

# **FLOOD RISK ASSESSMENT**

**Residential Development  
Walcott House, Ralphs Lane,  
Wyberton**

Mr J Mackay  
January 2020



## DOCUMENT ISSUE RECORD

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## EXECUTIVE SUMMARY

This Flood Risk Assessment is compliant with the requirements set out in the National Planning Policy Framework 2019, and the associated online Planning Practice Guidance. It has been produced on behalf of Mr J Mackay. This report demonstrates that the proposed development is not at significant flood risk, and will not increase flood risk to others, subject to the recommended flood mitigation strategies being implemented.

### Policy

| Size   | Development Type | Flood Zone | Vulnerability   |
|--------|------------------|------------|-----------------|
| 0.17ha | Dwelling Houses  | 3          | More Vulnerable |

### Climate Change Allowance

#### Peak River Flow

| ANGLIAN RIVER BASIN DISTRICT |                     |
|------------------------------|---------------------|
| Allowance Category           | Percentage Increase |
| Upper End                    | 65                  |
| Higher Central               | 35                  |

#### Peak Rainfall Intensity

| Allowance Category | Percentage Increase |
|--------------------|---------------------|
| Upper End          | 40                  |
| Central            | 20                  |

#### Sea Level Rise

| Area of England | Allowance      | 2000-2035 (mm/year) | 2036-2065 (mm/year) | 2066-2095 (mm)/year | 2096-2125 (mm/year) |
|-----------------|----------------|---------------------|---------------------|---------------------|---------------------|
| Anglian         | Higher Central | 5.8                 | 8.7                 | 11.6                | 13.0                |
|                 | Upper End      | 7.0                 | 11.3                | 15.8                | 18.1                |

### Flood Risk and Mitigation

| Flood Risk Source                | Level of Risk Without Mitigation | Proposed Mitigation  |
|----------------------------------|----------------------------------|--|
| Residual (Tidal)                 | High                             | Ground Floor level min 3.30m AOD.<br>Flood resistant ground floor doors to 3.90m AOD.<br>First floor safe refuge.<br>Flood resilience to 3.90m AOD.<br>Flood emergency plan. |
| Development Foul & Surface Water | To wider catchment               | Foul water to AW sewer.<br>Surface water to adjacent watercourse.  |

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- 1.1 This Flood Risk Assessment, (FRA), is compliant with the requirements set out in the National Planning Policy Framework 2019, (NPPF), and the associated online Planning Practice Guidance.
- 1.2 The FRA has been produced on behalf of Mr J Mackay in respect of a planning application for a residential development at Walcott House, Ralphs Lane, Wyberton.

**1.3 This FRA is based on the following information:**

- ## Existing Site

- 
- A detailed map of Wybe, showing a network of roads and drains. A red rectangle highlights a specific 'Location' on a road. The map includes labels for 'The Spinney', 'Brown's Farm', and various residential streets like 'Caven', 'St. Nicholas Close', and 'Wybe'. A north arrow and copyright notice are at the bottom.

### Figure 1.1 Site Location

- 1.5 LiDAR 2m DTM shows that the site is at approximately 2.60m AOD.
- 1.6 The online British Geological Survey maps indicates that the site is located on superficial deposits of clay and silt over a bedrock of mudstone.

### Proposed Development

- 1.7 The proposed development consists of a residential development as shown on the extract of the proposed plan below in **Figure 1.2**



**Figure 1.2 Proposed Plan**



## 2.0 FLOOD RISK PLANNING POLICY

### National Planning Policy Framework 2019

- 2.1 The NPPF sets out the Government's national policies on different aspects of land use planning in England in relation to flood risk. A supporting web-based Planning Practice Guidance is also available.
- 2.2 The guidance uses four Flood Zones to characterise flood risk which refer to the probability of river and sea flooding, ignoring the presence of defences.

### Sequential Test

- 2.3 The NPPF requires the application of a Sequential Test to ensure that new development is in areas with the lowest probability of flooding and the Flood Zones provide the basis for applying the Test.

