## Finsbury Design Ltd

# Cranmore Lane, Holbeach

# Flood Risk Assessment & Drainage Strategy

**March 2020**



**Revision Schedule**

**Cranmore Lane, Holbeach**

**Flood Risk Assessment & Drainage Strategy**

March 2020
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# 1 INTRODUCTION

## 1.1 Instructions

1.1.1 This report is prepared in accordance with instructions from Finsbury Design Ltd to support a planning application to South Holland District Council for a residential development at Cranmore Lane, Holbeach, PE12 7HT.

1.1.2 The purpose of the report is to assess flood risk in accordance with the National Planning Policy Framework (NPPF) and other current guidelines. It does not purport to be a detailed design for approval and/or construction purposes.

## 1.2 Technical Information

### *National Planning Policy Framework*

1.2.1 The National Planning Policy Framework and associated Planning Practice Guidance explains how flood risk should be taken into consideration during the planning and development process. It categorises flood risk by *flood zone* and defines the types of development *appropriate* to each flood zone according to *vulnerability*. The flood zones are defined as:

- Zone 1: Areas with a Low Probability of flooding (annual probability less than 0.1% or 1 in 1000 years).
- Zone 2: Areas with a Medium Probability of flooding (annual probability between 0.1% (1 in 1000 years) and 1.0% (1in 100 years) for rivers, 0.1 – 0.5% (1 in 1000 to 1 in 200 years) for coastal areas.
- Zone 3a: Areas with a High Probability of flooding (annual probability greater than 1.0% (1 in 100 years) for rivers, 0.5% (1 in 200 years) for coastal areas).
- Zone 3b: The Functional Floodplain (probability as Zone 3a).

### *Environment Agency Flood Maps*

1.2.2 The Environment Agency (EA) predicts the likelihood of flooding via a national series of indicative flood maps, available via the GOV.UK website.

1.2.3 The *Flood Map for Planning* shows the flood zones, described above, coloured in different shades of blue. In areas protected by flood defences, this flood map deliberately neglects their presence so as to present a worst-case scenario. Although it does not represent realistic risk, the *Flood Map for Planning* is the

authoritative guidance on flood risk for use in the preparation of flood risk assessments for planning applications.

1.2.4 The *Long Term Flood Risk* maps cover the following topics:

- *Flood Risk from Rivers and the Sea*. This map (previously known as the NaFRA map) shows the risk of fluvial and tidal flooding in a similar manner to the *Flood Map for Planning*, except that, where they exist, defences are recognised. The resulting realistic risk presentation provides useful data for insurance assessors.

- *Flood Risk from Surface Water.* This map shows potential overland flow routes and accumulation of runoff resulting from rainstorm events based on topography, divided into low, medium and high risk scenarios.

- *Flood Risk from Reservoirs*. This map shows areas which may be subject to flooding from the failure of reservoirs and other water retaining infrastructure, the risk of which is very low.

***South Holland District Council Strategic Flood Risk Assessment***

1.2.5 Local planning authorities are required to produce a Strategic Flood Risk Assessment (SFRA) which sets the scene for flood risk in their areas. South Holland District Council published its original SFRA, now superseded, in January 2010.

***South East Lincolnshire Local Plan***

1.2.6 The South East Lincolnshire Local Plan, prepared jointly by South Holland District Council, Boston Borough Council and Lincolnshire County Council, was adopted in March 2019. The South East Lincolnshire SFRA and the 2016 Update of the South Holland District Council SFRA, which includes Holbeach, form part of this Local Plan.

***Lincolnshire County Council Preliminary Flood Risk Assessment***

1.2.7 Lead Local Flood Authorities (LLFAs) are required to produce a Preliminary Flood Risk Assessment (PFRA) to identify areas where there is significant flood risk from ordinary watercourses and surface water run-off, but not from main rivers or the sea, or from sewers. Lincolnshire County Council, as the LLFA, published its PFRA in June 2011.

# 2 SITE INFORMATION

## 2.1 Existing Site

### *Location*

2.1.1 The site comprises an area of arable land on the west side of Cranmore Lane, Holbeach, PE12 7HT, some 70m wide by 70m deep, an area of about 0.5 ha. Residential properties Gatehouse and Latch Cottage and their gardens are situated to the north, while open agricultural land lies to the west and south. Access is gained directly from Cranmore Lane to the west. Holbeach town centre lies about 1 km to the east. The site location is shown on the attached Drawing No FD-1481-01-GA-001 *Location Plan*.

2.1.2 Holbeach is a small town founded in the Middle Ages on high ground encircled by marshland. Since the draining of the Fens, this low-lying land has been kept dry by the pumped drainage system, operated in this area by the South Holland Internal Drainage Board.

### *Watercourses and Flood Defences*

2.1.3 The nearest substantial watercourse to the site is the New River, a South Holland IDB High Priority Watercourse (Ref. DRN197P3703 – previously F37) which flows from north to south about 200m to the west.

2.1.4 The site and the land around are located in Catchment F – Little Holland North of the South Holland IDB which drains to the South Holland Main Drain to the south which connects to the River Nene in the east.

### *Topography*

2.1.5 The site comprises level ground, currently in arable cultivation, at a level of about +3.1m AOD (based on the cover level of Anglian Water Manhole 8202).

### *Sewerage*

2.1.6 There is an Anglian Water 150mm diameter public foul sewer which flows to the north along Cranmore Lane from terminal manhole 8202 about 25m north of the site – see Appendix 1. Manhole 8202 has a cover level of +3.16m AOD and a depth to invert of 1.51m.

### *Geology*

2.1.7 The site is located on Tidal Flat Deposits of Clay and Silt overlying the West Walton Formation of Mudstone and Siltstone.

## 2.2 Adjacent Development

2.2.1 The western boundary of the Holbeach Meadows residential development, where up to 900 houses are currently being built by Ashwood Homes on a 41 ha site, is located only 250m to the east of the site. This development was approved by South Holland District Council in December 2016 under Ref. H09-0521-14, supported by Flood Risk Assessment Ref. 13401:FRA by BSP Consulting.

2.2.2 Based on the findings of the FRA, Condition 16 of the permission requires all finished floor levels (FFLs) to be set not lower than +3.33m AOD with flood resilience measures incorporated to +3.78m AOD.

2.2.3 Surface water drainage was addressed under Conditions 14 and 15 which were discharged in December 2018 under Ref. H09-0782-18, supported by Surface Water Drainage Strategy Ref. MA10602-DS-R01 by Millward Consultants.

## 2.3 Proposed Development

2.3.1 It is proposed to develop the site with 6 No detached dwellings around a central access road, as shown by the illustrative layout reproduced on the attached Drawing No FD-1481-01-DR-001 *Drainage Strategy*.

2.3.2 In line with the proposed floor levels for the Holbeach Meadows development, the ground floor level (FFL) of the new houses will be set at +3.33m AOD with flood resilience measures provided up to 3.78m AOD.

2.3.3 The current indicative layout would create an impermeable area of about 0.25 ha, about 50% of the site area.

# 3 FLOODING INFORMATION

## 3.1 Flood History

3.1.1 According to the *Historic Flood Map* on the GOV.UK website, there have been no flood events recorded at the site.

3.1.2 Neither the South Holland SFRA nor the Lincolnshireshire County Council PFRA, make any reference to flood history at the site.

## 3.2 Potential for Fluvial/Tidal Flooding

### *EA Long Term Flood Map – Flood Risk from Rivers or the Sea*

3.2.1 The *Flood Risk from Rivers or the Sea* map shows the site to be entirely located in an area of Medium flood risk which is the equivalent of Flood Zone 3 on the *Flood Map for Planning*.

