

RESIDENTIAL DEVELOPMENT
BEHIND 34 AND 34A COWBIT ROAD, SPALDING. PE11 2RQ
FLOOD RISK ASSESSMENT

CONFIDENTIAL



This flood risk assessment has been prepared solely to support the planning application for a pair of proposed dwellings behind 34 and 34A Cowbit Road, Spalding. The author has made every effort to provide an accurate assessment of the flood risk but accepts no liability should the information be found to be incorrect or incomplete.

Introduction

The site is within Flood Zone 3 as shown on the Environment Agency's Flood Zone Map. These maps do not take into account existing flood defences.

The Planning Application requires a Flood Risk Assessment to be carried out as required in the Technical Guidance to the National Planning Policy Framework.

The site is shown within the defended area of the South Holland District Council's Strategic Flood Risk Assessment (SHDC SFRA) map and is located in the South Holland Internal Drainage Board district.

Application Site

The development is located on the eastern side of the River Welland. The National Grid Reference of the site is 524686 321909.

The position and extent of the site is shown on the plan at the end of this document.

The proposed development is within Flood Zone 3(a) "High Probability" as detailed on the Environment Agency's flood zone maps without defences, as defined in Table 1 of the Technical Guidance.

Applying the flood risk vulnerability classification in Table 2 of the Guidance, the development is classified as "more vulnerable" in Table 3 of the Guidance, which states that residential use is only permitted after the exception test is followed.

Exception Test

For the Exception Test to be passed:

- a) It must be demonstrated that the development provides wider sustainability benefits to the community that outweigh flood risk, informed by a SFRA;
- b) The development should be on developable previously developed land or, if not, it must be demonstrated there is no such alternative land available; and
- c) A FRA must demonstrate that the development will be safe, without increasing flood risk elsewhere, and, where possible, reducing flood risk overall.

All three parts of this test must be satisfied in order for the development to be considered appropriate in terms of flood risk. There must be robust evidence in support of every part of the test.

Sections (a) and (b) were in the most part demonstrated by the previous approval granted in 2008, and will be confirmed by the planning authority in their determination of the proposed planning application.

This flood risk assessment will demonstrate that Section (c) is passed.

Strategic Flood Risk Assessment

The following information about the flood risk at the location of the proposed development has been gained from the maps produced for the South Holland District Council Strategic Flood Risk Assessment:

1. Report Maps

- Map 5 indicates the site to be low or medium risk and protected by flood defences.
- Map 6 indicates the peak depth is zero for the present day 1% / 0.5% tidal event probability.
- Map 7 indicates the peak velocity is zero for the present day 1% fluvial / 0.5% tidal event probability.
- Map 8 indicates the risk extent is zero for the present day 1% fluvial / 0.5% tidal event probability.
- Map 10 indicates the actual risk extent for the 0.1% event probability is low but reliant upon protection by flood defences.
- Map 12 indicates the actual risk extent for the year 2055 for the 1% fluvial / 0.5% tidal event probability is high.
- Map 14 indicates the actual risk extent for the year 2115 for the 0.1% event probability is low, and indicates that this flooding would develop more than 3 hours after any breach occurs.
- Map 16 indicates the site is within a rapid inundation zone both for the present day and 2115.

2. Flood Maps Table D1

The maps illustrate the actual flood hazard which is as follows:

For the present day	Depth of flooding ... zero
	Extent of flooding .. zero
	Hazard Nil
	Velocity ... Nil
For year 2115	Depth of flooding ... zero
	Extent of flooding ...zero
	Hazard ... Nil
	Velocity .. Nil

The maps illustrate residual flood hazard which is as follows:

For the present day	Depth of flooding ...Between 1.0m and 1.5m
	Extent of flooding .. Medium or High

	Hazard ...	Significant
	Velocity ..	0 to 0.1m / sec
For the year 2115	Depth of flooding ...	Between 1.0m and 1.5m
	Extent of flooding ..	High probability
	Hazard ...	Significant
	Velocity ..	0 to 0.1m / sec

3. Maximum flood levels:

Maximum flood levels in the River Welland and the Coronation Channel are shown in the reports as follows:

	Present	Present + Climate Change
1 in 100 year	4.32	4.69
1 in 1,000 year	4.34	4.69

The lowest level of the left bank of the Coronation Channel stated in the SFRA is 5.28m OD.

