

NEW MILLS, MARSDEN

FLOOD RISK ASSESSMENT & DRAINAGE STRATEGY



CLIENT:	John Edward Crowther (Holdings) Plc
ARCHITECT:	KPP Architects
SITE ADDRESS:	New Mills Brougham Road Marsden HD7 6AZ
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AUTHOR:	Jonathan Allchin	DATE:	14/01/2026
CHECKER:	Peter Dixon	DATE:	14/01/2026



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REVISION	DATE	AUTHOR	CHECKER	COMMENTS
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P02	03/12/2025	J. Allchin	P. Dixon	Updated site layout and drawings
P03	14/01/2026	J. Allchin	P. Dixon	Minor changes to wording

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1 INTRODUCTION

- 1.1 Dudleys Consulting Engineers have prepared this site-specific Flood Risk Assessment and Drainage Strategy for the redevelopment of the New Mills site, off Brougham Road, Marsden, West Yorkshire.
- 1.2 The assessment investigates the potential flood risk impacts of the proposed development in accordance with the National Planning Policy Framework (NPPF) and supporting Planning Practice Guidance. This FRA is considered proportionate to the degree of flood risk and to the scale, nature, and location of the development.
- 1.3 This Flood Risk Assessment and Drainage Strategy have been carried out generally in accordance with:
 - National Planning Policy Framework (December 2024)
 - Planning Practice Guidance: Flood Risk and Coastal Change (September 2025)
 - BS 8533:2017 “Assessing and managing flood risk in development, Code of Practice”
 - CIRIA Report C753” The SUDS Manual” (2015)
 - National Standards for Sustainable Drainage Systems (SuDS) (July 2025)
 - Building Regulations Part H
 - Sewerage Sector Guidance (November 2023)



2 CONSULTATION AND EVIDENCE

- 2.1 The site is located in Marsden, West Yorkshire. Kirklees Council are the Lead Local Flood Authority and the Local Planning Authority for the area.
- 2.2 The LLFA were consulted as part of a pre-app submission. As part of their comments, they accepted the principles of a Flood Risk Technical Summary (FRTS) prepared by Dudleys Consulting Engineers, dated February 2024. This FRA follows the same principles of the FRTS.
- 2.3 Yorkshire Water is the Local Sewerage Authority, and they will be consulted during the planning process. A copy of their records is included in Appendix C.
- 2.4 The site is not within an Internal Drainage Board area.
- 2.5 Bespoke pre-planning advice has been sought from the Environment Agency, and a copy of the correspondence and the flood information data for the site has been included within Appendix D.
- 2.6 The site has been allocated for mixed-use development in the Kirklees Local Plan 2019, with the site reference MXS11. The constraints for the site, as stated in the Local Plan, include the following:
 - Part of the site is within Flood Zone 3,
 - Surface water issues,
 - Proximity to Special Protection Area / Special Area of Conservation,
 - Site is within/close to a Conservation Area,
 - Site is close to archaeological site,
 - Assessment required for presence of habitats that are important for off-site foraging by South Pennine Moors SPA qualifying bird species (i.e. functionally connected land).
- 2.7 Other site-specific considerations listed within the Local Plan include the following:
 - The flood risk vulnerability of proposed uses will be considered, and an exception test may still be required as part of a planning application as set out in national planning policy,
 - De-culverting should be considered through this re-development, but environmental benefits may be limited,
 - Residential amenity will need safeguarding through sensitive siting of buildings and landscape buffer areas,
 - The original buildings of New Mills shall be retained and reused as part of any development proposals, unless adequate justification is provided for their loss, in accordance with LP7 and LP24.
- 2.8 SuDS design guidance requires sustainable drainage systems to be provided for the management of the surface water runoff for redeveloped areas.
- 2.9 Planning policy requires that the site be developed in accordance with NPPF requirements in terms of flood risk management, climate change allowances and reduced runoff from the development.



3 EXISTING SITE DESCRIPTION

- 3.1 The site includes a series of industrial mill buildings bounded by the River Colne, Warehouse Mill Road and Crowther Bruce Mill Road to the north, Crowther Bruce Mill Road to the east, Brougham Road and Derby Terrace to the south, and residential properties and Peel Street to the west.
- 3.2 The approximate grid reference of the site is E405042, N411701.
- 3.3 The topography of the site falls from south to north towards the River Colne, with levels ranging from 182mAOD to 178mAOD. Topographical surveys and building surveys are included in Appendix A.
- 3.4 There is a culverted section of the River Colne underneath existing buildings to the north of the site, flowing from west to east. There is also another culverted watercourse running along the eastern boundary of the site, flowing from south to north, which connects into the River Colne. Both of these watercourses are classified as EA Main Rivers. Surveys of the rivers and the existing culverts are included in Appendix A.
- 3.5 The site is surrounded by Yorkshire Water sewers, please refer to a copy of their records, included in Appendix C.
- 3.6 The site is a brownfield site, with existing drainage connections to the Yorkshire Water sewers and the culverted watercourses that run under the site. The existing drained impermeable area of the site is 1.52ha. A drainage survey is included in Appendix A.
- 3.7 A site location plan is shown below in Figure 1.



Figure 1 – Site Location Plan



4 DEVELOPMENT PROPOSALS

- 4.1 The proposed site is a mixed-use development of residential, retail, commercial and light industrial usage. A number of the existing mill buildings will be retained, while others will be demolished, with new buildings, car parking and landscaping constructed in their place.
- 4.2 The existing buildings above the culverted section of the River Colne are proposed to be demolished to allow for de-culverting of this section of the River Colne.
- 4.3 It is not practical or feasible to de-culvert the other watercourse running from south to north across the site, due to the presence of significant historic buildings which are to be retained. Further justification is provided by Shepherd Planning in their Flood Risk Sequential Test, Exceptions Test and De-Culverting Analysis.
- 4.4 The proposed layout for the scheme is shown in Figure 2 below and in Appendix B.

