Borough of Broxbourne

Flood Risk Exception Test Report

April 2017

BOROUGH OF
BROXBOURNE
2017: Year of the Environment

1.0 METHODOLOGY

1.1 In establishing where new growth should occur the Council has had regard to a range of sustainability criteria including flood risk. The findings for most of this work can be found in the Sustainability Appraisal. This report documents and details how the Flood Risk Exception Test was carried out to inform the site allocations proposed in the emerging Local Plan.

1.2 The Council commissioned its sustainability consultants Lepus to carry out a sequential test for the sites identified through the Strategic Land Availability Assessment process as having the potential for development. This report can be found at www.broxbourne.gov.uk/strategic-flood-risk-assessment

1.3 From the sequential test, it was concluded that the Council would be unable to meet its housing need in a manner consistent with wider sustainability objectives, by relying exclusively on development on sites within Flood Zone 1 (the zone of lowest flood risk). The Council therefore needed to look at sites located within Flood Zones 2 (medium risk) and 3 (highest risk) to meet its housing need, and an exception test is required to see whether the sustainability benefits of the sites outweigh the flood risk.

1.4 The exception test is applied to sites with the potential for development which wholly or partly fall within Flood Zones 2 or 3. The flood zones are:

- **Zone 1: Low probability**
  Land having a less than 1 in 1,000 annual probability of river or sea flooding.
  (Usually shown as 'clear' on flood maps – all land outside Zones 2 and 3)

- **Zone 2: Medium probability**
  Land having between a 1 in 100 and 1 in 1,000 annual probability of river flooding;
  (Usually shown as light blue on flood maps)

- **Zone 3a: High probability**
  Land having a 1 in 100 or greater annual probability of river flooding;
  (Usually shown as dark blue on flood maps)

- **Zone 3b: The functional floodplain**
  This zone comprises land where water flows or is stored in times of flood.
  (Not separately distinguished from Zone 3a on the Flood Map)

1.5 To pass the exception test, the National Planning Policy Framework (NPPF), states that following two criteria must be met[1]:

● it must be demonstrated that the development provides wider sustainability benefits to the community that outweigh flood risk; and

● a site-specific flood risk assessment must demonstrate that the development will be safe for its lifetime taking account of the vulnerability of its users, without increasing flood risk elsewhere, and, where possible, will reduce flood risk overall.

[1] The relevant sections of the NPPF are listed in Appendix 1

1.6 Both elements of the test have to be passed before a site is allocated for development in the Local Plan.

1.7 Thirteen sites were identified through the Strategic Land Availability Assessment (SLAA) and Sequential Test exercise (Lepus, March 2017) as having potential for development, which were partially or wholly within Flood Zone 2 or 3. It was agreed that a Level 2 Strategic Flood Risk Assessment (SFRA) would be carried out on these sites to gather more detailed information about the nature of the flood risk. The exception test could then be applied, if necessary, if the site was still considered to be suitable for development.

1.8 To determine whether the exception test was required, a preliminary assessment was made on the extent and nature of the flood hazard, and the vulnerability[2] of the proposed use. Table 1 shows the outcome of this assessment.

[2] The vulnerability table is included in Appendix 2

Table 1: Sites identified from the SLAA and Sequential Test considered for Exception Test

Site	Settlement	Flood Zone Coverage (%)			Proposed land use	Vulnerability rating	Exception Test Required
		FZ3a	FZ3b	FZ2			
Brookfield *	Wormley	10%	6%	12%	Mixed Use - commercial, retail, community, leisure, with residential - including for elderly people. Residential, 2 primary schools, local shops	More vulnerable - provided that the proposed use does not include a fire, police or ambulance station which is required to be operational during flooding. Inclusion of these uses would place the site into the Highly vulnerable category	Yes
Cheshunt Lakeside (Delamare Road Strategic Site)	Cheshunt	15%	1%	98%	Mixed Use - Residential led but also B1a and B1c uses at ground floor level for northern third of site.	More Vulnerable - dwelling houses.	Yes
Derwent Turnford	Turnford	59%	48%	66%	Two uses proposed - Residential or Access to secondary school/school	More Vulnerable - school use and -residential use dwelling houses.	Yes
Gas Holder Site	Brox-bourne	2%	2%	6%	Residential	More vulnerable - dwellings	Yes
Land East of Dinant Link	Hoddesdon	6%	6%	34%	Residential	More vulnerable	Yes

Site	Settlement	Flood Zone Coverage (%)			Proposed land use	Vulnerability rating	Exception Test Required
		FZ3a	FZ3b	FZ2			
Road						- dwellings	
Rush Meadow	Cheshunt	0%	1%	3%	Employment or Residential (is safeguarded land only so will be developed post 2031)	Depends on final use proposed Either: More vulnerable for dwellings or Less Vulnerable if offices. Assume worst case scenario for purposes of this exercise.	Yes
South of Church Lane Wormley	Brox-bourne	0%	0%	0.2%	Secondary School	More vulnerable - school	No
Turnford Surfacing Site	Hoddesdon	2%	19%	94%	Car park for station on site frontage and Residential	More Vulnerable - dwelling houses.	Yes
Theobald's Station car park	Waltham Cross	0%	0%	0.1%	Residential	More vulnerable - dwellings	No
Waltham Cross - Northern High Street (Land off Sturlas Way).	Waltham Cross	0%	0%	4%	Mixed Use - Ground Floor commercial, 300 new homes	More vulnerable - dwellings	No

Site	Settlement	Flood Zone Coverage (%)			Proposed land use	Vulnerability rating	Exception Test Required
		FZ3a	FZ3b	FZ2			
Waltham Cross Trade Centre	Waltham Cross	0%	0%	29%	Residential	More vulnerable - dwellings	No
Wolsey Hall, Windmill Lane	Cheshunt	0%	88%	96%	Residential	More Vulnerable - dwelling houses.	Yes

* For the level 1 SFRA and the sequential test this was listed as three separate sites: Brookfield, Brookfield Garden Village and Brookfield Riverside.

2.0 WIDER SUSTAINABILITY CONTEXT

2.1 The exception test requires consideration of the wider sustainability benefits of a proposal. Broxbourne is a small borough with semi-linear layout and configuration. This semi-linear configuration reflects historic ribbon development along the A10 and limited development since. This configuration limits the range of development options.

