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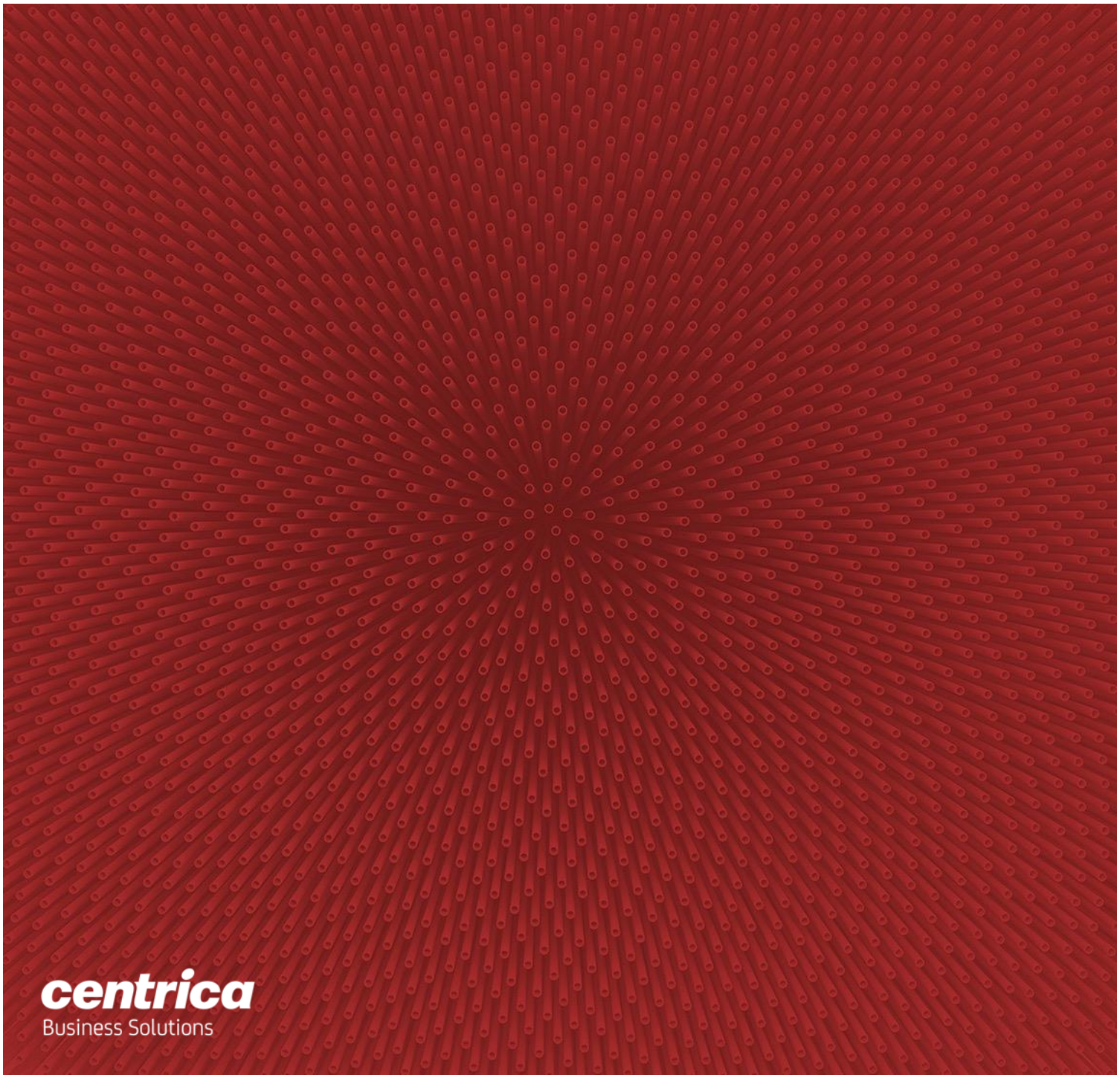
Business Solutions

Flood Risk and Drainage Assessment

Location: Brigg Power Station, Scawby Brook, DN20 9LT
Date: October 2024
Revision: 1.0



