

# Flood Risk Assessment (FRA)

REF N. 4003

May 2019

265 BURLINGTON ROAD  
NEW MALDEN



## Document Issue Record

**Project:** Phase 1 Flood Risk Assessment

**Prepared for:** Redrow Homes Limited

**Reference:** 4003

**Site Location:** 265 Burlington Road, New Malden, KT3 4PJ

**Proposed Development:** Demolition of the existing buildings and erection of two blocks of development ranging in height between seven and 15 storeys and comprising 456 new homes, of which 114 will be one beds, 290 will be two beds and 52 will be three beds. 499sqm of B1(a) office space will be accommodated at ground floor level along with 220 car parking spaces, 830 cycle parking spaces, a realigned junction onto Burlington Road, hard and soft landscaping and associated residential facilities. The application also includes minor changes to the layout and configuration of the retained Tesco car park.

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## 1. Summary

- 1.1 Ambiental Environmental Assessment has been appointed by Redrow Homes Limited to undertake a National Planning Policy Framework (NPPF) compliant Flood Risk Assessment (FRA) for the proposed development at 265 Burlington Road, New Malden, KT3 4PJ.
- 1.2 The site comprises a vacant 1980's office building arranged over two storeys with an interconnecting single storey office building at the rear and a section of car park land.
- 1.3 Demolition of the existing buildings and erection of two blocks of development ranging in height between seven and 15 storeys and comprising 456 new homes, of which 114 will be one beds, 290 will be two beds and 52 will be three beds. 499sqm of B1(a) office space will be accommodated at ground floor level along with 220 car parking spaces, 830 cycle parking spaces, a realigned junction onto Burlington Road, hard and soft landscaping and associated residential facilities. The application also includes minor changes to the layout and configuration of the retained Tesco car park.
- 1.4 The nearest watercourse to the site is the Pyl Brook, located to the north of the site. The Pyl Brook is classified as an EA main river. Communication with the EA has defined the top of bank. This has been required to assess the need for EA activity permits. At places to the north of the proposed development there is encroachment within the required 8m buffer. As the application progresses there will be a need therefore to apply for EA Activity Permits within this area.
- 1.5 The Environment Agency Flood Map for Planning identifies that the site is located within Flood Zone 2 and 3 (Medium and High Risk). Flood Zone 2 comprises land assessed as having between a 1 in 100 and 1 in 1000 annual probability of river flooding (1% – 0.1%). Flood Zone 3 comprises land assessed as having a 1 in 100 or greater annual probability of river flooding (>1%).
- 1.6 Review of the London Boroughs of Croydon, Sutton Merton and Wandsworth SFRA, has demonstrated that the redline application boundary is not located within Flood Zone 3b.
- 1.7 Under the NPPF vulnerability classification guidance, the existing site is classified as 'Less Vulnerable' due to the solely commercial use. The proposed development to provide residential and commercial uses and is therefore classified as 'More vulnerable' and 'Less Vulnerable' respectively).
- 1.8 As such, and given that:
  - a) The site is an existing brownfield site;
  - b) All sleeping and residential units are to be located above the 1 in 100+35% event;
  - c) Safe access / egress to be provided from the site during a 1 in 100 + 35% event;
  - d) Flood compensation can be provided to support the proposed development;
  - e) Betterment can be provided by the formalisation of a flood warning and evacuation plan.

Following the guidelines contained within the NPPF, the proposed development could be considered suitable assuming appropriate mitigation (including adequate warning procedures) can be maintained for the lifetime of the development.

Development Description	Existing	Proposed
<b>Development Type:</b>	Less Vulnerable uses	456 units at first floor level and above and commercial premises at ground floor level
<b>Number of Bedrooms:</b>	N/A <sup>2</sup>	114 – one bed, 290 – 2 bed, 52 – 3 bed (456 in total)
<b>EA Vulnerability Classification:</b>	Less Vulnerable	Less and More Vulnerable
<b>External Ground Level:</b>	Between 14.02mAOD to 15.00mAOD	Change – post development discussed in Section 8
<b>Level of Sleeping Accommodation:</b>	N/A <sup>2</sup>	First Floor and above. Should be set no lower than 14.95mAOD (600mm above 1% +35%CC flood level)
<b>Impermeable Surface Area:</b>	N/A <sup>2</sup>	N/A <sup>2</sup>
<b>Surface Water Drainage:</b>	N/A <sup>1</sup>	Surface Water Drainage Strategy to accompany application (Ambiental Ref 4003 SWDS)
<b>Site Size:</b>	N/A <sup>2</sup>	No change
Risk to Development	Summary	Comment
<b>EA Flood Zone:</b>	2 and 3	
<b>Flood Source:</b>	Fluvial	Pyl Brook
<b>1 in 20 year event</b>	<b>N/A</b>	
<b>1 in 100-year flood level</b>	14.26mAOD	Site unaffected for 1:20 year event. Node 49563 – flood plain levels (2D)
<b>1 in 100 year +35% (climate change) flood level</b>	14.35mAOD	
<b>Recorded Flood Events in Area:</b>	Yes	Surface water flood events (based on SFRA records) and 1968 fluvial event (based on EA records)
<b>Recorded Flood Events at Site:</b>	Yes	1968 fluvial event
<b>SFRA Available:</b>	Yes	Level 2 – SFRA – Merton
Management Measures	Summary	Comment
<b>Ground floor level above extreme flood levels:</b>	n/a	Ground Floor to be used for car parking and commercial uses – First Floor and above to accommodate residential units
<b>Safe Access/Egress Route:</b>	Yes	EA Flood Warning Service/ Section 7 of this FRA
<b>Flood Resilient Design:</b>	Yes	Section 7 of this report
<b>Site Drainage Plan:</b>	N/A <sup>2</sup>	Surface Water Drainage Strategy to accompany application (Ambiental Ref 4003 SWDS)
<b>Flood Warning &amp; Evacuation Plan:</b>	Yes	EA's Flood Warning Service
Offsite Impacts	Summary	Comment
<b>Displacement of floodwater:</b>	No	Compensation provided and discussed Section 8 of this FRA – Section 8
<b>Increase in surface run-off generation:</b>	N/A <sup>1</sup>	SWDS provided as supporting document to FRA (Ambiental Ref 4003)
<b>Impact on hydraulic performance of channels:</b>	None	Does not affect channel

Table 1 Summary of flood risks, impacts and proposed flood mitigation measures.

N/A<sup>1</sup> not required for this assessment; N/A<sup>2</sup> data not available.

## 2. Development Description and Site Area

### Proposed Development and Location

- 2.1 The proposed development is located at 265 Burlington Road, New Malden, KT3 4PJ (Figure 1).
- 2.2 The site comprises a vacant 1980's office building arranged over two storeys with an interconnecting single storey office building at the rear and a section of car park land.
- 2.3 Demolition of the existing buildings and erection of two blocks of development ranging in height between seven and 15 storeys and comprising 456 new homes, of which 114 will be one beds, 290 will be two beds and 52 will be three beds. 499sqm of B1(a) office space will be accommodated at ground floor level along with 220 car parking spaces, 830 cycle parking spaces, a realigned junction onto Burlington Road, hard and soft landscaping and associated residential facilities. The application also includes minor changes to the layout and configuration of the retained Tesco car park.
- 2.4 The nearest watercourse to the site is the Pyl Brook, located to the north of the site. The Pyl Brook is an EA main river. Communication with the EA has defined the top of bank. This has been required to assess the need for EA activity permits. At places to the north of the proposed development there is encroachment within the 8m buffer. As the application progresses there will be a need therefore to apply for EA Activity Permits.
- 2.5 A site-specific topographic survey of the site has demonstrated elevations on site vary between approximately 14.02mAOD at the lowest point along the west boundary rising to 15.00m AOD to the east on Burlington Road.

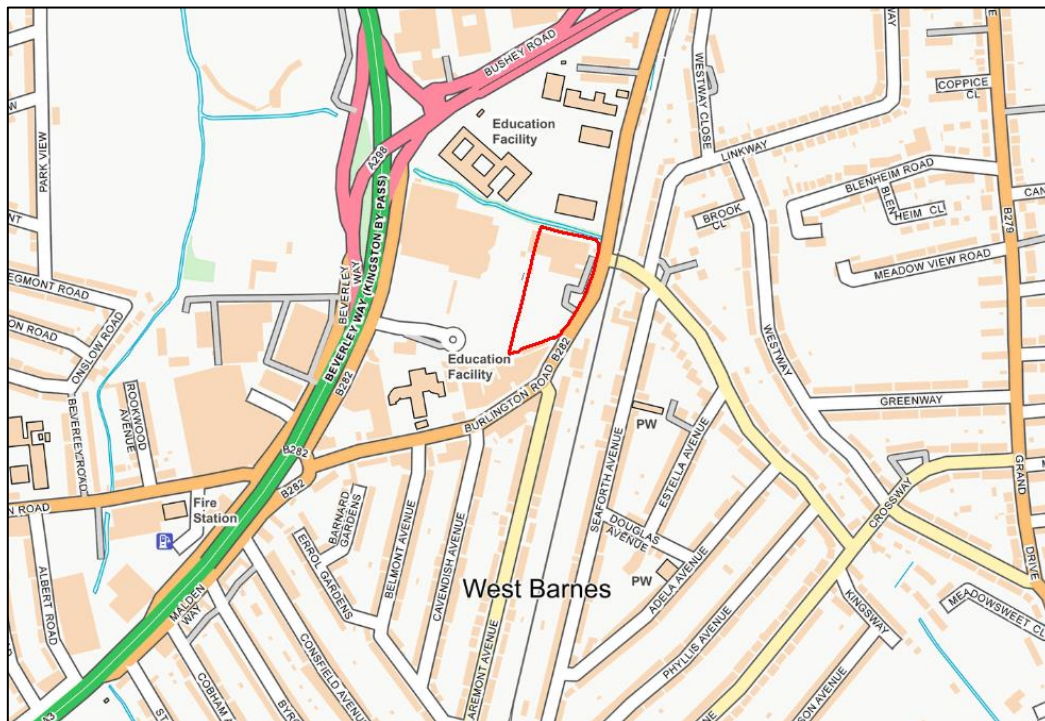


Figure 1: Location Map, identifying the location of the proposed development (Source: OS)

## Vulnerability Classification

- 2.6 The Environment Agency Flood Map for Planning (Figure 2) identifies that the site is located within Flood Zone 2 and 3 (Medium and High Risk). Flood Zone 2 comprises land assessed as having between a 1 in 100 and 1 in 1000 annual probability of river flooding (1% – 0.1%). Flood Zone 3 comprises land assessed as having a 1 in 100 or greater annual probability of river flooding (>1%).
- 2.7 Under the NPPF, the existing site is 'Less Vulnerable'. The proposed development is for the demolition of the existing structures to provide a new development which will consist of residential and commercial uses (More Vulnerable and Less Vulnerable respectively).

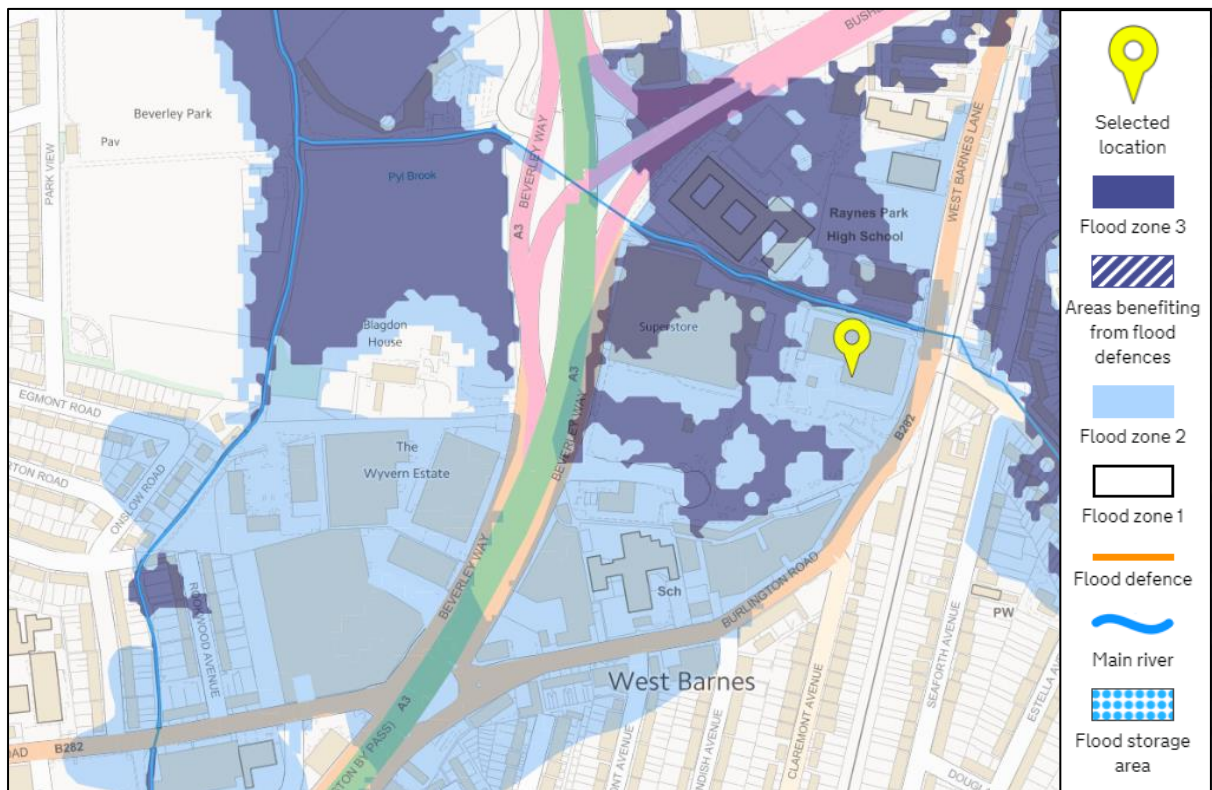


Figure 2: EA Flood Map for Planning

## Geology

- 2.8 The site's bedrock geology has been identified by the British Geological Survey's public mapping model as the London Clay Formation consisting of clay and silt. The superficial deposits have been recorded as Kempton Park Gravel consisting of Sand and Gravel (Source: BGS online).

### 3. Sequential Test/Exception Test

3.1 Under the NPPF, all new planning applications should undergo a *Sequential Test*. This test should be implemented by local planning authorities with a view to locating particularly vulnerable new developments (e.g. residential, hospitals, mobile homes etc.) outside of the floodplain. The NPPF *Sequential Test: Flood Risk Vulnerability and Flood Zone 'Compatibility' Table* is reproduced below;

Flood Risk Vulnerability Classification		Essential Infrastructure	Water Compatible	Highly Vulnerable	More Vulnerable	Less Vulnerable
Flood Zone	Zone 1	✓	✓	✓	✓	✓
	Zone 2	✓	✓	Exception Test Required	✓	✓
	Zone 3a	Exception Test Required	✓	✗	Exception Test Required	✓
	Zone 3b <i>Functional Floodplain</i>	Exception Test Required	✓	✗	✗	✗

Table 2 The Sequential Test: Flood Risk Vulnerability and Flood Zone 'Compatibility' Table as specified by NPPF. Please note: ✓ means development is appropriate; ✗ means the development should not be permitted.

3.2 Using the principles of the Sequential Test outlined above, the proposed development is 'Less and More Vulnerable' and located within Flood Zone 2 and 3 (as defined by the EA Flood Map for Planning, Figure 3) and as such, the development is required to implement the Exception Test, in accordance with Paragraph 160 and 161 of the NPPF.

3.3 For the Exception Test to be passed, the proposed development must meet the following criteria:

- it must be demonstrated that the development provides wider sustainability benefits to the community that outweigh the flood risk, as informed by a Strategic Flood Risk Assessment;
- a Flood Risk Assessment demonstrates that the development will be safe, without increasing flood risk elsewhere, and, where possible, will reduce flood risk overall.

(Source: the NPPF Paragraph 160)

3.4 As such, and in order to address these requirements, the planning application submitted by the applicant is required to be accompanied by an FRA which shows that the development can be achieved in a sustainable manner, with an overall reduction of flood risk to the site and surrounding area.



## 4. Site Flood Hazards

### Sources of Flooding

4.1 The proposed development is located within Flood Zone 2 and 3 and can be considered to be ‘Less and More Vulnerable’ according to NPPF vulnerability guidelines. Table 3 summarises the potential sources of flooding to the site:

Source	Description
Fluvial	Pyl Brook
Surface	Moderate
Groundwater	Low Risk
Sewer	Local Sewer Network

Table 3 Summary of flood sources.

### Fluvial

4.2 The EA Flood Map for Planning indicates that the site lies within Flood Zones 2 and 3 (Figure 2). The nearest watercourse to the site is the Pyl Brook, located to the north of the site. The Pyl Brook is an EA main river.

4.3 Review of the Level 2 SFRA has demonstrated that the site is not in Flood Zone 3b - it is however in close proximity. The redline application boundary for this development demonstrates the site to be outside of the Flood Zone 3b extent as demonstrated in Figure 3 below.

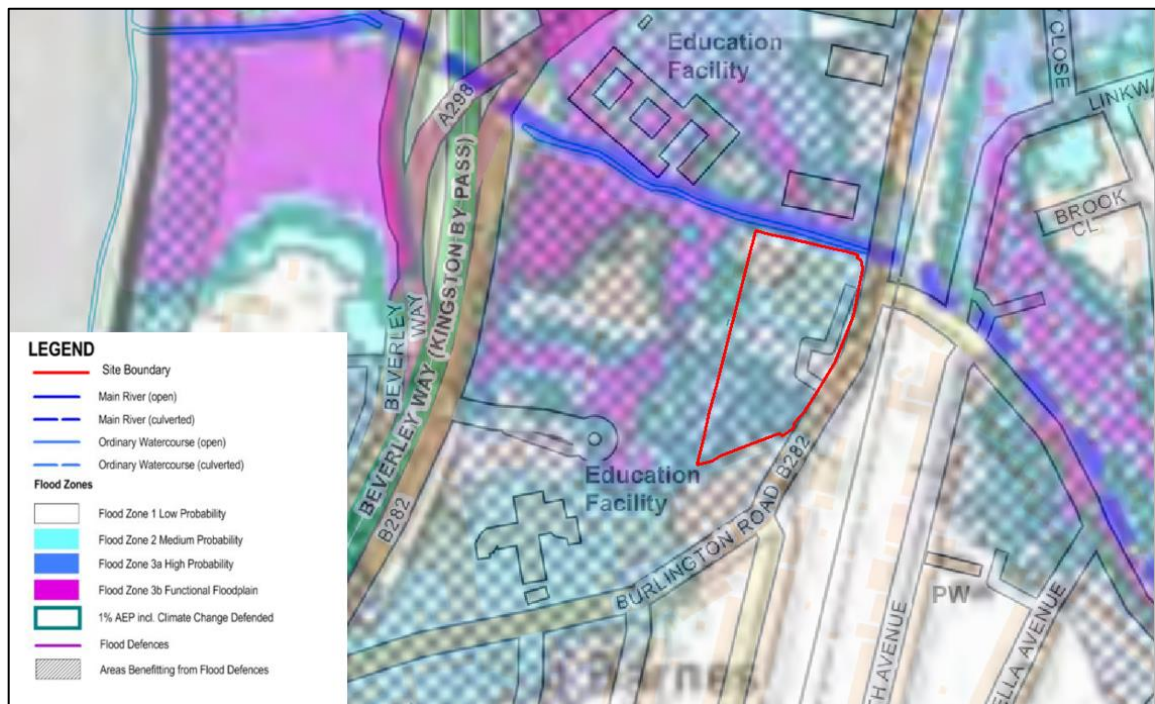


Figure 3 - Flood Zone map from the Level 2 SFRA – site demonstrated as redline application boundary.

- 4.4 To further understand the risk of flooding to the site Ambiental have liaised with the EA to confirm whether detailed site-specific data is available at this location. Ambiental have received a detailed flood data pack – a Product 4 dataset.
- 4.5 Ambiental, as part of further detailed discussions with the EA, have also obtained the Product 5, 6 and 7 for the Beverley Brook 2D model. Product 5, 6 and 7 are the model and model files used to generate the Product 4 dataset.
- 4.6 In-channel flood levels and 2D floodplain levels have been provided as part of the Product 4 dataset. It has been deemed that the floodplain levels could be considered more representative of the mechanisms of flooding at the site.
- 4.7 Analysis of both the 1D and 2D nodes has been conducted as part of this assessment.
- 4.8 Ambiental have re-run the existing EA model for the proposed development site to take into account the required 35% increase in flows to account for climate change.

