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Level 2 Strategic Flood Risk Assessment - Site SHELAA/143

Land south of Little Groves, Leysdown Road

Final

Prepared for
Swale Borough Council

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1 Background

This is a Level 2 Strategic Flood Risk Assessment (SFRA) site screening report for site SHELAA/143. The content of this Level 2 SFRA site screening report assumes the reader has already consulted the Swale Borough Council Level 1 SFRA and read the Swale Borough Council Level 2 SFRA main report and is therefore familiar with the terminology used in this report.

1.1 Site details

- Location: Land south of Little Groves, Leysdown Road, ME12 4EQ
- Site area: 2.58ha
- Existing site use: Greenfield with existing buildings on site
- Proposed site use: Residential
- Proposed use flood risk vulnerability classification: More Vulnerable

The site is situated in the western area of Leysdown-on-Sea and comprises greenfield land with existing buildings in the east and northwest. The site is bounded by Leysdown Road to the south and unnamed roads to the north and east. There are holiday parks to the north, west and east with a retirement home and greenfield land to the south.

1.2 Topography

Figure 1-1 shows the topography of the site represented by the Environment Agency 1m resolution LiDAR flown in 2022. The site's topography slopes down from the south to the north with the highest elevation being 8.2mAOD in the southwest adjacent to Leysdown Road and the lowest being 3.7mAOD in the northwest of the site. There is also an area of raised land in the west which carries on into the centre of the site and reaches 7.4mAOD.



Figure 1-1: Topography of the site.

1.3 Geology and soils

Geology at the site consists of:

- Bedrock - London Clay Formation consisting of clay, silt and sand.
- There are no underlain superficial deposits within the site.

Soils at the site consist of:

- Slowly permeable seasonally wet slightly acid but base-rich loamy and clayey soils

The potential influence of the site's geology and soil conditions on drainage is discussed in Section 7.

2 Sources of flood risk

2.1 Existing drainage features

There is a drainage ditch 95m north of the site and the sea is 320m northeast. The Warden Bay Stream, a statutory Main River is situated 320m west of the site.

The topography suggests that the surface water may drain to a drainage ditch to the north.

The site is within the North Kent Marshes Water Level Management Board district.

2.2 Flood Zones

2.2.1 Available data

The Environment Agency's Flood Map for Planning (FMfP) has been used within this assessment to determine Flood Zones 2 and 3a. Flood Zones 2 and 3a do not consider defences.

The 3.3% AEP (1 in 30-year) defended extent from the North Kent Coastal model has been used to determine Flood Zone 3b in this area.

2.2.2 Description of risk to the site

According to the FMfP, the northern area is within Flood Zone 3a and Flood Zone 2. This is mostly confined to the areas of lower topography within the site.

The majority of the impacted area is due to tidal flooding. However, there is a very small area in the northwest which is down to fluvial risk due to the close proximity to the Warden Bay Stream (Main River) to the west and local ground levels.

Table 2-1: Existing fluvial and tidal flood risk based on the Flood Zones

Flood Zone 1 (%)	Flood Zone 2 (%)	Flood Zone 3a (%)	Flood Zone 3b (%)
67	10	23	0

2.3 Fluvial present day defended risk

2.3.1 Available data

The Environment Agency's Flood Modeller/TUFLOW Warden Bay detailed hydraulic model (2016) for the Warden Bay Stream was used in this assessment. No defences are included in the model.

2.3.2 Description of risk to the site

The site is shown not to be at risk during the 3.3% AEP (1 in 30-year) or 1% AEP events. Although there is a small area in the northwest of the site which is at risk during the 0.1% AEP (1 in 1000-year) event due to there being low topography between the Warden Bay Stream 320m to the west and the site.

Table 2-2: Present day defended fluvial flood risk based on the Warden Bay hydraulic model

<0.1% AEP (1 in 1000-year) (%)	0.1% AEP (1 in 1000-year) (%)	1% AEP (1 in 100-year) (%)	3.3% AEP (1 in 30-year) (%)
>99	<1	0	0

2.4 Tidal/coastal present day defended risk

2.4.1 Available data

The North Kent Coast coastal modelling study (2024) has been used to understand the coastal flood risk.

2.4.2 Description of risk to the site

According to the North Kent Coast model, the site is not predicted to flood during the present day defended 3.3% AEP (1 in 30-year), 0.5% AEP (1 in 200-year) or the 0.1% AEP (1 in 1000-year) events.

2.5 Surface water present day risk

2.5.1 Available data

The Environment Agency's Flood Map for Planning – Surface Water Spatial Planning map has been used within this assessment to inform the extent and depth of surface water risk. Velocity and hazard data is not currently available from the Environment Agency for this dataset.

2.5.2 Description of risk to the site

During the 3.3% and 1% AEP events there is surface water pooling predicted in the north of the site just south of the road that makes up the northern boundary, with depths between

0.15m and 0.30m. This is because the road is at a slightly higher elevation so there is no flow route for the surface water. There is also flooding predicted in the east of the site.

During the 0.1% AEP event there is more extensive flooding in the areas mentioned as well as further flooding in the northwest and northeast, just south of the road along the northern boundary. The maximum flood depth remains between 0.15m and 0.30m in all events.

Table 2-3: Existing surface water flood risk based on the Flood Map for Planning map – Surface Water Spatial Planning map

Event	<0.1% AEP (1 in 1000-year) (%)	0.1% AEP (1 in 1000-year) (%)	1% AEP (1 in 100-year) (%)	3.3% AEP (1 in 30-year) (%)
Percentage of site at risk* (%)	93	7	2	2
Maximum depth (m)	N/A	0.15-0.30	0.15-0.30	0.15-0.30

** The percentage of 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 (1 in 100-year) includes the 3.3% AEP (1 in 30-year) percentage). The <0.1% AEP event shows the area of the site not predicted to be impacted by surface water flooding.*

2.6 Reservoir

The site is not shown to be at risk of reservoir flooding during the 'dry day' or 'wet day' scenario from the Environment Agency reservoir flood maps.

2.7 Sewers

Southern Water has confirmed that initial checks indicate that this site has limited network capacity and phasing of development may be needed alongside network reinforcement prior to occupation of the total number of dwellings indicated. The land proposed for development may also contain a sealed pressurised sewer rising main pipe along its southern boundary. As these assets are deemed critical sewers, it is not permissible for a developer to divert or build over/near them. Relocating these assets is not always viable, but the developer could make a sewer diversion application to Southern Water to request this service.

2.8 Groundwater

The JBA Groundwater Emergence Map shows there is negligible risk to groundwater flooding during a 1% AEP (1 in 100-year) groundwater event.

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.

2.9 Flood history

According to the Environment Agency's Historic Flood Map, a small part in the northeastern corner of the site flooded in 1978 due to overtopping of the sea defences.

The Kent County Council historic data was provided as point data with an easting and northing. Due to the protection of data, the eastings and northings were plotted on GIS and the number of incidents recorded within a 0.85km^2 area was calculated. Kent County Council's records indicate that the site lies across two reporting areas, one containing four recorded flood incidents and the other containing five recorded flood incidents.

According to Southern Water's Sewer Incident Report Form (SIRF), there have been 18 sewer flood incidents in the ME12 4 postcode area since 2015.

3 Climate change

Increased storm intensities due to climate change may increase the extent, depth, velocity, hazard, and frequency of both fluvial, tidal and surface water flooding.

Climate change allowances are determined by the management catchment in which the site is located. The site lies within the North Kent Management Catchment. Please see Section 6 of the Swale Borough Council Level 2 SFRA main report 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 Flood Zones plus climate change

3.1.1 Available data

The Environment Agency's Flood Map for Planning (FMfP) plus climate change has been used within this assessment. This shows the combined extent of Flood Zones 2 and 3 using the following climate change allowances:

- 'Central' allowance for the 2080s epoch (2070-2125) for risk of flooding from rivers
- 'Upper End' allowance for risk of flooding from the sea, accounting for cumulative sea level rise to 2125.

