560	
1440 minute winter	J8	2.002	SW1.04	0.6	0.089	0.002	0.5915	
1440 minute winter	SW1.04	1.008	J9	9.0	0.636	0.027	0.5915	
1440 minute winter	J9	1.009	J10	7.0	0.045	0.002	113.3313	
1440 minute winter	J10	1.010	SW1.05	4.9	0.373	0.015	0.5915	
1440 minute winter	SW1.05	1.011	J11	4.7	0.410	0.014	0.5915	
1440 minute winter	J11	1.012	J12	4.3	0.037	0.001	20.8237	
1440 minute winter	J12	1.013	SW1.06	3.9	0.367	0.012	0.5915	
1440 minute winter	SW1.06	1.014	J13	7.1	0.556	0.021	0.5915	
1440 minute winter	J13	1.015	J14	6.2	0.043	0.001	54.8916	
1440 minute winter	J14	1.016	SW1.07	5.2	0.387	0.016	0.5915	
1440 minute winter	SW1.07	1.017	J15	8.4	0.750	0.025	0.5915	
1440 minute winter	J15	1.018	J16	5.3	0.043	0.001	181.1643	
1440 minute winter	J16	1.019	SW1.08-FC	4.0	0.139	0.012	0.5915	
1440 minute winter	SW1.08-FC	StormBrake™	CW1.00	4.0				
1440 minute winter	CW1.00	1.021	CW7901	4.0	0.594	0.050	0.1014	598.5

Results for 30 year +40% CC Critical Storm Duration. Lowest mass balance: 86.38%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
1440 minute winter	CW7901	1380	64.935	0.045	4.0	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
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Results for 100 year Critical Storm Duration. Lowest mass balance: 86.38%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	SW1.00	10	68.938	0.738	123.5	0.8352	0.0000	SURCHARGED
15 minute summer	SW1.01	10	68.663	0.568	131.5	0.6423	0.0000	SURCHARGED
1440 minute winter	SW1.02	1380	66.563	1.333	9.1	4.6186	0.0000	SURCHARGED
1440 minute winter	J3	1380	66.563	1.338	8.9	0.0000	0.0000	OK
1440 minute winter	J4	1380	66.563	1.348	7.9	0.0000	0.0000	SURCHARGED
1440 minute winter	SW1.03	1380	66.563	1.353	12.3	4.6879	0.0000	SURCHARGED
1440 minute winter	J5	1380	66.563	1.358	12.2	0.0000	0.0000	OK
1440 minute winter	J6	1380	66.563	1.398	9.3	0.0000	0.0000	SURCHARGED
1440 minute winter	SW2.00	1380	66.563	1.378	3.7	4.7744	0.0000	SURCHARGED
1440 minute winter	J7	1380	66.563	1.383	3.5	0.0000	0.0000	OK
1440 minute winter	J8	1380	66.563	1.398	1.8	0.0000	0.0000	SURCHARGED
1440 minute winter	SW1.04	1380	66.563	1.403	8.7	6.3486	0.0000	SURCHARGED
1440 minute winter	J9	1380	66.563	1.408	8.3	0.0000	0.0000	OK
1440 minute winter	J10	1380	66.563	1.423	6.5	0.0000	0.0000	SURCHARGED
1440 minute winter	SW1.05	1380	66.563	1.428	4.6	4.9476	0.0000	SURCHARGED
1440 minute winter	J11	1380	66.563	1.433	4.4	0.0000	0.0000	OK
1440 minute winter	J12	1380	66.563	1.438	4.1	0.0000	0.0000	SURCHARGED
1440 minute winter	SW1.06	1380	66.563	1.443	6.8	4.9996	0.0000	SURCHARGED
1440 minute winter	J13	1380	66.563	1.448	6.7	0.0000	0.0000	OK
1440 minute winter	J14	1380	66.563	1.458	5.7	0.0000	0.0000	SURCHARGED
1440 minute winter	SW1.07	1380	66.563	1.463	7.9	5.0689	0.0000	SURCHARGED
1440 minute winter	J15	1380	66.563	1.468	7.7	0.0000	0.0000	OK
1440 minute winter	J16	1380	66.563	1.488	5.1	0.0000	0.0000	SURCHARGED
1440 minute winter	SW1.08-FC	1380	66.563	1.493	4.0	6.7556	0.0000	SURCHARGED
15 minute winter	CW1.00	464	65.015	0.045	3.8	0.0512	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	SW1.00	1.000	SW1.01	121.6	1.727	1.342	1.1112	
15 minute summer	SW1.01	1.001	SW1.02	129.9	1.846	1.423	2.1796	
1440 minute winter	SW1.02	1.002	J3	8.9	0.488	0.027	0.5915	
1440 minute winter	J3	1.003	J4	7.9	0.030	0.002	51.7272	
1440 minute winter	J4	1.004	SW1.03	6.8	0.288	0.020	0.5912	
1440 minute winter	SW1.03	1.005	J5	12.2	0.779	0.037	0.6034	
1440 minute winter	J5	1.006	J6	9.3	0.058	0.002	150.4272	
1440 minute winter	J6	1.007	SW1.04	6.4	0.338	0.019	0.5915	
1440 minute winter	SW2.00	2.000	J7	3.5	0.472	0.011	0.5915	
1440 minute winter	J7	2.001	J8	1.7	0.030	0.000	96.1385	
1440 minute winter	J8	2.002	SW1.04	0.6	0.089	0.002	0.5915	
1440 minute winter	SW1.04	1.008	J9	8.3	0.622	0.025	0.5915	
1440 minute winter	J9	1.009	J10	6.5	0.044	0.002	100.1169	
1440 minute winter	J10	1.010	SW1.05	4.6	0.370	0.014	0.5915	
1440 minute winter	SW1.05	1.011	J11	4.4	0.399	0.013	0.5915	
1440 minute winter	J11	1.012	J12	4.1	0.037	0.001	18.4256	
1440 minute winter	J12	1.013	SW1.06	3.8	0.353	0.011	0.5915	
1440 minute winter	SW1.06	1.014	J13	6.7	0.553	0.020	0.5915	
1440 minute winter	J13	1.015	J14	5.7	0.039	0.001	48.6375	
1440 minute winter	J14	1.016	SW1.07	4.9	0.362	0.015	0.5915	
1440 minute winter	SW1.07	1.017	J15	7.7	0.684	0.023	0.5915	
1440 minute winter	J15	1.018	J16	5.1	0.037	0.001	160.8334	
1440 minute winter	J16	1.019	SW1.08-FC	3.8	0.134	0.011	0.5915	
1440 minute winter	SW1.08-FC	StormBrake™	CW1.00	3.8				
15 minute winter	CW1.00	1.021	CW7901	3.8	0.586	0.047	0.0980	245.7

