PROPOSED DEVELOPMENT AT DRAPERS PLACE
SPALDING PE11 1BN
FLOOD RISK ASSESSMENT



View from north side of Drapers Place

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This flood risk assessment has been prepared solely to support the planning application for the proposed new development at Drapers Place, 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

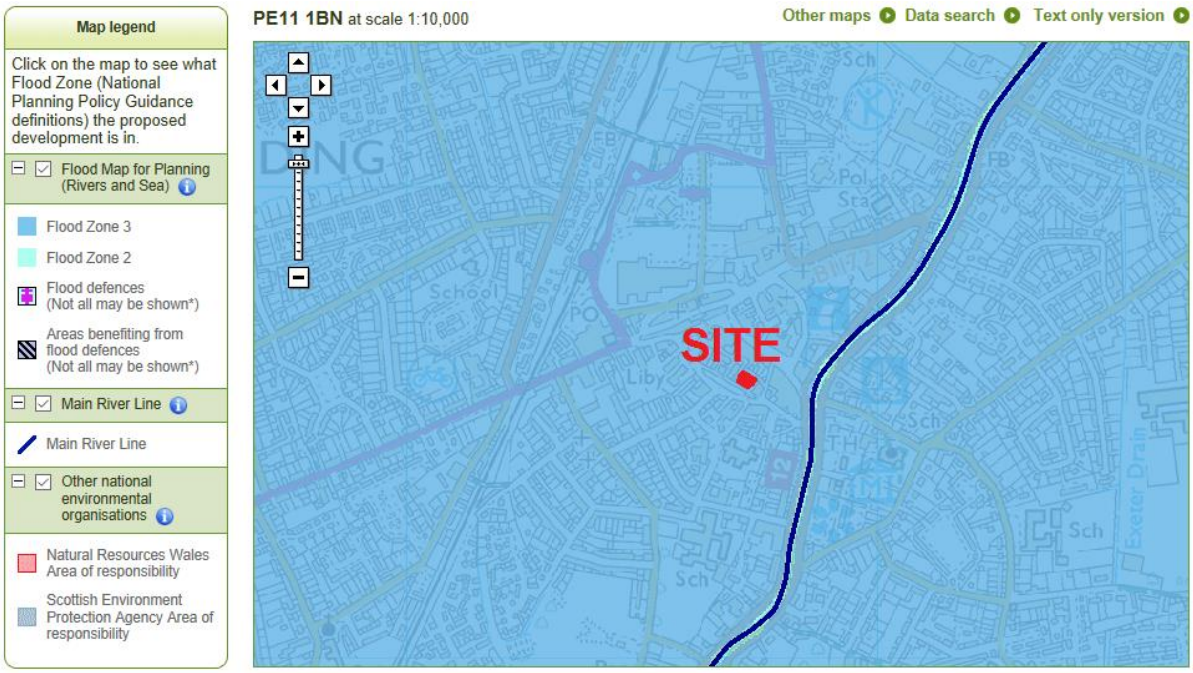
An application is due to be made to South Holland District Council for Planning Permission to construct a development consisting of an underground car park and residential units at ground floor level at Drapers Place, Spalding.

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 specified in the Practice Guidance to the National Planning Policy Framework Development and Flood Risk. 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.

Environment Agency (EA) Flood Zones

The map below is taken from the Environment Agency website and shows the flood zones in the area.



It can be seen that the whole of the central area of Spalding is in Flood Zone 3.

Application Site

The development is located on the western side of the River Welland. The National Grid Reference of the site is 524720 322585.

The location of the site is shown on the plan at the end of this document.

As the site is within a defended area the proposed development can be designated to be 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, a basement car park is designated as “less vulnerable” and multiple dwellings are classified as “more vulnerable”.

