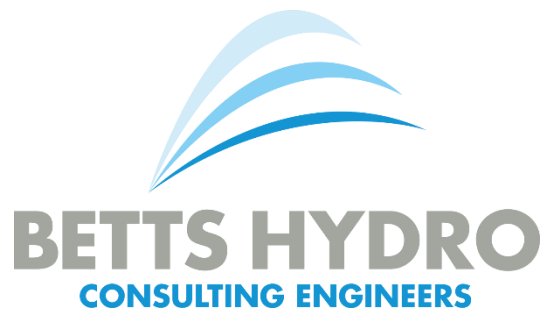




LAND OFF CRABTREE LANE MANCHESTER

FLOOD RISK ASSESSMENT



For

Keepmoat
Aviation House
No. 2 Windward Drive
Liverpool
L24 8QR



OCTOBER 2025

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LAND OFF CRABTREE LANE MANCHESTER

FLOOD RISK ASSESSMENT

Document Tracking Sheet

Document Reference: HYD1015_CRABTREE.LANE_FRA
Revision: 4.0
Date of Issue: 15/10/2025
Report Status: FINAL

Prepared by:

Jabez Thomas BSc (Hons)
Graduate Flood Risk Analyst

Checked by:

Kirsty Halliday BSc (Hons) MCIWEM
Associate

Authorised by:

Richard Nicholas BEng (Hons) MSc MBA GMICE MCIWEM
Director

Revision History:

Rev.:	Date:	Status:	Prepared by:	Checked by:	Issued by:
4.0	15/10/25	FINAL	HB	KH	HB
3.0	15/08/25	FINAL	HB	KH	HB
2.0	27/05/25	FINAL	KH	KH	KH
1.0	14/02/25	FINAL	JT	KH	HB
0	11/12/24	DRAFT	JT	KH	HB

Old Marsh Farm Barns
Welsh Road, Sealand
Flintshire CH5 2LY
Telephone: 01244 289 041



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EXECUTIVE SUMMARY

This Flood Risk Assessment was commissioned by Keepmoat Homes, referred to hereafter as 'the client'. This report has been prepared to support an application for the construction of 194no. residential dwellings on land located off Crabtree Lane in Manchester. The site lies solely within Flood Zone 1 based on the Environment Agency Flood Map for Planning. The proposals are classified as 'More Vulnerable' in Annex 3: Flood Risk Vulnerability Classification, within the National Planning Practice Framework. The Planning Practice Guidance confirms that more vulnerable development is appropriate when located within Flood Zone 1 providing there is no increase in flood risk elsewhere due to the proposals.

Consultations with the Environment Agency, United Utilities, Canal and River Trust, and Manchester City Council have not identified any historical flooding on or in proximity to the site. This report has reviewed all sources of flood risk both to and resulting from the proposed development site. The nearest watercourse is the River Medlock (Main River), located 1.3km north of the site. The fluvial flood risk to the site is therefore considered very low.

There is a culverted Ordinary Watercourse understood to cross the site. The watercourse is fully culverted through the site, and it has been assumed as being sized to cater for the incoming catchment flows. There has been no indication of any historic flooding of the site resulting from the culverted ordinary watercourse. There is a residual risk associated with failure or blockage of the upstream and downstream culverts.

In terms of infrastructure the most likely locations for culverts to exceed are access points such as manholes or inspection chambers. In the case of exceedance from manholes / inspection chambers, if a blockage or failure were to occur, exceedance would likely route in a westerly direction and toward the development proposals. There is a slight ridge in the centre of the site, and it is therefore understood exceedance would pond there instead of entering the development area. The risk to the site is therefore low.

There is also some pluvial risk onsite, there is some surface water and pluvial flood risk onsite, typically within the eastern part of the wider site, which have a greater probability due to these areas being particularly low lying at present. The proposed development is likely to require some levels changing onsite and will include a formal drainage system to capture and convey run-off routing through the site, both of which will minimise potential risk from pluvial runoff.

The nearest canal to the site is Ashton Canal, which is located immediately north of the site. Review of the Manchester City Council Strategic Flood Risk assessment has shown no evidence of historical canal flooding in proximity to the site. Much of the site is either at the level of the canal or lower, creating potential risk from exceedance during an overtopping or breach scenario. Canals are however carefully managed bodies of water, meaning that likelihood of overtopping or breach is low.

The site is at predominantly 'very low' chance of surface water flooding. There are isolated areas at higher risk, but these correspond with existing low-lying land and conveyance routes where ponding naturally occurs. The Sequential Test will be required where build development is proposed in areas of medium and high risk.

To mitigate any potential residual flood risks, it is advised that external levels fall away from the proposed dwellings, to minimise the flood risk associated with overland flows. By keeping the

Finished Floor Levels elevated relative to the externals (typically 150mm to 300mm), this should help create safe overland flood flow routes in the event of any source of flooding including fluvial, surface water and groundwater.

Although at present the site is mostly at low probability of surface water flooding, the additional proposed impermeable areas onsite have the potential to cause an increase in flood risk to others if not managed appropriately. A separate Drainage Management Strategy has been prepared which will detail the drainage proposals (refer to *HYD1015_CRABTREE.LANE_DMS_4.0_CON*).

To summarise, the proposals are at 'low' flood risk from the key flood sources reviewed as part of this assessment and appropriate mitigation will be put in place to ensure that there is no increase in flood risk because of the proposals. This assessment has been prepared in consultation with the relevant interested parties. The report is commensurate with the scale and nature of the proposals and is appropriate with the Planning Practice Guidance.

CONTENTS

Document Tracking Sheet	iii
EXECUTIVE SUMMARY	v
Figures & Tables.....	viii
Specialist Software	viii
Abbreviations & Acronyms	ix
1.0 INTRODUCTION	11
1.1 Planning Policy Context	11
<i>Sequential Testing</i>	11
1.2 Site Context	12
1.3 Consultation	12
2.0 EXISTING SITE LOCATION	13
2.1 Location	13
2.2 Existing and Historical Land Use	13
2.3 Topography	14
3.0 DEVELOPMENT PROPOSALS	15
3.1 Nature of the Development	15
4.0 SOURCES OF FLOOD RISK	17
4.1 Fluvial Flood Risk	17
<i>Main Rivers</i>	17
<i>Culverted Ordinary Watercourse</i>	17
4.2 Tidal Flood Risk.....	18
4.3 Flood Risk Vulnerability Classification and Flood Zone Compatibility	18
4.4 Surface Water Flood Risk	18
<i>Current Day Scenario</i>	19
<i>Future Climate Change Scenario</i>	20
<i>Surface Water Modelling</i>	21
<i>Pluvial (Overland run-off) Flood Risk</i>	22
<i>Sewer Flood Risk</i>	23
4.5 Groundwater Flood Risk	23
<i>Groundwater Source Protection Zones</i>	24
4.6 Artificial Sources of Flood Risk.....	24
<i>Reservoirs</i>	24
<i>Canals</i>	25
4.7 Historical and Anecdotal Flooding Information.....	25
4.8 Flood Risk Mitigation Measures & Residual Risks.....	25
<i>Mitigation Measures</i>	26

Residual Risks	26
5.0 SUMMARY AND CONCLUSIONS.....	27
6.0 RECOMMENDATIONS.....	29
BIBLIOGRAPHY & REFERENCES.....	30
Web-based References	30

Figures & Tables

Figure 1: Existing Features Plan (Google Maps, 2025)	13
Figure 2: Site Plan (JTP Studios, 2025)	15
Figure 3: Fluvial/Tidal Flood Zone Map for Planning Extract (GOV.UK, 2025)	17
Figure 4: FMfP Surface Water 1 in 100yr Annual likelihood of Flooding (EA, 2025)	19
Figure 5: Long-Term 'Current' Surface Water Flood Risk Map Extract (GOV.UK, 2025)	20
Figure 6: 'Future' Surface Water Flood Risk Map Overlay (GOV.UK, 2025)	21
Figure 7: Proposed 1% AEP plus 45%CC Surface Water Flood Depth (Betts Hydro, 2025)	22

APPENDIX A: NPPF & PPG EXTRACTS	
APPENDIX B: EA INFORMATION & CORRESPONDENCE	
APPENDIX C: UU CORRESPONDENCE.....	
APPENDIX D: LPA/LLFA CORRESPONDENCE	
APPENDIX E: CRT CORRESPONDENCE.....	
APPENDIX F: LOCATION PLAN	
APPENDIX G: TOPOGRAPHICAL SURVEY	
APPENDIX H: PROPOSED PLANNING LAYOUT	
APPENDIX I: SURFACE WATER DIRECT RAINFALL MODELLING.....	
APPENDIX J: PFRA/SFRA PLANNING EXTRACTS.....	
APPENDIX K: CULVERT CCTV SURVEY.....	
APPENDIX L: NOTES OF LIMITATIONS	

Specialist Software

-  MicroDrainage WinDES (v.2020.1.3) – Calculation of Greenfield run-off volumes, rates of rainfall and stormwater storage estimates.

Abbreviations & Acronyms

AEP	Annual Exceedance Probability
CC	Climate Change
CRT	Canal and River Trust
EA	Environment Agency
FRA	Flood Risk Assessment
LCC	Lancashire County Council
LLFA	Lead Local Flood Authority
LPA	Local Planning Authority
MCC	Manchester City Council
mAOD	Metres Above Ordnance Datum
NPPF	National Planning Policy Framework
PFRA	Preliminary Flood Risk Assessment
PPG	Planning Practice Guidance
SFRA	Strategic Flood Risk Assessment
TWL	Top Water Level
UU	United Utilities

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1.0 INTRODUCTION

1.1 Planning Policy Context

- 1.1.1 All forms of flooding and their impact on the natural and built environment are material planning considerations. The revised National Planning Policy Framework (NPPF) sets out the Government's objectives for the planning system, and how planning should facilitate and promote sustainable patterns of development, avoiding flood risk and accommodating the impacts of climate change.
- 1.1.2 Government policy with respect to development in flood risk areas is contained within the revised NPPF and the supporting Planning Practice Guidance (PPG) (refer to extracts in **Appendix A**). A Flood Risk Assessment (FRA) has been completed in accordance with the revised NPPF and the PPG to review all sources of flood risk both to and from the proposed development.
- 1.1.3 The proposals are classified as 'More Vulnerable' in Annex 3: Flood Risk Vulnerability Classification, within the National Planning Practice Framework. The PPG confirms that this type of land-use is appropriate for Flood Zone 1, providing there is no increase in flood risk elsewhere due to the proposals.

Sequential Testing

- 1.1.4 Recent updates to the NPPF (December 2024), along with recent appeal decisions have identified the requirement for focus on sequential testing future development sites in terms of the flood risks identified. *Paragraph 175 (NPPF, 2024)* states that:

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

- 1.1.5 Whilst the Local Planning Authority's/Lead Local Flood Authority's Strategic Flood Risk Assessment provides a starting point in terms of strategic assessment, where there is more up to date mapping which considers current and future flood risks, then this should also be assessed to steer future development to the most appropriate locations.
- 1.1.6 The Sequential Test has been undertaken by Euan Kellie in April 2025 and summarised below for completeness. In terms of the Site, it is located within Openshaw in East Manchester, approximately 5 km to the east of Manchester City Centre and is partially accommodates overgrown vegetation and vacant industrial buildings, which were previously occupied by a traditional forge works specialising in stainless steel and nickel forging and as part of the Connell Brothers operations. In planning terms, the site is located within 'East Manchester' as defined by MCC Core Strategy ("MCC CS") Policies EC5 and H4, and the 'Inner Areas' (MCC CS Policy SP1).
- 1.1.7 The MCC CS identifies that the Inner Areas will be the focus for the majority of new residential development, and this will be defined by the East Manchester Regeneration

Areas. The East Manchester Strategic Regeneration Framework seeks to provide higher quality family housing, acknowledging that the current housing supply in East Manchester does not provide a sufficient diversity of housing types and quality to support a range of people and families at various stages of life and income levels. This is in line with the objectives of Section 11 of the NPPF which seeks the effective use of land in meeting the need for homes and other uses, and also PFE Policy JP-Strat5 which supports the continued regeneration of Inner Areas for residential development.

1.1.8 Specifically, the redevelopment of this Site for residential purposes would bring a range of socio-economic and environmental benefits to Manchester's residential market and to the local area, including the following site-specific benefits which could not be realised through the development of any alternate site:

- Remediating a contaminated site;
- Bringing a currently underutilised site back into productive use;
- Improving the physical appearance of the site with a new development of high architectural quality; and
- Addressing the shortfall of family housing in East Manchester, including provision of affordable homes.

1.1.9 As such, there are no sequentially preferable sites which would be capable of delivering the development and realising the above benefits.

1.2 Site Context

1.2.1 This FRA has been prepared to support a planning application the construction of 194no. residential dwellings on land located off Crabtree Lane, Manchester. The proposals will be complete with access, car parking, external works, boundary fencing, external services, and drainage.

1.3 Consultation

1.3.1 The NPPF advises that Manchester City Council (MCC) as the Local Planning Authority (LPA) should consult with the EA who will provide advice and guidance on flood issues at a strategic level and in relation to planning applications.

1.3.2 The preparation of this report has been undertaken in consultation with the Environment Agency (EA), United Utilities (UU), Manchester City Council (MCC) and Canal and River Trust (CRT). The consultation responses can be seen in **Appendix B, C, D and E** respectively.

2.0 EXISTING SITE LOCATION

2.1 Location

- 2.1.1 The site is located off Crabtree Lane, Manchester. The nearest Ordnance Survey National Grid Reference is E: 388788, N: 398077 and the nearest postcode is M11 1GY (see the Location Plan in **Appendix F**). The whole site covers 3.053ha and is edged in red in **Figure 1**.
- 2.1.2 In terms of the surrounding land-use, the site is bound to the north by Ashton Canal, with industrial and commercial development beyond. To the west sits Clayton Industrial Estate off Claytonbrook Road, and to the east sits the Edge Lane Allotments. Further residential development can be found to the south of the site.



Figure 1: Existing Features Plan (Google Maps, 2025)

2.2 Existing and Historical Land Use

- 2.2.1 The site is currently a combination of undeveloped greenfield land, forested land, and existing industrial buildings. Historical mapping from between 1830 to 1880 shows a culvert to be present on the eastern side of the site. Discussion with the client, and review of both the historic mapping and topographic survey has identified that the culvert is still present and active onsite.

- 2.2.2 Historical mapping from between 1888 to 1915 shows a series of buildings to the north-west and north-east of the site referred to as Clayton Gardens and Crabtree Forge. 2005 satellite imagery shows more buildings located towards the west of the site than exist at present.

2.3 Topography

- 2.3.1 A topographic survey has been completed for the eastern half of the site, showing levels to vary by less than 2m across this area. Levels in this half of the site fall from east to west, then to rise slightly once reaching a north-to-south ridge running down the centre of the site (see topographic survey in **Appendix G**).
- 2.3.2 Since there has been no topographic survey of the western half of the site, a qualitative approach has been taken to assess levels using LiDAR data. The LiDAR data shows levels in the western half of the site to be relatively flat but following a shallow gradient from east to west. LiDAR again shows a relatively steeper ridge running from north to south down the centre of the site. The arrows shown in **Figure 1** indicate the general falls across the site.

3.0 DEVELOPMENT PROPOSALS

3.1 Nature of the Development

- 3.1.1 This planning application is for the construction of 194no. residential dwellings off Crabtree Lane, Manchester. The proposals will be complete with access, footpaths, car parking, external works, landscaping, boundary fencing, and drainage. The site plan is included within **Figure 2** (see full plan in **Appendix H**).



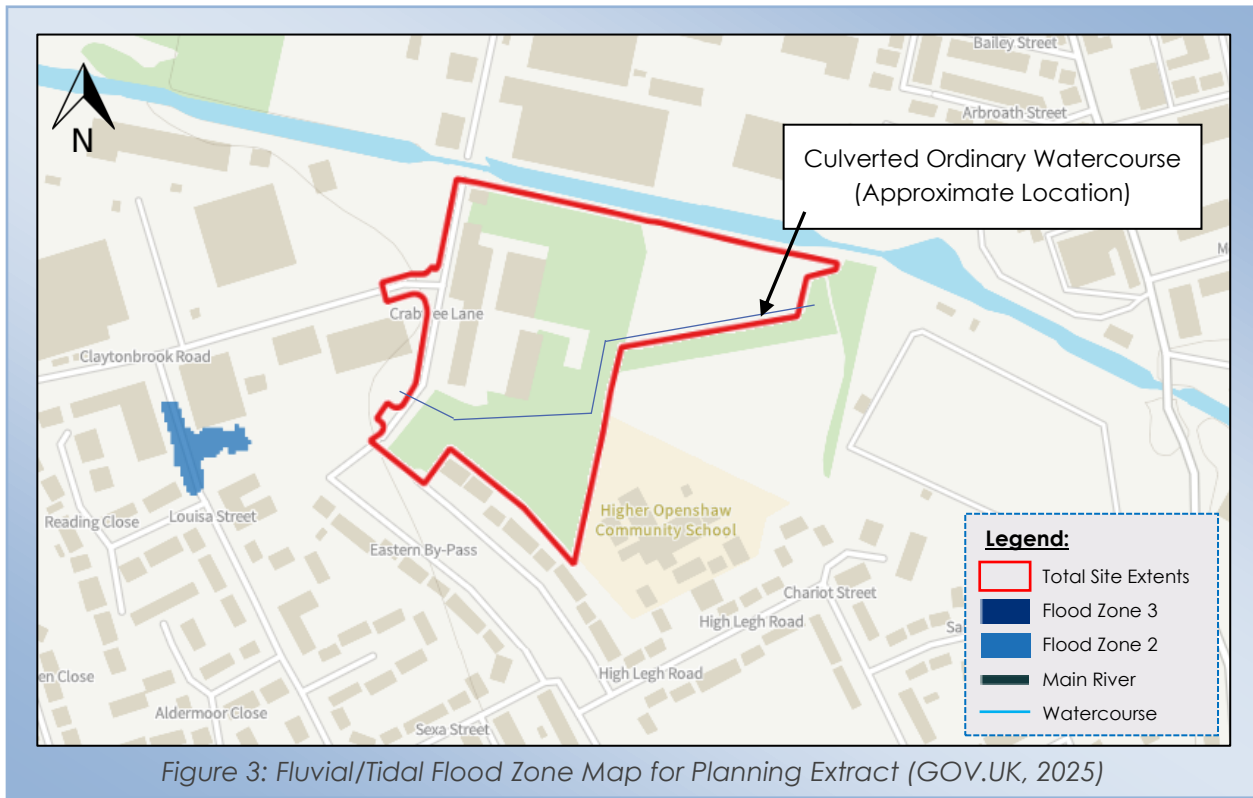
- 3.1.2 As shown in the planning layout (extract in **Figure 2**), there are existing culverts crossing the wider site from the east to west. The LLFA typically require a 6-8m offset to be maintained from the centreline of the culverted watercourses crossing the site. No development can take place within this zone without prior written approval from the LLFA.
- 3.1.3 A culverted system exists beneath the eastern part of the site. This culvert connects to a culverted watercourse running through the site from east to west. The function of this culvert is currently unknown; consultation with CRT has recommended further investigation into this system to determine whether it serves as a canal feeder / overflow or runs beneath the canal (see consultation response in **Appendix E**).
- 3.1.4 A full survey of the culverted watercourse has now been undertaken and is included in **Appendix K** for completeness.

- 3.1.5 The total site covers 3.053ha, with an approximate current impermeable area of 1.098ha. Based on the above planning layout, the impermeable areas will increase to 55% of the total site area post-development. Betterment in the form of permeable surfaces opposed to external hardstanding should also be considered to reduce the surface water run-off. Opportunities to provide soft landscaping on the site would provide added benefits to water quality and ecology.
- 3.1.6 National and local policy identifies that SUDS should be incorporated into new development where feasible to manage surface water run-off generated. A separate Drainage Management Strategy has been prepared to support the planning application which details the drainage strategy proposed (refer to *HYD1015_CRABTREE.LANE_DMS_4.0_CON*).

4.0 SOURCES OF FLOOD RISK

4.1 Fluvial Flood Risk

- 4.1.1 Information relating to flood risk at the site has been obtained from the Environment Agency and the Gov.uk website. An extract of the EA's Flood Zone Map for Planning is shown in **Figure 3**, which illustrates that the site is located solely within Flood Zone 1. Flood Zone 1 is an area considered to be at little or no flood risk from rivers and/or the sea (as defined by the EA).



Main Rivers

- 4.1.2 The nearest Main River to the site is the River Medlock, which is located 1.3km north of the site. The fluvial flood risk to the site from the River Medlock is 'very low' based on proximity and the surrounding topography. This is supported by the Flood Map for Planning, which shows the site in Flood Zone 1 and at little/no risk from fluvial sources as shown within **Figure 2** (see **Appendix B**).

Culverted Ordinary Watercourse

- 4.1.3 There is a culverted Ordinary Watercourse understood to cross the site in the approximate route penned onto the plan in **Figure 3**, as shown by historical mapping. Discussion with the client, and review of both the historic mapping and topographic survey has identified that the culvert is still present and active onsite.
- 4.1.4 Watercourses with catchments greater than 2km² are typically considered as part of the national flood mapping, however, in this case the contributing catchments are less than this. Although there is no detailed modelling, a qualitative assessment can be undertaken at this stage to assess the potential flood risks.

- 4.1.5 It should be noted that the watercourse is fully culverted through the site, and it has been assumed that this is currently sized to cater for the incoming catchment flows. There has been no indication during consultations of any historic flooding of the site resulting from the culverted ordinary watercourse.
- 4.1.6 There is still a residual risk associated with failure or blockage of the upstream and downstream culverts, in terms of infrastructure the most likely locations for culverts to exceed are access points such as manholes or inspection chambers. A qualitative assessment has therefore been undertaken.
- 4.1.7 There are manholes identified onsite which align with the routing of the culvert to the east of the site (identified by historic mapping). If a blockage, or failure were to occur, exceedance would likely route in a westerly direction and toward the development proposals. There is a slight ridge in the centre of the site, and it is therefore understood exceedance would pond there instead of entering the development area. The risk to the site is therefore low.
- 4.1.8 While the routing of the culverted watercourse through the site is known, the full route upstream of the site is not currently known. The LLFA (MCC) may require a more detailed assessment in due course to accurately consider capacity within the culverts and open channel lengths. A full survey of the culverted watercourse has now been undertaken, and is included in **Appendix K** for completeness.

4.2 Tidal Flood Risk

- 4.2.1 The Northwest Coastline is located over 55km west of the site. The tidal flood risks associated are therefore 'very low'. This is supported by the EA's Flood Map for Planning, which shows the site in Flood Zone 1 and at little/no risk from tidal sources.

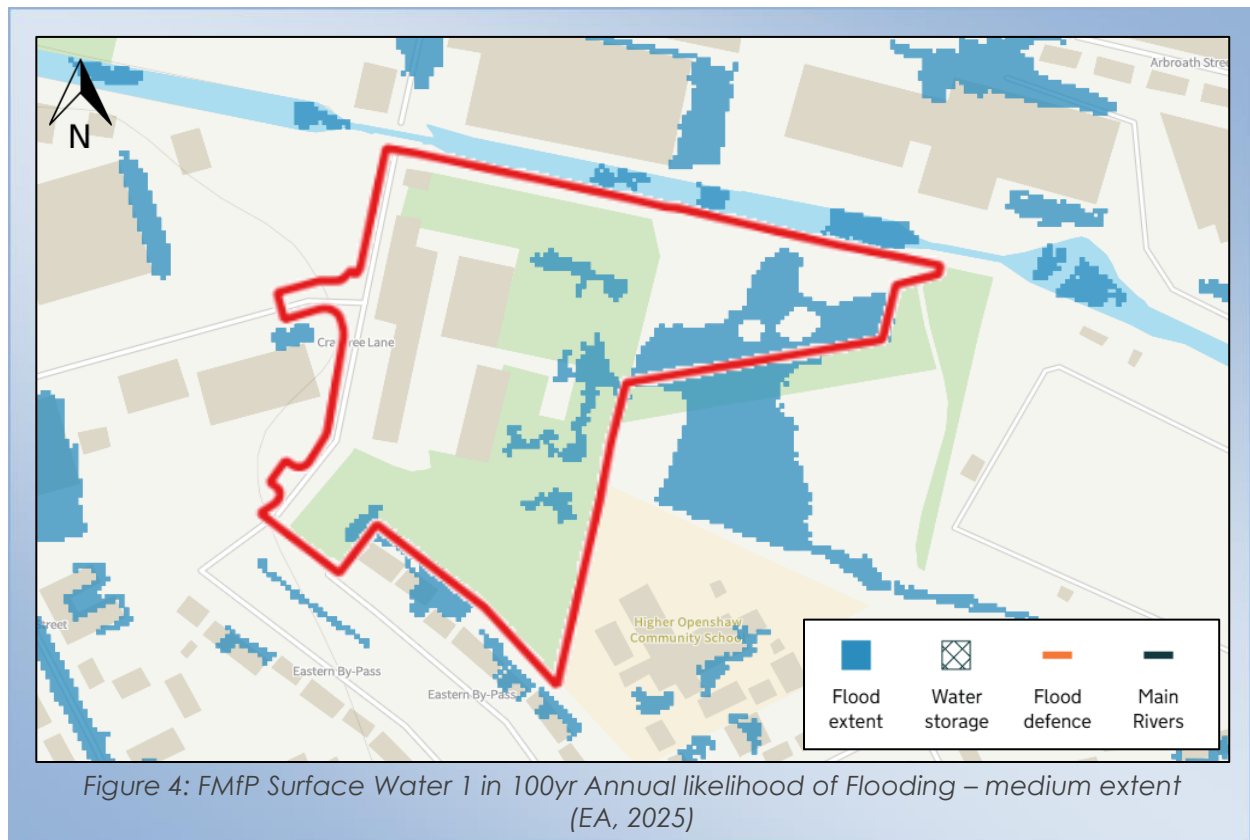
4.3 Flood Risk Vulnerability Classification and Flood Zone Compatibility

- 4.3.1 The proposals are classified as 'more vulnerable' in Annex 3: Flood Risk Vulnerability Classification within the National Planning Policy Framework. The Planning Practice Guidance confirms that this type of land-use is appropriate for Flood Zone 1, providing there is no increase in flood risk elsewhere due to the proposals.

4.4 Surface Water Flood Risk

- 4.4.1 Surface water flooding occurs when rainwater is unable to drain away through the normal drainage systems or soak into the ground but lies on or flows over the ground instead. The recently updated Flood Map for Planning (FMfP) data (25th March 2025), includes new published information relating to surface water flooding. The Surface Water Flood Map for Planning data includes present-day chance of flooding only and does not currently show climate change scenarios for surface water.
- 4.4.2 Considering the Surface Water Flood Map for Planning, the chance of surface water flooding in some parts of the wider site could be more than 3.3% AEP (1 in 30yr RPE) each year, particularly in those naturally low-lying areas in the existing scrubland in the east (refer to full mapping in Appendices).

- 4.4.3 The updated FMfP mapping also shows that there are parts of the site to have a chance of flooding equal to the 1% AEP (1 in 100yr RPE) chance of flooding each year (see **Figure 4**). This is considered to represent the medium risk scenario, and the areas again correlate to the lowest parts of the site in the east, where the surrounding levels fall towards the site in this locations and result in surface water flow routes onto the site.
- 4.4.4 Larger parts of the site are shown to be located within areas with a low chance of surface water flooding occurrence or 0.1% AEP (1 in 1000) chance of flooding each year (refer to full mapping in Appendices).

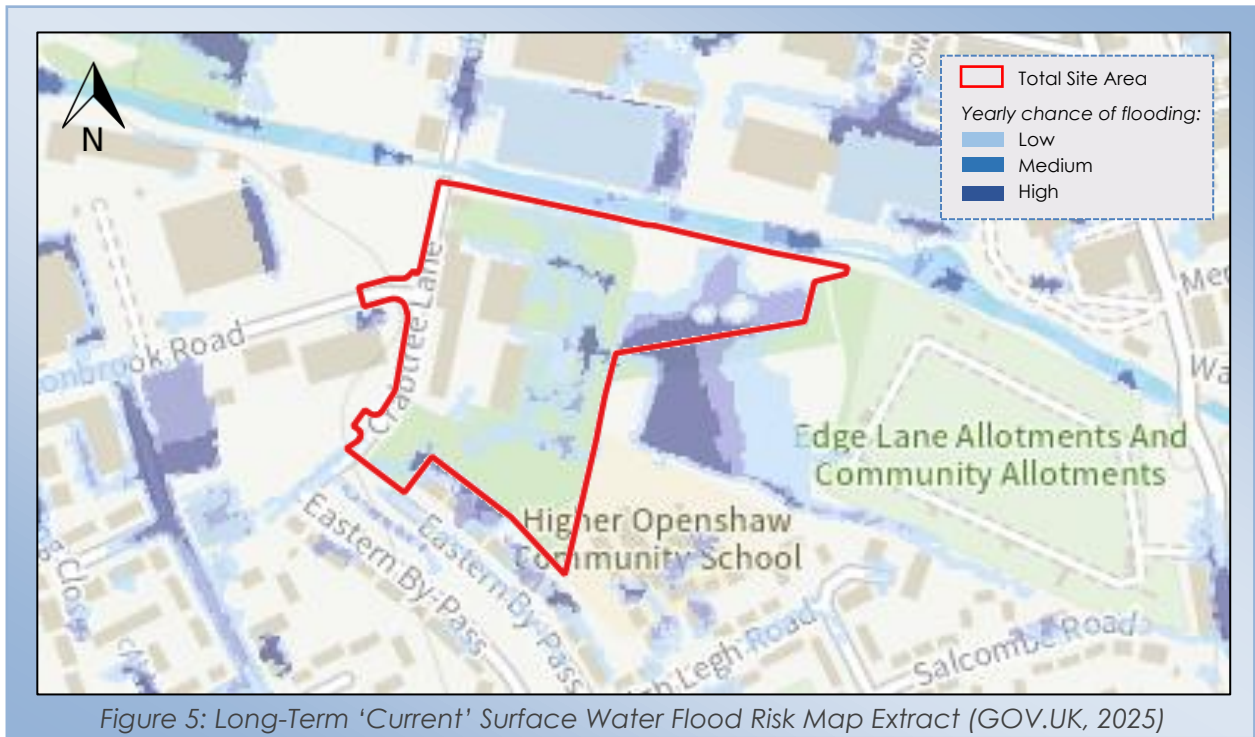


- 4.4.5 The EA also provide further information in terms of surface water flooding in the form of the long-term Risk of Flooding from Surface Water (RoFSW) mapping, extracts from which have been included subsequently and discussed (**Figure 5 & Figure 6**). Whilst this data is not intended for use in planning, the guidance does say that it can be used as part of initial risk assessment works.

Current Day Scenario

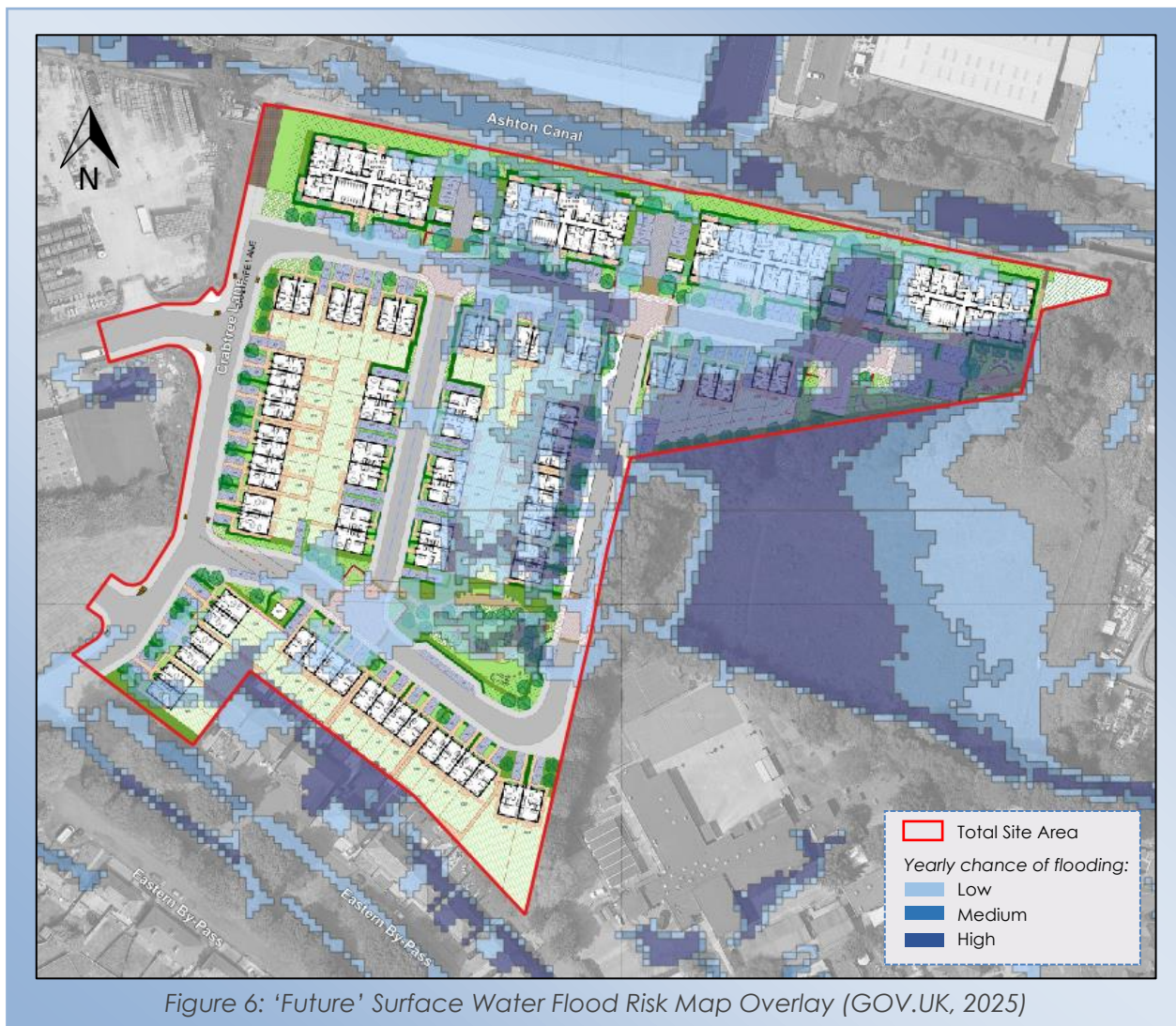
- 4.4.6 The EA RoFSW dataset shows the current present-day risk from surface water, represented on a 2m resolution grid. The risk is displayed as one of three likelihood categories:
- High (greater than or equal to 1 in 30 or 3.3% chance of flooding for any given year);
 - Medium (less than 1 in 30 or 3.3%, but greater than or equal to 1 in 100 or 1% chance of flooding in any given year), and;
 - Low (less than 1 in 100 or 1% chance of flooding, but greater than or equal to 1 in 1000 or 0.1% chance of flooding in any given year).

- 4.4.7 As indicated in **Figure 5**, the site does fall within areas classified as having low, medium and high chance of surface water flooding. The highest risk areas are typically within the eastern part of the wider site, which have a greater probability due to these areas being particularly low lying at present (where ponding is most likely to occur during extreme and prolonged rainfall events).



Future Climate Change Scenario

- 4.4.8 Along with current chance of surface water flooding, future climate change scenarios have also been provided as part of the recently updated and published EA mapping. This updated future scenario indicates the predicted impacts of climate change on future flood risk. The climate change allowances are based on the latest UK Climate Projections (UKCP18) from the Met Office, using the Representative Concentration Pathway (RCP) 8.5. A near-term epoch (2040 – 2060 “2050s” epoch) and central allowances are used.
- 4.4.9 An overlay using the updated future scenario surface water flood risk mapping and the proposed landscape plan is shown in **Figure 6**. As indicated in **Figure 6**, the future surface water flood likelihood extents reach slightly further onsite when compared to the current surface water extent. Whilst it is typically feasible to mitigate for the risk from surface water in most cases, this would not negate the need for sequential testing for un-allocated or previously non-tested sites, in accordance with the updated NPPF (December 2024).
- 4.4.10 Regarding the areas of medium and high risk (**Figure 6**) an intra-site sequential approach should ideally be taken, and it would therefore be recommended that the proposed residential development avoids these medium and high-risk areas where practical. Where residential development is required within these higher risk locations then the Sequential Test may be required, especially where sites have not been allocated as part of the Local Plan.



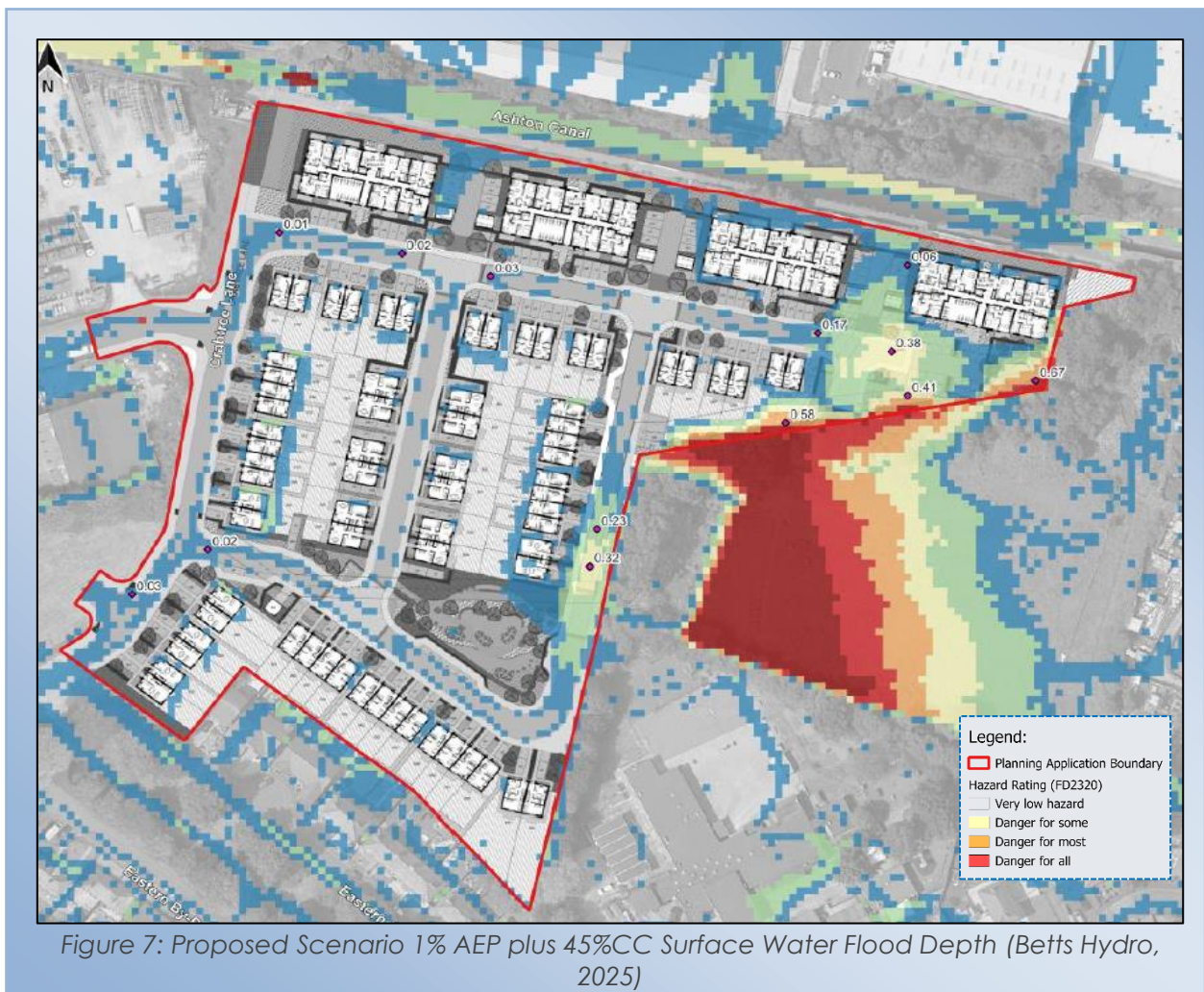
- 4.4.11 In terms of safeguarding any residual risks onsite post-development, it is advised that external levels fall away from the proposed dwellings, to minimise the flood risk from a variety of sources. By keeping the Finished Floor Levels elevated relative to the externals (typically up to 300mm to conform to Building Regs), this should help create safe overland flood flow routing in the event of flooding that could lead to overland flows.
- 4.4.12 Any run-off conveying through the site at present should be catered for through continued routing in an appropriate manner, this will ensure no increased run-off elsewhere because of the proposals.
- 4.4.13 Potential residual flood risk from surface water will be managed, post-development through the implementation of a sustainable surface water management regime, to manage surface water run-off generated by the proposed development in a sustainable and efficient manner.

Surface Water Modelling

- 4.4.14 Site-specific direct rainfall modelling has been undertaken by Betts Hydro, utilising Flood Modeller Pro. The purpose of this direct rainfall modelling was to refine the long-term nationalised surface water modelling by determining actual 'risk' using defined hazard.

The full 'Surface Water Flood Risk Modelling Report' has been included within **Appendix I**, however, a summary is provided below for completeness.

- 4.4.15 Whilst the results shown are considered conservative as they do not account for below ground drainage systems, the extents of the direct rainfall modelling generally align with the EA surface water flood risk maps. The site is still shown to be at risk of surface water flooding for a range of return periods up to the 1 in 1000 year event (including the impacts of climate change).



- 4.4.16 This site specific assessment identifies that the built form is within areas of medium and high surface water flood risk and potentially triggers the requirement for the sequential test. This should be discussed further with the LPA. The proposed modelling which incorporated the proposed onsite external levels design predicts onsite buildings will remain flood free from surface water flooding in the 1 in 100 year plus climate change event (future medium chance). An extract of the proposed scenario Flood depth plan for the 1 in 100yr plus 45% climate change simulation is included within **Figure 7** for review (see **Appendix I** for other mapping).

Pluvial (Overland run-off) Flood Risk

- 4.4.17 Intense rainfall that is unable to soak into the ground or enter drainage systems can run-off land and result in flooding. Local topography and the land-use can have a strong influence on the direction and depth of flow.

- 4.4.18 The site is mainly surrounded by built up land, both residential and industrial; these developed land areas are likely to be served by formal drainage infrastructure and the risk of pluvial run-off impacting the site as a result would be minimal.
- 4.4.19 Review of the aerial mapping shows there to be undeveloped land to the east of the site; this is likely to generate pluvial run-off and in terms of ground levels and potential routing review of the surface water mapping (**Figure 5 and 6** previously), conveyance would route towards the site's eastern boundary from this direction. Interception measures can be incorporated along the sites boundary where routing requires, to intercept anything directing towards the site and convey it safely onward to outfall.
- 4.4.20 Based on current land-use there is a part of the wider site which is currently undeveloped and would generate pluvial run-off. The proposals will likely come with changes in existing ground levels and undoubtedly the inclusion of a new drainage system; these will likely sufficiently mitigate against pluvial risk onsite.
- 4.4.21 The volume and rate of overland flow from land can be exacerbated if development increases the percentage of impermeable areas. Any overland flows generated by the development must be carefully controlled; safe avenues directing overland flow away from adjacent development are advised. An appropriate surface water management regime will be implemented post-development, to cater for the increase in impermeable areas on the site, meaning a reduction in the overland flows generated on the site.

Sewer Flood Risk

- 4.4.22 In urban areas, rainwater is frequently drained into surface water sewers or sewers containing both surface and wastewater known as 'combined sewers'. Foul water flooding often occurs in areas prone to overland flow and can result when the sewer is overwhelmed by heavy rainfall and will continue until the water drains away.
- 4.4.23 Consultation with United Utilities has been undertaken and has identified modelled flood risk within vicinity of the site (refer to consultation responses in **Appendix C**). At this stage, no incidences of sewer flooding on the site have been identified.
- 4.1.24 It is advised that external levels fall away from the proposed dwellings to minimise the flood risk from a variety of sources. By keeping the Finished Floor Levels elevated relative to the externals, this should help create an overland flood flow route in the event of a breach or any other source of overland flooding.

