Steeple Renewables Project

Appendix 8.1: Flood Risk Assessment

Environmental Statement – Volume 2

April 2025

Document Reference: EN010163/APP/6.3.8

Revision: 1

Planning Act 2008

Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009 - Regulation 5(2)(a)

Appendix 8.1: Flood Risk Assessment

Document Properties		
Prepared By	**The Steeple Renewables Project Consultant Team**	
Version History		
Version	**Date**	**Version Status**
Application Version	April 2025	Rev 1

STEEPLE SOLAR FARM LIMITED

STEEPLE RENEWABLES PROJECT

Flood Risk Assessment

680819-R5(02)-FRA
April 2025

LDE
CIVILS | STRUCTURES | HYDROLOGY
an RSK company

RSK GENERAL NOTES

Project No.: 680819-R5(02)-FRA

Site: Steeple Renewables Project

Title: Flood Risk Assessment

Client: Steeple Solar Farm Limited

Date: 30th April 2025

Office: Hemel Hempstead

Status: Final

[redacted]

Issue No	Version/Details	Date issued	Author	Reviewed by	Approved by
R5(01)	Draft	25.03.25	AC	CW	CW
R5(02)	Final	30.04.25	AC	CW	MC

Where field investigations have been carried out, these have been restricted to a level of detail required to achieve the stated objectives of the work.

This work has been undertaken in accordance with the quality management system of RSK LDE Ltd.

CONTENTS

TABLES

FIGURES

APPENDICES

EXECUTIVE SUMMARY

ES.1 This Flood Risk Assessment (FRA) has been produced in accordance with the National Policy Statements for the development of nationally significant infrastructure[1] and in consultation with the Environment Agency (EA), Nottinghamshire County Council as the Lead Local Flood Authority (LLFA), the Trent Valley Internal Drainage Board (IDB), Severn Trent Water (water authority) and the Canal and River Trust (CRT).

ES.2 The aim of the FRA is to establish the flood risk to the Proposed Development from all sources of flooding, taking account of climate change over the lifetime of the development and the vulnerability of the proposed use. The impacts of the Proposed Development on flood risk elsewhere are also assessed. Where applicable, mitigation requirements are identified in order to ensure the safety of the Proposed Development over its lifetime and to demonstrate there will be no increase in flood risk off-site. Opportunities to provide a reduction in flood risk within the wider area are also investigated.

ES.3 According to the published EA Flood Map for Planning, approximately the eastern 30% of the Site falls within Flood Zone 3 (high probability of fluvial flooding), with a further 5% falling within Flood Zone 2 (medium probability of fluvial flooding). However, this mapping does not take into account the presence of flood defences along the River Trent. The defended fluvial 1 in 100 year plus climate change scenario, confirmed by the EA to be the 'design' scenario for the Proposed Development (see correspondence in **Appendix E**), shows that there is no fluvial flood risk from the River Trent to the developable area of the Site. No floodplain compensatory storage is required in relation to fluvial flood risk from the River Trent.

ES.4 There is a residual risk of fluvial flooding occurring should the River Trent flood defences fail (breach). A worse-case breach scenario could result in flooding of the majority of the eastern parcel, with depths of up to 3.83m in the 1 in 100 year plus climate change flood event. As this is a residual risk scenario, there is no requirement for the infrastructure to be designed to withstand such a flood event. Rather, it is proposed that the Proposed Development would be wholly or partially shut down remotely in the unlikely event of a breach of the flood defences causing flooding of the Site. Site closure would be triggered by EA flood warnings in combination with remote CCTV monitoring of the Site. Should shut down be necessary, this can be undertaken remotely with no

[1] https://www.gov.uk/guidance/nationally-significant-infrastructure-projects-national-policy-statements

personnel presence required. Any personnel present would be evacuated on receipt of a Flood Warning. However, the Site will generally be unmanned aside from maintenance visits, which would not be scheduled at times of extreme rainfall or unusually high fluvial flows.

ES.5 The Ordinary Watercourses crossing the Site are not included within the EA's Tidal Trent flood model. Therefore, at the request of the EA, a flood modelling exercise has been undertaken for the Catchwater Drain, Mother Drain and New Ings Drain. The 1D modelling exercise undertaken demonstrates that no overtopping is expected for the Mother Drain during the design 1 in 100 year plus climate change event, and only very minor overtopping would occur for the Catchwater Drain and New Ings Drain for the 1 in 100 year plus climate change event. The resulting flooding during overtopping events is expected to be of minimal extent and depth, occurring at only one location on each watercourse and with in-channel water levels only 30mm-100mm higher than the respective bank levels. The sensitive equipment associated with the solar panels will be significantly above the expected flood level for the Catchwater Drain and New Ings Drain, and no compensatory floodplain storage is required in relation to fluvial flooding from any of the modelled Ordinary Watercourses.

ES.6 The FRA identifies a risk of surface water flooding for parts of the Site. However, outside of the watercourse channels and limited areas immediately upstream of railway / road culverts, both the likelihood and depths of surface water flooding are generally assessed as low. For the vast majority of the Site, the likelihood of flood depths reaching 300mm is classed as 'very low' based on the latest EA's surface water flood risk mapping. Flood sensitive equipment (inverters and the BESS and substation equipment) have been directed to areas with a low risk of surface water flooding, and will be raised at least 200mm above ground level to manage residual risks during extreme scenarios. Solar panels located within the medium and high risk areas will be inherently raised above any expected flood levels. Given the very limited footprint of infrastructure located within the medium and high risk surface water flood extents (comprising panel supports only) and given the low likelihood and shallow depths of surface water flooding expected, no significant impact is anticipated to local flow paths. Any minor deflection of flows around proposed infrastructure would not impact any sensitive receptors or adjacent landowners.

ES.7 Other sources of flooding, comprising tidal, sewer, groundwater and reservoir flooding are only considered to represent a flood risk to the Site during extreme events. Any residual risks from these sources are not considered significant given the nature of the Proposed Development (unmanned facility with much

of the infrastructure raised above ground level) and the ability of the facility to be shut down remotely in the event of any flooding.

ES.8 In order to ensure there is no increase in flood risk off-site, a drainage strategy based on the use of Sustainable Drainage Systems has been designed for the Proposed Development. This will limit discharges of runoff to local watercourses to pre-development rates and will control runoff from the development area. All watercourse crossings will be designed to ensure there is no restriction of flows and will gain the appropriate consent.

ES.9 Additional to the mitigation requirements to manage the impacts of the Proposed Development, two large detention basins have been proposed as part of the Proposed Development which aim to reduce the existing surface water flood risk to Sturton le Steeple village. These will aim to intercept and retain runoff from the agricultural land to the west of the village, releasing it to local watercourses at a controlled rate after the peak of the rainfall event has passed.

ES.10 Overall, the FRA has demonstrated that the Proposed Development would be safe from a flood risk perspective over its lifetime and that potential impacts from the development have been mitigated to ensure no off-site increase in flood risk. Additionally, the incorporation of detention basins to the west of Sturton le Steeple village will contribute to a reduction in flood risk to the local area.

ES.11 Flood risk Sequential and Exception Tests are discussed within the separate **Sequential Test** report prepared by Pegasus **[EN010163/APP/7.5]**.

GLOSSARY

Breach flood event	Flooding that occurs as a result of a structural failure of an existing flood defence structure
Canal flooding	Flooding that occurs when the water level in a canal overtops its banks
Flood Zone 1	Area with an annual probability of fluvial or tidal flooding of less than 1 in 1000
Flood Zone 2	Area with an annual probability of fluvial flooding of between 1 in 1 in 100 and 1 in 1000 or an area with an annual probability of tidal flooding of between 1 in 200 and 1 in 1000
Flood Zone 3a	Area with an annual probability of fluvial flooding of greater than 1 in 100, or an annual probability of tidal flooding of greater than 1 in 200
Flood Zone 3b	Also known as functional floodplain. Land where water from rivers or the sea has to be stored at times of flood. Usually defined as areas with a greater than 1 in 30 annual probability of fluvial or tidal flooding
Fluvial flooding	Flooding that occurs when a watercourse overtops its banks and inundates the surrounding land
Groundwater flooding	Flooding that occurs when groundwater levels rise to the ground surface
Main river	Usually large rivers or streams, designated as main rivers on the Environment Agency Statutory Main River Map. These are managed and regulated by the Environment Agency
Ordinary watercourse	Any channel that water flows through, which isn't part of the main river network. These are managed and regulated by the Lead Local Flood Authority or Internal Drainage Boards
Reservoir flooding	Flooding resulting from a failure of a reservoir structure and release of water from the reservoir

Sewer flooding	Flooding that occurs when private or public sewer systems surcharge
Surface water flooding	Flooding that occurs when the capacity of soils to absorb rainfall is exceeded and water ponds or runs off over the surface
Tidal flooding	Flooding originating from coastal bodies or rivers that are influenced by the tides

1 INTRODUCTION

1.1 RSK Land and Development Engineering Ltd were commissioned by Steeple Solar Farm Limited (the Applicant) to provide a Flood Risk Assessment (FRA) to support the Development Consent Order (DCO) application for the installation and operation of a solar farm with the capacity of up to 450 MW of solar energy generation and a 150 MW Battery Energy Storage System (BESS) with associated infrastructure and equipment.

1.2 The purpose of the FRA is to establish the risk associated with the Proposed Development and to propose suitable mitigation, if required, to reduce the flood risk to an acceptable level. The FRA must demonstrate that the Proposed Development will be safe for its lifetime (in this case limited by the Order to 40 years) taking account of the vulnerability of its users, without increasing flood risk elsewhere.

1.3 This document has been produced to assess the flood risk from tidal, fluvial, surface water, groundwater, sewers, reservoirs and artificial sources in line with the National Policy Statements for the development of nationally significant infrastructure[2].

1.4 A **Surface Water Drainage Strategy** has been produced as a separate document as **Appendix 8.2 to the Environmental Statement [EN010163/APP/6.3.8]** and is referenced where applicable in this FRA.

1.5 A flood risk Sequential Test and Exception Test are also submitted as a separate document **Sequential Test [EN010163/APP/7.5]**.

1.6 This assessment has been undertaken in consultation the Environment Agency (EA), Nottinghamshire County Council as the Lead Local Flood Authority (LLFA), the Trent Valley Internal Drainage Board (IDB), Severn Trent Water (water authority) and the Canal and River Trust (CRT).

1.7 The comments given in this report and opinions expressed are subject to RSK Group Service Constraints provided in **Appendix A**.

[2] https://www.gov.uk/guidance/nationally-significant-infrastructure-projects-national-policy-statements

2 SITE DESCRIPTION & PROPOSALS

2.1 Existing site

Site description

2.1.1 The Site is located approximately 5km to the south of Gainsborough in the county of Nottinghamshire and comprises areas of agricultural land to the east and west of Sturton le Steeple and south of West Burton Power Station.

2.1.2 The Site is centred roughly at National Grid Reference 478706E, 383906N and postcode DN22 9HY. A Site location plan is included as **Figure 2.1**.

2.1.3 The Site covers an area of approximately 888.31ha with the majority of the Site comprising of multiple agricultural fields, with the field boundaries defined by hedgerow and individual trees. The Site also includes part of the existing West Burton Power Station Site, covering the area around the existing 400kV substation. The nearest settlement to the Site is Sturton le Steeple. There is a network of roads located both within the Site and adjacent to the boundary. A railway bisects the western part of the Site. The River Trent lies adjacent to the eastern boundary of the Site.

2.1.4 Within the wider surrounding area, settlements include Knaith approximately 250m east on the opposite side of the River Trent, North Leverton with Habblesthorpe and Fenton located adjacent to the southern boundary, South Leverton approximately 1.1km south, Clarborough approximately 850m west, North Wheatley and South Wheatley approximately 1.3km and 1km north-west respectively, and Gainsborough located c. 5km to the north-east of the Site.

2.1.5 A site inspection was undertaken in July 2024 in order to observe local watercourses, flood defences and to gain an understanding of local overland flow routing. Observations from the Site inspection are noted where applicable in this report.

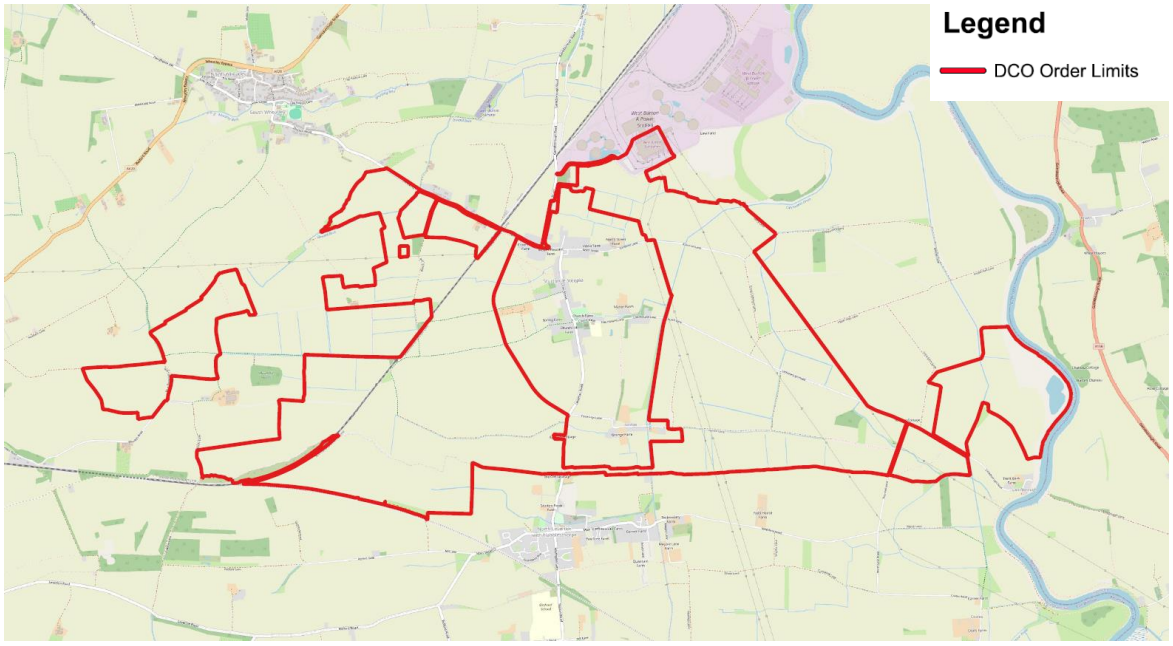


Figure 2.1: Site location plan

Topography

2.1.6 A site-specific topographic survey was carried out in November 2024. This confirms that the Site generally slopes from west to east, towards the River Trent. Levels in the eastern part of the Site are relatively flat, sloping gently from Sturton le Steeple at around 10m AOD down to the eastern boundary at approximately 3m AOD. The western part of the Site has a more significant gradient, sloping from Sturton le Steeple up towards high ground along the western boundary at approximately 75m AOD. A vegetated earth bund (flood defence) runs along the eastern Site boundary with a crest level of approximately 7m AOD and a height 3-4m above adjacent land. The Site is crossed by various drainage ditches with bunds of up to 1m height shown along the banks of the Catchwater Drain in the east of the Site. The topographic survey is included in **Appendix B**.

2.1.7 The lowest area of land proposed for built development (installation of solar panels and inverters) lies at approximately 3.5m AOD and is located immediately to the north of Littleborough Road in the east of the Site. The BESS is proposed within an area with levels of c.6-7m AOD, and the substation is proposed in an area with ground levels between c.7.5-9m AOD.

Existing drainage

Public

2.1.8 Severn Trent Water sewer plans have been obtained for the Site and are included in **Appendix C**. These plans indicate the following network of sewers in the vicinity of the Site:

- A network of foul and surface water sewers within North Wheatley to the northwest of the Site;
- A 150mm diameter foul sewer serving the cluster of residential properties on Wheatley Road immediately to the north of the Site and running to Sturton le Steeple village beneath Wheatley Road;
- A 150mm diameter pressurised foul main running around the eastern edge of the West Burton Power Station to the north of the Site, and passing through the northern part of the Site;
- A pressurised foul main running along the western side of Catchwater Drain crossing the proposed cable corridor in the south of the Site; and
- Foul and surface water sewers within the highways serving Sturton le Steeple village.

2.1.9 The only Severn Trent assets within the Site boundary are the 150mm foul sewer within the northern part of the Site and the foul sewer beneath Wheatley Road.

Private

2.1.10 Currently, runoff from the fields either infiltrates into the ground or is conveyed overland following the local gradients. Overland flow is captured by drainage ditches and conveyed to the Ordinary Watercourses or larger IDB drains and ultimately to the River Trent to the east of the Site. Field drains are likely to serve the fields at a local level.

2.2 Development proposals

2.2.1 The Proposed Development is for an electricity generating station with a capacity over 50 megawatts (MW), comprising the installation of a ground mounted solar photovoltaic (PV) electricity generation with an approximate capacity of 450 MW of energy generation and associated development comprising 150 MW of energy storage, grid connection infrastructure and all other infrastructure integral to the construction, operation and maintenance of

the Scheme including access. Areas are proposed for biodiversity mitigation in the east of the Site close to the River Trent and in the west of the Site. The proposed scheme is shown in **Appendix D**.

2.2.2 The Proposed Development falls within the definition of a 'nationally significant infrastructure project' (NSIP) under Section 14(1)(a) and 15(2) of the Planning Act 2008 (the "Act") as the construction of a generating station in England with a capacity of more than 50MW, with a capacity in the region of 600MW.

2.2.3 The Development is likely to include the following infrastructure:

- Solar PV modules;
- PV module mounting infrastructure;
- Inverters;
- Transformers;
- Onsite underground cabling;
- Underground cabling to point of connection at existing substation at West Burton Power Station;
- Fencing and security measures;
- Access tracks and construction of new accesses onto the highway;
- Energy storage facility;
- A substation and control building; and
- Equipment facilitating the electrical connection to the existing substation at West Burton Power Station.

2.2.4 It is proposed that the lifetime of this scheme will be 40 years.

2.2.5 During the construction phase, one or more temporary construction compound(s) will be required as well as temporary roadways to facilitate access to all parts of the Site.

2.2.6 The construction phase of the Proposed Development is currently anticipated to last up to two years. The types of construction activities that may be required include (but are not limited to):

- Importing of construction materials;
- The establishment of the construction compounds – these will likely move over the course of the construction process as each section is built out;
- Creation of a new access points for the Site;
- Installing the security fencing around the Site;

- Importing the PV panels and the energy storage equipment;
- Erection of PV frames and modules;
- Digging of cable trench and laying cables for connection to the West Burton Power Station substation;
- Installing transformer cabins;
- Construction of onsite electrical infrastructure for the export of generated electricity; and
- New habitat creation.

2.2.7 The Proposed Development will be decommissioned at the end of its approved operational phase. All PV modules, mounting poles, energy storage equipment, inverters, transformers etc would be removed from the Site. These items would be recycled or disposed of in accordance with good practice and market conditions at the time. Decommissioning is expected to take approximately 12 months.

3 ENVIRONMENTAL SETTING

3.1 Hydrology

3.1.1 Ordnance Survey (OS) mapping and the EA's web-based mapping indicates that the nearest EA Main River is the River Trent which runs along the eastern Site boundary. It flows in a northerly direction, eventually discharging into the Humber Estuary at Blacktoft Sands approximately 38km north of the Site. A large flood storage area is located on land adjoining the River Trent approximately 3km north (downstream) of the Site, to the west of Gainsborough.

3.1.2 OS mapping also identifies a number of Ordinary Watercourses crossing the Site, as shown in **Figure 3.1**.

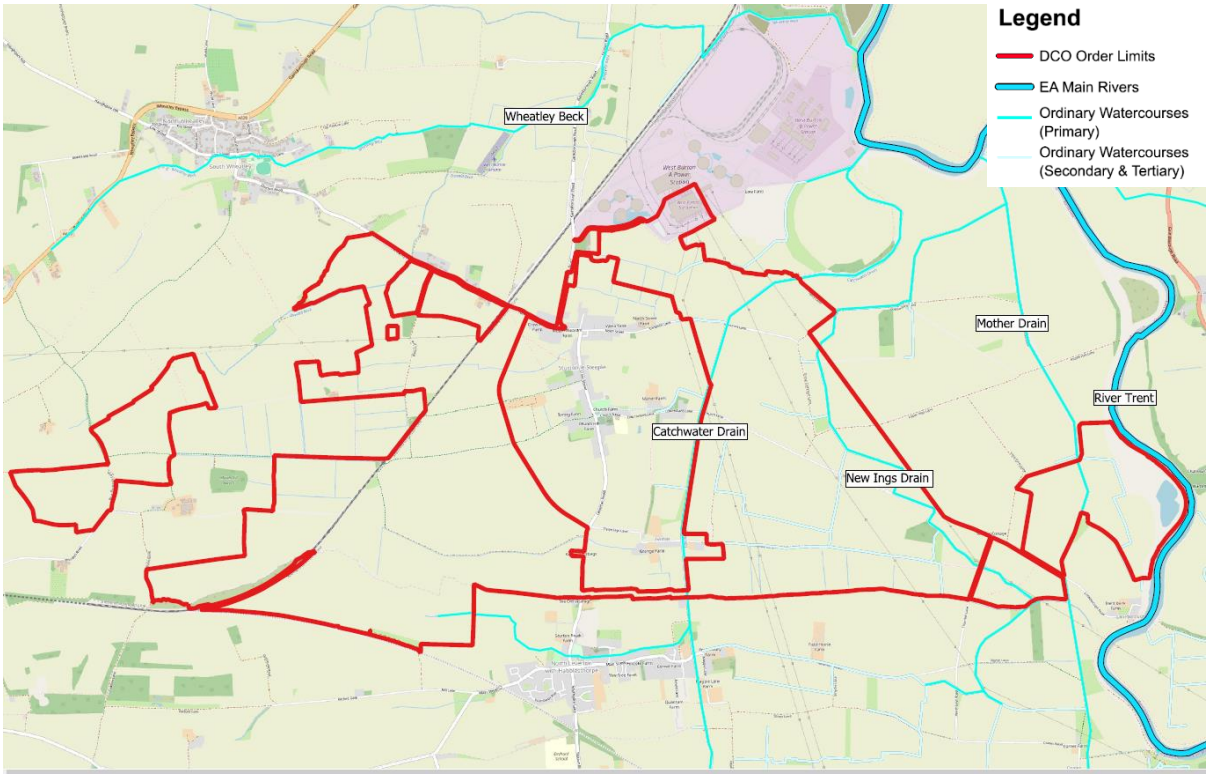


Figure 3.1: On-Site watercourses

3.1.3 The EA categorise these watercourses as primary, secondary and tertiary rivers as shown in **Figure 3.1**. Primary watercourses consist of Main Rivers and major Ordinary Watercourses, secondary watercourses consist of smaller

Ordinary Watercourses, and tertiary watercourses comprise drainage ditches and Ordinary Watercourses receiving limited flows. Two primary rivers are shown within the Site. The first is the Catchwater Drain which flows from south to north through the eastern part of the Site, discharging to the River Trent approximately 1km to the northeast of the Site via a pumped outfall. The second is the Mother Drain which flows from south to north just within the southeastern Site boundary, also discharging into the River Trent to the northeast of the Site. A number of unnamed secondary and tertiary watercourses pass through the Site, generally flowing from west to east, and discharging into the Catchwater Drain or the Mother Drain. Many of these were noted as dry during the Site visit, which was undertaken on a dry sunny day during the summer months (July 2024).

3.1.4 The Ordinary Watercourses in the eastern half of the Site, including and to the east of the Catchwater Drain, are managed by the Trent Valley IDB. Those Ordinary Watercourses that do not fall under the IDB's jurisdiction are the responsibility of Nottinghamshire County Council, the LLFA. The River Trent (Main River) falls within the EA's control, although the Canal and River Trust is the Navigation Authority for the Trent and has freehold landowner interests with respect to the riverbed.