Table 3 of the Guidance is shown below:

Flood Zones	Flood Risk Vulnerability Classification				
	Essential infrastructure	Highly vulnerable	More vulnerable	Less vulnerable	Water compatible
Zone 1	✓	✓	✓	✓	✓
Zone 2	✓	Exception Test required	✓	✓	✓
Zone 3a †	Exception Test required †	✗	Exception Test required	✓	✓
Zone 3b *	Exception Test required *	✗	✗	✗	✓*

Therefore it can be seen that “less vulnerable” development is satisfactory in flood zone 3(a) but for “More vulnerable” development the sequential and exception test should be followed before the development can be deemed satisfactory.

Sequential Test

The aim of the Sequential Test, as set out in the Planning Practice Guidance, is to ensure that a sequential approach is followed to steer new development to areas with the lowest probability of flooding. The flood zones as defined in the Strategic Flood Risk Assessment for the area provide the basis for applying the Test. The aim is to steer new development to Flood Zone 1 (areas with a low probability of river or sea flooding). Where there are no reasonably available sites in Flood Zone 1, local planning authorities in their decision making should take into account the flood risk vulnerability of land uses and consider reasonably available sites in Flood Zone 2 (areas with a medium probability of river or sea flooding), applying the Exception Test if required. Only where there are no reasonably available sites in Flood Zones 1 or 2 should the suitability of sites in Flood Zone 3 (areas with a high probability of river or sea flooding) be considered, taking into account the flood risk vulnerability of land uses and applying the Exception Test if required.

As can be seen from the map on page 2 of this report the whole of the area of central Spalding is in Flood Zone 3. Therefore it would be difficult to find a similar site for development that is in a lower flood zone.

Taking into account the guidance, it can be seen that it is extremely unlikely that an alternative site with a lower flood risk could be found in Spalding. The safety of the development will be delivered by ensuring the floor level of the proposed new dwelling is above predicted residual flood levels for this area.

The South Holland District Council Core Strategy states that there is a limited number of sites in the South Holland DC area available for residential development. Some further land will need to be identified to enable the Council to meet the RSS and Structure Plan requirement for 2021. Therefore there is a requirement for further land to be brought forward and used for residential development.

Therefore I consider that the sequential test has been passed.

Exception Test

The Sequential Test has demonstrated that it is not possible, consistent with wider sustainability objectives, for the development to be located in zones with a lower probability of flooding. Therefore the Exception Test must be applied and for this to be passed:

- It must be demonstrated that the development provides wider sustainability benefits to the community that outweigh flood risks, informed by the Strategic Flood Risk Assessment; and
- A site-specific flood risk assessment must demonstrate that the development will be safe for its lifetime taking into account of the vulnerability of its users, without increasing flood risk elsewhere, and where possible will reduce flood risk overall.

Both 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.

The first section will be demonstrated by the Supporting Planning Statement and compliance with South Holland District Council's planning policies.

This flood risk assessment will demonstrate that the development will be safe for its lifetime and it will not increase flood risk elsewhere.

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% fluvial / 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 zero.
- Map 12 indicates the actual risk extent is zero.
- Map 13 indicates the 1% fluvial / 0.5% tidal event probability for 2115 for the site is zero.
- Map 14 indicates the actual risk extent for the year 2115 for the 0.1% event probability is zero.
- Map 16 indicates the site is not within a 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 .. zero
	Hazard …. Nil
	Velocity … Nil
For year 2115	Depth of flooding … zero
	Extent of flooding .. Low or medium flood probability
	Hazard … Nil
	Velocity .. Nil

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

For the present day	Depth of flooding … zero
	Extent of flooding .. Low or medium flood probability
	Hazard … zero
	Velocity .. zero

- For the year 2115 Depth of flooding … zero

Extent of flooding .. Low or medium flood probability

Hazard … zero

Velocity .. zero

3. **The maximum flood levels in the fluvial section of the Spalding Welland is shown in the reports as follows:**

	Peak 1 in 100		Peak 1 in 1000	
Year	2007	2115	2007	2115
Level	4.43	4.67	4.45	4.68

The defence level of left bank of Spalding Welland is 5.20m OD

4. **The extreme tide levels in the section of the River Welland north of Fulney Lock is 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 occurs 200 metres north of Fulney Lock, where a section 300 metres long has a minimum level of 6.98m OD.