3.1.2 Description of risk to the site

Present day Flood Zones are included in Table 3-1 as a comparison to the Flood Zones plus climate change dataset. Present day Flood Zones cover the northern area and encroaches 74m into the site while the Flood Zones plus climate change inundates nearly the entire site except the southwestern corner.

Table 3-1: Flood Zones compared to Flood Zones plus climate change

Event	Flood Zones	Flood Zones plus climate change
Percentage of site at risk (%)	33	93

3.2 Fluvial

3.2.1 Available data

The fluvial model of the Warden Bay has been run with the most up to date climate change allowances. These are the 22%, 34% and 67% allowances for the North Kent Management catchment for the 2080s (2070 to 2125) epoch. The Central allowance was used for this assessment.

3.2.2 Description of risk to the site

The site is not predicted to be at risk of flooding during the 1% AEP (1 in 100-year) plus 22% climate change event.

3.3 Tidal

3.3.1 Available data

The North Kent Coast flood risk coastal modelling study (2024) has been used to understand the tidal and coastal flood risk within the Local Plan area. The mapping provides information for present day and for the Upper End climate change event for the years 2100 and 2125. Only the 2125 event has been assessed in this site summary sheet due to the likely lifetime of development (100-years) for residential sites.

3.3.2 Description of risk to the site

The 0.5% AEP (1 in 200-year) 2125 defended Upper End event is predicted to encroach 55m into the northern area of the site due to the close proximity to the coast and local ground levels. Predicted flood depths vary with the highest flood depths being in the northwestern corner with a depth of 0.54m and the predicted flood hazard is danger for most in the northwestern corner.

Table 3-2: Comparison of tidal flood risk to the site between the 0.5% AEP (1 in 200-year) present day and 0.5% AEP (1 in 200-year) 2125 Upper End climate change events

Event	0.5% AEP (1 in 200-year) 2125 UE
Percentage of site at risk (%)	20
Maximum depth (m)	0.54
Maximum velocity (m/s)	0.26
Maximum hazard classification	1.27 - Danger for most

3.4 Surface water

3.4.1 Available data

The Environment Agency's Surface Water Spatial Planning Dataset, released in May 2026, has been used within this assessment to inform the extent and depth of surface water risk with climate change. Climate change outputs are available for the 3.3% (1 in 30-year), 1%, (1 in 100-year) and 0.1% AEP (1 in 1,000-year) events with the Upper End climate change allowance for the 2070s epoch. There is currently no available velocity or hazard information to use within this assessment.

It should be noted that the Environment Agency's Upper End allowance for the 2050s epoch for the 1% AEP (1 in 100-year) event in the North Kent Management Catchment is greater than the 2070s epoch for the 1% AEP (1 in 100-year) event so the climate change uplift may be slightly underestimated.

3.4.2 Description of risk to the site

The extent of surface water flooding in the 1% AEP (1 in 100-year) plus climate change event is predicted to increase slightly compared to the 1% AEP (1 in 100-year) event, particularly in the northeast, east and northwest, in topographic low points just south of the road along the northern boundary. The maximum flood depth is predicted to remain between 0.15m and 0.30m in both events, predominantly in the north of the site.

Table 3-3: Comparison of surface water flood risk to the site between the 1% AEP (1 in 100-year) present day and 1% AEP (1 in 100-year) climate change events

Event	1% AEP	1% AEP plus climate change
Percentage of site at risk (%)	2	5
Maximum depth (m)	0.15 - 0.30	0.15 - 0.30

4 Flood risk management infrastructure

4.1 Defences

The Environment Agency AIMS (Asset Information Management System) dataset shows the site is protected by an embankment 125m north and a wall 300m to the northeast with conditions with ratings of 3 and 2 respectively (where 1 is good and 5 is bad). The standard of protection for both assets is for a 1 in 100-year event.

4.2 MEAS Hold the Line Benefit Area

The Medway Estuary and Swale flood and coastal risk management Strategy (MEAS) sets out the Environment Agency's plan to sustainably manage the coastline and tidal defences in the Medway estuary and Swale area. It aims to protect people, properties, designated habitat and agricultural land over the next 100 years. The MEAS Hold the Line Benefit Area is where the long-term strategic intention is to continue maintaining or improving flood defences, subject to future funding and review.

The site is not within a MEAS (Medway Estuary and Swale Strategy Benefit Areas) Hold the Line Benefit Area

4.3 Residual risk

There is a risk of the defences to the north being breached by the sea, which could cause tidal flooding. There is breach modelling available for the North Kent Coast model for the 0.5% AEP (1 in 200-year) 2075 Upper End event which shows the site would not be at risk of flooding. However, for this site, as the proposed land use is residential development, the 2125 0.5% AEP (1 in 200-year) flood event should be assessed within a breach model as part of a detailed Flood Risk Assessment.

The Warden Bay Stream is also culverted underneath Warden Bay Road 325m to the northwest. There is potential for the culvert to collapse or build-up of debris causing water levels to exceed the bank levels and flow overland which may impact the site.

5 Coastal Change Management Area

The site is located 8m southwest of the Coastal Change Management Area (CCMA). This has been defined by the North Kent Coast 2125 Upper End defended 3.3% AEP flood extent zone in this area. The implications of the CCMA can be found within Appendix J of the Level 1 SFRA.

6 Emergency planning

6.1 Flood warnings and alerts

The site is located in the Environment Agency's "Coast from Warden Bay to Hamlet of Shellness" Flood Warning Area and the "Isle of Sheppey and coast from Kemsley to Seasalter" Flood Alert Area.

6.2 Access and escape

Safe access and escape will need to be demonstrated in the 1% AEP (1 in 100-year) plus climate change fluvial and surface water events as well as the 0.5% AEP (1 in 200-year) plus climate change tidal event. Site layout and design should address the requirements for safe access and escape, 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.

6.2.1 Current and potential access to the site

Current access to the site can be achieved through the unnamed road leading to the holiday park in the east and north. Potential further access can be achieved via Leysdown Road or the unnamed road along the western boundary.

6.2.2 Fluvial

During the 1% AEP (1 in 100-year) plus 22% climate change fluvial event, there is flood free access and escape via all current and potential routes.

6.2.3 Tidal

Safe access and escape is predicted to be impeded within and from the site via the unnamed road to the north during the tidal 0.5% AEP (1 in 200-year) 2125 Upper End climate change event. Although, flood free access and escape would be possible via Leysdown Road and the unnamed road to the east and west.

6.2.4 Surface water

During the 1% AEP (1 in 100-year) surface water climate change event, there are some small areas of ponding along Leysdown Road and either side of the unnamed access roads to the east but the predicted flood depth remains between 0.15m and 0.30m, so safe access and egress for vehicles should be possible.

6.3 Dry islands

A dry island is a parcel of land that is elevated above surrounding areas at risk of flooding and is not at risk of flooding itself.

The site is not located on a dry island.

7 Requirements for drainage control and impact mitigation

7.1 Assessment of possible SuDS constraints

- The site is not considered to be susceptible to groundwater flooding, due to the nature of the local geological conditions. This should be confirmed through additional site investigation work.
- BGS data indicates that the underlying geology is clay, silt and sand and therefore permeability could be highly variable. As a result, permeability should be confirmed through infiltration testing. Off-site discharge may be required to discharge surface water runoff from the site. This would need to be in accordance with the SuDS hierarchy.
- 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 topography slopes from south to north which will accelerate surface water runoff, increase erosion risks, and limit the space available for gravity-fed infiltration features like basins.
- The site is not located within a historic landfill site.

7.2 Recommended approach to SuDS design

- 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 Environment Agency) 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.
- 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 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.