## 1D – In-Channel Analysis

- 4.9 Ambiental have been provided with a Product 4 dataset. Within the Product 4 dataset an annual exceedance probability modelled flood extent map has been provided. This map demonstrates the flood extent for a range of return periods;
- 20% (1 in 5 year event)
  - 5% (1 in 20 year event)
  - 2% (1 in 50 year event)
  - 1% (1 in 100 year event)
  - 1% + CC (20%) (1 in year event + climate change 20%)

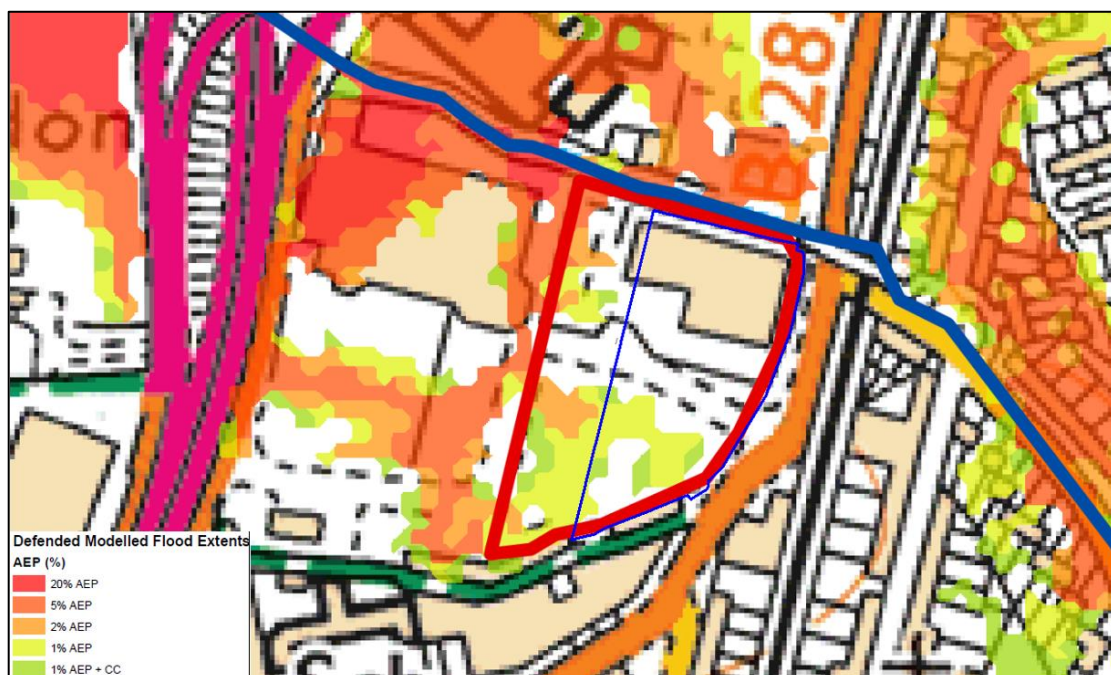
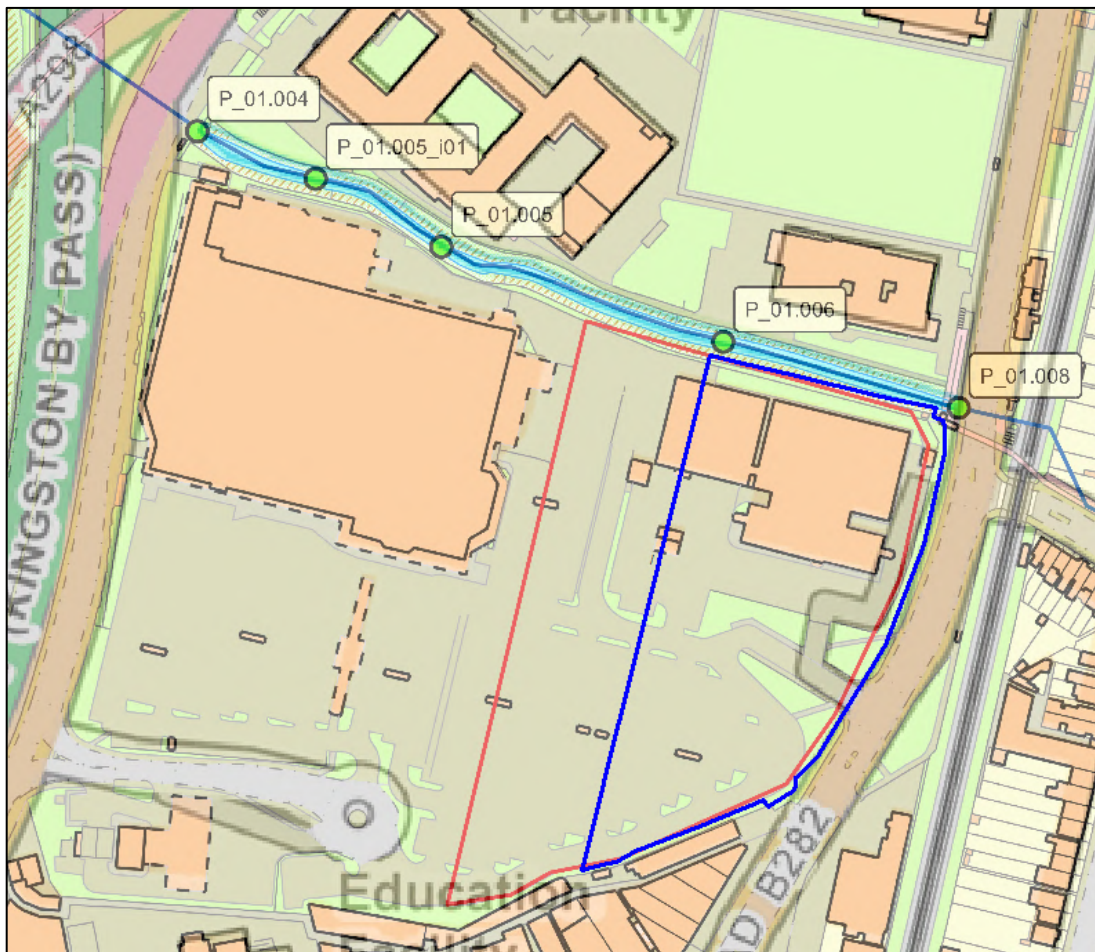


Figure 4 – EA defended Modelled Flood Extents - application boundary demonstrated as blue line boundary within the redline boundary provided by the EA.

- 4.10 From review of Figure 4, flood water appears to exceed the channel capacity downstream of the site. The flood water then follows the fall of the topography to the southernmost part of the site.
- 4.11 The topography of the site is greatest to the north of the site. This is further evidenced when reviewing the in-channel flood levels of the Pyl Brook against topographic levels adjacent to these nodes. Node P\_01.008 and P\_1.006 could be considered most representative.
- 4.12 Topographic levels using 2m LiDAR has demonstrated that top of bank within the redline application boundary to be 15.01mAOD for Node P\_01.008 and 14.80mAOD for Node – P\_01.006. Comparison of these elevations with the Flood Levels demonstrated in Figure 5, demonstrates that the site at this point is topographically greater than the modelled flood levels.



Node ID	Easting	Northing	Modelled Flood Level for Annual Exceedance Probability Shown, in Metres AOD					1% AEP Plus Climate Change
			20% AEP	5% AEP	2% AEP	1% AEP		
06340_PY_P_01.008	522733	168498	14.37	14.64	14.66	14.67	14.68	
06340_PY_P_01.006	522654	168520	14.29	14.6	14.63	14.65	14.66	
06340_PY_P_01.005	522560	168551	14.2	14.51	14.53	14.53	14.54	
06340_PY_P_01.005_i01	522518	168574	14.18	14.56	14.59	14.61	14.63	
06340_PY_P_01.004	522479	168590	14.14	14.5	14.55	14.58	14.6	

Figure 5 – In channel Node Location and corresponding Flood Levels table – site demonstrated as blue line boundary

- 4.13 Analysis of the elevations downstream of the site have demonstrated a bank elevation of 14.562mAOD – downstream of P\_01.006. From review of the modelled flood levels shown in Figure 5, channel exceedance could occur at this point, resulting in flooding on site – this is also indicated on the AEP map in Figure 4. The below image (Figure 6) demonstrates the topographic levels (2m LiDAR) of the channel where exceedance occurs with the EA modelled flood extents map overlain to further evidence how flooding could occur on site.



Figure 6 – Transect of river profile, with 1d node location and AEP exceedance demonstrating exceedance of channel

## 2D Node Analysis

- 4.14 From review of the EA Product 4 dataset, multiple nodes have been provided across the proposed development site. The node most representative of the site location with respect to the southernmost building to be constructed is Node 49563. A range of annual exceedance probabilities have been provided for this node - these are demonstrated in Figures 7 and 8.
- 4.15 Analysis of Figure 8 has demonstrated that when reviewing Node 49563, the site would only be affected by flooding during a 1 in 100 year event (1% event). The flood level for this event is 14.29mAOD at Node 49563. Topographic levels where the southernmost building is to be constructed are between 14.01mAOD and 14.40mAOD (as defined by Site Specific Topographic Survey). Comparison of the maximum flood level (14.29mAOD) and minimum topography (14.01mAOD) indicates that depths could be as great as 0.28m for the 1 in 100 year event (1% event).
- 4.16 For Node 49563, no flooding has been demonstrated during a 1% + CC (20%) event. However, from review of the AEP map it does demonstrate that where the southernmost structure would be constructed that this area could be inundated during this event.
- 4.17 As such, the risk of flooding from fluvial sources to the site could be considered **moderate**.

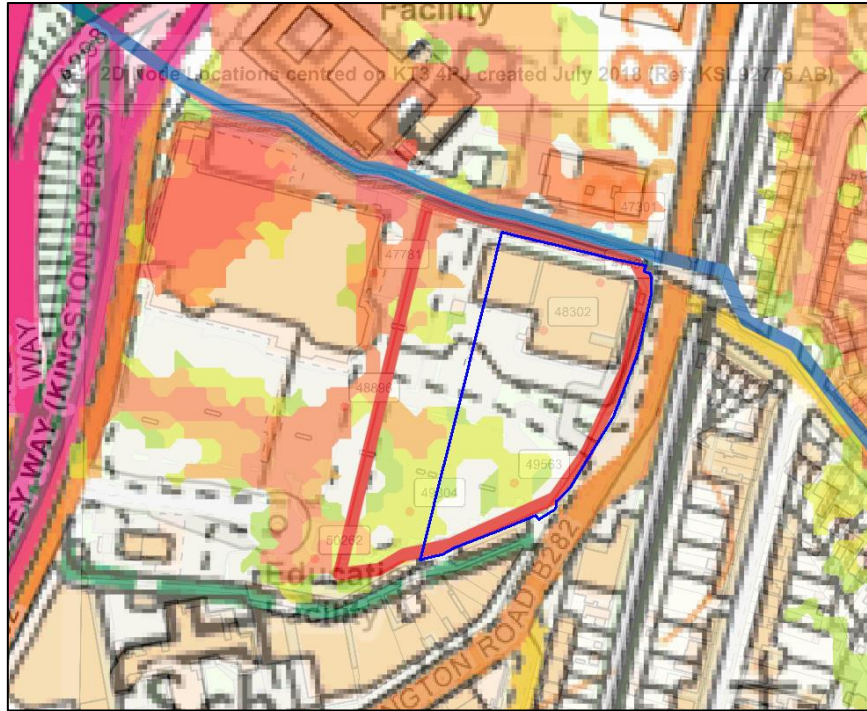


Figure 7– EA Flood Extents map with 2D nodes overlain.

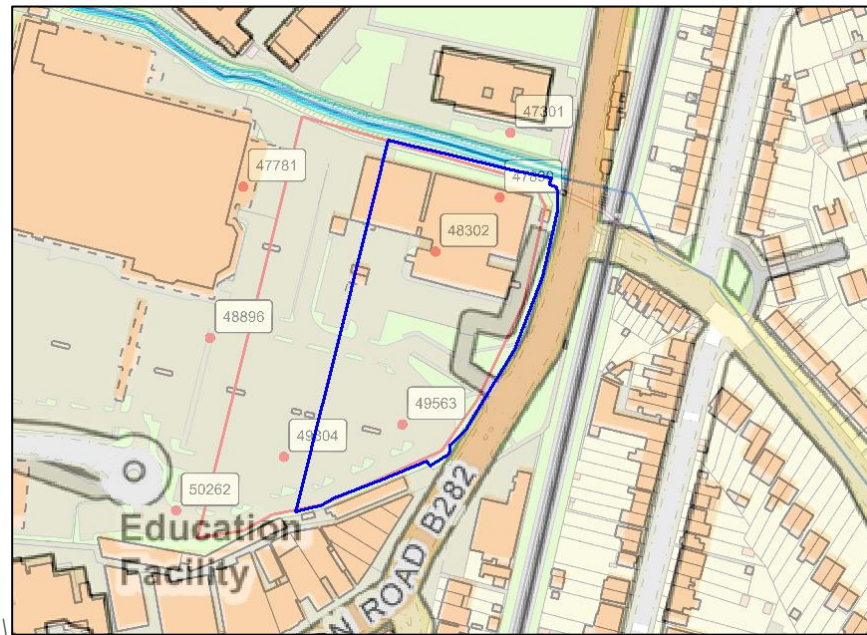


Figure 8– EA Flood Extents map with 2D nodes overlain.

Modelled Flood Level for Annual Exceedance Probability Shown, in Metres AOD							
Node ID	Easting	Northing	20% AEP	5% AEP	2% AEP	1% AEP	1% AEP Plus Climate Change
47301	522706	168519	Nil Return	14.55	14.60	14.63	14.71
47781	522581	168494	Nil Return	14.55	14.57	14.58	14.41
47890	522701	168489	Nil Return	Nil Return	Nil Return	Nil Return	14.83
48302	522671	168464	Nil Return	Nil Return	Nil Return	Nil Return	14.74
48896	522566	168424	Nil Return	14.40	14.41	14.42	Nil Return
49563	522656	168384	Nil Return	Nil Return	Nil Return	14.29	Nil Return
49804	522601	168369	Nil Return	Nil Return	Nil Return	14.29	Nil Return
50262	522551	168344	Nil Return	14.07	14.24	14.30	14.10

## Surface Water (Pluvial)

- 4.18 Review of the Level 2 SFRA – Appendix C identifies the proposed development site to be as Site 46 and 47. Within the SFRA for Site 47, it identifies the site to be located within a Critical Drainage Area (CDA). The site is in Group7\_002 which is an area with localised flooding issues. The SFRA stipulates that potential development should not increase flood risk to other areas in the CDA. The site is within Drainage Catchment 30, which is distributed across three London Boroughs, including Merton, Kingston and Sutton. It drains much of Worcester Park, Motspur Park and West Barnes.
- 4.19 The EA's Risk of Flooding from Surface Water map shows the site and surrounding area to be within of 'Low' risk of flooding from surface water area (Figure 9). Areas identified to be of 'Low' risk of flooding have between a 0.1% and 1% chance of flooding annually.
- 4.20 The EA Surface Water Depth Map - High Chance of Occurring (1:30 year event) demonstrates the site to be located in an area not to be affected by flooding as no depths are shown. The risk of flooding during this event is relatively low (Figure 10).
- 4.21 The EA Surface Water Depth Map - Medium Chance of Occurring (1:30 to 1:100-year event) demonstrates the site to be located in an area not to be affected by flooding as no depths are shown. The risk of flooding during this event is relatively low with the majority of the site remaining unaffected based on EA modelling (Figure 11).
- 4.22 The EA Surface Water Depth Map - Low Chance of Occurring (1:100 to 1:1000-year event) demonstrates the site to be in an area where depths could reach 300mm to 900mm for the majority of the site during this event (this is demonstrated in Figure 12). There is an area of the site that though is demonstrated be over 900mm depth during this event. The southern area of the site is greater affected than that of the north.
- 4.23 The Level 2 SFRA states that there have been 3 records of surface water flood events within a 100m radius of the site. However, there are no reported incidents held by Merton Council for this site itself.
- 4.24 Based on the desktop analysis, the risk of flooding from surface water flooding to the site could be considered **moderate**.

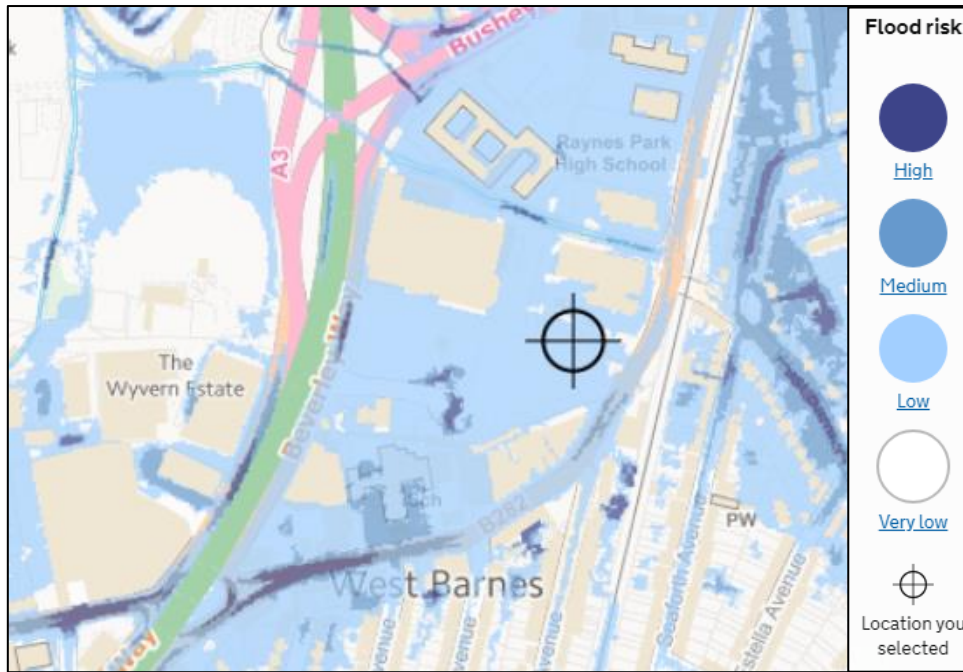


Figure 9: EA Surface Water Flood Risk Map. (Source: EA)

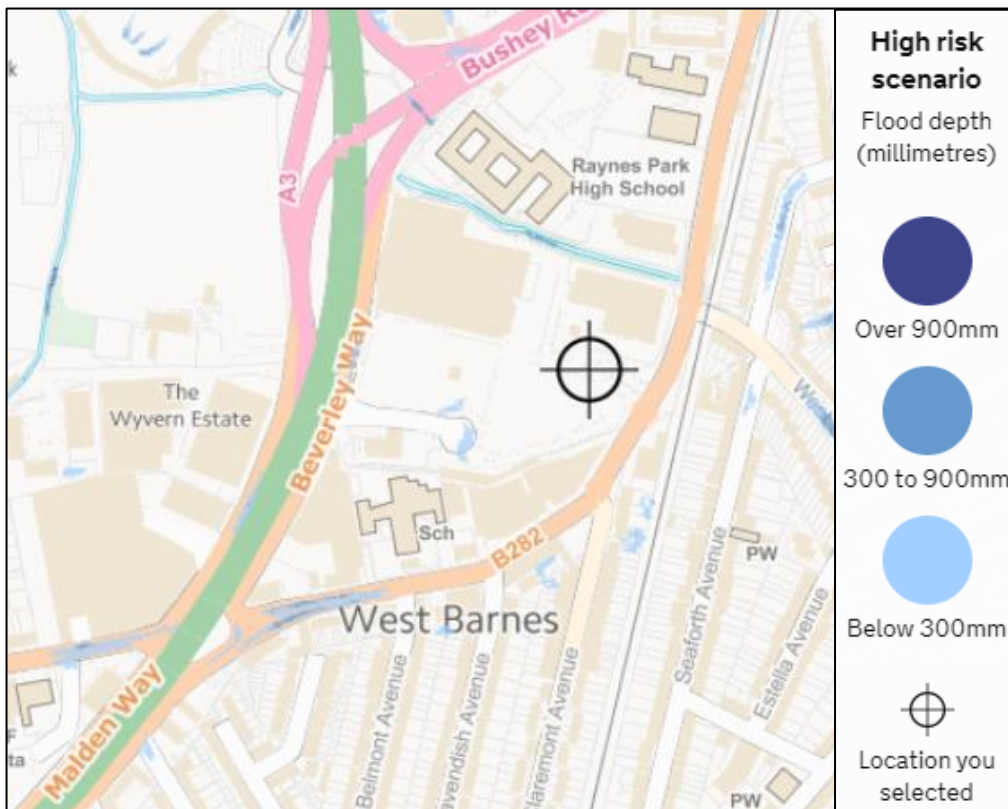


Figure 10: Surface Water Depths for a High Risk Scenario. (Source: EA)