The lowest levels of the right bank of the Welland through Spalding stated in the SFRA are 4.90m OD, although measured levels around the site are approximately 5.20m OD.

4. Extreme tide levels

The extreme tide levels in the section of the Coronation Channel and River Welland between Fulney Lock and Marsh Road Sluice are shown in the report as follows:

	2007	2055	2115
1 in 100 year	5.98	6.31	7.12
1 in 1,000 year	6.32	6.65	7.46

The lowest bank level on the left bank of the Coronation Channel is 6.88m OD.

The lowest bank level on the right bank of the tidal River Welland is 7.57m OD.

Existing Flood Alleviation Measures

The site is within a defended flood plain, as defined in Appendix 1 of the Environment Agency's "Policy and Practice for the Protection of Flood Plains" and is considered to be passive until such time that a flood greater than the defences can withstand occurs. The likelihood of flooding due to overtopping or failures of the defences is considered to be very low.

The site is approximately 40 metres from the River Welland, which is the main river and maintained by the Environment Agency.

The site is approximately 2.5km south of the tidal defences of the River Welland and Coronation Channel.

The area between the River Welland and the Coronation Channel is drained by surface water sewers maintained by Anglian Water, which discharge either into the River Welland or into drainage channels maintained by South Holland Internal Drainage Board. The water levels in the IDB channels are controlled by Clay Lake Pumping Station, which is operated by South Holland IDB, and discharges into the Coronation channel.

Existing Ground Levels and Proposed Levels of Buildings

The site is in the rear gardens of 34 and 34A Cowbit Road and has a level of 3.23m OD. A plan showing these levels is shown on page 11 of this report. The levels on the site are lower than the level of the footpath alongside Balmoral Avenue, as can be seen from the section shown on page 8.

Potential Sources of Flooding

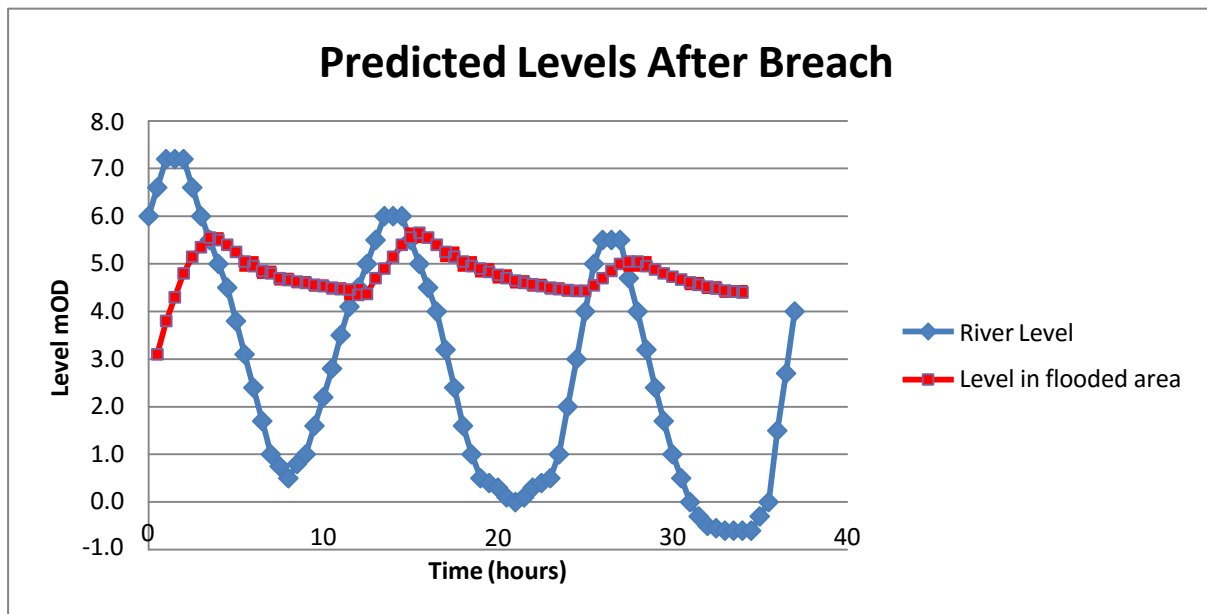
The following sources of flooding have been identified:

