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Level 2 Strategic Flood Risk Assessment - Site HO/21/00287

Land Crampton's Road, Sevenoaks

FINAL

Prepared for
Sevenoaks District Council

Date
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Contents

1 Background

This is a Level 2 Strategic Flood Risk Assessment (SFRA) site screening report for site HO/21/00287. 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 Crampton's Road, Greatness
- Site area: 1.73ha
- Existing site use: Brownfield
- Proposed site use: Residential
- Proposed use flood risk vulnerability classification: More Vulnerable

The site, shown in Figure 1-1, is located in Greatness. The site is bordered to the east by railway lines, to the south by commercial developments, to the west by residential developments and to the north by Sevenoaks Water Treatment Works. The site was previously part of the water treatment works.

Figure 1-1: Location of site HO/21/00287

1.2 Topography

Figure 1-2 shows the topography of the site represented by the Environment Agency (EA) 1m resolution LiDAR. The site is generally at a lower elevation than surrounding land, particularly the land to the west, and topography reflects the previous development on the site associated with the water treatment works. The foundations of demolished and current buildings are represented in the LIDAR, as well as an elevated mound in the northeast of the site. The lowest elevations (67.8mAOD) are seen in the centre of the site, and greatest elevations are seen on the east and west boundaries of the site. The maximum elevation of 74.5mAOD occurs on the northwest boundary. The site is situated within a developed urban area, and LIDAR data may not be representative of the actual site topography. As such, this may have an impact on some of the flood risk datasets used within this assessment.

Figure 1-2: Topography of the site.

1.3 Geology and soils

Geology at the site consists of:

- Bedrock - Folkestone Formation consisting of sandstone
- Superficial - There is no superficial geology data available for the site

Soils at the site consist of:

- Freely draining slightly acid loamy soils

2 Sources of flood risk

2.1 Location of site within the catchment

The site is located within the catchment for the Upper Darent Water Body which is part of the Darent Operational Catchment. The Upper Darent Water Body has a catchment area of 100.4km² and is described as not heavily modified.

2.2 Existing drainage features

There are no identifiable drainage features within the site boundary. However, as there is an existing development on the site it is expected that the development is served by a surface water drainage system.

Watercress Stream, a Main River, flows in a northwest direction approximately 200m north of the site. Watercress Stream drains into the River Darent approximately 1km northwest of the site, and is culverted beneath Watercress Drive approximately 160m northeast of the site.

2.3 Fluvial

2.3.1 Available data

The site is within the catchment for the Upper Darent Water Body, which was modelled in the Darent and Cray detailed hydraulic model, however extents from Watercress Stream to the north of the site is not included in the model. Therefore, 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 ponding is concentrated in the centre and north of the site, associated with low elevation.

As shown in Table 2-2, the 3.3% AEP (high risk) extent covers approximately 7% of the site, dispersed across the north, centre and south. The maximum depth of up to 0.60m occurs in several places in the northern half of the site, associated with low elevation on two access roads. The maximum velocity of 0.25m/s and maximum hazard classification of Moderate (dangerous for some) occur in several places across the northern, southern and central areas of the site, reflecting the areas of greatest depth.

Concentrated in the north half of the site, the 1% AEP (medium risk) extent is similar to that of the 3.3% AEP extent, and increases to cover approximately 10% of the site. The maximum depth of up to 0.60m remains in the northern half of the site with an increase in area. The maximum velocity remains 0.25m/s, and the maximum hazard rating remains Moderate (dangerous for some), both occurring in the north, centre and south of the site.

The most significant increase in extent occurs in the 0.1% AEP (low risk) event which covers 24% of the site, concentrated in the northern half. The maximum depth remains up to 0.60m, which covers an increased area in the northern half of the site. Maximum velocity also remains 0.25m/s, dispersed across the site. The maximum hazard classification increases to Significant (dangerous for most people) which occurs on the access track in the north of the site.