Results for 100 year Critical Storm Duration. Lowest mass balance: 86.38%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	CW7901	464	64.934	0.044	3.8	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
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Results for 100 year +45% CC Critical Storm Duration. Lowest mass balance: 86.38%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	SW1.00	10	69.830	1.630	179.0	1.8439	0.0000	SURCHARGED
15 minute summer	SW1.01	10	69.257	1.162	190.0	1.3143	0.0000	SURCHARGED
1440 minute winter	SW1.02	1020	68.095	2.865	21.4	9.9241	0.0000	SURCHARGED
1440 minute winter	J3	1020	68.097	2.872	16.3	0.0000	0.0000	SURCHARGED
1440 minute winter	J4	1020	68.091	2.876	16.6	0.0000	0.0000	SURCHARGED
1440 minute winter	SW1.03	1020	68.093	2.883	21.7	9.9874	0.0000	SURCHARGED
1440 minute winter	J5	1020	68.091	2.886	22.6	0.0000	0.0000	SURCHARGED
1440 minute winter	J6	1020	68.089	2.924	21.9	0.0000	0.0000	SURCHARGED
1440 minute winter	SW2.00	1020	68.102	2.917	18.2	10.1057	0.0000	SURCHARGED
1440 minute winter	J7	1020	68.097	2.917	24.9	0.0000	0.0000	SURCHARGED
1440 minute winter	J8	1020	68.094	2.929	25.1	0.0000	0.0000	FLOOD RISK
1440 minute winter	SW1.04	1020	68.089	2.929	30.2	13.2519	0.0000	SURCHARGED
1440 minute winter	J9	1020	68.094	2.939	37.2	0.0000	0.0000	FLOOD RISK
1440 minute winter	J10	1020	68.096	2.956	31.0	0.0000	0.0000	SURCHARGED
1440 minute winter	SW1.05	1020	68.100	2.965	29.7	10.2708	0.0000	SURCHARGED
600 minute winter	J11	570	67.793	2.663	11.5	0.0000	0.0000	SURCHARGED
1440 minute winter	J12	1020	68.633	3.508	16.5	0.0000	0.0000	FLOOD RISK
1440 minute winter	SW1.06	1020	68.073	2.953	21.5	10.2305	0.0000	SURCHARGED
1440 minute winter	J13	1020	68.081	2.966	16.8	0.0000	0.0000	SURCHARGED
1440 minute winter	J14	1020	68.079	2.974	20.0	0.0000	0.0000	SURCHARGED
1440 minute winter	SW1.07	1020	68.077	2.977	24.9	10.3121	0.0000	SURCHARGED
1440 minute winter	J15	1020	68.076	2.981	15.5	0.0000	0.0000	SURCHARGED
1440 minute winter	J16	1020	68.075	3.000	13.4	0.0000	0.0000	SURCHARGED
1440 minute winter	SW1.08-FC	1020	68.075	3.005	12.5	13.5964	0.0000	SURCHARGED
1440 minute winter	CW1.00	1020	65.022	0.052	5.0	0.0588	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	SW1.00	1.000	SW1.01	175.6	2.494	1.939	1.1112	
15 minute summer	SW1.01	1.001	SW1.02	188.3	2.675	2.063	2.2119	
1440 minute winter	SW1.02	1.002	J3	-16.5	0.484	-0.049	0.5915	
1440 minute winter	J3	1.003	J4	16.6	0.033	0.004	69.3445	
1440 minute winter	J4	1.004	SW1.03	20.2	0.312	0.060	0.5912	
1440 minute winter	SW1.03	1.005	J5	22.6	0.817	0.068	0.6034	
1440 minute winter	J5	1.006	J6	21.9	0.060	0.004	196.5391	
1440 minute winter	J6	1.007	SW1.04	25.0	0.351	0.075	0.5915	
1440 minute winter	SW2.00	2.000	J7	24.9	0.514	0.075	0.5915	
1440 minute winter	J7	2.001	J8	25.1	0.026	0.005	145.2265	
1440 minute winter	J8	2.002	SW1.04	20.0	0.121	0.060	0.5915	
1440 minute winter	SW1.04	1.008	J9	37.2	0.609	0.111	0.5915	
1440 minute winter	J9	1.009	J10	31.0	0.052	0.008	127.3422	
1440 minute winter	J10	1.010	SW1.05	29.7	0.401	0.089	0.5915	
1440 minute winter	SW1.05	1.011	J11	100.6	0.429	0.301	0.5915	
600 minute winter	J11	1.012	J12	7.9	0.051	0.001	23.1098	
1440 minute winter	J12	1.013	SW1.06	21.5	0.377	0.064	0.5915	
1440 minute winter	SW1.06	1.014	J13	16.8	0.530	0.050	0.5915	
1440 minute winter	J13	1.015	J14	20.0	0.043	0.004	60.2678	
1440 minute winter	J14	1.016	SW1.07	24.0	0.326	0.072	0.5915	
1440 minute winter	SW1.07	1.017	J15	-14.4	0.743	-0.043	0.5915	
1440 minute winter	J15	1.018	J16	-15.5	0.056	-0.004	195.9224	
1440 minute winter	J16	1.019	SW1.08-FC	-12.6	0.121	-0.038	0.5915	
1440 minute winter	SW1.08-FC	StormBrake™	CW1.00	5.0				
1440 minute winter	CW1.00	1.021	CW7901	5.0	0.633	0.062	0.1194	654.9

Results for 100 year +45% CC Critical Storm Duration. Lowest mass balance: 86.38%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
1440 minute winter	CW7901	1020	64.940	0.050	5.0	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
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StormBrake™