### Flood Zone Definition

|                      |   |
|----------------------|---|
| <b>Flood Zone 1</b>  | Low probability (1 in 1000 annual probability of river or sea flooding (<0.1%)).  |
| <b>Flood Zone 2</b>  | Medium probability (between 1 in 100 and 1 in 1000 annual probability of river flooding (1.0%-.0.1%) or between 1 in 200 and 1 in 1000 annual probability of sea flooding (0.5%-.0.1%) in any given year).  |
| <b>Flood Zone 3a</b> | High probability (1 in 100 or greater annual probability of river flooding (>1.0%) or 1 in 200 or greater annual probability of sea flooding (>0.5%) in any given year).  |
| <b>Flood Zone 3b</b> | This zone comprises land where water must flow or be stored in times of flood. Land which would flood with an annual probability of 1 in 20 (5.0%), or is designed to flood in an extreme flood (0.1%) should provide a starting point for discussions to identify functional floodplain. |

- 2.4 The Flood Zones do not consider the projected effects of climate change and may not represent potential flooding from smaller watercourses.
- 2.5 The aim is to steer new development to Flood Zone 1 and where there are no reasonably available sites in Flood Zone 1, local planning authorities in their decision making should consider the flood risk vulnerability of land uses and consider reasonably available sites in Flood Zone 2, applying the Exception Test if required.
- 2.6 Only where there are no reasonably available sites in Flood Zones 1 or 2 should the suitability of sites in Flood Zone 3 be considered, considering the flood risk vulnerability of land uses and applying the Exception Test if required.
- 2.7 The guidance also sets out the vulnerability to flooding of different land uses and some of these are detailed below.

## Flood Risk Vulnerability Classification

|                                 |   |
|---------------------------------|---|
| <b>Essential Infrastructure</b> | Transport Infrastructure; Utility Infrastructure; Wind Turbines.  |
| <b>Water Compatible</b>         | Flood Control Infrastructure; Water and Sewage Infrastructure; Navigation Facilities.   |
| <b>Highly Vulnerable</b>        | Emergency Services (which are required in times of flood); Basement Dwellings; Caravans, Mobile Homes and Park Homes, (intended for permanent residential use); Installations requiring Hazardous Substances Consent.   |
| <b>More Vulnerable</b>          | Hospitals and other Health Services; Residential Institutions; Dwelling Houses, Drinking Establishments; Nightclubs; Hotels; Non-residential uses for Health Services; Nurseries; Educational Establishments; Landfill and Hazardous Waste Management Facilities; Sites used for Holiday or short-let Caravan and Camping sites, (subject to a specific warning and evacuation plan). |
| <b>Less Vulnerable</b>          | Commercial Establishments; Emergency Services not required in times of flood; Land and Buildings used for Agriculture and Forestry. Waste Treatment; Minerals Working; Water Treatment Works; Sewage Treatment Works.   |

## Appropriate Development

- 2.8 Based on the vulnerability of a development the guidance states what Flood Zone(s) the development is appropriate within. The flood risk compatibility is summarised below.

|                      |   |
|----------------------|---|
| <b>Flood Zone 1</b>  | Appropriate Development – All.  |
| <b>Flood Zone 2</b>  | Exception Test - Highly vulnerable.<br>Appropriate Development - Essential Infrastructure; More vulnerable; Less vulnerable and Water Compatible.                           |
| <b>Flood Zone 3a</b> | Should not be permitted – Highly vulnerable.<br>Exception Test – Essential Infrastructure, More vulnerable.<br>Appropriate Development – Less vulnerable; Water compatible. |
| <b>Flood Zone 3b</b> | Should not be permitted – Highly vulnerable; More vulnerable; Less vulnerable.<br>Exception Test – Essential Infrastructure.<br>Appropriate Development – Water compatible. |

- 2.9 The Planning Practice Guidance also states that all sources of flooding should be considered when preparing a FRA.

