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Level 2 Strategic Flood Risk Assessment - Site SHELAA/323

Sheppey Beach Villas, Manor Way

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/323. 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: Sheppey Beach Villas, Manor Way, ME12 4QQ
- Site area: 3.77ha
- Existing site use: Brownfield with existing buildings on site
- Proposed site use: Residential
- Proposed use flood risk vulnerability classification: More Vulnerable

The site is situated within Leysdown-on-Sea and comprises a coastal residential area. Nutts Avenue enters the site in the south and Manor Way enters from the west and east. The Promenade lies to the west, Park Avenue to the east, Shellness Road to the south and the coast to the north. There are commercial properties to the west of The Promenade and holiday parks to the east and south.

1.2 Topography

Figure 1-1 shows the topography of the site represented by the Environment Agency (EA) 1m resolution LiDAR flown in 2022. The site's topography slopes down from the southwest to the northeast with the highest elevation being 10.1mAOD in the southwest and the lowest being 5.0mAOD in the north of the site.



Figure 1-1: Topography of the site.

1.3 Geology and soils

Geology at the site consists of:

- Bedrock - London Clay Formation consisting of clay, silt and sand.
- Superficial - Alluvium consisting of clay, silt, sand and peat in the northwestern corner.

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

Warden Bay Stream, a statutory Main River flows 950m to the west of the site. The coast is parallel to the northern boundary, and the topography suggests that the surface water will drain towards the sea. As there is an existing development on the site, it is expected that the development is served by a surface water drainage system, which discharges into the local sewer systems.

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

The northern boundary is within Flood Zone 3b due to close proximity to the sea and local ground level. The rest of the site is within Flood Zone 1. The impacted area is due to tidal flood risk.

In this area Flood Zone 3b has a larger extent than Flood Zone 2 and 3a. This is due to the overtopping of flood defences.

Table 2-1: Present day fluvial and tidal flood risk based on Environment Agency FMfP

Flood Zone 1 (%)	Flood Zone 2 (%)	Flood Zone 3a (%)	Flood Zone 3b (%)
86	0	0	14

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 not shown to flood during the 3.3% (1 in 30-year), 1% (1 in 100-year) or 0.1% AEP (1 in 1000-year) events.

2.4 Tidal/coastal present day defended risk

2.4.1 Available data

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

2.4.2 Description of risk to the site

During the defended 3.3% AEP (1 in 30-year), 0.5% AEP (1 in 200-year) and the 0.1% AEP (1 in 1000-year) events the northern area of the site is predicted to flood due to the proximity to the coast and low lying land. All three events are predicted to encroach approximately 40m into the site.

Table 2-2: Present day defended tidal flood risk based on the North Kent Coast 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) (%)
85	15	14	14

**The percentages quoted show the percentage of the site at flood risk from that particular event, including the percentage of the site at flood risk at a higher risk. The <0.1% AEP event shows the area of the site not predicted to be impacted by tidal flooding.*

2.5 Surface water

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% (1 in 30-year) and 1% AEP (1 in 100-year) events, there is surface water pooling predicted adjacent to the existing buildings and roads within the site. This is predicted in the centre, southeast, north and northwest.

During the 0.1% AEP (1 in 1000-year) event there is more extensive flooding predicted in the areas mentioned as well as further flooding along Manor Way in the eastern area of the site. The maximum flood depths predicted in all events is between 0.30m and 0.60m.

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* (%)	86	14	5	3
Maximum depth (m)	N/A	0.30-0.60	0.30-0.60	0.30-0.60

* 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% (1 in 30-year) AEP percentage). The <0.1% AEP (1 in 1000-year) 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 Groundwater

The JBA Groundwater Emergence Map shows there is negligible risk of 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.

2.8 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. Southern Water infrastructure crosses the site and may require easements or diversion. Southern Water should be consulted to confirm requirements.

The Environment Agency has confirmed that new development should aim to connect to the existing mains drainage network. The use of private sewage treatment works, or NAVs should be avoided.

2.9 Flood history

According to the EA's Historic Flood Map, the site has not experienced any flood incidents but the 1978 flooding due to overtopping of the sea defences was 40m to the west of the site.

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. According to Kent County Council's recorded flood incidents, the site is within an area that has had 6 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 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 covers part of the northern area while the Flood Zones plus climate change inundates nearly half of the site and encroaches into the centre of the site from the northern boundary.

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

Event	Flood Zones	Flood Zones plus climate change
Percentage of site at risk (%)	14	46

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. It is predicted to flood 280m to the west.

3.3 Tidal

3.3.1 Available data

The North Kent Coast 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 events 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 defended 0.5% AEP (1 in 200-year) 2125 Upper End event is predicted to encroach 50m into the site. The maximum flood depth is predicted to be 1.99m and hazard classification is a danger for most. This is predicted to be located along the northern boundary and reduce as the flooding encroaches further into the site.

Table 3-2: Tidal flood risk to the site in the defended 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 (%)	24
Maximum depth (m)	1.99
Maximum velocity (m/s)	0.80
Maximum hazard classification	2.42 - Dangerous for most - Significant Danger

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 1000-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 compared to the 1% AEP (1 in 100-year) present day event, particularly in the centre in between Manor Way and an unnamed road as well as in between the current housing. There is also more extensive flooding predicted in the east, south and north. The maximum flood depth is predicted to remain between 0.30m and 0.60m in both events, in the northwestern area 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) plus climate change events.

Event	1% AEP (1 in 100-year)	1% AEP (1 in 100-year) plus climate change
Percentage of site at risk (%)	5	10
Maximum depth (m)	0.30-0.60	0.30-0.60

4 Flood risk management infrastructure

4.1 Defences

The Environment Agency AIMS (Asset Information Management System) dataset shows a sea wall 30m to the northwest with a condition rating of 2 (where 1 is good and 5 is bad). The standard of protection of the defence is for a 1 in 1000-year event.

The Environment Agency has confirmed development would only be acceptable if sea defences are improved to provide the appropriate levels of protection, taking into consideration climate change and sea level rise. The current defence would not provide sufficient protection for the lifetime of the development.

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 Hold the Line Benefit Area.

The site is within the Warden Bay to Leysdown-on-Sea 4A05 Shoreline Management Plan policy unit. Here, the overall intention is for a natural shoreline, not to encourage new defences. In some areas, where specified in the Shoreline Management Plan, works to repair or construct short stretches of defence to provide localised protection (such as to a slipway, access point or isolated properties) may be considered by the Local Planning Authority.

4.3 Residual risk

There is a risk of the defences to the northwest 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 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.

5 Coastal Change Management Area

The northern boundary of the site is located along the boundary of the Coastal Change Management Area (CCMA). This has been defined by the North Kent Coast 2125 Upper End defended 3.3% AEP (1 in 30-year) flood extent zone.

The Local Plan's CCMA policy is set out under Policy C6. Permanent residential development will not be appropriate in this area. Development for other uses will only be appropriate subject to the criteria defined in Policy C6.

A Coastal Change Vulnerability Assessment will need to accompany any planning application for the site. However, as the site is at risk of inundation only, this could largely be satisfied by the submission of a Flood Risk Assessment.

The implications of the site being located within the CCMA can be found within Appendix J of the Level 1 SFRA and Policy C6 of the Local Plan.

6 Emergency planning

6.1 Flood warnings and alerts

The northern area of 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 and future access and escape from the site could be via Nutts Avenue which leads into the southern boundary of the site, Manor Way from the west, and Park Avenue from the east.

6.2.2 Fluvial

According to the Warden Bay model in the 1% AEP (1 in 100-year) plus 22% climate change event, there is flood free access via all access and escape routes.

6.2.3 Tidal

During the 0.5% AEP (1 in 200-year) 2125 Upper End Climate change event, there is flood free access and escape to and from the site via all routes when travelling from the west along Shellness Road as long as the northern area of the site is avoided. However, when travelling from the east, there are flood depths up to 1m which will inhibit access and escape via all routes.

6.2.4 Surface water

During the 1% AEP (1 in 100-year) surface water climate change event, there is predicted flooding along all three access roads as well as connecting roads such as Leysdown Road. However, the predicted flooding 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 southwest to northeast 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 area.

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 pre-development runoff rates for the site for the 50% AEP (1 in-2 year) and 1% AEP (1 in-100) year storm events 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.
- 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 partly located within Flood Zone 3b. "More vulnerable" development should not be permitted in Flood Zone 3b.

