

Memo



SUBJECT
London Borough of Croydon Level 2 SFRA Update

TO
London Borough of Croydon

DATE
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OUR REF

DEPARTMENT
Flood Risk and Hydrology

PROJECT NUMBER
10054792

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Introduction

Arcadis Consulting (UK) Limited (Arcadis) were commissioned by Croydon Council to produce an assessment of four new sites flood risk from all sources an updated addendum of the published 2021 Level 1 Strategic Flood Risk Assessment (SFRA). Of the four new sites, two are classified as mixed use (business and residential), one residential renewal development and one business development.

Throughout the tables below the terminology Annual Exceedance Probability and 1 in X year events are used interchangeably to classify the risk of flooding. The surface water hazard mapping is informed by a Hazard Rating (HR). The HR denotes the degree of hazard a flood may have on individuals and is included in the risk to people equation which considers the number of people and vulnerabilities (area and people). The HR is a function of flood depth (m), velocity of floodwaters (m/s), a debris factor (0,0.5 or 1 depending on probability that debris will lead to a hazard) and a constant of 0.5 (n). The HR denotes four different degrees of flood hazard, as shown in Table 1 below.

Table 1: Hazard to people table taken from supplementary note on Flood Hazard ratings and thresholds.

Hazard Rating	Degree of Flood Hazard	Description
<0.75	Low	Caution – “Flood zone with shallow flowing water or deep standing water”
0.75 – 1.25	Moderate	Dangerous for some (i.e. children) - “Danger: Flood zone with deep or fast flowing water”
1.25 – 2.0	Significant	Dangerous for most people - “Danger: flood zone with deep fast flowing water”
>2.0	Extreme	Dangerous for all - “Extreme danger: flood zone with deep fast flowing water”

Update to guidance

Since the publication of the 2021 Level 1 SFRA the Planning Practice Guidance (PPG) for flood risk and coastal change and climate change allowance guidance have been updated. This section will provide an overview of the updates and the relevance to this appendix.

Climate Change allowances

When determining flood risk of developments climate change needs to be accounted for to understand the impacts it will have on flooding. Allowances for peak river flow, peak rainfall intensity, sea level rise and offshore wind speed and extreme wave height are given by the Environment Agency (EA). Peak river flow allowances show the anticipated changes to peak flows. The range of allowances is based on percentiles, classified as the proportion of possible scenarios that fall below an allowance level. With the 50th percentile being the point in which half of the possible scenarios for peak flow fall below it and half above it. Three different allowances are classified as:

- Central allowance is based on the 50th percentile,
- Higher central allowance is based on the 70th percentile,
- Upper end allowance is based on the 95th percentile.

Picking which allowance to use is based upon the flood zone the infrastructure falls within and the flood risk vulnerability classification. Peak rainfall intensity affects surface water flood extents and how drainage systems are designed. The peak rainfall allowances map¹ produced by the EA outlines the anticipated changes in peak rainfall, for catchments smaller than 5 square kilometres (500 hectares). When modelling larger catchments (larger than 500 hectares) it is advised to use the peak river flow allowances.

In 2022, the peak rainfall allowance was updated to include the UKCP Local 2.2km projections. Peak rainfall allowances are now provided for 2 epochs (2050s and 2070s) for the 1 in 100 year chance of occurrence (1% AEP) and the 1 in 30 year chance of occurrence (3.3% AEP) as opposed to the previous 3 epochs. Guidance updates on how to apply the peak rainfall allowances for the Central allowance and the Upper end allowance was also published.

Changes to Planning Practice Guidance

The National Planning Policy Framework (NPPF)² was published in February 2019 and revised in July 2021. Planning practice guidance (PPG) documents are published and updated to support the NPPF. The relevant document to this study is the flood risk and coastal change PPG³. The flood risk and coastal change PPG outlines how through the planning process flooding and coastal change and the risks associated with them can be accounted for and addressed. The guidance was updated in August 2022, with the main changes relevant to this document being revisions to classifications of the design flood, functional floodplain and lifetime of non-residential developments. Alongside updates to the Sequential and Exception Tests. Additional updates covered a more integrated approach to flood management, impacts of developments on flood risk, safeguarding of land and relocation, Sustainable Drainage Systems (SuDS), reducing the causes and impacts of flooding and coastal change.

Within the changes in 2022, the definition of 'design flood' was changed to now include an allowance for climate change and accounts for surface water flood risk. The functional floodplain now has a starting point of the 1 in 30 year chance of occurrence (3.3% AEP). The lifetime of a non-residential development is now 75 years.

The Sequential Test guidance was also updated in 2022. The majority of the updates were to improve clarity and definition of roles and responsibilities for Local Planning Authorities. The Exception Test however, has more guidance written on how developments will reduce flood risk overall and wider sustainability benefits. In addition, the flood risk vulnerability and flood zone 'compatibility' table has been updated to what is now the flood risk vulnerability and flood zone 'incompatibility'. However, no material updates to the table have been undertaken.

¹ Climate Change Allowances, published by the EA, accessed at:

<https://environment.data.gov.uk/hydrology/climate-change-allowances/rainfall?mgmtcatid=3049>

² National Planning Policy Framework, accessed at: <https://www.gov.uk/government/publications/national-planning-policy-framework--2>

³ Flood Risk and Coastal Change Planning Practice Guidance, accessed at: <https://www.gov.uk/guidance/flood-risk-and-coastal-change>

Site Name: Centrale			
Site ID:	New4	Area (ha):	5.3
Proposed Use:	Business	Vulnerability Classification:	Less Vulnerable

Flood Zones and Historic Flooding			
Flood Zone 1 (<0.1% AEP): 100%	Flood Zone 2 (<0.1% AEP): 0%	Flood Zone 3 (<0.1% AEP): 0%	Area Benefitting from Defences: 0%

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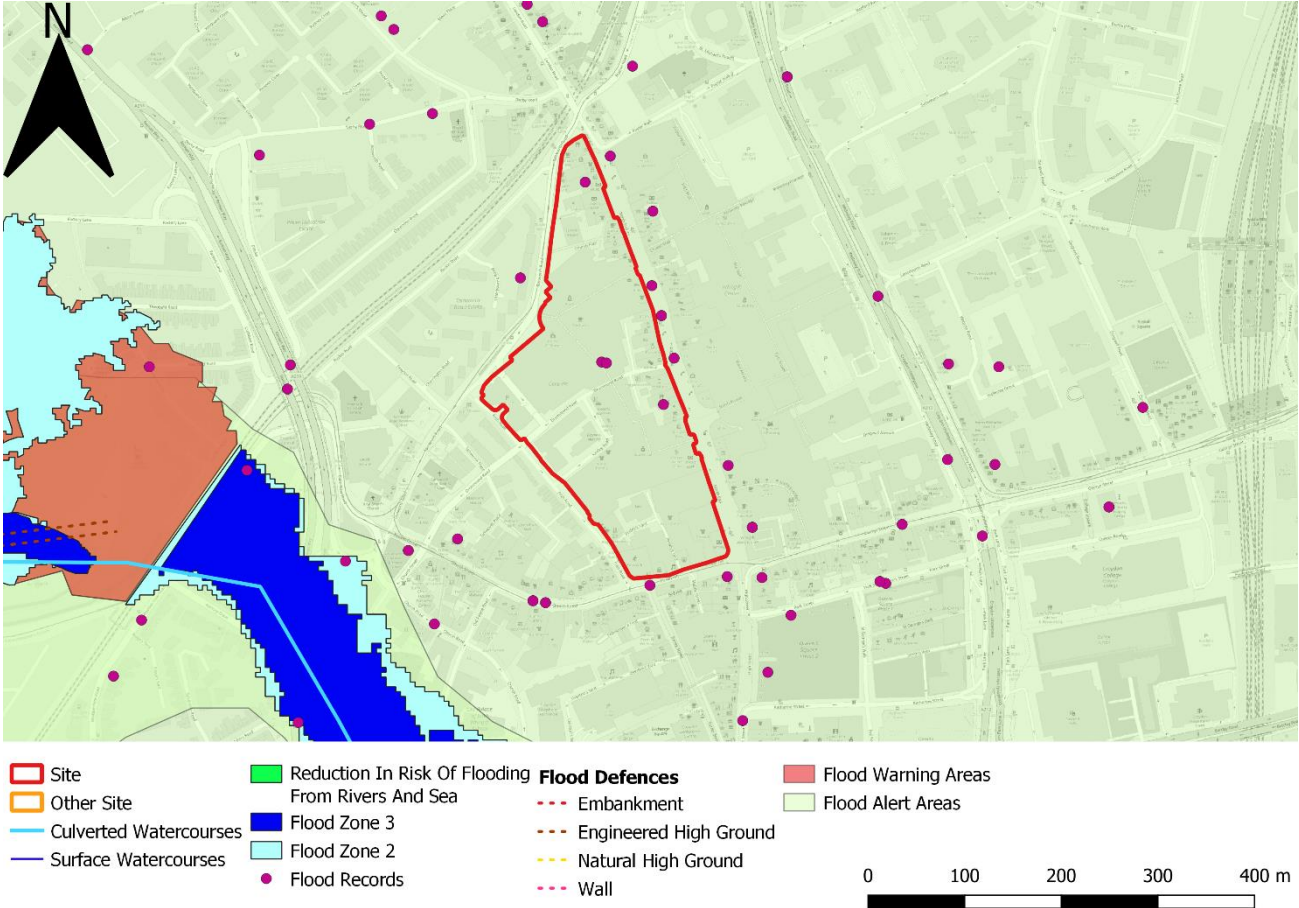


Figure 1: Flood Zones, Flood Records and Flood Warning and Alert Areas

Flood Warning Area	None. The site is located within the Kent, South London and East Sussex groundwater flooding in South East London flood alert area.
Flood Records within 500m of the site:	Four records of flooding within the site boundary. An additional 54 instances of flooding located within 500m of the site. With 25 instances attributed to surface water flooding, nine instances attributed to sewer flooding, four instances of groundwater flooding, eight instances of unknown flooding, five instances attributed to road flooding (likely attributed to blocked drains) and three instances attributed to blocked drains.

River Flooding

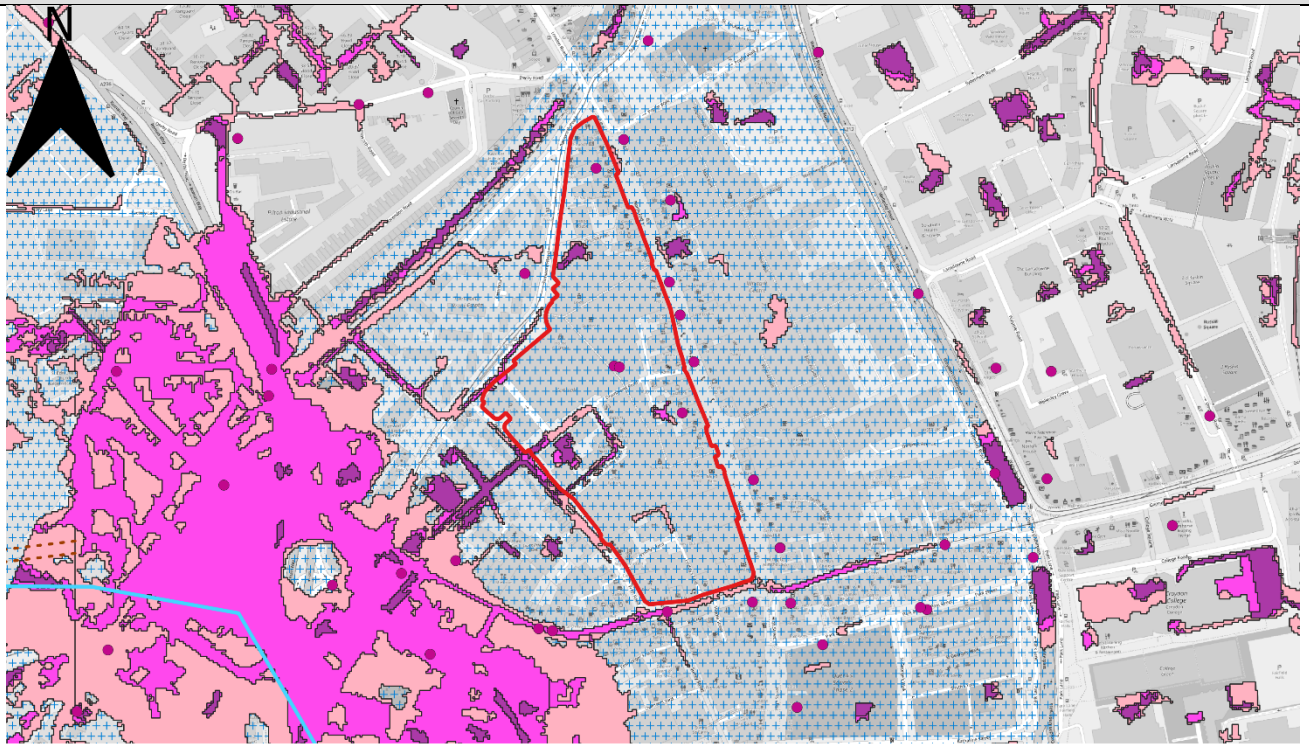
Please Note: the site is not at risk of river flooding and so no data is present.

