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Level 2 Strategic Flood Risk Assessment - Site HO/21/00227

Land at Archer Lane, Swanley

FINAL

Prepared for

Sevenoaks District Council

Date

July 2026

Contents

1 Background

This is a Level 2 Strategic Flood Risk Assessment (SFRA) site screening report for site HO/21/00227. The content of this Level 2 SFRA site screening report assumes the reader has already consulted the Sevenoaks Level 1 SFRA and read the Level 2 SFRA Main Report and is therefore familiar with the terminology used in this report.

1.1 Site details

- Location: Land at Archer Lane, Swanley
- Site area: 2.59ha
- Existing site use: Mostly greenfield, some existing buildings onsite
- Proposed site use: Residential
- Proposed use flood risk vulnerability classification: More Vulnerable

Shown below in Figure 1-1, the site is located in east Swanley. The site is bordered to the southeast by railway lines, to the northeast by agricultural land, and to the west by residential dwellings on Archer Way.

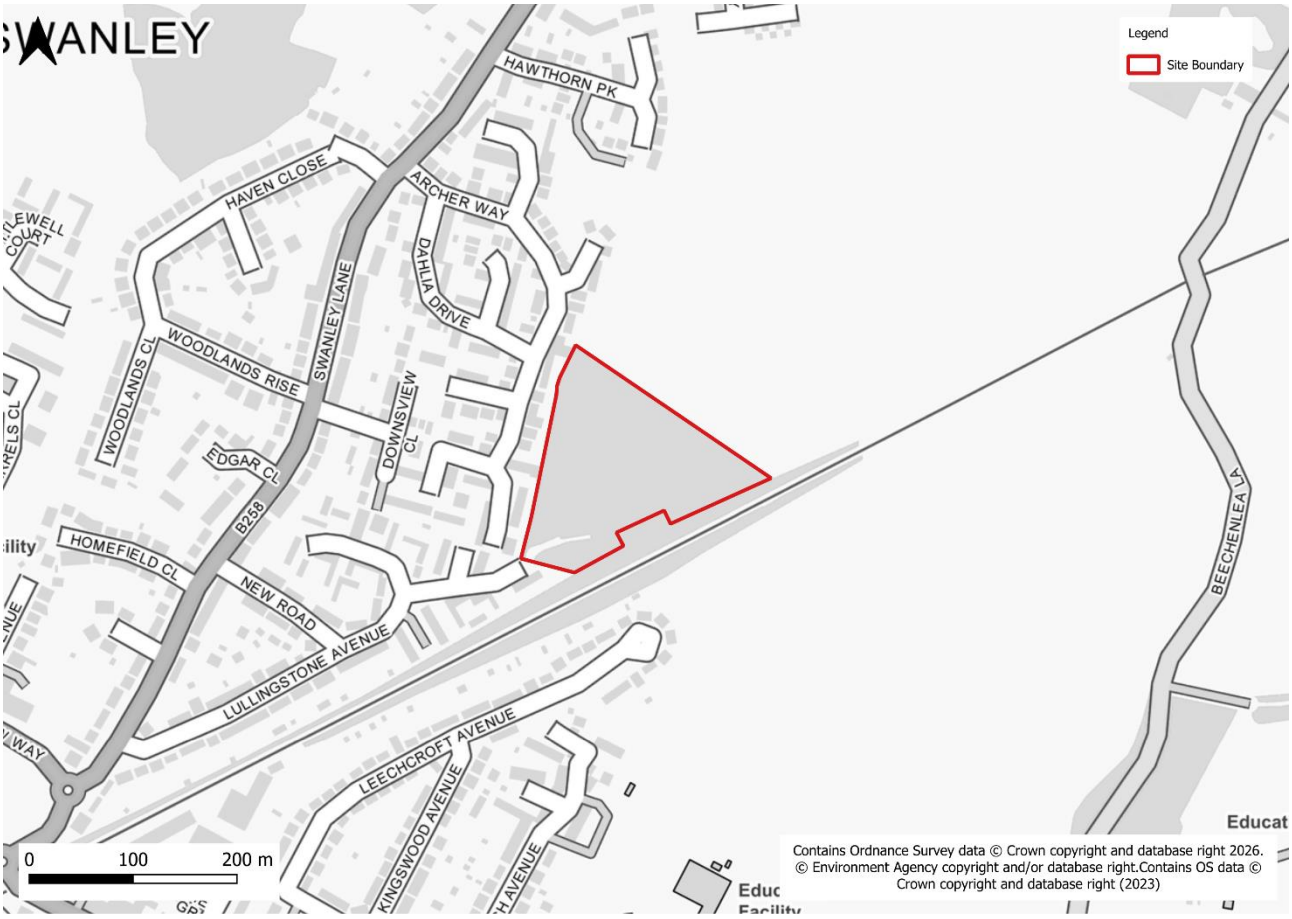

Figure 1-1: Location of site HO/21/00227

1.2 Topography

Figure 1-2 shows the topography of the site represented by the Environment Agency (EA) 1m resolution LiDAR. A shallow valley divides the site, with the highest elevations occurring in the east and west of the site, and the lowest elevation occurring near the centre. The maximum elevation of 56.7mAOD occurs along the west boundary, and the minimum elevation of 50.3mAOD occurs in the northeast. The LiDAR mapping also shows that the railway line to the south of the site is built up on an embankment.

Figure 1-2: Topography of the site.

1.3 Geology and soils

Geology at the site consists of:

- Bedrock - Seaford Chalk Formation consisting of Chalk
- Superficial:
  - In the west of the site: River terrace deposits consisting of sand and gravel
  - In the east of the site: Head consisting of sand and gravel

Soils at the site consist of:

- Freely draining slightly acid but base-rich soils

2 Sources of flood risk

2.1 Location of site within the catchment

The site is located within the catchment for the Middle and Lower Darent Water Body, which is part of Darent Operational Catchment. The Middle and Lower Darent Water Body has a catchment area of 153.5km² and is described as not heavily modified.

2.2 Existing drainage features

There are no identifiable drainage features at the site.

The nearest watercourse is the River Darent, which flows in a northerly direction approximately 3.7km east of the site.