2.2 Most of Broxbourne's vacant brownfield land has now been developed. The remaining greenfield land in Broxbourne is highly constrained. The borough has significant environmental constraints including: internationally designated wildlife sites such as the Wormley-Hoddesdonpark Woods Special Area Conservation and the Lee Valley Special Protection Area and Ramsar Site; a considerable number of local wildlife sites; areas of archaeological interest and areas at risk of flooding.

2.3 Approximately 65% of the borough is designated as Green Belt.

3.0 SITE SAFETY CONTEXT

3.1 The exception test requires the Council to be confident that the site can be made safe for the lifetime of the development. To assist with this, the Council commissioned a detailed Level 2 Strategic Flood Risk Assessment (SFRA) in March 2017 to better understand the nature of the flood risk for each site identified as potentially suitable for development. To enable the Council to determine whether the development will be safe, information was gathered on the likely depth and velocity (speed) of flood water on the site, and a hazard rating assigned.

3.2 Safety is a serious consideration in times of flood and many people are unaware of the highly hazardous nature of flood water. People are unable to stand in deep or fast flowing floodwater. Once they are unable to stand, there is a high risk of death or serious injury. Research funded by Defra[3] found that adults are unable to stand in still floodwater with a depth of about 1.5m or greater (depending on the height of the person) and much less when the floodwater is flowing. For example, some people will be at risk when the water depth is only 0.5m if the velocity is 1m/s (about 2 mph). If the velocity increases to 2m/s (about 4mph), some people will be unable to stand in a depth of water of only 0.3m. Most people will be unable to stand when the velocity is 2m/s and the depth is 0.6m.

3.3 The chances of people being unable to stand in floodwater is increased if the ground is uneven or there are holes in the ground beneath the water surface, for example service access covers (manholes) that have been displaced. Surcharging of sewers which displaces manhole covers usually occurs in surface water flood incidents following a period of high intensity rainfall.

3.4 The same research noted that most cars and vans are unstable in 0.5 metres (50 cm) of still water and that large vehicles such as fire engines become unstable in 0.9 metres (90 cm) of still water. This value also reduces as the velocity of the water increases.

[3] Defra (2006). Flood Risks to People: Phase 2

4.0 SITE ANALYSIS

4.1 Each of the sites for which the exception test is considered necessary is assessed in turn below.

4.2 Detailed flood risk information on each of the sites from the Councils Strategic Flood Risk Assessment Level 2 can be accessed on the Council's Local Plan web pages. All of the sites below will require a detailed, site specific Flood Risk Assessment at the time of the planning application to confirm or contradict the information gathered at the strategic level.

4.3 BROOKFIELD

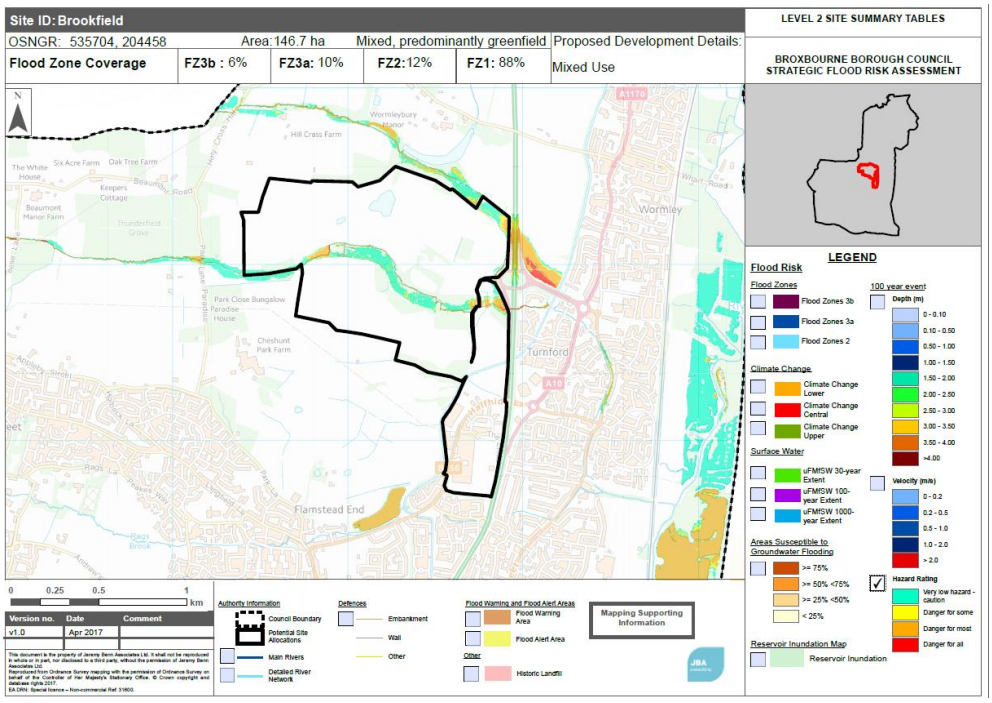
4.3.1 This site is a 140 ha site, incorporating Brookfield Garden Village, Brookfield Riverside and the existing Brookfield development. The proposed use includes:

Brookfield Riverside

- civic centre
- a retail and leisure development including a cinema
- a business campus
- housing
- housing for the elderly

Brookfield Garden Village

- school
- housing
- housing for the elderly
- local shops
- open space.



NATURE OF THE FLOOD RISK

4.3.2 Multiple watercourses cross the site and Flood Zones 3a and 3b are associated with these. These include Wormleybury Brook in the north of the site flowing west to east, Turnford Brook across the centre of the site flowing west to east, and an unnamed ordinary watercourse that flows west to east along the southern boundary of the site. Additional fluvial flood risk is posed by the tributaries of these watercourses within the site.

WIDER SUSTAINABILITY BENEFITS

4.3.3 As stated earlier, development options within the borough are highly constrained, meaning that large-scale strategic green belt releases are required to meet development needs.

4.3.4 The Brookfield site is the critical strategic site within the Borough. A significant proportion of the borough's housing, employment, retail and leisure needs are proposed to be met through the allocation of this site, which is centrally located within the borough. The site is proposed to become a new borough centre, helping to create a place-based identity for the residents of Broxbourne. Locating a range of facilities at this site will help to reduce unsustainable trips outside the borough to other centres.