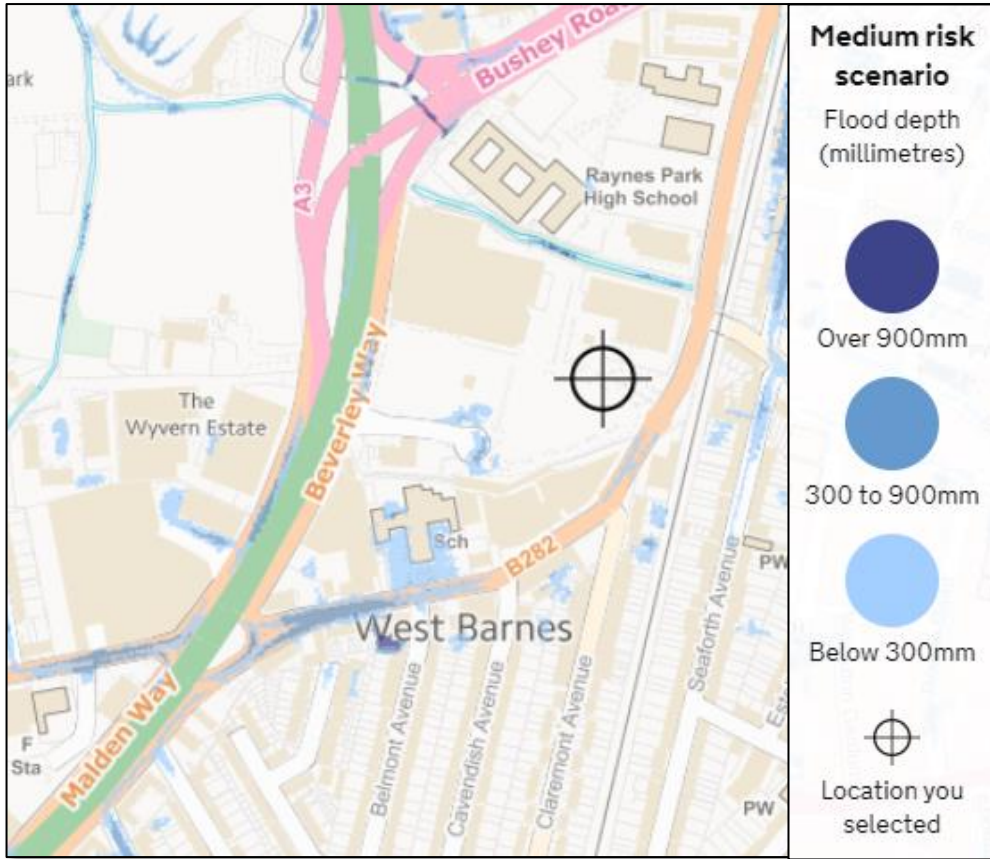


Figure 11: Surface Water Depths for a Medium Risk Scenario. (Source: EA)

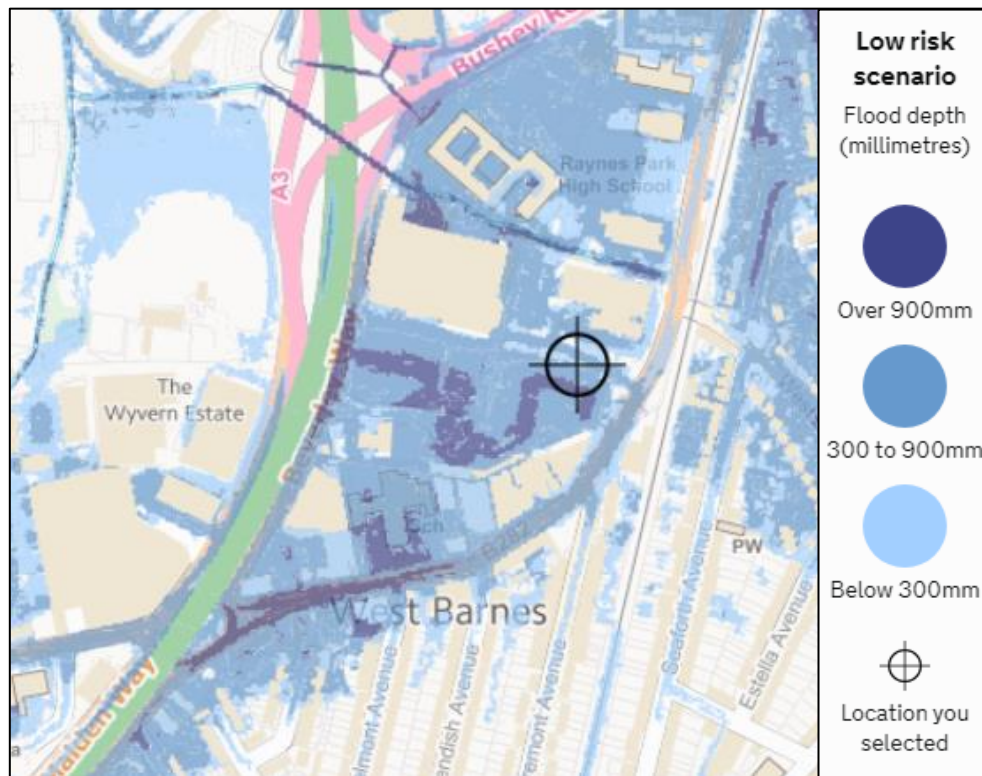


Figure 12: Surface Water Depths for a Low Risk Scenario. (Source: EA)



## Groundwater

- 4.25 Review of the MAGIC maps service provided by DEFRA has demonstrated that the site is not located in a Source Protection Zone.
- 4.26 Review of the Level 2 SFRA has detailed that the site has potential for groundwater flooding to occur at the surface, but no historic records of groundwater flooding have been recorded at the site.
- 4.27 The risk of flooding from this source could be considered to be relatively low to moderate.

## Sewer

- 4.28 The Level 2 SFRA states that the site has not experienced sewer flooding previously. The risk of flooding from this source could therefore be considered **relatively low**.
- 4.29 It is recommended that any new sewer connections should be installed with non-return valves to protect against backflow into the building.

## Surface Water Drainage Strategy

- 4.30 A supporting Surface Water Drainage Strategy has been produced as separate document to the FRA (Ambiental document ref 4003\_SWDS). Within this document it outlines options possible to support the proposed development whilst also adhering to the guidance set out by Merton, NPPF and The Adopted London Plan.

## Records of Historical Flooding

- 4.31 The EA have identified that the site was subject to fluvial flooding September 1968 (Figure 13). No further flood incidents have been recorded at the site other than this event.
- 4.32 There are no reported surface water incidents held by Merton Council for this location. The Level 2 SFRA, further states that there have been 3 records of surface water flood events within a 100m radius of the site.

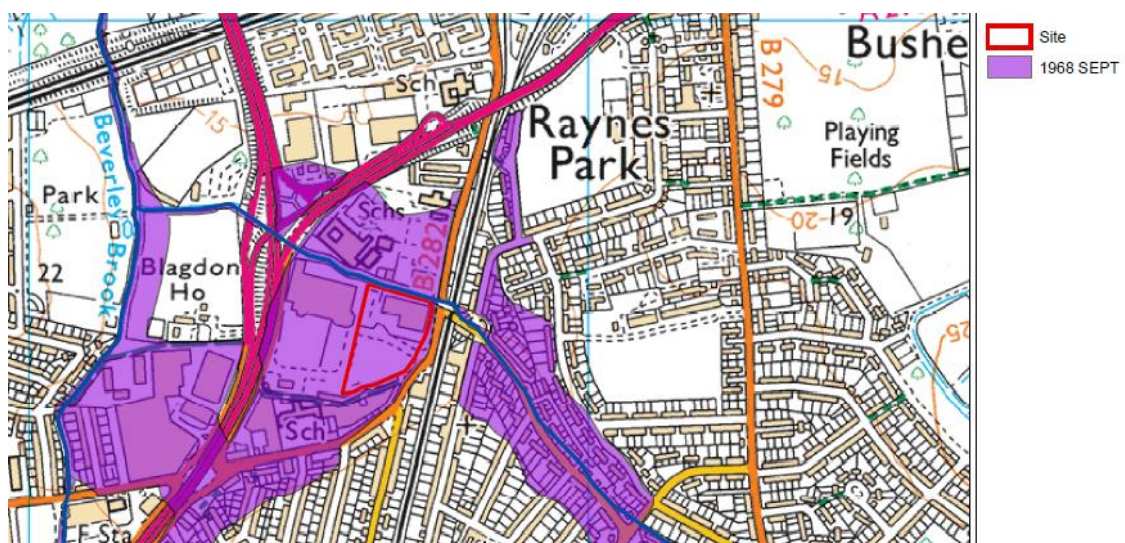


Figure 13: EA Historic Flood Extents Map

## 5. Probability of Flooding

### Flood Zones

- 5.1 According to the EA Flood Map for Planning the site is located within Flood Zones 2 and 3.
- 5.2 The EA Flood Map for Planning has been produced in part using a relatively coarse, national scale flood modelling strategy, and in part by detailed modelling. It is important to note that only the potential floodplain is modelled; **the mitigating effects of any flood defences currently in place are not considered**. For reference, the definition of the NPPF flood risk zones is included below.

Zone	Description
<b>1</b>	<b>Low Probability.</b> This zone comprises land assessed as having a less than 1 in 1000 annual probability of river or sea flooding in any year (<0.1%).
<b>2</b>	<b>Medium Probability.</b> This zone comprises land assessed as having between a 1 in 100 and 1 in 1000 annual probability of river flooding (1% – 0.1%) or between a 1 in 200 and 1 in 1000 annual probability of sea flooding (0.5% – 0.1%) in any year.
<b>3a</b>	<b>High Probability.</b> This zone comprises land assessed as having a 1 in 100 or greater annual probability of river flooding (>1%) or a 1 in 200 or greater annual probability of flooding from the sea (>0.5%) in any year.
<b>3b</b>	<b>The Functional Floodplain.</b> This zone comprises land where water has to flow or be stored in times of flood. SFRA's should identify this Flood Zone (land which would flood with an annual probability of 1 in 20 (5%) or greater in any year or is designed to flood in an extreme (0.1%) flood, or at another probability to be agreed between the LPA and the EA, including water conveyance routes).

Table 4 Definition of the NPPF Flood Zones. (Source: EA)

### Climate Change on Site

- 5.3 Climate change is likely to increase the flow in rivers, raise sea levels and increase storm intensity. The range of allowances in Tables 5 and 6 is based on percentiles. A percentile is a measure used in statistics to describe the proportion of possible scenarios that fall below an allowance level. The 50th percentile is the point at which half of the possible scenarios for peak flows fall below it and half fall above it.

The:

- central allowance is based on the 50th percentile.
  - Higher central is based on the 70th percentile.
  - Upper end is based on the 90th percentile.
- 5.4 So, if the central allowance is 30%, scientific evidence suggests that it is just as likely that the increase in peak river flow will be more than 30% as less than 30%.
- 5.5 At the higher central allowance 70% of the possible scenarios fall below this value. So, if the higher allowance is 40%, then current scientific evidence suggests that there is a 70% chance that peak flows will increase by less than this value, but there remains a 30% chance that peak flows will increase by more (Source: EA).

- 5.6 The risk of flooding to the site would therefore be expected to increase following the effects of climate change. The likely increases in peak rainfall intensity would also lead to an increased risk of surface water flooding. The increase in river flows for the Thames Basin have been provided below in Table 6.

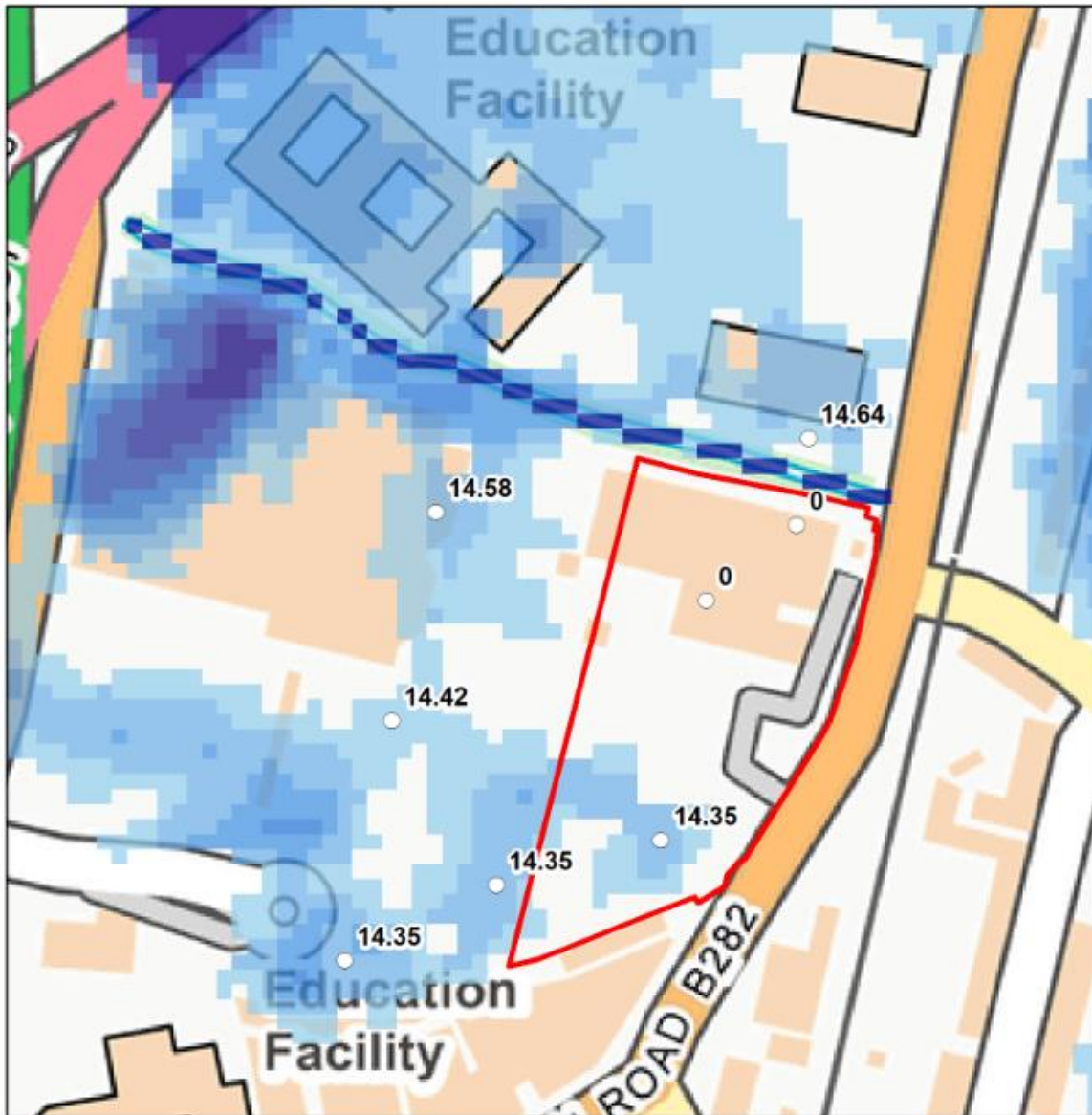
Flood Zone	Essential Infrastructure	Highly Vulnerable	More vulnerable	Less Vulnerable	Water Compatible
2	Higher Central and Upper End	Higher Central and Upper End	Central and Higher Central	Central	None of the allowances
3a	Upper End	Development should not be permitted	Higher Central and Upper End	Central and Higher	Central
3b	Upper End	Development should not be permitted	Development should not be permitted	Development should not be permitted	Central

Table 5: Allowance and Flood Zone Table (Source EA)

River basin district	Allowance category	Total potential change anticipated for the '2020s' (2015 to 2039)	Total potential change anticipated for the '2050s' (2040 to 2069)	Total potential change anticipated for the '2080s' (2070 to 2115)
Thames	Upper end	25%	35%	70%
	Higher central	15%	25%	35%
	Central	10%	15%	25%

Table 6: Peak river flow allowances by river basin district (Source EA)

- 5.7 The EA have also stated that climate change will increase the peak rainfall intensity allowance in small and urban catchments. As such the proposed development will be at more risk of flooding in the future.
- 5.8 It can be identified from the data provided by the EA that both flood levels and flows will increase as a result of climate change.
- 5.9 The proposed development is considered “Less Vulnerable” and “More Vulnerable” under the NPPF. More Vulnerable developments in Flood Zone 3 must use the central and the higher central climate change allowances for their river basin district (Table 5). The allowances for the River Thames basin are provided in Table 6. ‘Higher Central’ allowances have been adopted to provide a worst-case scenario for this assessment.
- 5.10 Ambiental have manipulated the EA model to understand the +35% flood event. Further to this Ambiental have considered off site impacts – section 8 of this assessment. As part of this work a new 3D topographic surface has been proposed - the minimum topographic level being 14.150mAOD. The maximum depth during the 1% + 35% event could therefore be 0.20m for the proposed development and the new surface demonstrated in Figure 14.



Node ID	2% AEP	1% AEP	1% AEP +20% CC	1% AEP +35% CC
47301	14.60	14.63	14.64	14.64
47781	14.57	14.58	14.59	14.58
47890	Nil Return	Nil Return	Nil Return	Nil Return
48302	Nil Return	Nil Return	Nil Return	Nil Return
48896	14.41	14.42	14.43	14.42
49563	Nil Return	14.29	14.36	14.35
49804	Nil Return	14.29	14.36	14.35
50262	14.24	14.30	14.36	14.35

Figure 14: EA Model – 1%+ 35% Flood Level – Flood extent based on the **new** surface – minimum topographic level of 14.150mAOD for the southern building.

## 6. Residual Risks

### Identification of Residual Risks

6.1 Residual risks are those remaining after applying the sequential approach to the location of development and taking mitigating actions. Examples of residual flood risk include:

- the failure of flood management infrastructure such as a breach of a raised flood defence, blockage of a surface water conveyance system, overtopping of an upstream storage area, or failure of a pumped drainage system;
- failure of a reservoir, or;
- a severe flood event that exceeds a flood management design standard, such as a flood that overtops a raised flood defence, or an intense rainfall event which the drainage system cannot cope with.

### Defence Breach

6.2 The site is in an area that does not benefit from defences therefore the risk of breach could be considered low.

### Reservoir Failure

6.3 The EA Risk from Reservoir Map demonstrates the site to not be located in an area that has the potential of reservoir flooding. Therefore flooding from this source may be considered as a relatively low risk.

### Drainage Exceedance

6.4 As part of the analysis it has been shown that the risk of surface water flooding is moderate. All residential development will adhere to the guidance set out in The London Borough of Merton Level 2 SFRA – Appendix C, Site 47, 265 West Barnes Lane. This guidance states that residential development should have a minimum freeboard of 300mm above the 1 % event + climate change. This could provide mitigation against overland flows in the event of drainage failure/ exceedance. For 'Less Vulnerable' development (e.g. car parking), FFLs are not typically required to be raised with regards to policy.

## 7. Flood Risk Management Measures

- 7.1 It is understood that the development is for the demolition of the existing buildings and erection of two blocks of development ranging in height between seven and 15 storeys and comprising 456 new homes, of which 114 will be one beds, 290 will be two beds and 52 will be three beds. 499sqm of B1(a) office space will be accommodated at ground floor level along with 220 car parking spaces, 830 cycle parking spaces, a realigned junction onto Burlington Road, hard and soft landscaping and associated residential facilities. The application also includes minor changes to the layout and configuration of the retained Tesco car park.
- 7.2 The site has been shown to be located within Flood Zone 2 and 3 (Medium and High risk of flooding) by the EA Flood Map for Planning.
- 7.3 Ambiental have re-run the existing EA model for the proposed development site to take into account the required 35% increase in flows to account for climate change.
- 7.4 The following mitigation measures are recommended, where feasible:
- Non-return valves on any new sewer connections to prevent back-flow;
  - The majority of the proposed residential accommodation to be located at first floor level (podium level) or above. Two two-bedroom duplex units are proposed at ground floor, however the location of these units is outside the 1:100 + 35% Climate Change flood extent; additionally the minimum finished floor level of these units is to be set no lower than 14.65mAOD;
  - Minimum Finished floor levels of the ground floor units to be set no lower than 14.65mAOD (300mm above the 1 in 100 + 35% flood level);
  - Flood volume mitigation as per section 8 of this report to avoid displacement offsite in the 1in100yr+35% event.
  - Implementation of SuDs, post development;
  - Site owners and residents to sign up to EA Flood Warning/Alert Service and have an evacuation plan.
- 7.5 As per the NPPF, the proposals need to consider potential impact of the development on flood risk elsewhere. As part of this Assessment, flood risk elsewhere has been considered within section 8 of this report through the provision of flood compensation strategy. To achieve this, the proposed development will manipulate the existing surface of the site. By doing so, it is demonstrated that the proposed development can be accommodated without increasing flood risk elsewhere. The new surface has demonstrated a minimum topographic level of 14.085mAOD within the car park with the majority levels being over 14.100mOAD. The maximum flood depth within the car park compared to the 1% + 35% flood level of 14.35mAOD is 0.265m with the majority of the car park (including the entrance) being at a depth of less than 0.250m.
- 7.6 The proposed development with regards to the car park provides appropriate mitigation and complies with the Level 2 SFRA for Merton which states;

## 9.10 Car Parks

Where car parks are specified as areas for the temporary storage of surface water and fluvial floodwaters, flood depths should not exceed 300mm given that vehicles may be moved by water of greater depths. Where greater depths are expected, car parks should be designed to prevent the vehicles from floating out of the car park. Signs should be in place to notify drivers of the susceptibility of flooding and flood warning should be available to provide sufficient time for car owners to move their vehicles if necessary.