Surface Water Flooding

Critical Drainage Area	Group8_042 – South & Central Croydon
Drainage Catchment	DC39

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Site Name: Centrale



- Site
 - Surface Watercourses
 - Critical Drainage Areas
 - Other Site
 - Culverted Watercourses
 - Flood Records
- Risk of Flooding from Surface Water**
- 0.1% AEP (Low Probability)
 - 1% AEP (Medium Probability)
 - 3.3% AEP (High Probability)

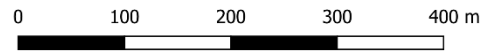
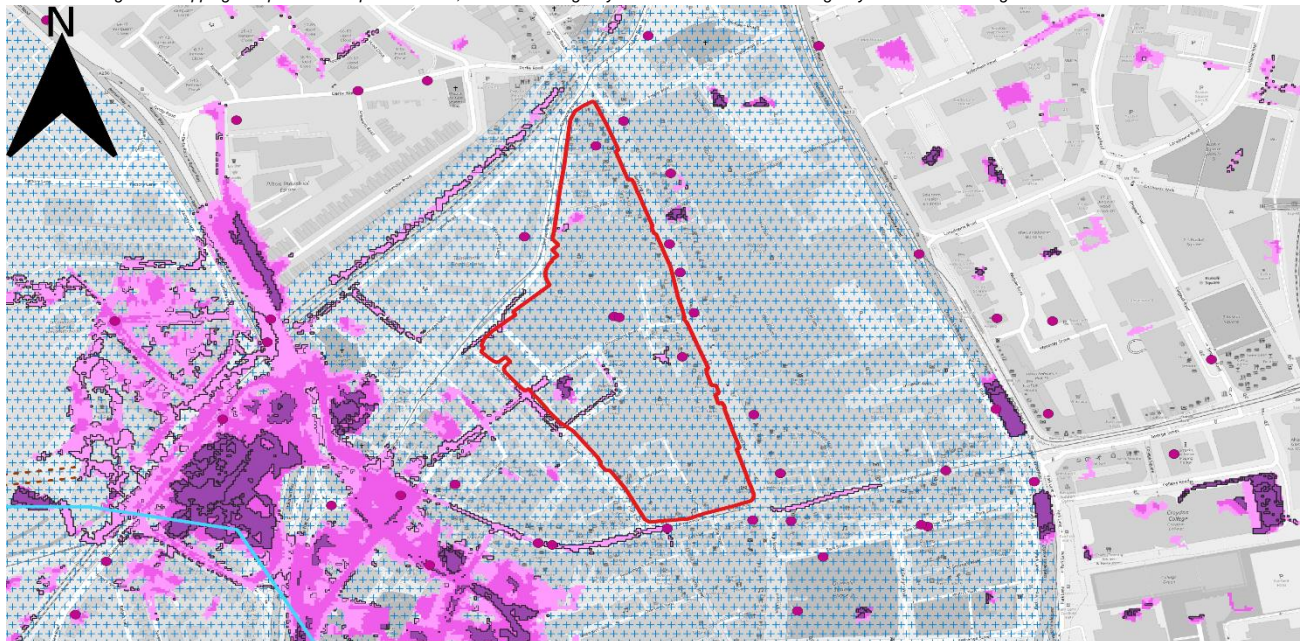


Figure 2: Risk of Flooding from Surface Water (RoFSW) Flood Extents.

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- Site
 - Surface Watercourses
 - Critical Drainage Areas
 - Other Site
 - Culverted Watercourses
 - Flood Records
- Risk of Flooding from Surface Water - 1% AEP Event, Depth**
- Below 300mm
 - 300 to 600mm
 - Over 600mm



Figure 3: Risk of Flooding from Surface Water (RoFSW) 1% AEP Flood Depth.

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Site Name: Centrale

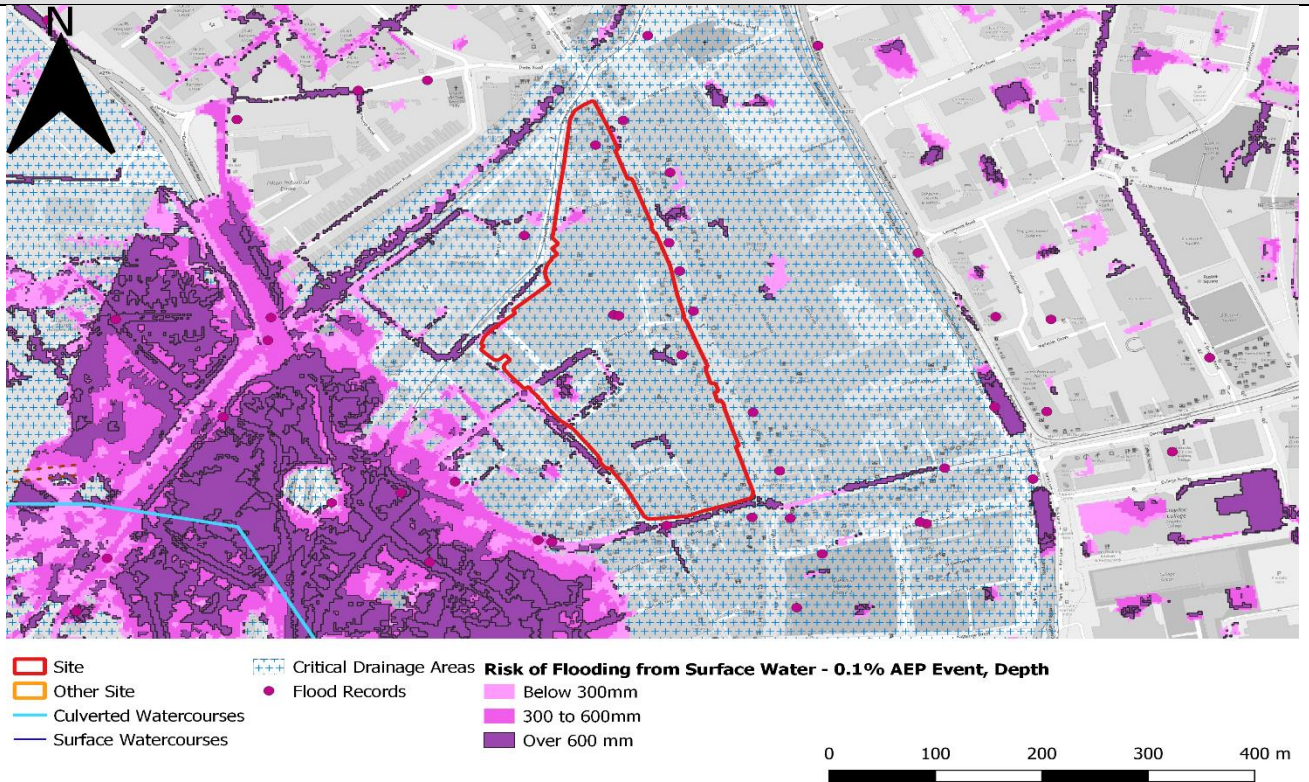


Figure 4: Risk of Flooding from Surface Water (RoFSW) 0.1% AEP Flood Depth.

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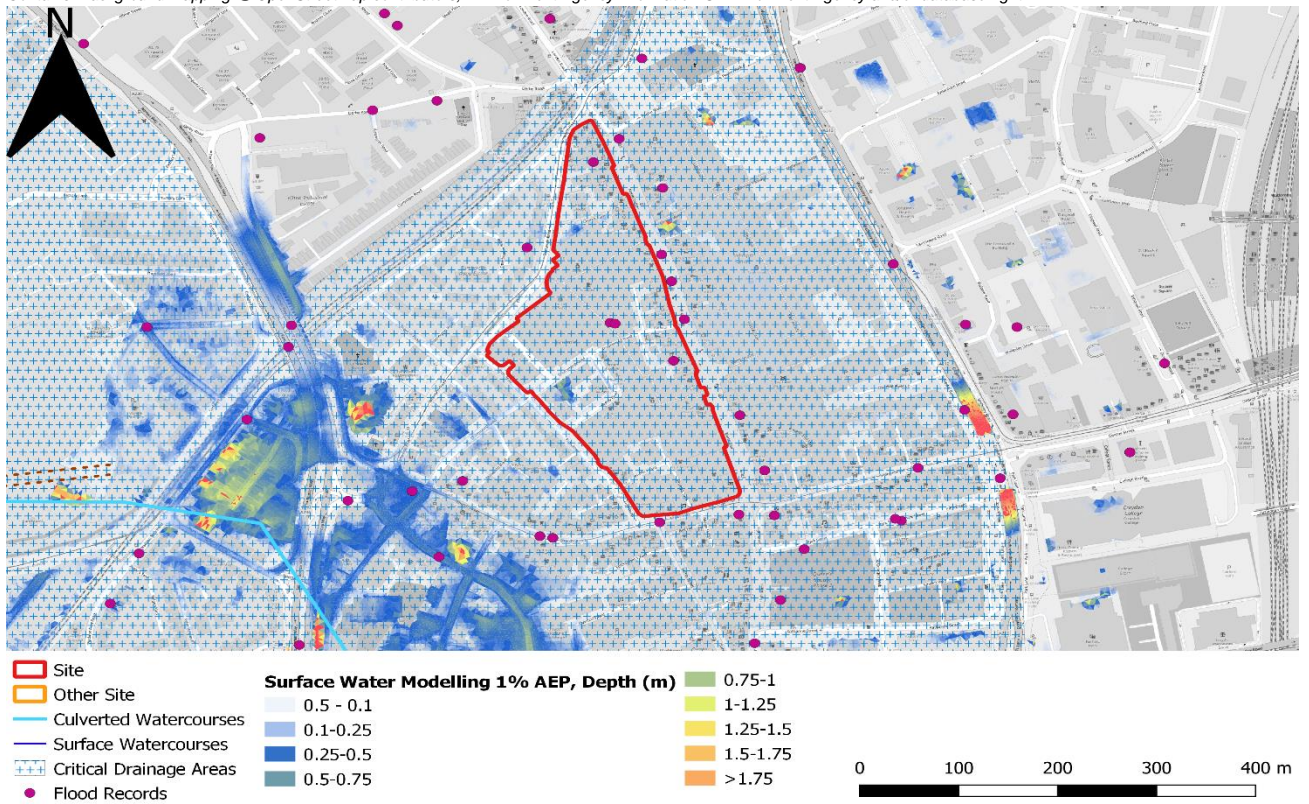


Figure 5: Surface Water Modelling 1% AEP Flood Depth.