3.2 Geology

3.2.1 Based on published geological records for the area (British Geological Survey (BGS) online mapping), the eastern part of the Site between the Catchment Drain and the River Trent is underlain by Alluvium (clay, silt, sand and gravel) and Holme Pierrepont Sand and Gravel Member (sand and gravels). A small, isolated area of Till is located in the northeast of the Site. The western part of the Site has limited linear areas of Head deposits in the vicinity of Springs Lane and along Oswald Beck.

3.2.2 The bedrock geology for the whole Site is recorded as Mercia Mudstone Group (mudstone, siltstone and sandstone).

3.2.3 BGS borehole logs have been reviewed for geological information as described in **Table 3.1**:

Table 3.1: BGS Borehole Records

BGS Borehole Ref	Location in relation to Site	Geology Recorded	Groundwater Recorded
SK78SE12	Within Site boundary, on Gainsborough Road to the north of Sturton le Steeple	Keuper Marl to at least 10.06m bgl	Yes – rest level 4.9m bgl
SK78SE28	Within Site boundary, immediately west of Leverton Road to the west of Fenton	Keuper Marl to 148m bgl	No
SK78SE27	Within Site boundary, between Northfield Road and Fenton Lane in the east of the Site	River Terrace Deposits to 1.4m bgl, Keuper Marl to at least 3m bgl	No
SK78SE26	Within eastern Site boundary, along existing overhead cable route	River Terrace Deposits to 3.4m bgl, Keuper Marl to at least 5m bgl	No
SK88SW39	Within eastern Site boundary, along existing overhead cable route	Clay, sand and gravel to 8.8m bgl, Keuper Marl to at least 9.75m bgl	Yes – 1.2m bgl
SK88SW38	Within eastern Site boundary, along existing overhead cable route	Sand and gravel to 5.94m bgl, Marl to at least 9.14m bgl	Yes – 1.98m bgl
SK88SW37	Within eastern Site boundary, along existing overhead cable route	Sand and Gravel to 5.49m bgl, Keuper Marl to at least 7.62m bgl	Yes – 1.07m bgl
SK88SW12	Within eastern Site boundary, along existing overhead cable route	Sand, silty sand and clay to 4.5m bgl, Calcareous Mudstone to at least 6m bgl	Yes – 1m bgl
SK88SW36	Within eastern Site boundary, along existing overhead cable route	Sand to 4.88m bgl, Marl to at least 6.71m bgl	Yes – 1.2m bgl

BGS Borehole Ref	Location in relation to Site	Geology Recorded	Groundwater Recorded
SK88SW4	Within Site boundary, in far east of Site 325m west of the River Trent	Alluvium to 7m bgl, River Terrace Deposits to 10m bgl, Keuper Marl to at least 11.5m bgl.	Yes - "H_2O shot to ground level as soon as broke through clay"
SK78NE35	250m north of the Site within West Burton Power Station	Sand and gravel to 7m bgl, Mercia Mudstone Group to a depth of 164m bgl and Sherwood Sandstone to 395m bgl	Yes – 80m bgl
SK78SE53	20m north of Site, on Gainsborough Road	Keuper Marl to at least 10.06m bgl	Yes – 4.9m bgl
SK78NE57	50m north of the Site on Wheatley Road	Keuper Marl to at least 6.4m bgl	Yes – "nearly full of water"
SK78SE13	70m north of the Site on Wheatley Road	Keuper Marl to at least 6.4m bgl	Yes – "nearly full of water"
SK78SE50	450m west of the Site	Keuper Marl to at least 100m bgl	Yes – 37.4m bgl
SK78SW44	800m west of the Site	Keuper Marl to 50.2m bgl	No
SK78SE42	95m south of the Site	Keuper Marl (no measurements given)	No
SK88SW42	70m east of the Site at Toll Bar Cottage	River Terrace sand and gravels to 15m bgl, Keuper Marl to at least 210m bgl	No

3.2.4 All available boreholes within the Site have been included in **Table 3.3** with the exception of any marked as 'confidential' or any that aren't legible due to

their age / scale of scanning. The table also includes any off-site records within 100m of the Site boundary, and selected boreholes within 1km of the Site – these are focussed to the west and south of the Site where there are limited records within the Site boundary.

3.2.5 The BGS borehole logs confirm the presence of Alluvium and Holme Pierrepont sands and gravels in the eastern part of the Site. No superficial deposits are recorded for the remainder of the Site, including for the boreholes closest to the proposed BESS and substation locations in the north of the Site. All boreholes record a bedrock of "Keuper Marl", now known as Mercia Mudstone.

3.2.6 No site-specific intrusive ground investigations have been undertaken for the Site to date.

3.3 Hydrogeology

3.3.1 Hydrogeological information was obtained from the online Magic Maps service. These maps indicate that the Alluvium and Holme Pierrepont Sand and Gravel Member are classified as a Secondary A superficial aquifer. The pockets of Till and Head deposits are classified as a Secondary (Undifferentiated) aquifer. The bedrock geology is classified as a Secondary B aquifer.

3.3.2 As shown in **Table 3.3**, groundwater levels within the BGS boreholes vary significantly. Groundwater is absent (or not recorded) in three of the on-site boreholes. Shallow groundwater (<5m bgl) generally correlates with the presence of Alluvium or Holme Pierrepont Sand and Gravel Member (sand and gravels), although shallow groundwater is also recorded within the Mercia Mudstone in some locations. Deeper groundwater (37m bgl and 80m bgl) is also recorded in the Mercia Mudstone at two locations.

3.3.3 The BGS borehole logs suggest isolated pockets of groundwater beneath the Site within bands of permeable deposits (superficial sands and gravels and / or permeable bands within the Mercia Mudstone) rather than a continuous shallow groundwater body. However, it is acknowledged that the BGS borehole logs do not provide sufficient Site coverage to draw firm conclusions. Where present, shallow groundwater is likely to flow locally towards the Ordinary Watercourses crossing the Site, and regionally in an easterly direction towards the River Trent. This is supported by the BGS Hydrogeological Map of the Northern East Midlands which indicates a general west to east direction of groundwater flow.

3.3.4 Defra's MAGIC maps confirm that the Site is not located within 1km of a groundwater Source Protection Zone or within 1km of a Drinking Water

Safeguard Zone (surface water or groundwater). However, the eastern part of the Site (land lying east of the Catchwater Drain) falls within a Drinking Water Protected Area relating to surface water. These are defined as locations where raw water is abstracted for human consumption providing, on average, more than 10 cubic metres per day, or serving more than 50 persons, or is intended for such future use.

4 PLANNING POLICY CONTEXT

4.1 National Policy Statements

4.1.1 The National Policy Statements (NPS) comprise the Government's objectives for the development of nationally significant infrastructure in a particular sector and state. The NPSs of relevance to the project with specific reference to flood risk requirements are as follows.

Overarching NPS for Energy (EN-1)[3]

4.1.2 In relation to flood risk, this NPS sets out requirements for application of the Sequential and Exception Tests (paragraphs 5.89 to 5.8.10 and paragraphs 5.8.21 to 5.8.23), as well as a sequential approach within the application boundary (paragraph 5.8.29). It describes policy aims to make development safe for its lifetime without increasing flood risk elsewhere (taking account of climate change) and, where possible, reducing flood risk overall (paragraph 5.8.36). Specifically, there should be no net loss of floodplain storage and any deflection or constriction of flood flow routes should be safely managed within the site (paragraph 5.8.12). Paragraph 5.8.14 states that an FRA should "*identify and assess the risks of all forms of flooding to and from the project and demonstrate how these flood risks will be managed, taking climate change into account*". The NPS sets out the minimum requirements for FRAs (paragraph 5.8.15).

4.1.3 In relation to climate change, paragraph 4.10.11 of this NPS states that "*applicants should demonstrate that proposals have a high level of climate resilience built-in from the outset and should also demonstrate how proposals can be adapted over their predicted lifetimes to remain resilient to a credible maximum climate change scenario*". However, it goes on to state in paragraph 4.10.12 that the credible maximum climate change scenario should be applied "*where energy infrastructure has safety critical elements*".

NPS for Renewable Energy Infrastructure (EN-3)[4]

4.1.4 Paragraph 2.10.84 of this NPS states that an FRA "*will need to consider the impact of drainage, but that as solar PV panels will drain to the existing ground, the impact will not, in general, be significant*". Paragraph 2.10.85 states that permeable access tracks should be used, as well as localised SuDS such as swales and infiltration trenches, to control any runoff where recommended.

[3] https://www.gov.uk/government/publications/overarching-national-policy-statement-for-energy-en-1

[4] https://www.gov.uk/government/publications/national-policy-statement-for-renewable-energy-infrastructure-en-3

4.1.5 Paragraph 2.10.86 of the NPS states that "*sites should be configured or selected to avoid the need to impact on existing drainage systems and watercourses*". Paragraphs 2.10.87 to 2.10.88 state that culverting existing watercourses or drainage ditches should be avoided but where culverting is necessary for access, "*applicants should demonstrate that no reasonable alternatives exist and where necessary will only be in place for the construction period*".

4.1.6 Paragraph 2.10.154 of the NPS states that "*where previous management of the site has involved intensive agricultural practice, solar sites can deliver significant ecosystem services value in the form of drainage, flood attenuation, natural wetland habitat, and water quality management*".

NPS for Electricity Networks Infrastructure (EN-5)[5]

4.1.7 In relation to climate change, paragraph 2.3.2 of this NPS requires applicants to set out how development has been designed to be resilient to flooding, "*particularly for substations that are vital to the network, and especially in light of changes to groundwater levels as a result of climate change*". Paragraph 2.9.19 of the NPS states that applicants should protect as far as reasonably practicable surface and ground waters.

4.2 Planning Practice Guidance – Flood Risk and Coastal Change

4.2.1 Although national planning policy is not applicable to DCO applications, paragraph 5.8.9 of NPS EN-1 makes specific reference to the Planning Practice Guidance (PPG) on Flood Risk and Coastal Change[6] with respect to application of the Sequential Test and the Exception Test. Paragraph 5.8.16 also makes reference to the PPG for further guidance when preparing a FRA.

4.2.2 Paragraph 24 of the PPG states that "*the Sequential Test ensures that a sequential, risk-based approach is followed to steer new development to areas with the lowest risk of flooding, taking all sources of flood risk and climate change into account*". It goes on to provide guidance on the application of the Sequential Test in relation to planning applications. The Sequential Test has been applied in relation to the Proposed Development, as described in the separate **Sequential Test Report** by Pegasus **[EN010163/APP/7.5].**

[5] https://www.gov.uk/government/publications/national-policy-statement-for-electricity-networks-infrastructure-en-5

[6] https://www.gov.uk/guidance/flood-risk-and-coastal-change#the-sequential-approach-to-the-location-ofdevelopment

4.2.3 Table 2 of the PPG indicates the compatibility of various land uses in each flood zone, dependent on their vulnerability to flooding. **Table 4.1** below is reproduced from Table 2 of PPG.

Table 4.1: Flood risk vulnerability and flood zone 'compatibility'

Flood Risk Vulnerability Classification		Essential Infrastructure	Water Compatible	Highly Vulnerable	More Vulnerable	Less Vulnerable
Flood Zone	Zone 1	Appropriate	Appropriate	Appropriate	Appropriate	Appropriate
	Zone 2	Appropriate	Appropriate	Exception Test Required	Appropriate	Appropriate
	Zone 3a	Exception Test Required	Appropriate	Should not be permitted	Exception Test Required	Appropriate
	Zone 3b functional floodplain	Exception Test Required	Appropriate	Should not be permitted	Should not be permitted	Should not be permitted

4.2.4 The EA has confirmed the classification of the proposed use as 'essential infrastructure'. Given that the Proposed Development falls partly within Flood Zone 3a, the Exception Test is required. A description of the application of the Exception Test for the Proposed Development is provided in the separate **Sequential Test Report [EN010163/APP/7.5].**

4.3 Local planning policy

4.3.1 The Bassetlaw Local Plan was adopted on the 29th May 2024. It contains the following policy relating to flood risk, drainage and water quality:

Policy ST50: Flood Risk and Drainage

4.3.2 This policy requires developments to be supported by a FRA which demonstrates that the development will be safe for its lifetime, without increasing flood risk elsewhere and where possible will reduce flood risk overall. Where relevant, proposals must pass the Sequential Test and where appropriate the Exceptions Test. All development where practicable should incorporate Sustainable Drainage Systems (SuDS) in line with national standards.

Policy ST51: Protecting Water Quality and Management

4.3.3 This policy seeks to "*minimise the impact of development on the quality of surface water and the Sherwood Sandstone Principal Aquifer and its ground source protection zones. Surface water flows from areas like car parks or service yards should have appropriate pollution prevention measures built in to protect groundwater and watercourses from pollutants. Proposals that improve or enhance existing waterbodies will be supported. All proposals must ensure that appropriate infrastructure for water supply, sewerage and sewage treatment, is available or can be made available at the right time to meet the needs of the development*".

5 SOURCES OF FLOOD RISK

5.1 Criteria

5.1.1 In accordance with the National Policy Statements and advice from the EA, an assessment of the risk associated with various flooding sources is required along with consideration of the effects of climate change over the design life of the development (in this case to be limited by the Order to 40 years).

5.1.2 The EA's most recent climate change guidance, published in May 2022[7], should be referenced in order to identify the appropriate peak river flow and rainfall intensity allowances for the scheme. The appropriate allowance for peak river flow is based on the location of the Site in the country, the lifetime of development, the relevant flood zone and the vulnerability of the proposed end use.

5.1.3 The flood risk elements that need to be considered for any Site are defined in BS 8533 'Assessing and managing flood risk in development Code of practice'8 as the "Forms of Flooding" and are listed as:

- Flooding from rivers (fluvial flood risk);
- Flooding from the sea (tidal flood risk);
- Flooding from the land (surface water flood risk);
- Flooding from groundwater;
- Flooding from sewers (sewer and drain exceedance, pumping station failure etc); and
- Flooding from reservoirs, canals and other artificial structures.

The following section reviews each of these in respect of the subject Site.

5.2 Flood risk from rivers (fluvial flood risk)

5.2.1 The EA Flood Zone mapping study for England is available on their website at: https://flood-map-for-planning.service.gov.uk.

5.2.2 The latest EA published flood zone map (**Figure 5.1**) shows that the eastern c.40% of the Site lies within Flood Zone 3, with a further c.5% falling within Flood Zone 2 and the remainder (central and western areas) within Flood

[7] Environment Agency, 'Guidance: Flood Risk Assessments: Climate Change Allowances'. https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances, last updated May 2022.

[8] BSI, 'BS 8533-2017 Assessing and managing flood risk in development Code of practice', December 2017.

Zone 1. However, this mapping does not take into account the presence of flood defences. The flood map indicates that defences are present along the River Trent to the east of the Site (a section of defence runs within the eastern Site boundary).

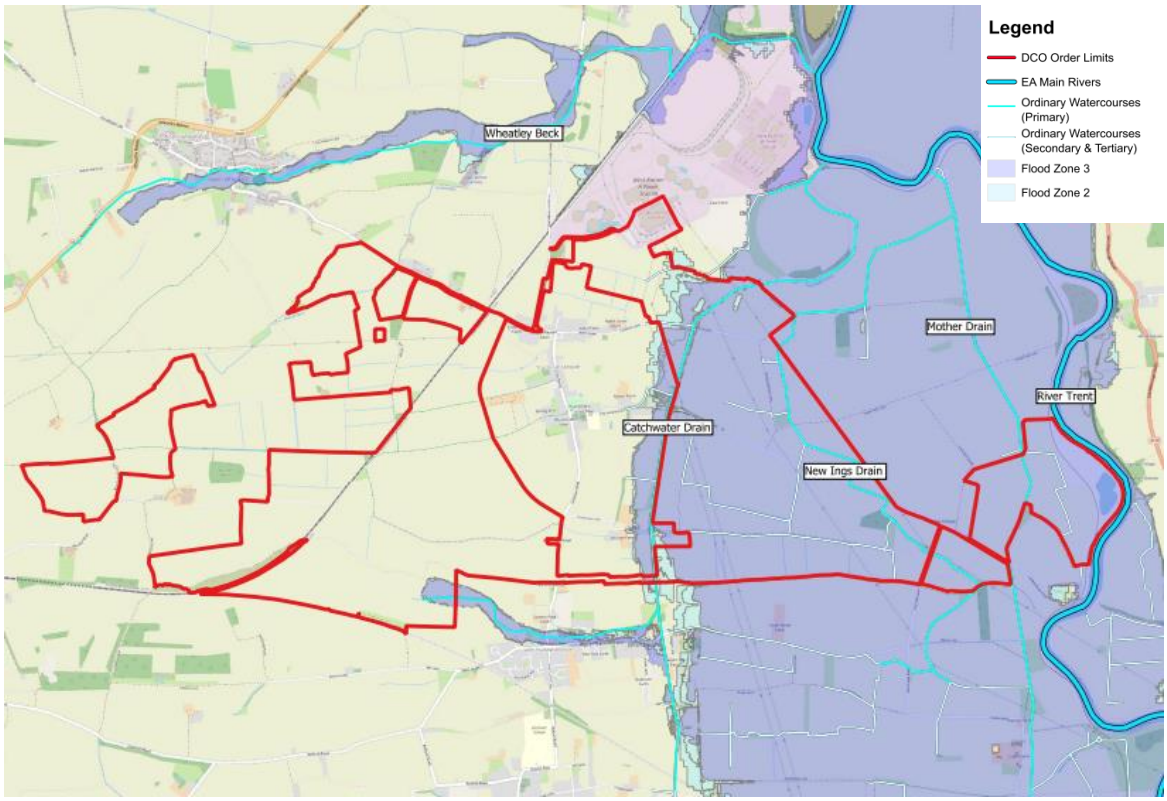


Figure 5.1: Environment Agency 'Flood map for planning'

5.2.3 The EA was consulted for further clarification of the flood risk to the Site. Information was provided by the National Infrastructure Team and the Customers and Engagement Team (East Midlands Area Office). Consultation responses from the National Infrastructure Team are included in **Appendix E**, with the flood data sourced from the Customers and Engagement Team included in **Appendix F**. The flood data was provided in the form of a Product 4 dataset, which gives the results of the EA's latest fluvial and tidal flood modelling for the subject area, including modelled flood extents and flood levels.

5.2.4 The EA has confirmed that fluvial flooding is the dominant source of flooding in this location. They have advised that the EA flood model for this area only takes account of flooding from the River Trent, and not the Ordinary

Watercourses crossing the Site. Therefore, these two sources of fluvial flooding are assessed separately below.

Fluvial Flood Risk from River Trent

5.2.5 The EA has provided undefended fluvial 1 in 100 year and 1 in 1000 year flood outlines, as shown in **Figure 5.2**.

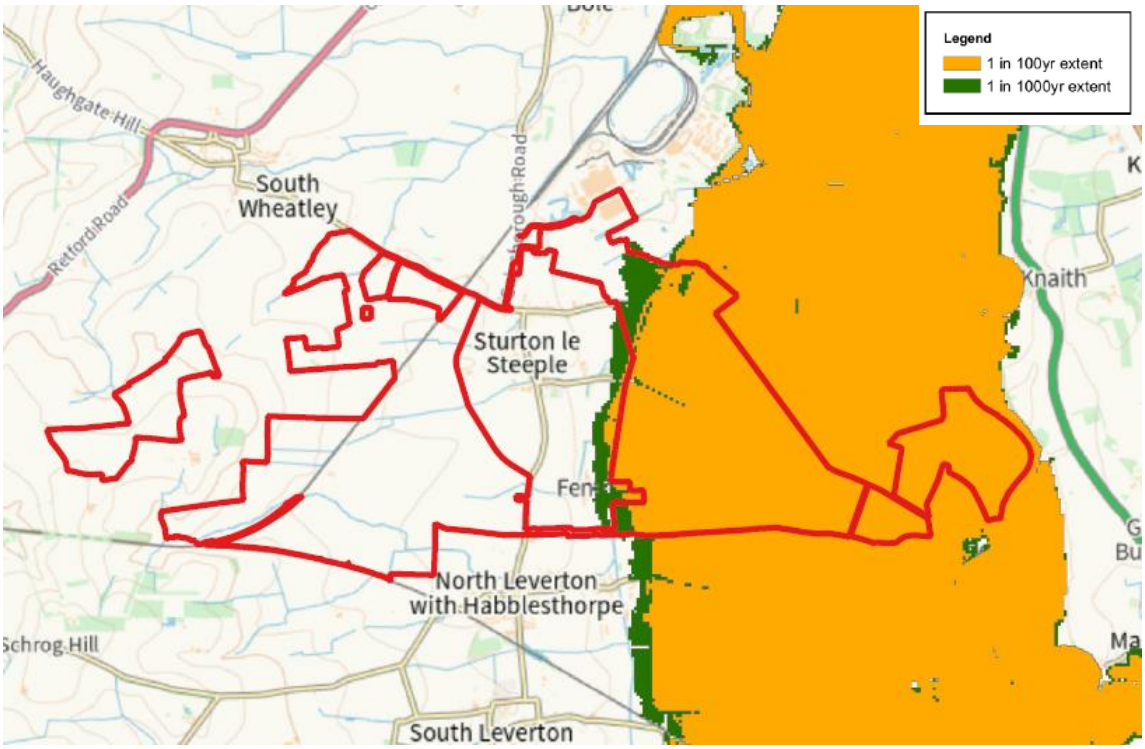


Figure 5.2: Modelled undefended fluvial flood outlines (2023 Jacobs Tidal Trent model)

5.2.6 These flood outlines show the extent of flooding if no defences were present. Similar to the Flood Map for Planning, these show the eastern c.30% of the Site to fall within the 1 in 100 year undefended flood outline, and a further c.5% to fall within the 1 in 1000 year undefended flood outline.

5.2.7 As noted above, the EA flood map shows that flood defences are located along the River Trent. The Product 4 dataset includes modelled defended fluvial flood outlines, i.e. taking into consideration the raised flood defences (flood embankment) along the banks of the River Trent. These model outputs are taken from the Tidal Trent model (Jacobs, 2023). The 1 in 100 year event has been modelled with a range of climate change allowances (29%, 39% and 62% climate change). A range of climate change scenarios were modelled by the EA to inform different types and durations of development. As described

below, the relevant design climate change allowance for the Proposed Development is 29%. Modelled defended fluvial dominated extents for the 1 in 100 year event plus various climate change allowances are shown in **Figure 5.3**. The 1 in 100 year plus 29% defended fluvial outline flood extent is significantly reduced compared to the 1 in 100 year present day undefended scenario (no undefended climate change extents were provided for direct comparison). Additional defended outlines are included in the Product 4 dataset (**Appendix F**). All events up to and including the 1 in 100 year (present day) event are shown to remain on the river-side of the River Trent defence embankment. With a climate change allowance, there is some overtopping of the defences, but the extent of flooding is significantly less than in the undefended 1 in 100 year scenario for events up to the 1 in 100 year plus 39% climate change scenario.