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 3b
- 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.

8.3 Guidance for site design and making development safe

- Residential development will need to be avoided within the area of the CCMA on site. Development for other uses in the CCMA will only be appropriate subject to the criteria defined in Policy C6 of the Local Plan. A Coastal Change Vulnerability Assessment will need to accompany any planning application for the site.
- 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. Development should be steered outside areas within Flood Zone 3b. Where ground raising or flood defences are

proposed as part of a development surface water 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.

- 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.
- Development is unlikely to be acceptable unless sea defences are improved to provide the appropriate levels of protection, taking into consideration climate change and sea level rise.
- A buffer of 16-metres from the toe of the flood defence, clear of development, will need to be maintained to allow for access and maintenance. Any flood risk activities carried out within 16 metres of the main river, or tidal defence would require a Flood Risk Activity Permit.
- 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. Wave overtopping should also be considered and the design of the development should take this into account.
- 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

The northern area of the site is within Flood Zone 3b and the rest of the site is within Flood Zone 1. A sea wall is located 30m to the northwest. In this area Flood Zone 3b has a larger extent than Flood Zone 2 and 3a. This is due to the overtopping of flood defences.

According to the North Kent Coast model defended extents, during the present day events the northern area of the site is predicted to flood due to the proximity to the coast and low lying land. During the climate change event, the flooding is predicted to encroach further into the site from the north.

According to the Warden Bay Stream model, the site is not shown to flood during the 3.3% (1 in 30-year), 1% (1 in 100-year) or 0.1% AEP (1 in 1000-year) events.

In terms of surface water flood risk, during the 3.3% (1 in 30-year) and 1% AEP (1 in 100-year) events, surface water flooding is predicted in between the current housing as well as between the roads in the centre, south, north and northwestern corner of the site. During the 0.1% AEP (1 in 1000-year) event there is more extensive flooding predicted in the areas mentioned as well as further flooding along Manor Way and the other unnamed roads within the site. The 1% AEP (1 in 100-year) plus climate change event is predicted to result in increased flooding compared to the 1% AEP (1 in 100-year) event, particularly in the central area between Manor Way and an unnamed road, as well as between the existing housing.

There have been 18 sewer flood incidents in the ME12 4 postcode area since 2015.

According to Kent County Council's historic records, the site is within an area that has had 6 flood incidents.

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

- Residential development will need to be avoided within the area of the CCMA on site. Development for other uses in the CCMA will only be appropriate subject to the criteria defined in Policy C6 of the Local Plan. A Coastal Change Vulnerability Assessment will need to accompany any planning application for the site.
- The Environment Agency has confirmed development would only be acceptable if sea defences are improved to provide the appropriate levels of protection, taking into consideration climate change and sea level rise. The current defence would not provide sufficient protection for the lifetime of the development.
- 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. Development should be steered outside areas within Flood Zone 3b. Where ground raising or flood defences are proposed as part of a development surface water flow paths should be avoided to prevent detriment elsewhere. If flow paths cannot be avoided then site-specific

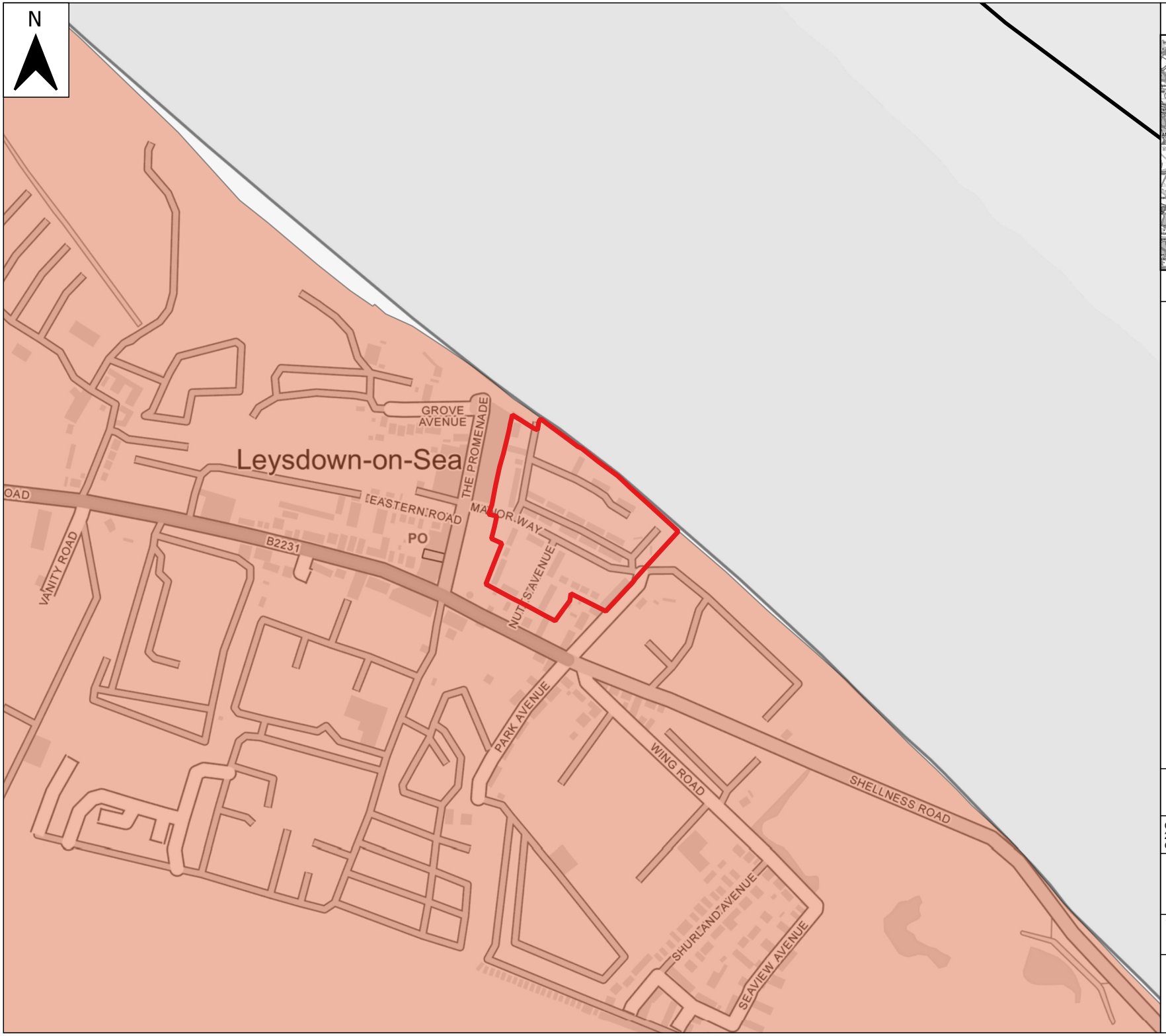
hydraulic modelling will be needed to demonstrate that there is no impact on flood risk elsewhere.

- 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. The impacts of wave overtopping should also be considered.
- 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 buffer of 16-metres from the toe of the flood defence, clear of development, will need to be maintained to allow for access and maintenance. Any flood risk activities carried out within 16 metres of the main river, or tidal defence would require a Flood Risk Activity Permit.

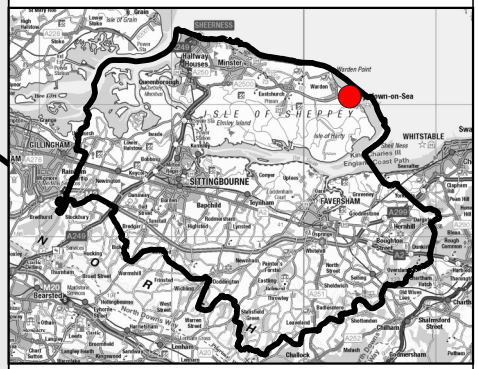
A Sources of information

- 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-323

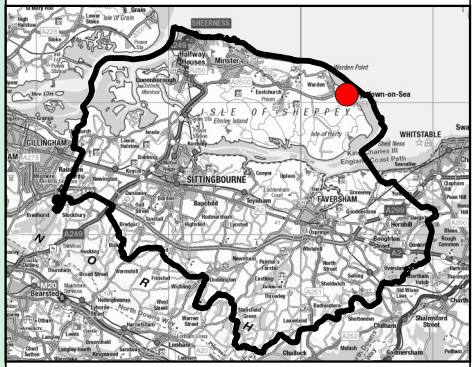
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Swale BOROUGH COUNCIL
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Location Plan



Legend

Swale Borough Outline

Site boundary

Topography

LIDAR 1m DTM (mAOD)

14.7

-0.74

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 50 100 m

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LEVEL 2 SFRA:
TOPOGRAPHY - SHELAA-323

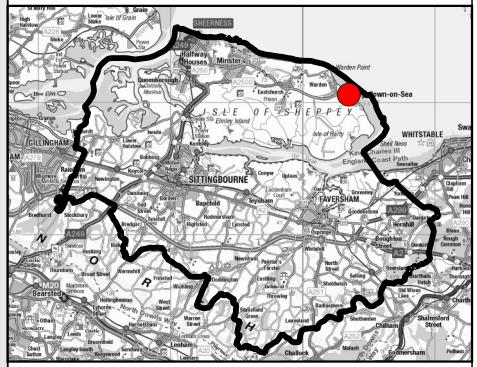
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Location Plan



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.