Contains: Background mapping @ OpenStreetMap contributors, Environment Agency information © Environment Agency and/or database right

Site Name: Centrale

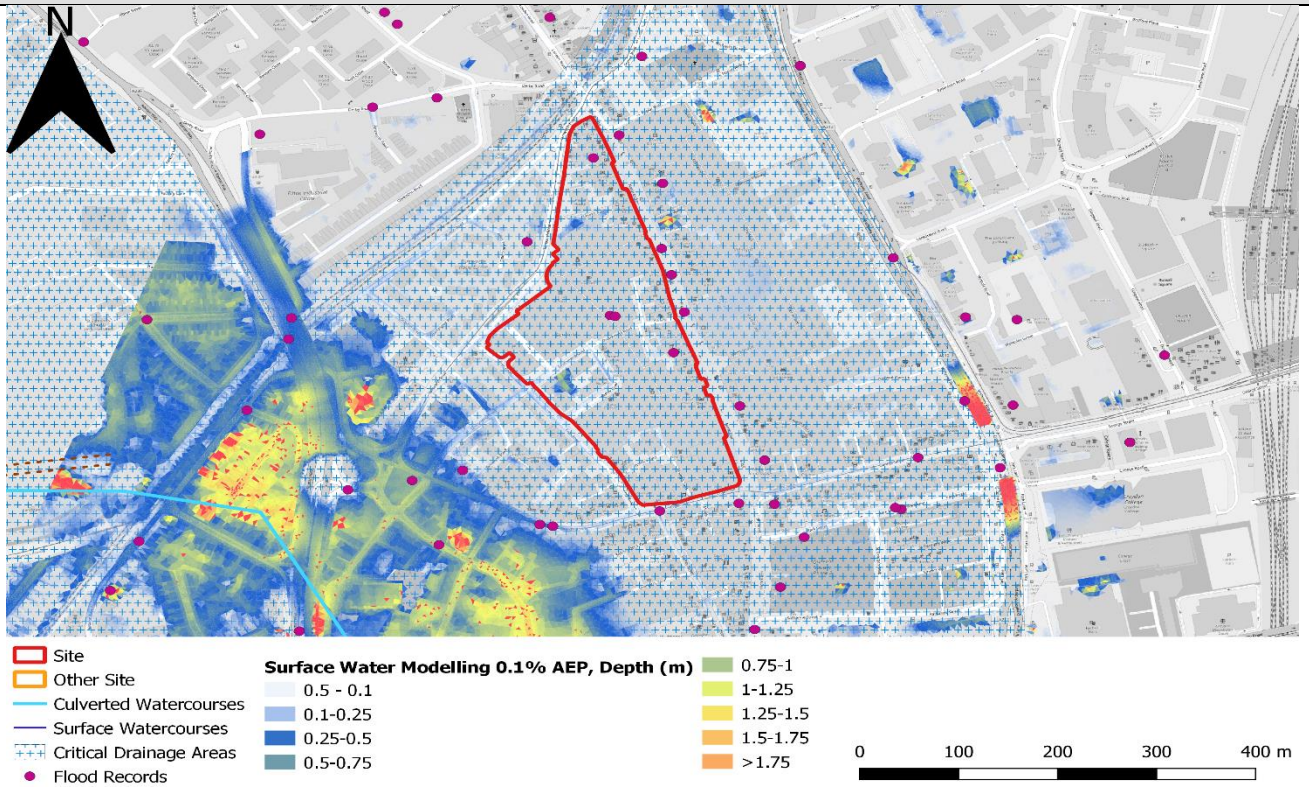


Figure 6: Surface Water Modelling 0.1% AEP Flood Depth.

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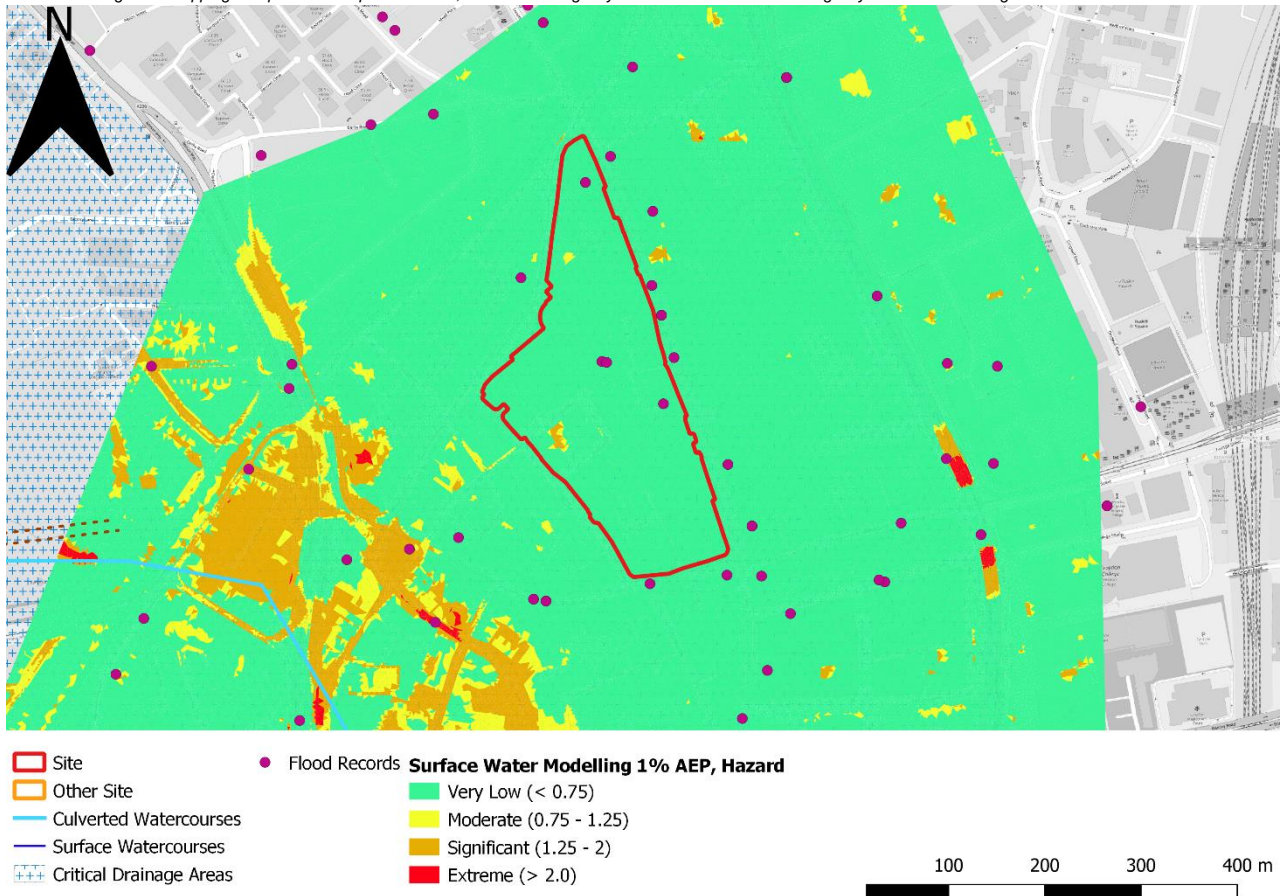
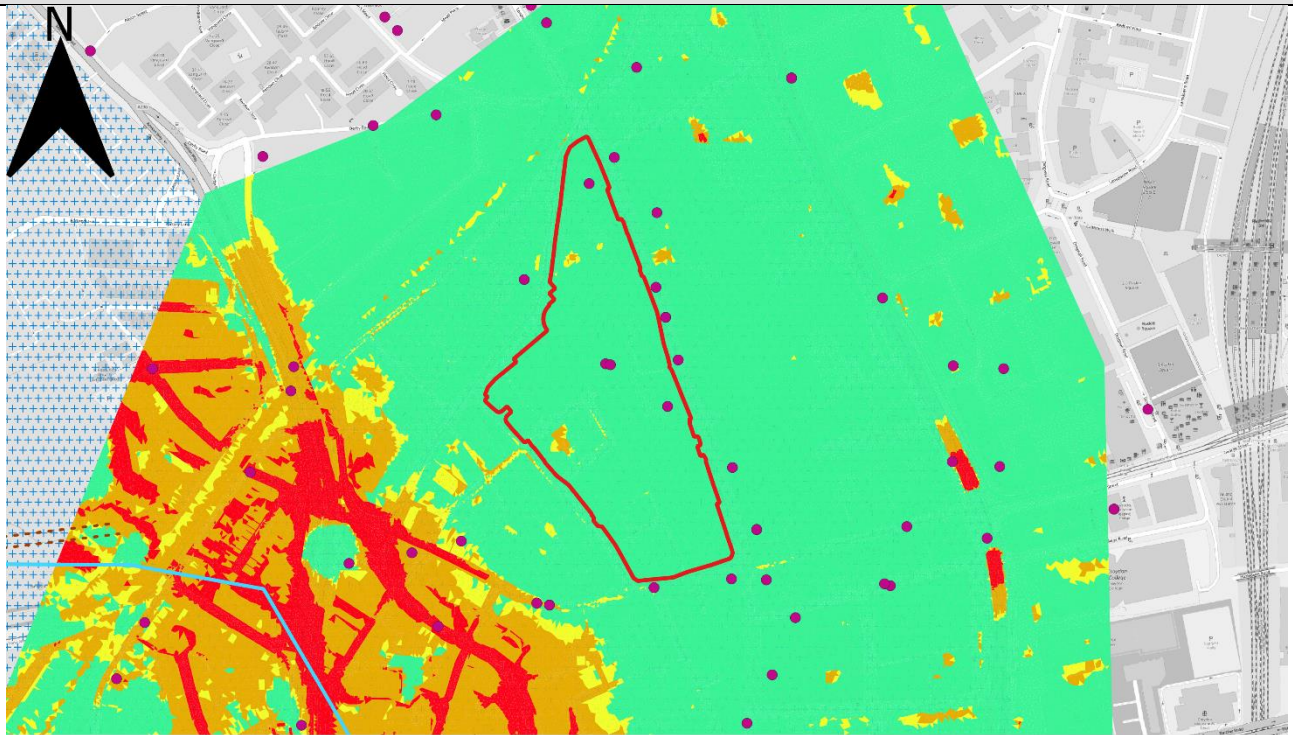


Figure 7: Surface Water Modelling 1% AEP Flood Hazard

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Site Name: Centrale



- Site
- Other Site
- Culverted Watercourses
- Surface Watercourses
- Critical Drainage Areas
- Flood Records
- Surface Water Modelling 0.1% AEP, Hazard**
- Very Low (< 0.75)
- Moderate (0.75 - 1.25)
- Significant (1.25 - 2)
- Extreme (> 2.0)

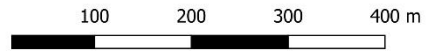


Figure 8: Surface Water Modelling 0.1% AEP Flood Hazard

Groundwater Flooding

Bedrock Geology	The northern parts consist of Harwich Formation - Sand and gravel and the rest consists Lambeth Group - Clay, silt and sand and some parts of Thanet Formation – Sand to the south.	Superficial Geology	Half of Lynch Hill Gravel Member - Sand and gravel and parts with no information.
Increased Potential for Elevated Groundwater		Data not available	
Susceptibility to Groundwater Flooding (BGS)		Limited potential for groundwater flooding to occur, Potential for groundwater flooding of property situated below ground level, Potential for groundwater flooding to occur at surface	

Other Sources

Risk of flooding from reservoirs	The EA Risk of Flooding from Reservoirs Map shows that the potential flood extent if large, embanked reservoirs were to fail and release the water they hold. The site is outside of the zone of flooding from this source.
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Summary

The site lies entirely (100%) within Flood Zone 1, which is classified with a low probability of river flooding. The site lies within the South & Central Croydon Critical Drainage Area. There are four records of flooding within the site boundary, two attributed to sewer flooding and two attributed to surface water flooding. An additional 54 instances of flooding are located along the boundary and within 500m of the site centroid. With 25 instances attributed to surface water flooding, nine instances attributed to sewer flooding, four instances of groundwater flooding, eight instances of unknown flooding, five instances attributed to road flooding (likely attributed to blocked drains) and three instances attributed to blocked drains. The nearest watercourse to the site is located 323m southwest of the site and is a culverted below surface watercourse.

Surface water modelling extents which included the Centrale site was available. The surface water modelling has a finer

Site Name: Centrale

spatial resolution than the RoFSW mapping and so will be used alongside the RoFSW mapping to determine the risks of surface water flooding.

The RoFSW mapping shows that the site boundary is only partially at risk of surface water flooding. During the High risk of flooding, classified as a 1 in 30 chance of annual occurrence within the site extents are shown at a service entrance adjacent to Tamworth Road, along Drummond Road, Keeley Road and adjacent to Playdays Nursery. Offsite adjacent to the western section of the site Frith Road is also classified as having a High risk of surface water flooding. The Medium risk, classified as a 1 in 100 chance of annual occurrence, increases the previous extent locations, but in addition Tamworth Road and an unnamed road off Drummond Road is at risk. Areas at Low risk, classified as a 1 in 1000 chance of annual occurrence, are located at the same locations but with larger extents, in addition Crown Hill and Priddy's Yard is also at risk.

The surface water modelling shows that the site boundary is not at widespread risk of flooding, with localised pockets of flooding. Depths for the risk of surface water with a 1 in 100 annual chance of occurrence, range between 0.5m and 1m adjacent to Drummond Road and Keeley Road. Whilst depths adjacent to Tamworth Road by the service entrance range between 0.1m and 0.5m. The hazard category between Drummond Road and Keeley Road range between Low and Significant. Whilst the hazard category next to the service entrance adjacent to Tamworth Road is classified between Low and Moderate.