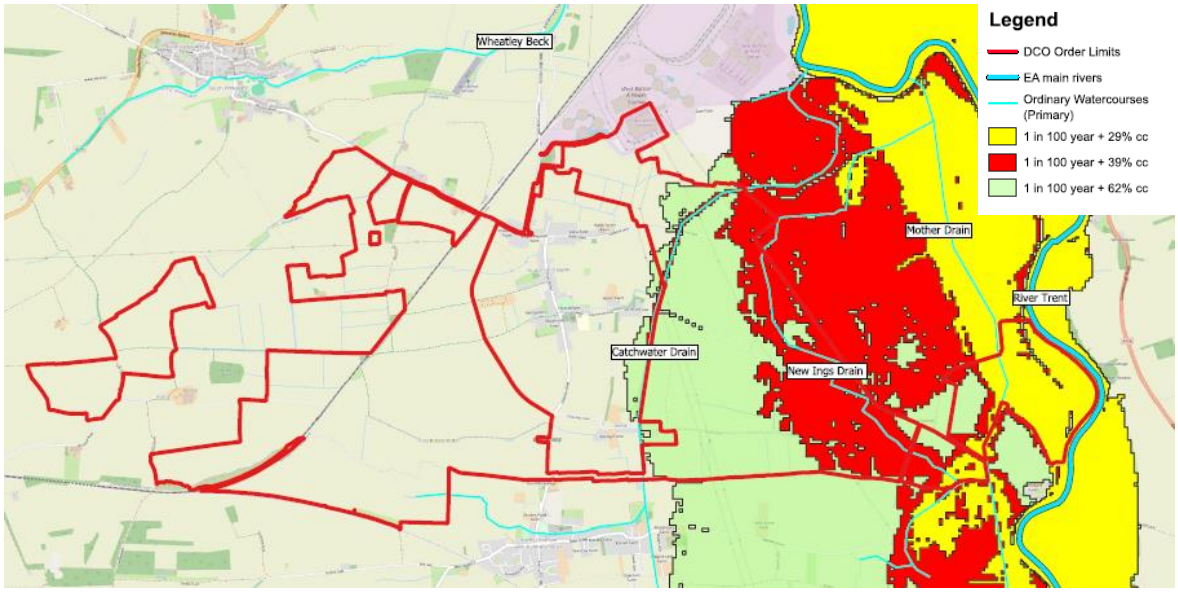


Figure 5.3: Modelled defended 1 in 100 year plus climate change fluvial dominated extents (2023 Jacobs Tidal Trent model)

5.2.8 The EA has also provided a modelled defended 1 in 30 year fluvial flood extent and water levels in order to establish the extent of Flood Zone 3b (functional floodplain) for the River Trent. This is provided in **Figure 5.4**. This mapping confirms that the 1 in 30 year fluvial flood extent remains within the river embankments and does not extend beyond the flood embankment just inside the eastern boundary of the Site. The Bassetlaw District Council Strategic Flood Risk Assessment (SFRA)[9] confirms that the presence of defences is

[9] JBA Consulting, Bassetlaw District Council Strategic Flood Risk Assessment, 2019

considered when mapping Flood Zone 3b. All built development is therefore confirmed to lie outside Flood Zone 3b for the River Trent.

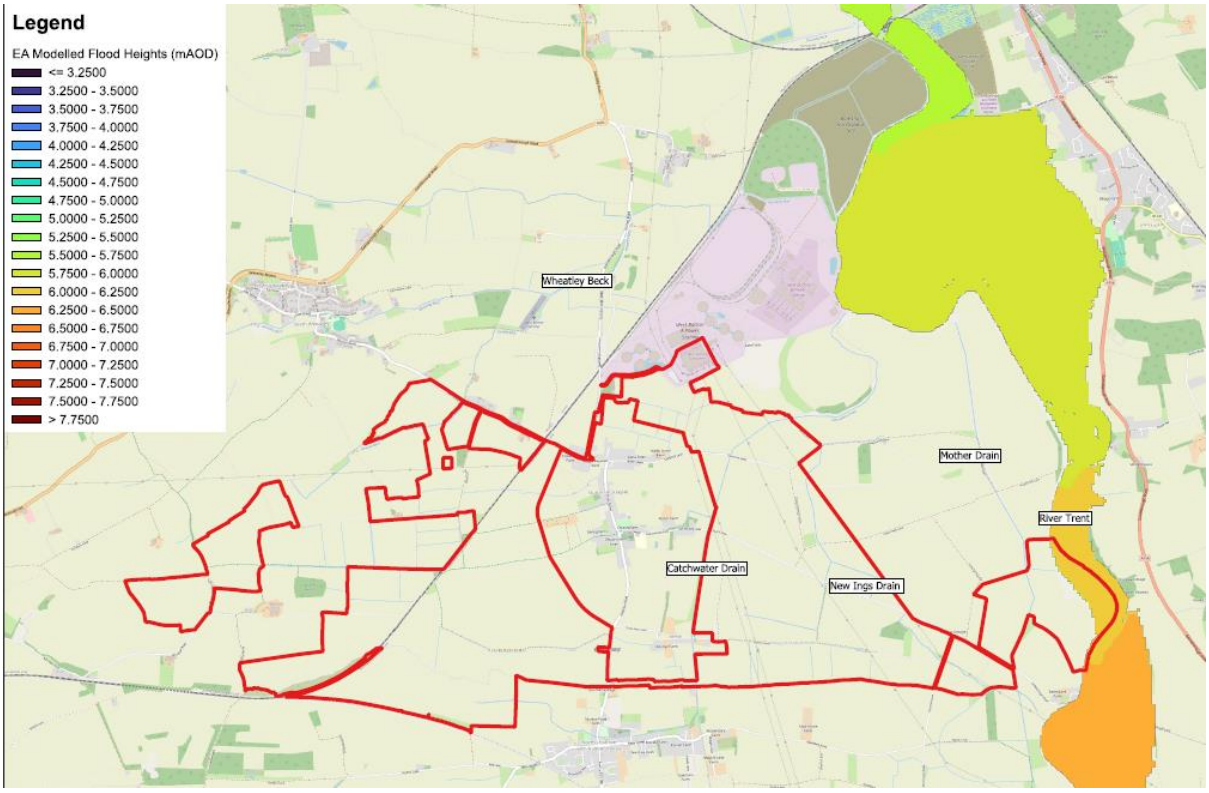


Figure 5.4: Modelled 1 in 30 year defended flood extent (2023 Jacobs Tidal Trent model)

5.2.9 The EA has advised that the 'design' flood event for the Proposed Development is the 1 in 100 year plus climate change defended flood extent. Based on the EA's latest climate change guidance[10], the 'higher central' climate change allowance should be used for 'essential infrastructure' development. The Proposed Development will be operational for a 40 year period from 2029 to 2069, the date of decommissioning will be specified within the DCO. As the operational period falls entirely within the 2050s epoch (covering the period 2040 – 2069), the 'higher central' climate change allowance within the Lower Trent and Erewash Management Catchment for the 2050s epoch of 23% is considered appropriate for the operational phase of the Development. This has been agreed with the EA (see correspondence in **Appendix F**).

[10] https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances

5.2.10 As the EA Tidal Trent model does not include outputs for the 23% climate change allowance, the 29% climate change outputs will be used to inform mitigation requirements as a worse-case scenario. The 1 in 100 year plus 29% climate change extent and flood levels are shown in **Figure 5.5**.

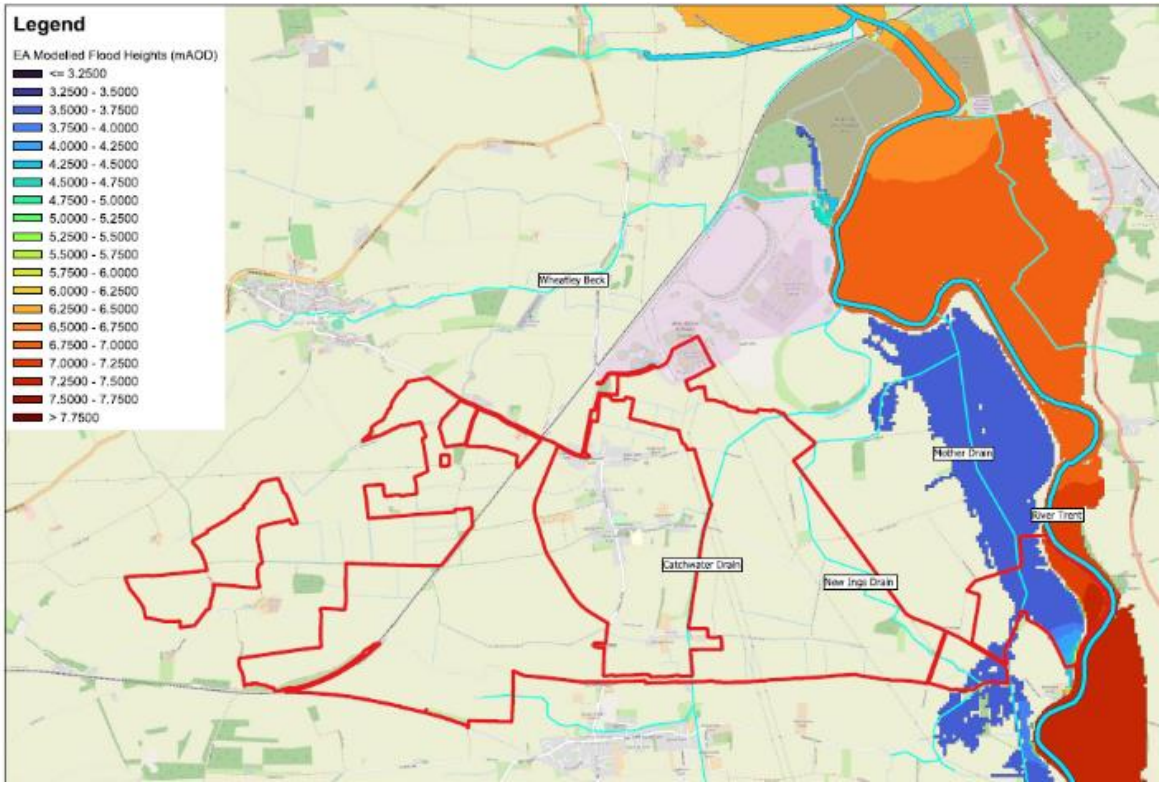


Figure 5.5: Modelled defended fluvial 1 in 100 year plus 29% climate change extent and levels (2023 Jacobs Tidal Trent model)

5.2.11 The modelled extent for the 1 in 100 year plus 29% climate change event occupies only the eastern-most part of the Site, comprising the land proposed for biodiversity mitigation only. The design 1 in 100 year plus 29% climate change flood level is **3.69m AOD**. Although localised parts of the operational part of the Site fall slightly below this flood level, to a minimum ground level of 3.5m AOD, the EA modelled flood extents show there are no pathways for floodwater to reach these areas.

5.2.12 As the decommissioning phase would extend into the 2080s epoch, the 1 in 100 year plus 39% climate change extent requires consideration for the decommissioning works, as requested by the EA. The 1 in 100 year plus climate change extent is shown in **Figure 5.3** and occupies the eastern part of the Site including areas proposed for solar arrays. The design 1 in 100 year plus 39% climate change flood level for the decommissioning phase of the

development is **4.35m AOD** (taken from the Product 4 dataset in **Appendix E**). This could result in flood depths of up to 0.85m in the lowest parts of the operational area of the Site.

5.2.13 As agreed with the EA (see correspondence in **Appendix F**), the 'credible maximum' climate change allowance (upper end) is not applicable for the Proposed Development. As specified within NPS EN-1, the credible maximum climate change allowance should be considered "*when energy infrastructure has safety critical elements*". The Proposed Development will be unmanned aside from maintenance visits and would be monitored via CCTV and safely shut down remotely in the event of extreme flooding. It will not form part of the National Grid, acting as a generating facility rather than a distributor, and there will therefore be no disruption to supply to the wider public in the event the facility needs to be shut down. It is therefore not considered to include 'safety critical elements'.

5.2.14 The EA has provided details of the flooding scenario in a worse-case scenario that a breach occurs in the River Trent flood embankment. A number of breach locations were modelled as part of the EA's Tidal Trent model. The EA has advised that the most appropriate breach location for the Site (i.e. the breach with the greatest impact to the Site) is Breach 29. This breach location is approximately 2km southeast of the Site.

5.2.15 The breach extent associated with Breach 29 during a 1 in 100 year plus 29% climate change event is shown in **Figure 5.6**.

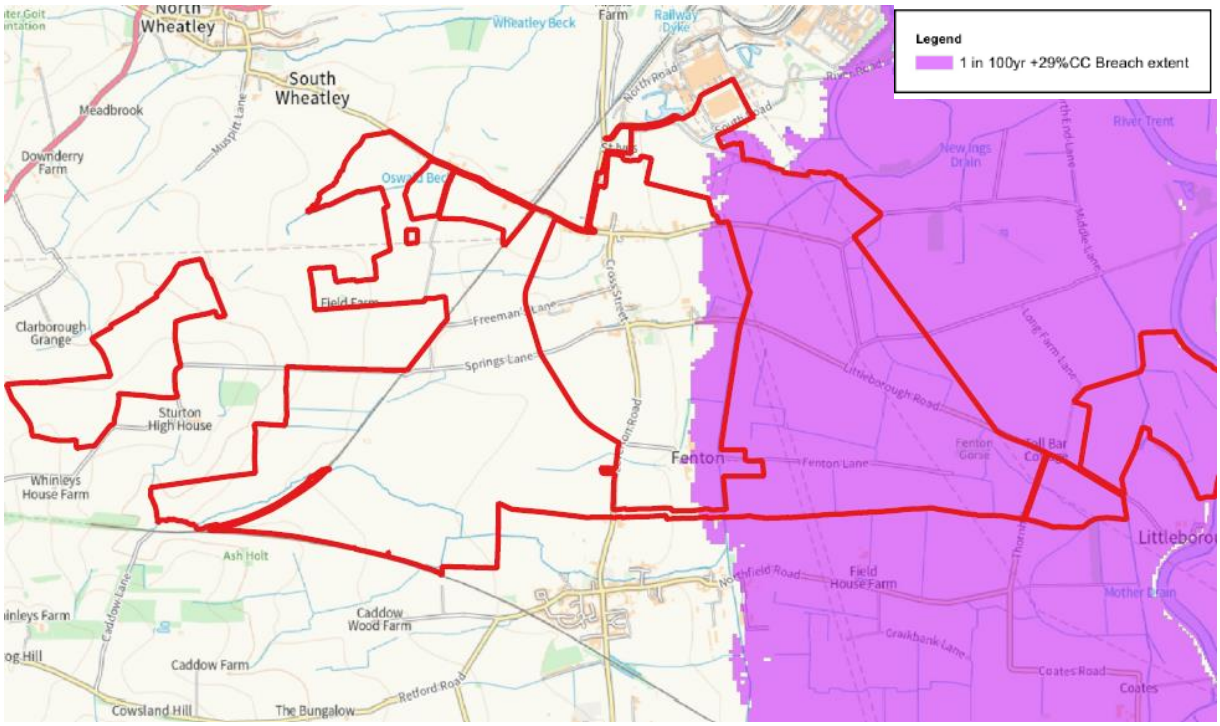


Figure 5.6: Modelled breach flood extent at Breach Location 29, 1 in 100 year plus 29% climate change event (2023 Jacobs Tidal Trent model)

5.2.16 The breach modelling outputs indicate a possible breach flood level of 7.33m AOD during the 1 in 100 year plus 29% climate change event. This could correspond to flooding of the majority of the eastern parcel of the Site, with flood depths of up to 3.83m within the areas for solar arrays and up to c.1.3m within the BESS area. The substation is located outside the breach extent. It is reiterated that this is a worse-case scenario that the flood defences fail, and that this failure occurs in specific the location modelled as Breach 29. A breach in other locations would result in smaller flood extents and lower flood levels on the Site.

5.2.17 The Bassetlaw Dirstrict Council SFRA[11] includes fluvial flood zone mapping, including climate change mapping, but this is considered to be superseded by the 2023 Jacobs Tidal Trent flood model discussed above.

5.2.18 Historical flood outlines have been obtained from the Defra Data Services Platform and are shown in **Figure 5.7**. Flooding to the landward side of the River Trent flood defence bund was recorded during during 1932, 1947, 1977 and 2000 to various extents. None of the historical events would have affected the proposed substation location and the BESS location would have remained

[11] JBA Consulting, Bassetlaw District Council Strategic Flood Risk Assessment, 2019

unaffected in all but one event (1947). The return period of the historical events and the level of the flood defence bund at the time of flooding are not known so it is difficult to estimate the likelihood of a reoccurence. However, should a similar event occur during the operational lifetime of the Proposed Development, the progression of floodwaters would be monitored remotely and it is likely that parts of the Proposed Development would need to be shut down temporarilty until flooding receded.

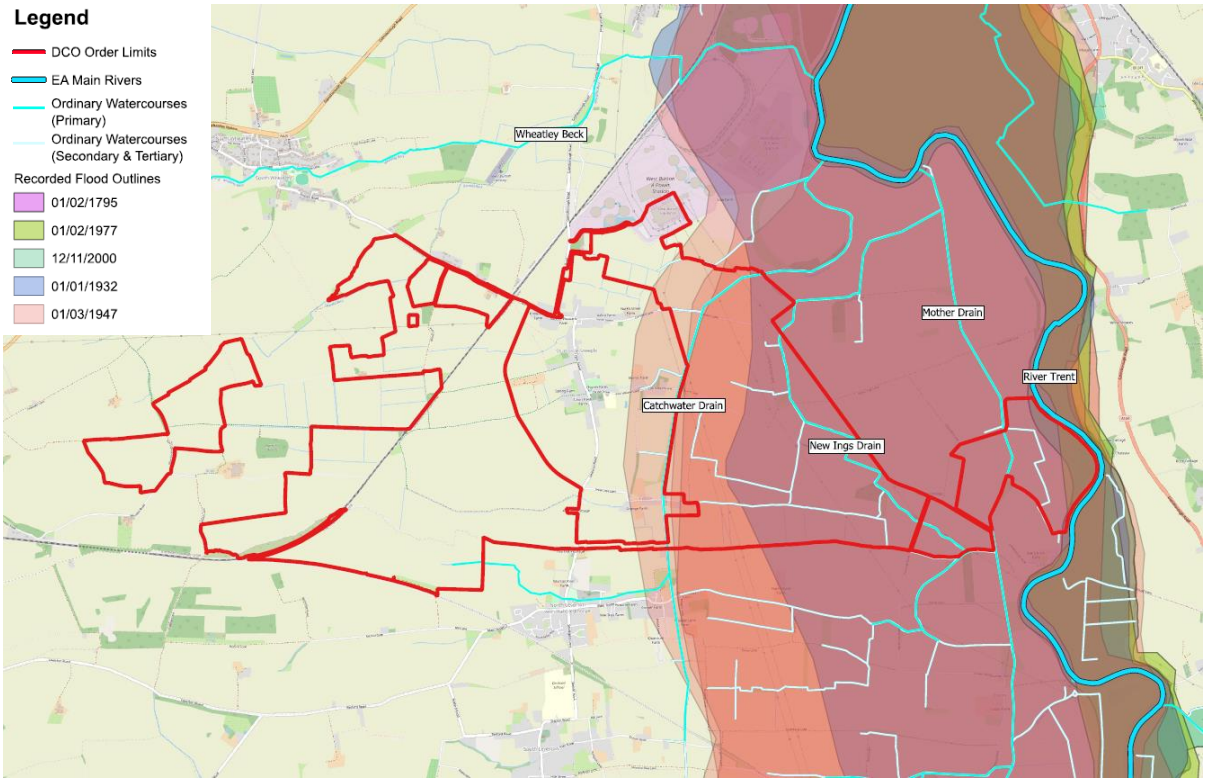


Figure 5.7: Historical recorded flood outlines (Defra Data Services Platform)

Fluvial Flood Risk from Ordinary Watercourses

5.2.19 The has EA advised that the River Trent flood model does not take into account the flood risk from the Ordinary Watercourses within the Site. They have advised that additional assessment should be undertaken in relation to the fluvial flood risk from these watercourses.

5.2.20 For the main IDB watercourses, namely the Catchwater Drain, Mother Drain and New Ings Drain, an assessment of fluvial flood risk was initially

undertaken by RSK using the Mannings approach. The full methodology and findings are provided in **Appendix G**. As the Mannings Assessment identified a possible lack of capacity within the Catchwater Drain and Mother Drain to contain the 1 in 100 year plus climate change event, a 1D modelling exercise was undertaken for all three watercourses, to refine the in-channel water levels. This confirmed that during the 1 in 100 year plus climate change event there was no overtopping of the Mother Drain and only limited overtopping in a single location for both the Catchwater Drain and New Ings Drain. The overtopping for the Catchwater Drain is considered to affect an area of open ground only, with the nearest area of proposed infrastructure being an area of solar panels c.400m away. For the New Ings Drain, the overtopping results from a water level only 30mm higher than the bank level in one location, with the nearby infrastructure comprising solar panels that will be inherently raised significantly above the flood level. The IDB watercourses assessed are considered to represent a low risk to the Proposed Development.

5.2.21 The latest EA Flood Map for Planning includes a 1 in 30 year defended fluvial flood extent which indicates a potential flood risk from the Catchwater Drain during this event (see **Figure 5.8**). However, the 1D fluvial flood modelling exercise confirms that for the 1 in 30 year event there is no out of bank flooding from the Catchwater Drain (or the New Ings Drain or Mother Drain). No areas of Flood Zone 3b are therefore considered to exist within the area of the Proposed Development.

Figure 5.8: EA Flood Map for Planning, 1 in 30 year defended fluvial flood extent

5.2.22 For the smaller IDB watercourses and the Ordinary Watercourses managed by the LLFA, it is considered appropriate to use the EA's surface water flood risk mapping as a proxy for the fluvial flood risk from these watercourses. This is due to the small catchment of these watercourses, many of which were noted as dry during the Site inspection. Surface water flood risk is discussed in **Section 5.4**, but with reference specifically to the Ordinary Watercourses it is noted that the 'medium' and 'high' probability events are shown to remain within or close to the watercourse channels with the exception of the area immediately to the west of the railway in the west of the Site, where a restriction through the railway culverts results in backing up of water behind the railway. With the exception of the area upstream of the railway culverts, the likelihood of flood depths outside the channels reaching 300mm is shown on the EA mapping to be 'very low'. Within the location of the BESS and substation, the likelihood of flood depths reaching 200mm is shown to be 'very low' outside of the drainage channels.

Fluvial Flood Risk Summary

5.2.23 During the design defended fluvial flooding scenario associated with the River Trent, no flooding is anticipated to the developable area of the Site. A residual risk remains in the unlikely event of a breach of the River Trent defences, which could result in a significant depth of flooding in the eastern part of the Site.

5.2.24 The Ordinary Watercourses (managed by the LLFA and IDB) have a limited associated fluvial flood risk. For the main IDB watercourses, very limited localised overtopping has been shown to occur at one location each for the Catchwater Drain and New Ings Drain, and for the smaller watercourses / ditches any overtopping is considered to remain close to the watercourse channel and associated depths are shown to be minimal (less than 300mm even in the extreme 0.1% annual exceedance probability (AEP) event with the exception of the area immediately upstream of the railway embankments).

5.2.25 The overall risk of fluvial flooding is considered to be **low to medium**.

5.3 Flood risk from the sea (tidal flood risk)

5.3.1 Although the River Trent is dominated by fluvial flows, there is an element of tidal influence. The EA has provided an undefended tidal flood extent from the Tidal Trent model, as shown in **Figure 5.9**. This shows that if flood defences were entirely absent, the eastern part of the Site (including part of the area of proposed solar development) could be impacted by tidal flooding during the 1 in 200 year and 1 in 1000 year events.