SAFETY OF THE SITE

4.3.5 The site is large and much of the site (almost 90%) has no flood hazard at all. The Level 2 SFRA shows that the site is mainly of no or low overall hazard. The hazard is rated a 'Danger for Most' at the western portion of the Turnford Brook within Brookfield Garden Village site area, and the section of the Turnford Brook, within the Brookfield Riverside site. The Wormleybury Brook to the north-east of the Garden Village site also as a hazard rating of 'Danger for Most'.

4.3.6 The Level 2 SFRA demonstrated that dry access to the site during fluvial flooding is available via the A10 in all scenarios. Dry access during surface water scenarios is lost during the 30-year event due to surface water flooding along the unnamed road leading to the A10 Interchange. The access to the site will change significantly as a result of the development.

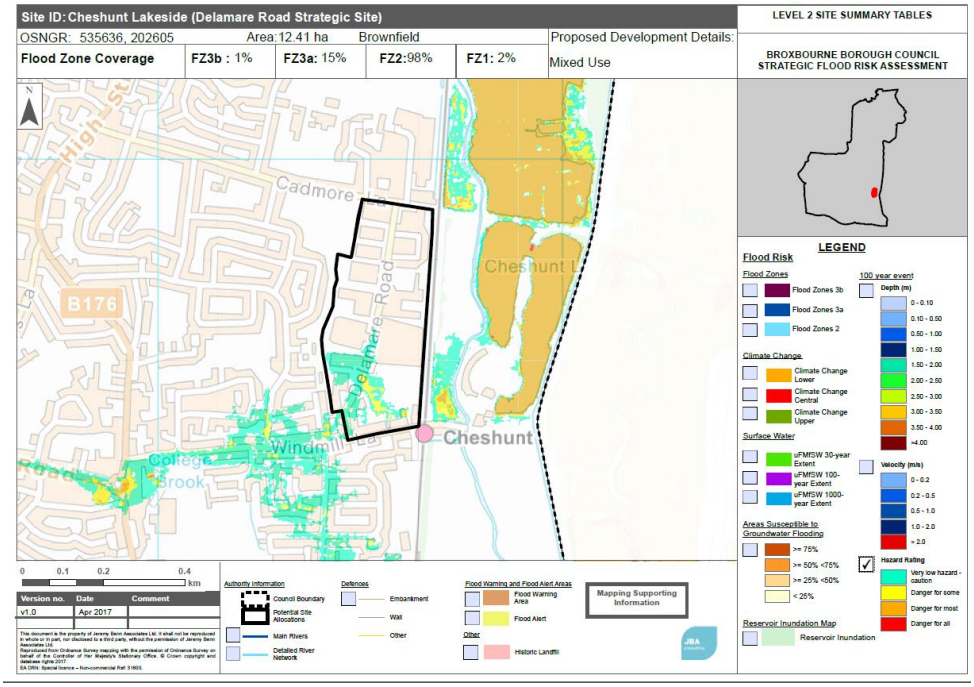
SUMMARY

4.3.7 The Council considers that there are significant wider sustainability benefits to the community from developing this site that outweigh the risk of flooding. Given the large size of the site, and the use of SuDS within a large landscaped river corridor, the Council is confident that the site can be safely developed, without making flood risk elsewhere worse.

4.3.8 A site-specific flood risk assessment (FRA) must demonstrate that the development will be safe for its lifetime, taking account of the vulnerability of its users, without increasing flood risk elsewhere.

4.4. CHESHUNT LAKESIDE

4.4.1 The site is proposed to be comprehensively redeveloped for a high density, mixed-use development of between 1000-2000 residential units, a parade of local shops to the south and offices at the ground floor level.



NATURE OF THE FLOOD RISK

4.4.2 Flood risk in the south west of the site stems largely from the unnamed watercourse which flows along the western boundary of the site, before cutting through the lower quarter of the site. Further flood risks are posed by College Brook and the River Lea. The site is located almost entirely within Flood Zone 2 representing the 1,000-year event. Flood Zone 3a is largely in the south of the site, whilst Flood Zone 3b is associated with the ordinary watercourse that runs across the site.

WIDER SUSTAINABILITY BENEFITS

4.4.3 Because of its proximity to Cheshunt Station, Cheshunt Old Pond and a number of leisure and recreation facilities including the Lee Valley Regional Park, the site is uniquely located to provide a significant number of units within the urban area. This location will minimise car trips associated with work, school, shopping and leisure facilities.

SAFETY OF THE SITE

4.4.4 Access to the site was identified as being located within both fluvial and surface water flood extents. Delamare Road access, and egress in the north onto Cadmore Lane, is only shown to be affected during the 1000-year fluvial event compared to the south which is affected in the 100-year fluvial event. Surface water inundates the southern access/egress of Delamare

from the 30-year event whilst surface water is shown to affect the northern access/egress route in the north.

4.4.5 The site specific flood risk assessment and the masterplanning process will need to ensure that access to and egress from the site is available under all scenarios.

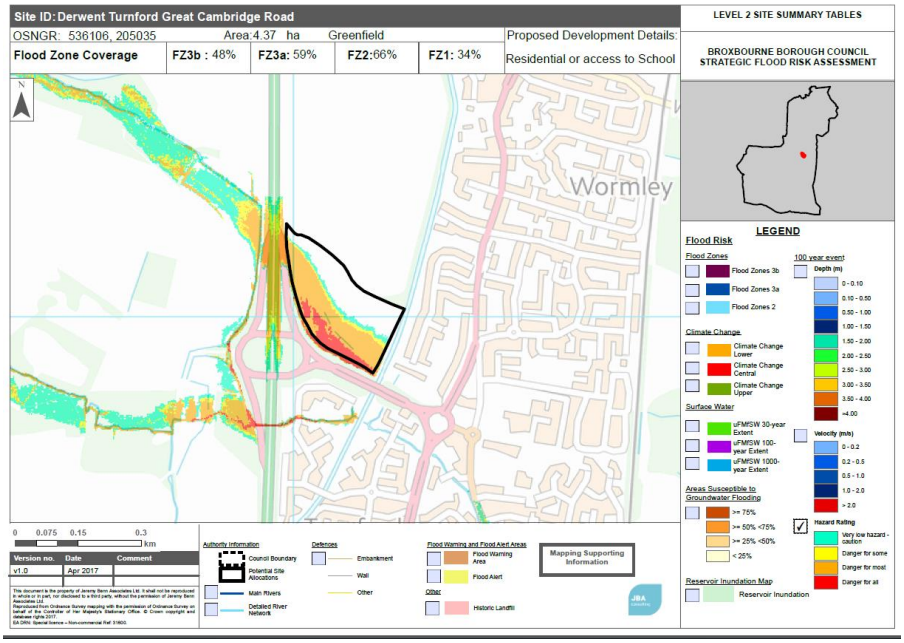
SUMMARY

4.4.6 The Council considers that there are wider sustainability benefits to the community that outweigh the risk of flooding on the site. Given the large size of the site, and the proposed use of SuDS, the Council is confident that the site can be safely developed, without making flood risk elsewhere worse.

