



**THREE OAKS RENEWABLE
ENERGY PARK
EXTENSION**

Flood Risk Assessment

MAY 2026

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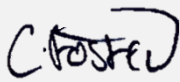
THREE OAKS RENEWABLE ENERGY PARK EXTENSION

FLOOD RISK ASSESSMENT

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Control Sheet

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1 EXECUTIVE SUMMARY

- 1.1.1 *Ridge Clean Energy Ltd.* are applying for permission for wind energy generation infrastructure, which would form phase two of the Three Oaks Renewable Energy Park to the north of Thornholme in the East Riding of Yorkshire.
- 1.1.2 The proposals comprise wind turbines, access tracks, crane hardstandings, transformers, cabling, permanent anemometer mast and ancillary infrastructure.
- 1.1.3 The entire site falls within Flood Zone 1 and is at Low risk of flooding from rivers and the sea. The proposals constitute 'Essential Infrastructure' and are appropriate in Flood Zone 1.
- 1.1.4 The site is not considered to be at risk of flooding from rivers, the sea, sewers, reservoirs, or other artificial sources.
- 1.1.5 The proposed turbine pads and access tracks are located outside of any areas of mapped surface water flood risk.
- 1.1.6 A surface water drainage strategy has been produced by TTC and is summarised in this report. The drainage strategy proposes to utilise infiltration through the use of infiltrating SuDS features such as infiltration basins, swales and filter strips.
- 1.1.7 The proposals would therefore have a negligible impact on local drainage.
- 1.1.8 This document demonstrates that the proposals meet the aims of the National Planning Policy Framework, being safe from all sources of flooding during its lifetime and not increasing flood risk elsewhere.

2 INTRODUCTION

2.1 Background

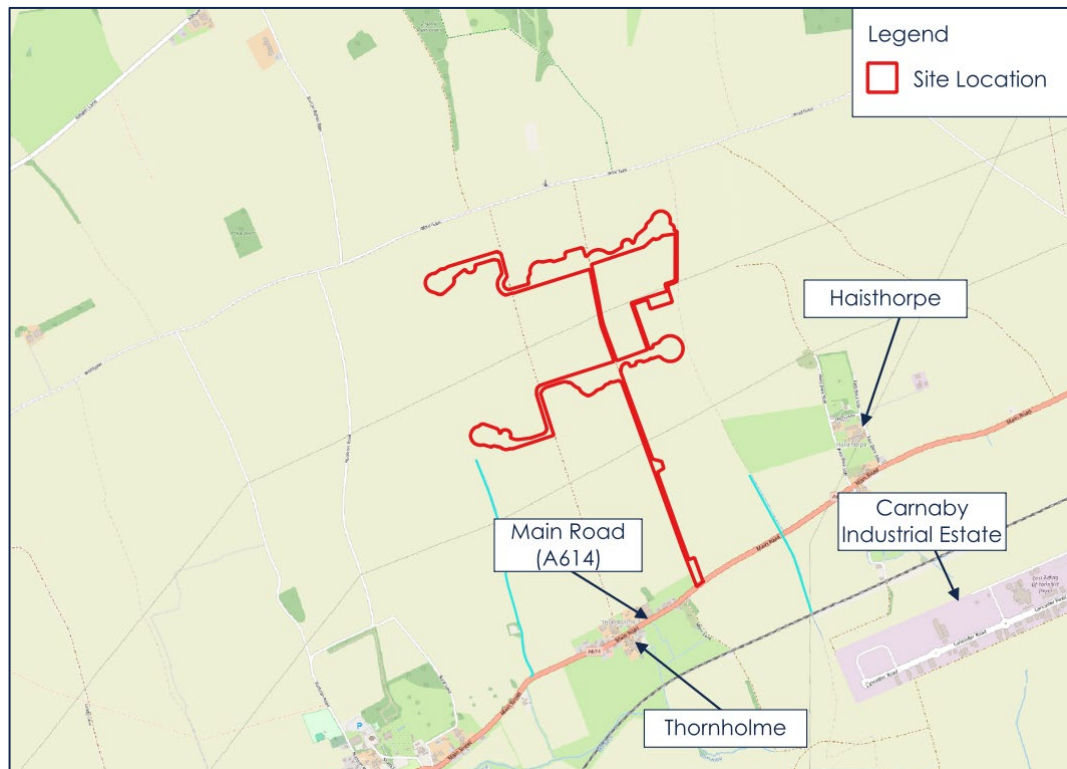
- 2.1.1 Calibro has been appointed by *Ridge Clean Energy Ltd* to undertake a Flood Risk Assessment (FRA) for wind power generation and associated infrastructure at the Proposed Development site.
- 2.1.2 The National Planning Policy Framework (NPPF) requires that the planning system takes full account of flood risk. This requires that:
- A 'site specific' FRA will be undertaken for any site that has a flood risk potential;
 - Flood risk potential is minimised by applying a 'sequential approach' to locating 'vulnerable' land uses;
 - Sustainable drainage systems are used for surface water management where practicable;
 - Flood risk is managed through the use of flood resilient and resistant techniques;
 - Residual risk is identified and safely managed;
 - Safe access and egress to and from the development can be achieved.
- 2.1.3 NPPF states that a site-specific FRA will be required for proposals:
- a) that are greater than 1 hectare in area within Flood Zone 1;
 - b) in Flood Zones 2 and 3;
 - c) in an area within Flood Zone 1 which has critical drainage problems;
 - d) in an area within Flood Zone 1 identified in a Strategic Flood Risk Assessment as being at increased flood risk in the future;
 - e) in an area in Flood Zone 1 that may be subject to other sources of flooding, where its development would introduce a more vulnerable use.
- 2.1.4 The site is entirely within Flood Zone 1 but measures over 1ha and therefore requires an FRA in accordance with NPPF.
- 2.1.5 This assessment considers the risks of all types of flooding to the site, including climate change and describes measures to minimise flood risk to the site, where required, and mitigate impacts to third parties.