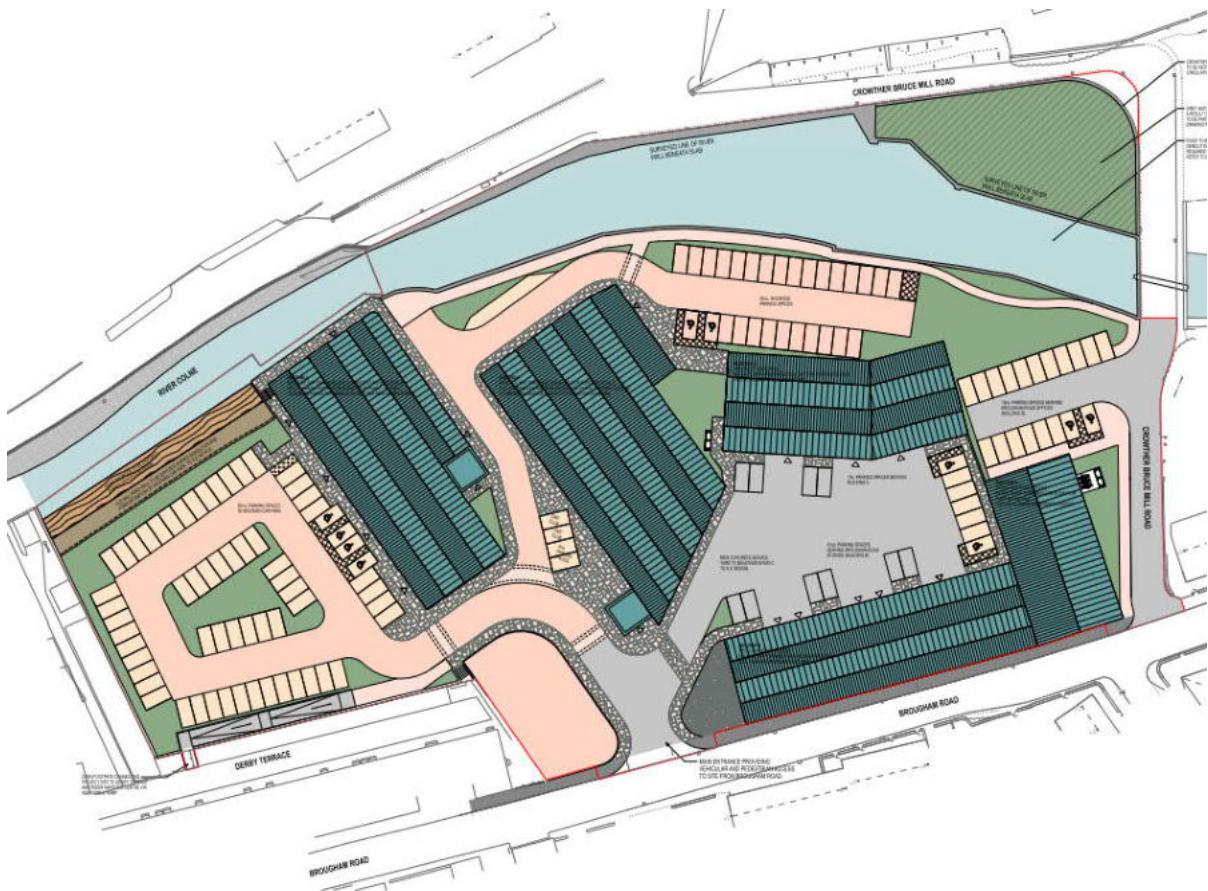


Figure 2 – Proposed Site Plan



5 FLOOD ZONE COMPATIBILITY

- 5.1 The Flood Risk Vulnerability Classification has been determined in accordance with Planning Practice Guidance, Flood Risk and Coastal Change. As the proposed development will be mixed-use, there will be varying vulnerability classifications across the site. The Planning Practice Guidance, Flood Risk and Coastal Change states that in these circumstances, the highest vulnerability category should be used when assessing the suitability of the proposals with the appropriate Flood Zones, unless the development is considered in its component parts. It is proposed to consider the proposals in its component parts to demonstrate the development is suitable in terms of Flood Risk Vulnerability Classification and Flood Zones.
- 5.2 The following table assesses the usage of the proposed buildings and their Flood Risk Vulnerability Classification, the Flood Zone in which they are situated, and the compatibility of the proposed development.

Table 1 – Flood Risk Vulnerability Classification

Building Name	Proposed Usage(s)	Flood Risk Vulnerability Classification	Flood Zone	Compatible?	Exception Test required?
West Mill (existing)	Ancillary Space @ Basement Floor Retail @ Lower Ground Floor Offices @ Ground Floor Residential @ Upper Floors	Less Vulnerable Less Vulnerable More Vulnerable	Flood Zone 2	Yes	No
East Mill (existing)	Ancillary Space @ Basement Floor Residential @ Ground Floor Residential @ Upper Floors	Less Vulnerable More Vulnerable More Vulnerable	Flood Zone 2	Yes	No
Building A: Brougham Road Offices (existing)	Light Industrial @ Ground Floor Offices @ Upper Floors	Less Vulnerable Less Vulnerable	Flood Zone 3a	Yes	No
Build B: Brougham Road Studios (existing)	Light Industrial @ Ground Floor Offices @ First Floor	Less Vulnerable Less Vulnerable	Flood Zone 3a	Yes	No
Building C (new)	Light Industrial	Less Vulnerable	Flood Zone 2	Yes	No

- 5.3 The Flood Risk Vulnerability Classification in the above table is in accordance with National Planning Policy Framework, Annex 3. The Flood Zone Compatibility in the above table has been reviewed in accordance with Planning Practice Guidance, Flood Risk and Coastal Change, paragraph 078 Table 2.
- 5.4 As can be seen from Table 1, the site lies within Flood Zones 1, 2 and 3. The Calder Catchment Strategic Flood Risk Assessment – Volume II (Kirklees Council) does not state the site is within Flood Zone 3b, and the flood information data supplied by the EA shows the site is not affected by frequent high river level events, and hence the site is not part of the functional floodplain and is within Flood Zone 3a.