4.5 Groundwater Flood Risk

- 4.5.1 High groundwater levels are usually the key source of groundwater flooding, which occurs when excess water emerges at the grounds surface (or within manmade underground structures such as basements). Groundwater flooding is often more insistent than surface water flooding and would typically last for weeks/months rather than days meaning the result to property is often more severe.
- 4.5.2 In general terms groundwater flooding can occur from three main sources:

- If groundwater levels are naturally close to the surface, then this can present a flood risk during times of intense rainfall.
- Seepage and percolation occur where embankments above ground level hold water. In these cases, water travels through the embankment material and emerges on the opposite side of the embankment.
- Groundwater recovery/rebound occurs where the water table has been artificially depressed by abstraction. When the abstraction stops the water table makes a recovery to its original level. There is the potential for groundwater flooding in low lying areas where groundwater levels have been depressed below their pre-pumping conditions, where these were at or close to ground level.

- 4.5.3 The mapping data for groundwater shows that the site is underlain by a Secondary B bedrock aquifer, meaning that the rock layers in this area store and yield limited amounts of groundwater. The BGS mapping states that the site is also underlain with Secondary (undifferentiated) superficial deposits (this refers to rock deposits with variable permeability and storage properties).
- 4.5.4 The online BGS mapping also provides information on Groundwater Vulnerability, this mapping illustrates the vulnerability of the groundwater to a pollutant discharged at ground level. The mapping uses hydrological, geological, hydrogeological and soil properties within a one-kilometre, square grid. In this case, the site area is not shown to be located within a medium-low risk area, which means that it is in an area with a lower likelihood of a pollutant reaching the groundwater (i.e., the vulnerability).
- 4.5.5 No historical flooding at or within proximity of the site due to groundwater related sources has however been identified as part of this assessment, including review of the Manchester City Council Strategic Flood Risk Assessment (see mapping extracts in **Appendix J**).
- 4.5.6 Irrespective, it is advised that external levels fall away from the proposed dwellings to minimise the flood risk from a variety of sources. By keeping the Finished Floor Levels elevated relative to the externals, this should help create an overland flood flow route in the event of a breach or any other source of overland flooding.

Groundwater Source Protection Zones

- 4.5.7 In addition to the aquifer bedrock designations, mapping is available that shows the extent of groundwater Source Protection Zones (SPZs). The SPZs show the risk of contamination from any activities that might cause pollution in the area. Review of the mapping has identified that the site is not located within a SPZ.

4.6 Artificial Sources of Flood Risk

- 4.6.1 National policy states that an FRA should consider the potential risks from a variety of other flood sources including artificial sources (such as risks from reservoirs and canals).

Reservoirs

- 4.6.2 The Environment Agency recognises reservoirs as bodies of water over 25,000cu.m and the long-term flood mapping is included in **Appendix B**. The mapping shows that the site is not susceptible to flooding should a failure occur in a nearby reservoir.

- 4.6.3 Irrespective, it is advised that external levels fall away from the proposed dwellings, to minimise the flood risk from a variety of sources. By keeping the Finished Floor Levels elevated relative to the externals, this should help create an overland flood flow route in the event of a breach or any other source of reservoir flooding.

Canals

- 4.6.4 The Ashton Canal is located to the north of the site within 3.5m of the site in some areas, with much of the site at the same level as the canal, or up to 2m below. There is therefore a risk of overtopping from the canal exceeding onto the site, and the potential for flooding of the site because of a breach of the embankment.
- 4.6.5 Given the proximity of the canal, and the associated levels, consultations have been undertaken with CRT to obtain any information they may hold regarding the flood risk from Ashton Canal. At this stage, a response is currently outstanding (see correspondence in **Appendix D**). Consultations have also been undertaken with the EA, UU, and RMBC, and no historic canal flooding has been identified (see responses in **Appendix B, C, and E**).
- 4.6.6 Qualitative review of LiDAR data has identified that should exceedance or a failure of the embankment occur north of the site, flows would likely route toward the site given the falls. In terms of mitigation requirements, canals are carefully managed bodies of water, and the likelihood of overtopping and breach are low. However, it would be good practice to try to incorporate safe overland flow routes through any proposed development for exceedance flooding to be routed to during a hypothetical flood event. This conveyance route could form POS or green space/play function and only utilised for flood water in the residual event of canal related flooding at this location.
- 4.6.7 Furthermore, it is advised that external levels fall away from the proposed dwellings, to minimise the flood risk from a variety of sources. By keeping the Finished Floor Levels elevated relative to the externals, this should help create an overland flood flow route in the event of a breach or any other source of canal flooding.

4.7 Historical and Anecdotal Flooding Information

- 4.7.1 Consultation with the Environment Agency, United Utilities, Canal and River Trust, and Manchester City Council has been carried out for this application and has not identified any historic flooding at or near to the site (correspondence in **Appendix B, C, D and E**).

4.8 Flood Risk Mitigation Measures & Residual Risks

- 4.8.1 The site is located wholly within Flood Zone 1 and is at little risk of fluvial/tidal flooding. To observe a conservative approach however, mitigation measures have been proposed below to safeguard against other potential residual sources of flood risk.
- 4.8.2 The mitigation measures also consider the uncertainties of climate change in accordance with the revised NPPF and PPG. Whilst the mitigation measures proposed are to safeguard the development, they would not remove the requirement for the Sequential and Exception Tests where built development is proposed within the extent of areas identified to be at high or medium flood risk.

Mitigation Measures

- 4.8.3 It is advised that external levels fall away from the proposed dwellings, to minimise the flood risk from a variety of sources. By keeping the Finished Floor Levels elevated relative to the externals (typically 150mm-300mm where practical), should help create a safe overland flood flow route externally in the event of a flooding associated with a variety of sources.
- 4.8.4 There is a naturally low-lying area along the sites farthest south-eastern boundary, where the national mapping shows conveyance for surface water/pluvial run-off to convey into the development and pond in this location. Proposed development onsite will likely require external levels changes and the inclusion of a sustainable surface water drainage system; therefore, any existing residual risk will likely be mitigated for.
- 4.8.5 Any run-off conveying through the site at present should be catered for through continued routing in an appropriate manner, this will ensure no increased run-off elsewhere because of the proposals. Safe avenues directing overland flow away from any existing/proposed buildings is advised. Interception measures can be incorporated along the site boundary where routing requires, to intercept anything directing towards the site and convey it safely onward to outfall.
- 4.8.6 The culvert as surveyed is 450mm in diameter, with depths varying up to 6m. In accordance with the guidance provided by the LLFA a 6m wide easement has been added (3m either side of the pipe). This is subject to agreement and formal consent from the LLFA.
- 4.8.7 To minimise the flood risk to the neighbouring properties it is recommended that the surface water run-off generated by the proposals be managed effectively with the peak rates of run-off being restricted to the equivalent of the pre-development situation (with betterment where required).
- 4.8.8 The proposed onsite surface water drainage system will need to be sized to contain exceedance from storm events up to and including the 1 in 100yr return period storm event with a 45% allowance for climate change being contained onsite. A separate Drainage Management Strategy has been prepared to support the application, which details the drainage strategy (refer to *HYD1015_CRABTREE.LANE_DMS_4.0_CON*).
- 4.8.9 As with any drainage system, blockages within either the foul or surface water system have the potential to cause flooding or disruption. It is important that should any drainage systems not be offered for adoption then an appropriate maintenance regime should be scheduled with a suitably qualified management company for these private drainage systems.

Residual Risks

- 4.8.10 If an extreme rainfall event exceeds the design criteria for the drainage system it is likely that there will be some overland flows that are unable to enter the system, it is important that these potential flows are catered for within the development site if the capacity of the drainage system is exceeded, or in the event of a system failure.

5.0 SUMMARY AND CONCLUSIONS

- 5.1 The proposals are classified as 'More Vulnerable' in Annex 3: Flood Risk Vulnerability Classification, within the National Planning Practice Framework. The Planning Practice Guidance confirms that more vulnerable development is appropriate when located within Flood Zone 1 providing there is no increase in flood risk elsewhere due to the proposals.
- 5.2 Consultations with the Environment Agency, United Utilities, Canal and River Trust, and Manchester City Council have not identified any historical flooding on or in proximity to the site. This report has reviewed all sources of flood risk both to and resulting from the proposed development site.
- 5.3 The nearest canal to the site is Ashton Canal, which is located immediately north of the site. Review of the Manchester City Council Strategic Flood Risk assessment has shown no evidence of historical canal flooding in proximity to the site. Much of the site is either at the level of the canal or below, creating risk from overtopping or breach. Canals are however carefully managed bodies of water, meaning that risk from overtopping or breach is low.
- 5.4 There is a culverted Ordinary Watercourse crossing the site. The watercourse is fully culverted through the site, and it has been assumed as being sized to cater for the incoming catchment flows. There has been no indication of any historic flooding of the site resulting from the culverted ordinary watercourse. There is a residual risk associated with failure or blockage of the upstream and downstream culverts.
- 5.5 In terms of infrastructure the most likely locations for culverts to exceed are access points such as manholes or inspection chambers. A qualitative assessment has therefore been undertaken. In the case of exceedance from manholes / inspection chambers, if a blockage or failure were to occur, exceedance would likely route in a westerly direction and toward the development proposals. There is a slight ridge in the centre of the site, and it is therefore understood exceedance would pond there instead of entering the development area. The risk to the site is therefore low.
- 5.6 There is some surface water and pluvial flood risk onsite, typically within the eastern part of the wider site, which have a greater probability due to these areas being particularly low lying at present (where ponding is most likely to occur during extreme and prolonged rainfall events). The proposed developments are likely to come with changes in levels and will include a new drainage system, both of which will minimise potential risk from surface or pluvial runoff.
- 5.7 To mitigate any potential residual flood risks, it is advised that external levels fall away from the proposed dwellings, to minimise the flood risk associated with overland flows. By keeping the Finished Floor Levels elevated relative to the externals (typically 150mm to 300mm), this should help create safe overland flood flow routes in the event of any source of flooding including fluvial, surface water and groundwater.
- 5.8 At present the site is mostly at low probability of surface water flooding. There are isolated areas at higher probability, but these correspond with existing low-lying land and conveyance routes where ponding naturally occurs. The additional proposed

impermeable areas onsite have the potential to cause an increase in flood risk to others if not managed appropriately. A separate Drainage Management Strategy has been prepared which will detail the drainage proposals (refer to *HYD1015_CRABTREE.LANE_DMS_4.0_CON*).

- 5.9 To summarise, the proposals are at 'low' flood risk from the key flood sources reviewed as part of this assessment and appropriate mitigation will be put in place to ensure that there is no increase in flood risk because of the proposals. This assessment has been prepared in consultation with the relevant interested parties. The report is commensurate with the scale and nature of the proposals and is appropriate with the Planning Practice Guidance.

6.0 RECOMMENDATIONS

- 6.1 It is advised that external levels fall away from the proposed dwellings, to minimise the flood risk from a variety of sources. By keeping the Finished Floor Levels elevated relative to the externals, this should help create a safe overland flood flow route externally in the event of a flooding associated with a variety of sources, including residual groundwater and surface water flooding.
- 6.2 Any run-off conveying through the site at present should be catered for through continued routing in an appropriate manner, this will ensure no increased run-off elsewhere because of the proposals. Safe avenues directing overland flow away from any existing/proposed buildings is advised.
- 6.3 The culvert as surveyed is 450mm in diameter, with depths varying up to 6m. In accordance with the guidance provided by the Lead Local Flood Authority a 6m wide easement has been added (3m either side of the pipe). This is subject to agreement and formal consent from the LLFA.
- 6.4 A full survey of the culverted watercourse has now been undertaken and is appended to this report for completeness. The survey has identified a collapse and blockage of the culvert, and therefore remedial works are required to ensure this asset remains operational post-development.
- 6.5 To minimise the flood risk to the neighbouring properties it is recommended that the surface water run-off generated by the proposals be managed effectively with the peak rates of run-off being restricted to the equivalent of the pre-development situation (with betterment where required).
- 6.6 The proposed onsite surface water drainage system will need to be sized to contain the 1 in 30yr return period event with exceedance from storm events up to and including the 1 in 100yr return period storm event with a 45% allowance for climate change being contained onsite.
- 6.7 A separate Drainage Management Strategy will be prepared in due course to support the planning application which will detail the preliminary drainage strategy (refer to HYD1015_CRABTREE.LANE_DMS_4.0_CON).

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APPENDIX A: NPPF & PPG EXTRACTS

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14. Meeting the challenge of climate change, flooding and coastal change

157. The planning system should support the transition to a low carbon future in a changing climate, taking full account of flood risk and coastal change. It should help to: shape places in ways that contribute to radical reductions in greenhouse gas emissions, minimise vulnerability and improve resilience; encourage the reuse of existing resources, including the conversion of existing buildings; and support renewable and low carbon energy and associated infrastructure.

Planning for climate change

158. Plans should take a proactive approach to mitigating and adapting to climate change, taking into account the long-term implications for flood risk, coastal change, water supply, biodiversity and landscapes, and the risk of overheating from rising temperatures⁵⁶. Policies should support appropriate measures to ensure the future resilience of communities and infrastructure to climate change impacts, such as providing space for physical protection measures, or making provision for the possible future relocation of vulnerable development and infrastructure.
159. New development should be planned for in ways that:
- a) avoid increased vulnerability to the range of impacts arising from climate change. When new development is brought forward in areas which are vulnerable, care should be taken to ensure that risks can be managed through suitable adaptation measures, including through the planning of green infrastructure; and
 - b) can help to reduce greenhouse gas emissions, such as through its location, orientation and design. Any local requirements for the sustainability of buildings should reflect the Government's policy for national technical standards.
160. To help increase the use and supply of renewable and low carbon energy and heat, plans should:
- a) provide a positive strategy for energy from these sources, that maximises the potential for suitable development, and their future re-powering and life extension, while ensuring that adverse impacts are addressed appropriately (including cumulative landscape and visual impacts);
 - b) consider identifying suitable areas for renewable and low carbon energy sources, and supporting infrastructure, where this would help secure their development; and

⁵⁶ In line with the objectives and provisions of the Climate Change Act 2008.

- c) identify opportunities for development to draw its energy supply from decentralised, renewable or low carbon energy supply systems and for co-locating potential heat customers and suppliers.
161. Local planning authorities should support community-led initiatives for renewable and low carbon energy, including developments outside areas identified in local plans or other strategic policies that are being taken forward through neighbourhood planning.
162. In determining planning applications, local planning authorities should expect new development to:
- a) comply with any development plan policies on local requirements for decentralised energy supply unless it can be demonstrated by the applicant, having regard to the type of development involved and its design, that this is not feasible or viable; and
 - b) take account of landform, layout, building orientation, massing and landscaping to minimise energy consumption.
163. When determining planning applications⁵⁷ for renewable and low carbon development, local planning authorities should:
- a) not require applicants to demonstrate the overall need for renewable or low carbon energy, and recognise that even small-scale projects provide a valuable contribution to significant cutting greenhouse gas emissions;
 - b) approve the application if its impacts are (or can be made) acceptable⁵⁸. Once suitable areas for renewable and low carbon energy have been identified in plans, local planning authorities should expect subsequent applications for commercial scale projects outside these areas to demonstrate that the proposed location meets the criteria used in identifying suitable areas; and
 - c) in the case of applications for the repowering and life-extension of existing renewable sites, give significant weight to the benefits of utilising an established site, and approve the proposal if its impacts are or can be made acceptable.
164. In determining planning applications, local planning authorities should give significant weight to the need to support energy efficiency and low carbon heating improvements to existing buildings, both domestic and non-domestic (including

⁵⁷ Wind energy development involving one or more turbines can also be permitted through Local Development Orders, Neighbourhood Development Orders and Community Right to Build Orders. In the case of Local Development Orders, it should be demonstrated that the planning impacts identified by the affected local community have been appropriately addressed and the proposal has community support.

⁵⁸ Except for applications for the repowering and life-extension of existing wind turbines, a planning application for wind energy development involving one or more turbines should not be considered acceptable unless it is in an area identified as suitable for wind energy development in the development plan or a supplementary planning document; and, following consultation, it can be demonstrated that the planning impacts identified by the affected local community have been appropriately addressed and the proposal has community support.

through installation of heat pumps and solar panels where these do not already benefit from permitted development rights). Where the proposals would affect conservation areas, listed buildings or other relevant designated heritage assets, local planning authorities should also apply the policies set out in chapter 16 of this Framework.

Planning and flood risk

165. Inappropriate development in areas at risk of flooding should be avoided by directing development away from areas at highest risk (whether existing or future). Where development is necessary in such areas, the development should be made safe for its lifetime without increasing flood risk elsewhere.
166. Strategic policies should be informed by a strategic flood risk assessment, and should manage flood risk from all sources. They should consider cumulative impacts in, or affecting, local areas susceptible to flooding, and take account of advice from the Environment Agency and other relevant flood risk management authorities, such as lead local flood authorities and internal drainage boards.
167. All plans should apply a sequential, risk-based approach to the location of development – taking into account all sources of flood risk and the current and future impacts of climate change – so as to avoid, where possible, flood risk to people and property. They should do this, and manage any residual risk, by:
 - a) applying the sequential test and then, if necessary, the exception test as set out below;
 - b) safeguarding land from development that is required, or likely to be required, for current or future flood management;
 - c) using opportunities provided by new development and improvements in green and other infrastructure to reduce the causes and impacts of flooding, (making as much use as possible of natural flood management techniques as part of an integrated approach to flood risk management); and
 - d) where climate change is expected to increase flood risk so that some existing development may not be sustainable in the long-term, seeking opportunities to relocate development, including housing, to more sustainable locations.
168. The aim of the sequential test is to steer new development to areas with the lowest risk of flooding from any source. Development should not be allocated or permitted if there are reasonably available sites appropriate for the proposed development in areas with a lower risk of flooding. The strategic flood risk assessment will provide the basis for applying this test. The sequential approach should be used in areas known to be at risk now or in the future from any form of flooding.
169. If it is not possible for development to be located in areas with a lower risk of flooding (taking into account wider sustainable development objectives), the exception test may have to be applied. The need for the exception test will depend on the potential vulnerability of the site and of the development proposed, in line with the Flood Risk Vulnerability Classification set out in Annex 3.

170. The application of the exception test should be informed by a strategic or site-specific flood risk assessment, depending on whether it is being applied during plan production or at the application stage. To pass the exception test it should be demonstrated that:
- a) the development would provide wider sustainability benefits to the community that outweigh the flood risk; and
 - b) the development will be safe for its lifetime taking account of the vulnerability of its users, without increasing flood risk elsewhere, and, where possible, will reduce flood risk overall.
171. Both elements of the exception test should be satisfied for development to be allocated or permitted.
172. Where planning applications come forward on sites allocated in the development plan through the sequential test, applicants need not apply the sequential test again. However, the exception test may need to be reapplied if relevant aspects of the proposal had not been considered when the test was applied at the plan-making stage, or if more recent information about existing or potential flood risk should be taken into account.
173. When determining any planning applications, local planning authorities should ensure that flood risk is not increased elsewhere. Where appropriate, applications should be supported by a site-specific flood-risk assessment⁵⁹. Development should only be allowed in areas at risk of flooding where, in the light of this assessment (and the sequential and exception tests, as applicable) it can be demonstrated that:
- a) within the site, the most vulnerable development is located in areas of lowest flood risk, unless there are overriding reasons to prefer a different location;
 - b) the development is appropriately flood resistant and resilient such that, in the event of a flood, it could be quickly brought back into use without significant refurbishment;
 - c) it incorporates sustainable drainage systems, unless there is clear evidence that this would be inappropriate;
 - d) any residual risk can be safely managed; and
 - e) safe access and escape routes are included where appropriate, as part of an agreed emergency plan.

⁵⁹ A site-specific flood risk assessment should be provided for all development in Flood Zones 2 and 3. In Flood Zone 1, an assessment should accompany all proposals involving: sites of 1 hectare or more; land which has been identified by the Environment Agency as having critical drainage problems; land identified in a strategic flood risk assessment as being at increased flood risk in future; or land that may be subject to other sources of flooding, where its development would introduce a more vulnerable use.

174. Applications for some minor development and changes of use⁶⁰ should not be subject to the sequential or exception tests but should still meet the requirements for site-specific flood risk assessments set out in footnote 59.
175. Major developments should incorporate sustainable drainage systems unless there is clear evidence that this would be inappropriate. The systems used should:
- a) take account of advice from the lead local flood authority;
 - b) have appropriate proposed minimum operational standards;
 - c) have maintenance arrangements in place to ensure an acceptable standard of operation for the lifetime of the development; and
 - d) where possible, provide multifunctional benefits.

Coastal change

176. In coastal areas, planning policies and decisions should take account of the UK Marine Policy Statement and marine plans. Integrated Coastal Zone Management should be pursued across local authority and land/sea boundaries, to ensure effective alignment of the terrestrial and marine planning regimes.
177. Plans should reduce risk from coastal change by avoiding inappropriate development in vulnerable areas and not exacerbating the impacts of physical changes to the coast. They should identify as a Coastal Change Management Area any area likely to be affected by physical changes to the coast, and:
- a) be clear as to what development will be appropriate in such areas and in what circumstances; and
 - b) make provision for development and infrastructure that needs to be relocated away from Coastal Change Management Areas.
178. Development in a Coastal Change Management Area will be appropriate only where it is demonstrated that:
- a) it will be safe over its planned lifetime and not have an unacceptable impact on coastal change;
 - b) the character of the coast including designations is not compromised;
 - c) the development provides wider sustainability benefits; and
 - d) the development does not hinder the creation and maintenance of a continuous signed and managed route around the coast⁶¹.

⁶⁰ This includes householder development, small non-residential extensions (with a footprint of less than 250m²) and changes of use; except for changes of use to a caravan, camping or chalet site, or to a mobile home or park home site, where the sequential and exception tests should be applied as appropriate.

⁶¹ As required by the Marine and Coastal Access Act 2009.

179. Local planning authorities should limit the planned lifetime of development in a Coastal Change Management Area through temporary permission and restoration conditions, where this is necessary to reduce a potentially unacceptable level of future risk to people and the development.

(<http://www.legislation.gov.uk/ukxi/2015/596/article/4/made>) to require planning permission to be sought in each case.

Paragraph: 075 Reference ID: 7-075-20220825

Revision date: 25 08 2022

How can neighbourhood plans and neighbourhood development/community right to build orders take account of coastal change?

In any instance where a Neighbourhood Area is proposed in a Coastal Change Management Area, careful attention should be paid to the guidance on [what development would be appropriate in such an area](#), including whether [time-limiting planning permissions](#) are needed. The local planning authority will need to be consulted about existing and anticipated levels of risk, and the types of development that may or may not be appropriate.

See related policy in [paragraphs 170 to 173 of the National Planning Policy Framework](#) (<https://www.gov.uk/guidance/national-planning-policy-framework/14-meeting-the-challenge-of-climate-change-flooding-and-coastal-change>).

Paragraph: 076 Reference ID: 7-076-20220825

Revision date: 25 08 2022

Flood Zone and flood risk tables

- Table 1: Flood Zones
- [National Planning Policy Framework Annex 3 - Flood risk vulnerability classification](#) (<https://www.gov.uk/guidance/national-planning-policy-framework/annex-3-flood-risk-vulnerability-classification>)
- [Table 2: Flood risk vulnerability and flood zone 'incompatibility'](#)

Paragraph: 077 Reference ID: 7-077-20220825

Revision date: 25 08 2022

Table 1: Flood Zones

Flood Zone	Definition
Zone 1 Low Probability	Land having a less than 0.1% annual probability of river or sea flooding. (Shown as 'clear' on the Flood Map for Planning – all land outside Zones 2, 3a and 3b)
Zone 2 Medium Probability	Land having between a 1% and 0.1% annual probability of river flooding; or land having between a 0.5% and 0.1% annual

Flood Zone	Definition
	probability of sea flooding. (Land shown in light blue on the Flood Map)
Zone 3a High Probability	Land having a 1% or greater annual probability of river flooding; or Land having a 0.5% or greater annual probability of sea. (Land shown in dark blue on the Flood Map)
Zone 3b The Functional Floodplain	This zone comprises land where water from rivers or the sea has to flow or be stored in times of flood. The identification of functional floodplain should take account of local circumstances and not be defined solely on rigid probability parameters. Functional floodplain will normally comprise: • land having a 3.3% or greater annual probability of flooding, with any existing flood risk management infrastructure operating effectively; or • land that is designed to flood (such as a flood attenuation scheme), even if it would only flood in more extreme events (such as 0.1% annual probability of flooding). Local planning authorities should identify in their Strategic Flood Risk Assessments areas of functional floodplain and its boundaries accordingly, in agreement with the Environment Agency. (Not separately distinguished from Zone 3a on the Flood Map)

Note: The Flood Zones shown on the Environment Agency's Flood Map for Planning (Rivers and Sea) do not take account of the possible impacts of climate change and consequent changes in the future probability of flooding. Reference should therefore also be made to the [Strategic Flood Risk Assessment](https://www.gov.uk/guidance/local-planning-authorities-strategic-flood-risk-assessment) (<https://www.gov.uk/guidance/local-planning-authorities-strategic-flood-risk-assessment>) when considering location and potential future flood risks to developments and land uses.

Paragraph: 078 Reference ID: 7-078-20220825

Revision date: 25 08 2022

Table 2: Flood risk vulnerability and flood zone 'incompatibility'

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	✓ *

Key:

✓ Exception test is not required

X Development should not be permitted

Notes to table 2:

- This table does not show the application of the [Sequential Test](#) which should be applied first to guide development to the lowest flood risk areas; nor does it reflect the need to avoid flood risk from sources other than rivers and the sea;
- The Sequential and [Exception Tests](#) do not need to be applied to those developments set out in [National Planning Policy Framework footnote 56](#) (<https://www.gov.uk/guidance/national-planning-policy-framework/14-meeting-the-challenge-of-climate-change-flooding-and-coastal-change>). The Sequential and Exception Tests should be applied to ‘major’ and ‘non major’ development;
- Some developments may contain different elements of vulnerability and the highest vulnerability category should be used, unless the development is considered in its component parts.

“†” In Flood Zone 3a essential infrastructure should be designed and constructed to remain operational and safe in times of flood.

“*” In Flood Zone 3b (functional floodplain) essential infrastructure that has passed the Exception Test, and water-compatible uses, should be designed and constructed to:

- remain operational and safe for users in times of flood;

- result in no net loss of floodplain storage;
- not impede water flows and not increase flood risk elsewhere.

Paragraph: 079 Reference ID: 7-079-20220825

Revision date: 25 08 2022

Site-specific flood risk assessment: Checklist

1 - Development site and location

You can use this section to describe the site you are proposing to develop. It would be helpful to include, or make reference to, a location map which clearly indicates the development site.

- a. Where is the development site located? (e.g. postal address or national grid reference)
- b. What is the current use of the site? (e.g. undeveloped land, housing, shops, offices)
- c. Which Flood Zone (for river or sea flooding) is the site within? (i.e. Flood Zone 1, Flood Zone 2, Flood Zone 3). As a first step, you should check the [Flood Map for Planning \(https://flood-map-for-planning.service.gov.uk/\)](https://flood-map-for-planning.service.gov.uk/). Check the Strategic Flood Risk Assessment for the area available from the local planning authority to identify if the site is within Flood Zone 1 but at increased risk of flooding in future due to climate change
- d. Also check the Strategic Flood Risk Assessment to identify if there are any other sources of flooding that may affect the site now or in the future.

2 - Development proposals

You can use this section to provide a general summary of the development proposals. It would be helpful to include, or make reference to, an existing block plan and a proposed block plan, where appropriate.

- a. What are the development proposal(s) for this site? Will this involve a change of use of the site and, if so, what will that change be?
- b. In terms of vulnerability to flooding, what is the vulnerability classification of the proposed development? See [National Planning Policy Framework Annex 3 \(https://www.gov.uk/guidance/national-planning-policy-framework/annex-3-flood-risk-vulnerability-classification\)](https://www.gov.uk/guidance/national-planning-policy-framework/annex-3-flood-risk-vulnerability-classification) for an explanation of the vulnerability classifications.
- c. What is the expected or estimated lifetime of the proposed development likely to be (e.g. 100 years or 75 years)? See [paragraph 006](#) of this guidance for further advice on how to assess the lifetime of developments for flood risk and coastal

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APPENDIX B: EA INFORMATION & CORRESPONDENCE

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Jabez Thomas

From: GMMC Info Requests <[REDACTED]>
Sent: 29 October 2024 15:06
To: Jabez Thomas
Subject: GMMC382396LB Response attached from the Environment Agency
Attachments: Location Plan.pdf; MNDB311D5BUH.pdf

Dear Jabez,

Thank you for your enquiry which was received on 28/10/2024.

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

I enclose the data requested, please see supporting comments from my colleague.
Please refer to the [Open Government Licence](#) which explains the permitted use of this information.

Please be aware you can check your risk of flooding on our external website <https://flood-warning-information.service.gov.uk/long-term-flood-risk/>

Here are some useful links below:

<https://www.gov.uk/guidance/flood-risk-assessment-local-planning-authorities>

<https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances>

For surface information please use link: <https://check-long-term-flood-risk.service.gov.uk/map?easting=362125.07&northing=388310.97&map=SurfaceWater>

The ShareFile link contains the following data:

<https://ea.sharefile.com/d-seb46a02a4c3447f1975332337316b5e7>

Corn Brook 2017 Report (P5)
Corn Brook 2017 Mapedit (P6)
Corn Brook 2017 Outputs (P6)
Corn Brook 2017 Model (P7)

Please can you advise that the link will expire in 30 days from 29/10/2024. It is therefore advisable that the client saves this data to their own system.

Product 5/6/7

1. You may use the Information for your internal or personal purposes and may only sublicense others to use it if you do so under a written licence which includes the terms of these conditions and the agreement and in particular may not allow any period of use longer than the period licensed to you.
2. Notwithstanding the fact that the standard wording of the Environment Agency Conditional Licence indicates that it is perpetual, this Licence has a limited duration of 5 years at the end of which it will terminate automatically without notice.
3. We have restricted use of the Information as a result of legal restrictions placed upon us to protect the rights or confidentiality of others. In this instance it is because of third party data. If you contact us in writing (this includes email) we will, as far as confidentiality rules allow, provide you with details including, if available, how you might seek permission from a third party to extend your use rights.

- 4.1 The Information may contain some data that we believe is within the definition of “personal data” under the Data Protection Act 1998 but we consider that we will not be in breach of the Act if we disclose it to you with conditions set out in this condition and the conditions above. This personal data comprises names of individuals or commentary relating to property that may be owned by an individual or commentary relating to the activities of an individual.
- 4.2 Under the Act a person who holds and uses or passes to others personal data is responsible for any compliance with the Act and so we have no option but to warn you that this means you have responsibility to check that you are compliant with the Act in respect of this personal data.
- 5 The location of public water supply abstraction sources must not be published to a resolution more detailed than 1km2. Information about the operation of flood assets should not be published.
- 6 .1 Where we have supplied model data which may include model inputs or outputs you agree to supply to the Environment Agency copies of any assessments/studies and related outputs, modifications or derivatives created pursuant to the supply to you of the Information, all of which are hereinafter referred to as “the Data”.
- 6.2 You agree, in the public interest to grant to the Environment Agency a perpetual royalty free non-exclusive licence to use the Data or any part thereof for its internal purposes or to use it in any way as part of Environment Agency derivative products which it supplies free of charge to others such as incorporation into the Environment Agency’s Open Data mapping products.

We are supplying this information to you under the Environment Agency Conditional Licence Please check the special conditions above to determine If the conditions on the use are suitable for your purposes. If they are not, this information is not provided with a licence for use, and the data is provided for read right only.

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,

Lauren Blackley

Customer and Engagement Officer
Greater Manchester, Merseyside and Cheshire

From: Jabez Thomas <[REDACTED]>
Sent: 28 October 2024 15:16
To: GMMC Info Requests <[REDACTED]>
Subject: GMMC382396LB 22.11 Flood Risk Information Request – Products 4, 5, 6, & 7

To whom it may concern,

Crabtree Lane, Manchester

Please could you confirm whether you have any information (where available, Products 4, 5, 6, & 7) that you feel would be valuable to a Flood Risk Assessment and Drainage Management Strategy for the above site (location plan attached), including details of historical flooding and specific drainage requirements; this would be greatly appreciated. If there are any other specific requirements that you require in a scope of works for this site, please can you advise at this stage so that it can be fully incorporated into the proposals at an early stage.

Please do not hesitate to contact me on the details below to discuss further should you require additional information or clarification.

Kind Regards,

Jabez Thomas BSc(Hons)
Graduate Flood Risk Analyst

BETTS HYDRO

Consulting Engineers

Old Marsh Farm Barns, Welsh Road, Sealand, Flintshire, CH5 2LY

[REDACTED]

[REDACTED]

www.betts-associates.co.uk

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Flood risk assessment data

Location of site: 388768 / 398011 (shown as easting and northing coordinates)

Document created on: 29 October 2024

This information was previously known as a product 4.

Customer reference number: MNDB311D5BUH

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)
- 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

Information that's unavailable

This document **does not** contain:

- past floods
- flood defences and attributes

We do not have past flooding data for this location.

Please note that:

- 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 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.

We aren't able to display flood defence locations and attributes as there are no formal flood defences in the area of interest.

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 Manchester District.

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

About the models used

Model name: Corn Brook 2017

Scenario(s): No defences exist fluvial, no defences exist climate change fluvial

Date: 31 December 2017

This model contains 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 1.

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:

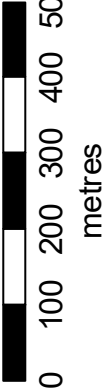
- refer to the land at risk of flooding and do not refer to individual properties
- refer to the probability of river and sea flooding, ignoring the presence of defences
- do not take into account potential impacts of climate change

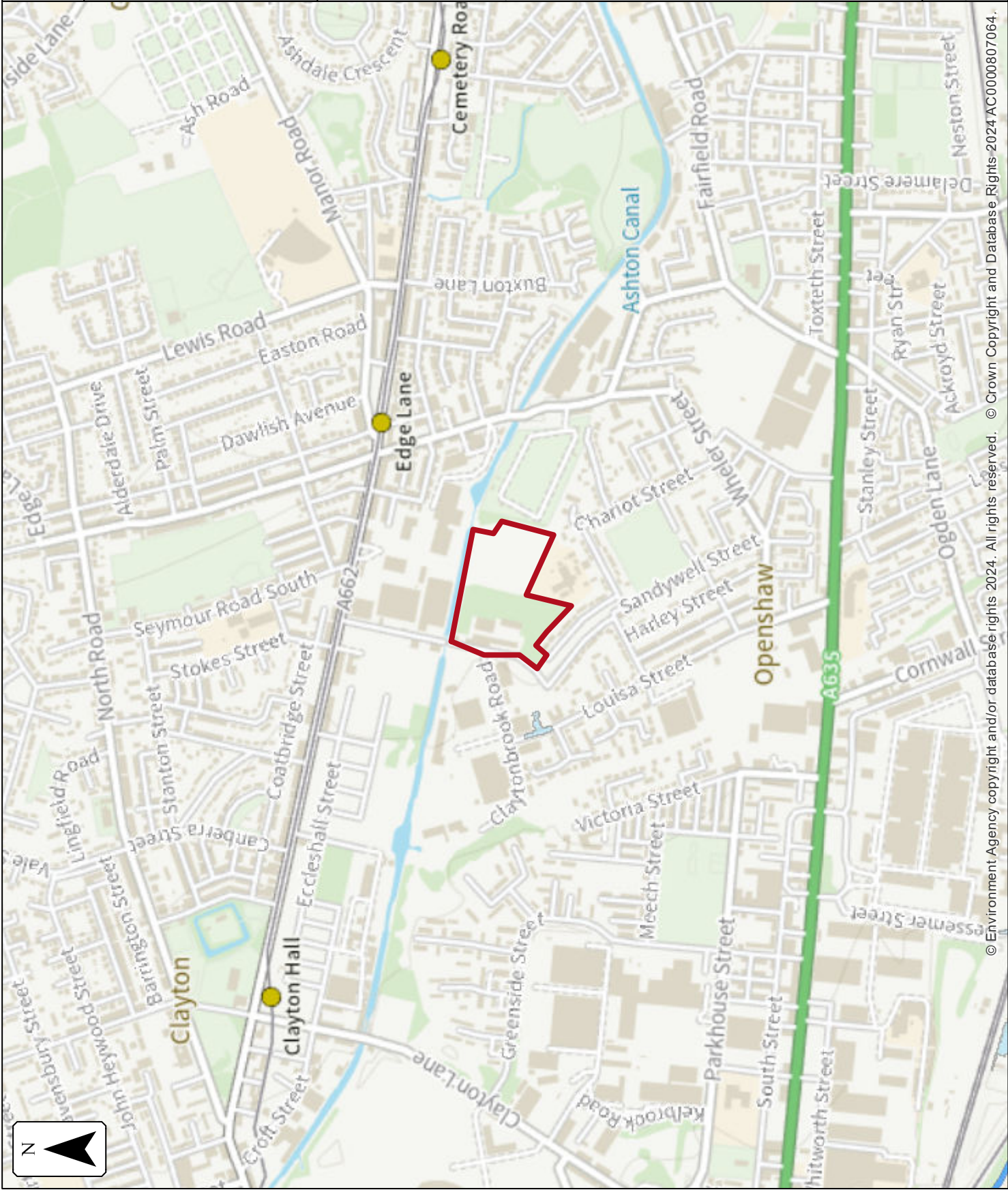
The flood zones are not currently being updated. The last update was in November 2023. Some of the flood zones may have changed, however all source data is included in the models below.



Flood map for planning
 Location (easting/northing)
388768/398011
 Scale
1:10,000
 Created
29 Oct 2024

 Selected area
 Flood zone 3
 Flood zone 2





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:

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



No defences exist modelled fluvial extent

Location (easting/northing)
388768/398011

Scale Created
1:10,000 29 Oct 2024

Model name
Corn Brook 2017

Selected area

Modelled flood extent

5% AEP

2% AEP

1.33% AEP

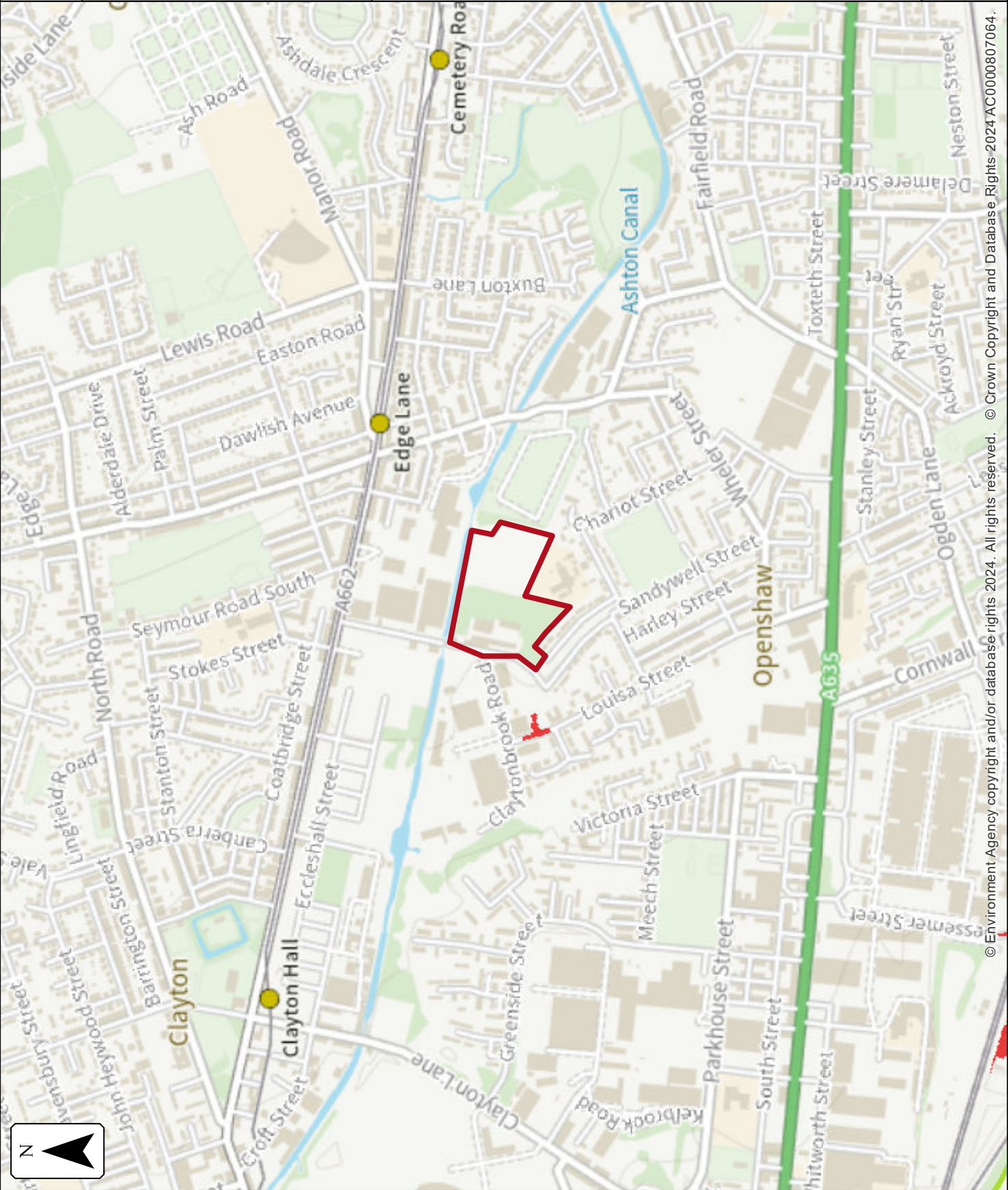
1% AEP

0.5% AEP

0.1% AEP

Flood extents may not be visible where they overlap other return periods

0 100 200 300 400 500 metres





Environment

Agency

No defences exist

climate change

modelled fluvial extent

Location (easting/northing)

388768/398011

Scale

1:10,000

Created

29 Oct 2024

Model name

Corn Brook 2017

Selected area

Main river

Modelled flood extent

1.0% AEP (+30%)

1.0% AEP (+35%)

1.0% AEP (+70%)

0.1% AEP (+30%)

