

RHODES BUSINESS PARK

TECHNICAL NOTE

Flood Zone Analysis Modelling Results

DOCUMENT CONTROL SHEET

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P00	30/11/2023	First issue
P01	01/05/2024	Addressed Environment Agency Planning Responses
P02	02/08/2024	Additional EA clarification provided – Flood Mitigation & Storm Events Section

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Introduction

As part of the Flood Risk Assessment and Drainage Strategy (40055 BGL-XX-XX-RP-D-0001-V4-Rhodes_BP-Flood Risk Assessment & Drainage Strategy) submission an independent flood modelling study was commissioned to supplement the FRA report as the proposed development site lies within a defended Flood Zone 3 along the northern bank of the River Irk.

JBA Consulting was commissioned to undertake the study on behalf of the client, Belshaw, to accurately represent the flood levels at the proposed development site. This includes flood levels, extents, velocities and depth of modelled flood scenarios.

The full JBA report, LGH-JBAU-XX-XX-RP-HM-S3-P01-Hydraulic_Model_Report, have been issued as part of the planning pack.

Following the submittal of the planning application, a formal response was received from the Environment Agency requesting that the applicant provide further clarifications on the flood risk element of the project.

The following paragraphs will address the EA's comments – comments addressed in **Green text**.

Approach

The JBA flood study covers the following storm events in their report – Ref Paragraph 2.7:

- 3.33% - 1 in 30 year event.
- 1% - 1 in 100 year event.
- 1% + 35% Climate Change factor - 1 in 100 year event +35% CC uplift.
- 0.1% - 1 in 1,000 year event.

The corresponding hydrographs were derived for each of the above storms and incorporated in the modelling.

Recent Topographical survey of the proposed development site was used, incorporating the top of the sheet-pile wall along the northern bank of the River Irk. This data, included with DEFRA 2m resolution DEM elevation data for the surrounding land was used in the model analysis.

Channel survey data was collected along the River Irk at key hydraulic structures, a total of 20 cross-sections were taken and used in the modelling analysis.

Results

A base line flood extents were determined based on the updated topography and water course sections, the results of the modelling analysis show that the 1:30 (3%) and 1:100 (1%) return events do not flood the site. During the 1:1000 (0.1%) event the entire site is flooded:

