



Liongate House, Ladymead, Guildford

Flood Risk Assessment

*For Borough Housing, Guildford Borough
Council*

Date: 15 October 2019

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1. INTRODUCTION

This report has been prepared by Hydrock Consultants Limited (Hydrock) on behalf of our client Borough Housing, Guildford Borough Council in support of an application to Surrey County Council for the proposed change of use from existing offices to residential use under permitted development.

Local Planning Authorities are advised by the Government's National Planning Policy Framework (NPPF) to consult the Environment Agency (EA) and Lead Local Flood Authority (LLFA) on development proposals in areas at risk of flooding. For a development of this nature the EA and LLFA normally require a Flood Risk Assessment to be submitted in support of such an application.

Whilst recognising that the application is being promoted under permitted development this report has been prepared to satisfy any concerns the EA and LLFA would have in connection with the development of this site and addresses Section C of the Exception Test, as defined within NPPF, through:

- Providing an assessment of whether the proposed development is likely to be affected by flooding; and,
- Detailing any measures necessary to mitigate any flood risks identified, to ensure that the proposed change of use and future occupants would be safe, and that flood risk would not be increased elsewhere.

The report considers the requirements for undertaking a FRA as stipulated in the Technical Guidance of NPPF. Only those requirements that are appropriate to a development of this nature have been considered in the compilation of this report.

This report has been prepared in accordance with current EA policy.

2. SITE INFORMATION

2.1 Location and Setting

The site is located towards the northern limit of Guildford and is bordered to the immediate south by the A25, to the east by Woking Road and by the A3 to the north. The A3 is separated from the site by a vegetated corridor in which there is secondary channel of the River Wey. The main River Wey channel is around 150m to the north of the site and 100m beyond the A3 road. The site is located within a predominantly developed area with existing commercial development to the west and east. To the south is Guildford Fire Station with residential development beyond.

The site is occupied by the Liongate Building which is currently used as an office building. The building itself is raised above the immediate ground level with undercroft parking being at lower levels. The building is also served by an internal access road and areas of car parking beyond the undercroft areas.

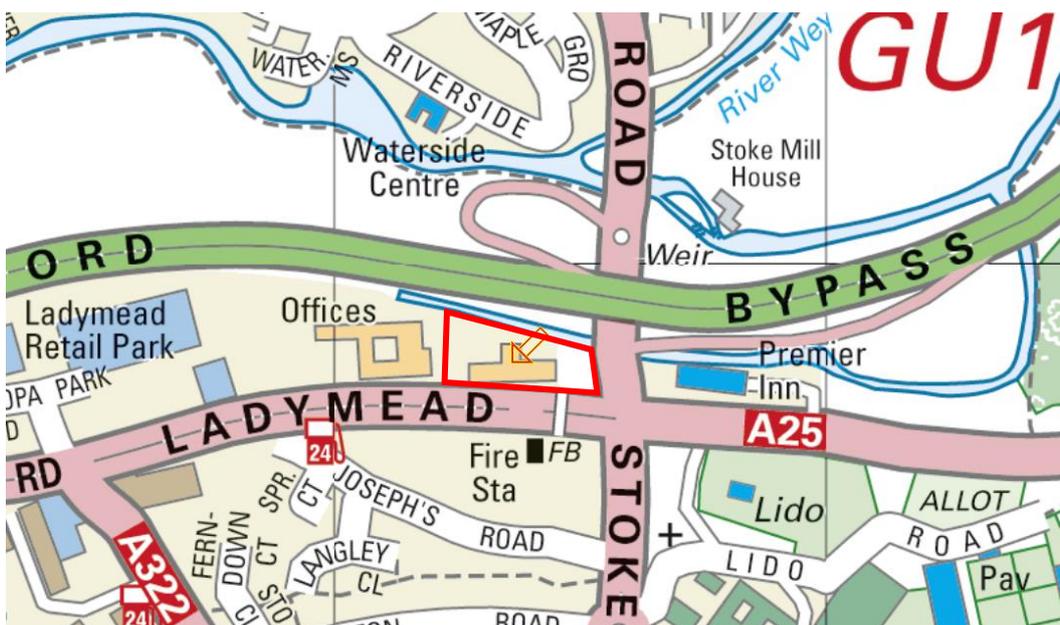
In respect to surface water drainage the site is almost entirely hardstanding.