### *EA Flood Map for Planning*

3.2.2 The EA *Flood Map for Planning* shows the site to be entirely located in Flood Zone 3a (High Probability – greater than 1 in 100 years for rivers and 1 in 200 years for coastal areas), associated with the Rivers Welland and Nene and the North Sea coast.

3.2.3 There is an area of Flood Zone 2 (Medium Probability - greater than 1 in 1000 years) located at and beyond the southern site boundary.

3.2.4 The nearest Flood Zone 1 (Low Probability - less than 1 in 1000 years) is at Holbeach town, about 1 km to the east.

3.2.5 The *Flood Map for Planning* shows flood zones assuming that no flood defences exist. Where areas benefit from defences this is usually shown by cross hatching the Flood Zone 3 on the map. In this case no benefit is indicated, so the 1 in 100 year event, as indicated by Flood Zone 3, is regarded as the design flood for development, as per generally accepted practice.

3.2.6 The EA flood maps are attached at Appendix 1.

### *South East Lincolnshire SFRA*

3.2.7 As can be seen from the attached wide area view of the *Flood Map for Planning*, almost the entire area of South East Lincolnshire is in Flood Zone 3. Strict adherence to the guidelines would consequently result in no development being permitted across a very large area which is clearly impracticable. The South East Lincolnshire SFRA has therefore been developed to ensure that there is a

consistent evidence base against which to take development decisions, particularly with respect to mitigation requirements.

***South Holland SFRA 2016 Update Maps***

3.2.8 Whereas the *Flood Map for Planning* simply assumes that defences are non-existent, the SFRA 2016 Update maps are based on modelling a theoretical series of breaches in the defence embankments. The map generally referred to in assessing development applications is the *Residual Peak Depth District 2115 1% Fluvial/0.5% Tidal Event Probability* map which not only forecasts the consequences of a defences breach but also the effect of climate change over the next 100 years. The map shows the site to be not at risk of flooding and located just outside of an area where flood depths between 0 and 0.25m are predicted for 2115 – see Appendix 3.

## 3.3 Potential for Surface Water Flooding

***EA Flood Risk from Surface Water Map***

3.3.1 The EA *Flood Risk from Surface Water* map shows no significant risk of surface water flooding at the site – see Appendix 2.

***Lincolnshire County Council PFRA***

3.3.2 There is no specific mention of flood risk at the site in the LCC *Preliminary Flood Risk Assessment* (PFRA).

***South Holland IDB***

3.3.3 The area is well drained by a system of ditches connected to the South Holland IDB High Priority Watercourse DRN197P3703 just west of the site, thereby preventing surface water flooding.

## 3.4 Potential for Flooding from Reservoirs

3.5.1 The EA *Flood Risk from Reservoirs* map shows no risk of reservoir flooding.

## 3.5 Potential for Flooding from Groundwater or Sewers

3.5.1 Flood risk from other sources such as groundwater or sewers is considered to be negligible in comparison with that for fluvial/tidal at this site. Consequently, flood risk from these sources is not addressed further in this assessment.

# 4 FLOOD RISK ASSESSMENT

## 4.1 General

4.1.1 As can be seen from the *Flood Map for Planning*, the main urban area of Holbeach which occupies the Flood Zone 1 island is fully built up. This means that the town can only expand by permitting development in the surrounding Flood Zones 2 and 3, as supported by the SFRA, using suitable mitigation measures.

4.1.2 Such development has been in progress during the past several years in the Hall Gate/Fen Road area to the south of the town, particularly at the Holbeach Meadows site where permission has been granted for up to 900 houses. In permitting residential development on these sites, the authorities generally considered the contingency scenario most recently represented by the *Residual Peak Depth District 2115 1% Fluvial/0.5% Tidal Event Probability* map from the SFRA and typically imposed the following conditions (Ref. H09-0521-14 - Condition 16):

- Finished floor levels (FFLs) set at a minimum of +3.33m AOD (equivalent to about 0.53m above original average ground level at Holbeach Meadows).
- Flood resilient construction to +3.78m AOD, i.e. 450mm above FFL.

4.1.3 In terms of existing ground levels and flood risk, the proposed Cranmore Lane development is very similar to those recently permitted at Holbeach Meadows.

## 4.2 Fluvial/Tidal Flooding

### *Defended Condition*

4.2.1 The EA *Long Term Flood Risk from Rivers or the Sea map* (previously known as the NaFRA map), represents the current defended state of the site and is used by insurers to assess the actual likelihood of a flood occurring. This map shows the site to be entirely located in an area of Medium flood risk, i.e. a chance of flooding of between 1% (1 in 100 years) and 3.3% (1 in 30 years).

### *Design Condition*

4.2.2 Regardless of the actual flood risk, any site-specific FRA submitted in support of a planning application must consider the flood risk without the benefit of defences, as shown on the EA *Flood Map for Planning*. This map shows the site to be entirely located in Flood Zone 3a, an area of High flood risk with a probability of between 1 in 100 and 1 in 1000 years for fluvial and between 1 in 200 and 1 in 1000 years for tidal flooding.

4.2.3 Residential development is classed as *more vulnerable* and *appropriate* for Flood Zone 3a subject to satisfying the Sequential and Exception Tests.

4.2.4 In view of its proximity to the Holbeach Meadows development and the flat nature of the terrain, it is considered reasonable to assume the same flood conditions and therefore adopt the same mitigation measures as imposed by Condition 16 of permission Ref H09-0521-14, namely:

- Finished floor levels (FFLs) set at a minimum of +3.33m AOD (equivalent to about 0.23m above existing ground levels at the Cranmore Lane site).
- Flood resilient construction to +3.78m AOD, i.e. 450mm above FFL.

***Residual Risk***

4.2.5 The South Holland SFRA 2016 Update map, *Residual Peak Depth District 2115 1% Fluvial/0.5% Tidal Event Probability* – see Appendix 3 – shows the site to be not at risk of flooding and located just outside of an area where flood depths between 0 and 0.25m are predicted for 2115. Based on this evidence, it appears that the indicated flooding on the *Flood Map for Planning* would not occur. However, bearing in mind the need for a suitable degree of contingency freeboard, the mitigation measures mentioned above may reasonably be adopted.

4.2.6 It would always remain possible that the site might flood and it would consequently be prudent for the occupants to operate a flood management plan so as to assure their safety – see Section 6 below.

***Fluvial Flood Storage Volume***

4.2.7 As the Flood Zone 3 indicated at the site extends as far as the coast without a break – see attached *Flood Map for Planning* - raising ground levels at the site will not occupy flood storage volume. Consequently, no floodplain compensation is required and there will be no increase in flood risk elsewhere as a result of the development.

## 4.3 Surface Water Flooding

4.3.1 As stated in 3.3.1 above, there is no significant risk of surface water flooding at the site. This is because the site is located adjacent to an open ditch which collects runoff from the site and discharges it to the IDB drain to the west.

4.3.2 Any overland flow occurring in an extreme event is collected by the ditch at the northern site boundary.

# 5 DRAINAGE STRATEGY

## 5.1 Surface Water Drainage

***Existing Site Drainage***

5.1.1 The site is currently classed as greenfield, i.e. 100% permeable, and any runoff drains to the ditch at the northern boundary which connects to the South Holland IDB High Priority Watercourse DRN197P3703 about 200m to the west.

