

# **Wirral Level 2 Strategic Flood Risk Assessment – Summary Report**

**Final Report**

**February 2022**

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V4.0 Final February 2022	Council comments addressed	John Entwistle

## Contract

This report describes work commissioned by John Entwistle, on behalf of Wirral Council, by an email dated 29 July 2021. Wirral Council’s representatives for the contract were John Entwistle and Rachel Bryan. Hannah Bishop, Laura Thompson, Maria Botterill and Mike Williamson of JBA Consulting carried out this work.

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## Purpose

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## Abbreviations

AOD	Above Ordnance Datum
BGS	British Geological Survey
EA	Environment Agency
FRCC-PPG	Flood Risk and Coastal Change Planning Practice Guidance
FMfP	Flood Map for Planning
FAA	Flood Alert Area
FRA	Flood Risk Assessment
FWA	Flood Warning Area
HFM	Historic Flood Map
LIDAR	Light Detection and Radar
LLFA	Lead Local Flood Authority
LPA	Local Planning Authority
NPPF	National Planning Policy Framework
RFM	Reservoir Flood Map
RoFSW	Risk of Flooding from Surface Water map
SFRA	Strategic Flood Risk Assessment
SuDS	Sustainable Drainage Systems
WFD	Water Framework Directive
UU	United Utilities

## 1 Introduction

Wirral Council (the Council) requires a Level 2 Strategic Flood Risk Assessment (SFRA), following on from the Level 1 SFRA, finalised June 2021. The Level 1 study assessed flood risk to 702 potential sites with 25 of these sites identified as requiring further, more detailed investigation through a Level 2 SFRA, before they could be considered for allocation in the Council's new Local Plan. The 25 sites are mainly located in the north and east of the Wirral administrative area, as shown on Figure 1-1.

As with the Level 1 SFRA, the Level 2 study must comply with the latest National Planning Policy Framework<sup>1</sup> (NPPF), revised in July 2021, and the latest Flood Risk and Coastal Change Planning Practice Guidance<sup>2</sup> (FRCC-PPG), published March 2014. The Level 2 study should also be prepared in line with the latest Environment Agency (EA) guidance on what local planning authorities (LPA) need to include in a Level 2 SFRA<sup>3</sup> and also the latest climate change allowances<sup>4</sup>, updated July 2021 for peak river flows.

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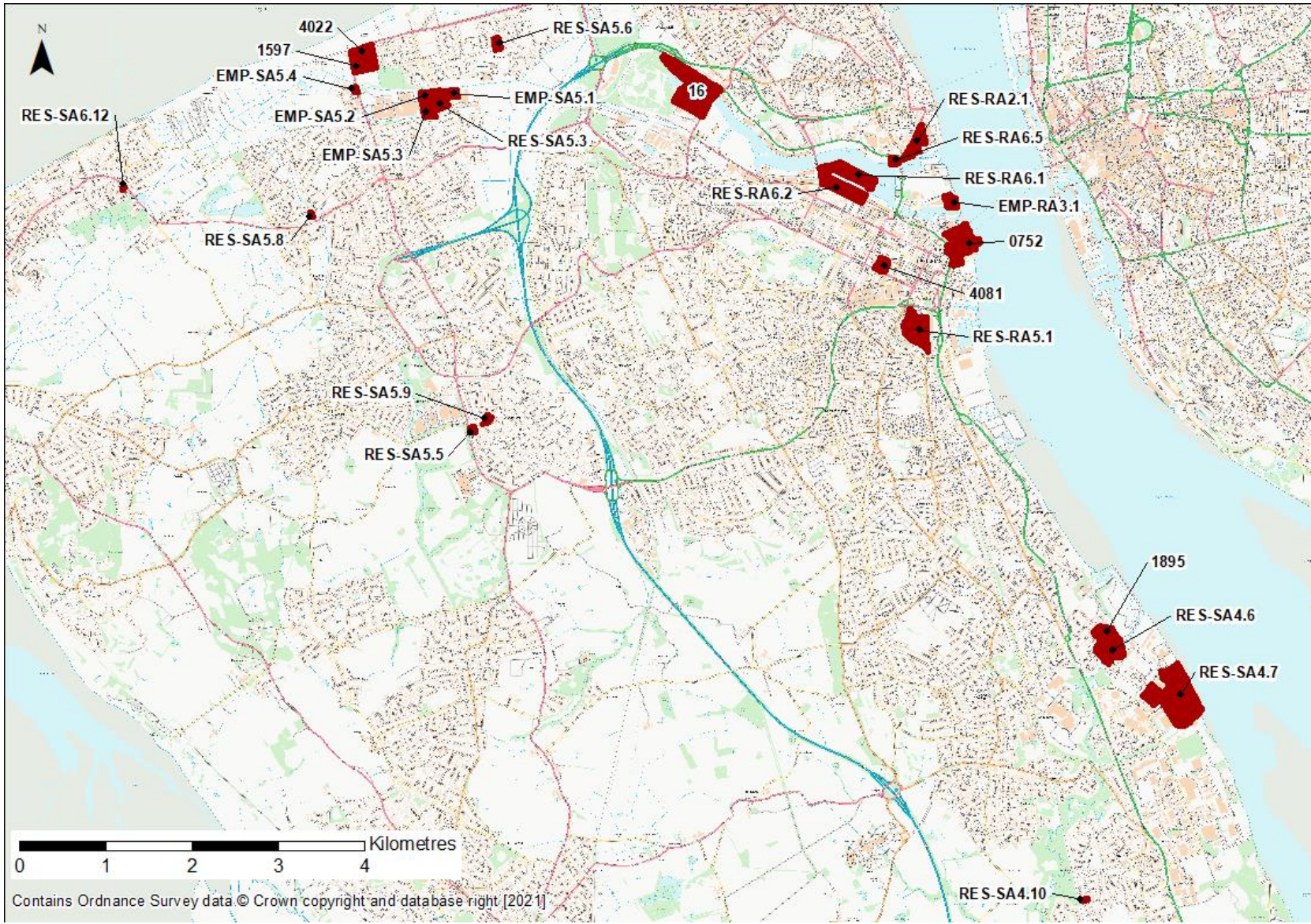
1 <https://www.gov.uk/government/publications/national-planning-policy-framework--2>

2 <https://www.gov.uk/guidance/flood-risk-and-coastal-change>

3 <https://www.gov.uk/guidance/local-planning-authorities-strategic-flood-risk-assessment#level-2-sfra-what-to-include>