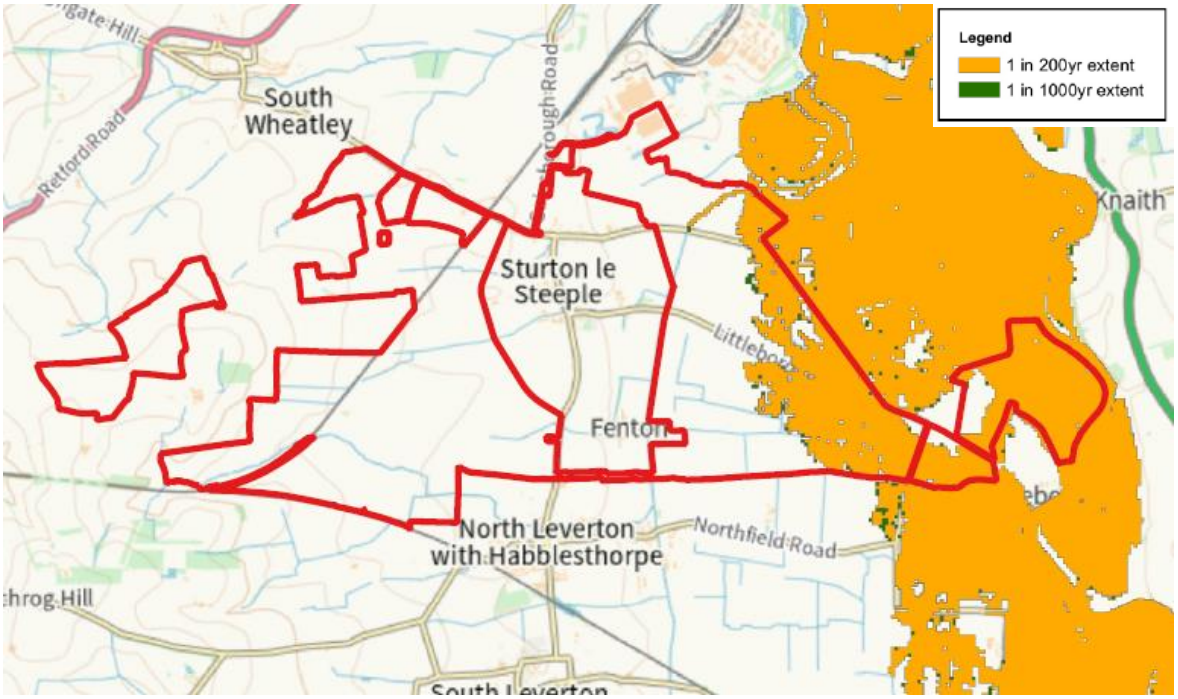


Figure 5.9: Modelled undefended tidal dominated flood extent (2023 Jacobs Tidal Trent model)

5.3.2 The 'design' tidal flood event is the 1 in 200 year event taking account of the presence of flood defences. The EA has provided defended tidal flood outlines for a range of return period events within their Product 4 dataset (**Appendix E**). From the extract in **Figure 5.10** it can be seen that the Site is unaffected by tidal dominated flooding for all return period events. This confirms that the dominant source of flooding in this located is fluvial flood risk.

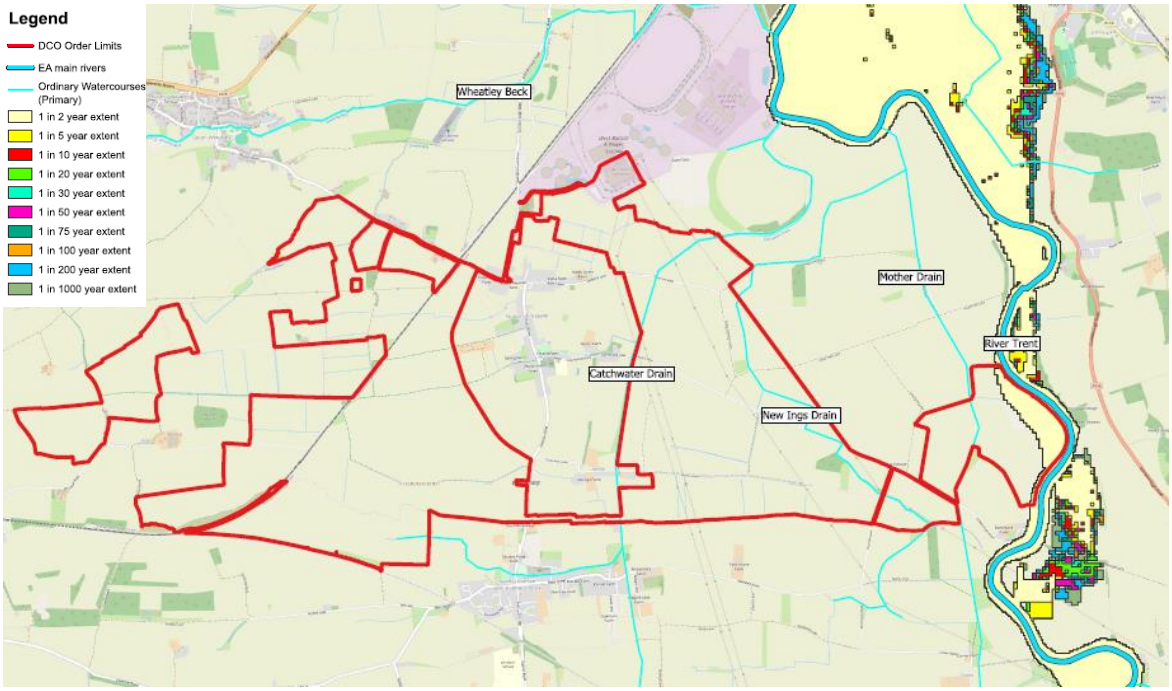


Figure 5.10: Modelled defended tidal flood extents (2023 Jacobs Tidal Trent model)

5.3.3 A tidal breach flood outline is provided within the Product 4 dataset, but is considerably smaller than the fluvial breach extent considered in **Section 5.2** and therefore consideration of a breach event within this FRA will be based on the fluvial breach scenario as a worse-case.

5.3.4 The overall tidal flood risk is considered to be **low**.

5.4 Flood risk from the land (surface water flood risk)

5.4.1 If intense rain is unable to soak into the ground or be carried through manmade drainage systems, for a variety of reasons, it can run off over the surface causing localised floods before reaching a river or other watercourse.

5.4.2 Generally, where there is impermeable surfacing or where the ground infiltration capacity is exceeded, surface water runoff can occur. Excess surface water flows from the Site are believed to drain naturally to the local water features, either by overland flow or through infiltration.

5.4.3 The EA's surface water flood map (**Figure 5.11**) shows areas of low, medium and high surface water flood risk throughout the Site. The western and eastern parts of the Site are described in turn below.

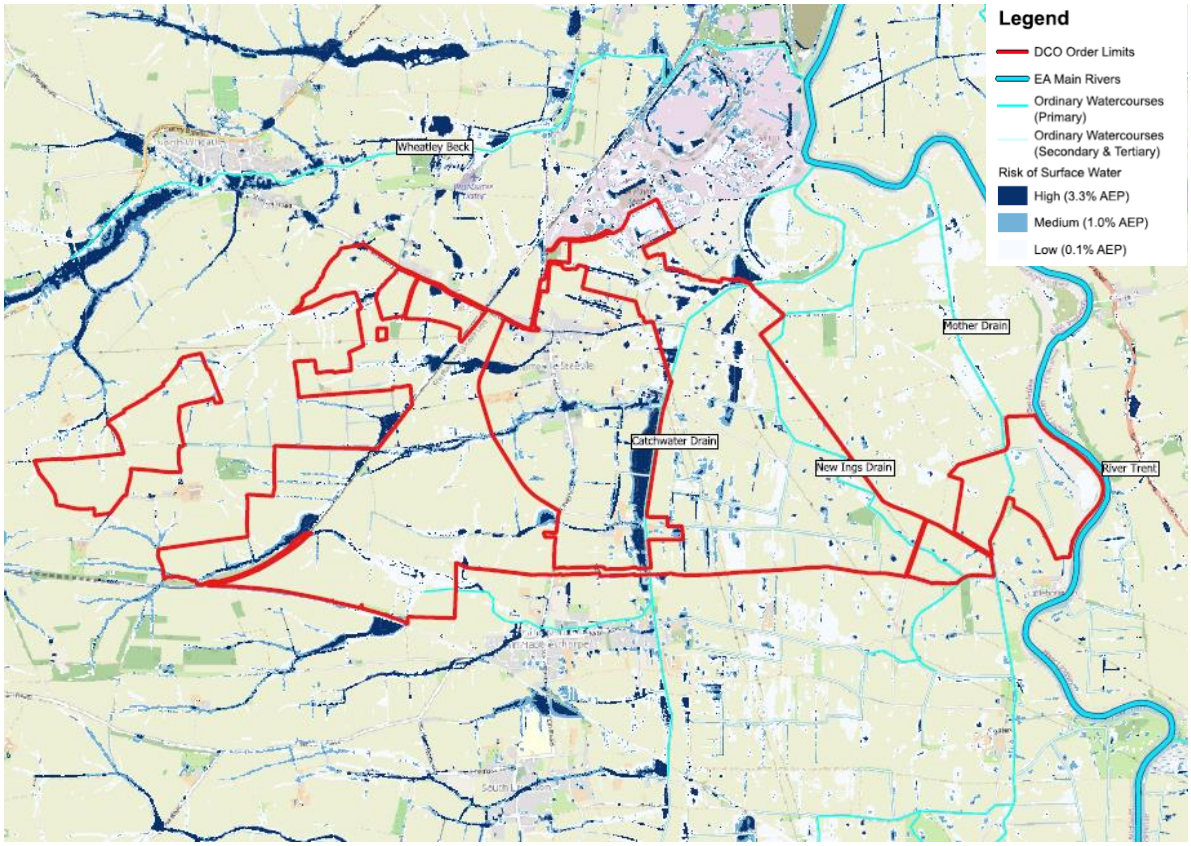


Figure 5.11: EA Risk of Flooding from Surface Water mapping

5.4.4 In the western part of the Site, areas of surface water flood risk broadly correlate to the Ordinary Watercourses within this part of the Site. In this part of the Site, the 'medium' and 'high' risk areas (corresponding to the 3.3% and 1.0% AEP events) largely remain within or close to the Ordinary Watercourse channels. Exceptions to this are:

- An overland flow path immediately to the south of Oswald Beck, representing overland flow across agricultural land rather than flow within a watercourse. Within this area, there is a low to high likelihood of depths of up to 200mm, and a very low to low likelihood of depths up to 300mm. The affected area is proposed for solar arrays only;
- Two locations on the Ordinary Watercourse running from Wood Lane towards Sturton le Steeple, where out of bank flow (flow not wholly contained within the watercourse channel) is shown to occur just upstream of the railway line (likely due to a constriction of flows through the culvert under the railway) and also between the railway and Sturton le Steeple village. Within these areas, there is a medium to high

likelihood of depths of up to 300mm. The likelihood of depths up to 600mm is low or very low. The affected areas are proposed for solar arrays in addition to a detention basin which is intended to help attenuate overland flows towards the village of Sturton le Steeple (additional details provided in **Section 8**);

- An area of out of bank flow on the Ordinary Watercourse flowing towards Fenton, immediately upstream of the crossing beneath Leverton Road, likely as a result of restricted flows through the culvert. This area has a low to high likelihood of depths up to 300mm and a very low to low likelihood of depths up to 600mm. This area is largely proposed as open land, with solar arrays at the western edge of the affected area;
- A linear overland flow path connecting the Ordinary Watercourse flowing towards Fenton with the Ordinary Watercourse flowing towards North Leverton with Habblesthorpe. Depths are almost entirely at a very low to low likelihood of reaching up to 200mm, with a very small area with a medium – high likelihood of reaching up to 200mm. This area is proposed for solar arrays only; and
- An area on the Ordinary Watercourse flowing towards North Leverton with Habblesthorpe, immediately upstream of the railway and likely as a result of restriction of flows through the railway culvert. Parts of the affected area have a medium to high likelihood of depths up to 1200mm. Solar arrays are proposed in this area.

5.4.5 Aside from the Ordinary Watercourse channels themselves and the areas identified above, all other areas in the western part of the Site indicated to be at risk of surface water flooding are shown to have a very low to low likelihood of flood depths up to 200mm.

5.4.6 No inverters are proposed within areas of medium or high surface water flood risk within the western part of the Site, these areas are solely proposed for solar arrays.

5.4.7 Within the eastern part of the Site, the areas of surface water flood risk generally relate to overland flows or ponded water within the agricultural fields, or with smaller field ditches, rather than corresponding to larger Ordinary Watercourses. This is due to the flatter nature of the eastern part of the Site, which results in standing water in the fields. In many cases, the patterns of surface water ponding appear to correlate to the plough lines within the fields. Key areas of surface water flood risk in the eastern part of the Site are:

- Localised areas of low to high risk to the west of the Catchwater Drain and to the south of West Burton Power Station. These areas appear to correspond to ponded areas on flat areas of agricultural land, with plough lines picked up by the model outputs. These areas almost entirely have a very low to low likelihood of depths of up to 200mm, with minimal areas with a medium likelihood of depths of up to 200mm. All areas have a very low likelihood of depths up to 300mm. The BESS and substation are proposed within these areas between the Catchwater Drain and the Power Station but are directed to areas almost entirely at a very low to low risk of surface water flooding. Solar arrays are located across the remainder of this area;
- Relatively large areas of low to high risk in the fields to the south of Common Lane. Again, plough lines are evident in the model outputs. These areas largely have a very low to low likelihood of depths of up to 200mm, with small areas showing a medium to high likelihood of depths of up to 200mm. All areas have a very low likelihood of depths of up to 300mm. These areas are proposed for solar arrays.
- Scattered isolated areas of low to high flood risk in the southern part of the eastern parcel (south of Littleborough Road), some areas corresponding to field drains and some to low points within the fields. Outside of the drainage channels and some very small isolated low points, all areas have a very low to low likelihood of depths of up to 200mm. These areas are proposed for solar arrays.

5.4.8 Within the eastern part of the Site, only one inverter is within an area with a medium or high risk of surface water flooding. In this area there is a very low (less than 0.1% AEP) likelihood of flood depths of up to 200mm, therefore the risk in this area is not considered significant.

5.4.9 **Figure 5.12** demonstrates the likelihood of flood depths reaching 300mm across the Site. The likelihood of flooding up to 300mm depth is very low (<0.1% AEP) for almost the entire Site (outside of the watercourse channels), with a greater depth of flooding expected to occur only in the areas immediately to the west (upstream) of the railway and upstream of the Leverton Road culvert, as described above.

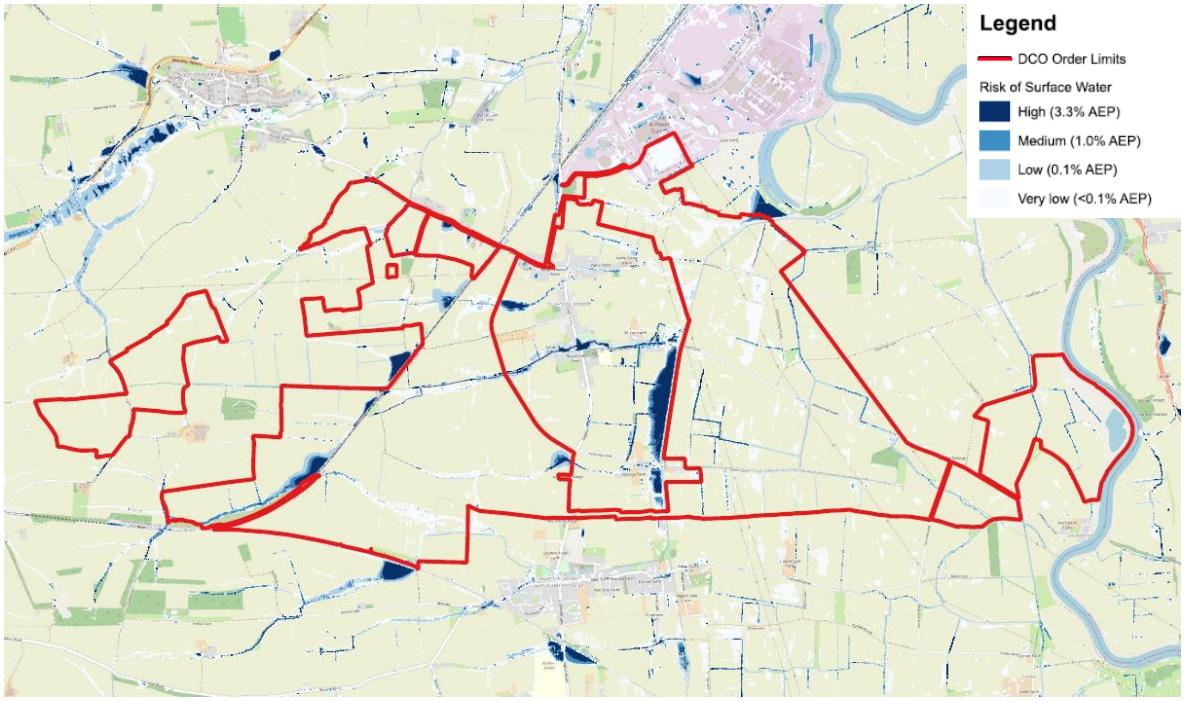


Figure 5.12: EA Risk of Flooding from Surface Water mapping – likelihood of depths up to 300mm

5.4.10 Overall, although areas of surface water flood risk have been identified on-site, these largely correlate to Ordinary Watercourse channels and immediately adjoining land in the western part of the Site, and with areas of low-lying land in the eastern part of the Site. Outside of watercourse channels, a very low to low likelihood of depths of up to 200mm has been identified for most areas. Those areas shown to be at greater depth are associated with isolated areas in the western part of the Site having a medium to high likelihood of depths up to 300mm, and one area upstream of a railway culvert in the west of the Site that has a medium to high likelihood of depths up to 1200mm.

5.4.11 The Bassetlaw District Council SFRA includes surface water flood risk mapping, but this is considered to be superseded by the 2025 mapping released by the EA.

5.4.12 Surface water flooding is likely to increase as a result of climate change in a similar ratio to fluvial flooding. Increased intensity and frequency of precipitation is likely to lead to reduced infiltration and increased overland flow. This could lead to locally increased extents and depths of surface water flood risk. However, given the raised nature of flood sensitive aspects of the Proposed Development, any increases in surface water flood risk are not considered significant.

5.4.13 The overall risk of surface water flooding at the Site is considered to be **very low to medium**.

5.5 Flood risk from groundwater

5.5.1 Groundwater flooding tends to occur after long periods of sustained high rainfall. Higher rainfall means more water will infiltrate into the ground and cause the water table to rise above normal levels. In low-lying areas the water table is usually at shallower depths anyway, but during very wet periods, with all the additional groundwater flowing towards these areas, the water table can rise up to the surface causing groundwater flooding.

5.5.2 BGS borehole logs suggest isolated pockets of shallow groundwater exist beneath the Site within bands of permeable deposits (superficial sands and gravels and / or permeable bands within the Mercia Mudstone) rather than a continuous shallow groundwater body although this has not been confirmed via intrusive investigation. Where recorded, shallow groundwater was generally present at between 1m and 5m bgl.

5.5.3 The Bassetlaw District Council SFRA includes mapping of areas susceptible to groundwater flooding. The mapping is of a strategic scale using a 1km square grid to indicate where geological and hydrogeological conditions suggest groundwater might emerge. The SFRA notes that "*this dataset covers a large area of land, and only isolated locations within the overall susceptible area are actually likely to suffer the consequences of groundwater flooding*". The data is indicative and should only be used in combination with other information, for example, local or historical data.

5.5.4 This mapping indicates that the susceptibility varies across the Site, from less than 25% susceptibility in the west of the Site to more than 75% susceptibility in the east of the Site. The SFRA also notes that there is increased risk of groundwater flooding throughout the district due to a history of mining in Bassetlaw.

5.5.5 Climate change could increase the risk of groundwater flooding as a result of increased precipitation filtering into the groundwater body. This is less likely to cause a significant change to flood risk than from other sources, since groundwater flow is not as confined. It is probable that any locally perched aquifers may be more affected, but these are likely to be isolated. The change in flood risk as a result of climate change is likely to be low.

5.5.6 The overall groundwater flood risk is considered to be **low to medium,** with the lower lying eastern part of the Site considered to be at the highest risk.

5.6 Flood risk from sewers

5.6.1 Flooding from artificial drainage systems and sewers occurs when flow entering a system, such as an urban storm water drainage system, exceeds its conveyance capacity, the system becomes blocked or it cannot discharge due to a high water level in the receiving watercourse. When exceeded, the surcharged pipe work could lead to flooding from backed up manholes and gully connections.

5.6.2 Severn Trent Water sewer records show the presence of very limited mains sewers beneath the Site, consisting of a 150mm diameter foul sewer within the northern part of the Site and a foul sewer beneath Wheatley Road. Any surcharging of these sewers is likely to be localised to the sewer locations and relatively shallow in depth.

5.6.3 The Bassetlaw District Council SFRA notes that Severn Trent Water hold records of at least 208 incidents of sewer flooding in Bassetlaw District administrative area. The settlements with the most recorded incidents include Retford, Worksop, Costhorpe and North Wheatley.

5.6.4 As the existing mains sewers are foul sewers, climate change impacts are not anticipated.

5.6.5 The overall sewer flood risk to the Site is considered to be **very low.**

5.7 Flood risk from reservoirs

5.7.1 Flood events can occur from a sudden release of large volumes of water from reservoirs.

5.7.2 The EA reservoir flood map (reproduced as **Figure 5.13**) shows the largest area that might be flooded if a reservoir were to fail and release the water it holds. Since this is a prediction of a worst-case scenario, it is unlikely that any actual flood would be this large.

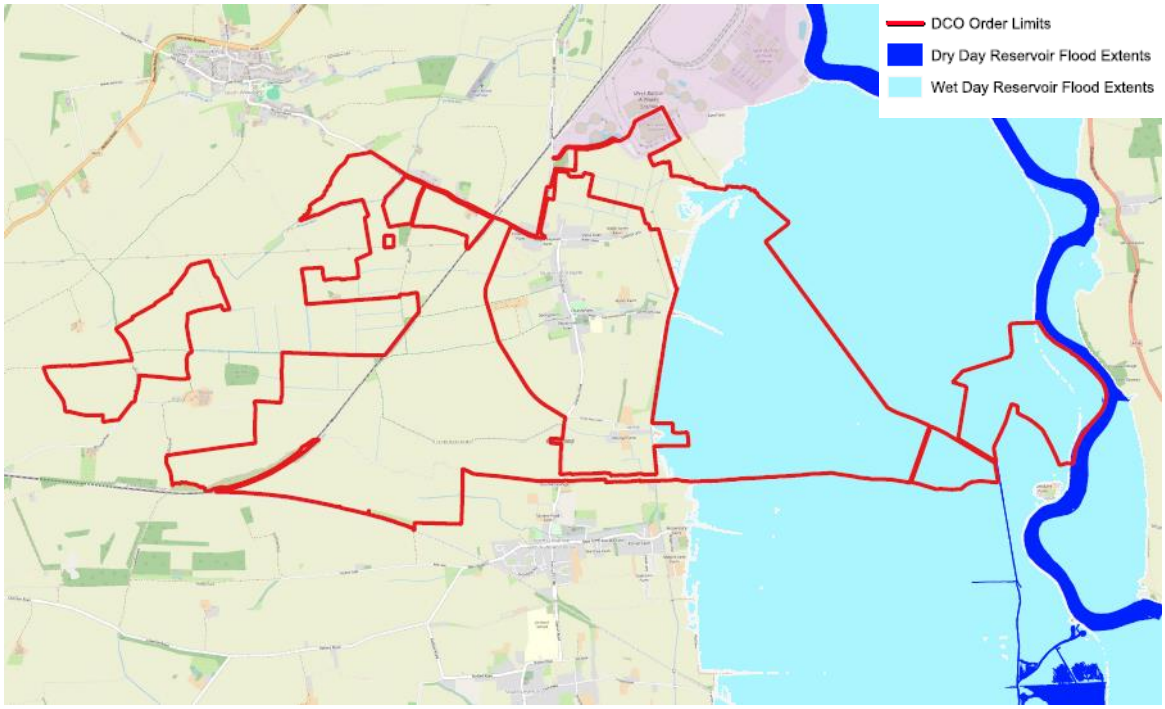


Figure 5.13: Environment Agency 'Flood risk from reservoirs' map

5.7.3 The EA mapping was updated in 2021 to demonstrate the potential maximum extent of flooding for two scenarios - a "dry day scenario" in which river levels are "normal", and a "wet day scenario" where the flooding from the reservoir coincides with flooding from rivers.

5.7.4 The map shows that the Site is not in a location at risk of reservoir flooding when river levels are normal, however, the eastern part of the Site is at risk should fluvial and reservoir flooding occur simultaneously. There is considered to be a residual risk should the peak fluvial event and reservoir failure occur at the same time. However, the reality is a reservoir failure is more likely to occur sometime after the peak of the event.