- 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.
- Surface water discharge rates should not exceed the existing greenfield runoff rates for the site for the 50% AEP (1 in-2 year) and 1% AEP (1 in-100) year storm events. 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.
- 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 Lead Local Flood Authority alongside confirmation with the asset owner of the available capacity.
- The site is within the North Kent Marshes Water Level Management Board (WLMB) district who may have additional requirements regarding discharge rates (directly or indirectly) into their district. The WLMB should be consulted during the detailed design of the site to establish the Board's requirements, approval to discharge into IDB watercourses (directly or indirectly) and ordinary watercourse consents.

8 NPPF and planning implications

8.1 Exception Test requirements

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

Annex F of the NPPF classifies residential development as "More vulnerable".

The Exception Test is required for this site because it is More vulnerable and located within Flood Zone 3a.

8.2 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:

- in Flood Zones 2 or 3 - see flood map for planning
- 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 - see flood map for planning
- 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 Local Authority, Lead Local Flood Authority, Southern Water, North Kent Marshes WLMB and the Environment Agency 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 Swale Borough Council Local Plan Policies.

The development should be designed with mitigation measures in place where required as outlined in Section 8.3.

8.3 Guidance for site design and making development safe

- A sequential approach to the location of development within the site should be undertaken. This means avoiding, so far as possible, development in current and future medium and high flood risk areas considering all sources of flooding including areas at risk of surface water flooding.
- Where ground raising or flood defences are proposed as part of a development surface water and fluvial flow paths should be avoided to prevent detriment elsewhere. If flow paths cannot be avoided then site-specific hydraulic modelling will be needed to demonstrate that there is no impact on flood risk elsewhere.

- The residual risk at the site should be assessed including for breach modelling for the 2125 0.5% AEP (1 in 200-year) tidal event and the risk of a culvert collapse or blockage.
- Where development cannot avoid areas at risk of flooding, then flood resilience and resistance measures e.g. raising of floor levels, including property flood resistance and resilience measures. should be implemented, where appropriate. These measures should be assessed to make sure that flooding is not increased either on or off the site.
- The risk from surface water flow routes should be quantified as part of a site-specific FRA, including a drainage strategy, so runoff volumes from the development are not increased by development. 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 retained as open space and SuDS or water compatible/essential infrastructure uses only.
- A Flood Response Plan will be required. Arrangements for safe access and escape will need to be provided for the 1% AEP surface water events, as well as the 0.5% AEP tidal 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.

9 Conclusions

According to the FMfP, the northern area is within Flood Zone 3a and Flood Zone 2.

In terms of fluvial modelled risk, the majority of the site is not at risk, although there is a small area in the northwest of the site which is predicted to flood in the 0.1% AEP (1 in 1000-year) event. The site is not at risk of flooding during the 1% AEP (1 in 100-year) plus 22% climate change event.

The site benefits from coastal defences in the form of an embankment 125m north and a wall 300m to the northeast. According to the North Kent Coast model, the site is not predicted to flood during the present day defended events. However, 20% of the site is predicted to flood in the defended 0.5% AEP (1 in 200-year) Upper End climate change event in the northern area.

In terms of surface water flood risk, during the 3.3% (1 in 30-year) and 1% AEP (1 in 100-year) events there is surface water pooling predicted in the north of the site. There is also flooding predicted in the east. During the 0.1% AEP (1 in 1000-year) event there is more extensive flooding in the areas mentioned as well as further flooding in the northwest and northeast. The 1% AEP (1 in 100-year) climate change event is predicted to increase slightly compared to the 1% AEP (1 in 100-year) event, particularly in the northeast, east and northwest.

According to the Environment Agency's Historic Flood Map the northeastern area of the site flooded in 1978 due to overtopping of the sea defences and the site is within two areas that have had 4 and 5 historic flood incidents respectively according to Kent County Council records.

There have been 18 sewer flood incidents in the ME12 4 postcode area since 2015 according to Southern Water's SIRF dataset.

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

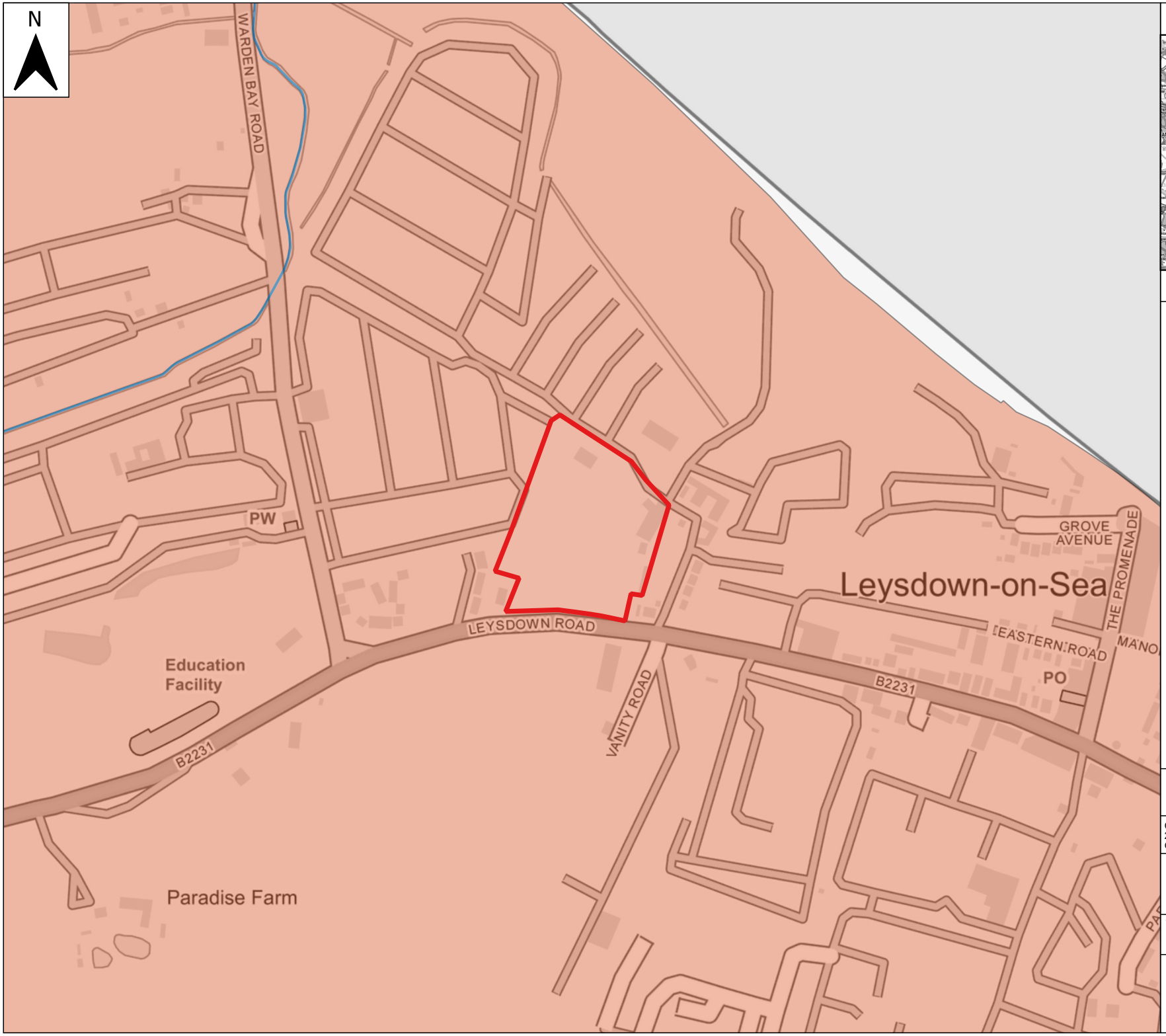
- A site-specific Flood Risk Assessment will be required which demonstrates that development can be safely accommodated on the site for its lifetime. A sequential approach should be applied within the site, locating development in the areas of lowest flood risk where possible. Where this is not possible, it may mean land raising and/or the construction of private flood defences are required. These measures should be assessed to make sure that flooding is not increased either on or off the site.
- The residual risk at the site should be assessed including for breach modelling for the 2125 0.5% AEP (1 in 200-year) tidal event and the risk of a culvert collapse or blockage.
- Where ground raising or flood defences are proposed as part of a development surface water and fluvial flow paths should be avoided to prevent detriment elsewhere. If flow paths cannot be avoided then site-specific hydraulic modelling will be needed to demonstrate that there is no impact on flood risk elsewhere.