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

Table 2-2: Existing surface water flood risk based on the EA FMfP and RoFSW mapping

Event	3.3% AEP (high risk)	1% AEP (medium risk)	0.1% AEP (low risk)
Percentage of site at risk* (%)	7.09	10.49	24.02
Maximum depth (m)	0.60	0.60	0.60
Maximum velocity (m/s)	0.25	0.25	0.25
Maximum hazard classification	0.75 - Moderate - Dangerous for some - Danger: Flood zone with deep or fast flowing water	0.75 - Moderate - Dangerous for some - Danger: Flood zone with deep or fast flowing water	1.25 - Significant - Dangerous for most people - Danger: Flood zone with deep 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).*

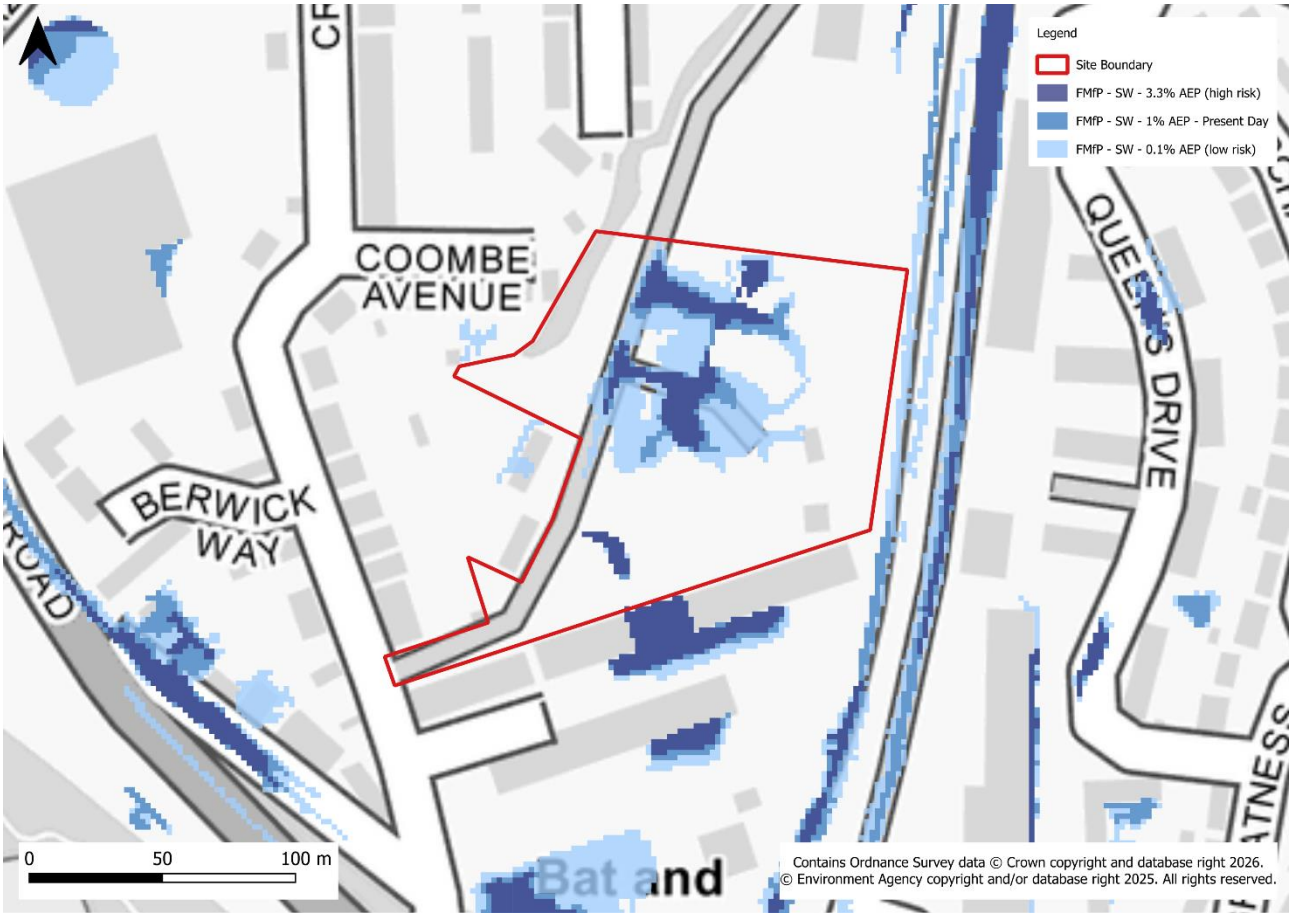

Figure 2-1: EA FMfP Surface Water Spatial Planning map

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.

The remaining water treatment works facility to the north of the site includes an underground reservoir. Whilst not included in the EA Reservoir Flood Mapping, the risk from the underground reservoir should be considered at site-specific FRA stage.

2.6 Groundwater

The JBA Groundwater Emergence Map (Figure 2-2) shows that across approximately 87% of the site, groundwater levels are predicted to reach shallow depths less than 0.025m below the ground surface during a 1% AEP groundwater flood event. This indicates high risk of groundwater emergence and flooding and poses risk to underground assets. On the west boundary of the site, groundwater is predicted to be between 0.025m and 0.5m below ground surface in the 1% AEP groundwater event; this also indicates high risk of groundwater emergence.