Information from the Environment Agency

The Environment Agency has provided predicted flood levels for the River Welland immediately east of the site which are taken from the Welland Catchment Model.

	2007	2115
Peak 1 in 100 year flood level	4.39m OD	4.68m OD
Peak 1 in 1,000 year flood level	4.40m OD	4.68m OD

Site Levels

The levels on the site vary from approximately 5.50m OD in the north eastern corner of the site to approximately 4.35m OD on the north western boundary.

A full topographical survey of the site has been produced which will be included with the planning application, and a simplified plan with levels is shown on page 11 of this report.

The proposed floor level of the residential part of the building is 5.30m OD and the proposed floor level of the basement car park under the dwelling is 2.50m OD. Further details of the proposed levels compared with existing levels can be seen on the cross section across the site shown on page 10 of this report.

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 210 metres from the River Welland, which is main river and maintained by the Environment Agency.

This area west of the River Welland is drained by surface water sewers maintained by Anglian Water, which discharge either into the River Welland or into drainage channels maintained by Welland and Deepings Internal Drainage Board. The water levels in the IDB channels are controlled by the water level in South Drove Drain which also is operated by Welland and Deepings IDB.

Potential Sources of Flooding

The following sources of flooding will be considered:

1. Failure or overtopping of the tidal defences.
2. Overtopping of the River Welland.
3. From IDB watercourses.
4. From ground water.
5. Surface water flooding.

1. Failure or overtopping of tidal defences.

The River Welland is tidal north of Fulney Lock, which is approximately 2km north of the site. 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. However if overtopping or a breach occured water would flow westwards from the tidal Welland and lower land to the west of the River Welland would be flooded. The central area of Spalding would remain unaffected, even if a tide of extreme proportions occurred.

It is reasonable to presume that within the next one hundred years works would be undertaken on this section of the bank to ensure that there will be a 1 in 200 year standard of defence continuing into the future.

2. Overtopping of the River Welland.

The west bank of the River Welland is at a level of 5.20m O.D. at London Road. This is not a raised defence at this point. The area around Double Street is also at a level of 5.20m OD. The maximum predicted water level in the fluvial section of the Welland is 4.68m OD. Soon after this level is exceeded siphons are activated to spill water

onto Cowbit and Crowland Washes. Also water will begin to flood over lower banks around Crowland. Therefore, the risk of flood water from this source reaching this area of the Crescent can almost be discounted.

Therefore, this source of flooding can almost be discounted.

3. Flooding from IDB watercourses

The highest predicted water levels in IDB drainage channels in the area are in Vernatts Drain which are 3.79m OD. As the proposed floor level of the new building is 4.45m OD this source of flooding can be discounted.

Maximum predicted water levels in the IDB catchment controlled by Pode Hole Pumping Station in a 1 in 100 year event in 2115 are below 1.00m OD and therefore this source of flooding can also be discounted.

4. Flooding from Ground Water

There is a risk that the basement could suffer from flooding if ground water levels were to rise above the floor level of the basement floor.

A site investigation has been carried out and the borehole information shows that to a depth of 2.5 metres the subsoil is made ground, and below this the soil is sandy, clayey silt. The information also shows that groundwater was first encountered at a depth of 7.0 metres and rose to 5.3 metres. Therefore it is unlikely that ground water will be encountered when construction takes place with a proposed level of the car park of 2.50m OD. The construction of the floor and walls to at least a level of 4.60m OD should be carried out with reinforced concrete with a suitable impervious liner to ensure there is no possibility of ground water, flood water or surface water from entering the basement car park area.