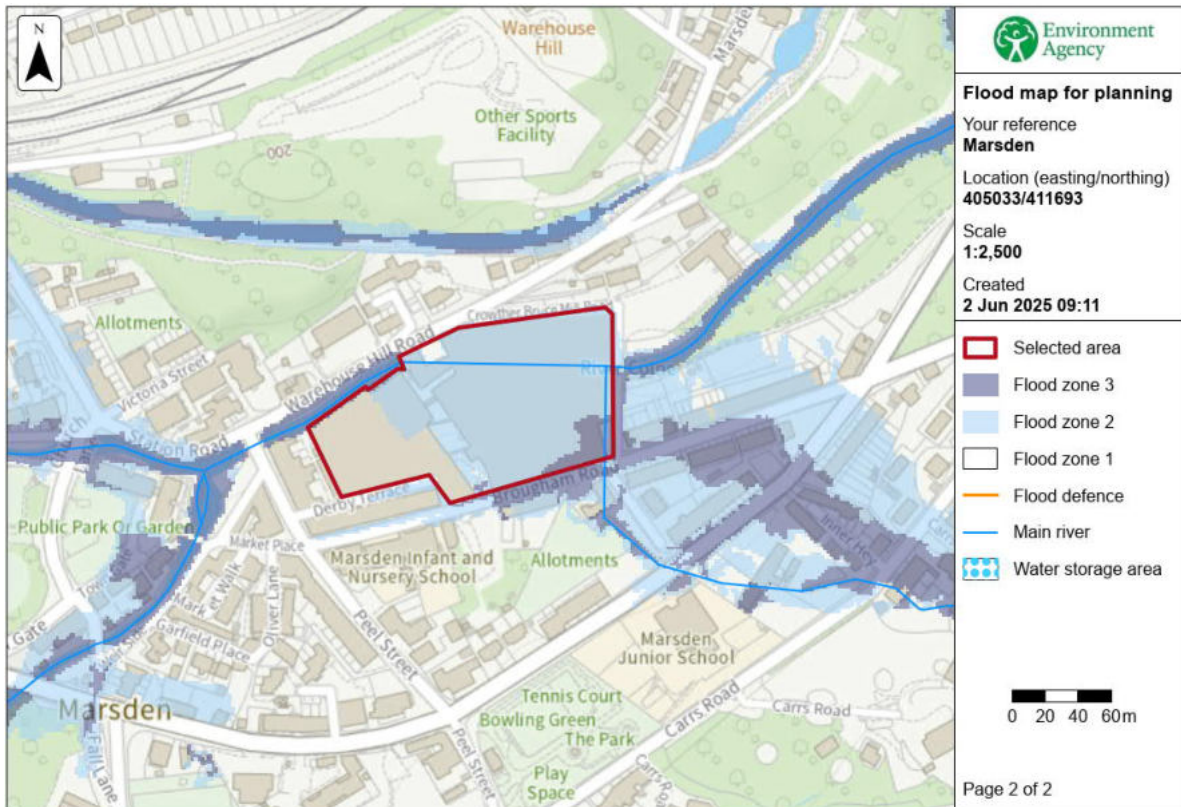


- 5.5 A drawing showing the Flood Zones overlapping the proposed site layout is included in Appendix D. The extent of the Flood Zones has been obtained from open licence information provided by the Department for the Environment, Food and Rural Affairs (DEFRA).
- 5.6 Table 1 demonstrates that the Exception Test will not be required for the development. A Sequential Test is normally required for developments in Flood Zone 2 or Flood Zone 3. However, as the site has been allocated for mixed-use development in the Kirklees Local Plan 2019, a Sequential Test is not required, in line with paragraph 180 of the National Planning Policy Framework (December 2024).
- 5.7 Hence the proposed development is suitable without the need for the Sequential Test or the Exception Test. However, as the EA's flood maps have been updated since the Kirklees Local Plan 2019 was adopted, a Sequential Test assessing available sites within Marsden has been undertaken by Shepherd Planning.
- 5.8 The Sequential Test concludes that there are no similar available sites within Marsden with a lower level of flood risk.
- 5.9 As stated above, the Exception Test is not required as all proposed uses are compatible with the Flood Zones in which they lie.



6 FLUVIAL FLOODING (FLOODING FROM RIVERS AND THE SEA)

- 6.1 Fluvial flooding occurs when high flows exceed the capacity of the river channel and spill out onto the floodplain, usually after a period of prolonged or heavy rainfall.
- 6.2 The Environment Agency Flood Map for Planning below shows that the site lies within Flood Zones 1, 2 and 3.



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Figure 3 – Flood Map for Planning (EA)

- 6.3 This shows that the flood risk varies across the site, from low to medium to high, and hence flood information data has been obtained from the EA, included in Appendix D.
- 6.4 The flood information data does not contain any information regarding historic flooding, and the open licence information available from DEFRA also does not contain any historic flood information. However, there is some information available from Kirklees Council.
- 6.5 The following figure is taken from the Kirklees Council Local Flood Risk Management Strategy Draft Summary Report, issued in 2023. The figure shows flood incidents, from any source, recorded as locally significant by Kirklees Council since 2007. These incidents include internal and external flooding of properties and businesses, and roads, footpaths and gardens. The major flooding events within Kirklees have mainly occurred around the main rivers: the River Colne, River Calder and Spen River.
- 6.6 The figure shows that there have been a number of significant flood incidents reported in Marsden since 2007, although details of the significant flood incidents is not publicly available.

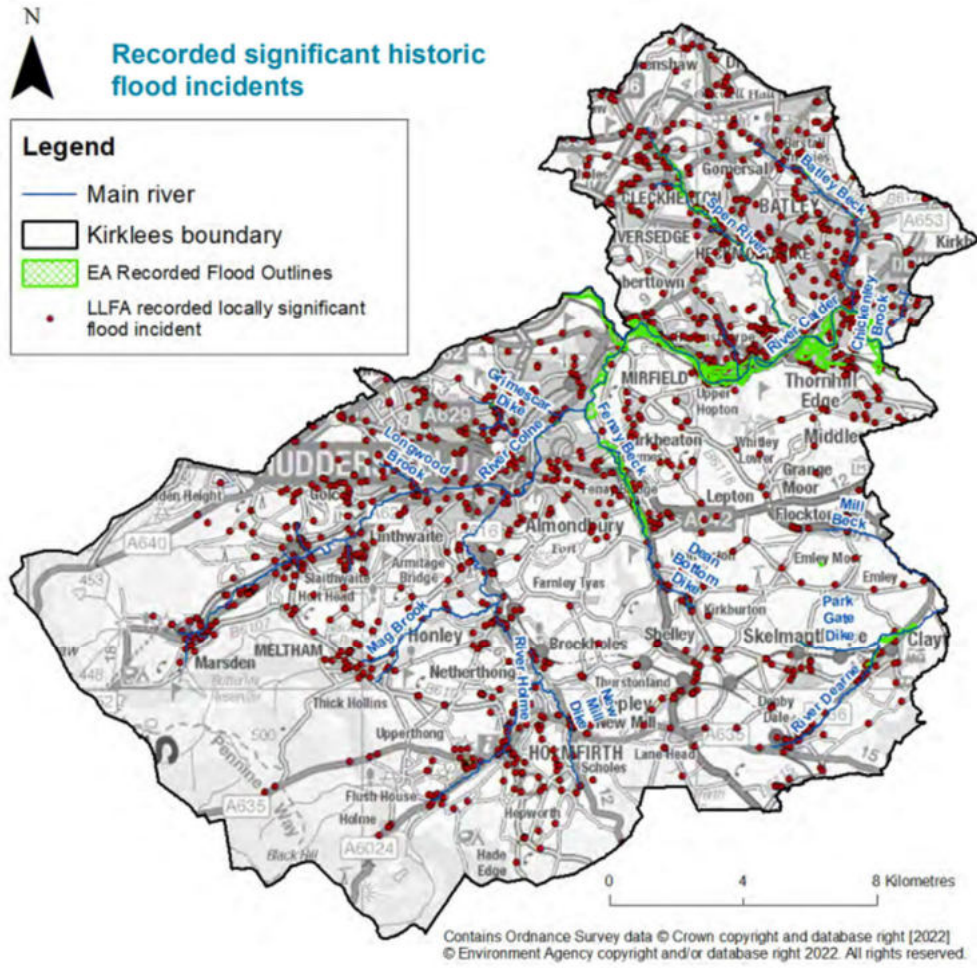


Figure 4 – Historical Flooding (Kirklees Council)

- 6.7 The flood information data provided by the EA included estimated flood levels for three different models: the 2019 Colne Model, the 2019 Crowhill Model, and the 2019 Wessenden Model. The 2019 Wessenden Model does not affect the site, but both the 2019 Colne Model and 2019 Crowhill Model do and hence will be used to determine appropriate flood risk mitigation measures for the proposed development.
- 6.8 Table 2 below shows the estimated flood levels from the 2019 Colne Model. Nodes 6, 7 and 8 from the information provided are the closest to the site, and the estimated flood levels for node 6 have been used as these are higher than the estimated flood levels for nodes 7 and 8 respectively.