Flood extents may not be visible where they overlap other return periods

0

100

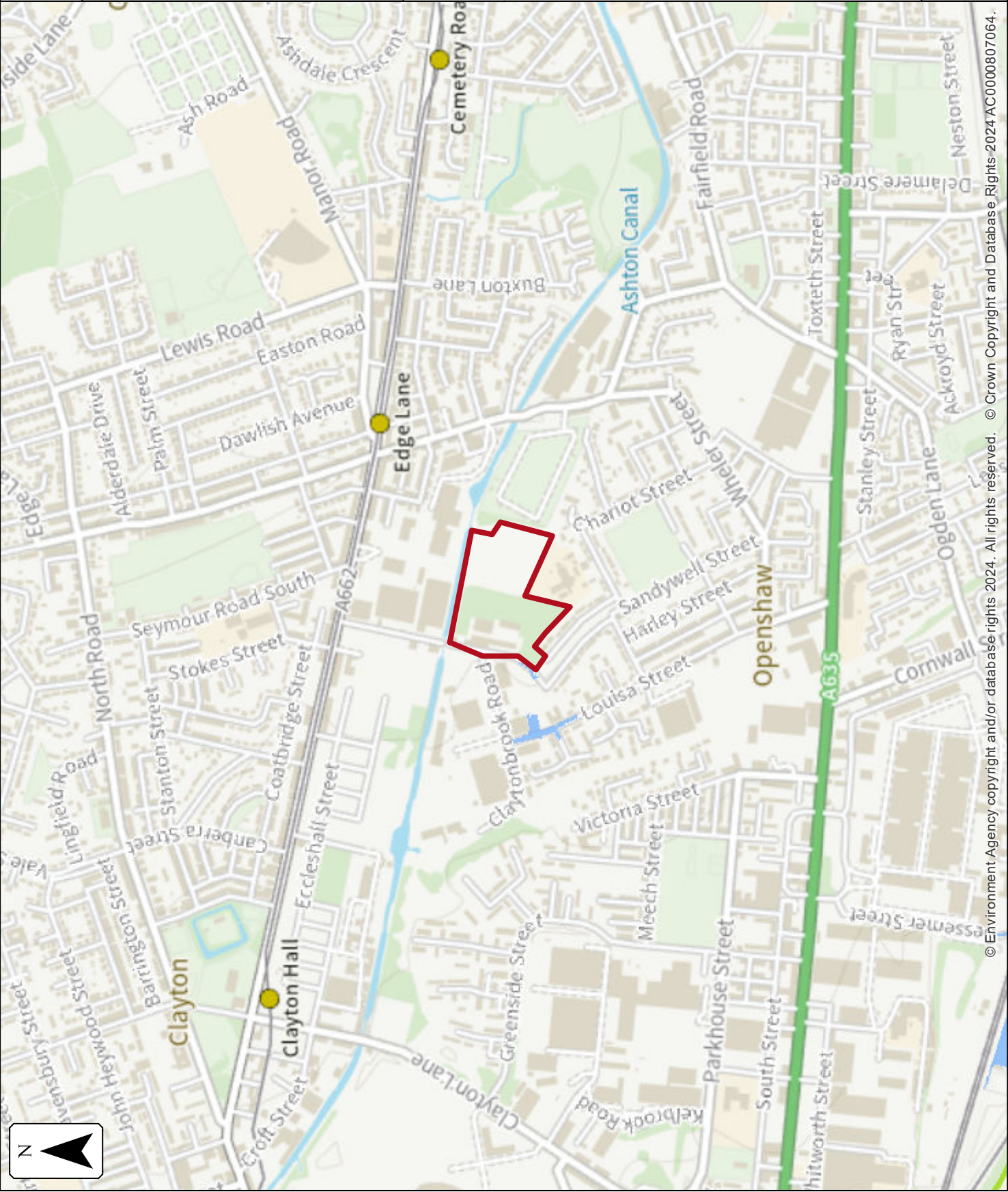
200

300

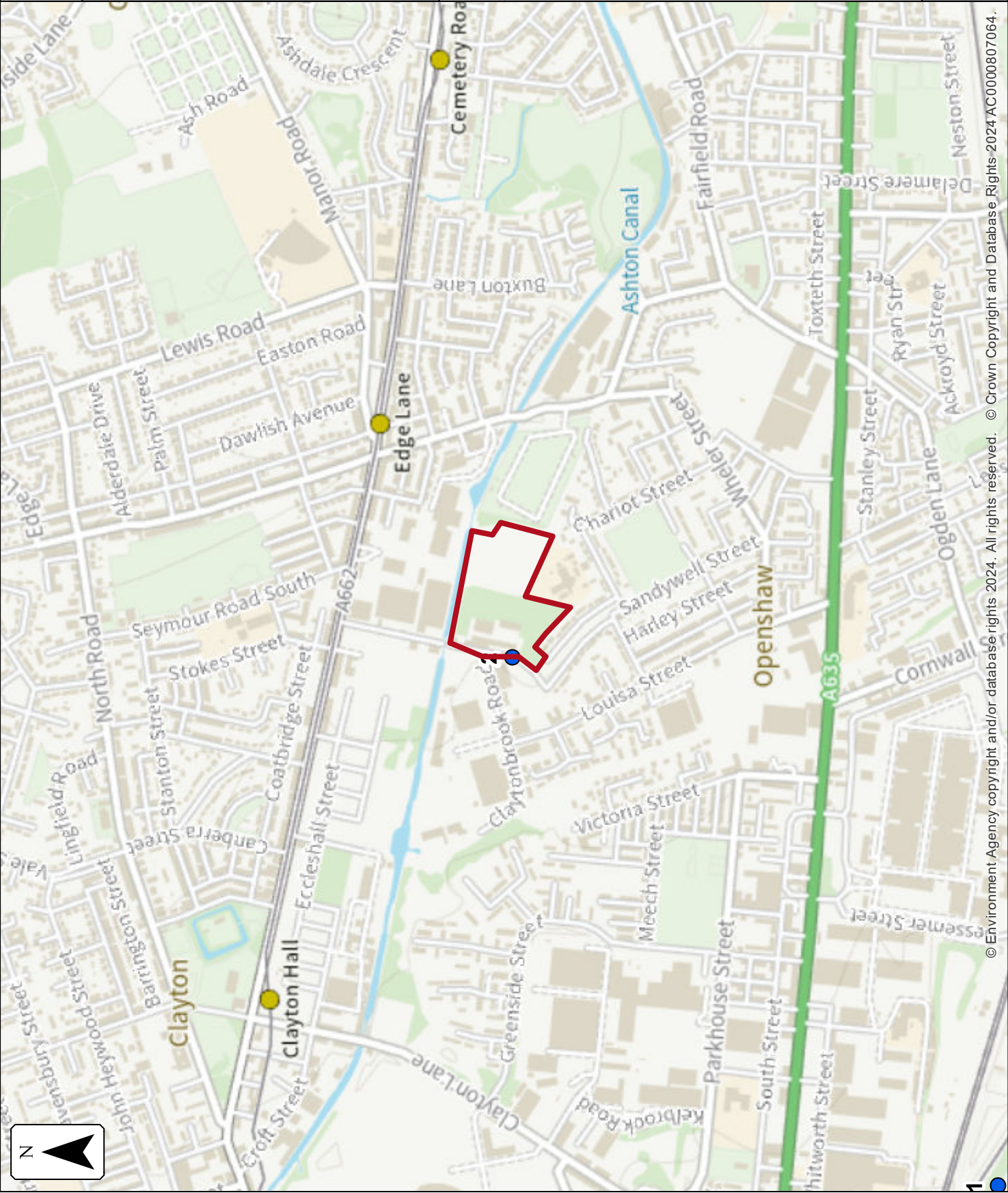
400

500

metres



	No defences exist modelled fluvial node locations Location (easting/northing) 388768/398011 Scale Created 1:10,000 29 Oct 2024 Model name Corn Brook 2017	Selected area Modelled location	
--	---	--	--



Modelled node locations data

No defences exist

Label	Modelled location ID	Easting	Northing	50% AEP	20% AEP	10% AEP	5% AEP	4% AEP	3.33% AEP	2% AEP	1.33% AEP	1% AEP	0.5% AEP	0.1% AEP
				Level	Level	Level	Level	Level	Level	Level	Level	Level	Level	Level
1	952463	387631	397055	52.49	52.56	52.62	52.65	52.67	52.71	52.79	52.85	52.90	53.05	53.48
2	952446	388653	397993	74.18	74.21	74.23	74.25	74.26	74.29	74.36	74.50	75.0	76.88	81.30

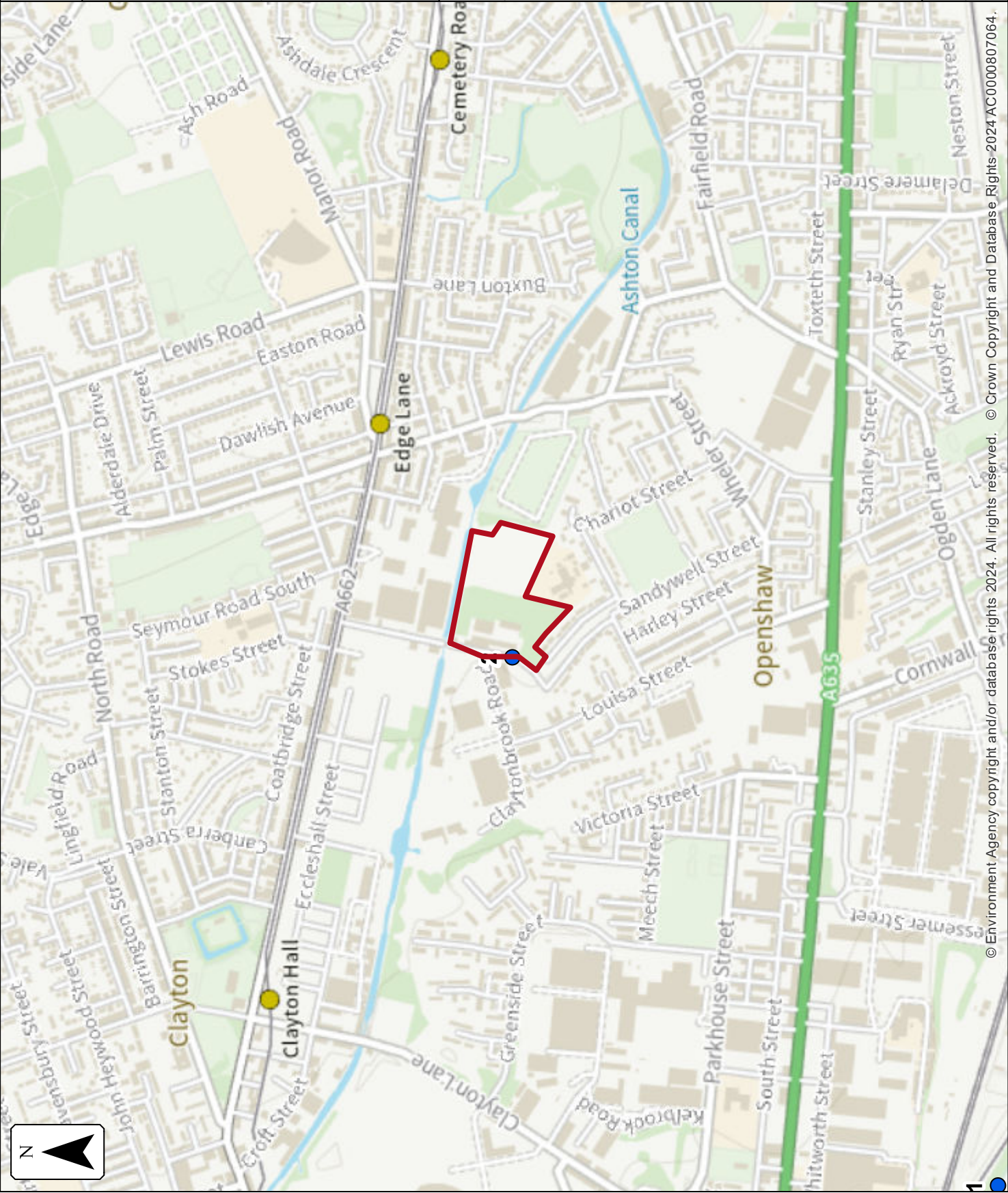
Data in this table comes from the Corn Brook 2017 model.
Level values are shown in mAOD, and flow values are shown in cubic metres per second.
Any blank cells show where a particular scenario has not been modelled for this location.
If no level or flow data is available for a scenario, no table will be shown.

No defences exist

Label	Modelled location ID	Easting	Northing	50% AEP	20% AEP	10% AEP	5% AEP	4% AEP	3.33% AEP	2% AEP	1.33% AEP	1% AEP	0.5% AEP	0.1% AEP
				Flow	Flow	Flow	Flow	Flow	Flow	Flow	Flow	Flow	Flow	Flow
1	952463	387631	397055	0.71	1.01	1.26	1.43	1.59	1.79	2.37	2.92	3.38	4.88	10.14
2	952446	388653	397993	3.08	2.54	5.15	6.69	0.46	0.66	0.81	0.95	1.09	1.03	2.04

Data in this table comes from the Corn Brook 2017 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.

	No defences exist climate change modelled fluvial node locations Location (easting/northing) 388768/398011 Scale Created 1:10,000 29 Oct 2024 Model name Corn Brook 2017	Selected area Modelled location	
--	--	--	--



Modelled node locations data

No defences exist climate change

Label	Modelled location ID	Easting	Northing	1% AEP (+30%)	1% AEP (+35%)	1% AEP (+70%)	0.1% AEP (+30%)	1% AEP (+30%)	1% AEP (+35%)	1% AEP (+70%)	0.1% AEP (+30%)
				Level	Level	Level	Level	Flow	Flow	Flow	Flow
1	952463	387631	397055	53.01	53.03	53.21	53.59	4.49	4.67	6.49	12.20
2	952446	388653	397993	76.46	76.74	78.88	81.48	1.26	1.78	2.26	2.66

Data in this table comes from the Corn Brook 2017 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.

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 Manchester District.

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](#)

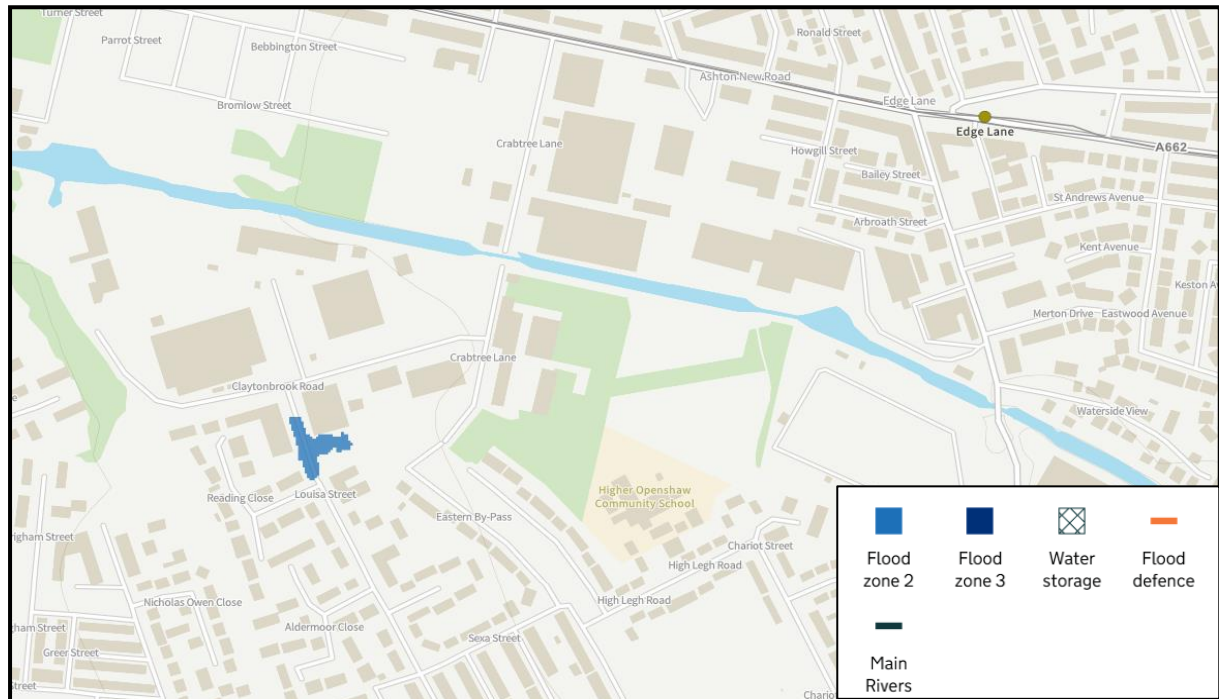
Help and advice

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

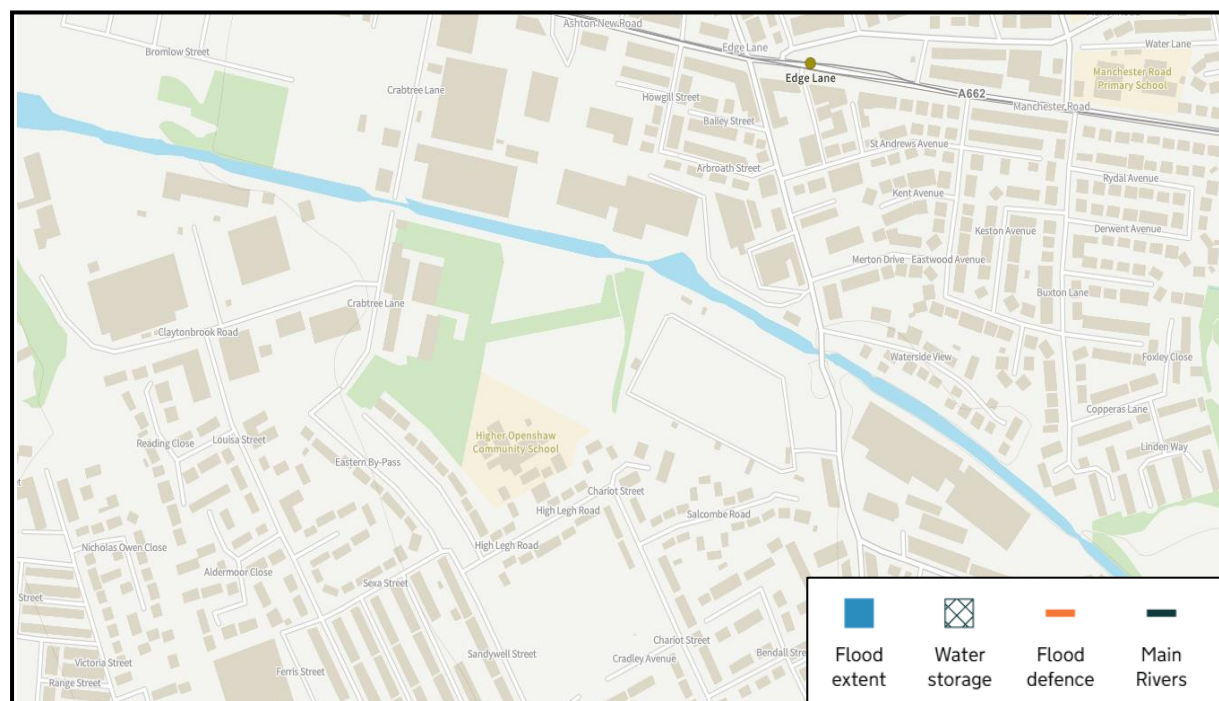
- [more information about getting a product 5, 6, 7 or 8](#)
- general help and advice about the site you're requesting data for

FLOOD MAP FOR PLANNING

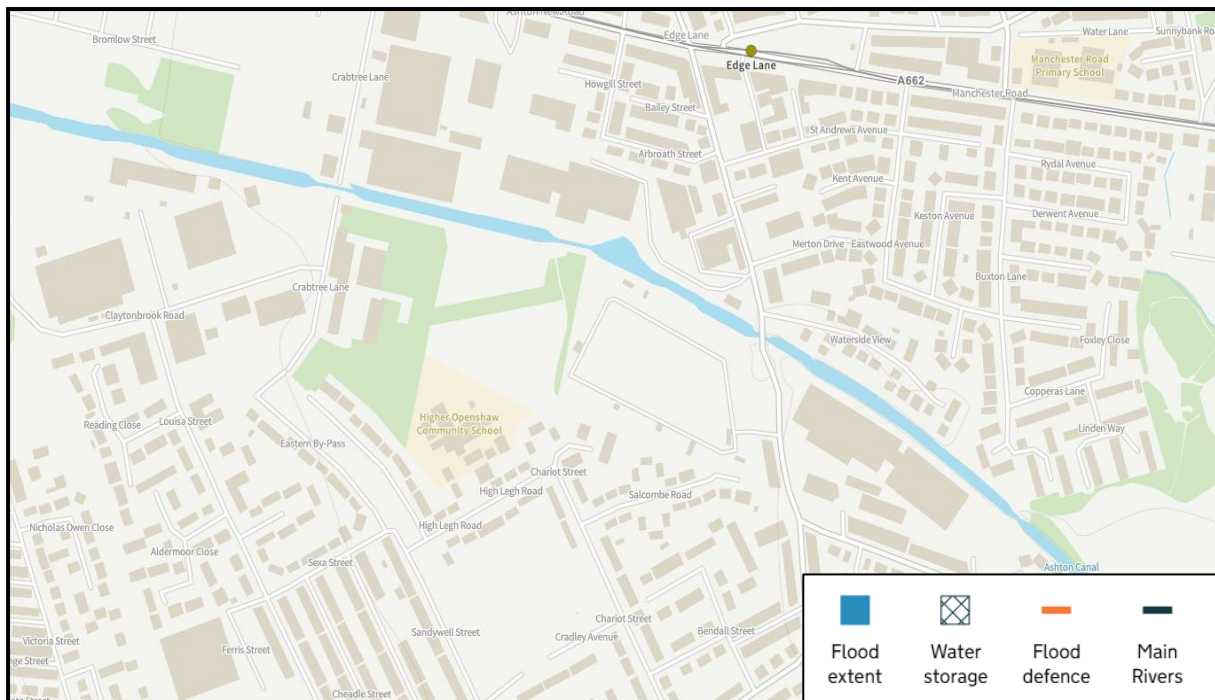
Flood Zones



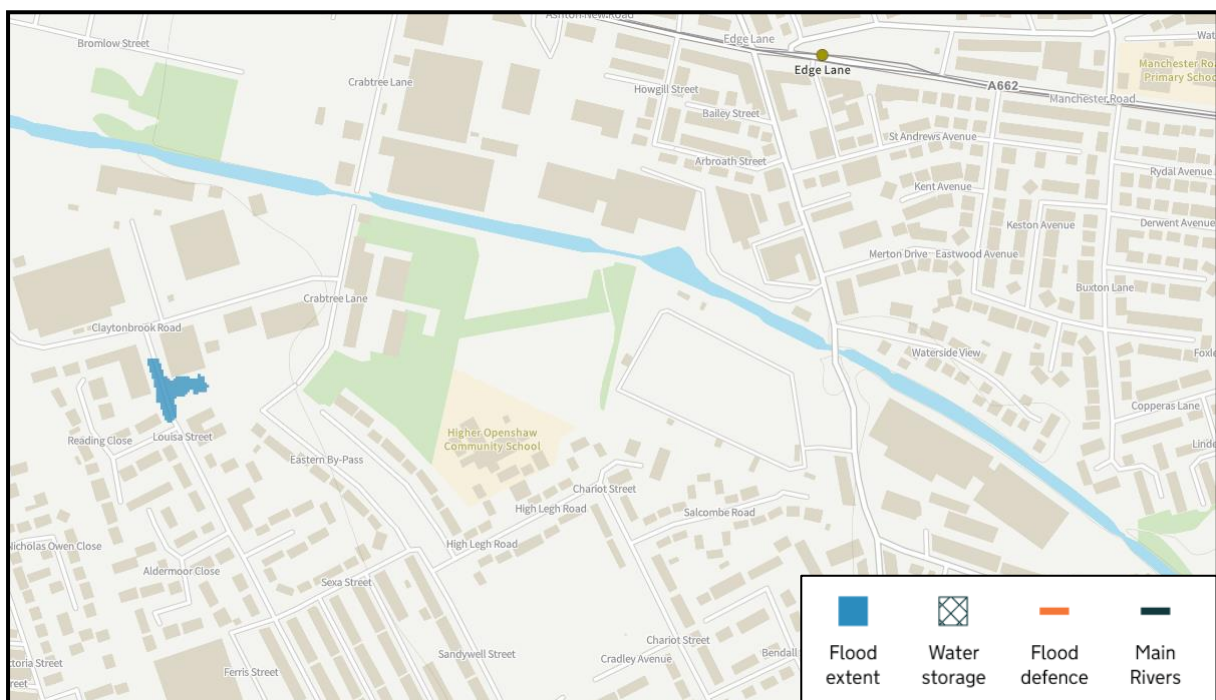
River and Sea with Defenses (Present Day) - 1 in 30yr



River and Sea with Defenses (Present Day) - 1 in 100yr/1 in 200yr

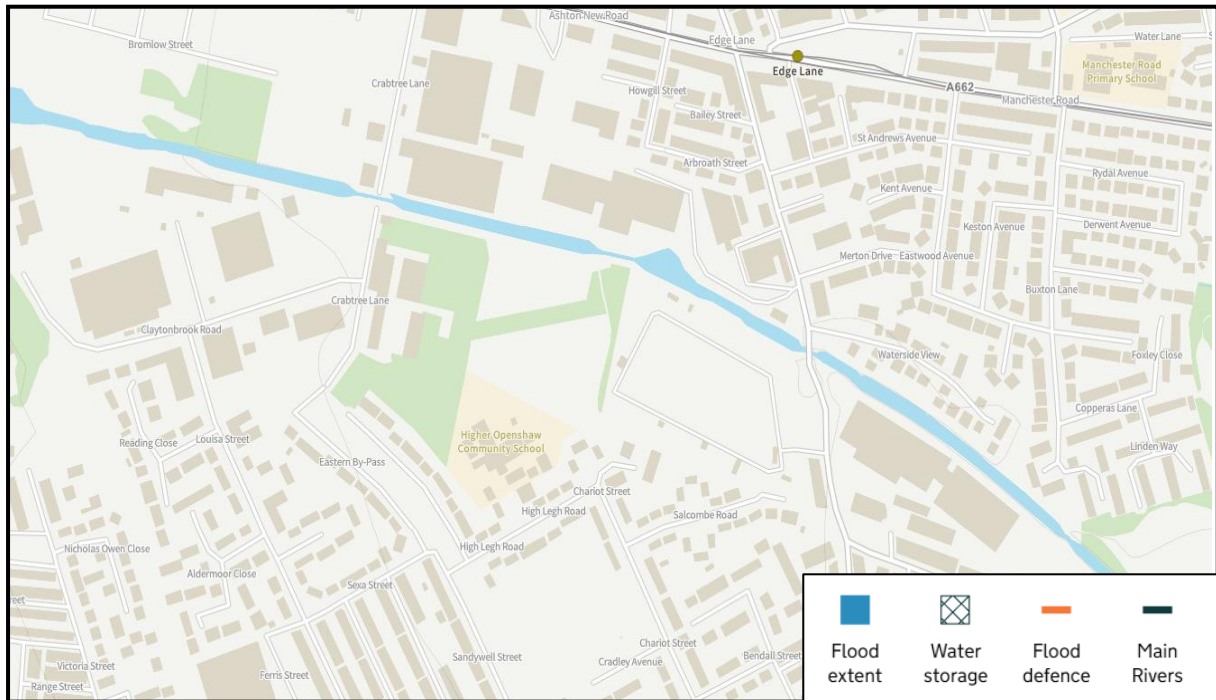


River and Sea with Defenses (Present Day) - 1 in 1000yr

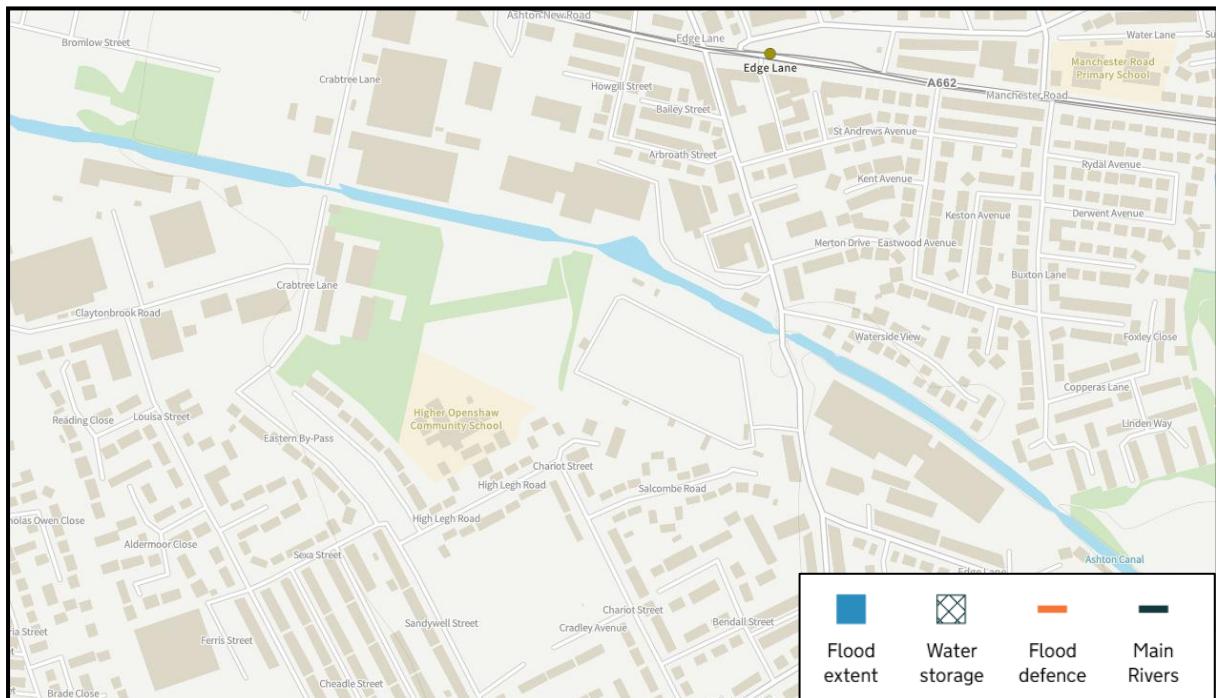


NATIONAL FLOOD MAPPING

River and Sea with Defenses (with Climate Change) – 1 in 30yr

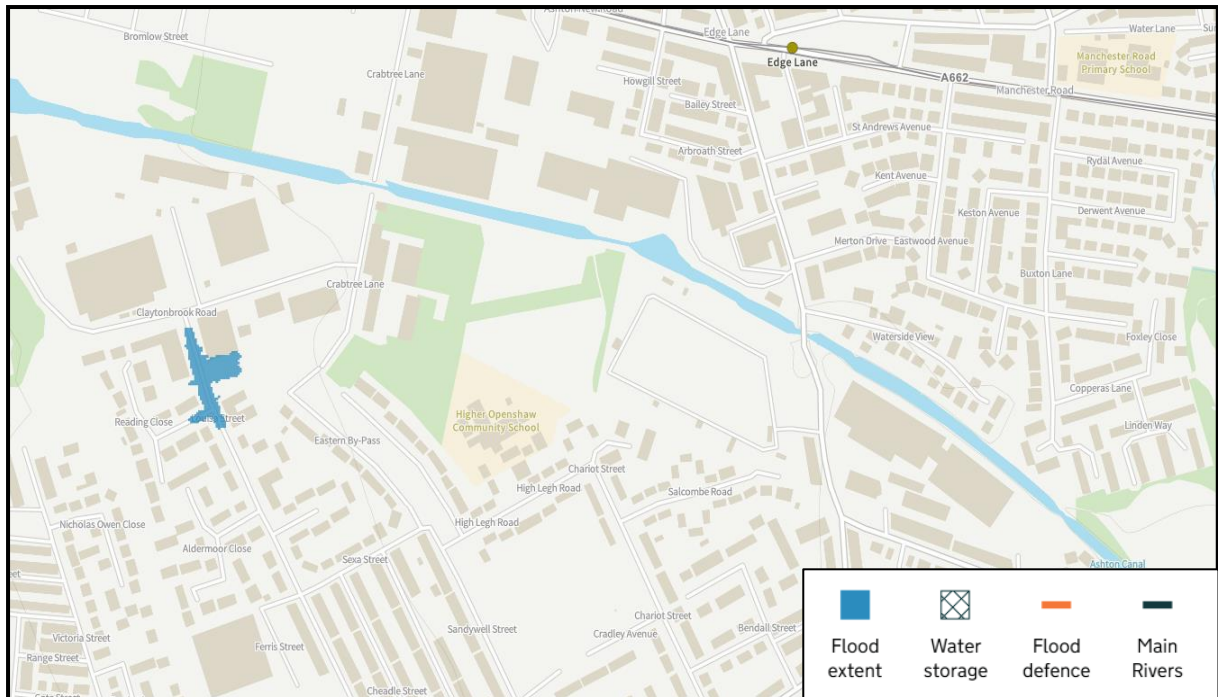


River and Sea with Defenses (with Climate Change) – 1 in 100/1 in 200yr

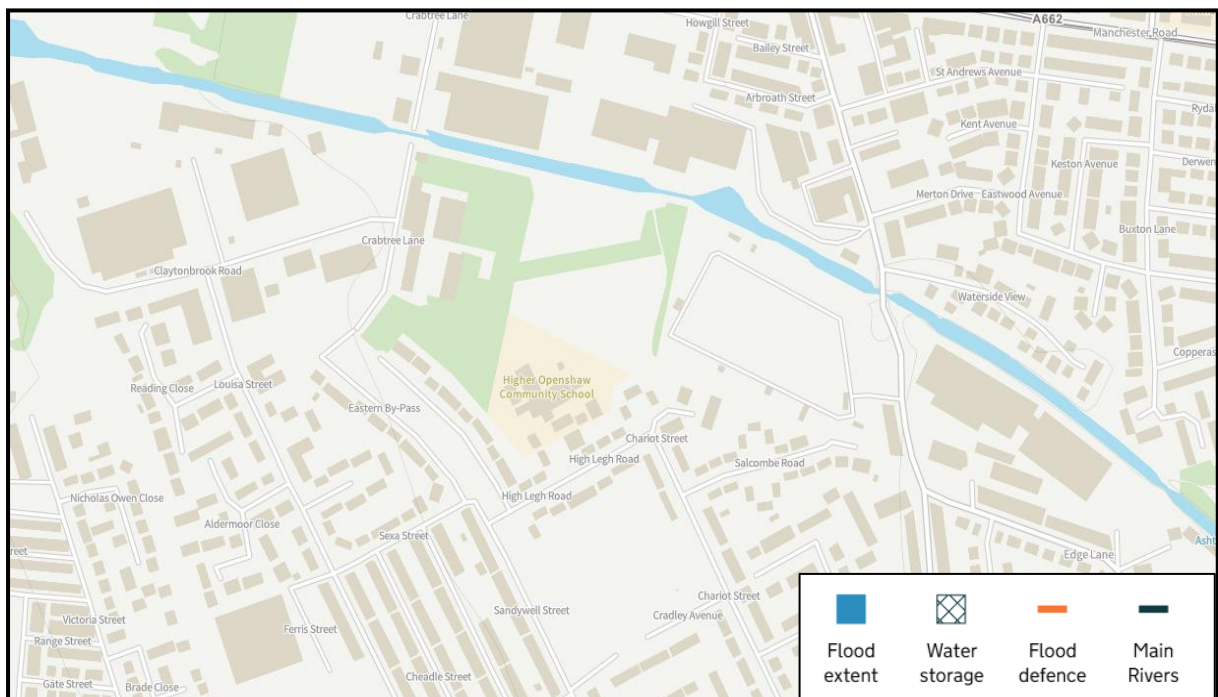


NATIONAL FLOOD MAPPING

River and Sea with Defenses (with Climate Change) – 1 in 1000yr



River and Sea without Defenses (Current Day) – 1 in 100yr/1 in 200yr



This map illustrates the flood risk and infrastructure for the Higher Openshaw Community School area. The school is highlighted in yellow. A blue area indicates the flood extent, which is located near the Reading Close and Louisa Street. A light blue line represents the water storage area, running along the Ashton Canal. A red line indicates the flood defence, located near the Edge Lane. A black line represents the main rivers, which are the Ashton Canal and the River Mersey. The map also shows various streets, including Crabtree Lane, Eastern By-Pass, High Legh Road, and Chariot Street. A legend in the bottom right corner defines the symbols used: Flood extent (blue square), Water storage (light blue line), Flood defence (red line), and Main Rivers (black line).

This map illustrates the geographical features and infrastructure of the High Wycombe area, specifically focusing on flood risk and water management. The map includes a legend with four categories:

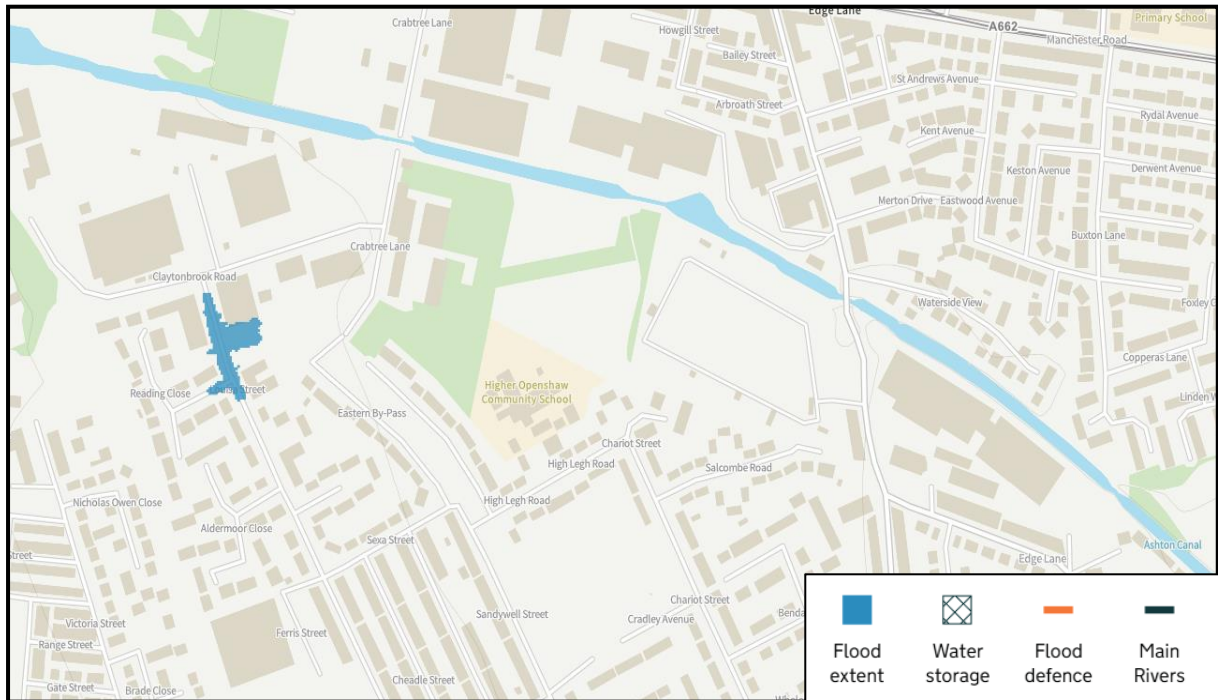
- Flood extent:** Represented by a solid blue color.
- Water storage:** Represented by a blue square with a white cross-hatch pattern.
- Flood defence:** Represented by a solid orange line.
- Main Rivers:** Represented by a solid dark blue line.

The map shows the River Uxue flowing through the area, with several flood extent areas (blue) along its course. Key locations and roads labeled include:

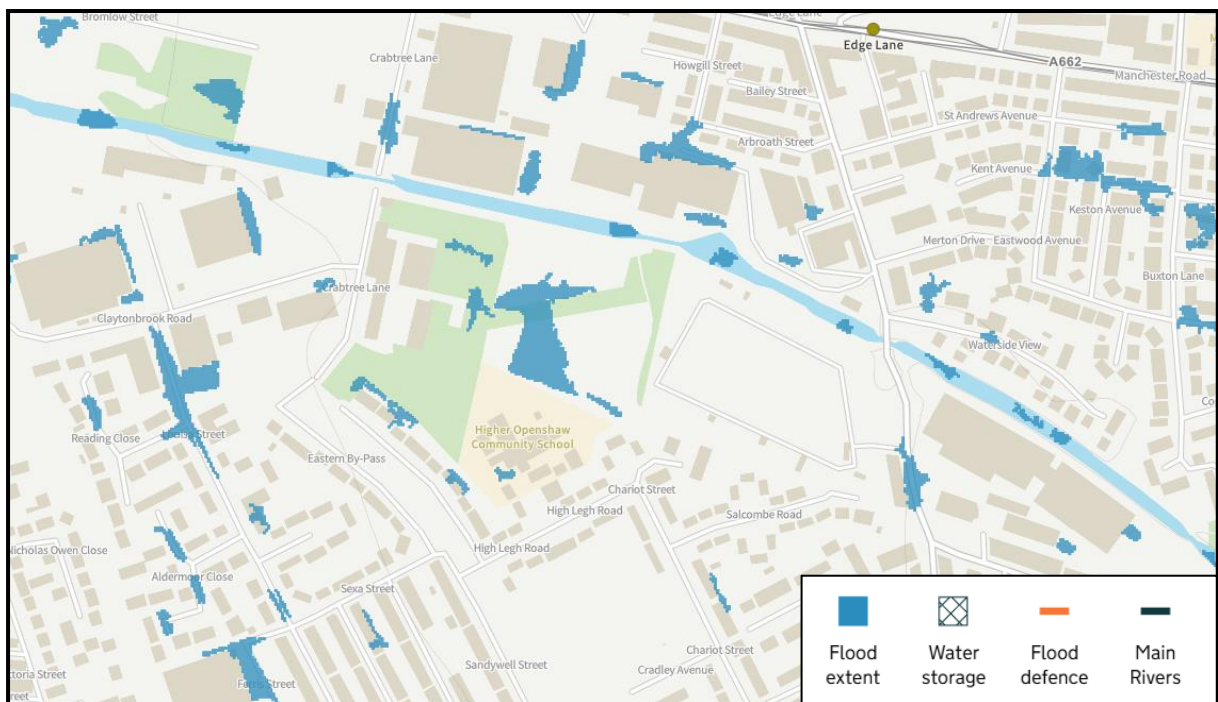
- Streets:** Crabtree Lane, Howgill Street, Bailey Street, Arbroath Street, Kent Avenue, Merton Drive, Eastwood Avenue, Rydal Avenue, Derwent Avenue, Buxton Lane, Fodley Close, Copperas Lane, London Way, Ashton Canal, Edge Lane, Salcombe Road, Chariot Street, High Leigh Road, Eastern By-Pass, Reading Close, Louisa Street, Nicholas Owen Close, Aldermoor Close, Sexa Street, Sandoval Street, Cradley Avenue, Bendall Street, Wheler Street, Chadea Street, Ferri Street, Range Street, Gate Street, Brade Close, Victoria Street, Greer Street, and Street.
- Landmarks:** Claytonbrook Road, High Wycombe Community School, and Primary School.
- Infrastructure:** A662 road and the River Uxue.