5.7.5 Reservoir flooding is extremely unlikely. There has been no loss of life in the UK from reservoir flooding since 1925. Since then reservoir safety legislation has been introduced to ensure reservoirs are maintained.

5.7.6 Reservoirs can be managed over time, controlling inflow/outflow of water and therefore there is the capacity to control the effects of climate change. Increased rainfall has the potential to increase base flow, but this should be minimal. It is unlikely that there will be a substantial change to the risk of flooding for this Site as a result of climate change.

5.7.7 The Bassetlaw District Council SFRA states that there are no records of flooding from reservoirs impacting properties within the district and that the

level and standard of inspection and maintenance required under the Reservoir Act means that the risk of flooding from reservoirs is relatively low.

5.7.8 The resultant flood risk is considered to be **low**.

5.8 Other sources of flood risk

Canals

5.8.1 There are no Canal & River Trust owned canals within close proximity to the Site. The nearest canal is the Chesterfield Canal c.2.3km to the west. The Bassetlaw District Council SFRA notes that there are records of historic canal overtopping and breach along the Chesterfield Canal. However, given the controlled nature of flows within the canal and its significant distance from the Site, it is not considered to represent a source of flood risk to the Proposed Development.

Other artificial features

5.8.2 No other artificial features with the potential to result in a flood risk to the Site have been identified.

6 CONSULTATION

6.1 Consultation has been undertaken with a number of key stakeholders, full consultation responses or minutes from stakeholder meetings are provided in the referenced appendices. A summary of the points discussed is provided below.

6.1 Lead Local Flood Authority

6.1.1 A meeting was held with the LLFA on 13th February 2025. Agreed meeting minutes are included in **Appendix H**. Key points agreed were:

- 5m easements for Ordinary Watercourses within LLFA control appear appropriate, but access requirements to be considered.
- Key requirement for crossings is to maintain existing flows. Land Drainage Consent will be required for crossings post-planning.
- Potential for development within surface water flood risk areas to deflect flows to be discussed within FRA, with reference to any sensitive receptors that may be affected;
- Principles of drainage strategy for BESS and substation agreed (climate change allowances, discharge rates and locations, nature of SuDS).
- Linear drainage features requested for access track and at lower edge of fields containing solar panels.

6.2 Trent Valley Internal Drainage Board

6.2.1 A meeting was held with the IDB on 5th March 2025. Agreed meeting minutes are included in **Appendix I**. Key points

- Principles of drainage strategy for BESS and substation agreed.
- IDB consent required for crossings over IDB assets, any new culverts or bridges to maintain existing flows.
- All cable crossings beneath IDB assets should be via HDD and will require IDB consent.
- 9m easements appropriate for IDB watercourses.

6.3 Environment Agency

6.3.1 Consultation undertaken with the National Infrastructure Team of the EA is provided in full in **Appendix E**. A summary of the key points discussed in relation to flood risk is given in **Table 6.1**.

6.3.2 Data requests were additionally made to the East Midlands Area Office. The responses to these data requests are included in **Appendix F**.

Table 6.1: Environment Agency Consultation (National Infrastructure Team)

Date	Form of Consultation	Key EA Comments
22.07.24	Online Meeting	EA was in acceptance of the principal of development within Flood Zone 3, subject to further details of flood risk assessment and mitigation. EA requested that sensitive equipment be raised 300mm above the 'design' 1 in 100 year plus climate change flood level and that consideration be given to sensitivity testing for greater climate change and breach flooding scenarios. EA requested that a high-level assessment was undertaken of the flood risk from the Catchwater Drain and Mother Drain as these are not included in the EA's River Trent flood model. EA requested a high-level assessment of any displacement of floodwater. EA requested a comparison of the Flood Map for Planning with the defended modelled flood outlines.
06.08.24	EIA Scoping Response	River crossings (bridges, culverts and buried cables) should have geomorphologically robust designs that will have minimal impacts on natural fluvial processes operating in the river / floodplain. Any development on the River Trent or its floodplain should be designed to have minimal impact on natural river dynamics and should not restrict future river restoration projects. Infrastructure developments should take account of the likelihood for increased lateral and vertical river dynamics resulting from continued hydro-climatic intensification (i.e. flood-proofed designs that are not just based on present-day baseline geomorphological configuration / behaviour).

Date	Form of Consultation	Key EA Comments
		The Sequential Test will need to be passed and a Sequential Approach taken within the boundary with critical infrastructure positioned in Flood Zone 1. If solar panels are positioned in Flood Zones 2 / 3, the Exception Test will need to be applied. Built development within the floodplain should be quantified to establish the need for compensatory flood storage. Consideration should be given to the flood risk from the Ordinary Watercourses crossing the Site. A 1 in 100 year fluvial flood event using the 2080s epoch higher central climate change allowance (39%) should be used as the design flood event, with panels and equipment raised 300mm above this level. A Credible Maximum scenario should also be considered, with proposals able to be adapted over their lifetime to this level (62%) climate change. Confirmation required of whether the Site will remain operational and staff will remain on Site during a flood event. Consideration should be given to access and egress during a flood event. The FRA should include a comparison of the published flood zones with the undefended 1 in 100 year and 1 in 1000 year model outputs. Defended scenarios with appropriate climate change allowances can then be used in further detailed assessment. The EA hold records of historical flooding in this location in 1932, 1947, 1977 and 2000. It would be sensible to consider the residual risk to the development in the event of a breach of the Trent embankments. This would not be used as a design scenario but would help to understand the resilience of the development in a breach scenario. EA noted the potential for shallow groundwater beneath the Site.
11.12.24	Email	EA confirmed acceptance of the 1 in 100 year plus 23% climate change flood event as the 'design' event and the use of the 1 in 100 year plus 29% climate change model outputs as a worse-case proxy for this design event.

Date	Form of Consultation	Key EA Comments
		EA are in acceptance of the 40 year design life, as long as a DCO requirements states that operation cannot continue beyond this. Decommissioning will extend into the 2080s epoch, therefore the 'higher central' climate change scenario for the 2080s epoch should be considered to identify any residual impacts during the decommissioning phase. EA acknowledged there are no safety critical elements to the Proposed Development, that the Development will not connect to the National Grid and that it could be shut down remotely during a flood event beyond the design scenario. Additionally, all infrastructure will be outside the design 1 in 100 year plus 29% climate change flood extent and all infrastructure raised a minimum of 300mm above the design flood level. A Credible Maximum climate change scenario is therefore not required to be assessed. Breach location 29 results in the largest flood extent within the Site. The extent and water levels from this scenario should be considered with regards to residual risk to the Proposed Development.
14.03.25	Consultation on PEIR	FRA to include assessment of increase in flood risk due to loss of floodplain storage. Additional modelling and assessment may be required for Ordinary Watercourses. Updated Risk of Flooding from Surface Water mapping to be assessed. Bridges to be designed with soffit levels above the 1 in 100 year plus climate change flood level. Detailed hydraulic modelling is recommended for the Catchwater Drain and is tributaries to assess flood risk to BESS and substation. The presence of shallow groundwater cannot be ruled out.

Additionally, the EA undertook a review of a draft version of this FRA on 10th April 2025. The key points raised are included in **Table 6.2**, together with a description of how these concerns have been addressed.

Table 6.2: Environment Agency comments on draft FRA and Applicant response

EA Comment	How Addressed	Additional Comments
Sequential Test not submitted for review	The Sequential Test will be submitted as a standalone document with the DCO application	As the Sequential Test is a planning matter, it is not considered appropriate to include within the FRA
The Flood Map for Planning was updated on 25th March	Figure 5.1 has been updated with the latest Flood Map for Planning. Figure 5.8 shows the latest 1 in 30 year defended Flood Map	N/A
The EA will seek a suitably worded DCO Requirement to ensure the development does not remain operational beyond 2069	N/A	The Applicant is in agreement with this approach
There is an apparent contradiction between the statement that the site will not be connected to the grid, and the description of development which includes grid connection infrastructure. Clarification is required	Clarification provided in Section 5.2.	The Applicant notes that there needs to be a connection to the grid in order to supply electricity. However, there is a switch (substation) separating the Proposed Development from the grid and the Development is able to be disconnected from the grid at any time without any interruption of power to end users. The Proposed Development will solely generate electricity, distribution is undertaken by the National Grid. Given the Proposed Development can be partially or wholly shut down without impact on grid supply, the credible maximum climate change scenario is not considered applicable.

EA Comment	How Addressed	Additional Comments
The FRA should include a description of the process for shutdown of the site during a flood event	N/A	This information will be detailed in a Flood Management Plan to be prepared post DCO consent and secured via DCO requirement. It is reiterated that the site can monitored and shut down remotely, and that all proposed infrastructure falls outside the design 1 in 100 year plus climate change flood extent for the River Trent.
Historical flood outlines should be considered in the context of the Development	Added to Section 5 and **Figure 5.7**	N/A
Details of all new watercourse crossings should be submitted in the FRA to show there is no increase in flood risk	No report amendments.	As discussed in Section 8.3, watercourse crossings will be designed in detail as part of the LLFA / IDB consenting process post-DCO consent. The principle of the proposed crossings has been agreed with these consultees i.e. that existing flows will be maintained, with additional design details to be provided as part of the watercourse consents post DCO consent.
The detention basins to alleviate flooding issues in Sturton le Steeple are welcomed. Limited information has been provided (Drainage Strategy report not reviewed). Hydraulic modelling required to ensure basins work effectively without increasing flood risk to others. Any storage of water above existing ground levels at or above 25,000m^3 will come	No report amendments.	Calculations supporting the design of the detention basins are included in Appendix K of the **Drainage Strategy Report, Appendix 8.2 of the ES [EN010163/APP/6.3.8]**. It is confirmed that the Reservoir Act thresholds are not met.

EA Comment	How Addressed	Additional Comments
under the requirements of the Reservoirs Act 1975.		
Within the Mannings Assessment, climate change should be applied by scaling the peak flows rather than the rainfall.	No report amendments	As acknowledged by the EA, this approach presents a conservative scenario
Calculations on channel capacity within the Mannings Assessment should be reviewed and amended and an updated assessment undertaken of the flood risk to the development.	**Appendix G** amended – Manning Assessment updated and 1D modelling undertaken for the IDB watercourses	N/A

6.4 Canal and River Trust

6.4.1 The Canal and River Trust is the Navigation Authority for the River Trent. They have requested that consideration be given to any changes in drainage to the River Trent, including the impact of any increase in discharge to the river or new outfalls on passing boat traffic.

7 MITIGATION MEASURES AND RESIDUAL RISK

7.1 Sequential approach within application boundary

7.1.1 Flood risk from all sources has been taken into account in the allocation of land uses within the Site boundary. The highest risk part of the Site from a fluvial / tidal, groundwater and reservoir flood risk perspective is the eastern part of the Site closest to the River Trent. This area is proposed for biodiversity mitigation, with the closest area of infrastructure located c.950m from the River Trent. All infrastructure is proposed outside the design 1 in 100 year plus 23% climate change extent, as conservatively represented by the 1 in 100 year plus 29% climate change extent. The most sensitive parts of the Site (BESS and substation) are situated outside Flood Zone 3 (1 in 100 year flood outline in an undefended scenario).

7.1.2 The breach fluvial flood extent is not considered by the EA to be a 'design' event but has been given consideration with regard to resilience during extreme events. The substation has been located outside the breach flood extent, but due to other constraints (for example the need to avoid clashes with existing assets) it has not been possible to locate the BESS or the solar panels outside this area. Instead, the resilience of these features during an extreme breach scenario are considered within this FRA.

7.1.3 The hydraulic modelling assessment of fluvial flood risk from the IDB Watercourses (Catchwater Drain, Mother Drain and New Ings Drain) has shown that very limited out of channel flow is expected during the design flood event for the New Ings Drain and Catchwater Drain only. Depths are shown to be minimal (with water levels 30mm to 100mm above the bank level), affecting only areas proposed for solar arrays. Similarly for the smaller Ordinary Watercourses, the EA surface water flood risk mapping indicates that any associated flooding is limited to the areas close to the channel and to isolated areas upstream of railway / road culverts. Significant development-free easements have been allowed for alongside the Ordinary Watercourses (9m for IDB watercourse and 5m for LLFA watercourse), reducing the likelihood of infrastructure being impacted in the event of overtopping. Areas of medium and high surface water flood risk are proposed for solar arrays only, with the panels and associated equipment elevated above the associated flood levels. The inverters, main substation and BESS have been directed to areas primarily at a low risk of surface water flooding, or where there is a 'very low' likelihood of surface water depths reaching 200mm.

7.2 Level of Sensitive Equipment

7.2.1 All infrastructure will be located outside the design fluvial 1 in 100 year plus climate change flood extent associated with the River Trent. The BESS and substation (most sensitive aspects of the Proposed Development) will be located at least 2m above the design fluvial flood level.

7.2.2 The hydraulic modelling assessment of fluvial flood risk associated with the IDB watercourses, in combination with the review of the EA's surface water flood risk mapping has shown that significant out of channel flows are unlikely for the IDB or Ordinary Watercourses during the design flood conditions. Any flooding that occurs is considered to remain localised to the watercourse channels and to limited depth, and the allowance of 5-9m easements along all watercourses means any equipment will be located away from the higher risk areas immediately adjacent to the watercourses. Areas of medium and high surface water risk are proposed for solar arrays only, with the panels and sensitive equipment raised above expected surface water flood levels. The greatest surface water depths are immediately to the west of the railway in the western part of the Site, here the solar panels will be raised at least 1200mm above ground level so as to be above the expected surface water flood level.

7.2.3 The BESS, substation equipment and inverters will be raised at least 200mm above ground level, ensuring they are above anticipated maximum surface water flood depths in this area in the extreme 'very low' likelihood (less than 0.1% AEP) scenario.

7.2.4 The raised nature of the BESS, substation, solar panels and associated equipment, and equipment associated with the inverters, all being elevated at least 200mm above ground level, provides additional protection in the event of residual flooding scenarios associated with high groundwater levels, sewer surcharging or reservoir breach.

7.2.5 During extreme flood events, for example in the unlikely event of a breach of the flood defences along the River Trent, any affected sections of the Development can be shut down remotely, if required. The EA has confirmed in their Scoping Response (see **Table 6.1**) that the breach flood event is not a 'design' scenario and only requires consideration as a residual risk scenario. Equipment has therefore not been raised above the breach flood level (this would not be viable given the potential worse-case depths involved).

7.3 Safe Access / Egress

7.3.1 During the design 1 in 100 year plus 23% climate change event, as represented by the 1 in 100 year plus 29% climate change flood outline, the entire operational area of the Site will remain unaffected by flooding and safe access and egress will remain available.

7.3.2 The Site will be unmanned with the exception of maintenance visits. In order to ensure the safety of personnel during more extreme events e.g. in the event of a breach of the flood defences, the operator will be registered to receive flood warnings from the EA. They will also monitor the Site remotely via CCTV. A Flood Evacuation Plan will be prepared prior to the operational phase of the Proposed Development. If flooding is predicted, or should any flooding of the Site occur, personnel will be advised not to attend the Site. As the breach location representing the worse-case flood risk to the Site is located approximately 2km from the Site, significant warning is anticipated to be available following a breach in this location, prior to any floodwater reaching the Site.

7.3.3 During the decommissioning phase, where a higher climate change allowance is required when establishing the 'design' flood event, flooding is shown to affect the eastern part of the development to a level of 4.35m AOD. Given the lowest parts of the operational area are at c.3.5m AOD, this could result in flood depths of up to 0.85m AOD. During the decommissioning phase, flood warnings will be monitored together with CCTV, and works will be halted and the Site evacuated should any risk of flooding be identified. This residual risk will be managed via a Flood Evacuation Plan.

8 IMPACT OF DEVELOPMENT ON FLOOD RISK

8.1 Displacement of floodwater

8.1.1 The design flood event for assessing floodplain compensation requirements is the 1 in 100 year plus 23% climate change fluvial event. No built development is proposed within the 1 in 100 year plus 29% flood event, used as a conservative proxy for the 1 in 100 year plus 23% climate change event. No land raising is proposed in the area in the east of the Site within the design flood extent (proposed for biodiversity improvements only) therefore there will be no displacement of floodwater within the design flood extent for the River Trent.

8.1.2 The fluvial flood extents of the smaller watercourse have been discussed in **Section 5**. For the design 1 in 100 year plus 23% climate change event, no significant out-of-bank flows are expected for the Catchwater Drain, Mother Drain or New Ings Drain, based on the hydraulic assessment in **Appendix G**. Water levels remain below bank levels in almost all locations, with only one location of potential overtopping on each of the Catchwater Drain and New Ings Drain, with water levels exceeding bank levels by c.100mm and c.30mm respectively. Any limited localised out of channel flow would impact solar arrays only. No significant displacement of floodwater is expected as a result of infrastructure within the flood extents of the main IDB watercourses.

8.1.3 For the smaller Ordinary Watercourses, review of the EA's surface water flood risk mapping shows that any floodwater remains close to the watercourse channels during the medium and high risk events. A 5m easement has been allowed either side of these Ordinary Watercourses, and any infrastructure within medium / high risk surface water extents beyond these easements is restricted to solar arrays only. Any displacement associated with the panel supports is considered to be negligible due to the minimal cross-sectional area of these supports and the very low surface water flood depths anticipated for the vast majority of the Site (less than 0.1% chance of flood depths reaching 300mm in all but small isolated areas).

8.1.4 Overall, negligible loss of floodplain storage is considered to result from the Proposed Development.

8.2 Disruption to existing flows

8.2.1 Localised flow paths have been identified from the EA's surface water flood risk mapping associated with land immediately alongside the Ordinary Watercourses and with overland flow paths within the low-lying fields in the east of the Site. As discussed above, infrastructure within the medium and high risk surface water flooding extents is limited to the solar arrays. Given the small cross-sectional areas of supporting poles and the very shallow flow depth anticipated in the vast majority of locations, the potential for disruption to flow paths is considered to be negligible. Any minor deflection of flows around proposed infrastructure would not impact any sensitive receptors given that land immediately surrounding the infrastructure will comprise grassland. Even during extreme events only shallow surface water depths are anticipated.

8.2.2 Perimeter fencing will be designed to be permeable to flood flows, even though it will be located outside the design 1 in 100 year plus climate change fluvial flood extent.

8.2.3 Overall, disruption to overland flow paths is considered negligible and is not considered to result in an increase in flood risk off-site.

8.3 Watercourse crossings

8.3.1 Watercourse crossings will be required for access where tracks intersect with existing watercourses. Existing crossings will be re-used where possible, but some new crossings will be required and some existing crossings will need to be widened. New crossings will either comprise clear span bridges or culverts dependent on local circumstances. In some situations open span structures will not be viable due to the shallow depth of the existing ditches and the cover required. Regardless of construction, they will be designed to ensure the existing flows are accommodated, with no restriction of flows resulting from the new structures. This approach has been agreed with the LLFA and IDB (**Appendix H & I**) who are the consultees for all watercourses within the Site. Both consultees have accepted the use of culverts, subject to appropriate consents being obtained at the post-planning stage.

8.3.2 Crossings required only for construction access will be removed following completion of construction. The remainder will be retained for the lifetime of the development to allow access for maintenance / repairs. They will be removed following decommissioning.

8.4 Watercourse easements

8.4.1 As agreed with the LLFA and IDB, a 5m easement has been incorporated either side of Ordinary Watercourses falling under the LLFA's jurisdiction, and a 9m easement has been incorporated either side of the Ordinary Watercourses managed by the IDB.

8.4.2 The flood defence embankment within the eastern Site boundary is located a significant distance (more than 900m) from the proposed infrastructure.

Appropriate easements have been incorporated for the watercourses and flood defences to maintain access for future inspection and maintenance.

8.5 Drainage impacts

8.5.1 In accordance with NPS EN-1, a Drainage Strategy has been developed for the Proposed Development. This is described in the separate **Surface Water Drainage Strategy, Appendix 8.2 of the ES [EN010163/APP/6.3.8]** which should be referred to for full details. The drainage strategy complies with the National Standards for Sustainable Drainage Systems and has been prepared in consultation with the LLFA (Nottinghamshire County Council) and Trent Valley IDB.

8.5.2 Following guidance within NPS EN-1, the surface water drainage strategy accounts for the predicted impacts of climate change throughout the Development's lifetime and demonstrates that the volumes and peak flow rates of surface water leaving the Site are no greater than the rates prior to the Proposed Development. SuDS have been incorporated into the drainage strategy, and the potential for contaminated runoff (for example, in the event of a fire) has been considered for the BESS.

8.5.3 Following the drainage hierarchy, the potential for rainwater collection for re-use has been considered initially. Rainwater harvesting will be used where feasible for re-use within the Proposed Development during construction, operational and decommissioning phases. Infiltration has been promoted where viable and where concerns regarding the potential contamination of groundwater do not preclude its use. Within the BESS area, where there is potential for contaminated runoff in the event of an emergency (e.g. a fire which results in generation of contaminated fire-fighting water), the SuDS features have been lined to prevent infiltration and discharge is instead proposed to local drainage ditches with appropriate controls to ensure contaminated runoff is prevented from release to the local ditch network.

Discharge rates have been agreed with the LLFA and IDB and are no greater than pre-development rates.

8.5.4 Within the BESS and substation areas, attenuation basins are proposed to retain runoff prior to release at a controlled rate. The BESS will be surrounded by suitable bunds to separate runoff from adjacent areas. Linear drainage features are also proposed along the access tracks (these will additionally be permeably surfaced with gravel) and along the lower edge of the fields containing solar arrays.

8.5.5 The land beneath the solar arrays will be planted with mixed grasses which will help stabilise the soils and protect against the formulation of rivulets where rainfall runs off the trailing edge of the panels. No formal attenuation is required for the solar panels as runoff will continue to discharge to the ground as in the current situation, with no loss of permeable area.

8.5.6 Overall, the proposed Drainage Strategy will ensure that there is no increase in the rate or volume of runoff discharged from the Site and that runoff is appropriately managed and treated to prevent any contamination of the local groundwater or watercourses.

8.5.7 A temporary drainage strategy will be established for the construction phase of development to prevent silt mobilisation and contaminated runoff.

8.5.8 A Maintenance and Management Plan for the proposed drainage system will be prepared prior to its operation.

8.6 Additional measures for reduction in flood risk

8.6.1 Aside from measures to mitigate the potential impacts from the Proposed Development, the applicant has considered whether there are any additional opportunities for the Proposed Development to contribute to a positive reduction in flood risk within the local area. Flooding issues have been reported within the village of Sturton le Steeple. Following discussions with local residents, this flooding is understood to occur following periods of heavy rainfall when runoff from the fields to the west of the village runs off the fields via drainage ditches and overland flow towards the village, accumulating at the junction of Cross Street and Leverton Road in the centre of the village.

8.6.2 To help alleviate this flooding issue, two large detention basins have been strategically placed within the Proposed Development on land to the west (up-gradient) of Sturton le Steeple. Their location and sizes have been carefully designed to intercept overland flows generated up-gradient of the Site, with water proposed to be held within the basins prior to release at a controlled rate

to the existing drainage ditches following the peak of the rainfall event. Full details of their design can be found in the **Drainage Strategy report, Appendix 8.2 of the ES [EN010163/APP/6.3.8]**.

8.6.3 The basins will be maintained as part of the maintenance strategy for the drainage system for the Proposed Development (produced subsequent to DCO consent and secured via DCO requirement), although it is reiterated that these basins are not part of the mitigation for the Proposed Development but comprise an additional voluntary measure that aims to provide additional benefits to the wider community.

8.7 Summary

8.7.1 As discussed, there will be no disruption to existing flow paths or displacement of floodwater as a result of the Proposed Development. Runoff from the Proposed Development will be managed through the proposed drainage strategy to ensure there is no increase in the rate of runoff discharged to the local drainage network. There will therefore be no increase in flood risk as a result of the proposed infrastructure. A net reduction in flood risk will be achieved through the inclusion of detention basins which have been proposed to help alleviate the known flood risk to the village of Sturton le Steeple.