A summary of the site referencing information is provided in table 1 and a site location plan is shown in figure 1.

Table 1: Site Referencing Information

Site Referencing Information	
Site Address	Liongate House, Ladymead, Guildford, GU1 1AT
Grid Reference	SU996508
X (Easting), Y (Northing)	499679, 150898

Figure 1: Site Location (with approximate site boundary)



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2.2 Proposed Development

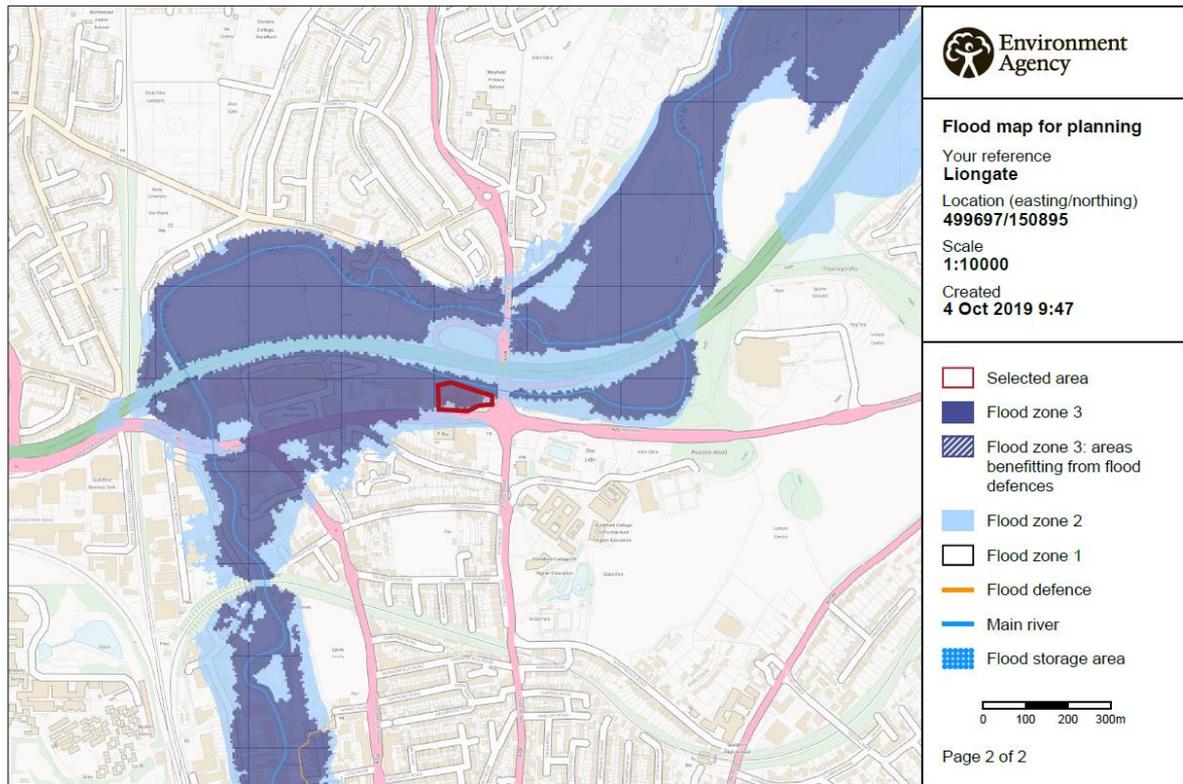
The proposals are for the conversion of the existing building to residential use.

A site layout plan is included with the application.

3. ASSESSMENT OF FLOOD RISK

3.1 Flood Zone Mapping

The site is currently shown by the EA’s Flood Zone Mapping, included in Appendix B, to be within Flood Zone 3 which comprises land having a greater than 1 in 100 annual probability of river flooding (>1%) in any year.



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Figure 2: EA Flood Map for Planning

3.2 Fluvial Flooding

The EA have provided the modelled outputs from the River Wey (Lower) model that was undertaken in 2009. The results include the modelled grid depth data to allow a more accurate assessment of predicted flood depths through the site whilst making an allowance for floodplain flow routing (2D results).