3 EXISTING SITE AND HYDROLOGY CHARACTERISTICS

3.1 Site Description

- 3.1.1 The site consists of agricultural land in between the villages of Thornholme and Haisthorpe, and to the north of Carnaby Industrial Estate within the East Riding of Yorkshire (ERY) administrative area. The approximate coordinates at the centre of the site are 511400, 465400. The nearest postcode is YO25 4NN.
- 3.1.2 Site Access will be from the A614 to the east of Thornholme via an unnamed road.
- 3.1.3 The site is bound by agricultural land on all sides. The site location is shown in Figure 3-1.

Figure 3-1 Site location



3.2 Geology and Soils

- 3.2.1 Geological data held by the British Geological Survey (BGS) shows that the entire site and surrounding areas are underlain by 'Flamborough Chalk Formation' bedrock.
- 3.2.2 The superficial deposits recorded in the area are 'Till, Devensian – Diamicton' and 'Sand and Gravel of Uncertain Age and Origin'. Superficial deposits are presented in Figure 3-2.

Figure 3-2 BGS Superficial Deposits



- 3.2.3 The BGS Hydrogeology aquifer classification records the bedrock beneath the site and surrounding areas as a *'Highly Productive Aquifer'*. Nearby BGS borehole records show that groundwater levels were recorded approximately 11.9m below the top of the well, which is at approximately 28mAOD, resulting in a water table level of approximately 16mAOD.
- 3.2.4 The site is located within multiple Source Protection Zones (SPZs), with the majority of the site being located within *'Zone 2 – Outer Protection Zone'* and the southern part of the site being located within *'Zone 3 – Total Catchment'*.
- 3.2.5 SoilScapes Mapping shows a variety of soil types across the site. With the soils in the northern part of the site being recorded as *'Shallow lime-rich soils over chalk or limestone'* and soils in the southern part of the site being recorded as *'Freely draining slightly acid but base-rich soils'*. Both of the above soil types are recorded as having freely draining characteristics