NATIONAL FLOOD MAPPING

River and Sea without Defenses (with Climate Change) – 1 in 1000yr



Surface Water Annual Likelihood of Flooding – 1 in 30yr



Surface Water Annual Likelihood of Flooding – 1 in 100yr



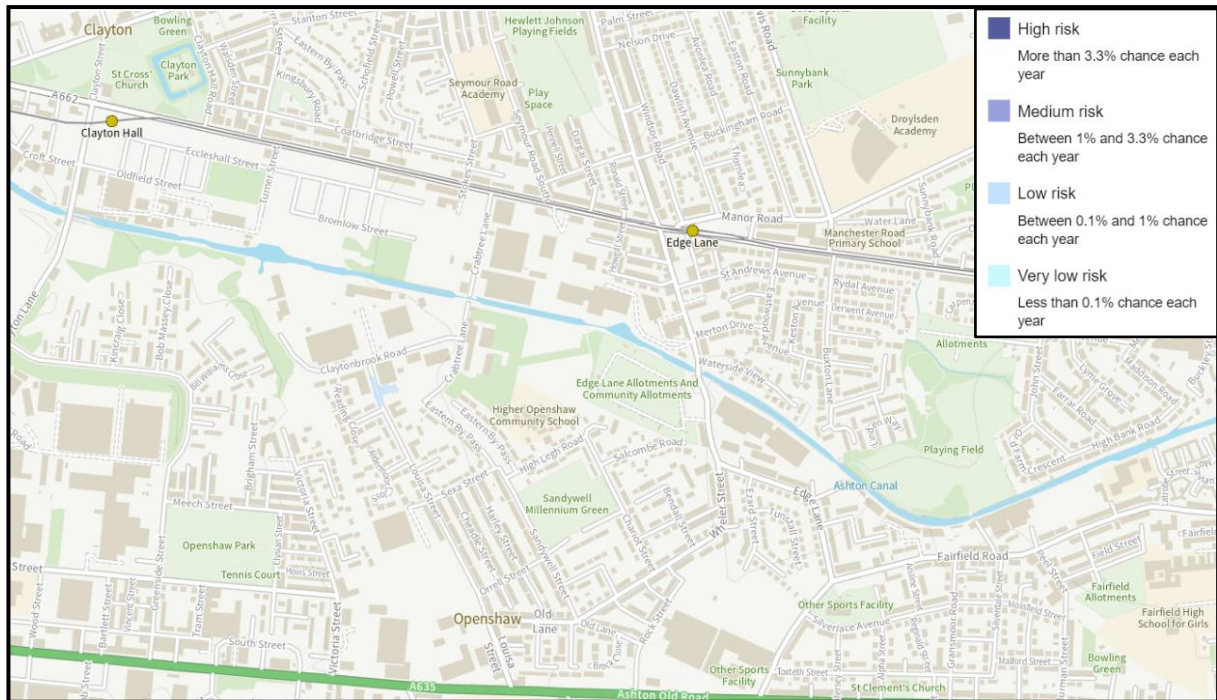
Surface Water Annual Likelihood of Flooding – 1 in 1000yr



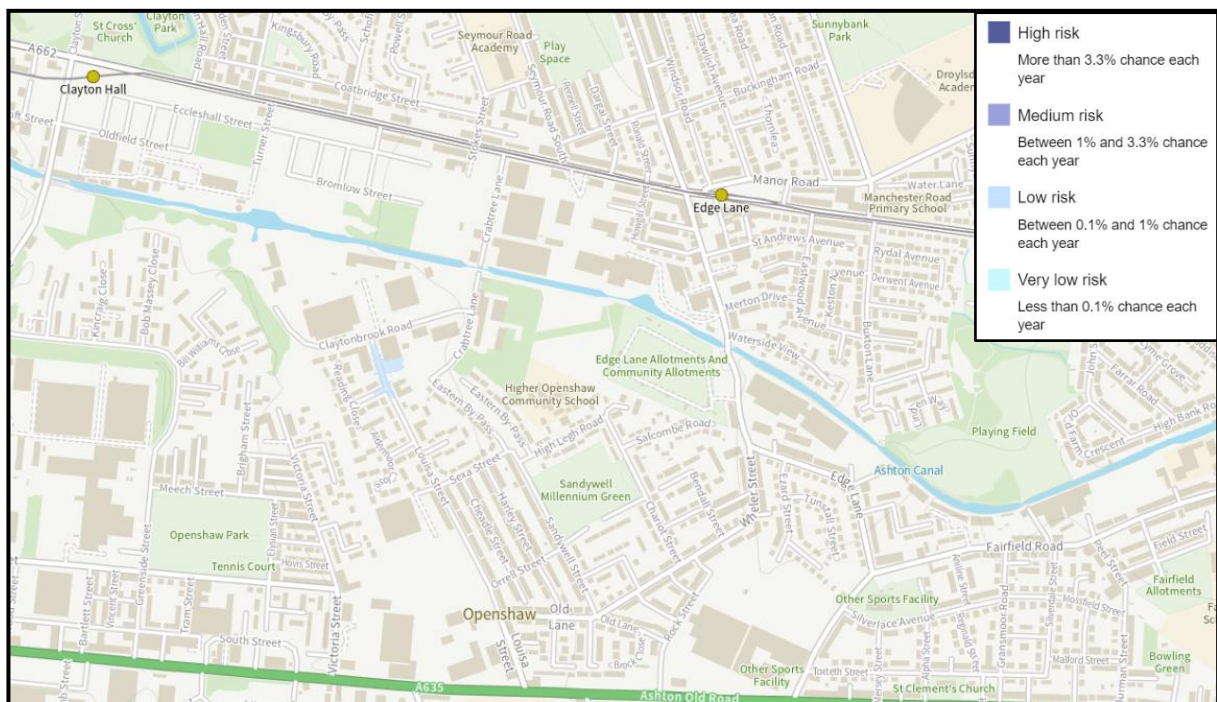
NATIONAL FLOOD MAPPING

LONG TERM RISK OF FLOODING MAPPING

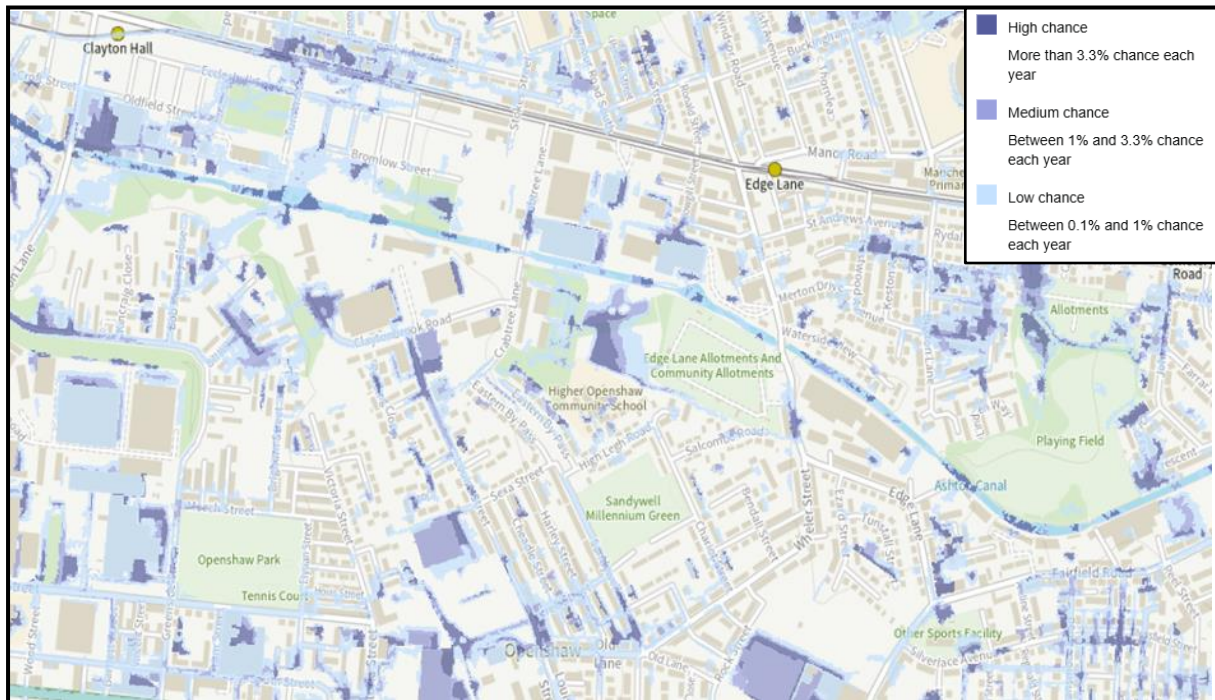
Rivers or Sea – Current



Rivers or Sea – Future (2036-2069)



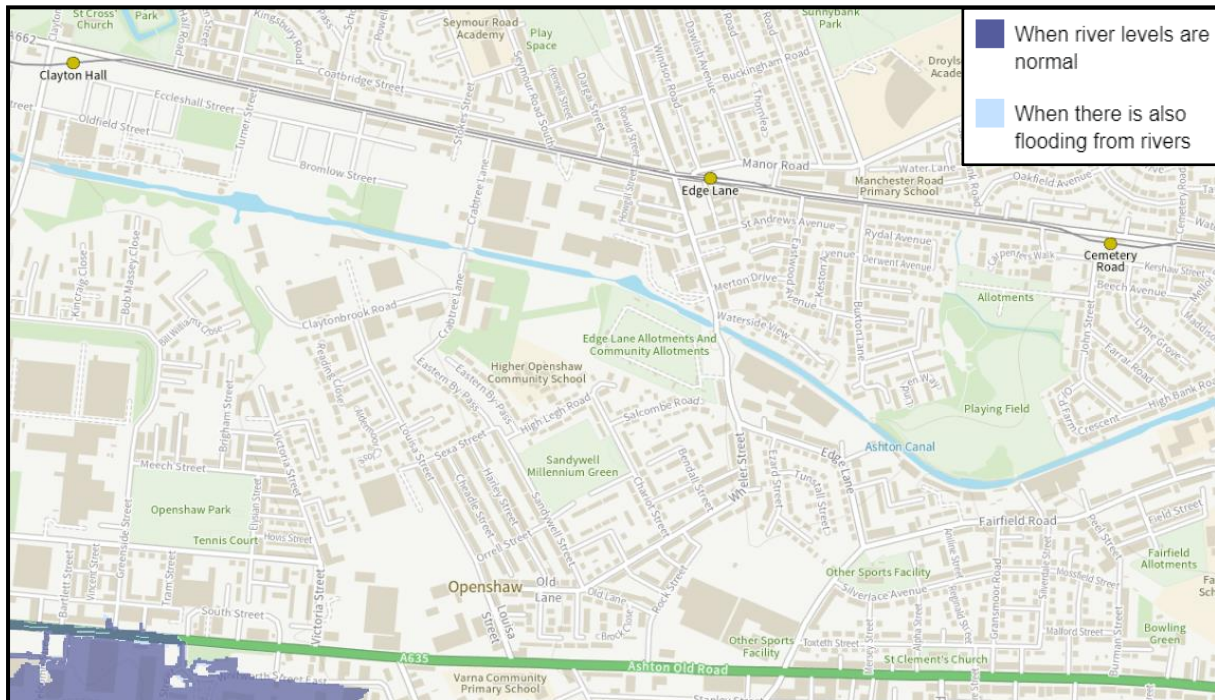
Surface Water – Current



Future (2040-2060)



Long Term Flood Risk - Reservoirs



APPENDIX C: UU CORRESPONDENCE

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Jabez Thomas

From: [REDACTED]
Sent: 30 October 2024 09:46
To: Jabez Thomas
Subject: RE: United Utilities - Our reference - 06540338 Crabtree Lane, Manchester

Hi Jabez,

Thank you for your email, please see below response:

UU REF 06540338 – Sewer Model Check, Crabtree Lane, Manchester

I can confirm that we do have modelled flood risk within the vicinity of the proposed development.

Please note that United Utilities Water Limited (UW) can only record and check flooding events which are reported to us and we have to comply with our Regulators instructions on the qualification of flooding events.

Our response does not include:

- any sewer flooding events caused by blockages or collapses which are the result of third party actions, natural events or other actions over which UW has no control and not a facet of sewer capacity; or
- any historical sewer flooding events that have been resolved as a result of investment in our infrastructure.

As with all development sites, we recommend you liaise with our water and wastewater engineers by contacting our Developer Services team so the details of your development proposal can be considered further. Details can be found at the following link.

<https://www.unitedutilities.com/services/builders-developers/>

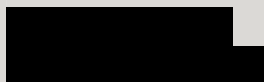
Should you require any further information please do not hesitate to contact me.

Regards

Anthony



Anthony Laithwaite
Ww Engineer
Developer Services & Metering
Customer Services



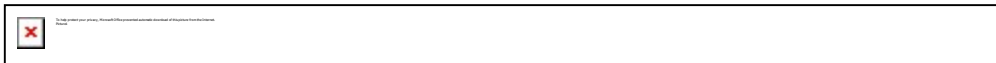
----- Original Message -----

From: [REDACTED]

Sent: 30/10/2024 08:30

To: [REDACTED]

Subject: United Utilities - Our reference - 06540338 Crabtree Lane, Manchester



Good Morning

Thank you for contacting United Utilities

I have logged your query to an engineer who will respond on or before 06/11/2024

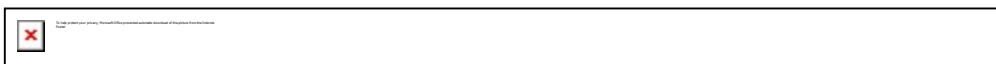
Kind Regards

If you feel you have received a good service from myself, please can you take two minutes to fill in the survey below. This will be much appreciated



Visit: <https://unitedutilities.thewowawards.co.uk/nominate>

The United Utilities logo, featuring a green stylized 'U' icon followed by the text "United Utilities" in a bold, green, sans-serif font. Below this, the tagline "Water for the North West" is written in a smaller, green, sans-serif font.	Olivia Morley Customer Advisor Advanced Developer Services & Metering Customer Services unitedutilities.com
	[REDACTED]



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

From: Jabez Thomas [REDACTED]

Sent: 28/10/2024 15:16

To: [REDACTED]

Subject: Sewer Flood Risk Information Request

To whom it may concern,

Crabtree Lane, Manchester

Please could you confirm whether you have any information that you feel would be valuable to a Flood Risk Assessment and Drainage Management Strategy for the above site (location plan attached), including details of historical flooding and specific drainage requirements; this would be greatly appreciated. If there are any other specific requirements that you require in a scope of works for this site, please can you advise at this stage so that it can be fully incorporated into the proposals at an early stage.

Please do not hesitate to contact me on the details below to discuss further should you require additional information or clarification.

Kind Regards,

Jabez Thomas BSc(Hons)

Graduate Flood Risk Analyst

BETTS HYDRO

Consulting Engineers

Old Marsh Farm Barns, Welsh Road, Sealand, Flintshire, CH5 2LY

Chester [REDACTED]

[REDACTED]

www.betts-associates.co.uk

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Water for the North West

Atkins - Utility Solutions

The Hub
500 Park Avenue,, Aztec West, Almondsbury
Bristol,
BS32 4RZ

FAO:

How to contact us:

**United Utilities Water Limited
Property Searches
Haweswater House
Lingley Mere Business Park
Great Sankey
Warrington
WA5 3LP**

**Your Ref: 227665
Our Ref: UUPS-ORD-587476
Date: 18/07/2024**

Dear Sirs

Location: Site off Crabtree Lane Openshaw

I acknowledge with thanks your request dated 17/07/2024 for information on the location of our services.

Please find enclosed plans showing the approximate position of United Utilities' apparatus known to be in the vicinity of this site.

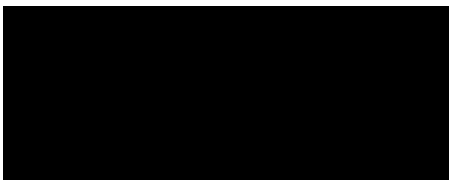
The enclosed plans are being provided to you subject to the United Utilities terms and conditions for both the wastewater and water distribution plans which are shown attached.

If you are planning works anywhere in the North West, please read United Utilities' access statement before you start work to check how it will affect our network. <http://www.unitedutilities.com/work-near-asset.aspx>.

I trust the above meets with your requirements and look forward to hearing from you should you need anything further.

If you have any queries regarding this matter please [REDACTED]

Yours Faithfully,



Karen McCormack
Property Searches Manager

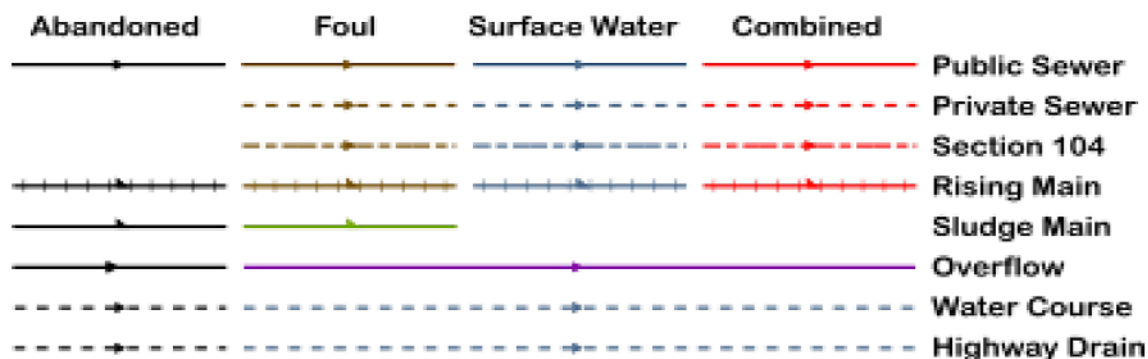
TERMS AND CONDITIONS - WASTEWATER AND WATER DISTRIBUTION PLANS

These provisions apply to the public sewerage, water distribution and telemetry systems (including sewers which are the subject of an agreement under Section 104 of the Water Industry Act 1991 and mains installed in accordance with the agreement for the self construction of water mains) (UUWL apparatus) of United Utilities Water Limited "(UUWL)".

TERMS AND CONDITIONS:

- This Map and any information supplied with it is issued subject to the provisions contained below, to the exclusion of all others and no party relies upon any representation, warranty, collateral contract or other assurance of any person (whether party to this agreement or not) that is not set out in this agreement or the documents referred to in it.
- This Map and any information supplied with it is provided for general guidance only and no representation, undertaking or warranty as to its accuracy, completeness or being up to date is given or implied.
- In particular, the position and depth of any UUWL apparatus shown on the Map are approximate only. UUWL strongly recommends that a comprehensive survey is undertaken in addition to reviewing this Map to determine and ensure the precise location of any UUWL apparatus. The exact location, positions and depths should be obtained by excavation trial holes.
- The location and position of private drains, private sewers and service pipes to properties are not normally shown on this Map but their presence must be anticipated and accounted for and you are strongly advised to carry out your own further enquiries and investigations in order to locate the same.
- The position and depth of UUWL apparatus is subject to change and therefore this Map is issued subject to any removal or change in location of the same. The onus is entirely upon you to confirm whether any changes to the Map have been made subsequent to issue and prior to any works being carried out.
- This Map and any information shown on it or provided with it must not be relied upon in the event of any development, construction or other works (including but not limited to any excavations) in the vicinity of UUWL apparatus or for the purpose of determining the suitability of a point of connection to the sewerage or other distribution systems.
- No person or legal entity, including any company shall be relieved from any liability howsoever and whensoever arising for any damage caused to UUWL apparatus by reason of the actual position and/or depths of UUWL apparatus being different from those shown on the Map and any information supplied with it.
- If any provision contained herein is or becomes legally invalid or unenforceable, it will be taken to be severed from the remaining provisions which shall be unaffected and continue in full force and affect.
- This agreement shall be governed by English law and all parties submit to the exclusive jurisdiction of the English courts, save that nothing will prevent UUWL from bringing proceedings in any other competent jurisdiction, whether concurrently or otherwise.

Wastewater Symbolology



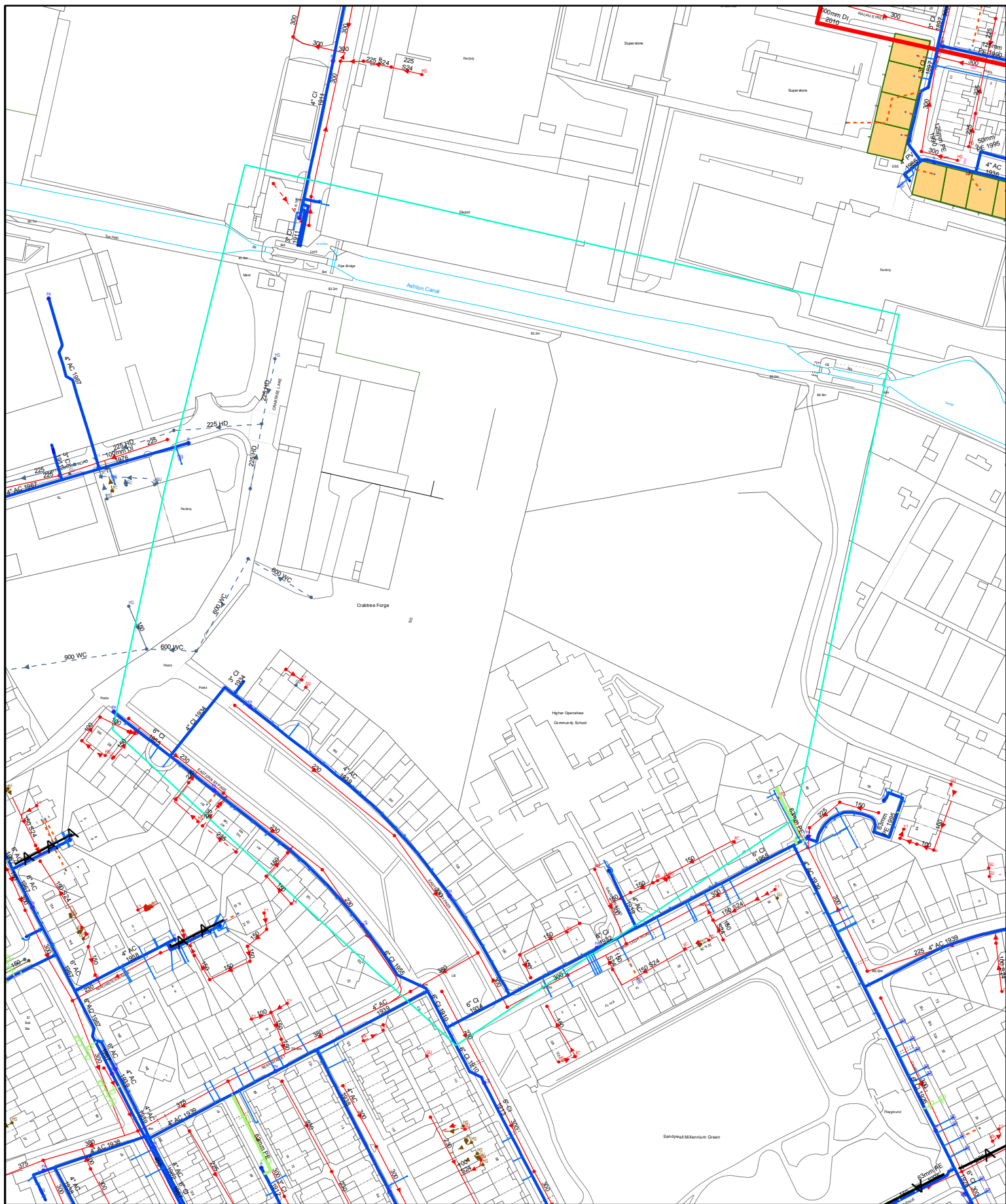
All point assets follow the standard colour convention: **red** – combined **brown** - foul
blue – surface water **purple** - overflow

Manhole	Side Entry Manhole
Head of System	Outfall
Extent of Survey	Screen Chamber
Rodding Eye	Inspection Chamber
Inlet	Bifurcation Chamber
Discharge Point	Lamp Hole
Vortex	T Junction / Saddle
Penstock	Catchpit
Washout Chamber	Valve Chamber
Valve	Vent Column
Air Valve	Vortex Chamber
Non Return Valve	Penstock Chamber
Soakaway	Network Storage Tank
Gully	Sewer Overflow
Cascade	Ww Treatment Works
Flow Meter	Ww Pumping Station
Hatch Box	Septic Tank
Oil Interceptor	Control Kiosk
Summit	DNM Network Monitoring Point
Drop Shaft	Change of Characteristic
Orifice Plate	

Clean Water Symbolology

Proposed	Abandoned	Live	
			Distribution Main
			Trunk Main
			Comms Pipe
			Private Pipe
			Concessionary Service
			Raw Water
			LDTM Raw Water
			LDTM Treated Water
			Air Valve
			AC Valve, open
			AC Valve, closed
			CC Valve, open
			CC Valve, closed
			Non Return Valve
			Pressure Management Valve
			OMS Valve
			Stop Tap
			Flow Meter
			Domestic Meter
			Commercial Meter
			Pump
			Hydrant
			Fire Hydrant
			Anode
			Chlorination Point
			De-chlorination Point
			Strainer Point
			Access Point
			Hatch Box
			IP Point
			Sampling Station
			Logger Box
			Bore Hole
			Inlet Point
			Bulk Supply Point
			End Cap
			Site Termination
			Change of Characteristic
			Condition Report
			<u>Property Types</u>
			Water Tower
			Valve House
			Booster Pumping Station
			Intake Pumping Station
			Water Treatment Works
			Supply Reservoir
			Service Reservoir
			Impounding Reservoir
			Pipe Bridge

Symbology for proposed assets is the same as above, but shown in **green**
Symbology for abandoned assets is the same as above, but shown in **black**



Date: 18/07/2024 **Extract from maps of public sewers and water mains**

Printed By:
Property Searches

Site off Crabtree Lane Openshaw



The position of underground apparatus shown on this plan is approximate only and is given in accordance with the best information currently available. The actual positions may be different from those shown on the plan and private pipes, sewers or drains may not be recorded. United Utilities Water PLC will not accept any liability for any damage caused by the actual positions being different from those shown.

© United Utilities Water PLC 2024. The plan is based upon the Ordnance Survey Map with the sanction of the Controller of H.M. Stationery Office, Crown copyright 100022432 and United Utilities Water PLC copyrights are reserved. Unauthorised reproduction will infringe these copyrights.

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APPENDIX D: LPA/LLFA CORRESPONDENCE

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Jabez Thomas

From: Jabez Thomas
Sent: 28 October 2024 15:16
To: [REDACTED]
Subject: Historic Flood Risk and Drainage Information Request
Attachments: Location Plan.pdf

To whom it may concern,

Crabtree Lane, Manchester

Please could you confirm whether you have any information that you feel would be valuable to a Flood Risk Assessment and Drainage Management Strategy for the above site (location plan attached), including details of historical flooding and specific drainage requirements; this would be greatly appreciated. If there are any other specific requirements that you require in a scope of works for this site, please can you advise at this stage so that it can be fully incorporated into the proposals at an early stage.

Please do not hesitate to contact me on the details below to discuss further should you require additional information or clarification.

Kind Regards,

Jabez Thomas BSc(Hons)
Graduate Flood Risk Analyst

BETTS HYDRO

Consulting Engineers

Old Marsh Farm Barns, Welsh Road, Sealand, Flintshire, CH5 2LY

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APPENDIX E: CRT CORRESPONDENCE

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Kirsty Halliday

From: Tim Bettany-Simmons [REDACTED]
Sent: 30 January 2025 15:08
To: Kirsty Halliday
Cc: Hannah Buchanan; Jabez Thomas
Subject: RE: Land at, Crabtree Lane, Openshaw, Manchester (HYD1015) [Filed 05 Feb 2025 12:57]

Follow Up Flag: Follow up
Flag Status: Completed

Categories: Filed by Mail Manager

Hi Kirsty

Thank you for your email. I have shared your email with a Senior Engineer in our Tunnels and Culverts team who has advised the following:

Ultimately, we don't know a great deal about this alleged culvert, the information we hold is limited to what's shown on the Terrier plan (below), which was only checked due to pre-application documentation showing a historical watercourse running from the direction of the canal on Page 12 of the Pre-App documentation.

An extract of the Terrier plan is shown below which shows the line of the 2ft culvert (apologies, I incorrectly stated 2" in the consultation response) crossing the canal adjacent to the Hope Boiler Works/Iron Foundry, with reference to a 16" pipe to the southern extent of what's mapped, potentially an indication of a connection to a 16" pipe as part of a larger culverted network.

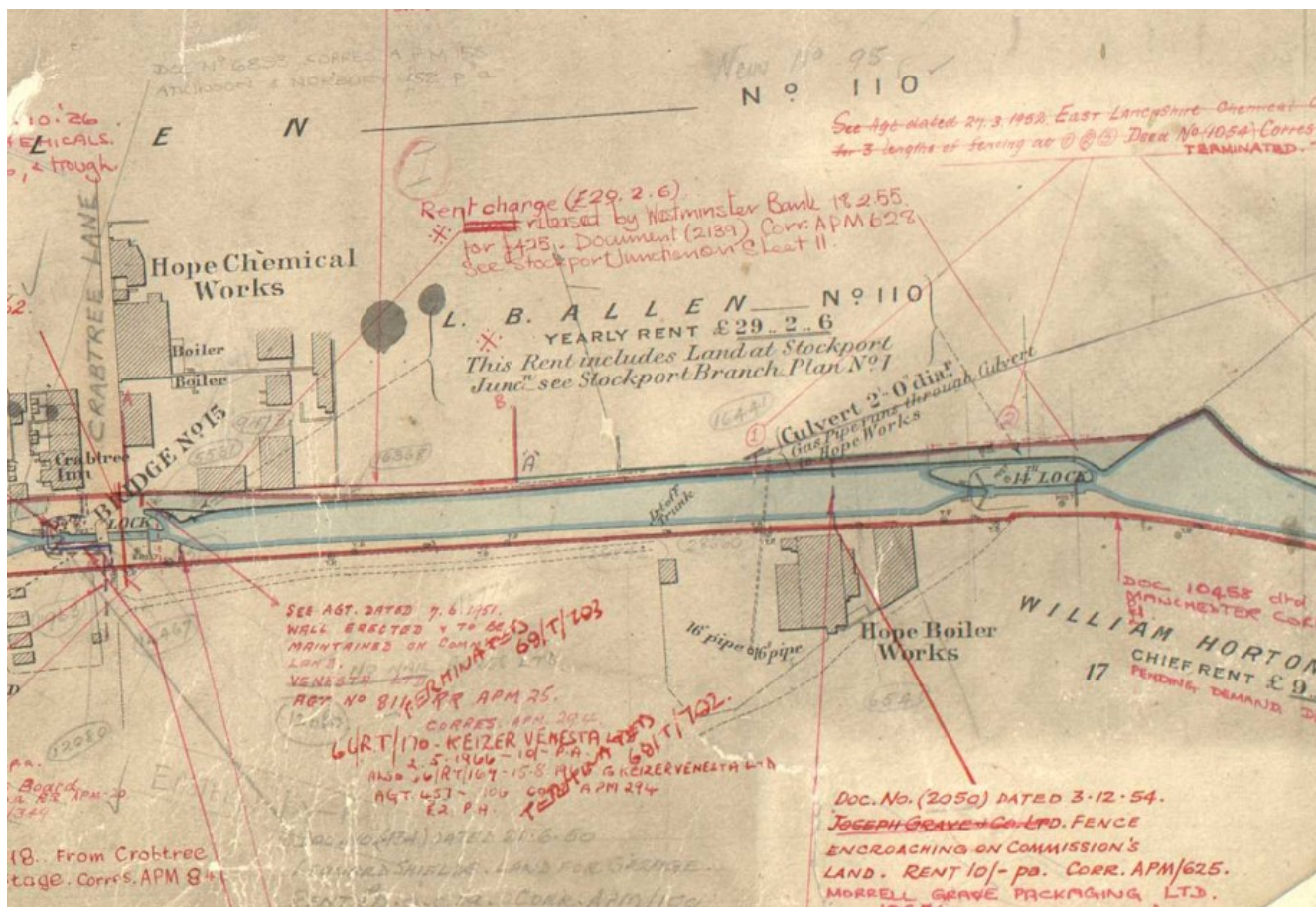
We don't know the nature of the culvert or whether it still exists. The land either side of the canal in this location has been re-developed, so there is the possibility that the culvert may have been formally abandoned, hence why we have no current knowledge of it, but this is not always the case.

I doubt the alleged culvert provided a feed to the canal, and there is no evidence to suggest it conveyed canal waste flows (overflow). The [1888 OS map](#) shows a small pond to the north of the canal, so I suspect that the culvert may have carried a small watercourse from the pond under the canal towards Clayton Brook, however, these are just assumptions in the absence of information.

With canal culverts, there is potential that they feature bed valves which would have allowed the canal to be drained, however, having looked on Google Streetview along the towpath, there is no evidence such as rollers on the towpath to indicate that is the case here.

I would recommend that the developer investigates further to CCTV survey and trace the incoming connection which they mention came from the direction of the canal. This would allow the Trust to clarify what level of remedial work (if any) would be required as part of the development. They could also carry out a GPR survey which may show up any pipework/culvert in the ground.

I'm not sure if the Trust have a standardised easement width, however, in line with the Land Drainage Act, we wouldn't be the riparian owner of the culverted watercourse beyond our land boundary, so I don't believe we'd place easement restrictions on a section of culvert passing under a third-party owned site.



I hope that this is of assistance.

Kind regards

Tim Bettany-Simmons BA (HONS), MSc, MRTPI
Senior Planner – Major Projects & Infrastructure

[Redacted signature block]

Canal & River Trust / Glandwr Cymru,
National Waterway Museum Ellesmere Port, South Pier Road, Ellesmere Port, Cheshire, England, CH65 4FW

From: Kirsty Halliday [Redacted]
Sent: 23 January 2025 13:11
To: Tim Bettany-Simmons [Redacted]
Cc: [Redacted]
Subject: Land at, Crabtree Lane, Openshaw, Manchester (HYD1015)

You don't often get email from kirstyhalliday@betts-associates.co.uk. [Learn why this is important](#)

Site Reference: Land at, Crabtree Lane, Openshaw, Manchester –

Good Afternoon Tim,

I trust this email finds you well. I have been asked by the client to liaise directly with you on the topic of flood risk associated with the Ashton Canal which bounds the site. I gather you have

already had a TEAMS call with the client and planning team on the issues for future development. CRT have provided a formal response attached.

In terms of my remit, I've been asked to establish flood risk associated with the canal, but also the feeder/overflow pipe that is understood to be in the north-eastern corner of the site. Do your records show flood risk associated with the canal itself, the upstream lock nearby or the canal feeder/overflow culvert onsite.

In the "pollution prevention" section of the document attached you refer to the canal culvert, although you note that you do not hold record of this. I understand that survey work has been previously undertaken by the client of the other culvert system (I think you refer to it as Clayton Brook in your letter attached) and this work did identify an incoming connection from the canal direction (it was not traced at that time). The client is currently trying to locate the relevant information for us to integrate further. Do your historic records pick up whether this canal culvert length was a feeder into the canal or overflow from the canal? Also are there any drawings or routing information from the historic records that you can share with us at this stage?

If the watercourse culvert is confirmed to still have a connection from the canal, then there are a few questions I am hoping you or your team can advise upon. So in the attached you mention:

"If an operational culvert is found to be present, then it would need to be inspected, maintained, and protected. It may be that during the construction phase that a watching brief (or similar) is undertaken in case this culvert is found. If disused/redundant and no longer required operationally, it would be important that it is located, plugged, and grouted to prevent runoff/pollution to the canal during the demolition/construction phase."

So questions we would like answering are:

1. If investigation shows the length of culvert between the canal and the culverted watercourse through the site to be present, but we assume this is a feeder to the canal and not an overflow from the canal can it simply be "plugged and grouted" to render it dis-used formally and therefore the existing route would not need to be maintained through offset or easement?
2. If investigation shows the length of culvert between the canal and the culverted watercourse through the site to be present, but you confirm it is an overflow from the canal not the above then would the route need to be maintained and offsets for development above included etc? if some what would be CRT's minimum offsets in this case?

I trust the above is understandable but if you need anything else from us then please do not hesitate to let me know by return. Thank you again in advance.

Kind Regards

Kirsty Halliday BSc(Hons) MCIWEM
Associate

Please note, I usually work Tuesdays through Thursdays and I will not always have access to emails on Mondays and Fridays.

BETTS HYDRO
Consulting Engineers

Old Marsh Farm Barns, Welsh Road, Sealand, Flintshire, CH5 2LY

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APPENDIX F: LOCATION PLAN

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LOCATION PLAN

Crabtree Lane, Manchester

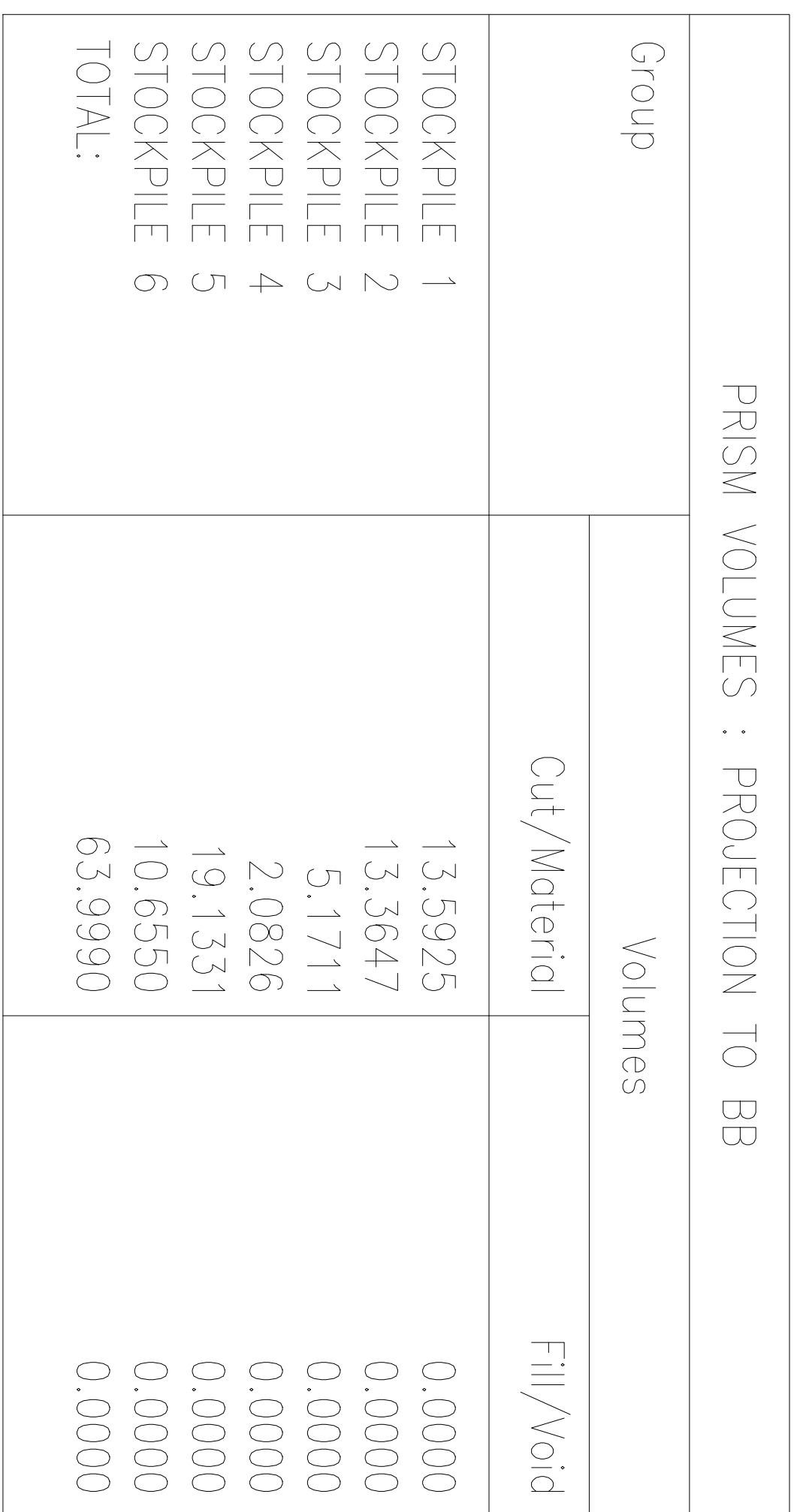


OS X (Eastings)	388788
OS Y (Northings)	398077
Nat Grid	SJ887980 / SJ8878898077
Nearest Post Code	M11 1GY
Lat (WGS84)	N53:28:45 (53.47929515618655)
Long (WGS84)	W2:10:13 (-2.1704081131393984)
Lat,Long (WGS84)	53.47929515618655,-2.1704081131393984
Lat (OSGB36)	N53:28:45 (53.479045773940705)
Long (OSGB36)	W2:10:08 (-2.1689602916686552)
Lat,Long (OSGB36)	53.479045773940705,-2.1689602916686552

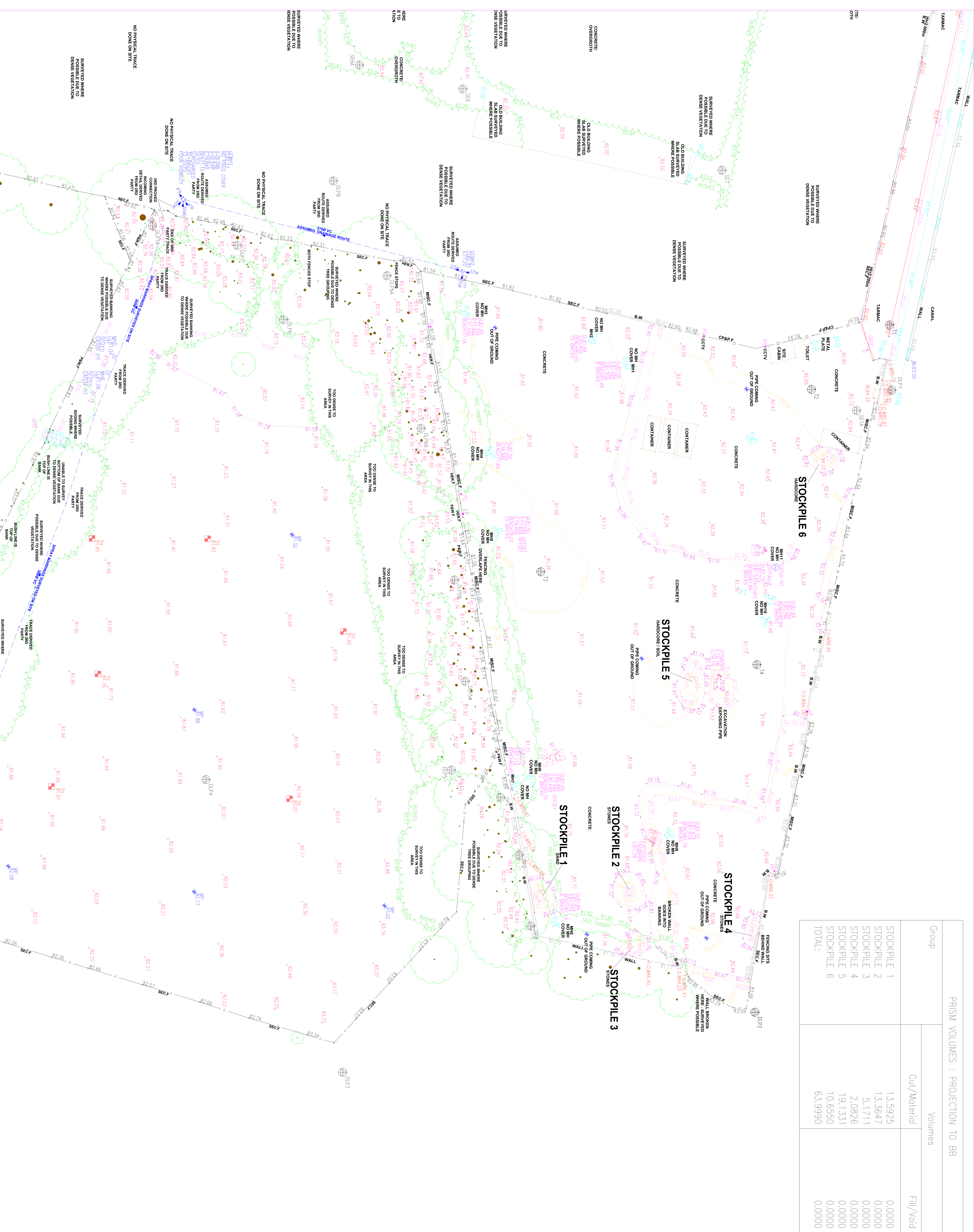


APPENDIX G: TOPOGRAPHICAL SURVEY

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PRISM VOLUMES : PROJECTION TO BB		
Group	Volumes	
	Cut/Material	Fill/Void
STOCKPILE 1	13.5925	0.0000
STOCKPILE 2	13.3647	0.0000
STOCKPILE 3	5.1711	0.0000
STOCKPILE 4	2.0626	0.0000
STOCKPILE 5	19.1331	0.0000
STOCKPILE 6	10.6550	0.0000
TOTAL:	63.9890	0.0000

[illegible]

APPENDIX H: PROPOSED PLANNING LAYOUT

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Factory



Hard Works	
	Vehicle Asphalt Surfacing Black color - To improve aesthetics & demonstrate
	Pedestrian Asphalt Surfacing Brown color - To improve aesthetics & demonstrate
	Vehicle Asphalt Surfacing with Red Chip Dark grey color with red chip - To improve aesthetics & demonstrate
	Precast Concrete Flag Paving To private patios and patios.
	Reclaimed Steel Paving To pedestrian thresholds.
	Precast Concrete Block Paving To private patios and patios.
	Colours: Silver / Mid Grey Mix To pedestrian thresholds.
	Self-Binding Gravel Surfacing To private patios and patios.
	Tactile paving To private patios and patios.
	High Friction Works To private patios and patios.
	Metal Railings To private patios and patios.
	Timber Feather Edge Fence To private patios and patios.
	Picket Benches To private patios and patios.
	Benches To private patios and patios.
	Timber Play Features To private patios and patios.
	Play Builders To private patios and patios.
	Installations To private patios and patios.
	Water Rail To private patios and patios.
	Railings To private patios and patios.
	Soft Works To private patios and patios.
	Proposed Feature Tree Planting To private patios and patios.
	Proposed Standard Tree Planting To private patios and patios.
	Proposed Feature Shrub Planting To private patios and patios.
	Proposed Climbing Plants To private patios and patios.
	Proposed Ornamental Hedge Planting To private patios and patios.
	Proposed Native Hedge Planting To private patios and patios.
	Proposed Ornamental Shrub Planting To private patios and patios.
	Proposed Native Shrub Planting To private patios and patios.
	Proposed Feature Mixed Planting 1 To private patios and patios.
	Proposed Feature Mixed Planting 2 To private patios and patios.
	Proposed Groundcover Planting To private patios and patios.
	Proposed Wildflower Meadow To private patios and patios.
	SUDs Planting mix To private patios and patios.
	Proposed Turf Grass To private patios and patios.
	Proposed Seeded Annuity Grass To private patios and patios.

