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Level 2 Strategic Flood Risk Assessment

Site HEA137; EA021

Prepared for: Southend-on-Sea City Council

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1 Background

This is a Level 2 Strategic Flood Risk Assessment (SFRA) site screening report for Site HEA137; EA021. The content of this Level 2 SFRA site screening report assumes the reader has already consulted the Southend-on-Sea City Council Level 1 SFRA and read the Southend-on-Sea City Council Level 2 SFRA Main Report and is therefore familiar with the terminology used in this report.

1.1 Site details

- Location: Land at Elm Road Shoeburyness - SS3 9RY
- Site area: 3.77ha
- Existing site use: Greenfield
- Proposed site use: Residential

1.2 Topography

Figure 1-1 shows the topography of the site represented by the Environment Agency (EA) 1m resolution LiDAR.

Topography at the site shows ground elevations are highest in the west of the site and slope downhill towards lower elevations in the east of the site. Minimum elevations of 6.1mAOD are found in the northeast corner of the site and maximum elevations of 8.1mAOD are found in the southwest of the site.

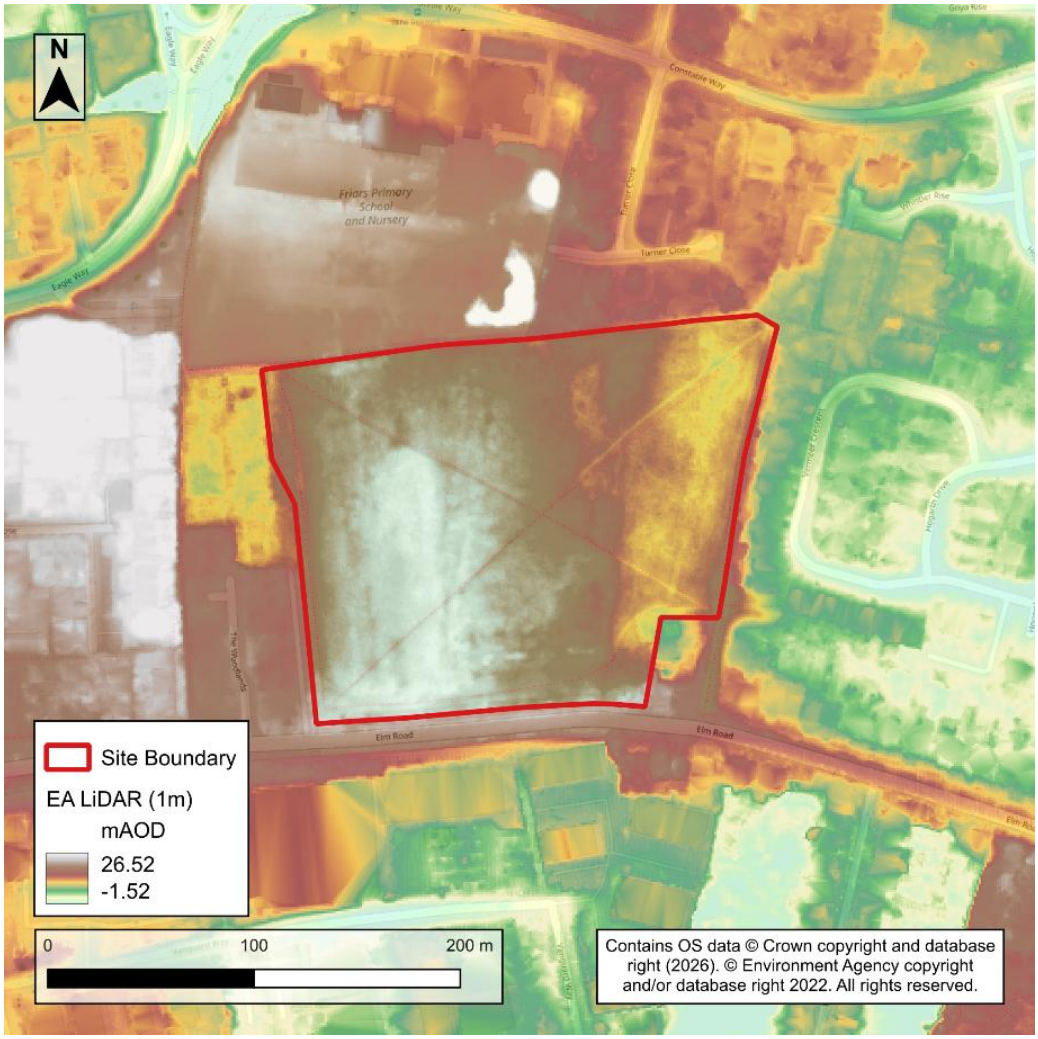


Figure 1-1: Topography of the site.

1.3 Geology and soils

Geology at the site consists of:

- Bedrock - London Clay Formation comprised of clay, silt and sand.
- Superficial - River terrace deposits comprised of and silt.

Soils at the site consist of freely draining slightly acidic loamy soils.

The likely impact of these on drainage within the site is discussed within Section 5.

2 Sources of flood risk

2.1 Location of site within the catchment

The site is located within the southeast of the study area. The site drains directly to the Thames Estuary.

2.2 Existing drainage features

Based on online mapping, there are no existing drainage features within the site.

The Thames Estuary is located approximately 2km south of the site.

2.3 Fluvial and tidal

2.3.1 EA's Flood Map for Planning

Based on the EA's Flood Map for Planning (FMfP) Flood Zones (accessed 21 April 2026) and Flood Zone 3b (functional floodplain), defined as set out in the Southend-on-Sea Level 1 SFRA, the site is not shown to be at risk of flooding based on the EA FMfP and is located entirely within Flood Zone 1.

2.3.2 Fluvial

There are no existing watercourses within or surrounding the site and no known fluvial risk to the site. The risk to the site is from tidal flooding, discussed in Sections 2.3.3 and 2.3.4.

2.3.3 Tidal - present day (2026 epoch)

As part of this SFRA, the existing EA hydraulic models of Southend and the Crouch and Roach estuary developed as part of the 2014 Essex, Suffolk and Norfolk Coastal modelling project were combined to cover the study area and have been used to assess the tidal risk across the study area.