4 <https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances>





**Figure 1-1: Level 2 site locations**



## 1.1 Scope

Site ID	Site name	Scope of main requirements
SHLAA 0953/ WELPS 16	Former Bidston Dock, Wallasey Bridge Road	Risk from Mersey Estuary West Float – Mersey Estuary 2018 model. Assess modelled depths, hazards. Modelling of climate change allowances required.  Surface water attenuation requirements
SHLAA 0752	Land at Woodside, Chester Street, Birkenhead	Required to pass Exception Test  Risk from Mersey Estuary – Mersey Estuary 2018 model. Assess modelled depths, hazards. Modelling of climate change allowances required.  Modelling of land raising mitigation option  Surface water attenuation requirements
SHLAA 1597	East of 169 to 187 Pasture Road, Moreton	Required to pass Exception Test  Risk from coast – Wirral Tidal model 2015, and also fluvial risk from the Birket - Birket Fender Arrow Brook Fluvial model 2011. Assess modelled depths, hazards. Modelling of climate change allowances required.  Modelling of defence breach scenario on Wallasey Embankment to assess residual risk. Require details on defences from EA, most appropriate breach location(s)  Modelling of land raising mitigation option  Surface water attenuation requirements
SHLAA 1895	Land and Marine Depot, Dock Road North, Bromborough Pool	Required to pass Exception Test  Tidal risk from Mersey Estuary and Dibbinsdale Brook – Mersey Estuary 2018 model. Assess modelled depths, hazards. Modelling of climate change allowances required.  Modelling of land raising mitigation option  Surface water attenuation requirements
SHLAA 4022	Land at Pasture Road/Leasowe Road	Required to pass Exception Test  Risk from coast – Wirral Tidal model 2015, and also fluvial risk from the Birket - Birket Fender Arrow Brook Fluvial model 2011. Assess modelled depths, hazards. Modelling of climate change allowances required.  Modelling of defence breach scenario on Wallasey Embankment



Site ID	Site name	Scope of main requirements
		to assess residual risk. Require details on defences from EA, most appropriate breach location(s)  Surface water attenuation requirements
SHLAA 4081	Birkenhead Leisure Centre Europa Boulevard	Surface water risk assessment of depths and hazards  Surface water attenuation requirements
EMP-RA3.1	Wirral Waters - Morpeth Wharf, Twelve Quays	Risk from Mersey Estuary – Mersey Estuary 2018 model. Assess modelled depths, hazards. Modelling of climate change allowances required.  Surface water attenuation requirements
EMP-SA5.1	Peninsula Business Park, Moreton	Tidal risk – Wirral Tidal model 2015, and / or Birket Fender Arrow Brook Fluvial model 2011. Assess modelled depths, hazards. Modelling of climate change allowances required.  Modelling of defence breach scenario on Wallasey Embankment to assess residual risk. Require details on defences from EA, most appropriate breach location(s)  Surface water attenuation requirements
EMP-SA5.2	Premier Brands, Reeds Lane - North of Access Road, Moreton	Tidal risk – Wirral Tidal model 2015, and / or Birket Fender Arrow Brook Fluvial model 2011. Assess modelled depths, hazards. Modelling of climate change allowances required.  Modelling of defence breach scenario on Wallasey Embankment to assess residual risk. Require details on defences from EA, most appropriate breach location(s)  Surface water attenuation requirements
EMP-SA5.3	East of Typhoo, Moreton	Tidal risk – Wirral Tidal model 2015, and / or Birket Fender Arrow Brook Fluvial model 2011. Assess modelled depths, hazards. Modelling of climate change allowances required.  Modelling of defence breach scenario on Wallasey Embankment to assess residual risk. Require details on defences from EA, most appropriate breach location(s)  Surface water attenuation requirements
EMP-SA5.4	Land at Tarran Way North, Moreton	Tidal risk – Wirral Tidal model 2015, and / or Birket Fender Arrow Brook Fluvial model 2011. Assess modelled depths, hazards. Modelling of climate change allowances required.  Modelling of defence breach scenario on Wallasey Embankment to assess residual risk. Require details on defences from EA, most appropriate breach location(s)  Surface water attenuation requirements

Site ID	Site name	Scope of main requirements
RES-RA2.1	SHLAA 5000 Scott's Quay	<p>Required to pass Exception Test</p> <p>Risk from Mersey Estuary East Float – Mersey Estuary 2018 model. Assess modelled depths, hazards. Modelling of climate change allowances required.</p> <p>Modelling of land raising mitigation option</p> <p>Surface water attenuation requirements</p>
RES-RA5.1	SHLAA 4078 Hind street	<p>Surface water risk assessment of depths and hazards</p> <p>Surface water attenuation requirements</p>
RES-RA6.1	Wirral Waters - Sky City	<p>Required to pass Exception Test</p> <p>Risk from Mersey Estuary East Float – Mersey Estuary 2018 model. Assess modelled depths, hazards. Modelling of climate change allowances required.</p> <p>Modelling of land raising mitigation option</p> <p>Surface water attenuation requirements</p>
RES-RA6.2	Wirral Waters - Vittoria Studios	<p>Required to pass Exception Test</p> <p>Risk from Mersey Estuary East Float – Mersey Estuary 2018 model. Assess modelled depths, hazards. Modelling of climate change allowances required.</p> <p>Modelling of land raising mitigation option</p> <p>Surface water attenuation requirements</p>
RES-RA6.5	SHLAA 2080 Wirral Waters - Northbank East 3	<p>Required to pass Exception Test</p> <p>Risk from Mersey Estuary East Float – Mersey Estuary 2018 model. Assess modelled depths, hazards. Modelling of climate change allowances required.</p> <p>Modelling of land raising mitigation option</p> <p>Surface water attenuation requirements</p>
RES-SA4.10	SHLAA 4088 - Maple Grove, Bromborough, Wirral	<p>Surface water risk assessment of depths and hazards</p> <p>Surface water attenuation requirements</p>
RES-SA4.6	SHLAA 2072 Former Croda, Bromborough Pool	<p>Required to pass Exception Test</p> <p>Tidal risk from Mersey Estuary and Dibbinsdale Brook – Mersey Estuary 2018 model. Assess modelled depths, hazards. Modelling of climate change allowances required.</p>