U R B A N
G R E E N

A: Ground Floor, The Tower,
Deva City Office Park, Trinity Way,
Manchester M3 7BF

T: +44 (0) 161 312 3131

weareurbangreen.co.uk

Client:

KEEP MOAT HOMES

**THE IRONWORKS
LAND AT CRABTREE LANE**

GENERAL ARRANGEMENT

PLANNING

Checked:	Approved:
----------	-----------

Scale @ A1:	Date:
-------------	-------

Revision:	104
-----------	-----

APPENDIX I: SURFACE WATER DIRECT RAINFALL MODELLING

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CRABTREE LANE, MANCHESTER

SURFACE WATER FLOOD RISK MODELLING REPORT

HYD1015

MAY 2025



BETTS HYDRO
CONSULTING ENGINEERS



LAND AT CRABTREE LANE, MANCHESTER
SURFACE WATER FLOOD RISK MODELLING REPORT

Document Tracking Sheet

Document Reference: HYD1015_CRABTREE.LANE.MANCHESTER_SWFR
Revision: 4.0
Date of Issue: 14.05.25
Report Status: FINAL

Prepared by:



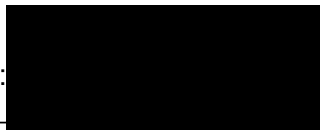
Patrick Taylor BSc (Hons) FRGS
Flood Risk Modeller

Checked by:



Dominic Kearney BEng (Hons), MSc, PhD GMICE
Principal Hydraulic Analyst

Authorised by:



Richard Nicholas BEng (Hons) MSc MBA GMICE MCIWEM
Director

Revision History:

Rev.:	Date:	Status:	Prepared by:	Checked by:	Issued by:
4.0	14.05.2025	FINAL	PT	DK	PT
3.0	17.04.2025	DRAFT	PT	RN	PT
2.0	04.04.2025	DRAFT	PT	DK	PT
1.0	31.03.2025	DRAFT	PT	DK/RN	PT
0.0	23.03.2025	DRAFT	PT	RN	



Old Marsh Farm Barns
Welsh Road, Sealand
Flintshire, CH5 2LY
Telephone: 01244 8289 041

www.betts-associates.co.uk

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CONTENTS

Document Tracking Sheet	ii
Figures & Tables	v
Specialist Software	v
Abbreviations & Acronyms	v
1.0 INTRODUCTION	1
1.1 Commission	1
1.2 Background	1
1.3 Approach	1
2.0 EXISTING SITE	2
2.1 Location	2
2.2 Long Term Surface Water Flood Mapping	2
3.0 DIRECT RAINFALL MODEL BUILD	4
3.1 Rainfall Data	4
3.2 Ground Model	5
4.0 RESULTS	7
4.1 Existing Scenario	7
<i>1 in 30 year event results</i>	7
<i>1 in 100 year event results</i>	7
<i>1 in 1000 year event results</i>	7
<i>1 in 30 year event results plus 40% climate change</i>	7
<i>1 in 100 year event results plus 45% climate change</i>	8
<i>Flood Hazard</i>	8
<i>Sensitivity testing</i>	9
<i>Results Discussion</i>	10
<i>Proposed Modelling</i>	10
5.0 CONCLUSIONS	12
BIBLIOGRAPHY & REFERENCES	13
Bibliography	13
Web-based References	13
 APPENDIX A: FEH RAINFALL DATA	
APPENDIX B: ReFH2 REPORT	
APPENDIX C: IRWELL MANAGEMENT CATCHMENT RAINFALL ALLOWANCES	
APPENDIX D: SURFACE WATER FLOOD PLANS	
APPENDIX E: PROPOSED SURFACE WATER PLANS	
APPENDIX E: NOTES OF LIMITATIONS	

Figures & Tables

Figure 1: Existing Features Plan (Google Maps, 2025)	2
Figure 2: Surface Water Flood Map Extract (Gov.UK, 2025)	3
Table 1: Key Catchment Descriptors (FEH 2025)	4
Table 2: Net Rainfall totals used in 2D Simulation (Betts Hydro, 2025)	4
Figure 3: Area of rainfall applied (Betts Hydro, 2025)	6
Figure 4: Existing Scenario 1% AEP plus 45%CC Water Flood Depth (Betts Hydro, 2025)	8
Figure 5: Existing Scenario 1% AEP plus 45%CC Water Flood Hazard (Betts Hydro, 2025)	9

Specialist Software

-  Flood Modeller 7.2
-  QGIS 3.34.15
-  ReFH2.3

Abbreviations & Acronyms

AEP	Annual Exceedance Probability	NPPF	National Planning Policy Framework
CC	Climate Change	OS	Ordnance Survey
EA	Environment Agency	TWL	Top Water Level
FEH	Flood Estimation Handbook	LLFA	Lead Local Flood Authority
FRA	Flood Risk Assessment	RP	Return Period
mAOD	Metres Above Ordnance Datum	ReFH2.3	Revitalised Flood Estimation Handbook
NaFRA2	National Flood Risk Assessment 2	RoFSW	Risk of Flooding From Surface Water
NGR	National Grid Reference		

1.0 INTRODUCTION

1.1 Commission

- 1.1.1 This report is a direct rainfall modelling exercise to ascertain flood risk and was commissioned by Keepmoat Homes for land at Crabtree Lane, Manchester.

1.2 Background

- 1.2.1 On the 28th January 2025 new National Flood Risk Assessment (NaFRA2) long term data was released which included revised surface water flood extents. This long term data also included a future scenario in which the uncertainty of climate change is considered. These future scenarios generally show increased extents of surface water flooding.
- 1.2.2 The National Planning Policy Framework (NPPF) requires that all sources of flood risk be considered including surface water. Where development is proposed within areas of medium and high risk the requirement to undertake the sequential test is potentially triggered. The Strategic Flood Risk Assessment (SFRA) mapping is the basis for applying the sequential test and the Risk of Flooding from Surface Water (RoFSW) mapping is used to establish areas that are potentially at greater risk.
- 1.2.3 Paragraph 175 of the NPPF establishes that site specific Flood Risk Assessment's (FRA's) can be used to supplement the RoFSW national data which has known limitations and defines the extents of 'chance' of flooding and not risk. The NPPF/Planning Policy Guidance (PPG) are clear that it is the 'risk' that should be assessed and that means that the consequence as well as likelihood should be considered.
- 1.2.4 To avoid the triggering of the sequential test the development proposals should avoid the areas identified as medium and high risk.

1.3 Approach

- 1.3.1 Betts Hydro have constructed a site specific direct rainfall model for land off Crabtree Lane, Manchester within Flood Modeller Pro using the Flood Estimation Handbook (FEH) Web Service to obtain the rainfall data and the revitalised flood handbook (ReFH2) to generate hyetographs.
- 1.3.2 The study focuses on surface water flood risk in the existing scenario for a range of return periods, including consideration for climate change.

2.0 EXISTING SITE

2.1 Location

2.1.1 The site is located off Crabtree Lane, Manchester. The nearest Ordnance Survey National Grid Reference is E: 388788, N: 398077 and the nearest postcode is M11 1GY. The whole site covers 3.053ha and is edged in red in Figure 1.

2.1.2 In terms of the surrounding land-use, the site is bound to the north by the Ashton Canal, with industrial and commercial development beyond. To the west sits Clayton Industrial Estate off Claytonbrook Road, and to the east are the school playing fields with the Edge Lane Allotments beyond. Further residential development can be found to the south of the site.



Figure 1: Existing Features Plan (Google Maps, 2025)

2.2 Long Term Surface Water Flood Mapping

2.2.1 The Environment Agency (EA) Long Term Flooding map shows that the site features areas of 'low', 'medium' and 'high' chance of surface water flood risk. For all events surface water flood chance extent is shown to be concentrated in the centre and the eastern corner of the site associated with existing depressions as seen in Figure 2.



Figure 2: Surface Water Flood Map Extract (Gov.UK, 2025)

2.2.2 The EA define the chance of flooding extents from surface water based on the following probability of occurrence;

- **High Chance** more than 3.3% chance each year
- **Medium Chance** between 1% and 3.33% chance each year
- **Low Chance** between 0.1% and 1% chance each year

2.2.3 The EA also provides surface water extents including for the impacts of climate change in the 2040 and 2060 (2050s epoch). This risk is referred to as 'future' risk and is generally more extensive than the non-climate change extents.

2.2.4 A site specific assessment has been undertaken to better define the flood depths, velocities and hazard for a range of chance events. This assessment also applies a greater climate change rainfall allowances for the 2070s epoch (appropriate for residential development).

3.0 DIRECT RAINFALL MODEL BUILD

3.1 Rainfall Data

3.1.1 Hyetographs for a range of rainfall events have been generated within ReFH2.3 software using FEH catchment descriptors and FEH 22 data from the FEH Web Service.

3.1.2 The key descriptors for the catchment are shown in Table 1:

Table 1: Key Catchment Descriptors (FEH 2025)

Description	
Catchment Area	1.4
BFIHOST	0.333
DPLBAR	2
DPSBAR	13
SAAR	923
SPRHOST	39.7
URBEXT2000	0.62

3.1.3 Hyetographs have been generated using ReFH2.3 for the following return periods:

-  1 in 30 year (3.3% AEP)
-  1 in 30 year (3.3% AEP) plus 40% climate change
-  1 in 100 year (1% AEP)
-  1 in 100 year (1% AEP) plus 45% climate change
-  1 in 1000 year (0.1% AEP)

3.1.4 The rainfall hyetograph storm duration is 5hours (the recommended storm duration for the catchment) with a timestep of 30 mins (see ReFH2.3 report in Appendix B). Net rainfall is applied in the model, this takes into account losses via infiltration, interception and evapotranspiration. As Urbext for the catchment is over 0.3, the summer urban hyetograph is used. Net rainfall used within the model are shown within Table 2 below.

Table 2: Net Rainfall totals used in 2D Simulation (Betts Hydro, 2025)

Time (hr)	Rainfall (mm)				
	1 in 30 year	1 in 30 year plus 40% CC	1 in 100 year	1 in 100 year +45% CC	1 in 1000 year
0	0.570	0.809	0.726	1.065	1.121
0.5	0.889	1.250	1.124	1.639	1.725
1	1.376	1.942	1.744	2.558	2.695
1.5	2.248	3.193	2.861	4.233	4.465
2	4.129	5.924	5.290	7.936	8.391
2.5	8.906	13.012	11.548	17.751	18.841
3	4.565	6.778	5.983	9.392	10.001
3.5	2.617	3.915	3.447	5.465	5.827
4	1.651	2.480	2.181	3.475	3.709
4.5	1.087	1.638	1.439	2.300	2.456
5	0.735	1.109	0.974	1.561	1.667

- 3.1.5 A rainfall climate change allowance of 40% is applied to the 30yr event and 45% applied for the 100yr event. This represents the upper allowance for the 3.3% AEP and 1% AEP event, in the Irwell Management catchment area respectively (2070s epoch).

3.2 Ground Model

- 3.2.1 The net rainfall was applied to a 2D ground model in order to predict surface water flow routes and areas where surface water accumulates.
- 3.2.2 One metre resolution LiDAR Digital Terrain Model (DTM) flown in 2022 has been obtained from the Defra Survey Data website for the Manchester area for model topography. The site specific topographic survey, undertaken in June 2021 is not incorporated into the model covering the site as there is limited level information due to dense vegetation at the time of the survey. A shapefile covering roads has been generated with road levels lowered by 0.1m to more accurately define kerb heights and roads as conveyance routes. Existing building footprints have been raised by 0.2m (including on site buildings) as recommended by Flood Modeller Pro guidance. The road and building mapping files were obtained from Ordnance Survey and Open Source Mapping respectively. These changes have been made to more accurately model surface water flow routes and are recommended for modelling direct rainfall.
- 3.2.3 A 2D rainfall area has been created to cover the site and surrounding area to accurately model catchment flow routes which may affect the site. The area in which the net rainfall has been applied to is shown in Figure 3 and has been defined through review of the contributing catchments using LiDAR elevation data. The model rainfall and model area has been sensitivity tested to ensure all contributing flow routes are considered (sensitivity testing is discussed further in Section 4).
- 3.2.4 Due to the presence of the Ashton Canal, which would intercept flows, incoming flows to the site are most likely to flow from higher elevations to the east of the site. The 2D simulations have been run over a 6 hour period with a 2m grid size and 1 second timestep.

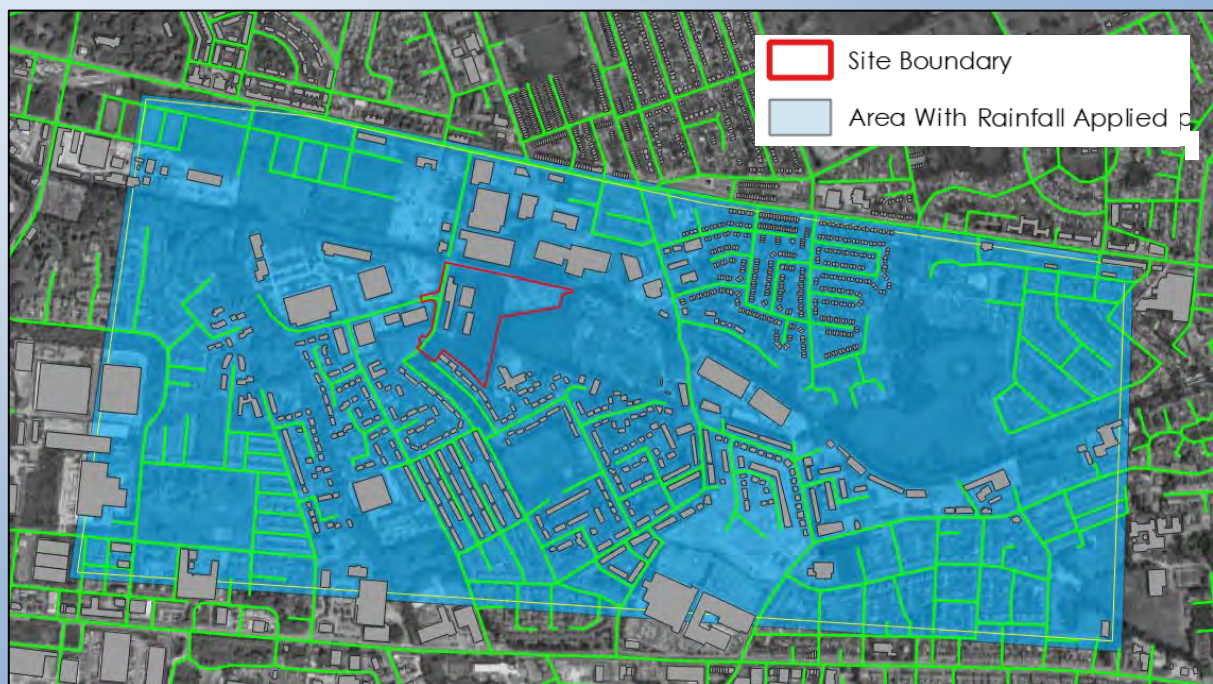


Figure 3: Area of rainfall applied (Betts Hydro, 2025)

4.0 RESULTS

4.1 Existing Scenario

4.1.1 Existing Scenario depth results are shown within Appendix D for the 1 in 30 year, 1 in 30 year plus climate change, 1 in 100 and 1 in 100 year plus climate change and the 1 in 1000 year event. The rainfall modelling results are considered conservative as losses to the sewer system in urban areas are not considered.

4.1.2 As rainfall is applied to every cell within the model domain (see Figure 4), in order to clearly define flow routes surface water flood depths below 0.02m are not shown in the flood depth results. The velocity results, however, do show areas of extent where depths are below 0.02m.

1 in 30 year event results

4.1.3 In the 30 year event (3.3% Annual Exceedance Probability), surface water flooding covers large areas within the site as shown in Drawing No. HYD1015/601/A within Appendix B. The peak surface water flood depth onsite is 0.52m in an area of proposed built form. The majority of flood depths onsite are below 0.20m. The maximum velocity onsite is 0.31m/s as shown in Drawing No. HYD1015/602/A, the majority of the site is below a velocity of 0.05m/s. This event typically defines the 'high chance' extent

1 in 100 year event results

4.1.4 In the 100 year event (1% AEP), surface water flooding covers large areas within the site as shown in Drawing No. HYD1015/603/A within Appendix B. The peak surface water flood depth onsite is 0.82m in an area of proposed built form. The majority of flood depths onsite are below 0.20m. The maximum velocity onsite is 0.90m/s as shown in Drawing No. HYD1015/604/A, the majority of the site is below a velocity of 0.05m/s. This event typically defines the 'medium chance' extent.

1 in 1000 year event results

4.1.5 In the 1000 year event (0.1% AEP), similar to the others events surface water flooding covers large areas within the site as shown in Drawing No. HYD1015/605/A within Appendix B. The peak surface water flood depth onsite is 0.85m in an area of proposed built form. The majority of flood depths onsite are below 0.20m. The maximum velocity onsite is 0.97m/s as shown in Drawing No. HYD1015/606/A, the majority of the site is below a velocity of 0.05m/s. This event typically defines the 'low chance' extent.

4.1.6 *1 in 30 year event results plus 40% climate change*

In the 30 year event (3.33% AEP) plus 40% climate change event, surface water flooding is shown to be more extensive than the non-climate change scenario as shown in Drawing No. HYD1015/610/A within Appendix B. The peak surface water flood depth in this area is 0.65m in an area proposed to have built form. The maximum velocity predicted is 0.55m/s as shown in Drawing No. HYD1015/611/A. This event typically defines the 'future high chance' extent. A hazard plan has been produced for this event in accordance with DEFRA guidance FD2320. The majority of predicted surface

water flooding is classified as 'very low hazard'. There are some areas of 'danger to some' and 'danger to most' concentrated in the eastern boundary in proposed areas of built form.

1 in 100 year event results plus 45% climate change

- 4.1.7 In the 100 year event (1% AEP) plus 45% climate change, surface water flooding is shown to have a similar extent to the 1 in 1000 year event as shown in Drawing No. HYD1015/613/A within Appendix B and Figure 4. The peak surface water flood depth is 0.82m. The majority of flood depths onsite are below 0.20m. The maximum velocity onsite is 0.90m/s as shown in Drawing No. HYD1015/614/A, the majority of the site is below a velocity of 0.05m/s. This event typically defines the 'future medium chance' event.

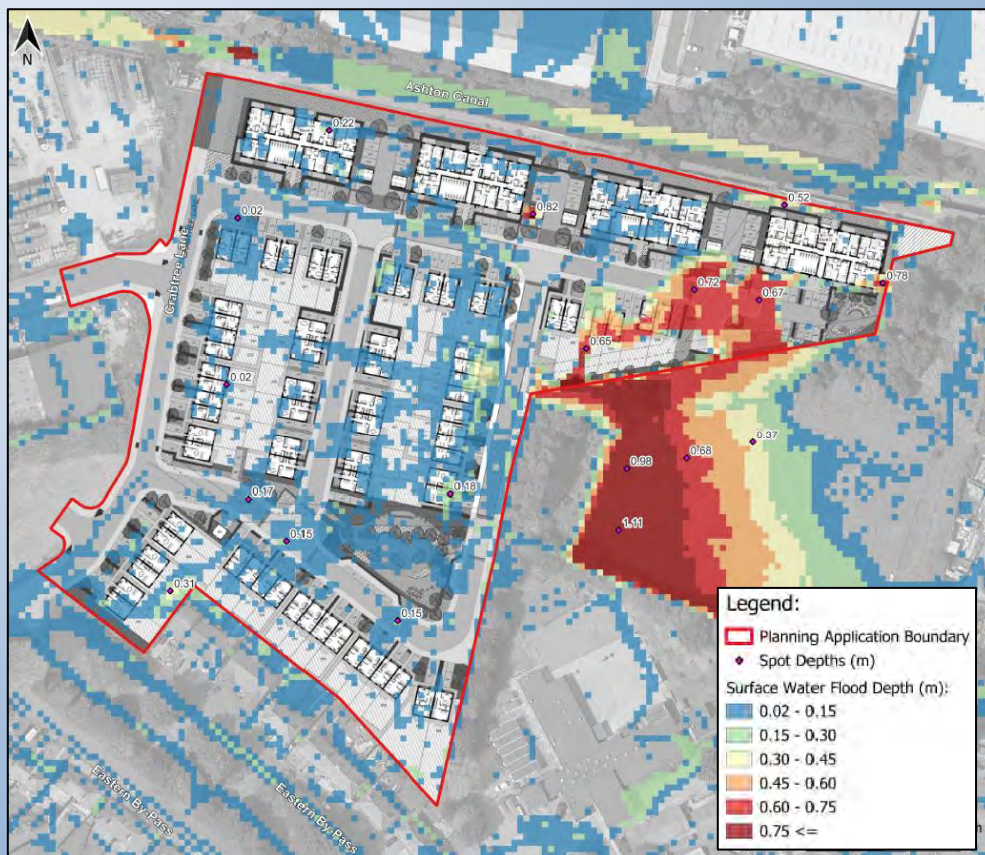
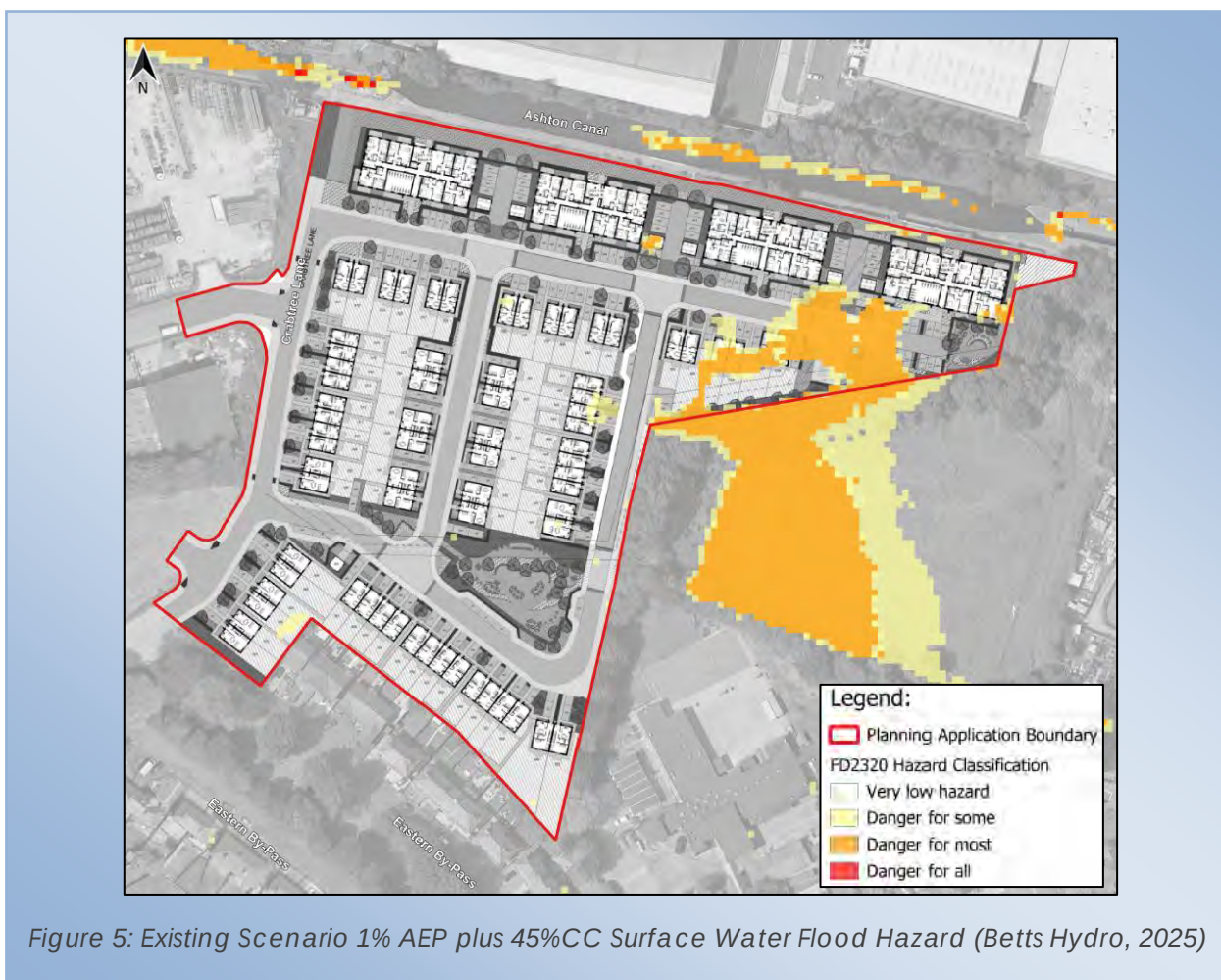


Figure 4: Existing Scenario 1% AEP plus 45%CC Surface Water Flood Depth (Betts Hydro, 2025)

Flood Hazard

- 4.1.8 A hazard plan has been produced for the 1% AEP plus 45% allowance for climate change event in accordance with FD2320. The majority of predicted surface water flooding is classified as 'very low hazard'. There are some areas of 'danger to some' and 'danger to most' concentrated in the east in areas of proposed built form as shown in Figure 5.
- 4.1.9 To accurately define the hazard rating two separate simulations have been run with a debris factor of 0.5 and a debris factor 1. In accordance with EA guidance FD2320 depths below 0.25m apply a debris factor of 0.5 and for depths above 0.25m a debris

factor of 1 is applied. These outputs have been processed to provide a composite output.



- 4.1.10 It should be noted that direct rainfall does not take into account below ground systems. It is understood that a culverted watercourse bisects the site and would possibly receive, or direct surface water flows safely through the site.

Sensitivity testing

- 4.1.11 Sensitivity testing of the results in the 1 in 100 year event plus 45% climate change has been undertaken. Grid size, rainfall area and mannings values were tested to review model sensitivity to these parameters.
- 4.1.12 The model outputs are from a 2m grid cell size, however a 4m grid and 1m grid have also been simulated. Both these different grid sizes have negligible increases and decreases in extent relative to the 2m grid size.
- 4.1.13 The area in which outputs are generated and rainfall applied has been simulated with larger and smaller areas. The surface water extents are shown to remain the same onsite when the area boundaries are extended, this validates that the study area selected is large enough to capture all potential surface water flows to the

development site. A reduced area leads to a negligible reduction in surface water extent for the site.

- 4.1.14 The default manning value of 0.03 was adjusted +/- 20%. When mannings values are reduced and increased by 20% the change in extent is shown to be negligible in all areas of the model. A mannings value of 0.03 is considered an appropriate average the given the urban land uses (in accordance with Chow, 1959).
- 4.1.15 Based on sensitivity testing the model shows low sensitivity to changes in key model variables.

Results Discussion

- 4.1.16 The purpose of this direct rainfall modelling is to more accurately define predicted flood depth, velocity and hazard for a range of return periods (including more appropriate climate change allowances compared to the published EA data). The results are used to inform the planning layout and review detailed surface water flood depths and velocities.
- 4.1.17 Flood Risk is defined as the combination of likelihood or chance of an event happening and the consequences or impact if that event occurred. For the purposes of steering development to 'low' risk areas, these low risk areas are defined as either:
- 1 in 100 year event or lesser chance of flooding (<1% AEP)
 - 'Very low hazard' classification in events up to and including the 1 in 100 year event
- 4.1.18 Future scenarios that include climate change should be considered when assessing the potential flood risk in accordance with the NPPF.
- 4.1.19 The different 'chance events' have been simulated to understand the 'risk' on site. The depth and velocity are calculated to ascertain the hazard rating. Where built development is proposed within the extent described as at medium and high risk, then the requirement for the sequential test is potentially triggered.

Proposed Modelling

- 4.1.20 The proposed levels for the site have been incorporated into the 2D domain and run in the 1 in 100 year plus climate change event to review proposed future flood risk for the site (future medium chance).
- 4.1.21 As shown in Drawing No. HYD1015/713/B within Appendix E and Figure 6 shows the flood depths in the 1 in 100 year plus climate change event. All proposed buildings are predicted to be flood free in this event and have been raised to ensure this. There are some isolated areas of ponding in the eastern corner of the site. The maximum depth in this area is 0.38m. Velocities on the site are predicted to be low (generally below 0.10m/s).

4.2.22 Drawing No. HYD1015/715/B within Appendix E shows the predicted flood hazard for this event in which only areas of 'little danger' and isolated areas of 'danger to some' are located (lower hazard than in the existing scenario).

4.2.23 There is shown to be minimal increases to flood depths in the undeveloped area to the south-east of the site, however this area is predicted to flood by over 0.9m at present. There is no increase in surface water flood extent to dwellings in the wider area.

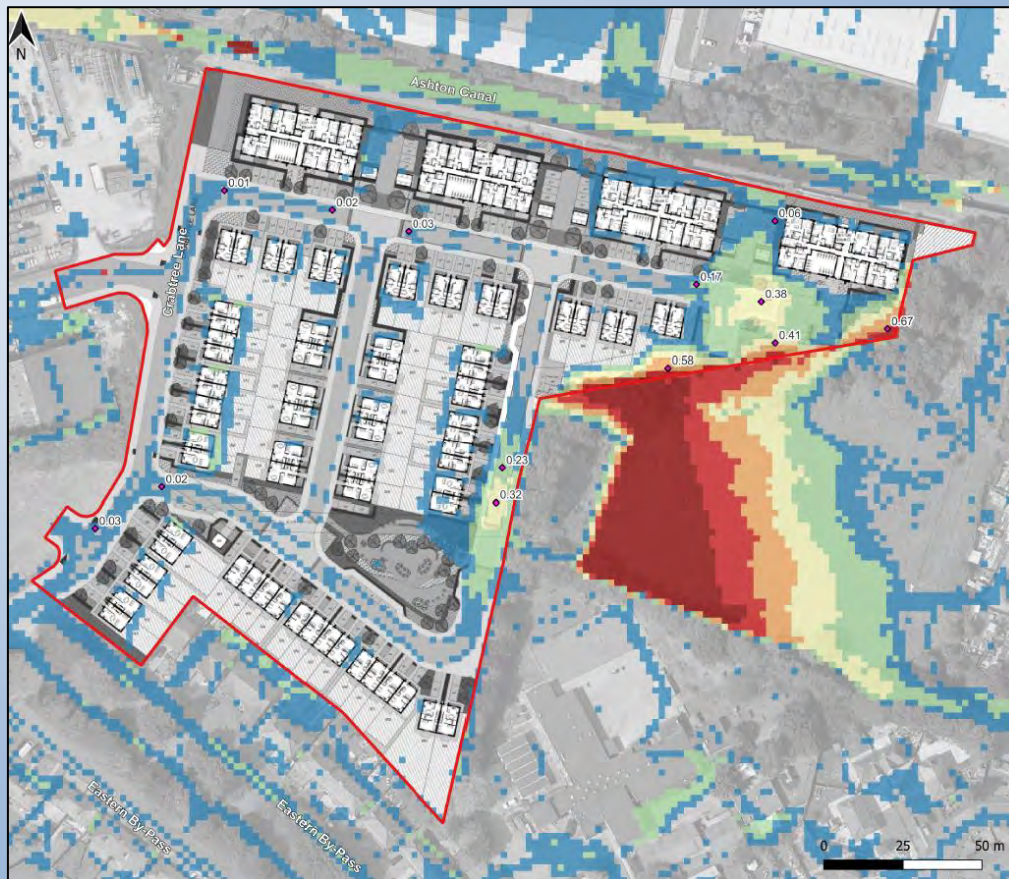


Figure 6: Proposed Scenario 1% AEP plus 45%CC Surface Water Flood Depth (Betts Hydro, 2025)

5.0 CONCLUSIONS

- 5.1 A site specific direct rainfall model has been constructed for Crabtree Lane within Flood Modeller Pro to provide site specific information. The site is shown to be at risk of surface water flooding for a range of return periods up to the 1 in 1000 year event (including the impacts of climate change).
- 5.2 Surface water flooding is predicted to affect areas of the site, towards the centre of the site, and near the eastern boundary. The extents of the direct rainfall modelling generally align with the EA surface water flood risk maps.
- 5.3 The site specific results define medium and high flood risk areas.
- 5.4 This site specific assessment identifies that the built form is within areas of medium and high surface water flood risk and potentially triggers the requirement for the sequential test. This should be discussed further with the LPA.
- 5.5 Proposed levels modelling predicts onsite buildings will be flood free from surface water flooding in the 1 in 100 year plus climate change event (future medium chance).
- 5.6 There are noted limitations to direct rainfall models. The results shown within this report are considered conservative as they do not account for below ground drainage systems.

BIBLIOGRAPHY & REFERENCES

Bibliography

Open Channel Hydraulics, Chow Mannings (1959)
National Planning Policy Framework, CLG (2024)
Planning Practice Guidance, CLG (2024)
Flood Risks to People Phase 2 FD2321, DEFRA (2006)
Flood Risk Guidance for New Development FD2320 (2005)
Explanatory Note for FD2320 and FD2321 (2008)

Web-based References

Centre for Ecology and Hydrology FEH Web - <https://fehweb.ceh.ac.uk/Map>
DEFRA LiDAR <https://environment.data.gov.uk/survey>
Google Maps – <http://maps.google.com/>
Ordnance Survey <https://osdatahub.os.uk/downloads/open/OpenRoads>
Open Source Mapping <https://osmbuildings.org/data/>

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APPENDIX A: FEH RAINFALL DATA

Rainfall modelling FEH22

FEH22

FEH13

☒ Design Rainfall (Duration:*) 2.45 Hours Sliding

☐ Event Rarity Return period (†) 30 Years

☒ Annual Max. ☐ Peaks over threshold

Calculate



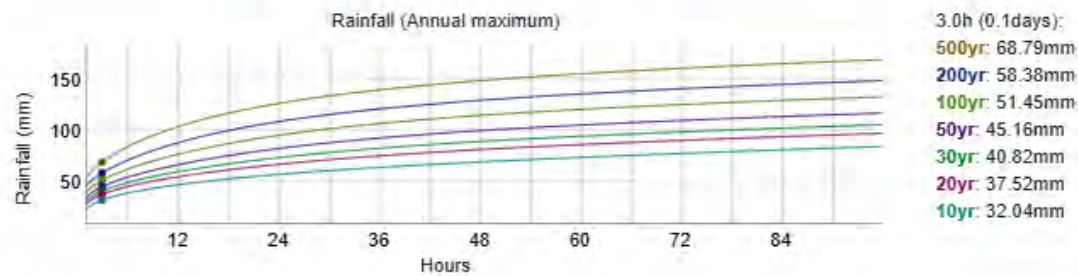
Export

Depth

38.75 mm

A design rainfall of 38.75 mm was calculated.

This design rainfall has been calculated for a return period on the annual maximum scale.



Save graph as image

Close

Rainfall modelling FEH22

FEH22

FEH13

☒ Design Rainfall (Duration:*) 2.45 Hours Sliding

☐ Event Rarity Return period (†) 100 Years

☒ Annual Max. ☐ Peaks over threshold

Calculate



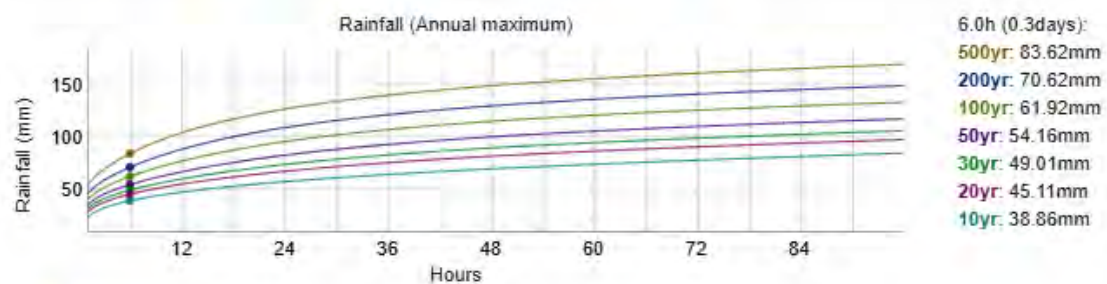
Export

Depth

48.92 mm

A design rainfall of 48.92 mm was calculated.

This design rainfall has been calculated for a return period on the annual maximum scale.



Save graph as image

Close

APPENDIX B: ReFH2 REPORT

UK Design Flood Estimation

Generated on Friday, March 14, 2025 3:12:03 PM by patricktaylor
Printed from the ReFH2 Flood Modelling software package, version 4.1.8879.22310

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

Site detailsChecksum: CC17-5A7B

Site name: FEH_Catchment_Descriptors_382950_379600_v5_0_1

Easting: 382950

Northing: 379600

Country: England, Wales or Northern Ireland

Catchment Area (km²): 0.63

Using plot scale calculations: No

Model: 2.3

Site description:None

Model run: 1 year

Summary of results

Rainfall - FEH22 (mm):	15.57	Total runoff (ML):	2.81
Total Rainfall (mm):	14.83	Total flow (ML):	5.80
Peak Rainfall (mm):	4.59	Peak flow (m ³ /s):	0.32

Parameters

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

Rainfall parameters (Rainfall - FEH22)

Name	Value	User-defined?
Duration (hh:mm:ss)	02:45:00	No
Timestep (hh:mm:ss)	00:15:00	No
SCF (Seasonal correction factor)	0.97	No
ARF (Areal reduction factor)	0.98	No
Seasonality	Summer	No

Loss model parameters

Name	Value	User-defined?
Cini (mm)	50.79	No
Cmax (mm)	451.45	No
Use alpha correction factor	No	No
Alpha correction factor	n/a	No

Routing model parameters

Name	Value	User-defined?
Tp (hr)	1.59	No
Up	0.65	No
Uk	0.8	No

Baseflow model parameters

Name	Value	User-defined?
BF0 (m ³ /s)	0.01	No
BL (hr)	27.55	No
BR	3.14	No

Urbanisation parameters

Name	Value	User-defined?
Sewer capacity (m ³ /s)	0	No
Exporting drained area (km ²)	0	No
Urban area (km ²)	0.45	No
Effective URBEXT2000	0.46	n/a
Impervious runoff factor	0.7	No
Imperviousness factor	0.4	No
Tp scaling factor	0.75	No
Depression storage depth (mm)	0.5	No

Time series data

Time (hh:mm:ss)	Rain (mm)	Sewer Loss (m³/s)	Net Rain (mm)	Runoff (m³/s)	Baseflow (m³/s)	Total Flow (m³/s)
00:00:00	0.342	0.000	0.096	0.000	0.006	0.006
00:15:00	0.509	0.000	0.147	0.001	0.006	0.007
00:30:00	0.779	0.000	0.228	0.004	0.006	0.010
00:45:00	1.253	0.000	0.369	0.011	0.006	0.017
01:00:00	2.238	0.000	0.667	0.023	0.006	0.029
01:15:00	4.586	0.000	1.394	0.045	0.006	0.051
01:30:00	2.238	0.000	0.694	0.084	0.007	0.091
01:45:00	1.253	0.000	0.392	0.140	0.007	0.147
02:00:00	0.779	0.000	0.245	0.199	0.008	0.207
02:15:00	0.509	0.000	0.161	0.255	0.009	0.264
02:30:00	0.342	0.000	0.108	0.297	0.011	0.308
02:45:00	0.000	0.000	0.000	0.310	0.013	0.323
03:00:00	0.000	0.000	0.000	0.299	0.015	0.314
03:15:00	0.000	0.000	0.000	0.273	0.018	0.290
03:30:00	0.000	0.000	0.000	0.239	0.020	0.259
03:45:00	0.000	0.000	0.000	0.204	0.022	0.226
04:00:00	0.000	0.000	0.000	0.172	0.024	0.196
04:15:00	0.000	0.000	0.000	0.143	0.025	0.169
04:30:00	0.000	0.000	0.000	0.117	0.027	0.144
04:45:00	0.000	0.000	0.000	0.094	0.028	0.121
05:00:00	0.000	0.000	0.000	0.072	0.029	0.101
05:15:00	0.000	0.000	0.000	0.052	0.030	0.082
05:30:00	0.000	0.000	0.000	0.035	0.030	0.065
05:45:00	0.000	0.000	0.000	0.022	0.031	0.053
06:00:00	0.000	0.000	0.000	0.014	0.031	0.045
06:15:00	0.000	0.000	0.000	0.009	0.031	0.040
06:30:00	0.000	0.000	0.000	0.006	0.031	0.037
06:45:00	0.000	0.000	0.000	0.003	0.031	0.035
07:00:00	0.000	0.000	0.000	0.002	0.031	0.033
07:15:00	0.000	0.000	0.000	0.001	0.031	0.032
07:30:00	0.000	0.000	0.000	0.000	0.031	0.031
07:45:00	0.000	0.000	0.000	0.000	0.031	0.031
08:00:00	0.000	0.000	0.000	0.000	0.030	0.031
08:15:00	0.000	0.000	0.000	0.000	0.030	0.030

Time (hh:mm:ss)	Rain (mm)	Sewer Loss (m ³ /s)	Net Rain (mm)	Runoff (m ³ /s)	Baseflow (m ³ /s)	Total Flow (m ³ /s)
08:30:00	0.000	0.000	0.000	0.000	0.030	0.030
08:45:00	0.000	0.000	0.000	0.000	0.030	0.030
09:00:00	0.000	0.000	0.000	0.000	0.029	0.029
09:15:00	0.000	0.000	0.000	0.000	0.029	0.029
09:30:00	0.000	0.000	0.000	0.000	0.029	0.029
09:45:00	0.000	0.000	0.000	0.000	0.029	0.029
10:00:00	0.000	0.000	0.000	0.000	0.028	0.028
10:15:00	0.000	0.000	0.000	0.000	0.028	0.028
10:30:00	0.000	0.000	0.000	0.000	0.028	0.028
10:45:00	0.000	0.000	0.000	0.000	0.028	0.028
11:00:00	0.000	0.000	0.000	0.000	0.027	0.027
11:15:00	0.000	0.000	0.000	0.000	0.027	0.027
11:30:00	0.000	0.000	0.000	0.000	0.027	0.027
11:45:00	0.000	0.000	0.000	0.000	0.027	0.027
12:00:00	0.000	0.000	0.000	0.000	0.026	0.026
12:15:00	0.000	0.000	0.000	0.000	0.026	0.026
12:30:00	0.000	0.000	0.000	0.000	0.026	0.026
12:45:00	0.000	0.000	0.000	0.000	0.026	0.026
13:00:00	0.000	0.000	0.000	0.000	0.025	0.025
13:15:00	0.000	0.000	0.000	0.000	0.025	0.025
13:30:00	0.000	0.000	0.000	0.000	0.025	0.025
13:45:00	0.000	0.000	0.000	0.000	0.025	0.025
14:00:00	0.000	0.000	0.000	0.000	0.024	0.024
14:15:00	0.000	0.000	0.000	0.000	0.024	0.024
14:30:00	0.000	0.000	0.000	0.000	0.024	0.024
14:45:00	0.000	0.000	0.000	0.000	0.024	0.024
15:00:00	0.000	0.000	0.000	0.000	0.024	0.024
15:15:00	0.000	0.000	0.000	0.000	0.023	0.023
15:30:00	0.000	0.000	0.000	0.000	0.023	0.023
15:45:00	0.000	0.000	0.000	0.000	0.023	0.023
16:00:00	0.000	0.000	0.000	0.000	0.023	0.023
16:15:00	0.000	0.000	0.000	0.000	0.023	0.023
16:30:00	0.000	0.000	0.000	0.000	0.022	0.022
16:45:00	0.000	0.000	0.000	0.000	0.022	0.022
17:00:00	0.000	0.000	0.000	0.000	0.022	0.022

Time (hh:mm:ss)	Rain (mm)	Sewer Loss (m ³ /s)	Net Rain (mm)	Runoff (m ³ /s)	Baseflow (m ³ /s)	Total Flow (m ³ /s)
17:15:00	0.000	0.000	0.000	0.000	0.022	0.022
17:30:00	0.000	0.000	0.000	0.000	0.022	0.022
17:45:00	0.000	0.000	0.000	0.000	0.021	0.021
18:00:00	0.000	0.000	0.000	0.000	0.021	0.021
18:15:00	0.000	0.000	0.000	0.000	0.021	0.021
18:30:00	0.000	0.000	0.000	0.000	0.021	0.021
18:45:00	0.000	0.000	0.000	0.000	0.021	0.021
19:00:00	0.000	0.000	0.000	0.000	0.020	0.020
19:15:00	0.000	0.000	0.000	0.000	0.020	0.020
19:30:00	0.000	0.000	0.000	0.000	0.020	0.020
19:45:00	0.000	0.000	0.000	0.000	0.020	0.020
20:00:00	0.000	0.000	0.000	0.000	0.020	0.020
20:15:00	0.000	0.000	0.000	0.000	0.020	0.020
20:30:00	0.000	0.000	0.000	0.000	0.019	0.019
20:45:00	0.000	0.000	0.000	0.000	0.019	0.019
21:00:00	0.000	0.000	0.000	0.000	0.019	0.019
21:15:00	0.000	0.000	0.000	0.000	0.019	0.019
21:30:00	0.000	0.000	0.000	0.000	0.019	0.019
21:45:00	0.000	0.000	0.000	0.000	0.018	0.018
22:00:00	0.000	0.000	0.000	0.000	0.018	0.018
22:15:00	0.000	0.000	0.000	0.000	0.018	0.018
22:30:00	0.000	0.000	0.000	0.000	0.018	0.018
22:45:00	0.000	0.000	0.000	0.000	0.018	0.018
23:00:00	0.000	0.000	0.000	0.000	0.018	0.018
23:15:00	0.000	0.000	0.000	0.000	0.017	0.017
23:30:00	0.000	0.000	0.000	0.000	0.017	0.017
23:45:00	0.000	0.000	0.000	0.000	0.017	0.017
24:00:00	0.000	0.000	0.000	0.000	0.017	0.017
24:15:00	0.000	0.000	0.000	0.000	0.017	0.017
24:30:00	0.000	0.000	0.000	0.000	0.017	0.017
24:45:00	0.000	0.000	0.000	0.000	0.017	0.017
25:00:00	0.000	0.000	0.000	0.000	0.016	0.016
25:15:00	0.000	0.000	0.000	0.000	0.016	0.016
25:30:00	0.000	0.000	0.000	0.000	0.016	0.016
25:45:00	0.000	0.000	0.000	0.000	0.016	0.016

