`PROPOSED DEVELOPMENT AT SITE WEST OF

33 KNIGHT STREET, PINCHBECK, SPALDING PE11 3RA

FLOOD RISK ASSESSMENT



CONFIDENTIAL

REVISION A: 29th August 2014 Revised recommendation that all floor levels to be at 4.10m OD.

This flood risk assessment has been prepared solely to support the planning application for a proposed development at Knight Street, Pinchbeck, 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

An application is due to be made to South Holland District Council for Planning Permission to construct a bungalow on a plot of land west of 33 Knight Street, Pinchbeck where a number of garages are at present located.

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 Welland and Deepings Internal Drainage Board district.

Application Site

The development is located on the southern side of the River Glen. The National Grid Reference of the site is 523990 325940.

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, and the statement 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) 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 to medium probability 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 low to medium probability 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 high, reliant upon protection by flood defences, and flooding starts to occur less than ½ hour after a breach.
- Map 12 indicates the actual risk extent for the year 2055 for the 1% fluvial / 0.5% tidal event probability is high.
- Map 13 indicates the site is within the high probability band for the year 2115 for the 1% fluvial / 0.5% tidal event probability.
- Map 14 indicates the actual risk extent for the year 2115 for the 0.1% event probability is medium or high, and indicates that this flooding would probably develop less than ½ hour after any breach occurs.
- Map 16 indicates the site is not within the present day or the year 2115 rapid inundation zone.

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 .. high
	Hazard …. low
	Velocity … zero
For year 2115	Depth of flooding …0 - 0.5m
	Extent of flooding …High flood probability,
	Hazard … Significant
	Velocity .. 0 to 0.1m / sec

- The maps also illustrate the residual flood hazard which is as follows:-

For the present day	Depth of flooding …0 - 0.5m	
	Extent of flooding .. High probability	
	Hazard …	Low
	Velocity ..	0 to 0.1m / sec
For the year 2115	Depth of flooding …0 - 0.5m	
	Extent of flooding .. High probability	
	Hazard …	Significant
	Velocity ..	0.1 to 0.25m / sec

3. Maximum flood levels:

Maximum flood levels in the River Glen are shown in the reports as follows:

	Present	Present + Climate Change
1 in 100 year	4.32	4.91
1 in 1,000 year	4.47	4.98

The bank level at this location is 4.39m OD, but there is a flood wall 900mm high along this length of the River which raises the defence height to 5.29m OD.

Maximum flood levels in the Vernatt's Drain are shown in the reports as follows:

	Present	Present + Climate Change
1 in 100 year	3.79	3.79
1 in 1,000 year	3.79	3.79

The bank level at this location is 4.25m OD

4. Extreme tide levels

The extreme tide levels in the River Welland between 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

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The lowest bank level on the left 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 280 metres south of the River Glen, which is main river and maintained by the Environment Agency.

The site is approximately 2.5 km from the tidal defences of the River Welland.

The area is drained by watercourses maintained by the Welland and Deepings IDB.

Proposed Levels of Buildings

The road level in Knight Street outside the existing property is 3.70m and the ground floor level of the existing house (No 33) on the site is approximately 3.68m OD. The floor level of the adjoining property to the west is 3.96m OD. It is recommended that the floor level of the proposed bungalow should be 520mm above the existing ground level of 3.58m OD at a level of 4.10m OD.

Potential Sources of Flooding

The following sources of flooding have been identified:

1. Failure or overtopping of the tidal defences of the River Welland
2. Flooding due to high water levels in Vernatt's Drain
3. Overtopping or breaching of the River Glen.
4. Failures of Pinchbeck Pumping Station (IDB).
5. Flooding from the IDB drainage system.
6. Blockages in local surface water and foul sewers (highway or Anglian Water).

1. Failure or overtopping of the tidal defences of the River Welland.

The tidal River Welland is 2.5km east of the site. The predicted levels in this watercourse show that the defences will not be overtopped in a 1 in 1000 year event in 2115. However there is still the risk that the earth bank could breach when the water levels are high. If a breach occurred in the west bank of the tidal Welland water would flow westwards and would flow into Vernatt's Drain. This will hold up the flow until the water level reaches 4.25m OD then water would flow out of Vernatt's Drain and start to flow westwards towards the development site.