***Proposed Site Drainage***

5.1.2 The current indicative layout would create an impermeable area of about 0.25 ha, about 50% of the total site area. Consequently, flow attenuation will be necessary prior to discharge of surface water to the ditch system.

***Sustainable Urban Drainage Systems (SuDS)***

5.1.3 The drainage system will be based on SuDS techniques for the disposal of surface water run-off, as described below.

5.1.4 The first consideration in the SuDS hierarchy is infiltration to ground. As the site surface geology comprises Tidal Flats deposits of Clay and Silt, infiltration to the ground is unlikely to be practicable. The situation may be confirmed if required by BRE 365 soakaway tests at the site investigation stage.

5.1.5 The second consideration in the SuDS hierarchy is discharge to watercourse. As the nearest receiving watercourse, the drainage ditch connecting to the IDB drain, is located at the site boundary, this is the principal feasible option.

5.1.6 The presence of the watercourse which receives the current runoff, makes the third consideration in the SuDS hierarchy, discharge to sewer, unnecessary.

5.1.7 SuDS techniques will be used to drain the surface water runoff from the new impermeable areas via attenuation and treatment features in driveways and verges prior to discharge to the drainage ditch.

5.1.8 With the indicative layout proposed, there will be insufficient land available for surface SuDS features such as ponds and swales. Attenuation and treatment will therefore be provided via permeable paving in the private driveways and oversized pipes in the access road and frontage verge. The access road will be drained via trapped gullies.

5.1.9 The level difference between the raised ground levels and the existing ditch invert should provide sufficient head for effective gravity drainage via surface attenuation and treatment features.

5.1.10 According to the UK SuDS online surface water storage volume estimation tool, a storage volume of about 150 $m^3$ will be sufficient to reduce the final discharge to the normally acceptable rate of 5 litres per second. It would be feasible to achieve this within the boundaries of the current indicative layout.

5.1.11 Consequently, it is not considered that there will be any significant flooding caused either within the site or in the surrounding area by future site surface water run-off.

***Surface Water Approvals***

5.1.12 At the detailed design stage, application will be made to the South Holland IDB for consent to discharge attenuated surface water flow from the proposed development to High Priority Watercourse DRN197P3703.

5.1.13 All relevant authorities will be kept fully informed regarding the detailed design of the surface water drainage system. It is normal practice for detailed surface water drainage design to be subject to the approval of the local planning authority subsequent to the grant of planning permission and this will be sought from South Holland District Council at the appropriate time.

***Allowance for Climate Change***

5.1.14 Climate change allowance with respect to rainfall will be made in accordance with the EA Guidance *Flood Risk Assessments: Climate Change Allowances*, February 2016, updated in March 2020.

***Allowance for Urban Creep***

5.1.15 In calculating the impermeable areas to be drained, suitable allowance for urban creep will be made in accordance with BS 8582:2013 *Code of practice for surface water management for development sites*.

***Management and Maintenance***

5.1.16 Where possible, the drains and SuDS features will be offered to Anglian Water for adoption. Otherwise, they will be managed by a site management company set up by the owners the new estate. An operation and maintenance manual for the SuDS elements will be prepared and administered.

## 5.2 Foul Sewerage

5.2.1 Foul sewage from the site will connect to the Anglian Water foul sewer in Cranmore Lane, via a new 150mm diameter sewer laid along the road.

***Foul Sewerage Approvals***

5.2.2 At the detailed design stage, application will be made to Anglian Water under the Water Industry Act 1991 for consent to discharge foul sewage from the proposed development to the public sewerage system.

5.2.3 All relevant authorities will be kept fully informed regarding the detailed design of the foul sewerage system. It is normal practice for detailed foul water drainage design to be subject to the approval of the local planning authority subsequent to the grant of planning permission and this will be sought from South Holland District Council at the appropriate time.

# 6 FLOOD MANAGEMENT

## 6.1 Flood Management

6.1.1 As the site may be at risk of flooding in a residual breach event, albeit there is a very low risk of floodwater entering the houses, a Flood Management Plan containing the following robust flood management provisions will be prepared and implemented.

## 6.2 Warnings and Evacuation

6.2.1 The residents of the new houses will register for the EA's *Floodline Warnings Direct* service which is available for the site. Should a flood warning be received or a flood event be otherwise predicted, residents will evacuate in good time before any local flooding occurs to dry ground at Holbeach town centre, about 1 km to the east.

6.2.2 Should residents choose not, or fail, to evacuate early, they might remain in their houses during flood conditions and ascend to safe refuge on the upper floors so as to remain well clear of flooding outside the houses or even of any floodwater entering at ground floor level. In the event of a need for evacuation of any personnel, e.g. for medical reasons, attendance by the emergency services would not be precluded by the depth of the floodwater on the highway.

6.2.3 In neither case would residents be exposed to any danger.

## 6.3 Sequential Test

6.3.1 As the ground floor level of the new houses will be set above the residual risk flood level, this raising of levels effectively places the development in Flood Zone 1 where the Sequential Test is not required to be addressed.

6.3.2 Furthermore, as there are no sites available outside the flood zones in Holbeach or the surrounding countryside, there is no alternative but to build in the flood zones, as recognised by the South Holland SFRA. This has been the case for some years in the area around Hall Gate and Fen Road where the established practice is to mitigate the flood risk by raising ground levels so as to lift the developments out of the floodplain.

6.3.3 Consequently, the Sequential Test is considered to be satisfied.

## 6.4 Exception Test

6.4.1 Notwithstanding the above, in order to ensure the safety of the occupants it is necessary to satisfy the NPPF Exception Test. The following points are relevant:

6.4.2 The development the new housing with easy access to the existing town facilities will provide significant sustainability benefits to the south side of the town.

6.4.3 The proposed buildings will be made safe by raising the ground floor level and adopting of a Flood Management Plan which includes early warning from the EA *Floodline Warnings Direct* service and the option of evacuation to dry ground in Holbeach town or safe refuge on the upper floors. Attendance by the emergency services would not be precluded by the presence of floodwater.

6.4.4 As the Flood Zone 3 area indicated at the site extends as far as the coast without a break, raising ground levels at the site will not occupy flood storage volume. Consequently, no floodplain compensation is required and there will be no increase in fluvial flood risk elsewhere as a result of the development.

6.4.5 Similarly, as a result of the SuDS-based runoff attenuation, there will be no increase in surface water flood risk elsewhere as a result of the development

6.4.6 Consequently, the Exception Test is considered to be satisfied.

# 7 CONCLUSIONS

7.1.1 The EA *Flood Map for Planning* shows the site to located in Flood Zone 3a, High Probability of flooding, associated with the Rivers Welland and Nene and the North Sea coast.

7.1.2 In view of its proximity to the Holbeach Meadows development and the flat nature of the terrain, it is considered reasonable to adopt the same flood conditions and therefore the same mitigation measures as imposed by Condition 16 of permission Ref H09-0521-14, namely:

- Finished floor levels (FFLs) set at a minimum of +3.33m AOD (equivalent to about 0.23m above existing ground levels).
- Flood resilient construction to +3.78m AOD, i.e. 450mm above FFL.

7.1.3 The South Holland SFRA 2016 Update map, *Residual Peak Depth District 2115 1% Fluvial/0.5% Tidal Event Probability* – see Appendix 3 – shows the site not to be at risk of flooding and located just outside of an area where flood depths between 0 and 0.25m are predicted for the year 2115. Based on this evidence, it appears that the indicated flooding on the *Flood Map for Planning* would not occur. However, bearing in mind the need for a suitable degree of contingency freeboard, the mitigation measures mentioned above may reasonably be adopted.