4.4.7 A site-specific flood risk assessment (FRA) must demonstrate that the development will be safe for its lifetime, without increasing flood risk elsewhere. The site specific flood risk assessment and masterplanning process will need to ensure that access and egress is available under all scenarios.

4.5 DERWENT TURNFORD

4.5.1 The site is proposed for two alternative uses: the first is residential and the second for access to the proposed secondary school site, north of the site, called the 'South of Church Lane' site.



NATURE OF THE FLOOD RISK

4.5.2 Fluvial flood risk is associated with the Wormleybury Brook that flows on the opposite side of the A10, approximately 60m from the site's western boundary. 66% of the site is within

Flood Zone 2 with a slight reduction in the extent of Flood Zone 3a. Flood Zone b is 48% of the site.

4.5.3 Flood modelling and mapping suggests flooding occurs from an overland flow route, originating from overtopping of the Wormleybury Brook's left bank upstream of the A10 and following the low-lying terrain of its natural flow path across the site. OS Maps suggest that the Wormleybury Brook was diverted southwards to join the Turnford, probably during construction of the A10 (Figure 1 below). However the modelling carried out for the Level 2 SFRA suggests that in times of flood, the Brook may revert to its natural course, crossing the A10 into the site, from where it does not appear to be drained. This would explain the depth of up to 3m on the site as the site drainage is impounded by the embanked A10 off-slip.

WIDER SUSTAINABILITY BENEFITS

Residential Use

4.5.4 Residential development of the site would help deliver the growth levels proposed for the borough.

WIDER SUSTAINABILITY BENEFITS

Access to Secondary School Use

4.5.5 Use of the site as access to the proposed secondary school on the South of Church Lane site to the north, would enable the proposed use of the site to the north. This would provide significant wider sustainability benefits to the community by meeting educational need close to where the demand arises, thereby providing the infrastructure to enable the growth proposed for the later stages of the emerging Local Plan.

SAFETY OF THE SITE

4.5.6 The site was classified in the Level 2 SFRA as 'Danger for Most' and 'Danger for All' (see Figure 2), primarily due to the depth of up to 3 metres flood water over the south-western half of the site.

Access for a residential use

4.5.7 There is no obvious safe access to the site which would enable a residential development.

Access for the access to the school use

4.5.8 The access to the school site would be likely to be in the form of a bridge or similar structure across the Derwent-Turnford site, because of the change in ground level from the A10 off-slip to the school site. Provided that the school site has an alternative access point (likely via Church Lane), then the wider sustainability benefits of the using the Derwent Turnford site for access to the school on a day to day basis would outweigh the flood risk of the site.

SUMMARY

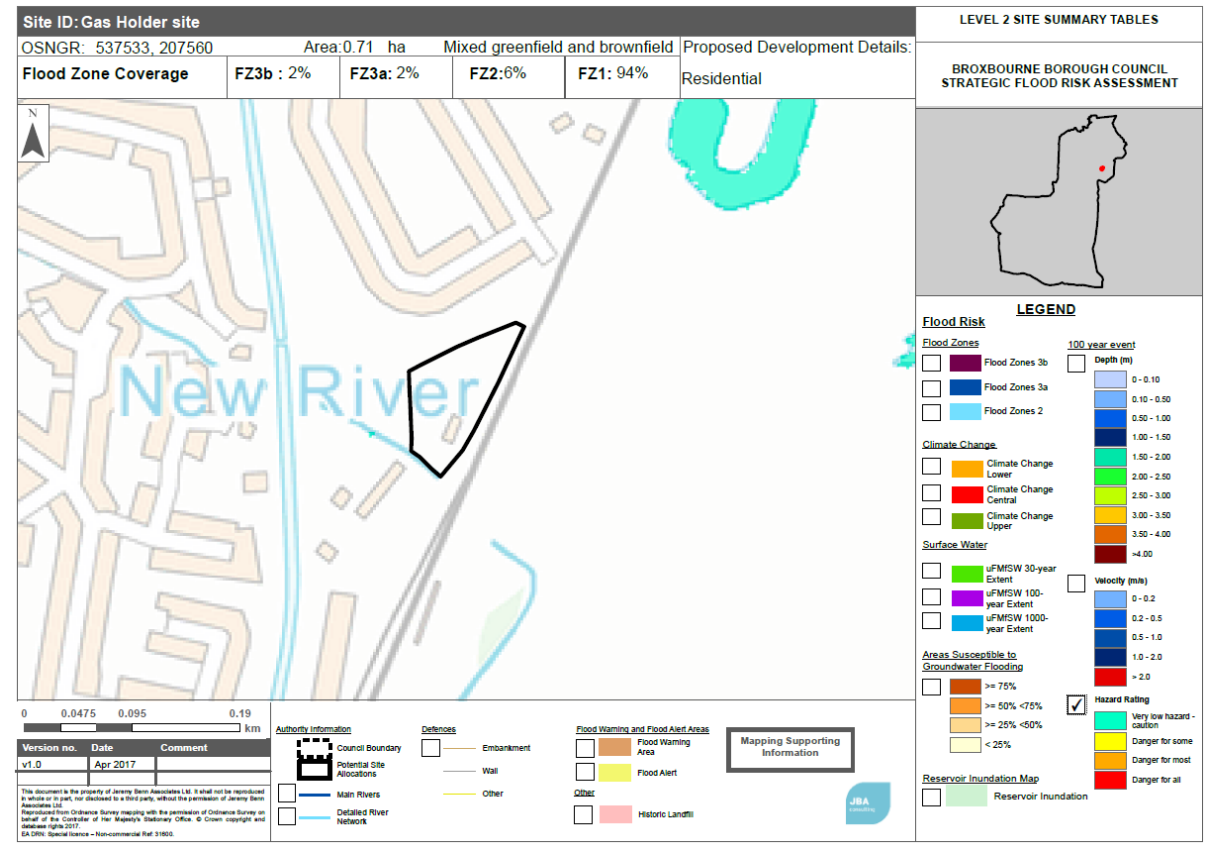
4.5.9 **Residential Use:** The Council does not consider that there are wider sustainability benefits to the community that outweigh the flood hazard at this site for a residential use. The site is small and the flood zones cover approximately two-thirds of the site. No safe access to the site can be identified. There are a number of other sites more suitable for residential development from a flood hazard perspective.