## Exception Test

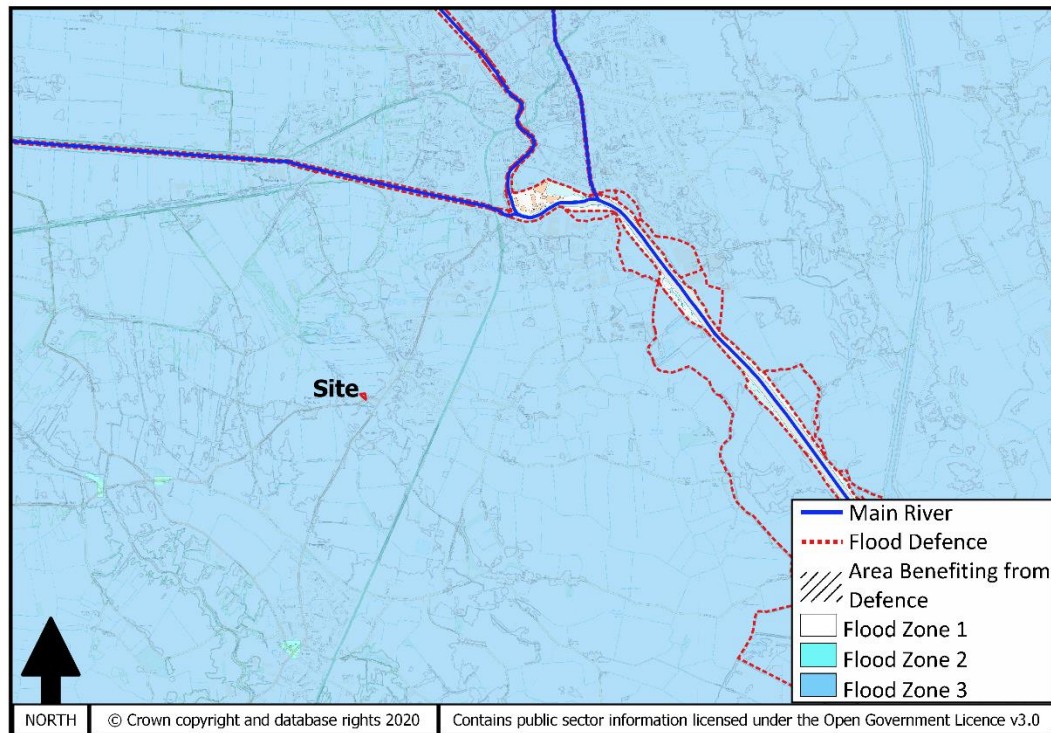
- 2.10 The Exception Test is a method to demonstrate and help ensure that flood risk to people and property will be managed satisfactorily, while allowing necessary development to go ahead in situations where suitable sites at lower risk of flooding are not available.
- 2.11 The first part of the Exception Test is to show that the proposed development will provide wider sustainability benefits to the community that outweigh flood risk. The second part is the requirement for a FRA to demonstrate that it will be safe for its lifetime, without increasing flood risk elsewhere and where possible reduce flood risk overall.

## Development Proposals

- 2.12 The proposed development consists of Dwelling Houses.

### Flood Zones

- 2.13 The Flood Zones are shown on **Figure 2.1** below which shows the site to be in Flood Zone 3.



**Figure 2.1 Flood Zones**

### Development Vulnerability

- 2.14 Dwelling Houses are More Vulnerable.

### Exception Test

- 2.15 A FRA is required to ensure the development will remain safe over its lifetime from all sources of flooding and not increase flood risk elsewhere.

## 3.0 CLIMATE CHANGE

- 3.1 The NPPF sets out how the planning system should help minimise vulnerability and provide resilience to the impacts of climate change.
- 3.2 As the Government's expert on flood risk on 19<sup>th</sup> February 2016 the Environment Agency, (EA), published revised climate change allowances to support the NPPF. The sea level rise allowances were further revised on the 17<sup>th</sup> December 2019.
- 3.3 The climate change allowances are based on projections and different scenarios of carbon dioxide (CO<sub>2</sub>) emissions to the atmosphere and provide predictions of anticipated change for:
- peak river flow by river basin district;
  - peak rainfall intensity;
  - sea level rise;
  - offshore wind speed and extreme wave height.