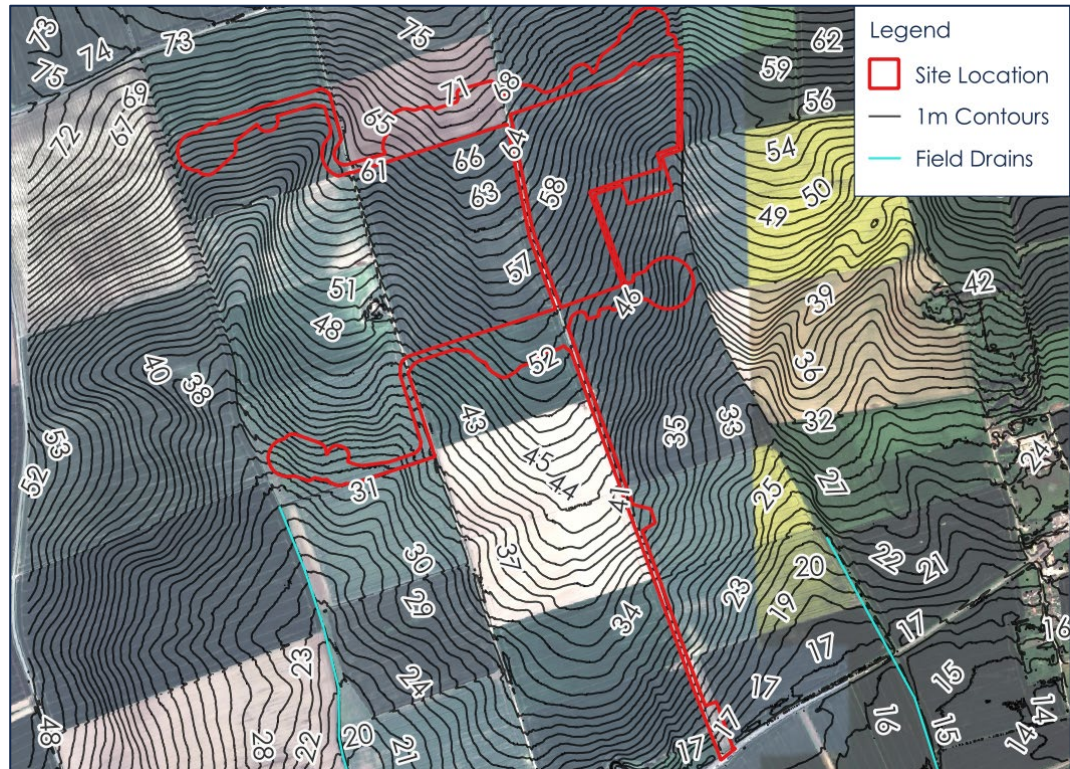
3.3 Topography and Hydrology

- 3.3.1 Site topography and hydrology have been assessed using 1m LiDAR data and a review of available mapping sources.
- 3.3.2 The land at the site generally slopes to the south, towards Main Road. The primary access road from Main Road is located on a ridge, meaning that land to the west slopes to the west and south, with land to the east sloping to the east and south.

3.3.3 The nearest watercourses to the site are existing field perimeter drains (ditches). One is located approximately 130m south of a proposed turbine location. The second is located approximately 800m to the southeast of the nearest proposed turbine location. The source of both watercourses are at least 10m lower than the turbine locations.

3.3.4 The topography and hydrology of the site is shown in Figure 3-3.

Figure 3-3 Topography and Hydrology



4 FLOOD RISK

4.1 National Planning Policy Framework (NPPF)

4.1.1 In accordance with the NPPF, this FRA considers all sources of flooding including:

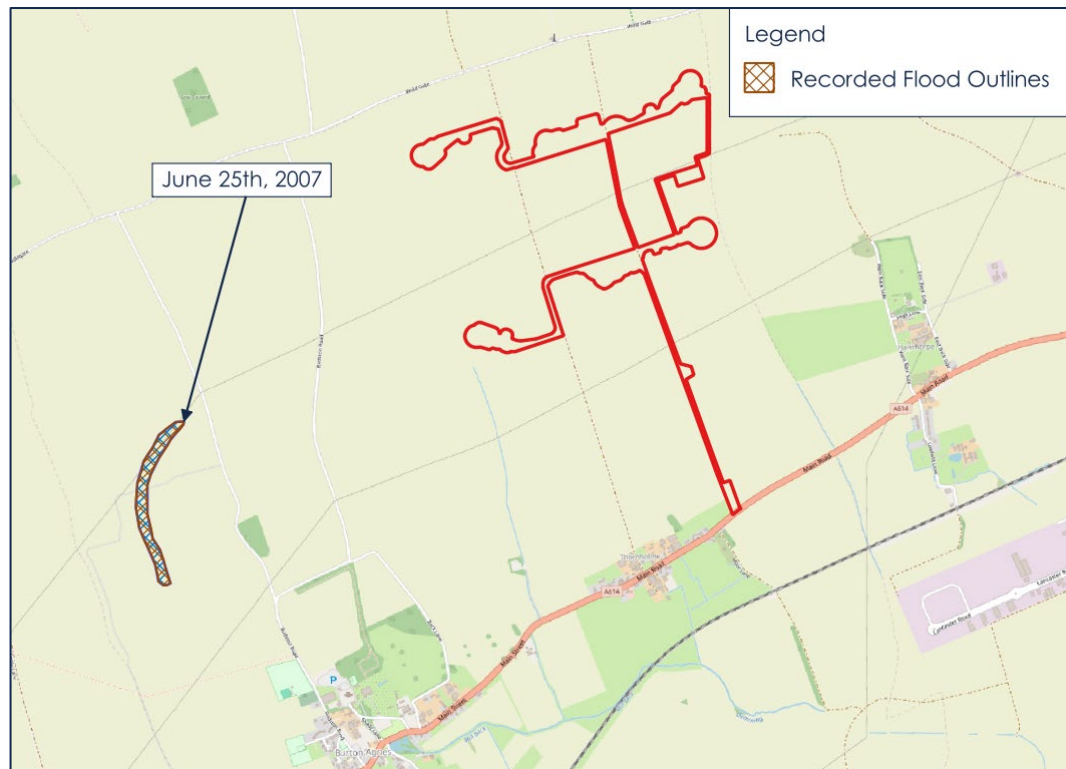
- a) Tidal Flooding – from the sea;
- b) Fluvial Flooding – from rivers and streams;
- c) Surface Water Flooding – from intense rainfall events;
- d) Groundwater flooding – from elevated groundwater levels or springs;
- e) Flooding from sewers – from existing sewer systems; and
- f) Artificial sources – from reservoirs, canals etc.