0 50 100 m

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SWALE BOROUGH COUNCIL
LEVEL 2 SFRA:
HISTORIC FLOODING - SHELAA-323

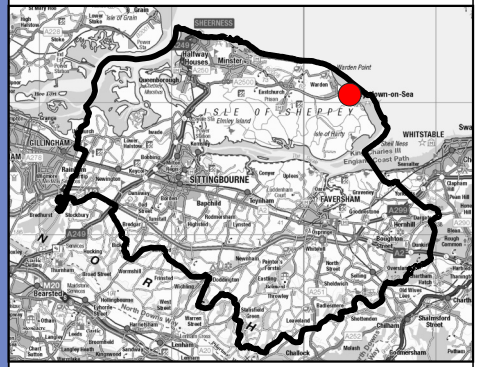
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Location Plan



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.

0 50 100 m

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SWALE BOROUGH COUNCIL
LEVEL 2 SFRA:
PRESENT DAY FLOOD RISK FROM RIVERS AND SEA (FLOOD ZONES) - SHELAA-323

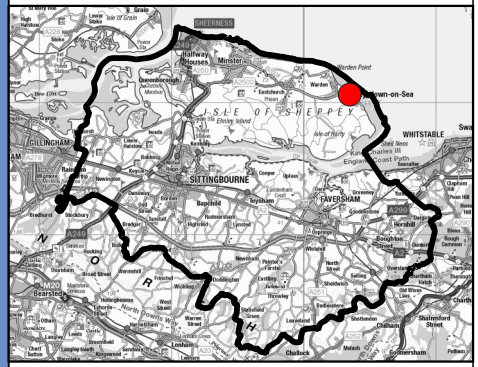
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Location Plan



Legend

- Swale Borough Outline
- Site Boundary
- 3.3% AEP (1 in 30-year)
- 0.5% AEP (1 in 200-year)
- 0.1% AEP (1 in 1000-year)

EA Flood Defence Types

- Wall

Notes

Present day extents for the North Kent Coast modelling study shows the tidal and coastal flood risk for the 3.3% AEP (1 in 30-year) defended flood event and 0.5% AEP (1 in 200-year) and 0.1% (1 in 1000-year) defended flood events.

0 50 100 m

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SWALE BOROUGH COUNCIL
LEVEL 2 SFRA:
NORTH KENT COAST MODEL - DEFENDED
PRESENT DAY TIDAL EXTENT - SHELAA-323

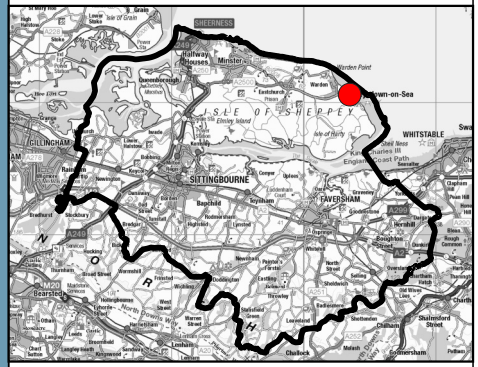
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Location Plan



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-

0 50 100 m

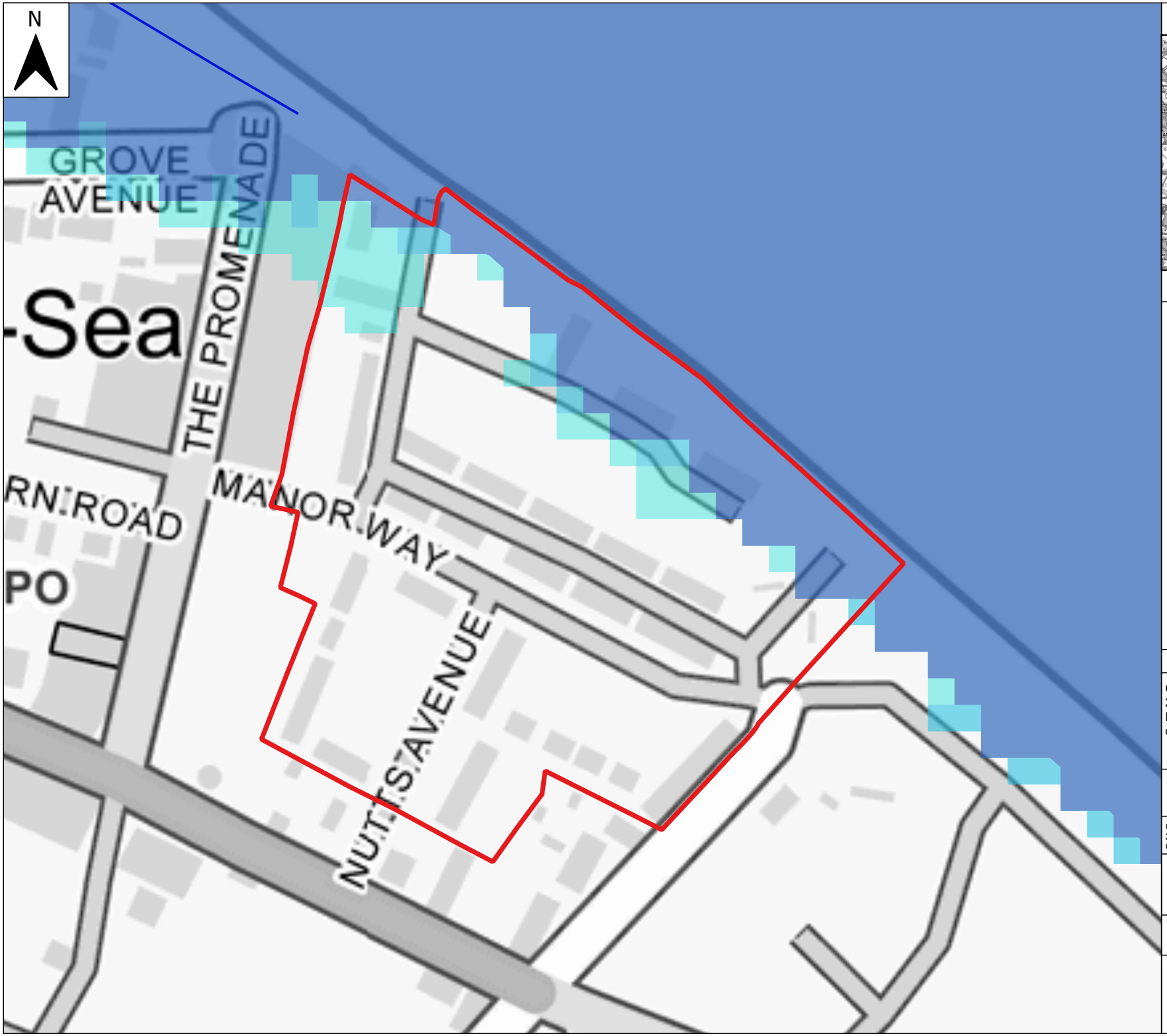
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LEVEL 2 SFRA:
FUTURE FLOOD RISK FROM RIVERS AND SEA - FLOOD MAP FOR PLANNING- SHELAA-323

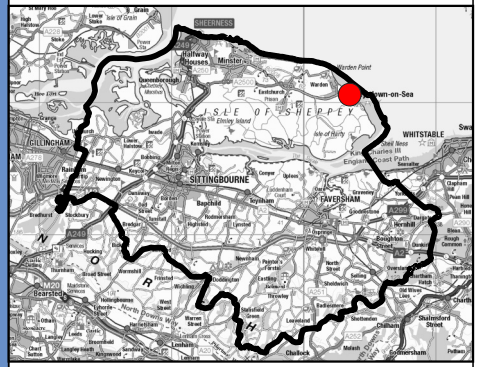
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Location Plan