ISSUE AND REVISION RECORD

Revision	Date	Originator	Checker	Approver	Narrative
1.0	10/10/2024	AF			Final

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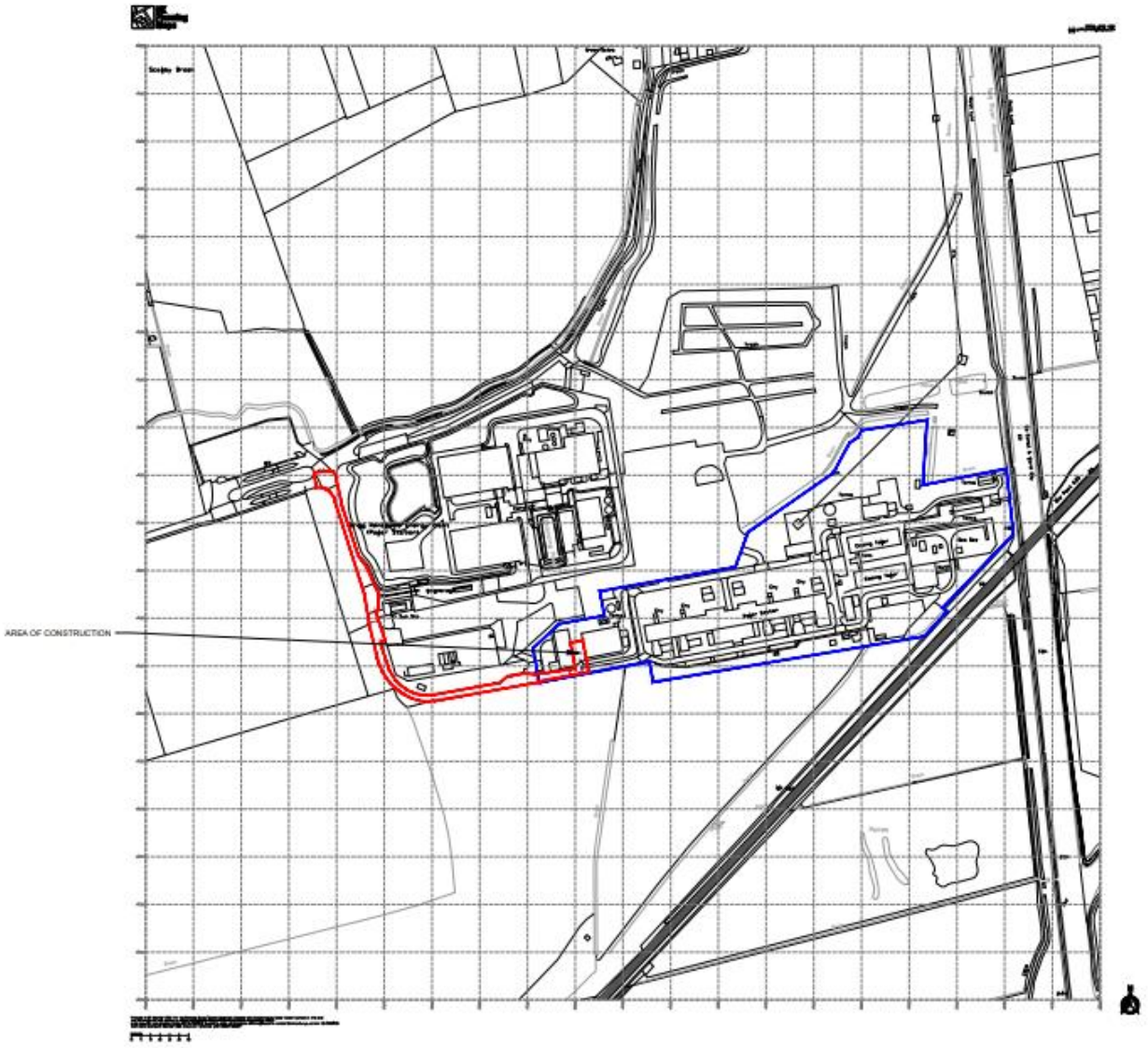
1 Introduction

This Flood Risk and Drainage Assessment has been prepared in support of a planning application for the construction of an external staircase to the DG1 Building at Brigg Power Station, Scawby Brook.

The proposed site location plan is shown below.



The aim of this report is to undertake a flood risk study that is appropriate to the nature and scale of the development proposal. The report will consider the risk of flooding from all sources (fluvial, pluvial, groundwater, reservoir and existing sewerage assets), assess how the proposed development will affect flood risk to the site and the surrounding area.