4.2 Historical Flooding

4.2.1 The Environment Agency Recorded Flood Outlines does not record any historical flooding on the site. The closest recorded event is located approximately 1.3km to the west of the site and is dated June 25th, 2007 (see Figure 4-1). This was a very significant event across the ERY and Humber region.

4.2.2 The Chronology of British Hydrological Events was searched for the key words 'Carnaby', 'Thornholme' and 'Haisthorpe'. No instances of flooding in the vicinity of the site were recorded in the database.

Figure 4-1 Recorded Flood Outlines



4.3 Flood Zones

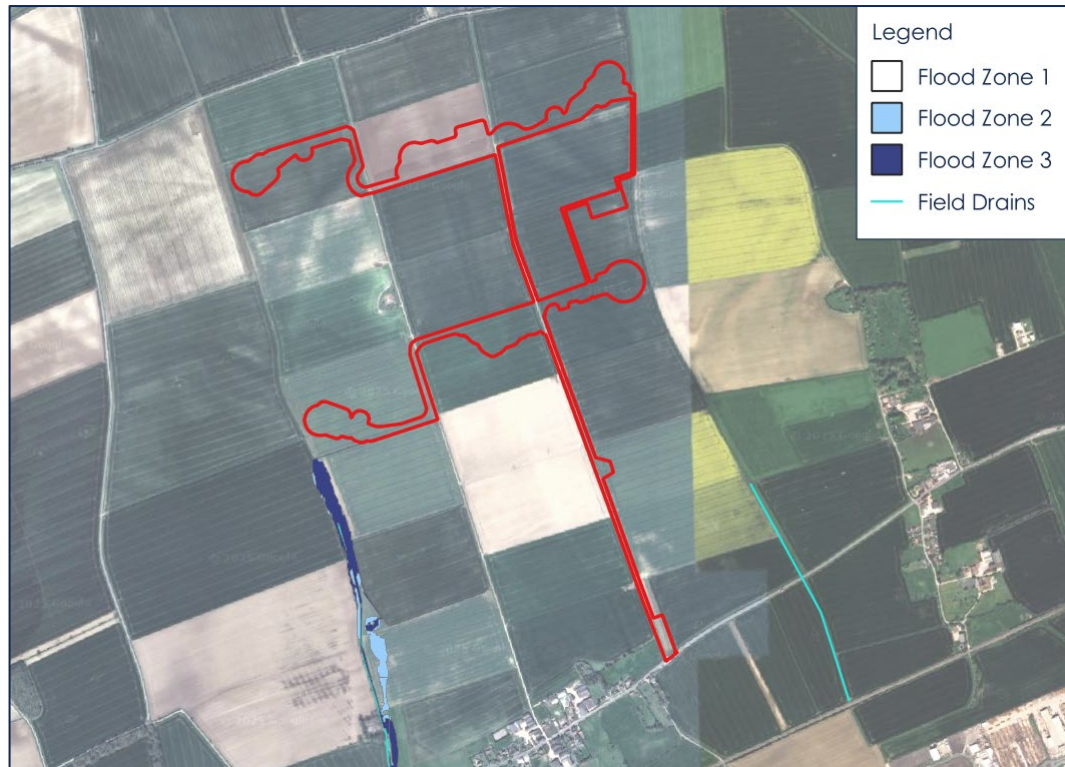
- 4.3.1 The flood zones are based on the assessed probability of the site flooding from rivers and the sea, ignoring the presence of flood defences. The flood zone classifications from the Flood Risk and Coastal Change Planning Practice Guidance (PPG) are presented in Table 4-1 below.