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

- Wall

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 50 100 m

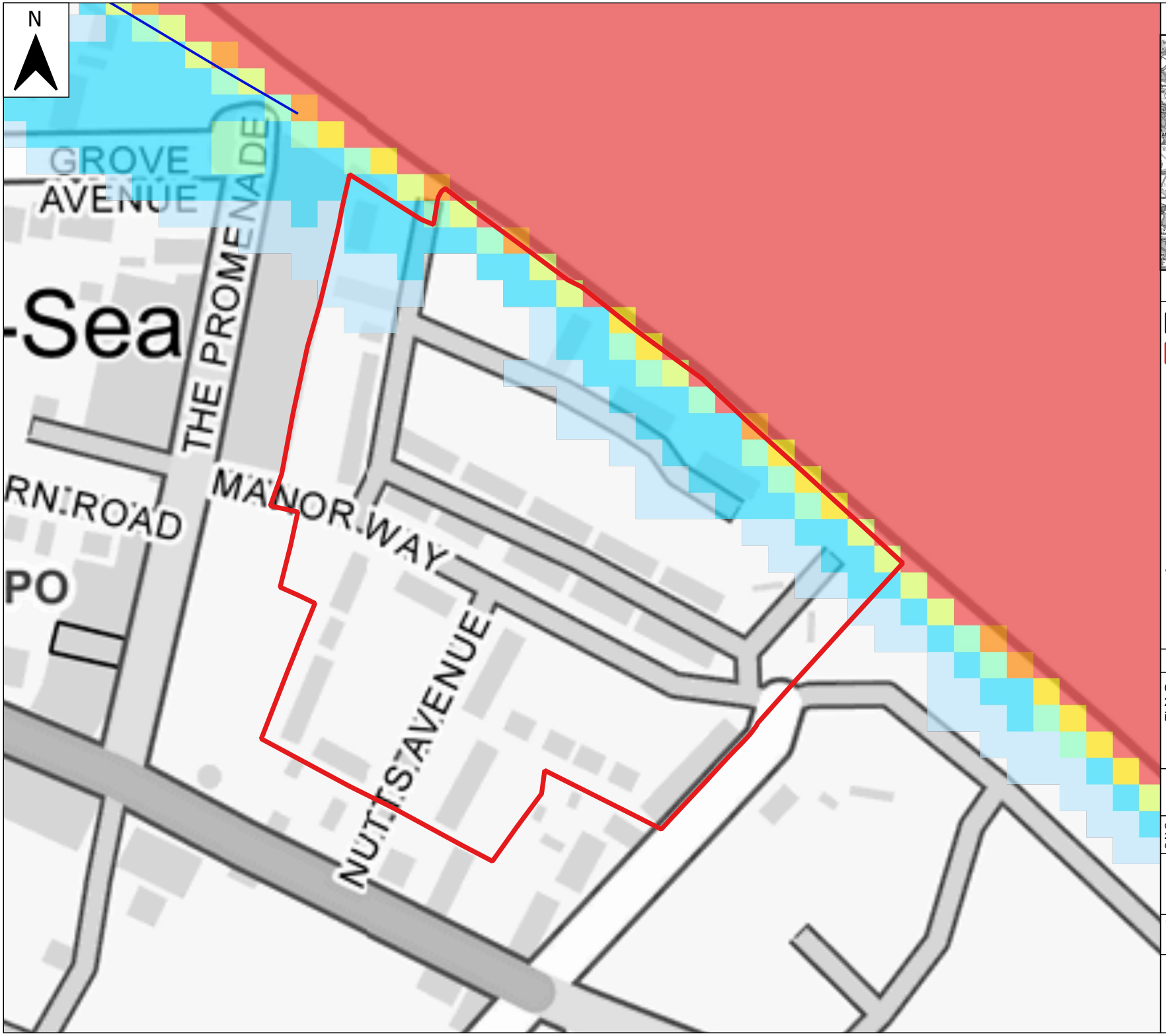
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FUTURE FLOOD RISK FROM THE SEA - NORTH KENT COAST MODEL - SHELAA-323

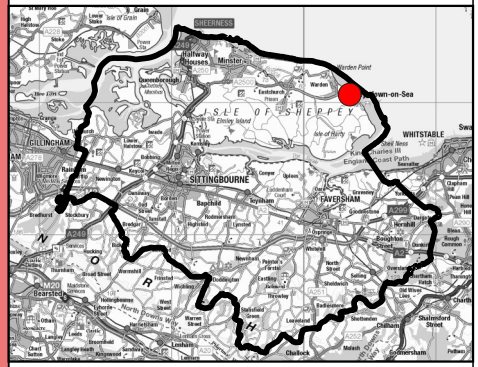
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Location Plan



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

- Wall

Notes

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

0 50 100 m

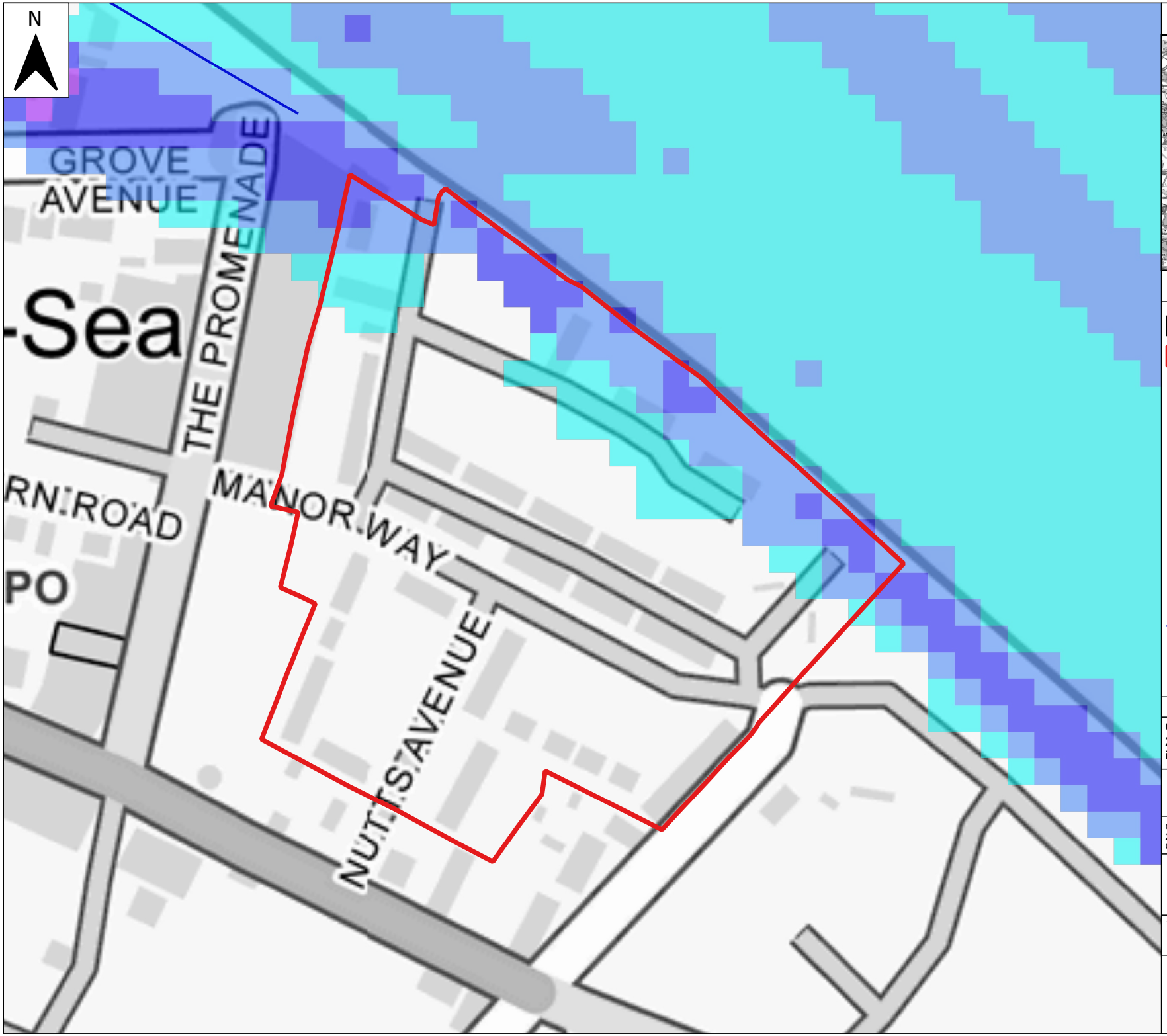
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LEVEL 2 SFRA:
FUTURE FLOOD RISK FROM THE SEA - NORTH KENT COAST MODEL DEPTH - SHELAA-323