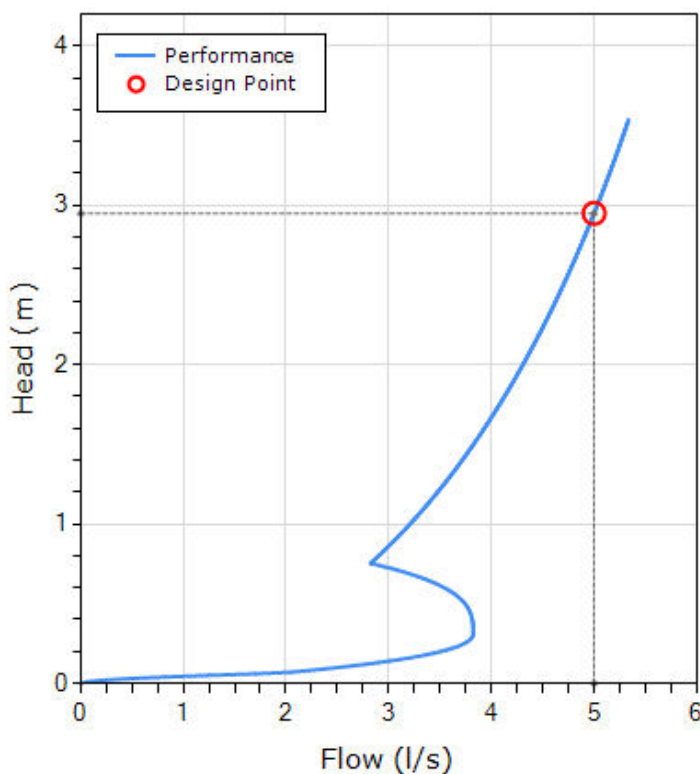
Performance Report



Contractor: Dudleys Consulting Engineers
Site: 24344
Date: 25/10/2024
Created By: Jonathan Allchin
Device Ref: FPM-SB1-02950-00500-0100

Head(m): 2.95
Flow(l/s): 5
Chamber Ref: SW1.08-FC
Mounting Style: LUGS (Default)

StormBrake™ Performance



Head (m)	Flow (l/s)
0	0.00
0.12	2.80
0.24	3.72
0.37	3.82
0.49	3.76
0.61	3.51
0.73	2.96
0.85	2.99
0.98	3.17
1.1	3.34
1.22	3.50
1.34	3.65
1.46	3.79
1.59	3.92
1.71	4.04
1.83	4.16
1.95	4.27
2.07	4.37
2.2	4.47
2.32	4.57
2.44	4.66
2.56	4.74
2.68	4.83
2.81	4.91
2.93	4.99
3.05	5.06
3.17	5.13
3.29	5.20
3.42	5.27
3.54	5.34

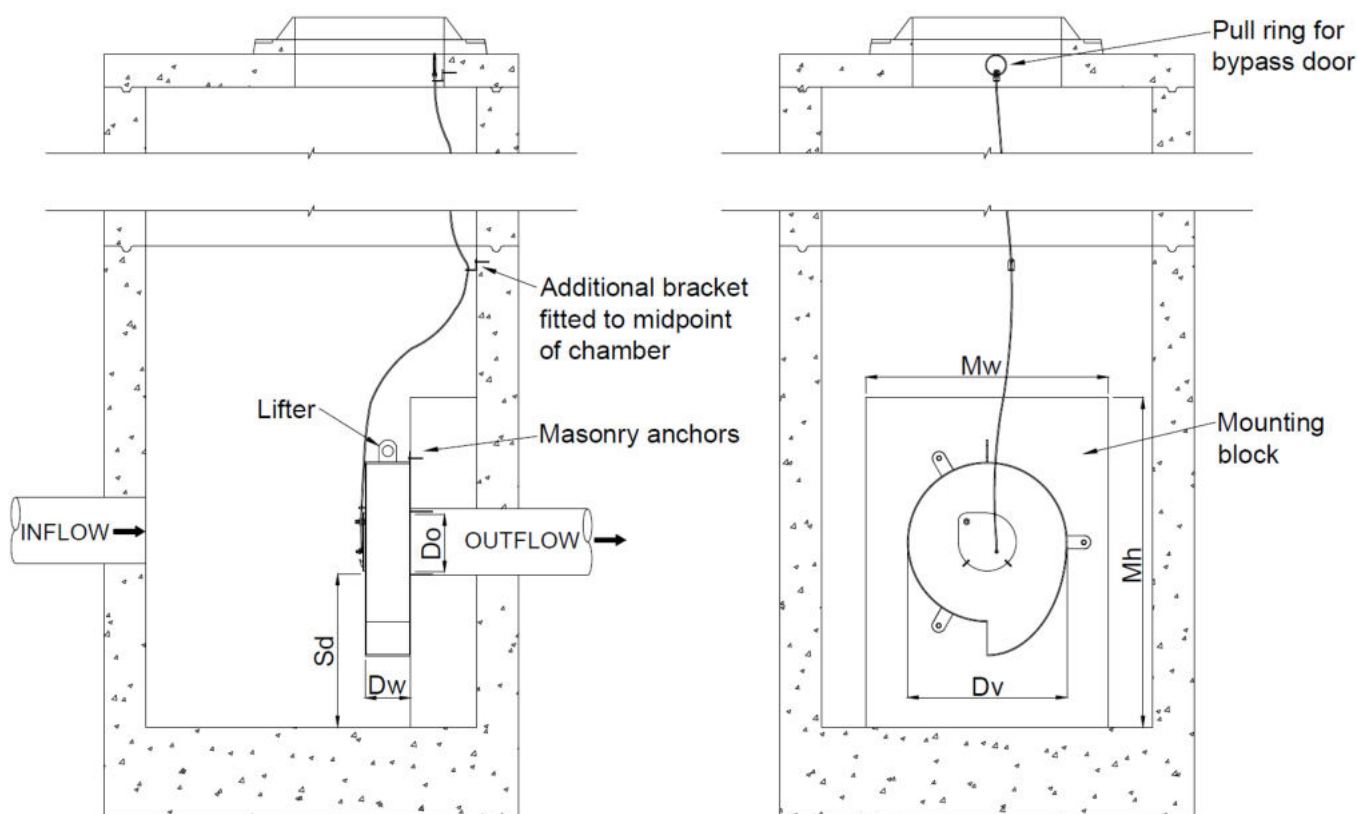
	Head (m)	Flow (l/s)
Design Point	2.95	5.00
Flush Flow	0.31	3.82
Kick Back	0.75	2.82

	Dims (mm)
Min. Chamber Diameter	1200
Min. Outlet Pipe Diameter	150
Min. Sump Depth	270

The unique performance characteristics of this StormBrake™ are derived from extensive dynamic modelling using parametric experimental testing and computational fluid dynamics.