2 Site and Proposed Development

Site Description

The site lies within the Brigg Power Station complex between two existing buildings as evidenced on the Location Plan and photograph below.

Existing Watercourses

The River Ancholme, which runs north-south and is defined as a 'statutory main river', can be found circa 120m to the east.

Geology and Ground Conditions

The information below is taken from available open-source data from the British Geological Society (BGS) online mapping.

Superficial Deposits and Bedrock Geology

The near surface superficial deposits are recorded as clay, silt, sand and gravel Sedimentary deposits. Underneath is bedrock, recorded as Hibaldstow Limestone.

The development

The development is the construction of an external staircase to an existing building within the Brigg Power Station Site. Vehicular and pedestrian access is taken from the B1206 to the west.

The proposed development is classified as 'essential infrastructure', due to its operational function being directly related to the production of electricity.

3 Legislative and Policy Framework

National Planning Policy and Framework and Guidance

The NPPF and accompanying PPG seek to ensure that flood risk is taken into account at all stages in the planning process, to avoid inappropriate development in areas at risk of flooding, and to direct development away from areas at highest risk. Where new development is absolutely necessary in such areas, policy aims to make it safe without increasing flood risk elsewhere and where possible, reducing flood risk overall.

A risk-based approach should be adopted at all levels of planning. Applying the source pathway-receptor model to planning for development in areas of flood risk requires:

- A strategic approach which avoids adding to the causes or "sources" of flood risk, by such means as avoiding inappropriate development in flood risk areas and minimising run-off from new development onto adjacent and other downstream properties, and into the river systems;
- Managing flood "pathways" to reduce the likelihood of flooding by ensuring that the design and location of the development maximises the use of Sustainable Drainage System (SuDS), and takes account of its susceptibility to flooding, the performance and processes of river systems and appropriate flood defence infrastructure, and of the likely routes and storage of floodwater, and its influence on flood risk downstream; and
- Reducing the adverse consequences of flooding on the "receptors" (i.e. people, property, infrastructure, habitats and statutory sites) by avoiding inappropriate development in areas at risk of flooding.

A FRA should be carried out to the appropriate degree at all levels of the planning process, to assess the risks of all forms of flooding to and from development, taking climate change into account. A sequential risk based approach should be applied to determine the suitability of land for development in flood risk areas.

In areas at risk of river or sea flooding, preference should be given to locating new developments in Flood Zone 1. If there is no reasonably available site in Flood Zone 1, the flood vulnerability of the proposed development can be taken into account in locating development in Flood Zone 2 and then subsequently Flood Zone 3a. Within each Flood Zone, new development should be directed to sites at the lowest probability of flooding from all sources.

Local Planning Policy and Guidance

The Core Strategy

'The Core Strategy', within the North Lincolnshire Local Development Framework, sets out the long-term spatial planning framework for the development of North Lincolnshire up to 2026. Laid out is the vision for the area, the scale and distribution of development, the provision of infrastructure to support it and the protection of the natural and built environment, focussing on sustainable development. The noteworthy studies are the following:

CS18 Sustainable Recourse Use and Climate Change

"The council will actively promote development that utilises natural resources as efficiently and sustainably as possible. This will include:

"Requiring the use of Sustainable Urban Drainage Systems (SuDS) where practicable."

CS19 – Flood Risk

"The council will support development proposals that avoid areas of current or future flood risk, and which do not increase the risk of flooding elsewhere. This will involve a risk based sequential approach to determine the suitability of land for development that uses the principle of locating development, where possible, on land that has a lower flood risk, and relates land use to its vulnerability to flood. Development in areas of high flood risk will only be permitted where it meets the following prerequisites:

a. It can be demonstrated that the development provides wider sustainability benefits to the community and the area that outweigh flood risk.

b. The development should be on previously used land. If not, there must be no reasonable alternative developable sites on previously developed land.

c. A flood risk assessment has demonstrated that the development will be safe, without increasing flood risk elsewhere by integrating water management methods into development.

Development within the Lincolnshire Lakes area will comply with the flood management principals set out in the Western Scunthorpe Urban Extension Exception Test Strategy. Any further flood management proposals will have to be agreed by both the council and the Environment Agency during the process of the Lincolnshire Lakes Area Action Plan. Development proposals in flood risk areas which come forward in the remainder of North Lincolnshire shall be guided by the Strategic Flood Risk Assessment for North Lincolnshire and North East Lincolnshire. This will ensure that proposals include site specific flood risk assessments which take into account strategic flood management objectives and properly apply the Sequential and, where necessary, Exception Tests.