Therefore it is very unlikely that flood water from this source would reach and cross Church Street and cause flooding to Pinchbeck and the risk of flooding from this source is extremely low.

2. Flooding due to high water levels in Vernatt's Drain

The SFRA states that the maximum water level in Vernatt's Drain is 3.79m OD. This is 450mm below the bank levels on the east side of 4.25m OD. These levels are lower than the proposed floor level of the proposed building and therefore this source of flooding can be discounted.

3. Overtopping or breaching of the River Glen.

The predicted maximum 1 in 100 year water level at the present time is 4.32m OD and the predicted 1 in 1000 year water level at the present time is 4.47m OD. These predicted levels are lower than the defence levels on this section of the bank of the River Glen which are all higher than 5.00m OD.

Predicted water levels with climate change are 4.91m OD for the 1 in 100 year event and 4.98 OD for the 1 in 1000 year event. These are still below the defence levels.

Although the actual risk is extremely low there is still a residual risk if the defences were to fail. The River Glen has a 1 in 100 year standard of service at the present time, which will decrease in the future unless work is carried out by the EA to raise banks. However the most common reason for breaches is overtopping of earth banks. This type of failure is more likely to happen at locations to the west of Pinchbeck where the earth banks are lower.

This source of flooding is the greatest risk to the site, and the hazards will be reviewed later in this report.

4. Failures of Pinchbeck Pumping Station (IDB)

The original pumps at Pinchbeck Marsh had a capacity of 1.5 cumecs, and the new part of the pumping station built approximately five years ago added a further 1.5 cumecs of capacity. The catchment area that the pumps serve is 850 hectares. Therefore this pumping station provides a good standard of service for the catchment area, and the risk of flooding from this source can be considered to be extremely low.

5. Flooding from the IDB Drainage System

The area of Pinchbeck village is drained by a piped IDB surface water drain which runs westwards under Church Street and discharges into Captains Drain. If any part of this system becomes blocked this could cause some minor flooding of lower areas of Pinchbeck, but the flooding would not rise to the level of the proposed building. Welland and Deepings have a regular maintenance programme on all of their open and piped drains which reduces the risk of this happening.

Therefore this source of flooding can be discounted.

6. Blockages in local surface water sewers and highway drains

Any flooding due to blockages in surface water sewers or highway drains could cause low level flooding in Knight Street but the flood water would flow away from the site northwards onto lower land and would not accumulate on the site.

Therefore this source of flooding 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 tidal event the 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 – Extreme Events

There is a residual risk from extreme events on this site. The major risk to the site is from high water levels in the River Glen. The defences on the south side of the river seem to provide a satisfactory defence, being 300mm higher than the 1 in 1000 predicted level including climate change.

If a breach occurred in the bank, or the stone flood wall collapsed, flood water would flow southwards flooding many of the properties behind the defences. The maps of the predicted residual depths for the 0.1% probability event show maximum flood depths of between 0.5 and 1.0 metres for properties and land along Glen Avenue to the north west of the site and then 0 to 500mm for this area of Knight Street. If the the proposed building has a floor level of 4.10m OD there should be a very low risk of the bungalow flooding in any event.

Conclusions

The following conclusions can be made:

- The proposed development is not in a functional flood plain as defined by PPS 25.
- Although the site is in flood zone 3, the actual risk of the site flooding from any Environment Agency water course is low.
- With the predicted maximum level in the River Glen with climate change of 4.98m OD, this will be 880mm above the proposed level of the proposed bungalow. As the water flows through any breach that may occur then initially there will be a head loss of at least 500mm as the water flows out of the river. After some time this may reduce, but so will the maximum level in the river as water escapes out of the river. This provides further evidence that any flood water will only reach a level of 4.10m OD at the proposed site.