5. Surface Water Flooding

The lower ground on the north western end of the site is at a level of 4.35m OD which is 950mm below the proposed floor level of the residential part of the dwelling. It is unlikely there will be any large accumulations of water in this small area and therefore the risk of any flooding from this source is extremely low.

Surface water from the roof of the new building will be attenuated on site to suit Anglian Water requirements, prior to discharge into the combined sewer.

Extent of known Flooding

During the preparation of this assessment, no evidence was discovered of any surface water flooding having occurred in this area of Spalding. This is not surprising as the land levels are some of the highest in the area.

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 – Extreme Events

The residual risk from extreme events is very low on this site. The major risk to the site is from a breach or overtopping of the tidal defences

The risk of this happening in this case is low and the hazard from any flooding is also low.

Therefore although this site is within Flood Zone 3 according to the initial classification because of the current standards of drainage and flood risk in Spalding there is a very low risk of flooding to this site.

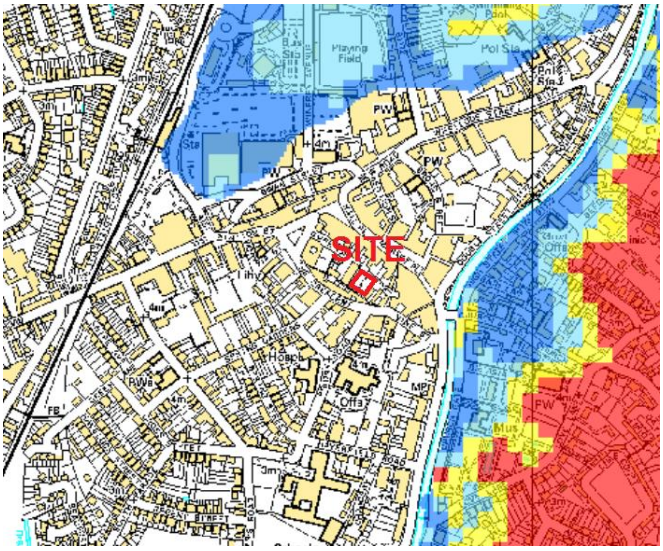
The flood zones were designated a number of years ago by the EA when little modelling had been carried out. Since then much work has been carried out by the EA which gives much better predictions of flood levels. If the designations were revisited this area would be at least designated in flood zone 2.

Climate Change

The recommendations for flood depths for this flood risk assessment use information mostly taken from the South Holland DC SFRA which was last updated in 2010. The EA have issued new guidance on recommended contingency allowances for predicted sea rises, fluvial flows and rainfall intensities which from 19th February 2016 needs to be considered in the FRA. The effects of these new recommendations are considered in Appendix A of this report (pages 13 to 15). It is concluded that no extra mitigation measures are necessary to comply with the new guidance on climate change.

Summary of Risk of Flooding to the Site

The map in the SFRA showing the predicted maximum residual peak flood depths in 2115 for the 0.1% (1 in 1000 year) event probability in 2115 shows the extent of the flooding is located 220 metres north of the site. The relevant part of the map is reproduced below.



This flood water would have flowed southwards from a breach in the bank of the tidal Welland immediately north of Fulney Sluice.

Levels of an area including The Crescent, Station Street, Abbey Path, Gore Lane, Foundry Lane and the northern end of Spring Gardens are all above 4.20m OD. Therefore the 1 in 1000 year flood level in this area will be approximately 4.10m OD.