Table 2 – Estimated Flood Levels from the 2019 Colne Model (EA)

Flood Event	Climate Change	Flood Height (mAOD) - Defended	Flood Height (mAOD) – Defences Removed
10% AEP	0%	176.95	177.13
3.33% AEP	0%	177.49	177.49
1% AEP	0%	178.06	178.06
1% AEP +CC	20%	Not provided	178.38
1% AEP +CC	30%	Not provided	178.53
1% AEP +CC	50%	Not provided	178.82
0.1% AEP	0%	178.92	178.92



- 6.9 In accordance with latest guidance, a central climate change peak river flow allowance should be used for more vulnerable, and less vulnerable, developments in Flood Zone 3a. The central peak river flow allowance for the Aire and Calder Management Catchment is 23%. Details of the 1% AEP+23% climate change flood level are not included within the data, so the 1% AEP+30% climate change estimated flood level has been used to determine the design flood level for the development. Therefore, using information from the 2019 Colne Model the design flood level for the development is 178.53mAOD.
- 6.10 In line with standing advice for vulnerable developments, any new buildings within Flood Zone 2 or 3 should have a finished floor level set at least 600mm above the estimated flood level. For existing buildings, the finished floor level should be raised as far as practicable, more vulnerable uses should be consigned to upper floors, and extra flood resistance and resilience measures should be included if the floor levels cannot be raised to 600mm above the estimated flood level.
- 6.11 The existing West Mill and East Mill buildings are shown to be affected in the 1%AEP+30% climate change event. The lower ground level finished floor level of the West Mill building is 180.35mAOD, which is significantly above the design flood level. The building has an existing basement with a finished floor level of 178.00mAOD. The basement is proposed as ancillary space and hence will be non-habitable. Flood resistance and resilience measures will need to be used up to a level of 179.13mAOD for the basement.
- 6.12 The ground floor level of the East Mill building is 180.80mAOD, which is significantly above the design flood level. The building has an existing basement, with a finished floor level of 178.10mAOD. The basement is proposed as ancillary space and hence will be non-habitable. Flood resistance and resilience measures will need to be used up to a level of 179.13mAOD for the basement.
- 6.13 As the design would keep out a depth of more than 600mm of water, advice from a structural engineer will be required, and the design and construction of the flood resistance and resilience measures will be monitored during the Building Control approval process.
- 6.14 The finished floor levels and mitigation measures for Buildings A, B, and C will be discussed later in this section.
- 6.15 As the site is also affected by the 2019 Crowhill Model, that model also needs to be analysed to determine appropriate flood risk measures for the proposed development.
- 6.16 Table 3 below shows the estimated flood levels from the 2019 Crowhill Model. Nodes 2, 3 and 4 from the information provided are the closest to the site, and the estimated flood levels for node 4 have been used as these are higher than the estimated flood levels for nodes 2 and 3 respectively.

Table 3 – Estimated Flood Levels from the 2019 Crowhill Model (EA)

Flood Event	Climate Change	Flood Height (mAOD) – No Defences Exist
10% AEP	0%	178.12
3.33% AEP	0%	178.33
1% AEP	0%	178.54
1% AEP +CC	20%	178.60
1% AEP +CC	30%	178.61
1% AEP +CC	50%	178.63
0.1% AEP	0%	178.68

- 6.17 Based on the same climate change parameters, the design flood level for the development, based on the 2019 Crowhill Model, would be 178.61mAOD. However, node 4 is situated within Brougham Road, which the topographical survey demonstrates is at a level above 182mAOD, which suggests all flooding would be



contained within the culverted watercourse and not affect the site. The estimated flood level also doesn't seem to correlate with the sample point data provided by the EA, which shows the expected depth and height of flooding at points within the site boundary.

6.18 Pre-planning advice was sought from the EA regarding the above discrepancies and the correspondence is included within Appendix D. The opening of the response from the EA is below:

“The customer is correct in their assessment of the node EA12312468_CROW1cb000, as this does show the level stated and it would seem this is within the culvert beneath the road. However, this node point data is a snapshot of the river level at this location only, so the customer is correct that flooding would appear to come from a different source.”

6.19 The response from the EA then includes a desk top assessment and concludes with the following statement:

“The area first identified appears to remain unconnected from the rest of the grids so it is most likely the expected flow route is overland flow from the upper regions.”

6.20 Therefore, when determining the appropriate flood risk measures for the site, it is more appropriate to treat the flood risk from the 2019 Crowhill Model as an overland flow route, rather than an estimated flood level.

6.21 Table 4 shows the salient sample point data provided by the EA, which shows the expected depth and height of flooding at points within the site boundary for the 1%AEP+30% climate change event.

Table 4 – Point Data for the 1%AEP+30% climate change event from the 2019 Crowhill Model (EA)

Point	Depth (m)	Height (mAOD)	Interpolated Ground Level (mAOD) (Height minus Depth)	Actual Ground Level (mAOD) (from topographical survey)
13	0.01	180.45	180.44	180.44
14	0.04	181.72	181.68	180.96
18	0.01	178.41	178.40	182.43
19	0.02	178.39	178.37	182.50

6.22 As can be seen from the above table, in some areas, the actual ground level is higher than the ground level interpolated from the 2019 Crowhill Model, which would mean the overland flow route might not extend as per the model. In other areas, the actual ground level is lower than the ground level interpolated from the 2019 Crowhill Model, which would mean the depth of flooding might be greater than the model.

6.23 Therefore, rather than setting finished floor levels 600mm above the estimated flood level for buildings at risk from the 2019 Crowhill Model, it would be more appropriate to use techniques relating to managing surface water flood risk. For the existing buildings A and B along Brougham Road, as there isn't scope for amending the road levels along Brougham Road, flood resistance and resilience techniques are proposed for 600mm above the existing adjacent road levels to account for the overland flow route, which is shown as fluvial flood risk on the 2019 Crowhill Model, and confirmed as such as part of the pre-planning advice from the EA.

6.24 For the proposed Building C, the proposed levels within the development can be designed to fall away from building thresholds and entrances, and hence the flood risk will be managed within the proposals. The overland flow route will be contained in hardstanding and landscaped areas.

6.25 For the existing West Mill and East Mill buildings, similarly, the proposed levels can be designed to fall away from the building thresholds and entrances, and hence the flood risk will be managed within the proposals. The overland flow route will be contained in hardstanding and landscaped areas.