9 CONCLUSIONS AND RECOMMENDATIONS

9.1 This FRA complies with the relevant NPSs and PPG and demonstrates that flood risk from all sources has been considered in the Proposed Development. It is also consistent with the Local Planning Authority requirements with regard to flood risk and has been prepared following consultation with key stakeholders.

9.2 The Site has been shown to be defended against a 1 in 100 year plus climate change fluvial event associated with the River Trent, and the risk associated Ordinary Watercourses within the Site has been assessed as low. There is a residual risk associated with a breach of the River Trent flood defences. A limited flood risk also exists associated with surface water flow paths, groundwater and reservoir flooding during extreme events, particularly in the eastern part of the Site.

9.3 Flood risk to the Proposed Development has been managed through the sequential allocation of the more sensitive infrastructure in the lowest risk parts of the Site. Where appropriate, equipment has been raised above expected flood levels. The higher risk parts of the Site (for example those areas within potential surface water overland flow paths) are proposed for solar arrays only, with negligible risks arising both to and from this infrastructure. The Proposed Development can be shut down remotely during extreme events (e.g. a breach of the River Trent defences).

9.4 The flood risk from the Proposed Development is mitigated through a Surface Water Drainage Strategy, positioning of infrastructure outside the highest flood risk areas and careful design of watercourse crossings. Additionally, two large surface water detention basins are proposed within the western part of the Site to help reduce the existing risk to Sturton le Steeple village.

9.5 This FRA has considered multiple sources of flooding and concluded the following:

Table 9.1: Flood risk summary

Source	Level of risk	Mitigation
Fluvial	Low/Medium	• No development within design fluvial flood extent (River Trent) • Sensitive equipment raised above modelled fluvial flood levels for main IDB watercourses and

Source	Level of risk	Mitigation
		surface water flood level as a proxy for other Ordinary Watercourse flooding • Flood Evacuation Plan for management of residual risks • Culverts / bridges for watercourse crossings designed to maintain existing flows
Tidal	Low	• Defended tidal extents do not extend onto developable area • Mitigation for fluvial flooding manages residual tidal flood risk
Surface water	Very Low - Medium	• Localised areas of surface water flood risk although depths are generally very shallow even for extreme events • Sensitive equipment directed outside medium / high risk areas • Sensitive equipment raised above anticipated surface water flood level • Flood Evacuation Plan for management of residual risks • SuDS Strategy for management of runoff from Proposed Development to ensure no increase in flood risk • Detention basins proposed to reduce existing flood risk to Sturton le Steeple village
Groundwater	Low - Medium	• Groundwater between 1m – 5m depth recorded in parts of the Site • Should groundwater flooding occur, the raised nature of equipment (panels, inverters, main substation and BESS) reduce the level of risk • In extreme events, the Proposed Development can be partially or wholly shut down remotely, managed via a Flood Evacuation Plan
Sewers	Very Low	• The raised nature of equipment (panels, inverters, main substation and BESS) reduce the level of risk during extreme events

Source	Level of risk	Mitigation
Reservoir	Low	• The raised nature of equipment (panels, inverters, main substation and BESS) reduce the level of risk during extreme events • In extreme events, the Proposed Development can be partially or wholly shut down remotely, managed via a Flood Evacuation Plan
Other sources	Very Low	• None required

9.6 Overall, taking into account the above points, the Proposed Development of the Site should not be precluded on flood risk grounds.

APPENDIX A
RSK GROUP SERVICE CONSTRAINTS

1. This report and the drainage design carried out in connection with the report (together the "Services") were compiled and carried out by RSK LDE Ltd (RSK) for RES (the "client") in accordance with the terms of a contract between RSK and the "client" dated March 2024. The Services were performed by RSK with the skill and care ordinarily exercised by a reasonable civil engineer at the time the Services were performed. Further, and in particular, the Services were performed by RSK taking into account the limits of the scope of works required by the client, the time scale involved and the resources, including financial and manpower resources, agreed between RSK and the client.

2. Other than that expressly contained in paragraph 1 above, RSK provides no other representation or warranty whether express or implied, in relation to the Services.

3. Unless otherwise agreed in writing, the Services were performed by RSK exclusively for the purposes of the client. RSK is not aware of any interest of or reliance by any party other than the client in or on the Services. Unless expressly provided in writing, RSK does not authorise, consent or condone any party other than the client relying upon the Services. Should this report or any part of this report, or otherwise details of the Services or any part of the Services be made known to any such party, and such party relies thereon that party does so wholly at its own and sole risk and RSK disclaims any liability to such parties. Any such party would be well advised to seek independent advice from a competent environmental consultant and/or lawyer.

4. It is RSK's understanding that this report is to be used for the purpose described in the introduction to the report. That purpose was a significant factor in determining the scope and level of the Services. Should the purpose for which the report is used, or the proposed use of the site change, this report may no longer be valid and any further use of or reliance upon the report in those circumstances by the client without RSK's review and advice shall be at the client's sole and own risk. Should RSK be requested to review the report after the date of this report, RSK shall be entitled to additional payment at the then existing rates or such other terms as agreed between RSK and the client.

5. The passage of time may result in changes in site conditions, regulatory or other legal provisions, technology or economic conditions which could render the report inaccurate or unreliable. The information and conclusions contained in this report should not be relied upon in the future without the written advice of RSK. In the absence of such written advice of RSK, reliance on the report in the future shall be at the client's own and sole risk. Should RSK be requested to review the report in the future, RSK shall be entitled to additional payment at the then existing rate or such other terms as may be agreed between RSK and the client.

6. The observations and conclusions described in this report are based solely upon the Services, which were provided pursuant to the agreement between the client and RSK. RSK has not performed any observations, investigations, studies or testing not specifically set out or required by the contract between the client and RSK. RSK is not liable for the existence of any condition, the discovery of which would require performance of services not otherwise contained in the Services. For the avoidance of doubt, unless otherwise expressly referred to in the introduction to this report, RSK did not seek to evaluate the presence on or off the site of asbestos, electromagnetic fields, lead paint, heavy metals, radon gas or other radioactive or hazardous materials.

7. The Services are based upon RSK's observations of existing physical conditions at the site gained from a walk-over survey of the site together with RSK's interpretation of information including documentation, obtained from third parties and from the client on the history and usage of the site. The Services are also based on information and/or analysis provided by independent testing and information services or laboratories upon which RSK was reasonably entitled to rely. The Services clearly are limited by the accuracy of the information, including documentation, reviewed by RSK and the observations possible at the time of the walk-over survey. Further RSK was not authorised and did not attempt to independently verify the accuracy or completeness of information, documentation or materials received from the client or third parties, including laboratories and information services, during the performance of the Services. RSK is not liable for any inaccurate information or conclusions, the discovery of which inaccuracies required the doing of any act including the gathering of any information which was not reasonably available to RSK and including the doing of any independent investigation of the information provided to RSK save as otherwise provided in the terms of the contract between the client and RSK.

8. The phase II or intrusive environmental site investigation aspects of the Services is a limited sampling of the site at pre-determined borehole and soil vapour locations based on the operational configuration of the site. The conclusions given in this report are based on information gathered at the specific test locations and can only be extrapolated to an undefined limited area around those locations. The extent of the limited area depends on the soil and groundwater conditions, together with the position of any current structures and underground facilities and natural and other activities on site. In addition chemical analysis was carried out for a limited number of parameters [as stipulated in the contract between the client and RSK] [based on an understanding of the available operational and historical information,] and it should not be inferred that other chemical species are not present.

9. Any site drawing(s) provided in this report is (are) not meant to be an accurate base plan, but is (are) used to present the general relative locations of features on, and surrounding, the site. Features (boreholes, trial pits etc) annotated on site plans are

not drawn to scale but are centred over the appropriate location. Such features should not be used for setting out and should be considered indicative only.

APPENDIX B
TOPOGRAPHIC SURVEY

KEY:

SITE BOUNDARY
(*OUTSIDE OF LINE DENOTES BOUNDARY*)

NOTES:

1. TOPOGRAPHIC SURVEY IS 06_220847 UNDERTAKEN BY LSTC IN 2024

SHEET 1 OF 7

1	FG	DC	WB	2024-11-29	First Issue
ISSUE	DRAWN	CHKD	APPD	DATE	REVISION NOTES

PURPOSE: OTHER	COORDINATES: OSGB 1936
SCALE: 1:2,500 @ A0	DATUM: N/A
LAYOUT DWG: N/A	T-LAYOUT NO.: N/A

PROJECT TITLE: STEEPLE SOLAR FARM

DRAWING TITLE: FIGURE 3.2
TOPOGRAPHIC SURVEY OF SITE

RES DRAWING NUMBER: 04954-RES-STE-DR-SV-003 | REV: 1

BEAUFORT COURT,
EGG FARM LANE,
KINGS LANGLEY,
HERTS WD4 8LR, UK
TEL: +44 (0) 1923 299200
WWW.RES-GROUP.COM

KEY:

SITE BOUNDARY
(*OUTSIDE OF LINE DENOTES BOUNDARY*)

NOTES:

1. TOPOGRAPHIC SURVEY IS 06_220847 UNDERTAKEN BY LSTC IN 2024

SHEET 2 OF 7

1	FG	OC	WB	2024-11-29	First Issue
ISSUE	DRAWN	CHKD	APPD	DATE	REVISION NOTES

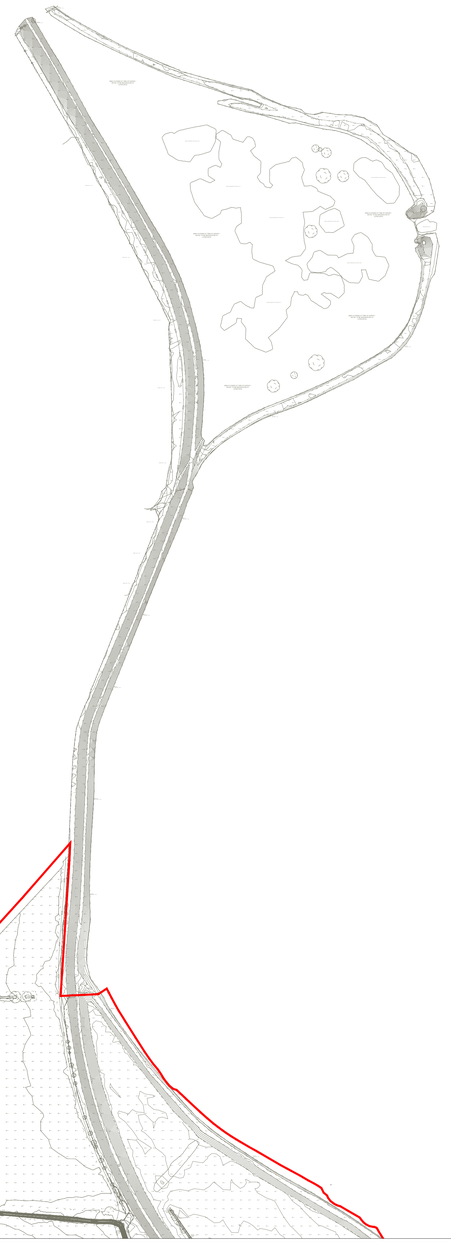
PURPOSE: OTHER	COORDINATES: OSGB 1936
SCALE: 1:2,500 @ A0	DATUM: N/A
LAYOUT DWG: N/A	T-LAYOUT NO.: N/A

PROJECT TITLE: STEEPLE SOLAR FARM

DRAWING TITLE: FIGURE 3.2
TOPOGRAPHIC SURVEY OF SITE

RES DRAWING NUMBER: 04954-RES-STE-DR-SV-003 REV: 1

BEAUFORT COURT,
EGG FARM LANE,
KINGS LANGLEY,
HERTS WD4 8LR, UK
TEL +44 (0) 1923 299200
WWW.RES-GROUP.COM



KEY:

SITE BOUNDARY
(*OUTSIDE OF LINE DENOTES BOUNDARY*)

NOTES:

1. TOPOGRAPHIC SURVEY IS 06_220847 UNDERTAKEN BY LSTC IN 2024

SHEET 3 OF 7

ISSUE	DRAWN	CHKD	APPD	DATE	REVISION NOTES
1	FG	DC	WB	2024-11-29	First Issue

PURPOSE: OTHER	COORDINATES: OSGB 1936
SCALE: 1:2,500 @ A0	DATUM: N/A
LAYOUT DWG: N/A	T-LAYOUT NO.: N/A

PROJECT TITLE: STEEPLE SOLAR FARM

DRAWING TITLE: FIGURE 3.2
TOPOGRAPHIC SURVEY OF SITE

RES DRAWING NUMBER: 04954-RES-STE-DR-SV-003 | REV: 1

BEAUFORT COURT,
EGG FARM LANE,
KINGS LANGLEY,
HERTFORDSHIRE, UK
TEL +44 (0) 1923 299200
WWW.RES-GROUP.COM

KEY:

SITE BOUNDARY
(*OUTSIDE OF LINE DENOTES BOUNDARY*)

NOTES:

1. TOPOGRAPHIC SURVEY IS 06_220847 UNDERTAKEN BY LSTC IN 2024

SHEET 4 OF 7

ISSUE	DRAWN	CHKD	APPD	DATE	REVISION NOTES
1	FG	DC	WB	2024-11-29	First Issue

PURPOSE: OTHER	COORDINATES: OSGB 1936
SCALE: 1:2,500 @ A0	DATUM: N/A
LAYOUT DWG: N/A	T-LAYOUT NO.: N/A

PROJECT TITLE: STEEPLE SOLAR FARM

DRAWING TITLE: FIGURE 3.2
TOPOGRAPHIC SURVEY OF SITE

RES DRAWING NUMBER: 04954-RES-STE-DR-SV-003

REV: 1

BEAUFORT COURT,
EGG FARM LANE,
KINGS LANGLEY,
HERTS WD4 8LR, UK
TEL +44 (0) 1923 299200
WWW.RES-GROUP.COM

KEY:

SITE BOUNDARY
(*OUTSIDE OF LINE DENOTES BOUNDARY*)

NOTES:

1. TOPOGRAPHIC SURVEY IS 06_220847 UNDERTAKEN BY LSTC IN 2024

SHEET 5 OF 7

ISSUE	DRAWN	CHKD	APPD	DATE	REVISION NOTES
1	FG	DC	WB	2024-11-29	First Issue

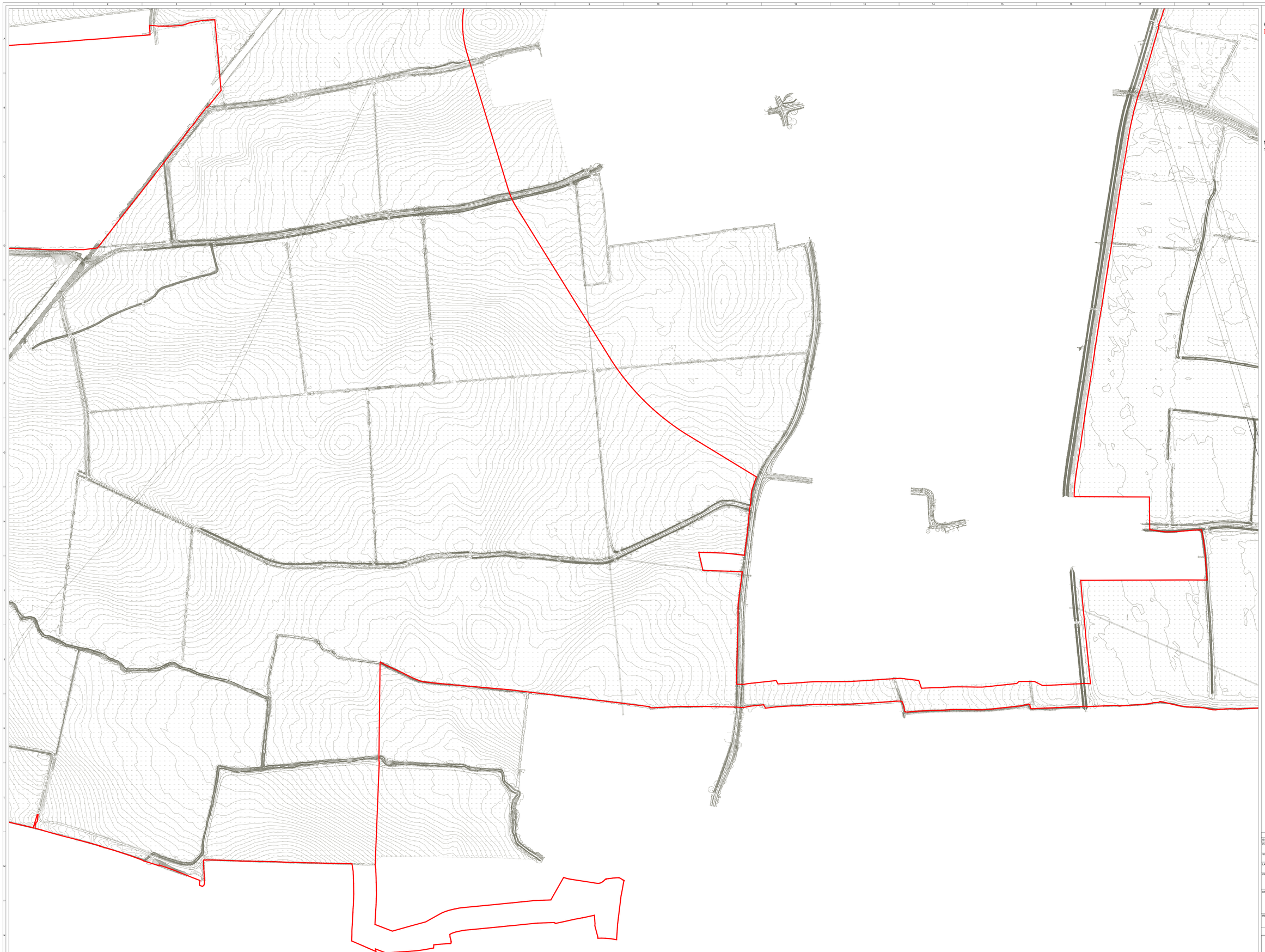
PURPOSE: OTHER	COORDINATES: OSGB 1936
SCALE: 1:2,500 @ A0	DATUM: N/A
LAYOUT DWG: N/A	T-LAYOUT NO.: N/A

PROJECT TITLE
STEEPLE SOLAR FARM

DRAWING TITLE
FIGURE 3.2
TOPOGRAPHIC SURVEY OF SITE

RES DRAWING NUMBER	REV
04954-RES-STE-DR-SV-003	1

BEAUFORT COURT,
EGG FARM LANE,
KINGS LANGLEY,
HERTS WD4 8LR, UK
TEL +44 (0) 1923 299200
WWW.RES-GROUP.COM



KEY:

SITE BOUNDARY
(*OUTSIDE OF LINE DENOTES BOUNDARY*)

NOTES:

1. TOPOGRAPHIC SURVEY IS 06_220847 UNDERTAKEN BY LSTC IN 2024

SHEET 6 OF 7

1	FG	DC	WB	2024-11-29	First Issue
ISSUE	DRAWN	CHKD	APPD	DATE	REVISION NOTES

PURPOSE: OTHER	COORDINATES: OSGB 1936
SCALE: 1:2,500 @ A0	DATUM: N/A
LAYOUT DWG: N/A	T-LAYOUT NO.: N/A

PROJECT TITLE:
STEEPLE SOLAR FARM

DRAWING TITLE:
FIGURE 3.2
TOPOGRAPHIC SURVEY OF SITE

RES DRAWING NUMBER: 04954-RES-STE-DR-SV-003 | REV: 1

BEAUFORT COURT,
ROWLEY LANE,
KINGS LANGLEY,
HERTS WD4 8LR, UK
TEL +44 (0) 1923 299200
WWW.RES-GROUP.COM

KEY:

SITE BOUNDARY
(*OUTSIDE OF LINE DENOTES BOUNDARY*)

NOTES:

1. TOPOGRAPHIC SURVEY IS 06_220847 UNDERTAKEN BY LSTC IN 2024

SHEET 7 OF 7

ISSUE	DRAWN	CHKD	APPD	DATE	REVISION NOTES
1	FG	DC	WB	2024-11-29	First Issue

PURPOSE: OTHER	COORDINATES: OSGB 1936
SCALE: 1:2,500 @ A0	DATUM: N/A
LAYOUT DWG: N/A	T-LAYOUT NO.: N/A

PROJECT TITLE: STEEPLE SOLAR FARM

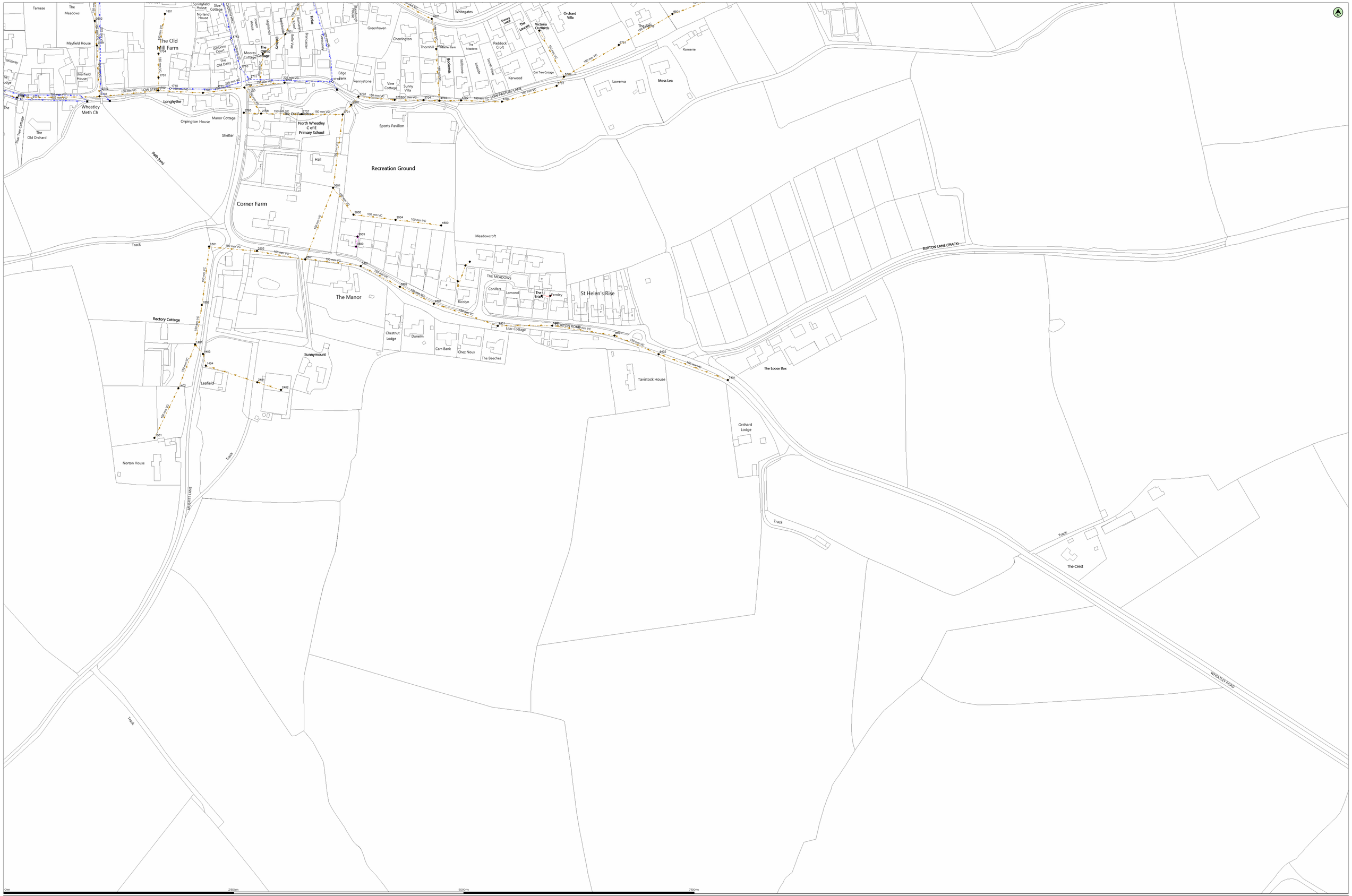
DRAWING TITLE: FIGURE 3.2
TOPOGRAPHIC SURVEY OF SITE