Time (hh:mm:ss)	Rain (mm)	Sewer Loss (m ³ /s)	Net Rain (mm)	Runoff (m ³ /s)	Baseflow (m ³ /s)	Total Flow (m ³ /s)
26:00:00	0.000	0.000	0.000	0.000	0.016	0.016
26:15:00	0.000	0.000	0.000	0.000	0.016	0.016
26:30:00	0.000	0.000	0.000	0.000	0.016	0.016
26:45:00	0.000	0.000	0.000	0.000	0.015	0.015
27:00:00	0.000	0.000	0.000	0.000	0.015	0.015
27:15:00	0.000	0.000	0.000	0.000	0.015	0.015
27:30:00	0.000	0.000	0.000	0.000	0.015	0.015
27:45:00	0.000	0.000	0.000	0.000	0.015	0.015
28:00:00	0.000	0.000	0.000	0.000	0.015	0.015
28:15:00	0.000	0.000	0.000	0.000	0.015	0.015
28:30:00	0.000	0.000	0.000	0.000	0.014	0.014
28:45:00	0.000	0.000	0.000	0.000	0.014	0.014
29:00:00	0.000	0.000	0.000	0.000	0.014	0.014
29:15:00	0.000	0.000	0.000	0.000	0.014	0.014
29:30:00	0.000	0.000	0.000	0.000	0.014	0.014
29:45:00	0.000	0.000	0.000	0.000	0.014	0.014
30:00:00	0.000	0.000	0.000	0.000	0.014	0.014
30:15:00	0.000	0.000	0.000	0.000	0.014	0.014
30:30:00	0.000	0.000	0.000	0.000	0.013	0.013
30:45:00	0.000	0.000	0.000	0.000	0.013	0.013
31:00:00	0.000	0.000	0.000	0.000	0.013	0.013
31:15:00	0.000	0.000	0.000	0.000	0.013	0.013
31:30:00	0.000	0.000	0.000	0.000	0.013	0.013
31:45:00	0.000	0.000	0.000	0.000	0.013	0.013
32:00:00	0.000	0.000	0.000	0.000	0.013	0.013
32:15:00	0.000	0.000	0.000	0.000	0.013	0.013
32:30:00	0.000	0.000	0.000	0.000	0.013	0.013
32:45:00	0.000	0.000	0.000	0.000	0.012	0.012
33:00:00	0.000	0.000	0.000	0.000	0.012	0.012
33:15:00	0.000	0.000	0.000	0.000	0.012	0.012
33:30:00	0.000	0.000	0.000	0.000	0.012	0.012
33:45:00	0.000	0.000	0.000	0.000	0.012	0.012
34:00:00	0.000	0.000	0.000	0.000	0.012	0.012
34:15:00	0.000	0.000	0.000	0.000	0.012	0.012
34:30:00	0.000	0.000	0.000	0.000	0.012	0.012

Time (hh:mm:ss)	Rain (mm)	Sewer Loss (m ³ /s)	Net Rain (mm)	Runoff (m ³ /s)	Baseflow (m ³ /s)	Total Flow (m ³ /s)
34:45:00	0.000	0.000	0.000	0.000	0.012	0.012
35:00:00	0.000	0.000	0.000	0.000	0.011	0.011
35:15:00	0.000	0.000	0.000	0.000	0.011	0.011
35:30:00	0.000	0.000	0.000	0.000	0.011	0.011
35:45:00	0.000	0.000	0.000	0.000	0.011	0.011
36:00:00	0.000	0.000	0.000	0.000	0.011	0.011
36:15:00	0.000	0.000	0.000	0.000	0.011	0.011
36:30:00	0.000	0.000	0.000	0.000	0.011	0.011
36:45:00	0.000	0.000	0.000	0.000	0.011	0.011
37:00:00	0.000	0.000	0.000	0.000	0.011	0.011
37:15:00	0.000	0.000	0.000	0.000	0.011	0.011
37:30:00	0.000	0.000	0.000	0.000	0.010	0.010
37:45:00	0.000	0.000	0.000	0.000	0.010	0.010
38:00:00	0.000	0.000	0.000	0.000	0.010	0.010
38:15:00	0.000	0.000	0.000	0.000	0.010	0.010
38:30:00	0.000	0.000	0.000	0.000	0.010	0.010
38:45:00	0.000	0.000	0.000	0.000	0.010	0.010
39:00:00	0.000	0.000	0.000	0.000	0.010	0.010
39:15:00	0.000	0.000	0.000	0.000	0.010	0.010
39:30:00	0.000	0.000	0.000	0.000	0.010	0.010
39:45:00	0.000	0.000	0.000	0.000	0.010	0.010
40:00:00	0.000	0.000	0.000	0.000	0.010	0.010
40:15:00	0.000	0.000	0.000	0.000	0.009	0.009
40:30:00	0.000	0.000	0.000	0.000	0.009	0.009
40:45:00	0.000	0.000	0.000	0.000	0.009	0.009
41:00:00	0.000	0.000	0.000	0.000	0.009	0.009
41:15:00	0.000	0.000	0.000	0.000	0.009	0.009
41:30:00	0.000	0.000	0.000	0.000	0.009	0.009
41:45:00	0.000	0.000	0.000	0.000	0.009	0.009
42:00:00	0.000	0.000	0.000	0.000	0.009	0.009
42:15:00	0.000	0.000	0.000	0.000	0.009	0.009
42:30:00	0.000	0.000	0.000	0.000	0.009	0.009
42:45:00	0.000	0.000	0.000	0.000	0.009	0.009
43:00:00	0.000	0.000	0.000	0.000	0.009	0.009
43:15:00	0.000	0.000	0.000	0.000	0.008	0.008

Time (hh:mm:ss)	Rain (mm)	Sewer Loss (m ³ /s)	Net Rain (mm)	Runoff (m ³ /s)	Baseflow (m ³ /s)	Total Flow (m ³ /s)
43:30:00	0.000	0.000	0.000	0.000	0.008	0.008
43:45:00	0.000	0.000	0.000	0.000	0.008	0.008
44:00:00	0.000	0.000	0.000	0.000	0.008	0.008
44:15:00	0.000	0.000	0.000	0.000	0.008	0.008
44:30:00	0.000	0.000	0.000	0.000	0.008	0.008
44:45:00	0.000	0.000	0.000	0.000	0.008	0.008
45:00:00	0.000	0.000	0.000	0.000	0.008	0.008
45:15:00	0.000	0.000	0.000	0.000	0.008	0.008
45:30:00	0.000	0.000	0.000	0.000	0.008	0.008
45:45:00	0.000	0.000	0.000	0.000	0.008	0.008
46:00:00	0.000	0.000	0.000	0.000	0.008	0.008
46:15:00	0.000	0.000	0.000	0.000	0.008	0.008
46:30:00	0.000	0.000	0.000	0.000	0.008	0.008
46:45:00	0.000	0.000	0.000	0.000	0.007	0.007
47:00:00	0.000	0.000	0.000	0.000	0.007	0.007
47:15:00	0.000	0.000	0.000	0.000	0.007	0.007
47:30:00	0.000	0.000	0.000	0.000	0.007	0.007
47:45:00	0.000	0.000	0.000	0.000	0.007	0.007
48:00:00	0.000	0.000	0.000	0.000	0.007	0.007
48:15:00	0.000	0.000	0.000	0.000	0.007	0.007
48:30:00	0.000	0.000	0.000	0.000	0.007	0.007
48:45:00	0.000	0.000	0.000	0.000	0.007	0.007
49:00:00	0.000	0.000	0.000	0.000	0.007	0.007
49:15:00	0.000	0.000	0.000	0.000	0.007	0.007
49:30:00	0.000	0.000	0.000	0.000	0.007	0.007
49:45:00	0.000	0.000	0.000	0.000	0.007	0.007
50:00:00	0.000	0.000	0.000	0.000	0.007	0.007
50:15:00	0.000	0.000	0.000	0.000	0.007	0.007
50:30:00	0.000	0.000	0.000	0.000	0.007	0.007
50:45:00	0.000	0.000	0.000	0.000	0.006	0.006
51:00:00	0.000	0.000	0.000	0.000	0.006	0.006
51:15:00	0.000	0.000	0.000	0.000	0.006	0.006

Appendix

Catchment descriptors

Name	Value	User-defined value used?
Area (km ²)	0.63	No
ALTBAR	73	No
ASPBAR	219	No
ASPVAR	0.53	No
BFIHOST	0.55	No
BFIHOST19	0.57	No
DPLBAR (km)	0.69	No
DPSBAR (mkm ⁻¹)	9.6	No
FARL	1	No
LDP	1.58	No
PROPWET	0.52	No
RMED1H	10.3	No
RMED1D	29.8	No
RMED2D	41.3	No
SAAR (mm)	822	No
SAAR4170 (mm)	807	No
SPRHOST	28.02	No
URBEXT2000	0.46	No
URBEXT1990	0.21	No
URBCONC	0.93	No
URBLOC	0.99	No
DDF parameter C	-0.03	No
DDF parameter D1	0.33	No
DDF parameter D2	0.38	No
DDF parameter D3	0.28	No
DDF parameter E	0.3	No
DDF parameter F	2.4	No
DDF parameter C (1km grid value)	-0.03	No
DDF parameter D1 (1km grid value)	0.33	No
DDF parameter D2 (1km grid value)	0.38	No
DDF parameter D3 (1km grid value)	0.28	No
DDF parameter E (1km grid value)	0.3	No
DDF parameter F (1km grid value)	2.4	No

APPENDIX C: Irwell Management Catchment rainfall allowances



Irwell Management Catchment peak rainfall allowances

3.3% annual exceedance rainfall event

Epoch	Central allowance	Upper end allowance
2050s	25%	35%
2070s	30%	40%

1% annual exceedance rainfall event

Epoch	Central allowance	Upper end allowance
2050s	25%	40%
2070s	30%	45%

*Use '2050s' for development with a lifetime up to 2060 and use the 2070s epoch for development with a lifetime between 2061 and 2125.

APPENDIX D: SURFACE WATER FLOOD PLANS

HYD1015_601_A_DIRECT.RAINFALL.30.YEAR.DEPTH_A3L

HYD1015_602_A_DIRECT.RAINFALL.30.YEAR.VELOCITY_A3L

HYD1015_603_A_DIRECT.RAINFALL.100.YEAR.DEPTH_A3L

HYD1015_604_A_DIRECT.RAINFALL.100.YEAR.VELOCITY_A3L

HYD1015_607_A_DIRECT.RAINFALL.1000.YEAR.DEPTH_A3L

HYD1015_608_A_DIRECT.RAINFALL.1000.YEAR.VELOCITY_A3L

HYD1015_610_A_DIRECT.RAINFALL.30.YEAR.CC.DEPTH_A3L

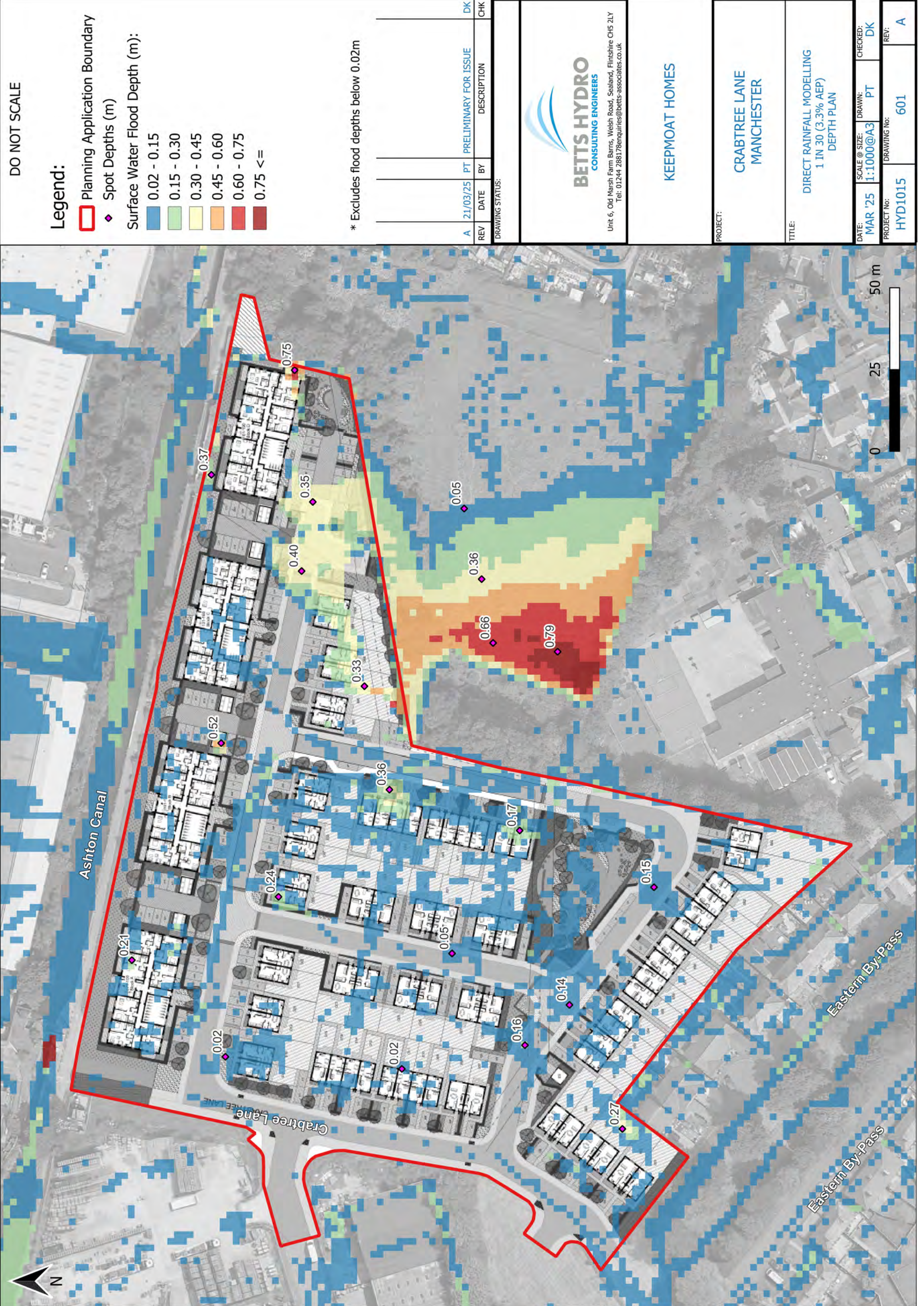
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HYD1015_612_A_DIRECT.RAINFALL.30.YEAR.CC.HAZARD_A3L

HYD1015_613_A_DIRECT.RAINFALL.100.YEAR.CC.DEPTH_A3L

HYD1015_614_A_DIRECT.RAINFALL.100.YEAR.CC.VELOCITY_A3L

HYD1015_615_A_DIRECT.RAINFALL.100.YEAR.CC.HAZARD_A3L



DO NOT SCALE

Legend:

Planning Application Boundary

◆

Spot Depths (m)

Surface Water Flood Depth (m):

0.02 - 0.15

0.15 - 0.30

0.30 - 0.45

0.45 - 0.60

0.60 - 0.75

0.75 <=

* Excludes flood depths below 0.02m

A	21/03/25	PT	PRELIMINARY FOR ISSUE		DK
REV	DATE	BY	DESCRIPTION		CHK
DRAWING STATUS:					

BETTS HYDRO

CONSULTING ENGINEERS

Unit 6, Old Marsh Farm Barns, Welsh Road, Sealand, Flintshire CH5 2LY

Tel: 01244 288178enquiries@betts-associates.co.uk

KEEPMOAT HOMES

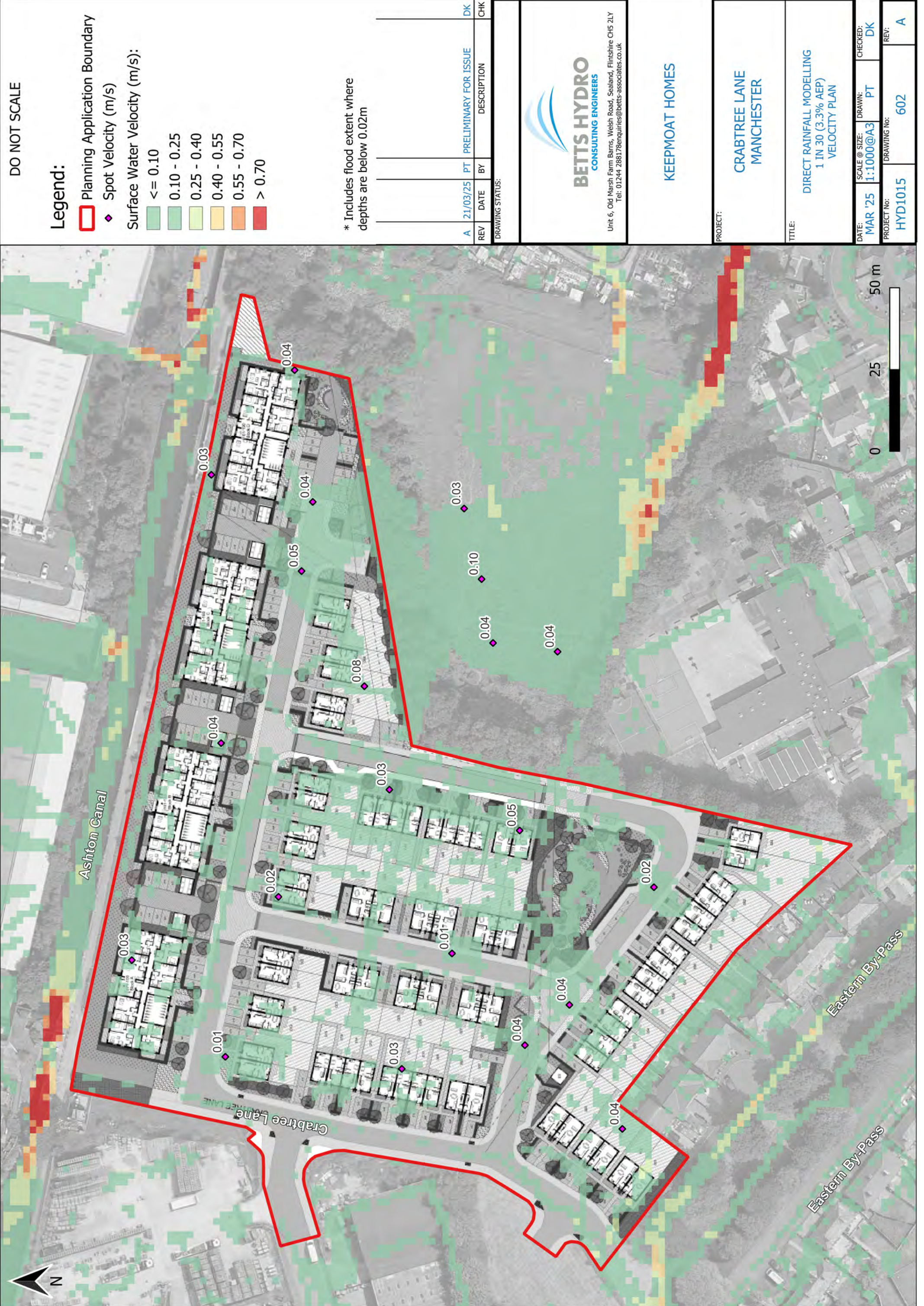
PROJECT:

CRABTREE LANE
MANCHESTER

TITLE:

DIRECT RAINFALL MODELLING
1 IN 30 (3.3% AEP)
DEPTH PLAN

DATE: MAR '25	SCALE @ SIZE: 1:1000@A3	DRAWN: PT	CHECKED: DK	
PROJECT No: HYD1015	DRAWING No: 601		REV: A	



DO NOT SCALE

Legend:

Planning Application Boundary

Spot Velocity (m/s)

Surface Water Velocity (m/s):

<= 0.10

0.10 - 0.25

0.25 - 0.40

0.40 - 0.55

0.55 - 0.70

> 0.70

* Includes flood extent where depths are below 0.02m

REV	DATE	BY	DESCRIPTION	CHK
A	21/03/25	PT	PRELIMINARY FOR ISSUE	DK

DRAWING STATUS:

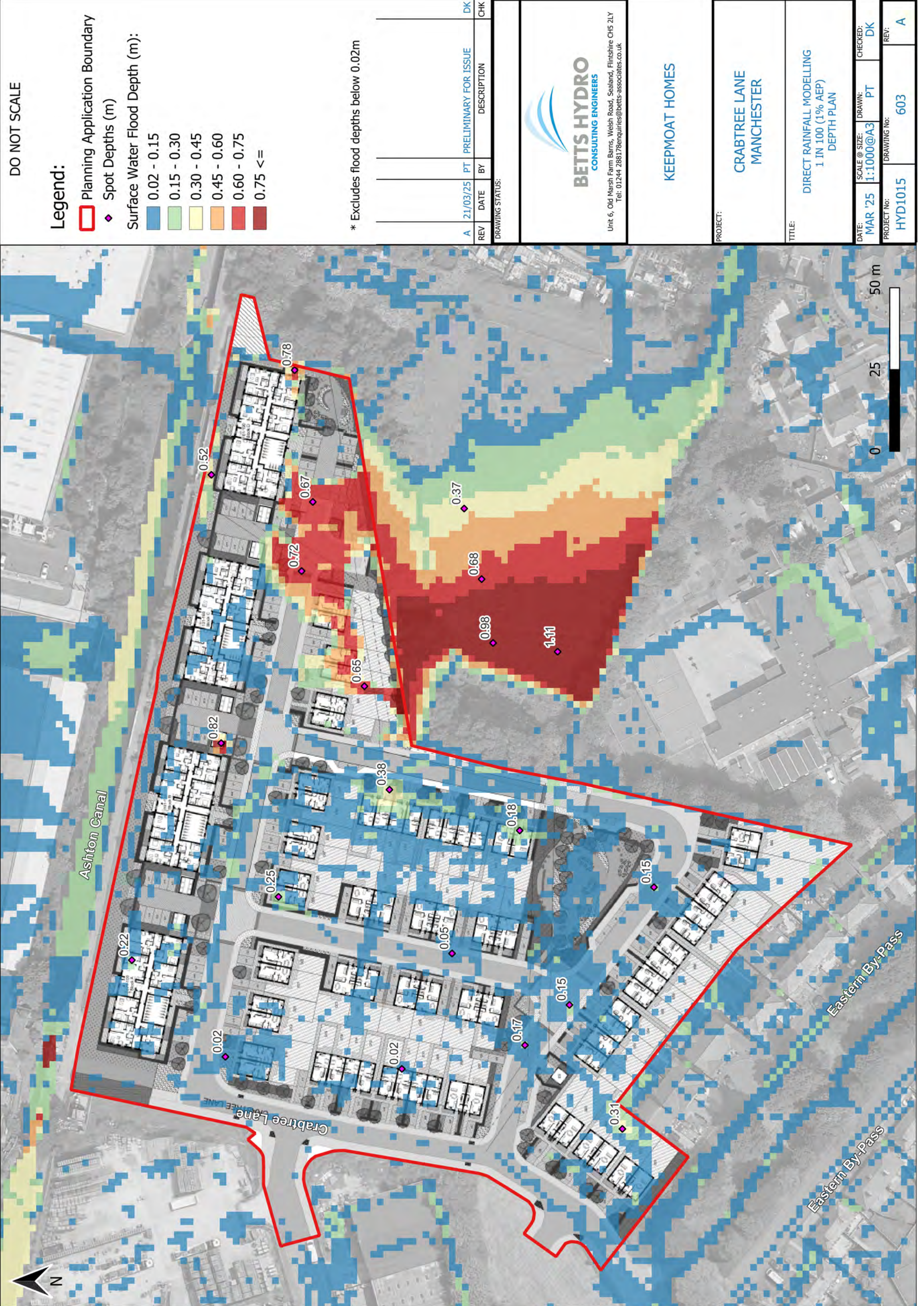
Unit 6, Old Marsh Farm Barns, Welsh Road, Sealand, Flintshire CH5 2LY
Tel: 01244 288178enquiries@betts-associates.co.uk

KEEPMOAT HOMES

CRABTREE LANE
MANCHESTER

DIRECT RAINFALL MODELLING
1 IN 30 (3.3% AEP)
VELOCITY PLAN

DATE:	SCALE @ SIZE:	DRAWN:	CHECKED:
MAR '25	1:1000@A3	PT	DK
PROJECT No:	DRAWING No:	REV:	
HYD1015	602	A	



DO NOT SCALE

Legend:

Planning Application Boundary

Spot Depths (m)

Surface Water Flood Depth (m):

- 0.02 - 0.15
- 0.15 - 0.30
- 0.30 - 0.45
- 0.45 - 0.60
- 0.60 - 0.75
- 0.75 <=

* Excludes flood depths below 0.02m

REV	DATE	BY	DESCRIPTION	CHK
A	21/03/25	PT	PRELIMINARY FOR ISSUE	DK
DRAWING STATUS:				

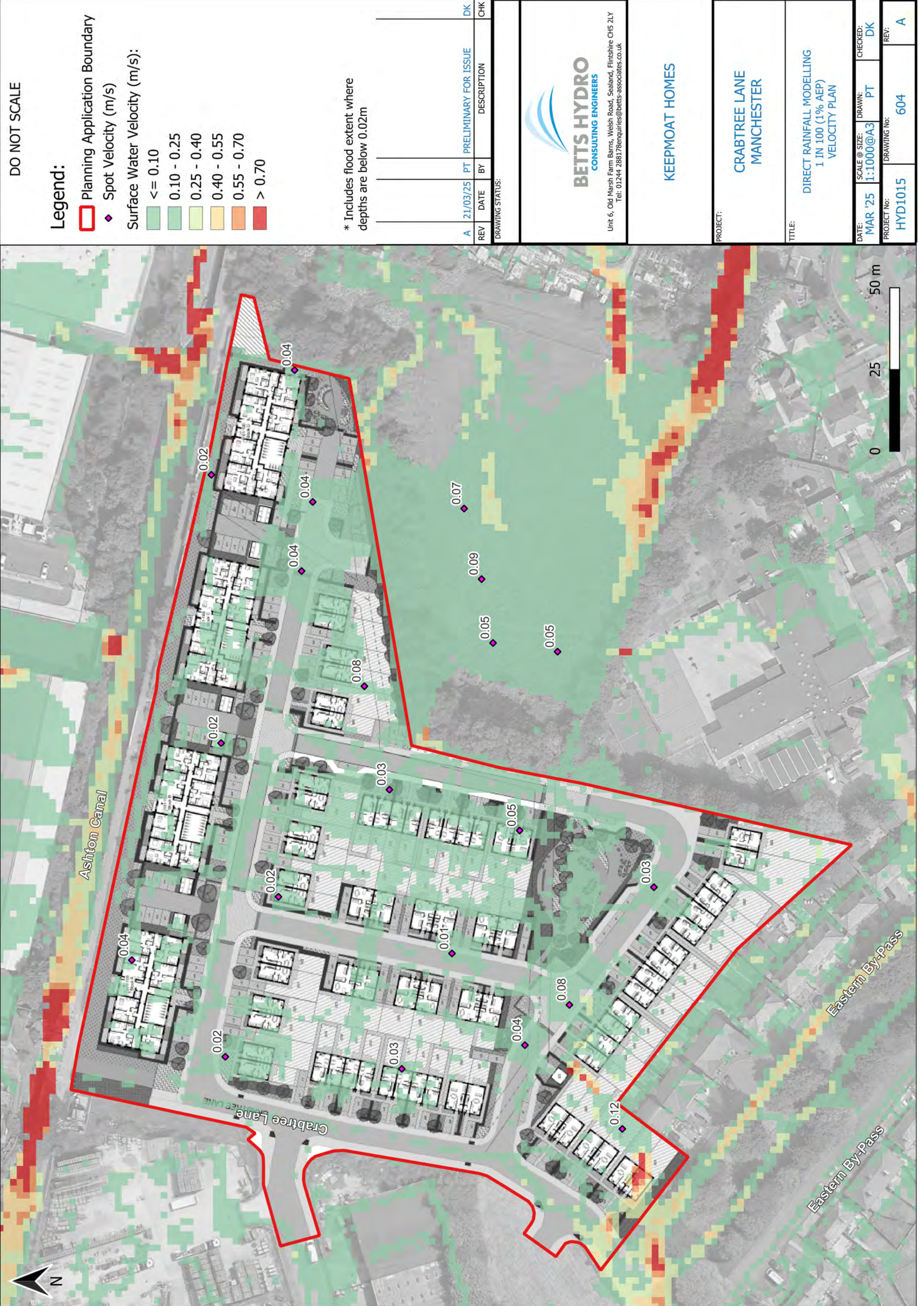
Unit 6, Old Marsh Farm Barns, Welsh Road, Sealand, Flintshire CH5 2LY
Tel: 01244 288178enquiries@betts-associates.co.uk

KEEPMOAT HOMES

CRABTREE LANE
MANCHESTER

TITLE:
DIRECT RAINFALL MODELLING
1 IN 100 (1% AEP)
DEPTH PLAN

DATE: MAR '25	SCALE @ SIZE: 1:1000@A3	DRAWN: PT	CHECKED: DK
PROJECT NO: HYD1015	DRAWING NO: 603	REV: A	



DO NOT SCALE

Legend:

Planning Application Boundary

◆ Spot Velocity (m/s)

Surface Water Velocity (m/s):

≤ 0.10

0.10 - 0.25

0.25 - 0.40

0.40 - 0.55

0.55 - 0.70

> 0.70

* Includes flood extent where depths are below 0.02m

REV	DATE	BY	DESCRIPTION	CHK
A	21/03/25	PT	PRELIMINARY FOR ISSUE	DK

DRAWING STATUS:



BETTS HYDRO
CONSULTING ENGINEERS

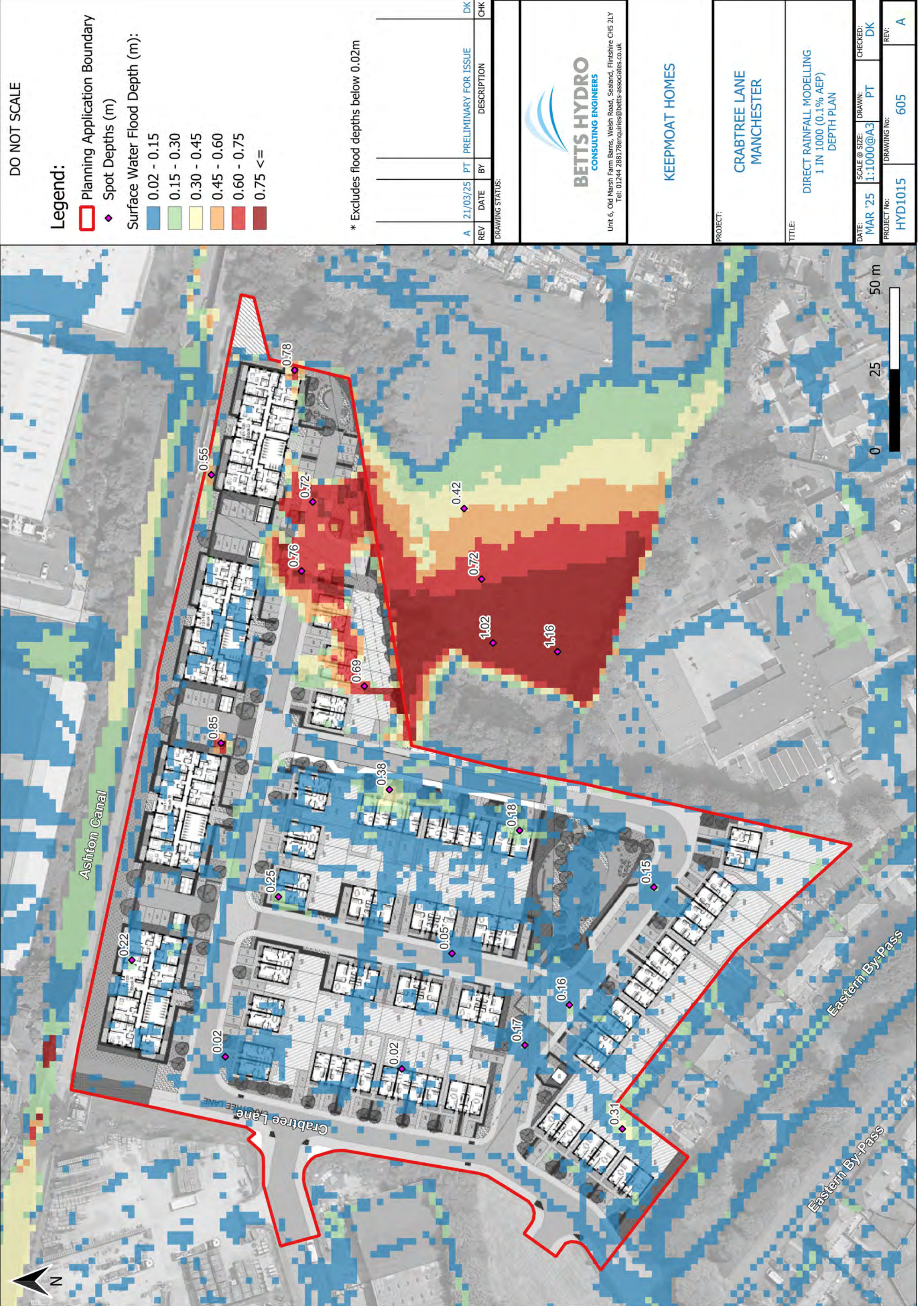
Unit 6, Old Marsh Farm Barns, Welsh Road, Sealand, Flintshire CH5 2LY
Tel: 01244 288178enquiries@betts-associates.co.uk

KEEPMOAT HOMES

CRABTREE LANE
MANCHESTER

DIRECT RAINFALL MODELLING
1 IN 100 (1% AEP)
VELOCITY PLAN

DATE:	SCALE @ SIZE:	DRAWN:	CHECKED:
MAR '25	1:1000@A3	PT	DK
PROJECT No:	DRAWING No:	REV:	
HYD1015	604	A	



DO NOT SCALE

Legend:

- Planning Application Boundary
- Spot Depths (m)

Surface Water Flood Depth (m):

- 0.02 - 0.15
- 0.15 - 0.30
- 0.30 - 0.45
- 0.45 - 0.60
- 0.60 - 0.75
- 0.75 <=

* Excludes flood depths below 0.02m

REV	DATE	BY	DESCRIPTION	CHK
A	21/03/25	PT	PRELIMINARY FOR ISSUE	DK
DRAWING STATUS:				

Unit 6, Old Marsh Farm Barns, Welsh Road, Sealand, Flintshire CH5 2LY
Tel: 01244 288178enquiries@betts-associates.co.uk

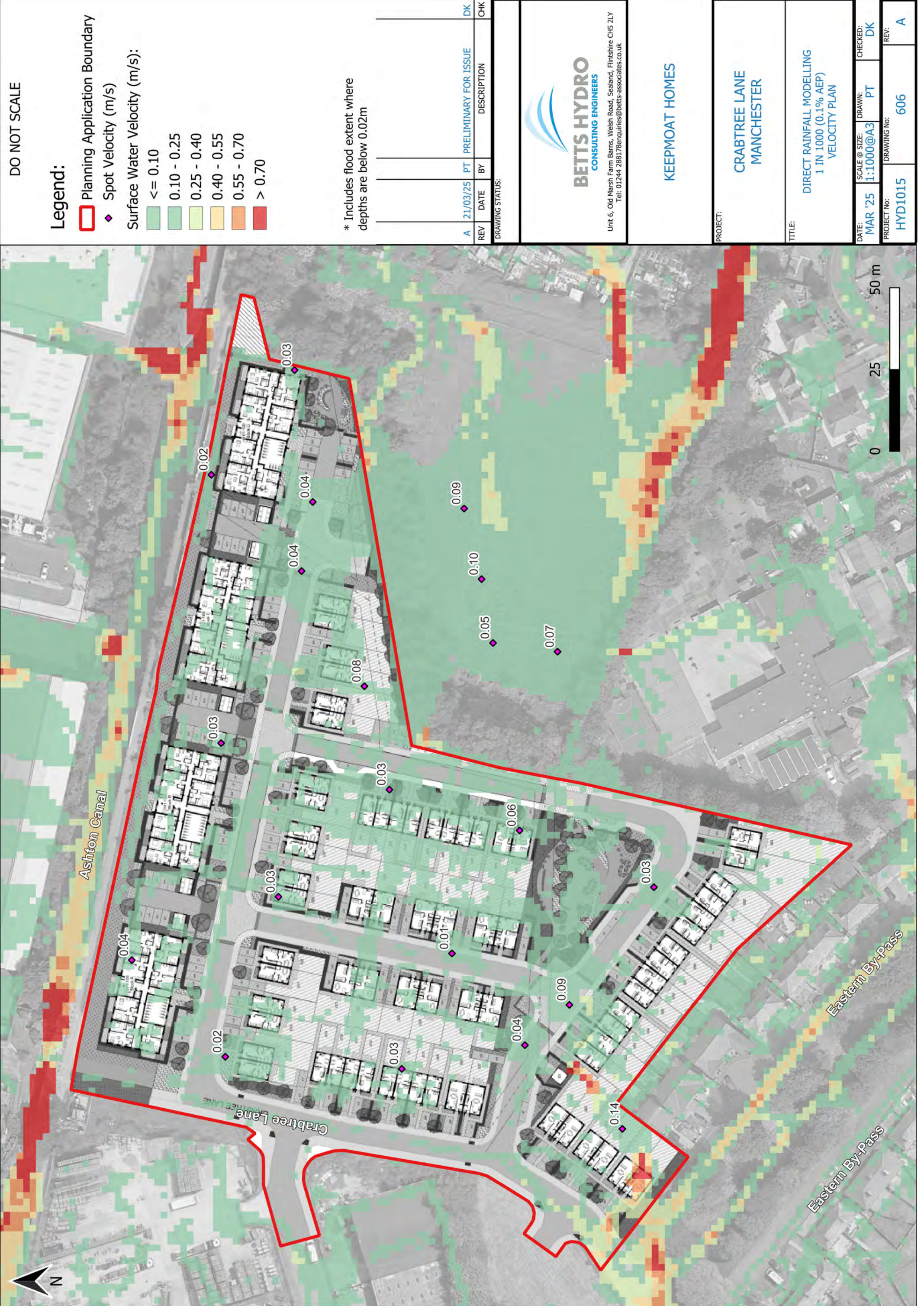
KEEPMOAT HOMES

CRABTREE LANE
MANCHESTER

TITLE:
DIRECT RAINFALL MODELLING
1 IN 1000 (0.1% AEP)
DEPTH PLAN

DATE: MAR '25
SCALE @ SIZE: 1:1000@A3
PROJECT No: HYD1015

DRAWN: PT
CHECKED: DK
REV: A



DO NOT SCALE

Legend:

Planning Application Boundary

◆ Spot Velocity (m/s)

Surface Water Velocity (m/s):

≤ 0.10

0.10 - 0.25

0.25 - 0.40

0.40 - 0.55

0.55 - 0.70

> 0.70

* Includes flood extent where depths are below 0.02m

REV	DATE	BY	DESCRIPTION	CHK
A	21/03/25	PT	PRELIMINARY FOR ISSUE	DK
				CHK

DRAWING STATUS:



BETTS HYDRO
CONSULTING ENGINEERS

Unit 6, Old Marsh Farm Barns, Welsh Road, Sealand, Flintshire CH5 2LY
Tel: 01244 288178enquiries@betts-associates.co.uk

KEEPMOAT HOMES

CRABTREE LANE
MANCHESTER

DIRECT RAINFALL MODELLING
1 IN 1000 (0.1% AEP)
VELOCITY PLAN

DATE:	SCALE @ SIZE:	DRAWN:	CHECKED:
MAR '25	1:1000@A3	PT	DK
PROJECT No:	DRAWING No:		REV:
HYD1015	606		A

Ashton Canal

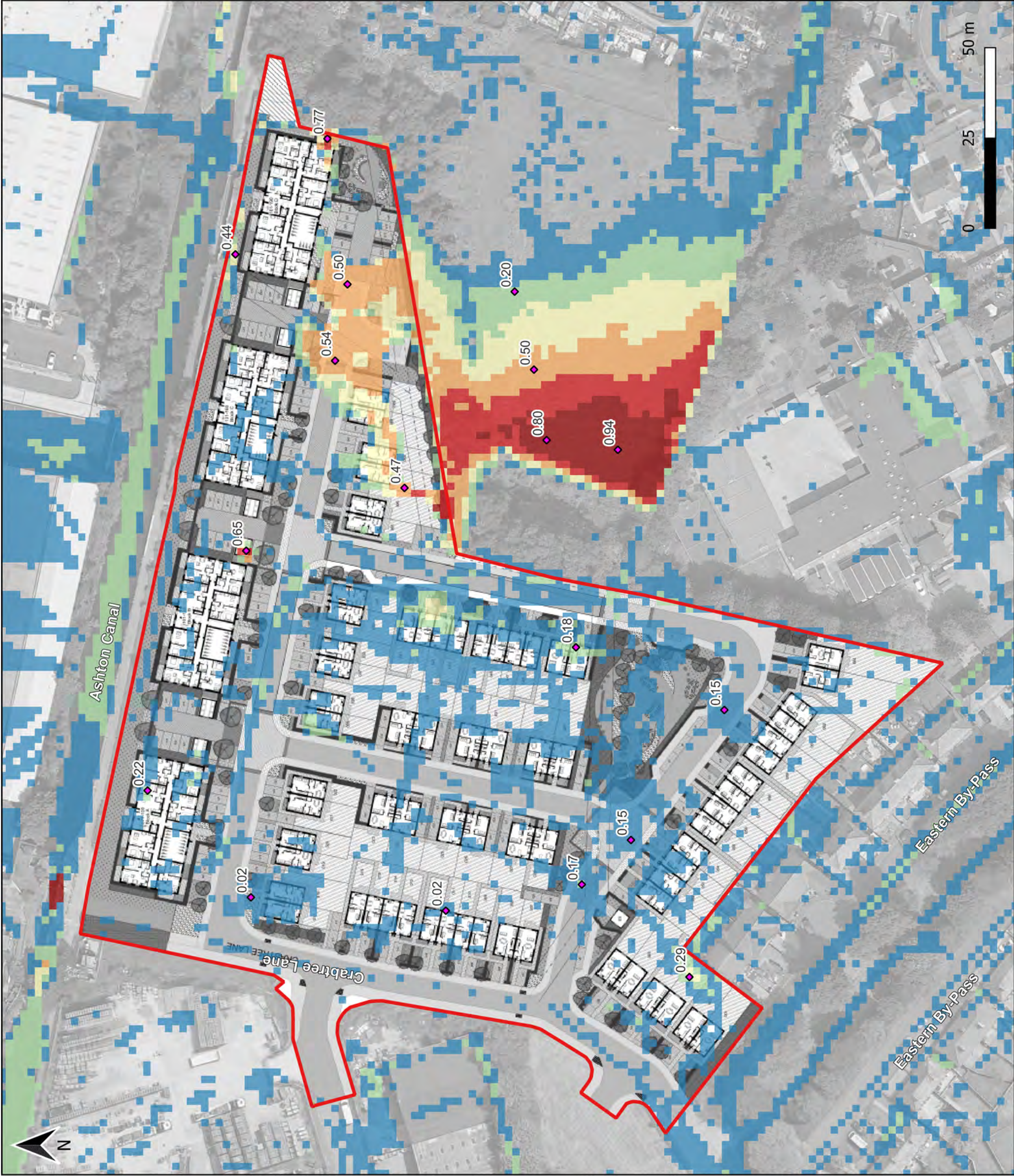
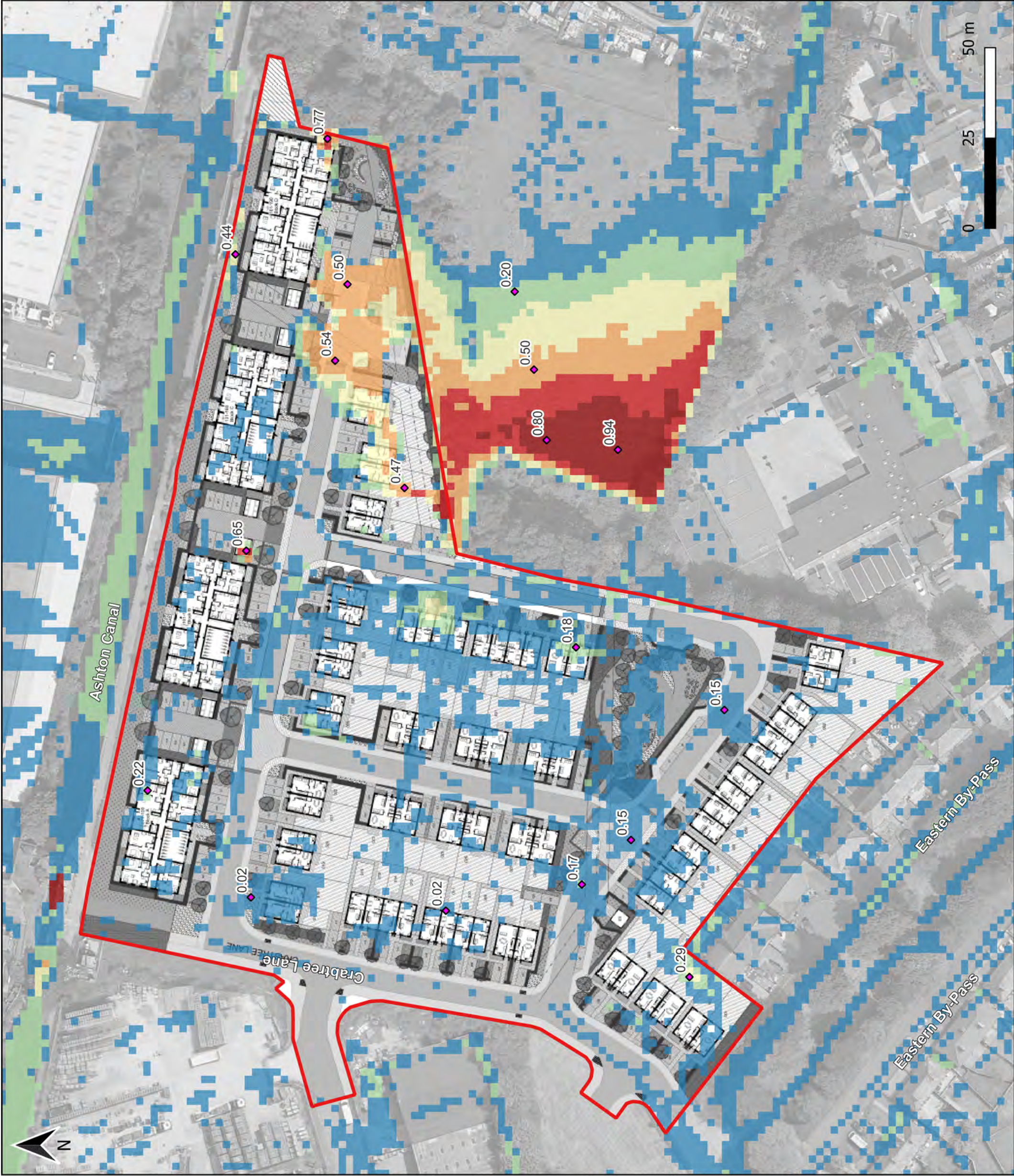
Crabtree Lane