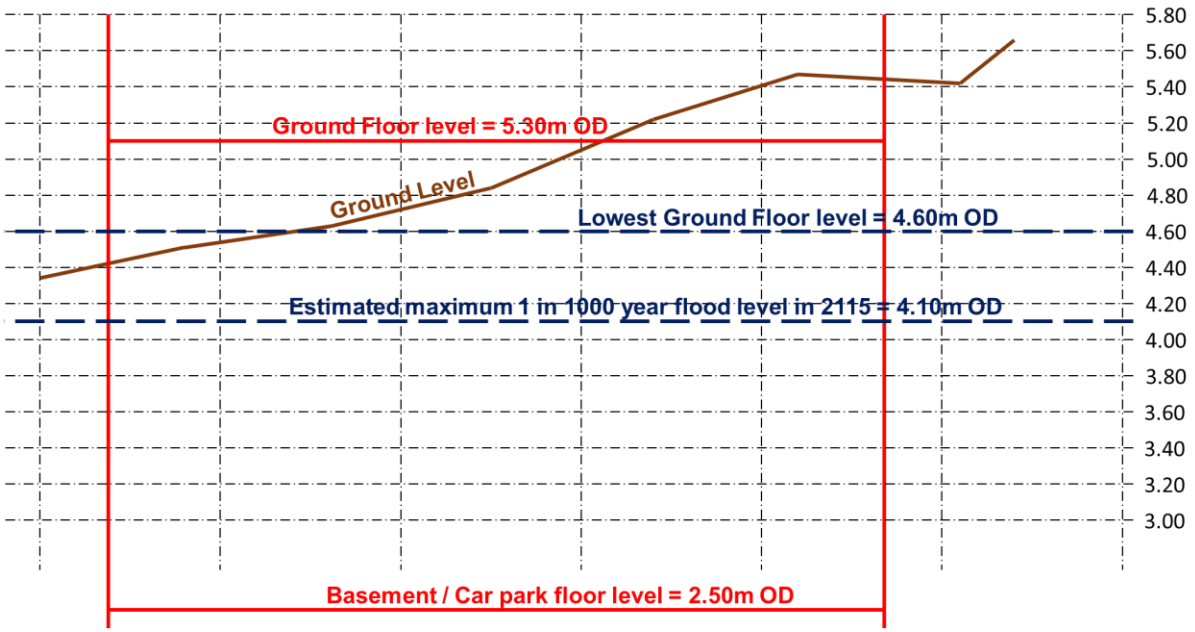
The Environment Agency recommendation for buildings with sleeping accommodation on the ground floor is that the floor level should be at least 300mm above the 1 in 1000 year flood level in 2115.

The Environment Agency have advised that predicted tidal flood levels will increase by 100mm above the levels predicted in the SFRA. An explanation of this is shown in Appendix A of this report.

Therefore with a predicted flood level of 4.10m OD it would be reasonable to add 400mm to this and state that the minimum ground floor level for a building with sleeping accommodation on the ground floor should be 4.50m OD.

However the Environment Agency objected to a recent planning application (H16-0635-16) and insisted that floor levels should be raised 100mm above this at a level of 4.60m OD. Therefore the recommendation is that all residential floor levels should be at or higher than 4.60m OD.

A cross section through the site is shown below, which summarises the proposed levels of the building compared with the existing ground levels and the maximum flood levels predicted in this part of Spalding.



The proposed level of the basement car park is below the maximum flood level for the area. However the basement will be constructed without any openings below 4.60m OD and all the entrance will be by way of a ramp with an entry level higher than 4.60m OD. The two entrance staircases will be inside the impervious outer wall of the basement.

Conclusions

The following conclusions can be made:

- The proposed development is not in a functional flood plain as defined by the Technical Guidance.
- Although the site is in flood zone 3, the actual risk of the site flooding from any Environment Agency watercourse is extremely low.
- The SFRA indicates that no actual or residual flooding is predicted to the area for the 0.1% event possibility in 2015, as shown on the map reproduced above taken from the SHDC SFRA.
- The risk of the site becoming flooded from any source is extremely low.
- The flood risk to the proposed building is extremely low and acceptable for residential use on the upper floor and car parking in the basement.

Recommendations

- In any area at risk of flooding it is preferable that a proposed building should be of at least 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, and ensure there is no danger to residents when they are asleep. However as the ground floor level of the proposed building will be a minimum

of 500mm above the 1 in 1000 year predicted flood level in 2115 then accommodation with bedrooms on the ground floor is considered satisfactory.