The site is not shown to be at risk from present day tidal flooding in the undefended and defended scenarios, according to the FMfP and local flood modelling.

2.3.4 Tidal - future risk (2126 epoch)

The EA’s FMfP Flood Zones plus Climate Change layer shows areas of the site likely to be at increased flood risk in future. Based on this dataset the eastern half of the site is shown to be at risk.

The combined tidal hydraulic model created as part of this SFRA (see Section 2.3.3 for further details) was uplifted for the 2126 epoch for the higher central and upper end climate change scenarios.

The model extent shows a significantly smaller area to be at risk than that represented in the FMfP. As demonstrated in Figure 2-1 and Figure 2-2 a small area in the northeast

corner of the site is shown to be at risk during the 0.1% AEP plus Upper End (95%) undefended and defended climate change scenarios. Flood depths remain below 0.15m, velocities below 0.25m/s, and the risk is classified as a 'Very Low Hazard'. The site is not shown to be at tidal risk in any of the other modelled tidal climate change events.

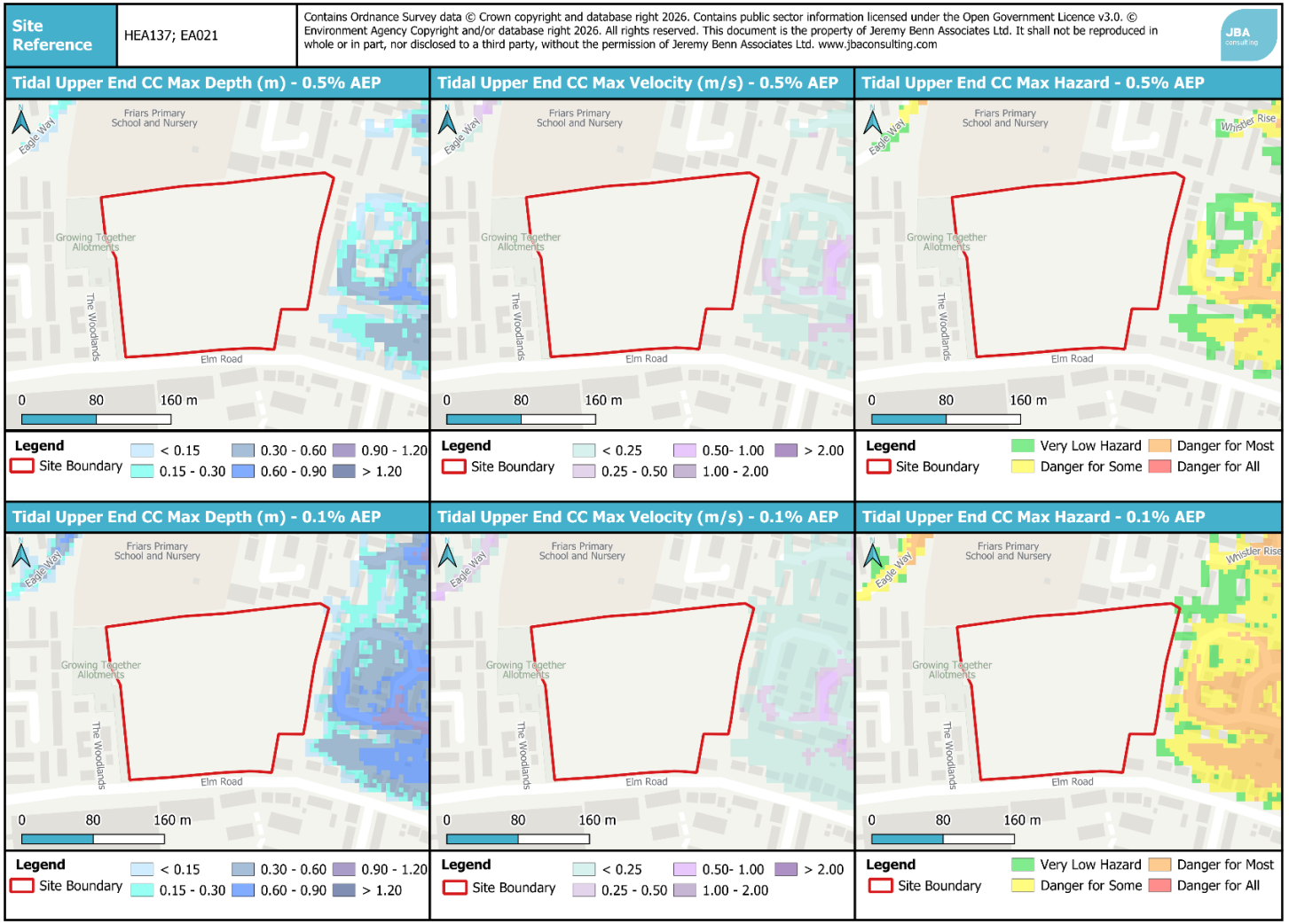


Figure 2-1: Tidal risk for the 0.5% AEP and 0.1% AEP upper end climate change undefended scenarios.

