FLOOD FISK ASSESSMENT



John Dickie Associates
Chartered Building Engineers
5, Victor Way,
Cherry Holt Road, Bourne, Lincs PE10 9PT
Tel 07778 297733 jda@ndirect.co.uk

ERECTION OF NINETEEN HOLIDAY LODGES, RECEPTION BUILDING, FACILITY MANAGER'S ACCOMMODATION AND MAINTENANCE SHED. FORMATION OF TWO FISHING LAKES AND ASSOCIATED HARD AND SOFT LANDSCAPING. BLEU RAY FARM, MILL GATE, WHAPLODE PE12 6RY

CLIENT ; VMM PROPERTIES LIMITED

DATE ; APRIL 2022

PROJECT REF ; JDA/2022/885

This document is part and parcel of a Full Planning Application submitted to South Holland District Council

This Flood Risk Assessment is part and parcel of a Full Planning Application submitted to South Holland District Council for the erection of nineteen holiday lodges, reception building, facility manager's accommodation and maintenance shed. formation of two fishing lakes and associated hard and soft landscaping. Bleu Ray Farm, Mill Gate, Whaplode PE12 6RR

This flood risk assessment has been prepared solely to support the planning application for residential development at Bleu Ray Farm. 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, or if it is used for any other purposes other than for which it was originally commissioned.

CONTENTS

1. INTRODUCTION

2. LOCATION

3. THE SITE AND SEQUENTIAL TEST

4. FLOOD HISTORY

5. ASSESSMENT OF THE RISK

6. STRATEGIC FLOOD RISK ASSESSMENT

7. SITE LEVELS

8. EXISTING FLOOD ALLEVIATION MEASURES

9. POTENTIAL SOURCES OF FLOODING

10. BLANK

11. BLANK

12. BLANK

13. MITIGATION MEASURES

14. CONCLUSIONS

15. RECOMMENDATIONS

APPENDIX A. EA STANDING ADVICE

APPENDIX B. FURTHER MITIGATION MEASURES

APPENDIX C. THE NPPF

APPENDIX D. SCHEME DESIGNS

RISK – Very Low to Low

The Site is located in Flood Zone1 and 2, this equates to a High risk of flooding from rivers and the sea. Analysis of the EA's model data indicates there is a Very Low to Low fluvial and tidal flood risk. Surface water (pluvial) flood risks are Very Low to Low. Groundwater flood risks are Negligible and flooding risks from artificial sources (i.e. canals, reservoirs and sewers) are Low. Mitigation measures are recommended in this report to reduce the risks to an acceptable level over the lifetime of the development.
In their Product data for site at Bleu Ray Farm (NGR: TF3241820989). CCN/ 2023/ 308215, the Environment Agency state that have no historical records of flooding in the area of the site.
The Environment Agency data also state that the site is not considered to be at risk of flooding from main rivers or tidal events
The site benefits from the presence of both river and tidal flood defences.
The application site area is defined on the submitted OS based Location Plan. The site area is 22,780 sq m – 5.63 acres.

-

1. INTRODUCTION

1.1 A Full planning application is to be submitted by John Dickie Associates on behalf of VMM Properties to seek permission to develop nineteen holiday lodges, reception building, facility manager's accommodation and maintenance shed. formation of two fishing lakes and associated hard and soft landscaping. Bleu Ray Farm, Mill Gate, Whaplode PE12 6RR

1.2 Planning approval requires a Flood Risk Assessment to be submitted to the LPA as the site, is shown as situated in Flood Zones 1 and 2 of the Agency's Flood Zone Maps. The Assessment is to be prepared to meet the requirements and general principles contained in Paragraph 9 of the Technical Guidance to the National Planning Policy Framework (NPPF).

The latest Agency Maps have been created as a tool to raise awareness of flood risk with the public and partner organisations such as Local Authorities, Emergency Services and Drainage Authorities. The Maps do not take into account any flood defences.

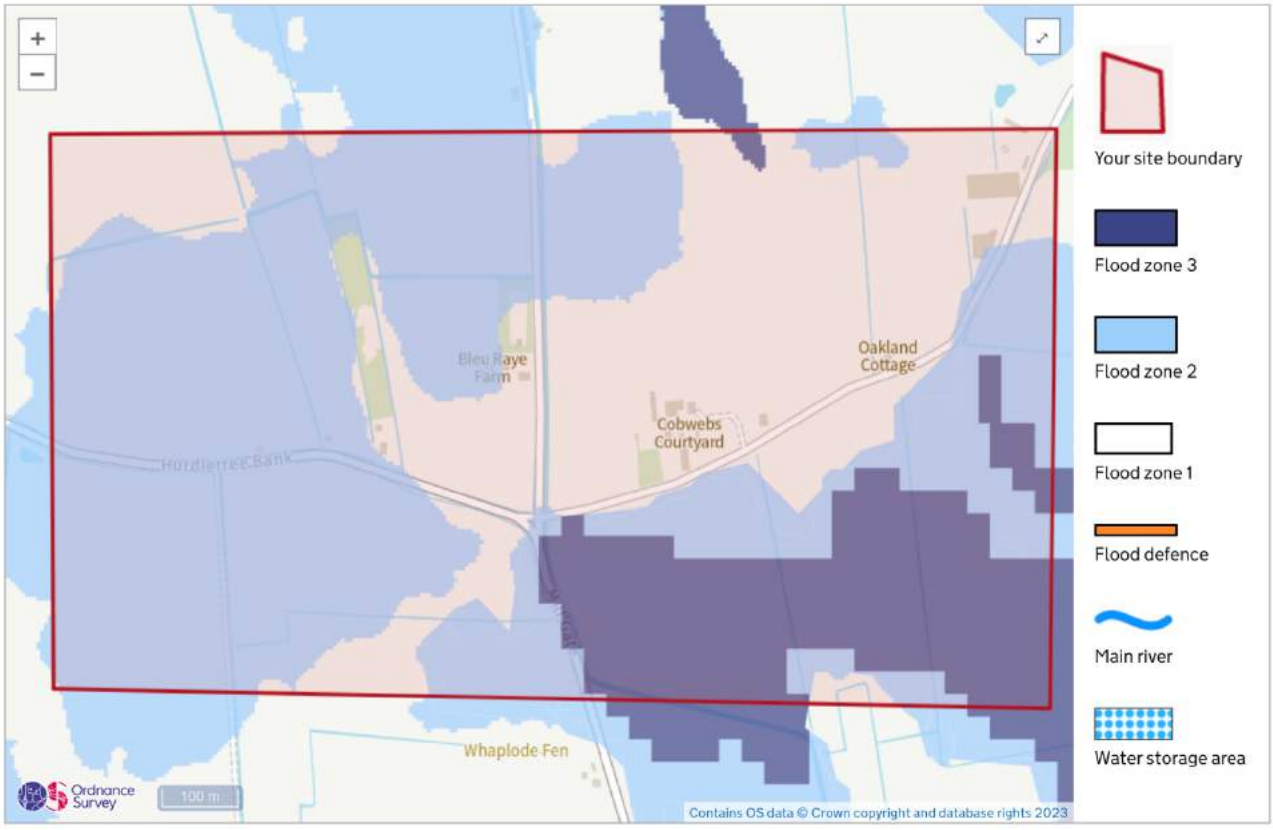
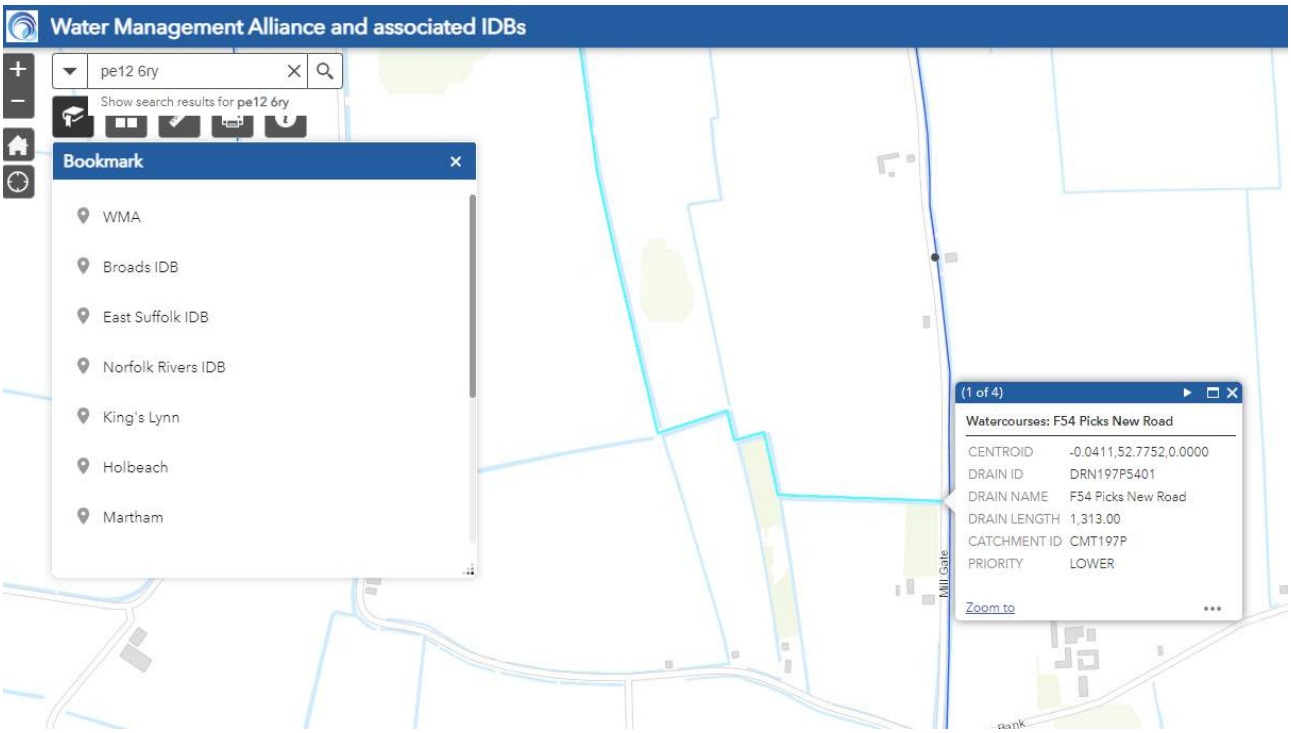


Fig 1. Extract from Environment Agency Mapping

It can be seen from the above EA Flood Mapping that this area is in defended Flood Zone 2. Whilst the Zone 2 designation suggests a probability of flooding, the area benefits from flood defences.

The site is in the South Holland Internal Drainage Board (IDB) area. As can be seen from the extract below from the WLMA IDB mapping resource, none of the Board's assets are affected by the development.



The British Geological Survey maps indicate the following :

Tidal flat deposits, including mud flat and sand flat deposits, form extensive nearly horizontal marshy land in the intertidal zone that is alternately covered and uncovered by the rise and fall of the tide. They consist of unconsolidated sediment, mainly mud and/or sand. They may form the top surface of a deltaic deposit.

Calcareous mudstone, silty mudstone and siltstone, with subordinate fine-grained sandstones and argillaceous limestone (cementstone) or siltstone nodules; typically rhythmic alternations of dark grey, silty mudstone (rich in fine-grained shell and plant material) with pale grey mudstone; ooidal, and in some cases coralline marls and limestones developed locally (including Elsworth Rock Member; Upware Limestone Member), (Gallois and Cox, 1977; Cox and Gallois, 1979).

Nearest Borehole Record shown below ;

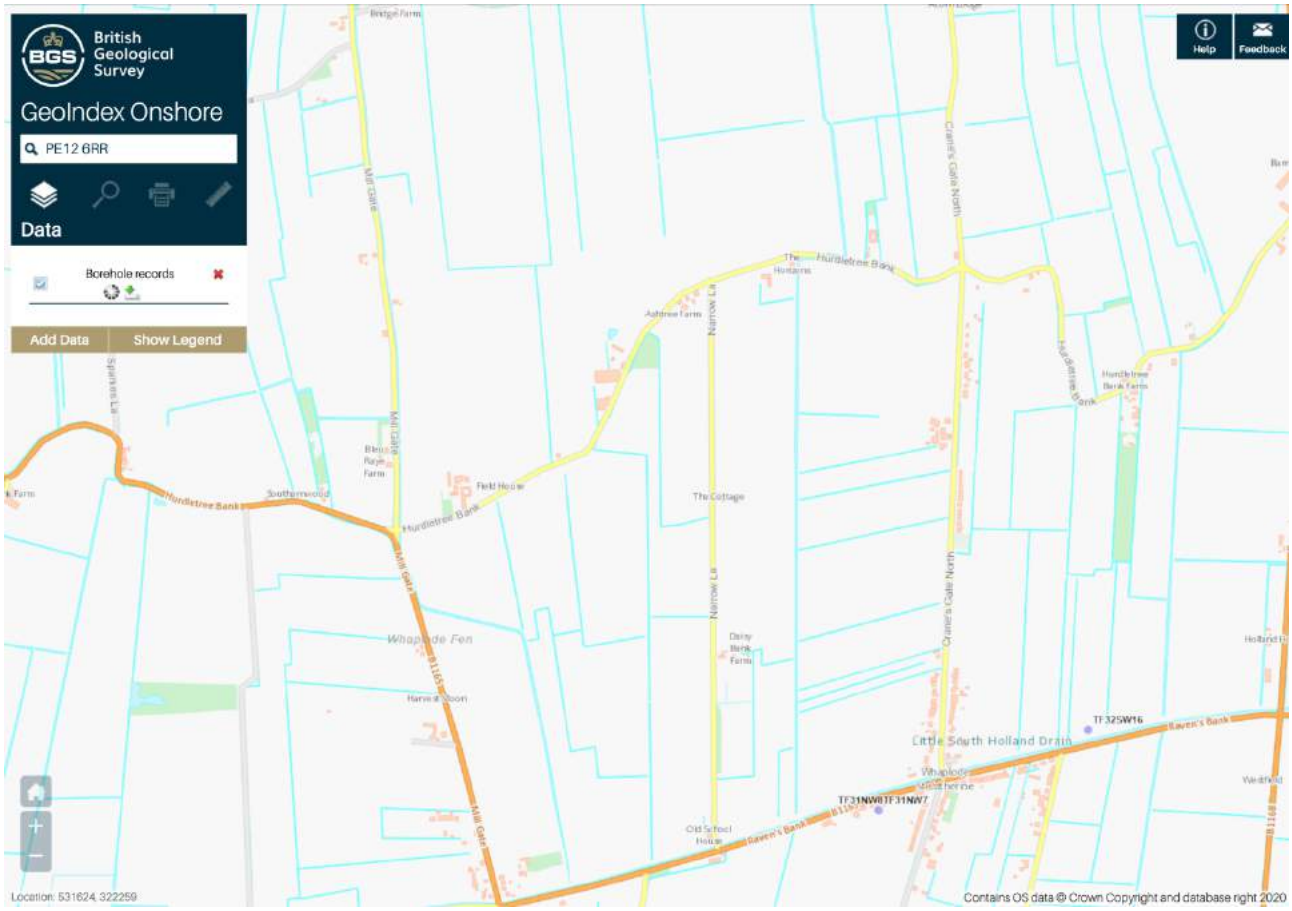
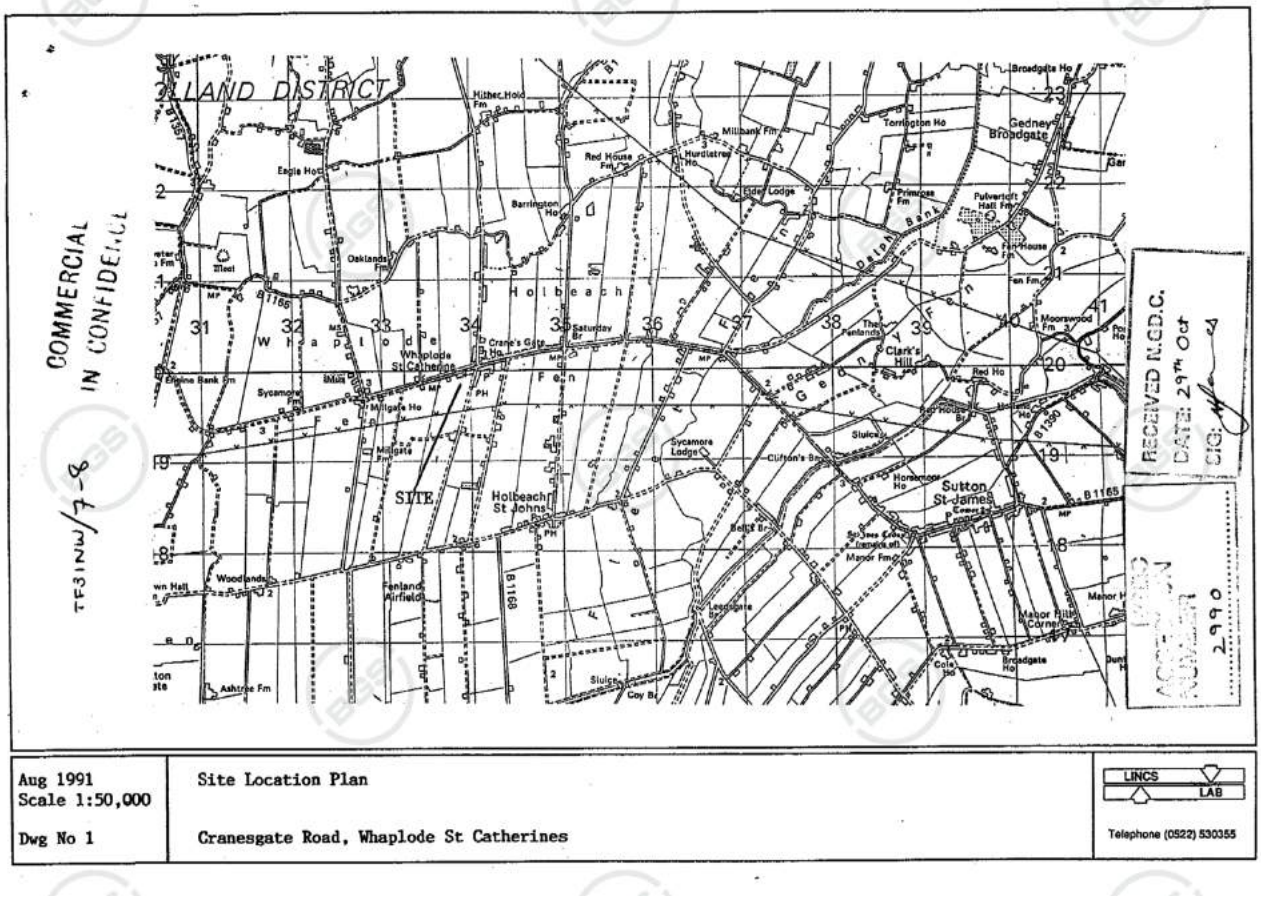


Fig 2. BGS Mapping

Borehole Reference: TF31NW8
Name: CRANESGATE ROAD TP 2
Water Well Reference: N/A
Precision: ± 10 METRES
Length (m): 2
Date: 1991
Easting: 533900
Northing: 319970

Scan Quality: not Entered
Record: Scan



TF3 1NW 8 3390 - 1997

Job Number: 1464	Site: Cranesgate Road, Whaplode St Catherines.	Trial Pit No.: 2	Sheet 1 of 1
Remarks: No ground water encountered. COMMERCIAL IN CONFIDENCE	Location: See plan	Orientation: NNE - SSW	Dimensions: Length: 2.00m. Width : 0.60m. Depth : 2.00m.
	Client: Ashwood Homes.	Face Logged: ESE	
	Excavation Method: JCB	Logged by: INH	Log Scale: 2.5 m/page Ground Level m AOD

Date 1991	Depth of Casing (m)	Depth of Water (m)	Sample/Test No.	Type	Depth (m)	Change of Strata Legend	Depth below GL (m)	Reduced Level OD (m)	Thickness of Stratum (m)	Description of Strata	P.T. Pene't mm	N	NMC %	Atterberg Limits LL %	PL %	PI %	Density Bulk kg/m³	Dry kg/m³	Shear Strength Cu kN/m²	Øu°	Type of Shear Test	Chemical SO_3 Class	pH	Other Tests
31/07									0.30	Brown silty,sandy TOPSOIL.														
							0.30		1.70	Medium dense,light brown to dark brown,slightly clayey,silty fine SAND with traces of red orange staining.(Al)														
			1	B	0.50-2.00																			G
										Land drain at 0.90m.														
31/07							2.00			END OF TRIALPIT.														

Scale As Shown

Disturbed Samples: W Water Sample; D Small Bag; B Large Bag; T Tin; J Jar

Undisturbed Samples: U100 100mm diameter; U38 38mm diameter

Symbols: PT Penetration Tests; M Macintosh Probe Count; N Blow Count; P Probe CBR

Type of Shear Test: V Shear vane; Cu Undrained Cohesive Strength; SB Shear Box; Øu Internal Friction Angle; TX Triaxial (undrained)

Notes: Geology: (Al):Alluvium; C:Grading

LINCS LAB Tel: (0522) 530355

2.0 Location

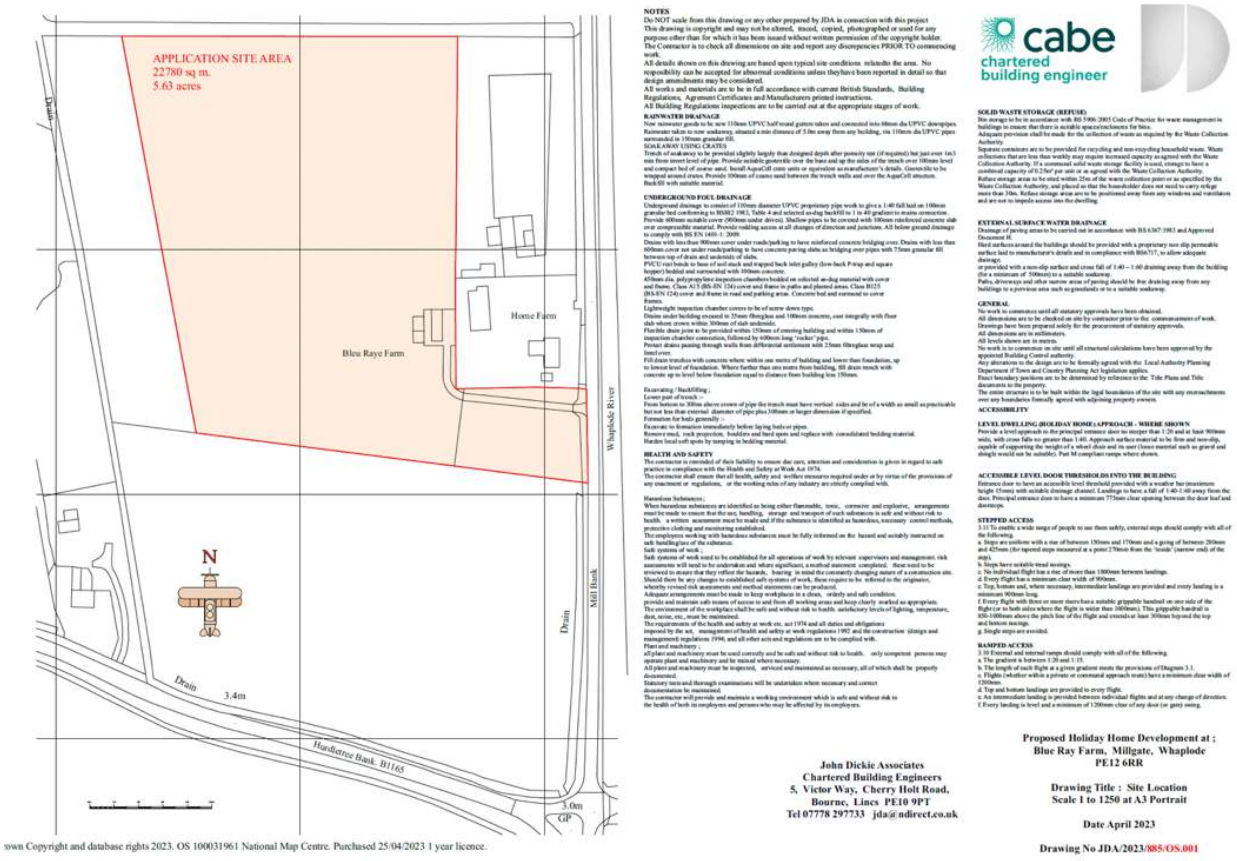
2.1 The circa 5.63 acre site sits to the West of Home Farm – a domestic residence off Mill Gate. It is bounded to the North by an IBD controlled watercourse that discharges under the adopted Highway into the Whaplode River – flat arable fields sit to the North of the watercourse. A small but mature area of woodland forms the entire Western boundary to the site. The Southern boundary is delineated by a row of very tall 'Leylandii' trees that have, over time, formed a dense 'hedgerow' obscuring the application site area from view - flat arable fields sit to the South of the aforementioned tree line where they abut Hurdletree Bank – the B1165.

The site is located some 2km from Whaplode St Catherines and 3km from the village of Whaplode. The market Town of Spalding is located some 6km to the North West of the site with Holbeach a similar distance to the North East.

Its position means that it will not be subject to rapid inundation from higher land and is not subject to flood flows from elsewhere.

2.2 The position and extent of the site are shown on Fig 1 – Site Location and Site Layout Plans at the end of the document.

2.3 The site is shown within Flood Zones 1 and 2 as detailed on the Environment Agency Flood Zone Map.



own Copyright and database rights 2023. OS 100031961 National Map Centre. Purchased 25/04/2023 1 year licence.

3.00. The site and sequential/exception tests

The National Planning Policy Framework (NPPF Section 14) requires a Sequential approach to new development, seeking to steer development to areas with the lowest risk of flooding as a starting point.

Where it is not possible for development to be located in flood zones with a lower risk of flooding the 'Exception Test' may have to be considered.

The proposal is for quasi 'residential' development and therefore is classed as being 'more vulnerable'. Paragraph 160 of the NPPF states that for the Exception Test to be passed, the following must be demonstrated :

a) That the development would provide wider sustainability benefits to the community that outweigh the flood risk; and

b) That the development will be safe for its lifetime taking account of the vulnerability of its users, without increasing flood risk elsewhere, and, where possible, will reduce flood risk overall.

The expanse of Flood Zones 2 and 3 in this area is vast and there is very little land in lower flood zones in this locality. Any land in lower flood zones are essentially dry islands and do not provide connectivity to any greater expanse of land outside Flood Zones 2 and 3.

Therefore, this FRA concentrates on the residual risk to the development taking the flood defences into account and also the mitigation measures that can be applied to ensure the development is safe for use.

Exception Test
The development, in order to pass the Exception Test will need to show that the development is safe in terms of flood risk for the lifetime of the development.

As part of the assessment we have considered at safe access / egress for the cabins to areas outside the breach and overtopping scenarios provided by the Environment Agency and we recommend minimum finished floor levels for the log cabins as part of the mitigation measures to be applied to this site.

-

4.00 Flood History
From available information there does not appear to be any record of flooding to this site in recent years. The storm events in 2007 had no significant effect.

-

5.0 Assessment of the Risk

Applying the flood risk vulnerability classification in Table 2 of the Guidance, a residential development is classified as “more vulnerable”.

Table 3 of the Environment Agency’s Technical Guidance is set out 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 †	X	Exception Test required	✓	✓
Zone 3b *	Exception Test required *	X	X	X	✓*

There are large, landscaped areas within the application site area, such that the roadway and roof run-off from the log cabins will be able to drain into the open spaces and ponds to percolate towards the drainage ditches and ponds, mimicking the existing green field scenario.

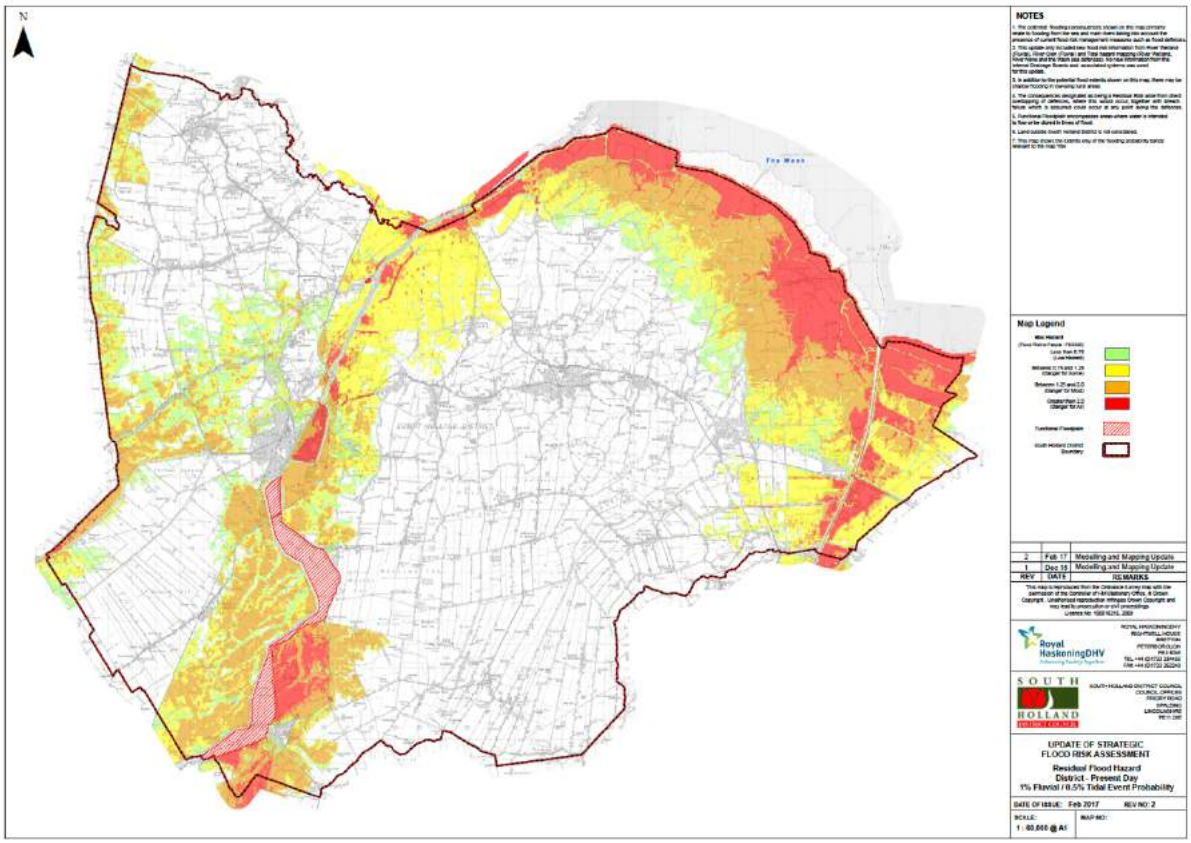
Significant lake areas are proposed as part of the development to provide visual amenity for the development as well as areas for the informal runoff from the built development to drain towards.

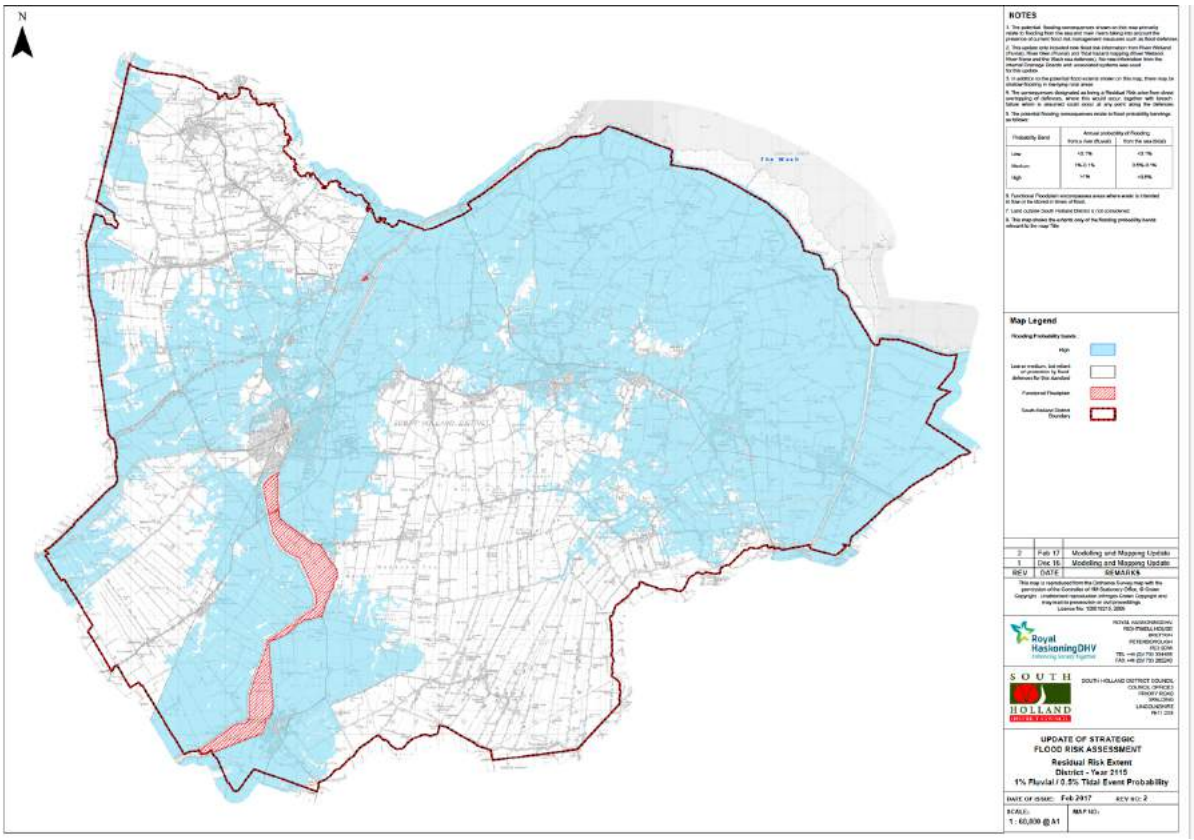
SuDS features are proposed to manage the surface water runoff generated by the development in a sustainable way. This will ensure the development does not increase surface water flood risk off-site.

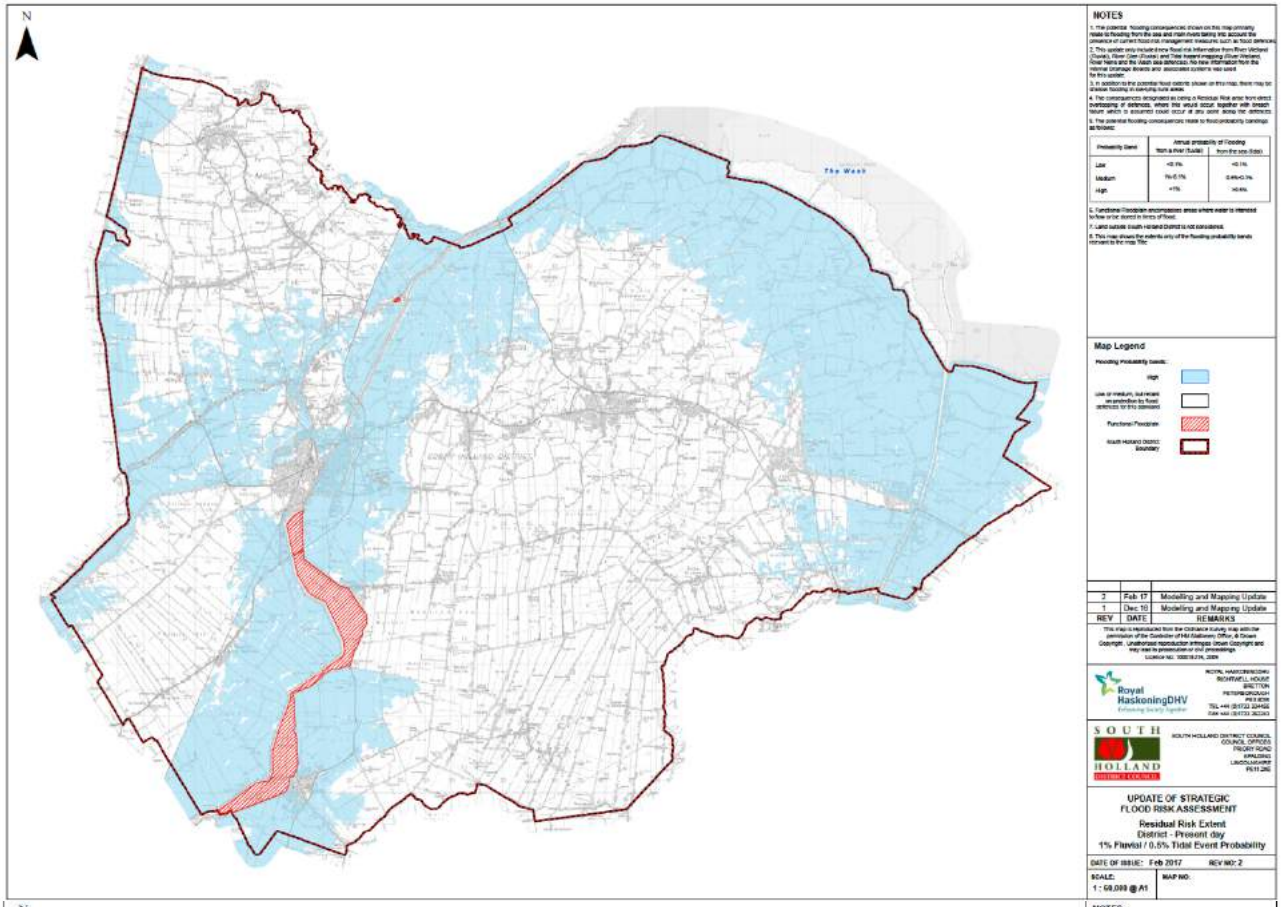
-

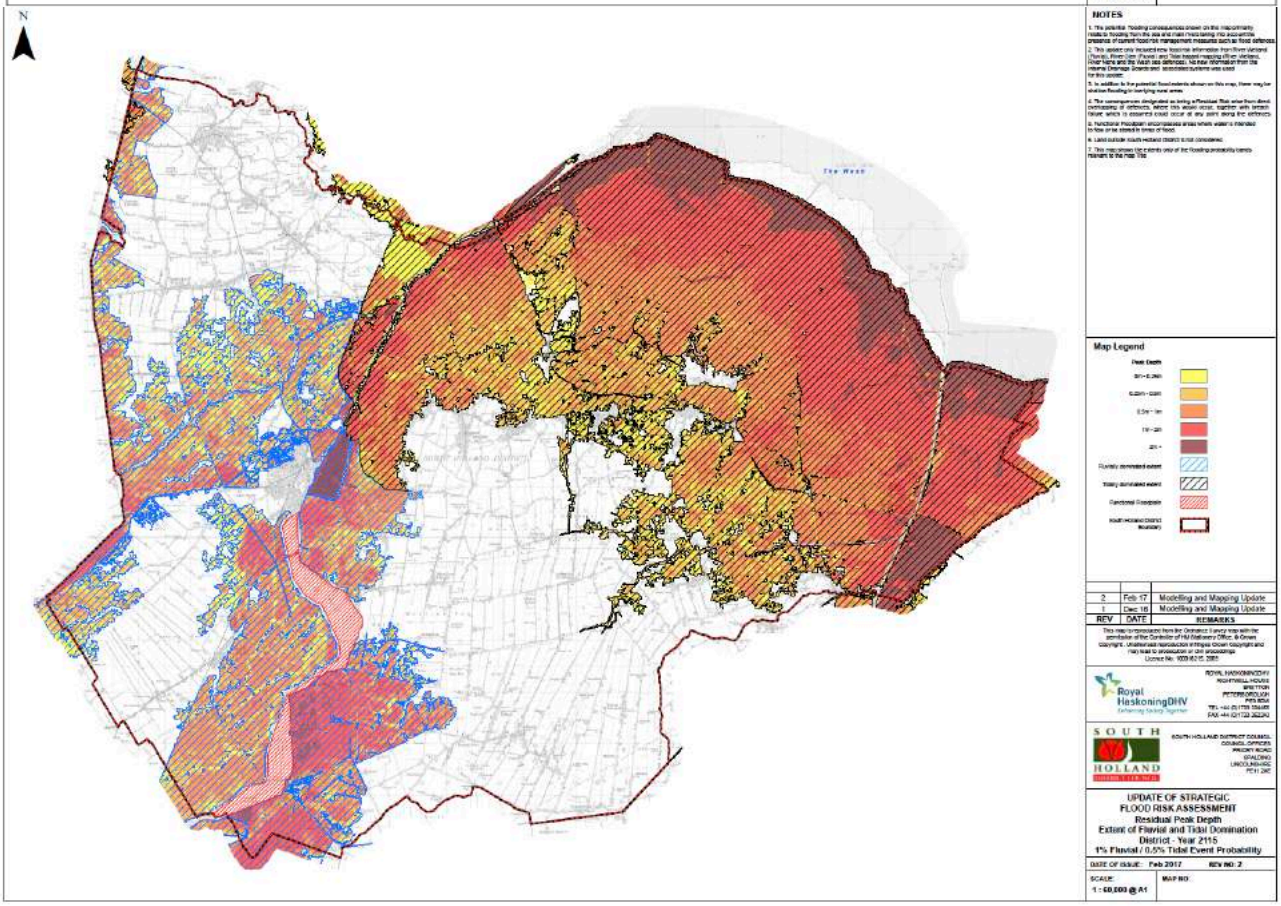
6.00. Strategic Flood Risk Assessment

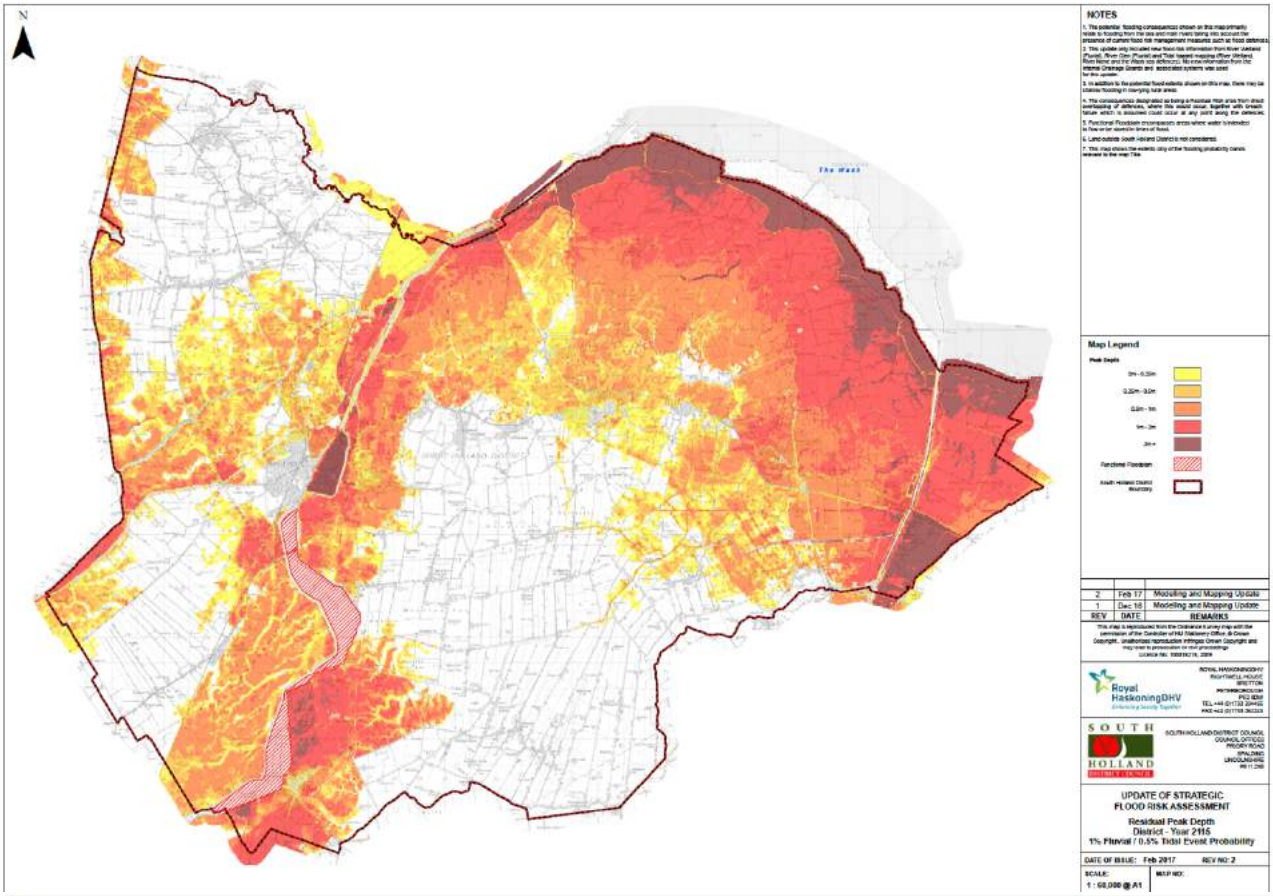
See below:

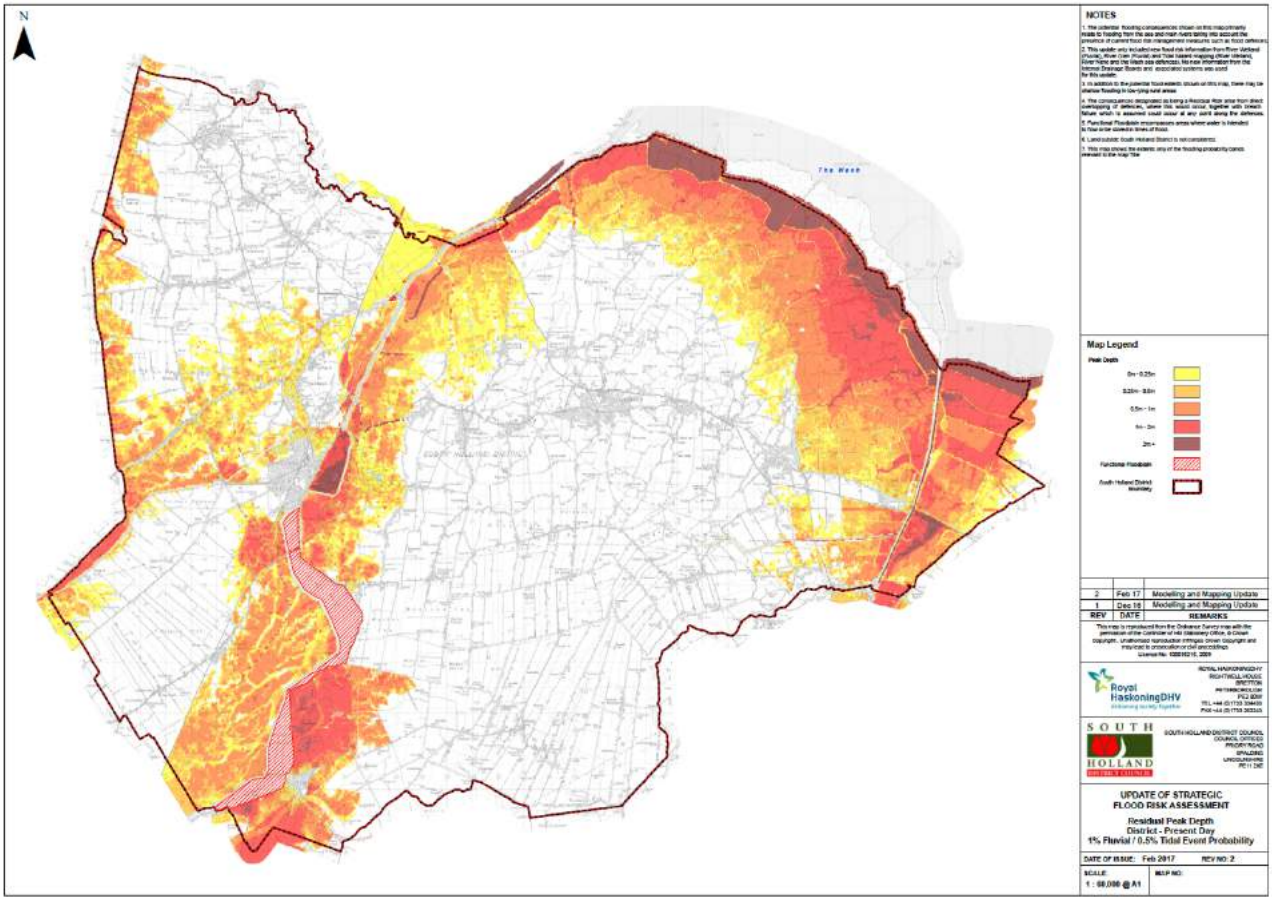


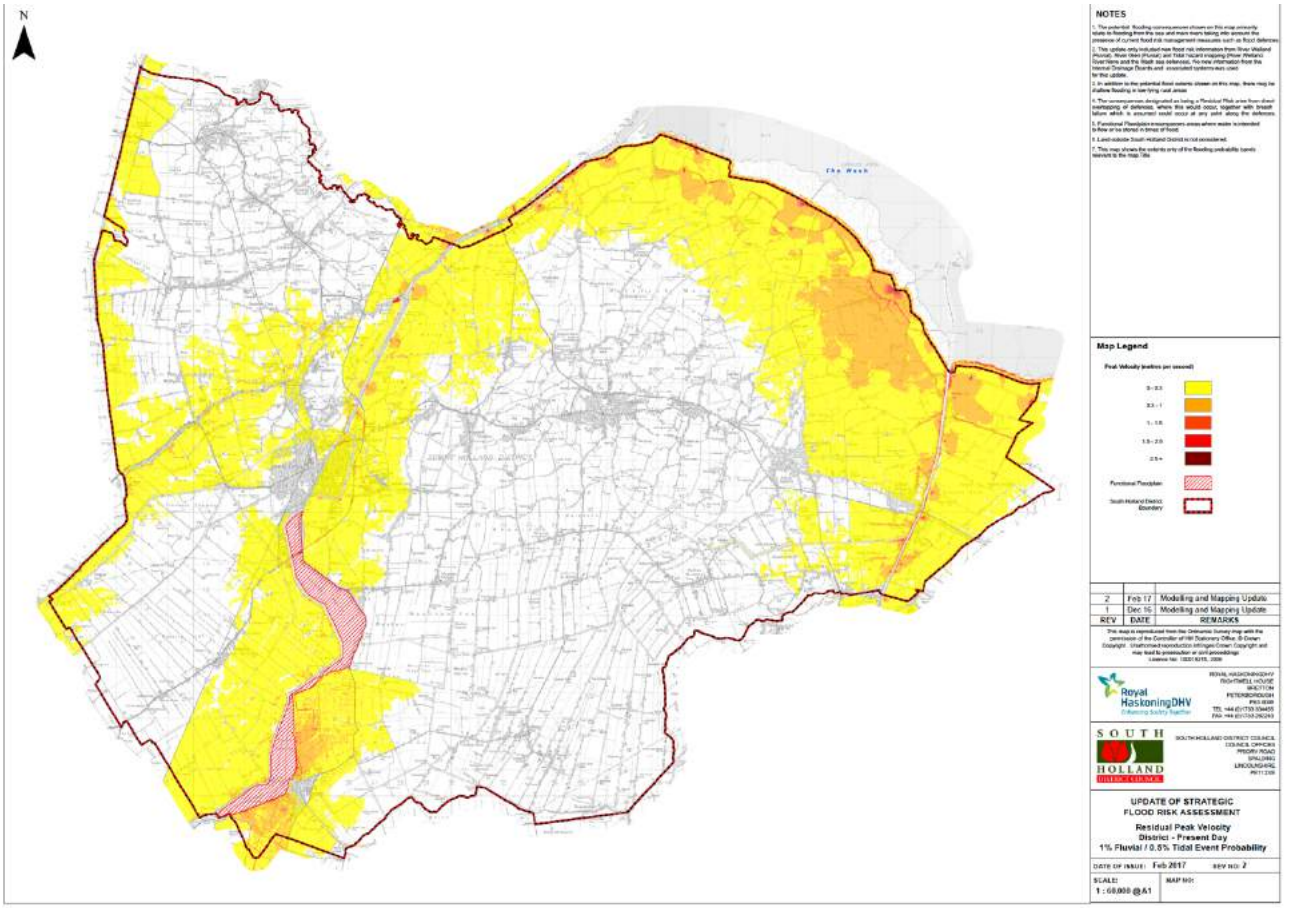


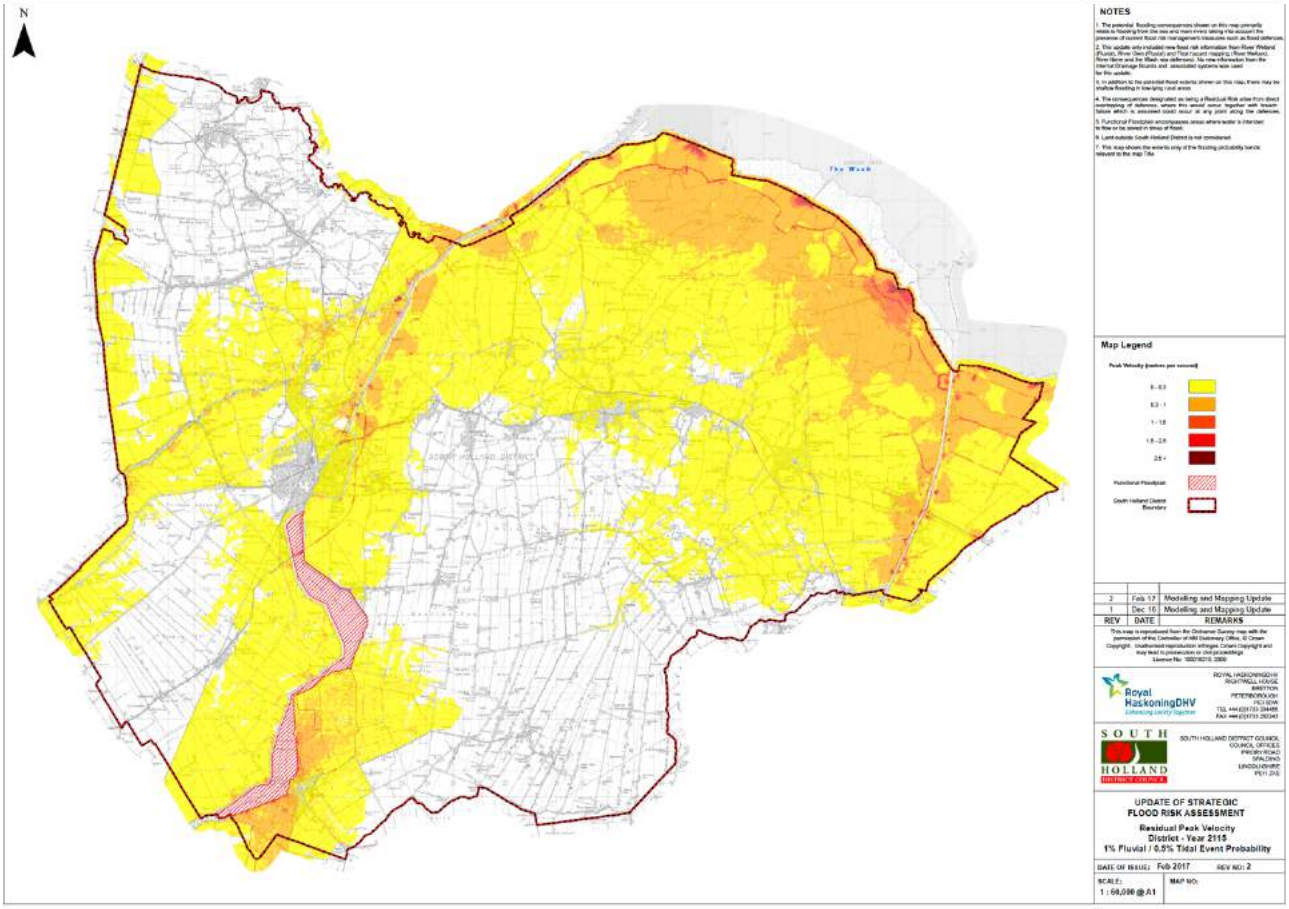

N
The Wash
NOTES
Map Legend
UPDATE OF STRATEGIC
FLOOD RISK ASSESSMENT
Residual Risk Extent
District - Present day
1% Fluvial / 0.5% Tidal Event Probability
DATE OF ISSUE: Feb 2017
REV NO: 2
SCALE:
1 : 60,000 @ A1
MAP NO:
2 Feb 17 Modelling and Mapping Update
1 Dec 16 Modelling and Mapping Update
REV DATE REMARKS
Royal HaskoningDHV
SOUTH HOLLAND

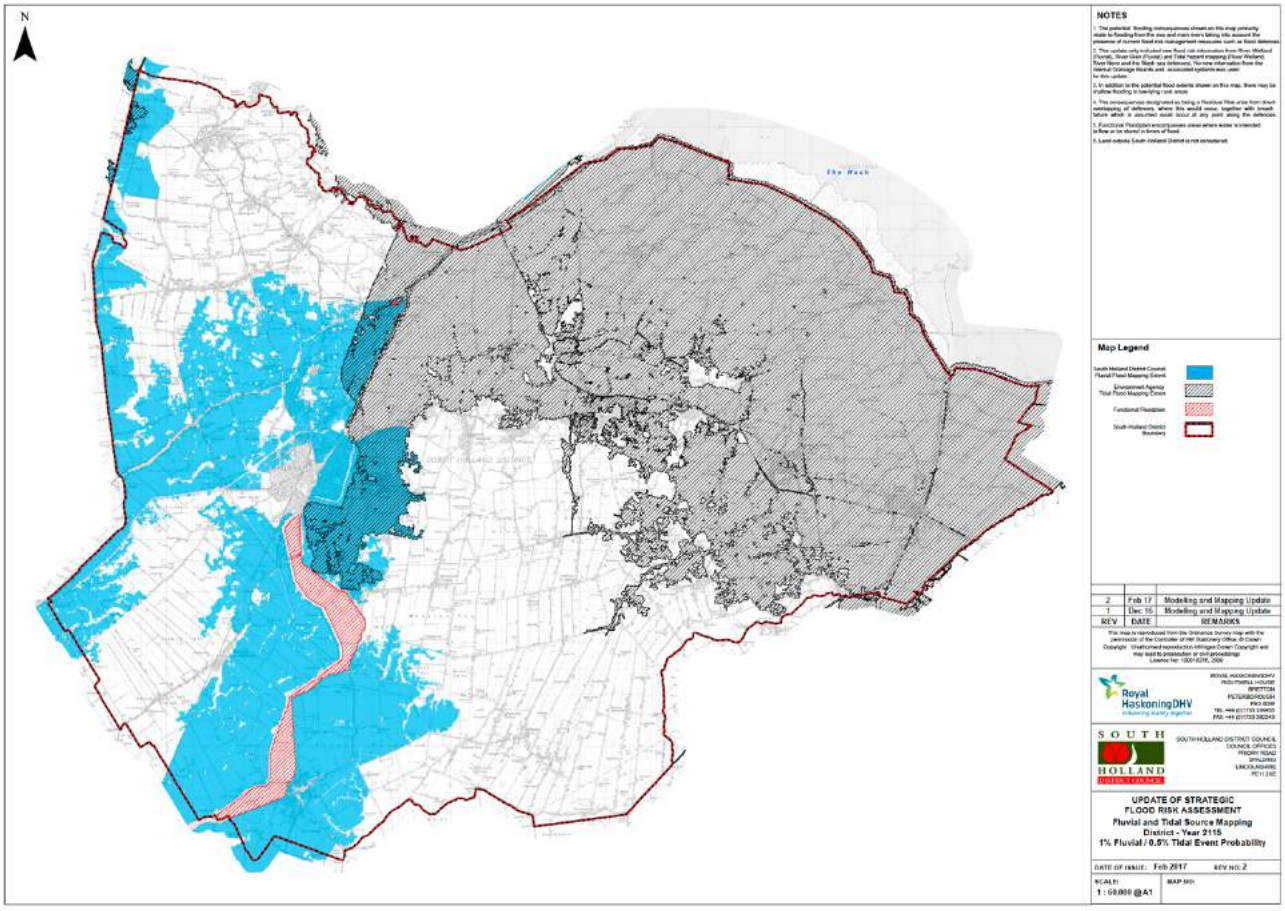

N
The Wash
NOTES
Map Legend
Peak Depth
UPDATE OF STRATEGIC
FLOOD RISK ASSESSMENT
Residual Peak Depth
Extent of Fluvial and Tidal Domination
District - Year 2115
1% Fluvial / 0.5% Tidal Event Probability
DATE OF ISSUE: Feb 2017
REV NO: 2
SCALE:
1 : 60,000 @ A1
MAP NO:
2 Feb 17 Modelling and Mapping Update
1 Dec 16 Modelling and Mapping Update
REV DATE REMARKS
Royal HaskoningDHV
SOUTH HOLLAND

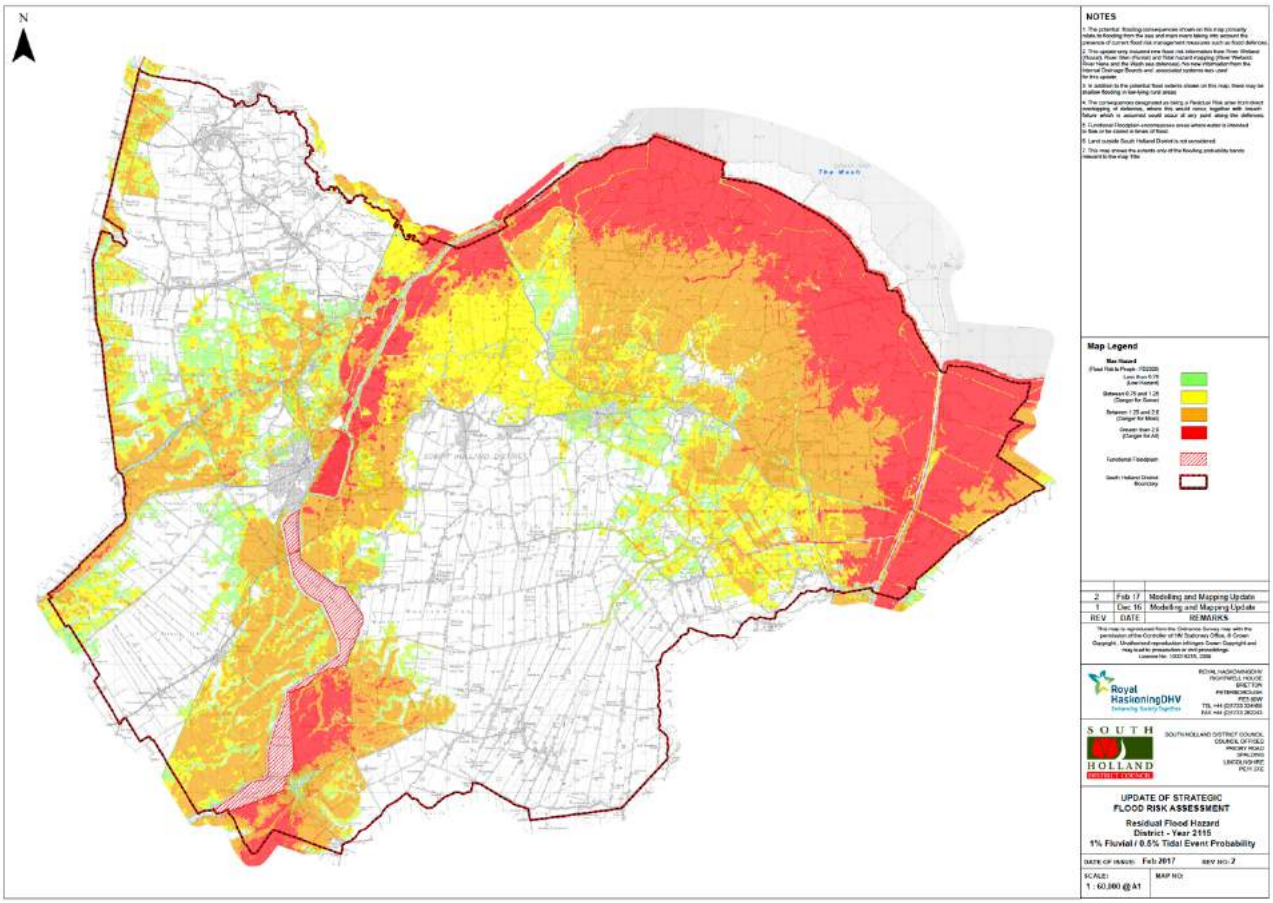

N
The Wash
NOTES
Map Legend
Peak Depth
0m - 0.25m
0.25m - 0.5m
0.5m - 1m
1m - 2m
2m +
Functional Floodplain
South Holland District Boundary
2 Feb 17 Modelling and Mapping Update
1 Dec 16 Modelling and Mapping Update
REV DATE REMARKS
Royal HaskoningDHV
SOUTH HOLLAND
UPDATE OF STRATEGIC
FLOOD RISK ASSESSMENT
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:


N
The Wash
NOTES
Map Legend
Peak Depth
0m - 0.25m
0.25m - 0.5m
0.5m - 1m
1m - 2m
2m +
Functional Floodplain
South Holland District Boundary
2 Feb 17 Modelling and Mapping Update
1 Dec 16 Modelling and Mapping Update
REV DATE REMARKS
Royal HaskoningDHV
SOUTH HOLLAND
UPDATE OF STRATEGIC
FLOOD RISK ASSESSMENT
Residual Peak Depth
District - Present Day
1% Fluvial / 0.5% Tidal Event Probability
DATE OF ISSUE: Feb 2017
REV NO: 2
SCALE:
1 : 60,000 @ A1
MAP NO:


N
The Wash
NOTES
Map Legend
Peak Velocity (metres per second)
0 - 0.5
0.5 - 1
1 - 1.5
1.5 - 2.5
2.5 +
Functional Floodplain
South Holland District Boundary
2 Feb 17 Modelling and Mapping Update
1 Dec 16 Modelling and Mapping Update
REV DATE REMARKS
Royal HaskoningDHV
Enhancing Society Together
SOUTH HOLLAND DISTRICT COUNCIL
UPDATE OF STRATEGIC FLOOD RISK ASSESSMENT
Residual Peak Velocity
District - Present Day
1% Fluvial / 0.5% Tidal Event Probability
DATE OF ISSUE: Feb 2017
REV NO: 2
SCALE: 1 : 60,000 @A1
MAP NO:


N
The Wash
NOTES
Map Legend
Peak Velocity (metres per second)
0 - 0.5
0.5 - 1
1 - 1.5
1.5 - 2.5
2.5 +
Functional Floodplain
South Holland District Boundary
2 Feb 17 Modelling and Mapping Update
1 Dec 16 Modelling and Mapping Update
REV DATE REMARKS
Royal HaskoningDHV
Enhancing Society Together
SOUTH HOLLAND DISTRICT COUNCIL
UPDATE OF STRATEGIC FLOOD RISK ASSESSMENT
Residual Peak Velocity
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:


N
The Wash
NOTES
Map Legend
Functional Floodplain
South Holland District Boundary
2 Feb 17 Modelling and Mapping Update
1 Dec 16 Modelling and Mapping Update
REV DATE REMARKS
Royal HaskoningDHV
SOUTH HOLLAND DISTRICT COUNCIL
UPDATE OF STRATEGIC FLOOD RISK ASSESSMENT
Fluvial and Tidal Source Mapping
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:


N
The Wash
NOTES
Map Legend
Functional Floodplain
South Holland District Boundary
2 Feb 17 Modelling and Mapping Update
1 Dec 16 Modelling and Mapping Update
REV DATE REMARKS
Royal HaskoningDHV
SOUTH HOLLAND DISTRICT COUNCIL
UPDATE OF STRATEGIC FLOOD RISK ASSESSMENT
Residual Flood Hazard
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:

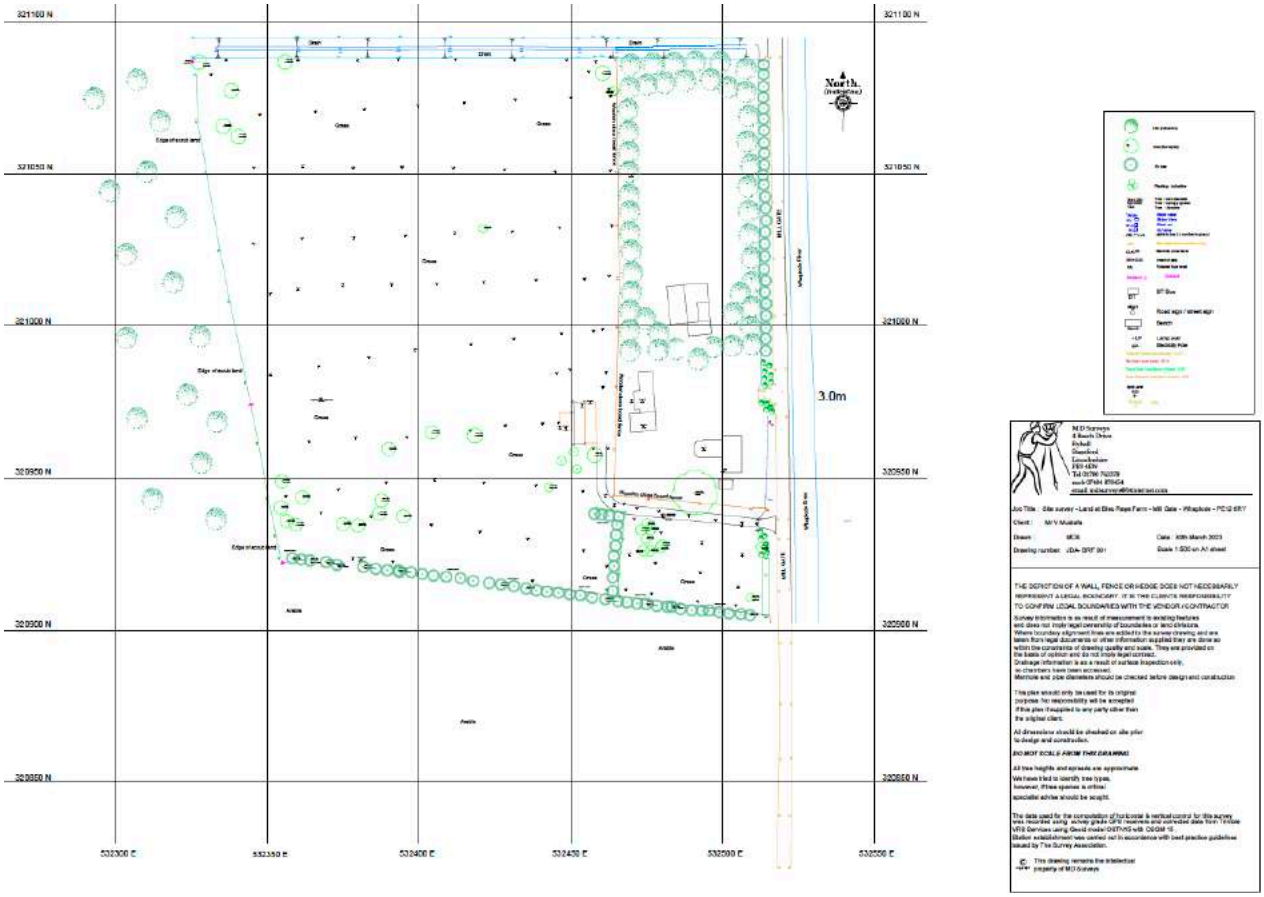
Notes on Flood Zone mapping in the SFRA:

The Flood Zones, whilst generally accurate on a large scale, are not provided for land where the catchment of the watercourse falls below 3km2. There are a number of small watercourse and field drains which may pose a risk to development (e.g. some ordinary watercourses and / or drains managed by Internal Drainage Boards). Therefore, whilst these smaller watercourses may not be shown as having flood risk on the flood risk mapping, it does not necessarily mean that there is no flood risk. As part of a site-specific FRA the potential flood risk and extent of flood zones should be determined for these smaller watercourses.

-

7.00. Site Levels

The prevailing level of the front extremity of the site (road frontage) is 2.85m.
A plan showing all these levels is shown on the accompanying topographic Survey.



-

8.00. Existing Flood Alleviation Measures

The site is protected by tidal defences on both the River Nene and the River Great Ouse. Said defences are the responsibility of the Environment Agency.

There is a long-term strategy for the maintenance of the Environment Agency defences which is reviewed and updated every 5 years. The main element of the strategy is a programme for protecting the riverbanks from natural erosion.

The extensive local drainage network is managed by the South Holland IDB. There are no IDB assets adversely affected by the proposed development – the 9m access strip alongside the

Board's asset (alongside the Northern boundary of the site) is clear of any form of development of landscaping. Surface water from the existing buildings and hard-standings drains naturally via infiltration leading eventually to the IDB drain system.

During the operation and maintenance of its pumping stations and other owned/maintained assets, the IDB seeks to maintain a standard capable of providing flood protection to its District. Routine maintenance programmes ensure that the appropriate levels of protection are maintained.

Current maintenance standards of the South Holland IDB and the Environment Agency's defences are considered good.

-

9.0. Potential Sources of Flooding
Probability of Flooding
The probability of flooding associated with blockages in the South Holland IDB drainage system is very low due to the aforementioned maintenance standards.

This site is not affected by breaching or overtopping for the present day (2006) scenarios for either the 1 in 200 (0.5% AEP) or 1 in 1000 (0.1% AEP) year event which means the present day flood risk to the site from this source is LOW.

The latest Environment Agency information online shows the extent of flooding from rivers and the sea encompassing the site but confirms a very low risk. Very low risk means that each year this area has a chance of flooding of less than 0.1%. This takes due account of the effect of any flood defences in this area. These defences reduce but do not completely stop the chance of flooding as they can be overtopped, or fail. However, the expected rise in sea levels due to climate change over the lifetime of the development does present a residual risk to the development site.

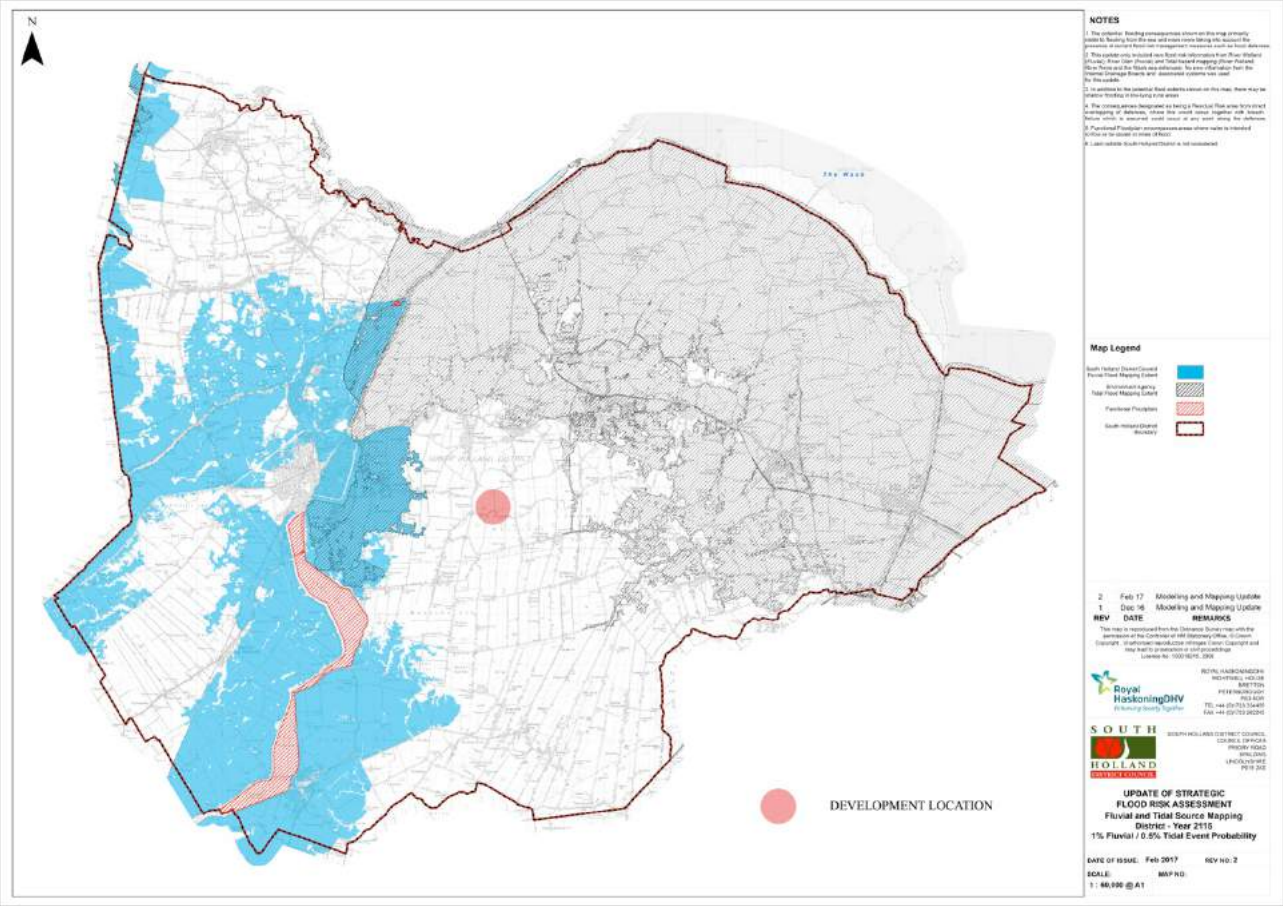
The Environment Agency have provided the year 2115 scenario which does affect the site which is assuming the development would still be in use in 100 years' time although this is unlikely, it has been taken into account as a precautionary measure.

Sources of Flooding
<u>Flooding from Adjacent Land / Development</u>
The main risk of flooding to the site from this source is from the IDB watercourse and/or the Whaplode River to the East of the site.

Due to the flat topography of the site and surrounding area, any overland flow from adjacent land site is likely to be shallow. There is also an extensive network of land drainage ditches which, by design, intercept overland flows.

The Lodges will not be positioned in any depressions or low points within the site. There are localised depressions and ponds proposed within the proposals which would take any surplus surface water run-off from adjacent land. Indeed, the finished floor level of the log cabins are to be elevated a minimum of 600mm above existing ground levels ensuring and flood flow routes are directed away from the log cabins and roadways. Overall, the risk of flooding from this source is considered to be LOW.

Based upon the SFRA mapping and the Environment Agency data, the site is geographically located on the periphery of the anticipated breach extents – see SFRA Mapping below with the application site identified :



Flooding from artificial sources

Artificial sources of flood risk include waterbodies or watercourses that have been amended by means of human intervention rather than natural processes. Examples include reservoirs (and associated water supply infrastructure), docks, sewers and canals. The flooding mechanism associated with flood risk from artificial sources is primarily related to breach or failure of structures (reservoir, lake, sewer, canal, flood storage areas, etc.).

There are several ditches in the vicinity of the site which convey field and highway runoff around the perimeter of the site and beyond. If these ditches were to overflow due to either blockage or exceedance of capacity, the flood water would be shallow due to the flat topography of the land in this area. These ditches are monitored and maintained by the IDB with regular clearance and unblocking whenever necessary.

Flood water from this source is unlikely to pose a significant risk to the development and the risk of flooding from this source is considered to be LOW.

Sewer flooding

The SFRA does not include any information regarding flooding events from sewers (SE Lincolnshire, 2017) of the Site.

Properties classified as “at risk” are those that have suffered, or are likely to suffer, internal flooding from public foul, combined or surface water sewers due to overloading of the sewerage system either once or twice in the ten year reference period. Records held by

the sewage utility company provide information relating to reported incidents, the absence of any records does not mean that the Site is not at risk of flooding.

Canal failure
According to Ordnance Survey (OS) mapping, there are no canals within 500 m of the Site.

Water supply infrastructure
Water supply infrastructure is comprised of a piped network to distribute water to private houses or industrial, commercial or institution establishments and other usage points. In urban areas, this represents a particular risk of flooding due to the large amount of water supply infrastructure, its condition and the density of buildings. The risks of flooding to properties from burst water mains cannot be readily assessed.
If more information regarding the condition and history of the water supply infrastructure within the vicinity of the Site is required, then it is advisable to contact the local water supplier (Anglian Water).

Culverts and bridges
The blockage of watercourses or structures by debris (that is, any material moved by a flowing stream including vegetation, sediment and man-made materials or refuse) reduces flow capacity and raises water levels, potentially increasing the risk of flooding. High water levels can cause saturation, seepage and percolation leading to failure of earth embankments or other structures. Debris accumulations can change flow patterns, leading to scour, sedimentation or structural failure.
Culverts and bridges have not been identified within 50 m of the Site.

Floodplain storage
Where flood storage from any source of flooding is to be lost as a result of development, onsite level-for-level compensatory storage, accounting for the predicted impacts of climate change over the lifetime of the development, should be provided. Where it is not possible to provide compensatory storage on site, it may be acceptable to provide it off-site if it is hydraulically and hydrologically linked.
The loss of floodplain storage is less likely to be a concern in areas benefitting from appropriate flood risk management infrastructure or where the source of flood risk is solely tidal.
The development is located within fluvial and tidal Flood Zone 3 and involves an increase in the proposed building footprint. However, the development is only affected by flooding in the case of a breach or overtopping of defences and benefits from the presence of formal fluvial and tidal flood defences, therefore compensatory storage is not considered to be necessary (CIRIA C624 (2004)).

Drainage and run-off
Based on the topography and low surface water flood risk in the vicinity, interference or interaction with overland flow paths and inflows from off-Site is considered unlikely.

The potential surface water run-off generated from the Site during a 1 in 100 year return period should be calculated, using FEH 2013 rainfall data from the online Flood Estimation Handbook (FEH), developed by NERC (2009) and CEH (2016).

The NPPF (2021) recommends the effects of climate change are incorporated into FRA's. As per the most recent update to the NPPG (May 2022) the applicable climate change factor for the 1 in 30 (≥ 3.3% AEP) and 1 in 100 (< 3.3 to 1% AEP) year event to apply to surface water flooding is dependent upon the management catchment.

The breach models show anticipated flood risk to the site at year 2115 which is 100 years in the future. The lifetime of this development is highly likely to be less than this, somewhere between 20 and 50 years as a maximum. Therefore, the breach scenarios at 2115 which have been used ensure a robust assessment of the residual flood risk from this source. The year 2115, 1 in 200 year breach scenario is more than sufficient
to assess the risk to the site based on the anticipated lifetime of the development.

Overall the risk of flooding from this source is considered to be LOW and there are mitigation measures proposed to deal with this residual risk such as raising land in the location of the Lodges to raise the FFLs out above any anticipated flood depths, raising the access road above anticipated flood depths to provide safe means of egress if required – refer to site layout drawings with spot levels.

-

13.00 Mitigation Measures

The assessment of flood risk in this assessment confirms a LOW risk of flooding from all sources of flooding.
An essential mitigation measure required to protect the proposed lodges from residual risk of flooding is a minimum finished floor level for all cabins – refer to the Site Layout drawings.
As such, the finished floor levels for all Lodges as indicated ensures all properties remain safe from flooding, even during extreme future events.
The foundations for all buildings to be ground supported reinforced concrete rafts.
Any electrical circuits should be in the ceiling cavity and down towards any light switches and sockets located within the ground floor area. This would protect against any potential flooding damage (highly unlikely but prudent to do this as part of the construction).
External levels are profiled to conduct any surface water runoff away from the lodges towards the landscaped areas.

-

14.00 Conclusions

The following conclusions can be made:
The proposed development is not in a functional flood plain as defined by PPS25.
As a result of this assessment, the following conclusions have been reached.
The proposed development is in a defended floodplain.
The risk of the site flooding from any Environment Agency watercourse is very low. The risk of flooding is further lowered due to the Internal Drainage Board drains incorporating a significant freeboard.
The risk of flooding from IDB watercourses is also extremely low.
Velocities, and therefore the hazard of any flood water in the area would be low.
The site is located within an IDB catchment with a minimum standard of drainage of 1% annual probability (1 in 100 chance each year) which exceed with DEFRA guidelines for rural development.
The actual risk is identified as low and its implication for the site should not prevent a planning application being approved.

-

15.00. Recommendations

It is recommended that the floor level of the dwellings are set 0.6m above ground level. It is recommended there is 0.3m of flood resilient construction above finished floor level to the ancillary buildings.
Surface water run-off from the development should be discharged to crate soakaways to BRE365 design requirements so that adjoining land and properties are not affected – refer to the JDA drainage layout.
The development passes the Sequential Test and Exception Test and is therefore suitable for the proposed location.

Occupiers of the all of the new properties should register with the Environment Agency's Floodline Warnings Direct Service to receive automated early warnings of potential flooding. Although the risk of flooding is extremely low, if through a set of circumstances acting together any flooding were to begin to occur, holidaymakers would have adequate time to evacuate the area and remain safe.

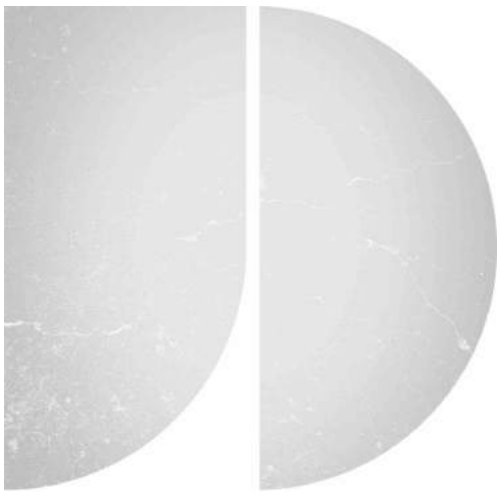
The essential and recommended mitigation measures will provide further protection to the development and reduce any residual risk as far as reasonably practicable. It is recommended that compliance with the recommendations of this FRA are conditioned as part of any planning permission.

This assessment concludes that the site is suitable for development for residential use without unacceptable risk of flooding from all sources to the site itself and elsewhere as long as the essential mitigation measures are applied to this development.

It is our conclusion that the development complies with NPPF and passes, or is not required to pass, the sequential and exemption tests and should therefore be permitted with appropriate Conditions.



John Dickie C. Build E MCABE
Chartered Building Engineer



- **Appendix A EA Standing Advice**

EA Flood Risk Standing Advice for vulnerable developments located in Flood Zones 2 or 3 (February, 2022)

For all relevant vulnerable developments (i.e. more vulnerable, less vulnerable and water compatible), advice on the points should be followed:
• Surface water management;
• Access and evacuation; and
• Floor levels.

Surface water management

Plans for the management of surface water need to meet the requirements set out in either the local authority's:
• Surface water management plan where available; OR
• Strategic flood risk assessment.

They also need to meet the requirements of the approved building regulations Part H: drainage and water disposal. Read section H3 rainwater drainage.
Planning permission is required to use a material that can't absorb water (e.g. impermeable concrete) in a front garden larger than 5m2.

Access and evacuation

Details of emergency escape plans should be provided for any parts of a building that are below the estimated flood level:
Plans should show:
• Single storey buildings or ground floors that don't have access to higher floors can access a space above the estimated flood level, e.g. higher ground nearby;
• Basement rooms have clear internal access to an upper level, e.g. a staircase;
• Occupants can leave the building if there's a flood and there's enough time for them to leave after flood warnings.

Floor levels

The following should be provided:
• average ground level of your site
• ground level of the access road(s) next to your building
• finished floor level of the lowest room in your building
Finished floor levels should be a minimum of whichever is higher of 300mm above the:
• average ground level of the site
• adjacent road level to the building
• estimated river or sea flood level
You should also use construction materials that have low permeability up to at least the same height as finished floor levels.
If you cannot raise floor levels to meet the minimum requirement, you will need to:
• raise them as much as possible
• consider moving vulnerable uses to upper floors
• include extra flood resistance and resilience measures
When considering the height of floor levels, you should also consider any additional requirements set out in the SFRA. Flood water can put pressure on buildings causing structural issues. If your design aims to keep out a depth of more than 600mm of water, you should get advice from a structural engineer. They will need to check the design is safe.

Extra flood resistance and resilience measures

Follow the guidance in this section for developments in flood risk areas where you cannot raise the finished floor levels to the required height. You should design buildings to exclude flood water where possible and to speed recovery in case water gets in.

Make sure your flood resilience plans for the development follow the guidance in the CIRIA Property Flood Resilience Code of Practice. Please note that the code of practice uses the term 'recovery measures'. In this guide we use 'resilience measures'.

Flooding can affect the structural stability of buildings. If your building design would exclude more than 600mm of flood water, you should get advice from a structural engineer. They will need to check the design is safe. Only use resistance measures that will not cause structural stability issues during flooding. If it is not possible to safely exclude the estimated flood level, exclude it to the structural limit then allow additional water to flow through the property.

The design should be appropriately flood resistant and resilient by:

- using flood resistant materials that have low permeability to at least 600mm above the estimated flood level
- making sure any doors, windows or other openings are flood resistant to at least 600mm above the estimated flood level
- using flood resilient materials (for example lime plaster) to at least 600mm above the estimated flood level
- by raising all sensitive electrical equipment, wiring and sockets to at least 600mm above the estimated flood level
- making it easy for water to drain away after flooding such as installing a sump and a pump
- making sure there is access to all spaces to enable drying and cleaning
- ensuring that soil pipes are protected from back-flow such as by using non-return valves

Temporary or demountable flood barriers are not appropriate for new buildings. Only consider them for existing buildings when:

- there is clear evidence that it would be inappropriate to raise floor levels and include passive resistance measures
- an appropriate flood warning or other appropriate trigger is available

If proposals involve the development of buildings constructed before 1919, refer to Flooding and Historic Buildings guidance produced by Historic England.

-

Appendix B Mitigation Measures

Given the Zone 3 low risk of the site there are no specific mitigation measures required apart from provision of an adequate drainage system.

It is recommended that the project proposals are drained, with roof water and clean areas being discharged to surface water soakaways. As there is low risk of the site being flooded, there are no particular measures proposed after the management of surface water flows and compliance with Environment Agency standing advice.

Based upon the information available from the EA during the preparation of this FRA, it is recommended that the floor level of the dwellings is 0.3m above typical ground levels. It is further recommended there is 0.3m of flood resilient construction above finished floor level.

The developer should ensure that the eventual occupiers of the dwellings are sufficiently aware of the risk of flooding and the standard of the existing defences. The Environment Agency provides a Flood Warning Service which includes Flood Warning Codes and uses direct warning methods where the risks and impacts of flooding are high.

In addition to direct and indirect flood warnings, the Environment Agency operates a 24 hour a day Floodline Service providing advice and information on flooding. The occupiers of the dwellings should register with the Floodline Direct Warnings Service to receive any future flood warnings.

During an extreme event it is anticipated that sufficient time would be available to take precautionary actions to limit the potential impact of flooding. The proposed dwellings will be three storey therefore, in the case of an exceedance event, there is a safe refuge on the first or second floors.

In addition to direct and indirect flood warnings, the Environment Agency operate 24 hours a day Floodline Service providing advice and information on flooding contact tel no. 0845 988 1188

Failure of Islington Pumping Station may occur due to long term mechanical breakdown or power supply being temporarily disrupted. However, in these circumstances, the IDB would take immediate emergency action to maintain the drainage level of service by utilising temporary pumping equipment. The Board of King's Lynn IDB has resolved to carry out replacement of the Islington Pumping Station to provide protection during the 1% annual probability (1 in 100 chance each year) with climate change event.

It is recommended that flood resilient construction techniques be adopted as set out below ;

Pollution Mitigation
Construction
Construction sequence, temporary bundage and settlement tanks should be considered and implemented during the works. Full reference should be made to PPG 6 Working on Construction and Demolition sites and Environmental Good Practice on Site 3rd Edition 2010. The selection of a contractor to carry out the works must show consideration of the contractor's proposals for pollution control during the works. A detailed spill action plan will be required to be put in place prior to construction.

Post Construction
Proposed Drainage: Clean and Foul Water
The proposed drainage will be clean water drainage restricted to flows from roof and discharged to soakaways – refer to JDA Drainage Layout.

Foul water will be dealt with via a connection to the AWA mains drainage system as shown – refer to JDA Drainage Layout.

CONSTRUCTION TECHNIQUES

There are two basic approaches that may be appropriate for the protection of buildings against the effects of flooding:

Dry proofing aims to prevent flood water from entering a building. It relies on the use of waterproof barriers integral to the structure, across entrances and non-return valves on drains. Dry proofing a building however can be difficult and is unlikely to work if buildings are subject to flooding for long periods. Simple measures are unlikely to prevent water penetration for more than a few hours while more complex solutions may protect the building for a day or two.

Wet proofing assumes water will enter the building and is based on the use of water resistant and resilient materials within the building and the raising of electrical wiring and sockets above the maximum flood level. This is the most practical approach and there are a number of ways to limit the damage from flooding. Wet proof construction should also allow water to drain easily from the building following a flood and not retain it in walls, floors and air pockets within the building footprint.

Figure 2: Wet proofing – measures to make the building more resilient to flooding

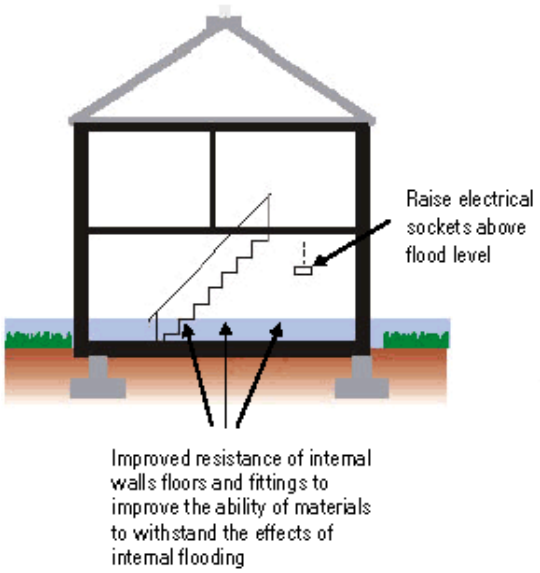
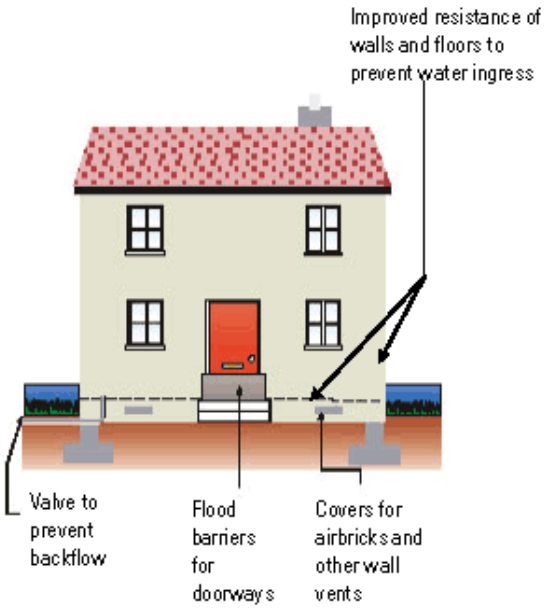


Figure 3: Dry proofing – measures to keep water out of building



Building components

Component	Most suitable	Suitable	Unsuitable
Flooring	Concrete, pre-cast or in situ	Timber floor, fully sealed, use of marine plywood.	Untreated timber Chipboard
Floor covering	Clay tiles Rubber sheet floors Vinyl sheet floors	Vinyl tiles Ceramic tiles	
External walls (to maximum flood level)	Engineering brick Reinforced concrete	Low water absorption brick	Large window openings
Doors	Solid panels with waterproof adhesives Aluminium, plastic or steel	Epoxy sealed doors	Hollow core plywood doors
Internal partitions	Brick with waterproof mortar Lime based plasters	Common bricks	Chipboard Fibreboard panels Plasterboard Gypsum plaster
Insulation	Foam or closed cell types	Reflective insulation	Open cell fibres
Windows	Plastic, metal	Epoxy sealed timber with waterproof glues and steel or brass fittings.	Timber with PVA glues and mild steel fittings

BUILDING AND FLOODING CHECK LIST:

Factors to consider before building in areas where flood risk is an issue

Background information

If flooding is an issue:

- Is the source of floodwater from watercourses, coastal waters, groundwater or sewers?
- If the source of flooding is from watercourses or coastal waters, is the annual probability of flooding greater than 0.5% (1:200)?
- What is the maximum flood level in the 0.5% event?
- Would the site be inundated rapidly, for example due to a breach in a flood defence, or slowly, for example in the case of groundwater flooding?

General issues (adapted from ABI, Assessment of the cost and effect on future claims of installing flood damage resistant measures)

- Records of previous flood levels.
- Ground conditions – e.g., permeability and provision of field drains.
- Floodwater pathways into the building – e.g., poorly maintained masonry, ventilation grilles, doors.

3. Floors

- Where possible use dense concrete screeds on solid concrete floor slabs.
- Use treated timber to protect it from rotting if exposed to standing water.
- Use steel joists and wall plates rather than timber.
- Use a damp proofing material around the ends of floor joists.
- Use a sump and pumping system in buildings at risk of groundwater flooding.
- Replace expensive flooring, such as Oak floorboards with treated timber boards.
- Raise floor levels – see foregoing text on finished floor levels.

4. Walls

- Install air bricks above expected flood level and duct down to solum.
- Use close cell insulation.
- Replace gypsum plaster with more water resistant materials.
- Fix plasterboard horizontally.

5. Interiors

- Replace door hinges with butt hinges that allow door to be removed and placed in a dry area prior to a flood.
- Fit kitchen units with extendable plastic or stainless steel feet so that they will not be damaged by shallow flooding.

- Use raised fitted ovens and fit above highest expected flood level.
-

Appendix C - NPPF

11. National Planning Policy Framework

NPPF and its associated Technical Guidance replaces Planning Policy Statement 25 and provides guidance on how to evaluate Sites with respect to flood risk.

A summary of the requirements of NPPF is provided below.

Sources of Flooding

NPPF requires an assessment of flood risk to consider all forms of flooding, and lists six forms of flooding that should be considered as part of a flood risk assessment. These forms of flooding are listed in Table 1, along with an explanation of each form of flooding.

Table 1 – Forms of Flooding

Flooding From Rivers (Fluvial Flooding)
Watercourses flood when the amount of water in them exceeds the flow capacity of the river channel. Flooding can either develop gradually or rapidly, depending on the characteristics of the catchment. Land use, topography and the proposed development can have a strong influence on flooding from rivers.
Flooding From the Sea (Tidal Flooding)
Flooding to low-lying land from the sea and tidal estuaries is caused by storm surges and high tides. Where tidal defences exist, they can be overtopped or breached during a severe storm, which may be more likely with climate change.
Flooding from Land (Pluvial Flooding)
Intense rainfall, often of short duration, that is unable to soak into the ground or enter drainage systems can run quickly off land and result in local flooding. In developed areas, this flood water can be polluted with domestic sewage where foul sewers surcharge and overflow. Local topography and built form can have a strong influence on the direction and depth of flow. The design of development down to a micro-level can influence or exacerbate this. Overland flow paths should be taken into account in spatial planning for urban developments. Flooding can be exacerbated if development increases the percentage of impervious area.
Flooding from Groundwater
Groundwater flooding occurs when groundwater levels rise above ground levels (i.e., groundwater issues). Groundwater flooding is most is most likely to occur in low-lying areas underlain by permeable rocks (aquifers). Chalk is the most extensive source of groundwater flooding.
Flooding from Sewers

In urban areas, rainwater is frequently drained into sewers. Flooding can occur when sewers are overwhelmed by heavy rainfall, and become blocked. Sewer flooding continues until the water drains away.
Flooding from Other Artificial Sources (i.e., reservoirs, canals, lakes and ponds)
Non-natural or artificial sources of flooding can include reservoirs, canals and lakes. Reservoir or canal flooding may occur as a result of the facility being overwhelmed and/or as a result of dam or bank failure.

Flood Zones

For river and sea flooding, NPPF uses four Flood Zones to characterise flood risk. These Flood Zones refer to the probability of river and sea flooding, ignoring the presence of defences, and are detailed in Table 2.

Table 2 – Flood Zones

Flood Zone	Definition
1	Low probability (less than 1 in 1,000 annual probability of river or sea flooding in any year (<0.1%))
2	Medium probability (between 1 in 100 and 1 in 1,000 annual probability of river flooding (1%-0.1%)or between 1 in 200 and 1 in 1,000 annual probability of sea flooding(0.5%-0.1%) in any year).
3a	High probability (1 in 100 or greater annual probability of river flooding (>1%) in any year or 1 in 200 or greater annual probability of sea flooding (>0.5%) in any given year).
3b	This zone comprises land where water has to flow or be stored in times of flood. Land which would flood with an annual probability of 1 in 20 (5%), or is designed to flood in an extreme flood (0.1%) should provide a starting point for discussions to identify functional floodplain.

Vulnerability

NPPF classifies the vulnerability of developments to flooding into five categories. These categories are detailed in Table 3.

Table 3 – Flood Risk Vulnerability Classification

Flood Risk Vulnerability Classification	Examples of Development Types
Essential Infrastructure	- - Transport Infrastructure - - Utility Infrastructure (e.g., water treatment works and wind - turbines)
Water Compatible	- - Flood Control Infrastructure - - Water and Sewerage Infrastructure - - Navigation Facilities
Highly Vulnerable	- - Emergency Services - - Basement Dwellings - - Mobile home parks
More Vulnerable	- - Hospitals and other health services - - Residential Establishments - - Educational Establishments
Less Vulnerable	- - Commercial Establishments (e.g., shops, restaurants and offices)

Based on the vulnerability of a development, NPPF states what Flood Zone(s) the proposed development is appropriate within. The flood risk vulnerability and Flood Zone 'compatibility ' of developments is summarised in Table 4.

Table 4 – Flood Risk Vulnerability and Flood Zone Compatibility

Flood Risk Vulnerability Classification		Essential Infrastructure	Water Compatible	Highly Vulnerable	More Vulnerable	Less Vulnerable
Flood Zone	**1**	✓	✓	✓	✓	✓
	2	✓	✓	Exception Test	✓	✓
	3a	Exception Test	✓	✗	Exception Test	✓
	3b	Exception Test	✓	✗	✗	✗

Hydrogeology
Based on the Environment Agency's online mapping, the Site is not located within a Ground Water Source Protection Zone (GWSPZ), above an aquifer, nor in an area designated as a Groundwater Vulnerability Zone (GVZ).

Artificial Water bodies
There are no artificial water bodies located within the boundary of the Site.

Historic Flooding
The Environment Agency Historic Flood Extent Map shows that the Site is not located within an area which has historically been reported to have flooding.

Ordinary Watercourses
There are a number of Ordinary Watercourses (drainage ditches) operating in the general vicinity of the proposed Site. Internal Drainage Board.

Planning Advice Note PAN 69

Building design can incorporate materials that are either flood resistant (i.e., unaffected by flood water), such as plastics, or materials that are resilient (i.e., they recover relatively undamaged from flooding) . Some materials, such as concrete, can be both resistant and resilient, for example solid concrete floors can provide an effective seal against water rising up through the floor, provided they are adequately designed. In addition, solid concrete floors generally suffer less damage than suspended floors and are less expensive and faster to restore following exposure to floodwater.

86. Good workmanship and maintenance will limit the amount of water that can seep through masonry walls. Re-pointing may be needed. Water-resistant coatings applied to porous surfaces will also fill any cracks in the masonry or the joints. To avoid trapping water in the wall however, any such coatings should be micro-porous to allow the wall to 'breathe'.

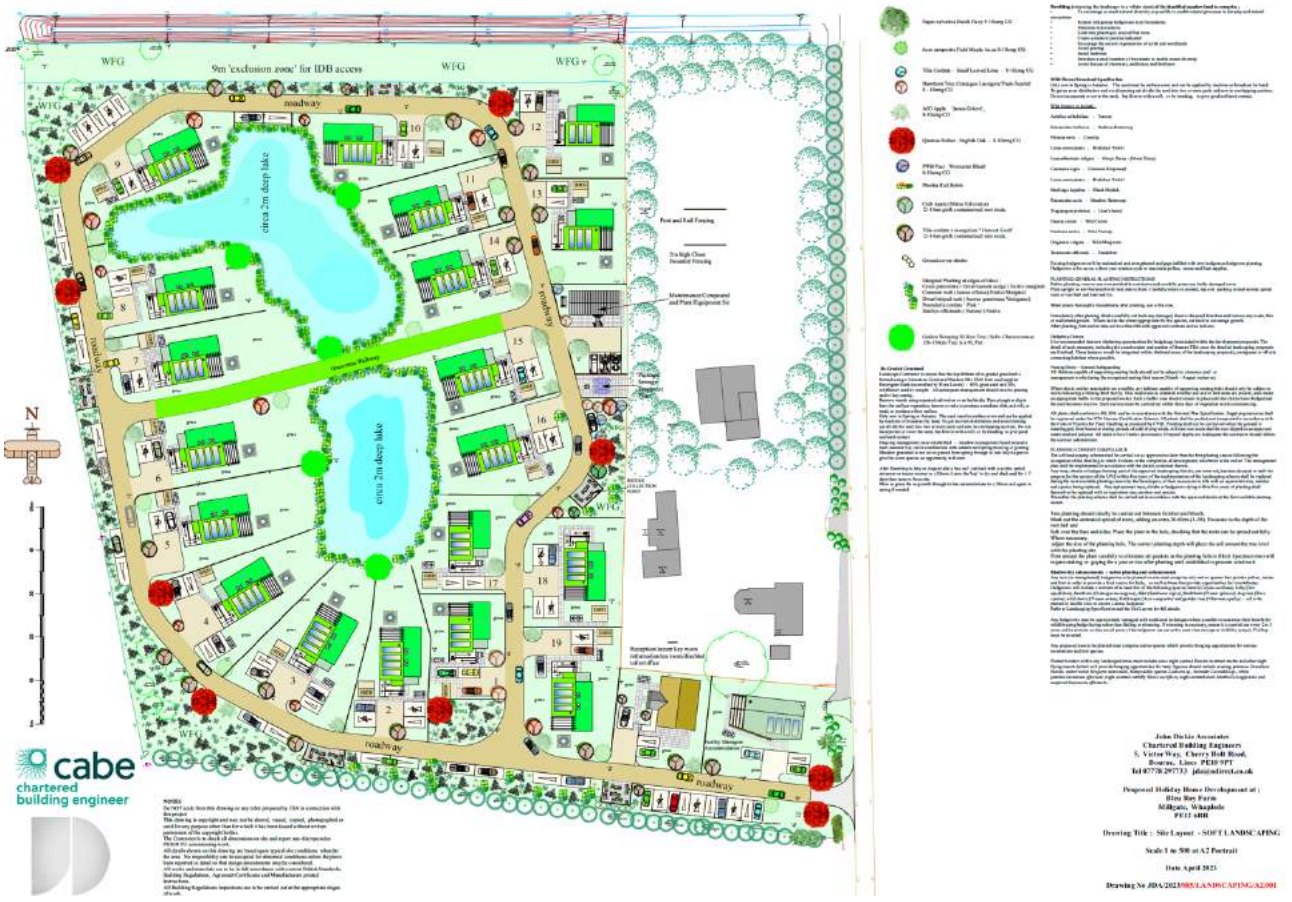
Table 2: Summary of the potential effects of exposure to flood water

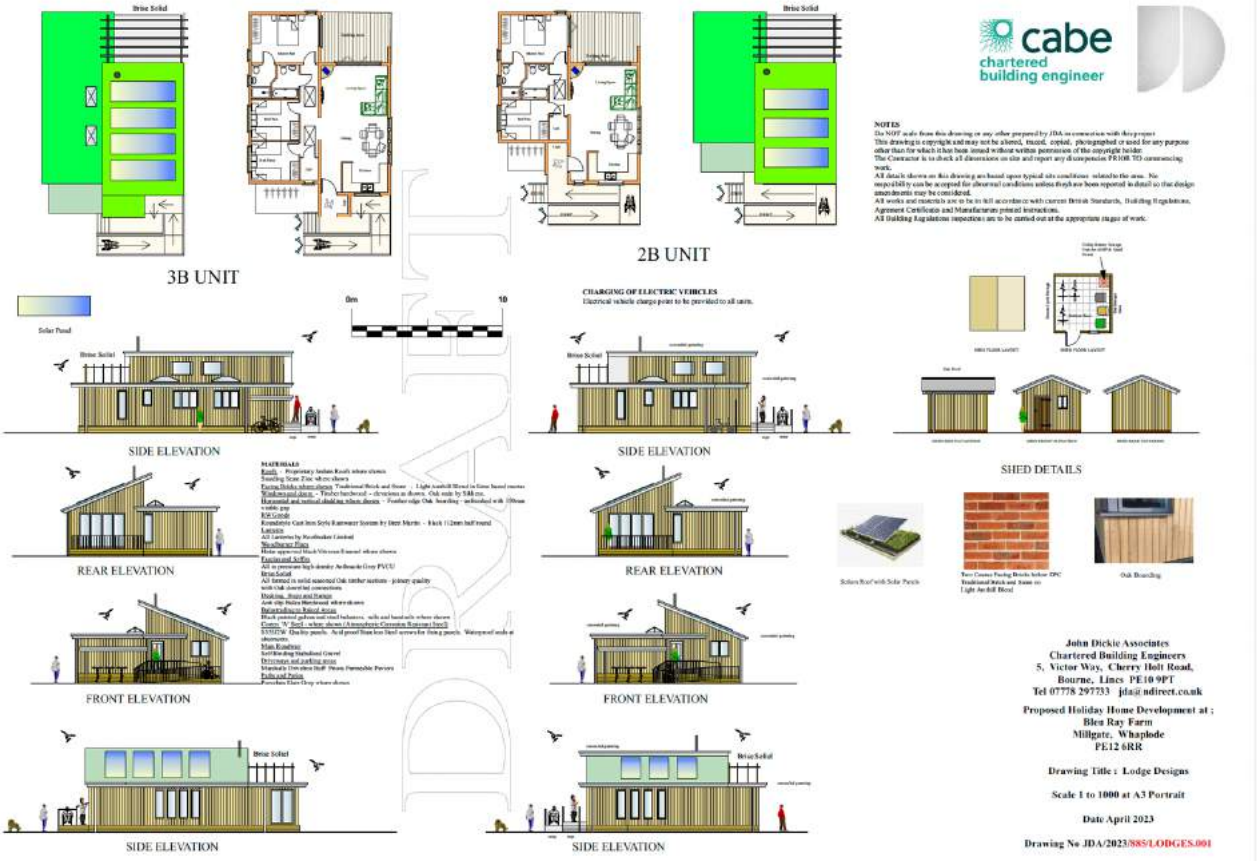
Material	General Effects
Masonry, Concrete and Brick	In general masonry and concrete are unlikely to be severely damaged by contact with floodwater. In the case of coastal flooding, salt water may cause surface powdering and flaking of soft brickwork. Lightweight concrete may expand and contract depending on moisture content so wetting and drying may cause some cracking.
Timber	Timber swells and may distort on wetting. In timber framed buildings, swelling of immersed members could cause damage in other parts of the structure, e.g. through stresses on external cladding. Timbers that become wet and cannot dry may be at risk of decay in the long term. Guidance on the selection of timber preservatives is provided in BS5268: Part 5:1989 for structural timber and BS 1186 Part1:1991 for joinery.
Wall finishes	Renderings containing cement are unlikely to suffer damage. Lime based plasters are preferable to gypsum which softens when wet. Similarly, following flooding, any plasterboard will probably be damaged beyond repair and require to be removed.
Metals	Metals are affected by the corrosive effects of sea water so resistant metals rather than mild steel should be used in coastal areas where flood risk is an issue.
Insulation	Close cell insulants will not absorb water but may restrict drying out of a cavity wall. Mineral fibre and other absorptive insulants will retain water and can lose their insulating properties or disintegrate over time.

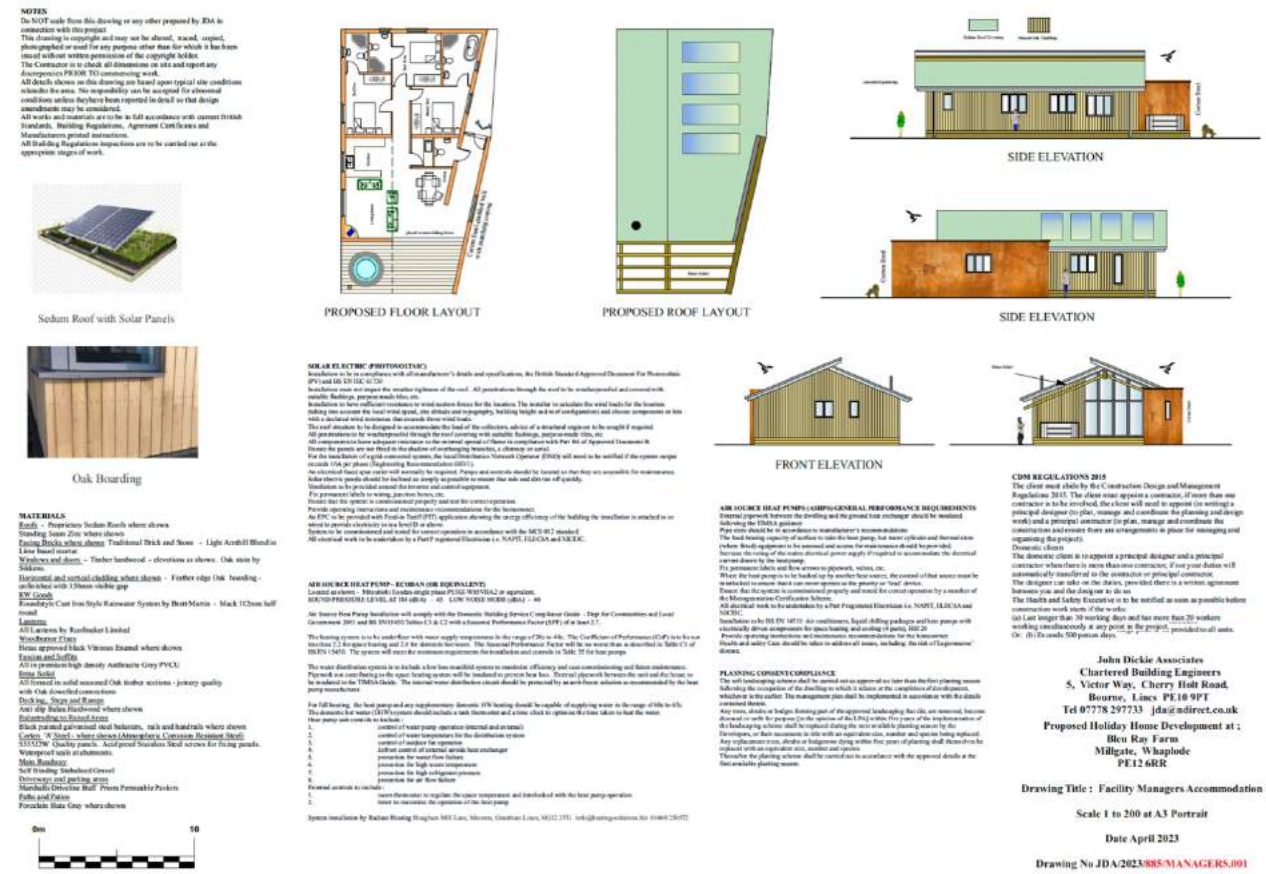
Source - Design Guidance on Flood Damage to Dwellings, The Scottish Office, 1996

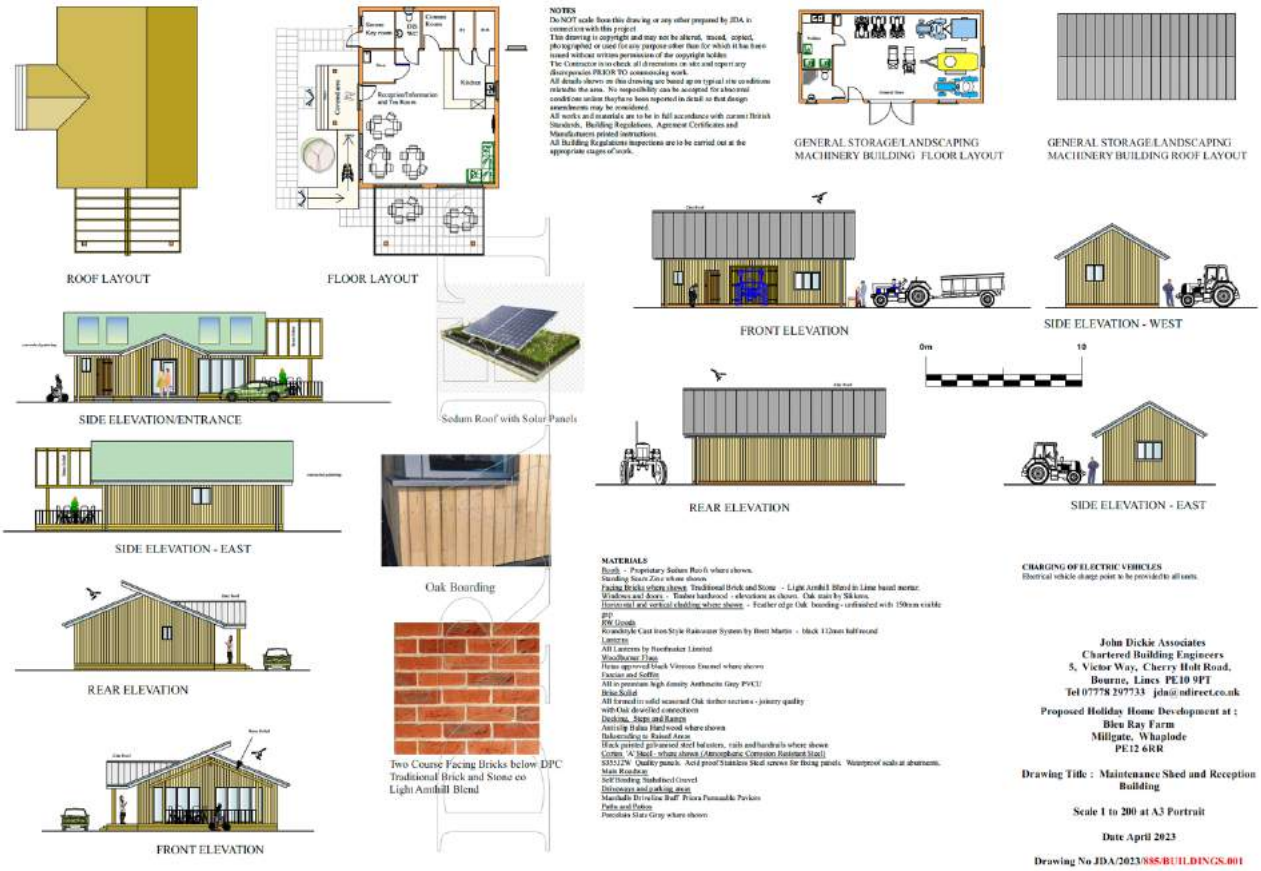
Appendix D. Scheme Drawings






3B UNIT
2B UNIT
SIDE ELEVATION
REAR ELEVATION
FRONT ELEVATION
SIDE ELEVATION
SHED DETAILS
Oak Boarding
John Dickie Associates
Chartered Building Engineers
5, Victor Way, Cherry Holt Road,
Bourne, Lincs PE10 9PT
Tel 07778 297733 jda@ndirect.co.uk
Proposed Holiday Home Development at ;
Bleu Ray Farm
Millgate, Whaplode
PE12 6RR
Drawing Title : Lodge Designs
Scale 1 to 1000 at A3 Portrait
Date April 2023
Drawing No JDA/2023/885/LODGES.001


Sedum Roof with Solar Panels
PROPOSED FLOOR LAYOUT
PROPOSED ROOF LAYOUT
SIDE ELEVATION
SIDE ELEVATION
Oak Boarding
FRONT ELEVATION
John Dickie Associates
Chartered Building Engineers
5, Victor Way, Cherry Holt Road,
Bourne, Lincs PE10 9PT
Tel 07778 297733 jda@ndirect.co.uk
Proposed Holiday Home Development at ;
Bleu Ray Farm
Millgate, Whaplode
PE12 6RR
Drawing Title : Facility Managers Accommodation
Scale 1 to 200 at A3 Portrait
Date April 2023
Drawing No JDA/2023/885/MANAGERS.001


ROOF LAYOUT
FLOOR LAYOUT
NOTES
GENERAL STORAGE/LANDSCAPING MACHINERY BUILDING FLOOR LAYOUT
GENERAL STORAGE/LANDSCAPING MACHINERY BUILDING ROOF LAYOUT
FRONT ELEVATION
SIDE ELEVATION - WEST
SIDE ELEVATION/ENTRANCE
Sedum Roof with Solar Panels
0m
10
REAR ELEVATION
SIDE ELEVATION - EAST
SIDE ELEVATION - EAST
Oak Bounding
REAR ELEVATION
Two Course Facing Bricks below DPC
Traditional Brick and Stone co
Light Amhill Blend
FRONT ELEVATION
MATERIALS
CHARGING OF ELECTRIC VEHICLES
John Dickie Associates
Chartered Building Engineers
5, Victor Way, Cherry Holt Road,
Bourne, Lincs PE10 9PT
Tel 07778 297733 jda@ndirect.co.uk
Proposed Holiday Home Development at :
Bleu Ray Farm
Millgate, Whaplode
PE12 6RR
Drawing Title : Maintenance Shed and Reception Building
Scale 1 to 200 at A3 Portrait
Date April 2023
Drawing No JDA/2023/885/BUILDINGS.001


9m 'exclusion zone' for IDB access
N
20W LED PIR Dome lighter wall mounted at 2m above FGL over doors
CPA FLUSH
11W LED ceiling mounted flush bulkhead light
Warm White - 3000K 1122 lm/60
Post Mounted 1W Charging Point with ROLEC 7.2Kw Modules
cabe
chartered
building engineer
John Dickie Associates
Chartered Building Engineers
5, Victor Way, Cherry Holt Road,
Bourne, Lincs PE10 9PT
Tel 07778 297733 jda@ndirect.co.uk
Proposed Holiday Home Development at :
Bleu Ray Farm
Millgate, Whaplode
PE12 6RR
Drawing Title : Site Layout - LIGHTING
Scale 1 to 500 at A2 Portrait
Date April 2023
Drawing No JDA/2023/885/LIGHTING.001

DISCLAIMER

This document has been prepared solely as a Flood Risk Assessment in support of a Full planning application for the erection of nineteen holiday lodges, reception building, facility manager's accommodation and maintenance shed. formation of two fishing lakes and associated hard and soft landscaping. Bleu Ray Farm, Mill Gate, Whaplode PE12 6RR

John Dickie Associates accepts no responsibility or liability whatsoever for any use made of this document other than by the client for the purposes it was originally commissioned and prepared. All comments and opinions made are based upon information available to John Dickie Associates during the necessary investigative process, and the conclusions and recommendations could therefore, differ in the event of material subsequently being found erroneous, incomplete or misleading. John Dickie Associates therefore, accepts no liability should this prove to be the case.

John Dickie Associates
Chartered Building Engineers
5, Victor Way,
Cherry Holt Road, Bourne, Lincs PE10 9PT
Tel 07778 297733 jda@ndirect.co.uk

DOCUMENT END