- 6.26 The requirement for flood compensation storage should be analysed for areas within the 1%AEP+30% climate change flood extents.
- 6.27 As the West Mill and East Mill buildings are existing buildings that are proposed to remain in place, no flood compensation storage will be required for these buildings.
- 6.28 The sample point data for the 2019 Crowhill Model shows a depth of flooding within the site boundary between 0.00 and 0.04m in the 1%AEP+30% climate change scenario. The expected flooding covers an area of 1.1ha. Taking an average depth of flooding of 0.02m, the existing volume of flood storage for flooding from the 2019 Crowhill Model, is 220m³.
- 6.29 The proposals will provide flood routes through the proposed development towards the River Colne and hence the majority of the site will still be available for use as flood storage. Where buildings are to be demolished above the existing culverted section of the River Colne, there is an approximate area of 0.26ha. It is proposed to de-culvert the watercourse, which will provide ample storage for the overland flow through the site. However, even if the de-culverting is to occur in a later phase, the area of demolished buildings above the culvert will provide the required amount of flood storage on site, based on the proposed levels and the data provided by the EA.
- 6.30 Therefore, the post-development flood storage will be greater than the pre-development flood storage on the site, and hence will reduce the flood risk of the site and the surrounding area.
- 6.31 On this basis, taking into account the setting of the finished floor levels, the use of flood resistance and resilience techniques, providing overland flow routes through the development, and sufficient space on the site for flood compensation storage, the risk of flooding from rivers and the sea is considered to be low.
- 6.32 A summary of the proposed flood risk mitigation measures for each building is shown in the below table, and is repeated in Section 12.

Table 5 – Summary of Proposed Flood Risk Mitigation Measures

Building	Flood Zone	Main Source of Fluvial Flood Risk	Proposed FFL (mAOD)	Flood Resistance and Resilience Measures
West Mill	FZ2	Colne/Crowhill	Existing Lower Ground Floor Level = 180.35 Existing Basement Floor Level = 178.00	Up to 179.13mAOD
East Mill	FZ2	Colne/Crowhill	Existing Lower Ground Floor Level = 180.80 Existing Basement Floor Level = 178.10	Up to 179.13mAOD
A	FZ3a	Crowhill	Existing Ground Floor Level = 181.71	Up to 600mm above the adjacent road levels.
B	FZ3a	Crowhill	Existing Ground Floor Level = 180.90	Up to 600mm above the adjacent road levels.
C	FZ2	Crowhill	180.90	None required



7 PLUVIAL FLOODING (FLOODING FROM SURFACE WATER)

- 7.1 The Environment Agency Flood Map showing Risk of Flooding from Surface Water is shown below. This type of flooding can be difficult to predict, much more so than river or sea flooding as it is hard to forecast exactly where or how much rain will fall in any storm.
- 7.2 Figure 5 below shows that the site has a high risk of surface water flooding.

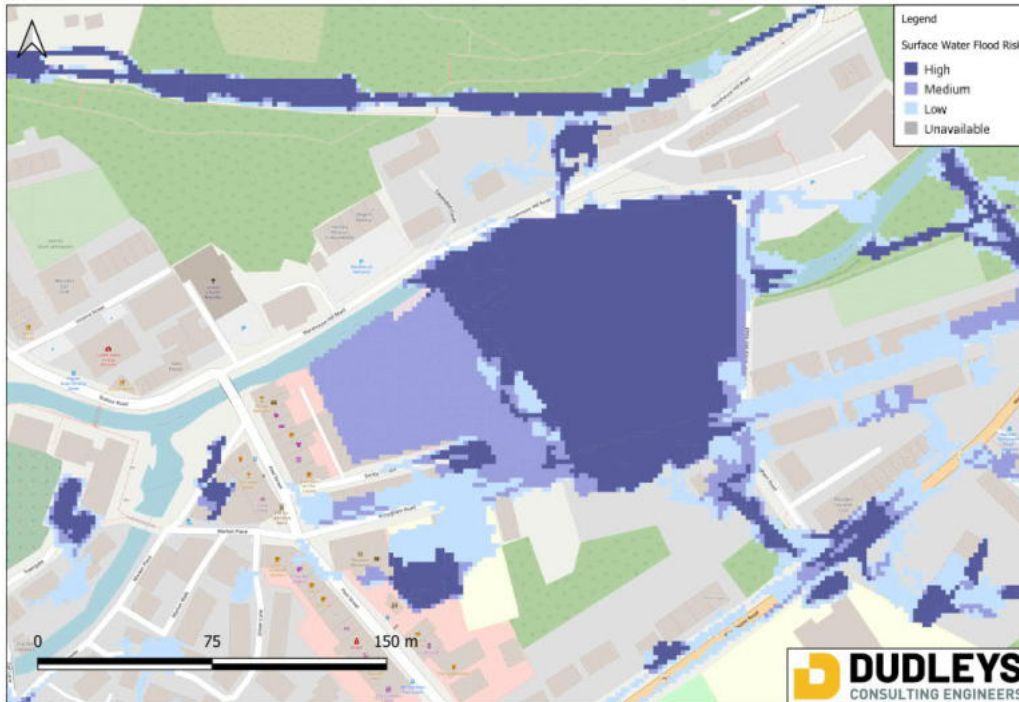


Figure 5 – Pluvial Flooding (EA)

- 7.3 As discussed in Section 6, buildings will either be set above the estimated fluvial flood level, have the proposed external levels fall away from entrances and thresholds, or use flood resistance and resilience measures to a level 600mm above the estimated flood level or the existing adjacent road level.
- 7.4 The data from the EA shows that for the vast majority of the site, the depth of surface water flooding is expected to be less than 300mm, with only a few isolated areas having a greater depth of flooding than this. Therefore, providing 600mm of flood resistance and resilience measures will ensure the development is protected from surface water flooding.
- 7.5 As part of the proposals, existing low spots within the site boundary will be designed out so that all hardstanding areas fall towards the River Colne. Surface water overland flows will be directed away from buildings wherever possible with surface water flooding managed within the proposed development.
- 7.6 On this basis, the risk of flooding from surface water is considered to be low.



8 GROUNDWATER FLOODING

- 8.1 Groundwater flooding occurs when water levels in the ground rise above surface levels this is more likely to occur in low lying areas.
- 8.2 The below figure is taken from the Calder Catchment Strategic Flood Risk Assessment – Volume II (Kirklees Council). It shows the site is in an area with a low susceptibility to groundwater flooding.