1. Failure or overtopping of the tidal defences.
2. Overtopping of the River Welland.
3. Overtopping or breaching of the Coronation Channel.
4. Failures of Clay Lake Pumping Station (IDB)
5. Blockages in Exeter Drain (IDB)
6. Blockages in local surface water sewers (highway or Anglian Water)

1. Failure or overtopping of tidal defences.

There is a short length of tidal defences on the Coronation Channel west of Marsh Road Sluice and on the River Welland north of Fulney Lock that defends the area between the River Welland and the Coronation Channel from flooding. The SFRA states that the defences are adequate to withstand a 1 in 200 year (0.5%) probability event for present day. In the future in 2115 some of the banks would be overtopped with a 0.5% probability event. An inspection of these banks has shown that there is a low section just west of Fulney Lock which is lower than the rest of the bank, however the top of the bank is at least 4.0 metres wide and it is at least 20 metres back from the edge of the Coronation Channel.

If a breach occurred in a 1 in 200 year event in the year 2115 it is estimated that the following levels of flood water, compared with levels in the tidal section of the River Welland, would occur at the site.



2. Overtopping of the River Welland.

The west bank of the River Welland is at an approximate level of 5.0m O.D. near the development site. However it is not a raised defence at this point. The bank top and the road have a minimum level of 5.00m OD and the land then gradually falls away eastwards. Therefore as there is a freeboard of at least 300mm above the 1 in 1,000 year maximum design level in the River this source of flooding can be discounted.

3. Overtopping or Breaching of the Coronation Channel

The area between the River Welland and the Coronation Channel is protected from flooding by banks on the west side of the channel, which are approximately 2.0m to 3.0m above the land. The top level of these banks is approximately 5.4m OD, which gives a freeboard of at least 700 mm above the 1 in 1,000 year maximum design level in the channel.

If a breach occurred in the channel the maximum water level in the flooded area could reach between 4.0 m and 4.1 m OD for the present day situation and between 4.3m and 4.4 m OD if climate change is allowed for.

4. Failure of Clay Lake Pumping Station

The South Holland IDB estimate that the Clay Lake Pumping Station provides a 1 in 50 year standard with a freeboard, which in effect provides a 1 in 100 year protection against flooding. The pumping station is maintained in good condition and should a failure occur the Drainage Board would quickly deploy temporary pumps to alleviate the situation. It is highly unlikely that any flooding from this source would extend as far as this higher end of Balmoral Avenue, as the flood water would need to rise

above 3.20m OD, which is higher than the ground levels around the pumping station itself which would flood first.

Therefore flooding from this source can be discounted.

5. Blockages in Exeter Drain

The South Holland IDB has a regular annual maintenance programme and they remove weed growth from channels such as these twice each year. However, any flooding from this channel will not cause any flooding to the development site, as explained in (4) above.

Therefore flooding from this source can be discounted.

6. Blockages in local surface water sewers

Both Anglian Water and the Highways Authority maintain surface water drainage systems which discharge into the Exeter Drain (IDB) and the River Welland. If there is a blockage in an underground pipe surface water would collect in areas east of the site and cause localised flooding. However, this would not be excessive and the problem would be overcome quickly.

Therefore no serious flooding will occur and this source can be discounted.