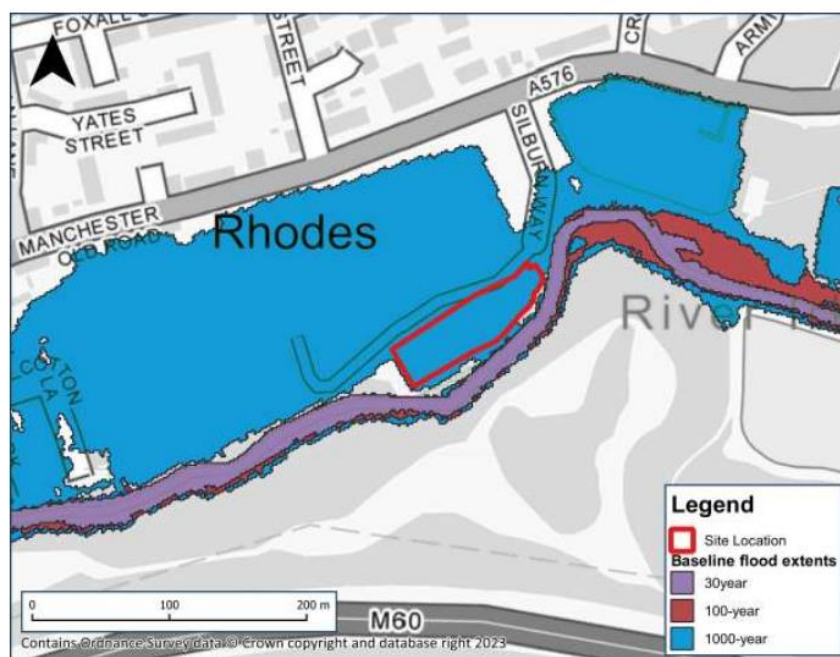
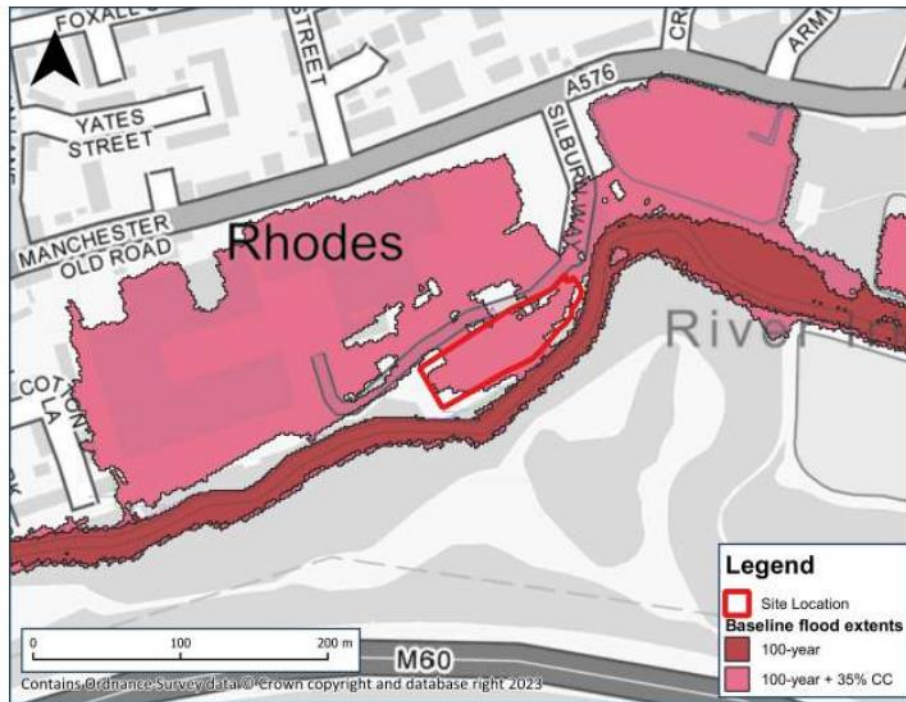
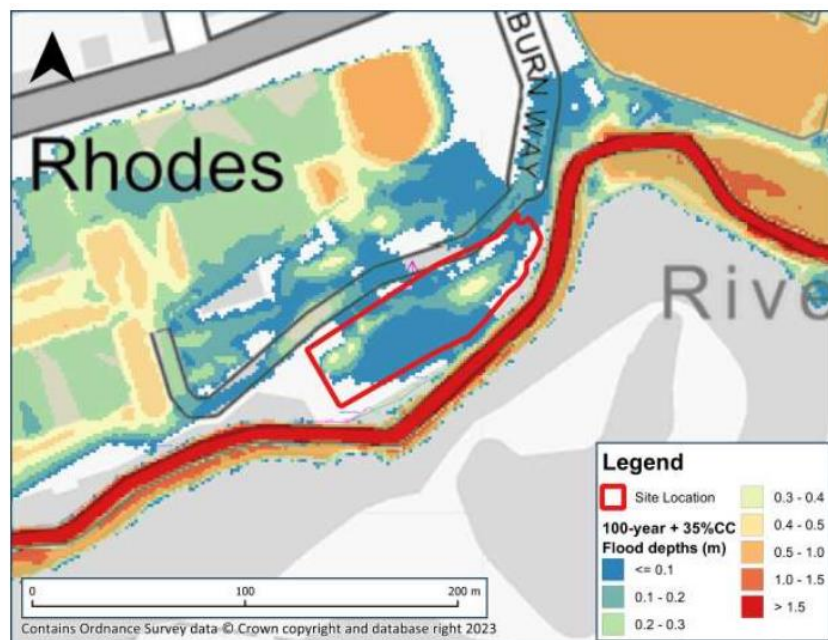


Figure 3-1: Baseline flood extents (30-year, 100-year, 1,000-year)

Although the 1:100 (1%) event storm does not flood the site, the addition of the 35% Climate Change factor uplift shows the site at a risk of flooding.