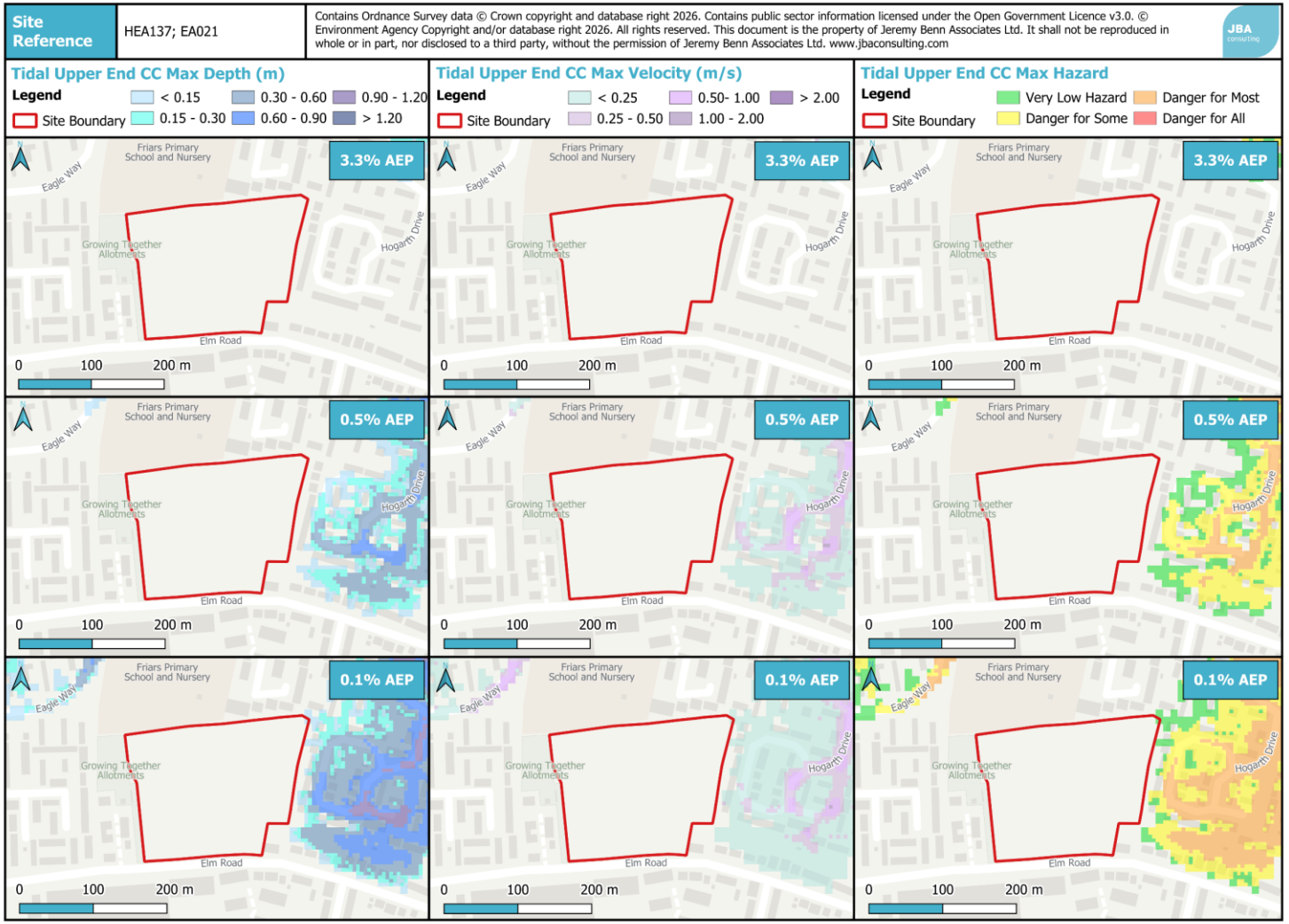


Figure 2-2: Tidal risk for the 3.3% AEP, 0.5% AEP and 0.1% AEP upper end climate change defended scenarios.

2.4 Surface water

2.4.1 Available data

The EA's FMfP Surface Water Spatial Planning Dataset, released in May 2026, has been used within this assessment to inform the extent and depth of the present day and future surface water risk. Climate change outputs are available for the 3.3%, 1%, and 0.1% AEP events with the Upper End climate change allowance for the 2070s epoch.

The Risk of Flooding from Surface Water (RoFSW) map has been used within this assessment to inform the velocity and hazard of the present day surface water risk. There is currently no available velocity or hazard information to use to assess future surface water risk.

Descriptions refer to the maximum depth, velocity, and hazard values experienced in each area of the site within a given event.

2.4.2 Present day

Most of the site is not shown to be at surface water flood risk, as shown in Figure 2-3.

During the 3.3% AEP event, there are two areas of ponding which emerge in the northeast of the site which show the maximum depth, velocity and hazard shown in Table 2-3.

During the 1% AEP event, the flood extent increases in both areas of ponding in the northeast of the site. Figure 2-4 shows that flood depths increase to between 0.15m and 0.30m in the ponding closest to the eastern boundary and in the new areas of risk within the southeast corner of the site. Maximum flood velocity and hazard remain the same as in the 3.3% AEP event.

During the 0.1% AEP, the areas of surface water ponding increase in the northeast and new areas of ponding emerge in the southeast and northwest corners of the site. These areas show maximum depths below 0.15m, the maximum flood velocity does not exceed 0.25m/s and hazard is classified as a 'Very Low Hazard'. The area of ponding also increases in the southeast corner of the site, showing the maximum depth velocity and hazard shown in Table 2-3.

Table 2-1: Present day surface water flood risk based on the EA's FMfP Surface Water Spatial Planning dataset (extent, depth) and RoFSW dataset (velocity, hazard).

Event	3.3% AEP	1% AEP	0.1% AEP
Percentage of site at risk* (%)	1	3	6
Maximum depth (m)	< 0.15	0.15 - 0.30	0.30 - 0.60
Maximum velocity (m/s)	< 0.25	< 0.25	0.25 - 0.50
Maximum hazard classification	Very Low Hazard	Very Low Hazard	Danger for Most

** The percentage surface water extents quoted show the percentage of the site at surface water risk from that particular event, including the percentage of the site at flood risk at a higher risk zone (e.g. the 1% AEP includes the 3.3% AEP percentage).*