Extent of known Flooding

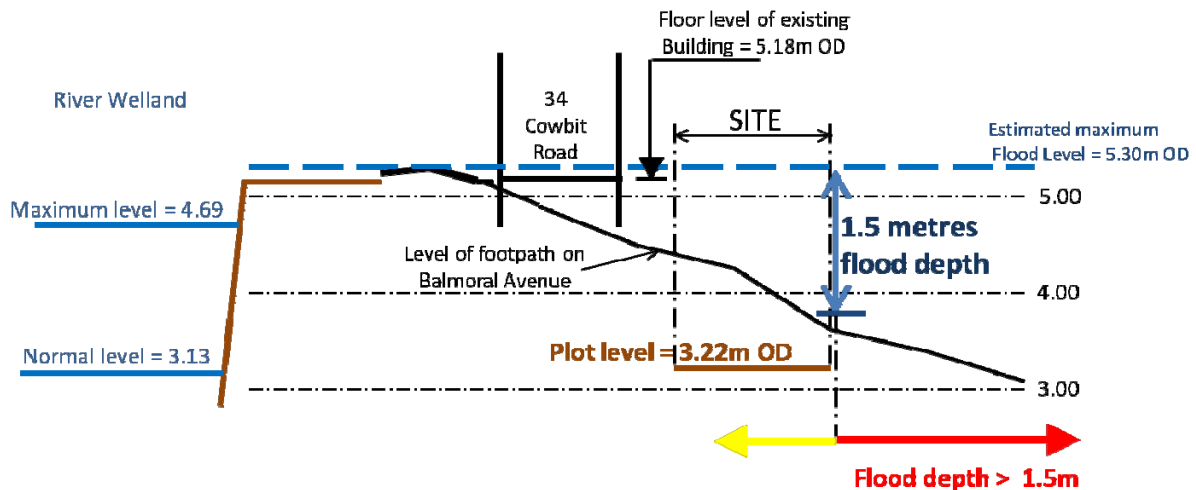
During the preparation of this assessment, no evidence was discovered of the site or any of the adjoining properties having been flooded in the last 50 years.

Probabilities and Trends of Flooding

The probability of this development flooding from Environment Agency main river is very low. In an extreme event any effect on this location would not be sudden and there would be time for residents to take precautionary measures to limit the impact of any flooding that may occur.

Residual Risk

The SFRA has indicated that in all actual 0.5% probability tidal situations and 1 % probability fluvial situations there is no risk of flooding to the site. However the SFRA predicts there is a residual risk of flood depths of between 1.0 metres and 1.5 metres in both the present day and in 2115. If this information is shown on the cross section along Balmoral Avenue this indicates a maximum level of 5.30m OD could occur in this scenario.



Recommendations

If a bungalow is to be constructed on the site then to comply with the Environment Agency's recommendations all sleeping accommodation should be above the 1 in 1000 predicted flood level. Therefore the floor level would need to be set at a minimum level of 5.35m OD. This is 2.1 metres above the existing level of the site and is impractical.

It would be possible to construct a two story building with a garage and store areas at ground level and all the living and sleeping accommodation on the first floor. This would clearly be the best option if flood risk is the only planning consideration.

A second option that is more preferable to the developer is to construct a traditional two story dwelling with all sleeping accommodation on the first floor. In order to access this building from Balmoral Avenue the floor level would need to be at a minimum level of 4.00m OD.

Conclusions

The following conclusions can be made:

- Although the site is in flood zone 3, the actual risk of the site flooding from any Environment Agency water course is low.
- There is no actual risk of flooding at the present time.
- The SFRA states there is a residual risk that the site could flood if a breach occurs in the tidal defences. Although the risk of a breach occurring is very low, calculations in this FRA show that if a breach 50 metres wide and 3.0 metres deep is assumed to form within minutes, then water levels in the area between the River Welland and the Coronation Channel could eventually reach 5.30m OD. However the SFRA states that flooding would not start to occur until at least 3 hours after a breach has occurred.
- If flooding were to occur in an extreme event residents of the building could exit the building safely as described above.

- In a flood risk area there is always a risk of an event occurring of greater magnitude than has been considered in this flood risk assessment.