Depths for the risk of surface water with a 1 in 1000 annual chance of occurrence, range between 0.01m and 1.1m adjacent to Drummond Road and Keeley Road. With the hazard rating between Low and Significant. Whilst depths adjacent to the Tamworth Road service entrance have a high of 0.5 with a hazard category between Low and Significant. Depths along Frith Road range between 0m and 0.2m with a Low hazard category.

Site Specific Recommendations

The site is draft allocated as being a primary shopping area within Croydon Metropolitan Centre. Given the location within Flood Zone 1, development is not subject to the application of the Exception Test. However, given the potential for surface water flooding in this area, steps should be taken to ensure that development is safe for its lifetime considering the impact of climate change, will not increase flood risk elsewhere, and where possible will reduce flood risk overall. To this end, the following recommendations are made throughout the site boundary:

- A Sequential Test should be applied within the AFI, with developments considered in areas of lower risk of surface water flooding before consideration of areas at greater risk.
- Development options should consider methods to restrict surface water runoff rates, this could be through SuDS such as rainwater harvesting on buildings, green spaces, permeable car parks.
- The RoFSW flooding maps shows that Fifth Road, Keeley Road and Drummond Road are at High risk of surface water flooding, classified as a 1 in 30 year chance of occurrence, with a Moderate to Significant hazard rating. Therefore, access and egress routes using the same point on Drummond Road should be considered.
- This area is covered by the Environment Agency Flood Alert Area for Groundwater flooding in South East London.
- A flood warning and evacuation plan should be prepared in accordance with the Council's wider emergency planning response.

Site Name: CityLink House			
Site ID:	New1	Area (ha):	0.2
Proposed Use:	Mixed use (residential and/or office)	Vulnerability Classification:	More vulnerable

Flood Zones and Historic Flooding			
Flood Zone 1 (<0.1% AEP): 100%	Flood Zone 2 (<0.1% AEP): 0%	Flood Zone 3 (<0.1% AEP): 0%	Area Benefitting from Defences: 0%

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Figure 9: Flood Zones, Flood Records and Flood Warning and Alert Areas

Flood Warning Area	None. The site is located within the Kent, South London and East Sussex groundwater flooding in South East London flood alert area.
Flood Records within 500m of the site:	None located within the site boundary. 22 records of flooding located within 500m of the site have been recorded, ten instances of surface water flooding, five instances attributed to road flooding (possible cause surface water or blocked drains), three recorded as basement flooding and four instance with an unknown source.
River Flooding	
Please Note: the site is not at risk of river flooding and so no data is present.	
Surface Water Flooding	
Critical Drainage Area	The site is not covered by a Critical Drainage Area
Drainage Catchment	DC39 and DC22

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Site Name: CityLink House



- Site
 - Other Site
 - Culverted Watercourses
 - Surface Watercourses
 - Critical Drainage Areas
 - Flood Records
- Risk of Flooding from Surface Water**
- 0.1% AEP (Low Probability)
 - 1% AEP (Medium Probability)
 - 3.3% AEP (High Probability)

0 75 150 225 m

Figure 10: Risk of Flooding from Surface Water (RoFSW) Flood Extents.

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- Site
 - Other Site
 - Culverted Watercourses
 - Surface Watercourses
 - Critical Drainage Areas
 - Flood Records
- Risk of Flooding from Surface Water - 1% AEP Event, Depth**
- Below 300mm
 - 300 to 600mm
 - Over 600 mm

0 75 150 225 m

Figure 11: Risk of Flooding from Surface Water (RoFSW) 1% AEP Flood Depth.

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Site Name: CityLink House



Figure 12: Risk of Flooding from Surface Water (RoFSW) 0.1% AEP Flood Depth.

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Figure 13: Risk of Flooding from Surface Water (RoFSW) 1% AEP Flood Hazard

Site Name: CityLink House

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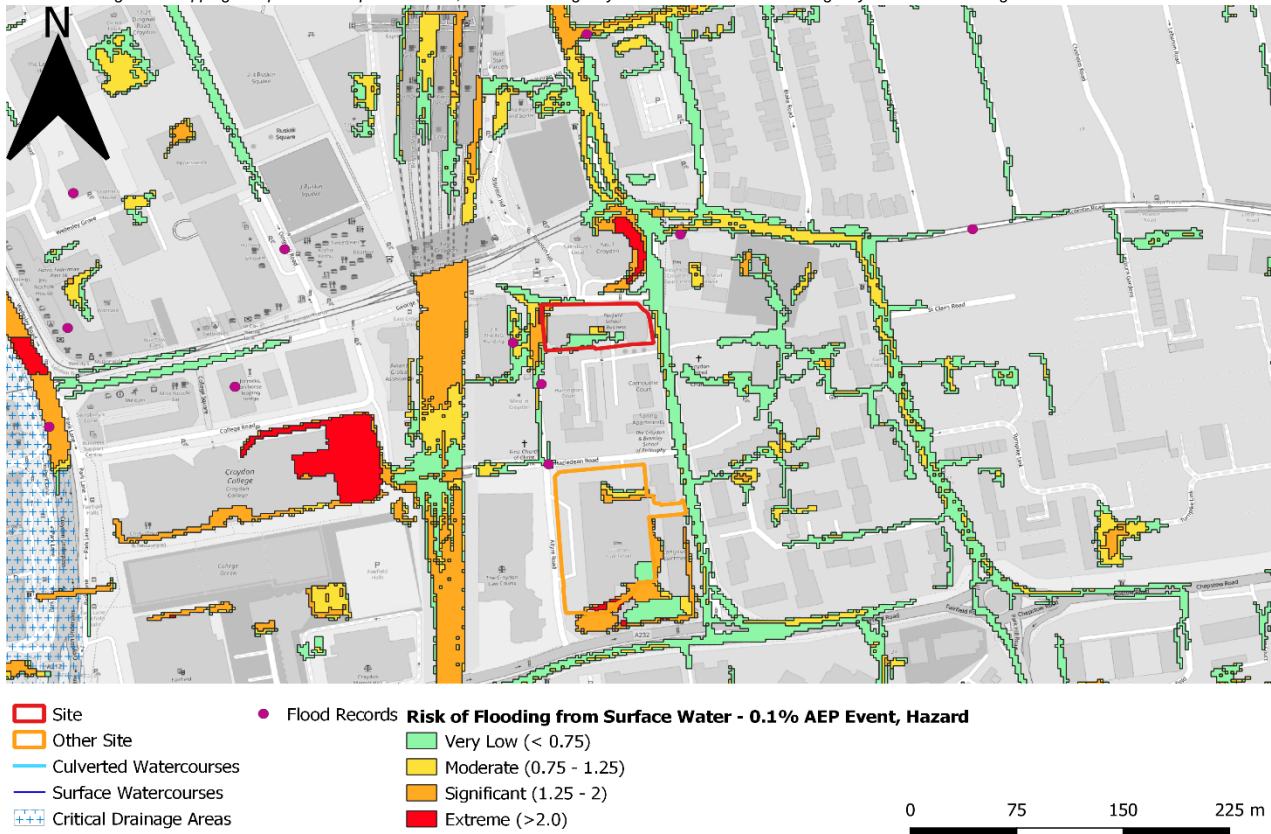


Figure 14: Risk of Flooding from Surface Water (RoFSW) 0.1% AEP Flood Hazard

Please Note: No surface water modelling for the site is present.

Groundwater Flooding

Bedrock Geology	Harwich Formation - Sand and gravel	Superficial Geology	Lynch Hill Gravel Member - Sand and gravel
Increased Potential for Elevated Groundwater		Data not available	
Susceptibility to Groundwater Flooding (BGS)		Limited potential for groundwater flooding to occur.	

Other Sources

Risk of flooding from reservoirs	The EA Risk of Flooding from Reservoirs Map shows that the potential flood extent if large, embanked reservoirs were to fail and release the water they hold. The site is outside of the zone of flooding from this source.
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Summary

The site lies entirely (100%) within Flood Zone 1, which is classified with a low probability of river flooding. The site does not lie within a Critical Drainage Area, but is located between two drainage catchments. There are no records of flooding within the site boundary. However two records have been recorded within 30m to the west and southwest of the site with the cause of one being attributed to surface water flooding whilst the other does not have a cause recorded. Within 500m a total of 22 flood events have been recorded, ten instances of surface water flooding, five instances attributed to road flooding (possible cause surface water or blocked drains), three recorded as basement flooding and four instance with an unknown source. The nearest watercourse is located approximately 1km to the west and is a culverted below surface watercourse. No surface water modelling extents where available for this site. The RoFSW mapping shows that this site is only partially at risk of surface water flooding, with the risk increasing as the event intensity increases. The site is at a High risk of surface water flooding, classified as a 1 in 30 chance of annual occurrence, this is located within the western section of the site boundary and continues onto Altyre Road. The Medium risk of surface water flooding, classified as a 1 in 100 chance of annual occurrence, increases the flood extents in the western section of the site, whilst no other part of the site is at risk. Adjacent to the site to the east Addiscombe Grove has a Medium risk to surface water flooding. The Low risk of surface water flooding, classified as a 1 in 1000 chance of occurrence, extents show that along parts of the northern boundary, all along the east and within the centre of the site partially along the access road is all at risk. Offsite to the east and west, both Addiscombe Grove and Altyre Road are

Site Name: CityLink House

at risk.

Depths for the risk of surface water flooding with a 1 in 100 annual chance of occurrence, range between 0.15m and greater than 1.2m in the eastern section of the site. The hazard category within the site is classified as between Low and Extreme, noting the majority of the onsite extent is classified as a Significant hazard. Offsite along Altyre Road depths range between 0.15m and 1.2m in areas in which extents are present, these extents have a hazard rating of Low and Moderate with a small section classified as Significant and Extreme. Along Addiscombe Grove the depths are between 0m and 0.15m, with a Low hazard classification.

Depths for the risk of surface water flooding with a 1 in 1000 annual chance of occurrence, have depths range between 0.15m and greater than 1.2m in the eastern section of the site. The hazard classification on the eastern section of the site is predominately Significant with small areas of Extreme, Moderate and Low. The depths located along the access road within the middle of the site range between below 0.15m and 0.6m. The hazard classification is predominately Low with some areas of Moderate and Significant. Offsite to the west depths range between below 0.15m and 0.6m with the majority of the extent ranging between 0.15m and 0.3m. The hazard classification is predominately Low or Moderate, with the extents closest to the site boundary classified as Significant. Offsite to the east depths are predominately below 0.15m but some areas are classified as between 0.15m and 0.3m. The hazard classification to the east is classified as Low or Moderate.

Site Specific Recommendations

A range of proposed uses may be considered across this site. Given the location within Flood Zone 1, development is not subject to the application of the Exception Test. However, given the potential for surface water flooding in this area, steps should be taken to ensure that development is safe for its lifetime considering the impact of climate change, will not increase the flood risk elsewhere, and where possible will reduce flood risk overall. To this end, the following recommendations are made for this option:

- A Sequential Test should be applied within the site, with developments considered in areas of lower risk of surface water flooding, before consideration of areas at greater risk, namely the western boundary of the site.
- Due to the risk of surface water flooding, surface water modelling should be undertaken covering the site to determine the risks. This to confirm the risks in the middle of the site which is currently only at a Low risk.
- Due to the currently High risk of surface water flooding, development options should consider methods to restrict surface water runoff rates, these could include SuDS such as a green roof, rainwater harvesting and permeable paving.
- Development options shouldn't increase the flood risk of the surrounding road which is currently at a Medium risk of surface water flooding.
- The surface water mapping shows that only Addiscombe Road is at a high risk of flooding, this extent increases and Addiscombe Grove become at risk during a 1 in 100 chance of annual occurrence. Therefore access/egress routes to the north should be considered. The south can be considered once surface water modelling confirms the Low risk of surface water flooding on the access road.
- This area is covered by the Environment Agency Flood Alert Area for Groundwater flooding in South East London.
- A flood warning and evacuation plan should be prepared in accordance with the Council's wider emergency planning response.