- Development should be steered outside the areas of surface water, tidal and fluvial flood risk on site. Where development cannot avoid areas at risk of flooding, then flood resilience and resistance measures e.g. raising of floor levels, including property flood resistance and resilience measures. should be implemented, where appropriate. These measures should be assessed to make sure that flooding is not increased either on or off the site.
- SuDS (filtration techniques, conveyance features such as swales or discharging to nearby sewers) should be incorporated throughout the site to manage runoff, provide climate change resilience and deliver wider water quality, biodiversity and amenity benefits.
- A Flood Response Plan will be required. Arrangements for safe access and escape will need to be provided for the 1% AEP surface water and 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.

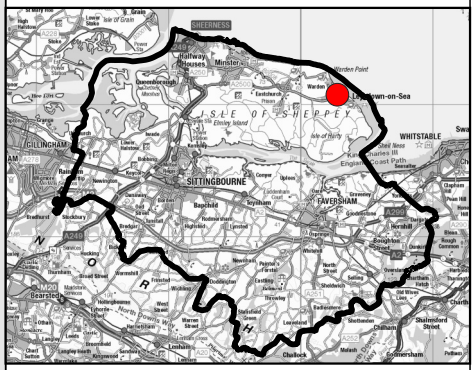
A Sources of information

- National Planning Policy Framework (NPPF)
  https://www.gov.uk/guidance/national-planning-policy-framework
- Planning Practice Guidance (PPG), Flood Risk and Coastal Change
  https://www.gov.uk/guidance/flood-risk-and-coastal-change
- Swale Borough Local Plan
  https://services.swale.gov.uk/media/files/localplan/adoptedlocalplanfinalwebversion.pdf
- Swale Borough Council Sequential and Exception Tests for Planning Applications
  https://swale.gov.uk/planning-and-regeneration/local-plans/local-plan-review-evidence/flood-risk#h2
- Swale Borough Council Level 1 SFRA
  https://swale.gov.uk/planning-and-regeneration/local-plans/local-plan-review-evidence/flood-risk#h2
- Kent County Council Local Flood Risk Management Strategy
  https://www.kent.gov.uk/__data/assets/pdf_file/0016/205621/Local-Flood-Risk-Management-Strategy-2024-2034.pdf
- Flood risk assessments: applying for planning permission
  https://www.gov.uk/guidance/flood-risk-assessments-applying-for-planning-permission
- Kent County Council's Drainage and Planning Policy Statement
  https://www.kent.gov.uk/about-the-council/strategies-and-policies/service-specific-policies/economic-regeneration-and-planning-policies/planning-policies/flooding-drainage-and-water-management-policies-and-guidance
- Defra's National standards for sustainable drainage systems (SuDS)
  https://www.gov.uk/government/publications/national-standards-for-sustainable-drainage-systems/national-standards-for-sustainable-drainage-systems-suds
- Flood Map for Planning - Flood Zones dataset
  https://environment.data.gov.uk/dataset/04532375-a198-476e-985e-0579a0a11b47
- Flood Map for Planning - Flood Zones plus Climate Change
  https://environment.data.gov.uk/dataset/59065c43-257e-4867-8798-fd2366156a6b
- British Geological Survey (BGS) Geology Viewer
  https://geologyviewer.bgs.ac.uk/
- Flood Warning sign up
  https://www.gov.uk/sign-up-for-flood-warnings

B Flood Risk Mapping



Location Plan



Legend

- Swale Borough Outline
- Site boundary

Watercourses

- Statutory Main Rivers
- Ordinary watercourses
- North Kent Marshes Water Level Management Board Watercourses
- North Kent Marshes Water Level Management Board

0 100 200 m

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SWALE BOROUGH COUNCIL
LEVEL 2 SFRA:
WATERCOURSES - SHELAA-143

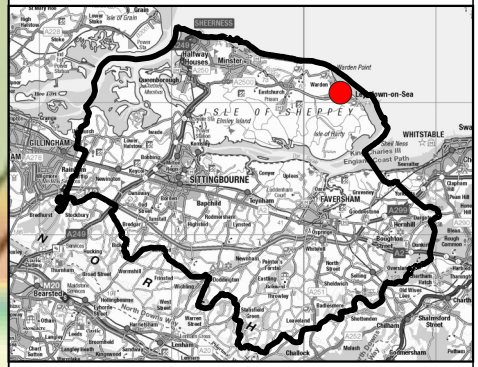
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Swale BOROUGH COUNCIL
Making Swale a better place



Location Plan



Legend

Swale Borough Outline

Site boundary

Topography

LIDAR 1m DTM (mAOD)

10.72

1.64

Notes

The LIDAR Composite DTM (Digital Terrain Model) is a raster elevation model covering ~99% of England at 1m spatial resolution. The DTM (Digital Terrain Model) is produced from the last or only laser pulse returned to the sensor. We remove surface objects from the Digital Surface Model (DSM), using bespoke algorithms and manual editing of the data, to produce a terrain model of just the surface.

Produced by the Environment Agency in 2022, the DTM is derived from a combination of the EA's Time Stamped archive and National LIDAR Programme surveys, which have been merged and re-sampled to give the best possible coverage. Where repeat surveys have been undertaken the newest, best resolution data is used. Where data was resampled a bilinear interpolation was used before being merged.

The 2025 LIDAR Composite contains surveys undertaken between 6th June 2000 and 1st August 2025.

0 40 80 m

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SWALE BOROUGH COUNCIL
LEVEL 2 SFRA:
TOPOGRAPHY - SHELAA-143

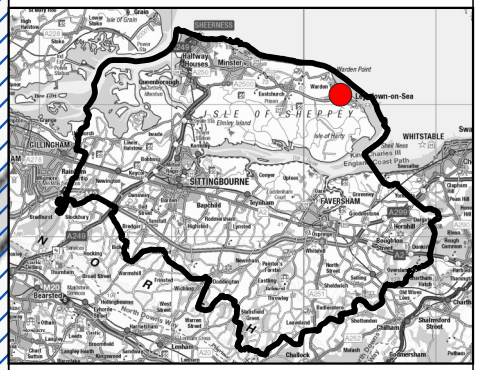
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Making Swale a better place



Location Plan



Legend

- Swale Borough Outline
- Site boundary

Environment Agency recorded flood outlines

- Main Rivers
- Sea

Notes

The Historic Flood Map shows the recorded flood outlines available from the Environment Agency. The dataset records historical flooding from rivers, the sea, groundwater and surface water.
It is possible that the pattern of flooding has changed and area would now flood or not flood under different circumstances.
Please note that not all historical records may be shown on this map, and that it is therefore advised you contact the Environment Agency for updated information.
The map does not include recorded incidents of flooding held by Kent County Council or Southern Water.