INSTALLATION INSTRUCTIONS

1. Position the StormBrake™ so that the inlet is at the bottom and the device outlet is in line with the chamber outlet pipe.
2. Mark the locations of the mounting points on the chamber/mounting wall.
3. Using the marked locations, drill holes to the required thickness and depth for the supplied masonry anchors (M10 throughbolts require 11 mm holes). Fit the bolts to the holes.
4. Attach the StormBrake™ to the anchor points, ensuring the neoprene gasket is flush with the chamber wall, and fasten the device by tightening the bolts. This will compress the neoprene gasket to provide a watertight seal between the StormBrake™ and the wall.
5. Fix the stainless steel wire cable from the front bypass door to the underside of the manhole cover, vertically above the device. A secondary bracket is supplied and should be fitted halfway up the chamber to guide the bypass door cable to the top.
6. Adjust the length of the bypass door cable accordingly, so that it reaches the ground level whilst ensuring the bypass door can open if required. Ensure the bypass door is closed for normal operating conditions.



Geometry	Annotation	(mm)
Device Vortex Diameter	Dv	436
Device Width	Dw	96
Device Orifice	Do	87
Sump Depth (outlet Ø150mm)	Sd	270
Mounting Block Width	Mw	680
Mounting Block Height	Mh	730

Dimensions quoted are minimum values based on the geometry of this unique StormBrake™ unit. These ensure the device can be fitted to the flow control chamber without restriction and meet the performance specification.



APPENDIX F – NORTH WEST SUDS PROFORMA

NORTH WEST SuDS PRO-FORMA

This pro-forma is a requirement for any planning application for major development.

It supports applicants in summarising and confirming how surface water from a development will be managed sustainably under current and future conditions.

Your sustainable drainage system should be designed in accordance with [CIRIA The SuDS Manual C753](#) and any necessary adoption standards.

HOW TO COMPLETE

Blue Box	Instruction/ Question
Orange Box	Evidence Required
White Box	To be completed by Developer / Consultant

1. Complete ALL white boxes
2. Submit this pro-forma to the Local Planning Authority, along with:
 - Sustainable Drainage Strategy
 - Site Specific Flood Risk Assessment (if required)
 - Minimum supporting evidence, as indicated in orange boxes of this pro-forma.

GUIDANCE TO SUPPORT YOU

The pro-forma should be completed in conjunction with ‘Completing your SuDS Pro Forma Guide.’

The pro-forma can be completed using freely available tools such as [Tools for Sustainable Drainage Systems](#) or appropriate industry standard surface water management design software.

SECTION 1. APPLICATION & DEVELOPMENT DETAILS

Planning Application Reference (if available)		
State type of planning application i.e. Pre-application, Outline, Full, Hybrid, Reserved Matters* *Information only required if drainage is to be considered as part of reserved matters application		Full
Developer(s) Name:		Westchurch Homes
Consultant(s) Name:		Dudleys Consulting Engineers
Development Address (including postcode)		Land off Dumers Lane, Radcliffe, M26 2BD
Development Grid Reference (Eastings/Northings)		E379783 N408108
Total Development Site Area (Ha)		1.94ha
Drained Area (Ha)* of Development		1.09ha
Please indicate the flood zone that your development is in. Tick all that apply. <i>Based on the Environment Agency Flood Map for Planning and the relevant Local Authority Strategic Flood Risk Assessment (to identify Flood Zones 3a/3b).</i>		Flood Zone 1 ☒ Flood Zone 2 ☒ Flood Zone 3a ☒ Flood Zone 3b ☐
What is the surface water risk of the site? Tick all that apply. <i>Based on the Environment Agency Surface Water Flood Map.</i>		High ☐ Medium ☒ Low ☒
Have you submitted a Site Specific Flood Risk Assessment (FRA)? <i>See separate guidance notes for clarification on when a FRA is required</i>		Yes ☒ No ☐
Have you submitted a Sustainable Drainage Strategy?		Yes ☒ No ☐
Does your drainage proposal provide multi-functional benefits via SuDS?		Yes ☒ No ☐
Expected Lifetime of Development (years) <i>Refer to Planning Practice Guidance "Flood Risk and Coastal Change" Paragraph 026</i>		100 years
Development Type:		State Proposed Number of Units
Greenfield Site Site is wholly undeveloped, and a new drainage system will be installed		☒ 84
Previously Developed/ Brownfield Site - Site is already developed, and the <u>entirety</u> of the existing surface water drainage system will be used to serve the new development (evidence must be provided to prove existing surface water drainage system is reusable); OR - Where records of the previously developed system are not available so that the hydraulic characteristics of the system cannot be determined or where the drainage system is not in reasonable working order i.e. broken, blocked or no longer operational for other reasons, then one of the approaches outlined in Section 24.5 of The SuDS Manual (C753) should be adopted.		☐
Please list any relevant document and or drawing numbers (including revision reference) to support your answers to Section 1.		24344-DCE-XX-XX-T-C-001-P01 FRA & DS

SECTION 2: IMPERMEABLE AREA AND EXISTING DRAINAGE

	Existing (E)	Proposed (P)	Change (P – E)
State Impermeable Area (Ha)	0.53ha	1.09ha	0.56ha
Evidence Required: Plans showing development layout of site with existing and proposed impermeable areas.			☒

Are there existing sewers, watercourses, water bodies, highway drains, soakaways or filter drains on the site?	Yes ☒ No ☐ Don't Know ☐
Evidence Required: Plan(s) showing existing layout to include all: • Watercourses, open and culverted • Water bodies – ponds, swales etc. • Sewers, including manholes • Highway drains, include manholes, gullies etc. • Infiltration features - soakaways, filter drains etc.	☒