Site Name: Croydon Park Hotel			
Site ID:	New3	Area (ha):	0.7
Proposed Use:	Mixed use	Vulnerability Classification:	More vulnerable

Flood Zones and Historic Flooding			
Flood Zone 1 (<0.1% AEP): 100%	Flood Zone 2 (<0.1% AEP): 0%	Flood Zone 3 (<0.1% AEP): 0%	Area Benefitting from Defences: 0%

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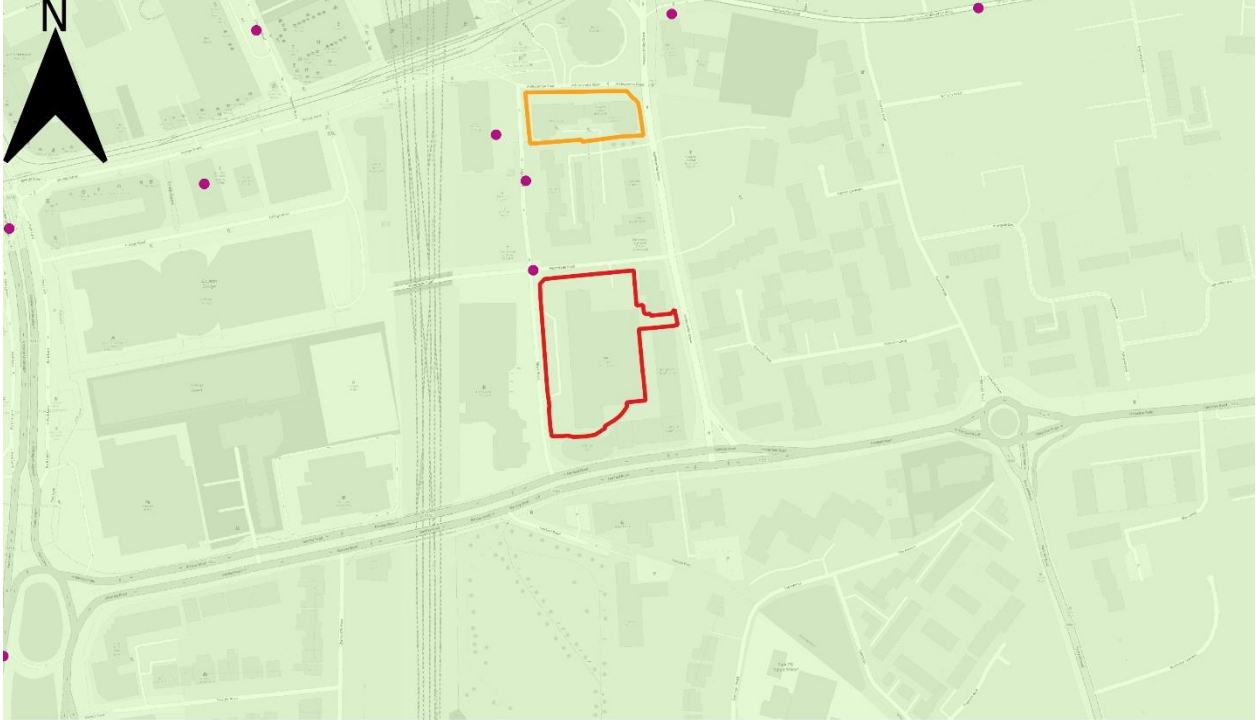


Figure 15: Flood Zones, Flood Records and Flood Warning and Alert Areas

Flood Warning Area	Flood warnings are not available in this area. The site is located within the Kent, South London and East Sussex groundwater flooding in South East London flood alert area.
Flood Records within 500m of the site:	None located within the site boundary. 26 instances of flooding are located within 500m of the site centroid. 11 instances of flooding attributed to surface water, four attributed to road flooding (surface water or blocked drains), four attributed to blocked gullies or sewer flooding and four attributed to basement flooding.

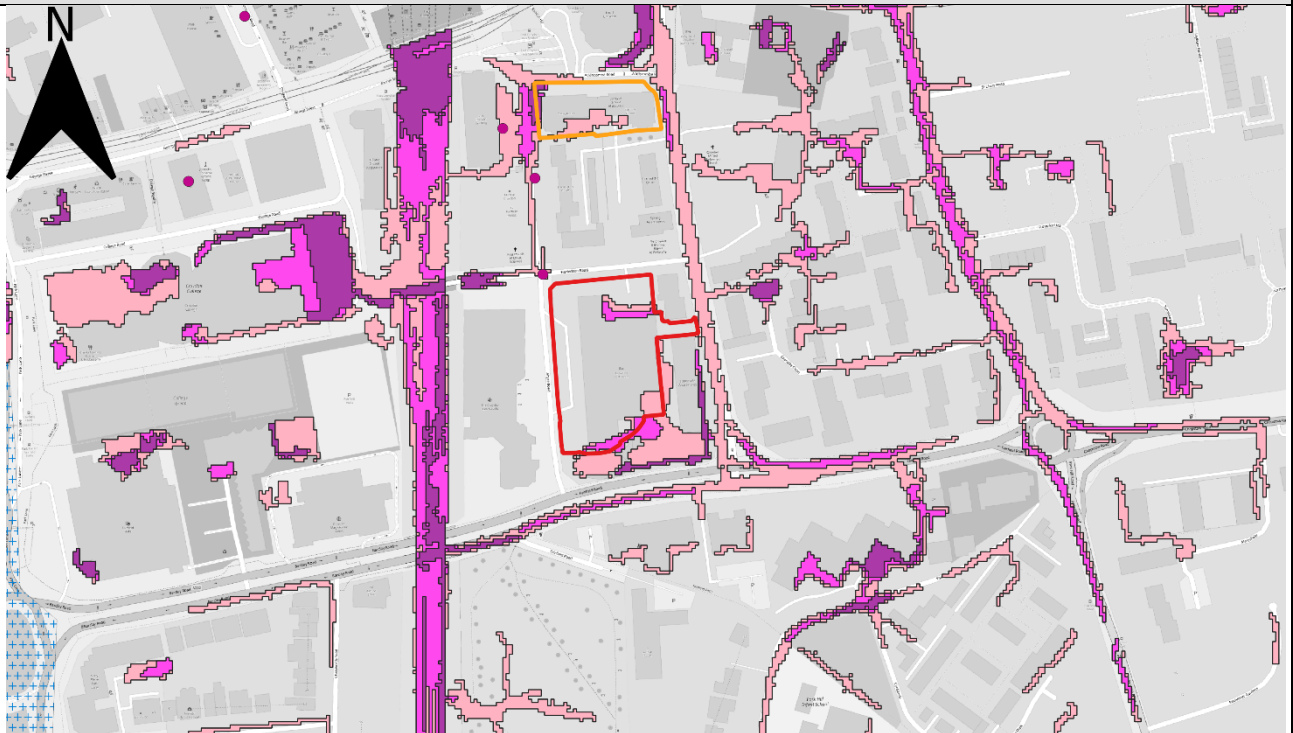
River Flooding

Please Note: the site is not at risk of river flooding and so no data is present.

Surface Water Flooding	
Critical Drainage Area	The site is not covered by a Critical Drainage Area
Drainage Catchment	DC39

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Site Name: Croydon Park Hotel

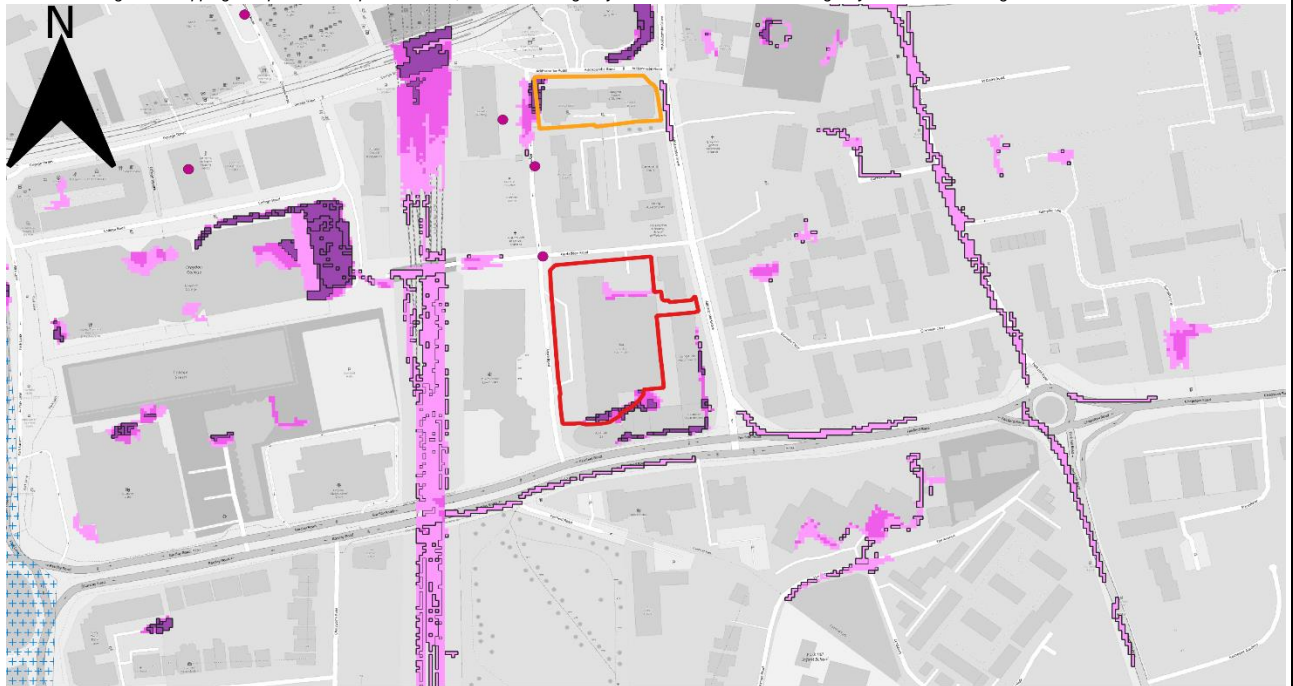


- Site
 - Other Site
 - Culverted Watercourses
 - Surface Watercourses
 - Critical Drainage Areas
 - Flood Records
- Risk of Flooding from Surface Water**
- 0.1% AEP (Low Probability)
 - 1% AEP (Medium Probability)
 - 3.3% AEP (High Probability)

0 75 150 225 m

Figure 16: Risk of Flooding from Surface Water (RoFSW) Flood Extents.

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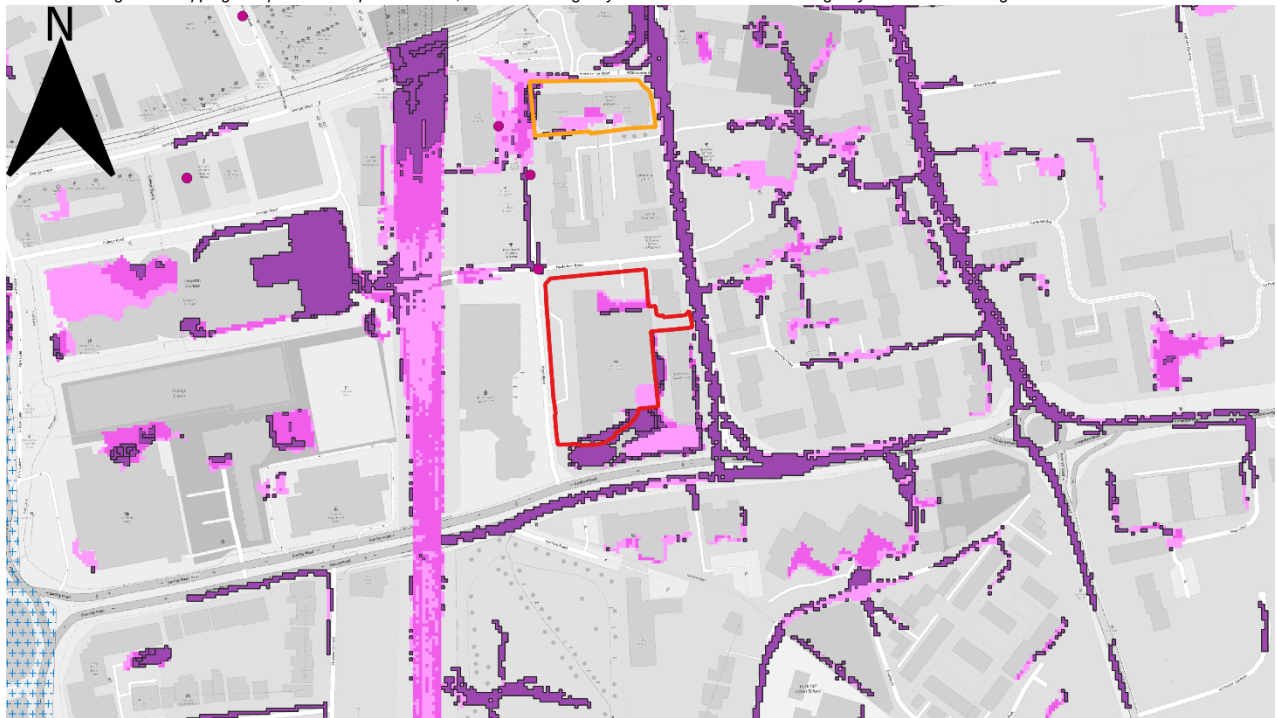
- Site
 - Other Site
 - Culverted Watercourses
 - Surface Watercourses
 - Critical Drainage Areas
 - Flood Records
- Risk of Flooding from Surface Water - 1% AEP Event, Depth**
- Below 300mm
 - 300 to 600mm
 - Over 600 mm

0 75 150 225 m

Figure 17: Risk of Flooding from Surface Water (RoFSW) 1% AEP Flood Depth.