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SWALE BOROUGH COUNCIL
LEVEL 2 SFRA:
HISTORIC FLOODING - SHELAA-143

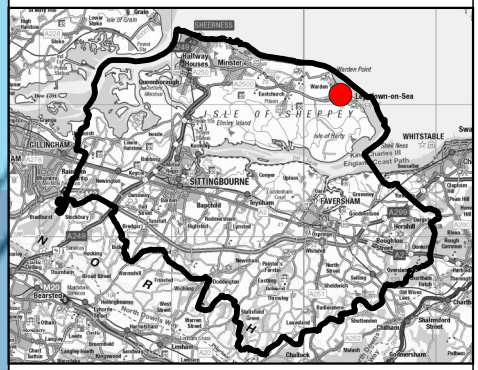
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Location Plan



Legend

- Swale Borough Outline
- Site boundary

Flood Zone

- Flood Zone 2
- Flood Zone 3
- Flood Zone 3b
- Generalised modelling used for Flood Zone 3b

Notes

Flood Zone 1: Land assessed as having a less than 0.1% AEP of river or sea flooding.
Flood Zone 2: Land assessed as having a 0.1% - 1% AEP (1 in 1000-year and 1 in 100-year) of river flooding or a 0.1% - 0.5% AEP (1 in 1000-year and 1 in 200-year) of flooding from the sea.
Flood Zone 3a: Land assessed as having a greater than a 1% AEP (1 in 100-year) of river flooding or a greater than 0.5% AEP (1 in 200-year) of flooding from the sea.
Flood Zone 3b: Land where water has to flow or be stored in times of flood (functional floodplain). The SFRA identifies this Flood Zone as land which floods with an annual probability of 3.3% AEP (1 in 30-year) where detailed modelling exists. Where the 3.3% AEP (1 in 30-year) ouputs are not available, Flood Zone 3a is used as a surrogate as a precautionary approach. If a proposed development is in Flood Zone 3, further analysis should be undertaken in a detailed site specific FRA to define and confirm the extent of Flood Zone 3b.

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SWALE BOROUGH COUNCIL
LEVEL 2 SFRA:
PRESENT DAY FLOOD RISK FROM RIVERS AND SEA (FLOOD ZONES) - SHELAA-143

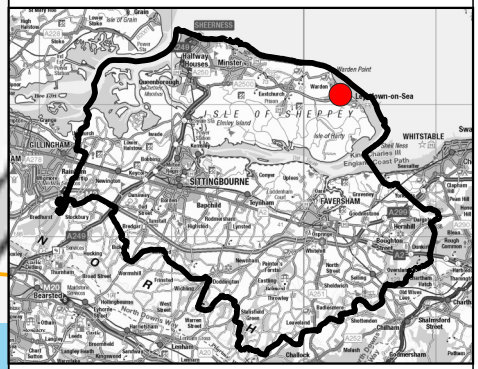
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Location Plan



Legend

- Swale Borough Outline
- Site boundary
- Fluvial events 3.3% AEP (1 in 30-year)
- Fluvial events 1% AEP (1 in 100-year)
- Fluvial events 0.1% AEP (1 in 1000-year)

Environment Agency Flood Defence Types

- Embankment

Notes

Present day 3.3% AEP (1 in 30-year), 1% AEP (1 in 100-year) and 0.1% AEP (1 in 1000-year) flood extents taken from Environment Agency's Scrapsgate Drain, Warden Bay and Iwade Stream fluvial models.

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SWALE BOROUGH COUNCIL
LEVEL 2 SFRA:
DETAILED MODELS - DEFENDED PRESENT DAY FLUVIAL EXTENT- SHELAA-143

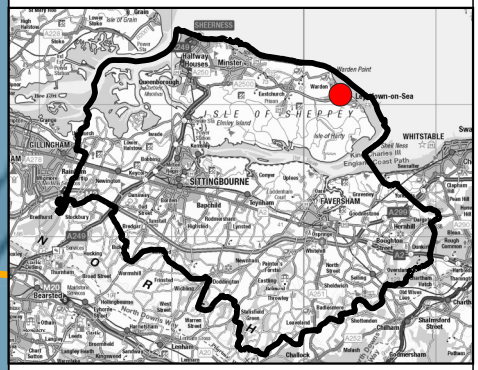
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Location Plan



Legend

- Swale Borough Outline
- Site Boundary
- 1% AEP (1 in 100-year) and 0.1% AEP (1 in 1000-year) undefended extents under the 2125 year climate change scenario

Notes

The Flood Zone plus Climate Change mapping was produced by combining the Flood Zone 2 and Flood Zone 3 extents with the relevant climate change allowances to illustrate the potential future flood risk to the area. This represents an undefended scenario, meaning that existing flood defences are not considered in the modelling. For further information on this flood extent dataset, please refer to the guidance available on;

https://flood-map-for-planning.service.gov.uk/how-to-use-

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SWALE BOROUGH COUNCIL
LEVEL 2 SFRA:
FUTURE FLOOD RISK FROM RIVERS AND SEA - FLOOD MAP FOR PLANNING- SHELAA-143

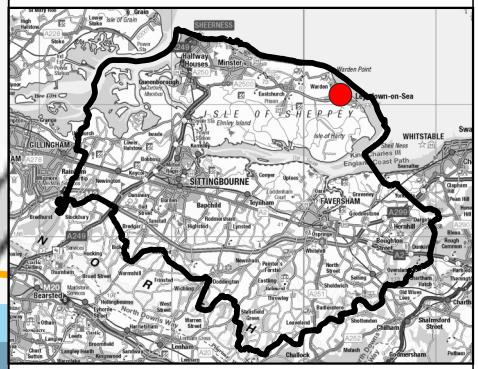
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Location Plan



Legend

- Swale Borough Outline
- Site boundary
- 1% AEP (1 in 100-year) plus 22% climate change allowance
- 0.1% AEP (1 in 1000-year) plus 22% climate change allowance

EA Flood Defences Types

- Embankment

Notes

Future fluvial modelling for the Iwade, Scrapsgate Drain and Warden Bay have been run with the most up to date climate change allowances, applying the Central 22% allowance for the 2070 and 2125 epochs within the North Kent Management Catchment.

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LEVEL 2 SFRA:
FUTURE FLOOD RISK FROM RIVERS - DETAILED RIVER MODELS - SHELAA-143

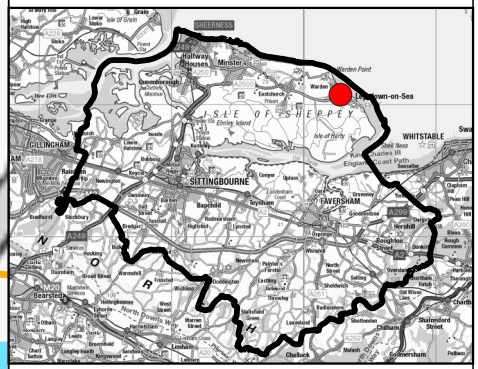
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Location Plan



Legend

Swale Borough Outline

Site boundary

1% AEP (1 in 100-year) plus 22% climate change flood depth (m)

- 0.00 - 0.10
- 0.10 - 0.50
- 0.50 - 1.00
- 1.00 - 1.50
- 1.50 - 2.00
- 2.00 - 2.50
- > 2.50

EA Flood Defences Types

- Embankment

Notes

Future fluvial modelling for the Iwade, Scrapsgate Drain and Warden Bay have been run with the most up to date climate change allowances, applying the Central 22% allowance for the 2070 epoch within the North Kent Management Catchment.

0 40 80 m

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SWALE BOROUGH COUNCIL
LEVEL 2 SFRA:
FUTURE FLOOD RISK FROM RIVERS - DETAILED RIVER MODEL DEPTHS - SHELAA-143

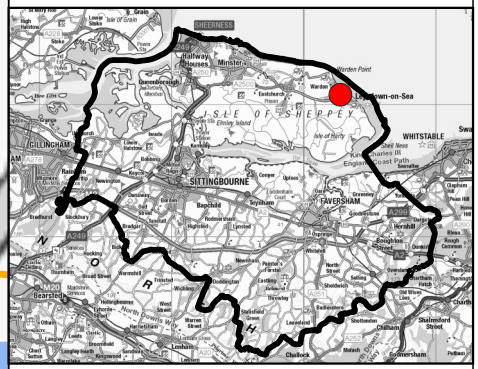
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Location Plan



Legend

- Swale Borough Outline
- Site boundary

1% AEP (1 in 100-year) plus 22% climate change flood velocity (m/s)

- 0.0 - 0.2
- 0.2 - 0.5
- 0.5 - 1.0
- 1.0 - 2.0
- > 2.0

EA Flood Defences Types

- Embankment

Notes

Future fluvial modelling for the Iwade, Scrapsgate Drain and Warden Bay have been run with the most up to date climate change allowances, applying the Central 22% allowance for the 2070 epoch within the North Kent Management Catchment.