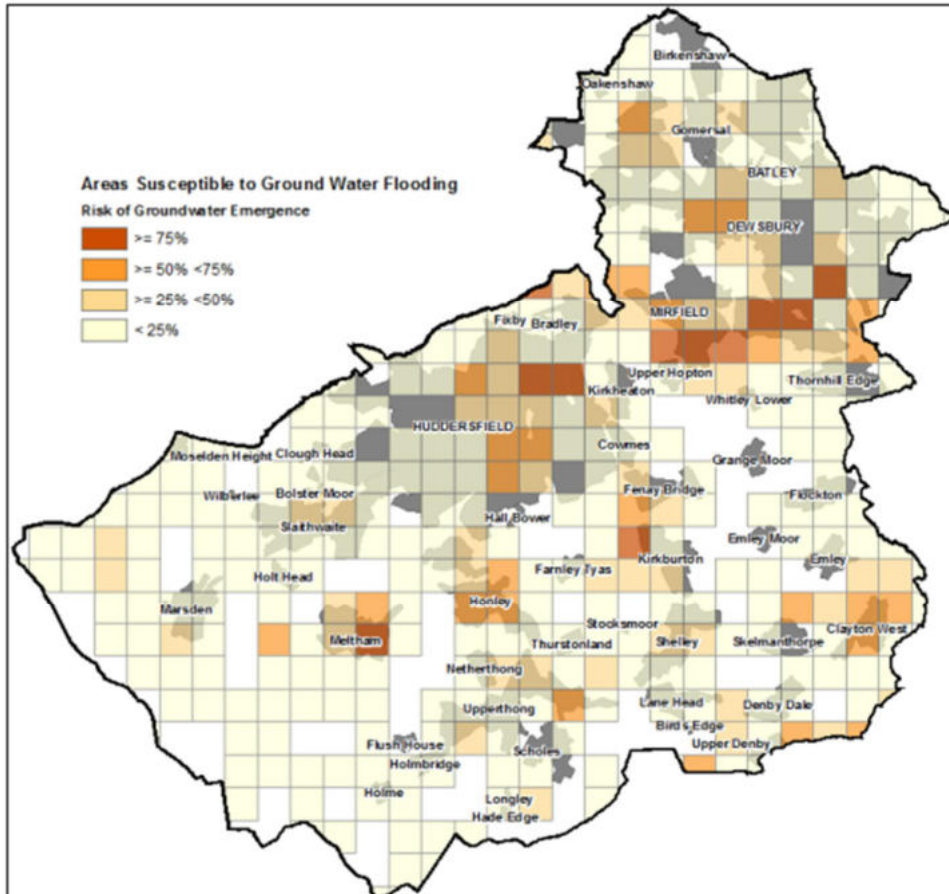


Figure 6 – Areas Susceptible to Groundwater Flooding (Kirklees Council)

- 8.3 On this basis, the risk of flooding from groundwater is considered to be low.

9 EXISTING INFRASTRUCTURE FLOODING

- 9.1 Flooding caused by the existing infrastructure network occurs when the network is over capacity or there is a blockage or failure in the existing system. There are numerous adopted Yorkshire Water sewers surrounding the site. A copy of the Yorkshire Water records is included in Appendix C.
- 9.2 As the site is set below the level of Brougham Road, and the topography falls from south to north towards the River Colne, it is anticipated that if the sewers in Brougham Road were to cause flooding, it would affect the site. However, the mitigation measures to prevent fluvial and pluvial flooding within the site will also mitigate against existing infrastructure flooding.
- 9.3 On this basis, the risk of flooding from existing infrastructure is considered to be low.



10 RESERVOIR AND OTHER ARTIFICIAL SOURCES OF FLOODING

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



Figure 7 – Reservoir Flooding (EA)



11 DRAINAGE ASSESSMENT

FOUL WATER DRAINAGE STRATEGY

- 11.1 The drainage survey in Appendix A shows there are existing foul water connections from the site to the Yorkshire Water combined sewer in Brougham Road. Foul water will be collected from buildings and will connect to the existing Yorkshire Water sewer in Crowther Bruce Mill Road.
- 11.2 An initial estimate of the quantity of foul water generated by the development has been produced using British Water’s Flows and Loads 4 guidance. In order to estimate the number of staff, the Homes & Communities Agency’s Employment Density Guide 3rd Edition has been used, and visitor numbers have been assumed at this stage.
- 11.3 The calculations are included in Table 6 below.

Table 6 - Foul Water Calculations

New Mills, Marsden Foul Water Calculations								
Building	Use	Floor Space (m ²)	No. 2 beds	No. of Residents	No. of Staff	No. of Visitors	Flow (litres per day)	Flow (l/s)
A	Office	747	N/A	N/A	62	N/A	3,113	0.036
B	Light Industrial	1900	N/A	N/A	40	N/A	2,021	0.023
C	Light Industrial	581	N/A	N/A	12	N/A	618	0.007
West Mill	Office	678	N/A	N/A	57	N/A	2,825	0.033
West Mill	Non-Food Retail	467	N/A	N/A	23	N/A	2,102	0.024
West Mill	Restaurant/Café	93	N/A	N/A	6	100	1,558	0.018
West Mill	Food Retail	279	N/A	N/A	19	120	2,874	0.033
West Mill	Residential	1603	21	84	N/A	N/A	12,600	0.146
East Mill	Residential	3284	32	128	N/A	N/A	19,200	0.222
Totals							46,911	0.543

- 11.4 As can be seen from the above table, the expected foul water discharge from the site is 46,911 litres per day, which is an average of 0.543l/s.

SURFACE WATER DRAINAGE STRATEGY

- 11.5 In line with the Building Regulations, planning policy and the SuDS Manual, the hierarchy for surface water disposal has been followed in the design process.
- 11.6 The use of infiltration techniques was considered, however due to the previous usage of the site and the potential for contaminated and made ground, infiltration is considered unviable. The response from the LLFA at the pre-app stage stated that soakaways should not be used.
- 11.7 Discharge to a watercourse was then considered. As the site currently has numerous outfalls to the culverted watercourses running through the site, this is the preferred method of surface water discharge.
- 11.8 The site is approximately 1.52ha in area and is fully impermeable. At 140l/s/ha, the existing brownfield runoff rate is 212.8l/s. In accordance with the Kirklees Local Plan, a 30% reduction in discharge rate should be applied to brownfield developments. The LLFA also confirmed in their pre-app comments that a 30% discount would be



suitable for this site. This would equate to a brownfield betterment rate of 149l/s. Therefore, discharge to the River Colne will be restricted to 149l/s.

- 11.9 The proposed impermeable area of the site is 1.01ha. It is proposed to connect to the River Colne towards the east of the site. An orifice plate with a diameter of 251mm will be used on the eastern outfall to restrict the discharge to 149l/s.
- 11.10 In order to contain the 1 in 100 year + 45% climate change rainfall scenario within the site, adhering to the above brownfield betterment rate, a geocellular attenuation tank with a storage of 290.7m³ will be required. The 45% climate change allowance is the Aire and Calder Management Catchment peak rainfall upper end allowance for the 2070s epoch.
- 11.11 The hydraulic calculations in Appendix E demonstrate there is no surcharging of the drainage system in the 1 in 2 year storm event, no surface water flooding in the 1 in 30 year + 40% climate change rainfall event, and no surface water flooding in the 1 in 100 year + 45% climate change rainfall event.
- 11.12 Furthermore, in all modelled scenarios, the total discharge rate from the site is less than the brownfield betterment rate of 149l/s.
- 11.13 A surcharged outfall has also been modelled to check the system still functions efficiently during a high-river level event. The depths of the surcharged outfalls have been taken from the EA modelling data. As can be seen from the hydraulic calculations in Appendix E, there is no flooding within the site in the 1 in 30 year +40% climate change rainfall event, and no surface water flooding in the 1 in 100 year +45% climate change rainfall event.
- 11.14 If the system were to exceed capacity, for example, due to a failure of the drainage system or a rainfall scenario in excess of the design event, water would leave the drainage system and follow the overland flow route towards the River Colne, and hence would not increase the flood risk of neighbouring properties.
- 11.15 Surface water will be collected from roofs, and from the parking/delivery areas via gullies and drainage channels and will then pass through a bypass separator in order to provide the appropriate level of water treatment, in line with the SuDS Manual and the Pollution Prevention Guidance for Businesses. The separator has been sized in accordance with the Building Regulations Part H.
- 11.16 Under Chapter 26 of the SuDS Manual, the runoff from the proposed roofs would be classified as a low risk, and the runoff from the parking/delivery areas would be classified as a medium risk and hence the Simple Index Approach should be used for assessing the level of water treatment required.
- 11.17 The following table shows the pollution hazard indices and mitigation indices for the site.