Based on the RoFSW and topography of the site it is likely that any groundwater that emerges will pool in the centre and north 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.

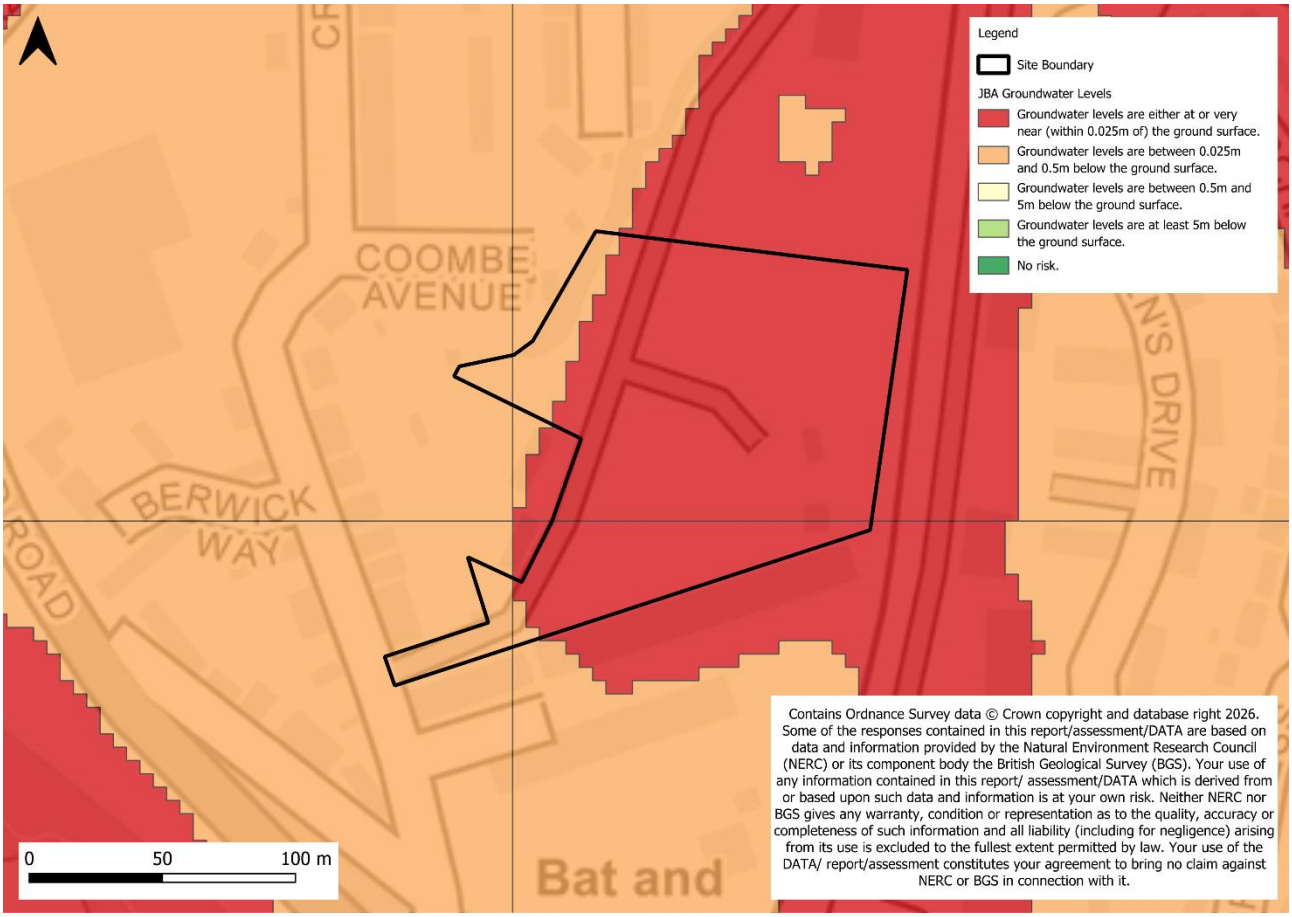

Figure 2-2: JBA Groundwater Emergence Mapping

2.7 Sewers

The site is located within postcode area TN14 5, where Thames Water sewer flooding incident data indicates that 13 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 boundary. Kent County Council LLFA flood incidents records include 3 flood incidents recorded within 50m of the site boundary, two of which occurred in 2023 and 2024 and 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

As discussed in Section 2.3.1, the Watercress Stream is not included in the Darent and Cray detailed hydraulic model. The Watercress Stream has also not been modelled in the EA RoFRS dataset. As a result, there is no fluvial climate change data available for the site, and an assessment of the impact of climate change on fluvial flood risk cannot be made at the time of writing. It is recommended that at FRA stage, a 1D-2D detailed hydraulic model is developed for the Main River, to assess the impact of climate change on fluvial flood risk at the site.