Table 4-1 EA Flood Zone Classification

Flood Zone	Risk	Fluvial Flooding Annual Chance	Tidal Flooding Annual Chance
1	Low	≥ 1 in 1,000	
2	Medium	Between 1 in 1,000 and 1 in 100	Between 1 in 1,000 and 1 in 200
3	High	≤ 1 in 100	≤ 1 in 200
3b	Functional Floodplain	Land where water has to flow or be stored in times of flood. This is defined in the relevant SFRA.	

- 4.3.2 The Flood Map for Planning, shown in Figure 4-2 and acquired in February 2026, defines the entire site as Flood Zone 1, at **Low** risk of fluvial flooding. The site is well beyond any tidal limits or influence so is at **Negligible** risk of tidal flooding.

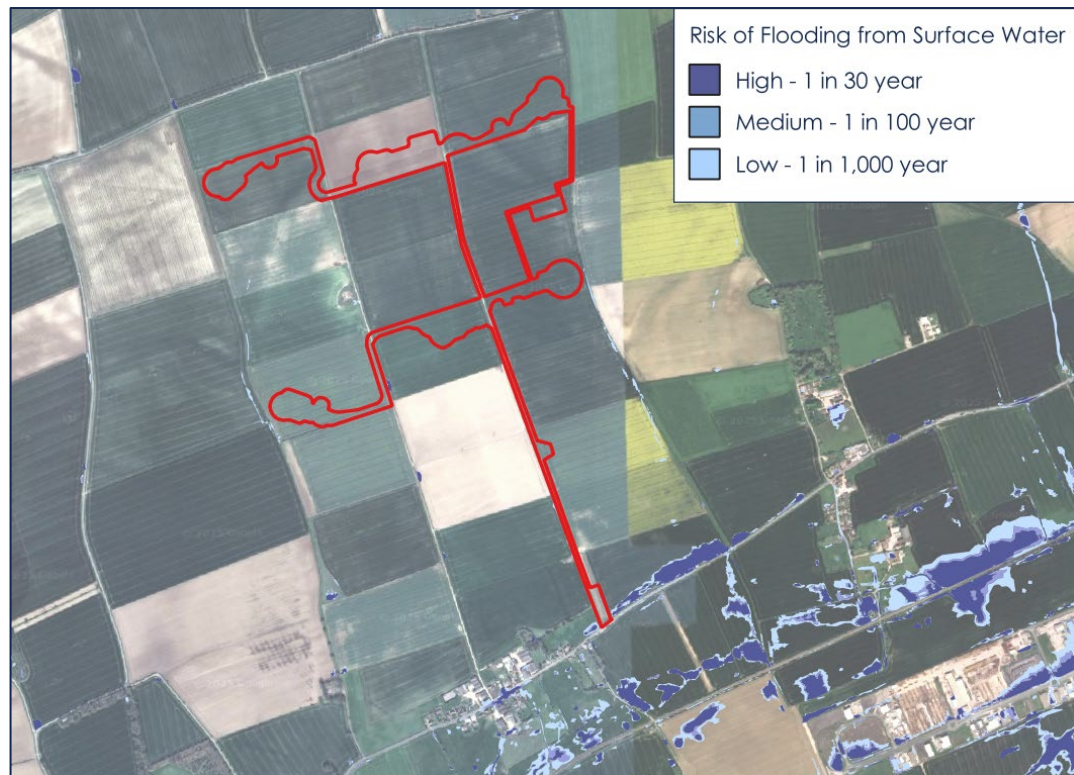
Figure 4-2 Flood Map for Planning



4.4 Surface Water Flooding

- 4.4.1 The 2025 generation of the Risk of Flooding from Surface Water (RoFSW) mapping, acquired in February 2026, indicates areas where water would tend to flow and accumulate during extreme rainfall events. The mapping is derived by simulating the 1 in 30, 1 in 100 and 1 in 1,000 year rainfall events to define areas at high, medium and low risk of surface water flooding respectively, and includes an uplift to account for climate change.
- 4.4.2 The climate change allowances used in the RoFSW modelling are based on the latest UK Climate Projections (UKCP18) from the Met Office. The mid-range allowance within the Representative Concentration Pathway (RCP) 8.5 have been used in the RoFSW modelling. The resultant estimations are based on projections for the middle of the century, which equates to a 20% uplift in peak rainfall rates.
- 4.4.3 The mapping is derived by simulation of these rainfall events over a digital terrain model (DTM). The DTM is defined on a 2m square grid and as a result small watercourses are often poorly defined. In addition, culverted sections and crossings are not represented.
- 4.4.4 The mapped extents for the three events are shown in Figure 4-3. This demonstrates that all proposed infrastructure would be located outside of any areas of mapped surface water flood risk.

Figure 4-3 RoFSW Extents



4.4.5 Local residents and the Highways Authority have observed some surface water flooding on the A614. It is understood this is partly caused by runoff from the unnamed road. As this road is subject to upgrade, the surface water flooding would be mitigated by the drainage strategy proposed by TTC and summarised later in this report.

4.4.6 As a result of the above, the site is assessed to be at **Very Low** risk of surface water flooding.

4.5 Groundwater Flooding

4.5.1 Relevant OS mapping shows that there are no springs located within the vicinity of the site.

4.5.2 The ERY Level 1 Strategic Flood Risk Assessment shows that the site is located in an area where less than 25% of the area is susceptible to groundwater flooding.

4.5.3 In addition, as mentioned in Section 3.2, a nearby BGS bore record indicates that groundwater levels in the areas are comfortably below the ground level. Groundwater was recorded as being at approximately 16mAOD. The lowest point of the proposed turbine pads is situated at approximately 33mAOD, almost 17m above the likely groundwater level in the area.