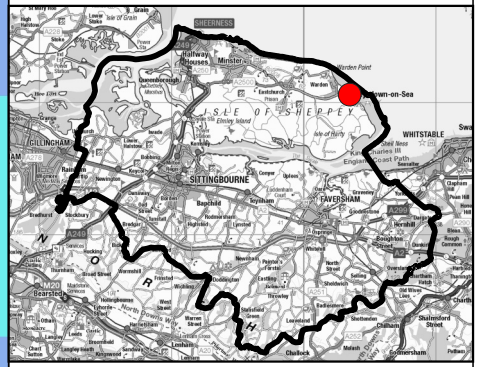
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Location Plan



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

- Wall

Notes

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

0 50 100 m

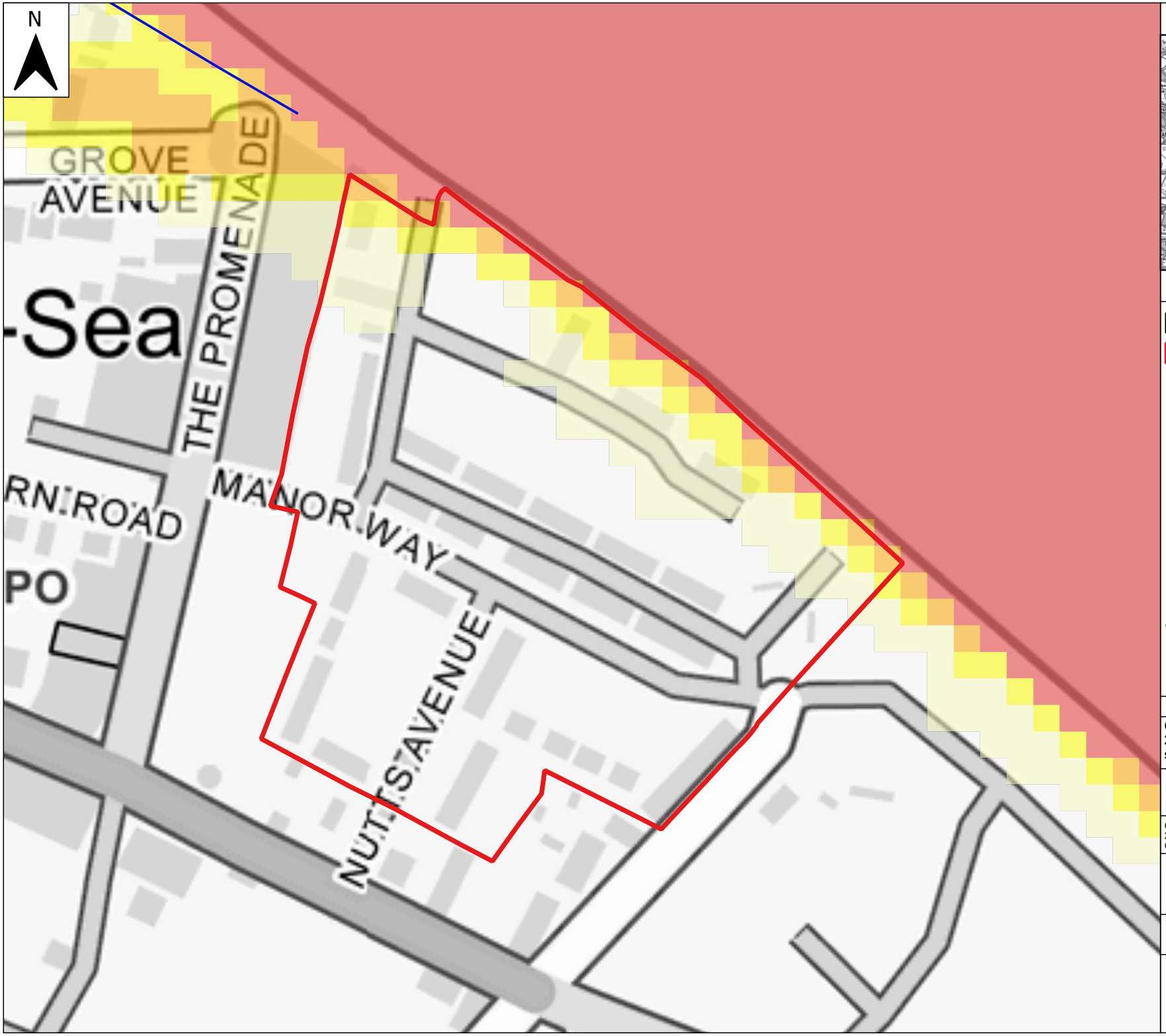
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SWALE BOROUGH COUNCIL
LEVEL 2 SFRA:
FUTURE FLOOD RISK FROM THE SEA - NORTH KENT COAST MODEL VELOCITY - SHELAA-323

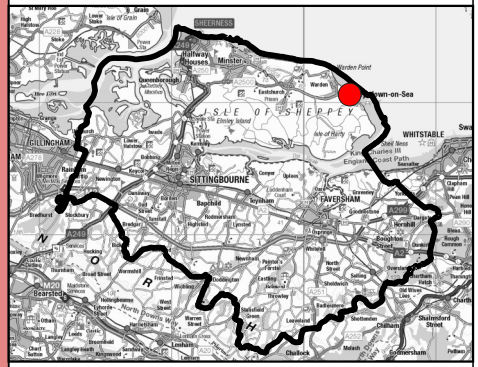
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Location Plan



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

- Wall

Notes

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

0 50 100 m

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SWALE BOROUGH COUNCIL
LEVEL 2 SFRA:
FUTURE FLOOD RISK FROM THE SEA - NORTH KENT COAST MODEL HAZARD - SHELAA-323

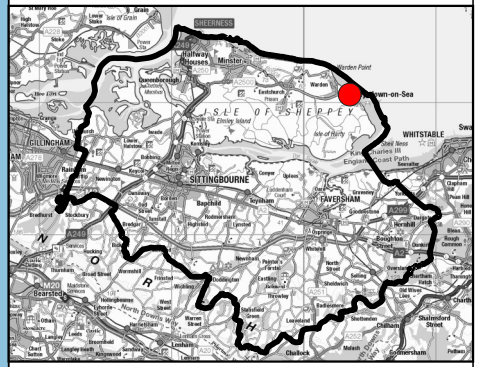
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Location Plan



Legend

- Swale Borough Outline
- Site boundary
- North Kent Coast Model - 0.5% AEP (1 in 200-year) 2075 UE Breach Extent

EA Flood Defences Types

- Wall

Notes

Breach modelling is a hydraulic approach used to simulate the failure or overtopping of a flood defence, such as a flood wall or embankment, during a given flood event. It assesses how such a failure would influence flood extents and the potential impacts on surrounding areas.
In the North Kent Coast Model, breach modelling was carried out at several locations. The results presented here relate to all of the breaches, which represent simulated failures of surrounding defences during the climate change 0.5% AEP (1 in 200-year) event with the Upper End estimate (2075), illustrating the predicted extent of flooding under these conditions.

0 50 100 m

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FUTURE BREACH RISK FROM THE SEA - NORTH KENT COAST MODEL EXTENT - SHELAA-323

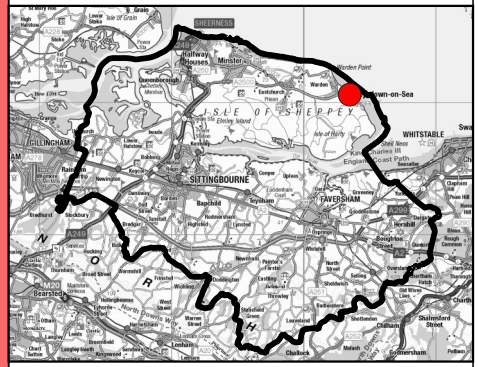
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Location Plan



Legend

- Swale Borough Outline
- Site boundary

North Kent Coast Model - 0.5% AEP (1 in 200-year) 2075 UE Breach 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

- Wall

Notes

Breach modelling is a hydraulic approach used to simulate the failure or overtopping of a flood defence, such as a flood wall or embankment, during a given flood event. It assesses how such a failure would influence flood extents and the potential impacts on surrounding areas.
In the North Kent Coast Model, breach modelling was carried out at several locations. The results presented here relate to the maximum depth of all the breaches, which represent simulated failures of surrounding defences during the climate change 0.5% AEP (1 in 200-year) event with the Upper End estimate (2075), illustrating the predicted depth of flooding under these conditions.