For the 1:100 (1%) +CC event, the pre-development depths of flooding are generally below a depth of 100mm, within the red line boundary, with slightly deeper flood depths in localised areas of depressions in the parking/yard area.



Responses to EA comments

EA Comment: 17 April 2024

In particular, the FRA fails to:

Consider how people will be kept safe from the identified flood hazards

- Consider the requirement for flood emergency planning including flood warning and evacuation of people for a range of flooding events up to and including the extreme event.

Flood Risk - Safety of People and Building Resilience

During Occupation, health and safety measures will be required to ensure the safe working area due to the flood zone classification. It is recommended that an Evacuation Management Plan is prepared to include as a minimum; the evacuation procedures, safe refuge locations, evacuation/safe refuge routes, responsible personnel, flood warning codes and emergency services contact details. It is also recommended that the end user sign up with the EA flood warning service.

A residual risk to building services still remains for the extreme flood event. The new development may wish to include flood resistant and resilient construction methods up to the 1 in 1000-year event. We have therefore suggested measures that may be beneficial to incorporate into the design, particularly where it may be a relatively simple change to the design but could have a significant impact on providing more resilience to flood water. We have provided a summary of potential mitigation measures. The requirements for Flood Resilient construction will be confirmed and refined at the detailed design stage, however typical flood resilient construction measures can include: The following typical flood resilient measures are suggested but not essential:

- Non-return valves on drains and other pipes entering/exiting the building below the flood level.
- Raised sub-station levels.
- Placing of sensitive power and data equipment above the predicted flood level.
- Electrical supply meter and consumer unit should where possible be fitted above the flood level. Where the supply meter and consumer unit are fitted above the flood level, good practice would be to separate all electrical services within the flood level from services that would not be above the flood level- this would allow light, heat and power until normality has been returned.
- In the event of a flood, the gas service shall be isolated at the emergency isolation control valve and only be turned on following a complete inspection by a registered engineer.
- Incoming cold-water mains to be fitted with a double check valve directly after the mains stop cock. In the event of flooding, water taps should not be used until told to do so by the local water authority.
- Raised finished floor levels. FFLs should be set 600mm above the flood level, including climate change. The proposed FFL is set at 70.900m AOD – modelled flood levels are predicted between 70.10 – 70.20m AOD for the 1:100+CC event. No basement construction is proposed in this development.
- Resistance and resilience measures. These have been addressed in the previous section.
- Safe access and egress routes. These have been addressed in the previous section.
- In addition, the site plan shows two condensers to be near the River Irk. If they are within 8 meters of the river, we are unlikely to grant a permit. These have been relocated outside the 8m buffer zone required by the EA – see attached updated site layout drawing.

- We would also like to assess the risk this proposal may have downstream, so would like to see more detail on the fencing shown on the site plan. The redline boundary fence is an existing palisade fence, this will not be replaced. Site photographs of the site fence shown below.



- Site photographs of the boundary palisade fence.

EA Comment: 23 May 2024

Flood Mitigation and Storm Events

The site is not prone to flooding for the 100 year storm event.

The site is at risk of flooding for the 100 year +35% climate change storm event. The predicted flood depths are generally less than 100mm across the site.

