AMBIENTAL

ENVIRONMENTAL ASSESSMENT

Flood Risk Assessment
5927

Land adjacent to 2 Silverdale Street,

Haverigg,

Copeland,

LA18 4EU

Ambiental Environmental Assessment
Sussex Innovation Centre,
Science Park Square,
Brighton, BN1 9SB

Document Issue Record

Project: Phase 1 Flood Risk Assessment

Prepared for: Tim Jones

Reference: 5927

Site Location: Land adjacent to 2 Silverdale Street, Haverigg, Copeland, LA18 4EU

Proposed Development: It is understood that the development is for the construction of two residential dwellings, on a brownfield site, which has previously been used for caravan, trailer storage and van parking.

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Contents

1. Summary

1.1 Ambiental Environmental Assessment has been appointed by Tim Jones to undertake a National Planning Policy Framework (NPPF) compliant Flood Risk Assessment (FRA) for the proposed development at Land adjacent to 2 Silverdale Street, Haverigg, Copeland, LA18 4EU.

1.2 The proposed development is for the construction of two semi-detached 3no. bedroom houses. The site is currently a hardstanding area, previously used for caravan, trailer storage and van parking.

1.3 With reference to the Environment Agency (EA) Flood Map for Planning, the proposed development is located within Flood Zone 3. The proposed development is considered "More Vulnerable" under Table 2 of the Flood Risk and Coastal Change Planning Policy Guidance and the NPPF.

1.4 A topographic survey has been completed by the client and indicates that the existing ground levels on the site vary between approximately 5.42mAOD, closest to Silverdale Road, and 5.71mAOD, at the eastern side of the site.

1.5 The Environment Agency have provided site-specific modelled flood levels and flood outlines for the tidal events for both the defended and undefended scenarios, extracted from the Tidal ABD Study (2014), and for fluvial flood events, taken from the Haverigg Study (2011).

1.6 As per comments provided by the Environment Agency, Ambiental have only considered the undefended scenarios. An analysis of the flood data within this report has demonstrated the following:

- The site could be affected by a flood level of 6.17mAOD in the modelled 1:200-year tidal flood event (undefended), resulting in flood depths of between 0.46m and 0.75m when compared with existing ground levels of the site.
- During the modelled 1:1,000-year tidal flood event (undefended), a flood level of 6.43mAOD could affected the site. This could result in flood depths of between 0.72m and 1.01m on site.
- Using the December 2019 updated climate change allowances for sea level rise, the 1:200-year +CC (Higher Central) undefended flood level for the site is 7.12mAOD; and 7.5mAOD in the 1:200-year +CC (Upper End) defended scenario. Based on existing ground levels of the site, this land could experience potential maximum flood depths of 1.7m in the 1:200-year +CC (Higher Central) scenario and 2.08m in the 1:200-year +CC (Upper End) defended scenario.
- The site should remain unaffected by fluvial flooding in the 1:25-year, 1:100-year, 1:1,000-year and 1:100-year +20%CC flood events, for both the defended and undefended scenarios.
- The main flood risk to the site is thus shown to be tidal.

1.7 Sleeping accommodation will be provided at the first-floor level of the proposed houses. It is recommended that the first-floor Finished Floor Levels of the residential dwellings are raised to 8.10mAOD (600mm above the calculated 1:200 year +CC (Upper End) undefended flood level of 7.50mAOD). Internal access should be maintained from the ground floor to first floor, to allow for emergency safe refuge on site.

1.8 The site is in an EA Flood Alert/Warning Service Area, so residents should sign up to this service. In the event of an EA Flood Warning, the site shall be evacuated for the duration of the warning.

1.9 The proposed dwellings should incorporate flood resilience measures in line with current best practice for construction within an area at risk of flooding in line with CLG 2007 'Improving the Flood Performance of New Buildings'. These measures are detailed in Section 7 of the report.

Following the guidelines contained within the NPPF, the proposed development is considered to be suitable assuming appropriate mitigation (including adequate warning procedures) can be maintained for the lifetime of the development.

Development Description	Existing	Proposed
Development Type:	Existing hardstanding area, previously used for car parking and similar uses,	Construction of two semi-detached 3no. bedroom houses. Sleeping will be at first-floor levels.
Number of Bedrooms:	N/A	6no. bedrooms
EA Vulnerability Classification:	Water Compatible	More Vulnerable
Ground Floor Level:	Existing ground levels on the site vary between approximately 5.42mAOD and 5.71mAOD (according to topographic survey provided by client).	
Level of Sleeping Accommodation:	N/A	First floor level
Impermeable Surface Area:	Site is considered to be wholly impermeable	
Surface Water Drainage:	No existing drainage infrastructure on site	Recommended that surface water runoff is discharged via the same drainage infrastructure as that used by the neighbouring dwellings.
Site Size:	Approximate site boundary is 275m^2	Same as existing
Risk to Development	**Summary**	**Comment**
EA Flood Zone:	Flood Zone 3	
Flood Source:	Tidal	
1:200 Year Flood Level (Undefended)	6.17mAOD	The Environment Agency provided modelled flood levels for the site, for both the defended and undefended scenarios, for tidal and fluvial flood events. This information was extracted from the Tidal ABD Study (2014) and the Haverigg Study (2011). As per comments from the Environment Agency, Ambiental have assessed the undefended flood levels for the site. Ambiental have used the tidal flood levels from the 2014 study and the EA's latest climate change allowances to assess the impact of climate change on tidal flood risk.
1:200 Year Flood Level & Climate Change (Undefended)	Higher Central – 7.12mAOD Upper End – 7.5mAOD	
1:1000 Year Flood Level (Undefended)	6.43mAOD	
Recorded Flood Events in Area:	No	No flood records in the area, according to Environment Agency data.
Recorded Flood Events at Site:	No	
SFRA Available:	Yes	Copeland Borough Council Strategic Flood Risk Assessment (2007)
Management Measures	**Summary**	**Comment**
Ground floor level above extreme flood levels:	No	Sleeping accommodation will be at first-floor level, which will be above the climate change flood levels and will therefore provide safe refuge.
Safe Access/Egress Route:	Yes	See Section 7
Flood Resilient Design:	Yes	See Section 7
Site Drainage Plan:	Recommend discharging surface water runoff to any existing surface water sewer near site, same as neighbouring dwellings.	
Flood Warning & Evacuation Plan:	Yes	EA Flood Warning Service
Offsite Impacts	**Summary**	**Comment**
Displacement of floodwater:	No	Site is in a tidal floodplain, so flood compensatory storage not required.
Increase in surface run-off generation:	Negligible	Existing site is wholly impermeable. Any additional surface water runoff to be discharge to existing surface water sewer; same as neighbouring dwelling.
Impact on hydraulic performance of channels:	None	Proposed development should not affect any watercourses.

Table 1 Summary of flood risks, impacts and proposed flood mitigation measures.
N/A[1] not required for this assessment; N/A[2] data not available.

2. Development Description and Site Area

Proposed Development and Location

2.1 The proposed development is located at Land adjacent to 2 Silverdale Street, Haverigg, Copeland, LA18 4EU (Figure 1).

2.2 The proposed development is for the construction of two semi-detached three-bedroom houses. The site is currently a hardstanding area, previously used for caravan, trailer storage and van parking.

2.3 A topographic survey of the site was completed by Spatial Data Limited in October 2020 for the client. It indicates that the existing ground levels on the site vary between approximately 5.42mAOD, closest to Silverdale Road, and 5.71mAOD, at the eastern side of the site. The client has confirmed that the topographic survey was referenced to OS Datum. The topography of the existing site slopes downwards towards the road, in a western direction. The topographic survey is included in Appendix 1.

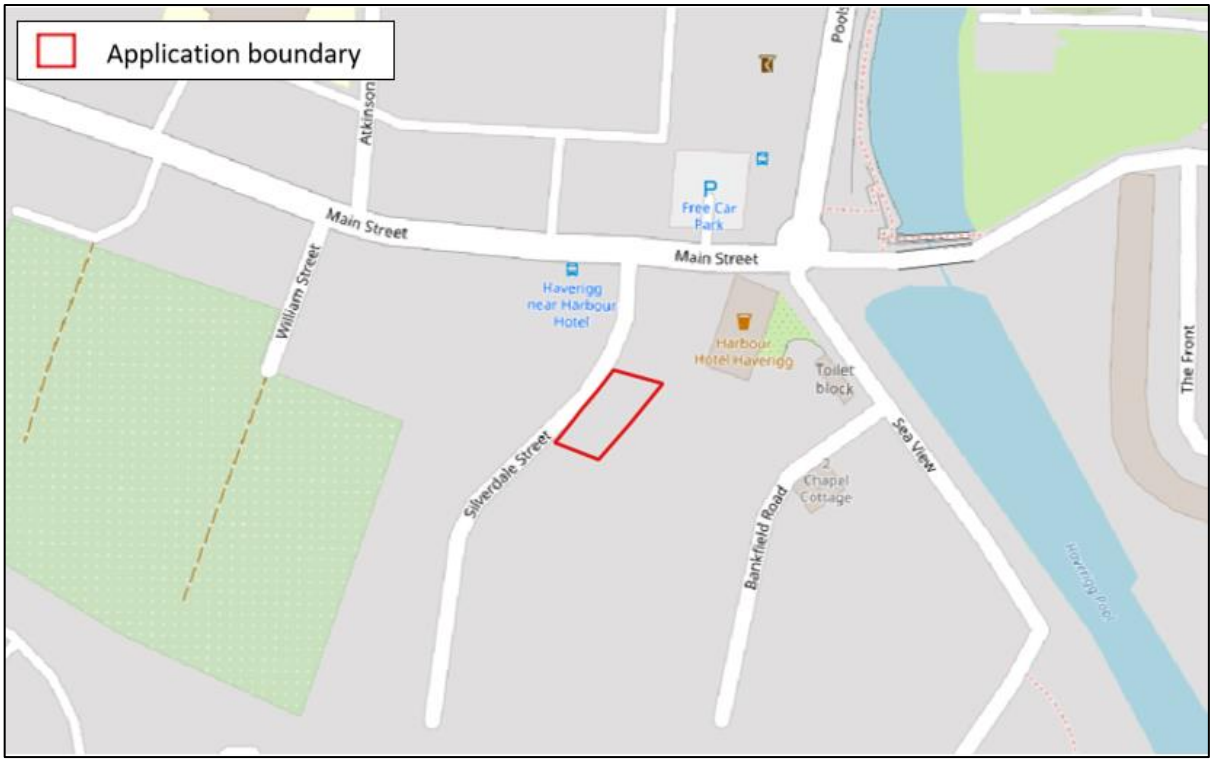


Figure 1 Location Map, identifying the location of the proposed development (Source: OS)

Figure 2 Aerial Imagery, showing location of site (Source: GoogleMaps)

Vulnerability Classification

2.4 The EA Flood Map for Planning (Figure 3) demonstrates that the proposed development lies within Tidal Flood Zone 3 with a high probability of greater than 1 in 200 (0.5%) of flooding from seas or tidal estuaries in any year.

2.5 Under Table 2 of the Flood Risk and Coastal Change Planning Policy Guidance and guidelines provided in the National Planning Practice Framework (NPPF), the existing site is classified as 'Water Compatible', as it is currently a hardstanding area, previously used for parking. The proposed residential development is classified as 'More Vulnerable'. As such, the flood risk vulnerability of the site will increase post-development.

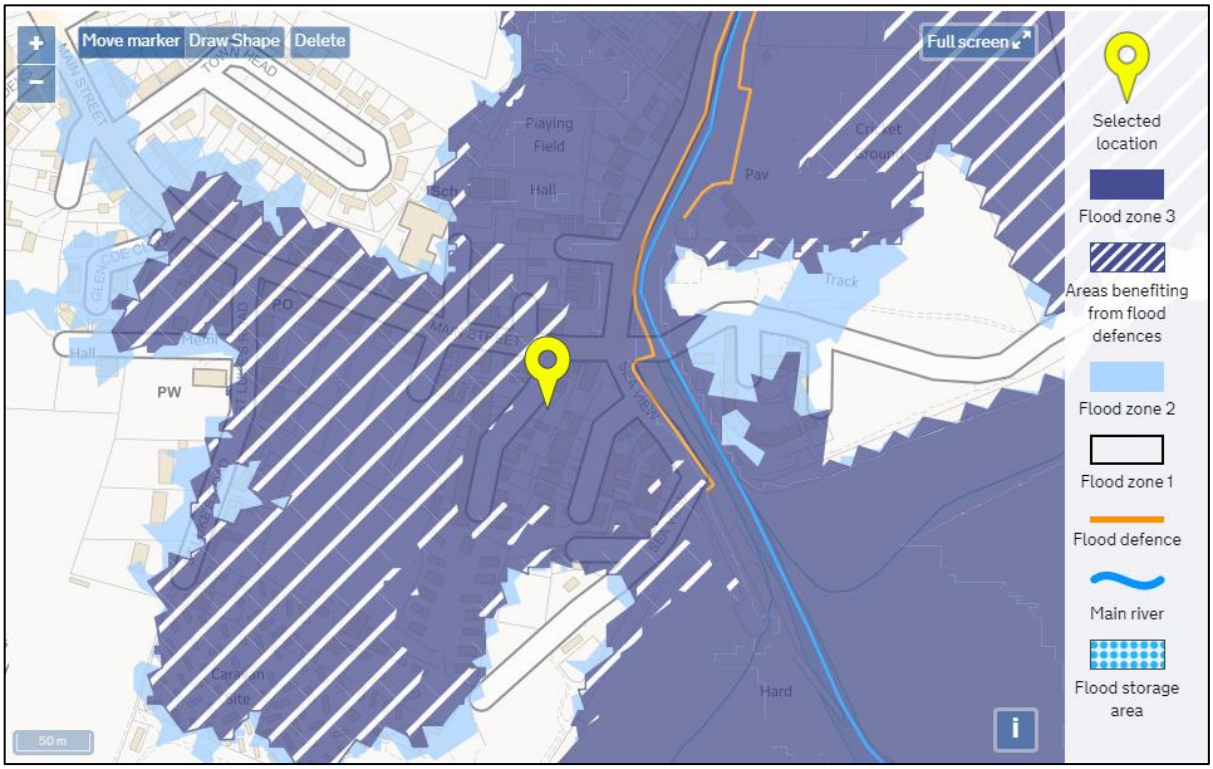


Figure 3 EA Flood Map for Planning, showing location of site (Source: EA)

Geology

2.6 The British Geological Survey (BGS) Geology of Britain Viewer indicates that the bedrock underlying the site is a Bees Sandstone Member, which comprises of sandstone (Source: BGS). This formation is considered to be a Principal aquifer (Source: EA; Magic Map online resource. See Figure 4). A Principal aquifer is highly permeable, supporting water supply and/or river base flow on a strategic scale.

2.7 The British Geological Survey (BGS) Geology of Britain Viewer indicates that the superficial deposits underlying the site are Alluvium, comprising of clay, silt, sand and gravel (Source: BGS). This formation is a Secondary 'A' aquifer (Source: EA; Magic Map online resource. See Figure 5). A Secondary 'A' aquifer is permeable, supporting water supplies at a local scale and may contribute to base flow of rivers.

2.8 The site is not within an EA groundwater Source Protection Zone, according to DEFRA's online Magic Maps (shown in Figure 6).

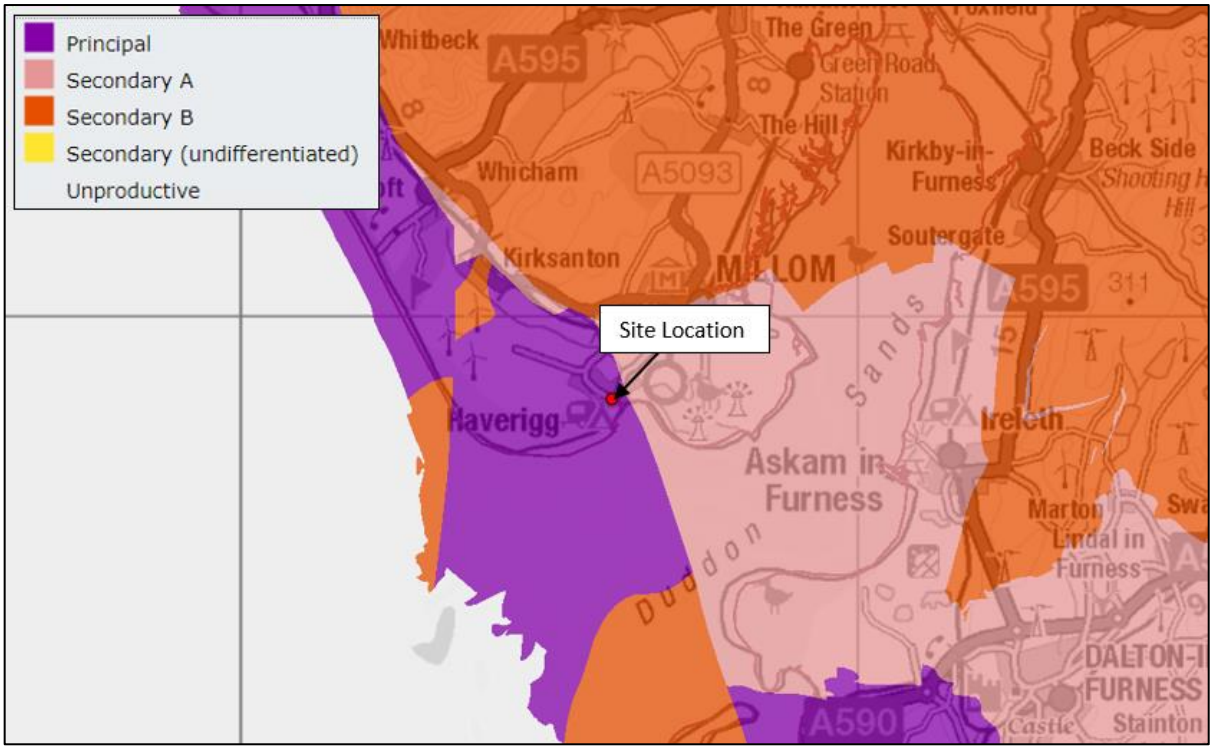


Figure 4 Aquifer Designation of Bedrock Geology, indicating location of site (Source: MagicMap online)