Site Name: Croydon Park Hotel

Contains: Background mapping @ OpenStreetMap contributors, Environment Agency information © Environment Agency and/or database right

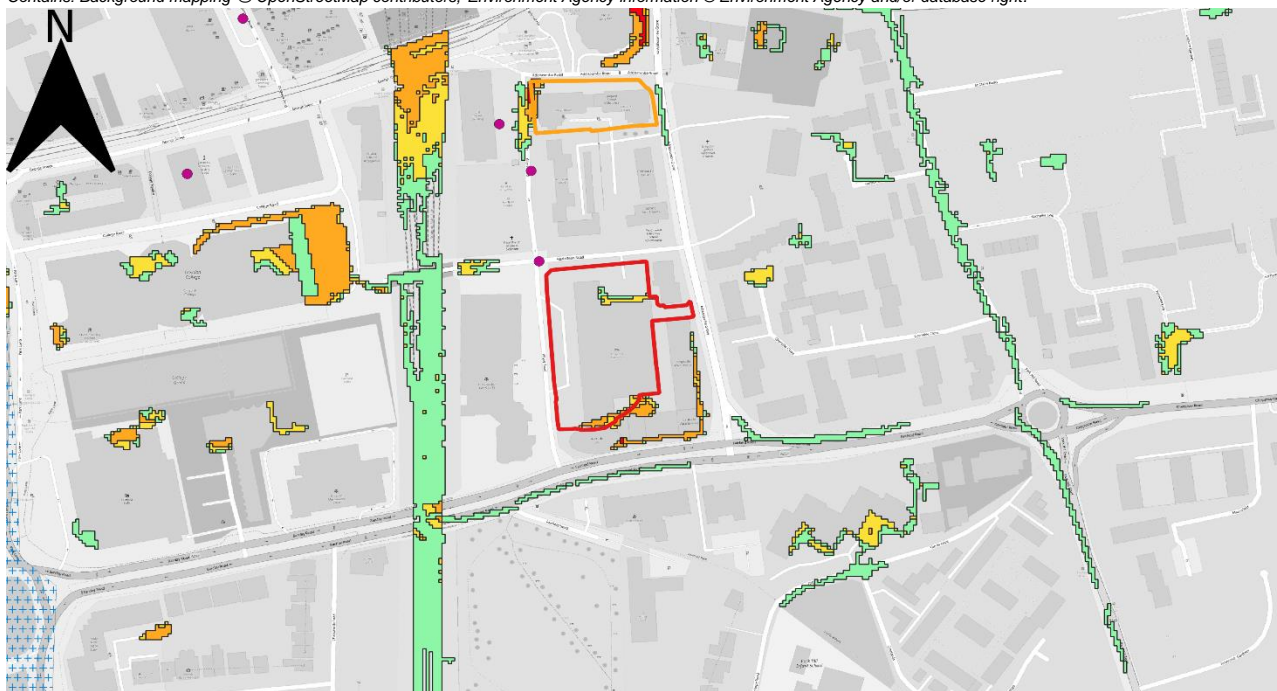


- Site
 - Other Site
 - Culverted Watercourses
 - Surface Watercourses
 - Critical Drainage Areas
 - Flood Records
- Risk of Flooding from Surface Water - 0.1% AEP Event, Depth**
- Below 300mm
 - 300 to 600mm
 - Over 600 mm

0 75 150 225 m

Figure 18: Risk of Flooding from Surface Water (RoFSW) 0.1% AEP Flood Depth.

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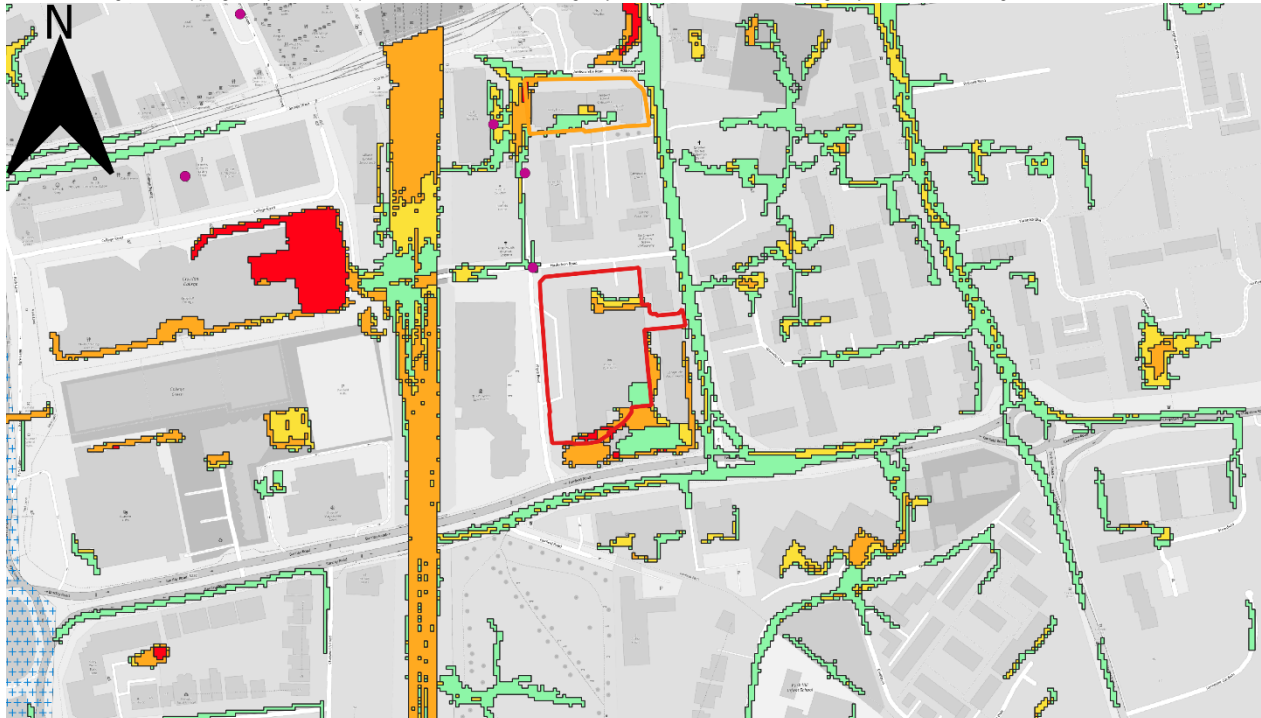
- Site
 - Other Site
 - Culverted Watercourses
 - Surface Watercourses
 - Critical Drainage Areas
 - Flood Records
- Risk of Flooding from Surface Water - 1% AEP Event, Hazard**
- Very Low (< 0.75)
 - Moderate (0.75 - 1.25)
 - Significant (1.25 - 2)
 - Extreme (> 2.0)

0 75 150 225 m

Figure 19: Risk of Flooding from Surface Water 1% AEP Flood Hazard

Site Name: Croydon Park Hotel

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- Site
 - Other Site
 - Culverted Watercourses
 - Surface Watercourses
 - Critical Drainage Areas
 - Flood Records
- Risk of Flooding from Surface Water - 0.1% AEP Event, Hazard**
- Very Low (< 0.75)
 - Moderate (0.75 - 1.25)
 - Significant (1.25 - 2)
 - Extreme (> 2.0)



Figure 20: Risk of Flooding from Surface Water 0.1% AEP Flood Hazard

Please Note: No surface water modelling for the site is present.

Groundwater Flooding

Bedrock Geology	Harwich Formation/Lambeth Group Clay	Superficial Geology	Lynch Hill Gravel Member
Increased Potential for Elevated Groundwater		Data not available	
Susceptibility to Groundwater Flooding (BGS)		Limited potential for groundwater flooding to occur.	

Other Sources

Risk of flooding from reservoirs	The EA Risk of Flooding from Reservoirs Map shows that the potential flood extent if large, embanked reservoirs were to fail and release the water they hold. The site is outside of the zone of flooding from this source.
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Summary

The site lies entirely (100%) within Flood Zone 1, which is classified with a low probability of river flooding. The site does not lie within a Critical Drainage Area but is located within the DC39 drainage catchment. No records of river flooding have been recorded within the site boundary, with only one instance recorded within 30m of the boundary. Within 500m of the site boundary a total of 26 instances of flooding have been recorded, 11 instances of flooding attributed to surface water, four attributed to road flooding (surface water or blocked drains), four attributed to blocked gullies or sewer flooding and four attributed to basement flooding. The nearest watercourse is located approximately 1km to the west and is a culverted below surface watercourse. The surface water modelling extents do not cover this site.

The RoFSW shows that the site boundary is not at a High risk of surface water flooding classified as a 1 in 30 chance of annual occurrence. The site is partially at risk of Medium risk of surface water flooding classified as a 1 in 100. The extents are located in the north of the site and along the southern boundary. The extents to the north of the site have

Site Name: Croydon Park Hotel

depths between 0.15m and 0.6m, with a hazard rating of Low and Moderate. The southern boundary has depths ranging between 0.15m and over 1.2m, with the majority of the extents having a Significant hazard rating with a small portion classified as Low and Moderate.

The Low risk of surface water flooding, classified with a 1 in 1000 annual chance of occurrence, extents extend along the southern and eastern boundary of the site. With a large area in the north of the site. Offsite to the southeast, is large extents, with Addiscombe Road to the east and Fairfield Road to the south having significantly large extents. Flood extents located along the southern and eastern boundary of the site have depths ranging between 0.15m and over 1.2m, with depths over 1.2m being most prolific. The hazard rating is predominately classified as Significant with some areas of Low and Extreme. Flood depths to the north range between 0.15m and 0.9m, with depths between 0.3m and 0.6m most prolific, with a hazard rating of Low, Moderate and Significant. Offsite to the southwest depths range between 0.15m and greater than 1.2m, with a hazard rating predominately Low, but with areas of Moderate and Significant. Offsite to the east and south along Addiscombe Road and Fairfield Road flood extents range between less than 0.15m and 0.3m, with a flood hazard rating of Low and Moderate.

Site Specific Recommendations

A range of proposed uses may be considered across this site. Given the location within Flood Zone 1, development is not subject to the application of the Exception Test. However, given the potential for surface water flooding in this area, steps should be taken to ensure that development is safe for its lifetime considering the impact of climate change, will not increase the flood risk elsewhere, and where possible will reduce flood risk overall. To this end, the following recommendations are made for this option:

- A Sequential Test should be applied within the site boundary, with developments considered in areas of lower risk of surface water flooding, before consideration of areas at greater risk, namely the southern to southeastern boundary of the site and to the north.
- Due to the Medium risk of surface water flooding, surface water modelling should be undertaken covering the site to determine the risks, and to confirm that the site is not at a High risk of surface water flooding.
- Due to the localised Medium risk of surface water flooding, development options should consider methods to restrict surface water runoff rates, with SuDS/green spaces being considered in the areas at Medium risk of surface water flooding. Additionally the site could benefit from rainwater harvesting and permeable paving to reduce the risk of surface water flooding in the southeast section of the site which will reduce flood risk off site.
- The surface water mapping shows that Addiscombe Road and Fairfield Road are inaccessible during the 1 in 1000 year chance of surface water flooding, whilst areas located in the southeast and middle of the site are at risk in the 1 in 100 year chance of surface water flooding. Hence, emergency access/egress routes to the west along Altyre Road should be considered.
- This area is covered by the Environment Agency Flood Alert Area for Groundwater flooding in South East London.
- A flooding warning and evacuation plan should be prepared in accordance with the Council's wider emergency planning response.