- Any flooding from the IDB drain or local sewers or drains will occur very slowly and it is extremely unlikely that flooding from this source would reach a level of 4.10m OD and flood the proposed dwelling.
- 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.

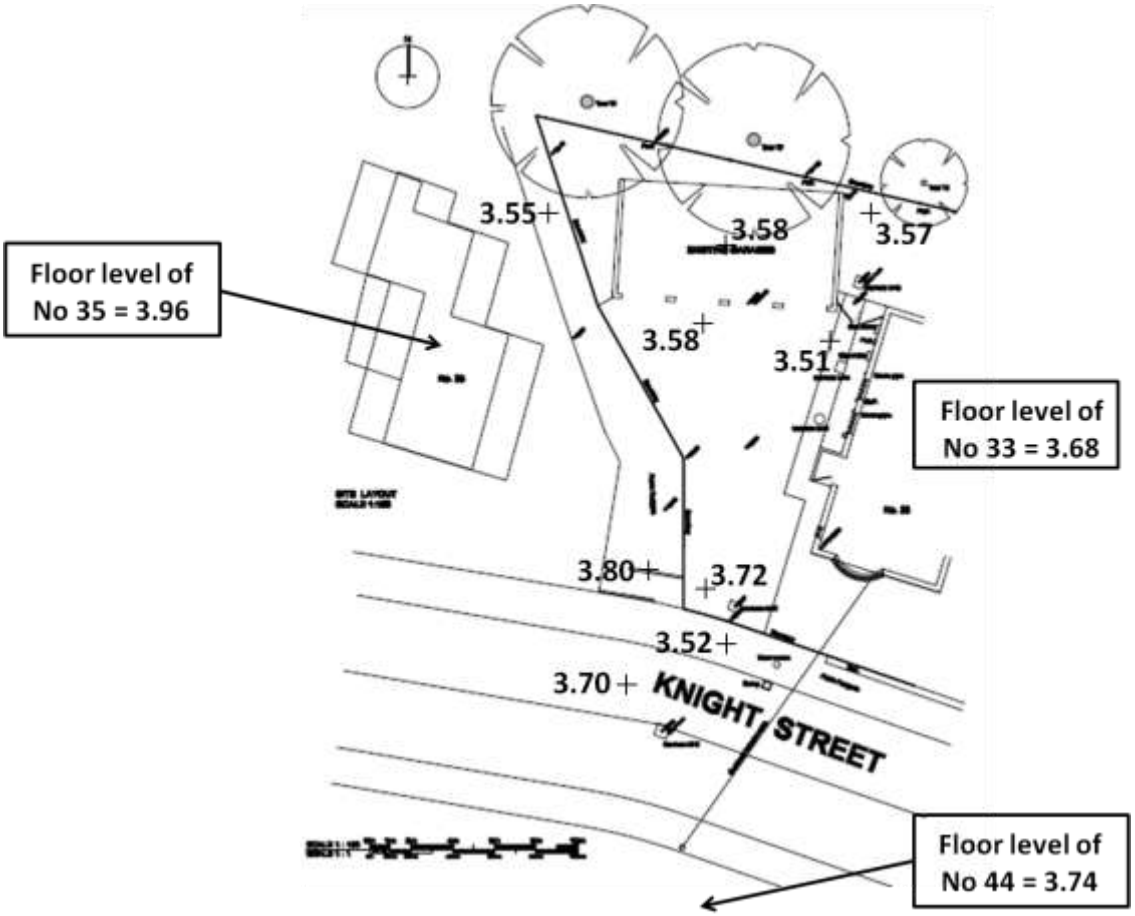
Recommendations

- In any area at risk of flooding it is preferable that a proposed building should be of two story construction with all bedrooms at first floor level. This will provide a refuge for residents if the building becomes flooded after a major breach of the River Glen, and ensure there is no danger to residents when they are asleep. As a bungalow is proposed with sleeping accommodation at ground floor level the developer should consider the provision of a staircase leading to a refuge at first floor level which will clearly be above the maximum level of flooding that could occur.
- It is recommended that the floor level of the proposed bungalow should be no lower than 4.10m OD which will be greater than 500mm above the land level on the site. The map showing the depths of residual flooding for the year 2115 in the SFRA indicates that the flood depth in the area of this property would be between 0 and 500mm.