The predicted depths through the site were reviewed and confirm that the site is predicted as being at risk during the 1 in 20year, the 1 in 100 year and 1 in 100 year plus climate change events. Based on the provided information (which is to a large resolution) the predicted depths during these events are 0.2-0.3m for the 1 in 20year and maximum depths of 0.3- 0.4m within the northern section of the site (not shown to impact the existing building) and around 0.6-0.7m deep within the centre of the site for the 1 in 100year and existing 1 in 100year plus climate change allowances. The climate change allowance used to determine these levels is a 20% increase in flows. The rest of the site has also been shown to be at risk during these events but with shallower depths.

The flood risk information provided by the EA also showed that the northern limit of the site is currently classified as being impacted during the 1 in 20year event and therefore is predicted as being within

Flood Zone 3b: Functional Floodplain. The area of the site within this flood zone is existing car parking. The building and access routes are shown as being outside Flood Zone 3B.

Following discussions with the EA, the current hydraulic model for the River Wey have been provided. This modelling doesn't include Navigational Channel which is considered to provide a potentially significant additional flow route in the area. It has been agreed with the EA that additional modelling to quantify the impact of including the Navigational Channel on flood risk, flow routes, and mechanisms is appropriate. The modelling works to include the Navigational Channel are discussed in Section 4.0

Measures to address flood risk are discussed in section 5.4.

The information provided by the EA has confirmed that the River Wey Navigation Channel is not tidally influenced at the location of the site. The site is therefore not considered at risk from tidal flooding.

3.3 Surface Water Flooding

The EA's Flood Risk from Surface Water mapping, as shown in Figure 3 below, shows the majority of the northern section of the site as being at 'low' risk of surface water flooding with depths of over 900mm being predicted.