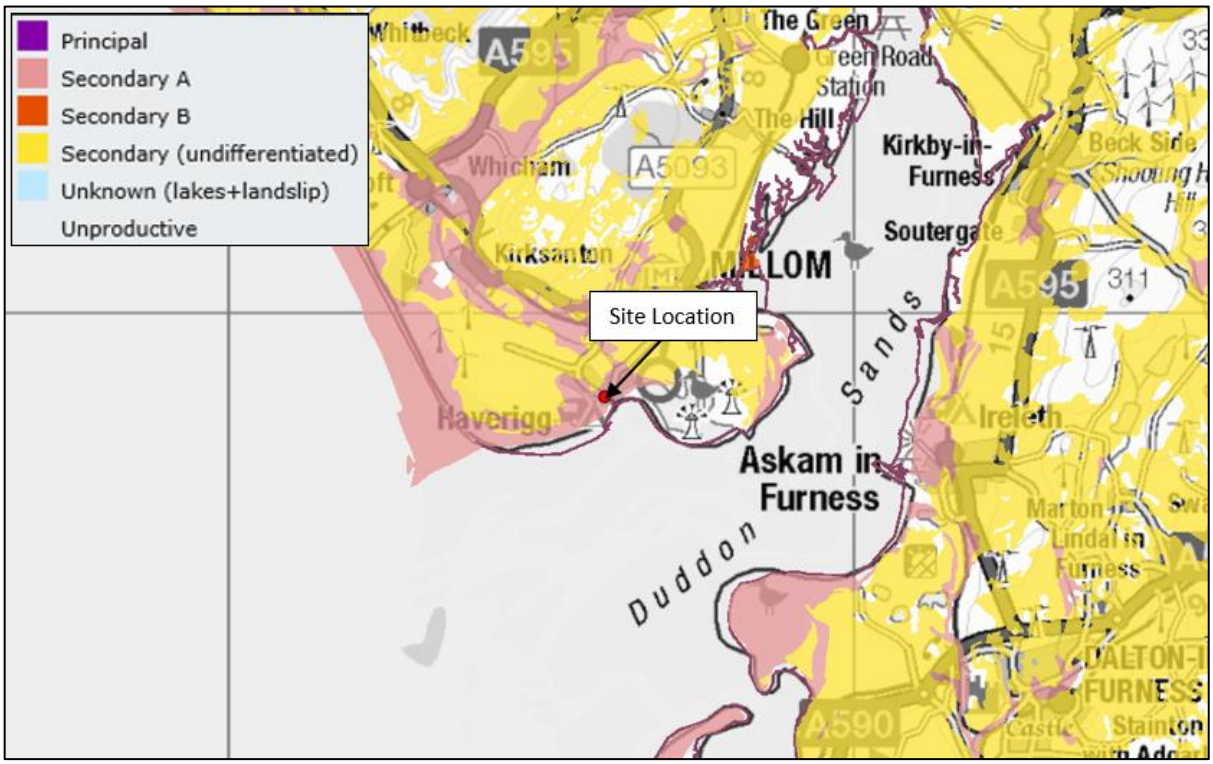


Figure 5 Aquifer Designation of Superficial Deposits Geology, indicating location of site (Source: MagicMap online)

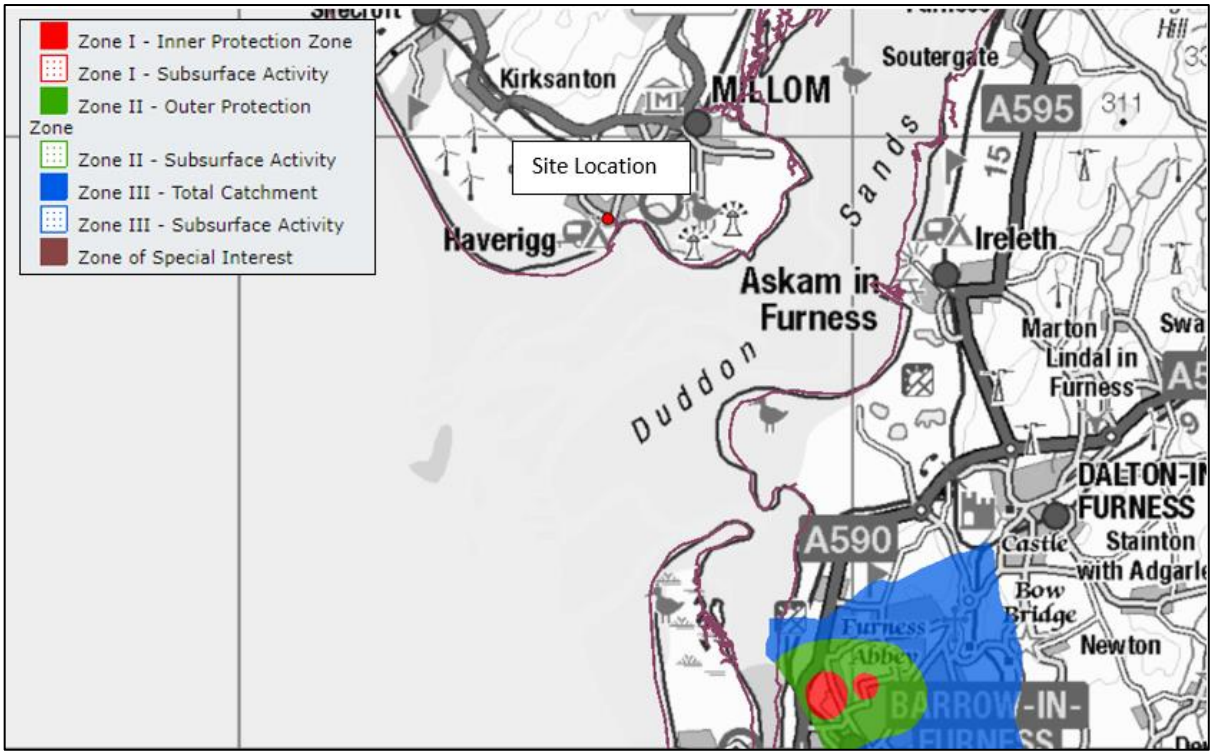


Figure 6 EA Groundwater Source Protection Zones, indicating location of site (Source: MagicMap online)

3. Sequential Test/Exception Test

3.1 Under the NPPF and Flood Risk and Coastal Change Planning Practice Guidance (PPG), all new planning applications should undergo a *Sequential Test*. This test should be implemented by local planning authorities with a view to locating particularly vulnerable new developments (e.g. residential, hospitals, mobile homes etc.) outside of the floodplain.

3.2 The Flood Risk and Coastal Change Planning Practice Guidance (PPG) *Sequential Test: Flood Risk Vulnerability and Flood Zone 'Compatibility' Table* is reproduced below:

Flood Risk Vulnerability Classification		Essential Infrastructure	Water Compatible	Highly Vulnerable	More Vulnerable	Less Vulnerable
Flood Zone	**Zone 1**	✓	✓	✓	✓	✓
	Zone 2	✓	✓	Exception Test Required	✓	✓
	Zone 3a	Exception Test Required	✓	×	Exception Test Required	✓
	Zone 3b ***Functional Floodplain***	Exception Test Required	✓	×	×	×

Table 2 The Sequential Test: Flood Risk Vulnerability and Flood Zone 'Compatibility' Table as specified by NPPF. Please note: ✓ means development is appropriate; × means the development should not be permitted.

3.3 The proposal is for a 'More Vulnerable' development, and the development site is in Flood Zone 3. As shown in Table 2 above, developments which are 'More Vulnerable' and located in Flood Zone 3a may require the application of an Exception Test; 'More Vulnerable' developments are not considered to be appropriate in Flood Zone 3b.

3.4 As such, the proposed development may require the application of the Exception Test.

3.5 Paragraph 60 of the Flood Risk and Coastal Change Planning Practice Guidance (PPG) states that, for the exception test to be passed, it should be demonstrated that:

- The development would provide wider sustainability benefits to the community that outweigh the flood risk; and
- 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.

3.6 To meet these requirements, this Flood Risk Assessment has been completed for the proposed development.

4. Site Flood Hazards

Sources of Flooding

4.1 The proposed development is located within Flood Zone 3 (high risk of flooding) and is considered to be 'More Vulnerable' according to NPPF guidelines. Table 3 summarises the potential sources of flooding to the site:

Source	Description
Tidal	Flood Zone 3 – Haverigg Pool (EA Main River)
Fluvial	Low risk – site unaffected by all modelled fluvial events
Surface	Very low to low risk at site
Groundwater	*'Limited potential for groundwater flooding to occur'*
Sewer	Borough identified as having drainage issues in the past

Table 3 Summary of flood sources.

Mechanisms and History of Flooding

4.2 The EA Flood Map for Planning (Figure 3) demonstrates the site to be located within Flood Zone 3 (high risk of flooding). It is important to note that the EA Flood Map for Planning shows only the potential floodplain; the mitigating effects of any flood defences currently in place are not considered.

Tidal

4.3 With reference to the EA Flood Map for Planning (Figure 3), the site is in Flood Zone 3 and does not benefit from flood defences.

4.4 The nearest watercourse to the site is the EA Main River, Haverigg Pool, which is approximately 60m east of the site boundary. This watercourse discharges into Duddon Channel, which then flows into the Irish Sea.

4.5 The main source of flooding to the site is considered to be tidal.

4.6 The Environment Agency have provided site-specific modelled flood levels and flood outlines for the extreme tidal events for both the defended and undefended scenarios, extracted from the Tidal ABD Study (2014). Given that the site is in an area that does not benefit from flood defences according to the EA Flood Map for Planning and as per comments provided by the Environment Agency, Ambiental have only considered the undefended flood levels.

4.7 In the modelled 1 in 200-year tidal flood event (undefended), the site could be affected by a flood level of 6.17mAOD, as shown in Figure 7. Existing ground levels on site vary between 5.42mAOD and 5.71mAOD, according to the topographic survey provided by the client. As such, the site could be affected by flood depths between 0.46m and 0.75m. This is based on existing ground levels.

4.8 During the modelled 1 in 1,000-year undefended tidal flood event, the site is shown to be potentially affected by a flood level of 6.43mAOD (see Figure 8). When compared with existing ground levels, the site could be affected by flood depths between approximately 0.72m and 1.01m.

4.9 Thus, this demonstrates that the risk of flooding to the site from tidal sources could be considered high.

4.10 The impact of climate change on tidal flood risk to the site is discussed in Section 5 of this Flood Risk Assessment.

4.11 The raising of ground floor Finished Floor Levels for the proposed dwellings has not been recommended, due to the amount of raising this would require. As indicated in the proposed plans, lower consequence uses will be provided within the residential dwellings (kitchen, dining room and living room), with sleeping accommodation provided at the first-floor level. As such, it is recommended that the first-floor Finished Floor Levels are raised above the 1:200-year +CC flood level using the Upper End scenario, providing a freeboard of 600mm. Thus, the proposed FFL of the first-floor level is 8.10mAOD. This would involve raising the first-floor FFLs approximately 2.39m to 2.68m above the existing ground levels of the site.

4.12 It is important to note that the proposed dwellings will be two storeys and thus emergency safe refuge could be sought at the first floor, if required. Furthermore, given the nature of tidal flooding, it is likely that sufficient early warning would be provided before flood waters reach the site.

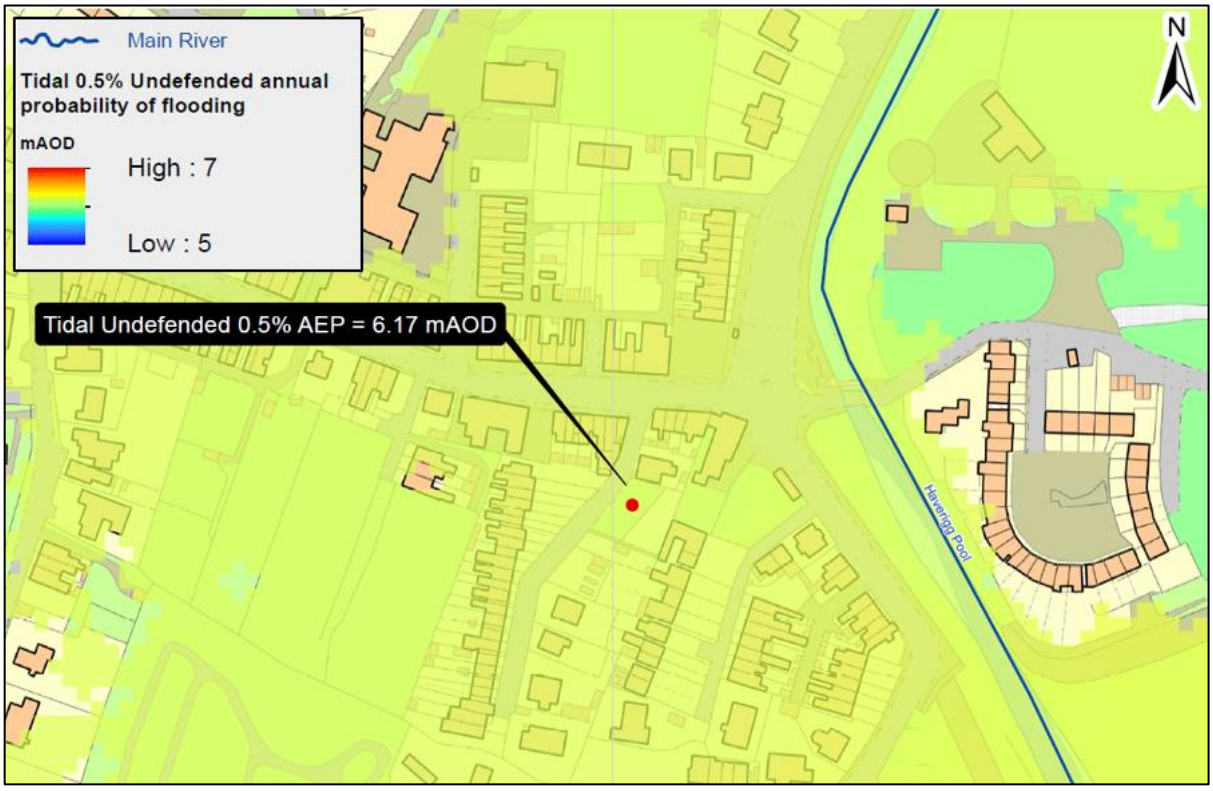


Figure 7 Modelled 1 in 200-year (0.5% AEP) tidal undefended flood event, showing location of site (Source: EA)

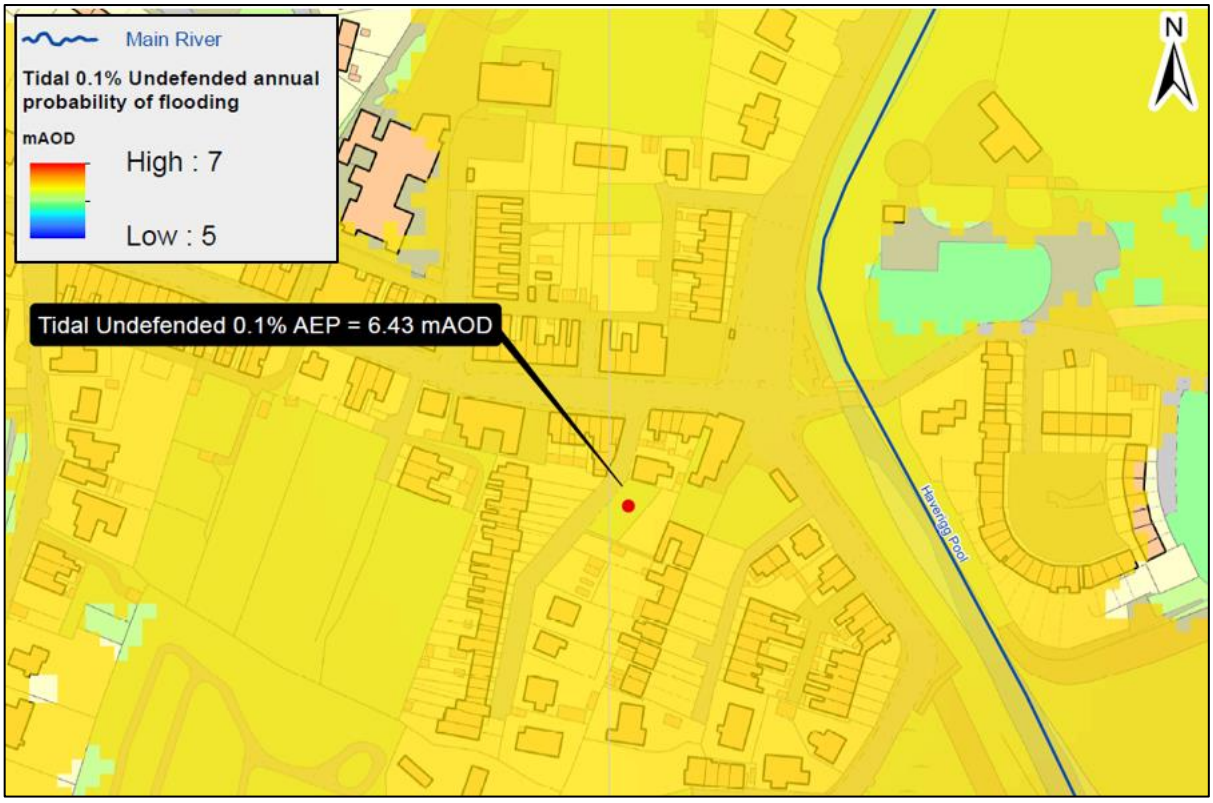


Figure 8 Modelled 1 in 1,000-year (0.1% AEP) tidal undefended flood event, showing location of site (Source: EA)

Fluvial

4.13 The nearest watercourse to the site is the EA Main River, Haverigg Pool, which is approximately 60m east of the site boundary. This watercourse discharges into Duddon Channel.