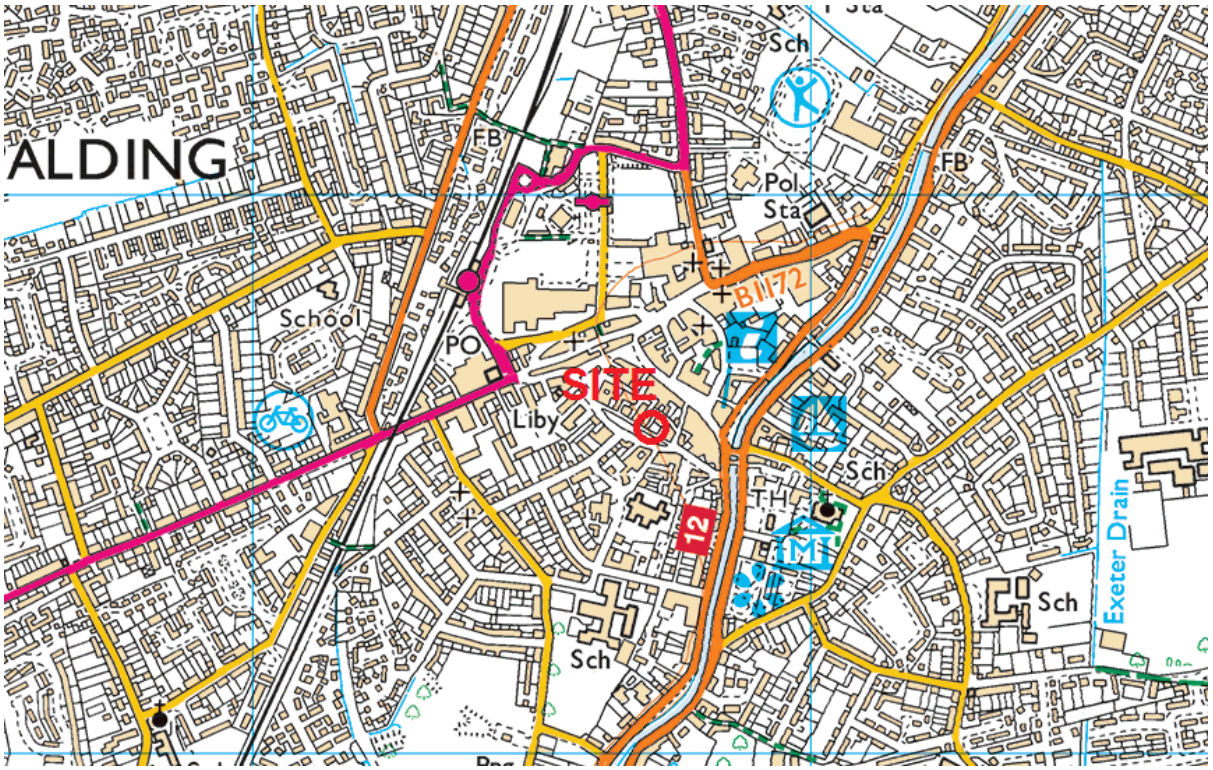
- The ground floor level of the new building, at the present time proposed to be 5.30m OD, should be no lower than 4.60m OD.
- Flood resistant construction should be incorporated throughout the development to a minimum level of 4.60m OD.
- The owner of the building should advise all tenants that they should register with the Environment Agency's Floodline Warnings Direct Service.
- On site surface water drainage should be discharged into a suitable surface water system and disposed of off site.
- 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.