Eastern By-Pass

0 25 50 m

0.22, 0.44, 0.54, 0.50, 0.77, 0.20, 0.50, 0.80, 0.94, 0.47, 0.65, 0.02, 0.18, 0.15, 0.15, 0.17, 0.29

-



Ashton Canal

Crabtree Lane

Eastern By-Pass

0 25 50 m

0.22, 0.44, 0.54, 0.50, 0.77, 0.20, 0.50, 0.80, 0.94, 0.47, 0.65, 0.02, 0.18, 0.15, 0.15, 0.17, 0.29

Ashton Canal

Crabtree Lane

Eastern By-Pass

0 25 50 m

0.22, 0.44, 0.54, 0.50, 0.77, 0.20, 0.50, 0.80, 0.94, 0.47, 0.65, 0.02, 0.18, 0.15, 0.15, 0.17, 0.29

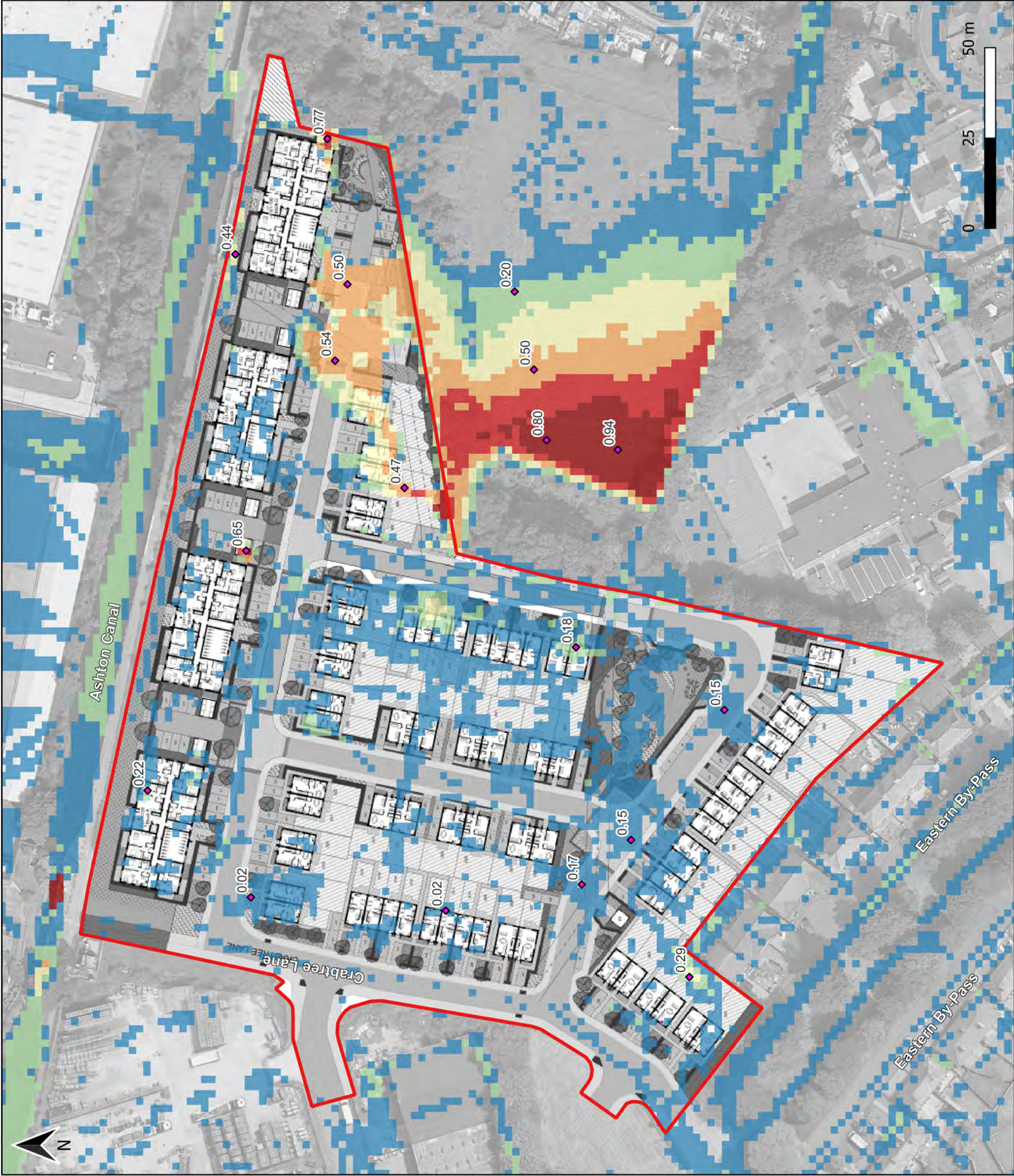
Ashton Canal

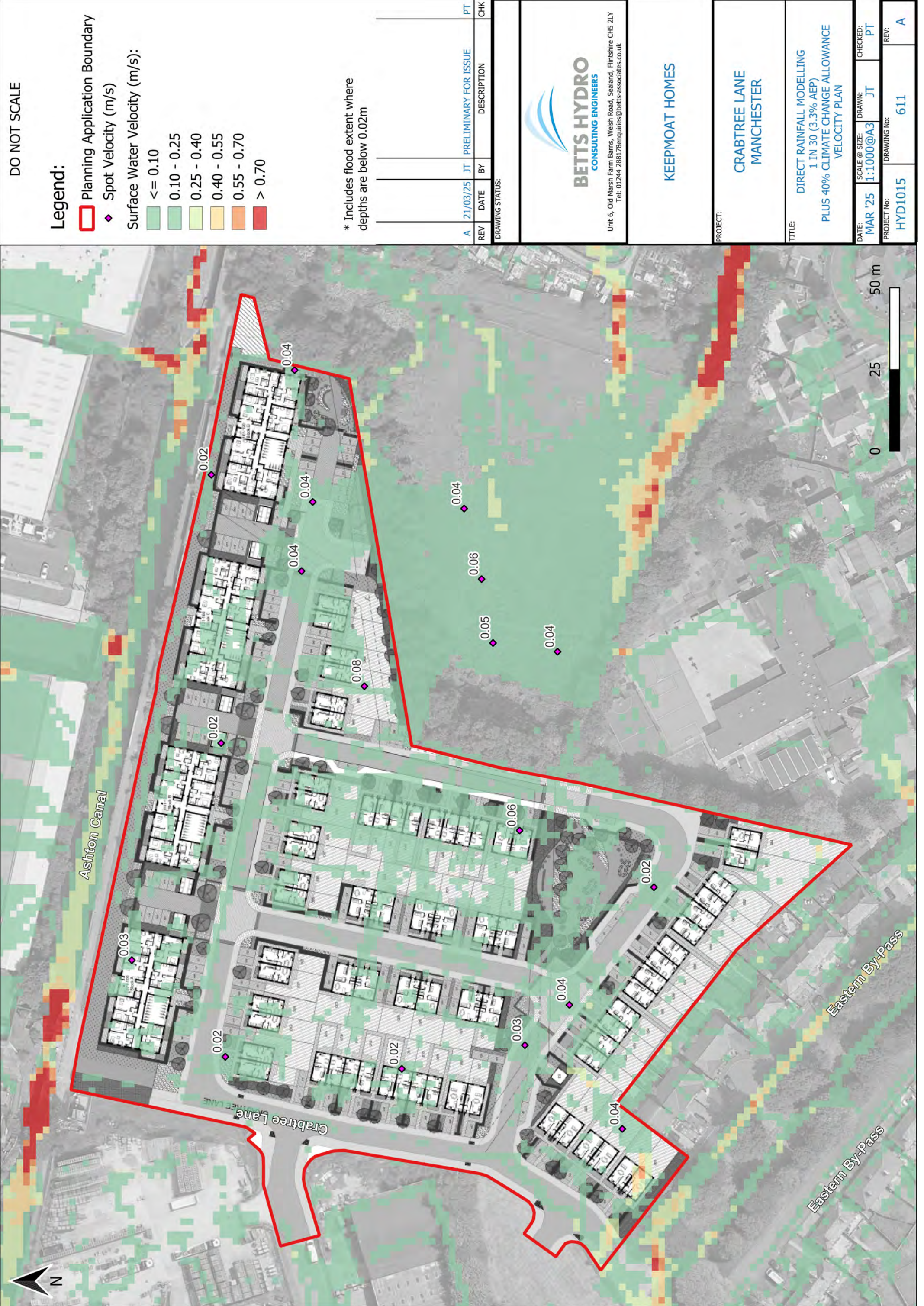
Crabtree Lane

Eastern By-Pass

0 25 50 m

0.22, 0.44, 0.54, 0.50, 0.77, 0.20, 0.50, 0.80, 0.94, 0.47, 0.65, 0.02, 0.18, 0.15, 0.15, 0.17, 0.29





DO NOT SCALE

Legend:

Planning Application Boundary

◆ Spot Velocity (m/s)

Surface Water Velocity (m/s):

≤ 0.10

0.10 - 0.25

0.25 - 0.40

0.40 - 0.55

0.55 - 0.70

> 0.70

* Includes flood extent where depths are below 0.02m

REV	DATE	BY	DESCRIPTION	PT	CHK
A	21/03/25	JT	PRELIMINARY FOR ISSUE		

DRAWING STATUS:



BETTS HYDRO
CONSULTING ENGINEERS

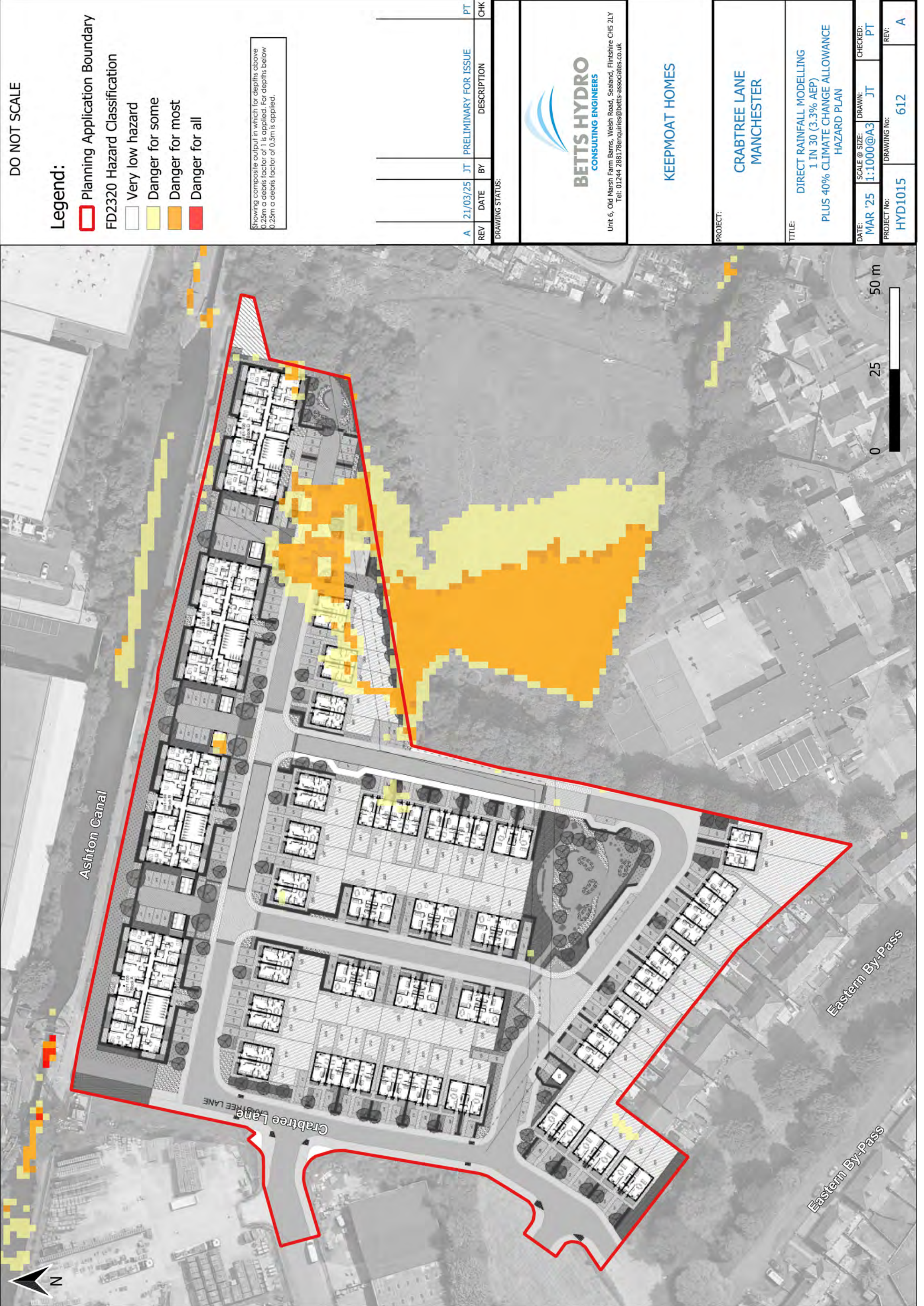
Unit 6, Old Marsh Farm Barns, Welsh Road, Sealand, Flintshire CH5 2LY
Tel: 01244 288178enquiries@betts-associates.co.uk

KEEPMOAT HOMES

CRABTREE LANE
MANCHESTER

TITLE:
DIRECT RAINFALL MODELLING
1 IN 30 (3.3% AEP)
PLUS 40% CLIMATE CHANGE ALLOWANCE
VELOCITY PLAN

DATE: MAR '25	SCALE @ SIZE: 1:1000@A3	DRAWN: JT	CHECKED: PT
PROJECT No: HYD1015	DRAWING No: 611	REV: A	



DO NOT SCALE

Legend:

- Planning Application Boundary
- FD2320 Hazard Classification
 - Very low hazard
 - Danger for some
 - Danger for most
 - Danger for all

Showing composite output in which for depths above 0.25m a debris factor of 1 is applied. For depths below 0.25m a debris factor of 0.5m is applied.

REV	DATE	BY	DESCRIPTION	PT	CHK
A	21/03/25	JT	PRELIMINARY FOR ISSUE	PT	CHK
DRAWING STATUS:					



BETTS HYDRO
CONSULTING ENGINEERS

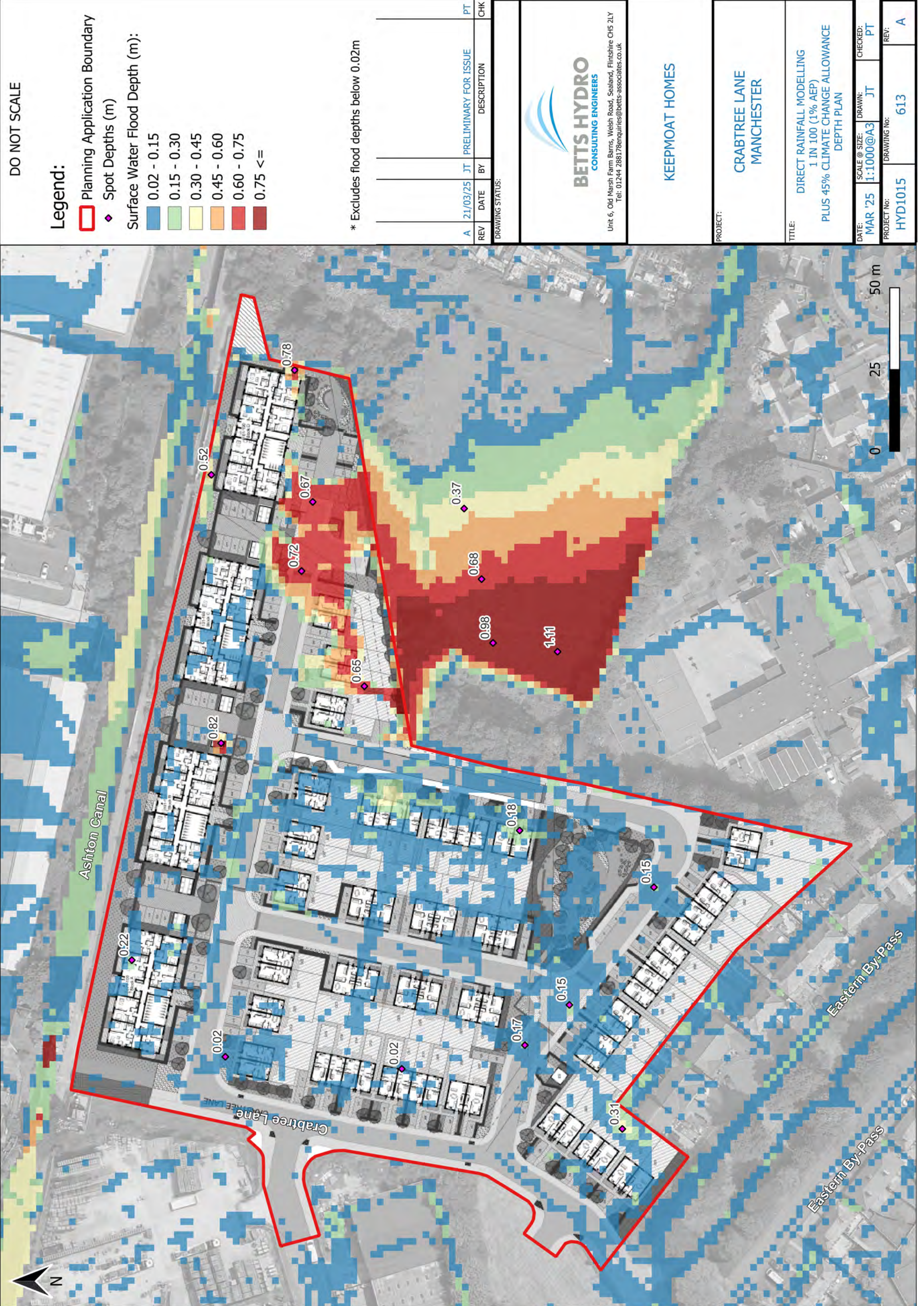
Unit 6, Old Marsh Farm Barns, Welsh Road, Sealand, Flintshire CH5 2LY
Tel: 01244 288178enquiries@betts-associates.co.uk

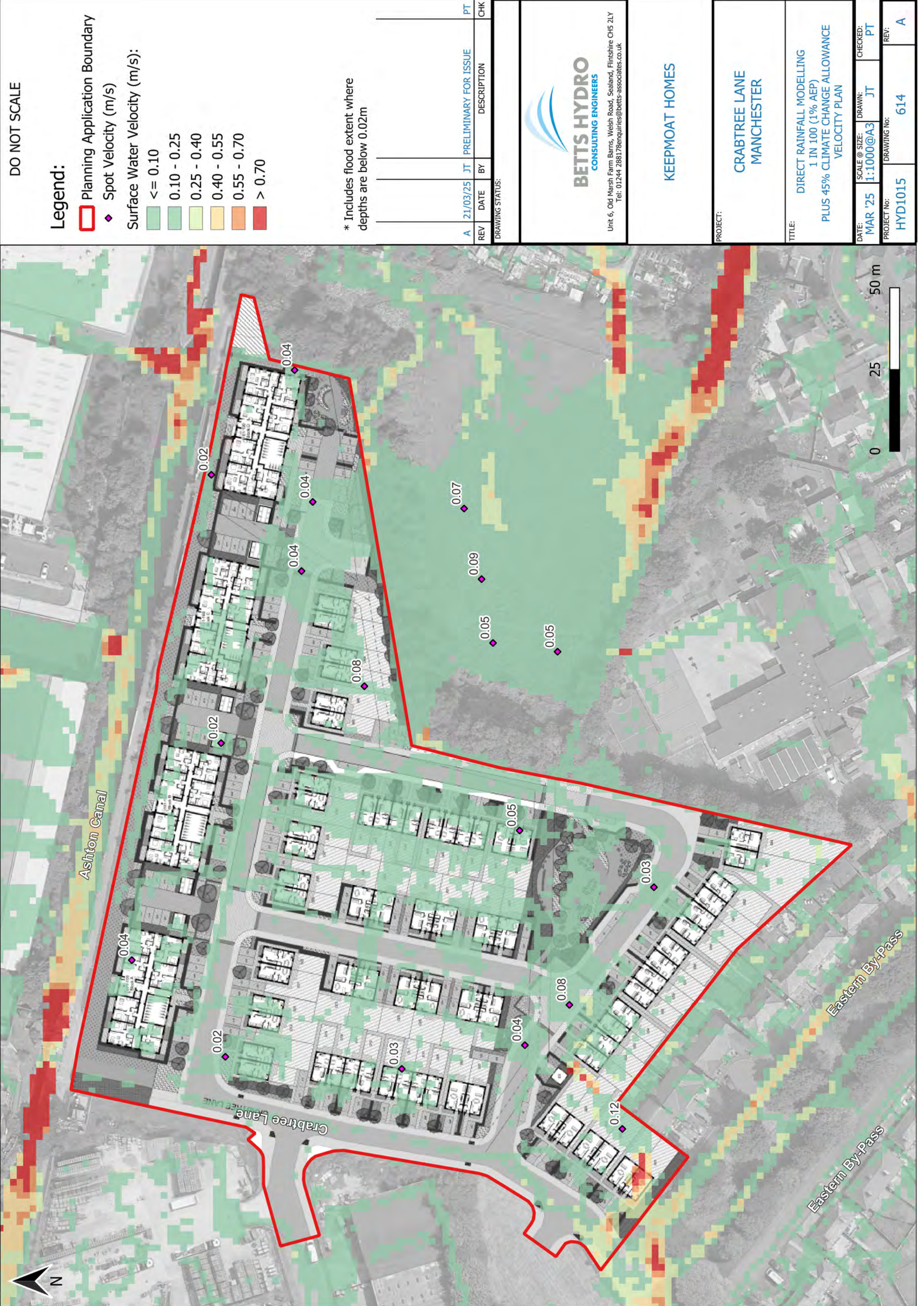
KEEPMOAT HOMES

CRABTREE LANE
MANCHESTER

TITLE: DIRECT RAINFALL MODELLING
1 IN 30 (3.3% AEP)
PLUS 40% CLIMATE CHANGE ALLOWANCE
HAZARD PLAN

DATE: MAR '25	SCALE @ SIZE: 1:1000@A3	DRAWN: JT	CHECKED: PT
PROJECT No: HYD1015	DRAWING No: 612	REV: A	





DO NOT SCALE

Legend:

Planning Application Boundary

Spot Velocity (m/s)

Surface Water Velocity (m/s):

- ≤ 0.10
- 0.10 - 0.25
- 0.25 - 0.40
- 0.40 - 0.55
- 0.55 - 0.70
- > 0.70

* Includes flood extent where depths are below 0.02m

REV	DATE	BY	DESCRIPTION	PT	CHK
A	21/03/25	JT	PRELIMINARY FOR ISSUE		

DRAWING STATUS:

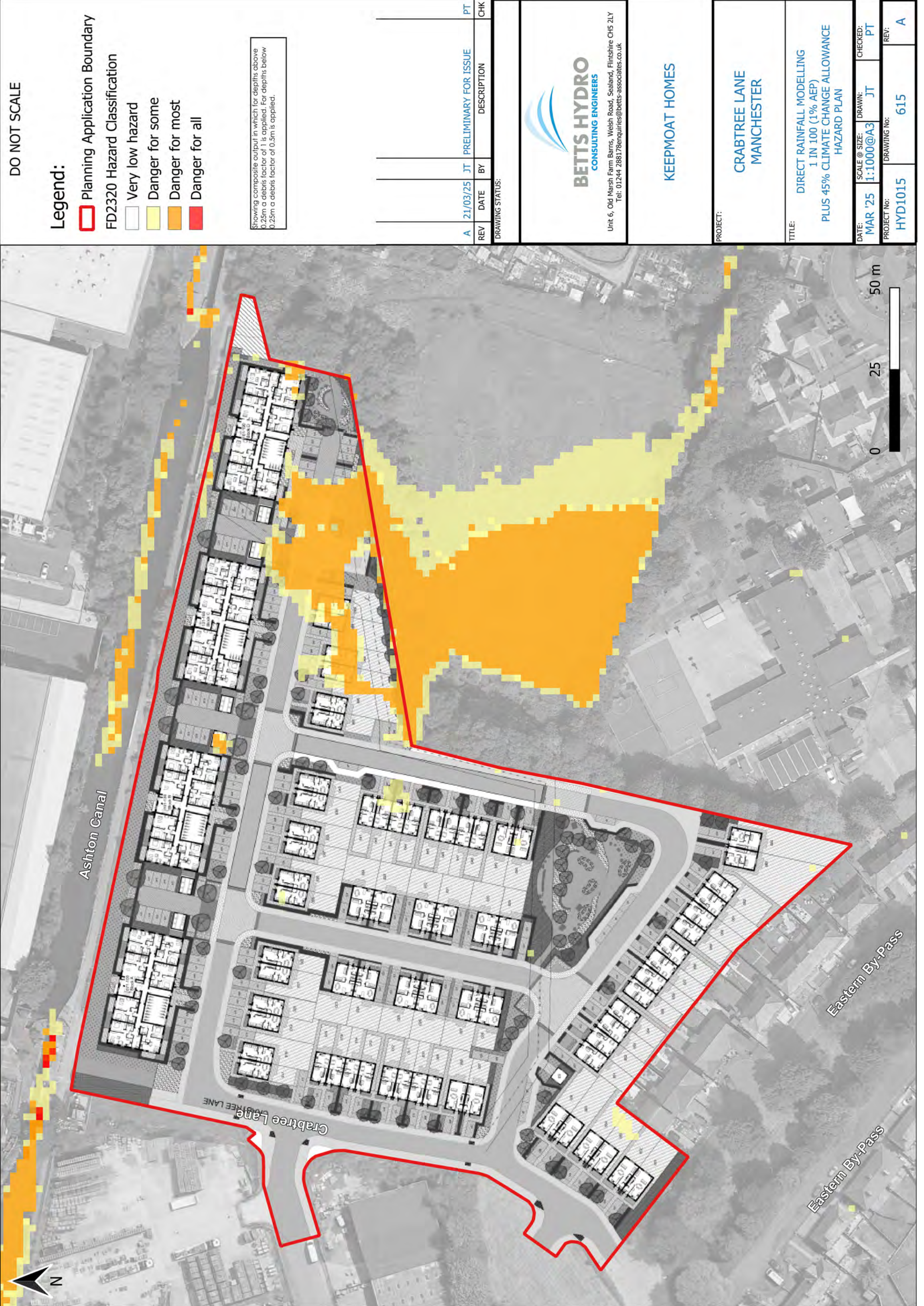
Unit 6, Old Marsh Farm Barns, Welsh Road, Sealand, Flintshire CH5 2LY
Tel: 01244 288178enquiries@betts-associates.co.uk

KEEPMOAT HOMES

CRABTREE LANE
MANCHESTER

TITLE:
DIRECT RAINFALL MODELLING
1 IN 100 (1% AEP)
PLUS 45% CLIMATE CHANGE ALLOWANCE
VELOCITY PLAN

DATE:	SCALE @ SIZE:	DRAWN:	CHECKED:	PT
MAR '25	1:1000@A3	JT		
PROJECT No:	DRAWING No:		REV:	
HYD1015	614		A	



DO NOT SCALE

Legend:

- Planning Application Boundary
- FD2320 Hazard Classification
 - Very low hazard
 - Danger for some
 - Danger for most
 - Danger for all

Showing composite output in which for depths above 0.25m a debris factor of 1 is applied. For depths below 0.25m a debris factor of 0.5m is applied.

REV	DATE	BY	DESCRIPTION	PT	CHK
A	21/03/25	JT	PRELIMINARY FOR ISSUE	PT	CHK

DRAWING STATUS:



BETTS HYDRO
CONSULTING ENGINEERS

Unit 6, Old Marsh Farm Barns, Welsh Road, Sealand, Flintshire CH5 2LY
Tel: 01244 288178enquiries@betts-associates.co.uk

KEEPMOAT HOMES

CRABTREE LANE
MANCHESTER

TITLE:
DIRECT RAINFALL MODELLING
1 IN 100 (1% AEP)
PLUS 45% CLIMATE CHANGE ALLOWANCE
HAZARD PLAN

DATE: MAR '25
SCALE @ SIZE: 1:1000@A3
PROJECT No: HYD1015

DRAWN: JT
CHECKED: PT
REV: A

APPENDIX E: PROPOSED SURFACE WATER FLOOD PLANS

HYD1015_713_A_PROPOSED-DIRECT.RAINFALL.100.YEAR.CC.DEPTH_A3L

HYD1015_714_A_PROPOSED-DIRECT.RAINFALL.100.YEAR.CC.VELOCITY_A3L

HYD1015_715_A_PROPOSED-DIRECT.RAINFALL.100.YEAR.CC.HAZARD_A3L

Proposed Swales

Swales to serve the apartment block parking area catchments & provide water quality improvement benefits, before discharging to the proposed Surface Water sewer network. Exact location/scale to be confirmed.

Length - 7.0m & 8.5m
Width - 3.50m
Depth - 0.50m
Embankment gradient - 1:3
Volume - 7.0m³ & 8.5m³

Existing Overflow

Assumed overflow from the Ashton Canal, connecting to the existing culvert crossing site. Further drainage investigation works (CCTV) required to determine connectivity, existing cover levels, invert levels, pipe dia, manhole dia and general condition.

Proposed Highway Drain

Highway drain serving proposed junction to Crabtree Lane.

Existing Sewers to be Abandoned

It is proposed that this length of existing combined sewer be abandoned.

Flow Control Chamber Manhole - S17 HB

Hydro International Hydrabreak Optimum

S17 HB

Cover level: 81.108 mAOD

Invert level: 78.544 mAOD

Unit

Reference = SHE-0209-2790-2400-2790
Design head = 2,400 m
Restricted discharge max. = 27.90 l/sec
Flow control orifice size = 202 mm

Proposed Surface Water Connection (6903/Existing)

A connection is proposed into the existing surface water sewer within Crabtree Lane.

Cover level: 80.897 mAOD (From Topo Survey)
Invert level: 74.620 mAOD (From Drainage Survey)
Proposed Connection Invert Level - 78.516 mAOD

Section 185 Sewer Diversion Works

A section 185 application will have to be undertaken to agree the diversion of existing combined sewers, the proposed diversion works are from manhole C1 to the proposed foul discharge point existing manhole 6901.

Existing Sewers to be Diverted

It is proposed that this length of existing combined sewer be abandoned and the discharge diverted to the sewer as part of the proposed development.

Proposed Foul Water Connection (6901/Existing)

A connection is proposed into the existing combined water sewer within Eastern Bypass.

Cover level: 80.488 mAOD (From Topo Survey)

Invert level: 77.080 mAOD (From Topo Survey)

Proposed Connection Invert Level - 77.135m mAOD

Existing Culverted Asset

Existing Culverted Asset, the origins of which are yet to be determined crosses site East to South West.

Further drainage investigation works (CCTV) required to determine connectivity, existing cover levels, invert levels, pipe dia, manhole dia and general condition.

Enquiry's should be undertaken to determine ownership and purpose of this asset (United Utilities, LFA, Private) prior to detailed design.

Drainage Strategy - Foul water

The proposed foul water drainage network for the development is designed to connect into the existing sewer infrastructure. Specifically, the foul water from the site will be directed to the existing United Utilities sewer (MH Ref: 6901) located adjacent to the southern boundary of the site.

Existing United Utilities Manhole:

MH Ref: 6901

Cover Level (CL): 180.468 mAOD

Invert Level (IL): 77.130 mAOD (130mm Ø - Proposed)

Invert Level (IL): 77.080 mAOD (123mm Ø - Existing)

Approval to connect into the existing combined sewer network must be confirmed with United Utilities prior to the detailed design stage as part of a pre-development enquiry.

Drainage Strategy - Surface water

Surface water from the development site will discharge into the existing United Utilities sewer (MH Ref: 6903) located within the southern most bellmouth into the site.

Proposed Discharge Manhole:

MH Ref: 6903

Cover Level (CL): 80.970 mAOD

BD Level (IL): 78.516 mAOD (300mm Ø - Proposed)

Invert Level (IL): 74.620 mAOD (600mm Ø - Existing)

The surface water pipe network has been designed to cater for 1:30yr with off-online attenuation cells serving the 1:100yr+45% Climate Change event.

A Green SUDs based attenuation feature such as a pond/ basin is not viable due to constraints from proposed levels/site fall, connection level & simulated water levels within the proposed pipe network.

Approval to connect into the existing surface water sewer network must be confirmed with United Utilities prior to the detailed design stage as part of a pre-development enquiry.

Further drainage investigation works, including a CCTV survey are required to firm the existing cover levels, invert levels, pipe diameters, manhole dimensions, and the overall condition of the system.

Maintenance Access

300mm Stilt Trap and Air Vent located up and down stream of cells. See Cellular Storage manufactures details/ requirements.

Proposed Cellular Storage (Off-line)

Storage volume - 380 m³

3 no. layers of 400mm deep units.

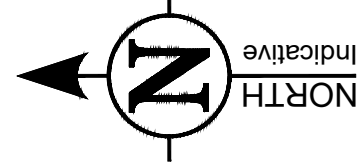
Cells

CL: 82.862 mAOD

IL: 78.970 mAOD

Length x Width x Depth = 25.0m x 10.0m x 1.6m

Cell Unit Size = 1.0m x 0.5m x 0.4m



LEGEND

Site Boundary

Proposed Finished Floor Level

Existing Boundary Ground Level

Proposed Road / Driveway Contour

- Major (0.50m interval)

Proposed Road / Driveway Contour

- Minor (0.05m interval)

Proposed Spot Level

Existing Surface Water Sewer

Existing Foul Water Sewer

Existing Combined Sewer

Existing Surface Water Sewer to be Abandoned

Existing Foul Water Sewer to be Abandoned

Existing Combined Sewer to be Abandoned

Proposed Surface Water Sewer

Proposed Highway Drainage

Proposed Foul Water Sewer

Proposed Combined Sewer

Proposed Sewer Easement

(from centre line of pipe work)

IMPORTANT - Invert levels at proposed points of connection are to be confirmed prior to any works commencing on site as onsite drainage and slab levels may be affected

NOTES

- Planning layout ref: 02292_S_03 Stepplan - Ground Floor-D11, 250129.
- Topographical survey provided by Survey Eng Ltd ref: 18.02.25, 31.01.25, Crabtree Lane, Operative - Topo Survey, Dated June 2021.
- Road detail, levels and layout are subject to local authority section 38 Highways approval.

Work	Date	Details	Revision history
P04	08.02.25	Whole Site levels reviewed and raised, no changes to proposed sewer invert levels.	CP
P03	14.04.25	Site raised @ 1:100yr+45% climate change event, EA surface water extents (future) removed	CP
P02	18.02.25	EA surface water extents (future) added	NR
P01	31.01.25	Preliminary issue for review	CP



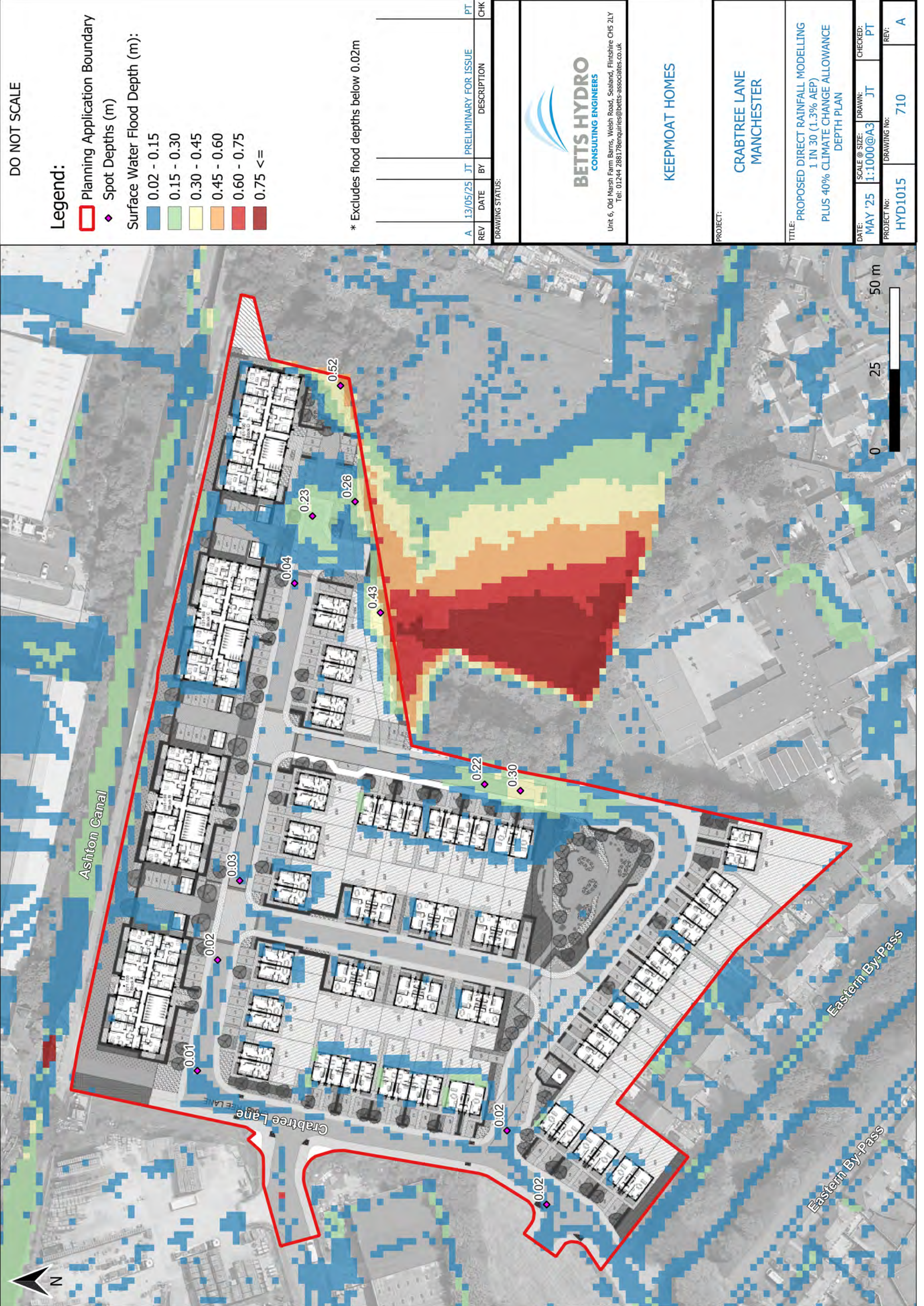
Crabtree Lane,
Manchester

Preliminary Drainage Layout

Scale:	1:500	for the original size of A1
Drawn by:	CP	Checked by: NR
Drawing title:	SR	
Date:	Jan 2025	

For Information

Job No:	Drawing No:	Origin:	Volume:	Level:	Type:	Disc:	Number:	Revision:
KMH28	CTL	BET	ZZ	xx	DK	C	0101	P04
Do not scale this drawing								
4, 7 Old Lane Farm, Warrington, Cheshire, CH9 2XT								
www.bettsassociates.co.uk								
Cheshire 01244 280178 info@betts.co.uk								



DO NOT SCALE

Legend:

Planning Application Boundary

◆

Spot Depths (m)

Surface Water Flood Depth (m):

0.02 - 0.15

0.15 - 0.30

0.30 - 0.45

0.45 - 0.60

0.60 - 0.75

0.75 <=

* Excludes flood depths below 0.02m

A	13/05/25	JT	PRELIMINARY FOR ISSUE				PT		
REV	DATE	BY	DESCRIPTION				CHK		

DRAWING STATUS:

BETTS HYDRO

CONSULTING ENGINEERS

Unit 6, Old Marsh Farm Barns, Welsh Road, Sealand, Flintshire CH5 2LY

Tel: 01244 288178enquiries@betts-associates.co.uk

KEEPMOAT HOMES

PROJECT:

CRABTREE LANE
MANCHESTER

TITLE:

PROPOSED DIRECT RAINFALL MODELLING

1 IN 30 (1.3% AEP)

PLUS 40% CLIMATE CHANGE ALLOWANCE

DEPTH PLAN

DATE:

MAY '25

SCALE @ SIZE:

1:1000@A3

DRAWN:

JT

CHECKED:

PT

PROJECT No:

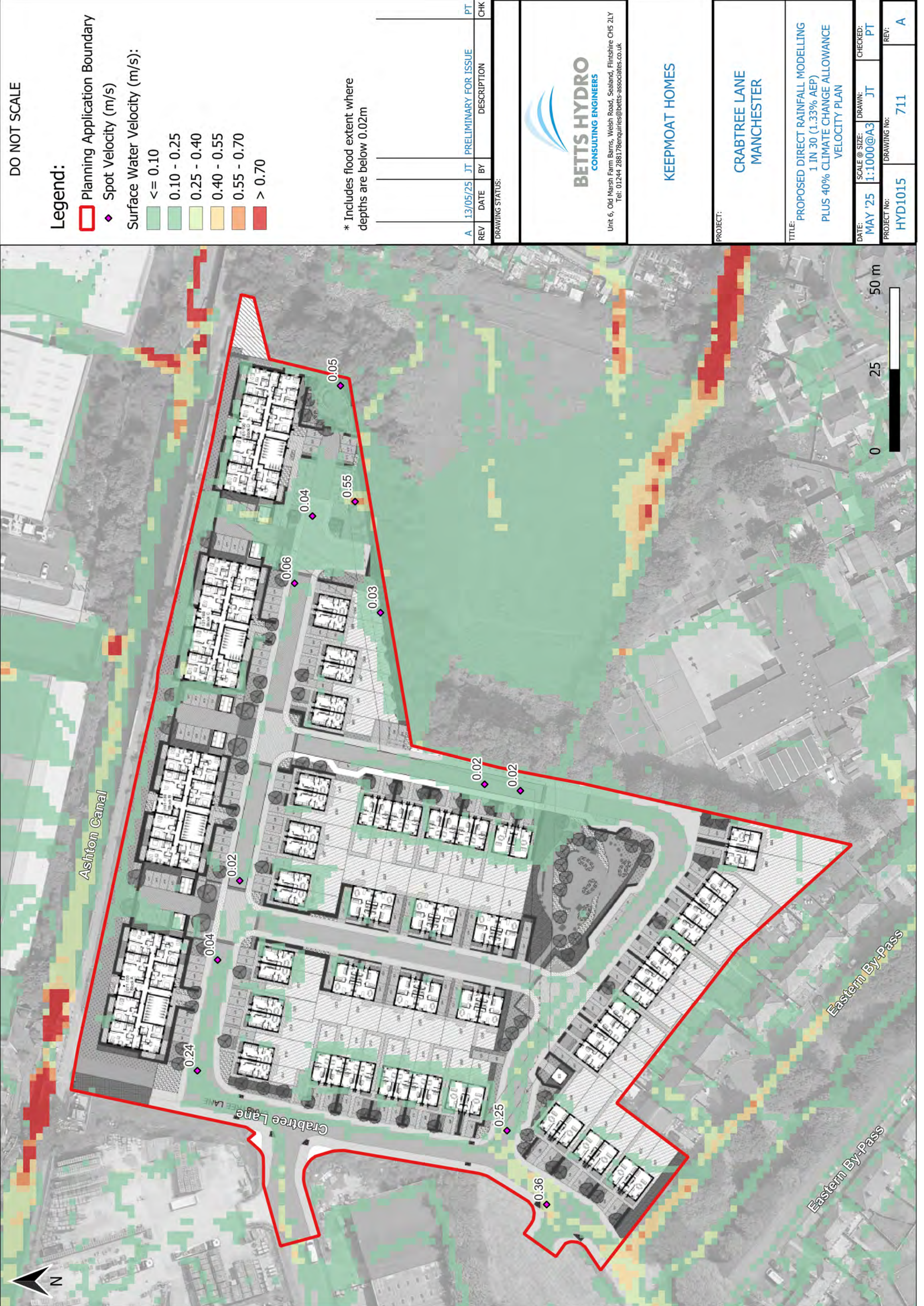
HYD1015

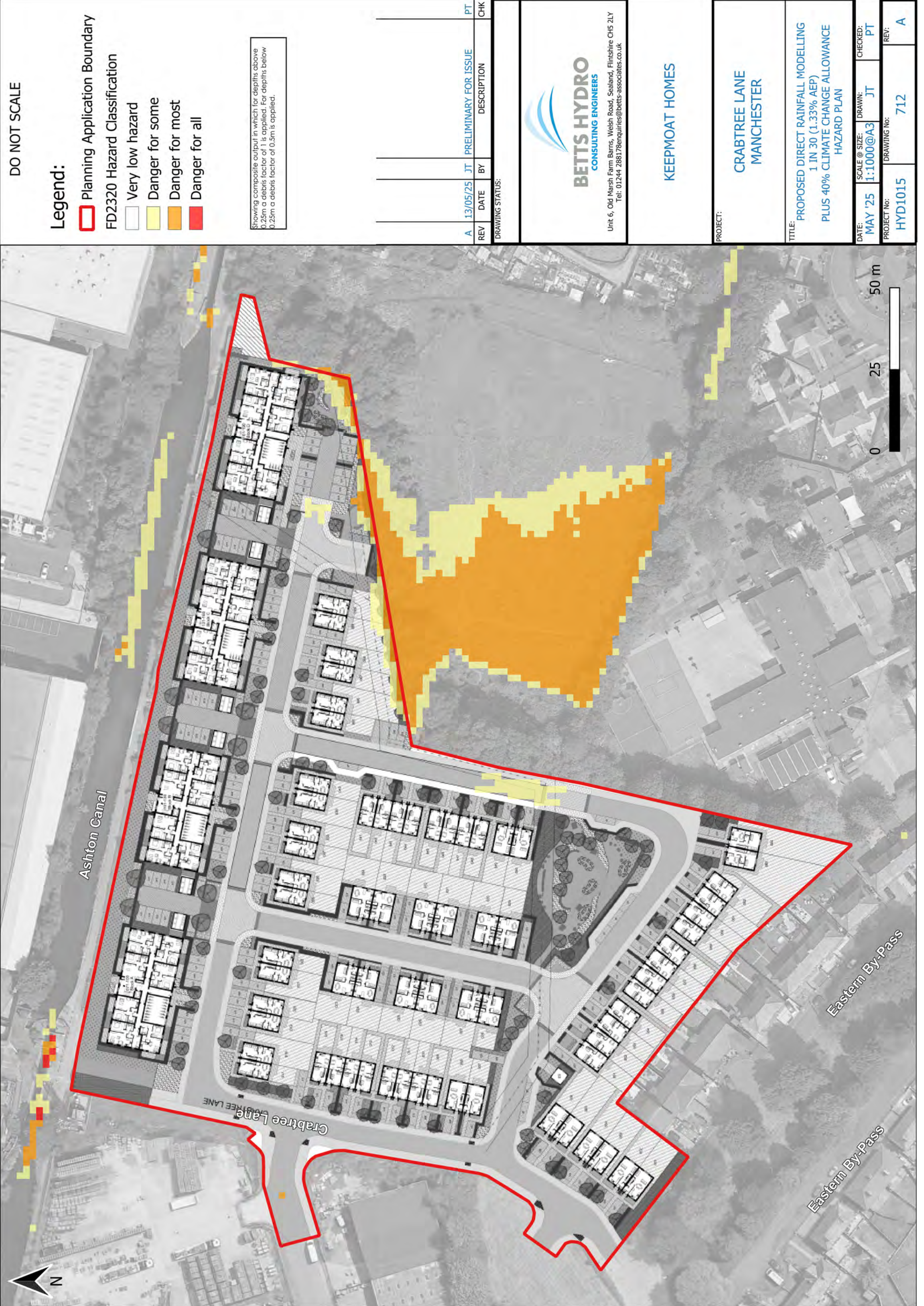
DRAWING No:

710

REV:

A





DO NOT SCALE

Legend:

- Planning Application Boundary
- FD2320 Hazard Classification
 - Very low hazard
 - Danger for some
 - Danger for most
 - Danger for all

Showing composite output in which for depths above 0.25m a debris factor of 1 is applied. For depths below 0.25m a debris factor of 0.5m is applied.