### Peak River Flow Allowances

- 3.4 The peak river flow allowances show the anticipated changes to peak flow by River Basin District, (RBD), with three allowances; central; higher central and upper end.
- 3.5 This proposed development is in the Anglian RBD.
- 3.6 The appropriate allowance depends on the Flood Zone and vulnerability classification of the development and for this proposal it is appropriate to use the upper end and higher central allowances.
- 3.7 The allowances change over three periods of time over the next century. The appropriate period should be chosen based on the expected lifetime of the development and for residential that is 100 years.
- 3.8 The following climate change allowances in peak river flows therefore need to be applied:

| ANGLIAN RIVER BASIN DISTRICT |                     |
|------------------------------|---------------------|
| Allowance Category           | Percentage Increase |
| Upper End                    | 65                  |
| Higher Central               | 35                  |

**Table 3.1 Climate Change Allowances for Peak River Flow**

### Peak Rainfall Intensity Allowance

- 3.9 Increased rainfall affects river levels and land and urban drainage and should be applied to surface water drainage systems.
- 3.10 These allowances are uniform across England and change over three periods of time over the next century. The appropriate period should be chosen based on the expected lifetime of the development and for residential that is 100 years
- 3.11 Surface water drainage strategies and detailed designs need to assess both the central and upper end allowances to understand the range of impact. The following climate change allowances in peak rainfall intensity therefore need to be applied to subsequent studies:

| Allowance Category | Percentage Increase |
|--------------------|---------------------|
| Upper End          | 40                  |
| Central            | 20                  |

**Table 3.2 Climate Change Allowances for Peak Rainfall Intensity**

### Sea Level Allowances

- 3.12 There is a range of allowances for each region and epoch or time frame for sea level rise as follows:

| Area of England | Allowance      | 2000-2035 (mm/year) | 2036-2065 (mm/year) | 2066-2095 (mm)/year | 2096-2125 (mm/year) |
|-----------------|----------------|---------------------|---------------------|---------------------|---------------------|
| Anglian         | Higher Central | 5.8                 | 8.7                 | 11.6                | 13.0                |
|                 | Upper End      | 7.0                 | 11.3                | 15.8                | 18.1                |

**Table 3.3 Climate Change Allowances for Sea Level Rise**

## 4.0 FLOOD RISK SOURCES

- 4.1 The following flood risk sources have been identified and where mitigation is required to reduce the flood risk this is discussed in **Section 5**.

### Fluvial

#### Main River

- 4.2 The nearest EA Main River to the site is the South Forty Foot Drain which is over 2.00km north of the site.

#### Ordinary Watercourses

- 4.3 The site lies within the district of the Black Sluice Internal Drainage Board, (IDB), and the Boards maintained watercourse is located approximately 70m to the north of the site.
- 4.4 An ordinary watercourse is located on the western boundary of the site which is a tributary of the IDB watercourse.

### Climate Change

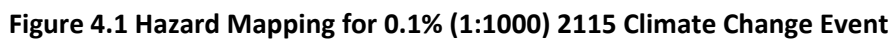
- 4.5 As the risk of flooding from fluvial sources is low and is less than the tidal risk, see below, climate change has not been considered.

### Tidal

- 4.6 The site is approximately 4.00km from the tidal defences to the east.
- 4.7 Information provided by the EA states that the tidal defences protecting this site consist of earth embankments. They are in good condition and reduce the risk of flooding (at the defence) to a 0.67% (1 in 150) chance of occurring in any year. The EA inspect these defences routinely to ensure potential defects are identified.
- 4.8 The risk of flooding from tidal sources is low.

4.9 The site is protected from flooding by raised defences. However, if those defences were to be overtopped or breached then flooding could occur.