4.14 Following correspondence with the Environment Agency, Ambiental have received modelled flood outlines for the fluvial events as follows, taken from the Haverigg Study (2011):

- 1 in 25-year (4%) defended and undefended
- 1 in 100-year (1%) defended and undefended
- 1 in 100-year plus 20% climate change (1% +20%CC) defended and undefended
- 1 in 1,000-year (0.1%) defended and undefended

4.15 The site of the proposed development is shown to remain unaffected by flooding in all of the above modelled flood events. Figure 9 below shows a close-up of the modelled flood outlines provided by the EA for the 1 in 25-year and 1 in 100-year fluvial events, with the site boundary of the proposed development overlain onto the map.

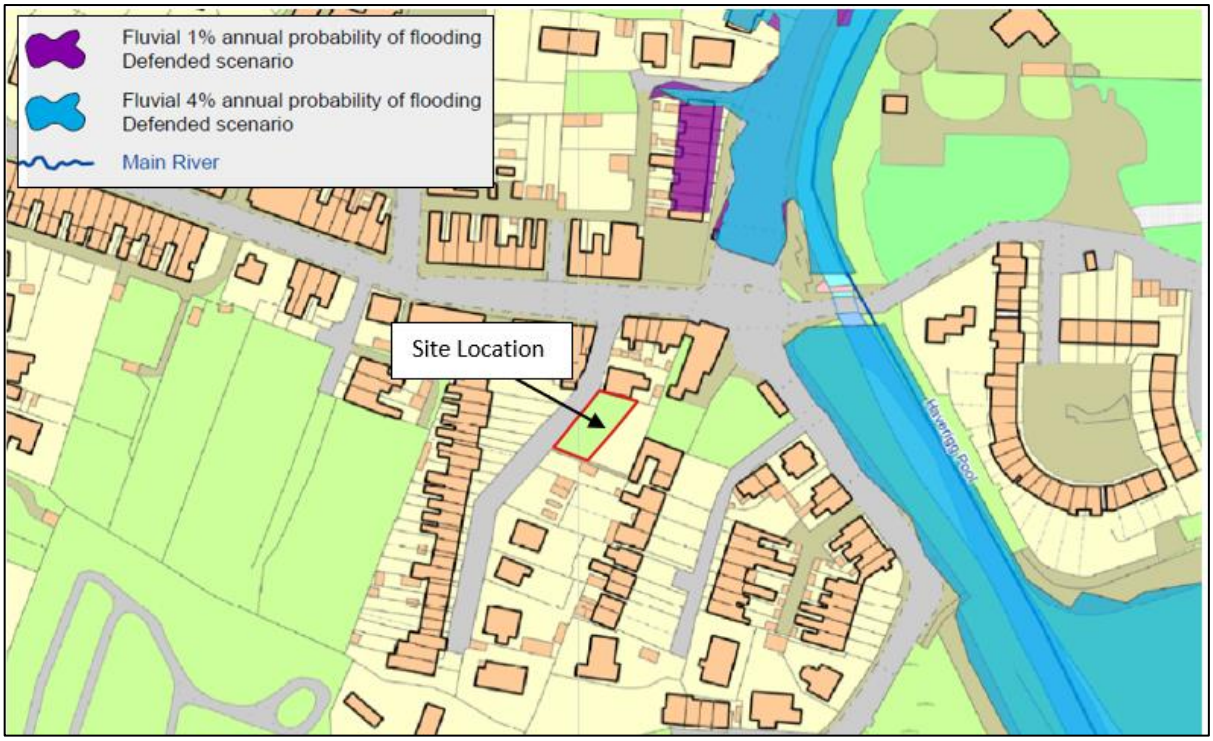


Figure 9 Modelled fluvial outlines for 1 in 25-year and 1 in 100-year, showing location of site (Source: EA)

Surface Water (Pluvial)

4.16 The Environment Agency Flood Risk from Surface Water map (Figure 10) shows the proposed development to be within an area of 'Low' and 'Very Low' risk of flooding from surface water.

4.17 The following definitions of the annual surface water flood risk classifications are given by the EA:

- 'High Risk'; >3.3% AEP (more often than 1 in 30);
- 'Medium Risk'; 3.3% to 1.1% AEP (between 1 in 30 and 1 in 100);
- 'Low Risk'; 1% to 0.1% AEP (between 1 in 100 and 1 in 1000);
- 'Very Low Risk'; <0.1% AEP (less often than 1 in 1000).

Figure 10 EA Surface Water Flood Risk Map, showing location of site (Source: EA)

Groundwater

4.18 The BGS Susceptibility to Groundwater Flooding Map demonstrates that the site is in an area identified with *'Limited potential for groundwater flooding to occur'*, as shown in Figure 11.

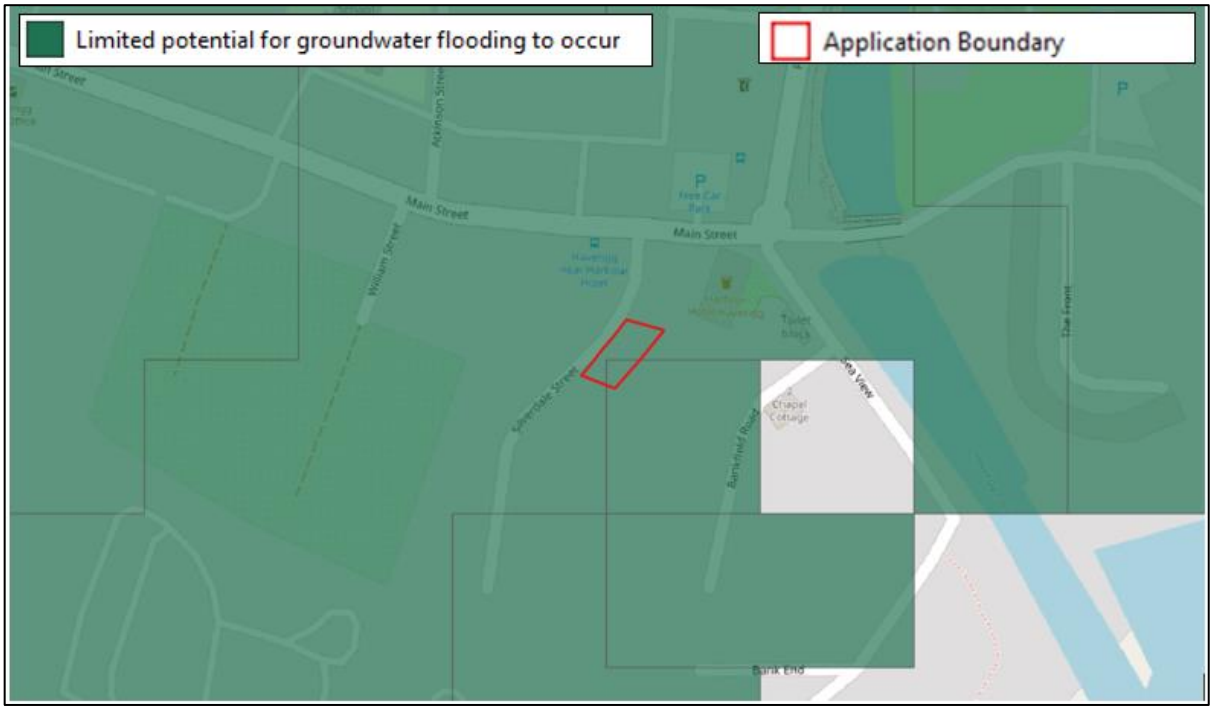


Figure 11 BGS Susceptibility to Groundwater Flooding map, showing location of site (Source: BGS)

Sewer

4.19 The Copeland Borough Council Strategic Flood Risk Assessment (2007) discusses that there have been a number of known drainage problems within the borough, which are typically localised and minor in nature, according to the report. United Utilities had been consulted to provide further information on the locations of these drainage problems when the SFRA was written; however, the information provided was very general and did not give any indication as to the location of sewer and drainage problems.

4.20 As such, it is not known whether the site or local area has been affected by sewer flooding in the past.

4.21 To mitigate against the potential risk of sewer flooding at the proposed development, any new sewer connections should be confirmed by the local sewer authority, and non-return valves should be fitted.

Surface Water Drainage Strategy

4.22 The proposed development is for the construction of two semi-detached 3no. bedroom houses. The site is currently a hardstanding area, previously used for caravan, trailer storage and van parking. It is not known whether there is any existing drainage on the site.

4.23 In order to mitigate flood risk posed by the proposed development, adequate control measures are required to be considered. This will ensure that surface water runoff is dealt with at source and the flood risk on/off site is not increased over the lifetime of the development.

4.24 The runoff generated will need to be managed in accordance with the National Planning Policy Framework (NPPF 2019) policy which requires the use of Sustainable Drainage Systems (SuDS). The design guidelines for the SuDS should follow the recommendations set out in the North West SuDS Proforma (2020).

4.25 The management of surface water has been considered in respect to the SuDS hierarchy (Table 4 below) (as detailed in Building Regulations Part H and within the CIRIA 753 'The SUDS Manual', Section 3.2.3):

SuDS Drainage Hierarchy				
			Suitability	**Comment**
↓	**1.**	**Infiltration**	-	Infiltration may be achievable on site. Infiltration testing will be required on site to further assess this.
	2.	**Discharge to Surface Water**	X	There are no open surface water features neighbouring the site, therefore a direct connection cannot be achieved.
	3.	**Discharge to Surface Water Sewer, Highway Drain or another Drainage System**	✓	The site is located in an existing residential area, so connection to the existing surface water sewer may be achievable.
	4.	**Discharge to Combined Sewer**	-	

Table 4: SuDS Hierarchy

4.26 The BGS mapping indicates that sandstone is expected beneath the site, with superficial deposits comprising of clay, silt, sand and gravel. The online Soilscapes website indicates that the soil in this area consists of *'Naturally wet, very acid sandy and loamy soils'.* Based on this information, it is anticipated that infiltration may be achievable in this area.

4.27 It is recommended that infiltration testing is undertaken on the site, in accordance with the requirements of BRE365, to further assess the viability of infiltration drainage devices.

4.28 There are no open surface water features or watercourses or ditches neighbouring the site, so a direct connection to one of these would not be possible.

4.29 The site is located in an existing residential area. As such, it is recommended that the proposed dwellings are connected to the nearest existing surface water sewer, as per the existing residential dwellings in the areas.

Records of Historical Flooding

4.30 There are no records of flooding near the site, based on Environment Agency data.

5. Probability of Flooding

Flood Zones

5.1 According to the EA Flood Map for Planning, the site is located within Flood Zone 3 (high risk of flooding).

5.2 The EA Flood Map for Planning has been produced in part using a relatively coarse, national scale flood modelling strategy, and in part by detailed modelling. It is important to note that only the potential floodplain is modelled; **the mitigating effects of any flood defences currently in place are not considered**. For reference, the definition of the NPPF flood risk zones is included below.

Zone	Description
1	**Low Probability.** This zone comprises land assessed as having a less than 1 in 1000 annual probability of river or sea flooding in any year (<0.1%).
2	**Medium Probability.** This zone comprises land assessed as having between a 1 in 100 and 1 in 1000 annual probability of river flooding (1% – 0.1%) or between a 1 in 200 and 1 in 1000 annual probability of sea flooding (0.5% – 0.1%) in any year.
3a	**High Probability.** This zone comprises land assessed as having a 1 in 100 or greater annual probability of river flooding (>1%) or a 1 in 200 or greater annual probability of flooding from the sea (>0.5%) in any year.
3b	**The Functional Floodplain.** This zone comprises land where water has to flow or be stored in times of flood. SFRA's should identify this Flood Zone (land which would flood with an annual probability of 1 in 20 (5%) or greater in any year or is designed to flood in an extreme (0.1%) flood, or at another probability to be agreed between the LPA and the EA, including water conveyance routes).

Table 5 Definition of the NPPF Flood Zones. (Source: EA)

Climate Change on Site

5.3 Climate change is likely to increase the flow in rivers, raise sea levels and increase storm intensity. The range of allowances in *Table 6* is based on percentiles. A percentile is a measure used in statistics to describe the proportion of possible scenarios that fall below an allowance level. The 50th percentile is the point at which half of the possible scenarios for peak flows fall below it and half fall above it.

5.4 The:

- central allowance is based on the 50th percentile
- higher central is based on the 70th percentile
- upper end is based on the 90th percentile

5.5 So, if the central allowance is 30%, scientific evidence suggests that it is just as likely that the increase in peak river flow will be more than 30% as less than 30%.

5.6 At the higher central allowance, 70% of the possible scenarios fall below this value. So, if the higher allowance is 40%, then current scientific evidence suggests that there is a 70% chance that peak flows will increase by less than this value, but there remains a 30% chance that peak flows will increase by more (Source: EA).

5.7 The risk of flooding to the site would, therefore, be expected to increase following the effects of climate change. The likely increases in peak rainfall intensity would also lead to an increased risk of surface water flooding.

Flood Zone	Essential Infrastructure	Highly Vulnerable	More Vulnerable	Less Vulnerable	Water Compatible
1	Central	Central	Central	Central	None
2	Upper End	Higher Central and Upper End	Higher Central and Upper End	Central and Higher Central	Central
3a	Upper End	Development should not be permitted	Higher Central and Upper End	Central and Higher Central	Central
3b	Upper End	Development should not be permitted	Development should not be permitted	Development should not be permitted	Central

Table 6: Allowance and Flood Zone Table (Source EA)

5.8 The proposed development is 'More Vulnerable' under the Flood Risk and Coastal Change Planning Policy Guidance. The site is in an area of Flood Zone 3 and the main source of flood risk is tidal/coastal.

5.9 The Environment Agency have provided modelled flood information for the site, for both fluvial and tidal flood risk.

Tidal

5.10 The modelled flood outlines indicate that the site of the proposed development could be affected by flooding in the 1:200-year, 1:1,000-year and 1:200-year +CC events.

5.11 The Environment Agency updated the climate change allowances for tidal flooding in 2016. The modelled flood information provided for this site was extracted from the Tidal ABD Study which was completed in 2014. As such, the modelled data does not account for the latest climate change allowances, which were published after the model was produced.

5.12 As per comments provided by the Environment Agency, Ambiental have used the modelled 1:200-year flood level (present day, undefended) extracted at the site (6.17mAOD) and the latest climate change allowances for sea level rise to estimate the risk of tidal flooding to the site as a result of climate change. Whilst both undefended and defended flood levels had been provided by the EA for the site, the EA Flood Map for Planning indicates that the site does not benefit from flood defences. Thus, the undefended flood level is deemed most appropriate to use for assessing tidal flood risk at the site.

5.13 Using the latest climate change allowances for sea level rise, Ambiental have calculated that the flood level in the 1:200-year tidal flood event when taking account of climate change could be 7.12mAOD in the Higher Central and 7.5mAOD in the Upper End scenario. This is shown in Table 7 below. Based on existing ground levels of the site, this land could experience potential maximum flood depths of 1.7m in the 1:200-year +CC (Higher Central) scenario and 2.08m in the 1:200-year +CC (Upper End) defended scenario.

5.14 It is not appropriate to apply the H++ sea level rise allowances for this Flood Risk Assessment, because the proposal is for the construction of 2 residential dwellings; whereas, the H++ allowances must be applied

when assessing flood risk to nationally significant infrastructure projects, new settlements or significant urban extensions. Also, the use of the H++ allowances could be deemed as onerous, given that all bedrooms in the proposed residential dwellings will be upstairs.

5.15 The EA data provided for the site, using the old climate change allowances, demonstrated that the flood level on site in the tidal undefended 1:200-year +CC scenario would be 6.86mAOD.

Start Year		**2014**	**2036**	**2066**	**2096**		
End Year		**2035**	**2065**	**2095**	**2125**		
Length of time (years)		*21*	*30*	*30*	*30*		
Sea level rise per year (mm)	**Higher Central**	4.5	7.3	10	11.2		
	Upper End	5.7	9.9	14.2	16.3	**Cumulative sea-level rise 2014 to 2125**	**Total sea level**
	High++	6	12.5	24	33	**(metres)**	**(mAOD)**
Cumulative rise (mm)	**Higher Central**	95	219	300	336	**0.95**	**7.12**
	Upper End	120	297	426	489	**1.33**	**7.5**
	High++	126	375	720	990	**2.21**	**8.38**

Table 7: climate change allowances for sea level rise

Fluvial

5.16 The site is shown to remain unaffected by the modelled flood outlines for the 1:100-year, 1:1,000-year and 1:100-year +CC (20%) fluvial events, in both the defended and undefended scenarios. See Appendix 2 for the EA data.

5.17 Given that the main flood risk to the site is tidal, the impact of climate change on the fluvial flood risk has not been assessed further.

6. Residual Risks

Identification of Residual Risks

6.1 Residual risks are those remaining after applying the sequential approach to the location of development and taking mitigating actions. Examples of residual flood risk include:

- the failure of flood management infrastructure such as a breach of a raised flood defence, blockage of a surface water conveyance system, overtopping of an upstream storage area, or failure of a pumped drainage system;
- failure of a reservoir, or;
- a severe flood event that exceeds a flood management design standard, such as a flood that overtops a raised flood defence, or an intense rainfall event which the drainage system cannot cope with.

Defence Breach

6.2 The EA Flood Map for Planning (Figure 3) does not identify the site to be located in an area benefitting from defences; however, an analysis of the modelled flood information provided by the EA for the site has demonstrated that existing tidal flood defences located on the nearby Haverigg Pool watercourse (EA Main River) provide some protection against tidal flooding.

6.3 No breach modelling was provided by the Environment Agency for the site, and a review of the Copeland Borough Council Strategic Flood Risk Assessment (SFRA, 2007) indicates that breach modelling was not undertaken.

6.4 Following the data request, the Environment Agency provided undefended modelled flood levels, which represent the worst-case scenario of flood risk at the site if there were no existing flood defences. Undefended flood scenarios are discussed in Section 4 of the report.

6.5 Given that the site is shown to be affected by tidal flooding in the 1:200-year and 1:1000-year flood events, the residual risk of flooding from defence breach has not been assessed further.