In addition, development will be required, wherever practicable, to incorporate Sustainable Urban Drainage Systems (SUDS) to manage surface water drainage. The Council will also seek to reduce the increase in flood risk due to climate change through measures to reduce carbon dioxide emissions."

Strategic Flood Risk Assessment

The SFRA, dated June 2009 was produced to assist North Lincolnshire Council in spatial planning decisions that are required to inform the local development framework (LDF) preparation. Using information and analysis gathered during the assessment, a strategic overview of the flood risk was carried out to identify any potential conflicts between development pressures and current flood risk, and potential flood risk in the future, to help determine the allocations of land for both housing and employment. This document acknowledges that the site is located within Flood Zone 3a.

The North Lincolnshire Flood Risk Advice Matrix, contained within the North Lincolnshire SFRA states: *"Infrastructure should remain operational during a 0.1% annual probability event, allowing for climate change, including a breach if relevant; and that to achieve this, critical equipment should be above the flood level for this event."*

Paragraph 4.65 states: *"There are two main sources of flooding in the River Ancholme area, combination of large waves and high water levels in the Humber Estuary and high river flows in the River Ancholme."* The 2 sections of fluvial floodplain, however, don't cover the area around the proposed development in question (Winterton Beck and South Ferriby).

The SFRA's 'Appendix A: Factors Affecting Flood Risk' states: *"During periods of very heavy rainfall pluvial) the volume of the water flowing off the surface of the ground can exceed the capacity of the existing drainage system, either natural or man-made, to remove it. This can be because the channels, ditches or pipes are not large enough to carry all the flow, or because they have become blocked so their capacity is reduced. When this happens the surface water will tend to flow overland where the ground is sloping towards a low point where it will collect. The velocity and depth of flow will depend on the slope of the ground and the volume of water that cannot enter the existing drainage system – the steeper the slope the faster and more dangerous the flow. The depth of water collecting in low points will depend on the local topography, the level will rise until the water can overflow and flood into an adjacent area."*

Catchment Flood Management Plan

The CFMP was compiled by the Environment Agency and published in December 2009 and sets out their preferred plan for sustainable flood risk management over the next 50 to 100 years. CFMPs can be used to help target limited resources where the risks are greatest.

The Site lies within the Grimsby and Ancholme CFMP, and in the sub-area of 'Brigg'. This CFMP identifies flood risk management policies to assist all key decision makers in the catchment, for this sub-catchment policy 5 is used. It was produced through a wide consultation and appraisal process, however it is only the first step towards an integrated approach to flood risk management.