4.5.4 In the extremely unlikely event that groundwater emerged at the site, the topography is such that water would flow overland and not pond sufficiently to cause flooding.

4.5.5 As a result of the above, the risk of flooding from groundwater across the site is assessed as being **Negligible**.

4.6 Flooding from Sewers

4.6.1 Given the rural setting of the site, it is unlikely there are any significant sewers located within the vicinity of the site to generate sewer flooding. Therefore, the risk of sewer flooding to the site is considered to be **Negligible**.

4.7 Flooding from Artificial Sources

4.7.1 Mapping data from the Environment Agency shows that the site is entirely outside the flood extents presented by potential breach of large reservoirs. There are no other artificial sources identified which pose a risk to the site.

4.7.2 The development is considered to be at **Negligible** risk of flooding from reservoirs, canals and artificial sources.

4.8 Safe Access and Egress

4.8.1 As discussed above, the Proposed Development is assessed to be at a **Very Low** to **Negligible** risk of flooding from all sources. It should however be noted that local residents and the local Highways Authority have observed runoff from the unnamed road flowing onto the A614. Mitigation is proposed to minimise this flooding meaning it would not hinder future access to and from the site.

4.8.2 The Proposed Development will be controlled remotely and only visited occasionally for maintenance operations. Consequently, in the extremely unlikely event that flooding occurs, general site access or egress could be avoided. This means that site operatives would remain safe even during an extreme rainfall event.

5 DEVELOPMENT PROPOSALS

5.1 Site Proposals

- 5.1.1 The proposals are for the installation of wind turbines, access tracks, crane hardstandings, transformers, cabling, permanent anemometer mast and ancillary infrastructure.
- 5.1.2 The proposals have an anticipated lifetime of approximately 40 years. The proposed site layout is included in Appendix A.
- 5.1.3 Several access tracks, parking and turning areas are proposed across the site, which will be constructed with permeable granular material.

5.2 Development Vulnerability

- 5.2.1 Table 2 of the PPG defines which types of development are acceptable in each Flood Zone and is reproduced in Table 5-1. The Proposed Development falls within the 'Essential Infrastructure' category. The development is located in Flood Zone 1 and therefore, is appropriate.

5.3 Sequential and Exception Test

- 5.3.1 The Sequential Test is required for development at risk of flooding, inclusive of climate change. The site is located within Flood Zone 1, outside of areas of mapped surface water flooding and assessed as being at low risk from all sources. Therefore, neither the Sequential nor Exception Tests are required.