2.3 Fluvial

2.3.1 Available data

The EA's Flood Map for Planning (FMfP) has been used within this assessment to determine Flood Zones 3a and 2. The 3.3% AEP defended extent from the EA's Risk of Flooding from Rivers and Sea (RoFRS) mapping has been used to determine Flood Zone 3b.

2.3.2 Description of risk to the site

As shown in Table 2-1, the site is located within Flood Zone 1 and is therefore predicted to be at a very low risk of fluvial flooding.

Table 2-1: Existing fluvial flood risk based on EA FMfP

Flood Zone 1 (%)	Flood Zone 2 (%)	Flood Zone 3a (%)	Flood Zone 3b (%)
100	0	0	0

2.4 Surface water

2.4.1 Available data

The EA's FMfP Surface Water Spatial Planning mapping has been used to assess the extent and depth of surface water flooding. The EA's Risk of Flooding from Surface Water (RoFSW) mapping has been used to assess the velocity and hazard of surface water flooding.

2.4.2 Description of risk to the site

Surface water flood risk at the site is attributed to a flow route which enters the in the southwest corner, which flows diagonally across the site following the topography. The flow route leaves the site halfway along the northeast boundary.

As shown in Table 2-2, the 3.3% AEP (high risk) extent covers approximately 4% of the site in the form of isolated ponding in low elevation areas, and against the railway embankment in the southwest corner. The maximum depth in the 3.3% AEP event is up to 0.30m; however, the majority of flooding is <0.15m in depth. The maximum velocity of 0.50m/s occurs in the southwest of the site, and the maximum hazard classification of Low (caution) applies to the entire 3.3% AEP extent.

The flow route becomes defined in the 1% AEP (medium risk) event covering 12% of the site. The maximum depth remains up to 0.30m, and the maximum velocity remains 0.50m/s, however both apply to larger areas of the 1% AEP extent. The hazard classification of Low (caution) applies to the entire 1% AEP extent.

The extent of the flow route increases to cover approximately 23% of the site in the 0.1% AEP (low risk) event. The maximum depth increases to 0.60m, which is concentrated in the east of the site. The maximum velocity remains 0.50m/s however occurs across a larger area, concentrated in the southwest of the site, where the flow route backs up against the railway embankment. In the 0.1% AEP event the maximum hazard classification increases to Moderate (dangerous for some), which is concentrated in the east of the site.

The FMfP Surface Water Spatial Planning mapping is shown in Figure 2-1.