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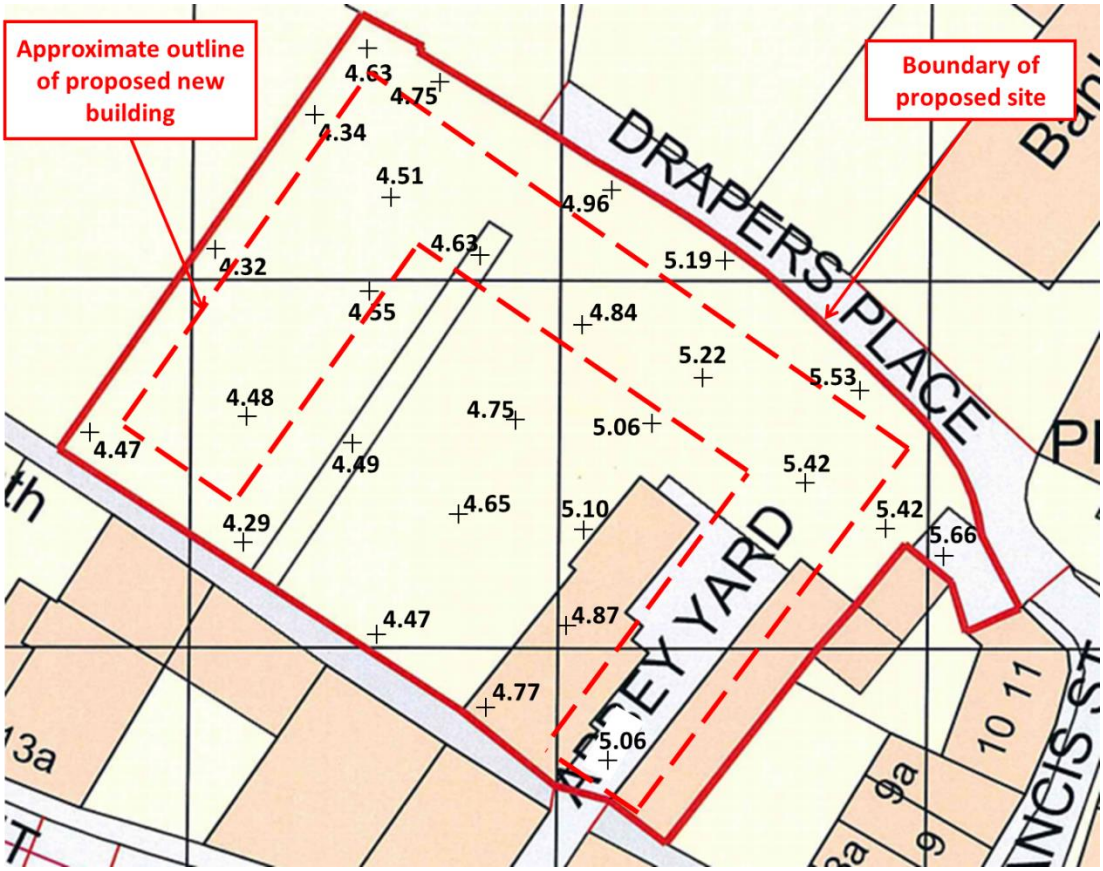
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27th October 2016

LOCATION PLAN



SITE LEVELS



APPENDIX A CLIMATE CHANGE

The Environment Agency has issued revised guidance on climate change and have now stated that the new predictions should be considered and incorporated into all flood risk assessments produced after 19th February 2016.

Listed below are the climate change allowances in three documents:

- South Holland SFRA
- EA guidance (2013)
- Revised EA guidance

The recommendations in each document are shown below.

2010 South Holland DC SFRA

The SHDC SFRA states that the the following allowances have been made for climate change:

4.4 Climate Change

Scenarios for the years 2055 and 2115 include for climate change contingency allowances to the amount suggested by PPS25[1]. These allowances are expressed in *Table 2*. Percentage increases are relative to the present-day.