7.1.4 As the Flood Zone 3 indicated at the site extends as far as the coast without a break, raising ground levels at the site will not occupy flood storage volume.

7.1.5 The EA *Flood Risk from Surface Water* map shows no significant risk of surface water flooding at the site. Surface water run-off will continue to discharge to the adjacent ditch and the IDB system, as it does at present. SuDS techniques will be used to drain the surface water runoff from the new impermeable areas via attenuation and treatment features in driveways and verges prior to discharge to the drainage ditch.

7.1.6 Climate change allowance will be made in accordance with the latest EA guidelines.

7.1.7 In order to address the risk of flooding, a Flood Management Plan will be prepared for the safety of occupants, involving early warning and either evacuation to dry ground or refuge on an upper floor, as required.

7.1.8 As the raising of levels effectively places the development in Flood Zone 1 and there are no alternative sites outside the flood zones, the NPPF Sequential Test is considered to be satisfied. Level raising is the normally acceptable mitigation

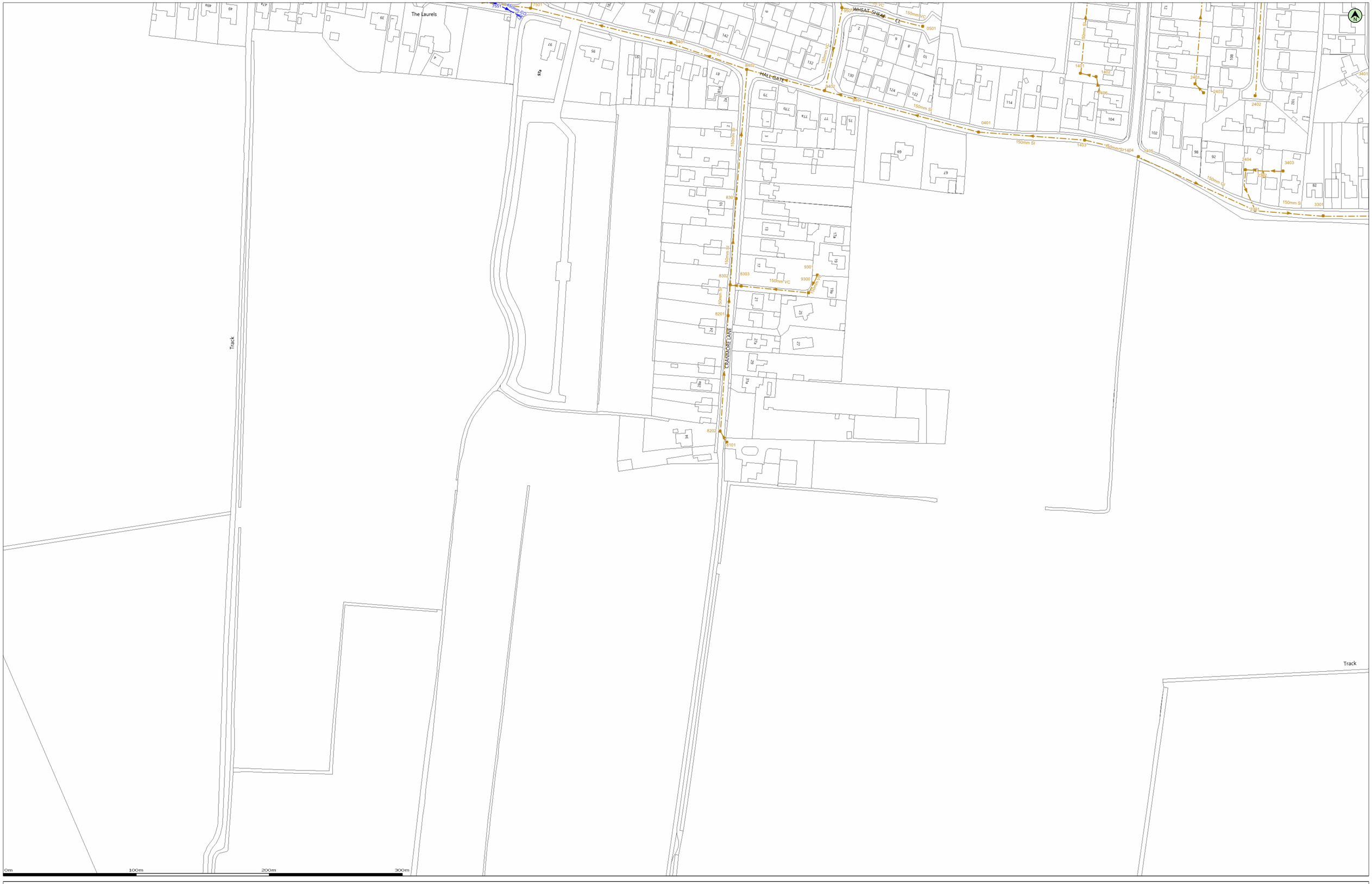
practice for similar developments in Holbeach and supported by the South Holland SFRA.

7.1.9 As the proposed houses will be made safe by raising the ground floor level and adopting of a Flood Management Plan which includes early warning from the EA and the option of evacuation, the NPPF Exception Test is considered to be satisfied.

7.1.10 With regard to flood risk and drainage, therefore, the site is suitable for the proposed use. The development may be occupied safely and adequately drained without increasing flood risk elsewhere.

## APPENDIX 1

## ANGLIAN WATER SEWER RECORDS




(c) Crown copyright and database rights 2020 Ordnance Survey 100022432 | Date: 23/03/20 | Scale: 1:1250 | Map Centre: 534837,324201 | Data updated: 06/03/20 | Our Ref: 377981 - 1 | Wastewater Plan A1

This plan is provided by Anglian Water pursuant its obligations under the Water Industry Act 1991 sections 198 or 199. It must be used in conjunction with any search results attached. The information on this plan is based on data currently recorded but position must be regarded as approximate. Service pipes, private sewers and drains are generally not shown. Users of this map are strongly advised to commission their own survey of the area shown on the plan before carrying out any works. The actual position of all apparatus MUST be established by trial holes. No liability whatsoever, including liability for negligence, is accepted by Anglian Water for any error or inaccuracy or omission, including the failure to accurately record, or record at all, the location of any water main, discharge pipe, sewer or disposal main or any item of apparatus. This information is valid for the date printed. This plan is produced by Anglian Water Services Limited (c) Crown copyright and database rights 2020 Ordnance Survey 100022432,This map is to be used for the purposes of viewing the location of Anglian Water plant only. Any other uses of the map data or further copies is not permitted. This notice is not intended to exclude or restrict liability for death or personal injury resulting from negligence.