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

When the upper end climate change allowance (40%) is applied to the 1% AEP event, the extent increases from approximately 10% of the site to approximately 22% of the site, as shown in Table 3-1. Extents remain concentrated on the access tracks in the north and centre of the site, associated with low elevation.

The maximum depth does not increase in the 1% AEP plus 40%; it remains up to 0.60m, however occurs over an increased area in the north half of the site.

A comparison of the surface water 1% AEP and 1% AEP plus 40% climate change extents is shown in Figure 3-1.

Table 3-1: 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 (%)	10.49	22.24
Maximum depth (m)	0.60	0.60

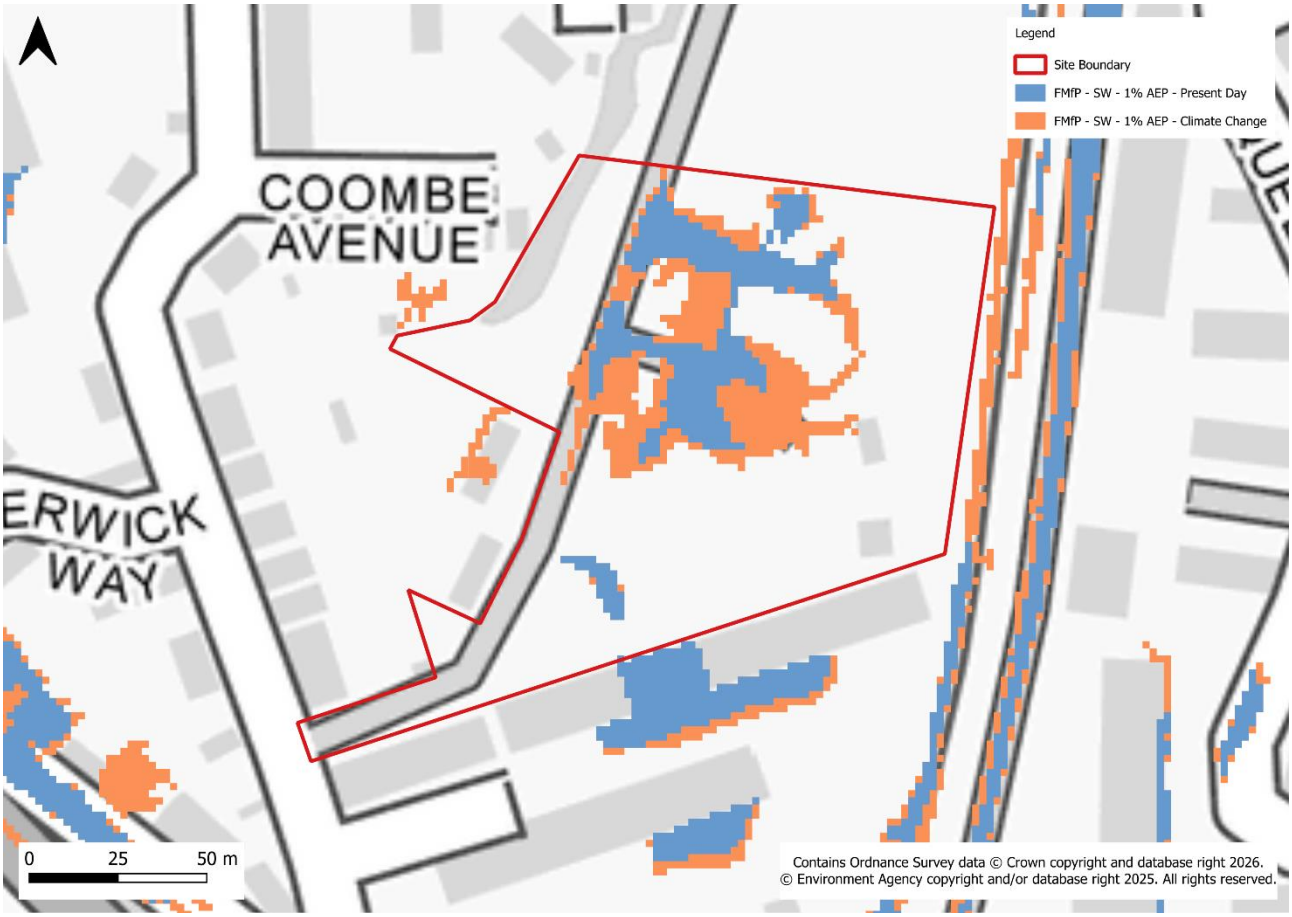

Figure 3-1: Comparison of surface water flood risk to the site between the 1% AEP and 1% AEP plus 40% climate change extents

4 Flood risk management infrastructure

4.1 Defences

Watercress Stream, which flows in a northwest direction approximately 200m north of the site. The EA AIMS dataset shows that the site is not protected by any formally engineered flood defences, however the section of Watercress Stream directly 200m north of the site is lined by natural high ground.

4.2 Residual risk

The water treatment works facility to the north of the site includes an underground reservoir. Residual risk is posed in the event of a breach of the underground reservoir, and this should be considered in the site-specific Flood Risk Assessment.

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 fluvial and 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

The site is currently accessed from the west via Crampton's Road, which is the only potential point of access.

5.3.2 Fluvial

At the time of writing is not possible to make an assessment of whether safe access and escape can be achieved in the 1% AEP plus climate change fluvial event, as Watercress Stream is not modelled within the EA RoFRS Climate Change dataset.

A 1D-2D detailed hydraulic model of the watercourse is required at FRA stage to assess the risk of fluvial flooding to the site, plus climate change allowances.

5.3.3 Surface water

Site access to Crampton's Road is maintained in the 1% AEP plus 40% climate change surface water event, and Crampton's Road is not obstructed by surface water flood extents. Further travel onto Otford Road and south onto Seal Road or St John's Hill is achievable;

flood extents on Otford Road are predicted to be up to 0.30m, which is considered suitable for vehicular travel. It is advised that further travel north on Otford Road is avoided, as flood depths of up to 0.90m are predicted where Otford Road crosses the M26; however, it is likely that these depths impact the M26 as opposed to Otford Road itself, which passes above the motorway. Similarly, flood depths of up to 0.60m cross Bradbourne Vale Road, southwest of Otford Road, however the flood depths are likely associated with the railway lines passing beneath the road rather than Bradbourne Vale Road itself. Safe vehicular access and escape is therefore achievable onto Crampton's Road, with further travel south on Otford Road.