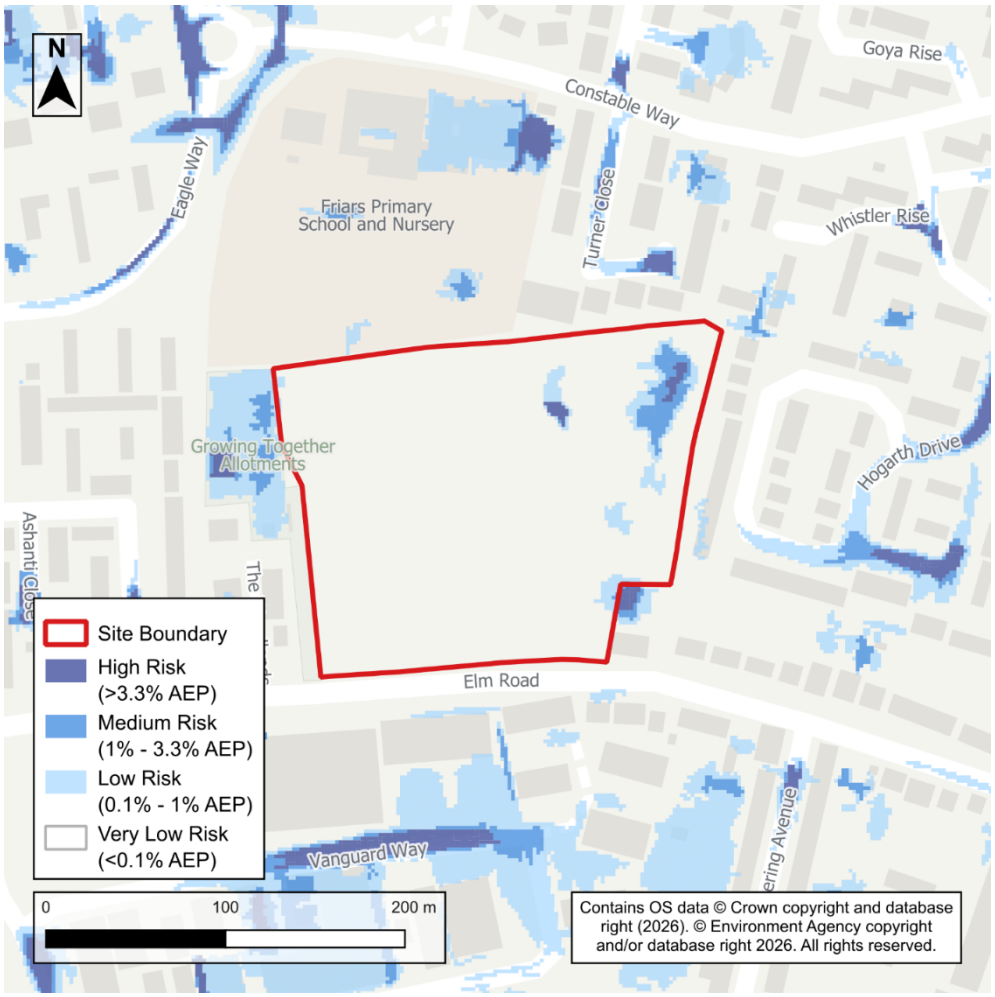


Figure 2-3 Present day surface water risk, based on the EA FMfP Surface Water Spatial Planning dataset.

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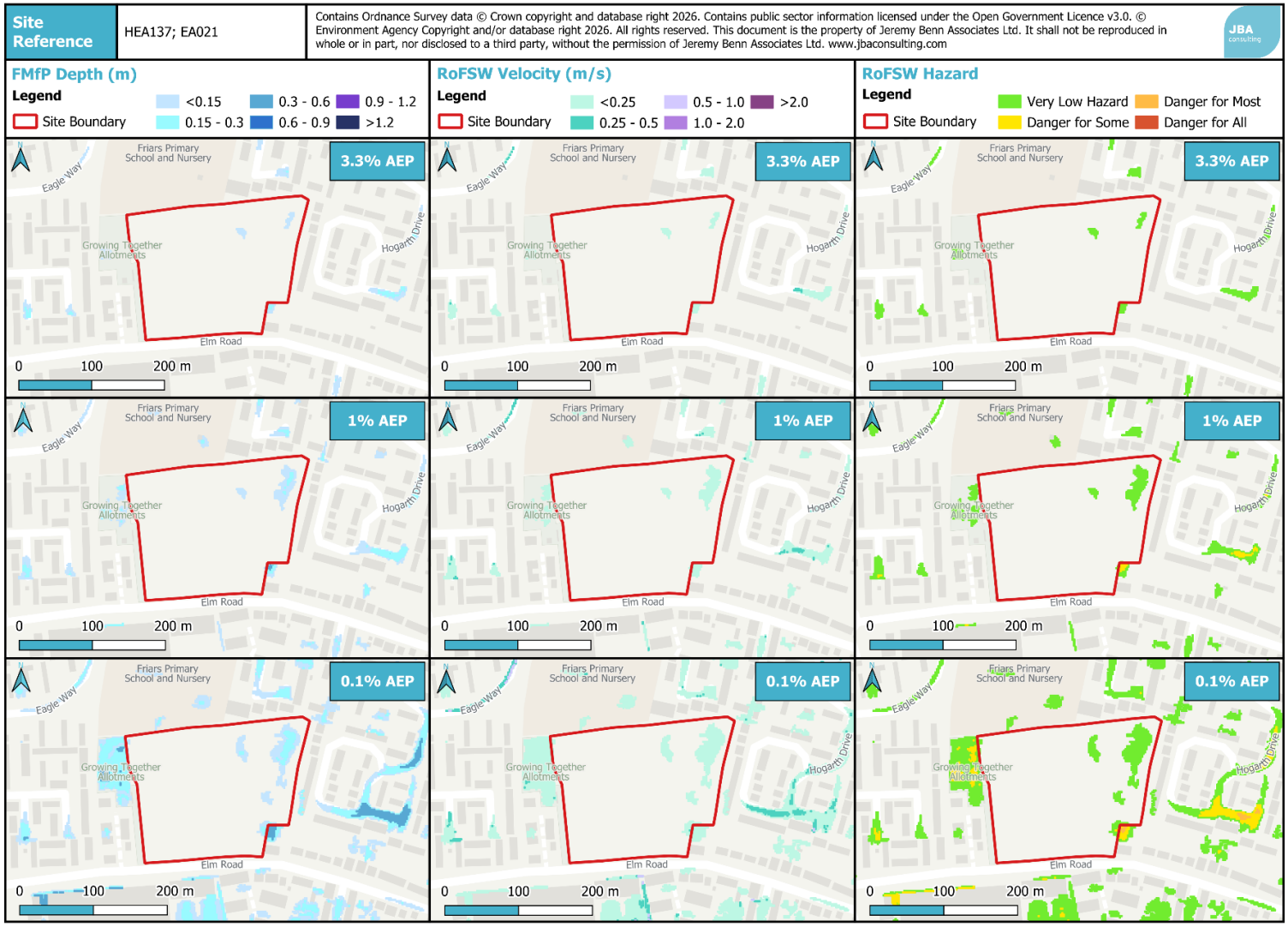


Figure 2-4 Present day surface water depth, velocity, and hazard for the 3.3%, 1%, and 0.1% AEP events.