Drainage Design <i>Outline planning applications should be able to demonstrate that a suitable drainage system is achievable.</i> <i>All other type of planning application should provide full details or reference to previous planning application where drainage details have been submitted or approved.</i>	
Select which design approach you are taking to manage water quantity (refer to Section 3.3 SuDS Manual) Approach 1 – Volume control / Long Term Storage (Technical Standards S2/3, S4/5) <i>The attenuated runoff volume for the 1 in 100 year 6 hour event (plus climate change allowance) is limited to the greenfield runoff volume for the 1 in 100 year 6 hour event, with any additional runoff volume utilising long term storage and either infiltrated or released at 2 l/s/ha</i> <i>The discharge rate for the critical duration 1 in 1 year event is restricted to the 1 in 1 year greenfield runoff rate</i> <i>The discharge rate for the critical duration 1 in 100 year event (plus climate change allowance) is restricted to the 1 in 100 year greenfield runoff rate</i> Approach 2 – Qbar (Technical Standards S6) <i>Justification has been provided that the provision of volume control/long term storage is not appropriate and an attenuation only approach is proposed. All events up to the critical duration 1 in 100 year event (plus climate change allowance) are limited to Qbar (1 in 2 year greenfield rate) or 2 l/s/ha, whichever is greater.</i>	☐ ☒
Evidence Required: Plans showing: - Existing flow routes and flood risks - Modified flow routes - Contributing and impermeable areas - Current (if any) and proposed ‘source control’ and ‘management train’ locations of sustainable drainage components (C753 Chapter 7) - Details of drainage ownership - Details of exceedance routes (Technical Standards S9) - Topographic survey - Locations and number of existing and proposed discharge points <i>Note consideration should be given to manage surface water from both impermeable and permeable surfaces (including gardens and verges) likely to enter the drainage system.</i>	☒

Please list any relevant document and or drawing numbers (including revision reference) to support your answers to Section 2.	24344-DCE-XX-XX-T-C-001-P01 FRA & DS
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SECTION 3: PEAK RUNOFF RATES – TECHNICAL STANDARDS S2, S3 AND S6 (UNLESS S1 APPLIES)

Rainfall Event	Existing Rate (l/s)	Greenfield Rate (l/s)	Proposed Rate (l/s) <i>Previously developed sites - In line with S3 should be equivalent to Greenfield runoff rates – discuss with LLFA if this is not achievable pre-application</i>
Qbar (Approach 2)	N/A	14.9	14.9
1 in 1 Year Event (Approach 1)	N/A	13.0	3.8 (1 in 2 year)
1 in 30 Year Event	N/A	29.1	3.8
1 in 100 Year Event* (Approach 1)	N/A	37.0	5.0
* Total discharge at the 1 in 100 year rate should be restricted to the greenfield runoff volume for the 1 in 100 Year 6 hour event with additional volumes (long-term storage volume) released at a rate no greater than 2 l/s/ha where infiltration is not possible. The climate change allowance should only be applied to the proposed rate and not the existing or greenfield rate.			
Evidence Required: Methodology used to calculate peak runoff rate clearly stated and justified. Impermeable areas plan, supported by topographical survey confirming positive drainage. Hydraulic calculations and details of software used.			☒ ☒ ☒

State the hydraulic method used in your calculations (Refer to Table 24.1 of The SuDS Manual)	FEH-22
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Please list any relevant document and or drawing numbers (including revision reference) to support your answers to Section 3.	24344-DCE-XX-XX-T-C-001-P01 FRA & DS
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SECTION 4: DISCHARGE VOLUME – TECHNICAL STANDARDS S4, S5 AND S6 (UNLESS S1 APPLIES)

Rainfall Event	Existing Volume (m ³)	Greenfield Volume (m ³)	Proposed Volume (m ³)
1 in 100 Year 6 Hour Event <i>(Approach 1)</i>	N/A	N/A	N/A
Does the below statement apply to your development proposal? Long term storage is not achievable on this site and, in accordance with S6 of the Non Statutory Technical Standards for SuDS, the surface water discharge rates for events up to and including the 1 in 100 year critical event are limited to Qbar (Approach 2)			Yes ☒ No ☐
Evidence Required: Approach to managing the quantity of surface water leaving the site clearly stated and justified Methodology used to calculate discharge volume clearly stated and justified. Hydraulic calculations and details of software used.			☒ ☒ ☒

Please list any relevant document and or drawing numbers (including revision reference) to support your answers to Section 4.	24344-DCE-XX-XX-T-C-001-P01 FRA & DS
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SECTION 5: STORAGE – TECHNICAL STANDARDS S7 AND S8

State climate change allowance used (%)	1 in 30 + 40%cc 1 in 100 + 45%cc
State housing density (houses per ha)	43
State urban creep allowance used (%)	10% applied to private areas
Evidence Required: State / used in appropriate industry standard surface water management design software.	☒

State storage volume required (m³) (excluding non-void spaces) <i>Must include an allowance for climate change and urban creep</i>	817m ³
Have you incorporated interception into your design? <i>(Refer to Chapter 24 of The SuDS Manual C753)</i> <i>Where possible, infiltration or other techniques are to be used to try and achieve zero discharge to receiving waters for rainfall depths up to 5mm.</i>	Partly, not for all areas Yes ☐ No ☐
Evidence Required: Drainage plans showing location of attenuation and all flow control devices and supporting calculations.	☒

Summarise how storage will be provided for 1 in 30 year event on site. <i>Storage must be designed to ensure that at no flooding occurs onsite in a 1 in 30 year event except in designed areas and no flooding occurs offsite in a 1 in 100 year (plus climate change allowance) event.</i>	Concrete box culverts within the proposed roads
Summarise how storage will be provided for 1 in 100 year (plus climate change) event on site. <i>Where storage above the 1 in 30 year rainfall event is provided in designated areas designed to accommodate excess surface water volumes, plans showing storage locations and surface water depths and supported by calculations used in appropriate industry standard surface water management design software. It is important to run a range of duration events to ensure the worst case condition is found for each drainage element on the site</i>	Concrete box culverts within the proposed roads
Evidence Required: Plans showing size and location of storage and supporting calculations. Where there is controlled flooding, extents and depths must be indicated.	☒

Please list any relevant document and or drawing numbers (including revision reference) to support your answers to Section 5.	24344-DCE-XX-XX-T-C-001-P01 FRA & DS
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SECTION 6: WATER QUALITY PROTECTION

Contaminated surface water run-off can have negative impacts on the quality of receiving water bodies. The potential level of contamination will influence final the design of an appropriate treatment train as part of your sustainable drainage system.

Is the proposal site known to be or potentially contaminated?	Yes ☒ No ☐
If the site is contaminated, it should be demonstrated that the sustainable drainage system will not increase the risk of pollution to controlled waters through the mobilisation of contaminants and/or creation of new pollution pathways.	