Table 2-2: Surface water flood risk based on the FMfP Surface Water Spatial Planning mapping and RoFSW mapping

Event	3.3% AEP (high risk)	1% AEP (medium risk)	0.1% AEP (low risk)
Percentage of site at risk* (%)	4.36	11.98	22.72
Maximum depth (m)	0.30	0.30	0.60
Maximum velocity (m/s)	0.50	0.50	0.50
Maximum hazard classification	0.50 - Low - Caution: Flood zone with shallow flowing water or deep standing water	0.50 - Low - Caution: Flood zone with shallow flowing water or deep standing water	0.75 - Moderate - Dangerous for some - Danger: Flood zone with deep or fast flowing water

** 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., 1% AEP includes the 3.3% AEP percentage).*

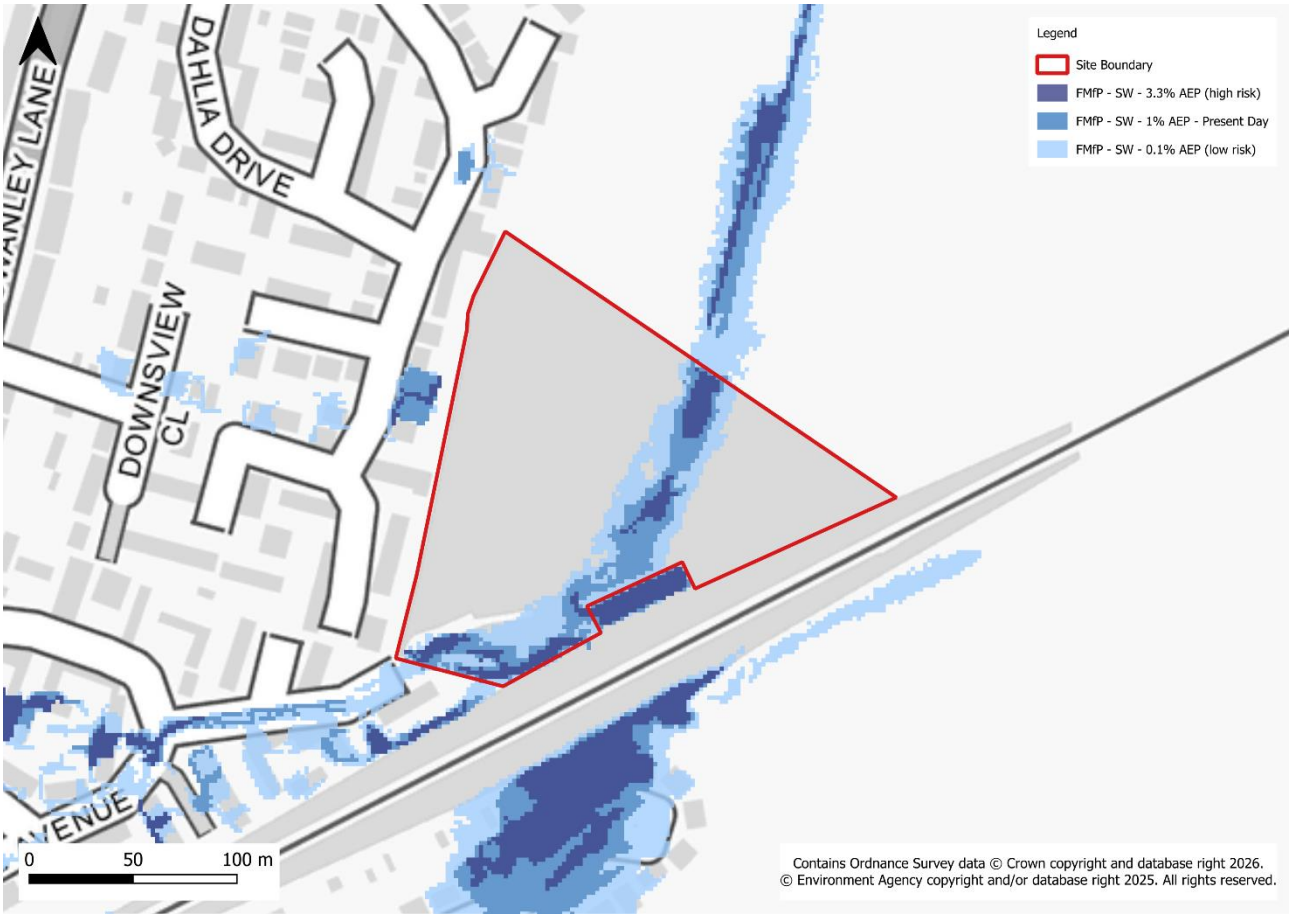

Figure 2-1: EA FMfP Surface Water Spatial Planning mapping

2.5 Reservoir

The site is not shown to be at risk of reservoir flooding during the Dry Day or Wet Day scenarios in the EA Reservoir Flood Maps.