4.5.10 **Access to the secondary school site to the north:** The Council considers that there are wider sustainability benefits to the community from using this site as access to the school site that outweigh the flood hazard. An elevated structure such as a bridge is likely to be required in order to be able to access the school site, and the Council is confident that the site can be developed for this use in a safe manner. It is possible that the school may require an alternative access in a flood situation.

4.5.11 A combined site-specific flood risk assessment (FRA) for this site and the school site will need to demonstrate that the development will be safe for its lifetime. Specifically, it will need to ensure that access and egress is available to the school under all scenarios.

4.6 GAS HOLDER SITE

4.6.1 This site in Hoddesdon is proposed for residential development.



NATURE OF THE FLOOD RISK

4.6.2 Fluvial flood risk is associated with the Spital Brook that flows along the site's southern boundary, and the River Lea that flows approximately 595m to the east of the site. Flood Zones 3a and 3b are associated with the Spital Brook and are confined to the in-channel area along the southern site boundary. Areas in the immediate vicinity of the western, eastern and southern site boundary are located in Flood Zone 2, though this is confined to the site boundaries.

4.6.3 The surface water flood map shows there is a very small area of the site in the immediate vicinity of the west, south and eastern site boundary that is affected in the 30-year flood, with a slightly enlarged extent in the 100-year event. A significant portion in the west of the site is affected in the 1000-year scenario.

WIDER SUSTAINABILITY BENEFITS

4.6.4 The use of the site for residential development will deliver a wide range of sustainability benefits as it will extend residential development within a residential area and provide essential housing to meet housing need in Broxbourne.

SAFETY OF THE SITE

4.6.5 Given that the flood risk is located primarily along the southern boundary of the site, and the site will be accessed from the northern boundary, the Council is satisfied that the site is safe for development.

SUMMARY

4.6.6 The Council considers that there are wider sustainability benefits to the community that outweigh the risk of flooding. The Council is confident that the site can be safely developed, without making flood risk elsewhere worse.

4.6.7 A site-specific Flood Risk Assessment (FRA) must demonstrate that the development will be safe for its lifetime, without increasing flood risk elsewhere, and, where possible will reduce flood risk overall.

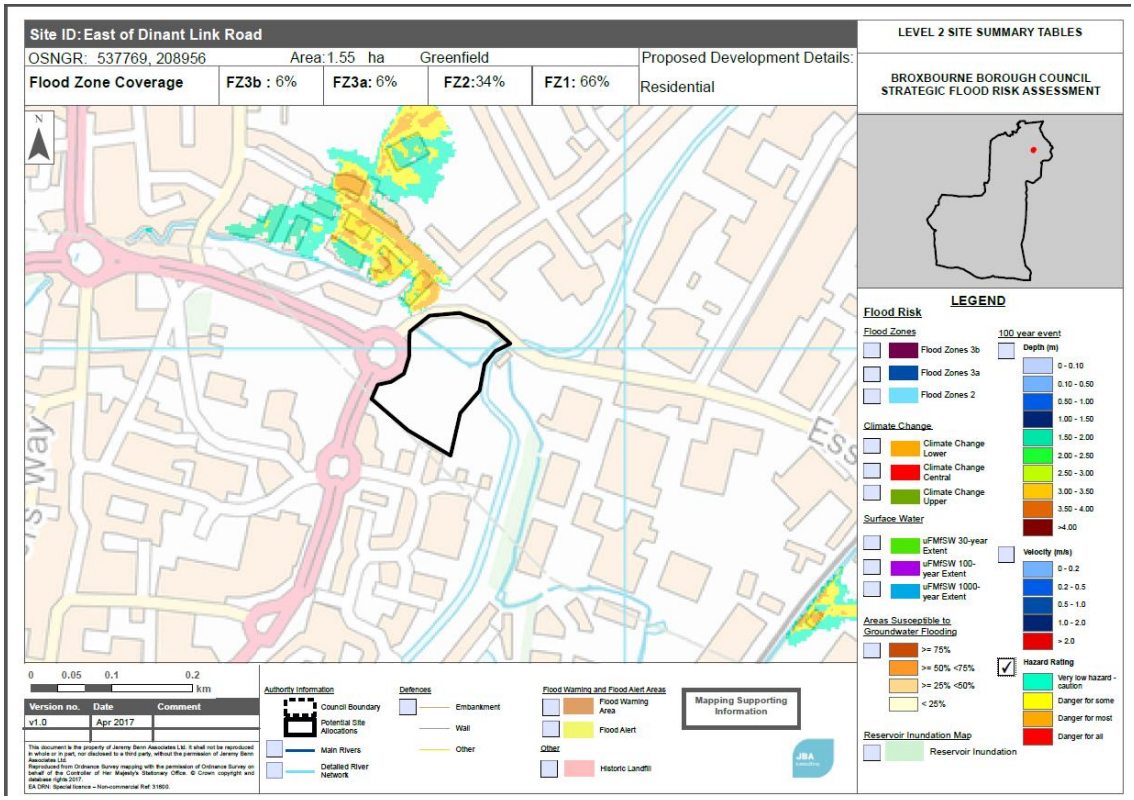
4.7 LAND EAST OF DINANT LINK ROAD

4.7.1 The site is located just off the Dinant Link Road roundabout. It is proposed for residential development.

NATURE OF THE FLOOD RISK

4.7.2 Fluvial flood risk is associated with the Woollens Brook (which becomes the River Lynch south of the railway line) that flows across the north of the site in a west to east direction.

Flood Zone 3 remains confined to the watercourse whilst the north of the site is entirely located in Flood Zone 2.