Site Name: Regina Road			
Site ID:	NEW2	Area (ha):	2.5
Proposed Use:	Residential	Vulnerability Classification:	More Vulnerable

Flood Zones and Historic Flooding

Flood Zone 1 (<0.1% AEP): 100%	Flood Zone 2 (<0.1% AEP): 0%	Flood Zone 3 (<0.1% AEP): 0%	Area Benefitting from Defences: 0%
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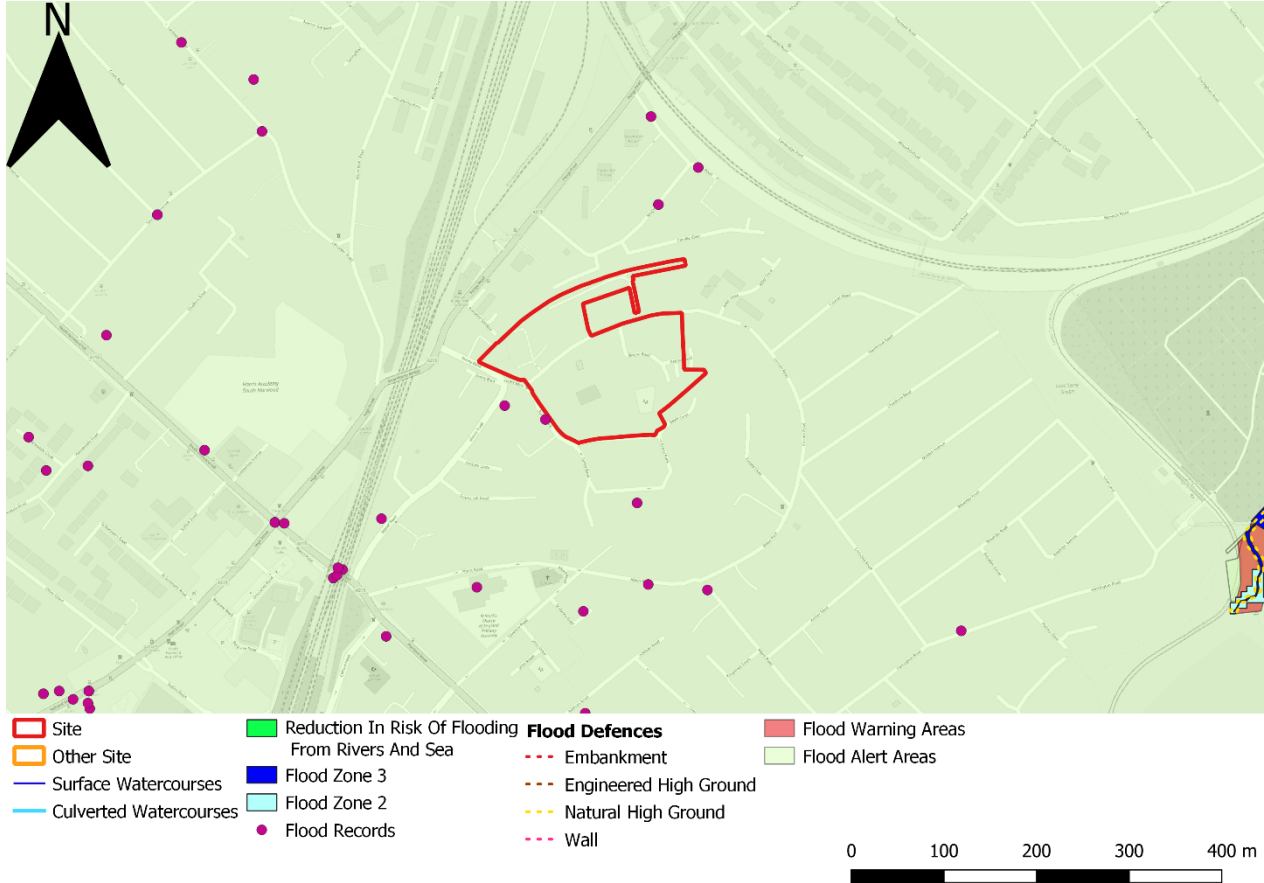


Figure 21: Flood Zones, Flood Records and Flood Warning and Alert Areas

Flood Warning Area	Flood warnings are not available in this area. The site is located within the Kent, South London and East Sussex groundwater flooding in South East London flood alert area.
Flood Records within 500m of the site:	No records of flooding are recorded within the site boundary. 31 instances of flooding within 500m of the site centroid are recorded, 12 attributed to surface water, eight to road flooding (which is a combination of surface water or blocked drains), four foul water flooding and seven form unknown sources.

River Flooding

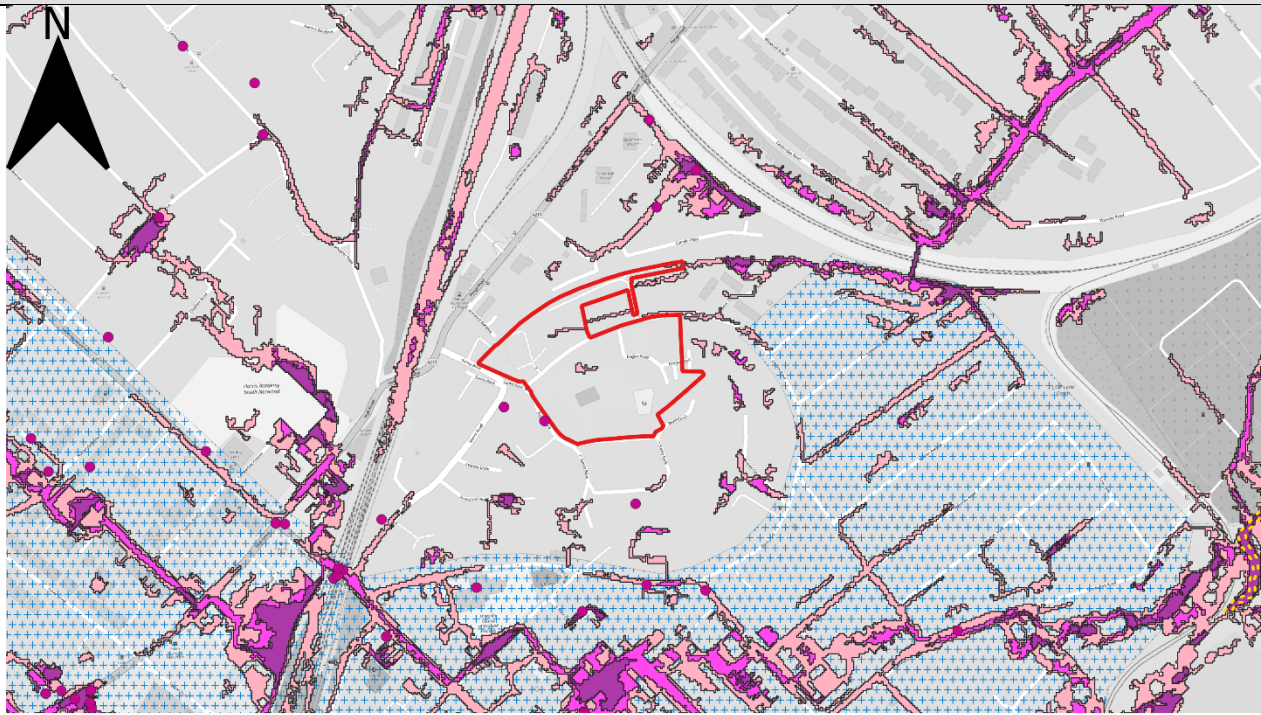
Please Note: the site is not at risk of river flooding and so no data is present.

Surface Water Flooding

Critical Drainage Area	The site is not covered by a Critical Drainage Area
Drainage Catchment	DC40

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Site Name: Regina Road



- | | | |
|--|---|---|
| Site | — Surface Watercourses | Risk of Flooding from Surface Water |
| Other Site | Critical Drainage Areas | 0.1% AEP (Low Probability) |
| — Culverted Watercourses | ● Flood Records | 1% AEP (Medium Probability) |
| | | 3.3% AEP (High Probability) |

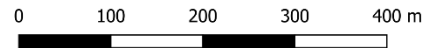
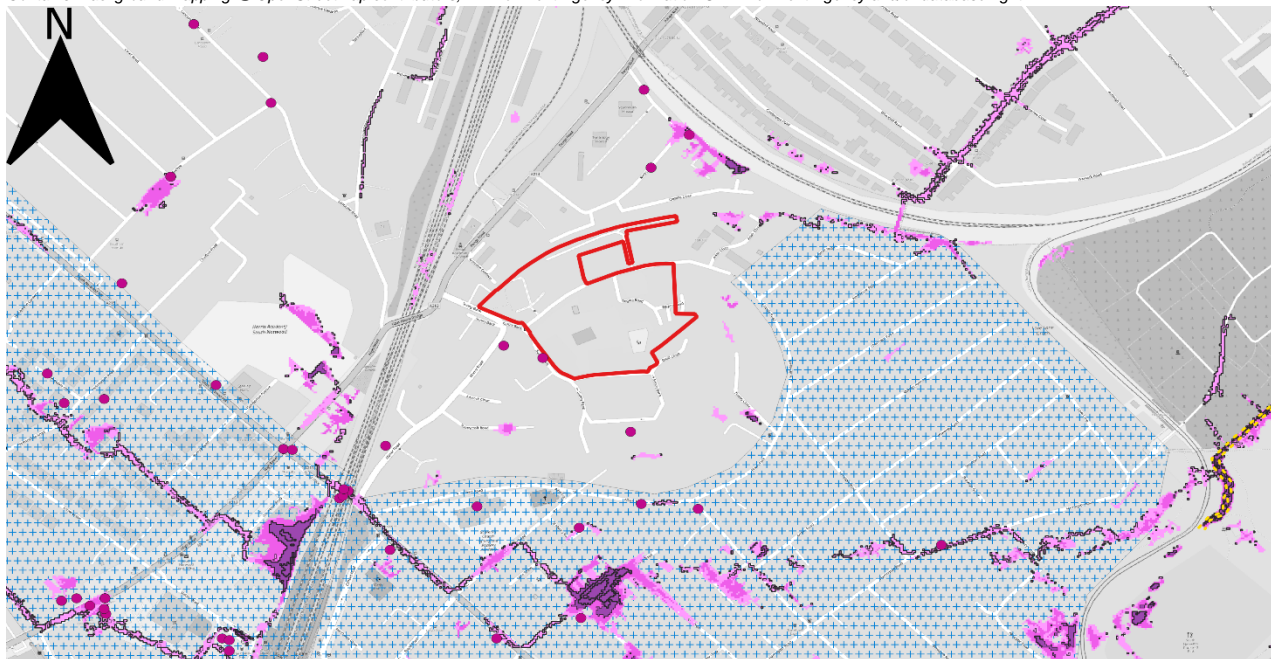


Figure 22: Risk of Flooding from Surface Water (RoFSW) Flood Extents.

Contains: Background mapping @ OpenStreetMap contributors, Environment Agency information © Environment Agency and/or database right



- | | | |
|--|---|--|
| Site | Critical Drainage Areas | Risk of Flooding from Surface Water - 1% AEP Event, Depth |
| Other Site | ● Flood Records | Below 300mm |
| — Culverted Watercourses | | 300 to 600mm |
| — Surface Watercourses | | Over 600 mm |

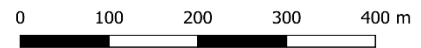


Figure 23: Risk of Flooding from Surface Water (RoFSW) 1% AEP Flood Depth.