2.6 Groundwater

The JBA Groundwater Emergence Map (Figure 2-2) shows that at the site, groundwater levels are predicted to reach depths of between 0.5 and 5m below ground surface during a 1% AEP groundwater flood event. Based on the EA's FMfP Surface Water Spatial Planning and topography of the site it is likely that any groundwater that emerges will pool in the southwest and east of the site. Some groundwater may flow northeast out of the site.

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

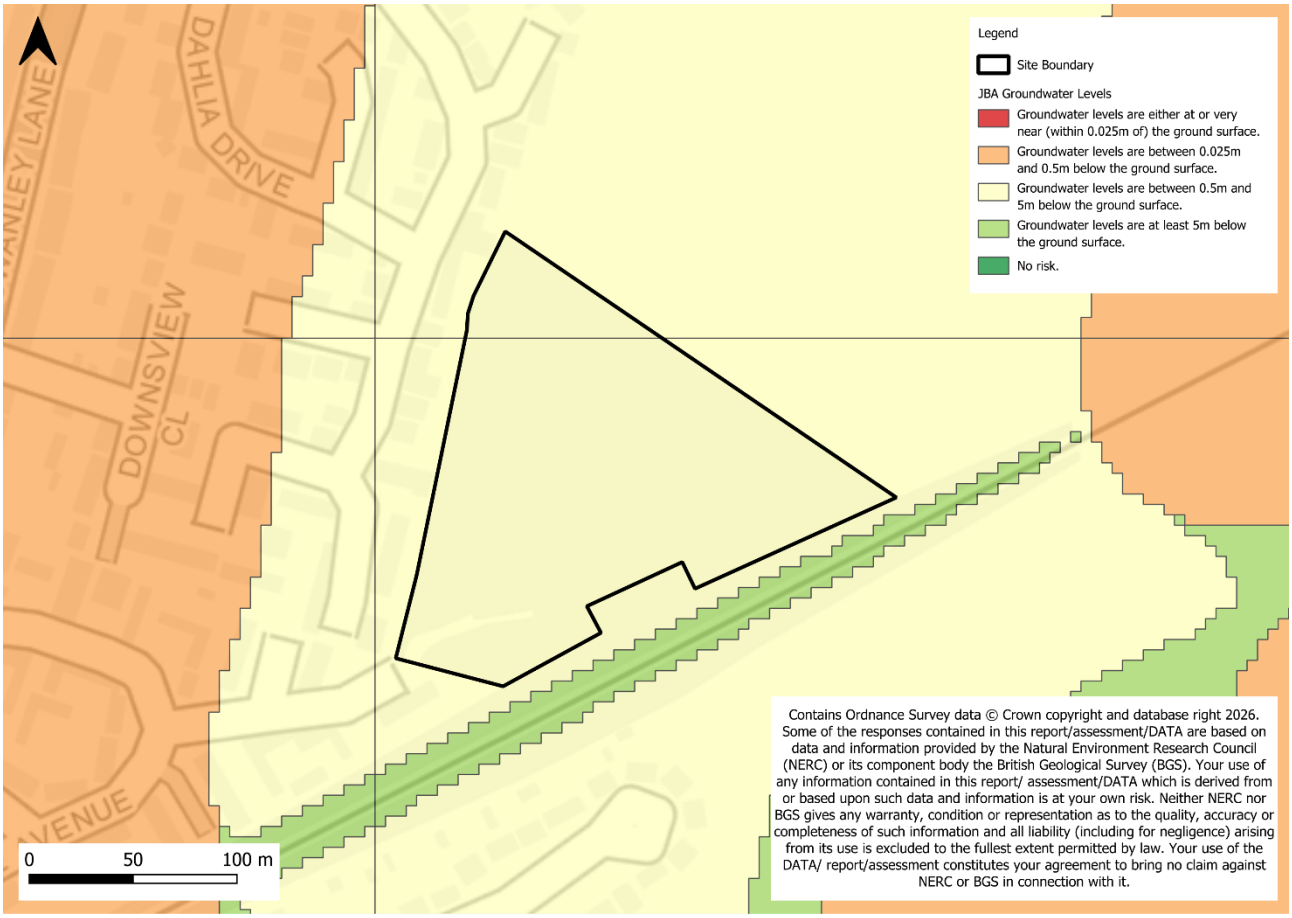

Figure 2-2: JBA Groundwater Emergence Mapping

2.7 Sewers

The site is located within postcode area BR8 7, where Thames Water sewer flooding incident data indicates that 6 incidents of foul sewer flooding have been recorded in the last 20 years.