Recommendations

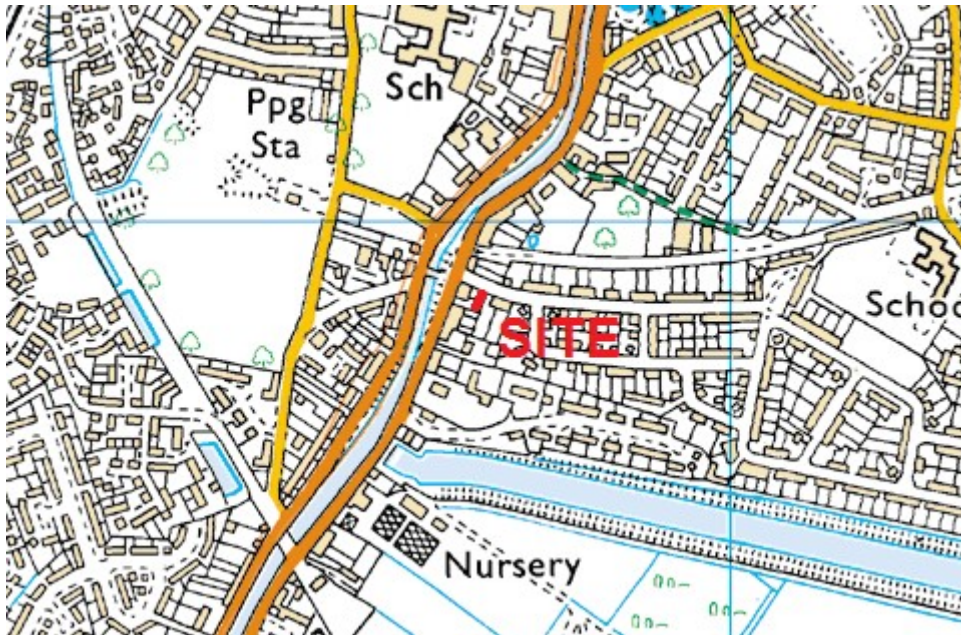
- It is proposed that the floor level of a two story building should be a minimum level of 4.00m OD.
- All sleeping accommodation should be on the first floor of building.
- A suitable emergency exit to the building should be constructed as detailed above.
- Occupiers of the property should register with the Environment Agency's Floodline Warnings Direct Service. If a very high tide is predicted (greater than 6.50m OD) then the occupiers are advised that they should make preparations to monitor the situation and be prepared to evacuate the building immediately if flooding begins to take place. They should drive or walk to the central area of Spalding or be advised of a safer place to go. Further details of these recommendations are detailed in the suggested Flood Warning and Evacuation Plan included as Appendix 2 on pages 13 and 14 of this report
- The building will need to be designed incorporating flood resistant/resilient techniques to allow it to be refurbished after being flooded to a depth of approximately 1400mm. Consideration should be given to the electrics and heating pipes being distributed at ceiling level rather than at floor level. Materials used for the floor and walls should be able to withstand flooding for a period of at least a week. Further details of suggested measures are shown in Appendix 1 on page 12 of this report.
- On site surface water drainage should be discharged into soakaways and these should be designed to BRE Digest 365 and approved under Building regulations. Careful consideration should be given to the design of the soakaways to ensure that the ground water levels are not increased in the adjoining garden of 2, Balmoral Avenue.

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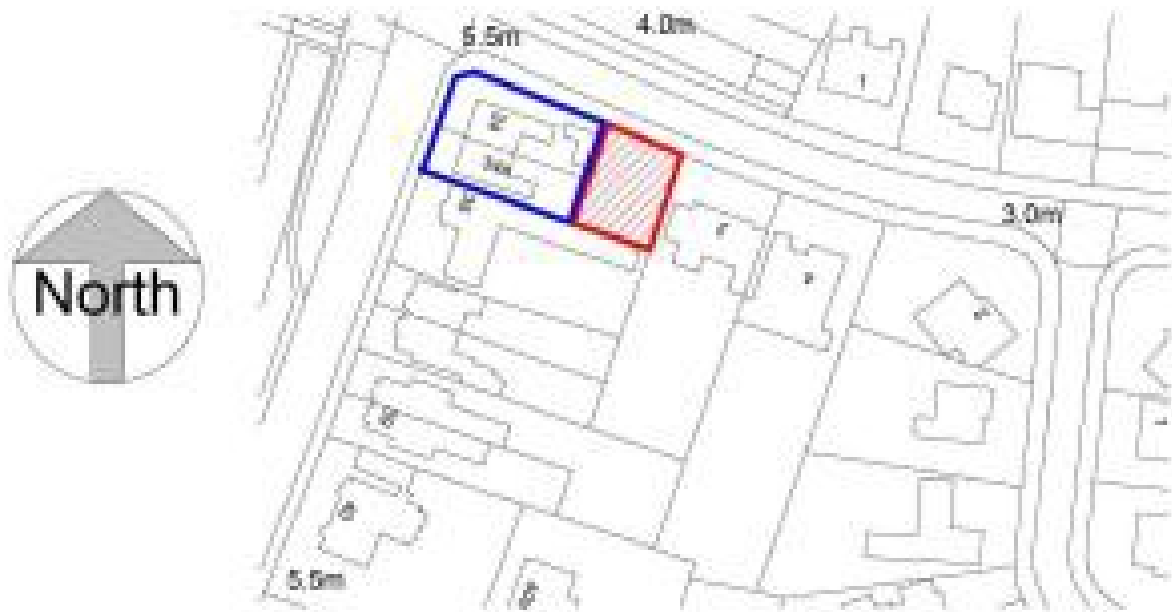
LOCATION PLAN