Confirm the Pollution Hazard Level of the proposed development - Tick ALL that apply		
Refer to Pollution Hazard Indices for different Land Use Classifications in Table 26.2 of The SuDS Manual C753 for further guidance.		
Pollution Hazard Level Tick ALL that apply	Surface water run-off from the proposed development will drain from:	
VERY LOW	☒	Residential roofs
LOW	☒	- Other roofs (typically commercial/industrial roofs) - Individual property driveways, residential car parks, low traffic roads (e.g. cul de sacs, home-zones and general access roads) - Non-residential car parking with infrequent change (e.g. schools, offices) i.e. < 300 traffic movements/day
MEDIUM	☐	- Commercial yard and delivery areas - Non-residential car parking with frequent change (e.g. hospitals, retail) - All roads except low traffic roads and trunk roads/motorways¹
HIGH	☐	- Sites with heavy pollution (e.g. haulage yards, lorry parks, highly frequented lorry approaches to industrial estates, waste sites) - Sites where chemicals and fuels (other than domestic fuel oil) are to be delivered, handled, stored, used or manufactured - Industrial sites - Trunk roads and motorways¹

If the development's Pollution Hazard Level is 'Very Low' or 'Low', has the sustainable drainage design been risk assessed and appropriate mitigation measures included?	Yes ☒ No ☐
If the proposed development has a very low or low polluting potential, you should design your sustainable drainage system to include an appropriate treatment train in accordance with The SuDS Manual (C753).	

If the development's Pollution Hazard Level is 'Medium' or 'High', is the application supported by a detailed water quality risk assessment?	Yes ☐ No ☐
- If the proposed development has a high polluting potential, a detailed risk assessment <i>will</i> be required to identify an appropriate SuDS treatment train and ensure compliance with Paragraph 170 of the National Planning Policy Framework. - If the proposed development has a medium polluting potential, a detailed risk assessment <i>may</i> be required depending on the nature, scale and location of the development.	

Has pre-application advice on water quality been obtained from the Environment Agency?	Yes ☐ No ☒
If YES, provide details:	

Please list any relevant document and or drawing numbers (including revision reference) to support your answers to Section 6.	24344-DCE-XX-XX-T-C-001-P01 FRA & DS
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¹ Motorways and trunk roads should follow the guidance and risk assessment process set out in Highways Agency (2009).

SECTION 7: DETAILS OF YOUR SUSTAINABLE DRAINAGE SYSTEM

a) Function of your Sustainable Drainage System

Do your proposals store rainwater for later use (as a resource)?	Yes ☐ No ☒
Evidence Required: Please provide a brief sentence in the adjacent white box to describe how this function has been achieved.	
Do your proposals promote source control to manage rainfall close to where it falls? (e.g. promoting natural losses through soakage, infiltration and evapotranspiration)	Yes ☐ No ☒
Evidence Required: Please provide a brief sentence in the adjacent white box to describe how this function has been achieved.	
Please list any relevant document and or drawing numbers (including revision reference) to support your answers to Section 7a.	24344-DCE-XX-XX-T-C-001-P01 FRA & DS

b) Hierarchy of Drainage Options – Planning Practice Guidance

The proposed method of discharge are set out within order of priority. Generally, the aim should be to discharge surface run off as high up the following hierarchy of drainage options as reasonably practicable.

Proposed method of surface water discharge		Is this proposed?	
Hierarchy Level 1: Into the ground (via infiltration)		Yes ☐ No ☒	
If YES - Evidence Required		If NO – Evidence Required Tick ALL that apply	
☐	A. Completed Infiltration Checklist from The SuDS Manual (C753) Appendix B <i>An editable version of this form is available on SusDrain website.</i>	☐	A. Site investigation to demonstrate that the ground is not free draining. Test results to be provided in accordance with: - The methodology within BRE 365 (2016), OR - Falling head permeability tests BS EN ISO 22282-2: 2012
☐	B. British Geological Survey (BGS) Infiltration SuDS Map	☒	B. NOTE: where an applicant is unable to access a site to undertake testing, e.g. where unable to access a site for an outline application, they can submit a SuDS GeoReport or similar.
☐	C. Infiltration testing to BRE 365 (2016) or falling head permeability tests to BS EN ISO 2228-2: 2012 (optional for outline)	☒	C. Evidence to confirm that infiltration to ground would result in a risk of deterioration to ground water quality.
☐	'Plan B' sustainable drainage plan and statement of approach with an alternative discharge method, in case infiltration proposals are proven not feasible upon further site specific ground investigation e.g. to consider seasonal variations to groundwater.	☐	D. Geotechnical advice from a competent person* which determines that infiltration of water to ground would pose an unacceptable risk of geohazards to the site and/or local area. <i>*Note: Competent person may include a Chartered Engineer, Chartered Geologists, Registered Ground Engineering Professionals (RoGEP).</i>

Proposed method of surface water discharge		Is this proposed?	
Hierarchy Level 2: To a surface water body (<i>select type</i>) NOTE: Consent from LLFA or Permit from Environment Agency may be required – refer to guidance		Yes ☐ No ☒ N/A ☐	
		☐ Main river ☐ Ordinary watercourse	☐ Canal ☐ Other water body
If YES - Evidence Required		If NO – Evidence Required Tick <u>ALL</u> that apply	
☐	Surface water body / watercourse survey and report	☒	Plan showing nearby watercourses and waterbodies AND ☒ Statement providing justification in your Sustainable Drainage Strategy Note: Where third party land is cited as a barrier, you should provide visibility of discussions held to date with the riparian landowner of the waterbody.

Proposed method of surface water discharge		Is this proposed?	
Hierarchy Level 3: To a surface water sewer or highway drain (<i>select type</i>)		Yes ☐ No ☒ N/A ☐	
		☐ Surface water sewer	☐ Highway drain
If YES - Evidence Required		If NO – Evidence Required Tick <u>ALL</u> that apply	
☐	Written correspondence from Water and Sewerage Company/ Highway Authority regarding proposed connection.	☒	Plan showing nearby sewers and highway drains AND ☒ Statement providing justification in your Sustainable Drainage Strategy

Proposed method of surface water discharge		Is this proposed?	
Hierarchy Level 4: To combined sewer		Yes ☒ No ☐ N/A ☐	
If YES - Evidence Required		If NO – Evidence Required	
☒	Written correspondence from Water and Sewerage Company	N/A	

Please list any relevant document and or drawing numbers (including revision reference) to support your answers to Section 7b.	24344-DCE-XX-XX-T-C-001-P01 FRA & DS
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c) Proposed SuDS Component Types