2.8 Flood history

There are no recorded flood incidents within the site. Kent County Council LLFA flood records include 8 incidents within 50m of the site boundary; all were reported to be due to blocked drains.

3 Climate change

Increased storm intensities due to climate change may increase the extent, depth, velocity, hazard, and frequency of both fluvial and surface water flooding. Please see Section 4.6 of the Sevenoaks District Level 2 SFRA for information on climate change allowances.

Development proposals at the site must address the potential changes associated with climate change and be designed to be safe for the intended lifetime. The provisions for safe access and escape must also address the potential increase in severity and frequency of flooding.

3.1 Fluvial

3.1.1 Available data

The EA RoFRS maps have been used to assess the impact of climate change on flood risk to the site. The 1% AEP plus 10% ('2080s' epoch Central allowance) climate change extents are currently available, and are based on national modelling. These are shown in shown in Table 3-1.No local detailed flood modelling is available.

3.1.2 Description of risk to the site

As shown below in Table 3-1, the site is not predicted to be impacted by fluvial flooding during the 1% AEP event plus central climate change allowances.

Table 3-1: Comparison of fluvial flood risk to the site between the 1% AEP and 1% AEP plus 10% climate change extents.

Event	1% AEP	1% AEP plus 10% CC
Percentage of site at risk (%)	0	0

3.2 Surface water

3.2.1 Available data

The EA's FMfP Surface Water Spatial Planning mapping has been used to assess the extent and depth of surface water flooding impact of climate change on flood risk to the site in the 1% AEP plus 40% event. The impact of climate change on surface water flood risk should be assessed as part of a site-specific Flood Risk Assessment, in line with the latest available climate change allowances and guidance.

3.2.2 Description of risk to the site

A comparison of the 1% AEP present day event and the 1% plus climate change scenario can be seen in Table 3-2 and Figure 3-1.

When the central climate change allowance is applied to the 1% AEP, the existing extents expand to cover approximately 21% of the site, similar to the present day 0.1% AEP. The maximum depth increases from 0.30m to 0.60m, which is concentrated in the northeast of the site.

Table 3-2: Comparison of surface water flood risk to the site between the 1% AEP and 1% AEP plus 40% climate change extents.

Event	1% AEP	1% AEP plus 40% CC
Percentage of site at risk (%)	11.98	21.09
Maximum depth (m)	0.30	0.60