Site ID	Site name	Scope of main requirements
		Surface water attenuation requirements
RES-SA4.7	SHLAA 4021 Land off Dock Road South, Bromborough	<p>Required to pass Exception Test</p> <p>Risk from Mersey Estuary – Mersey Estuary 2018 model. Assess modelled depths, hazards. Modelling of climate change allowances required.</p> <p>Surface water attenuation requirements</p>
RES-SA5.3	SHLAA 2068 East of Typhoo, Moreton	<p>Required to pass Exception Test</p> <p>Risk from coast – Wirral Tidal model 2015, and also fluvial risk from the Birket - Birket Fender Arrow Brook Fluvial model 2011. Assess modelled depths, hazards. Modelling of climate change allowances required.</p> <p>Modelling of defence breach scenario on Wallasey Embankment to assess residual risk. Require details on defences from EA, most appropriate breach location(s)</p> <p>Modelling of land raising mitigation option</p> <p>Surface water attenuation requirements</p>
RES-SA5.5	SHLAA 4014 THE STIRRUP, ARROWE PARK ROAD	<p>Surface water risk assessment of depths and hazards</p> <p>Surface water attenuation requirements</p>
RES-SA5.6	SHLAA 5146 Land at Twickenham Drive	<p>Required to pass Exception Test</p> <p>Tidal risk – Wirral Tidal model 2015, and / or Birket Fender Arrow Brook Fluvial model 2011. Assess modelled depths, hazards. Modelling of climate change allowances required.</p> <p>Modelling of defence breach scenario on Wallasey Embankment to assess residual risk. Require details on defences from EA, most appropriate breach location(s)</p> <p>Surface water attenuation requirements</p>
RES-SA5.8	SHLAA 0725 Rear of 1 to 5 Broster Close, Moreton	<p>Fluvial risk from Arroe Brook - Birket Fender Arrow Brook Fluvial model 2011. Assess modelled depths, hazards. Modelling of climate change allowances required.</p> <p>Surface water risk assessment of depths and hazards</p> <p>Surface water attenuation requirements</p>
RES-SA5.9	SHLAA 1908 Former Arroe Hill Primary School, Woodchurch	<p>Surface water risk assessment of depths and hazards</p> <p>Surface water attenuation requirements</p>

Site ID	Site name	Scope of main requirements
RES-SA6.12	SHLAA 5055 Beauty Within, 206 BIRKENHEAD ROAD, MEOLS, CH47 0NF	<p>Required to pass Exception Test</p> <p>Tidal risk – Wirral Tidal model 2015, and / or Birket Fender Arrow Brook Fluvial model 2011. Assess modelled depths, hazards. Modelling of climate change allowances required.</p> <p>Modelling of defence breach scenario on Wallasey Embankment to assess residual risk. Require details on defences from EA, most appropriate breach location(s)</p> <p>Surface water attenuation requirements</p>

**Table 1-1: Scope summary**



## 2 Level 2 SFRA

EA guidance states a Level 2 SFRA should:

- be detailed enough for the LPA to identify which development allocation sites have the least risk of flooding
- contain the information needed to apply the exception test, if relevant
- enable the LPA to decide if development can be made safe without increasing flood risk elsewhere

It should also enable the LPA to:

- apply the sequential test by identifying the severity and variation in risk within medium and high flood risk areas
- establish whether proposed allocations or windfall sites, on which your local plan will rely, are capable of being made safe throughout their lifetime without increasing flood risk elsewhere
- apply the exception test, where relevant.

### 2.1 The Exception Test

The FRCC-PPG states:

*In considering an allocation in a Local Plan a level 2 Strategic Flood Risk Assessment should inform consideration of the second part of the Exception Test. (FRCC-PPG para 025).*

The NPPF sets out the Exception Test as follows:

*The application of the exception test should be informed by a strategic or site-specific flood risk assessment, depending on whether it is being applied during plan production or at the application stage. To pass the exception test to be passed it should be demonstrated that:*

- a) the development would provide wider sustainability benefits to the community that outweigh the flood risk; and*
- b) the development will be safe for its lifetime taking account of the vulnerability of its users, without increasing flood risk elsewhere, and, where possible, will reduce flood risk overall.*

*Both elements of the exception test should be satisfied for development to be allocated or permitted. (NPPF paras 164 and 165).*

*The Exception Test is a method to demonstrate and help ensure that flood risk to people and property will be managed satisfactorily, while allowing necessary development to go ahead in situations where suitable sites at lower risk of flooding are not available. (FRCC-PPG para 023).*

The LPA will demonstrate that part a) of the Exception Test has been passed for each relevant site in a separate sequential and exception test paper. This Level 2 study therefore assesses whether each site can pass part b) of the Exception Test by providing further, more detailed, site-specific assessments based on the latest EA flood modelling and flood risk information.

### 2.2 Objectives

The aim of a Level 2 study is to build on the findings of the Level 1 assessment, focussing on high-risk communities or sites. This allows the SFRA to be time efficient using detailed modelling techniques only where they are required. These locations usually include significant development and regeneration areas that are at higher risk from main rivers, ordinary watercourses, or surface water. Flood risk data such as modelled flood extents, depths, velocities, and hazards, including for climate change, are used to assess the sustainability of these areas, appropriate mitigation techniques and achievable site layouts.

This detailed information should support further application of the Sequential Test, identify whether sites will pass the Exception Test at the site-specific FRA stage, where applicable, and allow for flood risk indicators to be produced for use in the Sustainability Appraisal.

In accordance with national policy and guidance, and with the Council's project brief, the key objectives of this Level 2 SFRA are to:

- Demonstrate whether the second part of the Exception Test (part b) can be passed for applicable sites. This should be through detailed assessment of flood risk for multiple modelled exceedance probability events both now and in the future, taking account of climate change using the EA's latest allowances on peak river flows,
- Carry out modelling of the latest climate change allowances using existing EA models,
- Document residual risk, including modelling, from reservoirs, canals, defence breaches, culvert / structural blockages,
- Provide site-specific advice on mitigation options i.e. developable / nondevelopable areas; blue / green infrastructure and open spaces; maintenance of fluvial and / or surface water flow routes; land raising and compensatory storage; and advice on likely minimum finished floor levels,
- Provide site-specific surface water flood risk screening / drainage calculations including recommendations on the requirements for drainage control; surface water runoff rates and impact mitigation, including Sustainable Drainage Systems (SuDS); and design solutions that could reduce flood risk,
- Assess existing flood warning, emergency planning procedures and safety of site access and egress routes in times of flood,
- Provide recommendations for additional and future works required following on from or to supplement the Level 2 SFRA i.e. further fluvial and/or surface water modelling, modelling of site layout/design options including provisions for safe access and egress routes, development optioneering (land raising, compensatory storage, flow routes/rates), drainage strategies, site-specific Flood Risk Assessment (FRA) requirements,
- Assess any catchment-wide or strategic solutions, e.g. upstream opportunity areas for flood management (storage solutions) to mitigate against the risk of flooding downstream and elsewhere,
- Assess the potential effects from Natural Flood Management (NFM) and Working with Natural Processes (WwNP) schemes on mitigating flood risk,
- Assess potential cumulative impacts of development,
- Assess effects of land raising as a mitigation option on several sites where this option may be feasible.