Figures 3-2 and 3-3 from the JBA report are reproduced below for reference showing the predicted flood extents and levels for the base line scenario (pre-development):

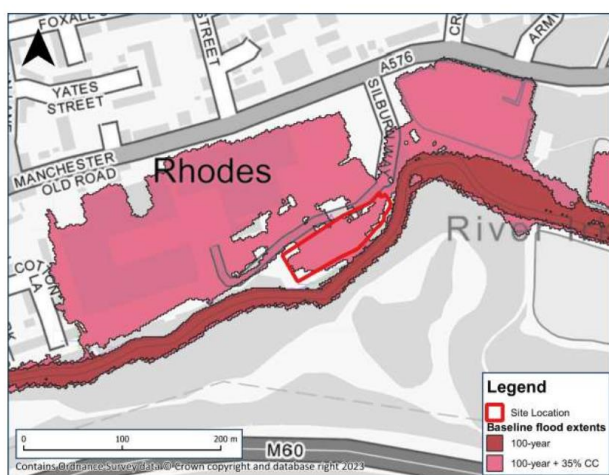


Figure 3-2: Baseline 100-year flood extent with climate change

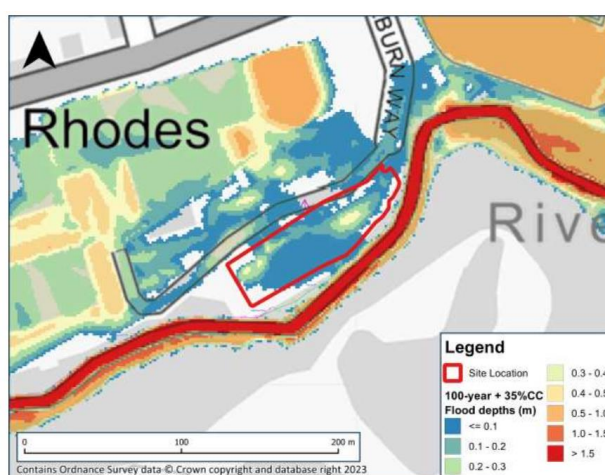


Figure 3-3: The 100-year plus 35% climate change flood depths

From Figure 3-2, above, and satellite image, below, the flood area extent reaches the existing industrial site and the park pond/basin to the northeast measuring ~42,500m² in plan area. The industrial estate is part of the development site which is owned by the applicant



Satellite Image of area

As can be seen in the JBS report figure 3-2, the primary overland flood routing is along Silburn Way through the industrial estate and rejoins the River Irk to the west of the property. The levels on Silburn Way drop from north to south into the industrial estate and then level out with the lowest levels in the estate at the western boundary along the river where the flow path rejoins the river.

There is a small breach along the River Irk along the southern boundary of the proposed development which floods the area - JBA Figure 3-4. The proposed levels for this development will reinstate the flood defence levels and prevent water entering the industrial estate thus reducing flood inflows to the industrial estate.

The introduction of the proposed development does not impede this overland flood flow path.

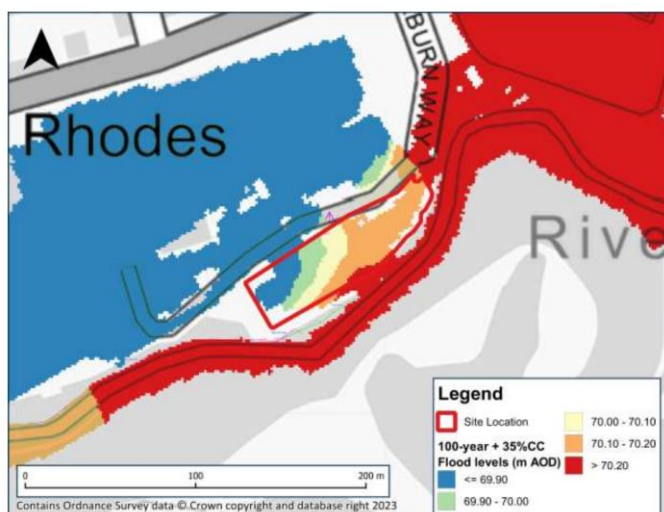


Figure 3-4: The 100-year plus 35% climate change flood levels

The proposed development earthworks, undertaken within the redline boundary, will prevent flooding directly along the southern boundary by re-instating the flood defence levels but also displace flood water entering from the north of the site. This is shown in the figures below in pre and post scenario.