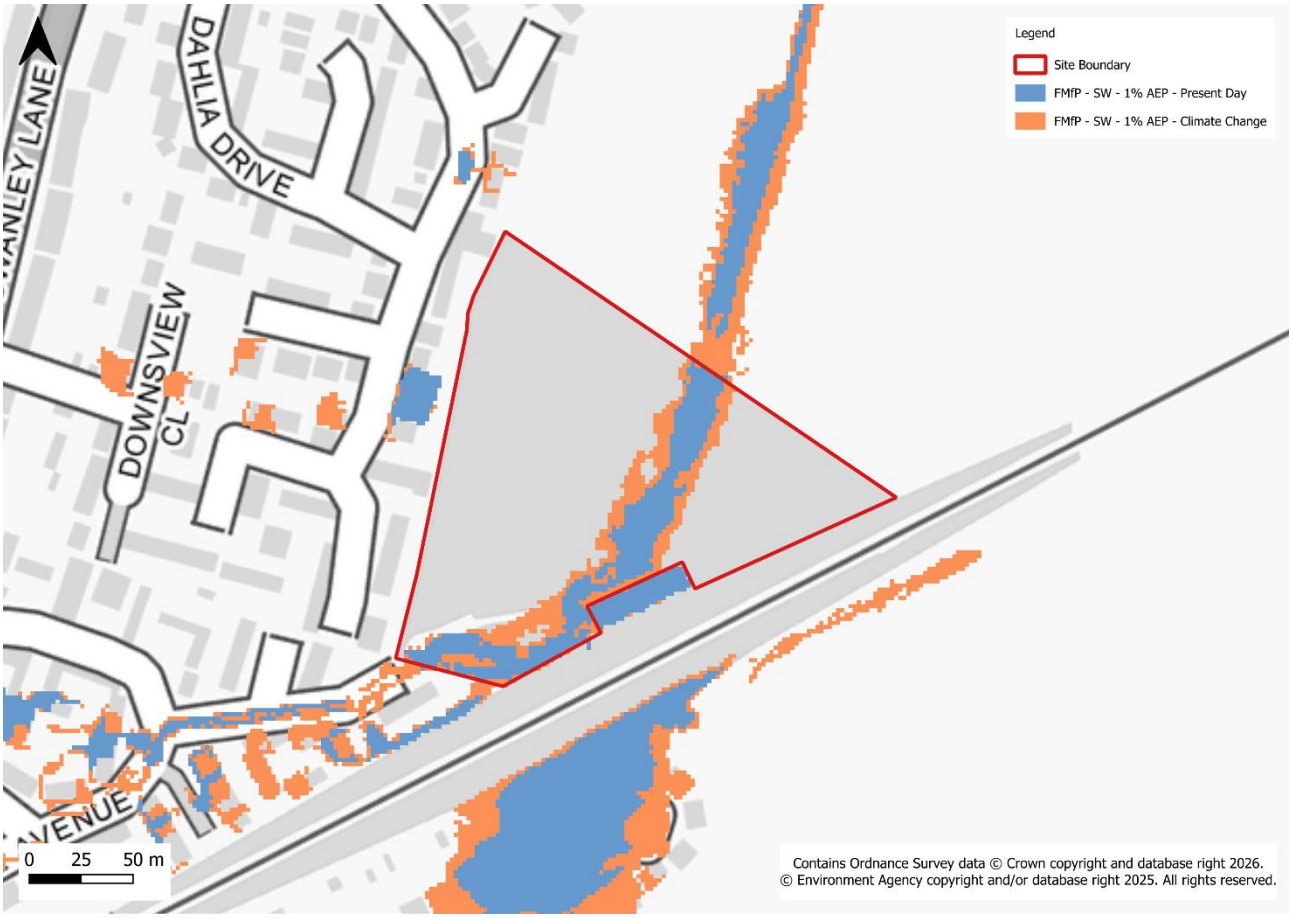

Figure 3-1: Comparison of surface water flood risk to the site between the 1% AEP and 1% AEP plus 40% climate change extents

4 Flood risk management infrastructure

4.1 Defences

The EA AIMS dataset shows that the site is not protected by any formal flood defences.

4.2 Residual risk

There is no residual risk to the site from flood risk management structures.

5 Emergency planning

5.1 Flood warnings and alerts

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

5.2 Existing emergency plans and procedures

Kent County Council's Kent Resilience Forum (KRF) is one of a number of Local Resilience Forums (LRFs) that have bene set up across England. The overall aim of an LRF is to ensure that the various agencies and organisations plan and subsequently work together so that responses to emergencies are coordinated appropriately. The KRF is made up of a number of different agencies and organisations that work together across a range of areas including planning for emergencies.

The Kent County Council Flood Response Plan (October 2023) sets out the principles that govern the Kent County Council's response to a significant flooding event within their local authority administrative area. The Plan is built upon the existence and maintenance by Category 1 and 2 Responders of their own plans for response to flooding. The response plan provides information on Kent County Council's actions, roles, and responsibility in response to a flood emergency in their administrative area.

5.3 Access and escape

Safe access and escape will need to be demonstrated in the 1% AEP plus climate change surface water events. 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.

5.3.1 Potential access

Access to the site is currently provided by Lullingstone Avenue. There are no other potential access routes for the site.

5.3.2 Fluvial

Safe access and escape from the site can be achieved during fluvial flood events.

5.3.3 Surface water

Surface water flood extents in the 1% AEP plus climate change event obstruct the only access point to Lullingstone Avenue in the southwest of the site. Flood extents within the southwest of the site and on Lullingstone Avenue reach maximum depths of up to 0.30m, which may be suitable for vehicular travel, however, this route is not suitable for pedestrians.

The surface water flow route, present in the 1% AEP plus climate change allowance, presents safe access and escape concerns within the site. Depths reach up to 0.60m and will impede safe escape from the eastern section of the site.

A site-specific Flood Risk Assessment (FRA) must show that the development can be designed to be safe and that there is adequate emergency planning provision.

5.4 Dry islands

The site is not located on a dry island.