### **2.3 Climate change modelling**

Please refer to the attached technical note – '2021s1045 - Modelling Technical Note'. Climate change scenarios were modelled for the 4% AEP event, 1% AEP event, 0.5% AEP event and 0.1% AEP event. Table 2-1 highlights each modelled return period with its corresponding Annual Exceedance Probability value.

Return Period	Annual Exceedance Probability
25 year	4%
100 year	1%
200 year	0.5%
1000 year	0.1%

**Table 2-1: Modelled return periods and corresponding Annual Exceedance Probabilities**

## 2.4 EA allowances

In July 2021, the EA updated its climate change allowances for peak river flows for use in SFRA and FRAs, based on UKCP18 projections. The updated allowances are now based on smaller scale management catchments rather than the larger river basin districts. The guidance on how to apply the allowances has also changed. The 'central allowance' should now be used for all assessments except for essential infrastructure, where the 'higher central allowance' should be applied. The 'upper end allowance' should be used for 'credible maximum scenario' assessments. For calculations into flood storage compensation, the central allowance should be used, except for where essential infrastructure is affected.

The updated allowances for the Lower Mersey management catchment are stated in Table 2-2. Based on the EA's updated guidance, the central and higher central allowances have been modelled for this SFRA.

Allowance category	Total anticipated change for the 2080s (2070-2115)
Upper end	+90%
Higher central	+57%
Central	+44%

**Table 2-2: Peak river flow allowances for the Lower Mersey management catchment**

Sea level allowances for the North West river basin district are shown below in Table 2-3.

Allowance	2000 to 2035 (mm)	2036 to 2065 (mm)	2066 to 2095 (mm)	2096 to 2125 (mm)	Cumulative rise 2000 to 2125 (metres)
Higher central	4.5 (158)	7.3 (219)	10 (300)	11.2 (336)	1.01
Upper end	5.7 (200)	9.9 (297)	14.2 (426)	16.3 (489)	1.41

**Table 2-3: sea level allowances by river basin district for each epoch in mm for each year (based on a 1981 to 2000 baseline) – the total sea level rise for each epoch is in brackets**

To gauge the impacts of climate change on surface water, the EA states the allowances for peak rainfall intensities provided in Table 2-4 should be used. The peak rainfall intensity

allowances apply to the whole of England for small catchments (less than 5 km<sup>2</sup>) and urban catchments. SFRAs and FRAs should assess both the central and upper end allowances to gauge the range of impacts.

At the time of writing, the EA is carrying out a project called 'FUTURE-DRAINAGE' that is analysing the high-resolution rainfall outputs of 'UKCP Local (2.2.km)' which will be the basis for updating peak rainfall allowances. It is anticipated that the outputs of this project will be available in late-2021.

Allowance category	Total potential change anticipated for...		
	2015-2039	2040-2069	2070-2115
Upper end	+10%	+20%	+40%
Central	+5%	+10%	+20%

**Table 2-4: Peak rainfall intensity allowances in small and urban catchments for England**



### 3 Level 2 site screening assessments

25 individual Level 2 site screening tables have been produced which summarise the detailed site-specific assessments carried out through this Level 2 SFRA, including:

- Redline site boundary location plans overlain with the EA's Flood Map for Planning (FMfP), flood defences, main rivers, national Risk of Flooding from Surface Water (RoFSW) map, EA modelled flood outlines, including for climate change,
- Details of existing onsite and offsite land use and topography,
- Assessment of modelled flood depths and hazards for existing and long term (through climate change) fluvial and tidal risk,
- Assessment of surface water flood depths and hazards using national mapping,
- Indicative vehicular and pedestrian site access and egress points in times of flood,
- Details of any available flooding history,
- Details of existing flood defence infrastructure and information on any existing flood warning arrangements,
- Details of any land within national potential for Working with Natural Processes (WwNP) areas,
- Summary of mitigation options and site suitability based on fluvial, tidal and surface water risk and any residual risks,
- Details on any possible or known groundwater flood risk,
- Assessment of any residual risk from reservoirs, canals, defence breaches, structural blockages,
- Details of greenfield runoff rates and targeted rates for new development,
- Estimated developable/impermeable areas based on agreed generic development area percentage,
- Quantification of typical runoff and attenuation requirements for a range of design events,
- Options for managing surface water runoff and exceedance flows, opportunities for SuDS and identification of appropriate areas of the site for attenuation,
- Statement on likelihood of the site passing the second part of the Exception Test,
- Modelling effects of land raising as a mitigation option on several sites where this option may be feasible,
- Summary of recommendations for further investigative work or mitigation and FRA requirements.

### 3.1 Summary of Level 2 outcomes

Table 3-1 summarises the outcomes from the Level 2 assessment at each site.