2.4.3 Climate change - 2070s Upper End

Most of the site is not shown to be at future surface water flood risk, as shown in Figure 2-5.

During the 3.3% AEP climate change event, the flood extent increases from the present-day scenario at both areas of ponding in the northeast. Additional areas of risk develop within the southeast corner of the site, but depths remain below 0.15m.

Between the 1% AEP present day and climate change events there is a marginal increase in the flood extent in the northeast of the site. Most of this ponding shows flood depths of between 0.15m and 0.30m and flood depths increase to between 0.30m and 0.60m in a small area in the southeast corner of the site.

During the 0.1% AEP climate change event, new areas of ponding emerge adjacent to the eastern site boundary which converge with the large area of ponding in the northeast of the site. These additional areas show flood depths of less than 0.15m. New areas of risk within the western and northern site boundaries show maximum depths of between 0.15m and 0.30m. Maximum depth, velocity and hazard remains the same as the 1% AEP climate change event in the southeast of the site.

Table 2-2: Comparison of surface water flood risk between the present day and climate change scenarios based on the EA's FMfP Surface Water Spatial Planning.

Event	1% AEP	1% AEP plus 2070s Upper End Climate Change
Percentage of sites at risk* (%)	3	4
Maximum depth (m)	0.15 - 0.30	0.30 - 0.60

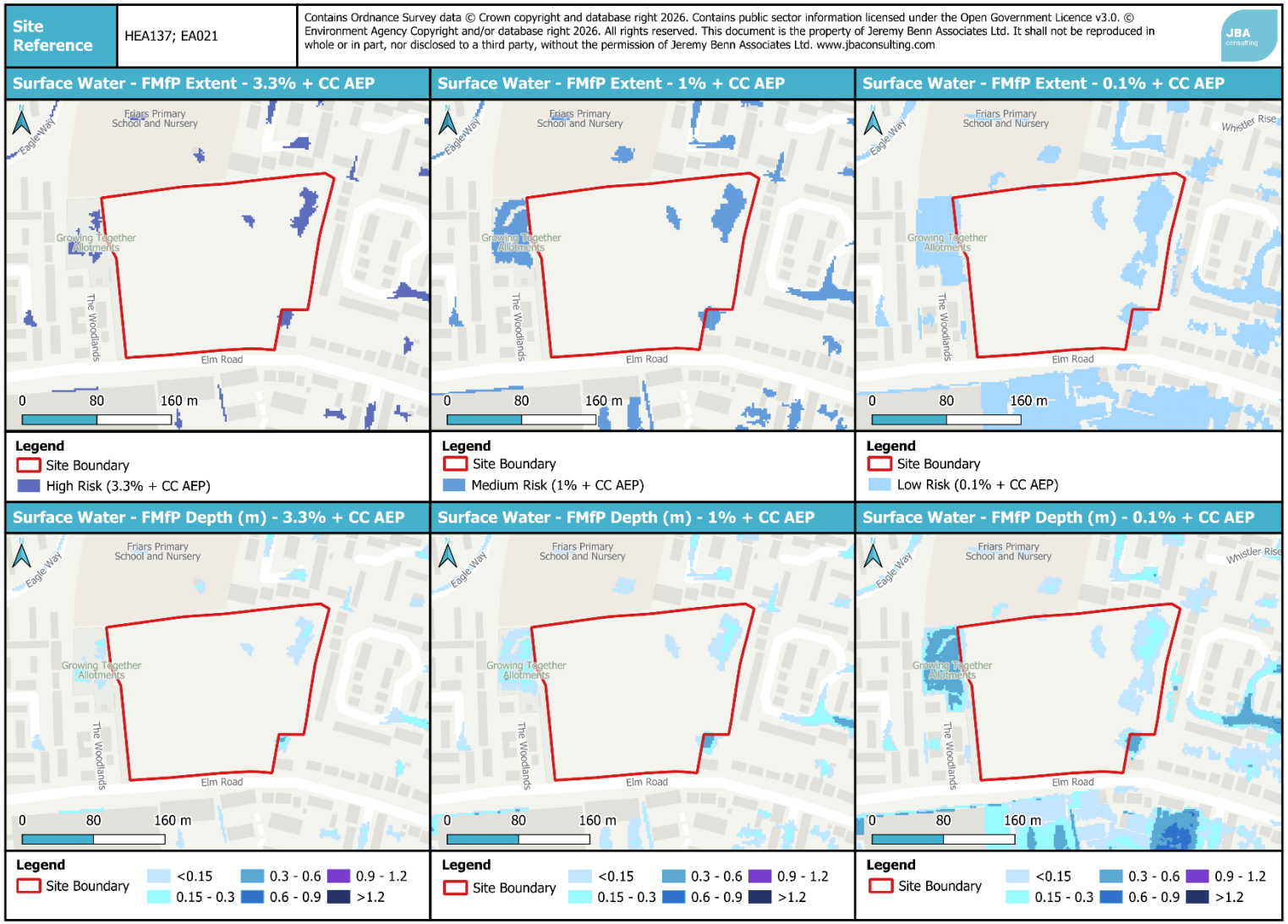


Figure 2-5 Surface water extents and depths for the 3.3%, 1%, and 0.1% AEP climate change events

2.5 Groundwater

The JBA Groundwater Emergence Map (Figure 2-6) shows the western half of the site to be at negligible risk from groundwater flooding due to the nature of the local geological deposits. Groundwater levels are predicted to lie between 0.025m and 0.5m below the ground surface during a 1% AEP flood event in the eastern half of the site. In this area, there is a risk of groundwater flooding to both surface and subsurface assets.

Based on the surface water mapping and topography of the site it is likely that any groundwater that emerges will flow to and pool in the low elevations in the southeast corner of the site.