Table 2 – Adopted Climate change contingency allowances

Parameter	Year 2055	Year 2115
Sea level rise (m)	+ 0.33	+ 1.14
Extreme wave height	+ 10%	+ 10%
Peak river flow and volume	+ 20%	+ 20%
Peak rainfall intensity	+ 20%	+30%

Where flows arise from pumping rather than natural run-off, notably in the Vernatt's Drain and for the Fenland subcatchments of the South Forty Foot Drain, peak flow rates for future eras have been taken as equal to current rates since this SFRA assumes all flood risk management measures will remain in their current state.

2013 Guidance to Planners

Guidance to planners was issued by EA in September 2013

Table 1: Recommended contingency allowances for net sea level rises (Net sea level rise (mm per year) relative to 1990)

	1990 to 2025	2025 to 2055	2055 to 2085	2085 to 2115
East of England, east midlands, London, south-east England (south of Flamborough Head)	4.0	8.5	12.0	15.0
South-west England	3.5	8.0	11.5	14.5
North-west England, north-east England (north of Flamborough Head)	2.5	7.0	10.0	13.0

document is out of date'a

Table 2: Recommended national precautionary sensitivity ranges for peak rainfall intensity, peak river flow, offshore wind speed and wave height

Parameter	1990 to 2025	2025 to 2055	2055 to 2085	2085 to 2115
Peak rainfall intensity	+5%	+10%	+20%	+30%
Peak river flow	+10%	+20%		
Offshore wind speed	+5%		+10%	
Extreme wave height	+5%		+10%	

s been withdrawn (19

Revised 2016 EA Guidance

Table 1 peak river flow allowances by river basin district (use 1961 to 1990 baseline)

River basin district	Allowance category	Total potential change anticipated for '2020s' (2015 to 39)	Total potential change anticipated for '2050s' (2040 to 2069)	Total potential change anticipated for '2080s' (2070 to 2115)
Anglian	Upper end	25%	35%	65%
	Higher central	15%	20%	35%
	Central	10%	15%	25%

For more vulnerable development in flood zone 3(a) the higher central and upper end should be used to assess the range of allowances.

Table 2 peak rainfall intensity allowance in small and urban catchments (use 1961 to 1990 baseline)

Applies across all of England	Total potential change anticipated for 2010 to 2039	Total potential change anticipated for 2040 to 2059	Total potential change anticipated for 2060 to 2115
Upper end	10%	20%	40%
Central	5%	10%	20%

Table 3 sea level allowance for each epoch in millimetres (mm) per year with cumulative sea level rise for each epoch in brackets (use 1990 baseline)

Area of England	1990 to 2025	2026 to 2050	2051 to 2080	2081 to 2115	Cumulative rise 1990 to 2115 / metres (m)
East, east midlands, London, south east	4 (140 mm)	8.5 (212.5 mm)	12 (360 mm)	15 (525 mm)	1.24 m

Table 4 offshore wind speed and extreme wave height allowance (use 1990 baseline)

Applies around all the English coast	1990 to 2050	2051 to 2115
Offshore wind speed allowance	+5%	+10%
Offshore wind speed sensitivity test	+10%	+10%
Extreme wave height allowance	+5%	+10%
Extreme wave height sensitivity test	+10%	+10%

Effects on Predictions of Flood Risk in FRA

The FRA has identified the only source of flooding where the new climate change recommendations could affect the predictions of flood levels in 2115 at the development site is flooding from the tidal River Welland

The contingency allowance in metres for the years 2055 and 2115 using 1990 as a baseline in the SFRA compared with the guidelines is as follows

Year	SFRA	2013 guidance	Revised 2016 guidance
2055	0.33	0.395	0.412
2115	1.14	1.205	1.24

The SFRA does not predict any residual flooding on any part of the site in a 1 in 1000 year event in 2115. The lowest land level on the site is approximately 4.35m OD.

The increase of 100mm in maximum levels in the tidal River Welland will not have the effect of causing flooding to the building, and has been incorporated into the recommendation on the minimum floor level for the development.