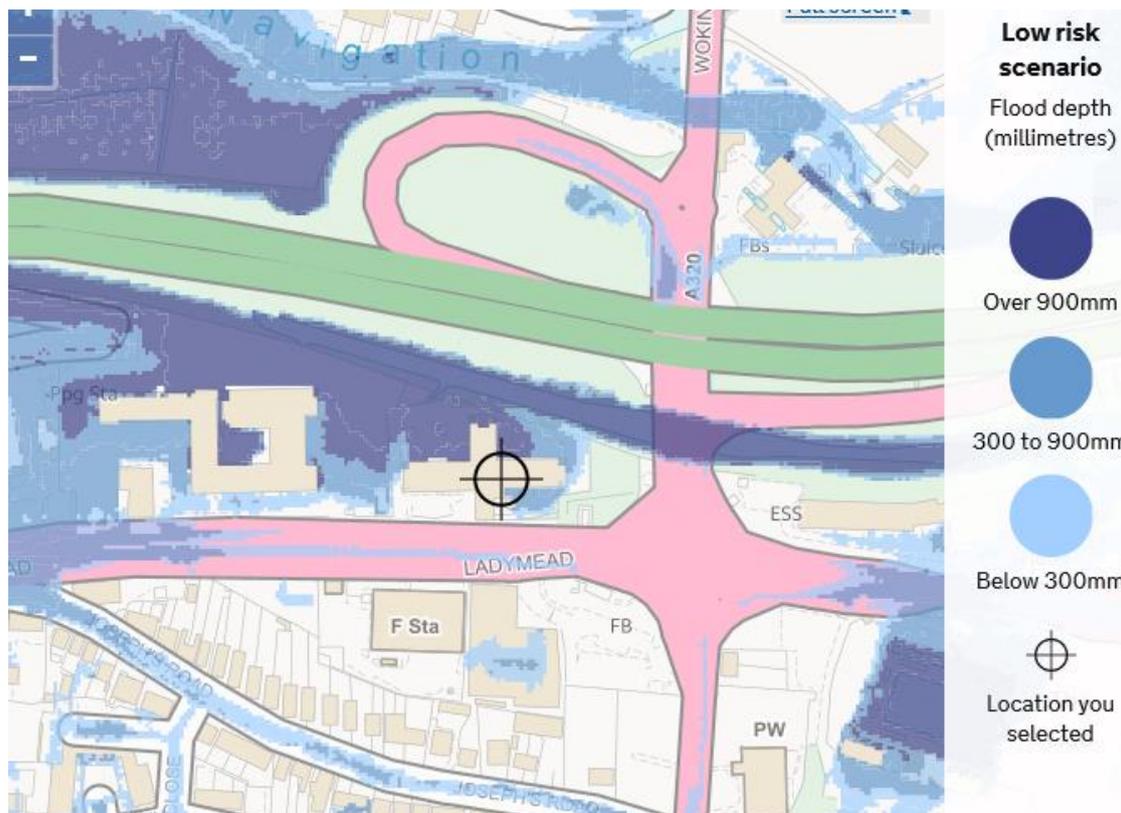


Figure 3: EA Flood Map from Surface Water

This area forms part of a wider area flow route with any generated overland flows being directed in an easterly direction towards the River Wey channel that runs along the northern site boundary. These flows are prevented from entering the main River Wey channel by the A3 road embankment

Whilst the majority of the site is shown as being at 'low' risk of surface water flooding the building, the southern limit of the site, and its access are shown as being at 'very low' risk. As such, this area of increased risk is considered as being representative of locally low points within the site and is not expected to impact on the building itself.

This would be considered a residual risk and therefore the site is concluded as being at risk from this source.

3.4 Groundwater Flooding

Given the proximity of the site to the River Wey it is expected that groundwater levels will be closely related to the 'normal' river level. As such, and given the observed site levels, the site is considered to be at low risk of groundwater flooding.

3.5 Infrastructure Failure Flooding

Given the existing use of the site there is expected to be an engineered sewerage system in the area. As such there is potential for the existing combined sewer network to become overwhelmed. However, no records of such incidences have been included within the SFRA for this area.

The site is therefore concluded to be at low risk from flooding as a result of sewer failure.

A review of the EA's Flooding from Reservoirs map indicates that the site is not within the maximum extent of flooding in the event of a failure of any artificial source.

The site is therefore concluded to be at negligible risk of flooding from artificial sources.

4. HYDRAULIC MODELLING

4.1 Introduction

As part of a permitted development planning application, a review has been undertaken of the modelling information supplied by the Environment Agency (EA). This showed that the northern section of the site is within an area currently categorised as Flood Zone 3b. The modelling predicts out-of-bank flows at this location for the modelled 1 in 20-year event (used to represent the ‘functional floodplain’).

Following discussions with EA, they have provided the hydraulic modelling files for the River Wey. Review of this modelling confirmed that the Navigational Channel that provides a potentially significant additional flow route has not been included in the modelling. By not including this channel the low routes and flooding mechanisms within the vicinity of the site are unlikely to be fully represented, and therefore will not reliably reflect actual site-specific fluvial flood risk.

The Navigational channel bifurcates from the River Wey around 80m upstream of the Woking Road bridge crossing upstream limit of the site. The Navigational Channel runs almost parallel to the River Wey, under Woking Road via a culvert, before flowing back into the River Wey via a lock system some 900m downstream of the site.

To investigate the impact the inclusion this Navigation Channel may have on modelled flood levels, and specifically in relation to an assessment of whether the proposed change of use is outside Flood Zone 3b, the original modelling has been augmented to include the Navigational Channel with modelling specifically addressing the 1 in 20-year event.

4.2 Inclusion of Navigational Channel

Given that the modelling provided by the EA is approved as being fit-for-purpose (and used to inform the current Flood Zone Mapping) changes to the model were strictly limited to those necessary to include the Navigational Channel. As such, the supplied model data relating to the hydrology and all modelled data for both the 1D and 2D elements (cross sections, structures, etc.) remain the same as those supplied, with alterations restricted purely to the locations between the junctions between the Navigation Channel and the River Wey.

A detailed survey has been undertaken along the Navigational Channel and included details of six cross sections and two structures. To model the Navigational Channel 11 sections were used augmenting the surveyed sections to include interpolates (to improve numerical stability) and ‘dummy’ units for the downstream faces of structures and junctions to follow the standard recommended approach. Given that these were to be included within a linked 1D-2D model, the survey focussed on levels between the top of banks only with floodplain levels being informed by the wide area LiDAR Data supplied by the EA (and upon which the wider area modelling was originally based).