This assessment does not negate the requirement that an appropriate assessment of the groundwater regime should be carried out at the site-specific Flood Risk Assessment (FRA) stage.

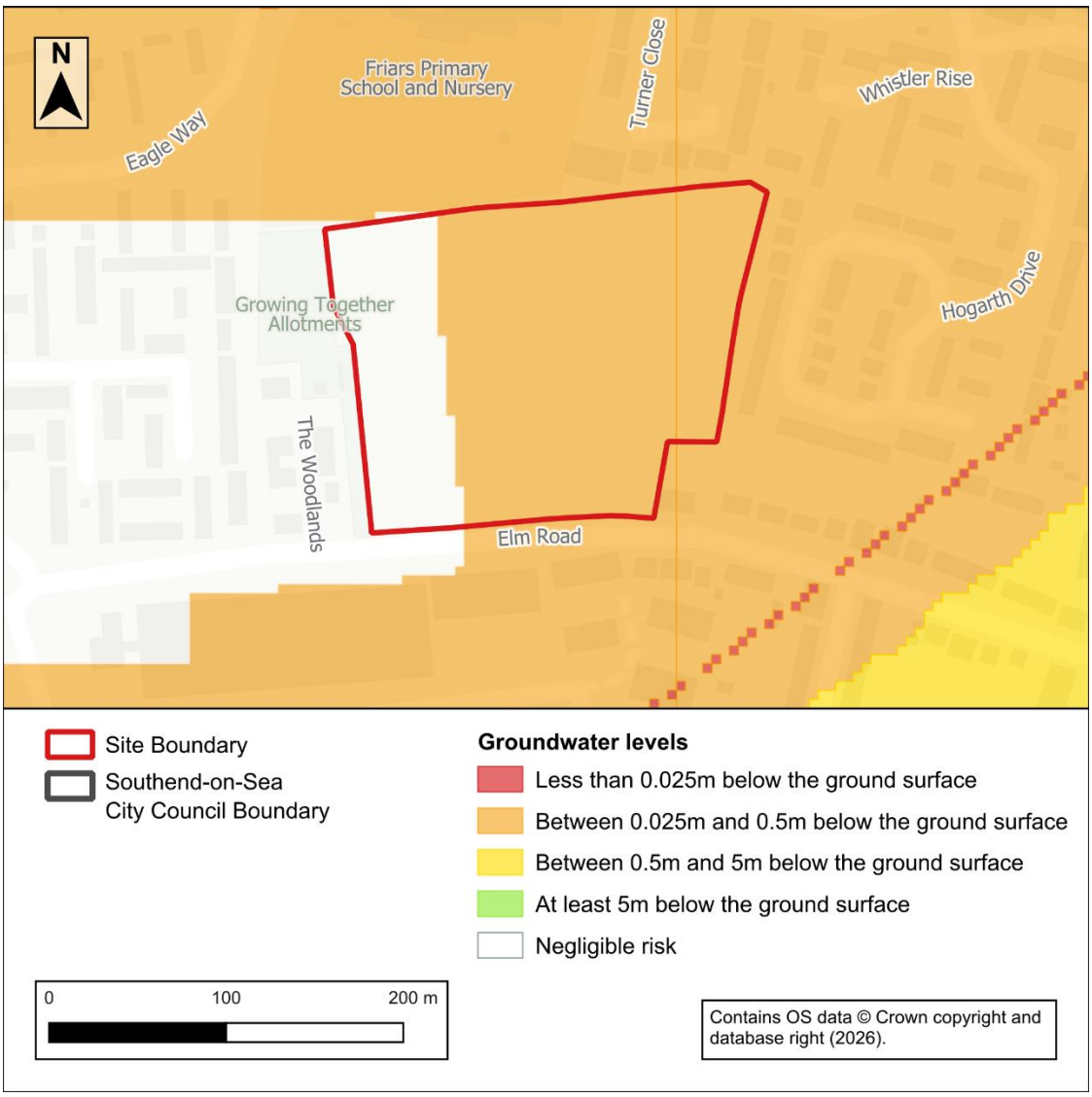


Figure 2-6 Predicted groundwater levels across the site in a 1% AEP groundwater flood event, based on the JBA Groundwater Emergence Map

2.6 Sewers

Anglian Water provided their DG5 dataset, which identifies internal and external historic sewer flooding records between 2022 and 2026.

This dataset shows one incident of sewer flooding approximately 10m west of the site at the neighbouring allotment.

The available data should always be supplemented by direct consultation with Anglian Water to ascertain if there is any site-specific risk from a public sewer. This is because sewer flood risk information is not publicly available and would need to be considered on a site-specific basis.

2.7 Flood history

The EA's Historic Flood Map shows no records of flooding at the site.

Data provided by Essex County Fire and Rescue Service shows no records of flooding at the site.

3 Flood risk management infrastructure

3.1 Defences

The site is shown to benefit from tidal flood defences along the Pig's Bay shoreline, shown in the EA AIMS dataset. These defences are located approximately 1km northeast of the site. However, the site is only shown to be at tidal risk in the 0.1% AEP Upper End climate change scenario in both the defended and undefended scenarios which show similar, minimal risk at the site.

3.2 Residual risk

Breach modelling has been carried out for the 3.3%, 1%, and 0.1% AEP events for present day and climate change scenarios for the higher central and upper end scenarios for the 2126 epoch. Three breach scenarios were considered. Details of the breaches are provided in Appendix D.

This site is shown to be impacted in all three breaches, during the 0.1% AEP plus upper end climate change scenario only. All three breaches provide warning time, with a rate of onset of 13 to 15 hours, and a maximum duration of 8 hours.

Table 4 1 provides the approximate rate of onset (time between the breach and the first flooding experienced at the site) and the maximum duration of the flooding at the site.

Table 3-1: Maximum depth, velocity, hazard, and rate of onset and duration of flooding for each breach scenario where the site is shown to be at risk of tidal flooding.