0 40 80 m

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SWALE BOROUGH COUNCIL
LEVEL 2 SFRA:
FUTURE FLOOD RISK FROM RIVERS - DETAILED RIVER MODEL VELOCITY - SHELAA-143

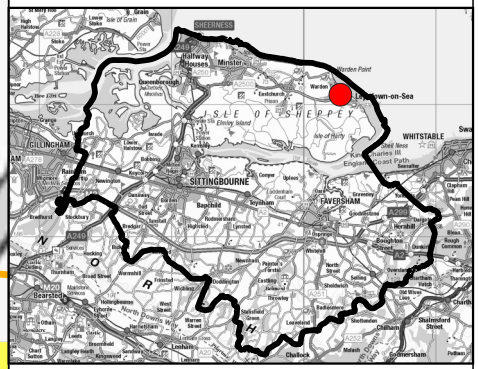
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Location Plan



Legend

- Swale Borough Outline
- Site boundary

1% AEP (1 in 100-year) plus 22% climate change flood hazard classification

- No hazard
- Very low hazard - Caution
- Danger for some
- Danger for most
- Danger for all

EA Flood Defences Types

- Embankment

Notes

Future fluvial modelling for the Iwade, Scrapsgate Drain and Warden Bay have been run with the most up to date climate change allowances, applying the Central 22% allowance for the 2070 epoch within the North Kent Management Catchment.

0 40 80 m

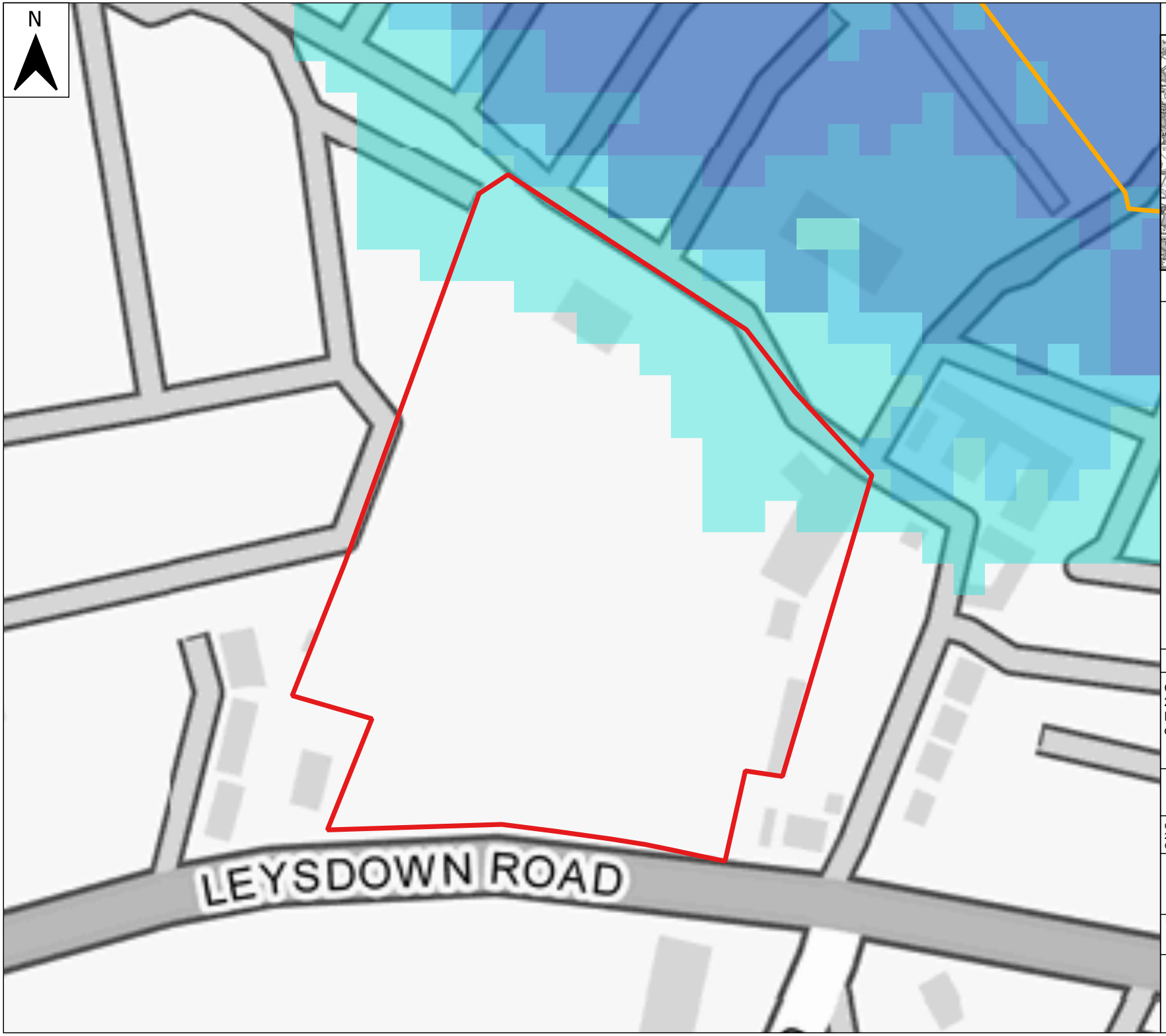
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SWALE BOROUGH COUNCIL
LEVEL 2 SFRA:
FUTURE FLOOD RISK FROM RIVERS - DETAILED RIVER MODEL HAZARD - SHELAA-143

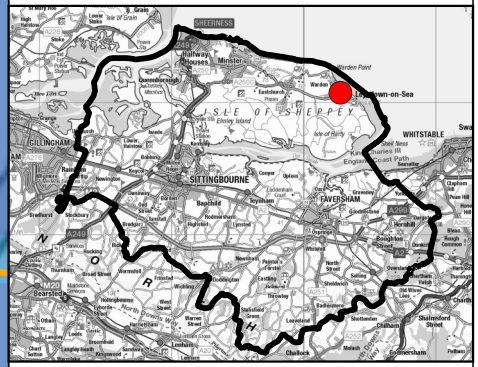
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Location Plan



Legend

- Swale Borough Outline
- Site boundary
- 0.5% AEP (1 in 200-year) 2100 defended (higher central)
- 0.5% AEP (1 in 200-year) 2100 defended (upper end)
- 0.5% AEP (1 in 200-year) 2125 defended (higher central)
- 0.5% AEP (1 in 200-year) 2125 defended (upper end)

EA Flood Defences Types

- Embankment

Notes

Climate change extents for the 0.5% AEP (1 in 200-year) events with the Higher Central and Upper End estimates (2100 and 2125) are shown. The difference in flood extents are relatively small.