Site ref	Site name	Summary of Level 2 assessment	Barriers to development	EA consultation response	Further work / next steps
SHLAA 0953 (WELPS 16)	Former Bidston Dock, Wallasey Bridge Road	Site not subject to the Exception Test though development may be permitted assuming effective resilience measure and emergency escape routes are put in place	None though inclusion of open water dock area must be carefully planned	We agree with the recommendations of the site screening report. Future development of the site will need to incorporate the applicable climate change allowances. We would have no objections should the council wish to allocate the site at this stage.	FRA
SHLAA 0752	Land at Woodside, Chester Street, Birkenhead	To pass the Exception Test, it must be proven that the site can be safe for its lifetime, which for residential development is 100 years. The climate change modelling in this Level 2 SFRA shows this will not be possible without more detailed options modelling work being undertaken. However, modelling of onsite ground level raising has indicated that land raising may be a viable option and should be explored further at the FRA stage, including for offsite impacts.	Present day tidal flood risk and impacts of climate change	We agree with the recommendations of the site screening report. Development within flood zone 3b is not appropriate. Development of other areas of the site may require further assessment due to the modelled impacts of climate change and we would therefore recommend against allocation of this site at present. Consultation with the council's emergency planners will be necessary	Options modelling will be required either through further Level 2 work or at the FRA stage

Site ref	Site name	Summary of Level 2 assessment	Barriers to development	EA consultation response	Further work / next steps
				regarding safe access and egress.	
SHLAA 1597	East of 169 to 187 Pasture Road, Moreton	To pass the Exception Test, it must be proven that the site can be safe for its lifetime, which for residential development is 100 years. The climate change modelling in this Level 2 SFRA shows this will not be possible without more detailed options modelling work being undertaken. However, modelling of onsite ground level raising has indicated that land raising may be a viable option and should be explored further at the FRA stage, including for offsite impacts.	Present day tidal and fluvial flood risk and impacts of climate change	We agree with the recommendations of the site screening report. Further assessment would be required prior to recommending allocation of residential development on the site. Consultation with the council's emergency planners will be necessary regarding safe access and egress.	Options modelling will be required either through further Level 2 work or at the FRA stage
SHLAA 1895	Land and Marine Depot, Dock Road North, Bromborough Pool	To pass the Exception Test, it must be proven that the site can be safe for its lifetime, which for residential development is 100 years. The climate change modelling in this Level 2 SFRA shows this will not be possible without more detailed options modelling work being undertaken. However, modelling of onsite ground level raising has indicated that land raising may be a viable option and should be explored further at the FRA stage, including for offsite impacts.	Present day tidal and fluvial flood risk and impacts of climate change	Safe access & egress would appear to be achievable via Dock Road North, however this should be confirmed with your emergency planners. We consider that options to raise levels at the site may be viable to allow a residential use, however we would recommend against allocation at this stage without further assessment.	Options modelling will be required either through further Level 2 work or at the FRA stage. Clarification on risk from Dibbinsdale Brook required
SHLAA 4022	Land at Pasture Road/Leasowe Road	To pass the Exception Test, it must be proven that the site can be safe for its lifetime, which for residential development is 100 years. The modelling in this Level	Present day tidal and fluvial flood risk and impacts of climate change	We agree with the recommendations of the site screening report. Further assessment would be required prior to	Options modelling will be required either through further Level 2 work or

Site ref	Site name	Summary of Level 2 assessment	Barriers to development	EA consultation response	Further work / next steps
		2 SFRA shows this will not be possible without more detailed options modelling work being undertaken.		recommending allocation of residential development on the site. Consultation with the council's emergency planners will be necessary in regard to safe access and egress.	at the FRA stage
SHLAA 4081	Birkenhead Leisure Centre Europa Boulevard	Site not subject to the Exception Test though development may be permitted assuming it can be shown that surface water and long-term tidal flood risk can be mitigated effectively onsite and included within the site design. If not, development of this site should not be permitted.	Impacts of climate change on tidal flood risk, surface water flood risk	We agree with the recommendations of the site screening report and would have no objections to the allocation of the site at this stage. Future development of the site would need to incorporate the applicable climate change allowances which would be secured by developer's detailed flood risk assessment	Options modelling will be required either through further Level 2 work or at the FRA stage
EMP-RA3.1	Wirral Waters - Morpeth Wharf, Twelve Quays	Site not subject to the Exception Test though development is appropriate according to the NPPF, subject to suitable FRA including for effective mitigation against climate change.	Impacts of climate change on tidal flood risk	We agree with the recommendations of the site screening report and would have no objections to the allocation of the site for employment use at this stage. Future development of the site would be subject to developer's individual site flood risk assessments.	FRA
EMP-SA5.1	Peninsula Business Park, Moreton	Site not subject to the Exception Test though development is appropriate according to the NPPF, subject to suitable FRA including for effective mitigation	Impacts of climate change on tidal flood risk	We consider development for employment use at this site may be achievable following further assessment and	FRA



Site ref	Site name	Summary of Level 2 assessment	Barriers to development	EA consultation response	Further work / next steps
		against climate change.		depending on site levels and layout e.g. buildings would not be appropriate within 8m proximity of the embankment. We recommend consultation with the council's emergency planners prior to considering allocation.	
EMP-SA5.2	Premier Brands, Reeds Lane - North of Access Road, Moreton	Site not subject to the Exception Test though development is appropriate according to the NPPF, subject to suitable FRA including for effective mitigation against climate change.	Impacts of climate change on tidal flood risk	We consider development for employment use at this site may be achievable following further assessment and depending on site levels and layout e.g. buildings would not be appropriate within 8m proximity of the embankment. We recommend consultation with the council's emergency planners prior to considering allocation	FRA
EMP-SA5.3	East of Typhoo, Moreton	Site not subject to the Exception Test though development is appropriate according to the NPPF, subject to suitable FRA including for effective mitigation against climate change.	Impacts of climate change on tidal flood risk	We consider development for employment use at this site may be achievable following further assessment and depending on site levels and layout. We recommend consultation with the council's emergency planners prior to considering allocation	FRA

Site ref	Site name	Summary of Level 2 assessment	Barriers to development	EA consultation response	Further work / next steps
EMP-SA5.4	Land at Tarran Way North, Moreton	Site not subject to the Exception Test though development is appropriate according to the NPPF, subject to suitable FRA including for effective mitigation against climate change.	Impacts of climate change on tidal flood risk	We agree with the recommendations of the site screening report. We recommend consultation with the council's emergency planners prior to considering allocation.	FRA
RES-RA2.1	Scott's Quay	To pass the Exception Test, it must be proven that the site can be safe for its lifetime, which for residential development is 100 years. The climate change modelling in this Level 2 SFRA shows this will not be possible without more detailed options modelling work being undertaken. However, modelling of onsite ground level raising has indicated that land raising may be a viable option and should be explored further at the FRA stage, including for offsite impacts.	Impacts of climate change on tidal flood risk	We consider development for residential use at this site may be achievable following further assessment and depending on site levels and layout and subject to developer's site flood risk assessment. Consultation with the council's emergency planners will be necessary regarding safe access and egress.	Options modelling will be required either through further Level 2 work or at the FRA stage
RES-RA5.1	Hind street	Site not subject to the Exception Test though development may be permitted assuming it can be shown that surface water and long-term tidal flood risk can be mitigated effectively onsite and included within the site design. If not, development of this site should not be permitted.	Impacts of climate change on tidal flood risk, existing and future surface water flood risk onsite and provision of safe access and egress routes	We consider development of this site for residential end use achievable via raising of levels. We recommend consultation with the LLFA and council's emergency planners prior to considering allocation.	Options modelling will be required either through further Level 2 work or at the FRA stage
RES-RA6.1	Wirral Waters - Sky City	To pass the Exception Test, it must be proven that the site can be safe for its lifetime, which for residential development is 100 years. The climate change	Impacts of climate change on tidal flood risk	We consider that development of this site for residential end use could be achievable based on raised levels and non-	Options modelling will be required either through further Level 2 work or