Reservoir Failure

6.6 The EA Risk from Reservoir Flooding Map (Figure 12) demonstrates that the site is outside flood extents in the event of reservoir flooding.

Figure 12 EA Risk from Reservoir Flooding Map, indicating location of site (Source: EA)

Drainage Exceedance

6.7 In the event of drainage system failure under extreme rainfall events or blockage, flooding may occur within the site. The site topography generally slopes down towards Silverdale Street at the western side of the site boundary. External ground levels should be designed away from the proposed dwellings, to divert any potential overland flows away from the dwellings and towards Silverdale Street.

7. Flood Risk Management Measures

Flood Risks

7.1 The proposed development is for the construction of two semi-detached 3no. bedroom houses. The site is currently a hardstanding area, previously used for caravan, trailer storage and van parking.

7.2 Using the December 2019 updated climate change allowances for sea level rise, the 1:200-year +CC (Higher Central) undefended flood level for the site is 7.12mAOD; and 7.5mAOD in the 1:200-year +CC (Upper End) undefended scenario. Existing ground levels on the site vary between approximately 5.42mAOD and 5.71mAOD. As such, this land could experience potential maximum flood depths of 1.7m in the 1:200-year +CC (Higher Central) scenario and 2.08m in the 1:200-year +CC (Upper End) defended scenario.

7.3 The raising of ground floor Finished Floor Levels for the proposed dwellings has not been recommended, due to the amount of raising this would require. As indicated in the proposed plans, lower consequence uses will be provided within the residential dwellings (kitchen, dining room and living room), with sleeping accommodation provided at the first-floor level. As such, it is recommended that the first-floor Finished Flood Levels are raised above the 1:200-year +CC flood level using the Upper End scenario, providing a freeboard of 600mm. Thus, the proposed FFL of the first-floor level is 8.10mAOD. This would involve raising the first-floor FFLs approximately 2.39m to 2.68m above the existing ground levels of the site.

7.4 It is important to note that the proposed dwelling will be two storeys and thus emergency safe refuge could be sought at the first floor, if required. Furthermore, given the nature of tidal flooding, it is likely that sufficient early warning would be provided before flood waters reach the site.

7.5 As such, the following mitigation measures are recommended:

- Where possible, raise first-floor FFLs of residential dwelling to 8.10mAOD (600mm above the calculated 1:200 year +CC (Upper End) undefended flood level of 7.5mAOD);
    - Internal access should be maintained from the ground floor to first floor, to allow for emergency safe refuge on site.
- Construction:
    - Sleeping accommodation to be confined to the first floor.
    - Flood resilient measures such as airbrick covers to be installed.
    - Ground floor to be of solid construction, with waterproof membrane (where possible).
    - Damp proof membranes should be included within the design of the dwellings, to minimise the passage of water through ground floors. Impermeable polythene membranes should be at least 1200 gauge to minimise ripping. Effective methods of joining membrane sections are overlaps of 300mm, and also taping (mastic tape with an overlap of 50mm minimum). Care should be taken not to stretch the membrane in order to retain a waterproof layer.
    - All floors to be finished with waterproof screed (where possible).
    - Wall cavities to be filled with closed-cell foam throughout.
    - Ground floor internal render to be waterproof.

  - Utilise waterproof seals on the doors/windows of the new building, to minimise flood water ingress during a flood event.
  - External walls to be resistant to flooding up to first floor level.
  - Exterior ventilation outlets, utility points and air bricks to be fitted with removable waterproof covers.

- Electrical connection:
  - Ground floor electrical main ring to be run from first floor level and on separately switched circuit from first floor (where possible).
  - Electrical incomer and meter to be situated at first floor level.
- Gas / water supply:
  - Boilers, control and water storage / immersion to be installed at first floor level (where possible).
  - Gas meter to be installed at first floor level (where possible).
  - All plumbing insulation to be of closed-cell design.
- Drainage:
  - Non-return valves to be fitted to all drain and sewer outlets.
  - Manhole covers to be secured.
  - Anti-syphon fitted to all toilets.
- Interior fittings:
  - Kitchen units to be of solid, water resistant material.
  - Units to be raised on legs above plinth.
  - Use of MDF carpentry (i.e. skirting, architrave, built-in storage) to be avoided at ground floor level.
- Site owners/ staff/ management/residents will be required to sign up to the EA Flood Warning Service.

Flood Warning Service

7.6 It is recommended that residents are aware of the EA Flood Information service which identifies whether any flood warnings or alerts have been issued for a specific postcode or place in England or Wales: https://flood-warning-information.service.gov.uk/.

7.7 During periods of bad weather, site users should monitor local weather reports and sign up for the Met Office UK weather warnings. Warnings can be monitored through an Apple/Android app, Twitter or directly via emails. Further information can be found at https://www.metoffice.gov.uk/.

7.8 The EA operates a 24-hour telephone service on 0345 988 1188 that provides frequently updated flood warnings and associated floodplain information. Further information can be found on www.environment-

agency.gov.uk/floodline. Floodline Warnings Direct is a free service operated by the EA that provides flood warnings direct to occupants by telephone, mobile phone, fax or pager.

7.9 The proposed development site is located within an EA Flood Warning Service Area (see Figure 13). As such, it is recommended that site users sign up to this service.

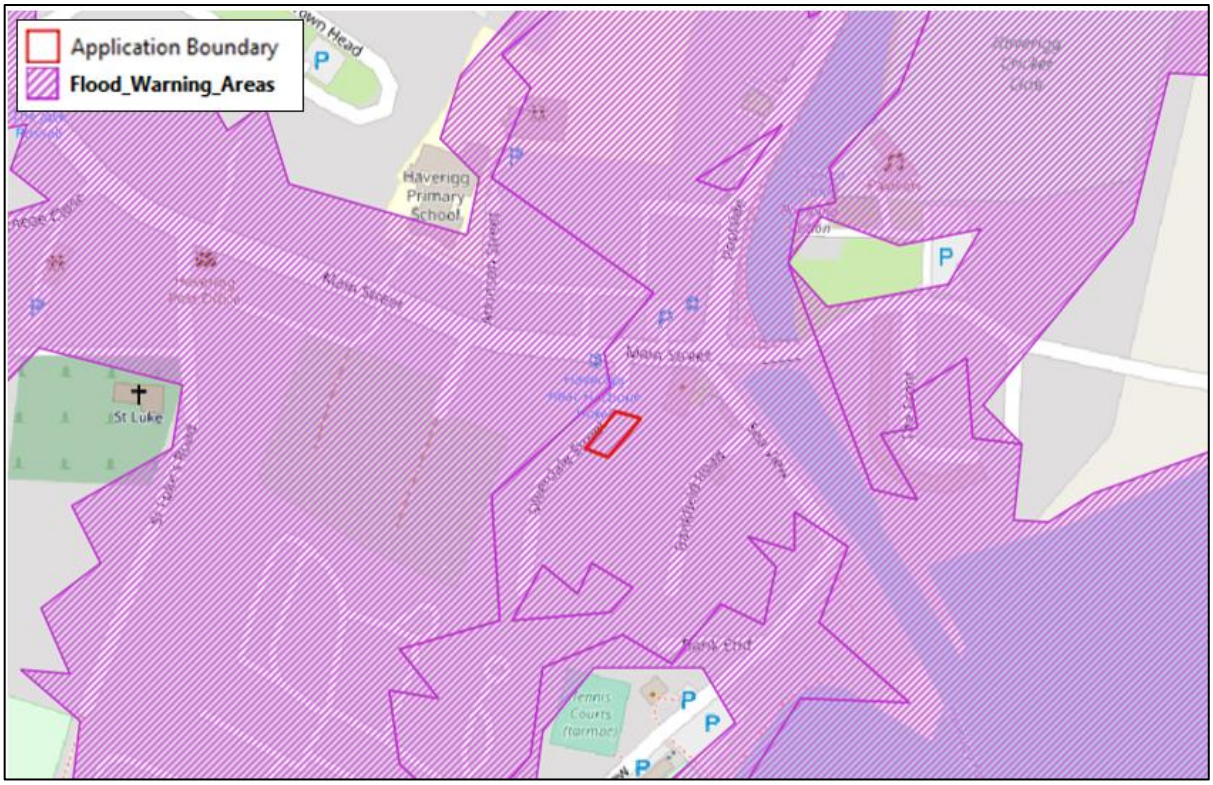


Figure 13: EA Flood Warning Areas, indicating location of site (Source: EA)

7.10 Upon receipt of a Flood Warning, site users are advised to evacuate the site to a designated place of safe refuge within Flood Zone 1.

7.11 If flood waters along the proposed evacuation route have exceeded 25cm, site users are advised, if possible, to seek refuge at the upper floors on site.

What to do if you receive a **Flood Alert**

7.12 A flood alert means you need to prepare, flooding is possible. You should:

- check your flood risk - https://flood-warning-information.service.gov.uk/long-term-flood-risk
- sign up for flood warnings - https://www.gov.uk/sign-up-for-flood-warnings
- keep up to date with the latest situation - call Floodline on 0345 988 1188 or follow @EnvAgency and #floodaware on Twitter for the latest flood updates
- have a bag ready with vital items like insurance documents and medications in case you need to leave your home
- check you know how to turn off your gas, electricity and water mains supplies
- plan how you'll move family and pets to safety

What to do if you receive a **Flood Warning**

7.13 A flood warning means you need to act, flooding is expected. You should do all the actions for a flood alert but also:

- move vehicles to higher ground if it's safe to do so
- move family and pets to safety
- move important items upstairs or to a safe place in your property, starting with cherished items and valuables, then furniture and furnishings
- turn off gas, electricity and water supplies if it's safe to do so; never touch an electrical switch if you're standing in water
- if you have property protection products such as flood barriers, or air brick covers, use them now
- keep track of the latest situation - https://flood-warning-information.service.gov.uk/warnings

What to do if you receive a **Severe Flood Warning**

7.14 A severe flood warning means there is danger to life: you must act now:

- call 999 if you're in immediate danger
- follow advice from the emergency services and evacuate if you're told to do so
- make sure you have an emergency kit including a torch, spare batteries, mobile phone and charger, warm clothes, important numbers like your home insurance, water, food, first aid kit and any medicines and baby care items you may need
- alert neighbours and offer help if it's safe to do so
- avoid driving or walking through flood water: just 30cm (1 foot) of fast flowing water could move your car and even shallow moving water can knock you off your feet
- keep your family and pets away from floodwater – it may contain heavy debris, sharp objects, open manhole covers, sewage and chemicals
- wash your hands if you've been in contact with flood water which may contain toxic substances

Flood Evacuation Plan

7.15 The controlling residual flood risk mechanism on site is tidal. Tidal flooding is generally caused by low pressure weather systems creating storm-surges (or storm tides), chiefly via high speed winds. These winds (and to a certain extent, the low pressure) create a 'bulge' of water which, if it coincides with high tide, can generate very high water levels. This mechanism is well understood, so it is very likely that an early warning would be issued before a tidal flood event. Given the nature of the tidal cycle, flood waters on site would likely recede as in-channel water levels fall. It should be noted however, that there may not be time to provide a Flood Warning in the event of the sudden and catastrophic failure of flood defences.

7.16 As with all Flood Evacuation Plans, in the first instance, all residents and occupants should always defer to, and cooperate with, the direction provided by "Blue Light Responders". This is especially true in areas which under normal circumstances would be protected by flood defences.

7.17 Upon receipt of a Flood Warning, site users are advised to evacuate the site to a designated place of safe refuge.

7.18 Based on the EA flood zone extents, a recommended evacuation route from the site to a place of safe refuge in Flood Zone 1 has been provided in Figure 14. Upon receipt of a Flood Warning, residents should leave the site, turn right down Silverdale Street and then turn left onto Main Street. After approximately 430m along this road, evacuees will be in an area of Flood Zone 1.

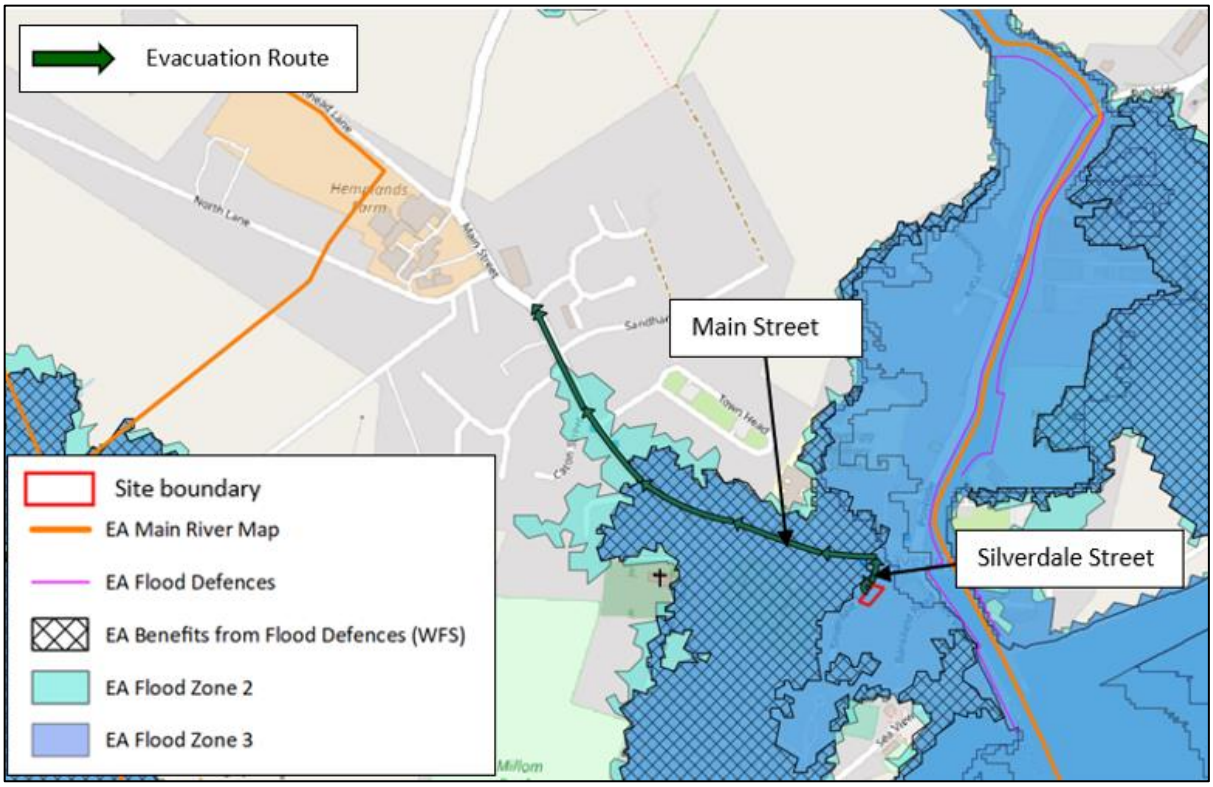


Figure 14: Recommended evacuation route from proposed site to an area of Flood Zone 1, using EA Flood Zone extents (Source: EA)

8. Off Site Impacts

Impact to Flood Risk Elsewhere

8.1 The proposed development is for the construction of two semi-detached residential dwellings. Given that the site is in an area of Flood Zone 3 which is tidally dominated, it is considered that flood compensatory storage is not required.

Generation of Runoff

8.2 The proposed development is for the construction of two semi-detached 3no. bedroom houses. The site is currently a hardstanding area, previously used for caravan, trailer storage and van parking. It is not known whether there is any existing drainage on the site.

8.3 In order to mitigate flood risk posed by the proposed development, adequate control measures are required to be considered. This will ensure that surface water runoff is dealt with at source and the flood risk on/off site is not increased over the lifetime of the development.

8.4 The site is located in an existing residential area. As such, it is recommended that the proposed dwellings are connected to the nearest existing surface water sewer, as per the existing residential dwellings in the areas.

9. Conclusion

9.1 Ambiental Environmental Assessment has been appointed by Tim Jones to undertake a National Planning Policy Framework (NPPF) compliant Flood Risk Assessment (FRA) for the proposed development at Land adjacent to 2 Silverdale Street, Haverigg, Copeland, LA18 4EU.

9.2 The proposed development is for the construction of two semi-detached 3no. bedroom houses. The site is currently a hardstanding area, previously used for caravan, trailer storage and van parking.

9.3 With reference to the Environment Agency (EA) Flood Map for Planning, the proposed development is located within Flood Zone 3. The proposed development is considered “More Vulnerable” under Table 2 of the Flood Risk and Coastal Change Planning Policy Guidance and the NPPF.

9.4 A topographic survey has been completed by the client and indicates that the existing ground levels on the site vary between approximately 5.42mAOD, closest to Silverdale Road, and 5.71mAOD, at the eastern side of the site.

9.5 The Environment Agency have provided site-specific modelled flood levels and flood outlines for the tidal events for both the defended and undefended scenarios, extracted from the Tidal ABD Study (2014), and for fluvial flood events, taken from the Haverigg Study (2011).

9.6 As per comments provided by the Environment Agency, Ambiental have only considered the undefended scenarios. An analysis of the flood data within this report has demonstrated the following:

- The site could be affected by a flood level of 6.17mAOD in the modelled 1:200-year tidal flood event (undefended), resulting in flood depths of between 0.46m and 0.75m when compared with existing ground levels of the site.
- During the modelled 1:1,000-year tidal flood event (undefended), a flood level of 6.43mAOD could affected the site. This could result in flood depths of between 0.72m and 1.01m on site.
- Using the December 2019 updated climate change allowances for sea level rise, the 1:200-year +CC (Higher Central) undefended flood level for the site is 7.12mAOD; and 7.5mAOD in the 1:200-year +CC (Upper End) defended scenario. Based on existing ground levels of the site, this land could experience potential maximum flood depths of 1.7m in the 1:200-year +CC (Higher Central) scenario and 2.08m in the 1:200-year +CC (Upper End) defended scenario.
- The site should remain unaffected by fluvial flooding in the 1:25-year, 1:100-year, 1:1,000-year and 1:100-year +20%CC flood events, for both the defended and undefended scenarios.
- The main flood risk to the site is thus shown to be tidal.