| | | | |
|---|---|---|---|
| Foul Sewer | Outfall* | Sewage Treatment Works | |
| Surface Sewer | | | |
| Combined Sewer | | Public Pumping Station | |
| Final Effluent | Inlet* | | |
| Rising Main* | | Decommissioned Pumping Station | |
| Private Sewer* | Manhole* | | |
| Decommissioned Sewer* | | *(Colour denotes effluent type) | |

nicholas@inspiredesigngroup.co.uk
Cranmore Lane

love every drop anglianwater

| Manhole Reference | Easting | Northing | Liquid Type | Cover Level | Invert Level | Depth to Invert |
|---|---|---|---|---|---|---|
| 0401 | 535057 | 324432 | F | 3.07 | 0.92 | 2.15 |
| 0501 | 535015 | 324511 | F | 3.06 | 1.78 | 1.28 |
| 1401 | 535134 | 324476 | F | 3.29 | 1.88 | 1.41 |
| 1402 | 535146 | 324473 | F | 3.31 | 2.01 | 1.3 |
| 1403 | 535137 | 324426 | F | 3.07 | 1.22 | 1.85 |
| 1404 | 535170 | 324418 | F | 2.95 | 1.38 | 1.57 |
| 1405 | 535177 | 324413 | F | 3.02 | 1.36 | 1.66 |
| 1406 | 535148 | 324462 | F | - | - | - |
| 2301 | 535265 | 324373 | F | 3.05 | 1.06 | 1.99 |
| 2302 | 535272 | 324399 | F | - | - | - |
| 2401 | 535220 | 324468 | F | 3.11 | 1.85 | 1.26 |
| 2402 | 535265 | 324459 | F | - | - | - |
| 2403 | 535226 | 324461 | F | - | - | - |
| 2404 | 535258 | 324404 | F | - | - | - |
| 3301 | 535316 | 324369 | F | 3.08 | 0.81 | 2.27 |
| 3403 | 535286 | 324403 | F | - | - | - |
| 7501 | 534721 | 324525 | F | 3 | -0.5 | 3.5 |
| 8101 | 534868 | 324199 | F | - | - | - |
| 8201 | 534869 | 324294 | F | 2.83 | 1.69 | 1.14 |
| 8202 | 534863 | 324207 | F | 3.16 | 1.65 | 1.51 |
| 8301 | 534875 | 324382 | F | 2.96 | 0.64 | 2.32 |
| 8302 | 534871 | 324317 | F | 2.8 | 1.006 | 1.794 |
| 8303 | 534879 | 324316 | F | 2.9 | 1.57 | 1.33 |
| 8401 | 534826 | 324499 | F | 3.11 | -0.06 | 3.17 |
| 8402 | 534883 | 324479 | F | 3.15 | 0.19 | 2.96 |
| 9300 | 534929 | 324311 | F | 2.9 | 1.883 | 1.017 |
| 9301 | 534936 | 324324 | F | 2.95 | 1.965 | 0.985 |
| 9401 | 534964 | 324457 | F | 3.1 | 0.49 | 2.61 |
| 9402 | 534941 | 324463 | F | 3.09 | 0.44 | 2.65 |
| 9501 | 534954 | 324525 | F | 2.88 | 0.81 | 2.07 |
| 7551 | 534694 | 324529 | S | 3.075 | 1.153 | 1.922 |

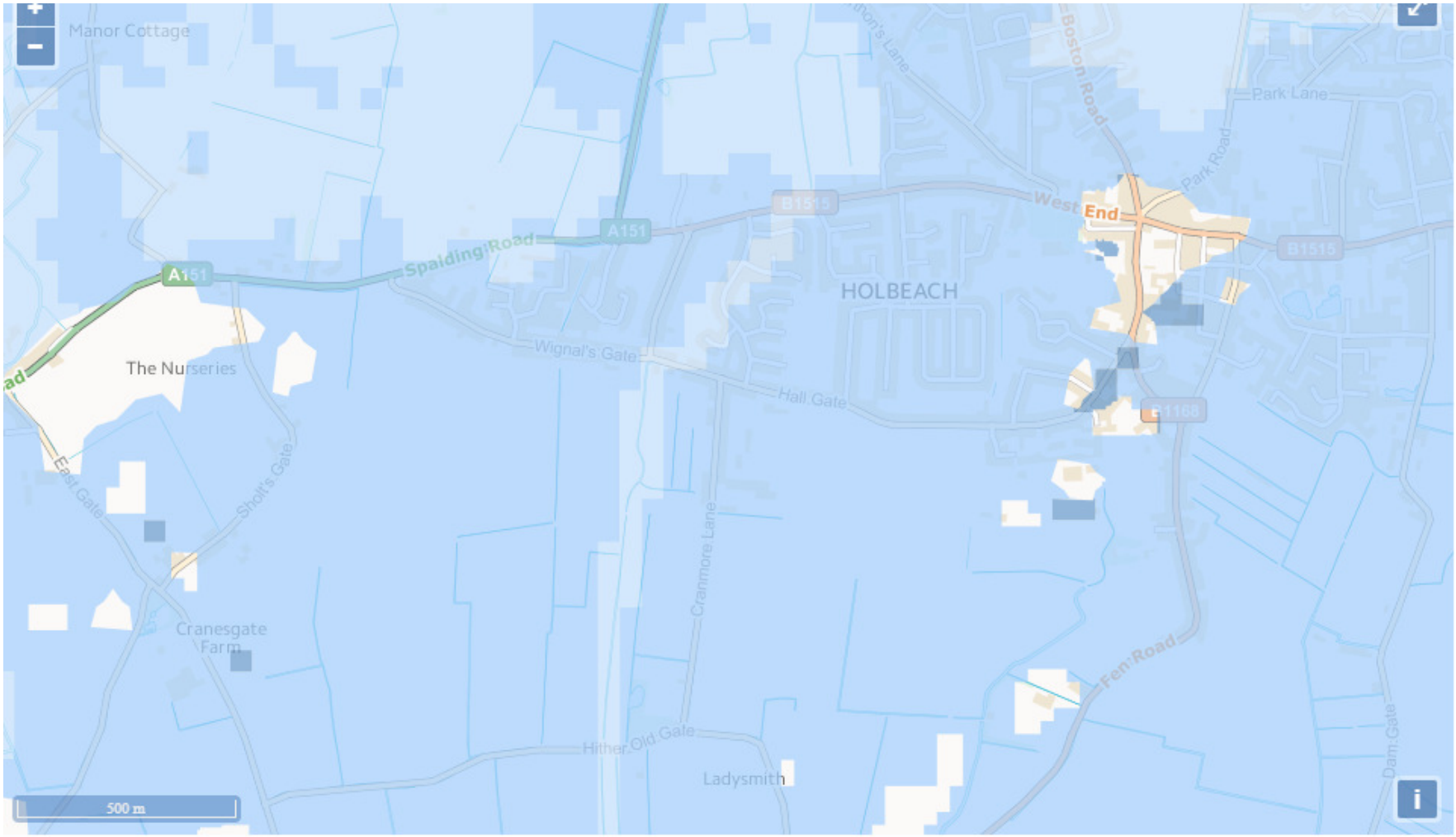
| Manhole Reference | Easting | Northing | Liquid Type | Cover Level | Invert Level | Depth to Invert |
|---|---|---|---|---|---|---|

| Manhole Reference | Easting | Northing | Liquid Type | Cover Level | Invert Level | Depth to Invert |
|---|---|---|---|---|---|---|

| Manhole Reference | Easting | Northing | Liquid Type | Cover Level | Invert Level | Depth to Invert |
|---|---|---|---|---|---|---|