A site-specific Flood Risk Assessment (FRA) must show that 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 sandstone, which is likely to be free draining, however groundwater levels are indicated to be within 0.025m of the ground surface and therefore pose a risk of groundwater flooding during the 1% AEP event. The viability of managing surface water runoff via infiltration should be confirmed through site investigations and infiltration testing, in line with Kent Couty Council LLFA guidance.
    - If infiltration is found viable, the location of infiltration features within the site will be limited by the presence of railway lines to the east of the site. National Rail requires a minimum distance of 30m between railway lines and proposed infiltration features.
- The entire site is located within Groundwater Source Protection Zone 1 (SPZ) and infiltration techniques may not appropriate for anything other than clean roof drainage. If infiltration is proposed for anything other than clean roof drainage a hydrogeological risk assessment should be undertaken, to ensure that the system does not pose an unacceptable risk to the source of supply. 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 pre-development discharge rates for the site and should be designed to be as close to greenfield runoff rates as reasonably practical in consultation 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 areas of risk should be retained and integrated with blue-green infrastructure and public open space.
- If it is proposed to discharge runoff to a watercourse or sewer system, the condition and capacity of the receiving watercourse or 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.
- 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, such as the increase in surface water flood extents in the north half of the site.
- 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.
- 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 greater than 1 hectare in area

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

Consultation with the Local Authority, Lead Local Flood Authority, Thames 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 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.
- A detailed 1D-2D baseline and climate change hydraulic model of Watercress Stream, based on detailed topographic survey of the watercourse channel, may be required at FRA stage to accurately represent the risk from this watercourse and set the height of any mitigation measures.
- 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 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.
- 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.
- Car parking of lower vulnerability should be prioritised as ground floor development, as opposed to more vulnerable residential development. Habitable areas and sleeping accommodation should be located on the first floor or above.
- 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 consists of more vulnerable development proposed within Flood Zone 1, and therefore the Exception Test is not required.