Site ref	Site name	Summary of Level 2 assessment	Barriers to development	EA consultation response	Further work / next steps
		<p>modelling in this Level 2 SFRA shows this will not be possible without more detailed options modelling work being undertaken. However, modelling of onsite ground level raising has indicated that land raising may be a viable option and should be explored further at the FRA stage, including for offsite impacts.</p>		<p>residential ground floor uses. Consultation with the council's emergency planners will be necessary regarding safe access and egress.</p>	<p>at the FRA stage</p>
RES-RA6.2	Wirral Waters - Vittoria Studios	<p>To pass the Exception Test, it must be proven that the site can be safe for its lifetime, which for residential development is 100 years. The climate change modelling in this Level 2 SFRA shows this will not be possible without more detailed options modelling work being undertaken. However, modelling of onsite ground level raising has indicated that land raising may be a viable option and should be explored further at the FRA stage, including for offsite impacts.</p>	<p>Impacts of climate change on tidal flood risk</p>	<p>We consider that development of this site for residential end use could be achievable based on raised levels and non-residential ground floor uses. Consultation with the council's emergency planners will be necessary regarding safe access and egress.</p>	<p>Options modelling will be required either through further Level 2 work or at the FRA stage</p>
RES-RA6.5	Wirral Waters - Northbank East 3	<p>To pass the Exception Test, it must be proven that the site can be safe for its lifetime, which for residential development is 100 years. The climate change modelling in this Level 2 SFRA shows this will not be possible without more detailed options modelling work being undertaken. However, modelling of onsite ground level raising has indicated that land raising may be a viable</p>	<p>Impacts of climate change on tidal flood risk</p>	<p>We consider that development of this site for residential end use could be achievable based on raised levels and non-residential ground floor uses. Consultation with the council's emergency planners will be necessary regarding safe access and egress.</p>	<p>Options modelling will be required either through further Level 2 work or at the FRA stage</p>

Site ref	Site name	Summary of Level 2 assessment	Barriers to development	EA consultation response	Further work / next steps
		option and should be explored further at the FRA stage, including for offsite impacts.			
RES-SA4.10	Maple Grove, Bromborough, Wirral	Site not subject to the Exception Test though development may be permitted assuming it can be shown that surface water risk can be mitigated effectively onsite and included within the site design. If not, development of this site should not be permitted.	Existing and future surface water flood risk onsite and provision of safe access and egress routes	We would have no objections to allocation of the site for residential end use.	Consultation with LLFA and drainage strategy required
RES-SA4.6	Former Croda, Bromborough Pool	Based on the information presented in this Level 2 SFRA, this site appears unlikely to pass the Exception Test. However, a FRA is evolving at this site, including the modelling of mitigation options to enable sustainable development.	Present day tidal and fluvial flood risk and impacts of climate change, based on the findings of this Level 2 SFRA.	We consider that options to raise levels at the site may be viable to allow a residential use, however we would recommend against allocation at this stage without further assessment	The LPA should consult with the developer or the FRA consultant on the outcomes of the FRA.
RES-SA4.7	Land off Dock Road South, Bromborough	Yes, assuming the Level 2 SFRA recommendations are fully considered.	Possibly climate change	We agree with the recommendations of the site screening report and consider the site suitable for allocation for residential use provided development is directed towards Flood Zone 1.	FRA
RES-SA5.3	East of Typhoo, Moreton	To pass the Exception Test, it must be proven that the site can be safe for its lifetime, which for residential development is 100 years. The climate change modelling in this Level 2 SFRA shows this will not be possible without more detailed options modelling work being undertaken. However, modelling of onsite	Impacts of climate change on tidal flood risk	We agree with the recommendations of the site screening report that based on modelled flood levels the site is not suitable for allocation to residential development.	Options modelling will be required either through further Level 2 work or at the FRA stage



Site ref	Site name	Summary of Level 2 assessment	Barriers to development	EA consultation response	Further work / next steps
		ground level raising has indicated that land raising may be a viable option and should be explored further at the FRA stage, including for offsite impacts.			
RES-SA5.5	THE STIRRUP, ARROWE PARK ROAD	Site not subject to the Exception Test though development may be permitted assuming it can be shown that surface water risk can be mitigated effectively onsite and included within the site design. If not, development of this site should not be permitted.	Existing and future surface water flood risk onsite and provision of safe access and egress routes	We would have no objections to allocation of the site for residential end use.	Drainage strategy
RES-SA5.6	Land at Twickenham Drive	To pass the Exception Test, it must be proven that the site can be safe for its lifetime, which for residential development is 100 years. The modelling in this Level 2 SFRA shows this will not be possible without more detailed options modelling work being undertaken.	Impacts of climate change on tidal flood risk	We agree with the recommendations of the site screening report that the site would not be suitable for allocation to residential development.	Options modelling will be required either through further Level 2 work or at the FRA stage
RES-SA5.8	Rear of 1 to 5 Broster Close, Moreton	Site not subject to the Exception Test though development may be permitted assuming it can be shown that surface water risk can be mitigated effectively onsite and included within the site design. If not, development of this site should not be permitted.	Existing and future surface water flood risk onsite and provision of safe access and egress routes	We would have no objections to allocation of the site for residential end use.	Drainage strategy
RES-SA5.9	Former Arrowe Hill Primary School, Woodchurch	Site not subject to the Exception Test though development may be permitted assuming it can be shown that surface water risk can be mitigated effectively onsite and included within the site design. If not, development of this site	Existing and future surface water flood risk onsite and provision of safe access and egress routes	We would have no objections to allocation of the site for residential end use.	Drainage strategy