## APPENDIX 2

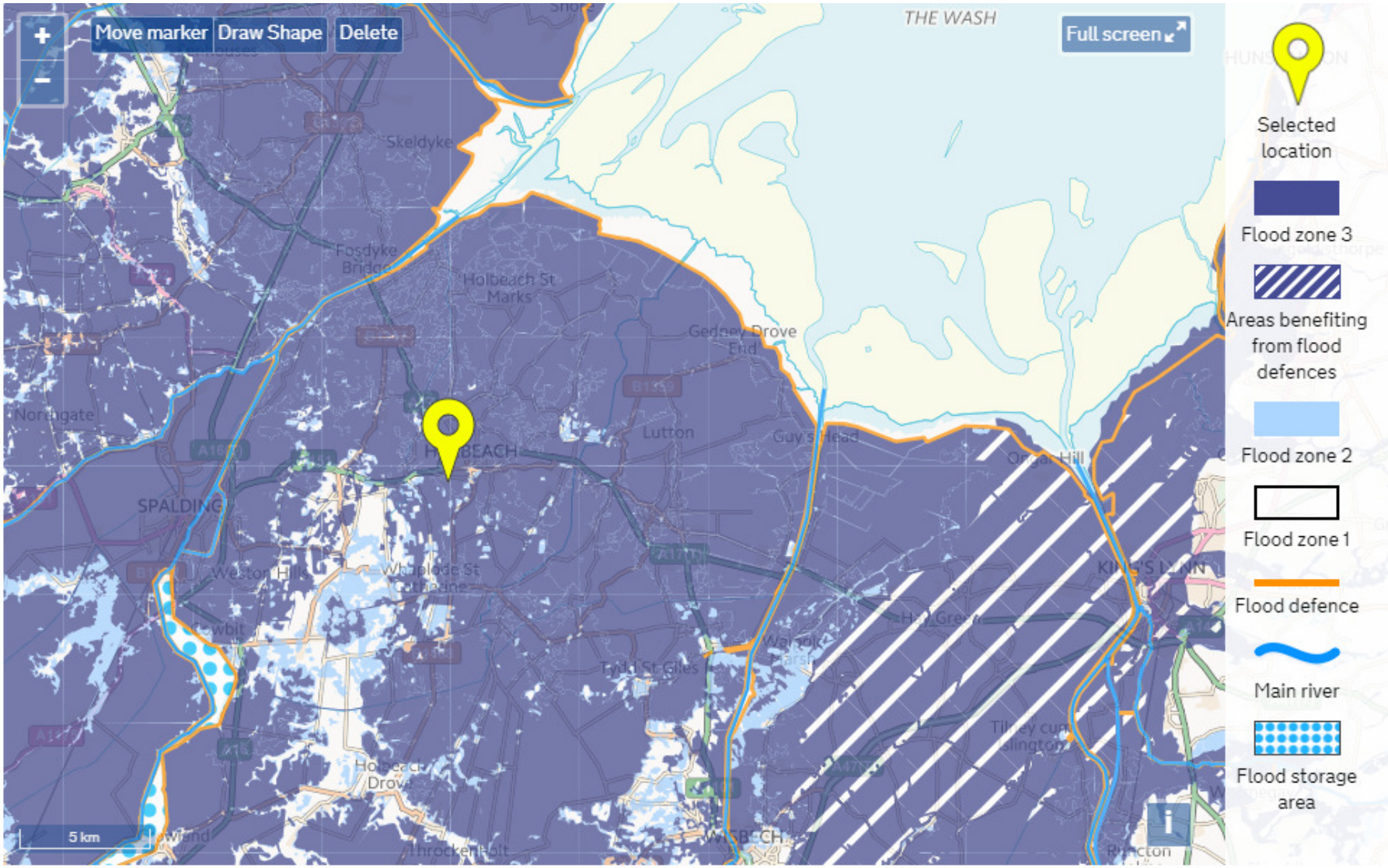
## ENVIRONMENT AGENCY FLOOD MAPS



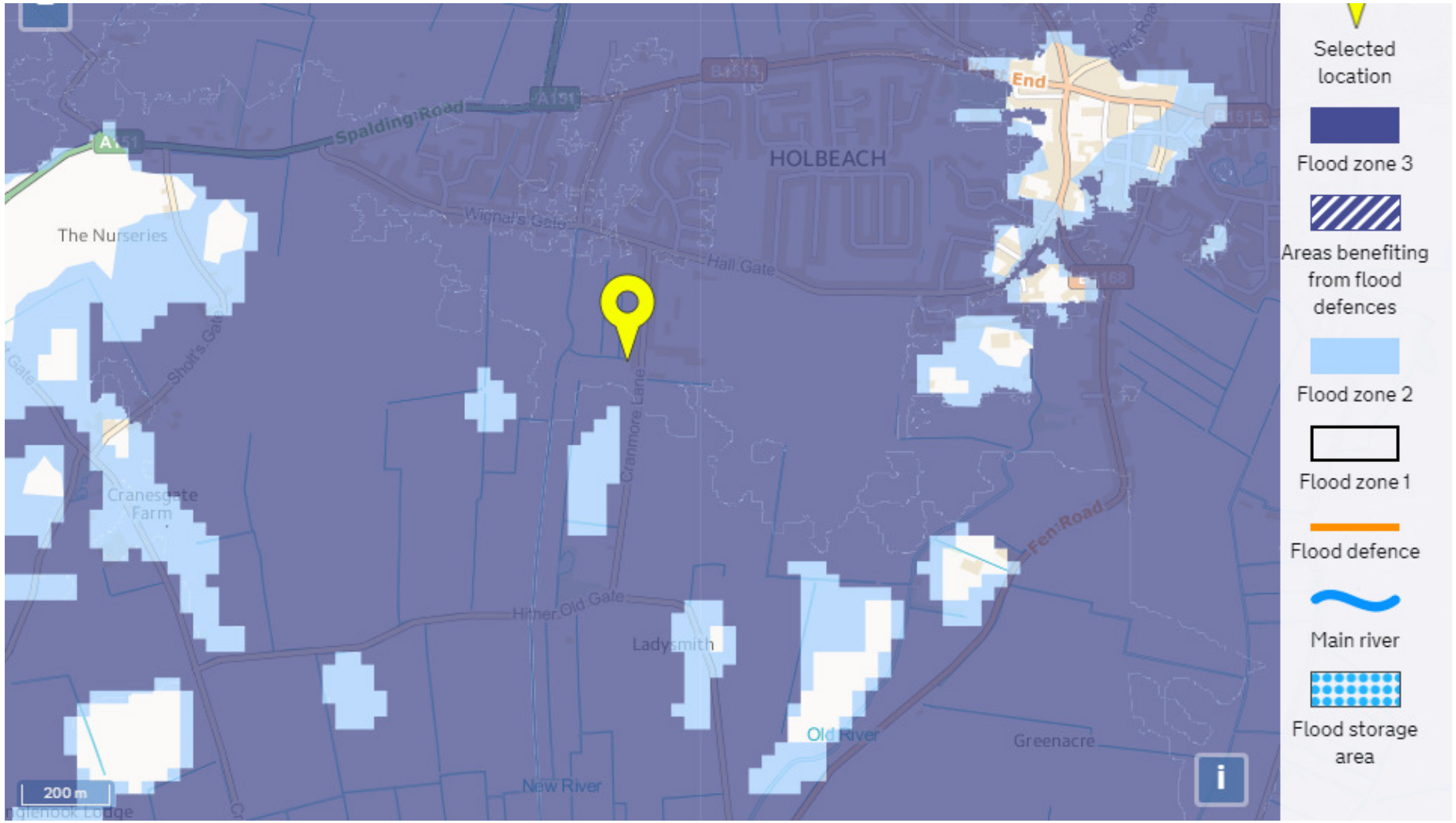

Extent of flooding from rivers or the sea

High Medium Low Very low

## Flood Risk from Rivers or the Sea

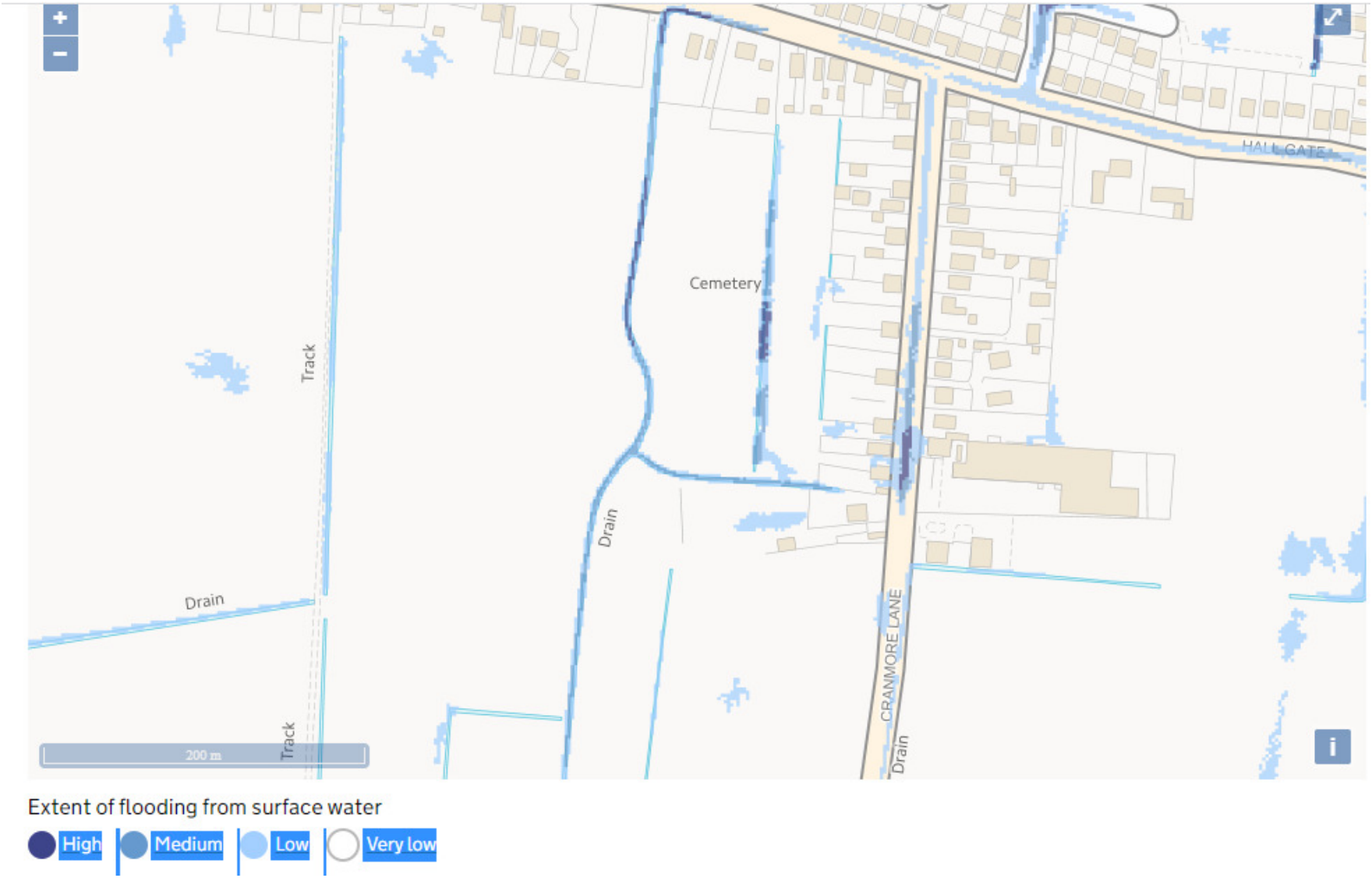



**Flood Map for Planning – Wide Area**




-