- 7.7 As such, the maximum depths of 0.265m would be in accordance with the Level 2 SFRA which sets out that depths should not exceed 300mm in car parks used for the temporary storage of fluvial floodwater.

## EA Activity Permits

- 7.8 A review of the plans provided by the client indicates that elements of the proposed development could be situated within 8m of the Pyl Brook (EA Main River). Ambiental have liaised with the KSL office of the EA to confirm the top of bank of the Pyl Brook, to ascertain an 8m buffer which is typically sought from the EA. The below image (Figure 15) demonstrates the confirmed top of bank with the EA – the dashed redline confirms the top of bank, 8m is to be measured from this dashed redline.
- 7.9 It is recommended that as the project progresses that an additional survey is conducted to confirm the top of bank.
- 7.10 Residential Core A (including the two duplex units at ground floor and the Block A cycles area) is located within 8m of the Pyl Brook – dashed red line, approximately 6m from the Pyl Brook. EA Activity permits would be required for this element.
- 7.11 An Electric LV Intake/Comms area is also located within 8m of the Pyl Brook, approximately 6m from the Pyl Brook. EA Activity permits would be required for this element.
- 7.12 Furthermore, as part of the proposed development a replacement substation will be constructed. This substation structure will be constructed more than 8m from the Pyl Brook top of bank.

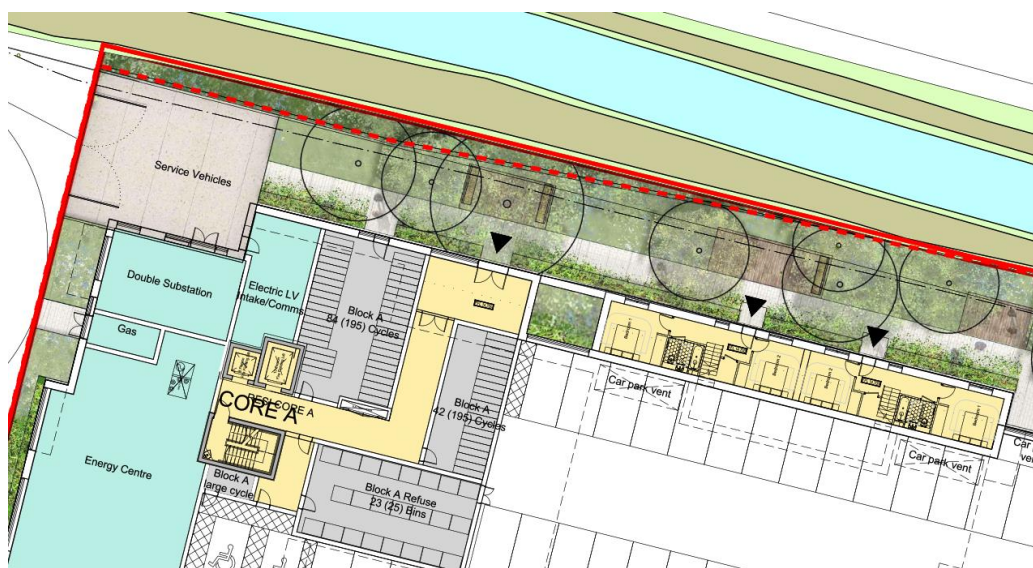


Figure 15 - Pyl Brook – Top of Bank – demonstrated as dashed redline. 8m to be measured from the dashed redline

## Flood Warning Service

- 7.13 The site resides within Flood Zone 2 and 3. The site is located within an EA Flood Warning Service Area and it is recommended that the site owner(s) sign up to this service., it is recommended that the site owner, management staff, and residents subscribe to the EA's Flood Warning/Alert Service.
- 7.14 If flooding has already occurred before prior evacuation, it is advised site users return to the property and await evacuation. FFLs for the residential units are to be set a minimum of 300mm above the 1:100 year +CC (35%) flood level and as such, safe refuge could be sought at the upper floors on site. No evacuation should be sought if flood depths exceed 25cm, and evacuation should only be sought with the assistance of the emergency services in these circumstances.
- 7.15 The EA operate a five day county-wide forecast in relation to flood risk. It is recommended that this service is regularly checked to ensure occupants/residents are aware of any possible risks: <https://flood-warning-information.service.gov.uk/5-day-flood-risk>.
- 7.16 The EA operate a Flood Information service which identifies whether any flood warnings or alerts have been issued for a specific postcode or place in England or Wales: <https://flood-warning-information.service.gov.uk/>. For the local area the EA provide the Beverley Brook at West Barnes warning service.
- 7.17 The EA also operates a 24-hour telephone service on 0345 988 1188 that provides frequently updated flood warnings and associated floodplain information. It is important to note that the EA's flood warnings are only in relation to fluvial and tidal flooding, and do not cover other sources of flooding such as surface water or groundwater flooding.
- 7.18 The resident(s) will be required to register for this service (<https://www.gov.uk/sign-up-for-flood-warnings>). It is advised that all residents and site users also register for this service. It is the responsibility of the occupants to make this service available to all site users.
- 7.19 Further information can be found on [www.environment-agency.gov.uk/floodline](http://www.environment-agency.gov.uk/floodline). Floodline Warnings Direct is a free service operated by the EA that provides flood warnings direct to occupants by telephone, mobile phone, fax or pager.
- 7.20 The Level 2, Merton SFRA, has further stated in Section 9.14 that the nearest emergency rest centre is located at Raynes Park High School.

## Flood Hazard, Flood Warning and Evacuation Plan (FWEP)

- 7.21 The SFRA states if a dry route is not possible, a route for people should be proposed where the flood hazards (in terms of depth and velocity of flooding) is low and not cause risk to people.
- 7.22 Ambiental have further reviewed the safe access and egress from the site based on the existing site surface against the 1 % flood event and the 1% + 35% event. We have further reviewed the proposed surface against the two AEPs (1% and 1% +35%). The outputs of each scenario have been mapped against the EA guidance of FD2320/TR2 tables 9.3 and 13.1. The hazard ratings are provided below and can be referenced against Figure 16 and 17.

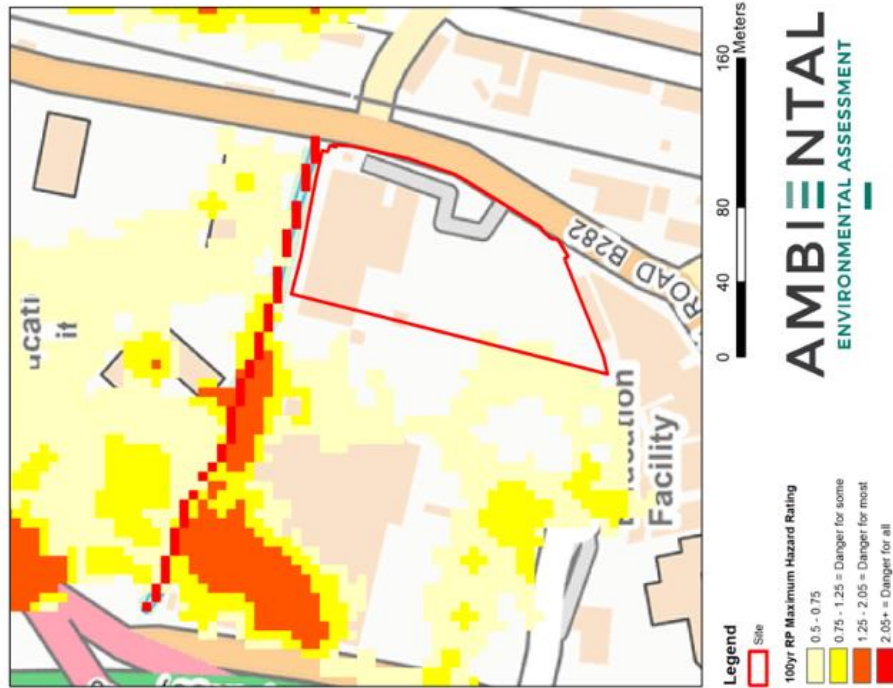


**Table 9-3 Hazard to People Rating (HR=d x (v +0.5) + DF) (Table 13.1 FD2320/TR2)**

Flood Hazard (HR)	Description
Less than 0.75	Very low hazard – Caution
0.75 to 1.25	Dangerous for some – includes children, the elderly and the infirm
1.25 to 2.0	Dangerous for most – includes the general public
More than 2.0	Dangerous for all – includes the emergency services

7.23 Based on these outputs it has been demonstrated that safe access /egress can be achieved from the site during a 1% + CC (35%) event. During a flood event, the car should only be accessed if depths appear less than 25cm. If a flood warning is issued the car park should only be accessed if flooding has not started on site. If flooding has occurred on site, access/ egress can be achieved via the stairwells associated with Core E and Core G. Access/Egress is not advised via Core F.

**Fluvial Flood Risk at Site Adjacent to Tesco  
Extra - New Malden - Maximum Hazard  
Rating - 1% AEP Event (Proposed Surface)**



**Fluvial Flood Risk at Site Adjacent to Tesco  
Extra - New Malden - Maximum Hazard  
Rating - 1% AEP Event (Existing Surface)**

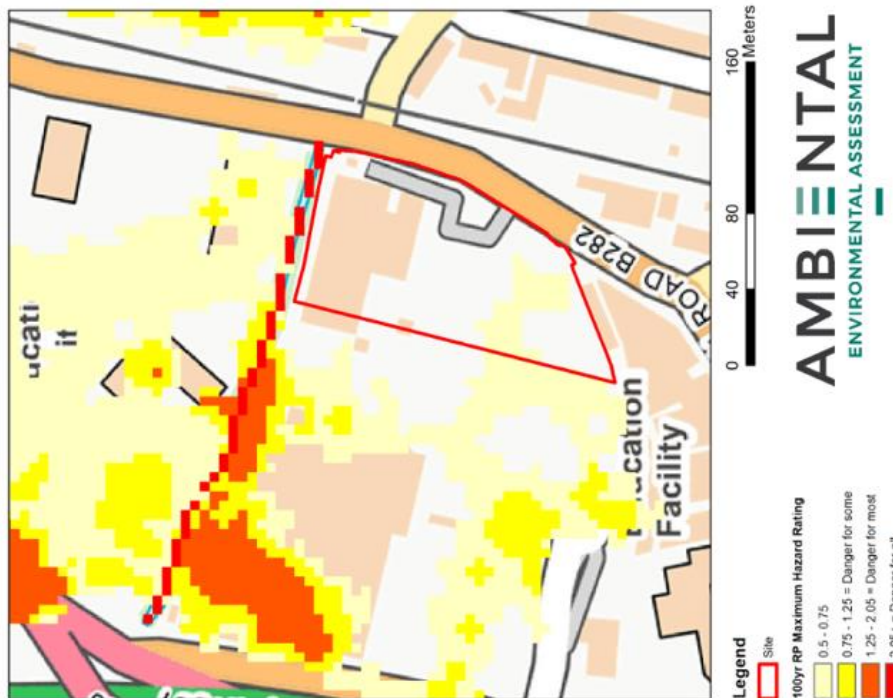


Figure 16: Existing and Proposed Surfaces, 1% AEP, Flood Hazard Ratings

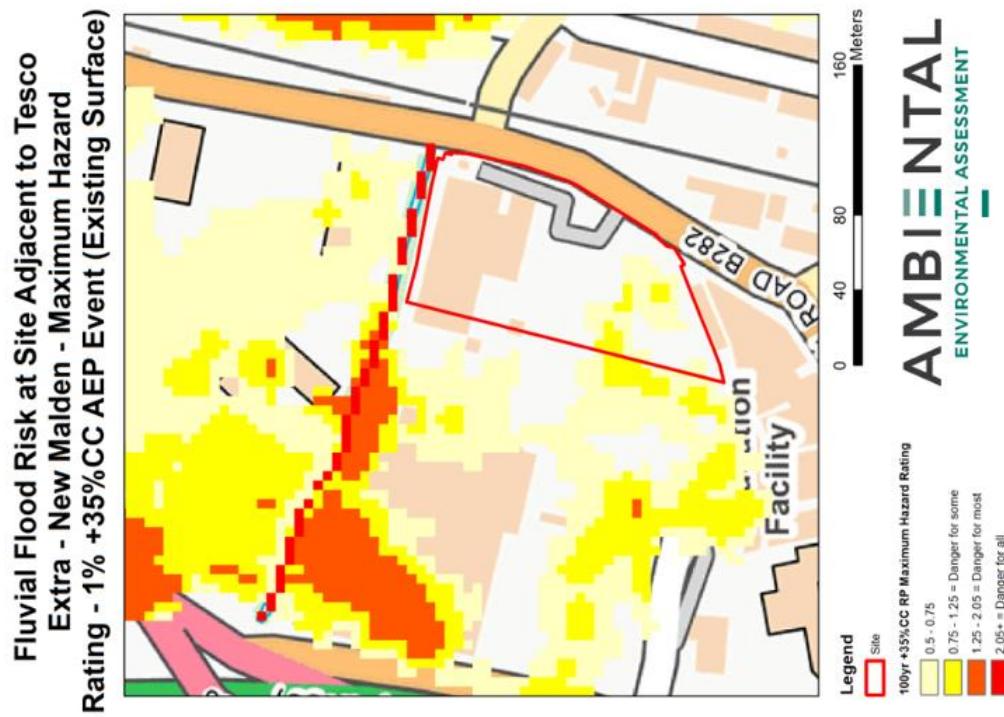
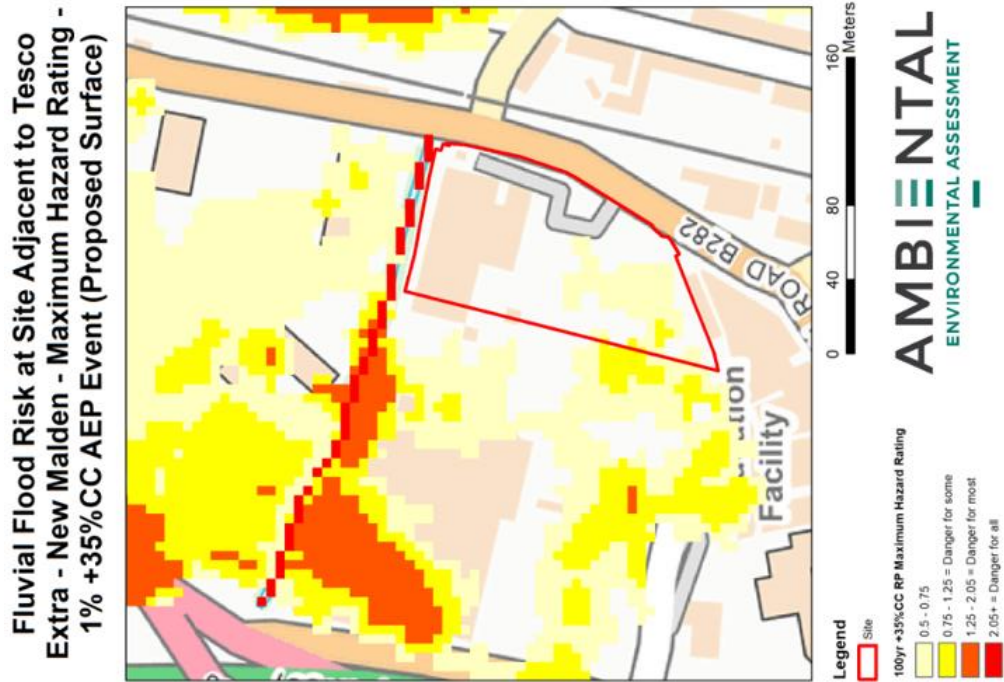


Figure 17: Existing and Proposed Surfaces, 1% AEP, Flood Hazard Ratings

## 8. Off Site Impacts

### Impact to Flood Risk Elsewhere

- 8.1 The development proposes new structures within the 1 in 100 year plus 35% climate change allowance floodplain. As per the EA guidance, where development is to be located within the floodplain and may displace flood waters, equivalent compensatory storage must be provided within the development.
- 8.2 Ambiental have referred to Node 49563 as being the most representative of flood levels at the southernmost part of the site (at which there will be an increase in footprint). For the flood compensation exercise Ambiental adopted Node 48896. This Node has a flood level of 14.42mAOD (1% +35%). **Therefore, by providing compensation for this flood level the site is providing additional capacity more so than is required if based on Node 49563 – flood level of 14.35mAOD.**
- 8.3 For flood compensation areas to be deemed appropriately designed it should meet the requirements outlined below (based on CIRIA C624 – Flood Risk and Development guidance):
1. **Level for Level:**
    - 100-300mm horizontal slices
    - Cut volumes should be greater than or equal to the fill volume for each slice
    - The highest levels are usually the hardest to achieve.
    - Compensation should be provided up to the 1 in 100 plus climate change flood level.
  2. **Appropriately located:**
    - The area should be as near as possible to where the loss of flood storage is occurring
    - Should be hydraulically linked so the area of compensation floods from the same watercourse as the area of fill used to flood from.
  3. **Completely Free Filling and Draining:**
    - This is to ensure the compensation area can fill and drain under gravity and so will be available should back to back flood events occur.
    - Flood water should be able to fill the lowest levels of the compensation area even during the smaller flood events.
  4. **Does not use culverted or piped entry routes:**
    - Culverts can become quickly blocked or have insufficient capacity for quickly raising flood waters
    - Culverts may not be located appropriately to convey water especially on larger sites.
- 8.4 Flood compensation volumes and extents are based on the 1 in 100 year plus 35% climate change allowance.
- 8.5 Figure 8 below shows the predicted flood extent on the site based on the predicted (most relevant) 2D modelled node flood level of 14.421mAOD. In line with the principles above, the flood depths have been divided into 200mm bandings to ensure that post development there is a level for level and volume for volume compensation (in line with the above guidance).



Figure 18 showing extents of existing fluvial flooding (with volume bandings) – areas circled red are where new structures are proposed and will result in displacement of flood waters; red arrows designate incoming flow route.

- 8.6 To calculate both the existing flood depths and volumes and proposed, Autodesk's Civils 3D was used to model the existing surface and the proposed structures and ground levels, then to take a volumetric difference between the predicted floodplain level of 14.421mAOD and the pre and post development situations. Volume bandings at 200mm were taken from 14.421mAOD to existing ground levels (these values are shown in Figure 18 above).
- 8.7 Figure 19 below shows the proposed flood compensation. This shows the majority of flooding will be constrained to the carpark and access road to keep flood volumes as close to the pre-development locations as possible.
- 8.8 Levels shown in Figure 19 have been designed to drain levels from the west into the carpark then north into the access road. As flood water recedes, this should then freely drain back along this route (closely matching the existing flood pathway). As such, openings need to be constructed on the west elevation to allow the flow of water as noted in Figure 19.
- 8.9 As can also be seen in Figure 19, volumes bands are shown to exceed (i.e. provide a betterment) versus the existing situation. In total an additional 24.98 m<sup>3</sup> of storage could be provided. Table 7 below, provides a comparison of pre and post development flood volumes on site for the 1 in 100 year plus 35% climate change event.



Level Banding	Flood Slice	Colour	Existing Volume	Proposed Volume	Difference
14.421m AOD – 14.221m AOD	0 – 200mm		330.10m <sup>3</sup>	337.22 m <sup>3</sup>	+ 7.12 m <sup>3</sup>
14.221m AOD – 14.021m AOD	200 – 400mm		91.56 m <sup>3</sup>	109.42 m <sup>3</sup>	+ 17.86 m <sup>3</sup>

Table 7 summary of pre and post development flood volumes for the 1 in 100 year plus 35% climate change event (designed flood level of 14.421m AOD).