Site ref	Site name	Summary of Level 2 assessment	Barriers to development	EA consultation response	Further work / next steps
		should not be permitted.			
RES-SA6.12	Beauty Within, 206 Birkenhead Road, Meols	To pass the Exception Test, it must be proven that the site can be safe for its lifetime, which for residential development is 100 years. The modelling in this Level 2 SFRA shows this will not be possible without more detailed options modelling work being undertaken.	Impacts of climate change on tidal flood risk	We agree with the recommendations of the site screening report that the site would not be considered suitable for residential allocation.	Options modelling will be required either through further Level 2 work or at the FRA stage

**Table 3-1: Level 2 assessment summary at each site**

## 4 Cumulative impacts

Strategic policies should also now consider the 'cumulative impacts in, or affecting, local areas susceptible to flooding' (para 156, NPPF), rather than just to or from individual development sites. Previous policies have relied on the assumption that if each individual development does not increase the risk of flooding, the cumulative impact will also be minimal. However, if there is a lot of development occurring within one catchment, particularly where there is flood risk to existing properties or where there are few opportunities for mitigation, the cumulative impact may be to change the flood response of the catchment.

When allocating land for development, consideration should be given to the potential cumulative impact of the loss of floodplain storage volumes, as well as the impact of increased flows on flood risk downstream. Whilst the loss of storage for individual developments may only have a minimal impact on flood risk, the cumulative effect of multiple developments may be more severe.

All new development plans must comply with the NPPF and demonstrate flood risk will not be increased elsewhere. Therefore, providing all new development complies with the latest guidance and legislation relating to flood risk and sustainable drainage, in theory there should not be any increase in flood risk downstream.

Strategic solutions may include upstream flood storage, integrated major infrastructure / Flood Risk Management schemes, new defences, and watercourse improvements as part of regeneration and enhancing green infrastructure, with opportunities for Working with Natural Processes and retrofitting of SuDS to existing development.

The Level 2 SFRA site screening reports consider the following strategic solutions when providing advice and recommendations:

- Use of sustainable flood storage and mitigation schemes to store water and manage runoff in locations that provide overall flood risk reduction as well as environmental benefits,
- In areas where flood risk is being managed effectively, there will be a need in the future to keep pace with increasing flood risk as a result of climate change,
- Assessment of long-term opportunities to move development away from the floodplain and to create open multifunctional greenspace and blue/green river corridors,
- Identification of opportunities to use areas of floodplain to store water during high flows, to reduce long-term dependence on engineered flood defences,
- Safeguarding the natural floodplain from inappropriate development,
- Where possible, changes in land management should look to reduce runoff rates from development whilst maintaining or enhancing the capacity of the natural floodplain to retain water. Land management and uses that reduce runoff rates in upland areas should be supported,
- Development should maintain conveyance of watercourses through hamlets and villages to help reduce the impact of more frequent flood events and to improve the natural environment and WFD targets,
- Implementation of upstream catchment management i.e. slow the flow and flood storage schemes could be implemented in upper catchments to reduce risk downstream and across neighbouring authority boundaries, and
- Promotion and consideration of SuDS at the earliest stages of development planning.

## 4.1 Site clustering

As shown in Figure 1-1, there are a number of sites clustered together such as the Wirral Waters sites in Birkenhead (Figure 4-1) and the sites at Moreton (Figure 4-2).

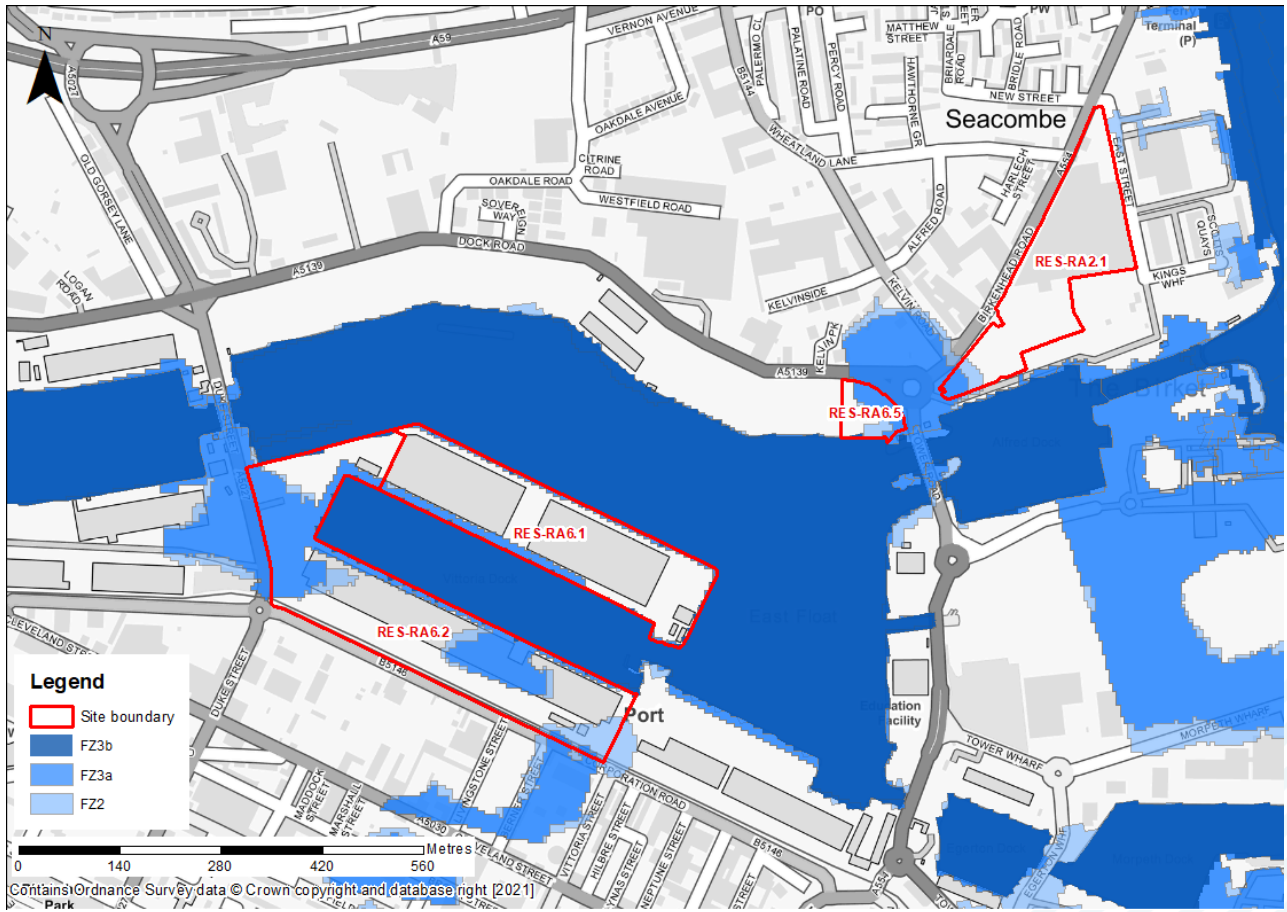
The main risk at the Wirral Waters sites comes from the dock areas. As acknowledged by the EA in their consultation on the Draft Level 2 SFRA, the docks are controlled bodies of water therefore water levels in the docks can be maintained at levels to reduce the risk of flooding. Also, the EA has stated that flows from the Birket are controlled and pumped into the docks. Fluvial flood risk from the Birket is therefore minimal and unlikely to have an impact on the Wirral Waters sites.