PLAN OF PROPOSED SITE WITH LEVELS



EXISTING SITE PLAN



APPENDIX 1

RECOMMENDATIONS ON LIMITING FLOOD DAMAGE TO BUILDING

- Walls: Construction to first floor level should be carried out with good quality brickwork. Specification for blockwork should be checked and only blockwork that does not absorb water should be used. If possible brickwork should be used instead of blockwork to first floor level. Construction below DPC should be carried out with engineering brickwork.
- Ground Floor: Either precast concrete beams with concrete infill, or concrete above made up ground should be used. Dense concrete screeds should be used.
- Doors: Doors should be solid construction, or plastic should be considered. Butt hinges should be fitted to allow doors to be removed and placed in a dry area prior to any flooding.
- Kitchens: Install plastic base feet and if possible other plastic items to reduce damage from low level flooding. Raise fitted ovens as high as possible.
- Electrical Services: Place all of electrical wiring at first floor level and drop wiring down to sockets at least 1.0 metre above ground level.

APPENDIX 2

FLOOD WARNING AND EVACUATION PLAN FOR DWELLING **AT BALMORAL ROAD SPALDING**

There is a risk of flooding to the proposed dwelling in Balmoral Avenue from two sources:

- 1) If a breach occurred in the bank of the bank of the Coronation Channel this would flood the house with a maximum depth of water of 0.5 metres.
- 2) If water flowed over the top of the bank of the tidal section of the River Welland or a breach in the bank happened, this would flood the house to a depth of 1.3 metres.

Residents should understand that deep flooding will only occur if a bank breaks. However the hazard if this occurs is high, and the safest course of action is to evacuate the building and leave this area of Spalding when water levels in the above watercourses are high and not return until the high water levels have dropped.

It is recommended that occupiers of the house should sign up to receive the Environment Agency's (EA) Floodline Warnings Direct Service. This service will telephone them to give them warnings of either FLUVIAL or TIDAL flooding.

Three levels of warning are sent by the EA:

- 1) Flood Alert: This will give between 2 days and 2 hours warning of very high water levels in the area.
- 2) Flood Warning: This will be given out when there is a greater chance of very high water levels occurring, typically between 1 day and half an hour before these high levels are likely to occur.
- 3) Severe Flood Warning: When the flooding poses a danger to life.

Residents should have a plan to prepare for this eventuality. A guide to the things they need to include in their plan are detailed on the EA website at:-

<http://www.environment-agency.gov.uk/homeandleisure/floods/38329.aspx>

If these warnings are received then residents should prepare themselves, using their plan that they have devised.

Residents should particularly listen to local radio which will give information on the situation.

High levels in the Coronation Channel will be caused by heavy rainfall on the preceding days. Residents can monitor this themselves by looking at the gauge board at the confluence of the Coronation Channel and the River Welland at Cowbit Road. If the level exceeds 4.00m OD and continues to rise residents should consider evacuating the house and not return until the level has dropped to approximately 4.0m OD again.

High levels in the Tidal part of the River Welland will be caused by very high tides. These will be predicted by the Meteorological Office and the EA and details of the situation will be widely broadcast on radio. If an extreme high tide is predicted then the residents will receive a "Severe Flood Warning" and the residents should consider evacuating the area until the high tide situation has passed.

A safe area to evacuate to is central Spalding where ground levels are higher than the maximum flood level possible in the area.

If the residents stay in the house and flooding begins to occur they should evacuate the house via the escape route of the building and make their way onto Cowbit Road, which is 1.1 metres higher than the floor level of the house. They should not return until they have ascertained that it is safe to do so.

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