0 50 100 m

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FUTURE BREACH RISK FROM THE SEA - NORTH KENT COAST MODEL DEPTH - SHELAA-323

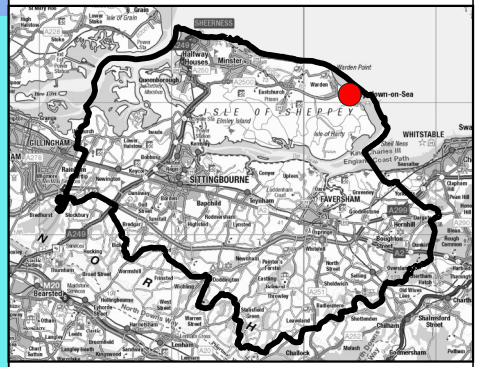
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Location Plan



Legend

- Swale Borough Outline
- Site boundary

North Kent Coast Model - 0.5% AEP (1 in 200-year) 2075 UE Breach 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

- Wall

Notes

Breach modelling is a hydraulic approach used to simulate the failure or overtopping of a flood defence, such as a flood wall or embankment, during a given flood event. It assesses how such a failure would influence flood extents and the potential impacts on surrounding areas.
In the North Kent Coast Model, breach modelling was carried out at several locations. The results presented here relate to the maximum velocity of all the breaches, which represent simulated failures of surrounding defences during the climate change 0.5% AEP (1 in 200-year) event with the Upper End estimate (2075), illustrating the predicted velocity of flooding under these conditions.

0 50 100 m

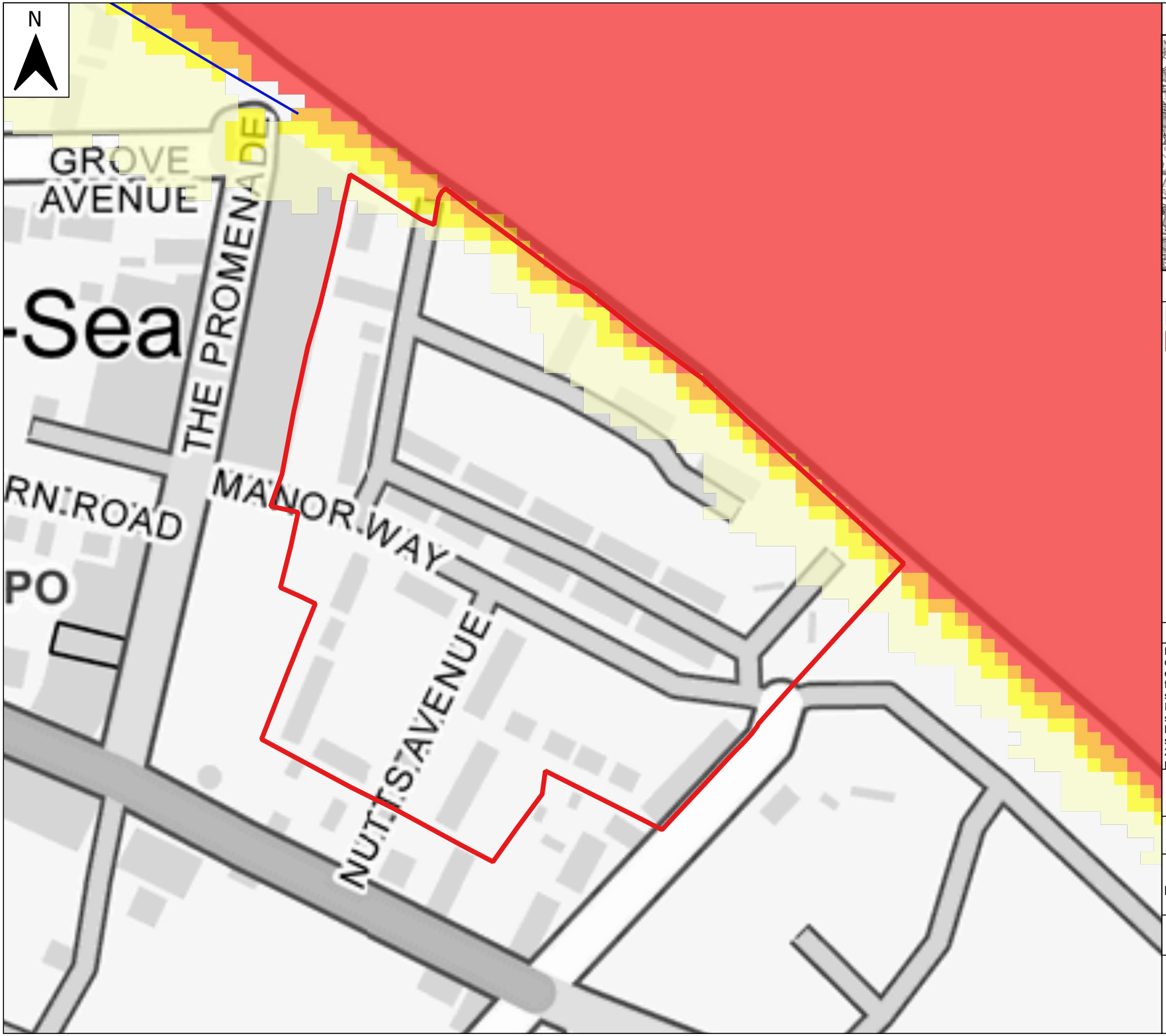
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FUTURE BREACH RISK FROM THE SEA - NORTH KENT COAST MODEL VELOCITY - SHELAA-323

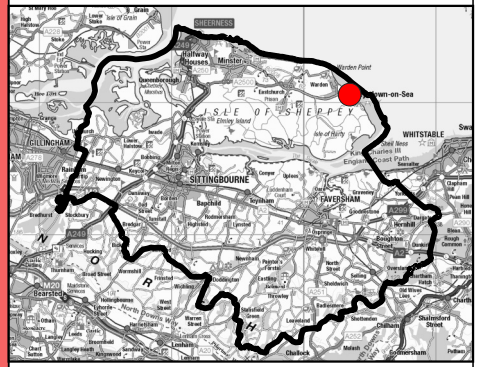
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Location Plan



Legend

- Swale Borough Outline
- Site boundary

North Kent Coast Model - 0.5% AEP (1 in 200-year) 2075 UE Breach Hazard Classification

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

EA Flood Defences Types

- Wall

Notes

Breach modelling is a hydraulic approach used to simulate the failure or overtopping of a flood defence, such as a flood wall or embankment, during a given flood event. It assesses how such a failure would influence flood extents and the potential impacts on surrounding areas.
In the North Kent Coast Model, breach modelling was carried out at several locations. The results presented here relate to the maximum hazard of all the breaches, which represent simulated failures of surrounding defences during the climate change 0.5% AEP (1 in 200-year) event with the Upper End estimate (2075), illustrating the predicted hazard of flooding under these conditions.

