

HYDRAULIC MODELLING NOTE

Prepared on behalf of Savills



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SITE: Land at Tortington, Arundel

1.0 INTRODUCTION

Ardent Consulting Engineers (hereafter referred to as Ardent) has been commissioned by Savills to undertake a hydraulic modelling exercise for a site known as "Land at Tortington, Arundel" centred at Ordnance Survey grid co-ordinates 500591mE, 106269mN. The nearest postcode to the Site is BN18 9EX (refer to **Figure 1**).



Figure 1: Site Location

The Environment Agency's online flood mapping indicate that the Site is located within Flood Zone 3. As the Site is considered sensitive to flood risk, it is required that the

revised climate change allowances should be used to determine minimum Finished Floor Levels and safe access and egress routes. Following consultation with the Environment Agency (EA), it was requested that the latest 100 year climate change requirements, which came into force on the 29th February 2016 for South East River Basin, were run.

This Technical Note outlines the methodology adopted to assess the latest Climate Change requirements for both fluvial and tidal models built for the river Arun and provides details of hydraulic model updates and results.

2.0 HYDRAULIC MODELLING

2.1 *Background*

The hydraulic model used to provide additional flood outlines was the existing InfoWorks RS Model of the tidal reaches of the River Arun in Sussex. The upstream limit is Pallingham Weir; from here the river flows generally in a southerly direction close by to Pulborough and through Arundel before discharging into the sea at Littlehampton. The downstream boundary is the Ford Railway Bridge on the west bank and the A259 on the east bank. In addition to the River Arun, the tributary the Black Ditch is also included within the existing model. The model covers all of the areas described above and in addition extends down to the mouth of the river at Littlehampton. The model has been extended to the sea in order to ensure that it accurately represents the propagation of tidal flood waters up the river. The model was developed by Atkins in November 2010 as part of The Lower Tidal River Arun Strategy (LTRAS).

2.2 *Model Changes*

InfoWorks RS was used to re-run the model for the updated climate change scenarios.

No changes were made to the model apart from recreating all boundary inputs and using more UpToDate LiDAR data.

2.3 *Hydrology – Fluvial Model*

Fluvial Inflows

Suitable allowance for increased river flow due to climate change were considered based on the EA's February 2016 guidance and the March 2020 update.

For more vulnerable residential developments in Flood Zone 3 the 'higher central' allowance is used and for less vulnerable commercial developments the 'central' climate change allowance is required and this should be considered for the lifetime of the development.

The Site of interest is located in the South East Region, therefore the following climate change allowances were assessed:

- 1 in 100yr plus 50% event which should be used as the design event
- 1 in 100yr plus 105% event which should be used for sensitivity testing

QT boundaries were revised to account for the new climate change allowances. There was only one QT boundary where the inflows were not updated as the model became unstable and no solution could be found without making significant changes to the model built. This inflow node is located downstream of the Site, approx. 9km to the south east of the Site and represents the inflow to a tributary of the River Arun. An increased inflow at that tributary is unlikely to have an impact on Site due to the remote location and also the fact that the site is tidally influenced.

Tidal Boundaries within the Fluvial Model

According to the model report produced by Atkins in November 2010, the fluvial design events were run with a Mean High Water Spring Tide (MHWS – 2.858 m AOD). The Tidal boundary was updated as well to include the updates in the anticipated rise in sea level for the south east of England. Guidance from the EA states¹ that the anticipated rise in sea level for the south east of England up to the year 2125 is expected to be 1.2 m. Therefore, this value was used for the Climate Change adjustment. Based on the above the MHWS climate change peak level is 4.058m AOD (current/updated climate change tidal boundary).

2.4 Hydrology – Tidal Model

Fluvial Inflows within the Tidal Model

According to the model report produced by Atkins in November 2010, the tidal design events were run with a mean winter fluvial flow. These were kept the same for the updated tidal climate change model.

Tidal Boundaries

¹ <https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances>

The tidal boundary was changed to include the updates in the anticipated rise in sea level for the south east of England. As mentioned above, the anticipated rise in sea level for the south east of England up to the year 2125 is expected to be 1.2 m. Therefore, this value was used for the Climate Change adjustment. Based on the above the 200yr climate change peak level is 5.348m AOD (current/updated climate change tidal boundary). The 1000yr climate change peak level is 5.54m AOD (current/updated climate change tidal boundary).

3.0 MODEL RESULTS**3.1 Fluvial Model**

The EA's LTRAS Fluvial Model was rerun to produce the 1 in 100 + 50% CC and 1 in 100 + 105% CC flood outlines with the MWS climate change boundary of 4.058m AOD (current/updated climate change tidal boundary).

The model results indicated that the maximum predicted flood level for the 100 + 50% Climate Change is 2.949m AOD within close proximity to the Site. The maximum predicted flood level for the 100 + 105% Climate Change is 3.427m AOD.

The flood extents were generated by the software. The original model DTM was missing from the data sent by the EA. Therefore, 50mm resolution LiDAR data were downloaded and used to produce the outlines shown below.

Figure 2 below shows the predicted flood outlines for the defended 1 in 100yr+50%CC and the 1 in 100yr+105%CC including a MWS+CC tidal boundary. The same figure also includes the defended 100yr and 1000yr event including a MWS tidal boundary as received from the EA.