The structures surveyed were the existing culvert under Woking Road and the existing lock gate at the downstream limit of the Navigational Channel. There are no other structures along this Navigation Channel.

The survey showed that the Woking Road culvert has a steep and sudden drop in bed level at the downstream face. As such, and to increase model stability, a spill unit was used to represent the drop-in bed elevation with ‘dummy’ cross sections from the nearest surveyed cross sections used to represent

channel dimensions at both the upstream and downstream faces. This approach was considered the most representative of conditions whilst suitably representing the flow process through this structure and improving numerical stability.

For the lock gate at the downstream limit of the Navigational Channel a conservative approach has been adopted. It is assumed that the Lock is shut. The channel bed levels at the point of the structure have been increased to the surveyed crest level of the weir gate to represent a 'worst case' control on water levels. Whilst several options were available for the modelling of this structure, the approach adopted is considered as having the greatest chance of conservatively representing upstream flood levels.

A copy of the structures surveyed, along with all of the surveyed cross sections, is included in the Appendices.

The 2D model was, as with the 1D elements, changed as little as possible from the already approved model. The Navigation Channel and cross sections have been included using the same methodology as that used within the supplied modelling but using a new version of the:

'2d_bc_ISISLink_NoMCS_split_HYD_Polyline', and, '2d_bc_ISISLink_NoMCS_split_HYD_Polygon' files.

These files have been used to represent the watercourse domain and also to provide the link between 1D and 2D Domains (via the use of CN lines). The Polygon layer, as with for the rest of the River Wey model, was broken at the location of structures with road/deck levels being informed by LiDAR levels.

The only other input layer amended from the original model was that with the ISIS Node Locations. This layer was updated to include the cross sections that have been surveyed, and interpolated, to represent the Navigational Channel. Once updated this layer was saved as '1d_1xd_ISISNodes_Split - Copy 1d_1xd_ISISNodes_Split - Copy Point'.

The changes made are referenced within the relevant 1D (DAT, IEF, IIC) and 2D (TRD, TCF, TGC, TBC) elements. This was then re-run as a linked model. The run parameters used within the IEF (MAXIT etc.) for the new Navigational Channel model matched those used within the original models. This was to ensure any comparison of the resultant new modelling to that of the original modelling could be undertaken. This comparison has allowed determination of the impact the inclusion of the Navigational Channel on flood extents and depths both at the site and in the wider area.

4.3 Results

The modelled results for both scenarios (original model and the new model that includes the Navigational Channel) have been compared for the 1 in 20 year event used to represent the limit of the functional floodplain. The comparison confirms that a significant volume of flow (around 14% during normal flows) is directed down the Navigational Channel.

Furthermore, the predicted flood extents for the new model with the Navigational channel included are noticeably reduced along the right bank of the River Wey in the location of the site. In addition, the resultant extents and depths of flooding within the area of land between the Navigational Channel and the main River Wey channel are also shown to increase.

Whilst noticeable differences in flood depths and extents around the Navigational Channel are predicted by including more realistic representation of the actual hydraulic environment in the location of junction between the channels, the results also confirm that the impact of this additional channel is

relatively localised with little, if any, impact to flood extents shown a short distance both upstream and downstream of the channel split/ confluence.

In relation to the site, the modelled 1 in 20 year event which now includes the Navigational Channel confirms that, whilst peak flood levels reach an elevation above that of the lowest surveyed site levels (taken from topographical survey as this is considered more accurate and representative than the wider area LiDAR Data), the predicted depths (and extent) of flooding within the site are marginally reduced from those provided by the EA using the original modelling.

Following the approval by the EA of the 1 in 20 year modelling, the EA have requested that the model be run for the 1 in 100 year event to determine the impact of the inclusion of the Navigational Channel on the existing Flood Zone 3.