4.7.3 The flood map for surface water shows the north of the site is within the 30-year flood extent. This extent grows to encompass more of the site of the 100 and 1000-year events until nearly half the site is within the extent.

WIDER SUSTAINABILITY BENEFITS

4.7.4 The site is well located with the urban area. Development of the site will help deliver the level of growth in the emerging Local Plan.

SAFETY OF THE SITE

4.7.5 The site has a very low hazard rating and therefore can be considered safe. This safety will be confirmed in a site specific Flood Risk Assessment.

SUMMARY

4.7.6 The Council considers that there are wider sustainability benefits to the community that outweigh the risk of flooding. The Council is confident that the site can be safely developed, without making flood risk elsewhere worse.

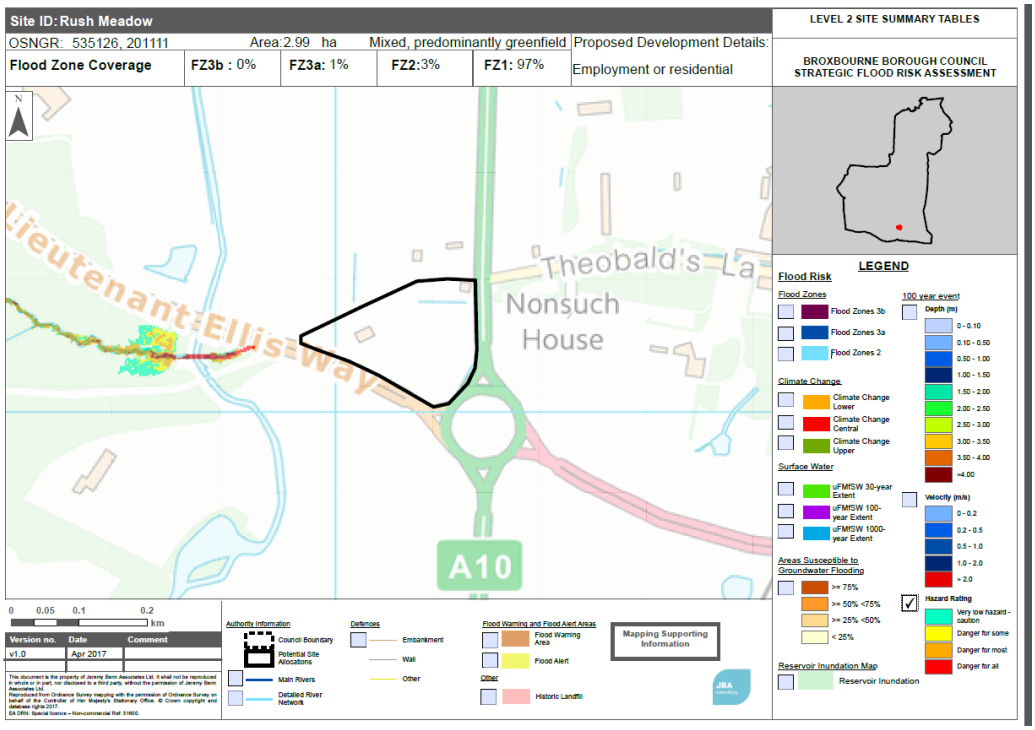
4.7.7 A site specific flood risk assessment (FRA) must demonstrate that the development will be safe for its lifetime, without increasing flood risk elsewhere, and, where possible will reduce flood risk overall.

4.8 RUSH MEADOW

4.8.1 This site is currently safeguarded for employment or residential development beyond the current plan period.

NATURE OF THE FLOOD RISK:

4.8.2 Fluvial Flood risk is a very limited in extent, predominantly in the north east of the site. The surface water flood map shows surface water flood risk is predominantly in the north east of the site, with an additional narrow band in the south.



WIDER SUSTAINABILITY BENEFITS

4.8.3 The site is well located for both residential and employment uses. It will effectively adjoin the Park Plaza West employment development to the south of Lieutenant Ellis Way, and have good access to the anticipated high levels of public transport provision associated with that development.

SAFETY OF THE SITE

4.8.4 The site has a very low hazard risk and so can be considered safe for development. This safety will be confirmed in a site specific Food Risk Assessment.

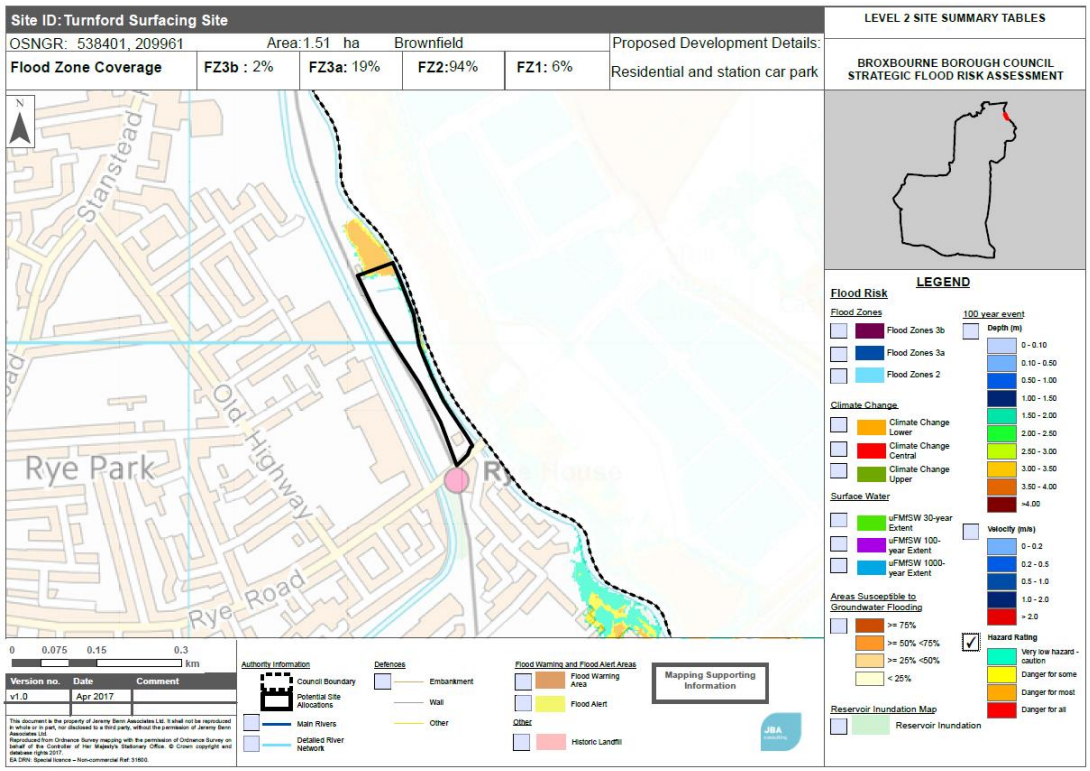
SUMMARY

4.8.5 The Council considers that there are wider sustainability benefits to the community that outweigh the risk of flooding. The Council is confident that the site can be safely developed, without making flood risk elsewhere worse.