0 50 100 m

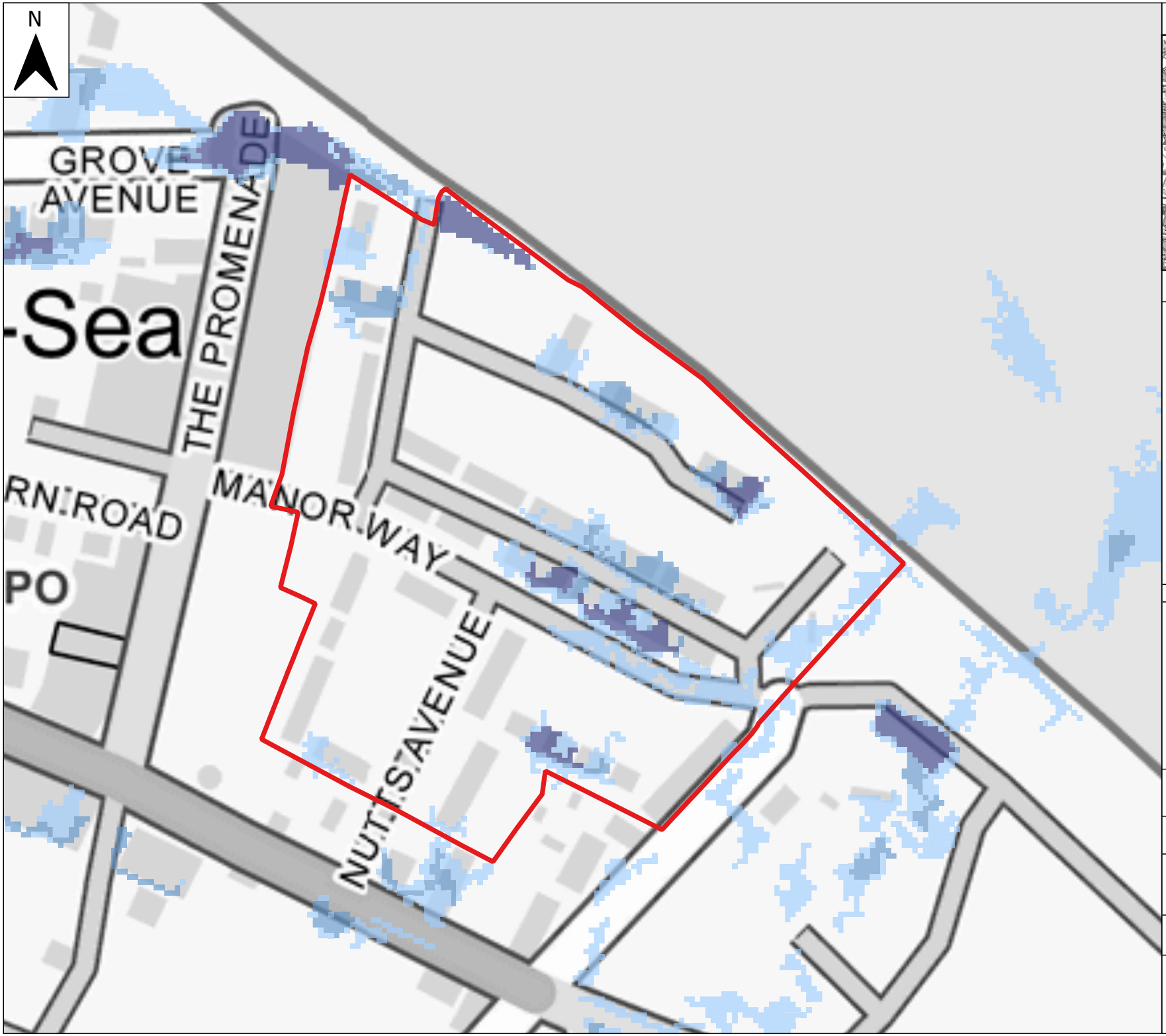
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LEVEL 2 SFRA:
FUTURE BREACH RISK FROM THE SEA - NORTH KENT COAST MODEL HAZARD - SHELAA-323

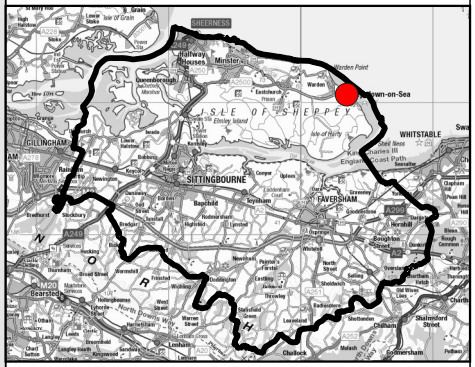
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Location Plan



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 50 100 m

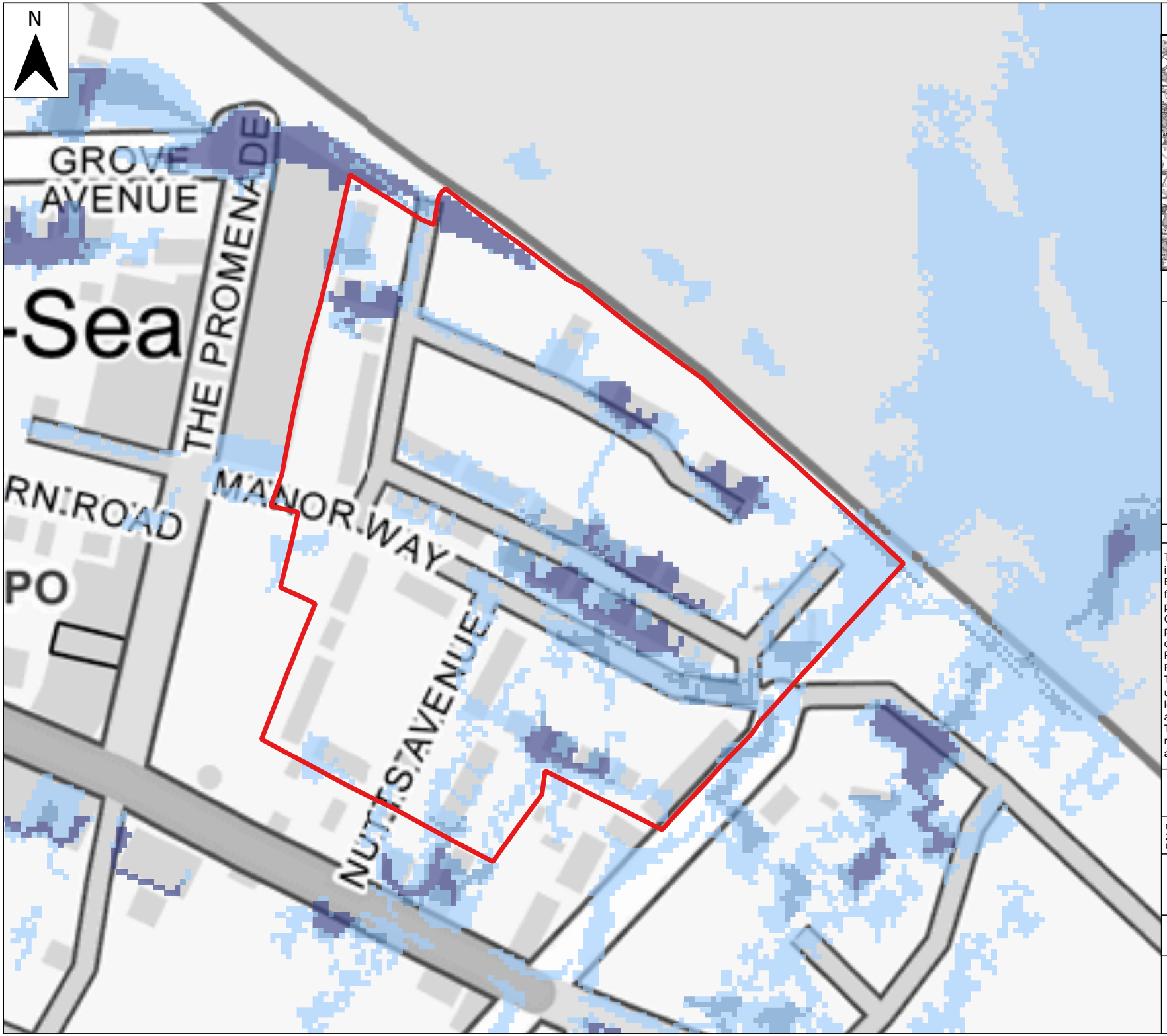
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LEVEL 2 SFRA:
SURFACE WATER FLOODING - SHELAA-323

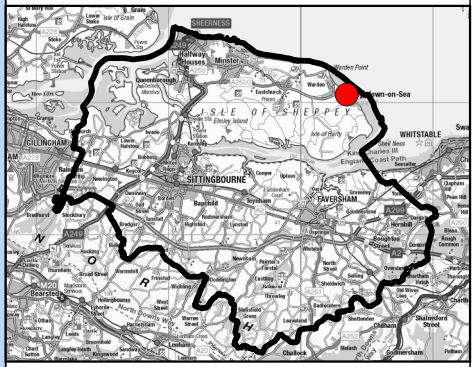
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Swale BOROUGH COUNCIL
Making Swale a better place