RES DRAWING NUMBER: 04954-RES-STE-DR-SV-003

REV: 1

BEAUFORT COURT,
EGG FARM LANE,
KINGS LANGLEY,
HERTFORDSHIRE, UK
TEL +44 (0) 1923 299200
WWW.RES-GROUP.COM

APPENDIX C
SEVERN TRENT WATER SEWER RECORDS



Date: 11/05/23 | Scale: 1:1250 | Map Centre: 476672,385347 | Data updated: 14/04/23 | Our Ref: 1174588 - 17 | Wastewater Plan A0

- Public Foul Gravity/Lateral Drain
- Public Combined Gravity/Lateral Drain
- Public Surface Water Gravity/Lateral Drain
- Pressure Foul
- Pressure Combined
- Pressure Surface Water
- Highway Drain
- Overflow Pipe
- Disposal Pipe
- Culverted Water Course
- Pumping Station
- Fitting
- Manhole Foul
- Manhole Surface
- Abandoned Pipe
- Chamber

Section 104 sewers are shown in green

Private sewers are shown in magenta

stat.payments@atkinsglobal.com

203570_1

SEVERN TRENT

Mammoliq Reference	Liquid Type	Cover Level	Invert Level	Depth to Invert
C		0	0	0
C		0	0	0
F		0	0	0
F		0	0	0
F		0	0	0
0701	F	20.16	18.62	1.54
0702	F	18.83	17.41	1.52
0802	F	21.44	19.99	1.45
1301	F		0	0
1401	F	20.22	18.32	1.9
1402	F	23.08	21.7	1.38
1403	F	19.61	19	0.61
1404	F	22.58	22.03	0.55
1501	F	18.74	17.53	1.21
1502	F	19.78	18.02	1.76
1701	F	18.86	18.02	0.84
1702	F	18.85	17.02	1.83
1703	F	18.96	16.91	2.05
1704	F	21.91	20.97	0.94
1801	F	24.95	23.91	1.04
2401	F		0	0
2402	F		0	0
2501	F	19.35	16.83	2.52
2502	F	18.87	17.12	1.75
2701	F		0	0
2702	F		0	0
2703	F	17.97	17.16	0.81
2704	F	18.19	16.59	1.6
2705	F	18.21	16.49	1.72
2706	F	17.9	16.38	1.52
2707	F	18.18	16.16	2.02
3500	F		0	0
3501	F	20.41	18.82	1.59
3502	F	22.07	20.05	2.02
3503	F		0	0
3504	F		0	0
3600	F		0	0
3601	F	18.24	16.26	1.98
3700	F		15.89	0
3701	F	18.15	15.89	2.26
3702	F	18.13	15.85	2.28
3703	F	17.94	15.72	2.22
3704	F	17.74	15.57	2.17
4401	F	24.69	20.58	4.11
4500	F		0	0
4501	F	23.18	20.42	2.76
4701	F	17.7	15.51	2.19
4702	F	17.88	15.5	2.38
4703	F	17.75	15.33	2.42
4704	F	23.8	22.37	1.43
4801	F	24.7	23.09	1.61
5401	F		0	0
5701	F	17.3	15.1	2.2
5702	F	17.16	15.01	2.15
5801	F	21.75	20.2	1.55
6401	F	24.68	21.03	3.65
6402	F	23.63	21.24	2.39
6701	F	16.79	14.91	1.88
6801	F	17.07	14.63	2.44
7401	F	23.16	21.78	1.38
9702	F	19.12	17.7	1.42
0713	S	18.98	17.76	1.22
1710	S		0	0
1711	S	19.14	18.14	1
1712	S	20.62	19.97	0.65
2710	S	18.93	17.33	1.6
2711	S	18.19	17.07	1.12
3710	S	18.18	16.73	1.45
9709	S		0	0
9710	S		0	0
9716	S	19.08	0	0

Date: 11/05/23

Scale: 1:1250

Map Centre: 478045,385347

Data updated: 14/04/23

Our Ref: 1174588 - 11

Wastewater Plan A0

Public Foul Gravity/Lateral Drain
Public Combined Gravity/Lateral Drain
Public Surface Water Gravity/Lateral Drain
Pressure Foul
Pressure Combined
Pressure Surface Water
Highway Drain
Overflow Pipe
Disposal Pipe
Culverted Water Course
Pumping Station
Fitting
Manhole Foul
Manhole Surface
Abandoned Pipe
Chamber

Section 104 sewers are shown in green
Private sewers are shown in magenta

stat.payments@atkinsglobal.com

203570_2

SEVERN TRENT

Manhole Reference	Liquid Type	Cover Level	Invert Level	Depth to Invert
5901	F		0	0
5902	F		0	0
5903	F		0	0
6801	F	21.6	19.37	2.23
6901	F	21.47	19.45	2.02
6902	F		0	0
6903	F		0	0
7803	F	21.46	19.07	2.39

Manhole Reference	Liquid Type	Cover Level	Invert Level	Depth to Invert

Manhole Reference	Liquid Type	Cover Level	Invert Level	Depth to Invert

Manhole Reference	Liquid Type	Cover Level	Invert Level	Depth to Invert

Manhole Reference	Liquid Type	Cover Level	Invert Level	Depth to Invert

Manhole Reference	Liquid Type	Cover Level	Invert Level	Depth to Invert

Manhole Reference	Liquid Type	Cover Level	Invert Level	Depth to Invert

Manhole Reference	Liquid Type	Cover Level	Invert Level	Depth to Invert

(c) Crown copyright and database rights 2023 Ordnance Survey 100031673 | Date: 11/05/23 | Scale: 1:1250 | Map Centre: 479417,385347 | Data updated: 14/04/23 | Our Ref: 1174588 - 9 | Wastewater Plan A0

- Public Foul Gravity/Lateral Drain
- Public Combined Gravity/Lateral Drain
- Public Surface Water Gravity/Lateral Drain
- Pressure Foul
- Pressure Combined
- Pressure Surface Water
- Highway Drain
- Overflow Pipe
- Disposal Pipe
- Culverted Water Course
- Pumping Station
- Fitting
- Manhole Foul
- Manhole Surface
- Abandoned Pipe
- Chamber

Section 104 sewers are shown in green
Private sewers are shown in magenta

stat.payments@atkinsglobal.com

203570_3

SEVERN TRENT

Manhole Reference	Liquid Type	Cover Level	Invert Level	Depth to Invert

Manhole Reference	Liquid Type	Cover Level	Invert Level	Depth to Invert

Manhole Reference	Liquid Type	Cover Level	Invert Level	Depth to Invert

Manhole Reference	Liquid Type	Cover Level	Invert Level	Depth to Invert

Manhole Reference	Liquid Type	Cover Level	Invert Level	Depth to Invert

Manhole Reference	Liquid Type	Cover Level	Invert Level	Depth to Invert

Manhole Reference	Liquid Type	Cover Level	Invert Level	Depth to Invert

Manhole Reference	Liquid Type	Cover Level	Invert Level	Depth to Invert

Date: 11/05/23

Scale: 1:1250

Map Centre: 480789,385347

Data updated: 14/04/23

Our Ref: 1174588 - 16

Wastewater Plan A0

Public Foul Gravity/Lateral Drain	Highway Drain	Manhole Foul	
Public Combined Gravity/Lateral Drain	Overflow Pipe	Manhole Surface	
Public Surface Water Gravity/Lateral Drain	Disposal Pipe	Abandoned Pipe	
Pressure Foul	Culverted Water Course	Chamber	
Pressure Combined	Pumping Station		
Pressure Surface Water	Filling		

Section 104 sewers are shown in green

Private sewers are shown in magenta

stat.payments@atkinsglobal.com

203570_4

SEVERN TRENT

Manhole Reference	Liquid Type	Cover Level	Invert Level	Depth to Invert

Manhole Reference	Liquid Type	Cover Level	Invert Level	Depth to Invert

Manhole Reference	Liquid Type	Cover Level	Invert Level	Depth to Invert

Manhole Reference	Liquid Type	Cover Level	Invert Level	Depth to Invert

Manhole Reference	Liquid Type	Cover Level	Invert Level	Depth to Invert

Manhole Reference	Liquid Type	Cover Level	Invert Level	Depth to Invert

Manhole Reference	Liquid Type	Cover Level	Invert Level	Depth to Invert

Manhole Reference	Liquid Type	Cover Level	Invert Level	Depth to Invert

(c) Crown copyright and database rights 2023 Ordnance Survey 100031673

Date: 11/05/23

Scale: 1:1250

Map Centre: 478045,384465

Data updated: 14/04/23

Our Ref: 1174588 - 4

Wastewater Plan A0

Public Foul Gravity/Lateral Drain
Public Combined Gravity/Lateral Drain
Public Surface Water Gravity/Lateral Drain
Pressure Foul
Pressure Combined
Pressure Surface Water
Highway Drain
Overflow Pipe
Disposal Pipe
Culverted Water Course
Pumping Station
Fitting
Manhole Foul
Manhole Surface
Abandoned Pipe
Chamber

Section 104 sewers are shown in green
Private sewers are shown in magenta

stat.payments@atkinsglobal.com

203570_7

SEVERN TRENT

Manhole Reference	Liquid Type	Cover Level	Invert Level	Depth to Invert
	F		0	0
	F		0	0
	F		0	0
	F		0	0
2001	F	18.31	16.43	1.88
3001	F	16.88	15.5	1.38
3500	F		0	0
3501	F	18.28	16.96	1.32
3502	F	16.96	15.42	1.54
3503	F	15.65	14.1	1.55
3504	F		0	0
4001	F	16.57	14.75	1.82
4101	F	16.53	14.11	2.42
4501	F	14.99	12.66	2.33
4601	F	15.87	13.67	2.2
4602	F	15.63	14.3	1.33
5101	F	15.62	13.25	2.37
5201	F	16.36	15.07	1.29
5300	F		0	0
5301	F	15	13.68	1.32
5302	F		0	0
5303	F		0	0
5304	F		0	0
5400	F		0	0
5401	F	13.68	12.07	1.61
5501	F	13.67	11.99	1.68
5502	F		0	0
6001	F	12.15	10.5	1.65
6002	F	10.99	9.34	1.65
6101	F	14.45	12.75	1.7
6501	F	13.43	11.56	1.87
6502	F	11.99	10.84	1.15
6503	F	13.29	11.43	1.86
6601	F	13.74	12	1.74
6801	F	21.6	19.37	2.23
6901	F	21.47	19.45	2.02
6902	F		0	0
6902	F	10.48	8.81	1.67
7501	F	11.07	9.51	1.56
7801	F	21.9	18.7	3.2
7803	F	21.46	19.07	2.39
8701	F	21.64	19.06	2.58
9701	F	21.51	20.46	1.05
9702	F	21.38	20.05	1.33
2510	S		0	0
3010	S		0	0
3011	S		0	0
3510	S	16.48	14.98	1.5
4010	S		0	0
4110	S	16.6	15.16	1.44
4510	S	15.34	0	0
5110	S		0	0
5410	S		0	0
5510	S		0	0
6110	S		0	0
6111	S		0	0
6112	S	14.51	13.83	0.68
6113	S	14.16	13.4	0.76
6510	S		0	0
6511	S		0	0

Manhole Reference	Liquid Type	Cover Level	Invert Level	Depth to Invert

Manhole Reference	Liquid Type	Cover Level	Invert Level	Depth to Invert

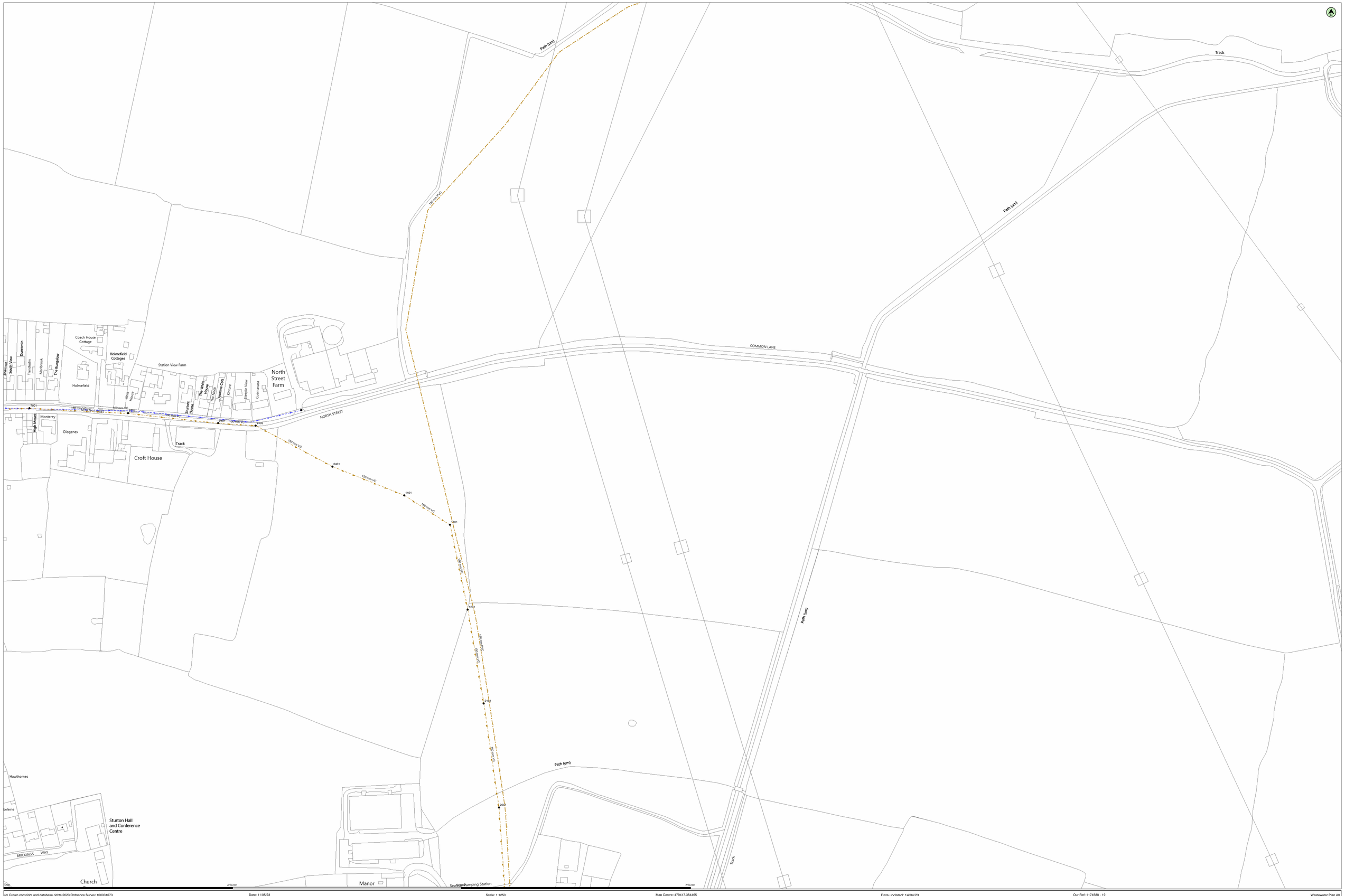
Manhole Reference	Liquid Type	Cover Level	Invert Level	Depth to Invert

Manhole Reference	Liquid Type	Cover Level	Invert Level	Depth to Invert

Manhole Reference	Liquid Type	Cover Level	Invert Level	Depth to Invert

Manhole Reference	Liquid Type	Cover Level	Invert Level	Depth to Invert

Manhole Reference	Liquid Type	Cover Level	Invert Level	Depth to Invert



(c) Crown copyright and database rights 2023 Ordnance Survey 100031673

Date: 11/05/23

Scale: 1:1250

Map Centre: 479417,384465

Data updated: 14/04/23

Our Ref: 1174588 - 19

Wastewater Plan A0

Do not scale off this map. The plan and any information supplied with it is furnished as a general guide, is only valid at the date of issue and no warranty as to its accuracy is given or implied. It should not be relied upon in connection with any contract. Users should satisfy themselves by independent enquiries (including but not limited to excavations) in the vicinity of SEVERN TRENT WATER assets on for the purposes of determining the suitability of a point of connection to the sewerage or distribution systems. Reproduction by permission of Ordnance Survey on behalf of HMSO. ©Crown Copyright and database rights 2023. All rights reserved. Ordnance Survey licence number 100031673. Document users other than SEVERN TRENT WATER business users are advised that this document is provided for reference purpose only and is subject to copyright, therefore, no further copies should be made from it.

Public Foul Gravity/Lateral Drain	Highway Drain	Manhole Foul
Public Combined Gravity/Lateral Drain	Overflow Pipe	Manhole Surface
Public Surface Water Gravity/Lateral Drain	Disposal Pipe	Abandoned Pipe
Pressure Foul	Culverted Water Course	Chamber
Pressure Combined	Pumping Station	Section 104 sewers are shown in green
Pressure Surface Water	Filling	Private sewers are shown in magenta

stat.payments@atkinsglobal.com

203570_8

SEVERN TRENT

Manhole Reference	Liquid Type	Cover Level	Invert Level	Depth to Invert
0401	F	9.53	7.23	2.3
1201	F	7.82	5.98	1.84
1301	F	8.39	6.4	1.99
1401	F	8.66	6.67	1.99
2001	F	7.46	0	0
2101	F	7.91	5.24	2.67
7501	F	11.07	9.51	1.56
8501	F	10.22	8.72	1.5
9401	F	9.29	7.98	1.31
9402	F	9.06	7.41	1.65

Manhole Reference	Liquid Type	Cover Level	Invert Level	Depth to Invert

Manhole Reference	Liquid Type	Cover Level	Invert Level	Depth to Invert

Manhole Reference	Liquid Type	Cover Level	Invert Level	Depth to Invert

Manhole Reference	Liquid Type	Cover Level	Invert Level	Depth to Invert

Manhole Reference	Liquid Type	Cover Level	Invert Level	Depth to Invert

Manhole Reference	Liquid Type	Cover Level	Invert Level	Depth to Invert

Manhole Reference	Liquid Type	Cover Level	Invert Level	Depth to Invert

Date: 11/05/23 | Scale: 1:1250 | Map Centre: 478045,383582 | Data updated: 14/04/23 | Our Ref: 1174680 - 15 | Wastewater Plan A0

- Public Foul Gravity/Lateral Drain
- Public Combined Gravity/Lateral Drain
- Public Surface Water Gravity/Lateral Drain
- Pressure Foul
- Pressure Combined
- Pressure Surface Water
- Highway Drain
- Overflow Pipe
- Disposal Pipe
- Culverted Water Course
- Pumping Station
- Filtrine
- Manhole Foul
- Manhole Surface
- Abandoned Pipe
- Chamber

Section 104 sewers are shown in green

Private sewers are shown in magenta

stat.payments@atkinsglobal.com

203570_12

SEVERN TRENT

Mainhole Reference	Liquid Type	Cover Level	Invert Level	Depth to Invert
2001	F	18.31	16.43	1.88
3001	F	16.88	15.5	1.38
4801	F	11.27	9.91	1.36
5802	F	10.8	9.26	1.54
6001	F	12.15	10.5	1.65
6002	F	10.99	9.34	1.65
6601	F	11.1	8.89	2.21
6902	F	10.48	8.81	1.67
6901	F	10.02	8.06	1.96
7601	F	15.7	13.51	2.19
7602	F	15.54	14.05	1.49
7700	F	0	0	0
7701	F	0	0	0
7702	F	0	0	0
7801	F	12.12	9.89	2.23
7901	F	10.52	7.47	3.05
7902	F	10.26	7.87	2.39
7710	S	15.75	14.7	1.05
7810	S	10.44	9.29	1.15

Date: 11/05/23

Scale: 1:1250

Map Centre: 479417,383582

Data updated: 14/04/23

Our Ref: 1174680 - 10

Wastewater Plan A0

Public Foul Gravity/Lateral Drain	Highway Drain	Manhole Foul	
Public Combined Gravity/Lateral Drain	Overflow Pipe	Manhole Surface	
Public Surface Water Gravity/Lateral Drain	Disposal Pipe	Abandoned Pipe	
Pressure Foul	Culverted Water Course	Chamber	
Pressure Combined	Pumping Station		
Pressure Surface Water	Filling		

Section 104 sewers are shown in green

Private sewers are shown in magenta

stat.payments@atkinsglobal.com

203570_13

SEVERN TRENT

Manhole Reference	Liquid Type	Cover Level	Invert Level	Depth to Invert
	F		0	0
	F		0	0
	F		0	0
	F		0	0
	F		0	0
	F		0	0
	F		0	0
	F		0	0
0901	F	8.16	5.88	2.28
1901	F	7.57	5.14	2.43
2900	F		0	0
2901	F		0	0
2903	F	7	4.58	2.42
2904	F	6.86	4.33	2.53
2905	F	6.69	0	0
2906	F		0	0
3901	F	6.64	5.13	1.51
6901	F	10.02	8.06	1.96
7601	F	15.7	13.51	2.19
7602	F	15.54	14.05	1.49
7700	F		0	0
7701	F		0	0
7702	F		0	0
7801	F	12.12	9.89	2.23
7901	F	10.52	7.47	3.05
7902	F	10.26	7.87	2.39
8801	F	11.53	9.78	1.75
8802	F		0	0
8901	F	9.92	8.35	1.57
8902	F	10.28	7.14	3.14
9901	F	8.54	6.21	2.33
9902	F	8.91	6.7	2.21
7710	S	15.75	14.7	1.05
7810	S	10.44	9.29	1.15

Manhole Reference	Liquid Type	Cover Level	Invert Level	Depth to Invert

Manhole Reference	Liquid Type	Cover Level	Invert Level	Depth to Invert

Manhole Reference	Liquid Type	Cover Level	Invert Level	Depth to Invert

Manhole Reference	Liquid Type	Cover Level	Invert Level	Depth to Invert

Manhole Reference	Liquid Type	Cover Level	Invert Level	Depth to Invert

Manhole Reference	Liquid Type	Cover Level	Invert Level	Depth to Invert

Manhole Reference	Liquid Type	Cover Level	Invert Level	Depth to Invert

(c) Crown copyright and database rights 2023 Ordnance Survey 100031673 | Date: 11/05/23 | Scale: 1:1250 | Map Centre: 478045,382700 | Data updated: 14/04/23 | Our Ref: 1174680 - 4 | Wastewater Plan A0

Public Foul Gravity/Lateral Drain	Highway Drain	Manhole Foul	
Public Combined Gravity/Lateral Drain	Overflow Pipe	Manhole Surface	
Public Surface Water Gravity/Lateral Drain	Disposal Pipe	Abandoned Pipe	
Pressure Foul	Culverted Water Course	Chamber	
Pressure Combined	Pumping Station		
Pressure Surface Water	Fitting		

Section 104 sewers are shown in green

Private sewers are shown in magenta

stat.payments@atkinsglobal.com

203570_18

SEVERN TRENT

Manhole Reference	Liquid Type	Cover Level	Invert Level	Depth to Invert
5202	F	11.08	9.71	1.37
5203	F	11.78	10.5	1.28
5301	F	13.17	11.99	1.18
5401	F	15.22	13.33	1.89
7201	F	11.17	9.4	1.77
7202	F	11.87	10.52	1.35
5310	S	12.48	11.81	0.67