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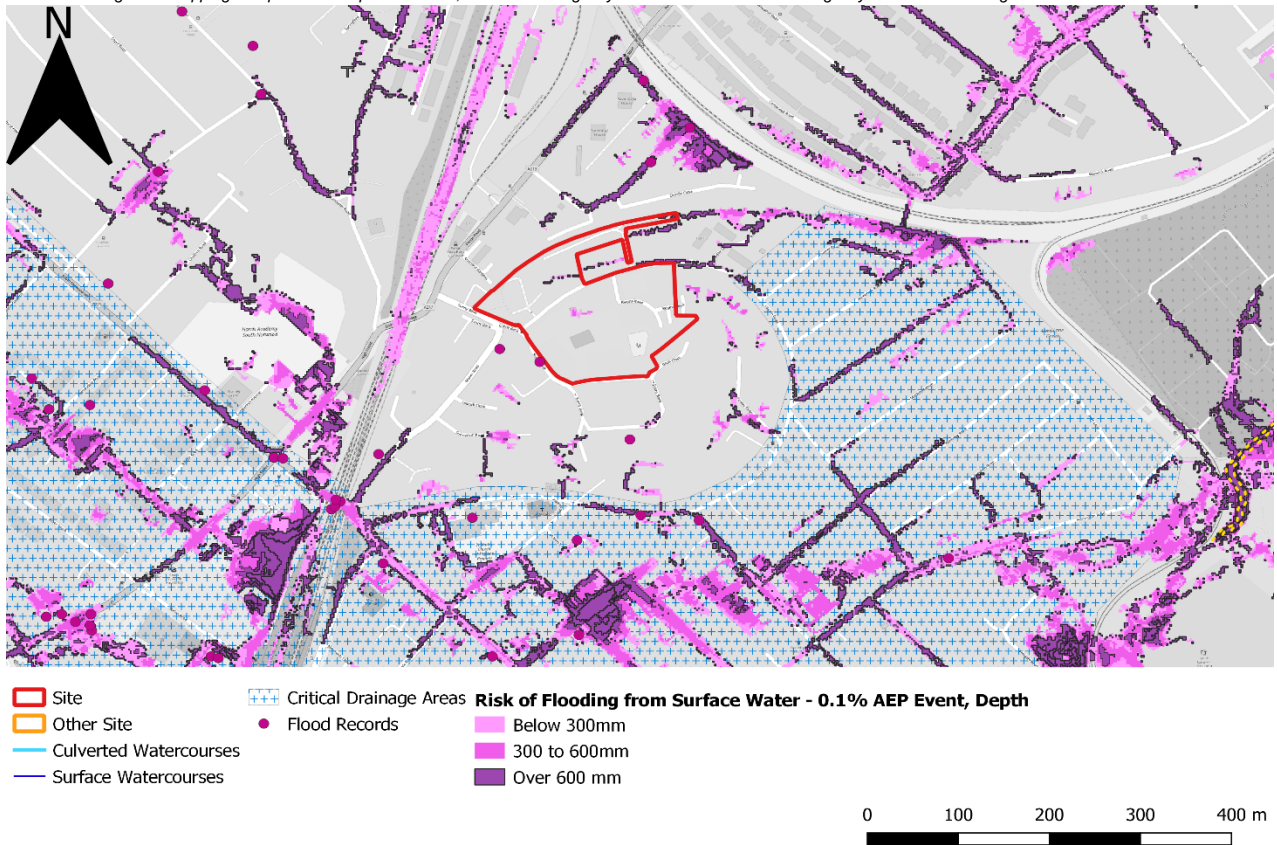


Figure 24: Risk of Flooding from Surface Water (RoFSW) 0.1% AEP Flood Depth.

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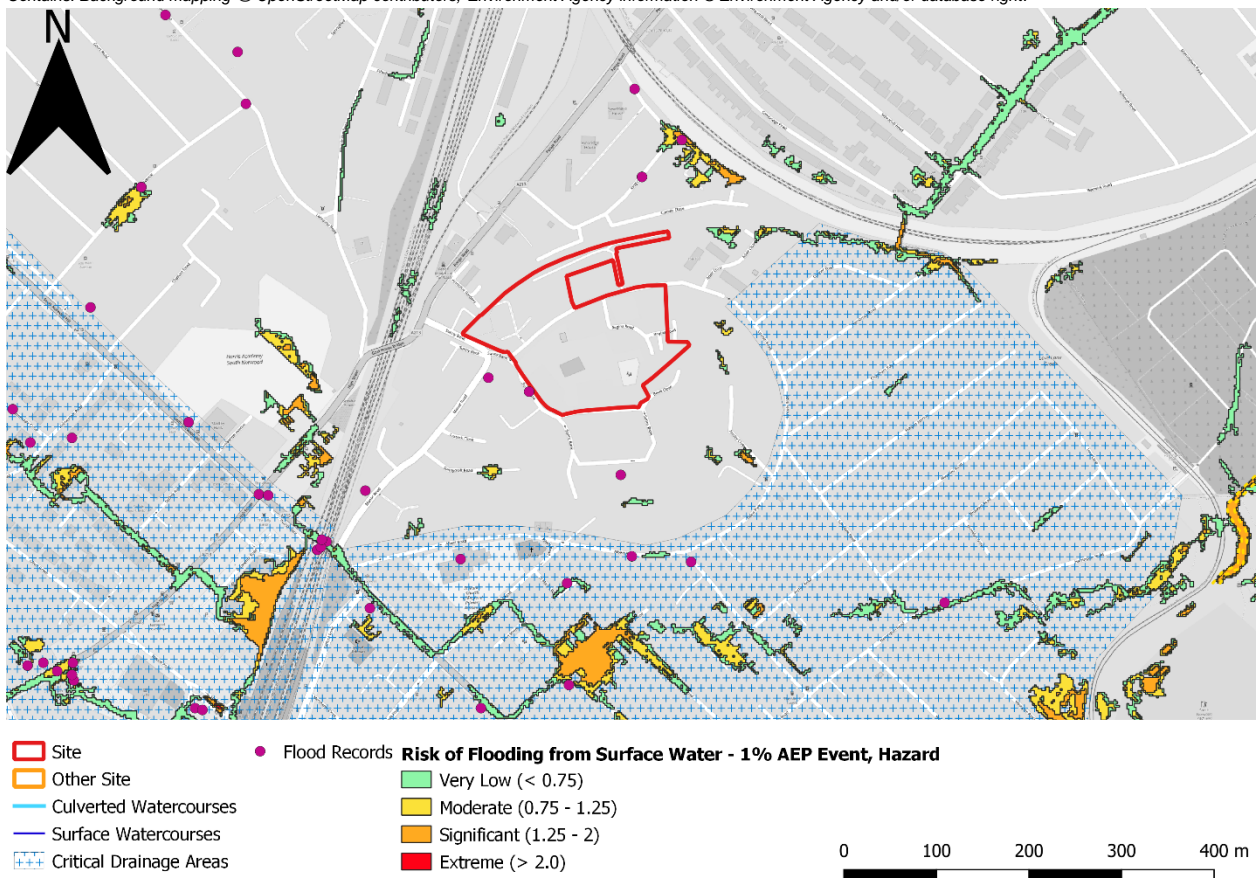


Figure 25: Risk of Flooding from Surface Water (RoFSW) 1% AEP Flood Hazard

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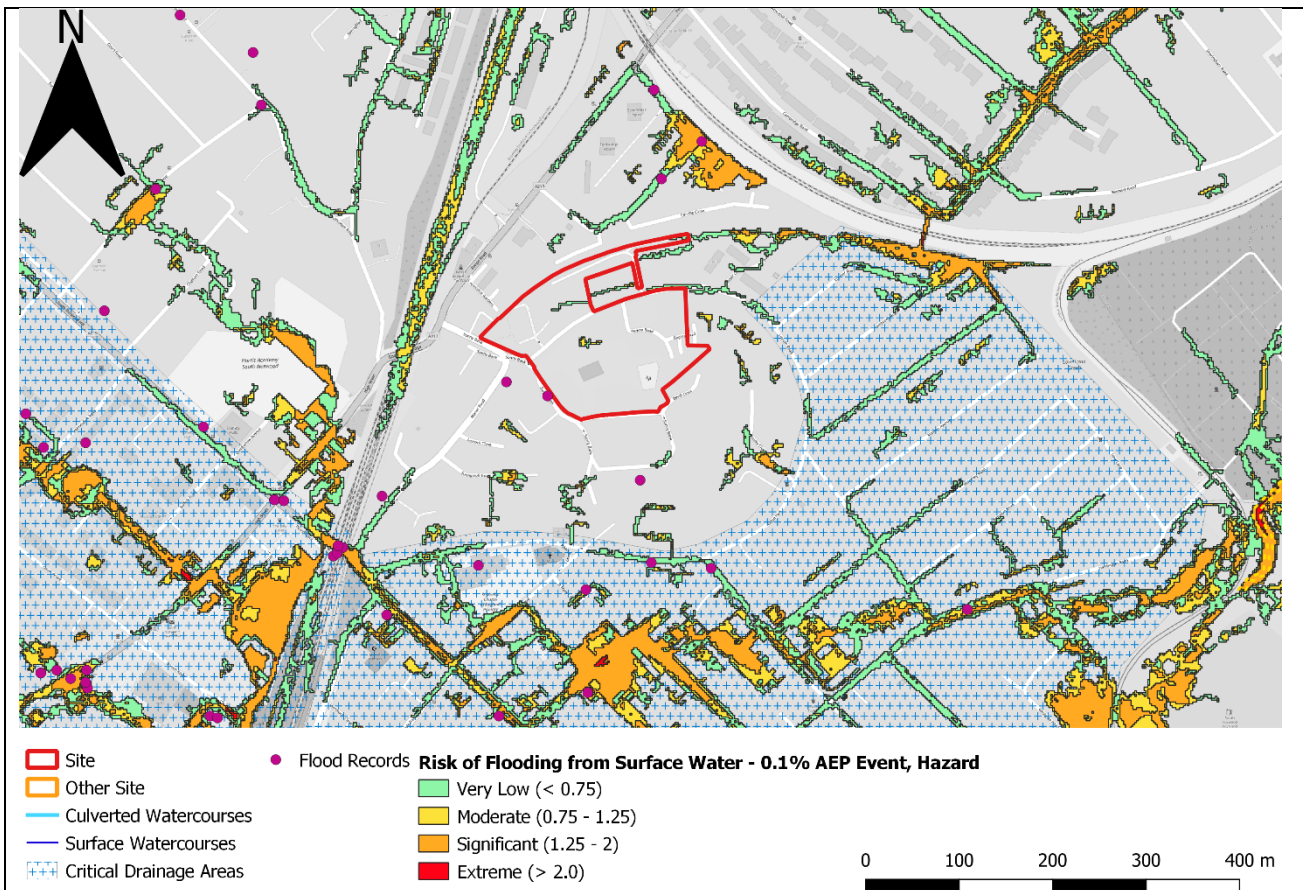


Figure 26: Risk of Flooding from Surface Water (RoFSW) 0.1% AEP Flood Hazard

Please Note: No surface water modelling for the site is present.

Groundwater Flooding

Bedrock Geology	Bedrock consists of London Clay Formation – Clay and silt	Superficial Geology	No superficial geology is present at the site.
Increased Potential for Elevated Groundwater		Data not available	
Susceptibility to Groundwater Flooding (BGS)		Potential for groundwater flooding to occur at surface.	

Other Sources

Risk of flooding from reservoirs	The EA Risk of Flooding from Reservoirs Map shows that the potential flood extent if large, embanked reservoirs were to fail and release the water they hold. The site is outside of the zone of flooding from this source.
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Summary

The site lies entirely (100%) within Flood Zone 1, which is classified with a low probability of river flooding. The site does not lie within a Critical Drainage Area, but is located within DC40 drainage catchment. No records of flooding have occurred within the site boundary, however from catchment centroid 31 instances of flooding has occurred, 12 instances of surface water flooding, eight instances of flooding on a road (potentially from surface water or blocked drains) and four from foul water flooding. The nearest watercourse is located approximately 645m to the east of the site boundary. The surface water modelling extents provided do not cover this site.

The site is not at risk of surface water flooding during the 1 in 30 year annual chance of occurrence event or during the 1 in 100 year annual chance of occurrence event. Offsite, small extents of surface water flooding with an annual chance of 1 in 100 occurrence are located at the end of King’s road, Adair Close, Sunnycroft Road and partially along Albert Road. However, none of these extents will impact evacuation routes.

The site is partially at risk of surface water during the 1 in 1000 year annual chance of occurrence event, with extents located within the centre of the site and parts located in the north section of the site and along an unnamed access road. Extent depths located in the north of the site and along the unnamed access road are between below 0.15m and 0.3m, with a hazard classification of Low. Surface water extents located within the centre of the site have a depth ranging between 0.15m and 0.6m with a hazard classification between Low and Moderate.

Site Specific Recommendations

The site is being proposed to be a regenerated residential development with community facilities. Given the location within

Flood Zone 1, development is not subject to the application of the Exception Test. Whilst the site is at a Low risk of surface water flooding, steps should be taken to ensure the development is safe for its lifetime considering the impact of climate change, will not increase flood risk elsewhere, and where possible will reduce flood risk overall. To this end, the following recommendations are made:

- To not increase the risk of flooding, developments options should consider methods to restrict surface water runoff rates. Household measures such as rainwater harvesting, SuDS and green roofs should be considered whilst more development focused measures could include soft landscaping, planting, and impermeable surfacing.
- Surface water modellign should be undertaken to confirm that the RoFSW flood mapping is accurate.
- This area is covered by the Environment Agency Flood Alert Area for Groundwater flooding in South East London.
- Flood warning and evacuation plans should be prepared, in accordance with the Council's wider emergency planning response.
- The risk of groundwater flooding and groundwater levels should be further assessed as part of a site investigation for specific developments within the boundary.