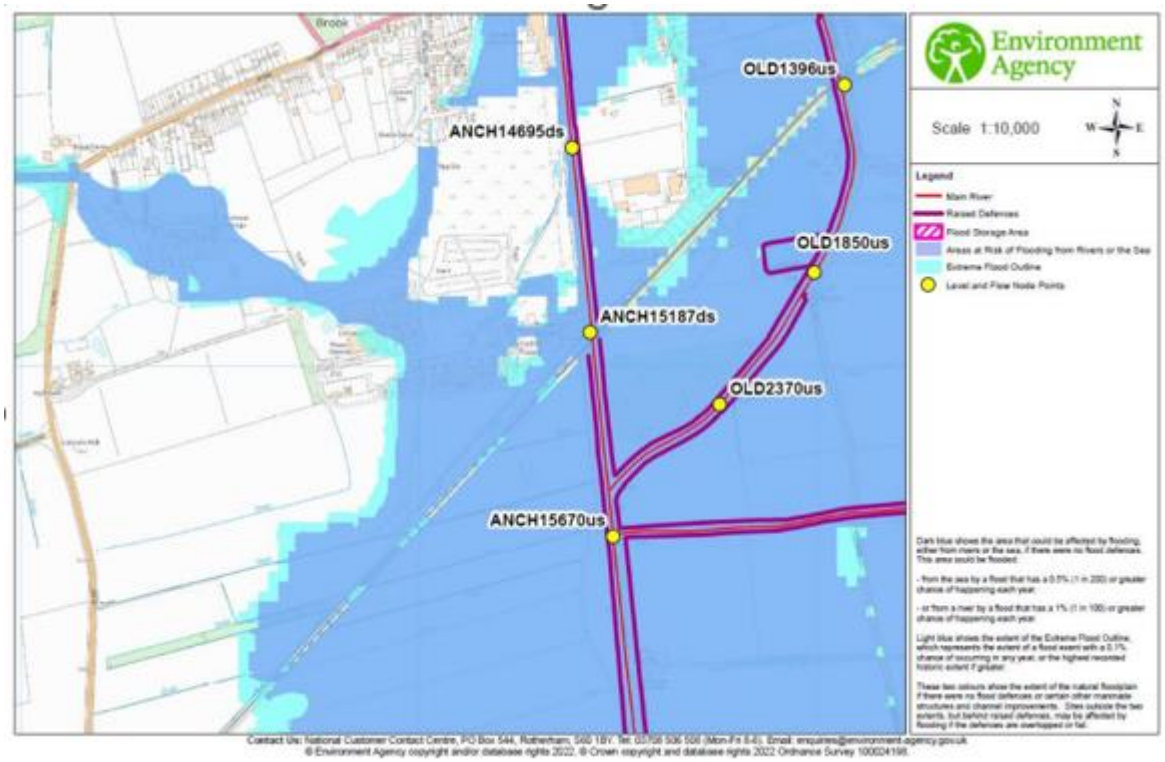
The sub-area 'Brigg' follows the flood risk management policy 5, which state: *"Areas of moderate to high flood risk where we can generally take further action to reduce flood risk. This policy will tend to be applied to those areas where the case for further action to reduce flood risk is most compelling, for example where there are many people at high risk, or where changes in the environment have already increased risk. Taking further action to reduce risk will require additional appraisal to assess whether there are socially and environmentally sustainable, technically viable and economically justified options."*