4.8.6 A site-specific flood risk assessment (FRA) must demonstrate that the development will be safe for its lifetime, without increasing flood risk elsewhere, and, where possible will reduce flood risk overall.

4.9 TURNFORD SURFACING

4.9.1 The site is proposed for residential development with station car parking at the front of the site.



NATURE OF THE FLOOD RISK

4.9.2 Fluvial flood risk is associated with the River Lee that flows north to south immediately outside the eastern site boundary. Flood Zone 3b (2%) and 3a encroach upon the site's eastern boundary with 19% in Flood Zone 3a, most prevalent in the north-east corner. 94% of the site is within the 1000-year extent (Flood Zone 2).

4.9.3 The flood map for surface water shows the site is only affected in the 1000-year event and this results in three narrow bands of surface water developing in the north of the site.

4.9.4 The site is within the flood inundation extent of the Rye Meads Lagoons 10, 12, 14 & 16 and Rye Meads Lagoons 11, 13, 15 & 17 in the event of breech.

4.9.5 The New River Canal is located approximately 22m away from the western site boundary at the closest point.

WIDER SUSTAINBAILITY BENEFITS

4.9.6 The site is on the edge of the urban area and is particularly well located for public transport being almost opposite Rye House rail station. Development of the site will help deliver the level of growth in the draft Local Plan.

SAFETY OF THE SITE

4.9.7 The site has a 'Danger for Most' rating in the north-east corner of the site and therefore can be considered safe overall. Access to the site will be from the south. This safety will be confirmed in a site specific Flood Risk Assessment.

SUMMARY

4.9.8 The Council considers that there are wider sustainability benefits to the community that outweigh the risk of flooding. The Council is confident that the site can be safely developed, without making flood risk elsewhere worse.

4.9.9 A site-specific flood risk assessment (FRA) must demonstrate that the development will be safe for its lifetime, without increasing flood risk elsewhere, and, where possible will reduce flood risk overall.

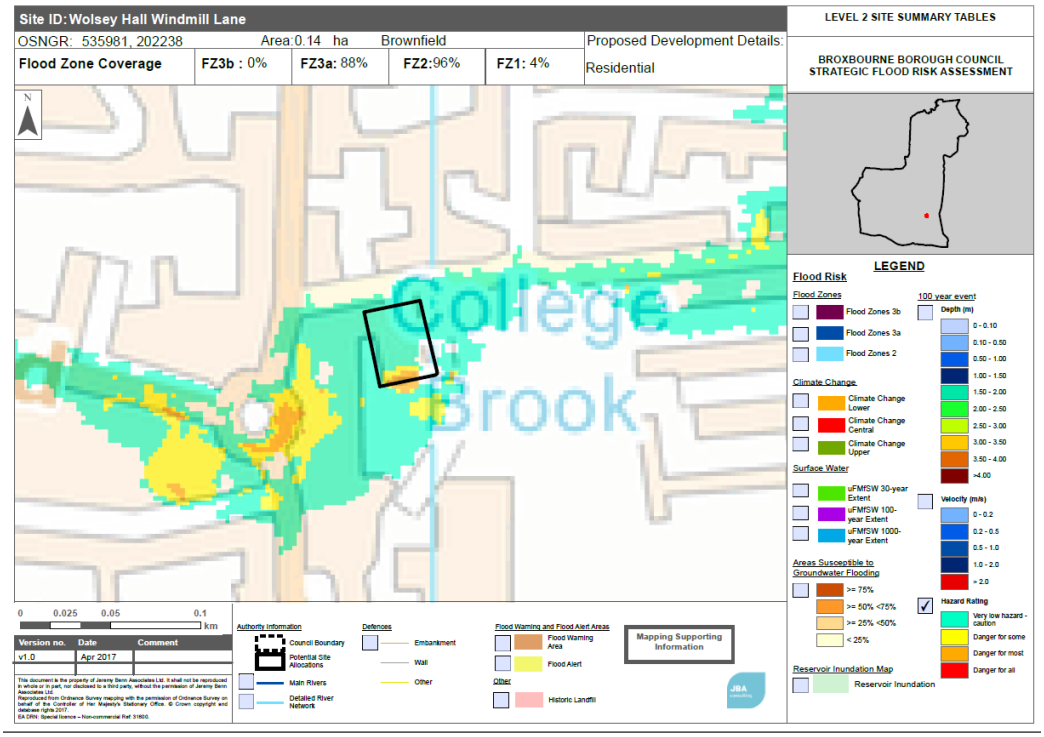
4.10 WOLSEY HALL

4.10.1 The site is proposed for residential development.

NATURE OF THE FLOOD RISK

4.10.2 Fluvial flood risk is associated with the College Brook approximately 20m to the south of the site. The site is largely inundated during the 100-year event with only a small dry area in the south east of the site (forming a dry island). 88% of the site is in Flood Zone 3a and 96% of the site is in Flood Zone 2.

4.10.3 Surface water flood risk at the site is minimal.



WIDER SUSTAINABILITY BENEFITS

4.10.4 The site is very well located in sustainability terms. It is in very close proximity to Cheshunt Old Pond, Cheshunt Station and leisure facilities. Development of the site will contribute to delivering housing in Broxbourne and add variety to the housing offer. The level of car trips arising from the site should be relatively lower than other urban sites.

SAFETY OF THE SITE

4.10.5 The site has a very low hazard rating. The Level 2 SFRA suggests it does not hold deep floodwater, nor is it fast flowing.