6 Requirements for drainage control and impact mitigation

6.1 Broadscale assessment of possible SuDS

- BGS data indicates that the underlying geology is chalk, which is likely to be free draining, however groundwater levels are indicated to be between 0.5 and 5m below ground level. The viability of managing surface water runoff via infiltration should be confirmed through site investigations and infiltration testing, in line with Kent County Council LLFA guidance. Off-site discharge in accordance with the SuDS hierarchy is likely to be required to discharge surface water runoff from the site.
    - If infiltration is viable, infiltration features will not be permitted along the southeast boundary of the site, which is bordered by railway lines. National Rail requires a minimum distance of 30m between the railway and any proposed infiltration features.
- The site is located within a Groundwater Source Protection Zone. Infiltration techniques may not be suitable and should only be used following the granting of any required environmental permits from the Environment Agency for Zones 2, 3 and 4 although it is possible that infiltration may not be permitted. Proposed SuDS should be discussed with relevant stakeholders (LPA, LLFA and EA) at an early stage to understand possible opportunities and 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. 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.
- The Risk of Flooding from Surface Water (RoFSW) mapping indicates the presence of surface water flood risk during the 3.3% AEP event. Existing flow paths should be retained and integrated with blue-green infrastructure and public open space.
- If it is proposed to discharge runoff to a sewer system, the condition and capacity of the receiving asset should be confirmed through surveys and the discharge rate agreed with the asset owner.
- Opportunities to incorporate filtration techniques such as filter strips, filter drains and bioretention areas must be considered.
- 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 potential to utilise conveyance features such as swales to intercept and convey surface water runoff should be considered. Conveyance features should be located on common land or public open space to facilitate ease of access.

6.2 Opportunities for wider sustainability benefits and integrated flood risk management

- Implementation of SuDS at the site could provide opportunities to deliver multiple benefits including volume control, water quality, amenity and biodiversity. This could provide wider sustainability benefits to the site and surrounding area. Proposals to use SuDS techniques should be discussed with relevant stakeholders (Local Planning Authority, Lead Local Flood Authority, and the EA) at an early stage to understand possible constraints.
- The central band of surface water flooding, which appears to form a flow path in the 1% AEP event, should be integrated into the site drainage strategy as blue-green infrastructure.
- Development at this site should not increase flood risk either on or off site. The design of the surface water management proposals should take into account the impacts of future climate change over the projected lifetime of the development.
- Opportunities to incorporate filtration techniques such as filter strips, filter drains and bioretention areas must be considered.
- Consideration should be made to the existing condition of receiving waterbodies and their Water Framework Directive objectives for water quality. The use of multistage SuDS treatment will improve water quality of surface water runoff discharged from the site and reduce the impact on receiving water bodies. The Middle and Lower Darent Water Body has a good ecological status.
- Opportunities to incorporate source control techniques such as green roofs, permeable surfaces and rainwater harvesting must be considered in the design of the site.

7 NPPF and planning implications

7.1 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 housing development as More Vulnerable.

The Exception Test is not required for this site because More Vulnerable development is proposed within Flood Zone 1.

While the Exception Test is not explicitly required for sites at risk from other sources of flooding, the LPA should follow a similar principle, as the proposed site is at risk from surface water flooding. This includes ensuring that site users can be kept safe through the lifetime of the development and ensuring that residual risk can be safely managed.

7.2 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 and has an area greater than 1 hectare.
- Is within Flood Zone 1 and the Flood Map for Planning shows it is at risk of flooding from surface water, now and in future

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

Consultation with the Local Authority, Lead Local Flood Authority, Water Company, 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 Sevenoaks District Council Local Plan Policies.

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

7.3 Guidance for site design and making development safe

- The site layout should adopt a sequential approach by steering the most vulnerable aspects of the development outside of areas at risk of surface water flooding.
- Developers should consider utilising the surface water flow route across the site as a green corridor.
- 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, from and within the site, will need to be provided for the 1% AEP surface events 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.
- The site is located within a catchment identified as highly sensitive to the cumulative impacts of development on flood risk. The site-specific FRA and surface water drainage strategy should consider the recommendations outlined for catchments of high sensitivity in the Sevenoaks District Level 1 SFRA Cumulative Impacts Assessment.
- Finished Floor Levels should be raised above the expected height of flooding in line with the EA's guidance and any raising of ground levels should ensure that flood risk is not increased elsewhere.
- Flood resilience and resistance measures should be implemented where appropriate, e.g. raising of floor levels. These measures should be assessed to make sure that flooding is not increased elsewhere. If the floor levels cannot be raised to meet the minimum requirements, developers will need to:
    - raise them as much as possible.
    - consider moving vulnerable uses to upper floors.
    - include extra flood resistance and resilience measures.
- Other examples of flood resistance and resilience measures include:
    - using flood resistant materials that have low permeability to at least 600mm above the estimated flood level.
    - making sure any doors, windows or other openings are flood resistant to at least 600mm above the estimated flood level.
    - by raising all sensitive electrical equipment, wiring and sockets to at least 600mm above the estimated flood level.