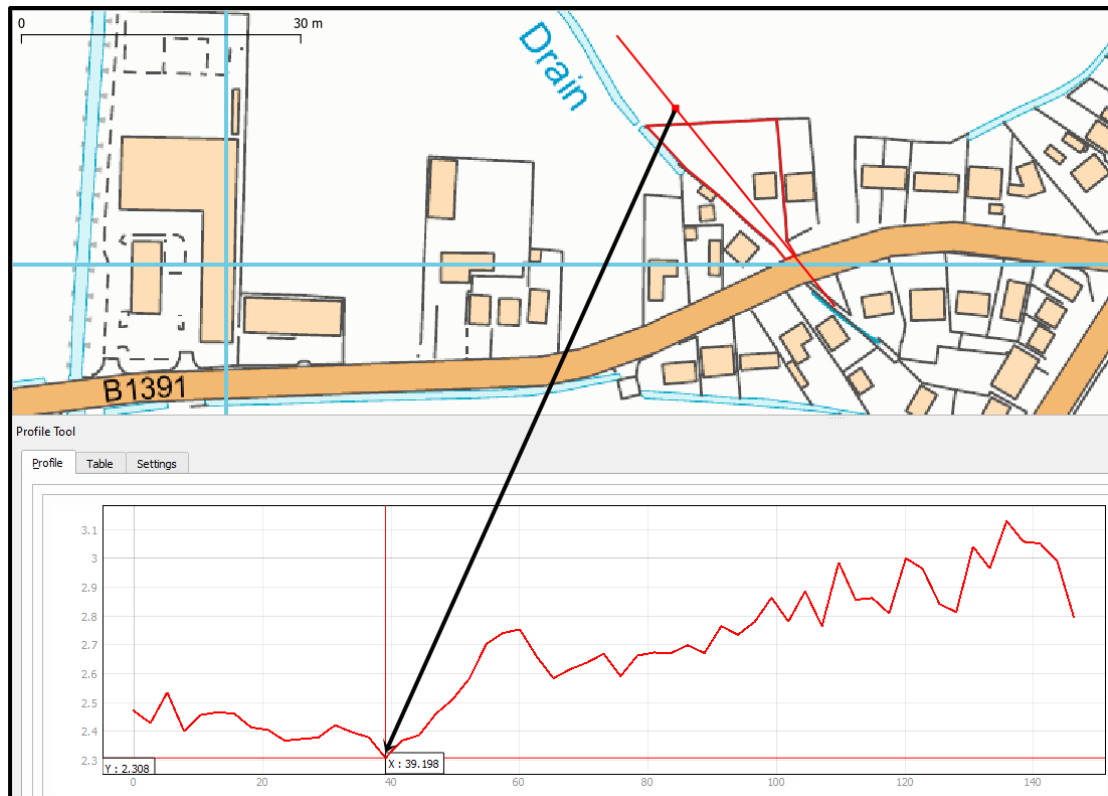
4.10 The EA have produced hazard mapping and **Figure 4.1** below shows the results of a breach for the 0.1% (1:1000) 2115 climate change event.



- 22a Brinkhall Way, Welton, Lincoln. LN2 3NS  
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4.12 **Figure 4.2** below shows the existing land levels using LiDAR 2m DTM.



**Figure 4.2 LiDAR 2m DTM Land Levels**

4.13 The lowest land level where the depth of flooding is between 1.00m and 1.60m is 2.30m AOD. The maximum 0.1% (2115) flood level on the site is therefore 2.30m AOD + 1.60m = **3.90m AOD**.

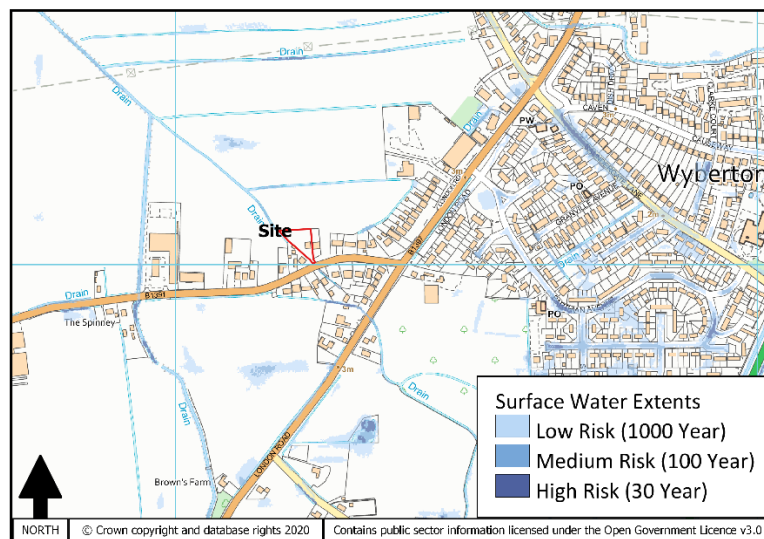
4.14 The residual risk of flooding from tidal sources is high and will require mitigation.

### Pluvial

4.15 The EA have produced maps showing flooding when rainwater lies or flows over the ground. The surface water flooding extents are shown below in **Figure 4.3**. Unlike the fluvial mapping, which is based on a detailed hydraulic model, this mapping is based purely on applying rainfall to a digital terrain model. As such this mapping serves to represent a worst-case scenario which may well overstate the actual probability of flooding in this area.