Table 7 - Simple Index Approach

Existing Pollution Risk				
	Hazard Level	TSS	Metals	Hydrocarbons
Other roofs (typically commercial/industrial)	<i>Low</i>	<i>0.3</i>	<i>0.2</i>	<i>0.05</i>
Proposed Pollution Mitigation				
SPEL ESR Stormceptor	X 0.5	0.8	0.6	0.9
<i>Mitigation Index Achieved</i>		<i>0.8</i>	<i>0.6</i>	<i>0.9</i>
<i>Mitigation Index Required</i>		<i>0.3</i>	<i>0.2</i>	<i>0.05</i>
		OK	OK	OK
Existing Pollution Risk				
	Hazard Level	TSS	Metals	Hydrocarbons
Commercial yard and delivery areas, non-residential car parking with frequent change.	<i>Medium</i>	<i>0.7</i>	<i>0.6</i>	<i>0.7</i>
Proposed Pollution Mitigation				
SPEL ESR Stormceptor	X 0.5	0.8	0.6	0.9
<i>Mitigation Index Achieved</i>		<i>0.8</i>	<i>0.6</i>	<i>0.9</i>
<i>Mitigation Index Required</i>		<i>0.7</i>	<i>0.6</i>	<i>0.7</i>
		OK	OK	OK

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

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



12 FLOOD RISK MITIGATION MEASURES

- 12.1 The proposed development lies within Flood Zones 1, 2 and 3 and the site is at risk from fluvial, pluvial, sewer and reservoir flooding.
- 12.2 In order to mitigate against the risk of the flooding, the following techniques will be used, as shown in Table 5 in Section 6.

Table 8 – Summary of Proposed Flood Risk Mitigation Measures

Building	Flood Zone	Main Source of Fluvial Flood Risk	Proposed FFL (mAOD)	Flood Resistance and Resilience Measures
West Mill	FZ2	Colne/Crowhill	Existing Lower Ground Floor Level = 180.35 Existing Basement Floor Level = 178.00	Up to 179.13mAOD
East Mill	FZ2	Colne/Crowhill	Existing Lower Ground Floor Level = 180.80 Existing Basement Floor Level = 178.10	Up to 179.13mAOD
A	FZ3a	Crowhill	Existing Ground Floor Level = 180.90	Up to 600mm above adjacent road levels
B	FZ3a	Crowhill	Existing Ground Floor Level = 180.90	Up to 600mm above adjacent road levels
C	FZ2	Crowhill	180.90	None required

- 12.3 The following flood resistance and resilience measures should be applied to the proposed and existing buildings, as per Table 7:
- Using flood resistance materials that have low permeability,
 - Making sure any doors, windows or other openings are flood resistance,
 - Using flood resilience materials (for example lime plaster),
 - Raising all sensitive electrical equipment, wiring and sockets,
 - Making it easy for water to drain away after flooding such as installing a sump and a pump,
 - Making sure there is access to all spaces to enable drying and cleaning,
 - Making sure that soil pipes are protected from back-flow such as by using non-return valves.
- 12.4 Advice from a structural engineer will be required on the suitability of the above measures, so as not to affect the structural stability of the proposed and existing buildings during a flood event.
- 12.5 In line with standing advice, buildings will be raised in relation to surrounding ground levels to divert water away from the buildings and manage the overland flow route in hardstanding and landscaped areas.



13 ACCESS AND ESCAPE

- 13.1 As parts of the development are below the estimated flood level in the 1%AEP+30% climate change river level event, details on safe access and escape from the site are required as part of a site-specific Flood Risk Assessment.
- 13.2 The safe access and escape from the site will be via the proposed site entrance off Brougham Road.
- 13.3 A summary of the proposed access and escape from each building within the site is shown below:

Table 9 – Summary of Access and Escape from each Building

Building	Flood Zone	Main Source of Fluvial Flood Risk	Access and Escape Facilities
West Mill	FZ2	Colne/Crowhill	Entrances at the southern end of the building will be above the 1%AEP+30% climate change estimated flood level from the 2019 Colne Model. The 2019 Crowhill Model estimates a depth of flooding of 0.01m at this location with a flow rate of 1.59l/s. Hence, access and escape through this depth of water at this velocity would not be classified as “Danger for some”, and access and escape can take place through the minimal floodwater.
East Mill	FZ2	Colne/Crowhill	Entrances at the southern end of the building will be above the 1%AEP+30% climate change estimated flood level from the 2019 Colne Model. The 2019 Crowhill Model estimates a depth of flooding of 0.01m at this location with a flow rate of 1.59l/s. Hence, access and escape through this depth of water at this velocity would not be classified as “Danger for some”, and access and escape can take place through the minimal floodwater.
A	FZ3a	Crowhill	The 2019 Crowhill Model estimates a depth of flooding of 0.04m at this location with a flow rate of 1.59l/s. Hence, access and escape through this depth of water at this velocity would not be classified as “Danger for some”, and access and escape can take place through the minimal floodwater.
B	FZ3a	Crowhill	The 2019 Crowhill Model estimates a depth of flooding of 0.04m at this location with a flow rate of 1.59l/s. Hence, access and escape through this depth of water at this velocity would not be classified as “Danger for some”, and access and escape can take place through the minimal floodwater.
C	FZ2	Crowhill	The 2019 Crowhill Model estimates a depth of flooding of 0.02m at this location with a flow rate of 1.59l/s. Hence, access and escape through this depth of water at this velocity would not be classified as “Danger for some”, and access and escape can take place through the minimal floodwater.

- 13.4 The references to depths and velocities in the above table are taken from the flood information data provided by the EA. The “Danger for some” refers to the ADEPT and EA Flood Risk Emergency Plans for New Developments guidance (September 2019). In some situations, where safe routes can’t be designed to be dry, access and escape is acceptable through limited flood depths, however the routes should not be subject to a



depth and velocity that would result in a flood hazard rating of 0.75 or greater, shown as “Danger for some” in the below figure, taken from FD2320 Flood Risk Assessment Guidance for New Development (March 2005).