SUMMARY

4.10.6 The Council considers that there are wider sustainability benefits to the community that outweigh the risk of flooding. The Council is confident that the site can be safely developed, without making flood risk elsewhere worse.

4.10.7 A site-specific flood risk assessment (FRA) must demonstrate that the development will be safe for its lifetime, without increasing flood risk elsewhere, and, where possible will reduce flood risk overall.

5.0. Conclusion

5.1 In accordance with national guidance the Council has used the Sequential Test, and where necessary the Exception Test, to inform the allocation of land in its emerging Local Plan. In all cases except one, the sites passed the sequential and exception tests. The site that failed the exception test was the Derwent Turnford site, where two alternative uses had been put forward. One use was for residential development, and the other use was for access to the proposed secondary school on the South of Church Lane site (adjoining to the north of the site).

5.2 The Derwent Turnford site failed the exception test on the proposed residential use. Given the site's high hazard rating and the extent of the site covered by this rating, the Council is not satisfied that the site will be safe for a residential use throughout it lifetime. For the proposed alternative use as an access to the secondary school, this will require a bridge to be built because of the steep levels off the A10 link road. The Environment Agency may be unwilling to allow use of this bridge for access to the school in a flood situation, in which case an alternative emergency access will be required. The detail of this will need to be assessed at the time of the planning application, based on the site specific Flood Risk Assessment.

5.3 The Council considers that the proposed site allocations provide the most appropriate way of utilising land available in Broxbourne, in accordance with the identified flood risk status, while at the same time taking into account wider sustainability issues of benefit to the community.

Appendix 1: NATIONAL PLANNING POLICY FRAMEWORK

100. Inappropriate development in areas at risk of flooding should be avoided by directing development away from areas at highest risk, but where development is necessary, making it safe without increasing flood risk elsewhere. Local Plans should be supported by Strategic Flood Risk Assessment and develop policies to manage flood risk from all sources, taking account of advice from the Environment Agency and other relevant flood risk management bodies, such as lead local flood authorities and internal drainage boards. Local Plans should apply a sequential, risk-based approach to the location of development to avoid where possible flood risk to people and property and manage any residual risk, taking account of the impacts of climate change, by:

- *applying the Sequential Test;*
- *if necessary, applying the Exception Test;*
- *safeguarding land from development that is required for current and future flood management;*
- *using opportunities offered by new development to reduce the causes and impacts of flooding; and*
- *where climate change is expected to increase flood risk so that some existing development may not be sustainable in the long-term, seeking opportunities to facilitate the relocation of development, including housing, to more sustainable locations.*

101. The aim of the Sequential Test is to steer new development to areas with the lowest probability of flooding. Development should not be allocated or permitted if there are reasonably available sites appropriate for the proposed development in areas with a lower probability of flooding. The Strategic Flood Risk Assessment will provide the basis for applying this test. A sequential approach should be used in areas known to be at risk from any form of flooding.

102. If, following application of the Sequential Test, it is not possible, consistent with wider sustainability objectives, for the development to be located in zones with a lower probability of flooding; the Exception Test can be applied if appropriate. For the Exception Test to be passed:

- *it must be demonstrated that the development provides wider sustainability benefits to the community that outweigh flood risk, informed by a Strategic Flood Risk Assessment where one has been prepared; and*
- *a site-specific flood risk assessment must demonstrate that the development will be safe for its lifetime taking account of the vulnerability of its users, without increasing flood risk elsewhere, and, where possible, will reduce flood risk overall.*

Both elements of the test will have to be passed for development to be allocated or permitted.

Appendix 2: PLANNING PRACTICE GUIDANCE: FLOOD RISK AND COASTAL CHANGE

Table 2: Flood risk vulnerability classification

Essential infrastructure

- Essential transport infrastructure (including mass evacuation routes) which has to cross the area at risk.
- Essential utility infrastructure which has to be located in a flood risk area for operational reasons, including electricity generating power stations and grid and primary substations; and water treatment works that need to remain operational in times of flood.
- Wind turbines.

Highly vulnerable

- Police and ambulance stations; fire stations and command centres; telecommunications installations required to be operational during flooding.
- Emergency dispersal points.
- Basement dwellings.
- Caravans, mobile homes and park homes intended for permanent residential use.
- Installations requiring hazardous substances consent. (Where there is a demonstrable need to locate such installations for bulk storage of materials with port or other similar facilities, or such installations with energy infrastructure or carbon capture and storage installations, that require coastal or water-side locations, or need to be located in other high flood risk areas, in these instances the facilities should be classified as 'Essential Infrastructure').

More vulnerable

- Hospitals
- Residential institutions such as residential care homes, children's homes, social services homes, prisons and hostels.
- Buildings used for dwelling houses, student halls of residence, drinking establishments, nightclubs and hotels.
- Non–residential uses for health services, nurseries and educational establishments.
- Landfill* and sites used for waste management facilities for hazardous waste.
- Sites used for holiday or short-let caravans and camping, subject to a specific warning and evacuation plan.

Less vulnerable

- Police, ambulance and fire stations which are not required to be operational during flooding.
- Buildings used for shops; financial, professional and other services; restaurants, cafes and hot food takeaways; offices; general industry, storage and distribution; non-residential institutions not included in the 'more vulnerable' class; and assembly and leisure.
- Land and buildings used for agriculture and forestry.
- Waste treatment (except landfill* and hazardous waste facilities).

- Minerals working and processing (except for sand and gravel working).
- Water treatment works which do not need to remain operational during times of flood.
- Sewage treatment works, if adequate measures to control pollution and manage sewage during flooding events are in place.

Water-compatible development

- Flood control infrastructure.
- Water transmission infrastructure and pumping stations.
- Sewage transmission infrastructure and pumping stations.
- Sand and gravel working.
- Docks, marinas and wharves.
- Navigation facilities.
- Ministry of Defence defence installations.
- Ship building, repairing and dismantling, dockside fish processing and refrigeration and compatible activities requiring a waterside location.
- Water-based recreation (excluding sleeping accommodation).
- Lifeguard and coastguard stations.
- Amenity open space, nature conservation and biodiversity, outdoor sports and recreation and essential facilities such as changing rooms.
- Essential ancillary sleeping or residential accommodation for staff required by uses in this category, subject to a specific warning and evacuation plan.

FLOOD RISK VULNERABILITY TABLE

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

Key:

✓ Development is appropriate

✗ Development should not be permitted.