- The Occupiers of the property should register with the Environment Agency's Floodline Warnings Direct Service. If a Flood Alert is received residents should stay vigilant and be prepared to relocate for the period when water levels are very high to a location east of the old A16. If a Flood Warning is received then residents should consider evacuating the area and only returning when the danger is over.
- If residents evacuate the area they should proceed to an area east of the old A16 or to the central part of Spalding where the risk of flooding is less.
- On site surface water drainage should be discharged into soak aways and these should be designed to BRE Digest 365 and approved under Building regulations.
- The buildings should be designed incorporating flood resistant and resilient techniques to allow it to be refurbished after being flooding to a depth of approximately 300mm above the floor level of the new building. 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 a few days. Further details are given in Appendix A on page 11.

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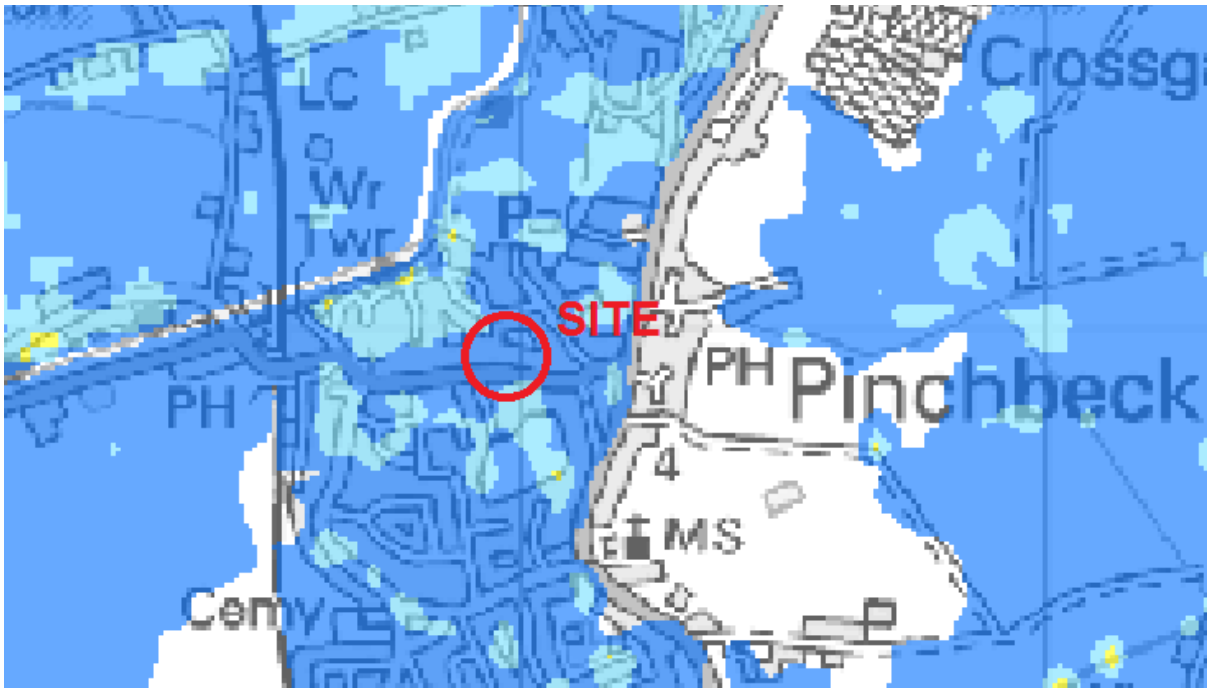
SITE PLAN WITH GROUND LEVELS



LOCATION PLAN



RESIDUAL PEAK DEPTH YEAR 2115 0.1% EVENT PROBABILITY



Dark blue.....predicted flood depth up to 500mm.

APPENDIX A

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.