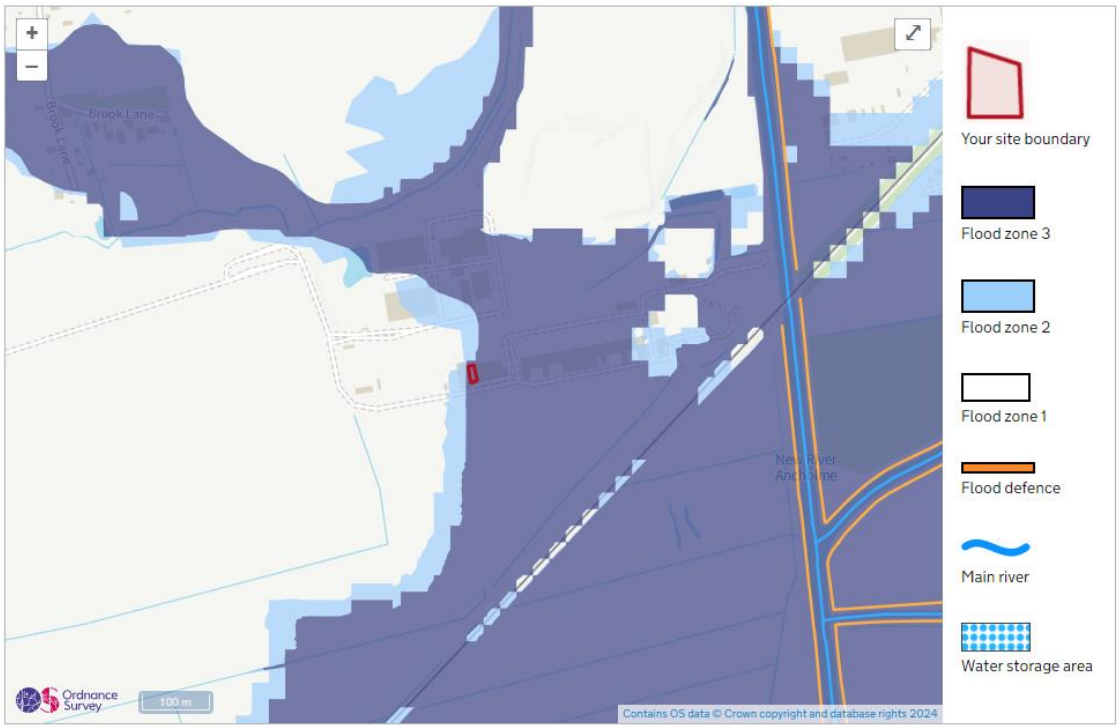
4 Flood Risk Sources

Fluvial

Fluvial flows are the result of rivers reaching their full capacity, and discharging their excess volumes of water onto the surrounding area. As part of the data package provided to RPS, the EA included a Flood Map with Modelled Node Points. The below figure shows no flood defences on the site along the New River Ancholme, where the development is located. It is noted, however, that the extents of the predicting flood are lesser within and around the site, in comparison to the eastern area, and the area south of the train line, where the flood defences have been constructed. The node closest to the site in question – ANCH15187ds – states that the fluvial flood level will be 3.31 mAOD for a 0.1% AED storm, plus 20% accounting for climate change, in accordance with the specification made in the North East Lincolnshire SFRA.

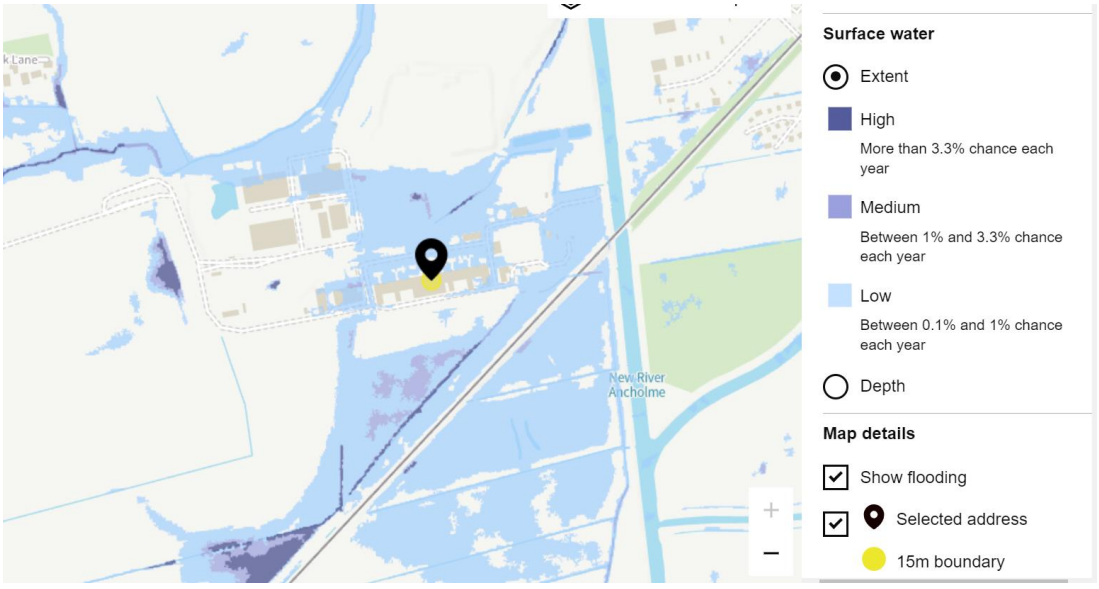
There are no records of historic fluvial flooding within the development site in question. The closest instance of fluvial flooding occurred to the south of the railway line in 2019, between a series of tributary drains running into the New River Ancholme. The EA's Flood Map for Planning shows that the area of planning application is within Fluvial Flood Zone 3a – deemed high risk, with a chance of flooding greater than 3.3% each year.





Pluvial

Pluvial or overland flows are a result of saturated ground being unable to accommodate any further infiltration, with excess flows following the natural topography and flow to lower lying areas of the site. This is further exacerbated where permeability of the ground is low or there has been a drought and the ground surface has been 'baked' preventing infiltration into the layers below. The most common situation of overland flows is where large areas of impermeable surfacing occur, such as highways or car parks that have insufficient drainage in place. The published EA Flood Maps for Pluvial flooding shows the surface water flood risk, indicate that the application site is at 'low risk' of surface water flooding.



Groundwater

Groundwater flooding can occur when groundwater levels exceed the ground surface levels as a result of prolonged rainfall events, resulting in a saturated ground. The underlying ground conditions, as detailed earlier in Geology and Ground Conditions: section, have a major influence on where this type of flooding occurs. It is most common in low lying areas underlain by permeable rocks (aquifers) at a shallow depth. There is always a risk of groundwater rising to the surface from perched layers within the superficial deposits, although this may be a perceived risk. An intrusive site investigation has been completed by Alan Wood & Partners. As part of this investigation a number of boreholes were dug. A soakaway drainage solution is not suitable for any new development due to the near surface superficial deposits being cohesive in nature.