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 50 100 m

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SWALE BOROUGH COUNCIL
LEVEL 2 SFRA:
SURFACE WATER FLOODING PLUS CLIMATE CHANGE - SHELAA-323

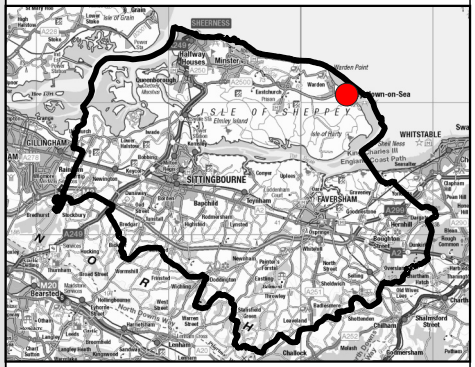
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FMfP Surface Water Spatial Planning Depths
1% AEP (1 in 100-year) plus climate change

- <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 50 100 m

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LEVEL 2 SFRA:
SURFACE WATER FLOODING PLUS CLIMATE CHANGE DEPTHS - SHELAA-323

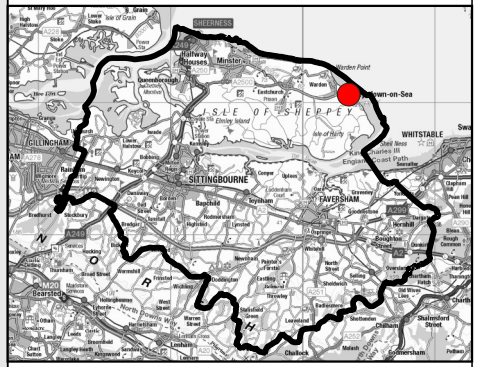
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JBA Groundwater Flood Map Depths

- 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 50 100 m

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LEVEL 2 SFRA:
JBA GROUNDWATER FLOOD MAP - SHELAA-323

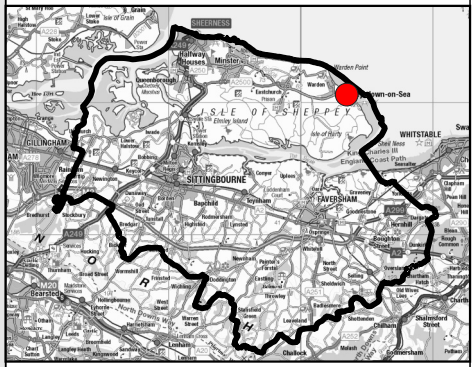
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Location Plan



Legend

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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.

0 50 100 m

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LEVEL 2 SFRA:
RISK OF FLOODING FROM RESERVOIRS - SHELAA-323

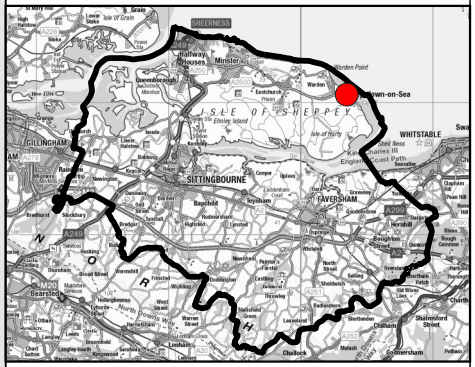
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Location Plan



Legend

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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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LEVEL 2 SFRA:
ENVIRONMENT AGENCY FLOOD WARNINGS AND ALERTS - SHELAA-323

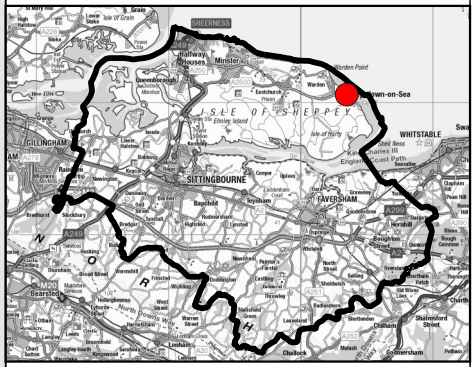
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Coastal Change Management Area

- Erosion Zone 1
- Erosion Zone 2
- North Kent Coast model Defended 3.3% AEP (1 in 30-year) 2125 Upper End

Notes

The North Kent Coast 2125 Upper End defended 3.3% AEP flood extent has been used to identify land which is predicted to be at risk of inundation by 2125.

The National Coastal Erosion Risk Map (NCERM) Shoreline Management Plan (SMP) 2055 plus 95% (Upper End) climate change allowance and 2105 plus 95% (Upper End) climate change allowance datasets have been used to identify the areas where the whole period covered by the SMP is No Active Intervention or Managed Realignment and there is predicted to be a coastal erosion risk over the next 100 years. It is noted that the SMP considers the year 2105 and does not consider 100 years into the future. However, this is the best readily available information.

Using the two epochs, the CCMA is divided into two separate zones:

- Erosion Zone 1 (defined as the Environment Agency's Coastal Erosion Climate Change (Upper End) to 2055 zone; and
- Erosion Zone 2 (defined as the Environment Agency's Coastal Erosion Climate Change (Upper End) to 2105 zone).

0 50 100 m

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LEVEL 2 SFRA:
COASTAL CHANGE MANAGEMENT AREAS - SHELAA-323

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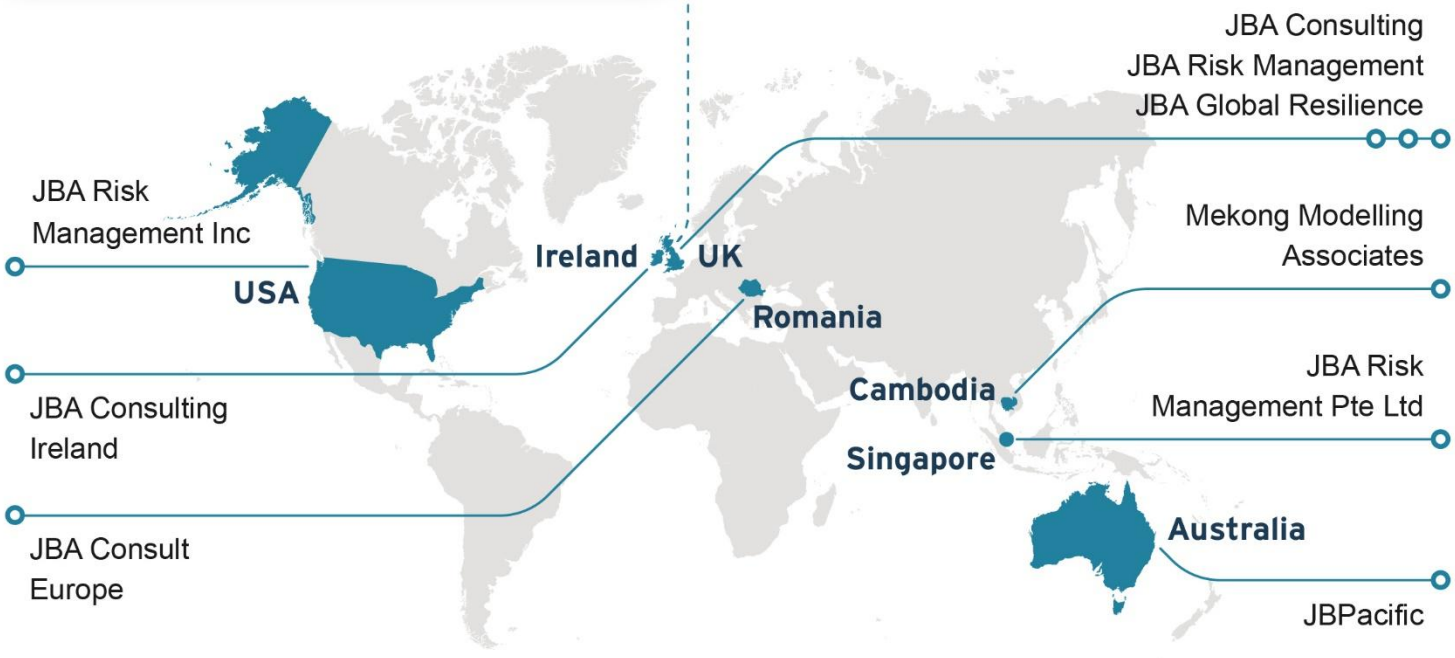
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