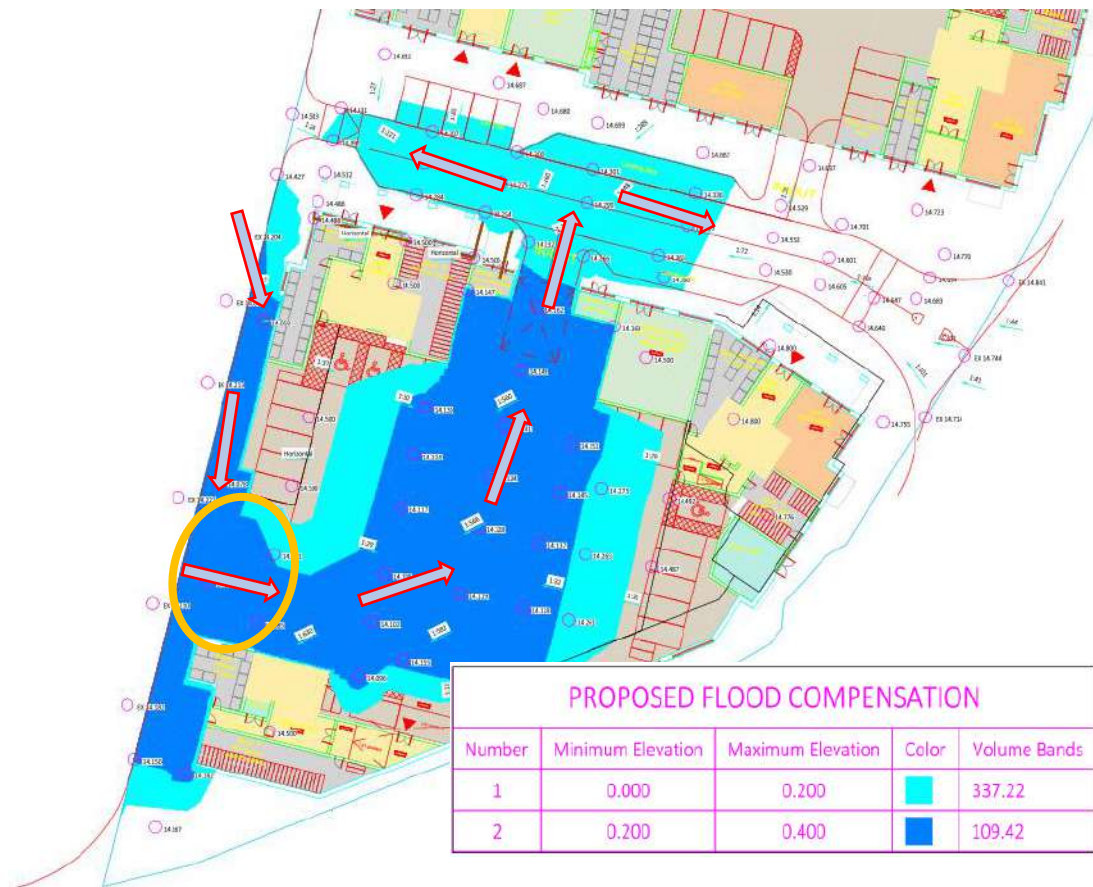


Figure 19 shows the proposed (post development) flood outlines to a level of 14.421m AOD. red arrows designate incoming flow route. Yellow oval shows where openings are required to allow the flow of water.

8.10 As can be seen from Figures 18 and 19, it is demonstrated that:

1. Level for Level compensation on site can be provided for the 1 in 100 plus 35% climate change event.
2. Flood compensation areas can be appropriately located and linked back to the flood plain and flood water can drain hydraulically via gravity back to the area of flooding (to the west)
3. Levels can be designed to allow free filling and draining
4. The flood compensation does not require culverts or piped entry routes to facilitate the free flow of flood water to or from the site.

- 8.11 Therefore, in line with current EA and CIRIA guidance, it is considered that appropriate flood compensatory storage could be provided in order to facilitate the development proposals while not increasing flood risk elsewhere.

### Generation of Runoff

- 8.12 A supporting Surface Water Drainage Strategy has been produced as separate document to the FRA. Within this document it outlines options possible to support the proposed development whilst also adhering to the guidance set out by Merton, NPPF and The Adopted London Plan.

## 9. Conclusion

- 9.1 Ambiental Environmental Assessment has been appointed by Redrow Homes Limited to undertake a National Planning Policy Framework (NPPF) compliant Flood Risk Assessment (FRA) for the proposed development at 265 Burlington Road, New Malden, KT3 4PJ.
- 9.2 The site comprises a vacant 1980's office building arranged over two storeys with an interconnecting single storey office building at the rear and a section of car park land.
- 9.3 Demolition of the existing buildings and erection of two blocks of development ranging in height between seven and 15 storeys and comprising 456 new homes, of which 114 will be one beds, 290 will be two beds and 52 will be three beds. 499sqm of B1(a) office space will be accommodated at ground floor level along with 220 car parking spaces, 830 cycle parking spaces, a realigned junction onto Burlington Road, hard and soft landscaping and associated residential facilities. The application also includes minor changes to the layout and configuration of the retained Tesco car park.
- 9.4 The nearest watercourse to the site is the Pyl Brook, located to the north of the site. The Pyl Brook is classified as an EA main river. Communication with the EA has defined the top of bank. This has been required to assess the need for EA activity permits. At places to the north of the proposed development there is encroachment within the required 8m buffer. As the application progresses there will be a need therefore to apply for EA Activity Permits within this area.
- 9.5 The Environment Agency Flood Map for Planning identifies that the site is located within Flood Zone 2 and 3 (Medium and High Risk). Flood Zone 2 comprises land assessed as having between a 1 in 100 and 1 in 1000 annual probability of river flooding (1% – 0.1%). Flood Zone 3 comprises land assessed as having a 1 in 100 or greater annual probability of river flooding (>1%).
- 9.6 Review of the London Boroughs of Croydon, Sutton Merton and Wandsworth SFRA, has demonstrated that the redline application boundary is not located within Flood Zone 3b.
- 9.7 Under the NPPF vulnerability classification guidance, the existing site is classified as 'Less Vulnerable' due to the solely commercial use. The proposed development to provide residential and commercial uses and is therefore classified as 'More vulnerable' and 'Less Vulnerable' respectively).
- 9.8 As such, and given that:
- The site is an existing brownfield site;
  - All sleeping and residential units are to be located above the 1 in 100+35% event;
  - Safe access / egress to be provided from the site during a 1 in 100 + 35% event;
  - Flood compensation can be provided to support the proposed development;
  - Betterment can be provided by the formalisation of a flood warning and evacuation plan.

Following the guidelines contained within the NPPF, the proposed development could be considered suitable assuming appropriate mitigation (including adequate warning procedures) can be maintained for the lifetime of the development.



## Appendix I - Site Plans

\*Ground Floor Plan included only for FRA , this is due to the ground floor being of greatest importance with regards to Flood Risk

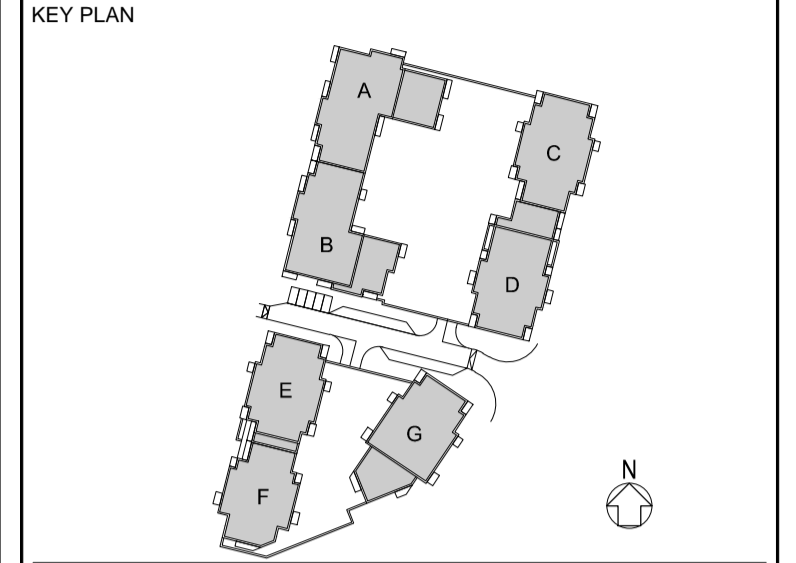


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Davies Murch



NOTES:

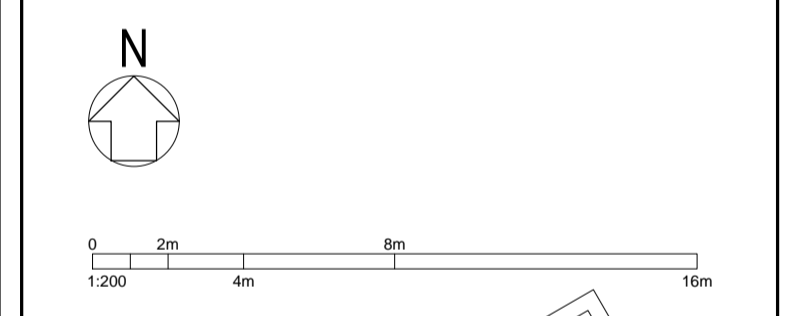
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NOTE: SERVICES AND STRUCTURE SHOWN INDICATIVELY. TO BE REVIEWED AND CONFIRMED BY STRUCTURAL, MECHANICAL AND SERVICES ENGINEERS, BASED ON PREVIOUS LAYOUTS.

- KEY**
- COMMERCIAL SPACE
  - RESIDENTIAL ENTRANCES
  - RESIDENTIAL CONCIERGE AND MEETING SPACE
  - RESIDENTIAL PLANT ROOMS
  - RESIDENTIAL CYCLE AND BIN STORES



**WORK IN PROGRESS**  
**INFORMATION ONLY**  
 PRINTED: 15.05.2019

No.	Date	Comment	Drawn	Chk'd
Revisions				

Issue Status

**PLANNING**

**tp bennett**  
architecture  
interiors  
planning

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Project  
265 Burlington Road  
New Malden

Drawing Title  
Buildings A, B, C & D  
Ground Floor Plan

Drawn	Date	Scale @ A1	Alt. Ref.
JH	Oct 18	1:200	--

tp bennett Project No. Drawing Number Rev  
**E1180 D 1100 P1**

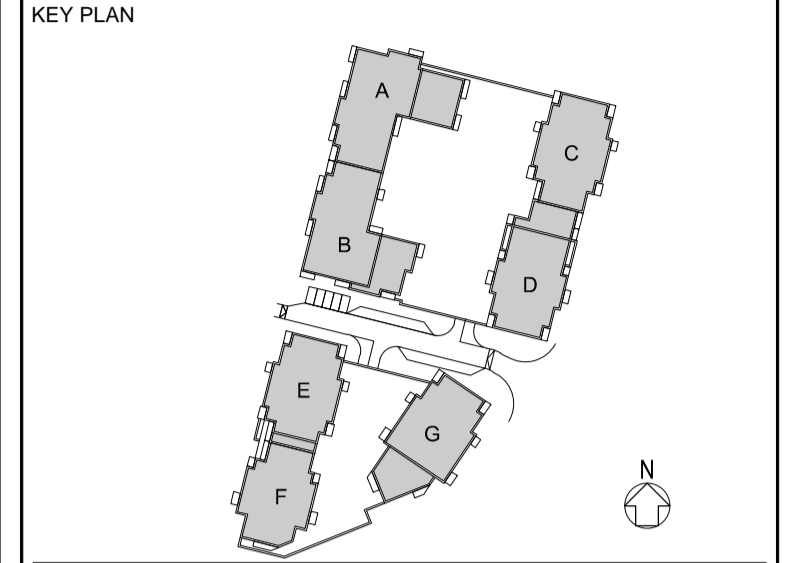


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NOTES:

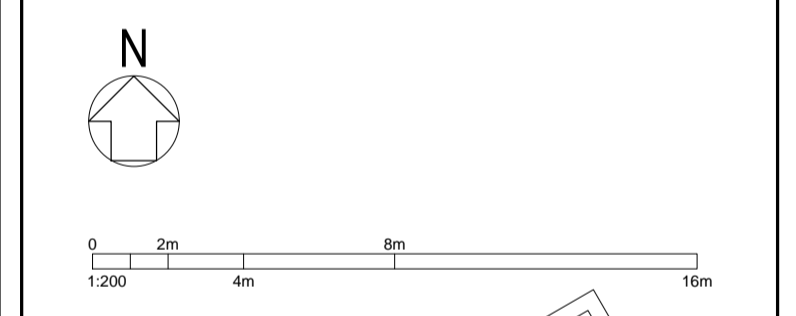
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Project  
265 Burlington Road  
New Malden

Drawing Title  
Buildings E, F & G  
Ground Floor Plan

Drawn	Date	Scale @ A1	Alt. Ref.
JH	Oct '18	1:200	--

tp bennett Project No.	Drawing Number	Rev
E1180	D 2100	P1

Product 4 (Detailed Flood Risk) for: 300 Beverley Way, New Malden KT3 4PJ

Requested by: Ambiantal Consultancy

Reference: KSL 92775 AB

Date: July 2018

## Contents

- Flood Risk Assessments: Climate Change Allowances
- Flood Map Confirmation
- Flood Map Extract
- Model Output Data
- Data Point Location Map
- Modelled Flood Outlines Map
- Defence Details
- Historic Flood Events Data
- Historic Flood Events Data Map
- Additional Data
- Surface Water
- Open Government Licence

The information provided is based on the best data available as of the date of this letter.

You may feel it is appropriate to contact our office at regular intervals, to check whether any amendments/improvements have been made to the data for this location. Should you re-contact us after a period of time, please quote the above reference in order to help us deal with your query.

This information is provided subject to the enclosed notice which you should read.

Orchard House, Endeavour Park, London Road, Addington, West Malling, Kent, ME19 5SH.

Customer services line: 020 8474 6848

Email: [kslenquiries@environment-agency.gov.uk](mailto:kslenquiries@environment-agency.gov.uk)

Website: <https://www.gov.uk/government/organisations/environment-agency>

## Appendix II - EA Data



## Flood Risk Assessments: Climate Change Allowances

### Updated climate change requirements for flood risk assessments

On 19/02/2016 the 'Flood risk assessments: climate change allowances' were published on gov.uk. You can view the new allowances at '[Flood risk assessments: climate change allowances](#)'. This replaces the previous guidance [Climate Change Allowances for Planners](#).

The data provided in this product does not include the new allowances. You will need to consider this data and factor in the new allowances to demonstrate the development will be safe from flooding.

The fluvial climate change factors are now more complex reflecting the fact that the latest information shows that a single uplift percentage across England cannot be justified.

The Environment Agency will incorporate the new allowances into future modelling studies.

It remains the applicant's responsibility to demonstrate through their proposals and flood risk assessments that new developments will be safe in flood risk terms for its lifetime.

## Flood Map for Planning Confirmation

### The Flood Map for Planning (Rivers & Sea)

Our Flood Map shows the natural floodplain for areas at risk from river and tidal flooding. The floodplain is specifically mapped ignoring the presence and effect of defences. Although flood defences reduce the risk of flooding they cannot completely remove that risk as they may be over topped or breached during a flood event.

The Flood Map indicates areas with a 1% (0.5% in tidal areas), Annual Exceedance Probability (AEP) - the probability of a flood of a particular magnitude, or greater, occurring in any given year, and a 0.1% AEP of flooding from rivers and/or the sea in any given year. The map also shows the location of some flood defences and the areas that benefit from them.

The Flood Map is intended to act as a guide to indicate the potential risk of flooding. When producing it we use the best data available to us at the time, taking into account historic flooding and local knowledge. The Flood Map is updated on a quarterly basis to account for any amendments required. These amendments are then displayed on the internet at [www.environment-agency.gov.uk](http://www.environment-agency.gov.uk).

### At this Site:

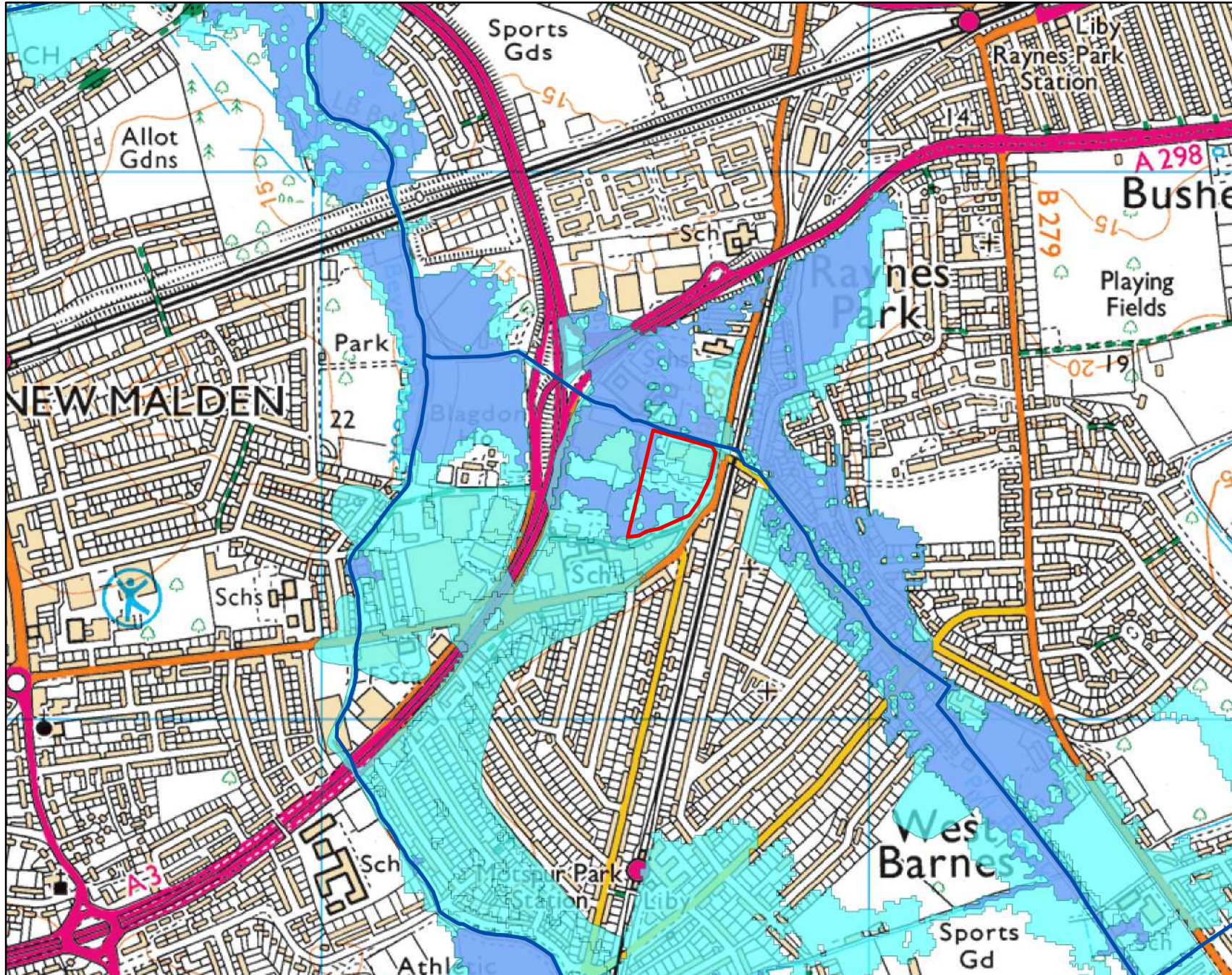
The Flood Map shows that this property/site lies within the outline of Flood Zone 3, this zone comprises land assessed as having a 1% chance of flooding from rivers in any given year. Some of the site also lies within the outline of Flood Zone 2 this zone comprises land assessed as having a 0.1% chance of flooding from rivers in any given year.



Enclosed is an extract of our Flood Map which shows this information for your area.

### Method of production








The Flood Map at this location has been derived using detailed fluvial modelling of Beverley Brook 2D Flood Risk Mapping Study completed in 2008 by Royal Haskoning.

# Detailed FRA Map centred on KT3 4PJ created July 2018 (Ref: KSL92775 AB)



**Legend**

-  Main River
-  Site
-  Flood Defences
-  Flood Storage Area
-  Areas Benefiting From Flood Defence
-  Flood Zone 3
-  Flood Zone 2

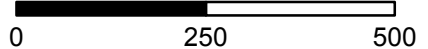
**Flood Map for Planning (assuming no defences)**

**Flood Zone 3** shows the area that could be affected by flooding:

- from the sea with a 0.5% or greater chance of occurring each year
- or from a river with a 1% or greater chance of occurring each year.

**Flood Zone 2** shows the extent of an extreme flood from rivers or the sea with up to a 0.1% chance of occurring each year.