0 40 80 m

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LEVEL 2 SFRA:
FUTURE FLOOD RISK FROM THE SEA - NORTH KENT COAST MODEL - SHELAA-143

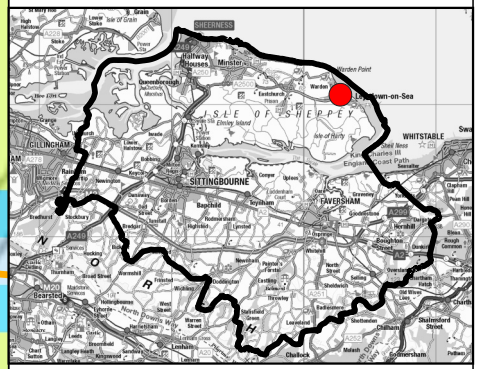
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Location Plan



Legend

Swale Borough Outline

Site boundary

North Kent Coast Model - Defended
0.5% AEP (1 in 200-year) 2125 UE depth (m)

- 0.00 - 0.10
- 0.10 - 0.50
- 0.50 - 1.00
- 1.00 - 1.50
- 1.50 - 2.00
- 2.00 - 2.50
- > 2.50

EA Flood Defences Types

Embankment

Notes

Climate change depths for the 0.5% AEP (1 in 200-year) event with the Upper End estimate (2125) is shown.

0 40 80 m

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FUTURE FLOOD RISK FROM THE SEA - NORTH KENT COAST MODEL DEPTH - SHELAA-143

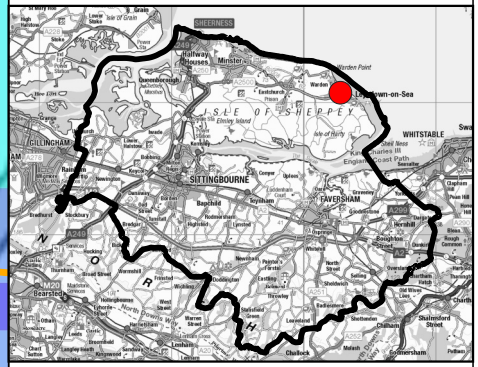
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Location Plan



Legend

- Swale Borough Outline
- Site boundary

North Kent Coast Model - Defended 0.5% AEP (1 in 200-year) 2125 UE Velocity (m/s)

- 0.0 - 0.2
- 0.2 - 0.5
- 0.5 - 1.0
- 1.0 - 2.0
- > 2.0

EA Flood Defences Types

- Embankment

Notes

Climate change velocity for the 0.5% AEP (1 in 200-year) event with the Upper End estimate (2125) is shown.

0 40 80 m

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SWALE BOROUGH COUNCIL
LEVEL 2 SFRA:
FUTURE FLOOD RISK FROM THE SEA - NORTH KENT COAST MODEL VELOCITY - SHELAA-143

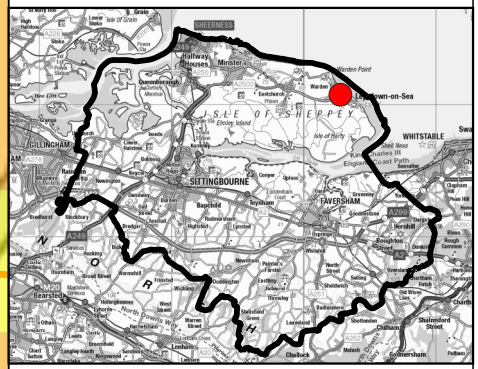
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Location Plan



Legend

- Swale Borough Outline
- Site boundary

North Kent Coast Model - Defended 0.5% AEP (1 in 200-year) 2125 UE hazard classification

- No hazard
- Very low hazard - Caution
- Danger for some
- Danger for most
- Danger for all

EA Flood Defences Types

- Embankment

Notes

Climate change hazard for the 0.5% AEP (1 in 200-year) event with the Upper End estimate (2125) is shown.

0 40 80 m

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SWALE BOROUGH COUNCIL
LEVEL 2 SFRA:
FUTURE FLOOD RISK FROM THE SEA - NORTH KENT COAST MODEL HAZARD - SHELAA-143

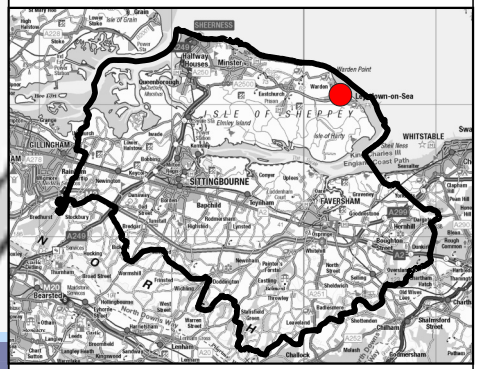
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Location Plan



Legend

- Swale Borough Outline
- Site boundary

FMfP - Surface Water Spatial Planning Extents

- 3.3% AEP (1 in 30-year)
- 1% AEP (1 in 100-year)
- 0.1% AEP (1 in 1000-year)

Notes

The Flood Map for Planning Service includes several layers of information. This includes Surface Water Spatial Planning Extents. These datasets show the extent of land at risk of flooding from surface water to a defined annual exceedance probability (AEP) or chance of flooding each year.
These datasets are designed to only give an indication of flood risk to an area of land and are not suitable for showing whether an individual property is at risk of flooding.

0 40 80 m

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SWALE BOROUGH COUNCIL
LEVEL 2 SFRA:
SURFACE WATER FLOODING - SHELAA-143

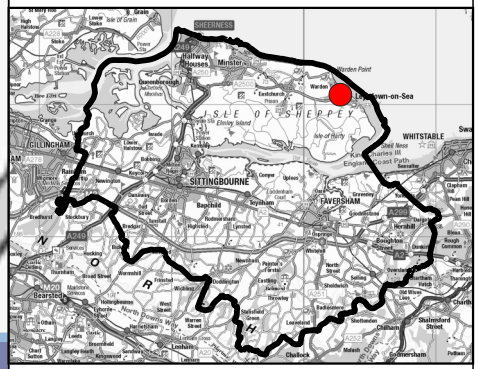
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Location Plan



Legend

- Swale Borough Outline
- Site boundary

FMfP - Surface Water Spatial Planning Extents plus climate change

- 3.3% AEP (1 in 30-year) plus CC
- 1% AEP (1 in 100-year) plus CC
- 0.1% AEP (1 in 1000-year) plus CC

Notes

The Flood Map for Planning Service includes several layers of information. This includes Surface Water Spatial Planning Extents. These datasets show the extent of land at risk of flooding from surface water to a defined annual exceedance probability (AEP) or chance of flooding each year.
Climate change scenarios have been produced to indicate the predicted impacts of climate change on future flood risk. The climate change allowances are based on the latest UK Climate Projections (UKCP18) from the Met Office, using the Representative Concentration Pathway (RCP) 8.5.
The 'Upper End' for the 2070s epoch (2061-2125) has been used for the climate change scenarios. We have chosen long-term epochs appropriate to support long-term planning and development decisions.
These datasets are designed to only give an indication of flood risk to an area of land and are not suitable for showing whether an individual property is at risk of flooding.

0 40 80 m

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SWALE BOROUGH COUNCIL
LEVEL 2 SFRA:
SURFACE WATER FLOODING PLUS CLIMATE CHANGE - SHELAA-143

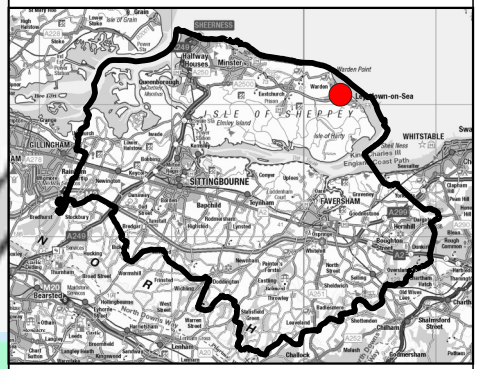
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Location Plan



Legend

Swale Borough Outline

Site boundary

FMfP Surface Water Spatial Planning Depths
1% AEP (1 in 100-year) plus climate change

- <150mm
- 150-300mm
- 300-600mm
- 600-900mm
- 900-1200mm
- 1200-2300mm
- >2300mm

Notes

The Flood Map for Planning Service includes several layers of information. This includes Surface Water Spatial Planning Extents. These datasets show the extent of land at risk of flooding from surface water to a defined annual exceedance probability (AEP) or chance of flooding each year.
Climate change scenarios have been produced to indicate the predicted impacts of climate change on future flood risk. The climate change allowances are based on the latest UK Climate Projections (UKCP18) from the Met Office, using the Representative Concentration Pathway (RCP) 8.5.
The 'Upper End' for the 2070s epoch (2061-2125) has been used for the climate change scenarios. We have chosen long-term epochs appropriate to support long-term planning and development decisions.
These datasets are designed to only give an indication of flood risk to an area of land and are not suitable for showing whether an individual property is at risk of flooding. This is because we cannot know all the details about each property.