## Flood Map for Planning – Local Area




## Flood Risk from Surface Water

## APPENDIX 3

## SOUTH HOLLAND SFRA 2016 UPDATE FLOOD MAPS

## Map Legend

Peak Depth




| REV | DATE | REMARKS |
|---|---|---|
| 2 | Feb 17 | Modelling and Mapping Update |
| 1 | Dec 16 | Modelling and Mapping Update |

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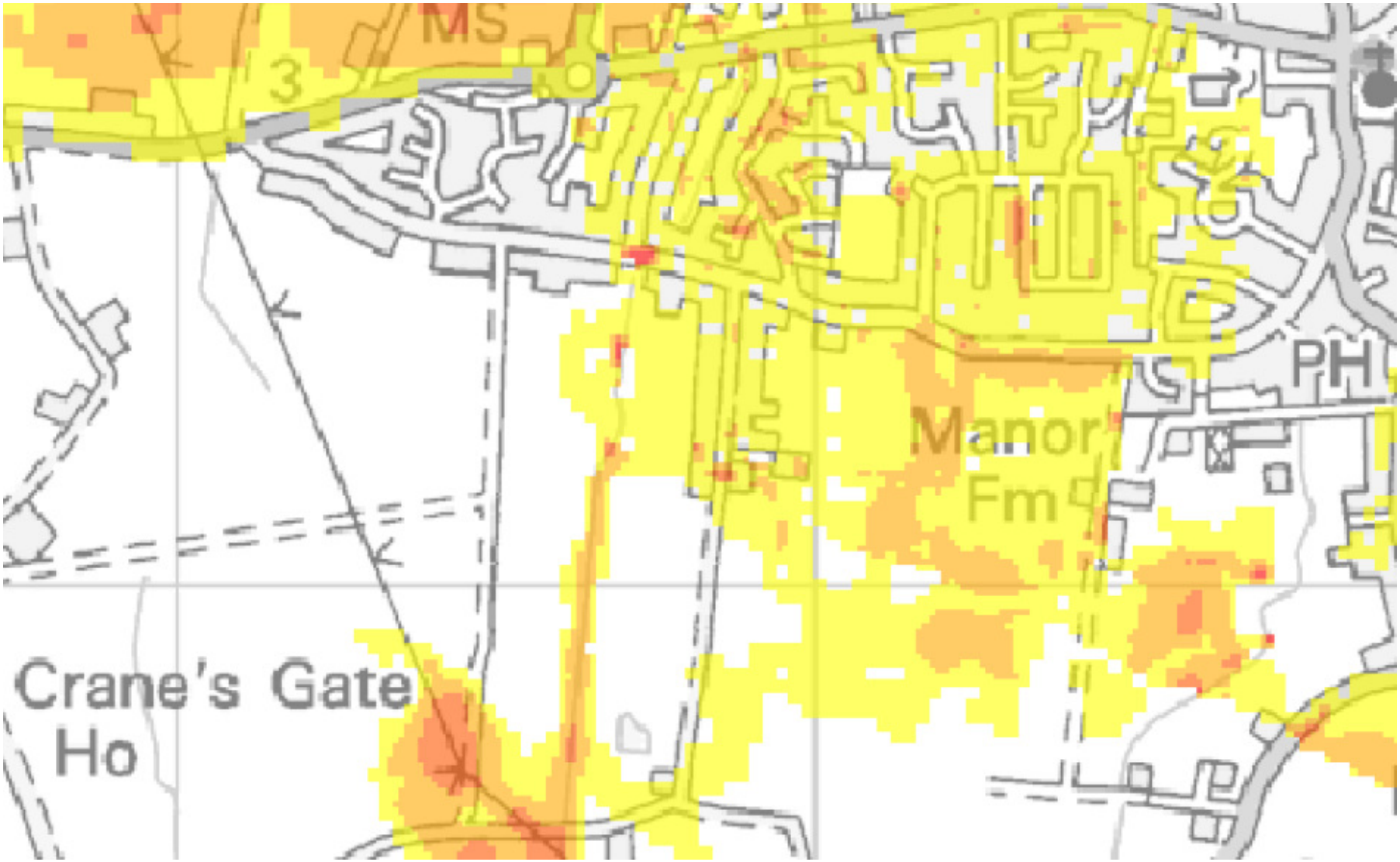
# UPDATE OF STRATEGIC FLOOD RISK ASSESSMENT