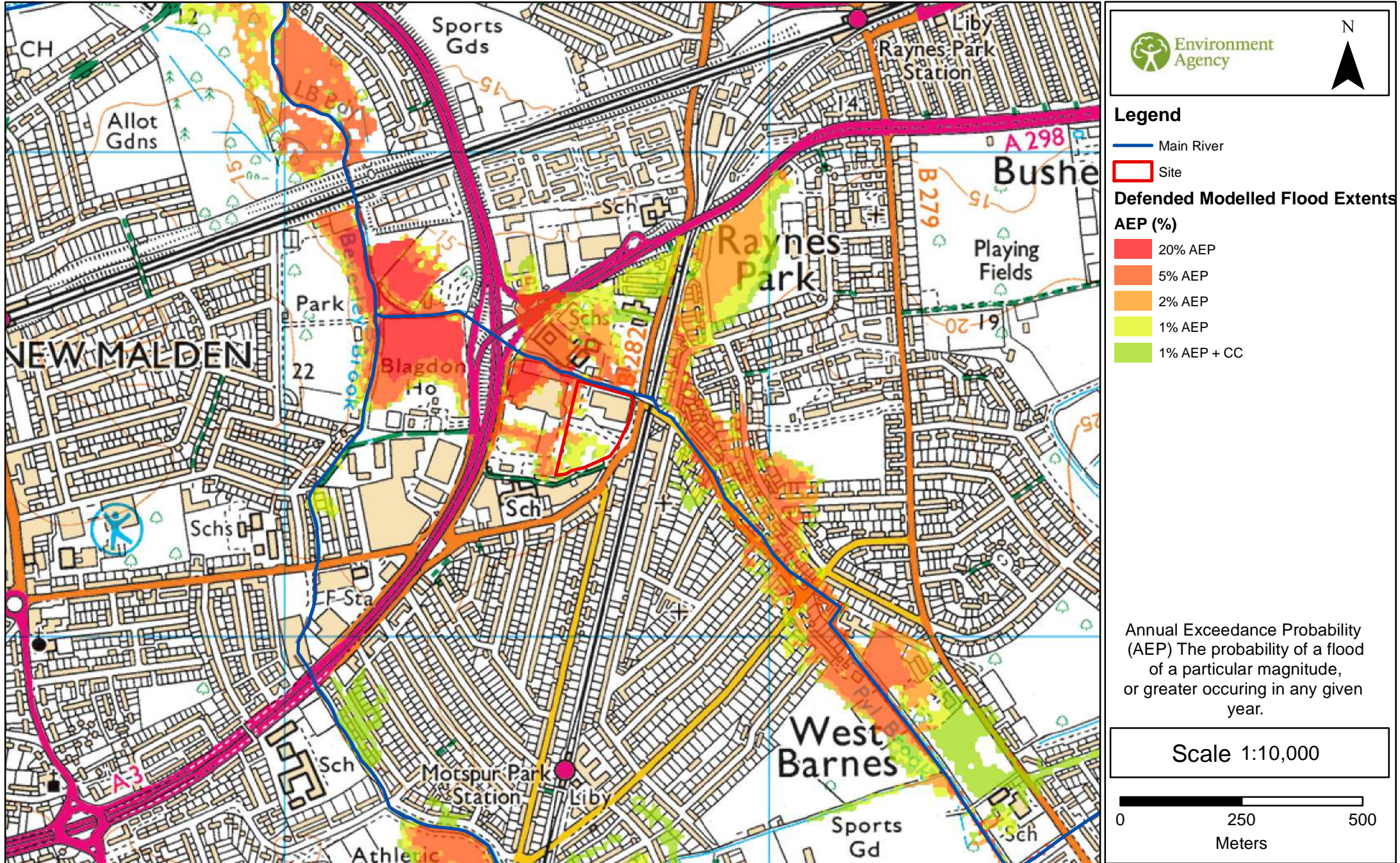
Scale 1:10,000



0                      250                      500  
Meters



# Modelled flood extents centred on KT3 4PJ created July 2018 (Ref: KSL92775 AB)



# 2D Node Locations centred on KT3 4PJ created July 2018 (Ref: KSL92775 AB)



## Model Output Data

You have requested flood levels for various return periods at this location.

2D

The modelled flood levels for the closest most appropriate model grid cells, any additional information you may need to know about the modelling from which they are derived and/or any specific use or health warning for their use are set out below.

Using a 2D TuFLOW model the floodplain has been represented as a grid. The flood water levels have been calculated for each grid cell.

A map showing the location of the points from which the data is taken is enclosed. Please note you should read the notice enclosed for your specific use rights.

Table 1: Modelled Undefended Node Levels

Node ID	Easting	Northing	Modelled Flood Level for Annual Exceedance Probability Shown, in Metres
			1% AEP
47301	522706	168519	14.62
47781	522581	168494	14.58
47890	522701	168489	Nil Return
48302	522671	168464	Nil Return
48896	522566	168424	14.41
49563	522656	168384	14.29
49804	522601	168369	14.29
50262	522551	168344	14.30

Beverley Brook 2D Flood Risk Mapping Study completed in 2008 by Royal Haskoning.

Orchard House, Endeavour Park, London Road, Addington, West Malling, Kent, ME19 5SH.

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Email: [kslenquiries@environment-agency.gov.uk](mailto:kslenquiries@environment-agency.gov.uk)

Website: <https://www.gov.uk/government/organisations/environment-agency>

Table 2: Modelled Defended Node Levels

Node ID	Easting	Northing	Modelled Flood Level for Annual Exceedance Probability Shown, in Metres AOD				
			20% AEP	5% AEP	2% AEP	1% AEP	1% AEP Plus Climate Change
47301	522706	168519	Nil Return	14.55	14.60	14.63	14.71
47781	522581	168494	Nil Return	14.55	14.57	14.58	14.41
47890	522701	168489	Nil Return	Nil Return	Nil Return	Nil Return	14.83
48302	522671	168464	Nil Return	Nil Return	Nil Return	Nil Return	14.74
48896	522566	168424	Nil Return	14.40	14.41	14.42	Nil Return
49563	522656	168384	Nil Return	Nil Return	Nil Return	14.29	Nil Return
49804	522601	168369	Nil Return	Nil Return	Nil Return	14.29	Nil Return
50262	522551	168344	Nil Return	14.07	14.24	14.30	14.10

Data taken from our Beverley Brook 2D Flood Risk Mapping Study completed in 2008 by Royal Haskoning.

There are no health warnings or additional information for these levels or the model from which they were produced.

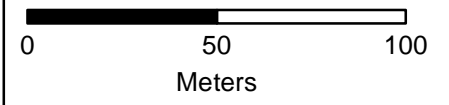
# 1D Node Locations centred on KT3 4PJ created July 2018 (Ref: KSL92775 AB)



## Legend

- 1D
- Main River
- Site

Scale 1:2,000



## 1D

The modelled flood levels for the most appropriate cross sections taken from our ISIS 1D modelling of the Beverley Brook, any additional information you may need to know about the modelling from which they are derived and/or any specific use or health warning for their use are set out below.

Table 3: Modelled Defended Node Levels

Node ID	Easting	Northing	Modelled Flood Level for Annual Exceedance Probability Shown, in Metres AOD				
			20% AEP	5% AEP	2% AEP	1% AEP	1% AEP Plus Climate Change
06340_PY_P_01.008	522733	168498	14.37	14.64	14.66	14.67	14.68
06340_PY_P_01.006	522654	168520	14.29	14.6	14.63	14.65	14.66
06340_PY_P_01.005	522560	168551	14.2	14.51	14.53	14.53	14.54
06340_PY_P_01.005_i01	522518	168574	14.18	14.56	14.59	14.61	14.63
06340_PY_P_01.004	522479	168590	14.14	14.5	14.55	14.58	14.6

Data taken from our Beverley Brook 1D Flood Risk Mapping Study completed in 2008 by Royal Haskoning.

Table 4: Modelled Defended Node Flows

Node ID	Easting	Northing	Modelled Discharge for Annual Exceedance Probability Shown, in m <sup>3</sup> /s				1% AEP Plus Climate Change
			20% AEP	5% AEP	2% AEP	1% AEP	
06340_PY_P_01.008	522733	168498	11.79	16.04	16.04	16.38	16.56
06340_PY_P_01.006	522654	168520	11.8	15.99	15.82	16.21	16.5
06340_PY_P_01.005	522560	168551	11.63	15.91	16.38	16.77	17.13
06340_PY_P_01.005_i01	522518	168574	11.21	12.71	12.23	12.32	12.22
06340_PY_P_01.004	522479	168590	11.23	13.83	13.3	12.94	12.72

Data taken from our Beverley Brook 1D Flood Risk Mapping Study completed in 2008 by Royal Haskoning.

There are no health warnings or additional information for these levels or the model from which they were produced.

## Defence Details

There are no formal flood defences owned or maintained by the Environment Agency in the area of this site.

Orchard House, Endeavour Park, London Road, Addington, West Malling, Kent, ME19 5SH.

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Email: [kslenquiries@environment-agency.gov.uk](mailto:kslenquiries@environment-agency.gov.uk)

Website: <https://www.gov.uk/government/organisations/environment-agency>



## Historic Flood Events Data

We hold records of historic flood events from rivers. Information on the floods that may have affected the area local to your property/site are provided below and in the enclosed map (if relevant).

### Flood Event Data

Dates of historic flood events in this area:

#### **September 1968**

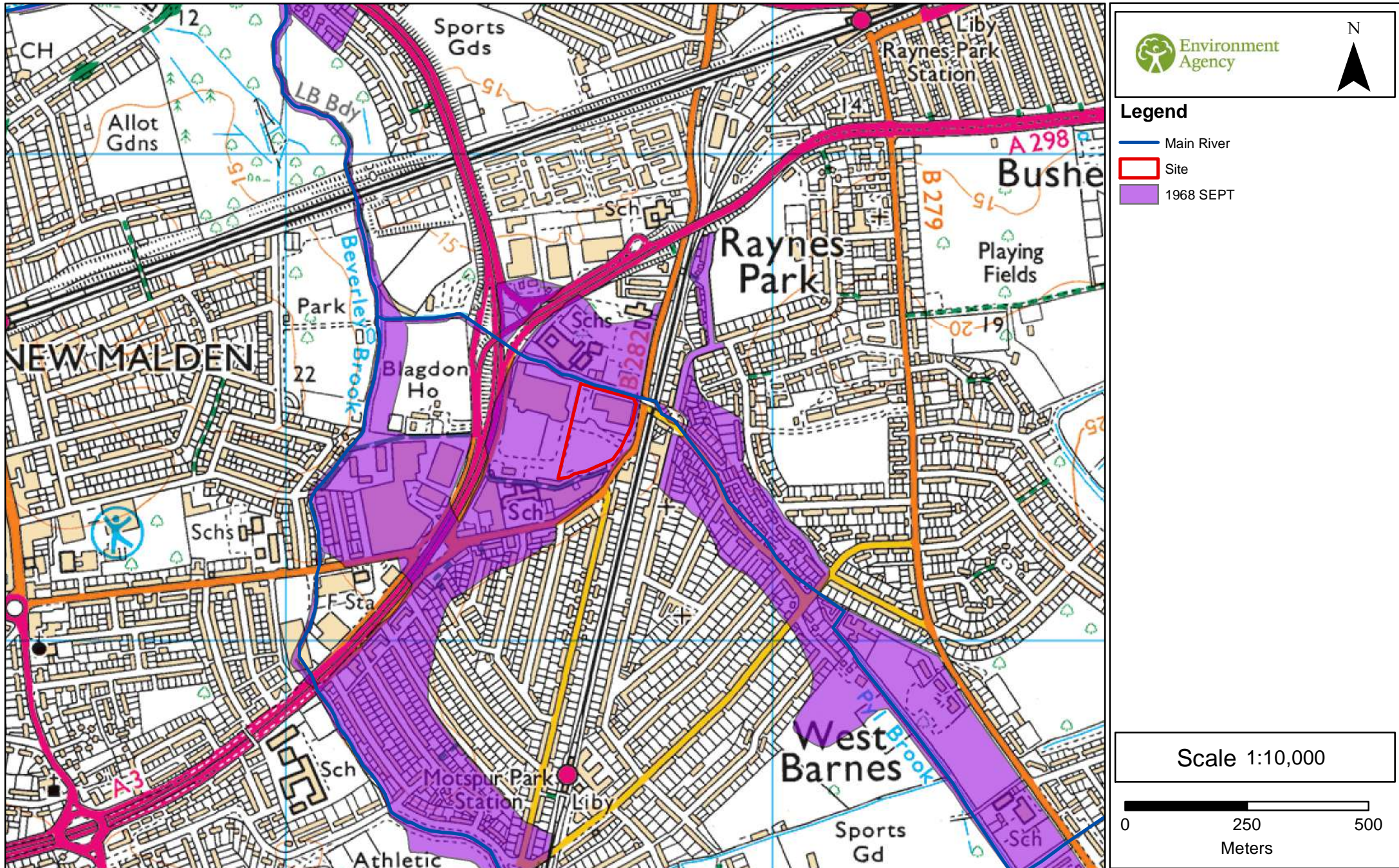
Please note that our records are not comprehensive. We would therefore advise that you make further enquiries locally with specific reference to flooding at this location. You should consider contacting the relevant Local Planning Authority and/or water/sewerage undertaker for the area.

We map flooding to land, not individual properties. Our historic flood event record outlines are an indication of the geographical extent of an observed flood event. Our historic flood event outlines do not give any indication of flood levels for individual properties. They also do not imply that any property within the outline has flooded internally.




Please be aware that flooding can come from different sources. Examples of these are:

- from rivers or the sea;
- surface water (i.e. rainwater flowing over or accumulating on the ground before it is able to enter rivers or the drainage system);
- overflowing or backing up of sewer or drainage systems which have been overwhelmed,
- groundwater rising up from underground aquifers

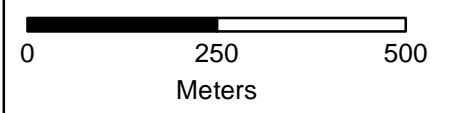
# Historic flood extents centred on KT3 4PJ created July 2018 (Ref: KSL92775 AB)



### Legend

-  Main River
-  Site
-  1968 SEPT

Scale 1:10,000



Currently the Environment Agency can only supply flood risk data relating to the chance of flooding from rivers or the sea. However you should be aware that in recent years, there has been an increase in flood damage caused by surface water flooding or drainage systems that have been overwhelmed.

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Email: [klenquiries@environment-agency.gov.uk](mailto:klenquiries@environment-agency.gov.uk)

Website: <https://www.gov.uk/government/organisations/environment-agency>

## Additional Information

### Information Warning - OS background mapping

The mapping of features provided as a background in this product is © Ordnance Survey. It is provided to give context to this product. The Open Government Licence does not apply to this background mapping. You are granted a non-exclusive, royalty free, revocable licence solely to view the Licensed Data for non-commercial purposes for the period during which the Environment Agency makes it available. You are not permitted to copy, sub-license, distribute, sell or otherwise make available the Licensed Data to third parties in any form. Third party rights to enforce the terms of this licence shall be reserved to OS.

### Planning advice and guidance

The Environment Agency are keen to work with partners to enable development which is resilient to flooding for its lifetime and provides wider benefits to communities. If you have requested this information to help inform a development proposal, then we recommend engaging with us as early as possible by using the pre-application form available from our website:

<https://www.gov.uk/government/publications/pre-planning-application-enquiry-form-preliminary-opinion>

Complete the form in the link and email back to [kslplanning@environment-agency.gov.uk](mailto:kslplanning@environment-agency.gov.uk)

We recognise the value of early engagement in development planning decisions. This allows complex issues to be discussed, innovative solutions to be developed that both enables new development and protects existing communities. Such engagement can often avoid delays in the planning process following planning application submission, by reaching agreements up-front. We offer a charged pre-application advice service for applicants who wish to discuss a development proposal.

We can also provide a preliminary opinion for free which will identify environmental constraints related to our responsibilities including flooding, waste, land contamination, water quality, biodiversity, navigation, pollution, water resources, foul drainage or Environmental Impact Assessment.

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Website: <https://www.gov.uk/government/organisations/environment-agency>

## Flood Risk Assessments guidance

### Flood risk standing advice for applicants

In preparing your planning application submission, you should refer to the Environment Agency's Flood Risk Standing Advice and the Planning Practice Guidance for information about what flood risk assessment is needed for new development in the different Flood Zones. This information can be accessed via:

<https://www.gov.uk/flood-risk-assessment-standing-advice>

<http://planningguidance.planningportal.gov.uk/>

<https://www.gov.uk/guidance/flood-risk-assessment-for-planning-applications>

<https://www.gov.uk/guidance/flood-risk-and-coastal-change>

You should also consult the Strategic Flood Risk Assessment and flood risk local plan policies produced by your local planning authority.

You should note that:

1. Information supplied by the Environment Agency may be used to assist in producing a Flood Risk Assessment where one is required, but does not constitute such an assessment on its own.
2. This information covers flood risk from main rivers and the sea, and you will need to consider other potential sources of flooding, such as groundwater or overland runoff. You should discuss surface water management with your Lead Local Flood Authority.
3. Where a planning application requires a FRA and this is not submitted or deficient, the Environment Agency may well raise an objection due to insufficient information

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Website: <https://www.gov.uk/government/organisations/environment-agency>

## Surface Water

We have provided two national Surface Water maps, under our Strategic Overview for flooding, to your Lead Local Flood Authority who are responsible for local flood risk (i.e. surface runoff, ground water and ordinary watercourse), which alongside their existing local information will help them in determining what best represents surface water flood risk in your area.

Your Lead Local Flood Authority have reviewed these and determined what it believes best represents surface water flood risk. You should therefore contact this authority so they can provide you with the most up to date information about surface water flood risk in your area.

You may also wish to consider contacting the appropriate relevant Local Planning Authority and/or water/sewerage undertaker for the area. They may be able to provide some knowledge on the risk of flooding from other sources. We are working with these organisations to improve knowledge and understanding of surface water flooding.

Orchard House, Endeavour Park, London Road, Addington, West Malling, Kent, ME19 5SH.

Customer services line: 020 8474 6848

Email: [kslenquiries@environment-agency.gov.uk](mailto:kslenquiries@environment-agency.gov.uk)

Website: <https://www.gov.uk/government/organisations/environment-agency>

## Open Government Licence

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

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Customer services line: 01732 223 202

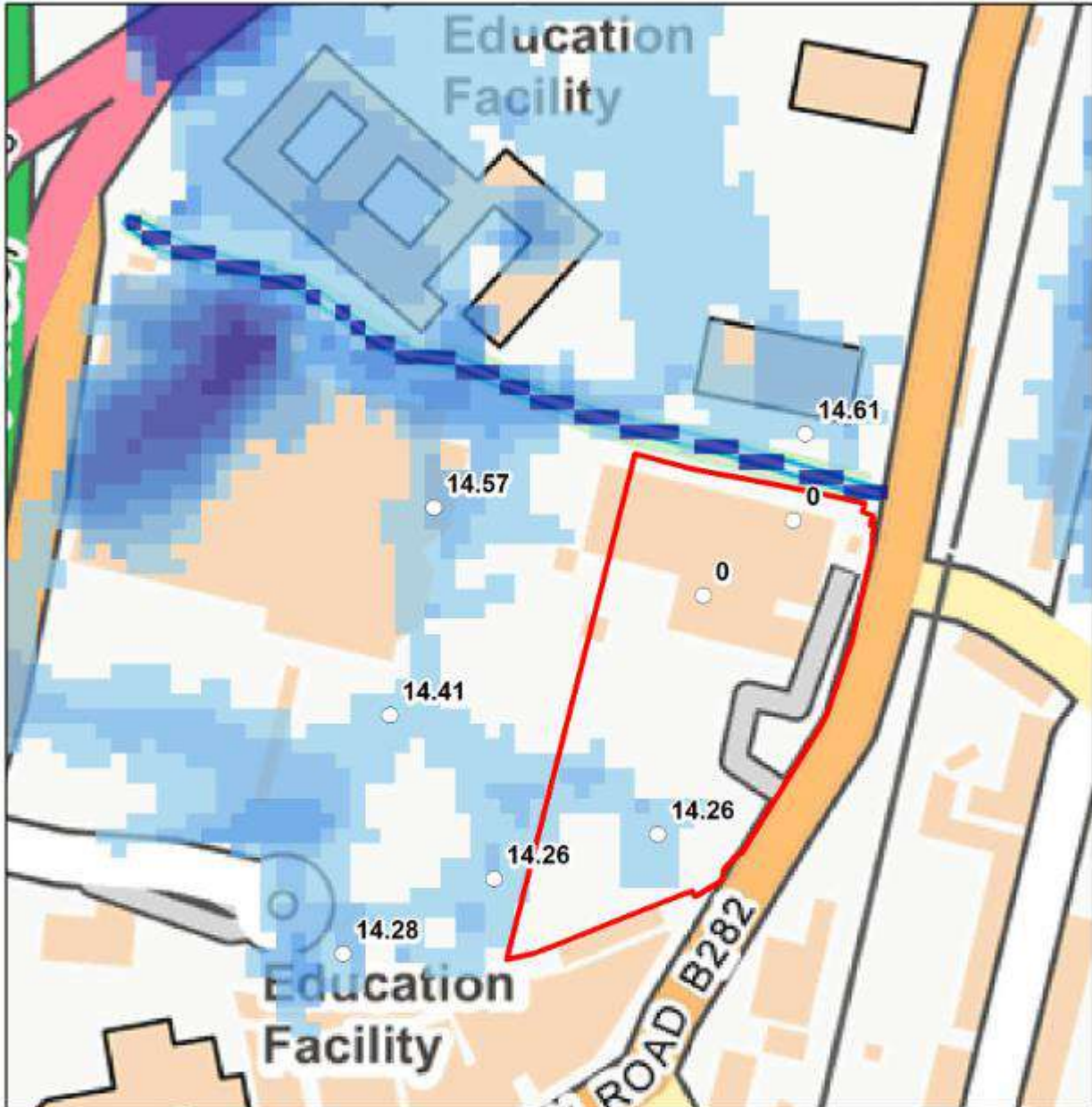
Email: [kslenquiries@environment-agency.gov.uk](mailto:kslenquiries@environment-agency.gov.uk)