The key risk at the cluster of sites at Moreton is from the impacts of climate change on sea levels and residual risk from a possible tidal breach of the Wallasey Embankment. This is the case for much of the north-eastern coastline of Wirral, not just the Moreton area. Although the risk is shown to be significant (see individual site screening reports), the risk is mostly residual and based on an unlikely breach of the Wallasey Embankment. Such a breach is considered unlikely in that the Lead Local Flood Authority owns and maintains the embankment and maintenance funding into the future is considered to be guaranteed given the protection the embankment provides to existing communities and the scale of the area currently protected. Fluvial risk from the Birket to the Moreton sites is shown to be low (see individual site screening reports).

Within each cluster, development decisions taken at one site may impact on the others. It would therefore be prudent to formulate a strategy to develop these sites in tandem and for consultation between each developer to take place to ensure a joined-up approach for sustainable development is in place, with consideration to the strategic solutions outlined above.

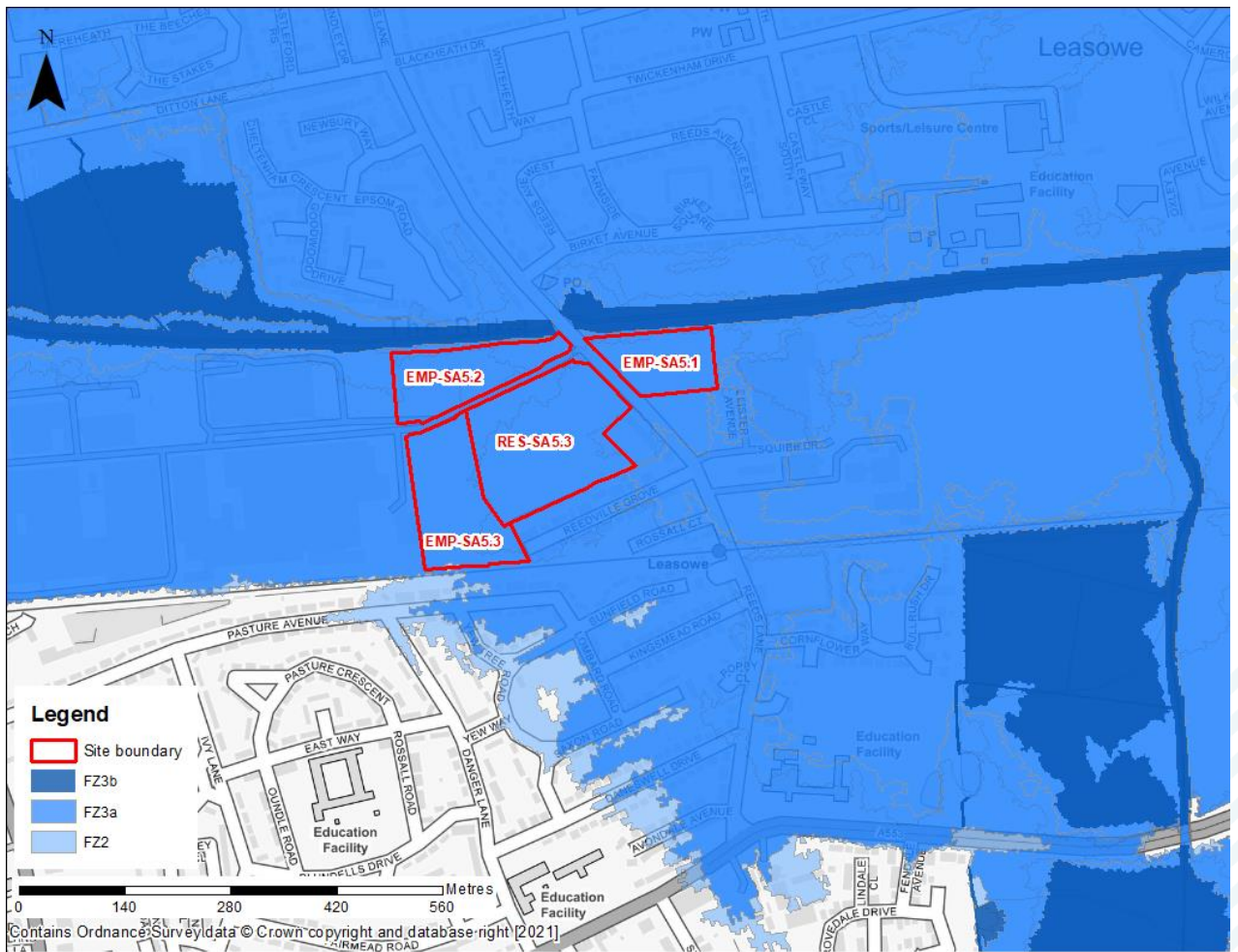
Using a phased approach to development, based on modelling outcomes of mitigation options, should ensure that any sites at risk of causing flooding to other sites are developed first to ensure flood mitigation measures are in place before other sites are developed, thus ensuring a sustainable approach to development and offsite impacts.

As a possible mitigation option, land raising of Wirral Waters sites RES-RA6.1, RES-RA6.2 and RES-RA6.5, and Moreton sites RES-SA5.3 and EMP-SA5.3 has been modelled, the results of which are shown and discussed in the individual site screening reports.



**Figure 4-1: Wirral Waters sites**





**Figure 4-2: Moreton sites**

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