Artificial Sources

Reservoirs and other artificial water bodies have the potential to hold a large volume of water, often above ground level. The current agreed limit under the Flood and Water Management Act 2010 states the reservoir act comes into force when above ground attenuation surpasses 10,000m3 of attenuated water.

Should the containment of these waterbodies fail (e.g. breach or overtopping), there is a sudden release of deep fast moving water with little warning able to be provided. However, due to regular maintenance, there is a low risk posed from such an event. Reservoir flooding is extremely unlikely to occur and there has been no loss of life in the UK from reservoir flooding since 1925.

Flood Risk from the Development

On sites where there is an increase in impermeable area, or a development located within a flood zone, there is always the potential to increase the risk of flooding as a result of the development. For the area in question, however, the existing section of shingle surface is due to be retained, and the net change in impermeable area is zero.

Flood Flow Routes

There are no known flood flow routes through the site.

Urban Creep

No allowance of urban creep has been made on this existing site, given the known nature of the site.

Tidal Flooding

Tidal flooding occurs when a high astronomical tide and storm (tidal surge) exceeds the level of coastal land or coastal flood defences. Tidal flooding can also be caused by ‘tide locking’ of rivers or estuaries. Tide locking prevents a river from discharging into the sea, causing ‘backing up’ and resulting in tidal/fluvial flooding. In addition, tidal flooding may arise from a tidal breach of defence.

The location of the site in question is considerable inland, meaning the risk posed by tidal flooding is considered to be zero.

Flooding from Sewers

Sewer flooding can occur during periods of heavy rainfall when water surcharges from a sewer with inadequate capacity. There are no available flooding records of sewers, therefore the risk of flooding from sewers is considered to be low.

5 Sequential and Exceptions Test

The NPPF and PPG advocate the use of the risk-based 'Sequential Test' to direct development away from areas shown to be in the highest flood risk areas. The NPPF aims to ensure that the development is safe throughout its lifetime, without increasing flood risk, and where possible reducing flooding risk. The table below, extracted from the Flood Risk and Coastal Change section of the PPG, and defines the level of flood risk within England.

Vulnerability Classification

With respect to the Table below, the proposed development is considered as 'Essential Infrastructure' in accordance with Annex 3 (NPPF) due to its current use of 'essential utility infrastructure which must be located in a flood risk area for operational reasons'.

The flood zones, land use vulnerability classifications and corresponding compatibility are shown on the Flood Risk and Coastal Change sections of the PPG.

Table 2: Flood risk vulnerability and flood zone 'incompatibility'

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

Key:

✔ Exception test is not required

X Development should not be permitted

Sequential Test

The Sequential Test, as set out in the PPG, aims to steer developments to areas with the lowest risk of flooding (Zone 1) where possible. Given the sole purpose of the development is to provide access to the roof of the DG1 building, which itself is wholly located in FRZ3a, it is not reasonably possible to locate the development in an alternative location at lower risk of flooding.

Exceptions Test

For the Exception Test to be passed, it should be demonstrated that; Development that has to be in a flood risk area will provide wider sustainability benefits to the community that outweigh flood risk; and The development will be safe for its lifetime taking account of the vulnerability of its users, without increasing flood risk elsewhere, and, where possible, will reduce flood risk overall.

Taking the first of these, the development is necessary for the operational functioning of a Power Station which generates electricity to supply businesses and homes across the country and as such it is concluded the development contributes significantly to wider sustainability benefits. On the other side of the equation, the proposal will have a neutral impact on flood risk given the nature of the scheme.

On the second point, the development will be safe and not increase flood risk given the nature the scheme and lack of footprint at ground level.

6 Surface Water Management

The site will drain off surface water using the existing network.

7 Flood Mitigation

Flood Resistance Measures

Flood resistance is the use of structures to prevent the entry of water into the building. Given the nature of the proposed development the incorporation of flood resistance measures are not reasonably necessary.

Flood Resilience Measures

Flood resilience is the use of practices aimed at making the development resilient to the effects of floodwater that has entered the building. With the site being only at low risk from pluvial flooding, and given the nature of the development resilience measures are not considered necessary.