Breach	Event	Maximum depth (m) (2dp)	Maximum velocity (m/s) (2dp)	Maximum hazard (2dp)	Rate of onset (hours) (1dp)	Maximum flooding duration (hours) (1dp)
1	0.1% AEP Upper End CC	0.01	0.10	0.51	15.3	8.0
2	0.1% AEP Upper End CC	0.01	0.10	0.51	13.6	8.0
3	0.1% AEP Upper End CC	0.01	0.10	0.51	13.8	8.0

4 Emergency planning

4.1 Flood warnings and alerts

The site is not located in an EA Flood Warning or Flood Alert Area.

4.2 Access and escape

Safe access and escape will need to be demonstrated in the 1% AEP plus climate change surface water event and the 0.5% AEP plus climate change tidal event. Site drainage proposals should address the requirements for access routes, avoid impeding surface water flows and preserve the storage of surface water to avoid exacerbation of flood risk elsewhere on the site and in the wider catchment.

4.2.1 Potential access

The site can currently be accessed via Elm Road which runs along the southern site boundary.

Access and escape onto Elm Road in the immediate vicinity of the site is not shown to be impeded. Access and escape into the wider area is likely to be possible to the north in a tidal flood event but may be impeded during a surface water flood event due to ponding at the Elm Road and Hermes Way roundabout. Access and escape to the east will be possible during a surface water event. The following sections discuss potential access and escape for each source of flood risk.

4.2.2 Tidal

Elm Road is bisected approximately 550m southwest and 400m to the southeast of the site during the 0.5% AEP plus climate change tidal event. Flood depths are between 1.20m and 2.30m, maximum flood velocity is greater than 2.00m/s and the maximum hazard classification is 'Danger for All', which would likely impact vehicular access and escape. However, access and escape will likely be viable via the residential roads heading north to join the B1017.

Due to the tidal risk surrounding the site, a Flood Warning and Evacuation Plan may be required to be prepared which considers the likely onset and duration of flooding and demonstrates how residents can safely be evacuated and/or shelter safely in situ during design events.

4.2.3 Surface water

Approximately 200m southeast of the site, there are minor areas of surface water ponding during the 1% AEP plus climate change surface water flood event along Elm Road. Ponding shows flood depths below 0.15m which is unlikely to impact access and escape.

However, surface water ponding at the Elm Road and Hermes Way roundabout (approximately 200m west of the site) shows depths of between 0.30m and 0.60m which could impact and escape.

4.3 Dry islands

The EA FMfP Flood Zones plus climate change layer shows the site is located within a dry island. The dry island is approximately 0.09km^2 and covers the western side of the site, the primary school and nursery to the north and residential area to the west. However, the detailed tidal modelling undertaken as part of this SFRA does not show the presence of a dry island at the site.

5 Requirements for drainage control and impact mitigation

5.1 Broadscale assessment of possible SuDS

Surface water at the site should be discharged in accordance with the drainage hierarchy as set out in the National standards for SuDS (gov.uk). SuDS that provide opportunities to deliver multiple benefits including volume control, water quality, amenity, and biodiversity should be prioritised. SuDS proposals should be discussed with relevant stakeholders (Local Planning Authority (LPA), Lead Local Flood Authority (LLFA), and the EA) at an early stage to understand possible constraints.

Surface water discharge rates should not exceed the existing greenfield runoff rates for the site. Opportunities to further reduce discharge rates should be considered and agreed with the LLFA.

Opportunities to incorporate source control techniques such as green roofs, permeable surfaces and rainwater harvesting must be considered in the design of the site.

The following factors should be considered when assessing whether infiltration is suitable at the site:

- BGS data indicates that the underlying geology is clay, silt and sand which is likely to have highly variable permeability. This should be confirmed through infiltration testing. Off-site discharge in accordance with the SuDS hierarchy may be required to discharge surface water runoff from the site.
- Groundwater levels are indicated to be less than 0.5m below ground level during a 1% AEP event. Detention and attenuation features should be designed to prevent groundwater ingress from impacting hydraulic capacity and structural integrity. Additional site investigation work may be required to support the detailed design of the drainage system. This may include groundwater monitoring to demonstrate that a sufficient unsaturated zone has been provided above the highest occurring groundwater level. Below ground development such as basements are not appropriate at this site.
- The site is not located within a Groundwater Source Protection Zone and there are no restrictions over the use of infiltration techniques with regard to groundwater quality.
- The site is not located within a historic landfill site.

If it is proposed to discharge runoff to a sewer system, the condition and capacity or the receiving asset should be confirmed through surveys and the discharge rate agreed with the asset owner.

Surface water outfalls that discharge into the Thames Estuary may be susceptible to tide locking due to high water levels. The impacts of tide locking will need to be considered in terms of the attenuation storage requirements of the site and placement of the outfalls.

5.2 Opportunities for wider sustainability benefits and integrated flood risk management

The following are opportunities for wider sustainability benefits and integrated flood risk management at the site:

- It may be possible to reduce site runoff by maximising the permeable surfaces on site using a combination of permeable surfacing and soft landscaping techniques.
- Opportunities to incorporate filtration techniques such as filter strips, filter drains and bioretention areas must be considered.

6 NPPF and planning implications

6.1 Exception Test requirements

The Local Planning Authority will need to confirm that the Sequential Test has been carried out in line with national guidelines. The Sequential Test will need to be passed before the Exception Test is applied.

The NPPF classifies residential development as 'More Vulnerable'.

The Exception Test is not required for this site because the entire site is not shown to be at fluvial or tidal risk within the EA's FMfP.

6.2 Requirements and guidance for site-specific Flood Risk Assessment

At the planning application stage, a site-specific FRA will be required as the proposed development site is:

- within Flood Zone 1 with a site area of 1 hectare or more
- within ‘Flood Zones plus Climate Change’, showing it is at increased risk of flooding from rivers or sea in future
- within Flood Zone 1 and the flood map for planning shows it is at risk of flooding from surface water, now or in future
- within Flood Zone 1 and the flood map for planning shows it is at risk of flooding from surface water, now or in future

All sources of flooding should be considered as part of a site-specific FRA.

Consultation with the LPA, LLFA, Anglian Water, and the EA should be undertaken at an early stage.