8 Conclusions

The site is located in Flood Zone 1 and is at very low risk of fluvial flooding, therefore the Exception Test is not required.

Surface water flood risk at the site is attributed to a flow route which enters the in the southwest corner, which flows diagonally across the site following the topography. The flow route presents safe access and escape concerns from and within the site.

Groundwater is between 0.5m and 5m below the ground surface in a 1% AEP groundwater event, indicating a medium risk of groundwater flooding. There is a risk to subsurface assets.

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

- Arrangements for safe access and escape will need to be provided for the 1% AEP fluvial and surface water events 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.
- A site-specific Flood Risk Assessment is required which demonstrates that site users will be safe during events up to and including the 1% AEP rainfall event, with an appropriate allowance for climate change. This will need to show that the site is not at an increased risk of flooding in the future and that development of the site does not increase the risk of surface water flooding either on or off the site.
- The site layout should adopt a sequential approach by steering the most vulnerable aspects of the development outside of the surface water flow route
- Due to the groundwater flood risk across the site, basements are not permitted.
- Developers should utilise SuDS with multiple benefits throughout the site, particularly in areas of predicted surface water ponding.

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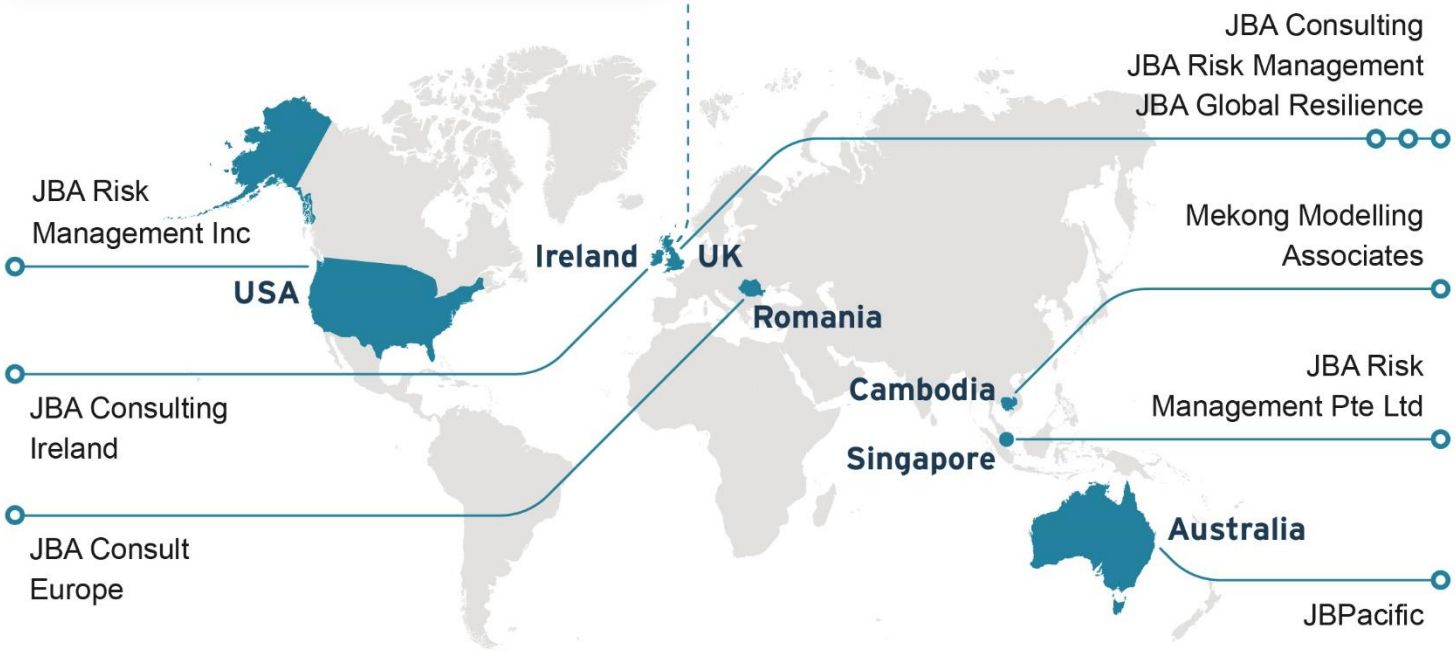

Registered Office
1 Broughton Park
Old Lane North
Broughton
SKIPTON
North Yorkshire
BD23 3FD
United Kingdom

+44(0) 1756 799919
info@jbaconsulting.com
www.jbaconsulting.com

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