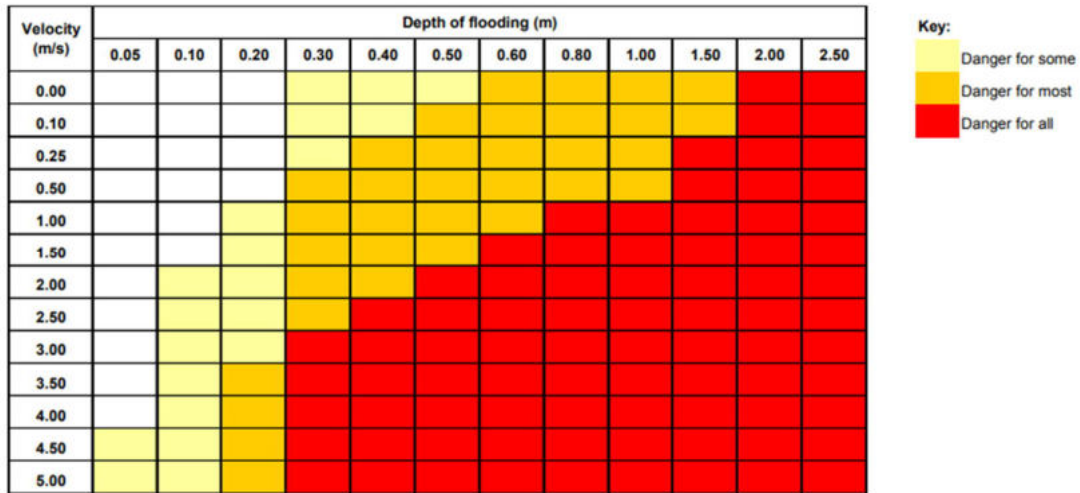


Figure 8 – Danger to People for Different Combinations of Depth and Velocity

- 13.5 Any basement areas or lower ground floor areas situated below the estimated flood level must have clear, internal access to an upper floor above the estimated flood level.
- 13.6 Owners, operators and occupiers of the development must sign up to the EA’s Flood Warning service. The site is covered by the River Colne and Fenay Beck Catchments Flood Alert, and is immediately downstream of the River Colne at Marsden Flood Warning Area.
- 13.7 Flood Alerts can be issued between 2 days and 2 hours in advance of flooding, and Flood Warnings can be issued between 1 day and 30 minutes in advance of flooding.
- 13.8 If a more extreme flooding scenario were to occur, and elevate the flood hazard rating above the “Danger for some” threshold, as all residential properties will be set more than 600mm above the design flood level, there will be sufficient internal safe places of refuge available for all residents on the site.
- 13.9 Therefore, safe access and escape has been considered for the development for each individual building and is deemed acceptable.



14 MAINTENANCE OF DRAINAGE SYSTEMS

14.1 The system has been designed so that the drainage system is fully accessible and maintainable with flooding easily visible if it occurs. The maintenance of the drainage system is the responsibility of the site owner.

14.2 The maintenance schedule for the individual elements of the scheme is as per manufacturer's recommendations and as follows.

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

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

Attenuation Tank	
Operation	Frequency
Inspect and identify any areas that are not operating correctly, if required, take remedial actions	Monthly for 3 months, then six monthly
Debris removal from attenuation tank (where may cause risk performance)	As required, but at least twice a year
Where rainfall into attenuation tank from above, check surface or filter for blockage or silt, algae or other matter by jetting	As required, but at least twice a year
Remove sediment from upstream surface water network by jetting.	Annually or as required



Attenuation Tank	
Operation	Frequency
Inspect/check all inlets, outlets, and overflow pipes to ensure that they are in good condition and operating as designed.	Annually and after large storms with remedials as required.
Survey inside of tank for sediment build up and remove if necessary.	Every 5 years.

Hydrocarbon Interceptor / Bypass Separator	
Operation	Frequency
Remove litter and debris and inspect for sediment, oil and grease accumulation	Six Monthly, or as required by the Manufacturer.
Change the Filter Media	As recommended by the Manufacturer
Remove sediment, oil, grease and floatables	As necessary – indicated by system inspection and monitoring system, or immediately following a fuel spill.
Replace malfunctioning parts or structures	As required
Inspect for evidence of poor operation	Six monthly
Inspect filter media and establish appropriate replacement frequencies	Six monthly or as required by the Manufacturer.
Inspect sediment accumulation rates and establish appropriate removal frequencies.	Monthly for first half year of operation, then every six months, or as required by the Manufacturer.
Note – All Hydrocarbon Interceptors should be maintained and monitored under a Service Plan which is compatible with the Manufacturer’s warranty and suited to the plant used.	

- 14.3 The maintenance of the drainage network and SuDS features are to be linked with the wider site maintenance.
- 14.4 A log of all maintenance activities is to be kept and made available to the local planning authority (LPA) and / or the Lead Local Flood Authority (LLFA) on request.



15 CONCLUSION AND RECOMMENDATIONS

- 15.1 The proposals include the redevelopment of existing mill buildings to create a mixed-use development. The site lies within Flood Zones 1, 2 and 3 and hence has a high risk of fluvial flooding. The site experiences flooding from both the 2019 Colne Model, and the 2019 Crowhill Model.
- 15.2 The site is also at risk from surface water flooding, flooding from existing sewers, and reservoir flooding. The site is not at risk from groundwater flooding.
- 15.3 As the site has been allocated for mixed-use development as part of the Kirklees Local Plan 2019, a Sequential Test should not be required, in line with the NPPF, although a Sequential Test has been undertaken which concludes there are no similar available sites in Marsden with a lower level of flood risk. The proposed usage of the buildings within the site has been designed so more vulnerable uses are in areas with a lower risk of flooding, and hence an Exception Test is not required, in line with the NPPF.
- 15.4 Flood information data obtained from the Environment Agency indicates a design flood level for the 1% AEP + 30% climate change storm event of 178.53mAOD for buildings affected by the 2019 Colne Model. The existing ground floor levels for the West and East Mill buildings are set above 179.13mAOD, although both buildings have non-habitable basement areas below the design flood level. Flood resistance and resilience measures will be required up to a level of 179.13mAOD for the existing West and East Mill buildings.
- 15.5 As part of pre-planning bespoke advice from the Environment Agency, it was confirmed that the flooding from the 2019 Crowhill Model was an overland flow route. Therefore, existing buildings A and B will have 600mm of flood resistance and resilience techniques above the existing adjacent road level to protect them against the overland flow route.
- 15.6 The site entrance will be used as the safe access and escape route from the development. The route from each building has been considered individually and is deemed acceptable.
- 15.7 The owners, operators and occupiers of the development must sign up for the EA Flood Warning notification system.
- 15.8 There are existing culverted watercourses within the site boundary, both classified as EA Main Rivers. It is proposed to demolish the existing buildings above the culverted section of the River Colne, to enable de-culverting of this section of the river.
- 15.9 The surface water drainage system has been designed in accordance with planning policy, building regulations, and industry guidance and will discharge to the River Colne, with the discharge rate restricted to the 30% brownfield betterment rate of 149l/s using a flow control device. Surface water storage totalling 290.7m³ will be required in order to contain the 1 in 100 year +45% climate change storm event within the site.
- 15.10 The proposed foul water drainage system has been designed in accordance with planning policy, building regulations, and industry guidance and will connect to the Yorkshire Water combined sewer in Crowther Bruce Mill Road. The total expected daily discharge of foul water is 46,911 litres.
- 15.11 The proposed development is wholly suitable for the proposed site on the basis of national and local planning policy and will not have any implications on neighbouring properties in terms of flood risk.

Jonathan Allchin IEng MICE
Principal Engineer