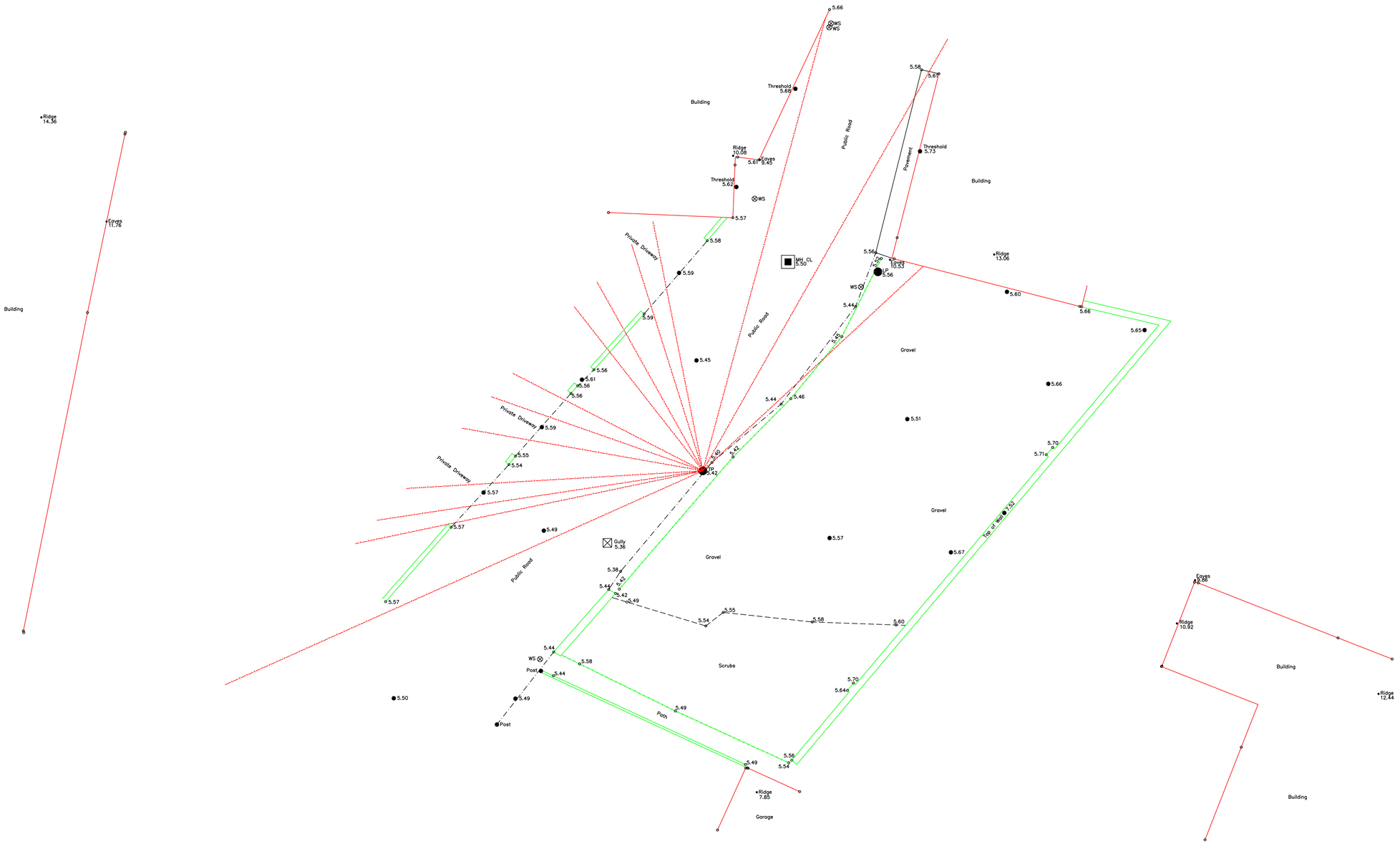
9.7 Sleeping accommodation will be provided at the first-floor level of the proposed houses. It is recommended that the first-floor Finished Floor Levels of the residential dwellings are raised to 8.10mAOD (600mm above the calculated 1:200 year +CC (Upper End) undefended flood level of 7.50mAOD). Internal access should be maintained from the ground floor to first floor, to allow for emergency safe refuge on site.

9.8 The site is in an EA Flood Alert/Warning Service Area, so residents should sign up to this service. In the event of an EA Flood Warning, the site shall be evacuated for the duration of the warning.

9.9 The proposed dwellings should incorporate flood resilience measures in line with current best practice for construction within an area at risk of flooding in line with CLG 2007 'Improving the Flood Performance of New Buildings’. These measures are detailed in Section 7 of the report.

Appendix I - Site Plans

Ambiental Environmental Assessment
Sussex Innovation Centre,
Science Park Square,
Brighton, BN1 9SB



Revision Notes:

Survey Note:

Survey on planar grid, referenced to OSGB36 at the following point:
315989.66mE
478649.78mN

Survey Key:

	Wall		Cover
			Man Hole
			Fire Hydrant
	Kerb	WS	Water Supply
		LP	Lamp Post
	Fence	EP	Electricity Pole
		TP	Telegraph Pole
	Vegetation Line		Anchor Point
	Tree		Bench Mark
			Bore Hole
	Bush	AV	Air Valve
		FP	Fire Point
	Gate	SV	Stop Valve
	Drop Kerb	CATV	Cable TV
		TBGH	Top of Bottom Gate Hanging
	O/H Telecomms		
	O/H Power		

SPATIAL DATA LIMITED
Chartered Land Surveyors

3 Boundary Bank, Kendal, Cumbria, LA9 5RR

Telephone:+44(0)1539 734400

E-mail: info@SpatialDataLtd.com
URL: www.SpatialDataLtd.com

Client: Craig and Meyer

Project: Silverdale Road, Haverigg

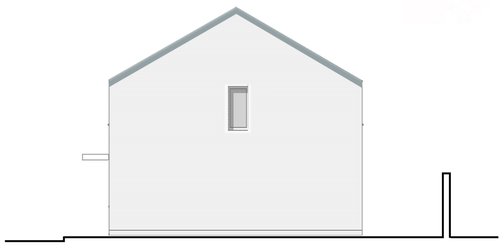
Site Survey: October 2020

Scale: 1:100 @ A1

Crew: HT,SM,EH Chk: NR Ref: LEE

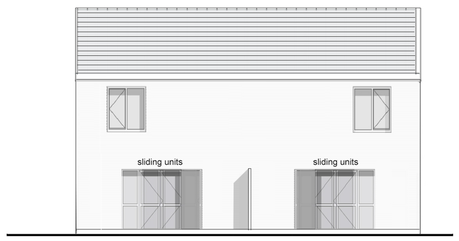
0 2 4 6 8 10

Scale Bar – metres

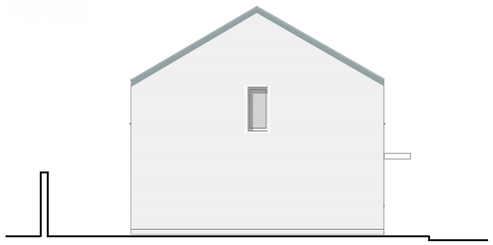


north east elevation

front elevation 1:50

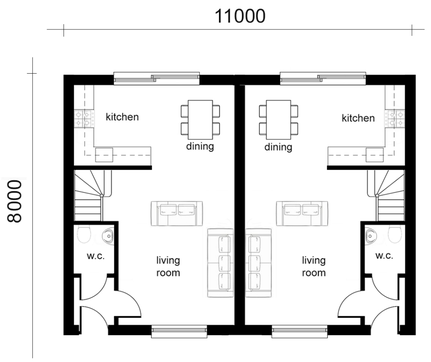


rear elevation 1:50

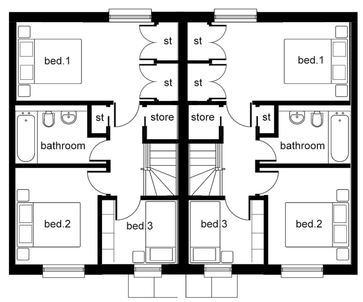


south west elevation

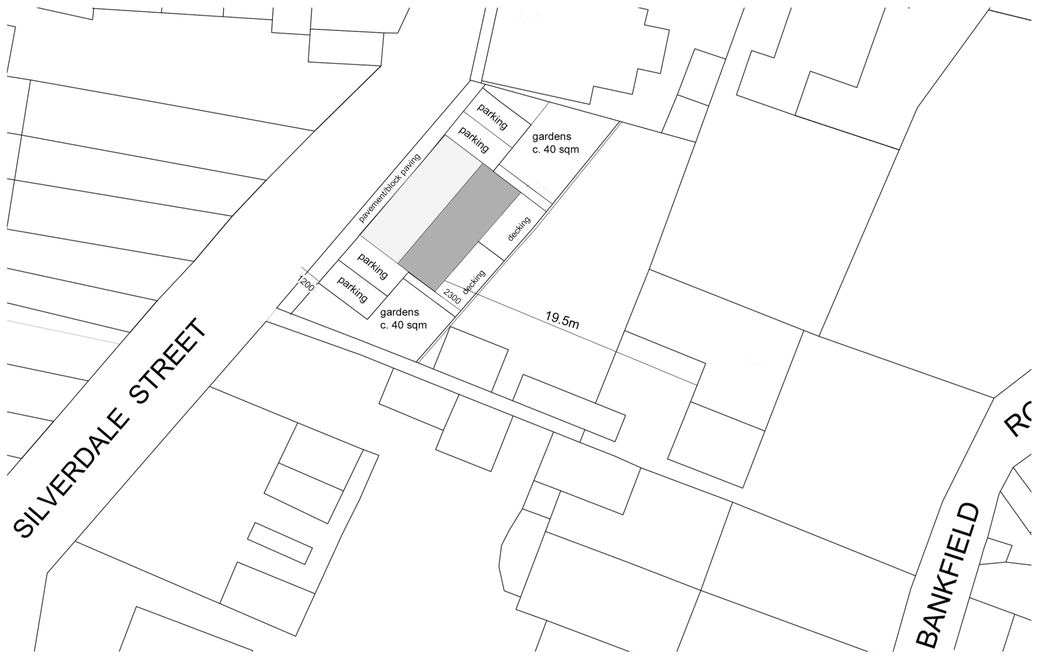
view of front of semi detached houses



ground floor plan 1:50

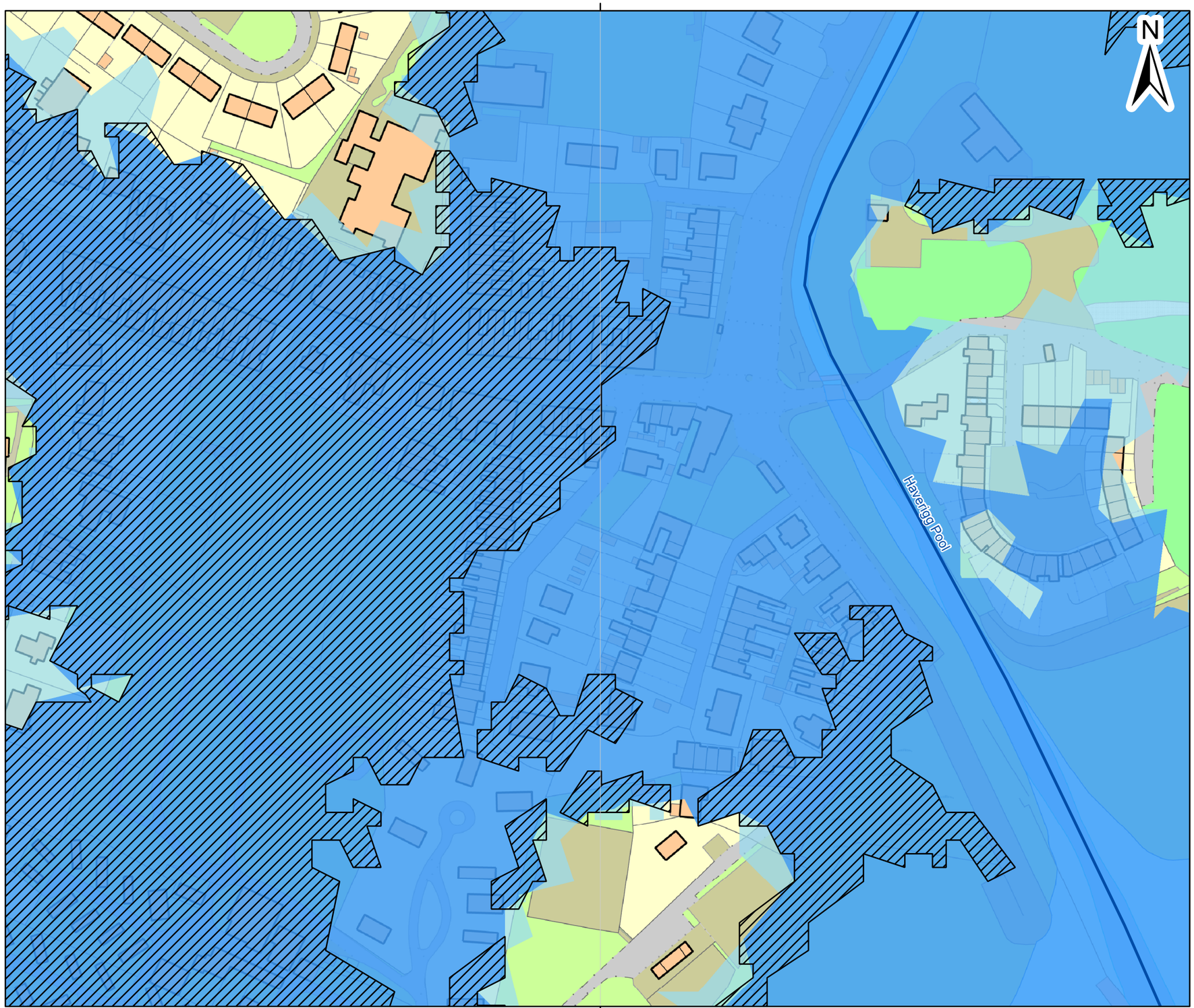


first floor plan 1:50



Vacant Land Silverdale St Haverigg	Drawing Number 2020 601	
	Scale: various	REV. 1
	Scheme Drawings Pre App.	

Appendix II - EA Data



Environment Agency

Flood Zones Map: 2 Silverdale Street, Haverigg, Copeland, LA18 4EU

Produced: 10 December 2020
Our Ref: CL194371
NGR: SD1600278650

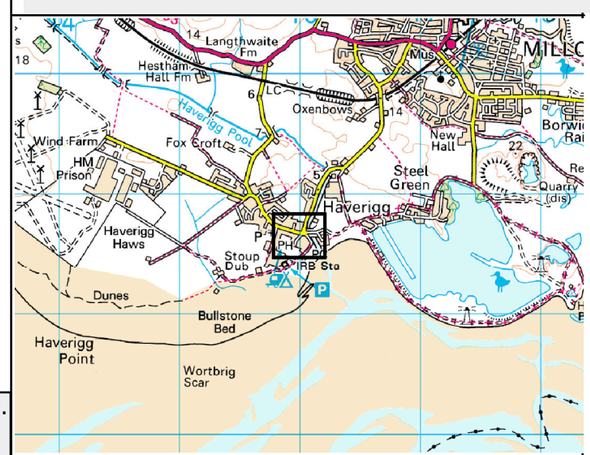
Key

- Main River
- Areas Benefitting from Defences
- Flood Zone 3
- Flood Zone 2

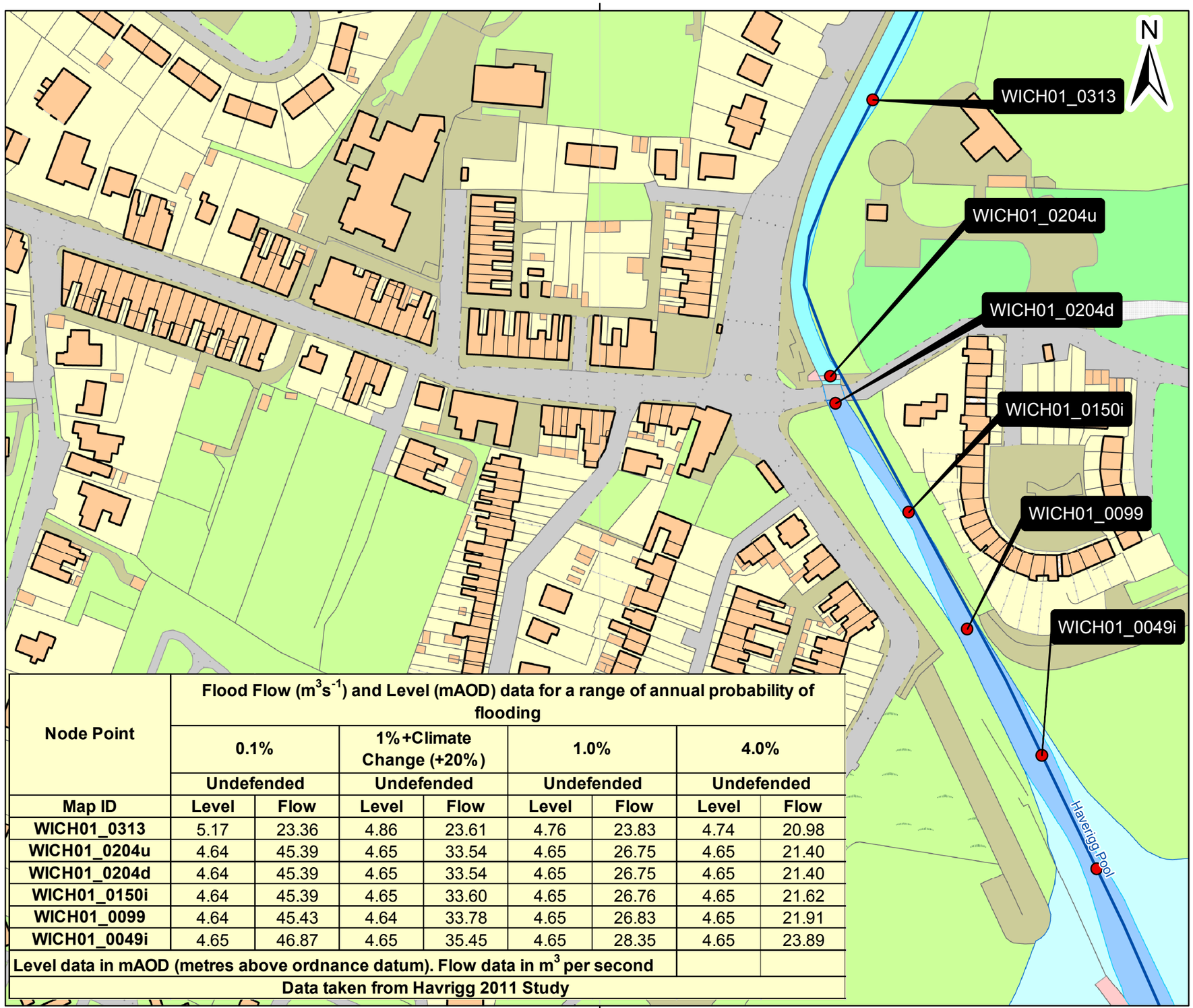
Flood Zone 3 shows the area that could be affected by flooding:
- from the sea with a 0.5% or greater chance of happening each year
- or from a river with a 1.0% or greater chance of happening each year.