As the site is located within Flood Zone 1, fluvial flood risk is considered to be very low. Surface water flooding is concentrated in the north half of the site, associated with low elevation.

Across most of the site, groundwater levels are predicted to reach shallow depths less than 0.025m below ground surface during a 1% AEP groundwater flood event, indicating the site is at high risk of groundwater emergence.

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

- Detailed 1D-2D baseline and post-development modelling of the Watercress Stream, informed by a topographic channel survey and CCTV survey of the culverted reach will be required to demonstrate that the development is not at risk of flooding and does not impact on flood risk elsewhere.
- A site-specific Flood Risk Assessment is required which demonstrates that site users will be safe during events up to and including the 0.1% and 1% AEP fluvial and surface water events, 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.
- Development should be steered outside of surface water flood risk where possible. Where this is not possible, flood resilience and resistance measures should be implemented, where appropriate e.g. raising of floor levels, including property flood resistance and resilience measures. Within areas at risk of surface water flooding, habitable living spaces should not be located on the ground floor. These measures should be assessed to make sure that flooding is not increased either on or off the site.
- The location of infiltration features at the site will be limited by the presence of railway lines to the east of the site. National Rail requires a minimum distance of 30m between railway lines and proposed infiltration features.
- 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.
- Due to the high groundwater flood risk across the site, basements are not permitted.
- Developers should utilise SuDS with multiple benefits throughout the site.

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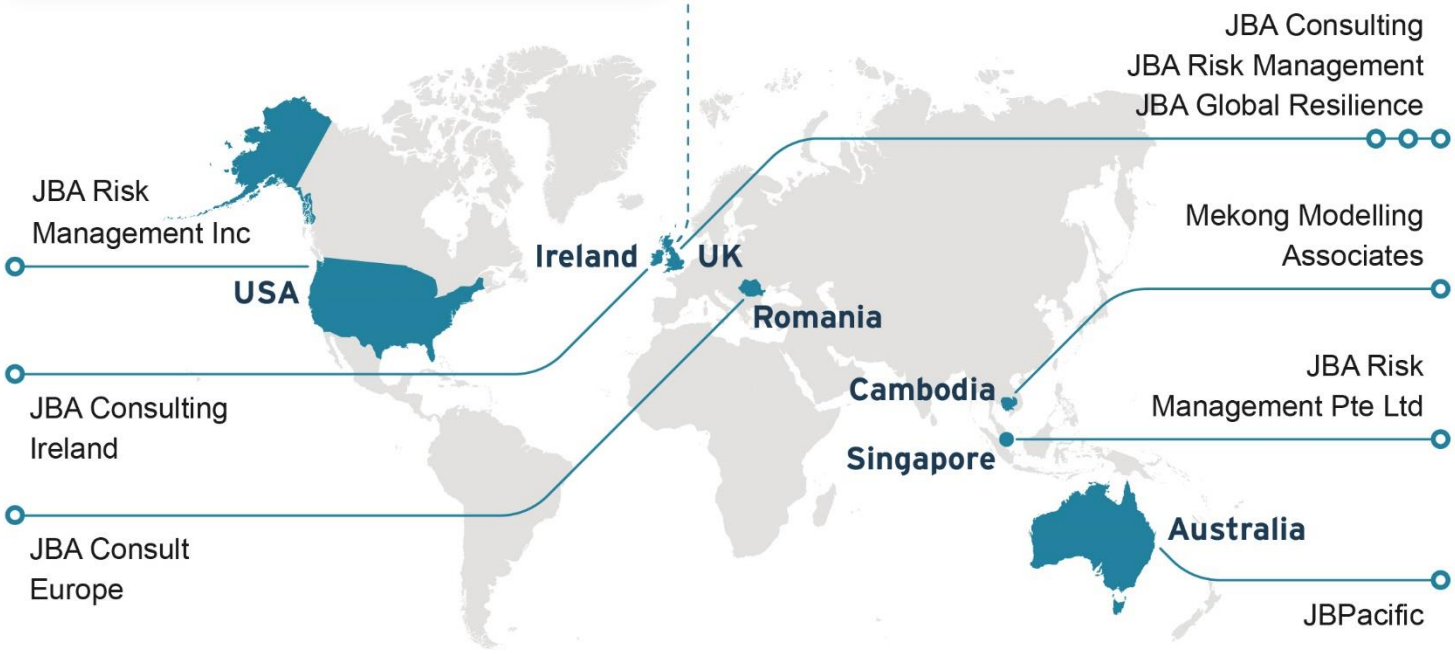

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