Website: <https://www.gov.uk/government/organisations/environment-agency>

## Appendix III - Ambiental 1% and 1% +35% runs of EA Model, Max Depth, Max Hazard outputs - existing and proposed surface



# Fluvial Flood Risk at Site Adjacent to Tesco Extra - New Malden - Maximum Flood Level - 1% AEP Event (Existing Surface)



**Legend**

Site

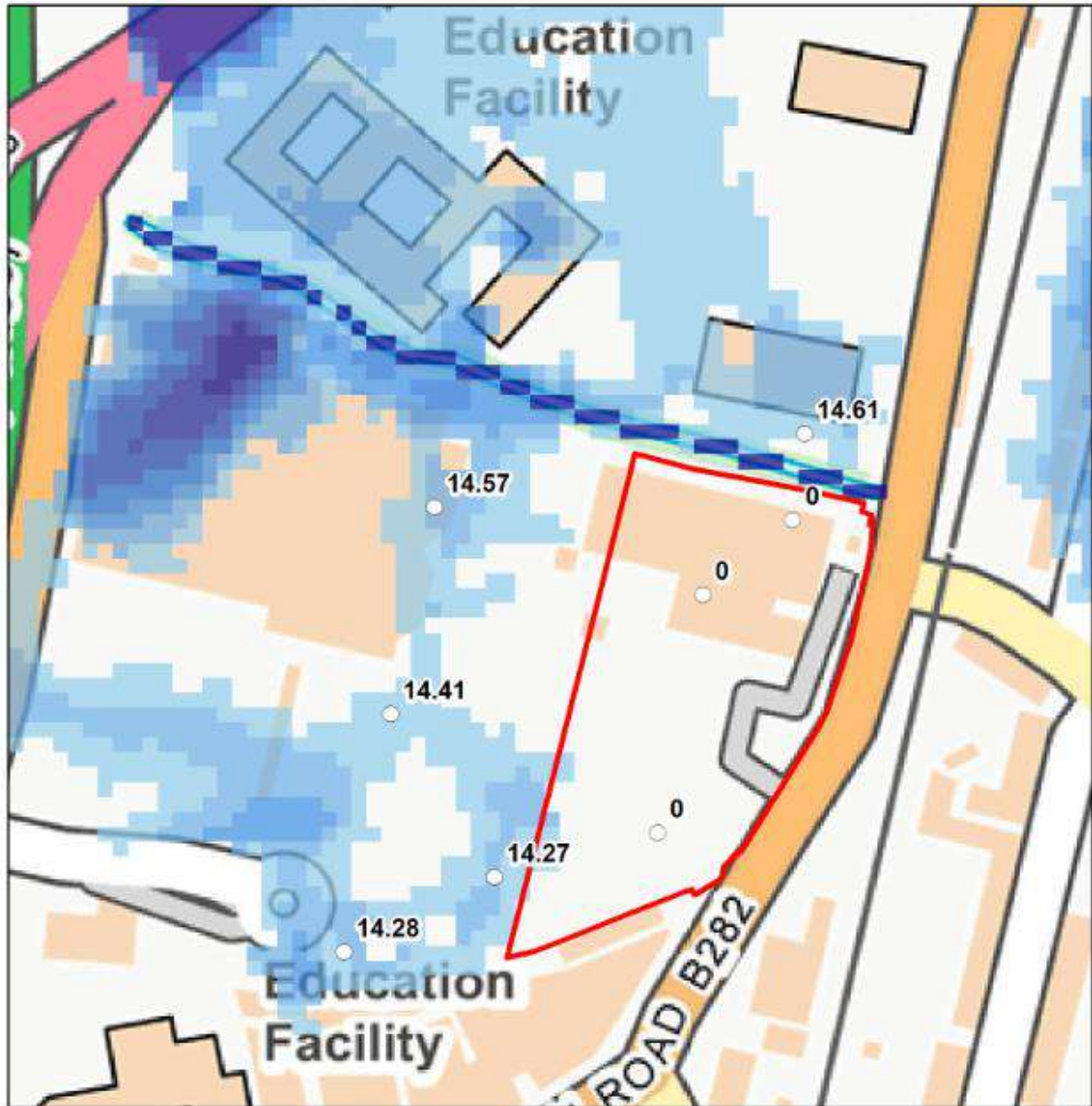
**100yr RP Maximum Depth (m)**

<span style="display: inline-block; width: 15px; height: 10px; background-color: #add8e6; border: 1px solid black;"></span> 0 - 0.15	<span style="display: inline-block; width: 15px; height: 10px; background-color: #4169e1; border: 1px solid black;"></span> 0.6 - 0.75
<span style="display: inline-block; width: 15px; height: 10px; background-color: #6495ed; border: 1px solid black;"></span> 0.15 - 0.3	<span style="display: inline-block; width: 15px; height: 10px; background-color: #4169e1; border: 1px solid black;"></span> 0.75 - 0.9
<span style="display: inline-block; width: 15px; height: 10px; background-color: #4169e1; border: 1px solid black;"></span> 0.3 - 0.45	<span style="display: inline-block; width: 15px; height: 10px; background-color: #00008b; border: 1px solid black;"></span> 0.9 - 1
<span style="display: inline-block; width: 15px; height: 10px; background-color: #00008b; border: 1px solid black;"></span> 0.45 - 0.6	



**AMBIENTAL**  
ENVIRONMENTAL ASSESSMENT

## Fluvial Flood Risk at Site Adjacent to Tesco Extra - New Malden - Maximum Flood Level - 1% AEP Event (Proposed Surface)



**Legend**

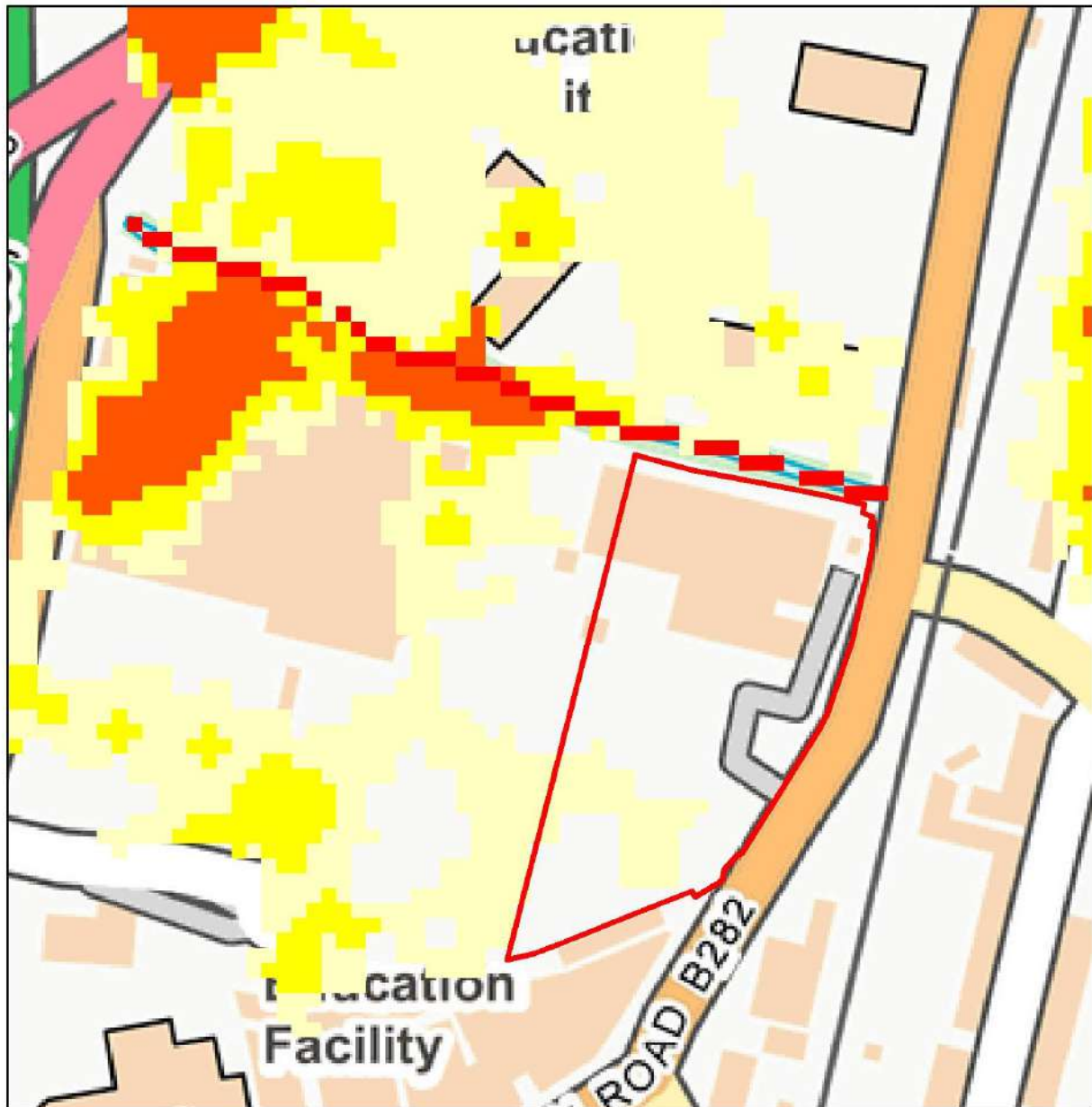
Site

**100yr RP Maximum Depth (m)**

	0 - 0.15		0.6 - 0.75
	0.15 - 0.3		0.75 - 0.9
	0.3 - 0.45		0.9 - 1
	0.45 - 0.6		



# Fluvial Flood Risk at Site Adjacent to Tesco Extra - New Malden - Maximum Hazard Rating - 1% AEP Event (Existing Surface)



### Legend

Site

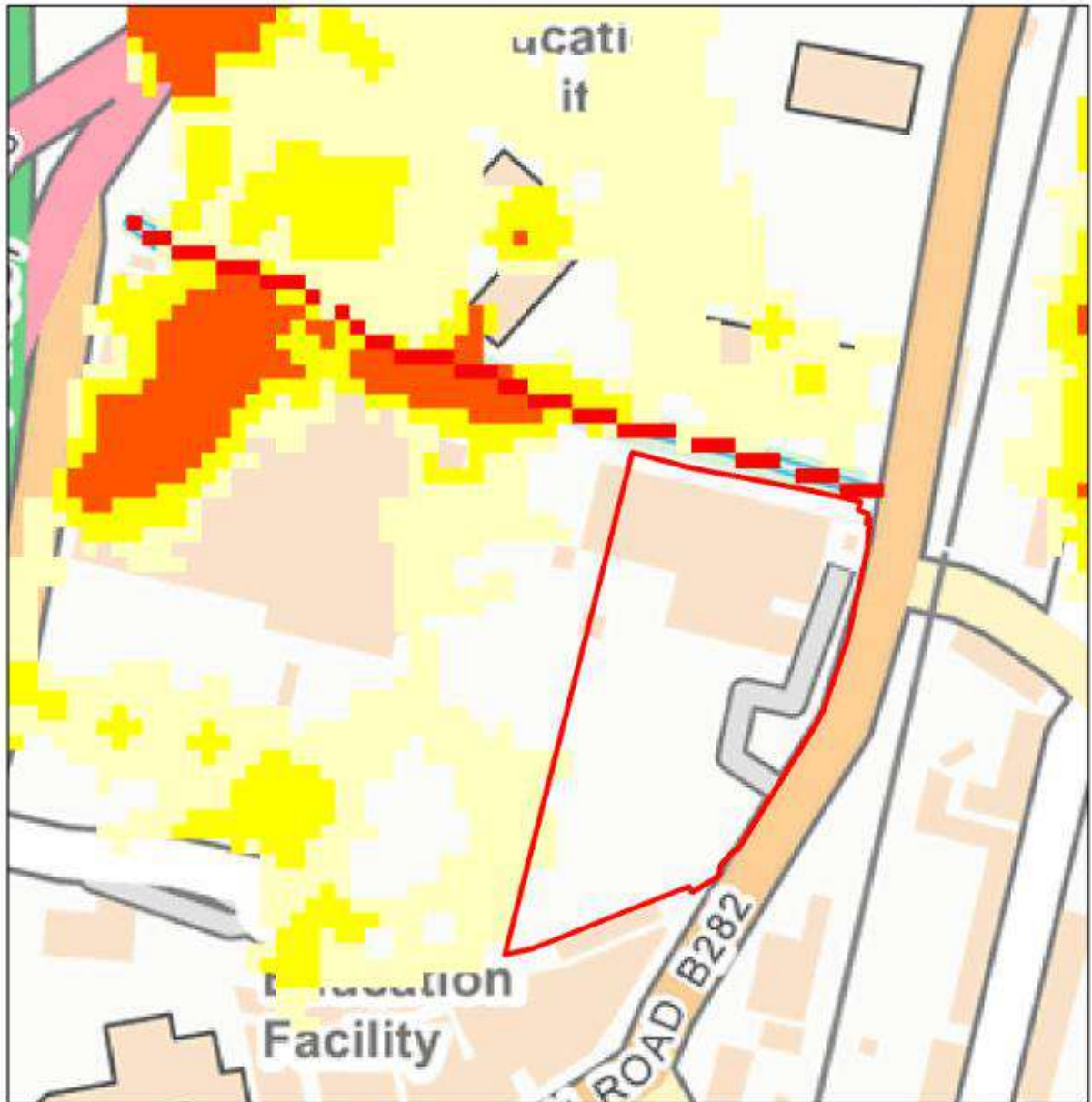
### 100yr RP Maximum Hazard Rating

- 0.5 - 0.75
- 0.75 - 1.25 = Danger for some
- 1.25 - 2.05 = Danger for most
- 2.05+ = Danger for all

0 40 80 160 Meters

**AMBIENTAL**  
ENVIRONMENTAL ASSESSMENT

## Fluvial Flood Risk at Site Adjacent to Tesco Extra - New Malden - Maximum Hazard Rating - 1% AEP Event (Proposed Surface)



**Legend**

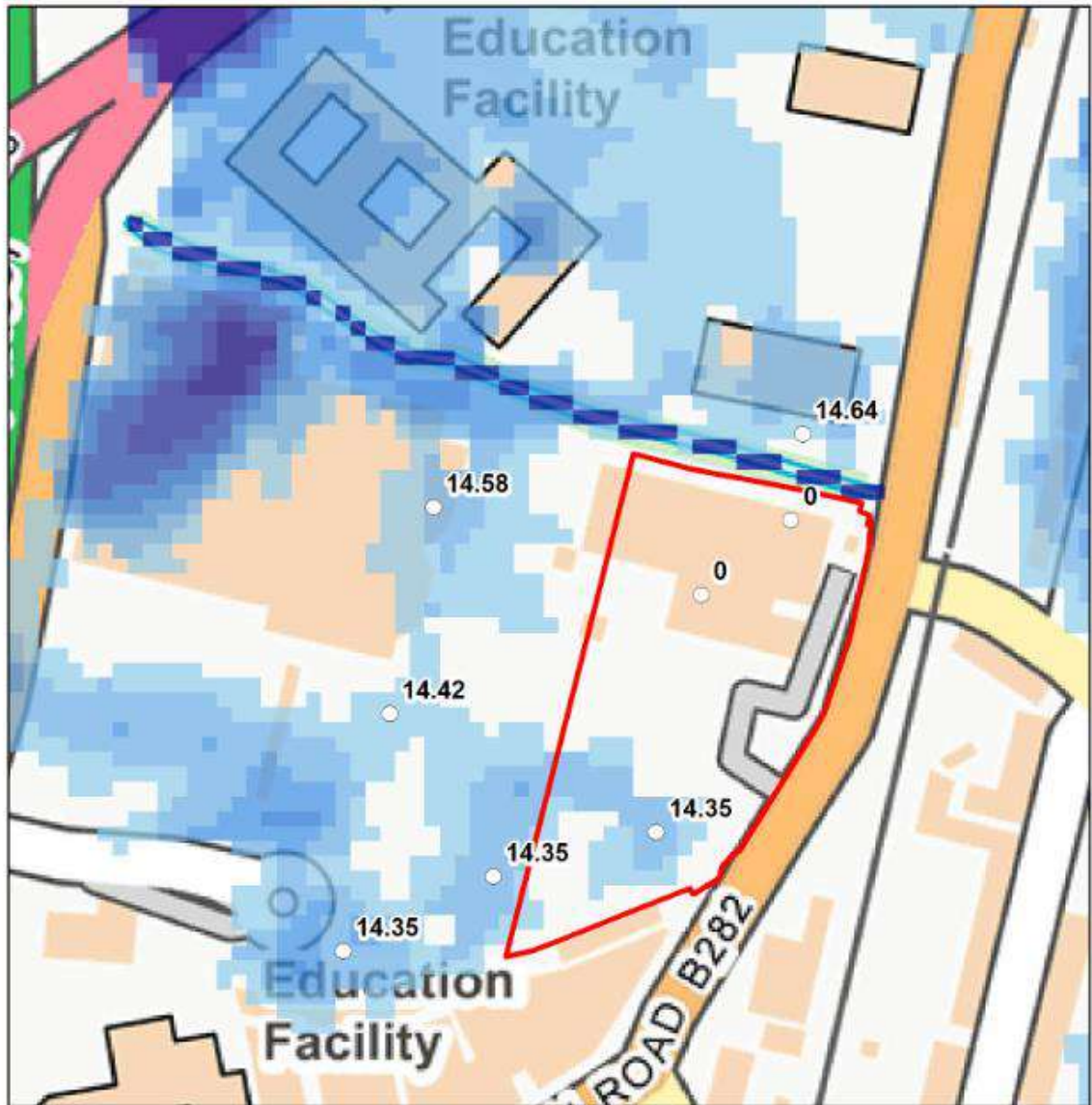
Site

**100yr RP Maximum Hazard Rating**

- 0.5 - 0.75
- 0.75 - 1.25 = Danger for some
- 1.25 - 2.05 = Danger for most
- 2.05+ = Danger for all

0 40 80 160 Meters

## Fluvial Flood Risk at Site Adjacent to Tesco Extra - New Malden - Maximum Flood Level - 1% +35%CC AEP Event (Existing Surface)



**Legend**

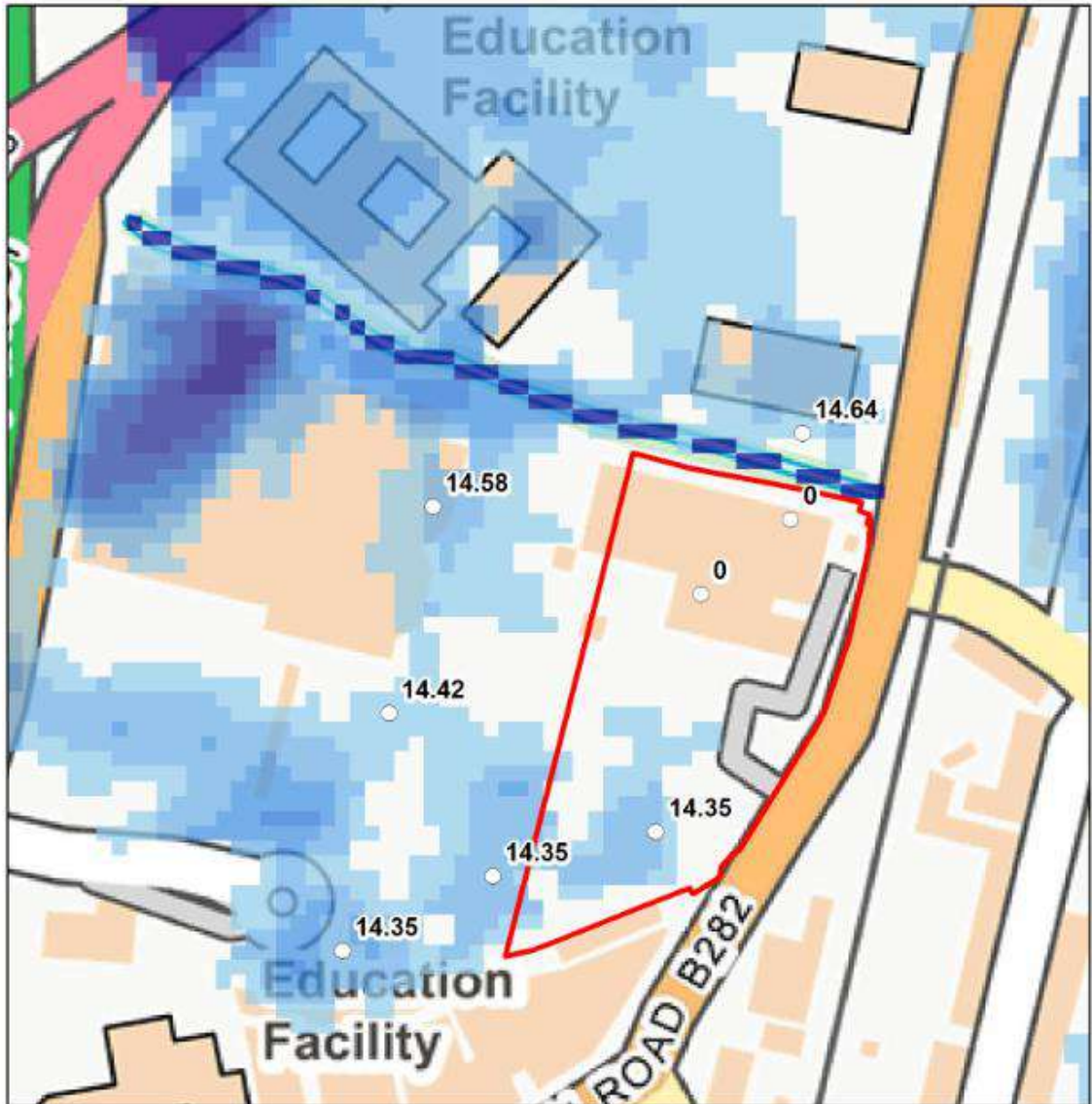
Site

**100yr +35%CC RP Maximum Depth (m)**

	0 - 0.15		0.6 - 0.75
	0.15 - 0.3		0.75 - 0.9
	0.3 - 0.45		0.9 - 1
	0.45 - 0.6		



## Fluvial Flood Risk at Site Adjacent to Tesco Extra - New Malden - Maximum Flood Level - 1% +35%CC AEP Event (Proposed Surface)