## Residual Peak Depth
## District - Year 2115
## 1% Fluvial / 0.5% Tidal Event Probability

**DATE OF ISSUE:** Feb 2017 **REV NO:** 2

**SCALE:** 1 : 60,000 @ A1

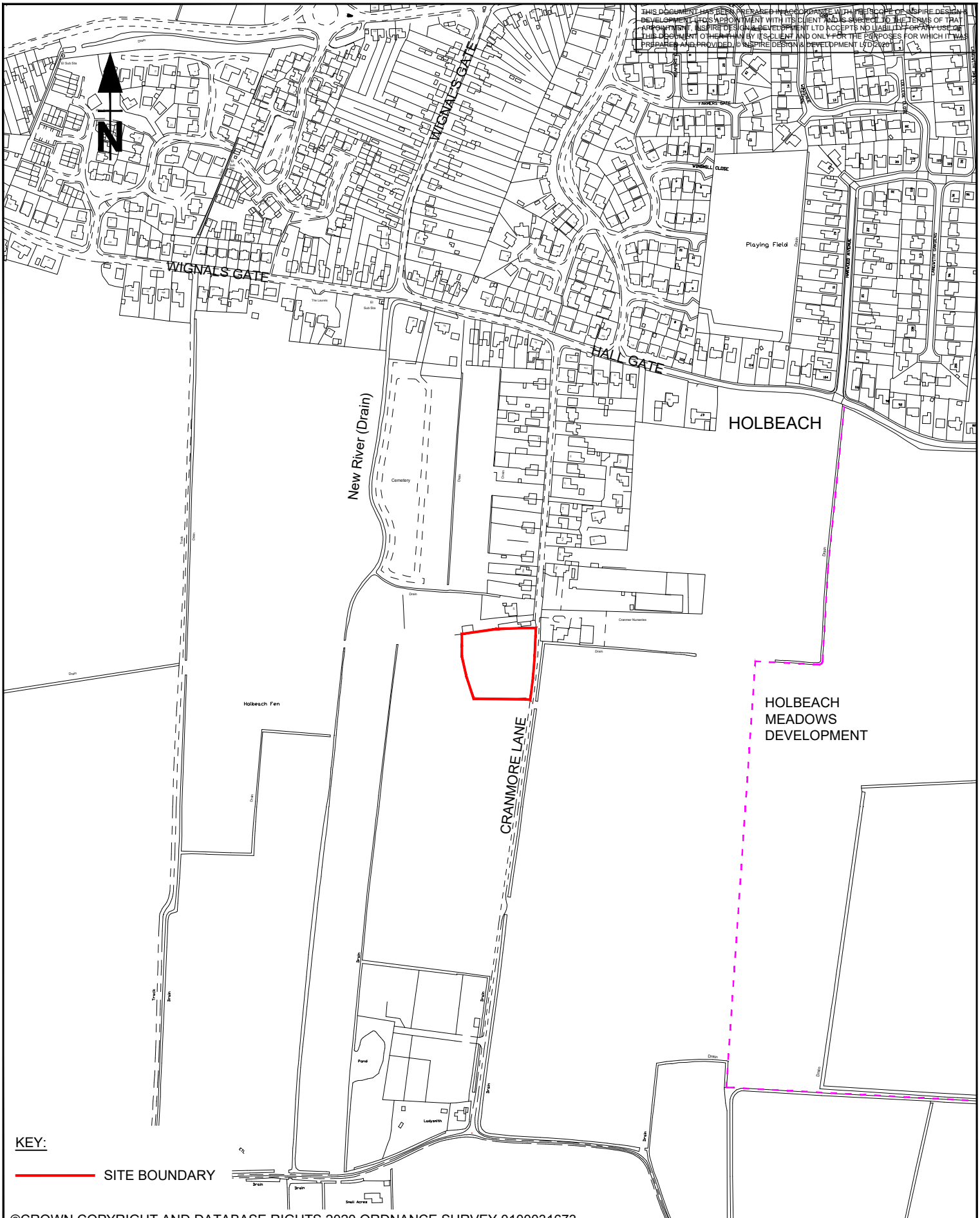
**MAP NO:**




**SFRA 2016 Update – 2116 Flood Depths 1% Fluvial/0.5% Tidal – Local Area**

**DRAWINGS**

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| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| DATE: | DRAWING TITLE: LOCATION PLAN | | REV | DATE | NAME | CHECK | NOTES |
| DRAWN: NGP | | | | | | | | |
| CHECKED: SR | | | DRAWING STATUS: FOR INFORMATION | | | | | |
| APPROVED: SR | PROJECT: CRANMORE LANE, HOLBEACH | CLIENT: FINSBURY DESIGN LTD | DRAWING No: FD-1481-01-GA-001 | | | REVISION No: | | |
| SCALE @ A4: 1:5000 | | | | | | | | |

N

CRANMORE LANE

24

27a

27

29

28a

31a

34

150mm Ø

ANGLIAN WATER
PUBLIC FOUL SEWER

8202

8101

Cranmer Nurseries

SHIDB HIGH PRIORITY WATERCOURSE

DRN197P1601 (PREVIOUSLY F16)

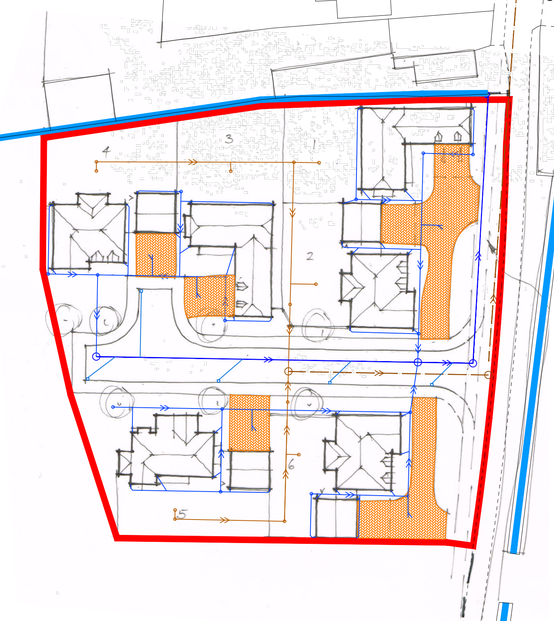
DRN197P3703 (PREVIOUSLY F37)

EXISTING DITCH

NEW RIVER

SHIDB HIGH PRIORITY WATERCOURSE

n Fen




KEY:

SITE BOUNDARY

EXISTING
FOUL SEWER
WATERCOURSE

PROPOSED
ADOPTED FOUL DRAINAGE
PROPOSED SURFACE WATER DRAINAGE
PRIVATE FOUL DRAINAGE
PRIVATE SURFACE WATER DRAINAGE
HIGHWAY GULLY
PERMEABLE PAVING

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| REV | DATE | NAME | CHECK | NOTE |
|---|---|---|---|---|

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DRAWING STATUS: FOR INFORMATION

DATE: 23/03/2020

SCALE @ A1: 1:500

| DRAWN: | CHECKED: | APPROVED: |
|---|---|---|
| NGP | SR | SR |

DRAWING No.: FD-1481-01-DR-001

REVISION No.: