FLOOD RISK ASSESSMENT AND DRAINAGE STRATEGY

LAND NORTH OF ROMAN BANK AND EAST OF MIDDLE MARSH ROAD AT RED HOUSE FARM, HOLBEACH BANK, SPALDING, PE12 8BY

GRID REFERENCE: X536995 Y328849

FULL APPLICATION FOR THE CONSTRUCTION AND OPERATION OF A 48MW SOLAR FARM COMPRISING GROUND MOUNTED SOLAR PHOTOVOLTAIC ARRAYS TOGETHER WITH ASSOCIATED INFRASTRUCTURE AND LANDSCAPING



SEPTEMBER 2022

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1.0 Introduction

1.1 Flood Risk UK have undertaken a Flood Risk Assessment (FRA) and Drainage Strategy (DS) in support of a proposed ground-mounted solar energy generation scheme at Red House Farm, Holbeach Bank, Spalding, PE12 8BY (the "site"). The site is under the administrative area of South Holland District Council as the Local Planning Authority (LPA), Lincolnshire County Council as Lead Local Flood Authority (LLFA), South Holland Internal Drainage Board (SHIDB) as the land drainage authority and Anglian Water as the Water and Sewerage Company (WaSC).

1.2 The National Planning Policy Framework (NPPF) requires a FRA for new development proposed on sites: on the floodplains of rivers; at risk of coastal flooding; over one hectare or in critical drainage areas. To comply with the NPPF, the FRA must demonstrate 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, reducing overall flood risk. The application site comprises approximately 80 hectares, which is proposed to be used for a 48MW solar energy generation development, including associated infrastructure and landscaping. The site is within Flood Zone 3, an area that has a high probability of river or coastal flooding. The proposed solar energy generation use is classified as 'essential infrastructure' in the context of flooding, as defined within Table 2 of the Flood Risk and Costal Change Guidance. Opportunities for the provision of Sustainable Drainage Systems (SuDS) are described in later sections of this report.

1.3 Information presented in this report contains data from a Groundsure search. The search was undertaken prior to confirmation of the final development layout and red line boundary. In the intervening period, the red line boundary has been rationalised to accommodate the development proposals, however some of the mapping presented in the body of the report and in the appendices covers the larger original area.

2.0 Site Context

Topography

2.1 The site is located in a rural setting surrounded by farmland and lies approximately 2.5km north of the settlement of Holbeach. The application site measures approximately 80 hectares of greenfield land located between the villages of Holbeach St Marks, Holbeach Bank and Holbeach Hurn. The site is bound by Middle Marsh Road to the west, with farmsteads and isolated residential properties located on the western side of Middle Marsh Road, opposite the site. Roman Bank borders the southern boundary, and open countryside lies to the north and east. The site boundaries are largely defined by drainage ditches that demarcate existing field boundaries within the site.



Figure 1: Site Location, Grid Reference TF367279, nearest postcode PE12 8BY

2.2 The River Welland lies approximately 4.5km to the northwest of the site. There are several ditches within the site used to drain the farmland. The site contains large, irregular shaped

open arable fields bound and defined by a network of drainage ditches that also run along the northern and eastern site boundaries, which are used to drain the farmland.

2.3 The site comprises approximately 80ha of land, which currently consists of fields used for agriculture and grazing livestock and areas of woodland. The farmstead of Red House Farm is located along the farm track/lane to the south of the site, connecting to Roman Bank and Middle Marsh Road.

2.4 A site walkover survey was undertaken in September 2021 to assess the site for apparent flood risk. The site walkover was also undertaken to attempt to verify any sources, pathways or receptors of flooding.

2.5 As shown by the topographic survey contained in Appendix A, the site is very flat, with little variation in level difference. Levels vary from approximately 3.5mAOD to 4.0mAOD, with locally lower elevations within watercourses in the site.

Geology

2.6 The bedrock geology, according to BGS 1:10,000 scale mapping (**Figure 2**) consists of *West Walton Formation – Mudstone and Sandstone*.

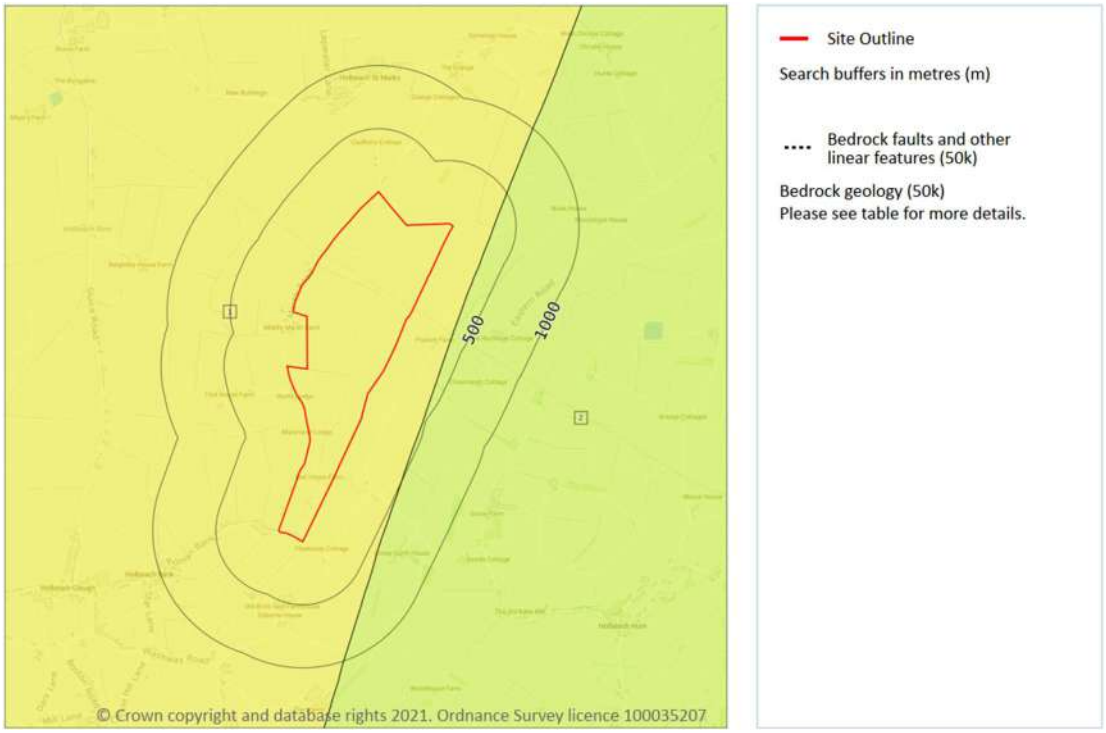


Figure 2: Bedrock Geology (Groundsure map)

2.7 Bedrock permeability ranges from low to very low, and any marginal flow through the bedrock is anticipated to be facilitated through fractures.

2.8 The superficial geology is shown in **Figure 3** and consists of *Tidal Flat Deposits – Clay and Silt*. The superficial geology is anticipated to have low to very low permeability, with any permeability being facilitated through fine particles within the soil matrix.

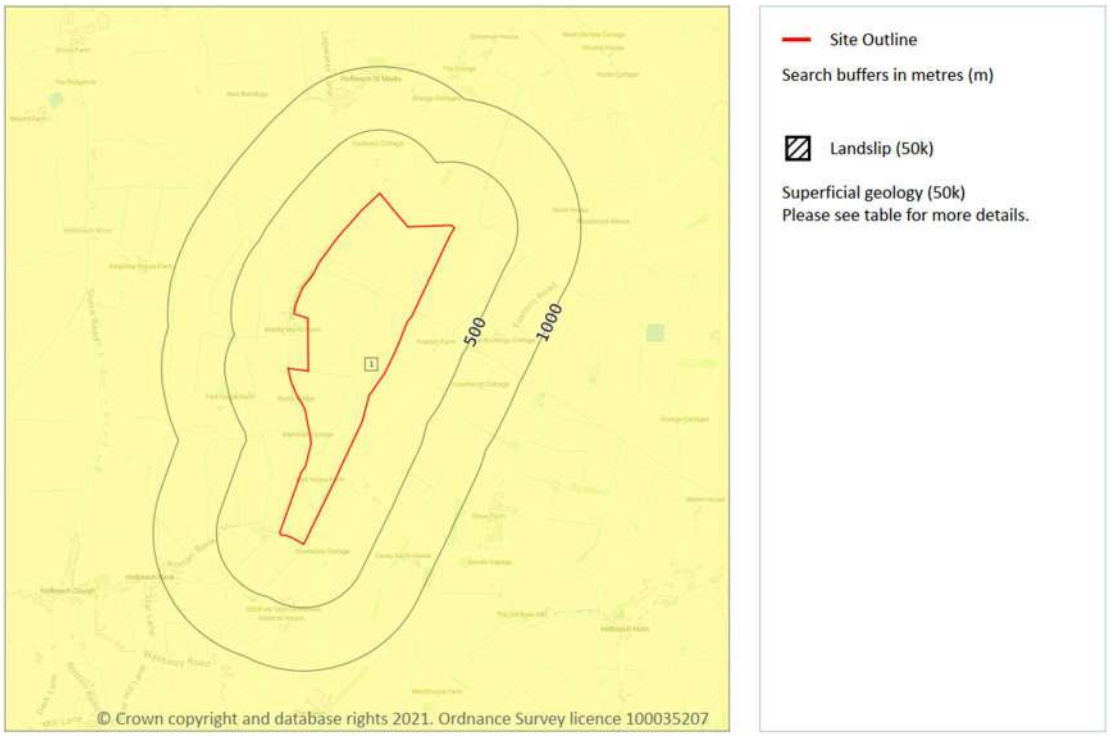


Figure 3: Superficial Geology (Groundsure map)

2.9 The Cranfield Soil and Agrifood Institute Soilscapes mapping indicates loamy and clayey soils of coastal flats with naturally high groundwater, as shown in **Figure 4**. Drainage in its semi-natural state is directed towards watercourses and marginal ditches and, due to the flat topography, water within these ditches naturally and slowly drains to groundwater. The slow moving watercourses and shallow groundwater mean that the groundwater resource is vulnerable to pollution from agricultural nutrients, pesticides and wastes applied to the land.

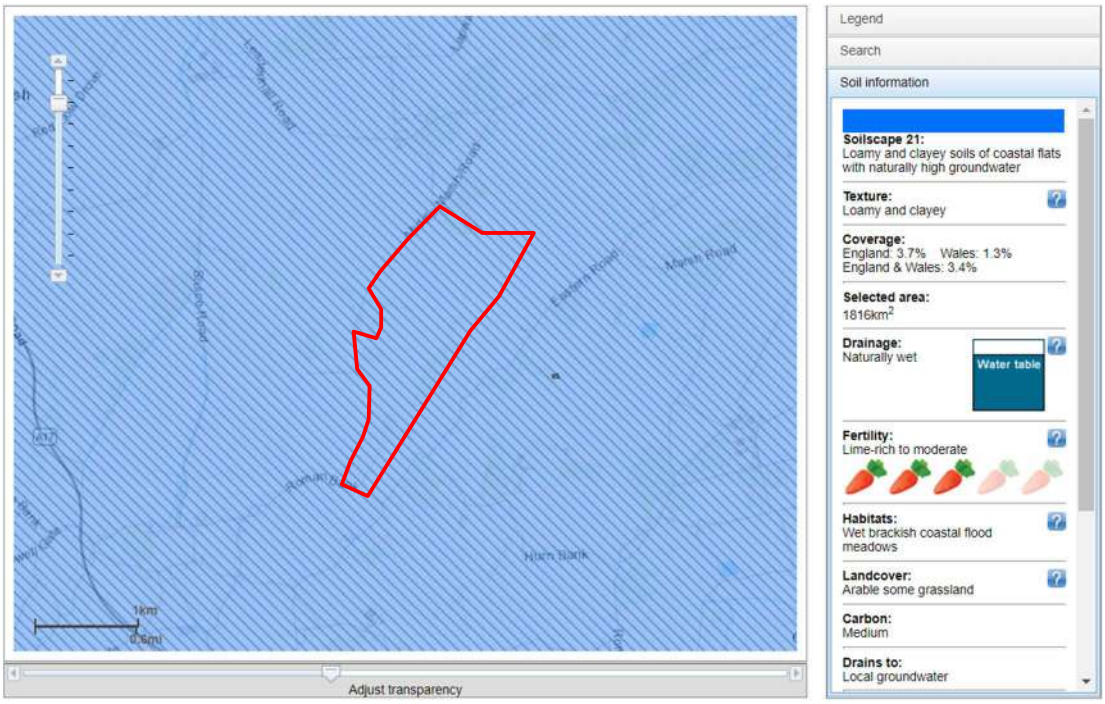


Figure 4: Soilscapes map

2.10 The topography, geology and soil types across the site indicate that the permeability of the ground is likely to be low and that groundwater is likely to be located at shallow depth, closely following the level of water in the surrounding land drainage network.

Hydrogeology

2.11 The site is within an Unproductive superficial aquifer area, and is underlain by an Unproductive bedrock aquifer. These aquifers have low permeability due to the rock types and drift deposits and have a negligible significance on water supply or river base flow.

2.12 The site is not within any source protection zones, and there are no active or historic groundwater, surface water or potable water abstractions within 2000m of the site boundary.

Hydrology

2.13 At the time of the site visit on 24th August 2021, there were signs of surface water drainage features within the site boundary. The surface water features included field and land drainage ditches and culverted pipes within the site boundary and are not influenced by normal tidal action. Watercourses within the site and nearby are illustrated as shown in **Figure 5**.

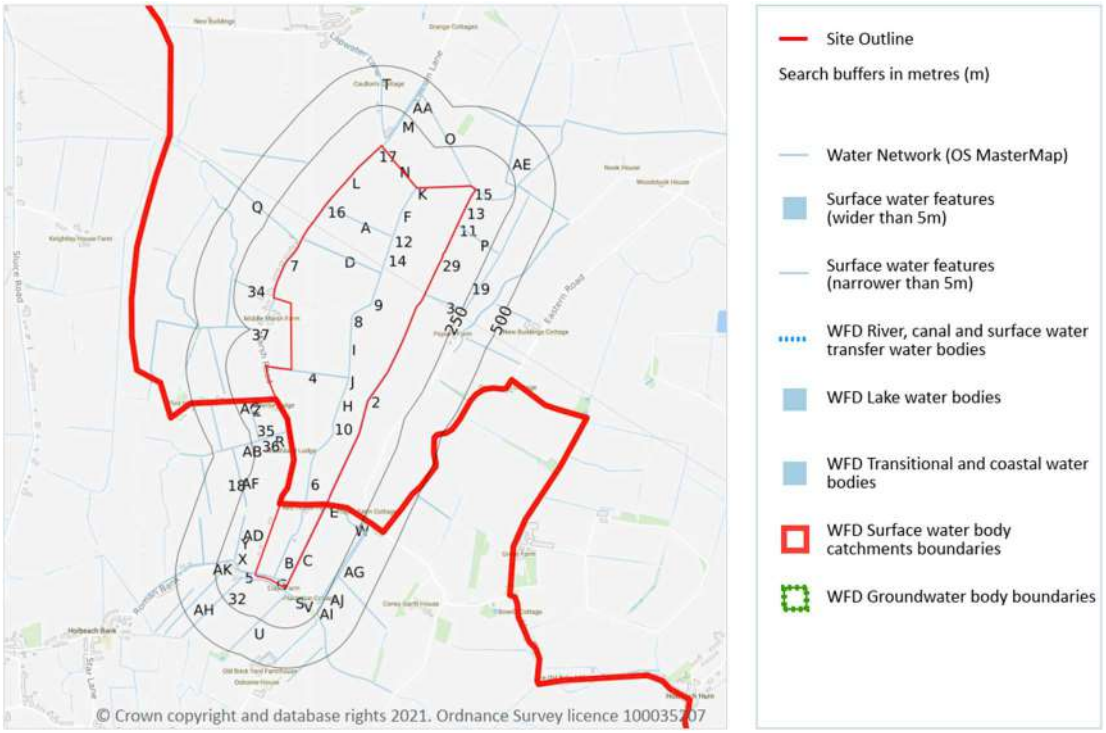


Figure 5: Watercourse network (Groundsure map)

2.14 An Internal Drainage Board (IDB) maintained watercourse (known as "N04 Lawyers") is located centrally within the site and runs in a south to north direction (**Figure 6**). N04 Lawyers is classed as an ordinary watercourse, not a main river, as it is adopted and under the management of the SHIDB rather than the Environment Agency (EA). The full SHIDB watercourse network for this catchment is provided in Appendix B.

2.15 N04 Lawyers is classed as a high priority watercourse by SHIDB and requires a 9m buffer zone to either side of the top of the bank to ensure that the watercourse can be maintained by the IDB. A full explanation of the restrictions within 9m of the watercourse is available within the SHIDB Byelaws (https://www.wlma.org.uk/uploads/SHIDB_Byelaws.pdf).

2.16 All other watercourses within the site should be provided with a minimum buffer zone of 3m to either side of the top of the bank to ensure that the watercourse can be maintained by the landowner.

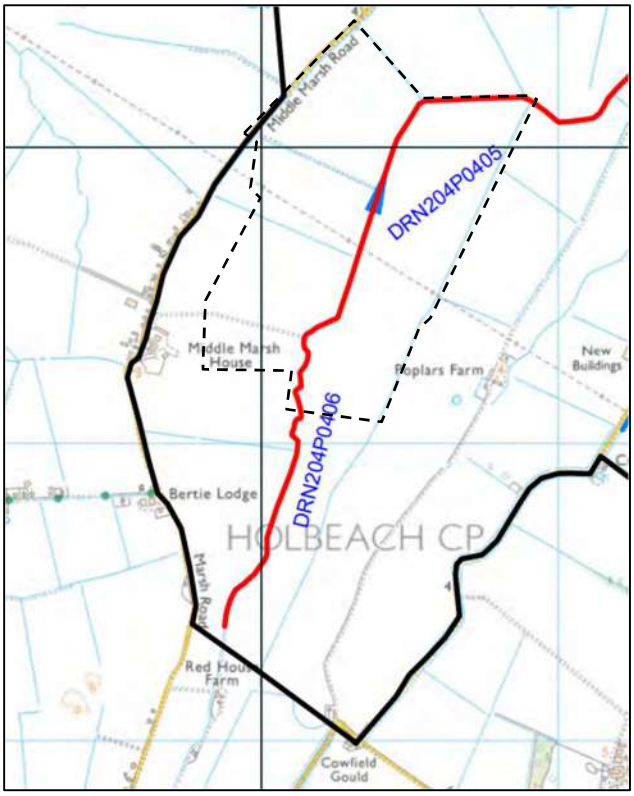


Figure 6: N04 Lawyers (red line) extent within site boundary (site in dashed black)

2.17 The site lies within the *Whaplode River* surface water body catchment of the Water Framework Directive (WFD), which is detailed in **Table 1**. This is a river waterbody catchment associated with the Lower Welland catchment, which joins the River Welland before the coast.

Table 1: WFD Surface-water data (Groundsure tables)

ID	Location	Type	Water body catchment	Water body ID	Operational catchment	Management catchment
18	On site	River WB catchment	Whaplode River	GB205031055495	Lower Welland	Welland
19	On site	Coastal Catchment	Not part of a river WB catchment	117	Lower Welland	Welland

Environmentally Sensitive Sites

2.18 The site is not located within a local or national ecological designation. The Wash SSSI, SPA, SAC, RAMSAR site and NNR is located approximately 4.8km to the north, and the site falls out with the Impact Risk Zone for the SSSI, although it is noted that the site is located in close proximity to an area that is likely to be sensitive by virtue of the avian species located on or around the location, which could be affected by the project.

2.19 There is a Nitrate Vulnerable Zone (NVZ) on the site, namely the Whaplode River NVZ. The development proposals are likely to reduce the amount of agricultural nitrate pollution generated from the site.

3.0 Development Proposal

3.1 The proposal is to develop the site with arrays of ground-mounted solar panels to generate electricity. The proposals also include access into the site, small transformer housing units and a substation compound. The indicative proposed site layout is included in Appendix C.

3.2 The only built development on the site would consist of grid inverter stations, substations and combined welfare, site office, communications and maintenance spares buildings.

3.3 Inverter stations are proposed to be located strategically throughout the site, with the main complex of the above buildings proposed to be located centrally and close to an existing pylon and overhead lines.

3.4 The dimensions of the panels would be approximately 4.82m (length) x 1.13m (width). These panels would be installed on mounting structures. The structures would be constructed from galvanised steel and would be driven into the ground using specialist equipment to a depth of between 1m and 1.5m. There would be no concrete or foundations required as part of this installation process. The panels would then be installed at angles of between 20 and 30 degrees on top of the mounting structures. The overall finished height of the installed panels would be approximately 2.62m.

3.5 An access road would be installed within the site to allow maintenance vehicles to gain access to both the site and the panels. The site would be secured by a high deer fence or similar, of approximately 2.15m in height. Infra-Red (non-visible), pole-mounted CCTV cameras (4.0m in height) would also be provided at appropriate intervals along the boundary fence. These would enable remote surveillance of the site.

3.6 Parts of the access road will require new culverts to enable full site coverage by maintenance vehicles. New culverts will require land drainage consent from SHIDB under S23 of the Land Drainage Act 1991 and this will be sought following a successful planning approval.

3.7 NPPF Paragraph 159 states: “Inappropriate development in areas at risk of flooding should be avoided by directing development away from areas at highest risk (whether existing or future).”

3.8 The need for a viable connection to the electricity network, particularly as there is constrained grid capacity and costs will increase with distance from available connection points to the National Grid. The 132kV line which crosses the Application Site has sufficient capacity to

accommodate the proposed scheme. This infield connection avoids the requirement for expensive long underground cabling to provide the connection, which would make the scheme unviable if more than 2km in length. The need for the connection to the network has acted as a constraint to the siting of the proposed solar farm, which in turn will define the geographical such area for the Sequential Test. Nevertheless, a Sequential Test is a requirement.

3.9 Solar farms are regarded as essential infrastructure as defined by Annex 3 of the Framework: Flood Risk Vulnerability Classification. Table 3 defines the Flood Risk Vulnerability Classification by Flood Zone and confirms that essential infrastructure in Flood Zone 3 is appropriate subject to the Exception Test.

3.10 In terms of the NPPF Exception Test, it is considered that as the proposal is for essential infrastructure, it will meet part a) of the test. In terms of part b), the development will not be open to the general public and will not result in an increase in flooding elsewhere as demonstrated in this Flood Risk Assessment.

3.11 Overall, it is considered that the Exception Test can be passed using these principles.

4.0 Flood Risk Assessment

Fluvial/Tidal Flooding

4.1 The EA flood map for planning, included in **Figure 7** below, identifies areas at risk of flooding by rivers and the sea. This shows that the proposed site lies entirely within Flood Zone 3; land having a 1 in 100 or greater annual probability of river flooding; or land having a 1 in 200 or greater annual probability of sea flooding.

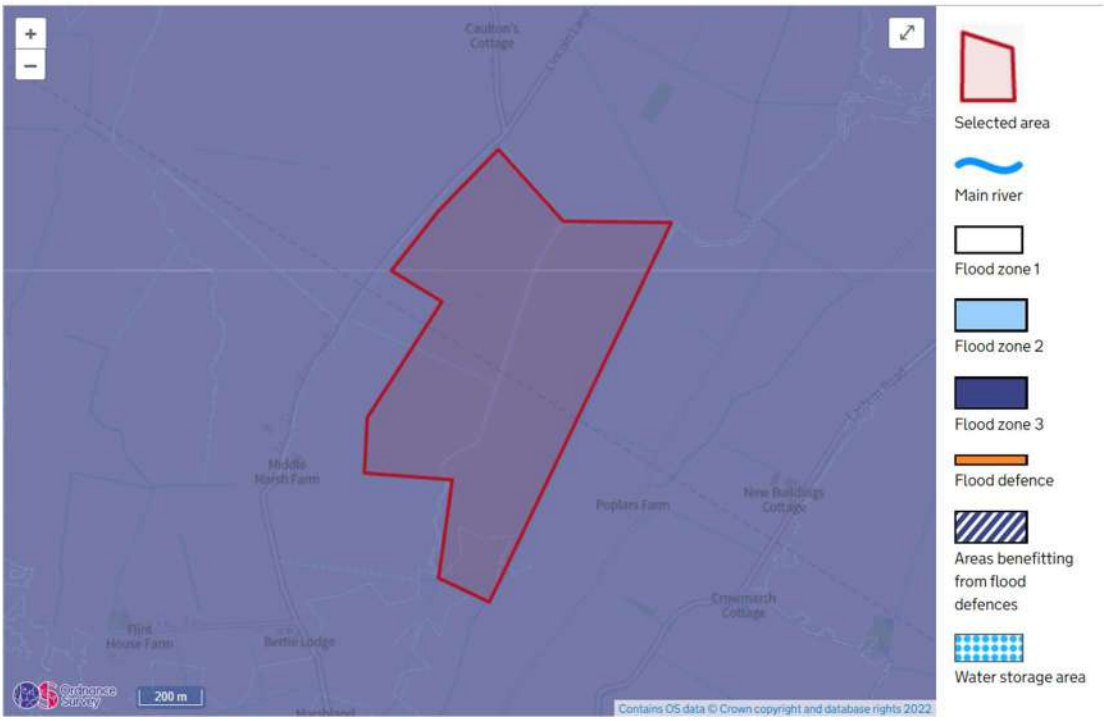


Figure 7: Environment Agency Flood Map for Planning

4.2 The site is considered at risk of fluvial/tidal flooding processes. There is a risk of fluvial flooding associated with the flow within the Rivers Welland and Nene and the IDB land drainage system that overwhelms channel capacity and/or that of associated infrastructure. There is also a risk of tidal flooding resultant from the failure of flood defences by overtopping of assets or due to breaching.

4.3 The risk of fluvial flooding by the Rivers Welland and Nene is generally accepted to be secondary in terms of its magnitude compared to the risk posed by tidal flooding (both overtopping and breaching of defences). The risk of fluvial flooding by the land drainage network is also deemed a lower magnitude risk compared to tidal flooding. Vast swathes of low-lying flat land that exist within the vicinity and the finite volumes of water within the system are conducive with shallow and slow flowing flood water, which would be most likely

to arise as a result of infrastructure failure or capacity being overwhelmed for prolonged periods.

4.4 As such, the higher magnitude and more onerous tidal flood risk associated with overtopping and breaching of defences is primarily considered for the purposes of this FRA. The predominant risks are posed both directly from the failure of the linear coastal defences 5km to the northeast but also as a result of tides travelling up the course of the Rivers Welland and Nene and overtopping defences, thus flooding the land drainage network. Tidal flood defences are shown by the Flood Map for Planning to exist along the East Coast and along the banks of the Rivers Welland and Nene for a considerable distance from the coast.

4.5 The presence of flood defences reduces the probability and magnitude of flooding under those 'design' and 'extreme' flood scenarios considered for the purposes of planning, which in line with best practice have a 0.5% AEP and 0.1% AEP, respectively. The presence of flood defences does not prevent flooding of land behind the defence line, with assets expected to be overtopped by both the design and extreme flood events. The extent of flooding would also broaden should, hypothetically, the defence line be breached by floodwaters.

4.6 Flood data from the 2018 East Coast and Wash Coastal Flooding Boundary study has been obtained from the Environment Agency for the purposes of this FRA. The model outputs provide estimations of the depth, velocity and hazard of flooding should breaching or overtopping of the tidal flood defence line occur, notably at the closest point to the site, circa 5.5km northwest of the site and a similar distance inland from the coast. The data is contained within Appendix D of this report, and whilst not definitive, this resource offers the best available estimate of the possible magnitude of tidal flooding and is utilised for the purposes of solar farm design and evacuation protocol.

4.7 The existing tidal defences protecting this site consist of earth embankments. They are currently in fair condition and provide a design standard of protection (SOP) in the order of 0.67% AEP; i.e. they would be overtopped by a tidal flood with an AEP greater than 0.67% (or 1 in 150). The Environment Agency inspect these defences routinely to ensure potential defects are identified. Tidal flood levels at Fosdyke Bridge, taken as present-day but in fact modelled for the year 2017, summarised in Table 1**Table 2** below, are understood to inform the asserted SOP.

Table 2: 2018 Coastal Flood Boundary Extreme Sea Levels

CFB Ref	Location	Easting Northing	Annual chance (1 in X) of tide level in metres AOD					
			1	10	50	100	200	1000
3992_5	Fosdyke Bridge	531886 332234	4.92	5.47	5.90	6.13	6.38	6.97

4.8 The 2017 design flood level with a return period of 1 in 200 years/ 0.5% AEP is 6.38m AOD. Although not stated in the EA modelling data, a crest height of the tidal flood defences of between 6.13m AOD and 6.38m AOD is implied to reflect a 0.67% AEP SOP.

4.9 The forecast lifespan of the proposed solar farm is 35 years; it is therefore estimated that its decommission year will be circa 2055. The design 0.5% AEP flood level in 2055 has been calculated to be 6.73m AOD with regard to sea level rise estimates contained within the National Planning Policy Framework matrix. Sea level rise up to the year 2115 0.5% AEP scenario would see a predicted flood level of 7.68m AOD.

4.10 Over the lifetime of the development, the frequency of flooding and associated water levels will increase, thus the design standard of existing flood defences will progressively fall. Strategically within the region, it is planned to hold the existing flood defence line by increasing the crest height of existing structures and to maintain the same SOP to the surrounding areas.

Lincolnshire and Northamptonshire Tidal Hazard Mapping – Tidal Defence Overtopping

4.11 The Lincolnshire and Northamptonshire Tidal Hazard Mapping considers the effect of flood defences being overtopped by tidal flood events with 0.5% and 0.1% AEPs for the 2115 climate scenario. The 0.5% AEP model is considered a design flood event as it represents an actual risk of flooding with operational defences and forms the benchmark against which the proposed solar farm should be designed. The 0.1% AEP model is considered an extreme flood event as it represents an actual risk but exceeds the benchmark against which the proposed solar farm should be designed since, statistically, it would not be expected to occur during the development lifetime. The extreme flood event is considered against the safety of site users and their evacuation. Model outputs include flood depths, velocities and associated hazard ratings, which categorise the danger of floodwater to people as follows.

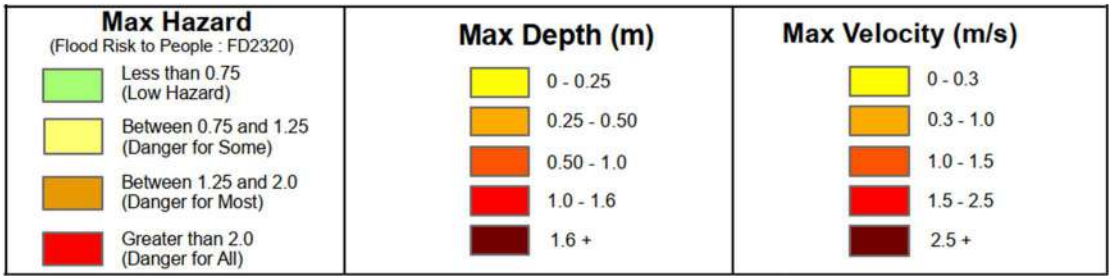


Figure 8: Categories of Flood Hazard, Depth and Velocity

4.12 The Environment Agency have confirmed that the site is outside the 0.5% AEP flood risk areas resultant from flood defence overtopping for the present day scenario (based on 2006) or the 2115 scenario. The site would, however, be affected by overtopping of defences in the 0.1% AEP 2115 scenario, as shown below (**Figure 9**). The maximum flood hazard across the site is generally non-existent or classified as "Low Hazard", with some isolated pockets of "Danger for Some". The maximum depth of floodwater is expected to be no higher than 0.5m above surrounding ground level (isolated higher depths are associated within on-site watercourses), and the floodwater would be expected to be slow-moving or still.

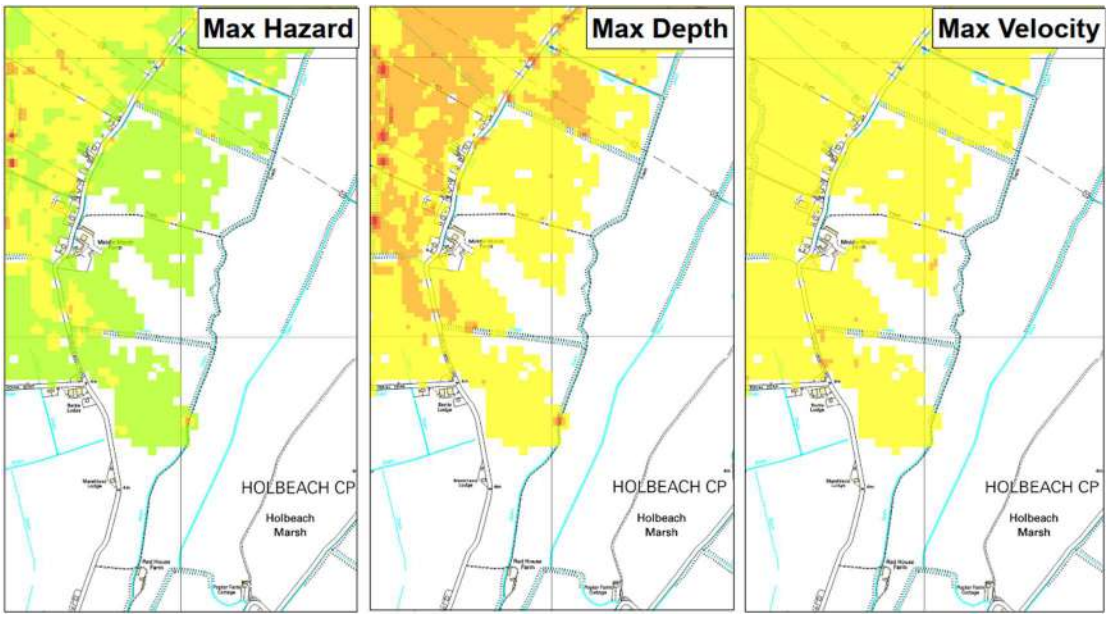


Figure 9: Tidal Overtopping Hazard Mapping – 2115 0.1% AEP

4.13 The Environment Agency have confirmed that the site is outside of the 0.5% AEP flood risk areas resultant from flood defence breaching for the present day scenario (based on 2006). The site, however, would be affected by the 0.1% AEP flood risk areas resultant from flood defence breaching for the present day scenario (based on 2006) as shown in **Figure 10**. The maximum flood hazard across the site is generally non-existent or classified as "Low Hazard", with some isolated pockets of "Danger for Some". The maximum depth of floodwater is expected to be no higher than 0.5m above surrounding ground level (isolated higher depths are associated with on-site watercourses), and the floodwater would be expected to be slow-moving or still.

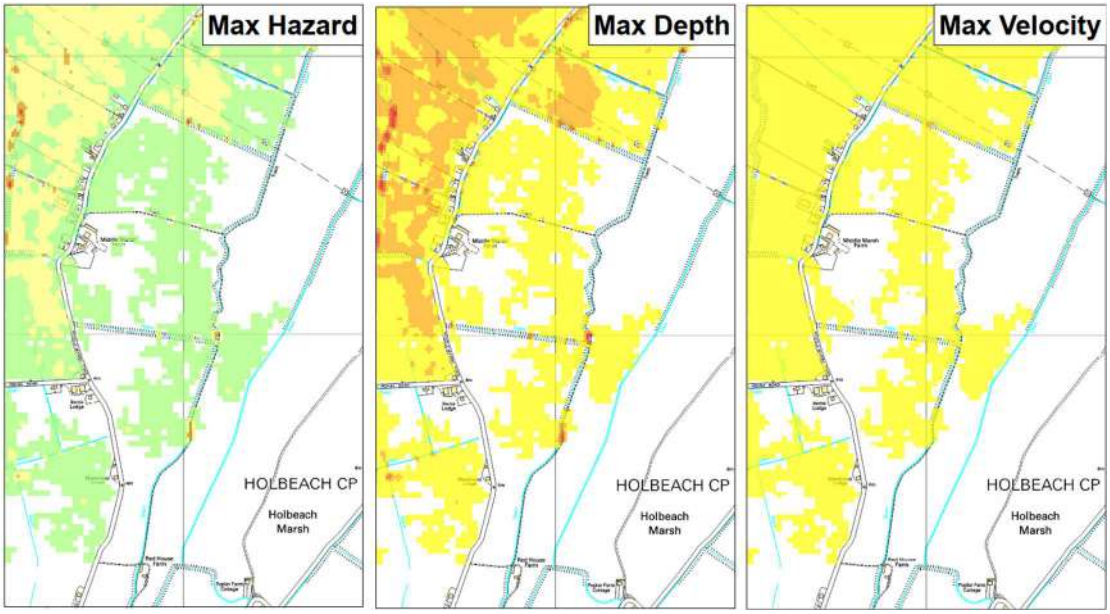


Figure 10: Tidal Breaching Hazard Mapping – 2006 0.1% AEP

4.14 The Environment Agency have confirmed that the site is within the 0.5% AEP flood risk areas resultant from flood defence breaching for the long term future scenario (based on 2115) as shown in **Figure 11**. The maximum flood hazard across the site is generally classified as "Danger to Most", with some isolated pockets of "Danger for All" within the watercourses. The maximum depth of floodwater is expected to be between 0.5m and 1.0m above surrounding ground level (isolated higher depths are associated with on-site watercourses), and the floodwater would be expected to be slow-moving or still.

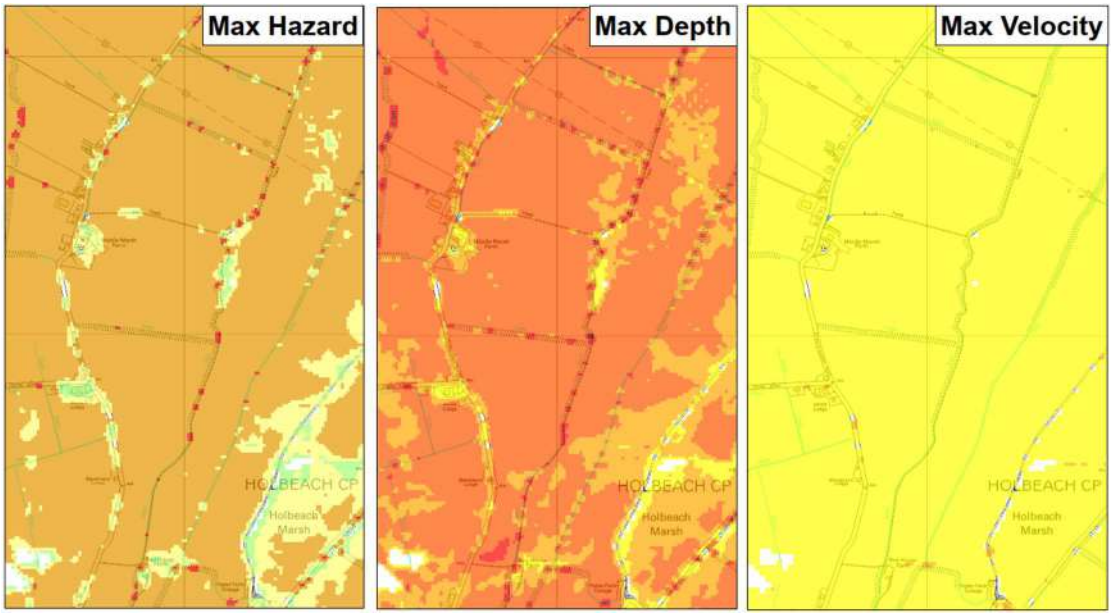


Figure 11**: Tidal Defence Breaching Hazard Mapping – 2115 0.5% AEP**

4.15 The Environment Agency have confirmed that the site is within the 0.1% AEP flood risk areas resultant from flood defence breaching for the long term future scenario (based on 2115) as shown in **Figure 12**. This scenario is considered an extreme event and is, statistically, very unlikely to occur during the lifetime of the development. The maximum flood hazard across the site is generally classified as "Danger to Most", with some isolated pockets of "Danger for All" within the watercourses. The maximum depth of floodwater is expected to be generally between 0.5m and 1.0m above surrounding ground level, although depths of up to 1.6m above surrounding ground level are possible in discrete areas of the site. The floodwater would be expected to be generally slow-moving or still, however, higher velocities of up to 1.0m/s are possible in areas near on-site watercourses.

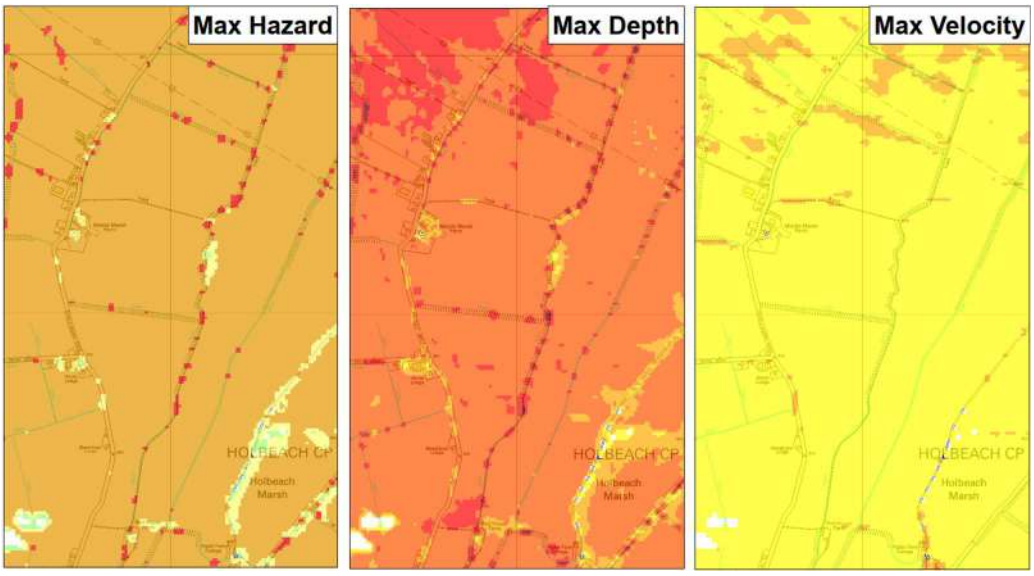


Figure 12: Tidal Breaching Hazard Mapping – 2115 0.1% AEP

4.16 The 0.5% AEP flood is considered a design flood event as it represents an actual risk of flooding and forms the initial benchmark against which the proposed solar farm should be designed. The entire site lies outside of the 0.5% AEP tidal defence overtopping model extent (based on 2006), which is considered as a proxy for the present day, and the 0.5% AEP tidal defence overtopping model extent (based on 2115), which considers the long term flood risk including the effects of climate change. As such, there should be no special requirements for mitigating against flood risk in the design of the development for the actual flood risk.

4.17 However, the residual risk of flooding as a result of tidal defence breaching, which would be caused by a failure of tidal defences through lack of maintenance or overtopping leading to erosion of flood defences, is expected to present a flood risk to the site. To account for this residual risk, the parameters of the 0.5% AEP tidal defence breaching model (based on 2115) are proposed to be used as the design parameters for the solar farm. These parameters also coincide with the 0.1% AEP tidal defence breaching model (based on 2115) in the area of the proposed substation compound, therefore designing for the 0.5% AEP conditions will also satisfy designing for the 0.1% AEP conditions in this area. The mitigation measures to be incorporated into the design are discussed at the end of this chapter.

Pluvial Flooding

4.18 Intense rainfall can create runoff which temporarily overwhelms the capacity of the drainage system. Under these conditions, localised 'flash' flooding can occur. In addition, surface water sewers can flood into foul sewers and overload both the surface water and combined sewer networks, which can be especially problematic.

4.19 The updated Flood Map for Surface Water (uFMfSW) provides information about surface water flooding, including multiple risk categories, as follows:

- **Very low;** has a chance of flooding on average of less than 1 in 1000 (0.1%).
- **Low;** has a chance of flooding on average between 1 in 1000 (0.1%) – 1 in 100 (1%),
- **Medium;** has a chance of flooding on average between 1 in 100 (1%) – 1 in 30 (3.3%)
- **High;** has a chance of flooding on average greater than 1 in 30 (3.3%).

4.20 In general terms, the uFMfSW alone should not be used to assess flood risk at the individual site level. Flooding from surface water is difficult to predict as rainfall location and volume are difficult to forecast. In addition, local features can greatly affect the probability and severity of flooding. When used to consider catchment-wide surface water or pluvial flows, the maps are a useful tool in determining generalised flood risk to an area.

4.21 An extract from the uFMfSW is shown in **Figure 13**, indicating, generally, very low risk of pluvial flooding across the vast majority of the site. There are, however, isolated areas of localised low, medium and high-risk pluvial flooding across the site and this is likely associated with a small depression within the fields.

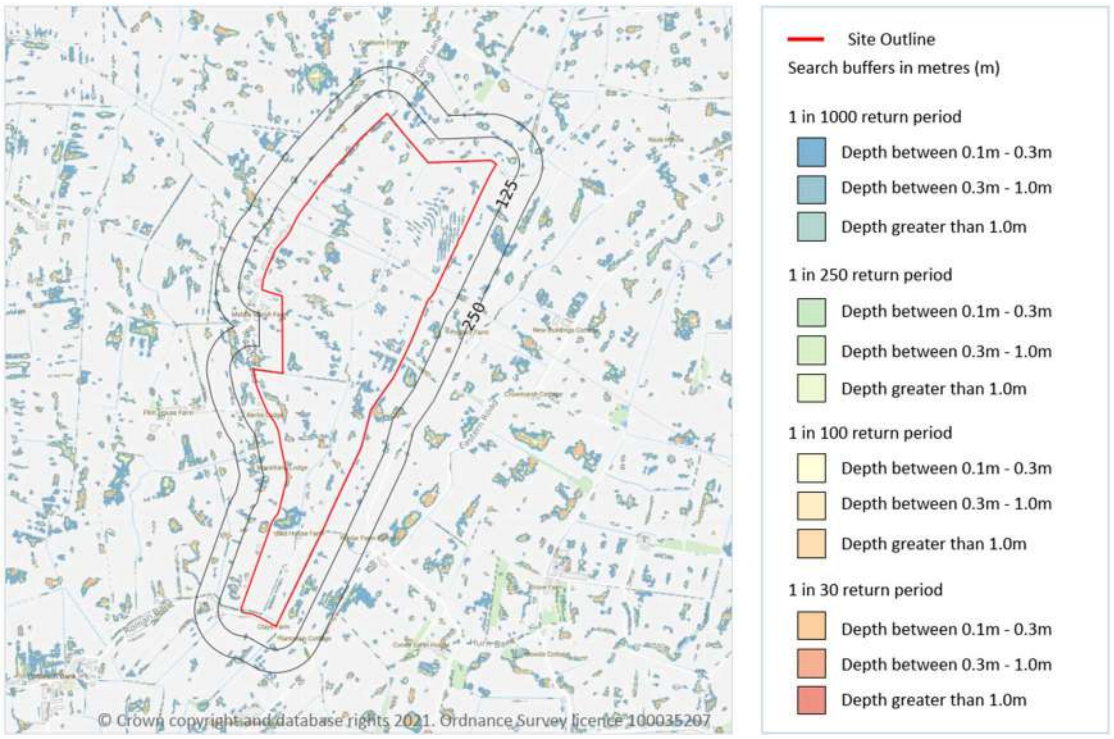


Figure 13: updated Flood Map for Surface Water (uFMfSW) extract

4.22 Groundsure data suggests that the highest risk of flooding in these areas would be from 1 in 30 year rainfall events and that the depth of water associated with these more common events would be between 0.1m and 0.3m. Depths associated with storm events of a lower probability of occurrence are noted as being in excess of 1.0m.

4.23 The areas of low, medium and high-risk flooding in the site coincide with the topography of the land. There are no apparent corridors of pluvial flooding that link the localised and isolated pockets of standing water. As there is no apparent interconnectivity between the isolated pockets of flooding, the velocity of floodwater outside of the normal watercourse channels is anticipated to be very slow. As such, the floodwater, although anticipated to be deep in the worst-case scenarios, should not preclude the placement of ground-mounted solar panels outside of the normal watercourse channels. Flooding from surface water is not considered to cause disruption to or movement of the solar panels, although electrically sensitive parts of the equipment should be located above the level of floodwater with a suitable freeboard applied, further discussion on this is provided at the end of this chapter.

Groundwater Flooding

4.24 Groundwater flooding is most commonly caused by rainfall which causes the groundwater table beneath a site to rise and eventually exceed ground level. Groundwater flooding can also occur where the water table is sufficiently close to the site surface that it inundates subterranean development. Like other sources of flooding, groundwater flooding will be affected by increased rainfall attributable to climate change.

4.25 Groundsure data (**Figure 14**) shows the site to be wholly within an area of negligible susceptibility to groundwater flooding and a small portion around the perimeter to have negligible susceptibility. The development proposals will not involve any substantial excavations for the installation of the ground-mounted solar panels or associated infrastructure, therefore the flood risk from groundwater is considered to be low.



Figure 14: Susceptibility to groundwater flooding (Groundsure map)

Reservoir Flooding

4.26 The Environment Agency 'Risk of Flooding from Reservoirs' map, which relates to flood risk from an uncontrolled release of water from a reservoir, shows that the site is not within an area expected to experience flooding from this source (**Figure 15)**. The nearest inundation risk area is approximately 9km northwest of the site. The elevation of the site above the valley means that there is a negligible risk of flooding from this source. Since dams in England are regulated by the Reservoirs Act 1975 and monitored for compliance by the Environment Agency, the probability of a reservoir breach is very low. The risk to the proposed development from reservoir flooding is deemed to be negligible.

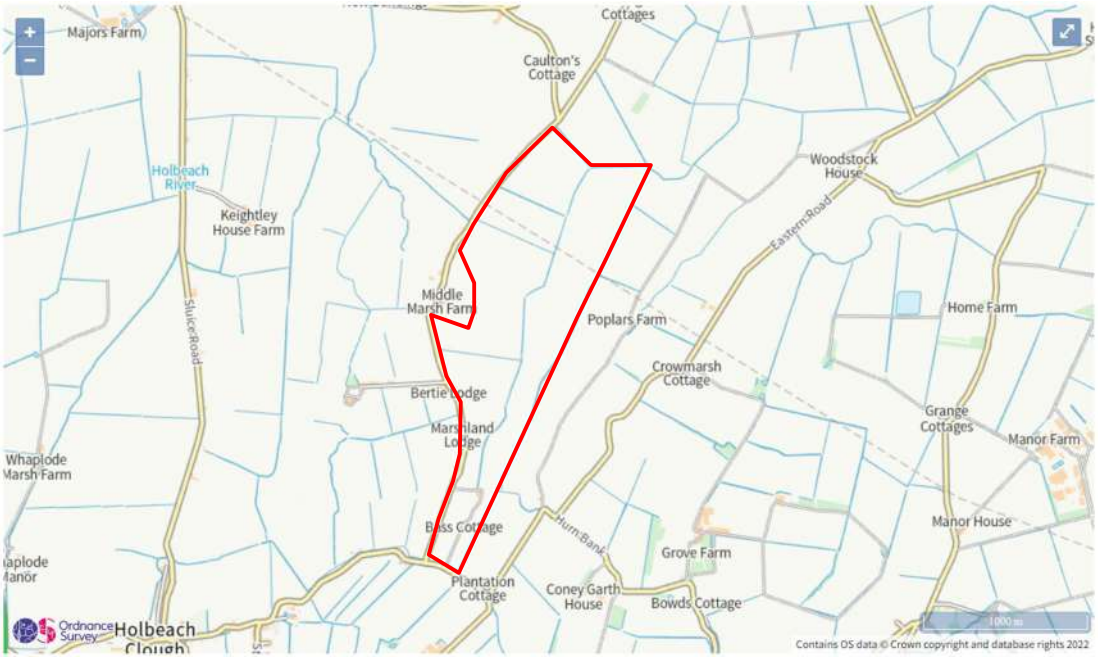


Figure 15: Environment Agency Reservoir Flood Risk Map

Design Mitigation – Loss of Flood Water Storage/Flood Flow Impedance

4.27 Consideration must be given to the potential displacement of floodwater caused by development of the new solar farm. Due to there being no "actual" risk of flooding to the site from fluvial or tidal sources, the displacement of floodwater as a result of the development is not considered to be an issue.

Design Mitigation – Access, Egress and Evacuation

4.28 As flooding of the site may occur over the lifetime of the development, it is necessary for access, egress, and evacuation to be considered as part of the proposed solar development. The "actual" flood risk, with regard for infrastructure and defences, is very predictable, therefore evacuation of the site well in advance of its inundation is viable. "Residual" flood

risk, associated with breaching may be less predictable. However, a 5km distance to the tidal defence line means the site will not lie within a Rapid Inundation Zone. Flooding of the site from non-tidal sources would be more finite and unlikely to result in substantial depths or velocities of floodwater.

4.29 The Environment Agency provides a flood warning service in England and Wales and supports the public in taking action to prepare and respond when these warnings are issued. The warnings are provided for flooding from rivers and the sea, but not for localised flash flooding and blocked or overloaded sewers or groundwater flooding.

4.30 Warnings are issued through the media, on TV and radio weather bulletins and on its website (https://check-for-flooding.service.gov.uk/). In areas of particular risk, the Environment Agency can send a warning message directly to people at home or at work by telephone, mobile, email, SMS text message, fax or pager using an Automatic Voice Messaging (AVM) system. The EA's Floodline (0345 988 1188) service for England and Wales carries recorded information on flood warnings in force anywhere in England and Wales. The information is regularly updated and is available 24 hours a day.

4.31 The proposed development site lies within the 'Far extent of Tidal Flooding from the Wash and Tidal Estuaries'. These flood warning systems are indicative of present-day tidal and fluvial flood risk to the area. The flood warning area will, over time, be appropriately extended to reflect increased flood risk attributable to climate change.

4.32 Public flood warnings are issued on local TV, including BBC Look North and BBC Radio Lincolnshire. Flood warnings can also be disseminated to individuals within the high flood risk area. The Environment Agency's early warning Flood Warning System is divided into three categories, depending on the stage of flooding and the predicted severity of flooding:

	**What it means** • Flooding is possible. Be prepared. **When it's used** • Two hours to two days in advance of flooding. **What to do** • Be prepared to act on your flood plan. • Prepare a flood kit of essential items. • Monitor local water levels and the flood forecast on our website.
	**What it means** • Flooding is expected. Immediate action required. **When it's used** • Half an hour to one day in advance of flooding. **What to do** • Move family, pets and valuables to a safe place. • Turn off gas, electricity and water supplies if safe to do so. • Put flood protection equipment in place.
	**What it means** • Severe flooding. Danger to life. **When it's used** • When flooding poses a significant threat to life. **What to do** • Stay in a safe place with a means of escape. • Be ready should you need to evacuate from your home. • Co-operate with the emergency services. • Call 999 if you are in immediate danger.

Figure 15: Stages of Flood Warning Service

4.33 A flood warning or severe flood warning issued by the Environment Agency should be used as a stimulus for evacuation of maintenance staff (on the infrequent occasions that they are on-site) to a known area of Flood Zone 1. This area is likely to be a company address or home residence that may not be defined at this planning stage. Evacuation should be via main roads that are typically elevated above the floodplain where they intersect the low-lying fenland.

Design Mitigation – Flood Resistant and Resilient Design

4.34 This report concludes earlier in this chapter that two design flood depths relate to the proposed solar farm development:

- The actual risk flood depth associated with overtopping of flood defences by a 0.5% AEP flood event 2115 climate change scenario; this flood extent does not include the site.
- The residual risk flood depth associated with breaching of flood defences by a 0.5% AEP flood event 2115 climate change scenario; this flood extent broadly corresponds to a maximum depth of water of up to 1.0m.

Solar Panels

4.35 The soffit level of the proposed solar panels would be no lower than 0.8m above ground level with the minimum soffit level. It is noted that panels are entirely watertight, as proven by their IP67 testing, and these would be unaffected by immersion in floodwater should it occur in a 0.5% AEP defence breach event. The lowest vulnerable point of the fixture is the panel junction box which should be set at least 1.3m above ground level. This is sufficient to elevate this fixture above the 0.5% AEP defence overtopping and defence breach design flood depths with a suitable freeboard allowance of 300mm to account for uncertainties in modelling.

Buildings, Substation and Inverters

4.36 Due to the prefabricated nature of the proposed inverter buildings on the site, no specialist flood-resistant or resilient measures shall be incorporated into their structures. Where possible, sensitive equipment contained within the inverter buildings should be positioned at least 1.3m above surrounding external ground level, either through the provision of internal structural racking or through an external plinth to elevate the building a suitable depth above the surrounding ground level. Should inverter buildings be elevated, this should be to no more than 0.6m above surrounding ground level, which is considered the maximum, practical design threshold for safe access.

4.37 The substation and surrounding buildings are most sensitive to flooding. As such, it is recommended that a watertight barrier is constructed around the substation sompound, including the immediately surrounding buildings. The barrier may take the form of a structural flood defence embankment or a structural flood defence wall. The crest level of the barrier should be no lower than 1.3m above surrounding ground level to defend this area from a 0.5% AEP tidal defence breach (based on 2115). This level of defence within the area of the

substation compound will also provide protection against a 0.1% AEP tidal defence breach (based on 2115).

4.38 The flood defence barrier should also be fitted with a watertight gated access, suitable for accommodating the proposed maintenance vehicles, which must be kept in the closed and locked position when not required for access.

4.39 The proposal to include a flood defence barrier to this area will also provide an area of safe refuge in the event of a tidal flood defence breach during scheduled or emergency maintenance activities.

Ground Levels

4.40 The topography of the post-development site should not be significantly altered in comparison to the pre-development situation. Any excavated material from cable laying and access road construction spread evenly to prevent the creation of bunds or channels, which will reduce the effects on the natural hydrology of the landscape.

5.0 Climate Change

5.1 Allowances for the flood risk related impacts of climate change are determined from the site's location based on NPPG, which references Environment Agency guidance and UK climate change projections. Due to the relatively close proximity and minor elevation difference separating the site from the sea, increased sea level rise allowances will have an impact on the proposed development. The predicted increase in sea level rise is discussed in the previous section.

5.2 The range of increases in peak rainfall intensity applicable to the proposed development is summarised in **Table 3** below.

Table 3: Climate change allowances

Development type and allowance lifetime:	Energy Generation	35 years (2050s – 2040 to 2069)
Allowance	**Category**	**Total potential change anticipated**
Peak rainfall intensity	Upper end	40%
	Central	20%

5.3 Planning practice guidance recommends that flood risk assessments consider the Upper End and Central estimates of peak rainfall intensity changes.

5.4 The development is proposed to be a temporary installation over a period of 35 years and then dismantled, with the field being returned to agricultural use. As such, a 40% factor for climate change uplift has been adopted for peak rainfall intensity.

6.0 Surface Water Drainage Strategy

Guiding Principles

6.1 In accordance with Local and National Planning Policy, requirements for the sustainable management of surface water from new development is a fundamental area for consideration within any planning application, achieved through the use of Sustainable Drainage Systems (SuDS). Current best practice, CIRIA's SuDS Manual (C753) and the Non-Statutory Technical Standards for SuDS, highlights that the main principle behind SuDS is to replicate natural drainage wherever possible. This can be achieved by increasing infiltration, attenuating water runoff and reducing the rate and volume of surface water flows. SuDS also provide opportunities to use rainwater as a resource, improve water quality by removing sediment and pollutants throughout the system prior to discharge, and enhance amenity and biodiversity value in the form of attractive natural systems. The SuDS strategy prioritises interventions as close as possible to the source, as follows:

1. Prevention – prevent rainwater runoff and pollution
2. Source control – capture and use rainwater close to where it falls
3. Site control – manage surface water on site
4. Regional control – manage water from a number of areas in a single location

6.2 As part of the identification and development of options for final discharge, the sustainable drainage hierarchy is followed. This helps to avoid impacts on and, in some cases, alleviate flooding downstream by promoting the discharge of surface water to the most suitable receptor. Surface water discharge options are assessed in the following order of preference:

1. Infiltration into the ground
2. Outfall to watercourse or river
3. Connection to surface water sewer
4. Connection to combined sewer

6.3 Whichever discharge option is ultimately selected, the incorporation of infiltration, treatment, gradual conveyance and flow control throughout the SuDS strategy provides the most efficient and effective approach.

6.4 The overriding principle of the surface water drainage strategy is to manage surface water runoff so as not to increase the rate or volume of surface water runoff in design storm events. Design storm events for this scheme range from 1 in 1 year up to 1 in 100 year + 40% climate change allowance.

6.5 The proposed development will not materially remove ground cover from the site. The solar panels are proposed to be mounted on frames that would be driven into the ground with spiked ground anchors, screw piles or a similar anchorage. The associated infrastructure will be comprised of cabins with a modest roof area and permeable access roads. As such, there is a very limited increase in the impermeable area on the site as a result of the development.

6.6 A 2013 study of the impact on surface water runoff volume as a result of solar panels on a greenfield site found that the post-development runoff volume increased by only 0.35%[1].

6.7 Surface water runoff from the solar panels is more concentrated than natural rainfall on greenfield land, which can lead to erosion of the soil beneath the lower edge of the solar panel arrays. Left unchecked, erosion can lead to channelised flows, increasing the rate and volume of surface water runoff leaving the site.

6.8 Site-specific sustainable drainage systems (SuDS) should be used to reduce the risk of flooding to the site and the wider downstream catchment as a result of rainfall.

SuDS Proposals

6.9 To mitigate against increased surface water flows leaving the site, SuDS should be provided on this site in the form of the following:

- Maintaining long vegetation in areas between solar arrays to minimise surface water channelising;
- Vegetated filter strips beneath the drip line of the solar arrays to reduce runoff velocity and encourage shallow infiltration, evapotranspiration and uptake by vegetation;
- Permeable surfacing along access tracks, using graded granular material to enable shallow infiltration and storage of excess runoff;
- Filter drains around the perimeter of buildings to enable shallow infiltration and storage of excess runoff;
- An enforceable land management and landscape maintenance plan to maintain good shallow soil drainage characteristics.

6.10 Beneath the drip line of the solar panel arrays, vegetation should remain, which will act as a filter strip to reduce runoff velocity, prevent channelising of the natural ground and encourage

[1] Hydrological Response of Solar Farms, Lauren M. Cook, S.M.ASCE$_1$; and Richard H. McCuen, M.ASCE$_2$

vegetation uptake of runoff and evapotranspiration. No formal drainage infrastructure will be required in these areas as runoff is intended to infiltrate into the natural soil.

6.11 To assist with the management of vegetation and ensure that it doesn't grow to a length that obscures the solar arrays, small livestock, such as sheep, chickens and geese, can be sustainably grazed within the fields, providing placement of solar panels a minimum of 700mm above ground levels to avoid damage to the panels. Additionally, all cabling and below-ground infrastructure should be suitably protected to prevent damage from livestock.

6.12 Access tracks should be surfaced in a permeable, nominally sized aggregate to promote interception and detention of runoff, reduction of runoff velocity and shallow infiltration into natural soils. No below ground drainage will be required for access tracks, although a permeable geotextile membrane will be required to the base and sides of the access track foundations to prevent the ingress of fine particles, which would otherwise reduce storage and infiltration capacity.

6.13 Immediately adjacent to the perimeter of the small buildings used to house electrical infrastructure, filter drain trenches should be used. These should be placed below the drip line of the buildings to intercept and detain runoff prior to shallow infiltration into natural soils. The filter drain trenches are not proposed to contain any pipework and would purely consist of nominally sized filter drain material and a permeable geotextile membrane to prevent the ingress of fine particles, which would otherwise reduce storage and infiltration capacity. The buildings should be located with a floor level at least 150mm above surrounding ground level to prevent surface water runoff entering through thresholds.

6.14 During construction, there is a risk of over-compaction of shallow depths of natural soil. In turn, this can lead to reduced infiltration capacity of shallow soils and increased runoff rates and volume leaving the site. To mitigate against this, the following methods can be used and should be agreed through a construction management plan:

- Using track mats for spreading the load of heavy plant, reducing soil compaction;
- Chisel ploughing soils between solar arrays to mitigate soil compaction during construction;
- Regular inspections to ensure vegetation is managed and bare and compacted ground conditions aren't experienced.

Exceedance Flows

6.15 In the event that the drainage system is inundated by a storm of greater magnitude than the design rainfall or a blockage occurs within the system, the capacity of the system could be exceeded. The uncertainties posed by climate change place further importance on this aspect of the design. Routes for exceedance flows are ultimately determined by the site layout and levels, particularly features such as road gradients, channels or slopes.

6.16 Site levels are not proposed to be materially altered; thus, exceedance flows will be conveyed off of the site through marginal ditches, in the same manner as the undeveloped situation. In all instances, post-development exceedance flows will follow the natural flow paths from the current undeveloped site.

Water Quality

6.17 The proposed SuDS will provide treatment for potential runoff pollutants prior to discharge. The level of treatment required is dependent on the pollution hazard level of the development and the sensitivity of the receiving waters. The site's location outside of any source protection zones does not require any particular water quality treatment measures.

6.18 The water quality treatment criteria have been determined based on the CIRIA SuDS Manual. The appraisal of the site's characteristics and relevant SuDS components is presented below, demonstrating that the hazard indices have been met by the proposed mitigation indices.

Minimum water quality management requirements for discharges to receiving surface waters and groundwater (SuDS Manual, 2015, Table 4.3)

Land use	**Pollution hazard level**	**Requirement for discharge to surface waters and groundwater**
Residential roofs (used as a proxy for solar PV arrays and associated buildings)	Very low	Removal of gross solids and sediments only
General access roads	Low	Simple index approach

Steps in the simple index approach (SuDS Manual, 2015, Box 26.2):

1. *Allocate suitable pollution hazard indices for the proposed land use*
2. *Select SuDS with a total pollution mitigation index that equals or exceeds the pollution hazard index*
3. *Where the discharge is to protected surface waters or groundwater, consider the need for a more precautionary approach*

Pollution hazard indices for different land use classifications (SuDS Manual, 2015, Table 4.3)

Land use	**Pollution hazard level**	**Total suspended solids TSS**	**Metals**	**Hydrocarbons**
Residential roofs	Very low	0.2	0.2	0.05
General access roads	Low	0.5	0.4	0.4

Indicative SuDS mitigation indices for discharges to surface waters (SuDS Manual, 2015, Table 26.3)

Type of SuDS component	**TSS**	**Metals**	**Hydrocarbons**
Filter strip	0.4	0.4	0.5
Filter drain	0.4	0.4	0.4
Permeable pavement	0.7	0.6	0.7

Indicative SuDS mitigation indices for discharges to groundwater (SuDS Manual, 2015, Table 26.4)

Characteristics of the material overlying the proposed infiltration surface, through which the runoff percolates	**TSS**	**Metals**	**Hydrocarbons**
A layer of dense vegetation underlain by a soil with good contaminant attenuation potential of at least 300 mm in depth (i.e. existing soils below partial infiltration SuDS features)	0.6	0.5	0.6

Maintenance Plan

6.19 It is prudent as part of the planning application to consider the future maintenance and operation of SuDS, including the continued realisation of any non-drainage related benefits such as visual amenity, habitat and biodiversity. This section outlines the maintenance arrangements and the requirements for key SuDS components.

Management Arrangements

6.20 **Developer Maintenance**; because the proposal is for a solar farm, it is most likely that the developer/site owner will be in a position to undertake maintenance of SuDS in perpetuity.

6.21 **Service Management Companies;** Responsibility for maintenance of drainage systems could be subcontracted and included within the responsibilities of a service management company. The Local Authority would require details of how this future maintenance is to be funded and undertaken.

Key Component Requirements

6.22 To ensure that SuDS components operate efficiently over the lifetime of the development it is fundamental that routine maintenance duties are undertaken. The areas of the site drainage system which require regular maintenance are those where silt and debris accumulate, limiting the storage or conveyance function of individual components, which in turn exacerbates the probability of drainage system failure. Regular maintenance requirements broadly relate to the following components:

- Filter strips and filter drains
- Permeable paving

6.23 The provision of the final maintenance schedule will, in the first instance, be reliant on the type of SuDS ultimately incorporated into the scheme and, subsequently matters such as a legal agreement for maintenance funding in perpetuity. While the provision of a detailed SuDS management/maintenance schedule should be secured through planning condition, a typical example is outlined below (including **Table 4** and **Table 5**) for each of the key components. Ultimately, the developer is responsible for ensuring that full instructions for maintenance, along with the details of any parts that may need to be replaced, are provided to the appropriate person(s).

Table 4: Filter Strip and Filter Drain Maintenance Requirements

Maintenance Schedule	Required Action	Typical frequency
Regular Maintenance	Litter and debris removal	Monthly or as required
	Cut grass – to retain grass height with specified	As required
	Manage other vegetation and remove nuisance plants	Monthly (at start, then half-yearly)
	Inspect filter strip surface to identify evidence of erosion, poor vegetation growth, compaction, ponding, sedimentation and contamination	Monthly (at start, then half-yearly)
	Inspect filter drain surface for blockages, clogging, standing water and structural damage	Monthly (at start, then half-yearly)
Occasional Maintenance	Reseed areas of poor vegetation growth; alter plant types to better suit conditions, if required.	As required or if bare soil is exposed over >10% of the filter strip area
Remedial Actions	Repair erosion or other damage by re-turfing or reseeding	As required
	Scarify and spike topsoil layer to improve infiltration performance, break up silt deposits and prevent compaction of the soil surface	As required

Table 5: Permeable Access Track Maintenance Requirements

Type	Required Action	Typical frequency
Occasional Maintenance	Stabilise and mow contributing and adjacent areas	As required
	Removal of weeds	As required
Remedial Actions	Remedial work to any depressions and rutting considered detrimental to the structural performance or hazard to users	As required

7.0 Conclusion

7.1 A solar farm development is proposed on the 80ha undeveloped site located in a rural setting surrounded by farmland lying approximately 2.5km north of the settlement of Holbeach. The proposed development is within Flood Zone 3, the high fluvial and tidal flood risk area. Following an appraisal of topographic and geological records and additional flood mapping resources, the development site is considered to have a low risk of flooding from surface water, sewers, groundwater and reservoirs. The proposed development is classified as 'essential infrastructure', and is therefore appropriate within Flood Zone 3.

7.2 The SHIDB adopted ordinary watercourse, N04 Lawyers, runs south to north centrally through the site and requires a 9m buffer zone to either side of the top of the bank to ensure that the watercourse can be maintained by the IDB. The SHIDB Byelaws should be adhered to unless prior consent is obtained from SHIDB.

7.3 All other watercourses within the site should be provided with a minimum buffer zone of 3m to either side of the top of the bank to ensure that the watercourse can be maintained by the landowner.

7.4 The predominant risk of flooding on the site is tidal flooding. Environment Agency flood mapping resources demonstrate that the site lies outside of the extents of flooding from a 0.5% AEP tidal defence overtopping scenario under both 2006 and 2115 modelling parameters. These scenarios represent an actual risk of flooding to the site. No measures are required in the design or operation of the development to mitigate against flooding from these scenarios.

7.5 Environment Agency flood mapping resources also demonstrate that the site lies outside the extents of flooding from a 0.5% AEP tidal defence breaching scenario (failure of tidal defences) under 2006 modelling parameters. However, Environment Agency flood mapping resources demonstrate that the site lies within the extents of flooding from a 0.5% AEP tidal defence breaching scenario under 2115 modelling parameters, which includes the effects of climate change. These scenarios represent a residual risk of flooding to the site.

7.6 Although the development lifetime is not expected to be beyond 35 years and, therefore, not expected to be exposed to the latter scenario, a risk-averse based approach has been taken with regard to mitigation of the risks of flooding in the design of the development.

7.7 It is recommended that an emergency evacuation plan is prepared for the development to safeguard operational staff in the event of a flood warning or a flood event as a result of a breach of tidal flood defences.

7.8 Above ground electrically sensitive components of the development in areas outside of the substation compound are recommended to be placed at a minimum of 1.3m above surrounding ground level to provide protection to these components in the event of a tidal defence breach.

7.9 The soffit level of the proposed solar panels would be no lower than 0.8m above ground level with the minimum soffit level. The panels are entirely watertight, as proven by their IP67 testing, and these would be unaffected by immersion in floodwater should it occur in a 0.5% AEP defence breach event. The lowest vulnerable point of the fixture is the panel junction box which should be set at least 1.3m above ground level. This is sufficient to elevate this fixture above the 0.5% AEP defence overtopping and defence breach design flood depths with a suitable freeboard allowance of 300mm to account for uncertainties in modelling.

7.10 Due to the prefabricated nature of the proposed inverter buildings on the site, no specialist flood-resistant or resilient measures shall be incorporated into their structures. Where possible, sensitive equipment contained within the inverter buildings should be positioned at least 1.3m above surrounding external ground level, either through the provision of internal structural racking or through an external plinth to elevate the building a suitable depth above the surrounding ground level. Should inverter buildings be elevated, this should be to no more than 0.6m above surrounding ground level, which is considered the maximum, practical design threshold for safe access.

7.11 The substation and surrounding buildings are most sensitive to flooding. As such, it is recommended that a watertight barrier is constructed around the substation sompound, including the immediately surrounding buildings. The barrier may take the form of a structural flood defence embankment or a structural flood defence wall. The crest level of the barrier should be no lower than 1.3m above surrounding ground level to defend this area from a 0.5% AEP tidal defence breach (based on 2115). This level of defence within the area of the substation compound will also provide protection against a 0.1% AEP tidal defence breach (based on 2115).

7.12 The flood defence barrier should also be fitted with a watertight gated access, suitable for accommodating the proposed maintenance vehicles, which must be kept in the closed and locked position when not required for access.

7.13 The proposed SuDS strategy favours runoff interception and storage as close to the source as possible. The geology indicates that low permeability soils with a naturally shallow watertable are likely to be present on the site. Unchecked, the development proposals would result in a relatively small increase in runoff volume and runoff rate in all design storm events, and this is proposed to be mitigated through the use of filter strips, filter drains and permeable surfacing to access tracks.

7.14 The proposals will not result in an increase to flood risk on or off of the site and planning apapproval should not be withheld with regard to flood risk.

APPENDIX A

TOPOGRAPHIC SURVEY

The scaling of this drawing cannot be assured.

This drawing is based on dimensional survey information provided by others. Clendon Architecture cannot accept responsibility for the accuracy of this information.

All dimensions shown are in metric.

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Revision	Description	Date	Drawn	Checked
A	Application Boundary Amended	03.02.22	AS	-
B	Application Boundary Amended	14.02.22	AS	-
C	Application Boundary Amended	22.08.22	VB	-

Planning Application Boundary

OS Topographic Data

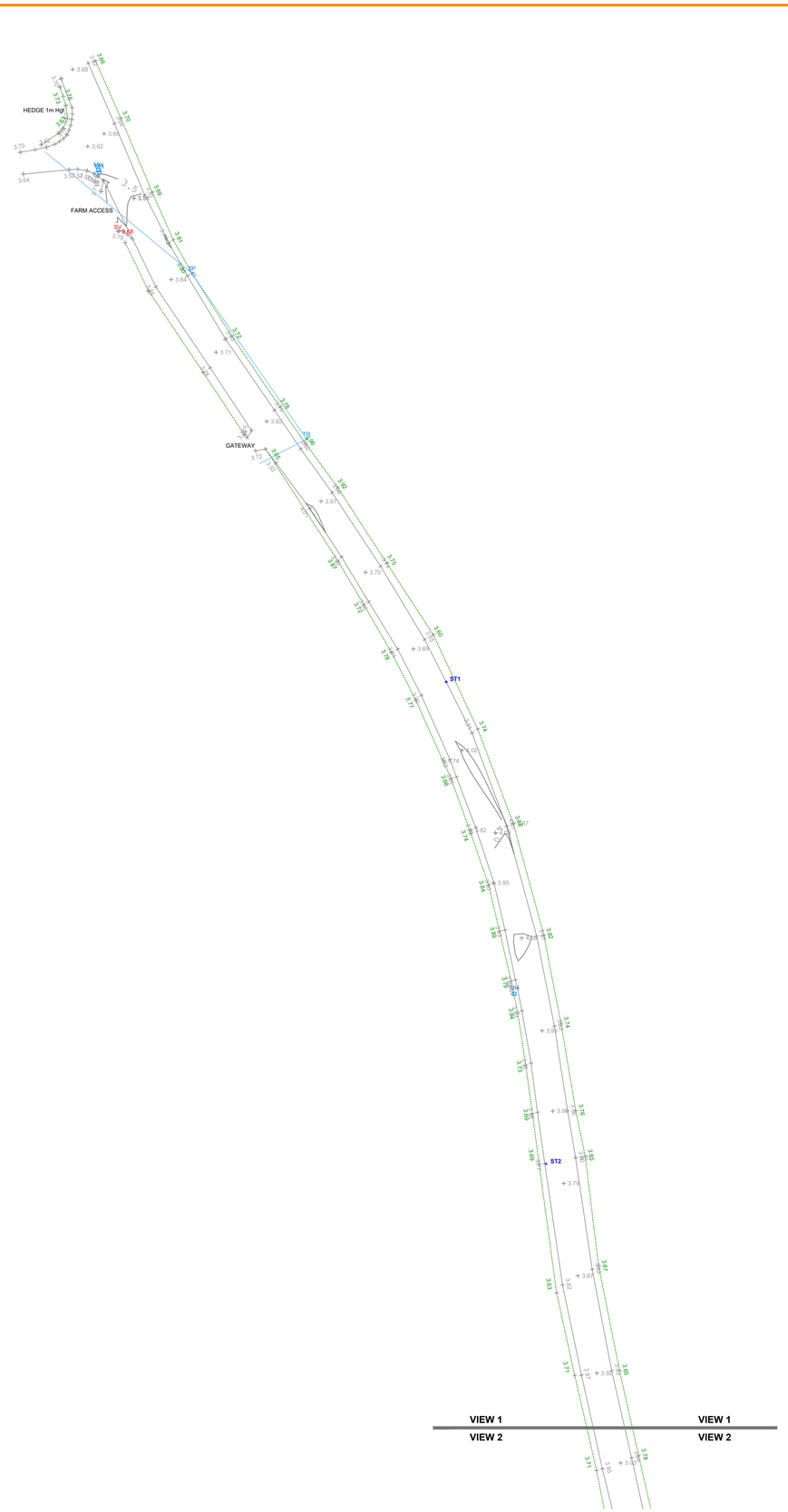
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Drawing Title
Existing Site Plan

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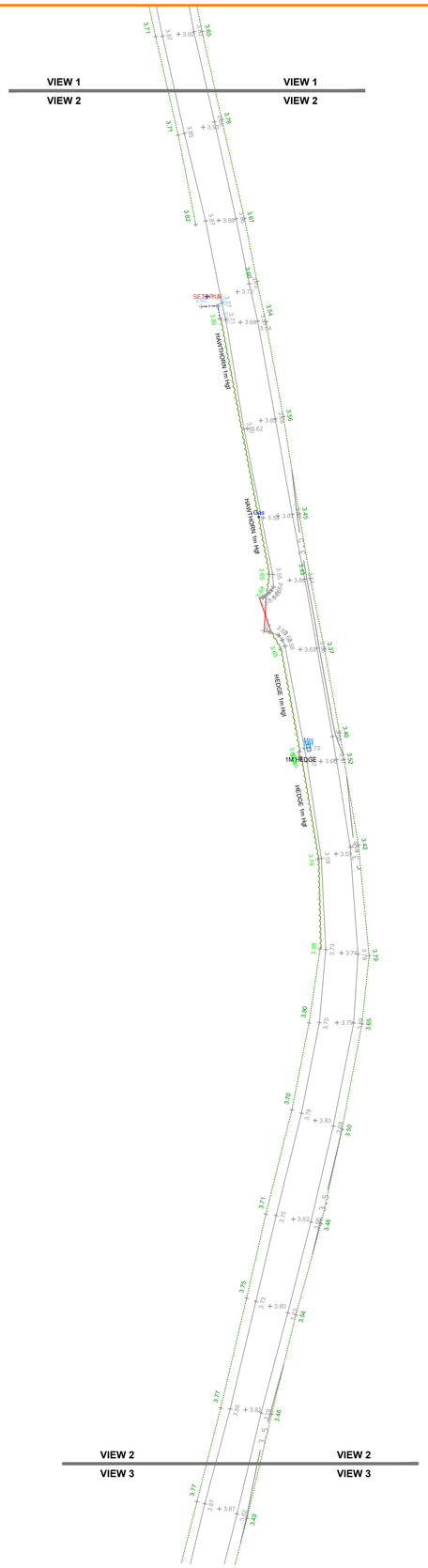
• Master Planning & Urban Design
• Architecture • Building Control
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EXISTING SITE PLAN

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VIEW 1



VIEW 2

Notes

1. Do not scale this drawing. All dimensions must be checked/ verified on site. If in doubt ask.
2. This drawing is to be read in conjunction with all relevant architects, engineers and specialists drawings and specifications.
3. All dimensions in metres unless noted otherwise. All levels in metres unless noted otherwise.
4. Any discrepancies noted on site are to be reported to the engineer immediately.
5. No scale factor has been applied to this survey, therefore the os coordinates are to be treated as arbitrary. Please refer to survey station information below for on site control establishment.
6. All coordinates and height data relate to OSGB36(15). Control stations are coordinated by means of GPS receiving real time corrections via OS smart net.
7. All manhole data is collected from ground level therefore discrepancies may occur. More accurate data is only achievable via confined space entry.

ABBREVIATIONS (Land & Utilities)

AR	ASSUMED ROUTE	KO	KERB OUTLET	SIL	SIGNAL LOST
AV	AIR VALVE	Lby	LIFEBOUY	SP	SIGN POST
BB	BELISHA BEACON	Lck	LOCK GATE	SPil	SHEET PILING
BD	BACKDROP	Ldr	LADDER	Spr	SPRING
Bdl	BED LEVEL	LH	LAMP HOLE	SPt	SAMPLING POINT
BH	BOREHOLE	LP	LAMP POST	ST	STOP TAP
BHch	BASEMENT HATCH COVER	LV	LOW VOLTAGE	Sti	STILE
Bin	LITTER / GRIT SALT BIN	MgP	MOORING POST	Stl	STRUCTURE TOP LEVEL
BL	BASEMENT LIGHT	mH	METERS HIGH	Stp	STUMP (TREE)
Bol	BOLLARD	Mhcy	MACHINERY	StP	STAND PIPE
BP	BOUNDARY POST	MH	MANHOLE	StPo	STAY POST
BS	BUS STOP	Mkr	MARKER POST	StW	STAY WIRE
BTIC	BRITISH TELECOM CHAMBER	MkrE	MARKER POST (ELECTRIC)	SV	STOP VALVE
CatL	CATENARY LEVEL	MkrG	MARKER POST (GAS)	SVP	SOIL VENT PIPE
CATV	CABLE TV COVER	MkrR	MARKER POST (RAILWAY)	TBM	TEMPORARY BENCH MARK
CB	CONTROL BOX	MkrT	MARKER POST (TELECOM)	TCB	TELEPHONE CALL BOX
CBt	CONVEYOR BELT	MkrW	MARKER POST (WATER)	TEL	TELECOM CHAMBER COVER
CC	COAL CHUTE	MP	MILE POST	TFR	TAKEN FROM RECORDS
CG	CATTLE GRID	MS	MILE STONE	Thl	THRESHOLD LEVEL
ChL	CHANNEL LEVEL	NL	NOT LOCATED	TL	TRAFFIC LIGHT
Chy	CHIMNEY	NP	NAME PLATE	TP	TELEGRAPH POLE
CI	CAST IRON	OSA	OUTSIDE SURVEY AREA	Tpt	TRIAL PIT
CJB	CABLE JOINT/JUNCTION BOX	OSBM	O.S BENCH MARK	Tr	TROUGH
CL	COVER LEVEL	OGP	OVERGROUND PIPE	UTF	UNABLE TO FIND
CO	CONCRETE	OHCu	O/H CABLE (UNIDENTIFIED)	UTGA	UNABLE TO GAIN ACCESS
CP	CABLE PIT	OHE	OVERHEAD CABLE (ELECTRIC)	UTL	UNABLE TO LIFT
CpL	COPING LEVEL	OHG	OVERHEAD GANTRY	UTR	UNABLE TO ROD
Cpsn	CAPSTAN	OHP	OVERHEAD PIPE	UTS	UNABLE TO SURVEY
Cpst	CAMERA POST	OHT	OVERHEAD CABLE (TELECOM)	UTT	UNABLE TO TRACE
CR	CABLE RISER	OP	OUTLET PIPE	VC	VITREOUS CLAY
CrL	CROWN LEVEL	P	POST	VP	VENT PIPE
CulP	CULVERT PIPE	Pb	PARK BENCH	VR	VAPOUR RECOVERY
CWM	CABLE WINDING MACHINERY	PB	POST BOX	VS	VENTILATION SHAFT
d	DEPTH	POug	PEDESTRIAN CROSSING	VW	VALVE / SLUICE WHEEL
Dia.	DIAMETER	PE	POLYETHALINE	WB	WEIGHBRIDGE
DS	DIRECTION SIGN	PF	PITCH FIBER	WL	WATER LEVEL
EIC	ELECTRIC INSPECTION COVER	Pl	PILE	WM	WATER METER
EoC	EDGE OF CANOPY	Pir	MOVEMENT DETECTOR	WO	WASH OUT VALVE
EOR	END OF RECORDS	Pmd	PLANT MOTOR DRIVE	Wr	WEIR
EOT	END OF TRACE	PP	PETROL / DIESEL PUMP	WrL	WEIR LEVEL
EP	ELECTRICITY POLE	PR	PIPE RISER	WrPl	WEIR PLATE (TOP)
ER	EARTH ROD	Psk	PENSTOCK	WWP	WASTE WATER PIPE
EShwr	EMERGENCY SHOWER	PU	PUMP		
ESP	ELECTRICITY SUPPLY POINT	PV	PIPE (VERTICAL)	FENCE TYPES:	
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GIP	GAS INLET PIPE	RS	ROAD SIGN	IWF	INTERWOVEN
GP	GUIDE POST	RSP	RAILWAY SIGNAL POST	PCF	POST & CHAIN
GPR	TRACED BY G.P.R	RWP	RAIN WATER PIPE	PIF	POST & IRON RAIL
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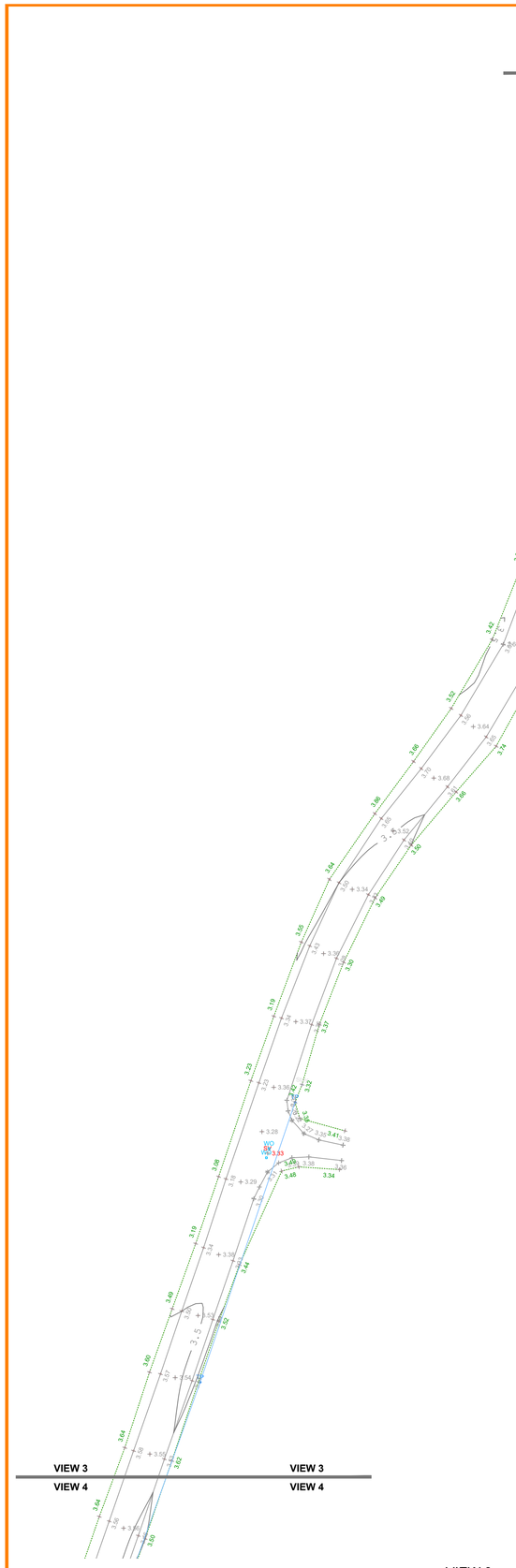
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VIEW 3



VIEW 4

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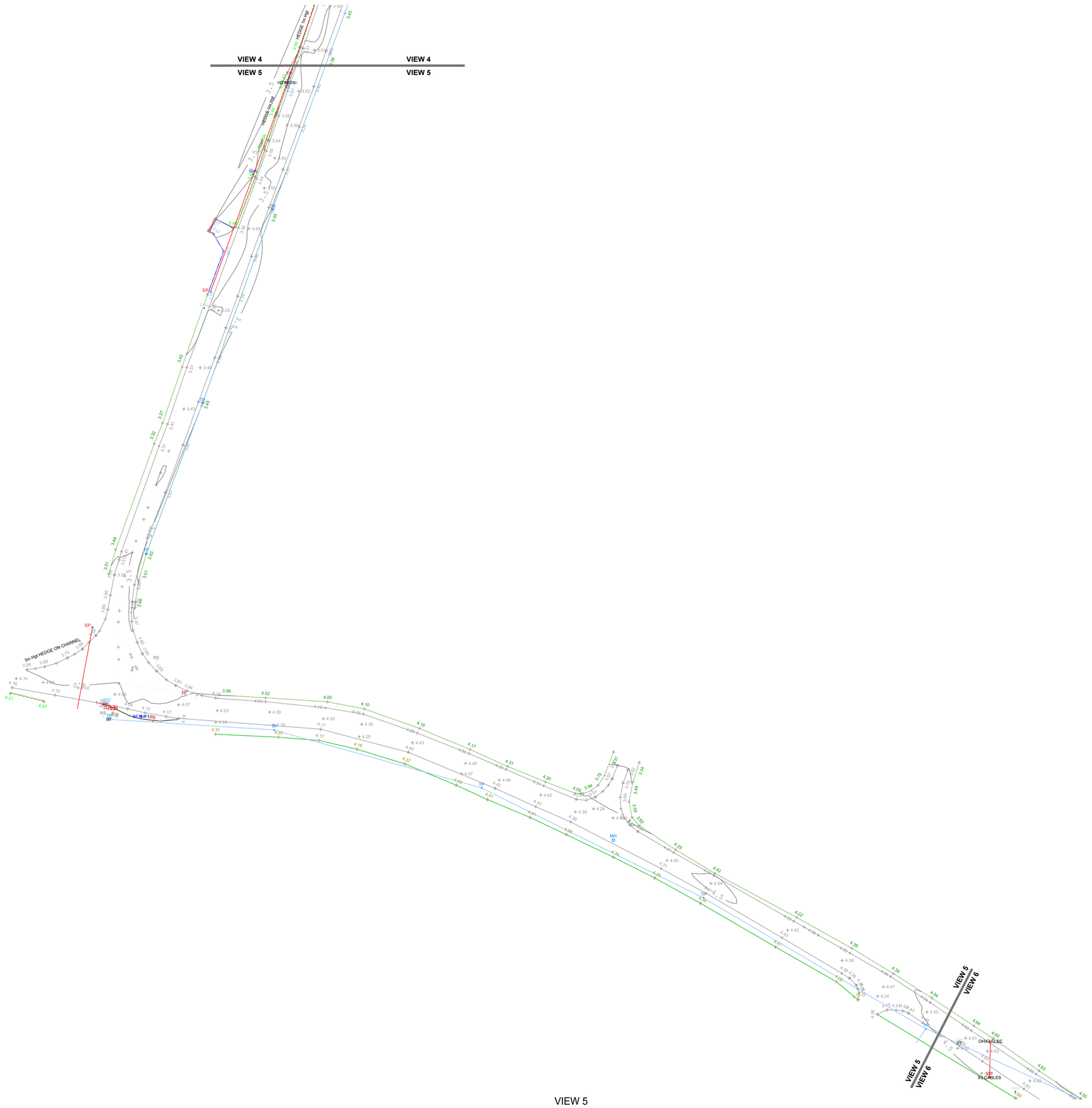
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VIEW 5

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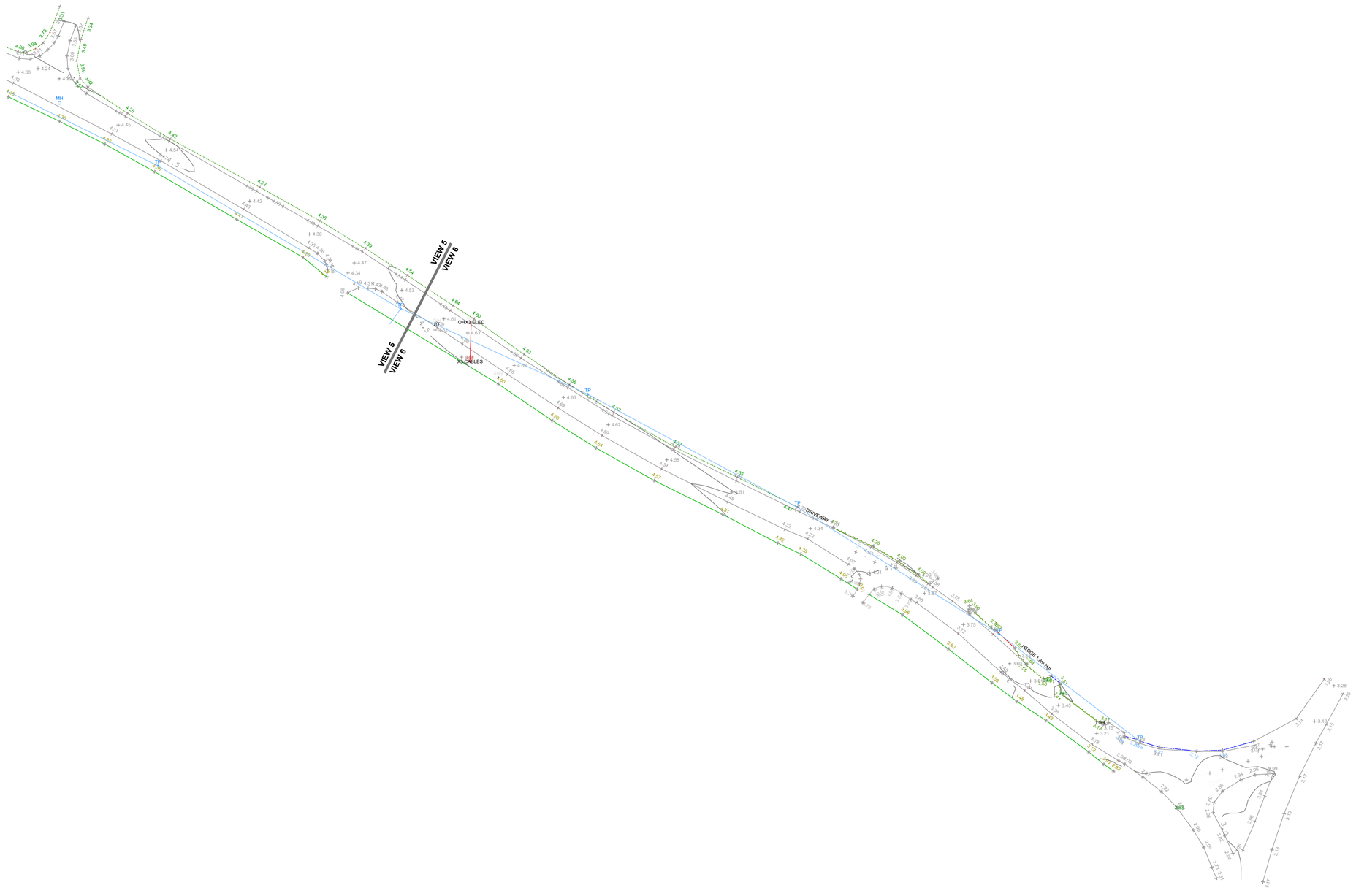
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VIEW 6

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Topographic Survey and Photography Locations

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S5005-BOS-001-4	Sheet No 4 of 4	Preliminary Survey

APPENDIX B

SOUTH HOLLAND INTERNAL DRAINAGE BOARD MAP

520000 530000 540000 550000

330000

320000

310000

River Welland

River Nene

Meters 3000 0 3000 6000

1:101787

EA MAIN RIVER

South Holland Drainage Board

LEGEND

- IDB Boundary
- IDB Ordinary Watercourse
- EA Main River

KEY MAP



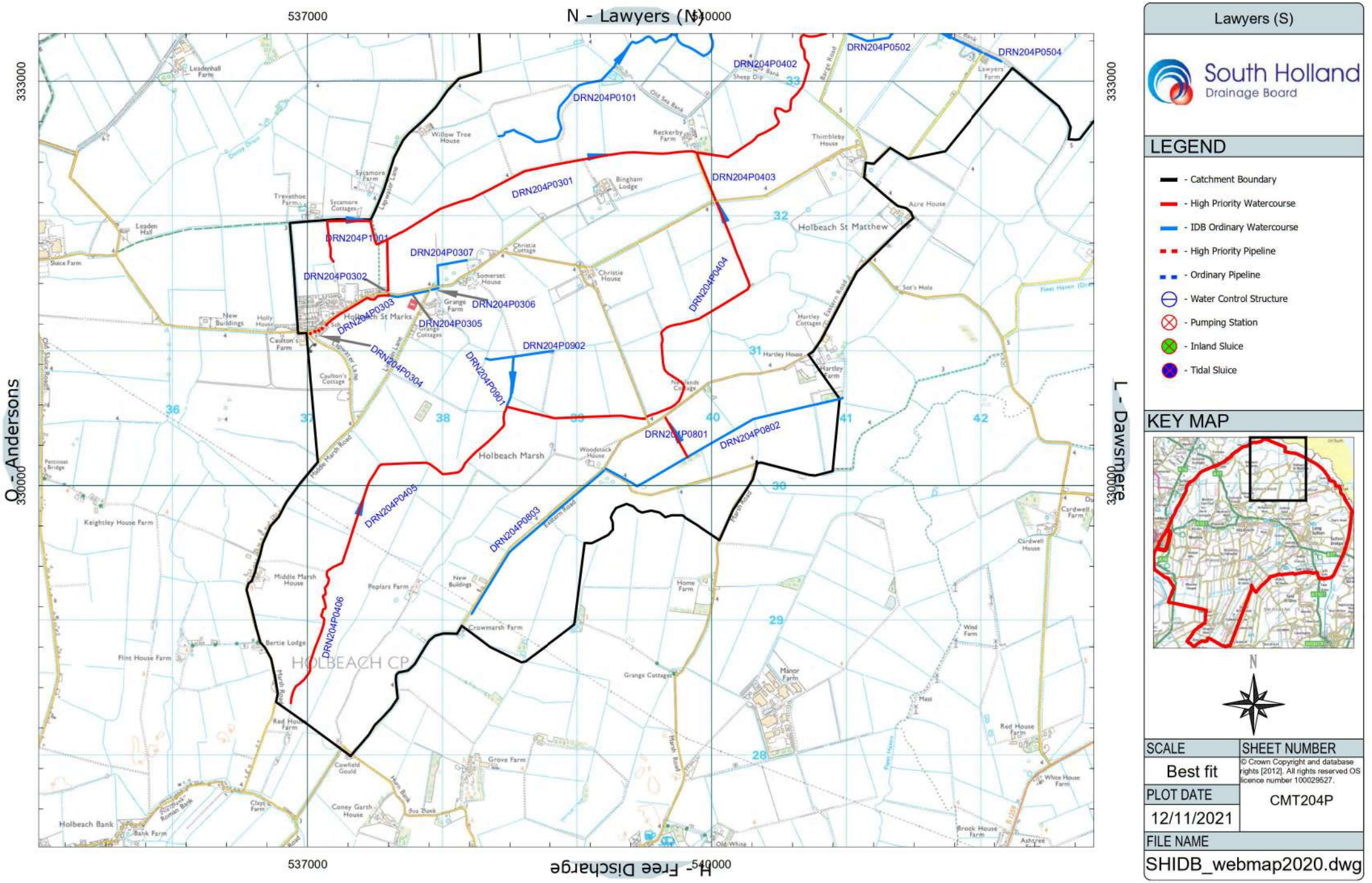
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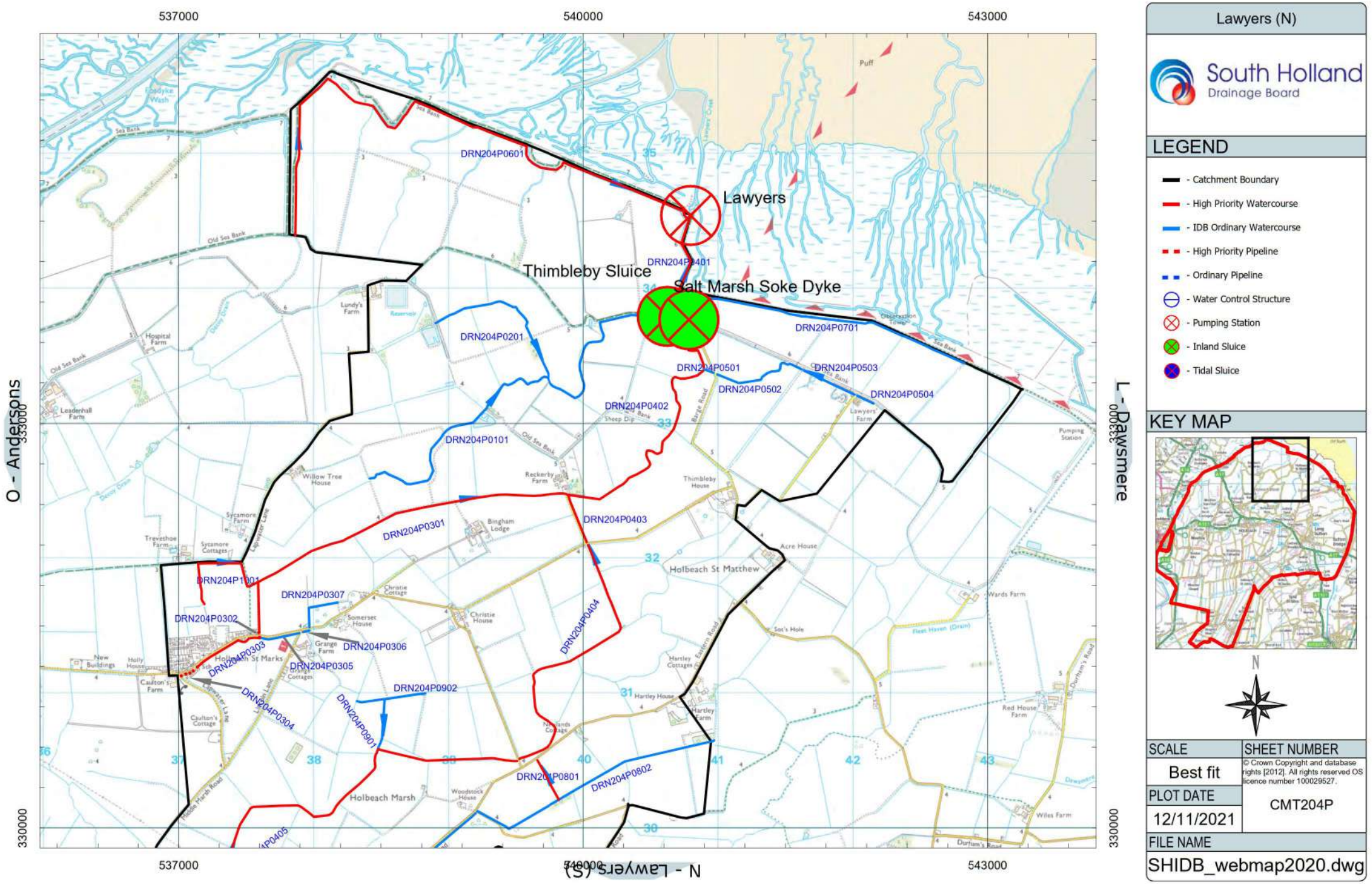
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FILE NAME

EAmainriver



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Lawyers (N)
South Holland Drainage Board
LEGEND
- Catchment Boundary
- High Priority Watercourse
- IDB Ordinary Watercourse
- High Priority Pipeline
- Ordinary Pipeline
- Water Control Structure
- Pumping Station
- Inland Sluice
- Tidal Sluice
KEY MAP
N
SCALE
Best fit
SHEET NUMBER
CMT204P
PLOT DATE
12/11/2021
FILE NAME
SHIDB_webmap2020.dwg
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537000
540000
543000
330000
O - Andersons
L - Dawsmere
N - Lawyers (S)
Lawyers
Thimbleby Sluice
Salt Marsh Soke Dyke
DRN204P0601
DRN204P0401
DRN204P0201
DRN204P0701
DRN204P0501
DRN204P0503
DRN204P0502
DRN204P0504
DRN204P0402
DRN204P0101
DRN204P0403
DRN204P0301
DRN204P1001
DRN204P0307
DRN204P0302
DRN204P0303
DRN204P0306
DRN204P0305
DRN204P0404
DRN204P0902
DRN204P0304
DRN204P0901
DRN204P0801
DRN204P0802
DRN204P0405
Holbeach St Matthew
Holbeach St Marks
Holbeach Marsh
Thimbleby
Reckerby Farm
Bingham Lodge
Sycamore Farm
Trevethoe Farm
Willow Tree House
Leadenhall Farm
Hospital Farm
Lundy's Farm
Grange Farm
Somersec House
Christie House
Christie Cottage
Acre House
Wards Farm
Red House Farm
Wiles Farm
Hartley Farm
Hartley House
Caulton's Farm
Caulton's Cottage
New Buildings
Holly House
Woodstock House
Lawyers' Farm
Pumping Station
Sot's Hole
Fleet Haven (Drain)
Barge Road
Eastern Road
Sea Bank
Old Sea Bank
Lawyers Drain
Lincoln Lane
Holbeach Marsh Road
Durham's Road
Puff
Eastdyke Wash

APPENDIX C

DEVELOPMENT PROPOSALS

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All dimensions shown are in metric.

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Revision	Description	Date	Drawn	Checked
A	Application Boundary Amended	03.02.22	AS	-
B	Application Boundary Amended	14.02.22	AS	-
C	Application Boundary Amended	22.08.22	VB	-
D	Flood Gate added	14.09.22	VB	-

- Planning Application Boundary
- Leaseholder Site Boundary
- Site Access
- PV Solar Panel Array
- DNO Sub-station & Grid Connection Point
- Proposed areas of tree and scrub planting
- Proposed hedgerows with hedgerow trees

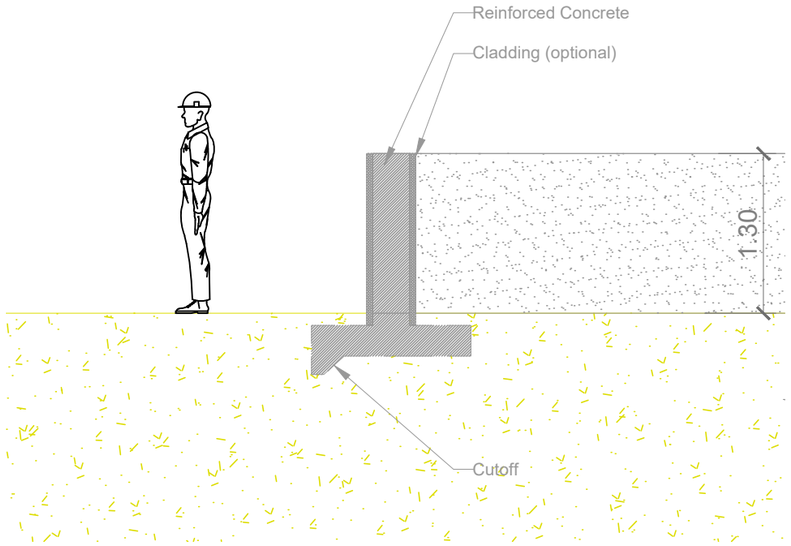
Client
AUK PE12 LIMITED
Project
Boston Solar
Holbeach Bank, Holbeach
Drawing Title
Proposed Site Layout

First Issue Date	Scale	Drawn by	Check by
17.01.2022	1:2500@A0	AS	VB
Project No		Status	Revision
CAL020821		-	D
Drawing No			
MP-04			

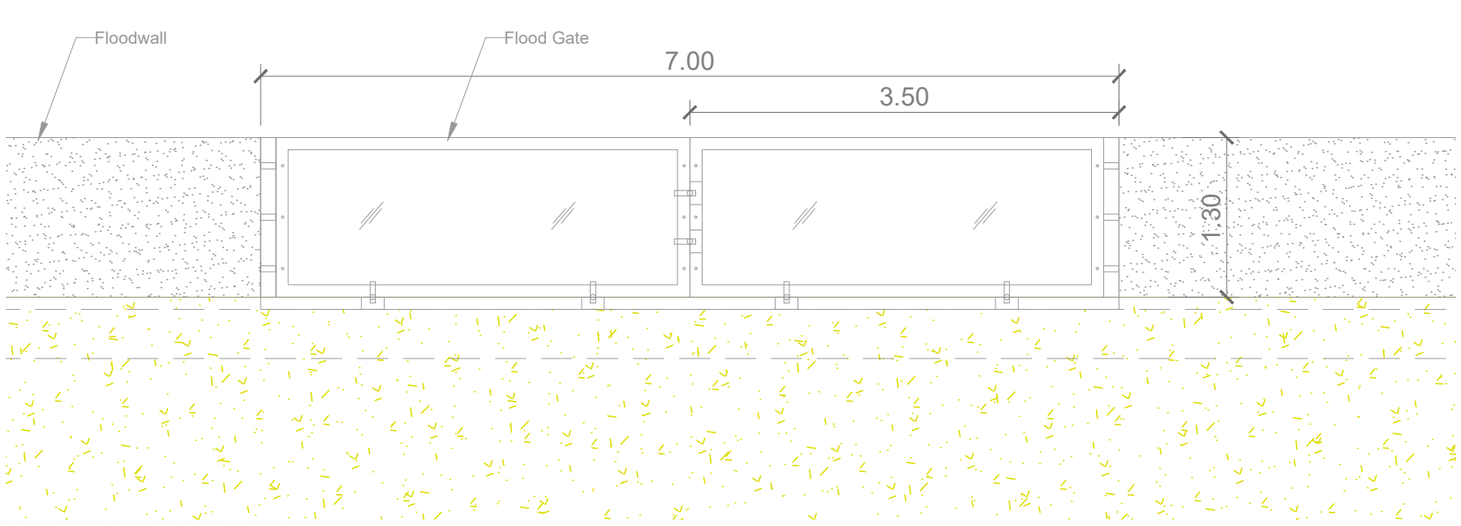
• Master Planning & Urban Design
• Architecture • Building Control
• Public Engagement • 3D Visuals
• Graphic Communication
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1 Bar Lane York YO1 6JU
01904 341408

PROPOSED SITE LAYOUT

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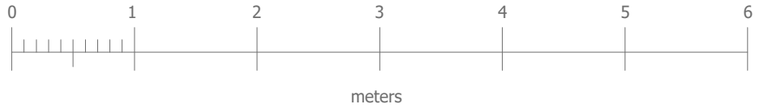


FLOODWALL TYPICAL SECTION 1:50



FLOODWALL TYPICAL ELEVATION 1:50

INDICATIVE FLOODWALL AND FLOOD GATE



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This drawing is based on dimensional survey information provided by others. Clendon Architecture cannot accept responsibility for the accuracy of this information.

All dimensions shown are in metric.

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Revision	Description	Date	Drawn	Checked
-	-	-	-	-

NOTE:
Flood defence wall and gate is to be designed to a specialist design following planning approval

Client
AUK PE12 LIMITED
Project
Boston Solar
Holbeach Bank, Holbeach
Drawing Title
Indicative Floodwall and Flood Gate

First Issue Date	Scale	Drawn by	Check by
14.09.22	1:50 @ A3	VB	TG
Project No		**Status**	**Revision**
CAL030821		-	-
Drawing No			
MP-08			

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• Architecture • Building Control
• Public Engagement • 3D Visuals
• Graphic Communication

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01904 341408

APPENDIX D

ENVIRONMENT AGENCY FLOOD RISK ASSESSMENT INFORMATION

matthew.freeman@floodriskuk.com

Our ref: CCN-2021-238223

Date: 03/11/2021

Dear Matt

Provision of Flood Risk Information for Site East of Middle Marsh Road, Holbeach.

Thank you for your request to use our flood risk information for the above site. The information is set out below and attached. It is important you read any contextual notes on the maps provided.

If you are preparing a Flood Risk Assessment (FRA) for this site, please note this information may not be sufficient by itself to produce an adequate FRA to demonstrate the development is safe over its lifetime. Additional information may be required to carry out an appropriate assessment of all risk, such as consequence of a breach in defences.

We aim to review our information on a regular basis, so if you are using this data more than twelve months from the date of this letter, please contact us again to check it is still valid.

1. Flood Map

The attached map includes the current Flood Map for your area. The Flood Map indicates the area at risk of flooding, **assuming no flood defences exist**, for a flood with a 0.5% chance of occurring in any year for flooding from the sea, or a 1% chance of occurring for fluvial (river) flooding. It also shows the extent of the Extreme Flood Outline which represents the extent of a flood with a 0.1% chance of occurring in any year, or the highest recorded historic extent if greater.

In some locations, such as around the fens and the large coastal floodplains, showing the area at risk of flooding assuming no defences may give a slightly misleading picture in that if there were no flood defences, water would spread out across these large floodplains. This flooding could cover large areas of land but to relatively shallow depths and could leave pockets of locally slightly higher land as isolated dry islands. It is important to understand the actual risk of the flooding to these dry islands, particularly in the event of defence failure.

The Flood Map also shows the location of formal raised flood defences and flood storage reservoirs. It represents areas at risk of flooding for present day only and does not take account of climate change.

The Flood Map only indicates the extent and likelihood of flooding from rivers or the sea. It should also be remembered flooding may occur from other sources such as surface water sewers, road drainage, etc.

2. Historic Flood Event Outlines

With regards to the history of flooding I can advise we do not have any records of flooding in this area. It is possible recent flooding may have occurred which we are currently investigating, therefore this information may be subject to change. It is possible other flooding may have occurred which other risk management authorities, such as the Lead Local Flood Authority (ie top tier council) or Internal Drainage Board (where they exist) have responsibility.

3. Schemes in the area

There are no ongoing capital projects to reduce or sustain the current flood risk to this site.

4. Fluvial Flood Risk Information

This site is not considered to be at risk of flooding from main rivers.

The site may be at risk from local ordinary watercourses for which other risk management authorities, such as the Lead Local Flood Authority (ie top tier council) or Internal Drainage Board (where they exist) have responsibility.

5. Tidal Flood Risk Information

5.1 Tidal Defence Information

The existing tidal defences protecting this site consist of earth embankments.

They are in fair condition and reduce the risk of flooding (at the defence) to a 0.67% (1 in 150) chance of occurring in any year. We inspect these defences routinely to ensure potential defects are identified.

Refer to paragraph 3 for details of any ongoing capital projects to reduce the flood risk to this site.

5.2 Tidal Flood Levels

The attached data sheets show our current best estimate for extreme tide levels.

Please read the information notes on the data sheets.

5.3 Tidal Hazard Mapping

For certain locations we have carried out modelling to map the maximum values of flood depth, velocity and hazard rating (danger to people) resulting from overtopping and / or breaching of defences at specific locations for a number of scenarios.

At present this information is available along the full coastal / tidal floodplain, except the tidal Witham Haven in Boston (upstream of Hobhole) where only breaching and not overtopping has been modelled and the tidal River Welland upstream of Fosdyke Bridge where neither breaching nor overtopping are available.

The number of locations we have this information for is expected to increase in time.

The attached maps show the maximum values of flood depth, velocity and hazard rating (danger to people) resulting from breaching of the defences at specific locations for the scenarios below. For some locations the breach mapping also includes flooding from overtopping if this is expected in that scenario. The location of modelled tidal breaches is shown on a separate attached map.

5.3.1 Tidal Hazard Mapping - Breaches

- Year 2006 0.1% (1 in 1000) chance
- Year 2115 0.5% (1 in 200) chance
- Year 2115 0.1% (1 in 1000) chance

Your site is not affected by breaching of the tidal defences for the 1 in 200 present day (2006) scenario.

5.3.2 Tidal Hazard Mapping – Overtopping

The attached maps show the maximum values of flood depth, velocity and hazard rating (danger to people) resulting from simulated overtopping of defences for the following scenarios:

- Year 2115 0.1% (1 in 1000) chance

Your site is not affected by overtopping of the defences for the present day (2006) scenarios or the 1 in 200 climate change (2115) scenario.

6. Development Planning

If you would like local guidance on preparing a flood risk assessment for a planning application, please contact our Sustainable Places team at lnplanning@environment-agency.gov.uk. It will help if you mention this data request and attach your site location plan.

We provide free preliminary advice; additional/detailed advice, review of draft FRAs and meetings are chargeable at a rate set to cover our costs, currently £100 (plus VAT) per hour of staff time. Further details are available on our website at https://www.gov.uk/guidance/developers-get-environmental-advice-on-your-planning-proposals.

General advice on flood risk assessment for planning applications can be found on GOV.UK at https://www.gov.uk/guidance/flood-risk-assessment-for-planning-applications

Climate change will increase flood risk due to overtopping of defences. Please note, unless specified otherwise, the climate change data included has an allowance for 20% increase in flow. Updated guidance on how climate change could affect flood risk to new development - 'Flood risk assessments: climate change allowances' was published on GOV.UK in February 2016. The appropriate updated climate change allowance should be applied in a Flood Risk Assessment.

You should also consult the Strategic Flood Risk Assessment produced by your local planning authority.

7. Data Licence and Other Supporting Information

We respond to requests for recorded information we hold under the Freedom of Information Act 2000 (FOIA) and the associated Environmental Information Regulations 2004 (EIR).

This information is provided in accordance with the Open Government Licence which can be found here: http://www.nationalarchives.gov.uk/doc/open-government-licence/version/3/

Further information on flood risk can be found on the GOV.UK website at:
https://www.gov.uk/browse/environment-countryside/flooding-extreme-weather

8. Other Flood Risk Management Authorities

The information provided with this letter relates to flood risk from main river or the sea. Additional information may be available from other risk management authorities, such as the Lead Local Flood Authority (ie top tier council) or Internal Drainage Board (where they exist).

I hope we have correctly interpreted your request. If you have any queries or would like to discuss the content of this letter further please contact Frederic Stuhldreer using the email address below.

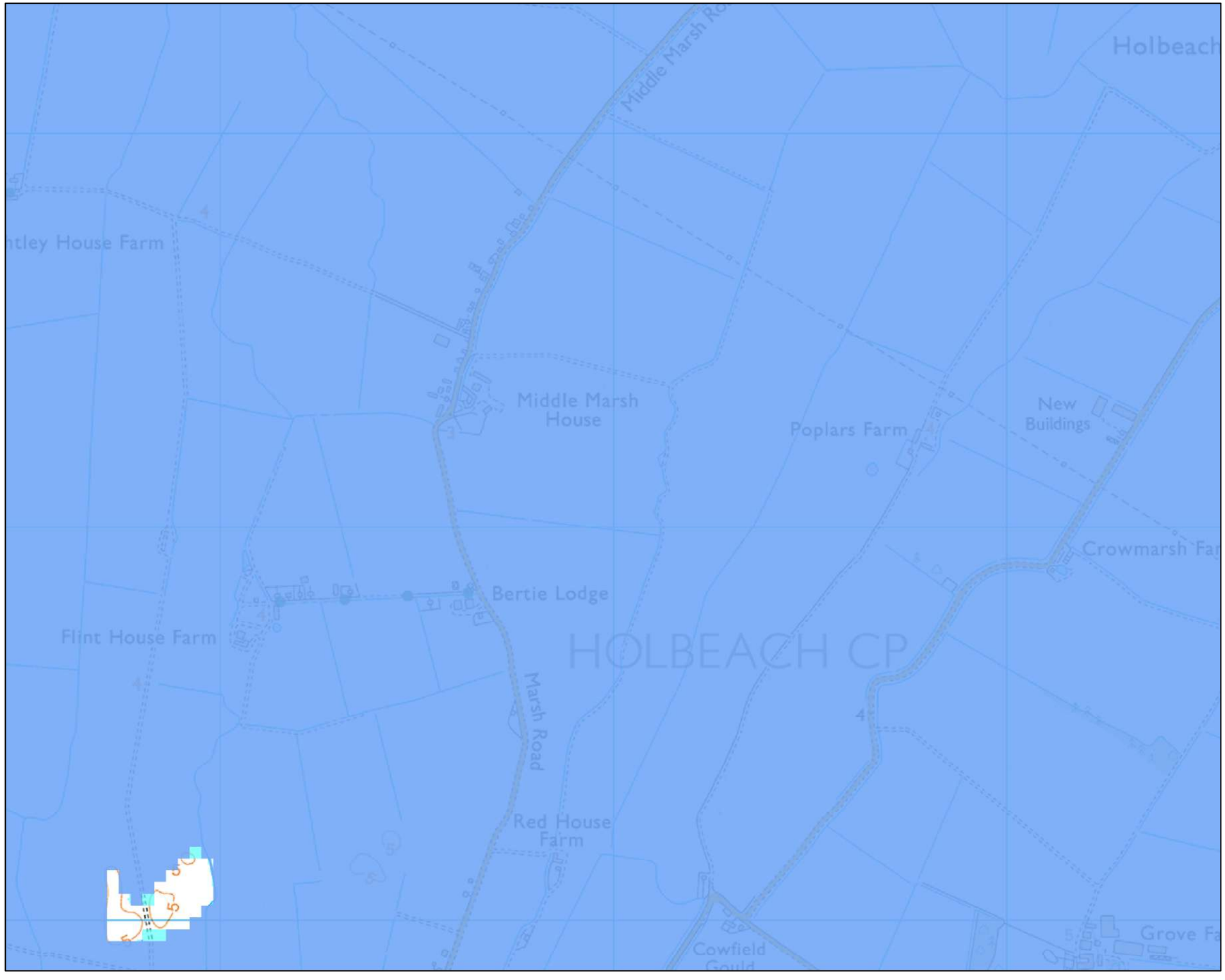
Yours sincerely,



for Alastair Windler
Welland and Nene Partnerships and Strategic Overview Team Leader
e-mail PSOWN@environment-agency.gov.uk

Enc.
Flood Map
Tidal Level Data Sheets - Map and Tables
Tidal Breach Points – Locations Map
Hazard Mapping – Breaching
Hazard Mapping – Overtopping

Flood Map centred on TF 37000 29100 - created October 2021 [Ref: CCN-2021-238223]



Environment Agency

Scale 1:10,000

N

Legend

- Main River
- Raised Defences
- Flood Storage Areas
- Area at Risk of Flooding from Rivers or The Sea
- Extreme Flood Outline

Dark blue shows the area that could be affected by flooding, either from rivers or the sea, if there were no flood defences. This area could be flooded:

- from the sea by a flood that has a 0.5% (1 in 200) or greater chance of happening each year.

- or from a river by a flood that has a 1% (1 in 100) or greater chance of happening each year.

Light blue shows the extent of the Extreme Flood Outline, which represents the extent of a flood event with a 0.1% chance of occurring in any year, or the highest recorded historic extent if greater.

These two colours show the extent of the natural floodplain if there were no flood defences or certain other manmade structures and channel improvements. Sites outside the two extents, but behind raised defences, may be affected by flooding if the defences are overtopped or fail.

Created by the Partnerships and Strategic Overview Team, Kettering

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Contact Us: National Customer Contact Centre, PO Box 544, Rotherham, S60 1BY. Tel: 03708 506 506 (Mon-Fri 8-6). Email: enquiries@environment-agency.gov.uk

East Coast and Wash - 2018 Coastal Flood Boundary [CFB] Dataset
Key Node Points



Environment Agency

Scale 1:550,000

N W E S

▲ East Coast and Wash

See seperate data sheet for predicted flood levels

Created by the Partnerships and Strategic Overview Team, Lincoln

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East Coast and Wash: Immingham to the West Lighthouse

2018 Coastal Flood Boundary Extreme Sea Levels

CFB Ref	Location	Easting	Northing	Annual Chance (1 in x) of Tide Level in metres ODN																		
				1			10			50			100			200			300			1000		
				Confidence Bound			Confidence Bound			Confidence Bound			Confidence Bound			Confidence Bound			Confidence Bound			Confidence Bound		
				2.5%	50%	97.5%	2.5%	50%	97.5%	2.5%	50%	97.5%	2.5%	50%	97.5%	2.5%	50%	97.5%	2.5%	50%	97.5%	2.5%	50%	97.5%
3888	**Immingham**	520440	417625	4.16	4.17	4.19	4.50	4.53	4.62	4.73	4.80	5.00	4.83	4.93	5.19	4.93	5.06	5.41	4.98	5.14	5.55	5.15	5.38	6.01
3890	**Haborough Marsh**	522100	416512	4.14	4.15	4.17	4.48	4.51	4.60	4.70	4.77	4.97	4.80	4.90	5.16	4.90	5.03	5.38	4.94	5.10	5.51	5.11	5.34	5.97
3898	**Grimsby**	529295	413162	3.98	3.99	4.01	4.31	4.34	4.43	4.53	4.60	4.80	4.61	4.71	4.97	4.71	4.84	5.19	4.74	4.90	5.31	4.88	5.11	5.74
3906	**Buck Beck**	534709	407369	3.87	3.88	3.90	4.19	4.23	4.31	4.41	4.50	4.68	4.50	4.61	4.86	4.61	4.75	5.10	4.64	4.82	5.22	4.80	5.05	5.66
3910	**Tetney**	538035	405537	3.85	3.86	3.89	4.17	4.22	4.30	4.40	4.50	4.67	4.49	4.61	4.86	4.60	4.75	5.10	4.63	4.82	5.21	4.80	5.06	5.66
3918	**Donna Nook**	544641	401997	3.82	3.83	3.86	4.14	4.19	4.27	4.38	4.48	4.65	4.47	4.60	4.85	4.58	4.74	5.10	4.63	4.82	5.22	4.81	5.08	5.68
3928	**Saltfleet**	549131	393360	3.78	3.79	3.82	4.11	4.16	4.26	4.36	4.46	4.64	4.47	4.59	4.86	4.57	4.74	5.11	4.63	4.83	5.25	4.83	5.11	5.74
3942	**Boygrift**	555131	380860	3.72	3.74	3.77	4.06	4.11	4.22	4.33	4.43	4.65	4.43	4.57	4.87	4.56	4.73	5.13	4.62	4.83	5.28	4.85	5.15	5.82
3968	**Gibraltar Point**	557652	356181	4.16	4.17	4.20	4.51	4.56	4.67	4.76	4.85	5.08	4.85	4.97	5.27	4.94	5.10	5.49	4.99	5.18	5.63	5.14	5.41	6.09
3992_14	**Hobhole**	535990	340116	4.96	4.97	5.01	5.40	5.44	5.56	5.66	5.76	5.98	5.78	5.90	6.20	5.88	6.04	6.44	5.92	6.11	6.57	6.03	6.31	6.99
	Grand Sluice*	532366	344510	4.93	4.94	4.98	5.3	5.3	5.3	5.3	5.3	5.3	5.3	5.3	5.3	5.3	5.3	5.3	5.3	5.3	5.3	5.3	5.3	5.3
3992_9	**Boston Barrier**	532754	342852	4.93	4.94	4.98	5.41	5.45	5.57	5.73	5.83	6.05	5.85	5.97	6.27	5.93	6.09	6.49	5.94	6.13	6.59	5.98	6.26	6.94
3992_5	**Fosdyke Bridge**	531886	332234	4.87	4.88	4.92	5.31	5.35	5.47	5.58	5.68	5.90	5.71	5.83	6.13	5.82	5.98	6.38	5.87	6.06	6.52	6.01	6.29	6.97
4008	**West Lighthouse**	550094	329971	4.87	4.88	4.91	5.21	5.26	5.37	5.46	5.56	5.78	5.56	5.68	5.98	5.66	5.82	6.21	5.71	5.90	6.35	5.86	6.14	6.81
-	**Marsh Road**	525988	324065	-	5.04	-	-	5.44	-	-	5.73	-	-	5.85	-	-	5.98	-	-	-	-	-	-	-
-	**Wisbech**	546110	309940	-	4.83	-	-	5.25	-	-	5.53	-	-	5.66	-	-	5.78	-	-	-	-	-	-	-
-	**Dog-in-a-Doublet**	527200	299287	-	3.67	-	-	4.00	-	-	4.22	-	-	4.32	-	-	4.42	-	-	-	-	-	-	-

See next page for notes

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Email: enquiries@environment-agency.gov.uk
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East Coast and Wash: Immingham to the West Lighthouse

2018 Coastal Flood Boundary Extreme Sea Levels

NOTES:

The following notes apply to all CFB sites (ie all on table excluding Marsh Road, Wisbech, Dog-in-a-Doublet)

- The base date for the data is 2017.
- The levels are still water levels. Depending on the use of the data it may be necessary to consider wave heights and / or joint probability analysis of water level and other variables.
- Levels for other annual chance probabilities are available if required.
- For additional information relating to the 2018 Coastal Flood Boundary Extreme Sea Levels or to access the full dataset for the above sites or intermediate locations refer to the Defra Metadata Catalogue at https://deframetadata.com/geonetwork/srv/eng/catalog.search#/metadata/84a5c7c0-d465-11e4-b0bd-f0def148f590

The following notes apply to all Marsh Road, Wisbech, Dog-in-a-Doublet

- The base date for the data is 2006
- The levels are still water levels. Depending on the use of the data it may be necessary to consider wave heights and / or joint probability analysis of water level and other variables.
- Levels for other annual chance probabilities are available if required.
- These levels will be updated as their respective tidal river models are updated.

The following notes apply to Grand Sluice

- The data is based on CFB 2018 data for Boston Barrier site, capped at 5.3mAOD to reflect use of the barrier.
- The base date for the data is 2017
- The levels are still water levels. Depending on the use of the data it may be necessary to consider wave heights and / or joint probability analysis of water level and other variables.
- For additional information relating to the 2018 Coastal Flood Boundary Extreme Sea Levels or to access the full dataset for the above sites or intermediate locations refer to the Defra Metadata Catalogue at https://deframetadata.com/geonetwork/srv/eng/catalog.search#/metadata/84a5c7c0-d465-11e4-b0bd-f0def148f590

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KINGSTON UPON HULL to
Rotterdam (Europort) 11 hrs
Zeebrugge 15 hrs

^ **Modelled Breach Locations**

0 3.5 7 14 Kilometres

This map indicates the location of where we have modelled the consequence of breaches in the defences along the coastline and tidal rivers. We have mapped the the maximum values of Hazard Rating (Danger to People), Depth and Velocity.

We have not assumed that all breaches occur at the same time, but have modelled each breach individually and overlaid the results to find the maximum values.

Our modelling only considers the consequences of a breach, it does not make any assumption about the likelihood of a breach occurring. Our defences generally provide a good standard of flood defence but a risk of breaching remains.

Please contact the Environment Agency for information on how these maps are used in the management of flood risk.

General Enquiries No: 03708 506 506.
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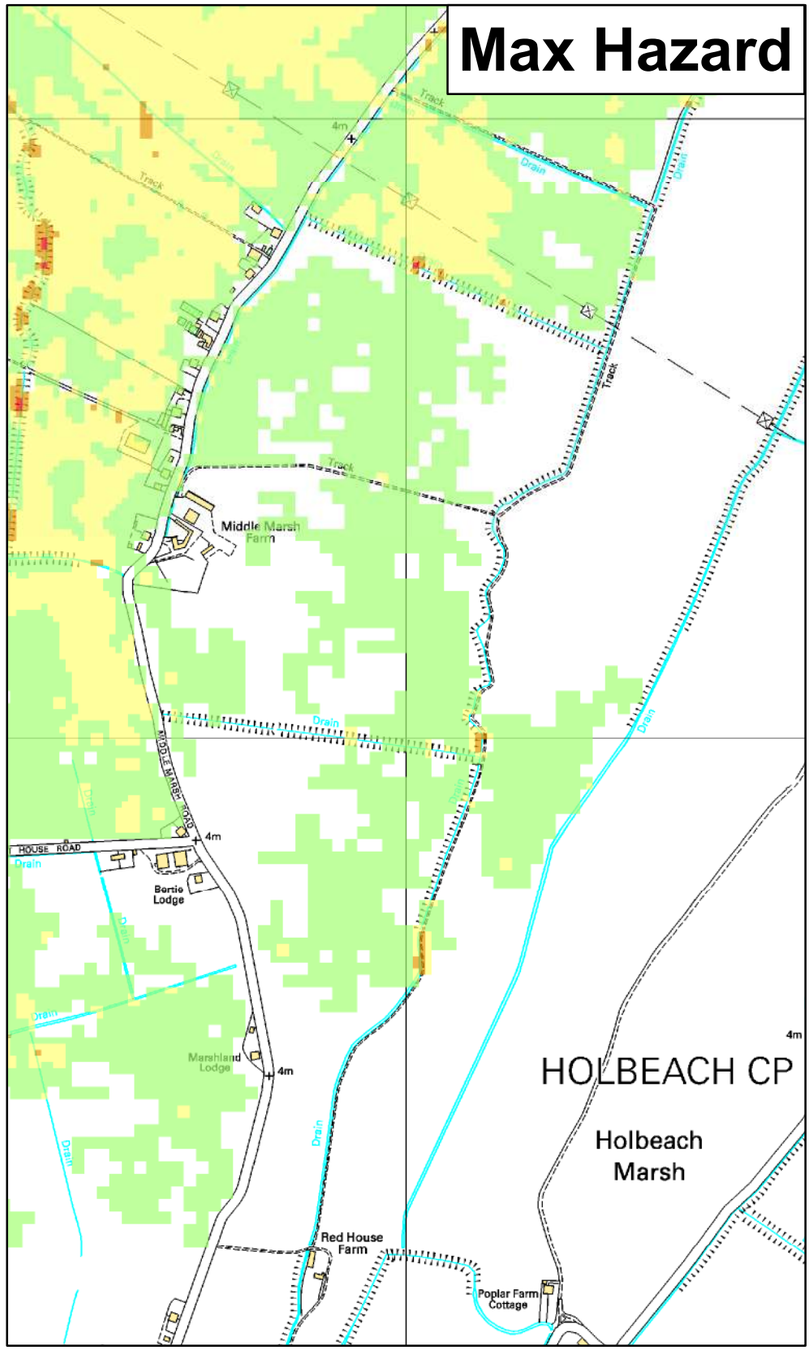
Environment Agency

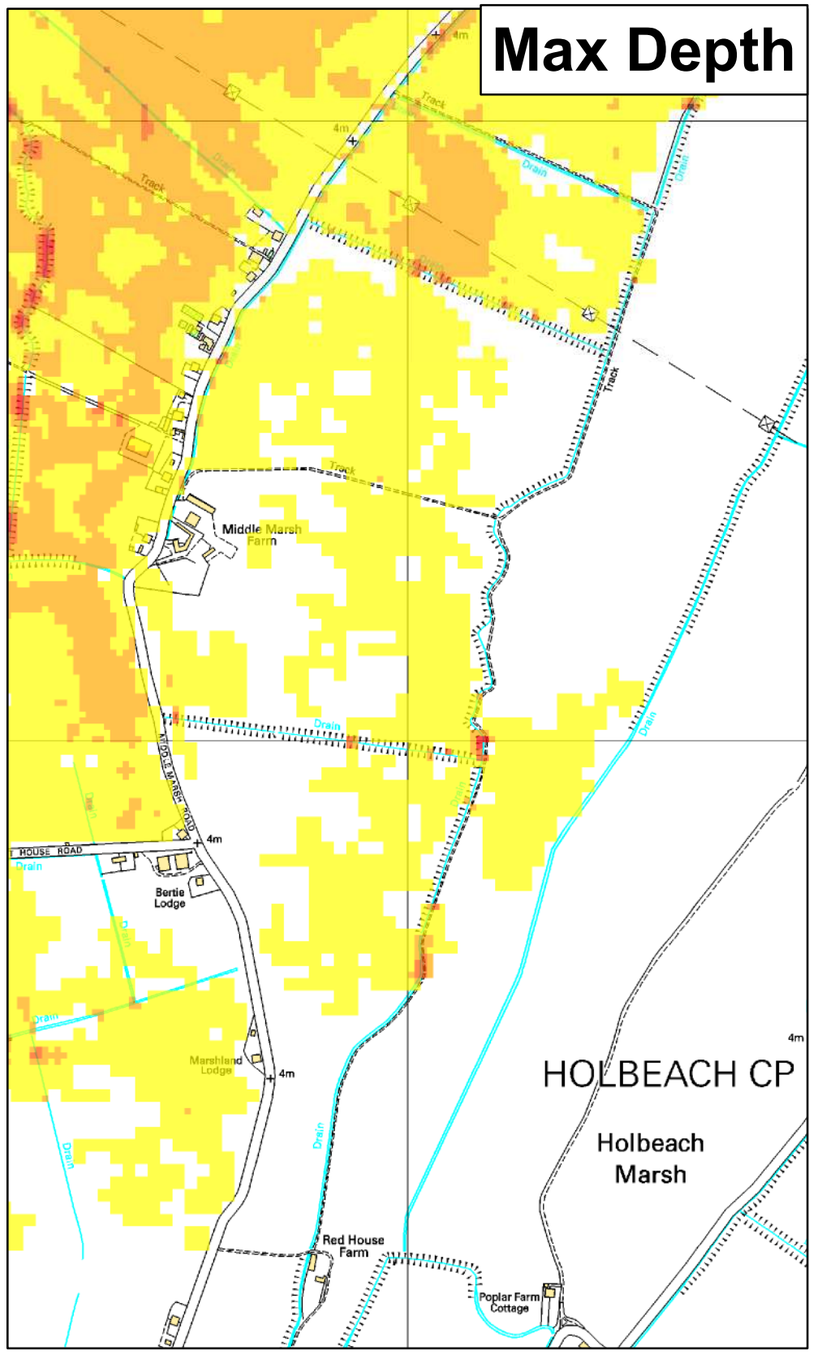
Produced by the Partnership and Strategic Overview Team, Lincoln
General Enquiries No: 03708 506 506

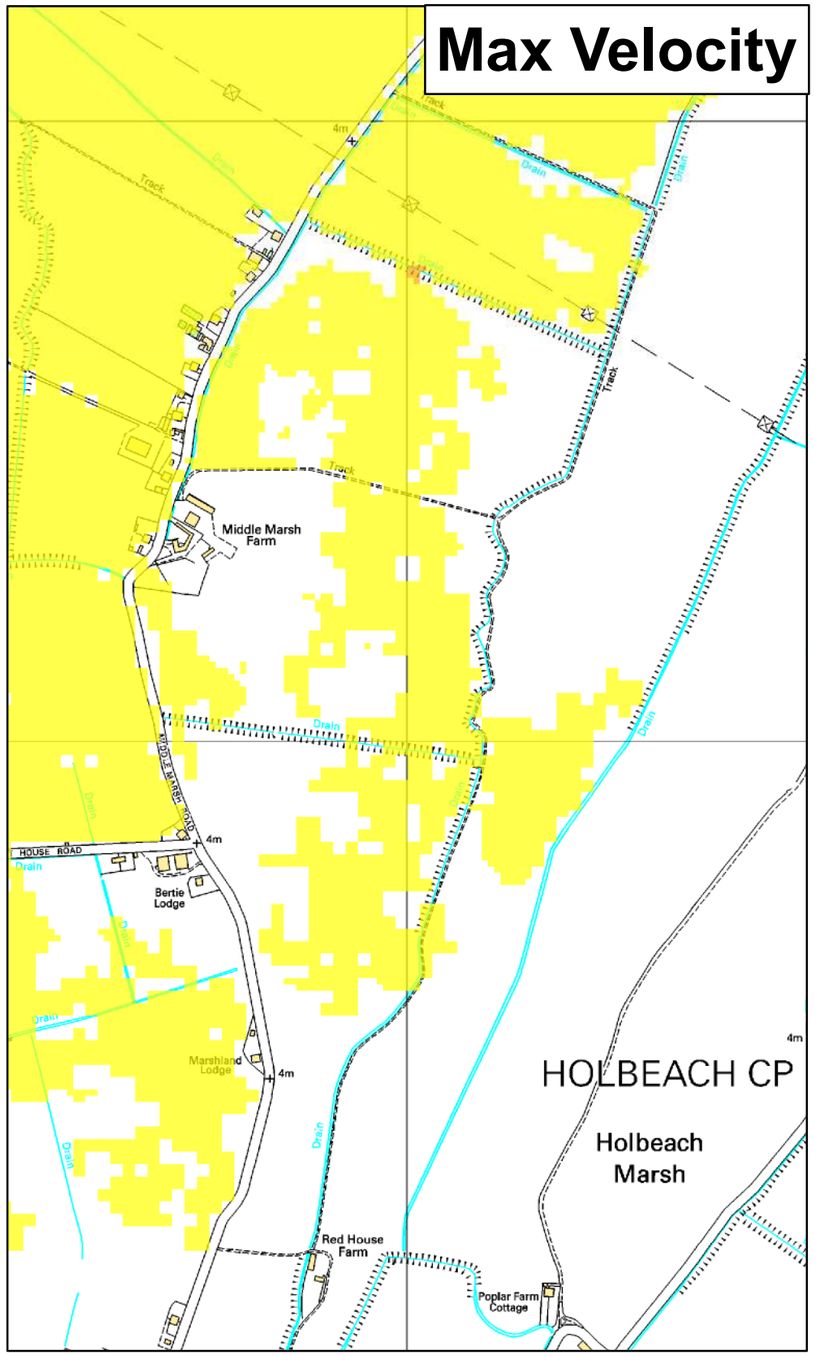
Northern Area Tidal Hazard Mapping

Location of Modelled Breaches

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★ **Modelled Breach Locations** - see also the accompanying plan "Location of Modelled Breaches"

Max Hazard
(Flood Risk to People : FD2320)

- Less than 0.75 (Low Hazard)
- Between 0.75 and 1.25 (Danger for Some)
- Between 1.25 and 2.0 (Danger for Most)
- Greater than 2.0 (Danger for All)

Max Depth (m)

- 0 - 0.25
- 0.25 - 0.50
- 0.50 - 1.0
- 1.0 - 1.6
- 1.6 +

Max Velocity (m/s)

- 0 - 0.3
- 0.3 - 1.0
- 1.0 - 1.5
- 1.5 - 2.5
- 2.5 +

Date Printed	November 2021	Scenario year	2006	Scenario Annual Chance	0.1% (1 in 1000)	CCN Number	CCN-2021-238223

This map shows the level of flood hazard to people (called a hazard rating) if our flood defences are breached at certain locations, for a range of scenarios. The hazard rating depends on the depth and velocity of floodwater, and maximum values of these are also mapped.

The map is based on computer modelling of simulated breaches at specific locations. Each breach has been modelled individually and the results combined to create this map. Multiple breaches, other combinations of breaches, different sized tidal surges or flood flows may all give different results.

The map only considers the consequences of a breach, it does not make any assumption about the likelihood of a breach occurring. The likelihood of a breach occurring will depend on a number of different factors, including the construction and condition of the defences in the area. A breach is less likely where defences are of a good standard, but a risk of breaching remains.

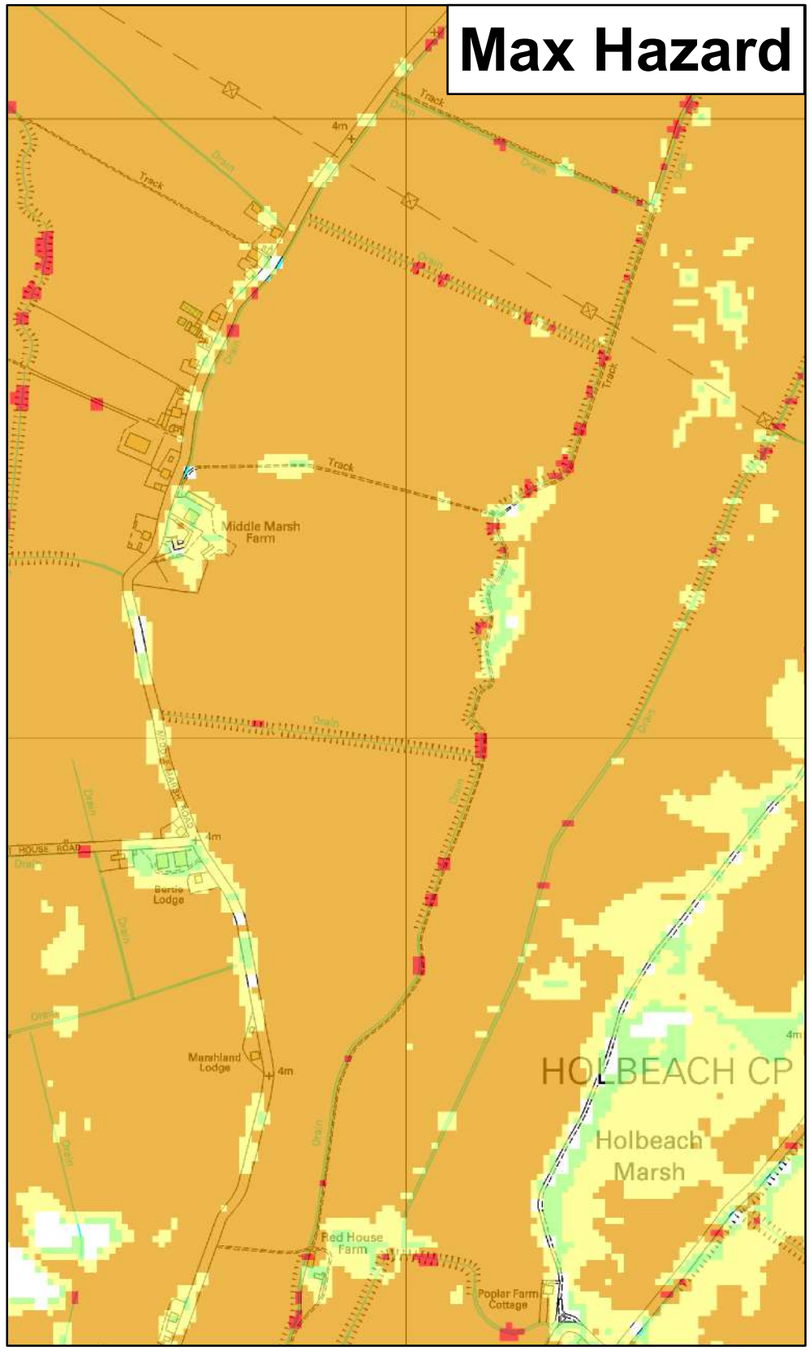
General Enquiries No: 03708 506 506. Weekday Daytime calls cost 5p plus up to 6p per minute from BT Weekend Unlimited. Mobile and other providers' charges may vary

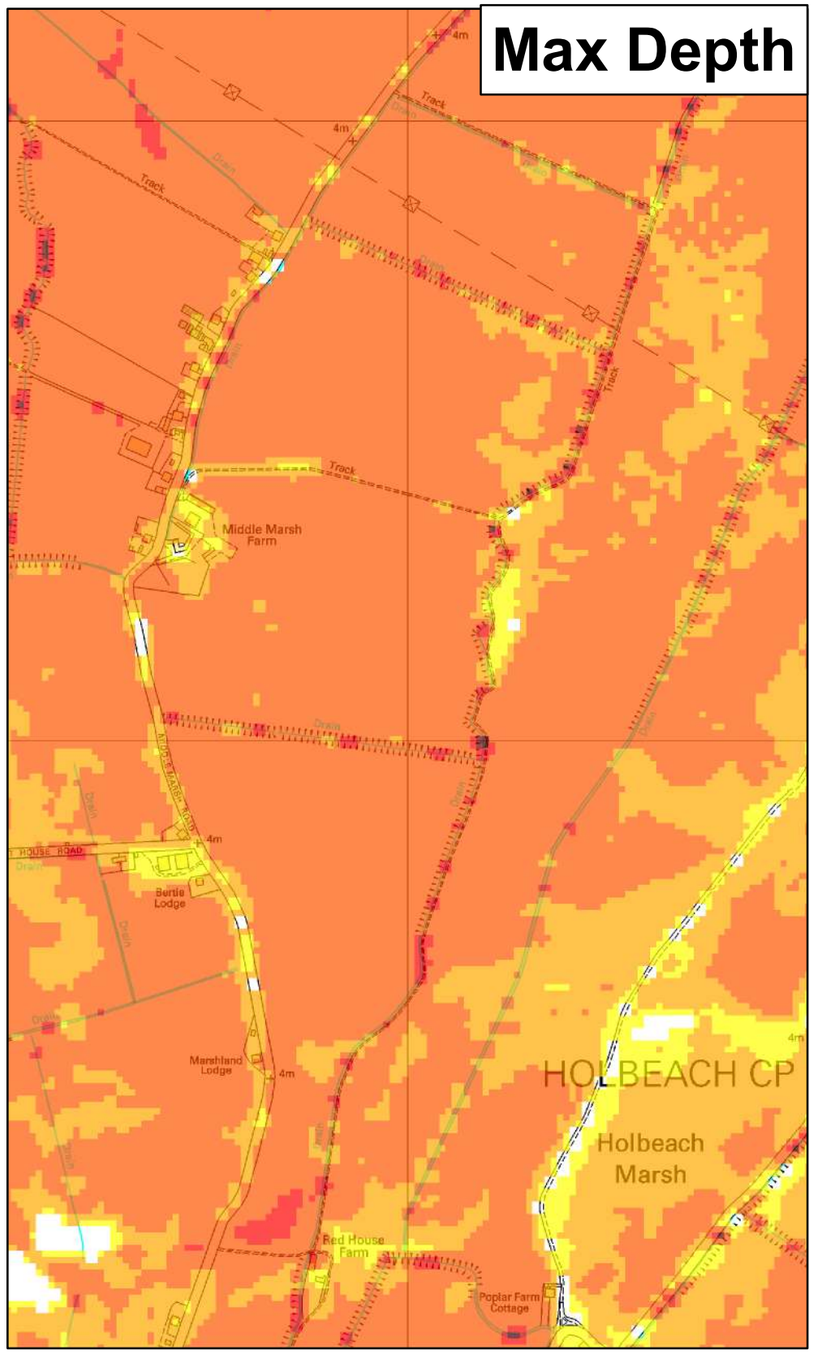
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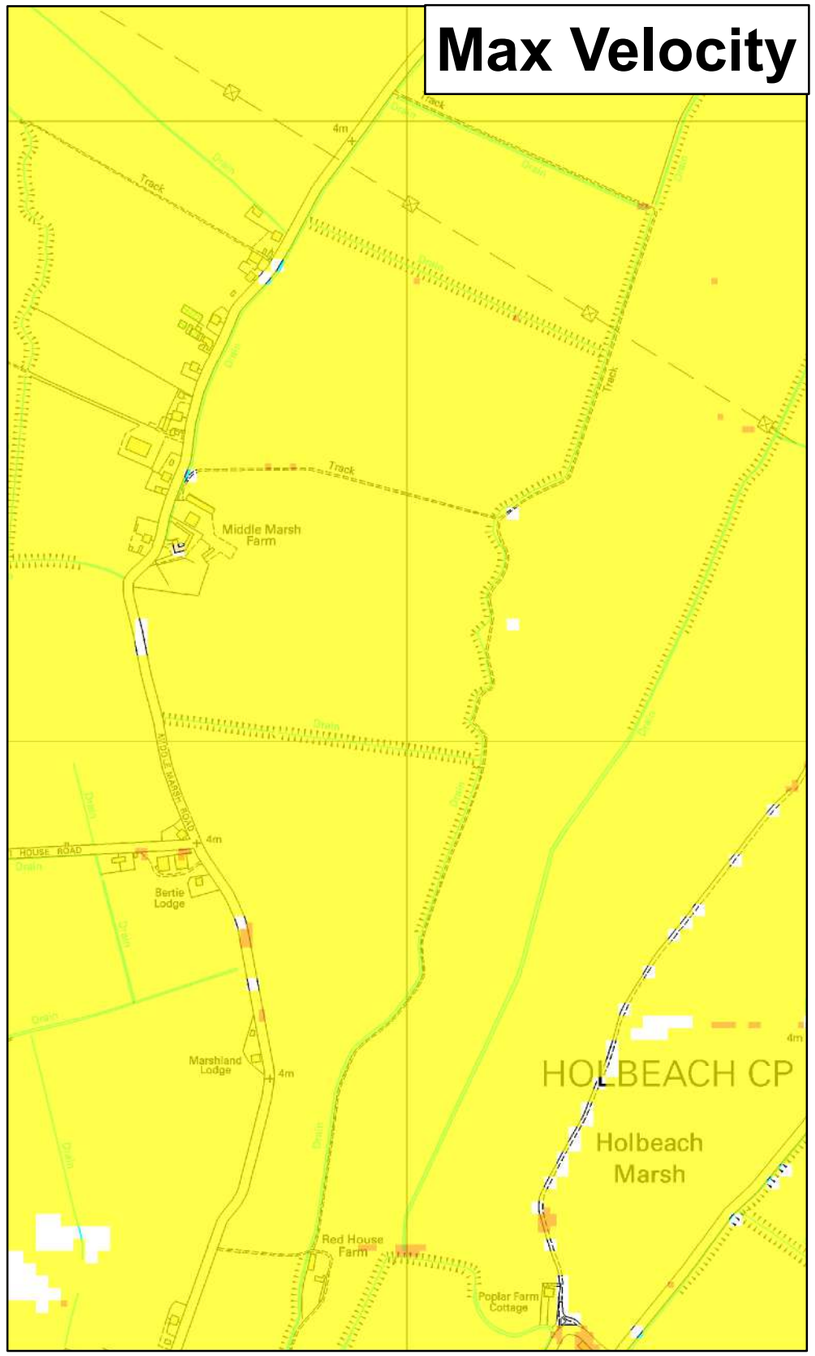
Lincolnshire and Northamptonshire Tidal Breaching Hazard Mapping

Map Centred on TF 37000 29100

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★ **Modelled Breach Locations** - see also the accompanying plan "Location of Modelled Breaches"

Max Hazard
(Flood Risk to People : FD2320)

- Less than 0.75 (Low Hazard)
- Between 0.75 and 1.25 (Danger for Some)
- Between 1.25 and 2.0 (Danger for Most)
- Greater than 2.0 (Danger for All)

Max Depth (m)

- 0 - 0.25
- 0.25 - 0.50
- 0.50 - 1.0
- 1.0 - 1.6
- 1.6 +

Max Velocity (m/s)

- 0 - 0.3
- 0.3 - 1.0
- 1.0 - 1.5
- 1.5 - 2.5
- 2.5 +

Date Printed	November 2021	Scenario year	2115	Scenario Annual Chance	0.5% (1 in 200)	CCN Number	CCN-2021-238223

This map shows the level of flood hazard to people (called a hazard rating) if our flood defences are breached at certain locations, for a range of scenarios. The hazard rating depends on the depth and velocity of floodwater, and maximum values of these are also mapped.

The map is based on computer modelling of simulated breaches at specific locations. Each breach has been modelled individually and the results combined to create this map. Multiple breaches, other combinations of breaches, different sized tidal surges or flood flows may all give different results.

The map only considers the consequences of a breach, it does not make any assumption about the likelihood of a breach occurring. The likelihood of a breach occurring will depend on a number of different factors, including the construction and condition of the defences in the area. A breach is less likely where defences are of a good standard, but a risk of breaching remains.