REV	DATE	BY	DESCRIPTION	PT	CHK
A	13/05/25	JT	PRELIMINARY FOR ISSUE		
DRAWING STATUS:					



BETTS HYDRO
CONSULTING ENGINEERS

Unit 6, Old Marsh Farm Barns, Welsh Road, Sealand, Flintshire CH5 2LY
Tel: 01244 288178enquiries@betts-associates.co.uk

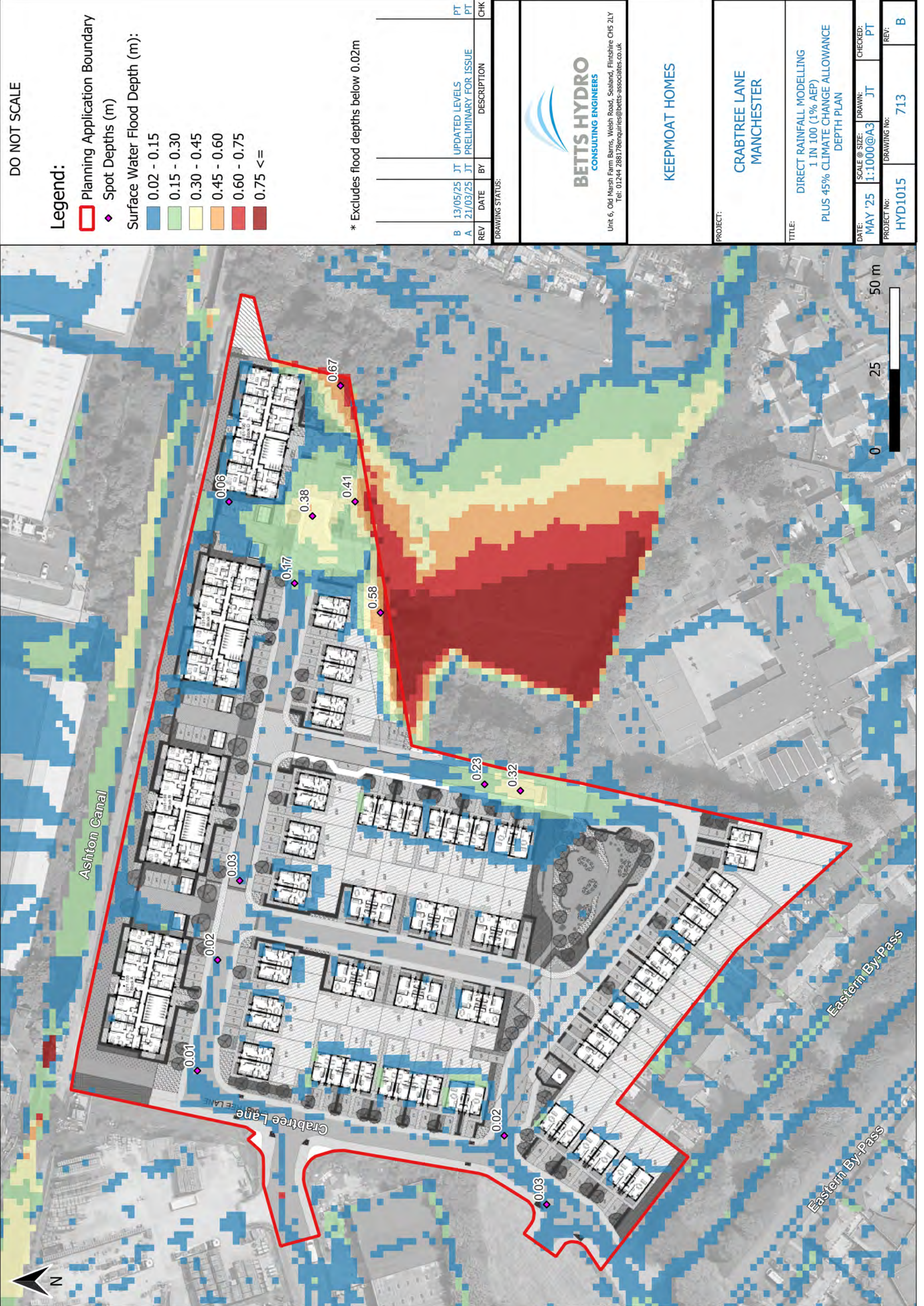
KEEPMOAT HOMES

PROJECT:
**CRABTREE LANE
MANCHESTER**

TITLE:
PROPOSED DIRECT RAINFALL MODELLING
1 IN 30 (1.33% AEP)
PLUS 40% CLIMATE CHANGE ALLOWANCE
HAZARD PLAN

DATE:	SCALE @ SIZE:	DRAWN:	CHECKED:
MAY '25	1:1000@A3	JT	PT

PROJECT No:	DRAWING No:	REV:
HYD1015	712	A



DO NOT SCALE

Legend:

- Planning Application Boundary
- Spot Depths (m)

Surface Water Flood Depth (m):

- 0.02 - 0.15
- 0.15 - 0.30
- 0.30 - 0.45
- 0.45 - 0.60
- 0.60 - 0.75
- 0.75 <=

* Excludes flood depths below 0.02m

REV	DATE	BY	DESCRIPTION	CHK
B	13/05/25	JT	UPDATED LEVELS	PT
A	21/03/25	JT	PRELIMINARY FOR ISSUE	PT

DRAWING STATUS:

BETTS HYDRO
CONSULTING ENGINEERS

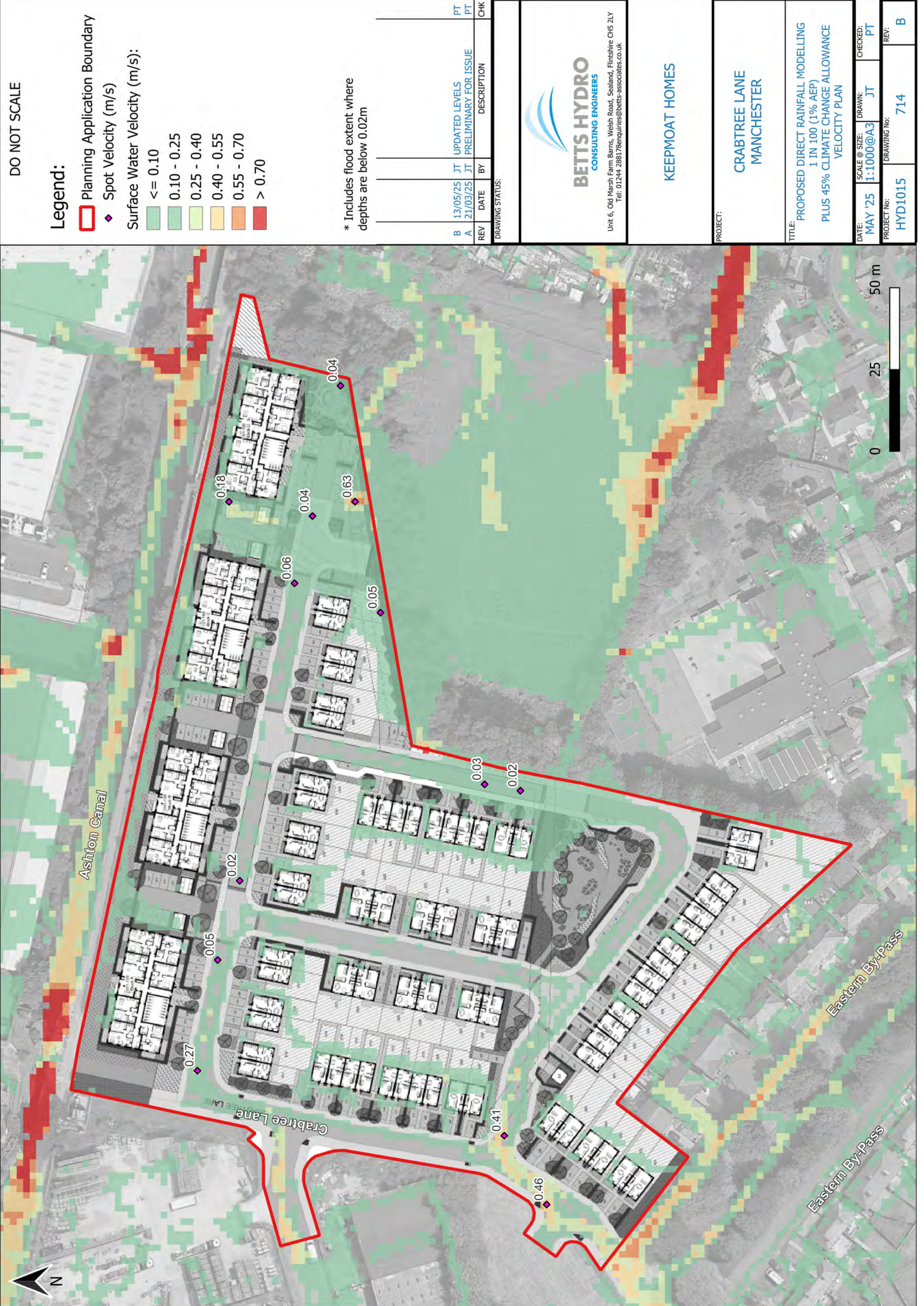
Unit 6, Old Marsh Farm Barns, Welsh Road, Sealand, Flintshire CH5 2LY
Tel: 01244 288178enquiries@betts-associates.co.uk

KEEPMOAT HOMES

CRABTREE LANE
MANCHESTER

TITLE: DIRECT RAINFALL MODELLING
1 IN 100 (1% AEP)
PLUS 45% CLIMATE CHANGE ALLOWANCE
DEPTH PLAN

DATE: MAY '25	SCALE @ SIZE: 1:1000@A3	DRAWN: JT	CHECKED: PT
PROJECT No: HYD1015	DRAWING No: 713	REV: B	



DO NOT SCALE

Legend:

Planning Application Boundary

◆ Spot Velocity (m/s)

Surface Water Velocity (m/s):

≤ 0.10

0.10 - 0.25

0.25 - 0.40

0.40 - 0.55

0.55 - 0.70

> 0.70

* Includes flood extent where depths are below 0.02m

REV	DATE	BY	DESCRIPTION	CHK
B	13/05/25	JT	UPDATED LEVELS	PT
A	21/03/25	JT	PRELIMINARY FOR ISSUE	PT

DRAWING STATUS:



BETTS HYDRO
CONSULTING ENGINEERS

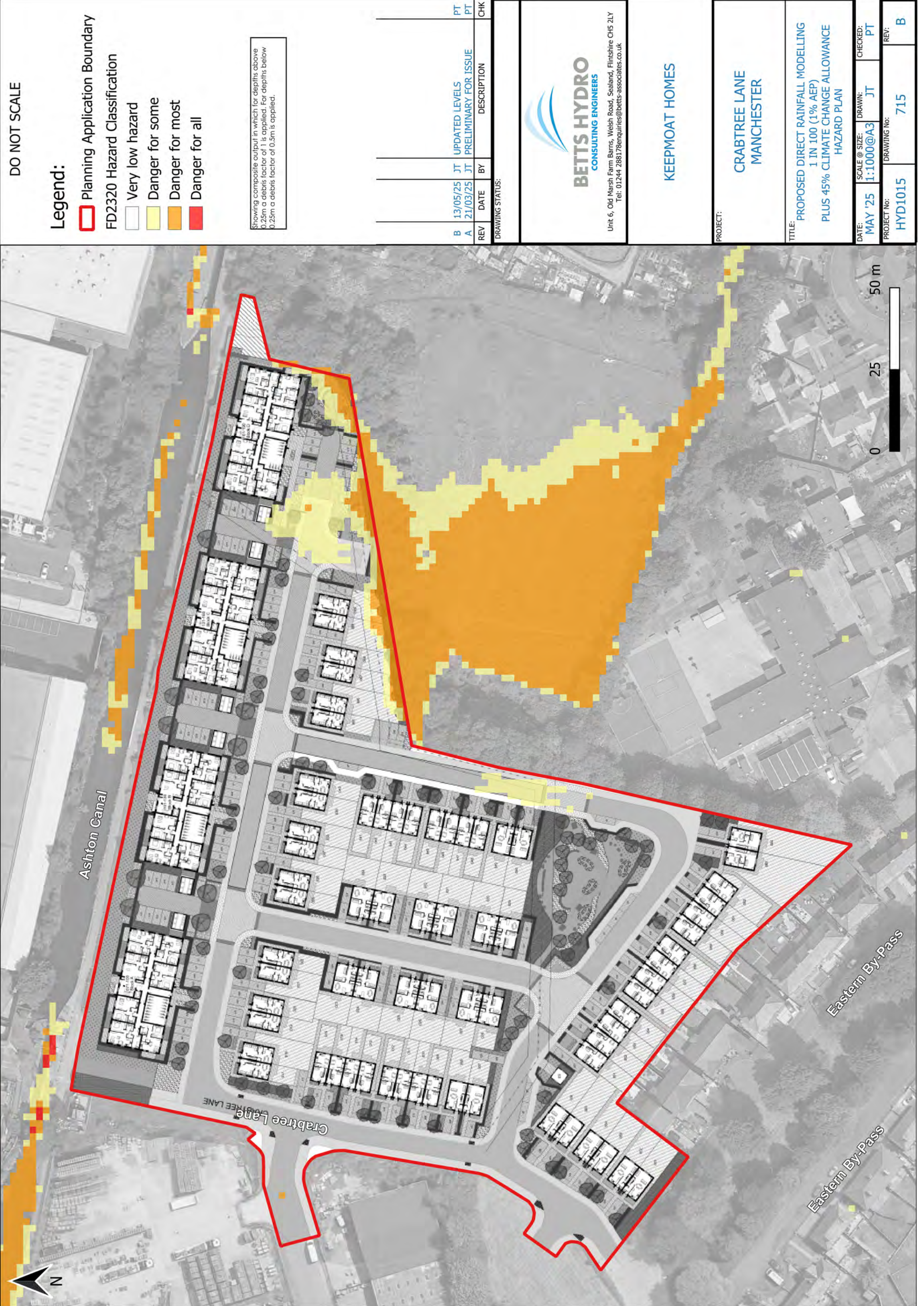
Unit 6, Old Marsh Farm Barns, Welsh Road, Sealand, Flintshire CH5 2LY
Tel: 01244 288178enquiries@betts-associates.co.uk

KEEPMOAT HOMES

CRABTREE LANE
MANCHESTER

TITLE:
PROPOSED DIRECT RAINFALL MODELLING
1 IN 100 (1% AEP)
PLUS 45% CLIMATE CHANGE ALLOWANCE
VELOCITY PLAN

DATE:	SCALE @ SIZE:	DRAWN:	CHECKED:
MAY '25	1:1000@A3	JT	PT
PROJECT No:	DRAWING No:	714	REV:
HYD1015			B



DO NOT SCALE

Legend:

- Planning Application Boundary
- FD2320 Hazard Classification
 - Very low hazard
 - Danger for some
 - Danger for most
 - Danger for all

Showing composite output in which for depths above 0.25m a debris factor of 1 is applied. For depths below 0.25m a debris factor of 0.5m is applied.

REV	DATE	BY	DESCRIPTION	CHK
B	13/05/25	JT	UPDATED LEVELS	PT
A	21/03/25	JT	PRELIMINARY FOR ISSUE	PT
				CHK

DRAWING STATUS:



BETTS HYDRO
CONSULTING ENGINEERS

Unit 6, Old Marsh Farm Barns, Welsh Road, Sealand, Flintshire CH5 2LY
Tel: 01244 288178enquiries@betts-associates.co.uk

KEEPMOAT HOMES			
PROJECT:			
CRABTREE LANE MANCHESTER			
TITLE:			
PROPOSED DIRECT RAINFALL MODELLING 1 IN 100 (1% AEP) PLUS 45% CLIMATE CHANGE ALLOWANCE HAZARD PLAN			
DATE:	SCALE @ SIZE:	DRAWN:	CHECKED:
MAY '25	1:1000@A3	JT	PT
PROJECT No:	DRAWING No:		REV:
HYD1015	715		B

APPENDIX E: NOTES OF LIMITATIONS

The data essentially comprised a study of available documented information from various sources together with discussions with relevant authorities and other interested parties. There may also be circumstances at the site that are not documented. The information reviewed is not exhaustive and has been accepted in good faith as providing representative and true data pertaining to site conditions. If additional information becomes available which might impact our conclusions, we request the opportunity to review the information, reassess the potential concerns and modify our opinion if warranted.

It should be noted that any risks identified in this report are perceived risks based on the available information.

This report was prepared by Betts Hydro Ltd for the sole and exclusive use of the titled client in response to instructions. Any other parties using the information contained in this report do so at their own risk and any duty of care to those parties is excluded.

This document has been prepared for the titled project only and should any third party wish to use or rely upon the contents of the report, written approval from Betts Associates Ltd must be sought.

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APPENDIX J: PFRA/SFRA PLANNING EXTRACTS

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Figure 6-7: GM LLFA historic flood incidents

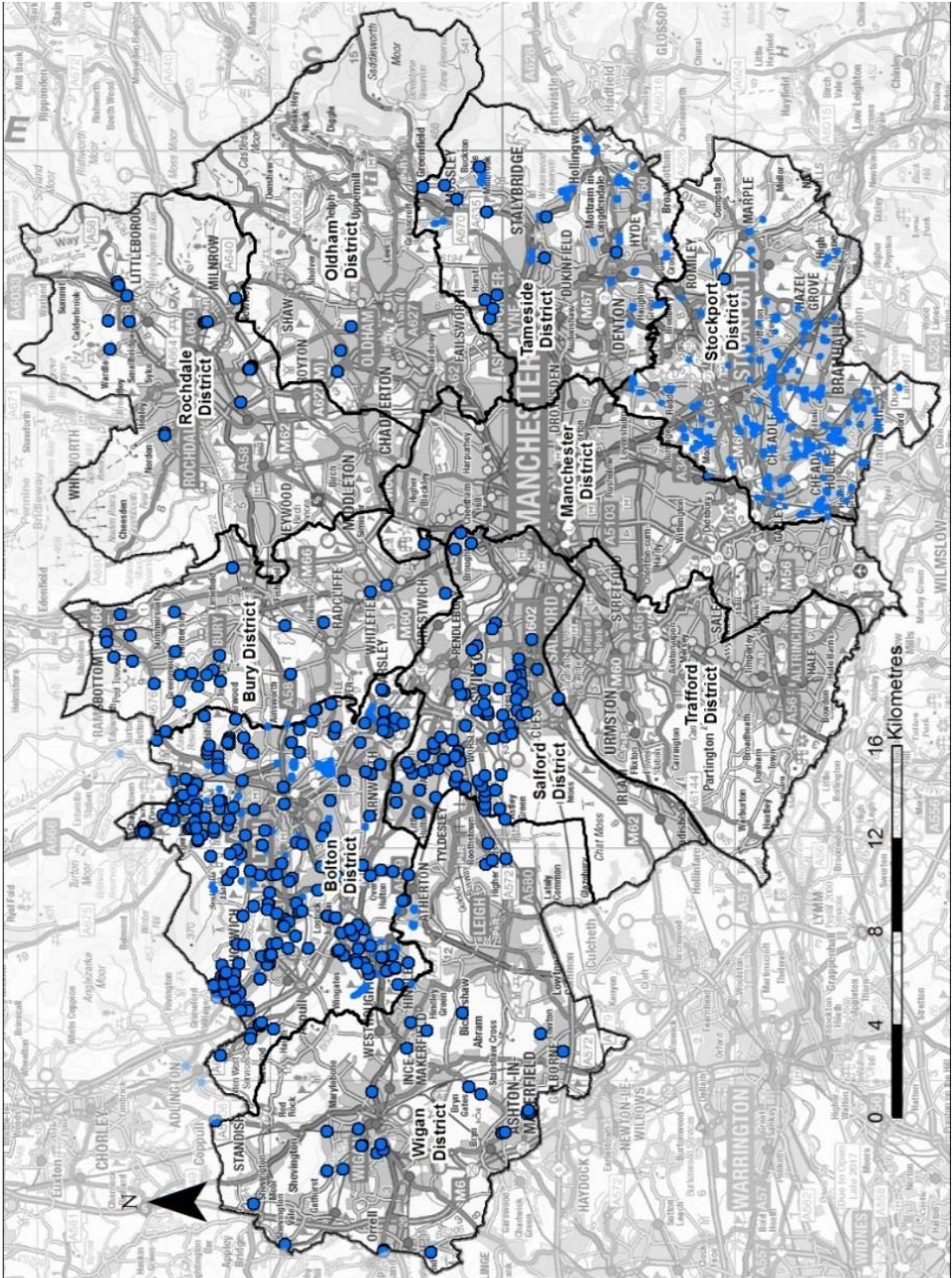
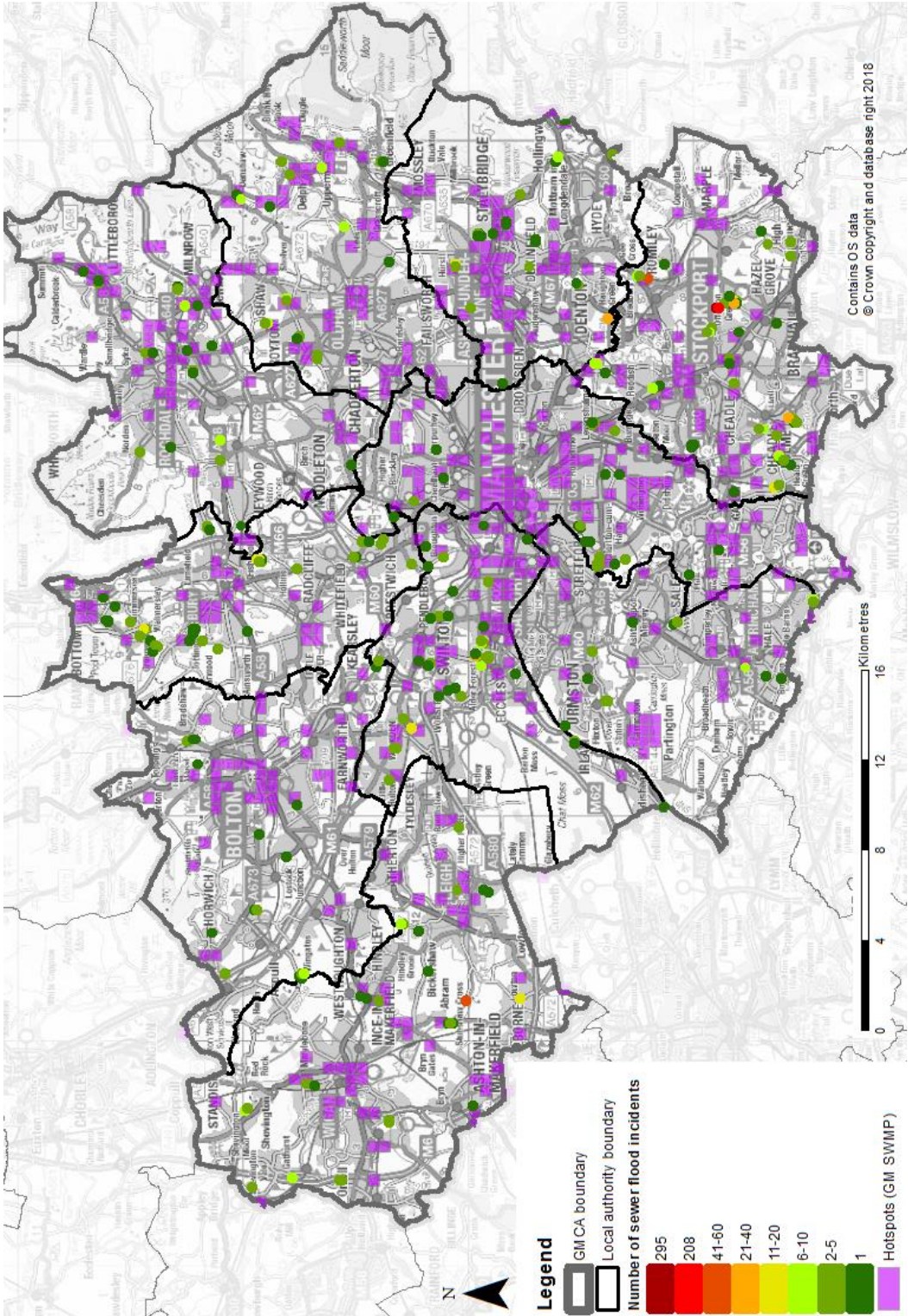
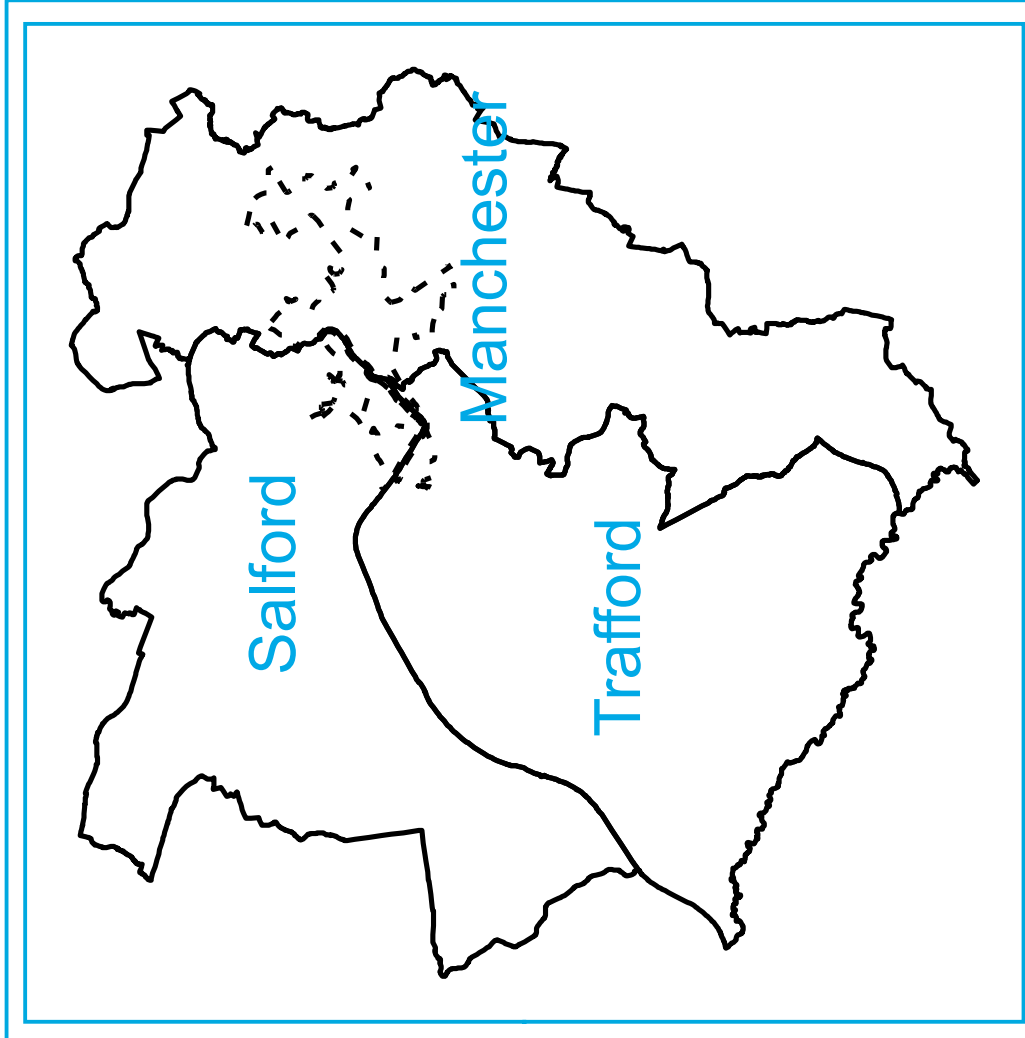
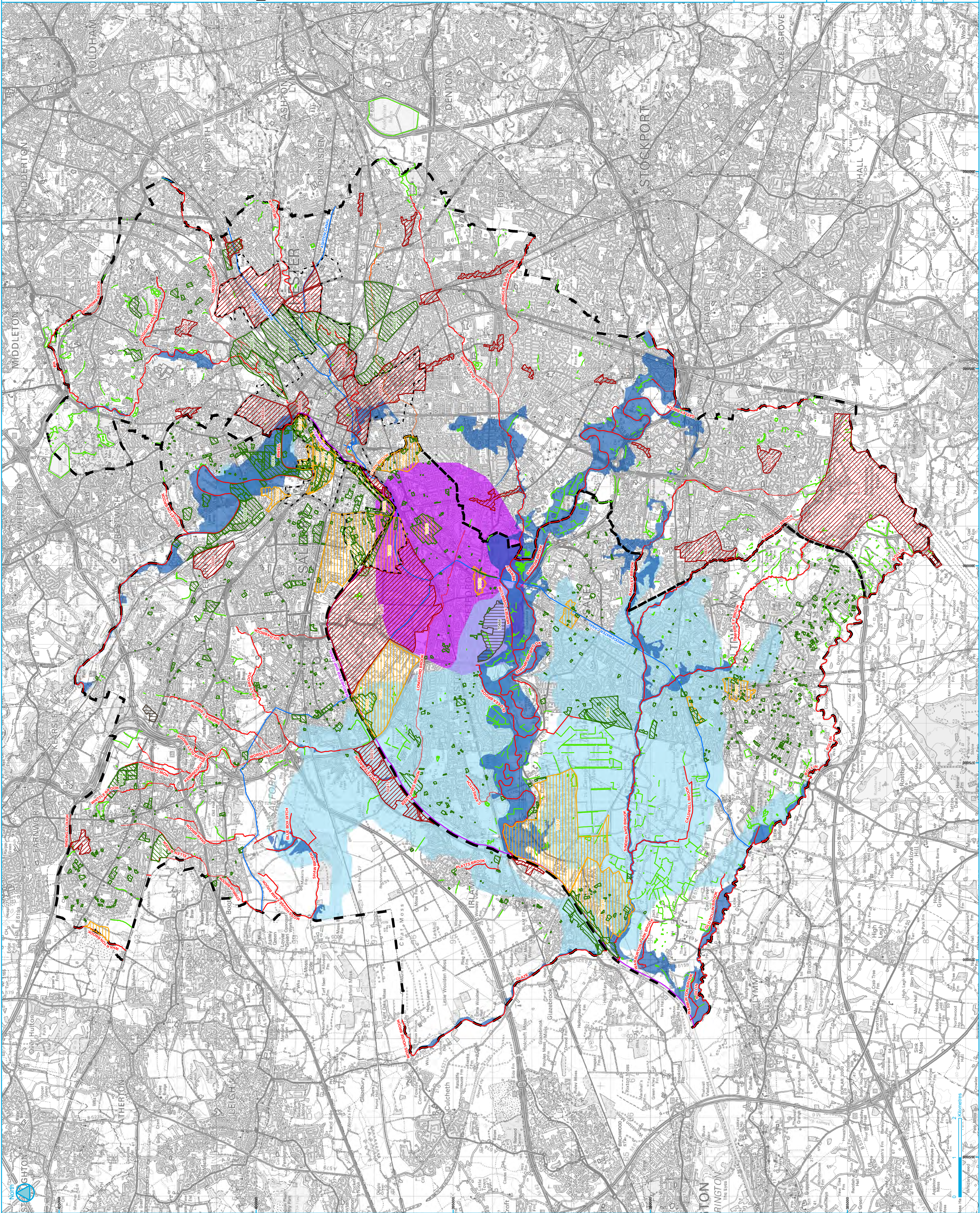


Figure 6-8: UU historic sewer flooding incidents and GM SWMP Hotspots





- Ashton, Bridgewater and Rochdale Canals
- Manchester Ship Canal / Grey Inwell
- Other Waterbodies
- Main Rivers (V8.0)
- Potential Development Sites / Locations
- Employment
- Housing
- Mixed Use
- Other
- Regional Centre Boundary
- Groundwater Issue
- Areas at risk of GW Flooding
- Areas of shallow GW
- Areas at risk of GW rebound
- Digitised River Lines
- Culverted
- Open
- Culverted
- Open

The map has been produced in accordance with PPS25. Development and Flood Risk and its Planning Code. This map shows areas that are potentially at risk from groundwater flooding and should be used to scope suitable mitigation measures in a site specific Flood Risk Assessment.

The Main River information shown in the SFRA is provided by the Environment Agency, the centreline data may deviate from that shown on basemapping due to inherent differences in the data sources. The mapping of culverted sections of watercourse is a strategic screening only based upon Ordnance Survey 1:10,000 mapping and should be confirmed for more detailed studies such as site specific Flood Risk Assessment. The canals layer does not necessarily cover all the canal arms, but the modeled overtopping/breaching and hydraulic interactions with rivers and waterbodies is complete and accurate as appropriate for a Strategic Flood Risk Assessment.

The information on the map is based on Environment Agency potential groundwater rebound areas, data from the Coal Authority, BGS drift geology mapping and Defra Groundwater Emergence Maps.

The River Irwell between Victoria Station and Pomona Island is not shown as a Main River on the Environment Agency's Flood Map although Flood Zones related to the river are. The same approach has been taken in this SFRA.

JBA consulting

www.jbaconsulting.co.uk
t 0161 8277777
e info@jbaconsulting.co.uk
Bentley Quay House
Salford Quay
Salford
M6 6PU
United Kingdom
Other offices at Manchester, Oldham, Bolton, Wigan, Stretford, Stockport, Tameside & Warrington

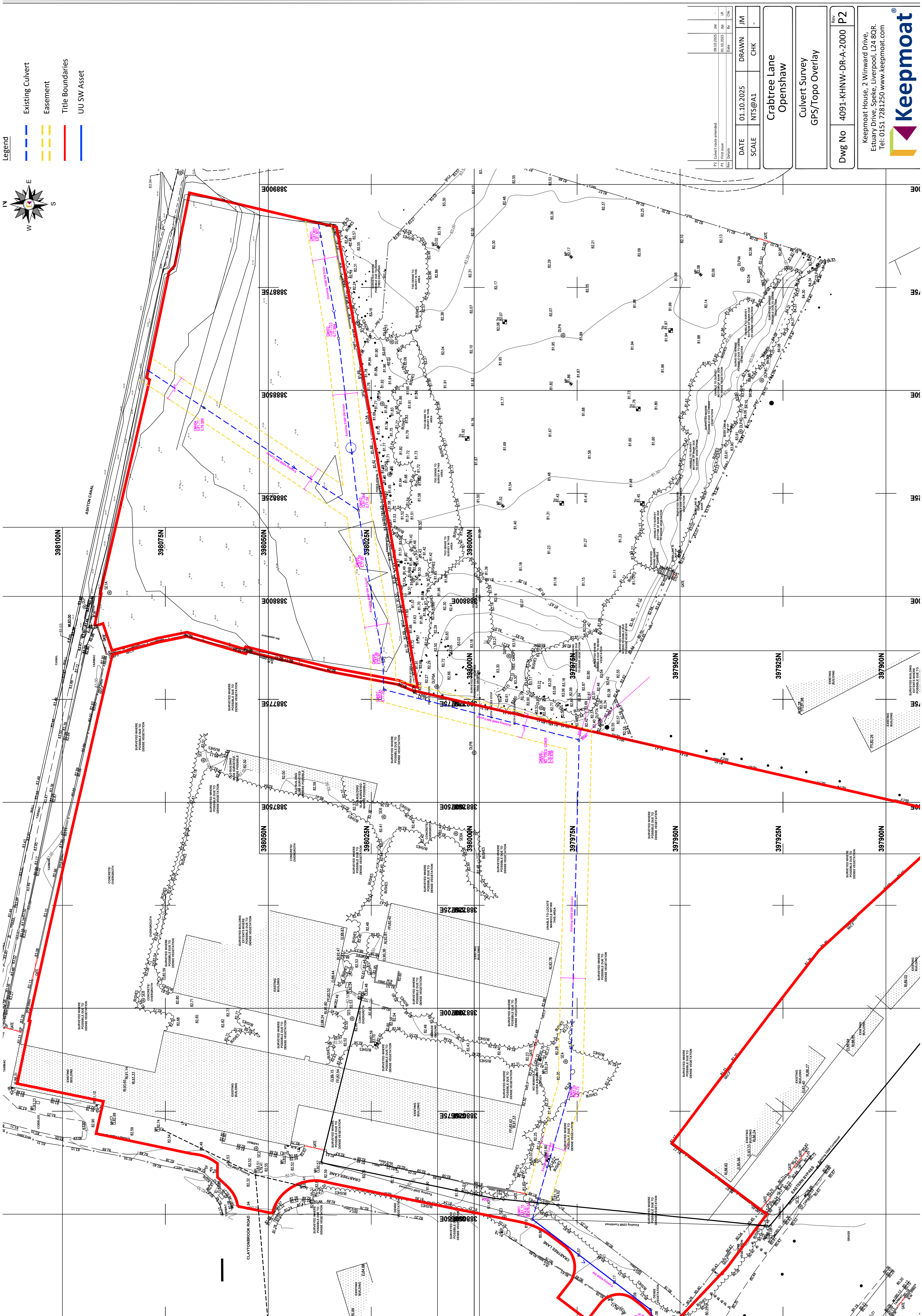
Manchester City, Salford City and Trafford Councils Level 2 Hybrid SFRA

Groundwater Flooding

Drawn by:	J. Chelham	Date:	08/02/2011
Checked by:	J. Dineley	Date:	01/02/2011
Approved by:	J. Cooper	Date:	01/02/2011
File Name:	..\\ArcView\\Mapping\\Level1\\MST_GroundwaterFlooding_V1.3.mxd		
Drawing Number:	GW_2.1	Status:	FINAL
Scale:	1:45,000		

APPENDIX K: CULVERT CCTV SURVEY

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DATE	01.10.2025	DRAWN	JM
SCALE	NTS@A1	CHK	-

Culvert Survey
GPS/Topo Overlay

Keepmoat House, 2 Winward Drive,
Estuary Drive, Speke, Liverpool, L24 8QR.
Tel: 0151 7281250 www.keepmoat.com



APPENDIX L: NOTES OF LIMITATIONS

The data essentially comprised a study of available documented information from various sources together with discussions with relevant authorities and other interested parties. There may also be circumstances at the site that are not documented. The information reviewed is not exhaustive and has been accepted in good faith as providing representative and true data pertaining to site conditions. If additional information becomes available which might impact our conclusions, we request the opportunity to review the information, reassess the potential concerns and modify our opinion if warranted.

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