	Tick ALL that apply				
Within property boundary	☐ Rainwater harvesting	☐ Green/ blue roofs	☒ Pervious pavements [Type: A ☐ B ☐ C ☒	☐ Soakaway	☐ Bio retention systems

	Tick ALL that apply				
Within development site boundary (not property)	☐ Infiltration system [Type: ☐ Surface level ☐ Below ground]		☐ Filter strips	☐ Filter drains	☐ Swales
	☐ Bio retention system	☐ Detention basins	☐ Ponds and wetlands	☒ Attenuation tanks/ Oversized pipes	☐ Other (state below)
	If 'Other' please state:				

Off site (not within the boundary of the proposed development)	Please state: N/A
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I confirm that the above selected components have been designed in accordance with The SuDS Manual (C753).	I confirm ☒
I confirm that the management of flows resulting from rainfall in excess of a 1 in 100 year plus climate change rainfall event, and their exceedance route(s), has been fully considered in order to minimise the risks to people, property (new and existing) and infrastructure.	I confirm ☒

Please list any relevant document and or drawing numbers (including revision reference) to support your answers to Section 7c.	24344-DCE-XX-XX-T-C-001-P01 FRA & DS
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SECTION 8: OPERATION AND MAINTENANCE – TECHNICAL STANDARD S12 AND NATIONAL PLANNING POLICY FRAMEWORK

The applicant is responsible to ensure that ALL components selected in Section 7 can be maintained for the design life of the development. This information is required so the Local Planning Authority can ensure the maintenance and management of the sustainable drainage system. The Local Planning Authority will discuss how this will be secured (e.g. via planning condition or planning obligation).

	Information Provided?
Management Plan	Yes ☒ No ☐
Evidence Required: Plan/ drawing provided to show the position of the different SuDS components with: - Key included to identify any of the adopting bodies that you will be offering your sustainable drainage components for adoption (<i>relates to maintenance and management arrangements below</i>). - Plan/ drawing to identify any areas where certain activities are prohibited, detailing reasons why.	☒
Action plan for accidental pollutant spillages.	☐

	Information Provided?
Maintenance Schedule	Yes ☒ No ☐
Evidence Required: A copy of the maintenance schedule including: Proactive and preventative maintenance Detailing regular, occasional and remedial maintenance activities including recommendations for inspection and monitoring. This should include recommended frequencies, advice on plant/ machinery required and an explanation of the objectives for the maintenance proposed and potential implications of not meeting them. Reactive and corrective maintenance (e.g. product repair and replacement). Including advice on excavations, or similar works, in locations that could affect the SuDS components/ adjacent structures.	☒

	Information Provided?
Maintenance and Management Arrangements	Yes ☒ No ☐
Evidence Required: Evidence of formal agreement with the party responsible for undertaking maintenance. Please select any of the adopting bodies that you will be offering your sustainable drainage components for adoption. Tick all that apply. ☒ Water and Sewerage Company <i>Section 104 agreement (Water Industry Act 1991)</i> ☒ Highway Authority <i>Section 278/38 agreement (Highways Act 1980)</i> ☐ Local Authority Public Open Space <i>[Refer to Local Authority Policy]</i> Please select the arrangement(s) for all non-adopted sustainable drainage components. Tick all that apply. ☒ Management Company ☒ Property Owner <i>(for SuDS components within property boundary only)</i> ☐ Other (please state) 	☒

Please list any relevant document and or drawing numbers (including revision reference) to support your answers to Section 8.	24344-DCE-XX-XX-T-C-001-P01 FRA & DS
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DECLARATION AND SUBMISSION

This pro-forma has been completed using evidence from information which has been submitted with the planning application.

The information submitted in the Sustainable Drainage Strategy and site-specific Flood Risk Assessment (FRA), where submitted, is proportionate to the site conditions, flood risks and magnitude of development and I agree that this information can be used as evidence to this sustainable drainage approach.

Submitter Details			
Completed by	Jonathan Allchin IEng MICE	Email Address	jonathan.allchin@dudleys.co.uk
		Telephone Number(s)	0113 2583611
Signed off by	Chris Brady	Accreditation(s) and/or Qualification(s) of Signatory	CEng MICE
Date (dd/mm/yyyy)	25/10/2024	Company	Dudleys Consulting Engineers

Client Details			
Name	Paul Sinclair	Company	Westchurch Homes



APPENDIX G – CORRESPONDENCE & SITE PHOTOS

Jonathan Allchin

From: seweradoptions@uuplc.co.uk
Sent: 24 October 2024 14:42
To: Chris Brady
Cc: Jonathan Allchin
Subject: [Filed on 2024-10-24] RE: FW: 06392280 Wastewater Pre-Development Enquiry Submission Bealey Industrial Estate Radcliffe M26 2BD

Categories: Filed to CloudFiler

Good Afternoon Chris,

Thank you for your response, Developer Day was great, we hope to see you at the next one 😊 please see below on behalf of James:

UU REF 06392280 – WW PDE – Bealey Industrial Estate, Radcliffe

I can confirm based on the evidence and information provided that we have no objections to a combined connection to manhole 7901, however the flow rate will be 5 l/s

Regards

Anthony



Anthony Laithwaite
Ww Engineer
Developer Services & Metering
Customer Services

T: 01925 429090
unitedutilities.com

----- Original Message -----

From: seweradoptions@uuplc.co.uk [seweradoptions@uuplc.co.uk]
Sent: 24/10/2024 11:14
To: chris.brady@dudleys.co.uk
Cc: jonathan.allchin@dudleys.co.uk
Subject: RE: FW: 06392280 Wastewater Pre-Development Enquiry Submission Bealey Industrial Estate Radcliffe M26 2BD

Good Afternoon,

Many thanks for your email.

Jonathan Allchin

From: GMMC Info Requests <InfoRequests.GMMC@environment-agency.gov.uk>
Sent: 27 September 2024 17:46
To: Jonathan Allchin
Subject: [Filed on 2024-09-30] GMMC374304SW Response attached from the Environment Agency-Follow On

Categories: Filed to CloudFiler

Dear Jonathan,

Thank you for your enquiry which was received on 26/09/24.

We respond to requests under the Freedom of Information Act 2000 and Environmental Information Regulations 2004.

Thank you for your email, unfortunately we do not have climate change scenarios for this location.

We are accepting Evidence Review Requests whereby the flood zones can be edited to reflect new evidence.