Table 5-1 PPG Development Vulnerability Classification

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

6 SURFACE WATER DRAINAGE

6.1 Introduction

- 6.1.1 A drainage strategy has been developed by TTC and is included in Appendix 8.6 of Volume 4 of the ES. The below is a summarisation of the proposed drainage strategy.
- 6.1.2 The proposed drainage strategy has been developed in accordance with the National Standards for SuDS and the East Riding of Yorkshire Council SuDS Guidance.

6.2 Approach

- 6.2.1 The proposed strategy follows the drainage hierarchy, prioritising infiltration as the most feasible option at the site. Runoff generated from the public highway, access tracks and proposed hardstanding areas will be managed through infiltration where practicable.
- 6.2.2 An infiltration rate of 6.7×10^{-5} m/s (0.2412 m/hr) has been adopted for the sandy and gravelly soils overlying the chalk bedrock. The above rate is consistent with typical infiltration rates in CIRIA C753 The SuDS Manual.
- 6.2.3 It is proposed to utilise multiple infiltration techniques across the site, including infiltration basins, filter strips and swales.
- 6.2.4 The proposed infiltration features have been designed so that rainfall events up to the 1 in 30 year event shall have a half drain time of less than 24 hours.
- 6.2.5 To account for uncertainties with the soil infiltration rates at the site, and the possible degradation of the features performance over time, a safety factor of 1.5 has been applied to the calculations, in accordance with Table 25.2 of CIRIA C753 The SuDS Manual.
- 6.2.6 Full infiltration testing is recommended to take place post planning.
- 6.2.7 Groundwater monitoring would not be required on account of the depth to the water table in the local area.
- 6.2.8 To protect proposed access tracks and hardstanding areas, a network of cutoff ditches are proposed on the upstream side of the above features.
- 6.2.9 Where it is appropriate, culverts ranging from 300-450mm in diameter will be used to permit flow beneath access tracks.
- 6.2.10 As the public highway will be upgraded to accommodate construction and delivery traffic, there is an opportunity to enhance the drainage systems associated with the highway. The proposed enhancements are explained further in the drainage strategy document.

- 6.2.11 The proposed infiltration basins have been designed to accommodate runoff from the 1 in 100 year + 40% climate change event. The proposed basins measure 1m deep have 1 in 4 side slopes and have a 300mm freeboard to ensure design resilience.
- 6.2.12 Sufficient mitigation against the likely pollutants expected at the site is provided by the multiple SuDS systems proposed in the drainage strategy. additionally, biodiversity benefit is maximised through the use of natural, open top SuDS systems such as planted infiltration basins, swales and ditches.
- 6.2.13 Operation and maintenance schedules in accordance with the CIRIA SuDS Manual has been provided for the proposed drainage strategy in the drainage strategy document.