Flood Zone 2 shows the extent of an extreme flood from rivers or the sea with up to 0.1% chance of occurring each year.

ABDs (Areas Benefiting from Defences) show the area benefiting from defences during a 0.5% tidal, or 1.0% fluvial flood event.



Contact Us: National Customer Contact Centre, PO Box 544, Rotherham, S60 1BY. Tel: 03708 506 506 (Mon-Fri 8-6). Email: enquiries@environment-agency.gov.uk



Node Point	Flood Flow (m^3s^{-1}) and Level (mAOD) data for a range of annual probability of flooding							
	0.1%		1%+Climate Change (+20%)		1.0%		4.0%	
	Undefended		Undefended		Undefended		Undefended	
Map ID	Level	Flow	Level	Flow	Level	Flow	Level	Flow
WICH01_0313	5.17	23.36	4.86	23.61	4.76	23.83	4.74	20.98
WICH01_0204u	4.64	45.39	4.65	33.54	4.65	26.75	4.65	21.40
WICH01_0204d	4.64	45.39	4.65	33.54	4.65	26.75	4.65	21.40
WICH01_0150i	4.64	45.39	4.65	33.60	4.65	26.76	4.65	21.62
WICH01_0099	4.64	45.43	4.64	33.78	4.65	26.83	4.65	21.91
WICH01_0049i	4.65	46.87	4.65	35.45	4.65	28.35	4.65	23.89
Level data in mAOD (metres above ordnance datum). Flow data in m^3 per second								
Data taken from Havrigg 2011 Study								

Environment Agency

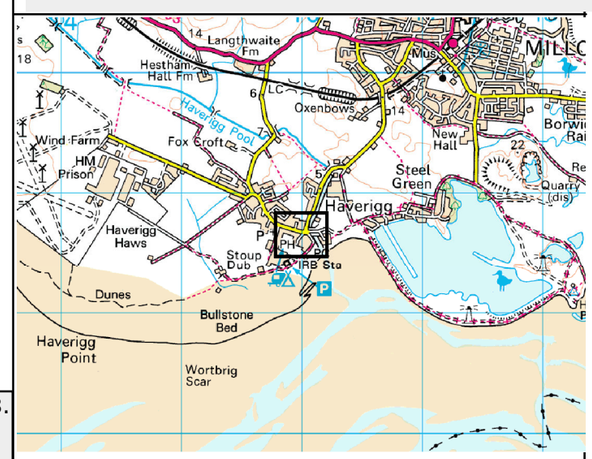
Fluvial Levels Map: 2 Silverdale Street, Haverigg, Copeland, LA18 4EU

Produced: 10 December 2020
Our Ref: CL194371
NGR: SD1600278650

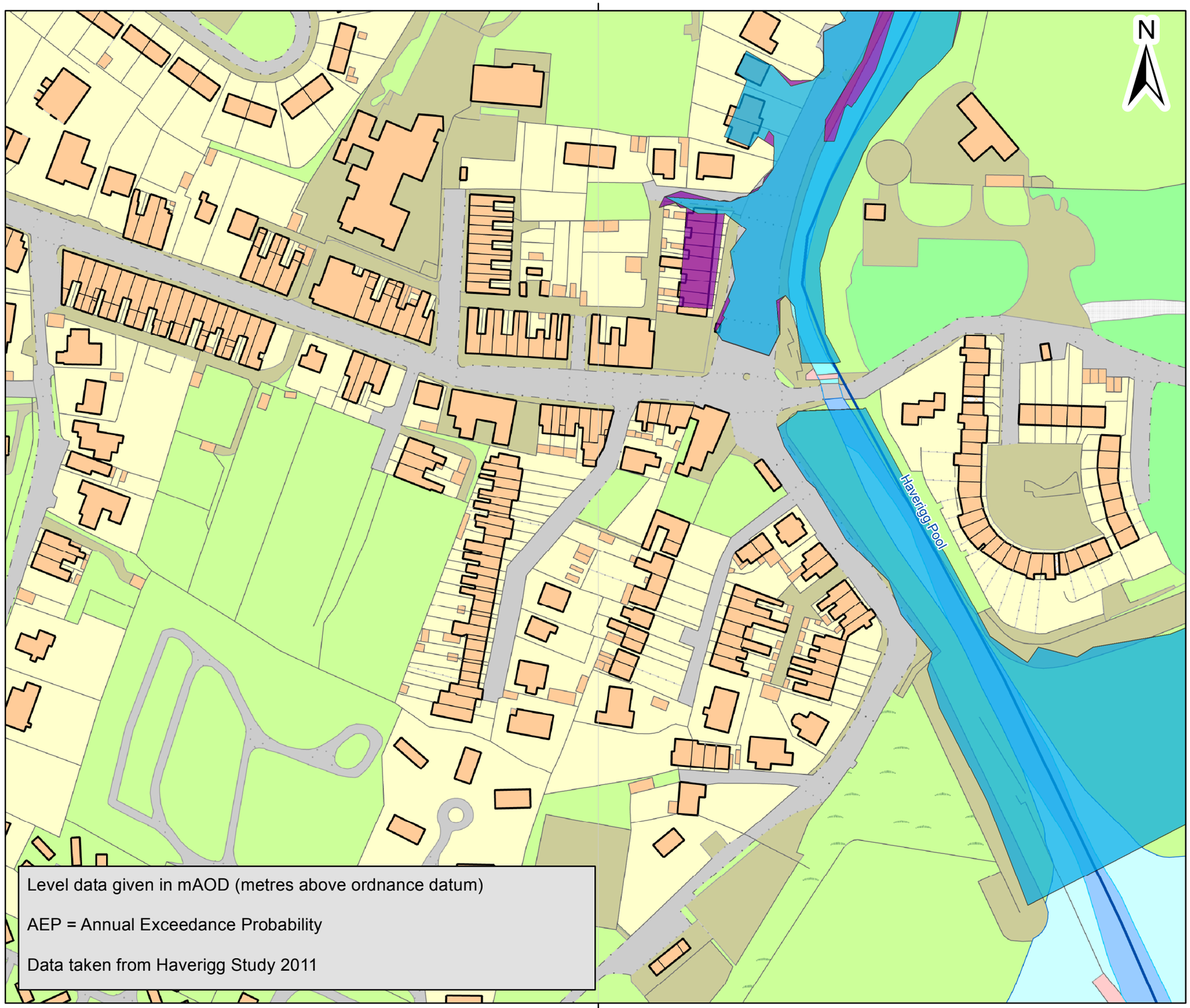
Flood Zone 3 shows the area that could be affected by flooding:
- from the sea with a 0.5% or greater chance of happening each year
- or from a river with a 1.0% or greater chance of happening each year.

Flood Zone 2 shows the extent of an extreme flood from rivers or the sea with up to 0.1% chance of occurring each year.

ABDs (Areas Benefiting from Defences) show the area benefiting from defences during a 0.5% tidal, or 1.0% fluvial flood event.



Contact Us: National Customer Contact Centre, PO Box 544, Rotherham, S60 1BY. Tel: 03708 506 506 (Mon-Fri 8-6). Email: enquiries@environment-agency.gov.uk



Level data given in mAOD (metres above ordnance datum)

AEP = Annual Exceedance Probability

Data taken from Haverigg Study 2011

Environment Agency

Fluvial Outlines Map: 2 Silverdale Street, Haverigg, Copeland, LA18 4EU

Produced: 10 December 2020
Our Ref: CL194371
NGR: SD1600278650

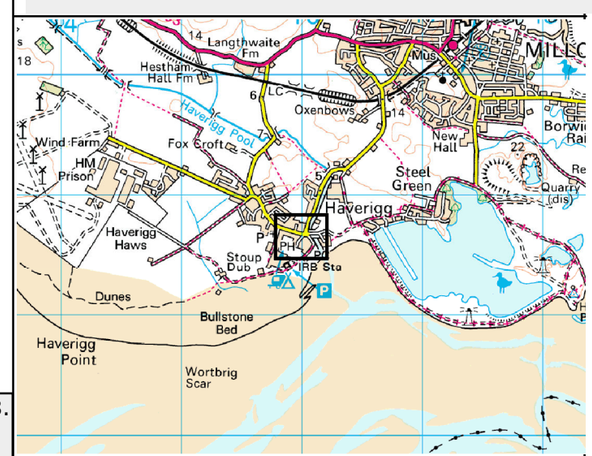
Key

- Fluvial 1% annual probability of flooding Defended scenario
- Fluvial 4% annual probability of flooding Defended scenario
- Main River

Flood Zone 3 shows the area that could be affected by flooding:
- from the sea with a 0.5% or greater chance of happening each year
- or from a river with a 1.0% or greater chance of happening each year.

Flood Zone 2 shows the extent of an extreme flood from rivers or the sea with up to 0.1% chance of occurring each year.

ABDs (Areas Benefiting from Defences) show the area benefiting from defences during a 0.5% tidal, or 1.0% fluvial flood event.



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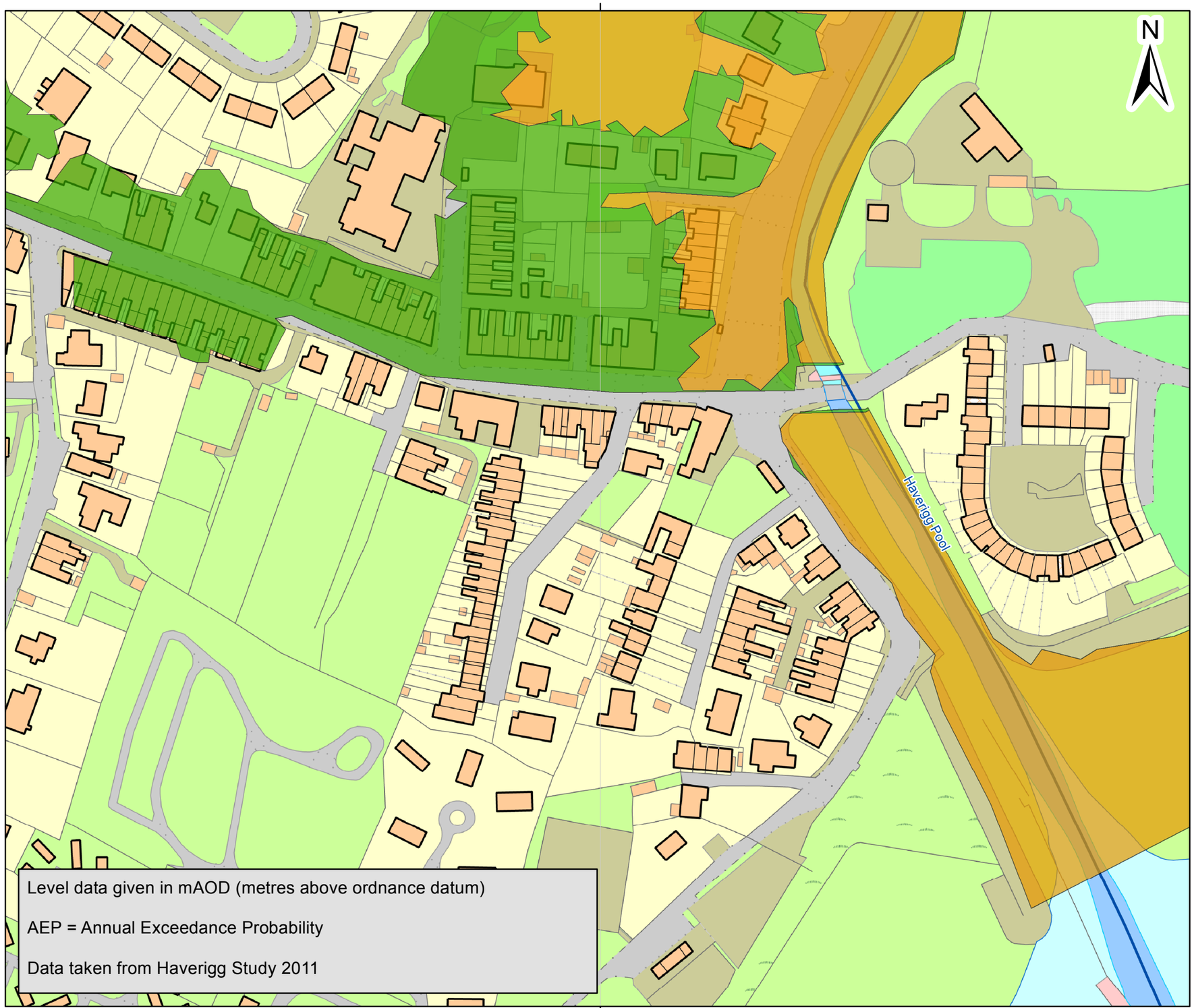


Level data given in mAOD (metres above ordnance datum)

AEP = Annual Exceedance Probability

Data taken from Haverigg Study 2011

Environment Agency

Fluvial Outlines Map: 2 Silverdale Street, Haverigg, Copeland, LA18 4EU

Produced: 10 December 2020
Our Ref: CL194371
NGR: SD1600278650

Key

Fluvial 0.1% annual probability of flooding Defended scenario

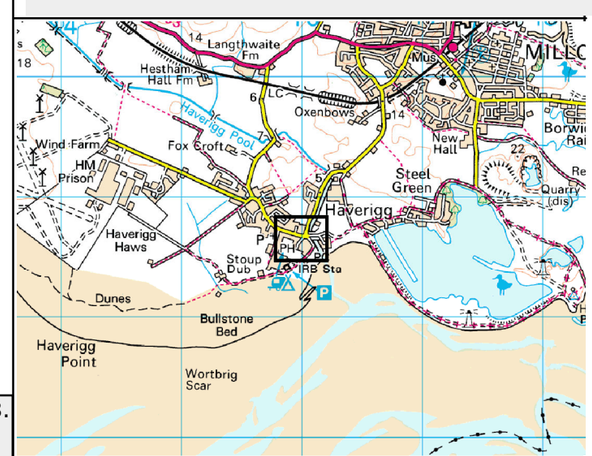
Fluvial 1% annual probability of flooding Defended scenario + 20% Climate change

Main River

Flood Zone 3 shows the area that could be affected by flooding:
- from the sea with a 0.5% or greater chance of happening each year
- or from a river with a 1.0% or greater chance of happening each year.

Flood Zone 2 shows the extent of an extreme flood from rivers or the sea with up to 0.1% chance of occurring each year.

ABDs (Areas Benefiting from Defences) show the area benefiting from defences during a 0.5% tidal, or 1.0% fluvial flood event.