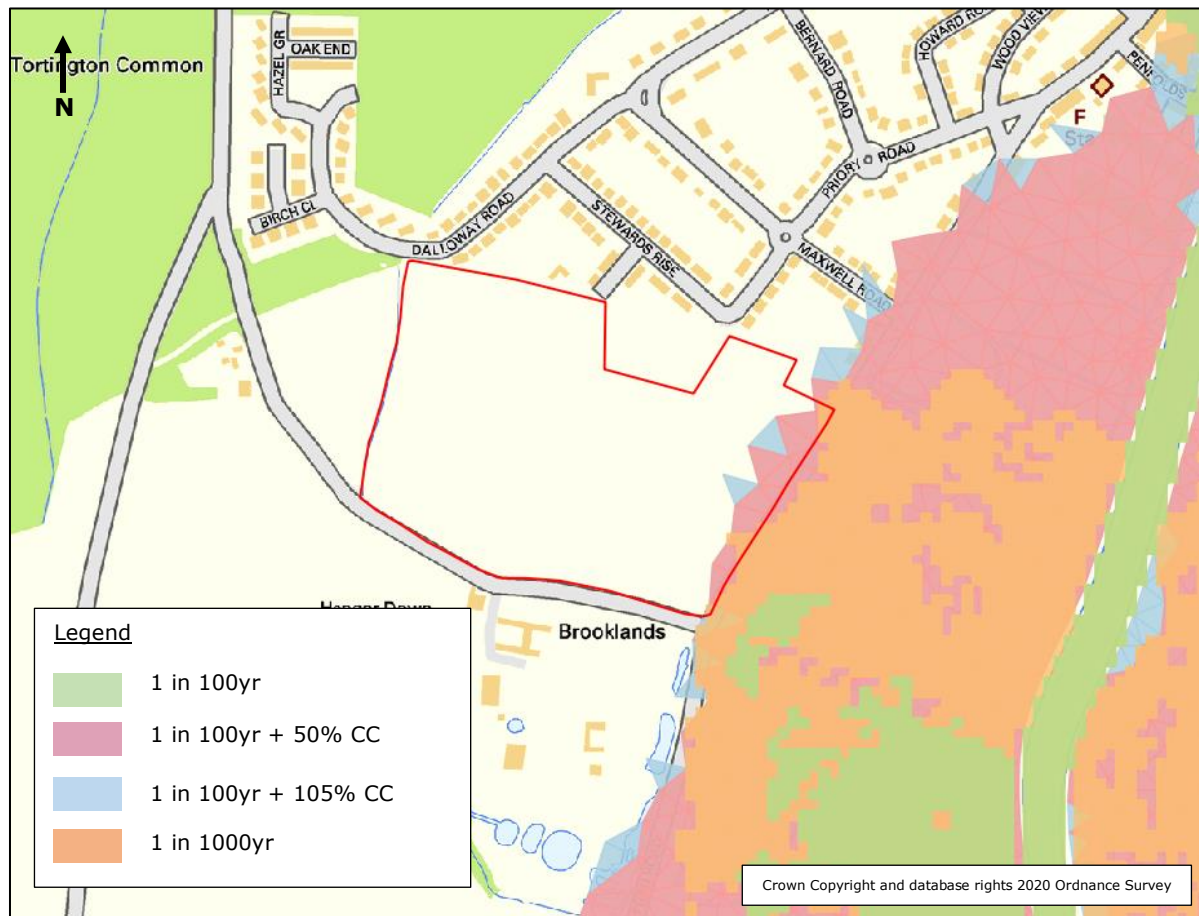


Figure 2: Fluvial Flood outlines

3.2 Tidal Model

The EA's LTRAS Tidal Model was rerun to produce the updated 200yr + CC flood and 1000yr + CC flood outline. The model was run with mean winter fluvial flows as per the original model and peak tidal boundaries of 5.348m AOD for the 200yr + CC event and 5.54m AOD for the 1000yr + CC event (current/updated climate change tidal boundary).

The model results indicated that the maximum predicted flood level for the 200yr and 1000yr Climate Change is 4.068m AOD and 4.081 respectively within close proximity to the Site.

Figure 3 below shows the predicted flood outlines for the defended mean winter fluvial flow including a 200yr+CC tidal boundary. The extent of the 1000yr+CC tidal outline is similar as the difference in predicted flood level is only 13mm between the two events.



Figure 3: Tidal Flood outline

4.0 CONCLUSIONS AND RECOMENDATIONS

Ardent Consulting Engineers has been commissioned by Savills to undertake a hydraulic modelling exercise for a site known as "Land at Tortington, Arundel".

The purpose of this modelling task was to produce additional flood outlines for the new climate change scenarios updated in February 2016 for both tidal and fluvial models.

The existing InfoWorks RS fluvial model of the River Arun in Sussex was rerun for the 100 year+50% climate change and 100 year+105% climate change events. The existing tidal model was also rerun for the 200yr and 1000yr climate change tidal boundary which included the anticipated rise in sea level for the south east of England up to the year 2125.

The maximum predicted fluvial flood level for the 100 + 50% Climate Change is 2.949m AOD within close proximity to the Site. The maximum predicted flood level for the 100 + 105% Climate Change is 3.427m AOD. The maximum predicted tidal flood level for the 200yr Climate Change is 4.068m AOD within close proximity to the Site and the maximum predicted tidal flood level for the 1000yr Climate Change is 4.081m AOD.

It is proposed that all residential development is located outside the 100 year +50% flood outline. Floodplain compensation will need to be provided for any development located within the 100 year +50% flood outline, in consultation with the EA. It is proposed that all Finished Floor Levels (FFLs) for residential development are set 300mm above the tidal 200yr + CC predicted flood (FFLs will need to be at 4.368m AOD or above). At the same time sleeping accommodation will need to be set above the 1000yr CC tidal level of 4.081m AOD which will be achievable given the difference in levels between the two events.

In terms of safe access and egress in the event of a flood, it is suggested that occupants can leave the site via Priory Lane heading west and subsequently north away of the floodplain.