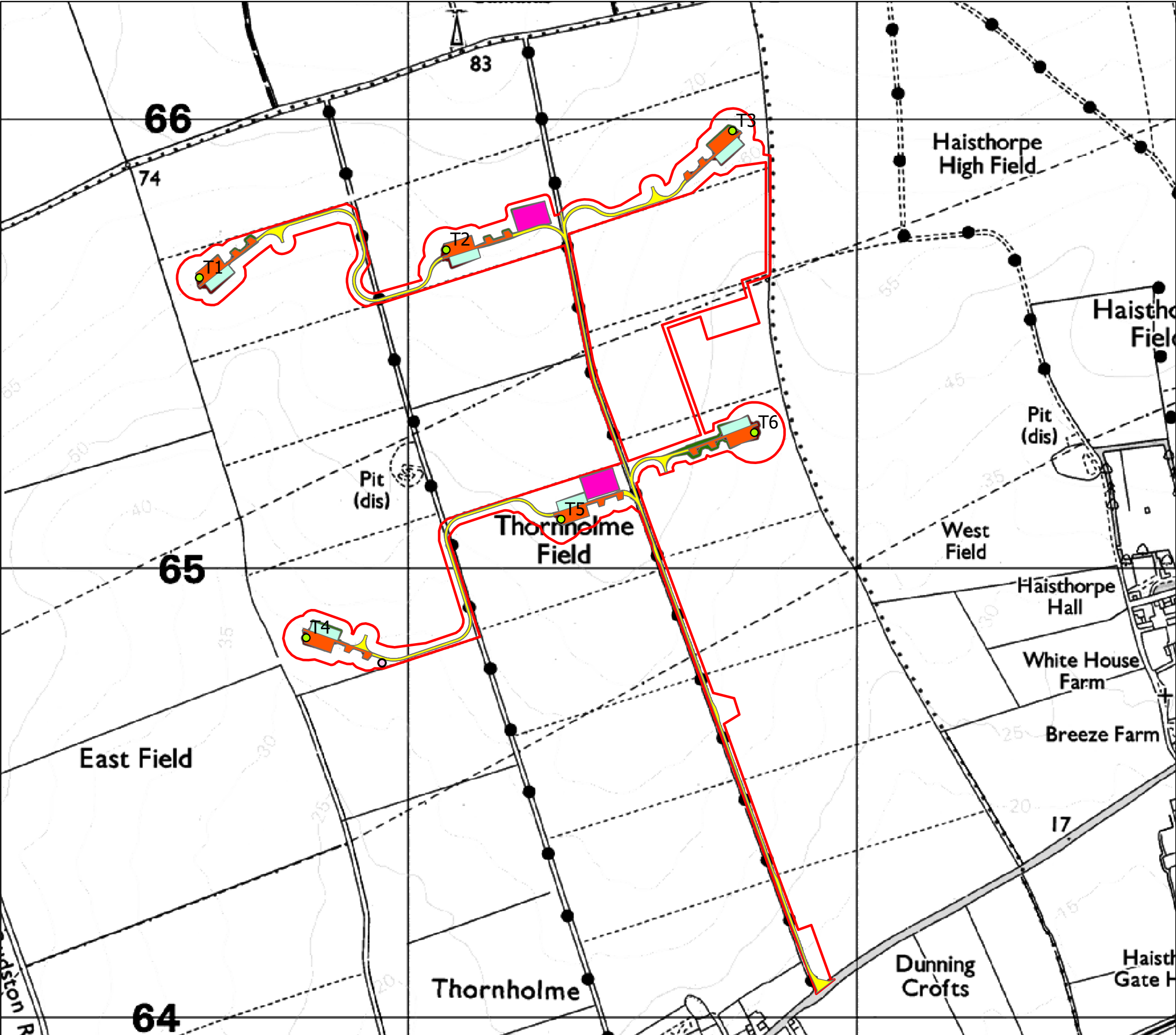
7 CONCLUSIONS

- 7.1.1 The site falls within Flood Zone 1 and is at low risk of flooding from rivers and the sea. The proposals constitute 'Essential Infrastructure' and are appropriate in Flood Zone 1. The site is not considered to be at risk of flooding from fluvial, tidal, groundwater, sewers, reservoirs, or other artificial sources.
- 7.1.2 The risk of flooding from surface water is very low across the site. the proposed turbine pads and access from the A614 are shown to be located outside of any areas of mapped surface water flood risk.
- 7.1.3 However, local residents and the Local Highway Authority has noted surface water flooding occurs at the junction of the unnamed road with Main Road. This would be mitigated by the site drainage strategy, meaning the site would be at Vey Low risk from surface water flooding.
- 7.1.4 The bedrock beneath the site is recorded as being a '*Highly Productive Aquifer*', however nearby borehole records indicate that the groundwater levels in the area are significantly below the ground surface.
- 7.1.5 The ERY Level 1 SFRA indicates that the site is located in an area where less than 25% of the area is susceptible to groundwater flooding and topography is not conducive to flooding. Consequently, the site is assessed as being at Negligible risk from groundwater flooding.
- 7.1.6 A surface water drainage strategy has been produced by TTC and is summarised in this report. The proposed drainage strategy utilises infiltration through the use of infiltrating SuDS features such as infiltration basins, swales and filter strips. This would mitigate the proposed track improvements and provide betterment to the existing flooding issues on the highway.
- 7.1.7 In conclusion, the proposed development will be safe from all forms of flooding and reduce downstream flood risk and pollution and therefore meets the aims of NPPF with regards to flood risk and drainage.

APPENDICES

APPENDIX A

Site Proposals



Legend

- Application Boundary
- Turbine Location V5
- Met Mast
- Temporary Construction Compounds
- Cut Extents
- Fill Extents
- Access Track
- Hardstandings
- Temporary Laydown Area

Scale: 1:8,000 @ A3
0 0.05 0.1 0.2 Kilometers



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Ordnance Survey AC0000808122

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Date: 13/02/2026

**Figure 2.2 Indicative Site
Layout Plan**

**Three Oaks Renewable Energy Park
Extension**



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