4.16 There is a caveat, as to the use of these maps and that they are not to be used to identify that an individual property will flood. Because of the way they have been produced and the fact that they are indicative these maps are not appropriate to act as the sole evidence for any specific planning or regulatory decision or assessment of risk in relation to flooding at any scale without further supporting studies or evidence.





**Figure 4.3 Surface Water Flooding Extents**

- 4.17 The site is not at risk of flooding from pluvial sources.

### Groundwater

- 4.18 The site is located on rocks with essentially no ground water and there are no known instances of groundwater flooding in the area.
- 4.19 The risk of flooding from groundwater is low.

### Sewers

- 4.20 Public maintained sewers run adjacent to the site but are unlikely to pose a significant flood risk as they are well maintained.
- 4.21 The risk of flooding from existing sewers is low.

### Reservoirs

- 4.22 The EA has prepared reservoir failure flood risk mapping to show the largest area that might be flooded if a reservoir were to fail and release the water it holds. The mapping displays a worst-case scenario and is only intended as a guide.
- 4.23 The site is not at risk of flooding from reservoirs.

### Canals and Artificial Water Bodies

- 4.24 The site is not at risk of flooding from canals.

### Development Foul & Surface Water

- 4.25 The proposed development will require the disposal of foul and surface water which could impact on existing systems and developments.

## 5.0 MITIGATION

- 5.1 Section 4.0 has identified the sources of flooding which could potentially pose a risk to the site and the proposed development. This section of the FRA sets out the mitigation measures which are to be incorporated within the proposed development to address and reduce the risk of flooding to within acceptable levels.