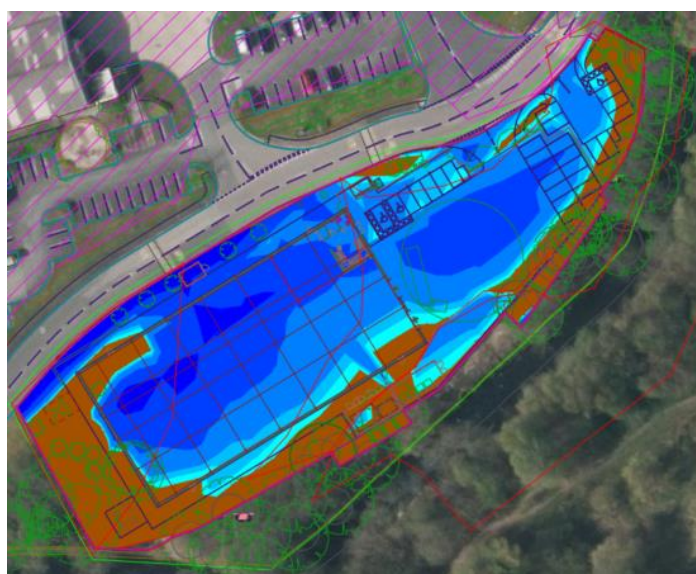


Figure a - Base line flood extent within redline boundary.

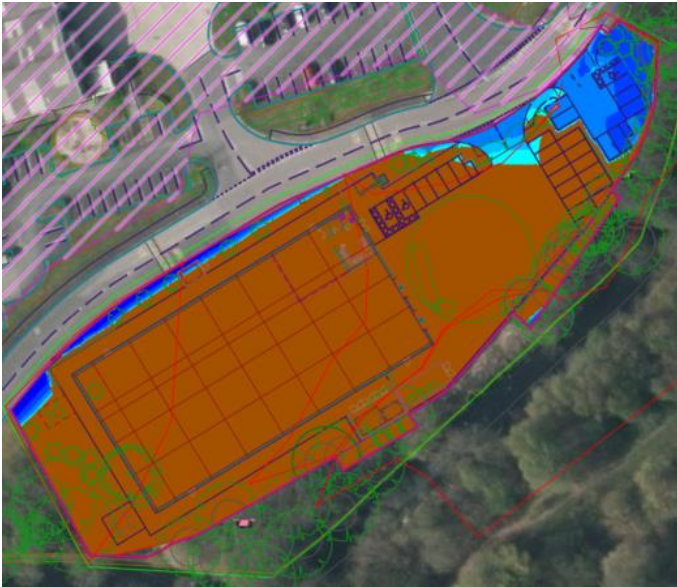


Figure b – Post Development flood extent within redline boundary.

The earthworks volumes and flood volume displacement calculations have been re-run and it shows that ~700m³ volume of water will be displaced. This displaced volume of flood water equates to ~17mm water level rise over the flood extent area shown in JBA Figure 3-2.

As the industrial estate floods up to 1m depth this increase in level is considered negligible on overland flood flow.

The industrial estate is owned by the applicant and it is understood that the estate will flood in the 100 year +35% Climate Change event. The development is deemed viable as it falls in a less vulnerable development category (see FRA & DS Section 4.6).

Vulnerability Classification		Essential Infrastructure	Water-compatible	Highly Vulnerable	More Vulnerable	Less Vulnerable
Flood Zone	Zone 1	✓	✓	✓	✓	✓
	Zone 2	✓	✓	Exception Test	✓	✓
	Zone 3a	Exception Test	✓	✗	Exception Test	✓
	Zone 3b	Exception Test	✓	✗	✗	✗
Key ✓ Development is appropriate ✗ Development should not be permitted						



Google 3D image of industrial park – site is in cut and lower than surrounding land.