0 40 80 m

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SWALE BOROUGH COUNCIL
LEVEL 2 SFRA:
SURFACE WATER FLOODING PLUS CLIMATE CHANGE DEPTHS - SHELAA-143

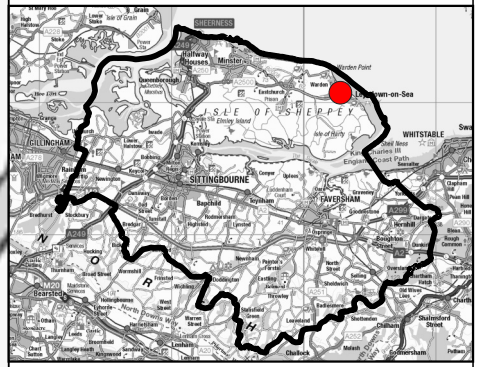
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Location Plan



Legend

Swale Borough Outline

Site boundary

JBA Groundwater Flood Map Depths

Groundwater levels are either at or very near (within 0.025m of) the ground surface.

Groundwater levels are between 0.025m and 0.5m below the ground surface.

Groundwater levels are between 0.5m and 5m below the ground surface.

Groundwater levels are at least 5m below the ground surface.

Low risk.

Notes

The modelled groundwater levels are not predictions of typical groundwater levels, rather they are flood levels. The 5m resolution JBA Groundwater Flood Map categorises the head difference (m) between the predicted groundwater levels and the surface level into five feature classes based on the 100-year flood model outputs.

It should be noted that the JBA Groundwater Flood Map is suitable for general broad-scale assessment of the groundwater flood hazard in an area, but is not explicitly designed for the assessment of flood hazard at the scale of a single property.

0 40 80 m

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JBA GROUNDWATER FLOOD MAP - SHELAA-143

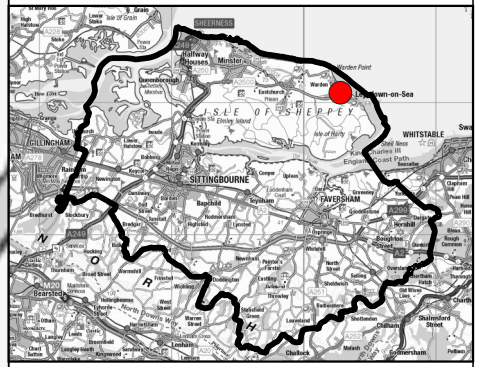
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Location Plan



Legend

- Swale Borough Outline
- Site boundary

Environment Agency Reservoir Flood Extents

- Dry Day
- Wet Day

Notes

The risk of inundation due to reservoir breach or failure of reservoirs within the area has been mapped using the outlines available from the Risk of Flooding from Reservoir dataset, made available by the Environment Agency. The Environment Agency dataset includes areas of sea flooding.

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RISK OF FLOODING FROM RESERVOIRS - SHELAA-143

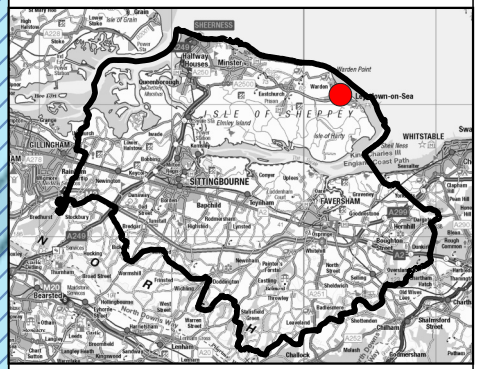
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Location Plan



Legend

- Swale Borough Outline
- Site boundary

Environment Agency Flood Warning and Alerts

- Flood Alert Area
- Flood Warning Area

Notes

Flood Alerts are used by the Environment Agency to warn people of the possibility of flooding and encourage them to be alert, stay vigilant and make early preparations. Flood Alerts are issued earlier than a flood warning to give notice of the possibility of flooding but before the Environment Agency are fully confident that flooding in Flood Warning Areas is expected.

Flood Warnings warn people of expected flooding and encourage them to take action to protect themselves and their property.

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ENVIRONMENT AGENCY FLOOD WARNINGS AND ALERTS - SHELAA-143

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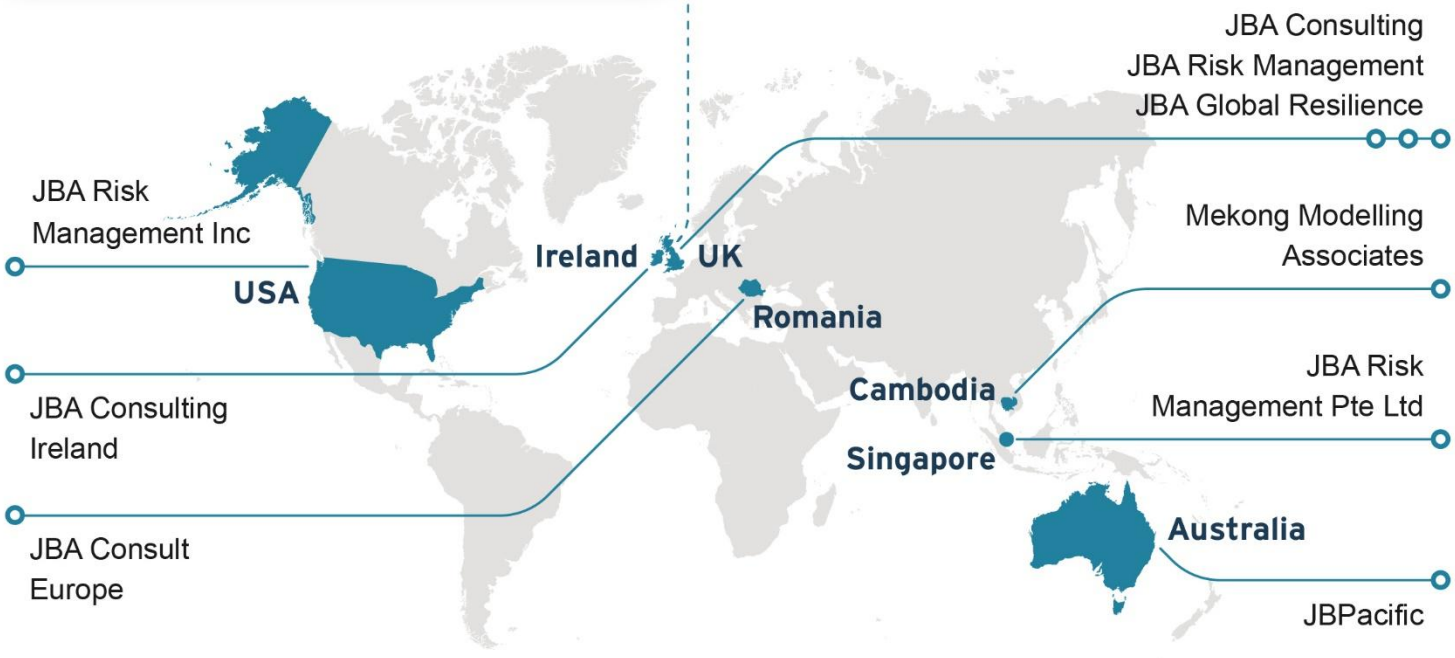
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