**Legend**

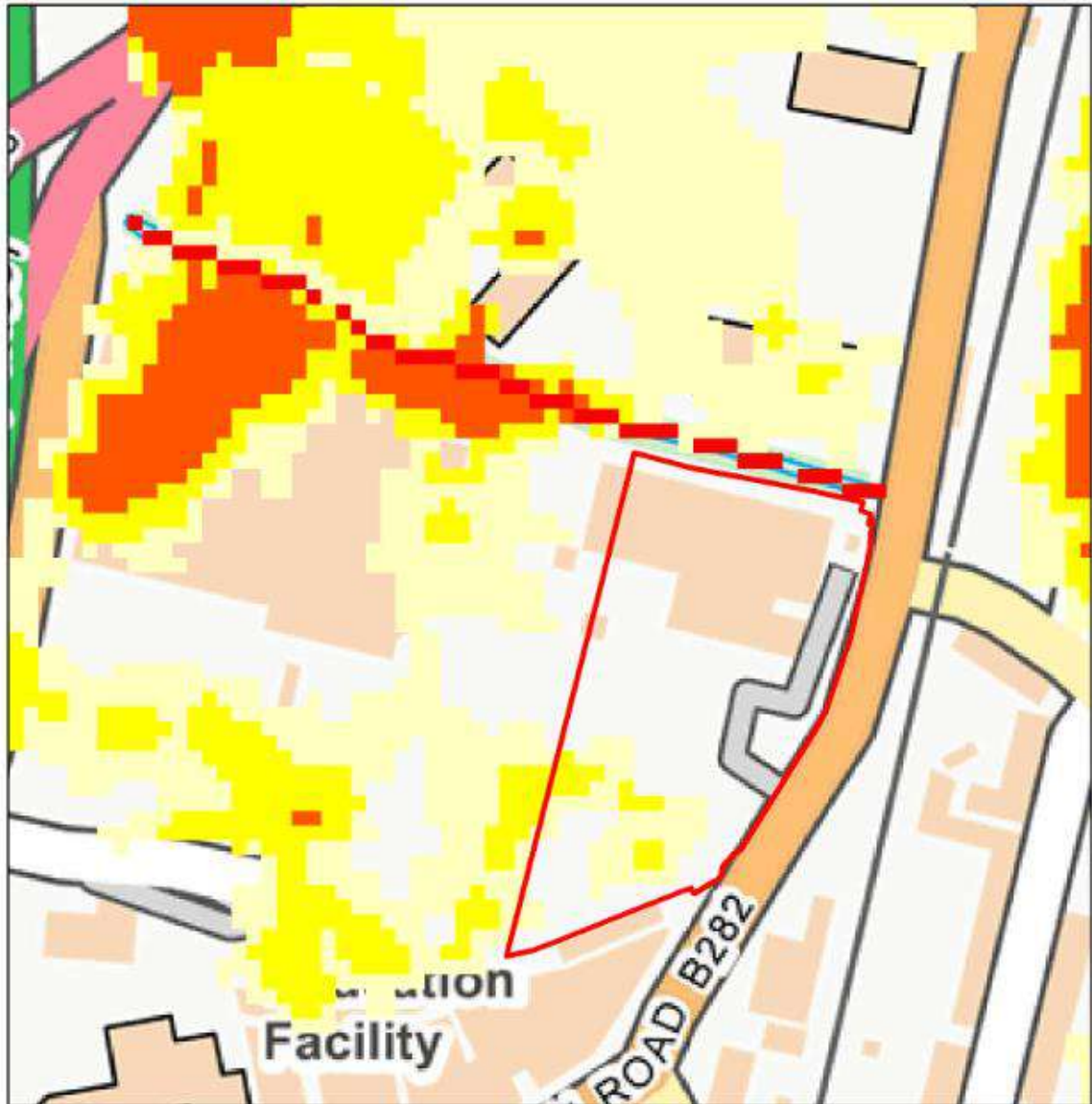
Site

**100yr +35%CC RP Maximum Depth (m)**

	0 - 0.15		0.6 - 0.75
	0.15 - 0.3		0.75 - 0.9
	0.3 - 0.45		0.9 - 1
	0.45 - 0.6		



## Fluvial Flood Risk at Site Adjacent to Tesco Extra - New Malden - Maximum Hazard Rating - 1% +35%CC AEP Event (Existing Surface)



**Legend**

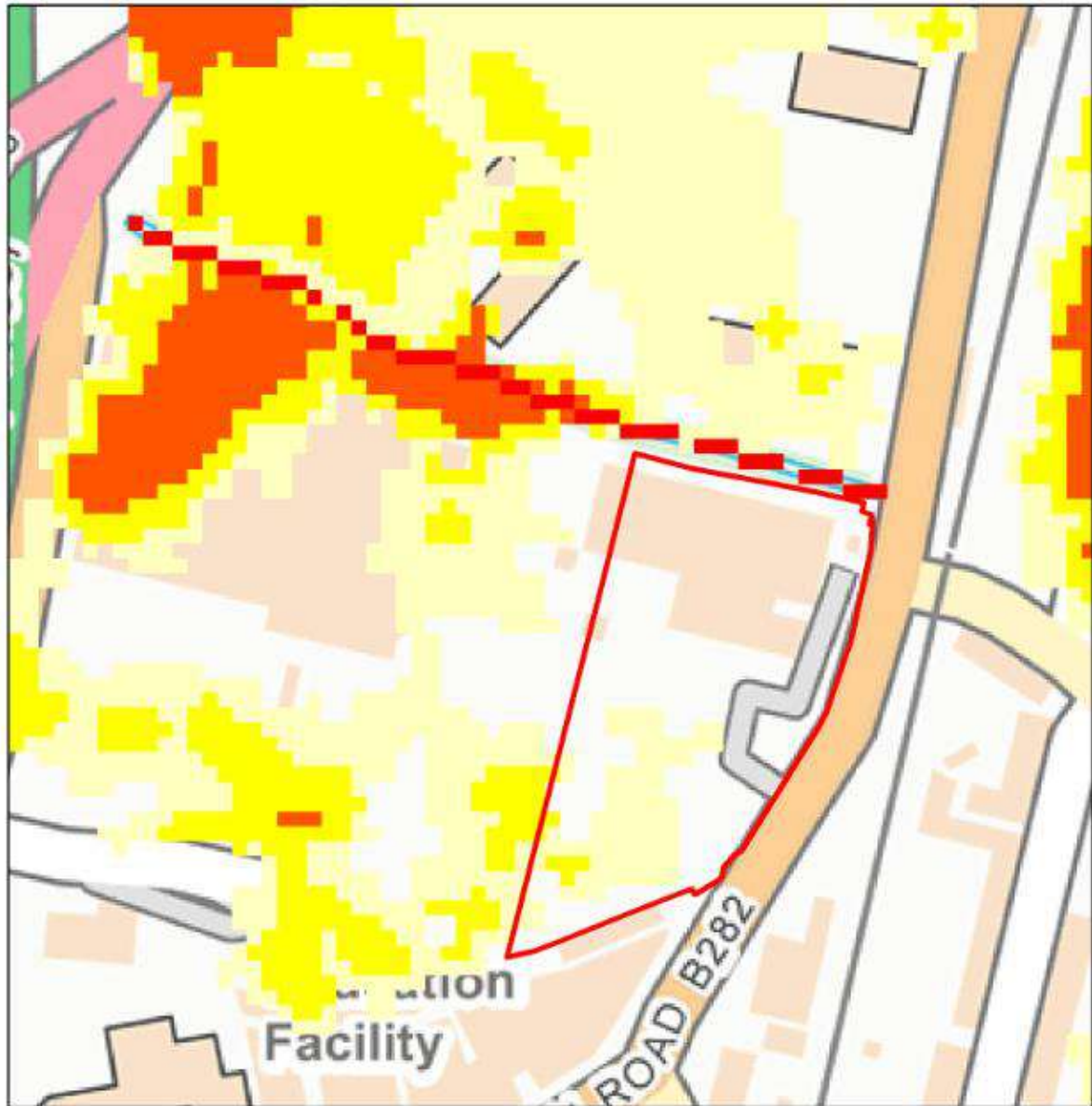
Site

**100yr +35%CC RP Maximum Hazard Rating**

- 0.5 - 0.75
- 0.75 - 1.25 = Danger for some
- 1.25 - 2.05 = Danger for most
- 2.05+ = Danger for all



## Fluvial Flood Risk at Site Adjacent to Tesco Extra - New Malden - Maximum Hazard Rating - 1% +35%CC AEP Event (Proposed Surface)



**Legend**

Site

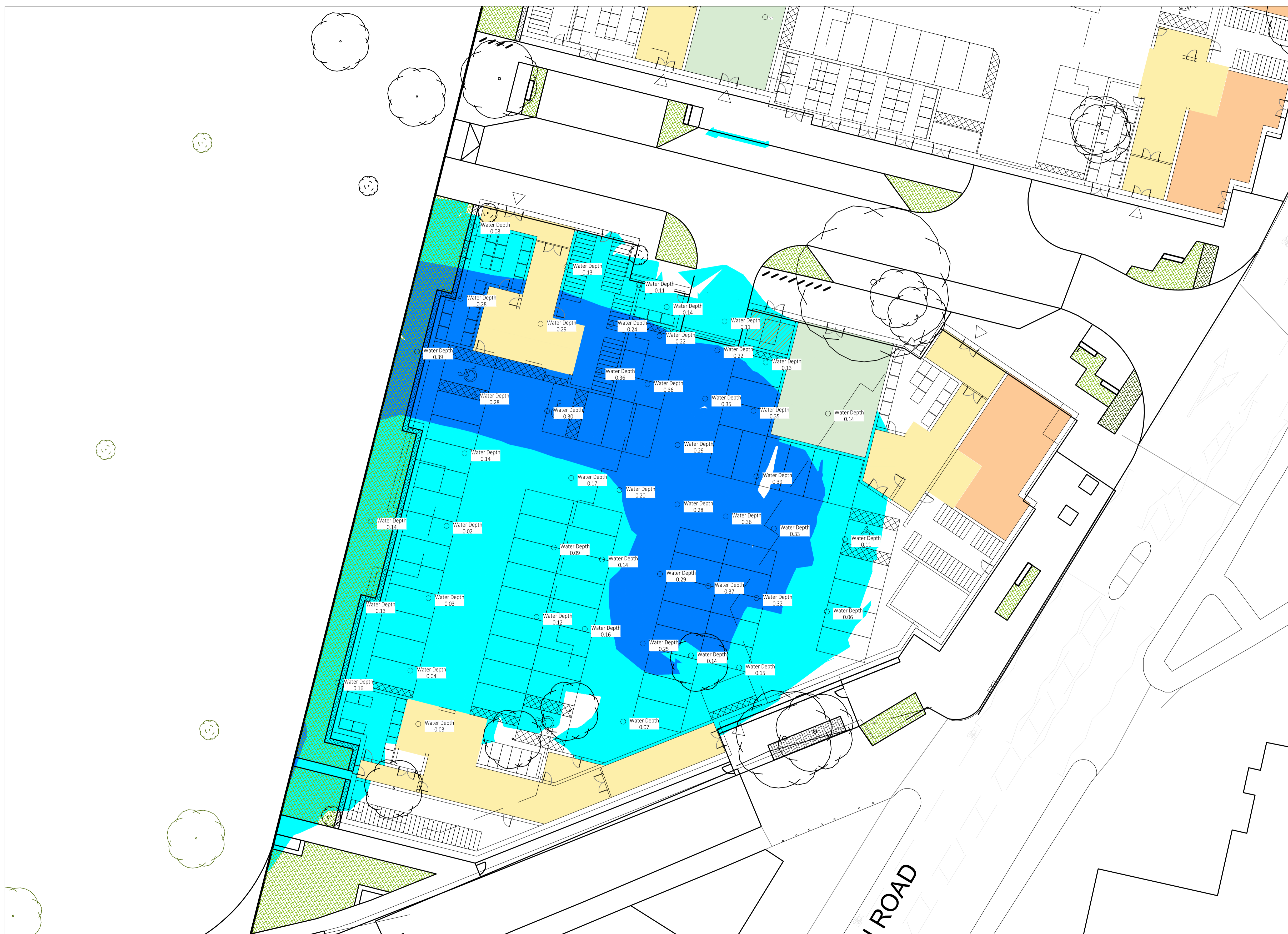
**100yr +35%CC RP Maximum Hazard Rating**

- 0.5 - 0.75
- 0.75 - 1.25 = Danger for some
- 1.25 - 2.05 = Danger for most
- 2.05+ = Danger for all

0      40      80      160  
Meters



1. GENERAL
- THIS DRAWING IS NOT TO BE SCALED, WORK TO FIGURED DIMENSIONS ONLY, CONFIRMED ON SITE.
  - THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL RELEVANT ARCHITECTURAL DRAWINGS, DETAILED SPECIFICATIONS WHERE APPLICABLE AND ALL ASSOCIATED DRAWINGS IN THIS SERIES.
  - ANY DISCREPANCY ON THIS DRAWING IS TO BE REPORTED IMMEDIATELY TO THE PARTNERSHIP FOR CLARIFICATION.
  - THE CONTRACTOR IS RESPONSIBLE FOR ALL TEMPORARY WORKS AND FOR THE STABILITY OF THE WORKS IN PROGRESS.



EXISTING FLOOD EXTENTS				
Number	Minimum Elevation	Maximum Elevation	Color	Volume Bands
1	0.000	0.200		330.10
2	0.200	0.400		91.56

REV DATE CKD APPD BY DESCRIPTION  
**PRELIMINARY DRAWING**  
 FOR INFORMATION ONLY. NOT FOR CONSTRUCTION.

Client  
 REDROW



Project  
 265 BURLINGTON ROAD  
 NEW MALDEN, KT3 4PJ

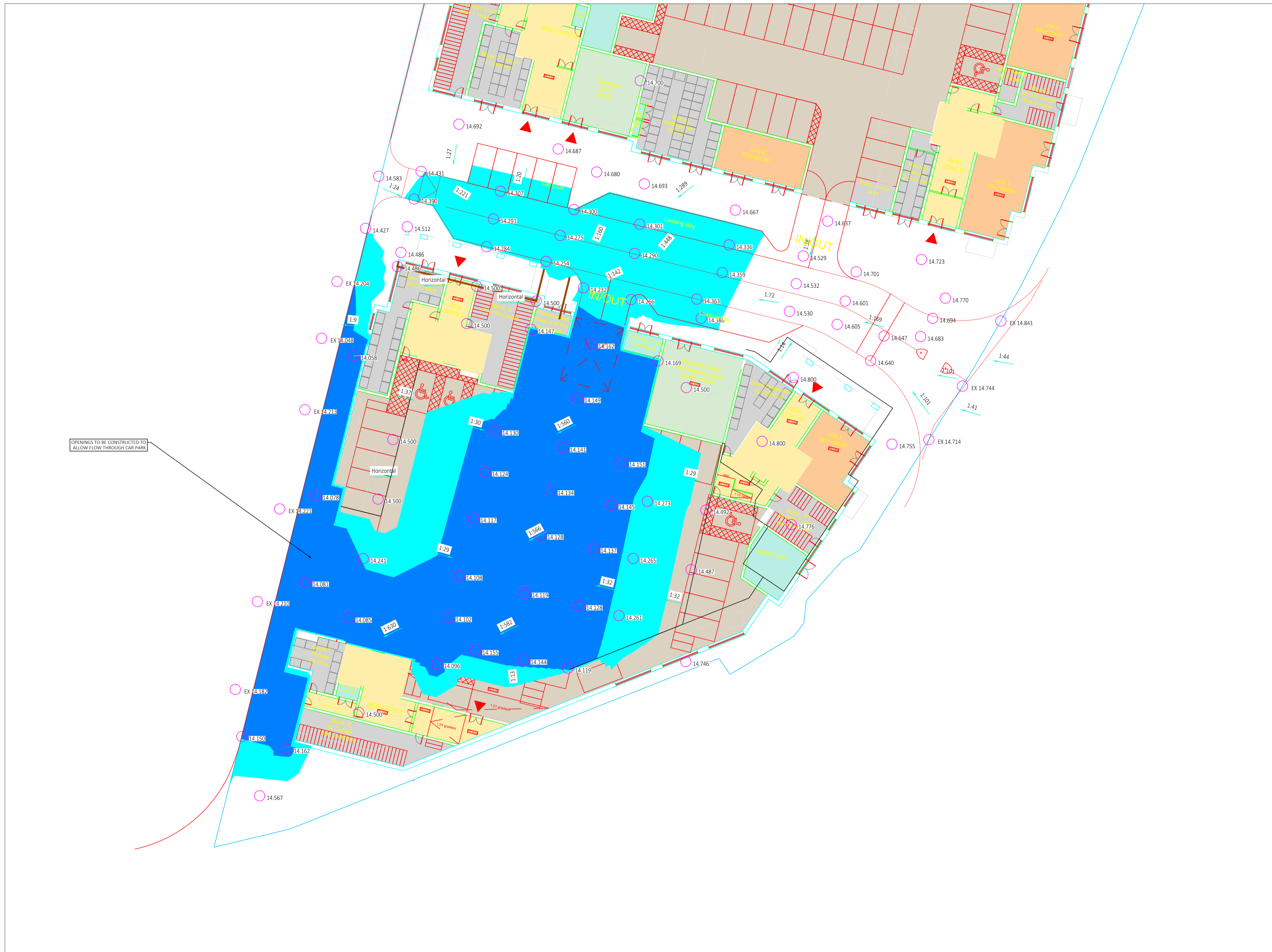
Drawing  
 SITE LAYOUT  
 EXISTING FLOODING EXTENTS

Drawn by: Intals Date: JAN - 2018  
 Drawing No. 4003 - FC EX 01 Revision -

Drawing Scale: 1:200 @ A1  
 0 2m 4m 6m 8m 10m

EXISTING FLOOD EXTENTS

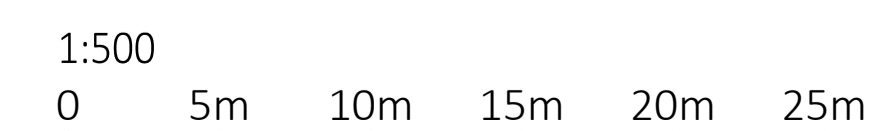
OPTION 3 DIRECTS STORAGE BENEATH THE SOUTHERN BUILDING, WITH OPEN EASTERN ELEVATION TO ALLOW FREE FLOW OF FLOOD WATERS TO AND FROM THE SITE



OPENINGS TO BE CONSTRUCTED TO ALLOW FLOW THROUGH CAR PARK

EXISTING FLOOD EXTENTS				
Number	Minimum Elevation	Maximum Elevation	Color	Volume Bands
1	0.000	0.200	Cyan	330.10
2	0.200	0.400	Blue	91.56

PROPOSED FLOOD COMPENSATION				
Number	Minimum Elevation	Maximum Elevation	Color	Volume Bands
1	0.000	0.200	Cyan	337.22
2	0.200	0.400	Blue	109.42



REV	DATE	CD	APPD	BY	DESCRIPTION
REV 001	22/05/2019				NEW PLANS
REV 002	22/05/2019				FIRST ISSUE

CHECK PRINT  
FOR CHECKING OR COMMENT ONLY

Client: REDROW



Project: 265 BURLINGTON ROAD  
NEW MALDEN

Drawing: FLOOD COMPENSATION  
PROPOSED FLOOD EXTENTS - OPTION 3

Drawn by: RH Date: 22/05/2019

Drawing No: 4003 - FC03 Revision: REV B

Drawing Scale:

## Appendix IV - Flood Compensation (Existing and Proposed 1% + 35%)