However, we will need some further detailed information before I can submit your request for a revision of the flood map to our Evidence and Risk team for review. We do not have any planned updates to the modelling in this area, without any detailed modelled evidence we will be unable to make changes to the flood map. Please note there is a 16 week turn around on Evidence Review Requests.

We will be updating our flood risk map products: Flood Zones (on Flood Map for Planning), Risk of Flooding from Rivers & Sea (RoFRS) and Risk of Flooding from Surface Water (RoFSW) in 2024/5 as part of the new National Flood Risk Assessment (NaFRA2). This should result in improvements to our mapping products, especially where we do not currently have any detailed local modelling.

In preparation for these changes, there is currently a pause on updates to these mapping products and therefore no map changes, using any new evidence you might provide, can take place until at least Spring 2025.

Whereby seeking to formal challenge/request changes to current EA zone mapping available in public domain these should be submitted to PSOWarrington@environment-agency.gov.uk in the first instance. Wider to providing initial confirmation of the location of challenge (national grid reference) / requested change, flood mapping change requests should include/be supported by the following submissions:

1. Written summary (preferentially in technical note format) as to why an amendment to current EA flood mapping is considered necessary and overview of the assessment work which has been undertaken to determine a consideration that an update/amendment to current EA flood mapping is required.
2. Associated with (1) above, submission of the relevant technical assessment work which has been undertaken to demonstrate/justify the suitability of amendment i.e. Any relevant flood modelling undertaken, relevant topographical survey data (present day).

In regard to alteration to current flood zone mapping, please be advised that we are currently seeking to publish new national risk information for flooding and coastal erosion (factoring future climate change scenarios), this is commonly referred to as the NaFRA2 exercise. Further details regarding the NaFRA2 exercise, with indicative timescales for completion of this update work are available via: [Updates to national flood and coastal erosion risk information - GOV.UK \(www.gov.uk\)](https://www.gov.uk/government/news/national-flood-risk-assessment-2024). We have paused updates to

the flood zones whilst this exercise is ongoing. Our Flood Zone mapping was last updated on 1st November 2023.

For the EA to consider a change of mapping for an area currently shown as Flood Zone 3, you will need to provide us with relevant flood modelling, supporting data, and results that include:

- a mapped flood extent and water levels for fluvial annual probability: 1% (one in 100) chance.
- a mapped flood extent and water levels for tidal annual probability: 0.5% (one in 200) chance

For EA to consider a change of mapping for an area currently show as Flood Zone 2, you will need to provide us with relevant flood modelling, supporting data, and results that include:

- a mapped flood extent and water levels for fluvial/tidal annual probability: 0.1% (one in 1000) chance

Whereby changes to the flood map are considered necessary due to the presence of defence(s), we would recommend the following information is provided as part of the supportive evidence base:

- validated survey (in sufficient detail to digitise the defence with confidence)
- photographic / video evidence
- asset improvement scheme 'As Built' drawings
- findings from a site visit/asset survey accurately marked up on OS Plan.

Information regarding relevant flood modelling standards can be found here:

[River modelling standards: who they're for and how to use them - GOV.UK \(www.gov.uk\)](#)

Please refer to the [Open Government Licence](#) which explains the permitted use of this information.

Please get in touch if you have any further queries or contact us within two months if you'd like us to review the information we have sent.

Kind regards,

Sarah Walters

Customer and Engagement Officer

Greater Manchester, Merseyside and Cheshire

Email: InfoRequests.gmmc@environment-agency.gov.uk

Office address: Richard Fairclough House, Knutsford Road, Latchford, Warrington, WA14 4UW

From: Jonathan Allchin <jonathan.allchin@dudleys.co.uk>

Sent: 26 September 2024 14:23

To: GMMC Info Requests <InfoRequests.GMMC@environment-agency.gov.uk>

Subject: GMMC374304SW Dumers Lane, Radcliffe, Bury Advice

You don't often get email from jonathan.allchin@dudleys.co.uk. [Learn why this is important](#)

Good afternoon,

The EA recently provided Product 4 data, attached, for a site off Dumers Lane, Radcliffe, Bury. The data shows that parts of the site are within Flood Zones 2 and 3. The data doesn't include any climate change models, are these available? Ideally, we'd like the 1%AEP +35% climate change estimated flood levels, to comply with current climate change allowances.

From the information already provided, I've summarised the data from node 6 in the below table:

Scenario	Level
1% AEP Defended	66.23
0.5% AEP Defended	66.55
0.1% AEP Defended	67.47
1% AEP Defences Removed	66.18
0.5% AEP Defences Removed	66.47
0.1% AEP Defences Removed	67.45

We have received a topographical survey from our Client, which shows the lowest point within our site boundary as 66.69mAOD. Therefore, as this is above the 0.5% AEP in both the defended and undefended scenarios, we are of the opinion that we do not need to provide any flood compensation storage within the site boundary, as there will be no flooding within the site in the 0.5%AEP event. The 0.5%AEP has been used in the absence of the 1%AEP+35%CC estimated flood levels. Please can you confirm if you agree?

Furthermore, we believe the flood zone maps should be altered so that our site is not classified as Flood Zone 3. Please can you confirm if this can be progressed?

Kind regards

Jonathan Allchin

Senior Engineer

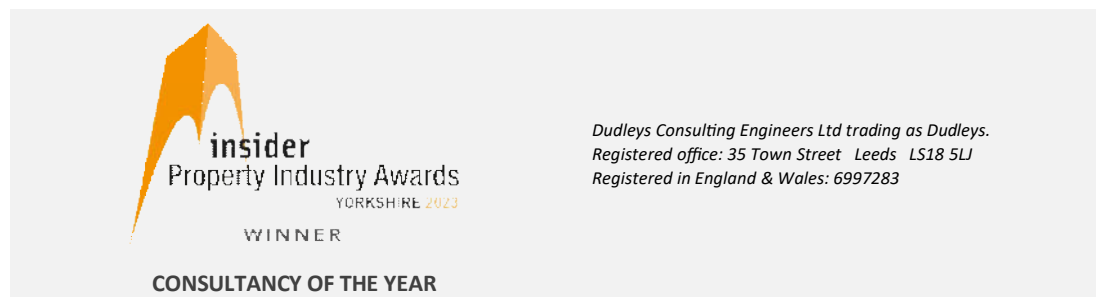


E: jonathan.allchin@dudleys.co.uk

T: 0113 258 3611

P: Tithe House, 35 Town Street, Leeds, LS18 5LJ

W: www.dudleys.co.uk



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03 October 2024