Any FRA should be carried out in line with latest guidance including the National Planning Policy Framework (NPPF), Flood Risk and Coastal Change Planning Practice Guidance (PPG), and Southend-on-Sea City Council Local Plan Policies.

The development should be designed with mitigation measures in place where required.

6.3 Guidance for site design and making development safe

The site layout must adopt a sequential approach by steering more vulnerable aspects of the development outside of the east of the site which is at tidal and surface water risk.

The risk from surface water flow routes should be quantified as part of a site-specific FRA, including a drainage strategy, so runoff magnitudes from the development are not increased by development across any ephemeral surface water flow routes. A drainage strategy should help inform site layout and design to ensure runoff rates are as close as possible to pre-development greenfield rates, with areas of surface water ponding used as open space and SuDS or water compatible/essential infrastructure uses only.

Arrangements for safe access and escape will need to be provided for the 1% AEP surface water event and the 0.5% AEP tidal event with an appropriate allowance for climate change, considering depth, velocity, and hazard. Design and access arrangements will need to incorporate measures, so development and occupants are safe.

Provisions for safe access and escape should not impact on surface water flow routes or contribute to loss of floodplain storage. Consideration should be given to the siting of access points with respect to areas of surface water flood risk.

7 Conclusions

Summary of the key areas of flood risk across the site:

- **Surface water:** Surface water risk to the site is predominantly from two large areas of ponding in the northeast corner of the site, with other small areas of ponding present within the western and northern boundaries. The site is shown to be moderately susceptible to climate change, particularly in the southeast corner of the site.
- **Tidal:** Tidal flood risk is confined to a small area in the northeast corner of the site during the 0.1% AEP Upper End Climate Change event. Areas surrounding the site are affected by tidal flooding during the 0.5% AEP Climate Change event which could impact access and escape.
- **Groundwater:** The JBA Groundwater Emergence Map shows that the east of the site is shown to have groundwater levels between 0.025m and 0.5m below the ground surface.

The following points should be considered in development of this site:

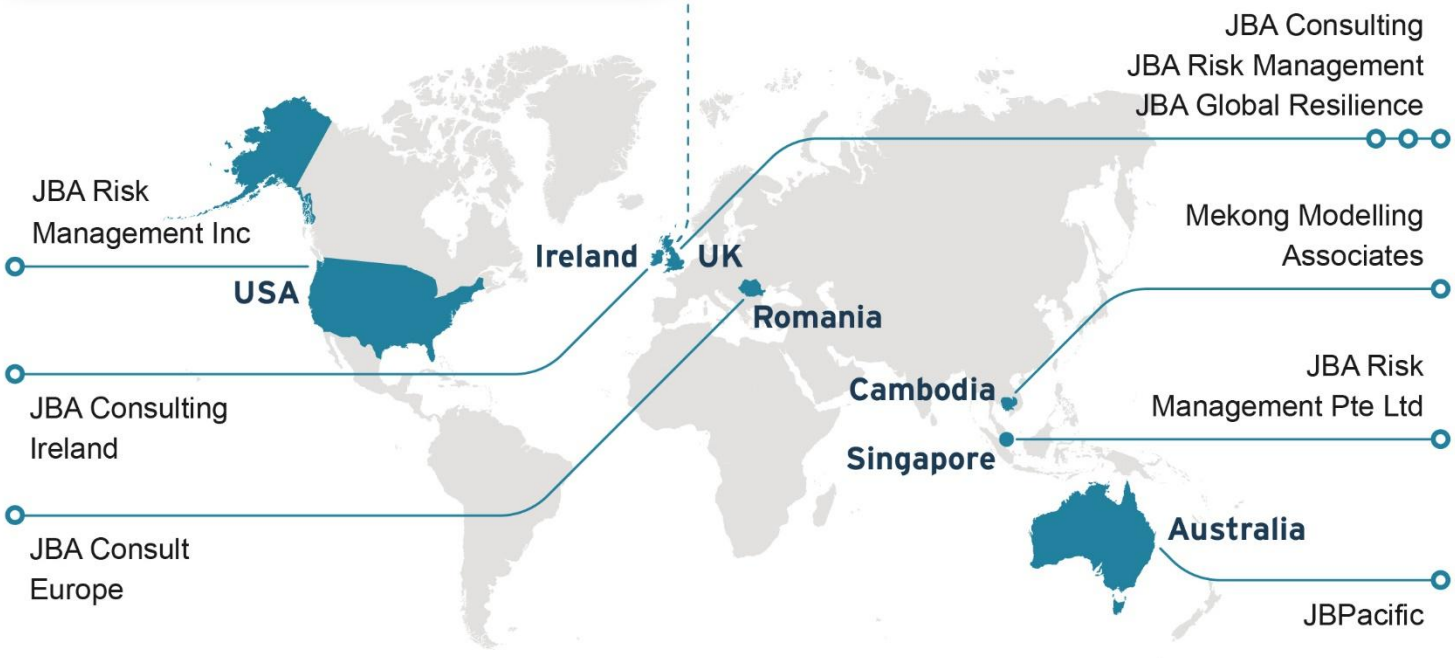
- The Exception Test is not required for this site because the entire site is not shown to be at fluvial or tidal risk within the EA's FMfP.
- A site-specific FRA should be undertaken, which assesses all sources of flood risk. This may require detailed surface water modelling.
- Safe access and escape should be considered in the design surface water and tidal events. Developers should demonstrate that safe access and escape routes can be achieved; however, any raising of access and escape routes must make sure that floodwater is not displaced elsewhere. Where safe access and escape is not possible, other means of safe refuge and evacuation must be considered. Due to the tidal risk surrounding the site, a Flood Warning and Evacuation Plan may be required to be prepared which considers the likely onset and duration of flooding and demonstrates how residents can safely be evacuated and/or shelter safely in situ during the design events.
- A carefully considered and integrated flood resilient and sustainable drainage design should be put forward, including a site-specific Surface Water Drainage Strategy, and SuDS maintenance and management plan and supported by detailed modelling.
- Anglian Water should be consulted at an early stage on drainage proposals for the site to identify any potential constraints or existing sewer flooding issues that may not have been identified through this high-level assessment.

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