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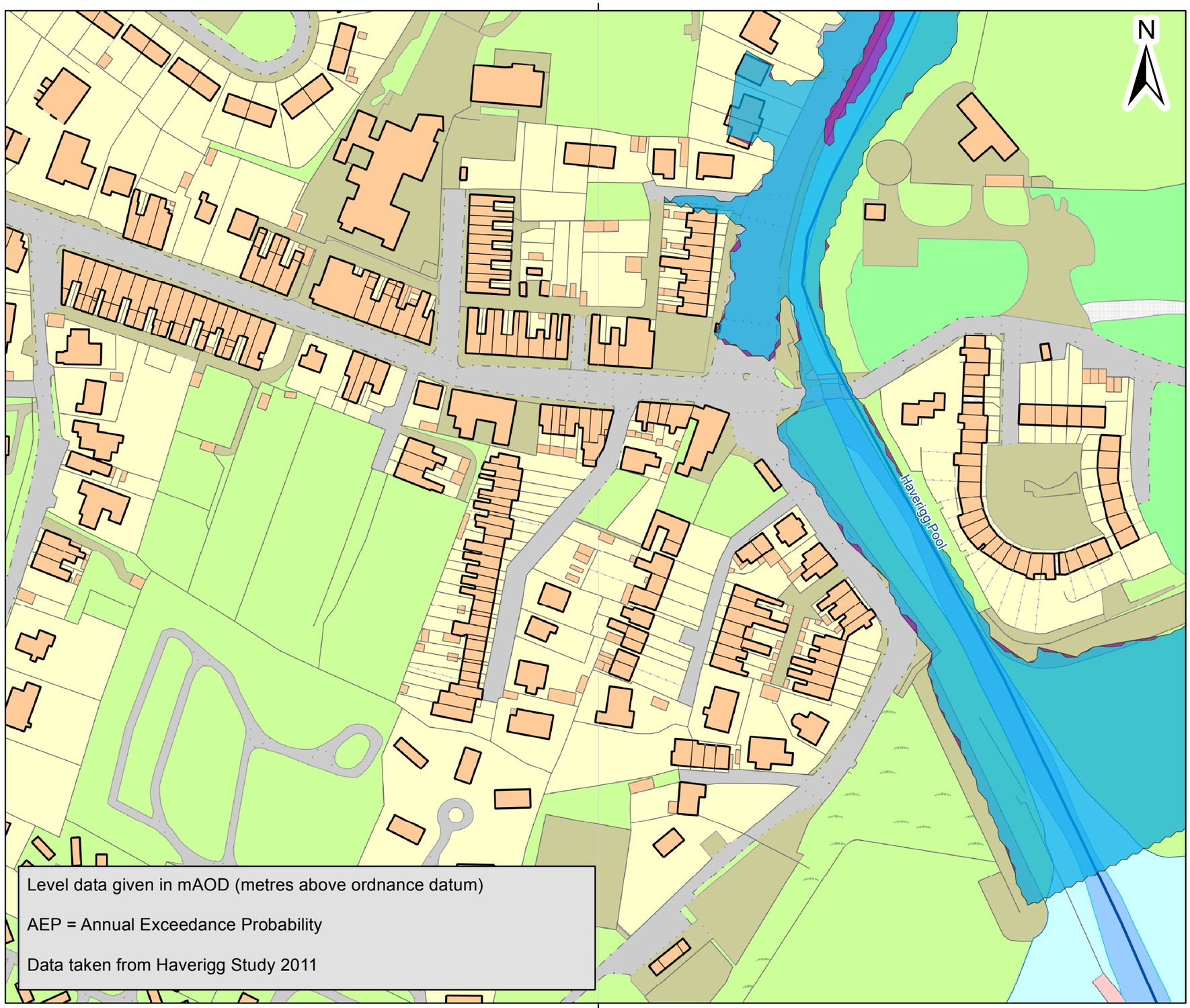

Level data given in mAOD (metres above ordnance datum)

AEP = Annual Exceedance Probability

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Key

Fluvial 1% annual probability of flooding Undefended scenario

Fluvial 4% annual probability of flooding Undefended scenario

Main River

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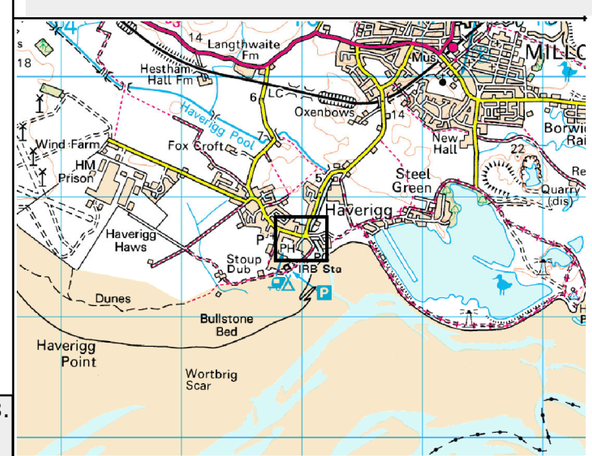

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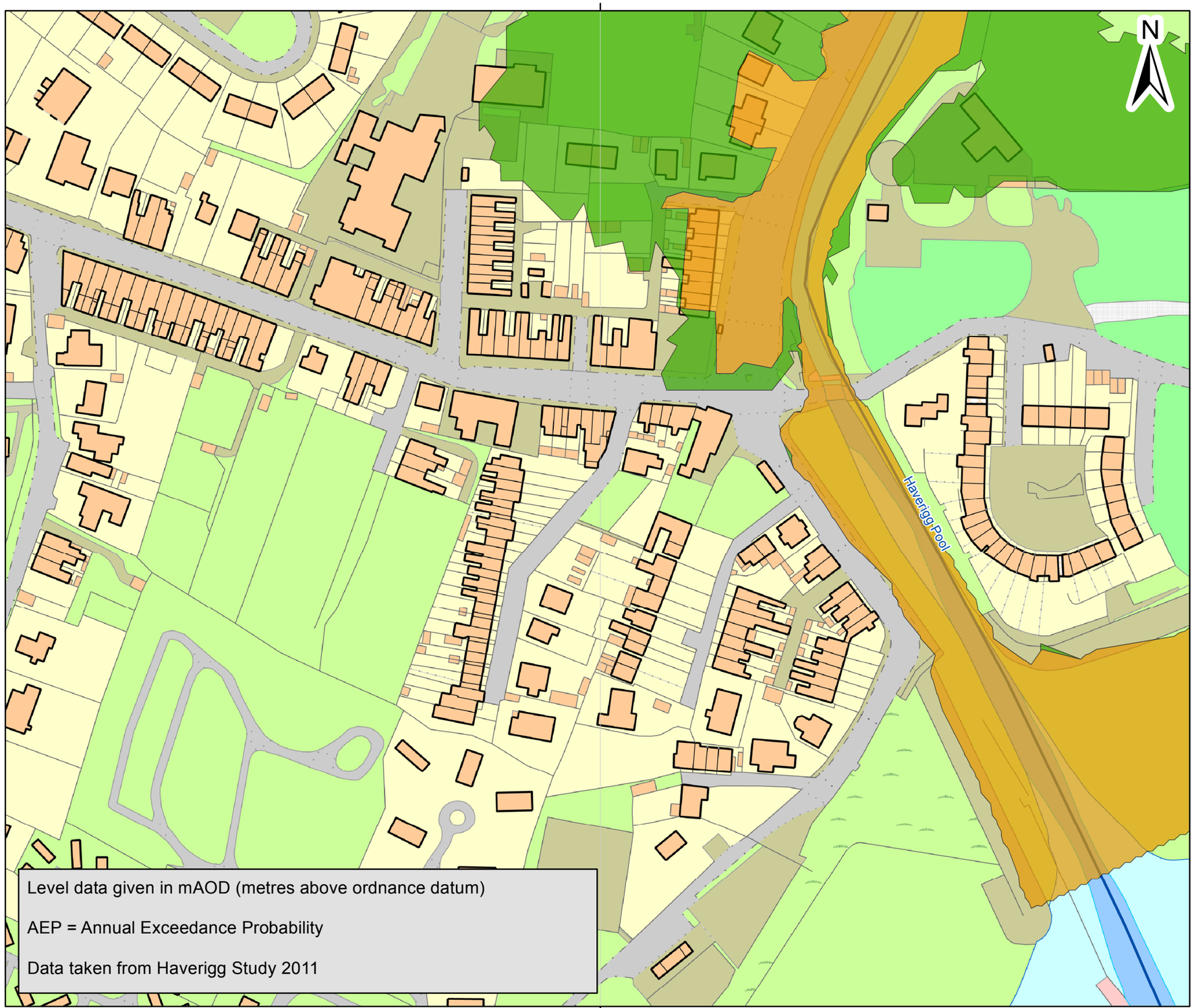

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Fluvial 1% annual probability of flooding Undefended scenario + Climate change

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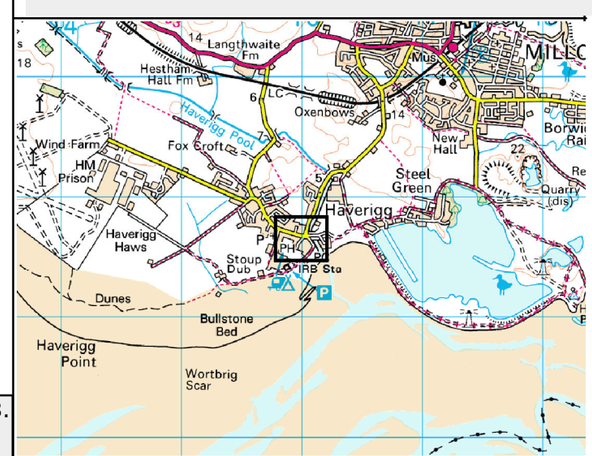

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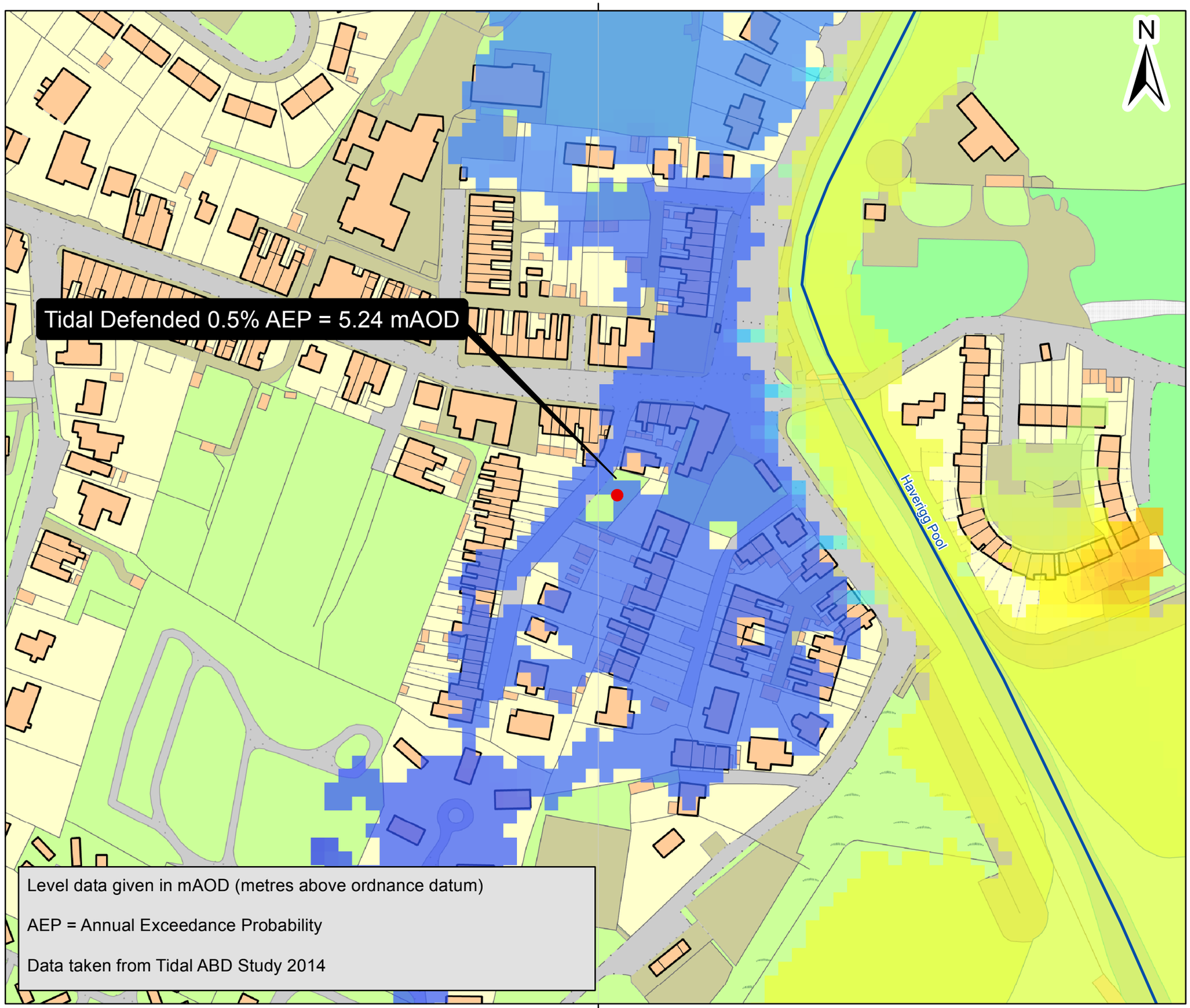

Tidal Flood Levels Map: 2 Silverdale Street, Haverigg, Copeland, LA18 4EU

Produced: 10 December 2020
Our Ref: CL194371
NGR: SD1600278650

Key

Main River

Tidal 0.5% Defended annual probability of flooding

mAOD

High : 7

Low : 5

Flood Zone 3 shows the area that could be affected by flooding:
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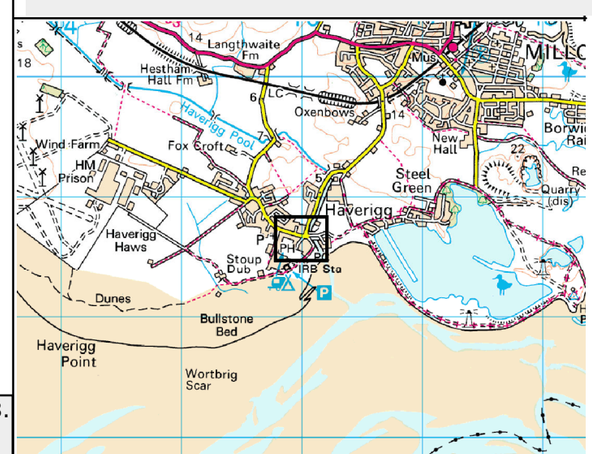

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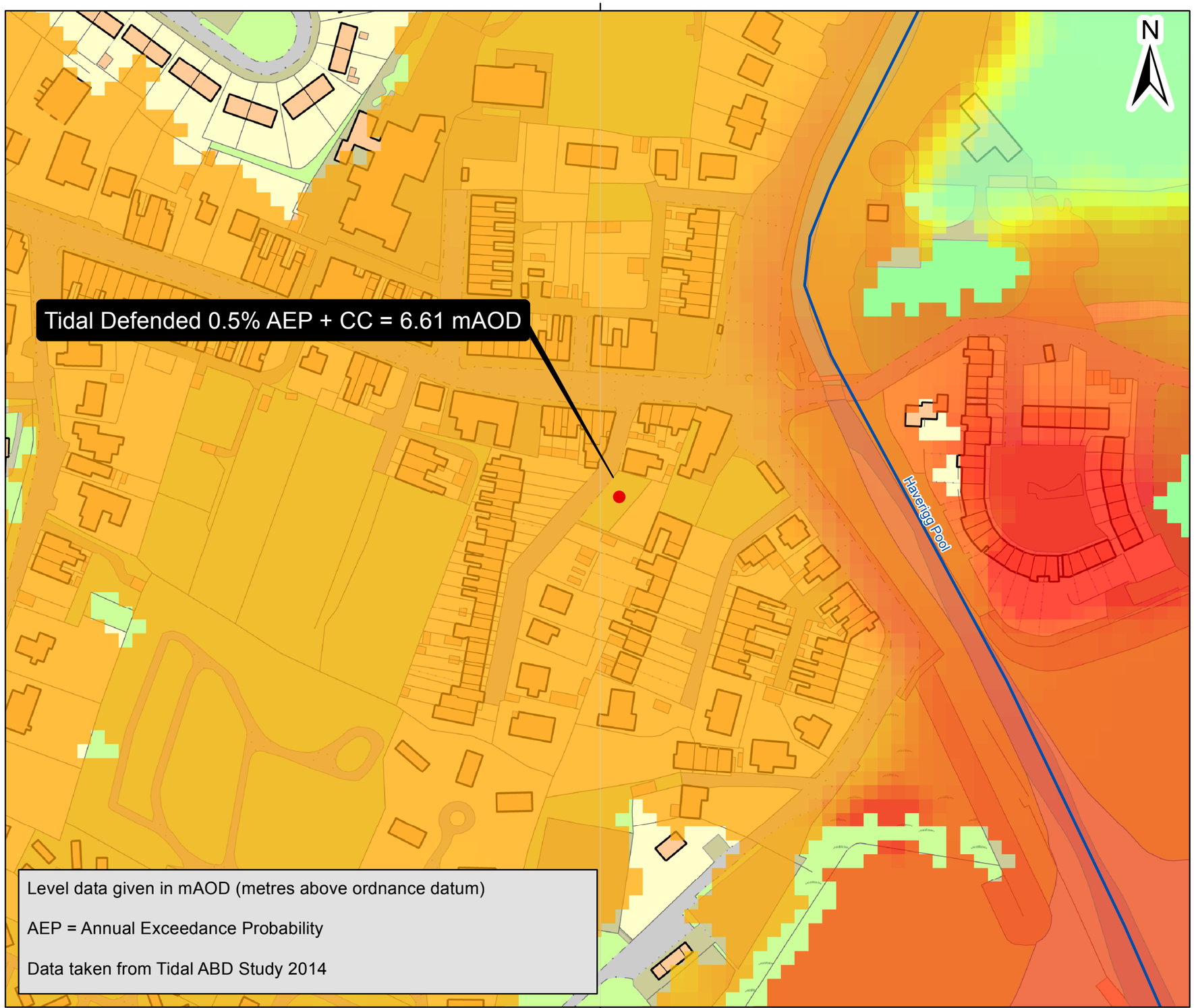

Environment Agency

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Produced: 10 December 2020
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NGR: SD1600278650