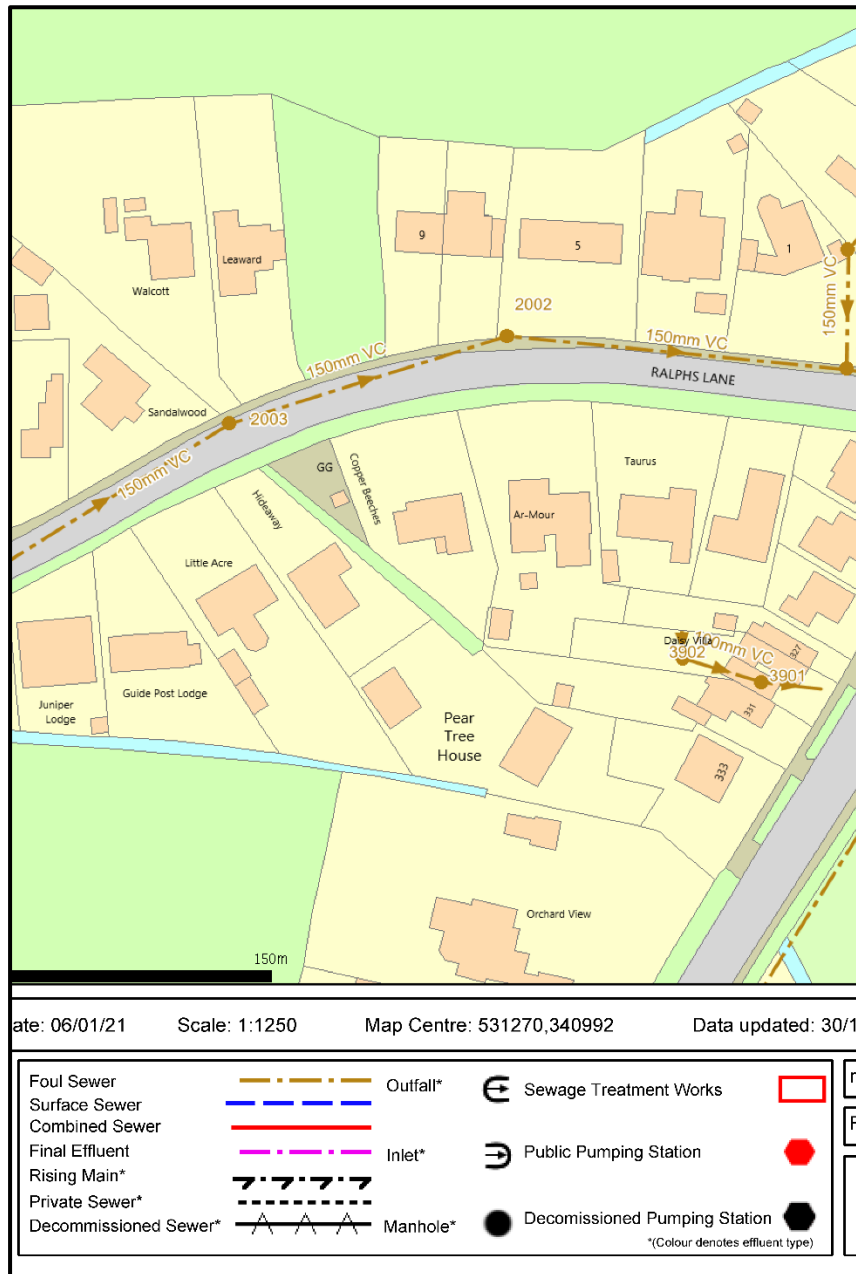
### Site Layout

- 5.2 The proposed development is at a high residual risk of flooding from tidal sources.
- 5.3 The maximum 0.1% (2115) flood level on the site is 3.90m AOD.
- 5.4 Plot 1 is a dormer style dwelling with the two main bedrooms on the first floor and a third bedroom on the ground floor. Plots 2 and 3 are traditional two-storey dwellings with all bedrooms on the first floor.
- 5.5 The site is adjacent to existing dormer style bungalows and there is a visual requirement to keep the height of the proposed dwellings as low as possible. It is therefore proposed that the minimum ground floor level will be 3.30m AOD. This will require the ground floors to be raised approximately 0.70m above existing ground level. In addition, passive flood proofing measures in the form of the ground floor external doors being water resistant to a depth of 0.60m will be incorporated. These will exclude water to the 0.1% (2115) flood level of 3.90m AOD.
- 5.6 All the plots have a first floor which will be used as a safe refuge.
- 5.7 Additional flood resilience measures will be included, where required, as follows;
- Water resisting airbricks.
  - Backwater valves and non-return valves.
  - Electrical installation to be above 3.90m AOD.
- 5.8 It is recommended that the future occupants sign up to the EA flood warning service and a flood emergency plan be the subject of a condition which includes as a minimum;
- Potential sources of flooding and severity;
  - Flood warning trigger level;
  - Actions to be taken by staff on receipt of warning;
  - Identification of escape routes and potential flood depths;
  - Deploying flood protection and safe refuge;
  - Reoccupation of the Site;
  - Training and Exercising;
  - Emergency contact information.

## Development Foul and Surface Water

### Foul Water

- 5.9 The foul water from the proposed development will be discharge to the Anglian Water foul sewer at manhole 2003 as shown in **Figure 5.1** below.



**Figure 5.1 Foul Water Sewers**

### Surface Water

- 5.10 The surface water from the proposed development will be discharged to the adjacent watercourse and will either be attenuated to the minimum of 5 litres/sec or a contribution made to the IDB for an unattenuated discharge.

## 6.0 CONCLUSIONS

- 6.1 This FRA is compliant with the requirements set out in the NPPF and the associated online Planning Practice Guidance.
- 6.2 The FRA has been produced on behalf of Mr J Mackay.
- 6.3 This report demonstrates that the proposed development is not at significant flood risk, and will not increase flood risk to others, subject to the recommended flood mitigation strategies being implemented.
- 6.4 The identified risks and mitigation measures are summarised below;

| Flood Risk Source                         | Level of Risk Without Mitigation | Proposed Mitigation  |
|---|----------------------------------|--|
| Residual (Tidal)                          | High                             | Ground Floor level min 3.30m AOD.<br>Flood resistant ground floor doors to 3.90m AOD.<br>First floor safe refuge.<br>Flood resilience to 3.90m AOD.<br>Flood emergency plan. |
| Fluvial<br>Tidal<br>Groundwater<br>Sewers | Low                              |  |
| Pluvial<br>Reservoir<br>Canal/Artificial  | None                             |  |
| Development Foul<br>& Surface Water       | To wider catchment               | Foul water to AW sewer.<br>Surface water to adjacent watercourse.  |

**Table 6.1 Summary of Risk and Mitigation**



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