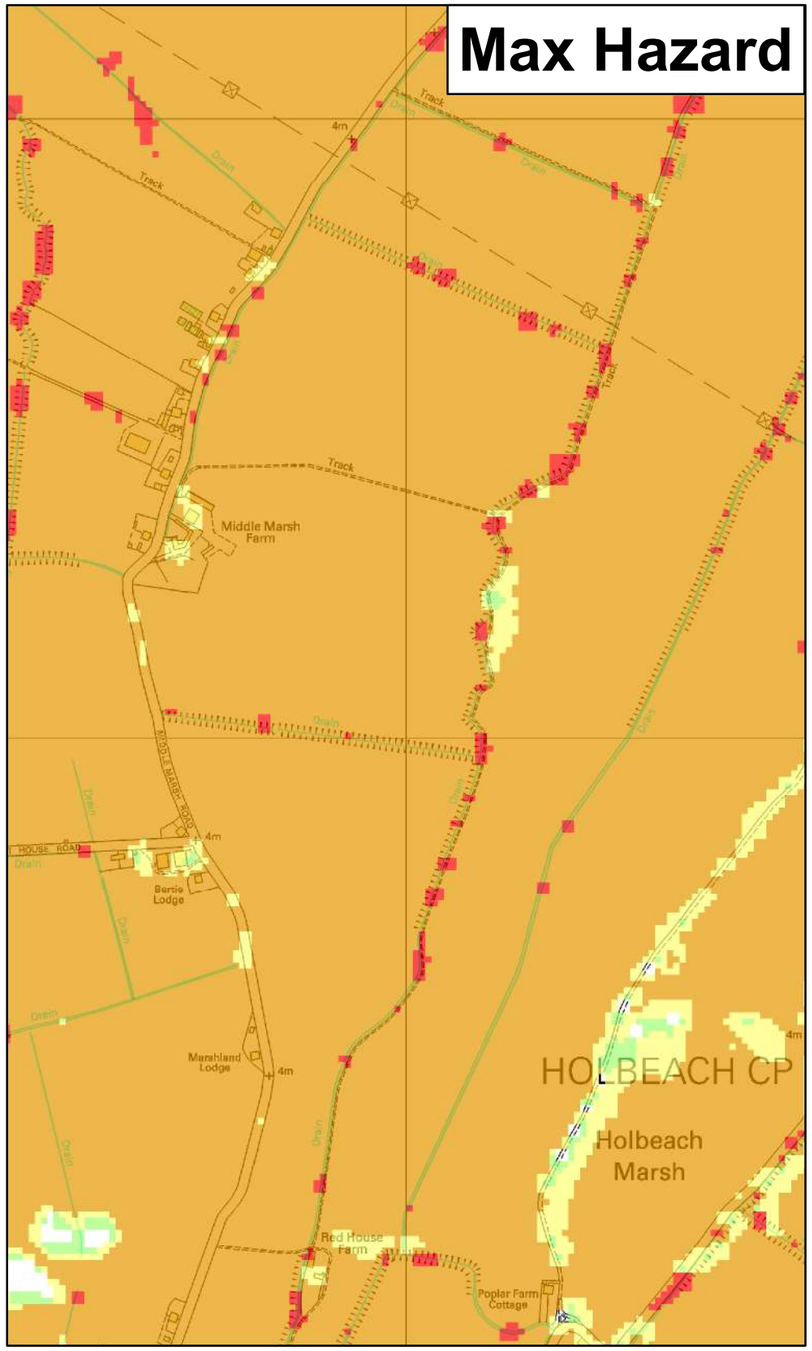
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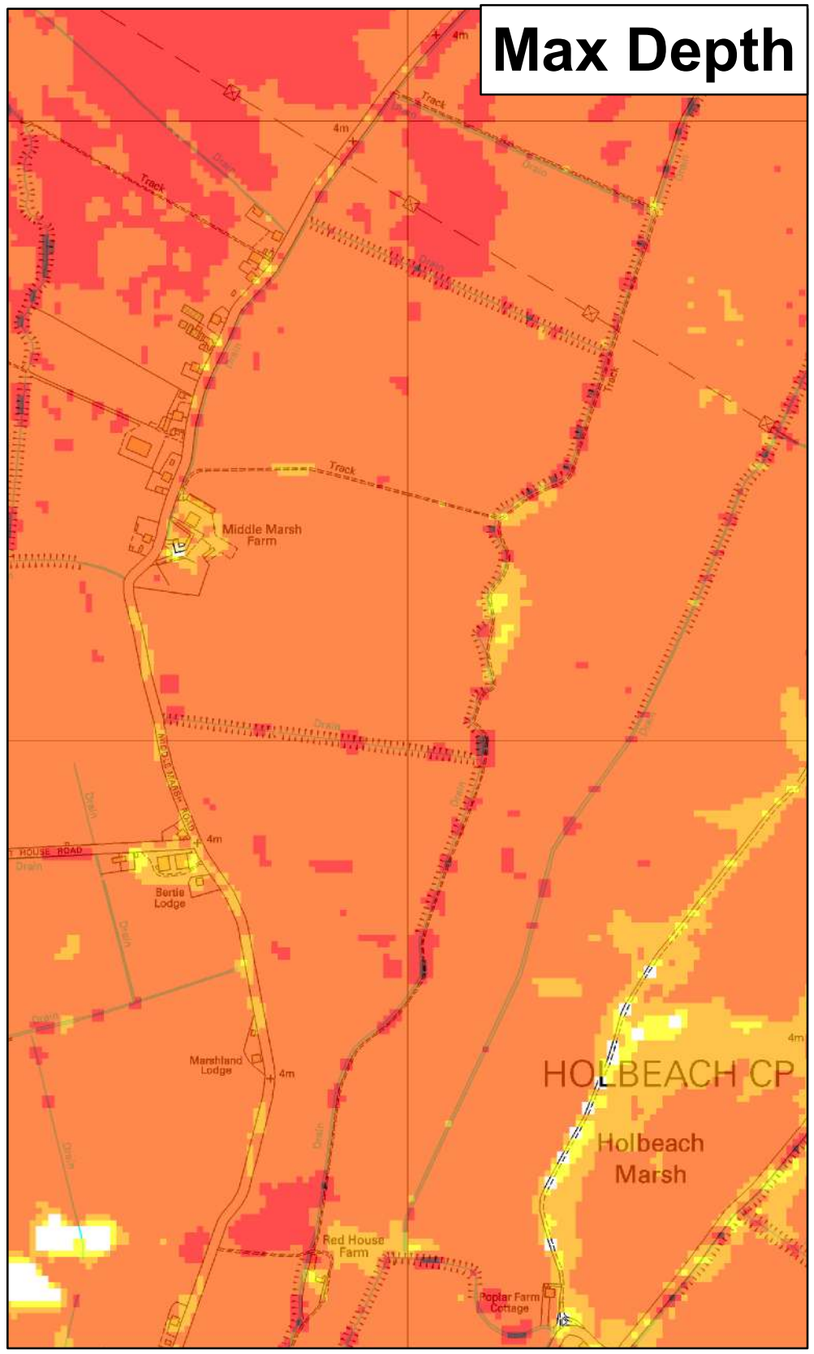
Environment Agency

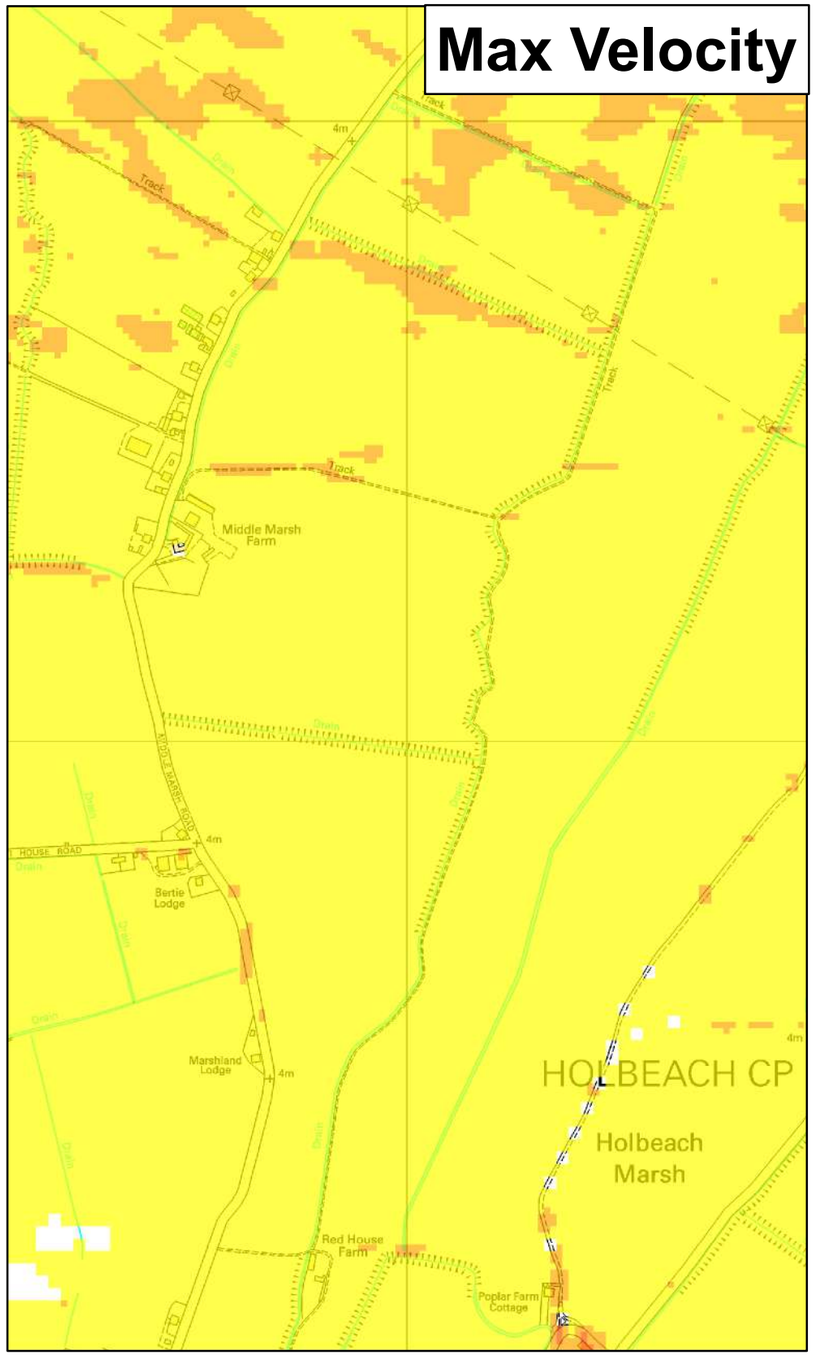
Lincolnshire and Northamptonshire Tidal Breaching Hazard Mapping

Map Centred on TF 37000 29100

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- 0 - 0.25
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- 0.50 - 1.0
- 1.0 - 1.6
- 1.6 +

Max Velocity (m/s)

- 0 - 0.3
- 0.3 - 1.0
- 1.0 - 1.5
- 1.5 - 2.5
- 2.5 +

Date Printed	November 2021	Scenario year	2115	Scenario Annual Chance	0.1% (1 in 1000)	CCN Number	CCN-2021-238223

This map shows the level of flood hazard to people (called a hazard rating) if our flood defences are breached at certain locations, for a range of scenarios. The hazard rating depends on the depth and velocity of floodwater, and maximum values of these are also mapped.

The map is based on computer modelling of simulated breaches at specific locations. Each breach has been modelled individually and the results combined to create this map. Multiple breaches, other combinations of breaches, different sized tidal surges or flood flows may all give different results.

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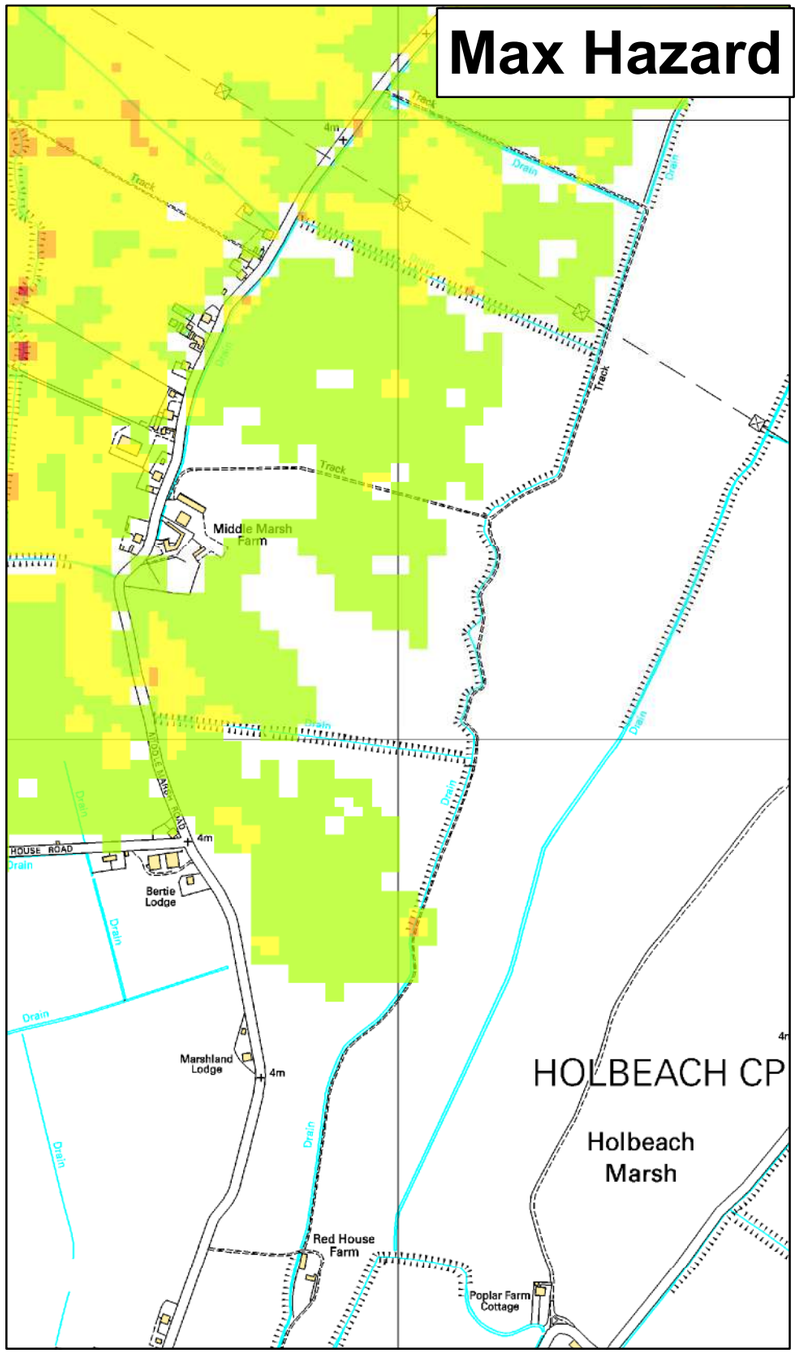
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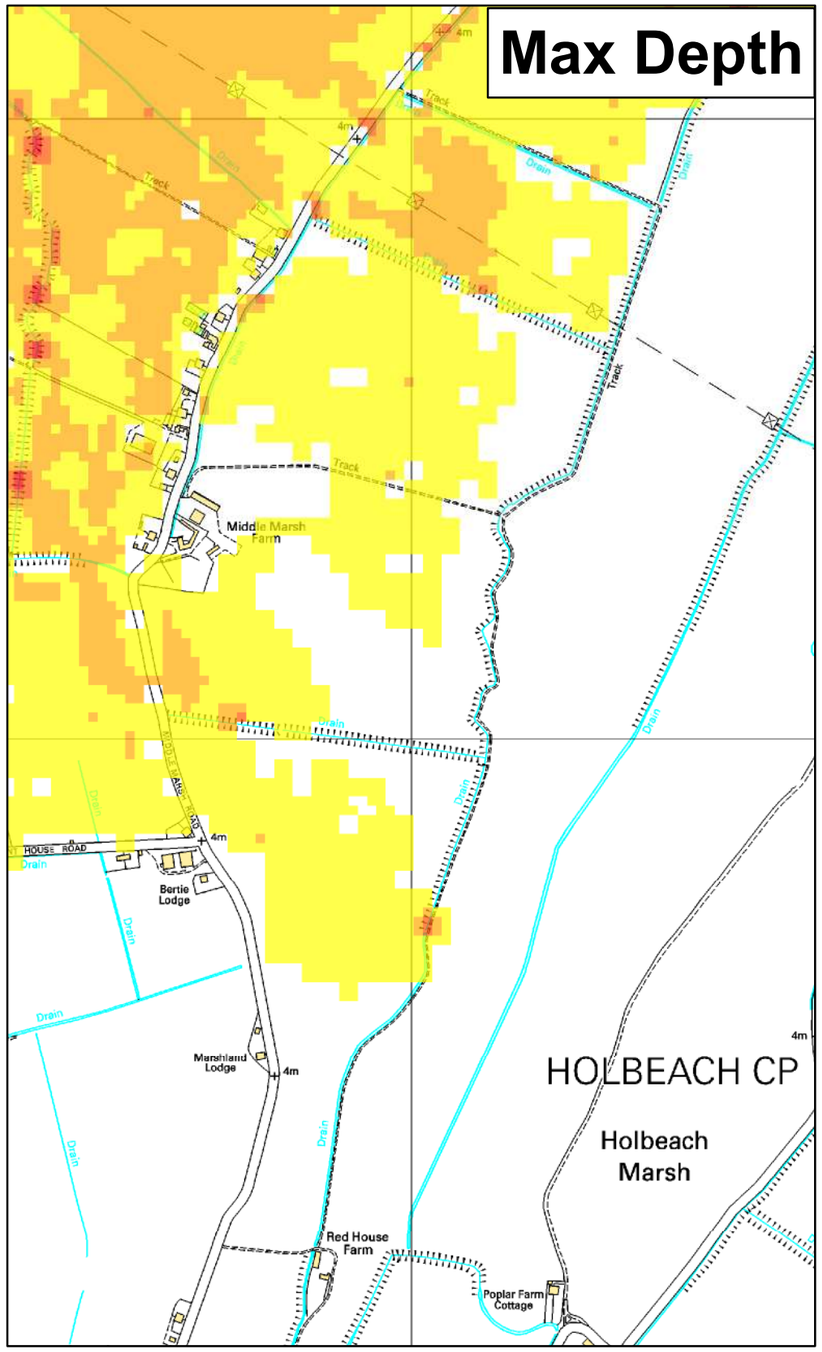
Environment Agency

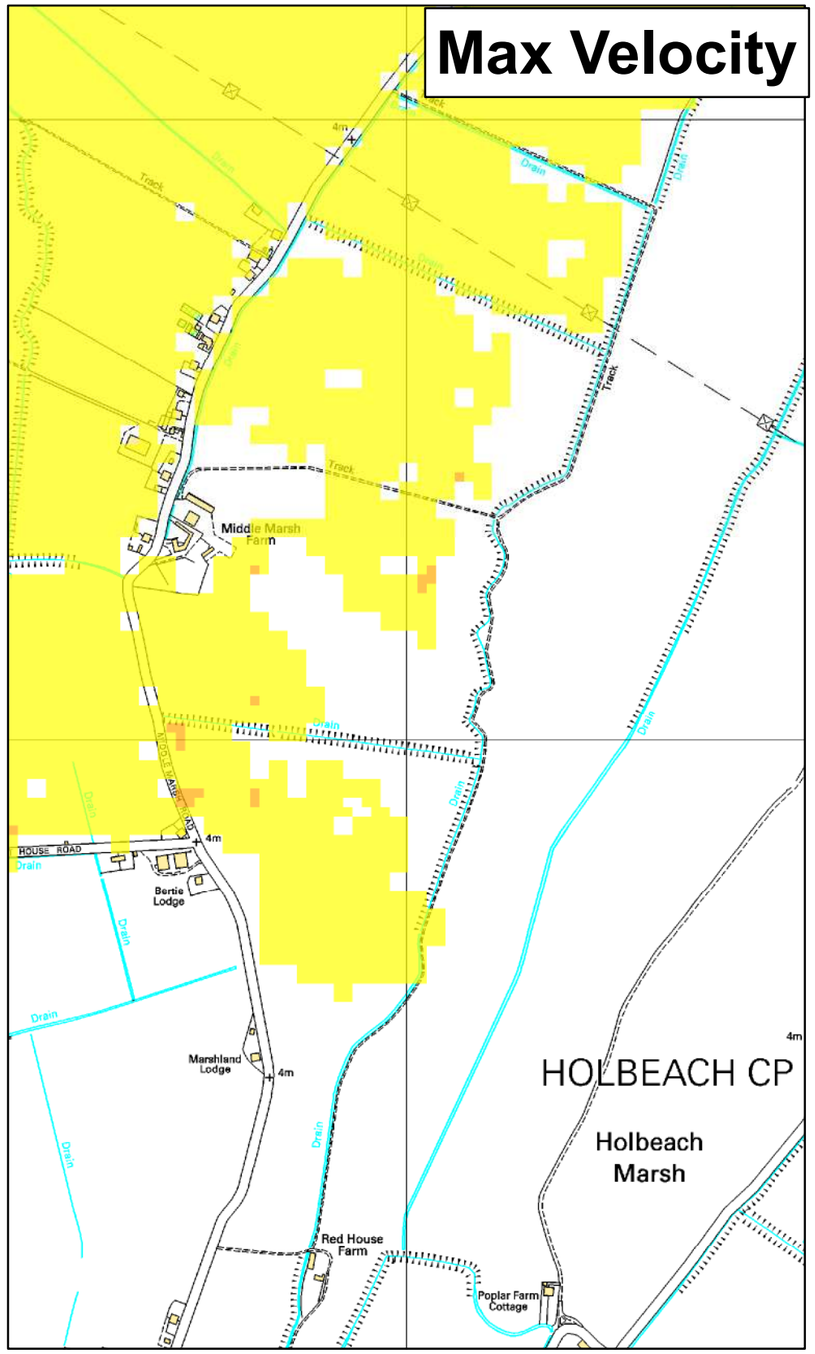
Lincolnshire and Northamptonshire Tidal Breaching Hazard Mapping

Map Centred on TF 37000 29100

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- 0 - 0.3
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- 1.5 - 2.5
- 2.5 +

Date Printed	November 2021	Scenario year	2115	Scenario Annual Chance	0.1% (1 in 1000)	CCN Number	CCN-2021-238223

The map is based on computer modelling of simulated overtopping of the main coastal defences for specific tidal scenarios. It does not include overtopping along the following tidal rivers which are currently being investigated: Witham Haven (upstream of Hobhole), and Welland (upstream of Fosdyke Bridge)

The map only considers the consequences of overtopping of the defences, and does not show the possible consequences of breaches of the tidal defences. Separate maps of the flood extent from just breaching of the defences are available.

For future climate change scenarios it is assumed that defences remain at 2006 heights.

These maps do not replace the flood zone maps used in the National Planning Policy Framework (NPPF)

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Lincolnshire and Northamptonshire Tidal Overtopping Hazard Mapping

Map Centred on TF 37000 29100

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