Key

Main River

Tidal 0.5% Defended annual probability of flooding + Climate change

mAOD

High : 7

Low : 5

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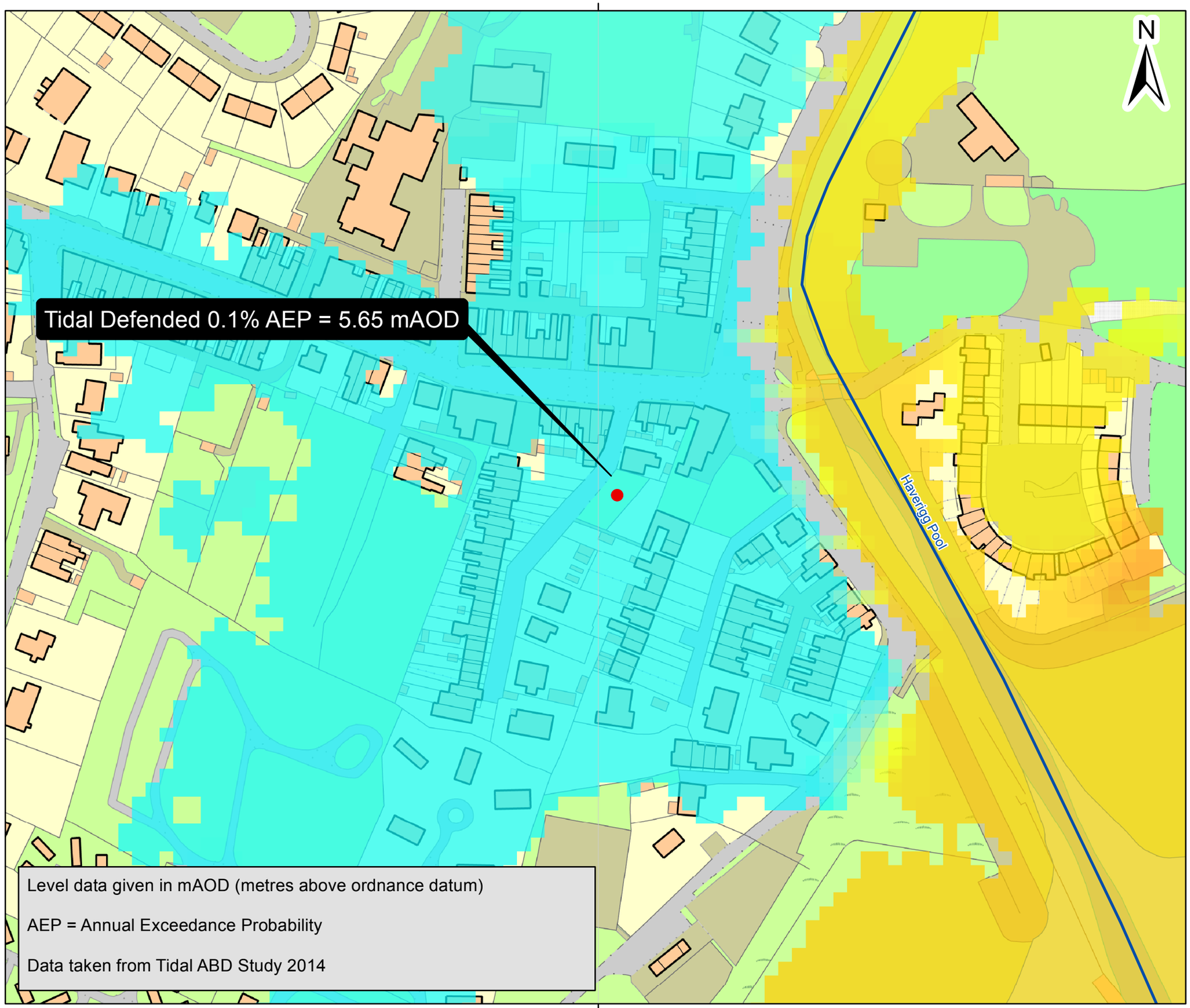

Tidal Flood Levels Map: 2 Silverdale Street, Haverigg, Copeland, LA18 4EU

Produced: 10 December 2020
Our Ref: CL194371
NGR: SD1600278650

Key

Main River

Tidal 0.1% Defended annual probability of flooding

mAOD

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Low : 5

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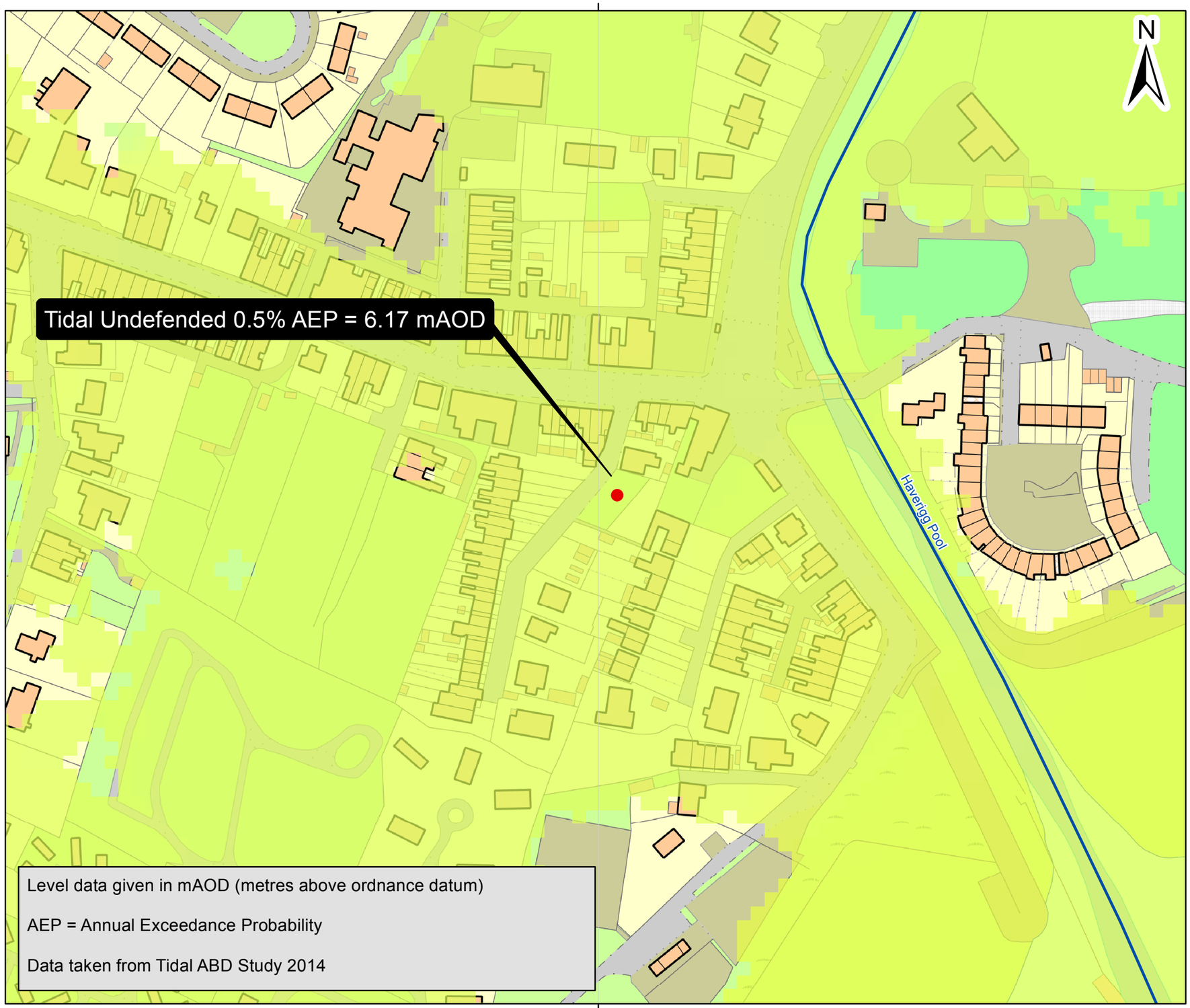

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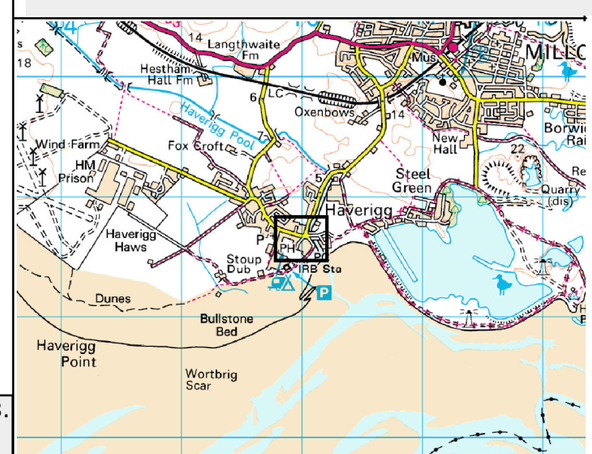

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Tidal 0.5% Undefended annual probability of flooding + climate change

mAOD

High : 7

Low : 5

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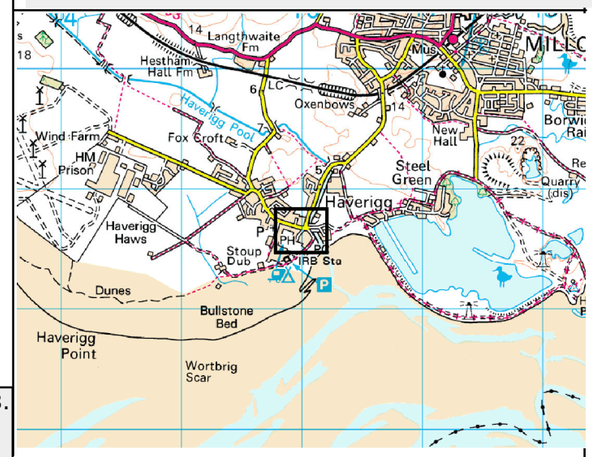

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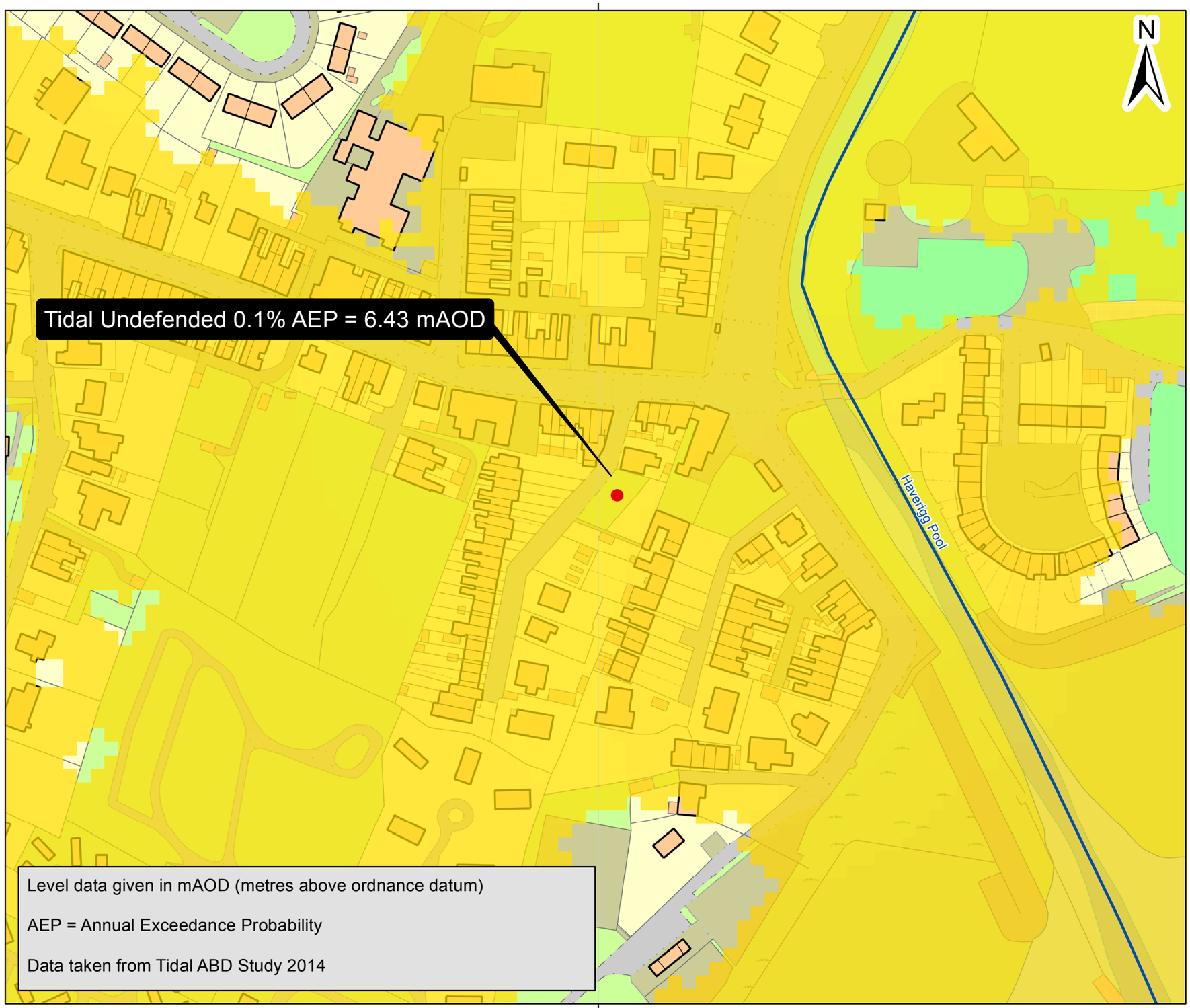

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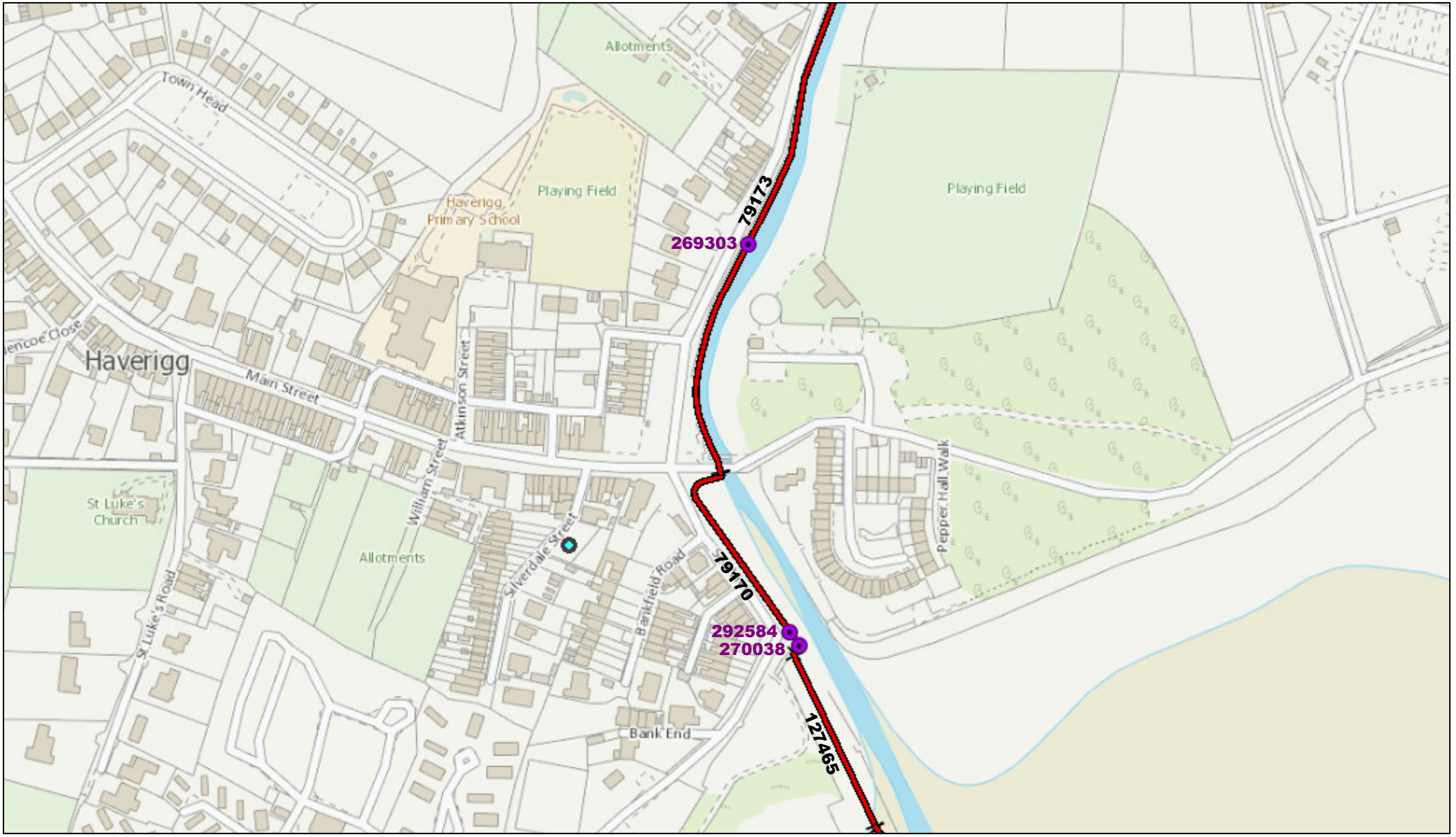
CL194371 2 Silverdale Street, Haverigg



November 23, 2020

- Structures
- Defences
- Blank

1:2,745

0 0.0225 0.045 0.09 mi

0 0.035 0.07 0.14 km

Site Location	2 Silverdale Street, Haverigg	CL194371

Tidal Defences

Asset ID	National Grid Reference	Asset Type	Protection Type	Location	Maintained By	Design Standard (Return Period)	Overall Condition Grade (Excellent 1-5 Very Poor)	Effective Crest Level (m)		E.C.L Data Quality (Reliable 1-4 Unreliable)	Length (m)	Height (m)
								UCL (mAOD)	DCL (mAOD)			
127465	SD 16164 78502	Wall	Tidal	Estuary at Haverigg to Sea View	Environment Agency	100	2	4.36	3.3	2	100.86	-
79170	SD 16121 78593	Wall	Tidal	Sea View to Road Bridge opposite Harbour Pub	Environment Agency	100	2	6.53	6.52	1	124.95	1
79173	SD 16082 78688	Wall	Tidal	Road Bridge opposite Harbour Pub to Whitriggclose Bridge	Environment Agency	100	2	6.51	6.52	1	541.81	1.3

The Environmental Permitting (England and Wales) Regulations 2016 require a permit to be obtained for any activities which will take place:

- **on or within 8 metres of a flood defence structure or culvert (16 metres if tidal)**
- **on or within 16 metres of a sea defence**

Site Location	2 Silverdale Street, Haverigg	CL194371

Tidal Structures

Asset ID	National Grid Reference	Asset Type	Protection Type	Location	Maintained By	Design Standard (Return Period)	Overall Condition Grade (Excellent 1- 5 Very Poor)	Width (m)	Height (m)
270038	SD 16124 78597	Outfall	Tidal	Adjacent Sea View	Environment Agency	-	2	-	-
292584	SD 16119 78605	Outfall	Tidal	Adjacent Sea View	Environment Agency	-	3	0.15	1.5
269303	SD 16097 78809	Outfall	Tidal	Raised Floodwall - Adjacent Poolside. sd16101 78817	Environment Agency	-	2	0.3	0.8