Based on the modelled results, the existing building and access points (both vehicular onto the A25 and pedestrian into the building) are concluded to be outside the Functional Floodplain (i.e. the 1 in 20 year event). As such the policy within Guildford Borough Council's Local Plan that states that development within Flood Zone 3b should not increase the existing vulnerability classification would not apply. A proposed change of use application in this location can therefore be considered acceptable provided suitable flood resilience and resistant approaches be included within the scheme. That said, it is noted that the northern section of the site and open car parking areas (i.e. not the undercroft) would be within Flood Zone 3b. However, there are no proposed changes to the use of these areas and they are to remain as car parking.

The 1 in 100 year modelling has been run and this confirms that whilst the site would remain as being predominantly within Flood Zone 3 and at high risk, the predicted levels have reduced from those provided by the EA with predicted flood levels being a maximum of 29.723m AOD.

5. NPPF REQUIREMENTS

5.1 Flood Risk to the site

Whilst an Exception Test is not required under the permitted development rights application, the following section details those measures recommended to mitigate any identified flood risks, to ensure that the proposed change of use and future occupants will be safe, and that flood risk will not be increased elsewhere, akin to the requirements of the second section of the Exception Test.

As discussed in section 3.2 the main risk from flooding is the potential inundation of the car park areas behind the existing building during design flood events. Following assessment of the predicted flooding depths, it is recommended that all habitable rooms be set no lower than 30.323m AOD to ensure all habitable rooms are set with a 600mm freeboard above the 1 in 100 year event. The provided topographical survey confirms that floor levels are set at 30.57m AOD and therefore are suitably raised above the current flood levels.

As car parking areas are predicted to be at risk during design events, it is recommended that a Flood Evacuation and Management Plan be prepared for the site which should be managed by the site Management Company and disseminated to all future occupiers of the site.

5.1.1 *Resistance and Resilience Measures*

Owing to the raised nature of the existing ground floor level, no particular measures are considered necessary as all residential uses will be suitably raised.

5.1.2 *Safe Access and Egress*

Access to the site will be via Ladymead Road on the southern site boundary which is confirmed to be at low risk of flooding, based on the EA's Flood Zone and Flood Risk from Surface Water mapping.

As such, a safe / dry access and egress is considered to be possible to and from the site.

5.1.3 *Flood Risk within Catchment*

The proposed development will not increase flood risk within the catchment through a loss of floodplain storage as no external changes in levels are proposed.

5.1.4 *Surface Water Drainage Strategy*

As the amount of hardstanding within the site is not changing, the volume or rate of surface water generated from the site is not expected to increase.

6. CONCLUSIONS

This report has considered the flood risk posed to the proposal site from a variety of sources of flooding, as defined by the NPPF.

The report has confirmed that the existing building is located within Flood Zone 3 but outside of the functional floodplain. The only areas shown to be within the Functional Floodplain are along the northern boundary which is an existing area of car parking. The area of car parking to the north is also shown as being at an increased risk from surface water. The southern section of the site (including the existing building) is at low risk from fluvial and surface water risks. The entirety of the site is also shown as being at low risk from sewer, and groundwater flooding and is not considered at risk from flooding from artificial sources.

The proposed change of use is 'more vulnerable' but as the minimum floor levels for residential use are to be raised to a level that is at or above the maximum predicted depth for the 1 in 100 year climate adjusted flood level, such use is considered appropriate in the proposed location under NPPF criteria.

The proposed development will, where possible, implement measures to 'wet proof' the building access areas to improve existing flood resilience. This should include locating vulnerable services above the design flood depth – ideally 500mm above the predicted 1 in 100year flood level of 29.723m AOD to ensure a flood resilient approach has been adopted. Given the currently floor levels this is achieved (floor level is at 30.57m AOD). This will be in addition to the site preparing a Flood Evacuation Plan and signing up to the EA's Early Warning Scheme.

Provided a suitable flood management plan is in place the proposed change of use is considered to be acceptable from a flood risk perspective and to provide a viable future for the building.

Based on the modelling the site is concluded to be outside the Functional Floodplain (i.e. the 1 in 20-year event). As such the policy within Guildford Borough Council's Local Plan that states that development within Flood Zone 3b should not increase the existing vulnerability classification does not apply. A proposed change of use application in this location can therefore be considered acceptable provided suitable flood resilience and resistant approaches be included within the scheme.

Hydrock Consultants Limited