Manhole Reference	Liquid Type	Cover Level	Invert Level	Depth to Invert

Manhole Reference	Liquid Type	Cover Level	Invert Level	Depth to Invert

Manhole Reference	Liquid Type	Cover Level	Invert Level	Depth to Invert

Manhole Reference	Liquid Type	Cover Level	Invert Level	Depth to Invert

Manhole Reference	Liquid Type	Cover Level	Invert Level	Depth to Invert

Manhole Reference	Liquid Type	Cover Level	Invert Level	Depth to Invert

Manhole Reference	Liquid Type	Cover Level	Invert Level	Depth to Invert

Date: 11/05/23

Scale: 1:1250

Map Centre: 479417,382700

Data updated: 14/04/23

Our Ref: 1174680 - 13

Wastewater Plan A0

Public Foul Gravity/Lateral Drain
Public Combined Gravity/Lateral Drain
Public Surface Water Gravity/Lateral Drain
Pressure Foul
Pressure Combined
Pressure Surface Water
Highway Drain
Overflow Pipe
Disposal Pipe
Culverted Water Course
Pumping Station
Filling
Manhole Foul
Manhole Surface
Abandoned Pipe
Chamber
Section 104 sewers are shown in green
Private sewers are shown in magenta

stat.payments@atkinsglobal.com

203570_19

SEVERN TRENT

Manhole Reference	Liquid Type	Cover Level	Invert Level	Depth to Invert
	F		0	0
	F		0	0
	F		0	0
	F		0	0
	F		0	0
	F		0	0
	F		0	0
0001	F	8.55	5.83	2.72
0002	F	9.16	7.79	1.37
0003	F	6.55	5.05	1.5
0202	F	9.31	7.93	1.38
1201	F		0	0
1202	F	7.8	6.05	1.75
2002	F	6.09	4.69	1.4
2003	F	6.21	5.02	1.19
2200	F		0	0
2201	F		0	0
2202	F		0	0
2203	F		0	0
2204	F		0	0
2205	F		0	0
2206	F		0	0
2207	F		0	0
2208	F		0	0
2209	F		0	0
2210	F		0	0
2211	F		0	0
2212	F		0	0
2213	F		0	0
2214	F		0	0
2215	F		0	0
2216	F		0	0
2217	F		0	0
2219	F		0	0
2220	F		0	0
3201	F	7.39	0	0
4201	F	6.46	4.74	1.72
7201	F	11.17	9.4	1.77
7202	F	11.87	10.52	1.35
8201	F	10.55	8.96	1.59
0010	S	6.45	5.48	0.97
1010	S		0	0
1210	S	8.11	6.89	1.22
1211	S	7.56	6.65	0.91

Manhole Reference	Liquid Type	Cover Level	Invert Level	Depth to Invert

Manhole Reference	Liquid Type	Cover Level	Invert Level	Depth to Invert

Manhole Reference	Liquid Type	Cover Level	Invert Level	Depth to Invert

Manhole Reference	Liquid Type	Cover Level	Invert Level	Depth to Invert

Manhole Reference	Liquid Type	Cover Level	Invert Level	Depth to Invert

Manhole Reference	Liquid Type	Cover Level	Invert Level	Depth to Invert

Manhole Reference	Liquid Type	Cover Level	Invert Level	Depth to Invert

Date: 18/05/23

Scale: 1:1250

Map Centre: 482162,382700

Data updated: 14/05/23

Our Ref: 1179955 - 2

Wastewater Plan A0

- Public Foul Gravity/Lateral Drain
- Public Combined Gravity/Lateral Drain
- Public Surface Water Gravity/Lateral Drain
- Pressure Foul
- Pressure Combined
- Pressure Surface Water
- Highway Drain
- Overflow Pipe
- Disposal Pipe
- Culverted Water Course
- Pumping Station
- Fitting
- Manhole Foul
- Manhole Surface
- Abandoned Pipe
- Chamber

Section 104 sewers are shown in green

Private sewers are shown in magenta

stat.payments@atkinsglobal.com

203570_21

SEVERN TRENT

Manhole Reference	Liquid Type	Cover Level	Invert Level	Depth to Invert

Manhole Reference	Liquid Type	Cover Level	Invert Level	Depth to Invert

Manhole Reference	Liquid Type	Cover Level	Invert Level	Depth to Invert

Manhole Reference	Liquid Type	Cover Level	Invert Level	Depth to Invert

Manhole Reference	Liquid Type	Cover Level	Invert Level	Depth to Invert

Manhole Reference	Liquid Type	Cover Level	Invert Level	Depth to Invert

Manhole Reference	Liquid Type	Cover Level	Invert Level	Depth to Invert

Manhole Reference	Liquid Type	Cover Level	Invert Level	Depth to Invert

GENERAL CONDITIONS AND PRECAUTIONS TO BE TAKEN WHEN CARRYING OUT WORK ADJACENT TO SEVERN TRENT WATER'S APPARATUS

Please ensure that a copy of these conditions is passed to your representative and/or your contractor on site. If any damage is caused to Severn Trent Water Limited (STW) apparatus (defined below), the person, contractor or subcontractor responsible must inform STW immediately on:
0800 783 4444 (24 hours)

a) These general conditions and precautions apply to the public sewerage, water distribution and cables in ducts including (but not limited to) sewers which are the subject of an Agreement under Section 104 of the Water Industry Act 1991(a legal agreement between a developer and STW, where a developer agrees to build sewers to an agreed standard, which STW will then adopt); mains installed in accordance with an agreement for the self-construction of water mains entered into with STW and the assets described at condition b) of these general conditions and precautions. Such apparatus is referred to as "STW Apparatus" in these general conditions and precautions.

b) Please be aware that due to The Private Sewers Transfer Regulations June 2011, the number of public sewers has increased, but many of these are not shown on the public sewer record. However, some idea of their positions may be obtained from the position of inspection covers and their existence must be anticipated.

c) On request, STW will issue a copy of the plan showing the approximate locations of STW Apparatus although in certain instances a charge will be made. The position of private drains, private sewers and water service pipes to properties are not normally shown but their presence must be anticipated. This plan and the information supplied with it is furnished as a general guide only and STW does not guarantee its accuracy.

d) STW does not update these plans on a regular basis. Therefore the position and depth of STW Apparatus may change and this plan is issued subject to any such change. Before any works are carried out, you should confirm whether any changes to the plan have been made since it was issued.

e) The plan must not be relied upon in the event of excavations or other works in the vicinity of STW Apparatus. It is your responsibility to ascertain the precise location of any STW Apparatus prior to undertaking any development or other works (including but not limited to excavations).

f) No person or company shall be relieved from liability for loss and/or damage caused to STW Apparatus by reason of the actual position and/or depths of STW Apparatus being different from those shown on the plan.

In order to achieve safe working conditions adjacent to any STW Apparatus the following should be observed:

1. All STW Apparatus should be located by hand digging prior to the use of mechanical excavators.

2. All information set out in any plans received from us, or given by our staff at the site of the works, about the position and depth of the mains, is approximate. Every possible precaution should be taken to avoid damage to STW Apparatus. You or your contractor must ensure the safety of STW Apparatus and will be responsible for the cost of repairing any loss and/or damage caused (including without limitation replacement parts).

3. Water mains are normally laid at a depth of 900mm. No records are kept of customer service pipes which are normally laid at a depth of 750mm; but some idea of their positions may be obtained from the position of stop tap covers and their existence must be anticipated.

4. During construction work, where heavy plant will cross the line of STW Apparatus, specific crossing points must be agreed with STW and suitably reinforced where required. These crossing points should be clearly marked and crossing of the line of STW Apparatus at other locations must be prevented.

5. Where it is proposed to carry out piling or boring within 20 metres of any STW Apparatus, STW should be consulted to enable any affected STW Apparatus to be surveyed prior to the works commencing.

6. Where excavation of trenches adjacent to any STW Apparatus affects its support, the STW Apparatus must be supported to the satisfaction of STW. Water mains and some sewers are pressurised and can fail if excavation removes support to thrust blocks to bends and other fittings.

7. Where a trench is excavated crossing or parallel to the line of any STW Apparatus, the backfill should be adequately compacted to prevent any settlement which could subsequently cause damage to the STW Apparatus. In special cases, it may be necessary to provide permanent support to STW Apparatus which has been exposed over a length of the excavation before backfilling and reinstatement is carried out. There should be no concrete backfill in contact with the STW Apparatus.

8. No other apparatus should be laid along the line of STW Apparatus irrespective of clearance. Above ground apparatus must not be located within a minimum of 3 metres either side of the centre line of STW Apparatus for smaller sized pipes and 6 metres either side for larger sized pipes without prior approval. No manhole or chamber shall be built over or around any STW Apparatus.

9. A minimum radial clearance of 300 millimetres should be allowed between any plant or equipment being installed and existing STW Apparatus. We reserve the right to increase this distance where strategic assets are affected.

10. Where any STW Apparatus coated with a special wrapping is damaged, even to a minor extent, STW must be notified and the trench left open until the damage has been inspected and the necessary repairs have been carried out. In the case of any material damage to any STW Apparatus causing leakage, weakening of the mechanical strength of the pipe or corrosion-protection damage, the necessary remedial work will be recharged to you.

11. It may be necessary to adjust the finished level of any surface boxes which may fall within your proposed construction. Please ensure that these are not damaged, buried or otherwise rendered inaccessible as a result of the works and that all stop taps, valves, hydrants, etc. remain accessible and operable. Minor reduction in existing levels may result in conflict with STW Apparatus such as valve spindles or tops of hydrants housed under the surface boxes. Checks should be made during site investigations to ascertain the level of such STW Apparatus in order to determine any necessary alterations in advance of the works.

12. With regard to any proposed resurfacing works, you are required to contact STW on the number given above to arrange a site inspection to establish the condition of any STW Apparatus in the nature of surface boxes or manhole covers and frames affected by the works. STW will then advise on any measures to be taken, in the event of this a proportionate charge will be made.

13. You are advised that STW will not agree to either the erection of posts, directly over or within 1.0 metre of valves and hydrants,

14. No explosives are to be used in the vicinity of any STW Apparatus without prior consultation with STW.

TREE PLANTING RESTRICTIONS

There are many problems with the location of trees adjacent to sewers, water mains and other STW Apparatus and these can lead to the loss of trees and hence amenity to the area which many people may have become used to. It is best if the problem is not created in the first place. Set out below are the recommendations for tree planting in close proximity to public sewers, water mains and other STW Apparatus.

15. Please ensure that, in relation to STW Apparatus, the mature root systems and canopies of any tree planted do not and will not encroach within the recommended distances specified in the notes below.

16. Both Poplar and Willow trees have extensive root systems and should not be planted within 12 metres of a sewer, water main or other STW Apparatus.

17. The following trees and those of similar size, be they deciduous or evergreen, should not be planted within 6 metres of a sewer, water main or other STW Apparatus. E.g. Ash, Beech, Birch, most Conifers, Elm, Horse Chestnut, Lime, Oak, Sycamore, Apple and Pear. Asset Protection Statements Updated May 2014

18. STW personnel require a clear path to conduct surveys etc. No shrubs or bushes should be planted within 2 metre of the centre line of a sewer, water main or other STW Apparatus.

19. In certain circumstances, both STW and landowners may wish to plant shrubs/bushes in close proximity to a sewer, water main of other STW Apparatus for screening purposes. The following are shallow rooting and are suitable for this purpose: Blackthorn, Broom, Cotoneaster, Elder, Hazel, Laurel, Privet, Quickthorn, Snowberry, and most ornamental flowering shrubs.

APPENDIX D
DEVELOPMENT LAYOUT

KEY:

- ORDER LIMITS (*OUTSIDE OF LINE DENOTES BOUNDARY*)
- EXISTING ACCESS TRACK TO BE UPGRADED WHERE REQUIRED
- ACCESS TRACK
- EXISTING WATERCOURSE CROSSING TO BE UPGRADED WHERE REQUIRED
- VEHICULAR WATERCOURSE CROSSING
- PEDESTRIAN WATERCOURSE CROSSING
- SOLAR PV ARRAY
- INVERTER / TRANSFORMER STATION AREA
- HARDSTAND
- SUBSTATION COMPOUND
- BESS COMPOUND
- ATTENUATION BASIN
- SWALE
- CABLE CORRIDOR (50m WIDE)
- CABLE CORRIDOR AND/OR SOLAR PV ARRAY
- PERIMETER FENCE LINE
- PERIMETER GATE
- EXISTING HEDGEROW GAP / WATERCOURSE USED FOR PROJECT ACCESS
- PUBLIC RIGHT OF WAY (DEFINITIVE MAP)
- PROPOSED PERMISSIVE PATH
- SITE ENTRANCE VISIBILITY SPLAY

SITE LOCATION - NOT TO SCALE

OVERVIEW
SHEET 1 OF 7

ISSUE	DRAWN	CHKD	APPD	DATE	REVISION NOTES
2	FG	DC	CC	2025-03-17	Design freeze issue
1	FG	DC	CC	2025-02-18	First Issue

PURPOSE	PERMITTING
COORDINATES	OSGB 1936
SCALE	1:10,000 @ A0
DATUM	N/A
LAYOUT DWG	N/A
T-LAYOUT NO.	N/A
PROJECT TITLE	STEEPLE SOLAR FARM
DRAWING TITLE	FIGURE 5 INFRASTRUCTURE LAYOUT ENLARGEMENT
RES DRAWING NUMBER	04954-RES-LAY-DR-PT-004
REV	2

BEAUFORT COURT,
EGG FARM LANE,
KINGS LANGLEY,
HERTS WD4 8LR, UK
TEL +44 (0) 1923 299200
WWW.RES-GROUP.COM

APPENDIX E
EA CONSULTATION RESPONSES

Meeting Minutes

Steeple Renewables Project	
Meeting Date:	22nd July 2024
Time:	13.00
[redacted]	

Key points of discussion (**actions in bold**):

- AC outlined the proposed scheme and the flood risk appraisal works undertaken to date including presenting the 1 in 100 year plus 39% cc ('higher central') flood outline and depths.
- PS confirmed that the 100 year plus 39% cc defended flood event is a reasonable design event for 'essential infrastructure' projects such as this.
- PS noted that the Flood Map for Planning doesn't take account of defences, whereas the modelled flood levels provided by the EA as part of their Product 4 dataset take account of defences on the River Trent.
- PS requested that 'sensitivity testing' is undertaken using the 1 in 100 year plus 62% ('upper end') climate change flood level. Infrastructure should be resilient to this level. **AC to request 100 year plus 62% cc flood level from EA as not provided within Product 4 dataset.**
- PS asked that the breach event is also taken into consideration, again for resilience. This is particularly important for the BESS / substation area. Breach location 28 was considered the most relevant. The model could be re-run with updated boundary conditions. **AC to review the EA dataset and consider the best approach to consideration of a breach event. Proposed approach to be discussed with EA.**
- PS asked that the flood risk from the Mother Drain and Catchwater Drain are considered as they are not included in the EA flood model. **AC to check if LLFA or IDB can provide any modelling for these watercourses, and if not consider the most appropriate form of assessment / modelling. Proposed approach to be discussed with EA.**
- JB requested that the FRA includes a comparison of the published Flood Map for Planning against the modelled flood outputs side by side with an explanation of what each shows. **AC to include in FRA.**
- JB requested that the residual risk (defended vs breach scenario) is explained within the FRA. **AC to include in FRA.**
- JB requested that the modelled and breach scenarios are considered particularly in relation to the BESS / substation area, although initial review suggests these areas are outside the design flood extent. **AC to review the BESS / substation locations with reference to the breach flood extent.**
- JB confirmed that sensitive equipment (electrical components beneath panels, invertor stations, BESS and substation) should be elevated 300mm above the 1 in 100 year plus climate change flood level for the 'higher central' climate change scenario where possible. As previously discussed, the 62% 'upper end' climate change scenario should be used for

Meeting Minutes

sensitivity testing. Sensitive equipment should be ideally set above the 100 year plus 62% climate change flood level (no requirement for freeboard).

- JB acknowledged that displacement of floodwater was likely to be negligible for the panel supports and would be difficult to quantify. AC noted that the invertor stations would also be located within the design flood extent with a small associated volume occupied by the supports beneath the raised invertor units. JB suggested an initial high-level assessment of floodwater displacement i.e. approximate volumes displaced and a comparison to the volume of the flood envelope with the aim of demonstrating a negligible impact. **AC to undertake initial exercise (estimation of displaced flood volumes) for further discussion with EA. Worse case scenarios to be considered where scheme design not fixed.**
- AC queried whether there were any requirements in relation to perimeter fencing. JB confirmed that there were no set design requirements but fencing should be permeable to floodwater. **AC to provide further information / fence design to EA for comment.**
- PS noted that permits may be required for works within 8m of the River Trent and that an 8m easement should ideally be applied. AC noted that the land close to the River Trent would be for biodiversity works only, with no infrastructure proposed.
- AC queried whether creation of new drainage ditches, or improvements to existing ditches, for biodiversity improvement would raise any concerns with the EA. JB noted that further information would be required to comment further, but that in principal he didn't envisage any major issues as long as the existing defences weren't adversely affected, the ditches didn't have raised embankments and the excavated material was removed from the floodplain. **AC to provide further information to the EA for review once proposals have progressed.**

creating a better place
for people and wildlife

Environment Agency

The Planning Inspectorate
[SteepleRenewables@planninginspectorate.gov.uk]

Our ref: XA/2024/100119/01-L01
Your ref: EN010163

Date: 6 August 2024

Dear Sir/Madam

PLANNING ACT 2008 (AS AMENDED) AND THE INFRASTRUCTURE PLANNING (ENVIRONMENTAL IMPACT ASSESSMENT) REGULATIONS 2017 (THE EIA REGULATIONS)– REGULATIONS 10 AND 11 - SCOPING OPINION

APPLICATION BY RENEWABLE ENERGY SOLUTIONS (RES) (THE APPLICANT) FOR AN ORDER GRANTING DEVELOPMENT CONSENT FOR THE STEEPLE RENEWABLES PROJECT - LOCATED TO THE EAST AND WEST OF STURTON LE STEEPLE AND SOUTH OF WEST BURTON POWER STATION

Thank you for your consultation on the Environmental Impact Assessment (EIA) Scoping Opinion for the above Nationally Significant Infrastructure Project (NSIP). We have reviewed the Steeple Renewables Project EIA Scoping Report Main Text, Appendices and Figures. We have the following advice to offer.

Chapter 8 – Ecology and Biodiversity

Fisheries

The Catchwater Drain and Mother Drain are both hydrologically connected to the River Trent and the Oswald Beck may provide suitable habitat for fish. It is known the European eel inhabit such ditches/drains and small watercourses. European eel are listed as critically endangered on the International Union for Conservation of Nature (IUCN) Red List of Threatened Species, they are listed as a species of principal importance under Section 41 of the Natural Environment and Rural communities (NERC) Act 2006. They are also protected under The Eels (England and Wales) Regulations 2009. It is recommended that fish surveys are conducted on ditches/drains across the site. The results should then form part of the baseline data for the EIA.

Section 8.3

The effects on fish have only been scoped in as being neutral and with beneficial effects overall. Activities during construction, operation and decommissioning have the potential to negatively impact fish. Such impacts may include damaging fish spawning habitat from increased surface runoff of pollutants and fine sediment, behavioural impacts on fish from noisy construction activities and loss of habitat from waterbody crossings. Therefore, the potential impacts on fish from construction,

operation and decommissioning should be scoped in and be assessed in the ES. Mitigation should be included within the Construction Environmental Management Plan.

Section 8.4
The Salmon and Freshwater Fisheries Act 1975 has not been included in the list of legislation that is relevant to biodiversity. The legal responsibility on the applicant pertaining to this fish specific legislation has not been considered. This act should be listed as relevant in the Preliminary Environmental Information Report (PEIR) and Environmental Statement (ES).

Section 9.6
Any culverting of a watercourse or waterbody that contains fish can impact on lifecycle migration, both locally and more long distant. Culverting also impacts on fish habitat and spawning habitat by decreasing the quality of substrate. Therefore, we are opposed to the culverting of any watercourse and would prefer the installation of a clear full span crossing that maintains the natural substrate and allows free passage of fish.

Biodiversity
Table 8.1 and Section 8.3
We agree in general with all ecological features 'Scoped In' with regards to Aquatic Biodiversity, along with the deemed potential likely significant effects.

We note that an Invasive Non-Native Species (INNS) search is planned. We hold multiple records for INNS on and around the site, including Least Duckweed and Chinese mitten crab (recorded on ordinary watercourses within the central section), Nuttall's water-weed (recorded in the eastern section on Mother Drain) and Himilayan balsam (recorded across the different sections of the site, and just outside the site boundary.

Other INNS recorded just outside the site boundary within or near connected watercourses include Japanese knotweed, Canadian waterweed and waterfern. Therefore, we strongly suggest that INNS are 'Scoped In'. We recommend that the applicant submits a Biosecurity Method Statement and Invasive Species Management Plan alongside the DCO application for the proposed development.

Section 8.3.18
Biodiversity Net Gain (BNG) BNG will become a legal requirement for NSIPs in November 2025 and we would like to have the opportunity to comment on this report, if possible, particularly with regards to the Water Metric element. It is positive to read that the applicant has conducted a habitat survey using the U.K. Habitats Classification System (UK HABs) (1.1.4, Appendix 8B), which provides more accurate habitat identification data for the BNG Metric, and plans to verify the habitat classifications in a later survey (1.1.7, Appendix 8B). The applicant should use the

latest statutory (official) version of the biodiversity metric tool to calculate BNG, and we would also encourage the use of the Watercourse Metric.

There is no reference to the applicant's intended BNG target. It will become a legal requirement to deliver at least 10% BNG, but we would encourage the applicant to provide more. It is noted that habitat enhancement may take place after construction. However, the biodiversity metric rewards units if enhancements are delivered early. Therefore, we would encourage habitat enhancements to be delivered earlier to provide wetland habitat ahead of project completion.

Section 8.3.6
A Habitats Regulations Assessment (HRA) will be completed as part of the application process to consider any potential impacts to designated sites. Although this is within the remit of Natural England, we would like to note that functionally linked watercourses (such as Catchwater Drain and Mother Drain) should be included in the assessment.

The applicant should refer to the following:

'Habitats Regulations Assessment relevant to nationally significant infrastructure projects' published by the Planning Inspectorate.

Section 8.6
The designed-in mitigation proposes the retention of semi-natural buffers to protect habitats and species. We recommend the provision of a 10-metre buffer from watercourse bank-tops as a minimum, to effectively protect the watercourse from sediments, enable bank stabilisation through vegetation establishment and allow space for commuting by mammals. However, where natural geomorphic processes take place (such as lateral channel migration), we advise the applicant to consider buffers greater than 10-metres in some locations where watercourse migration is identified.

Section 9.3.6
We note that a WFD Assessment has been 'Scoped-In' during the construction phase. This should include an assessment of any potential impacts (such as, but not limited to, sediment pollution) to watercourses on-site and the potential to impact hydrologically linked watercourses, which may therefore also impact the biodiversity that relies on these watercourses.

Further advice
In relation to the Eastern Biodiversity Mitigation Area, the habitat survey found coastal and floodplain grazing marsh and reedbed habitats present near the River Trent (1.2.3, Appendix 8). A large assemblage of wetland birds was also found. We strongly recommend that the Landscape Ecological Management Plan (LEMP)

considers the maintenance and potential enhancement of these habitats, and habitats that support the recorded species, as part of the planning and design.

It is positive to read that the applicant will consider potentially enhancing the Local Wildlife Sites (LWS) on-site. We recommend that the Nottinghamshire Wildlife Trust are consulted with regards to assessing impacts to these LWS.

Geomorphology

The Scoping Report suggests that river crossings (bridges, culverts, and buried cables) may be required as part of this development. Therefore, we would expect to see geomorphologically robust designs that will cause minimal impacts on natural fluvial processes operating in the river/floodplain environment over the course of the 21st century.

Any infrastructural developments on the river/floodplain environment of the River Trent should be designed and delivered to have a minimal impact on natural river dynamics (e.g. erosion, deposition, meander migration etc.) and should not place any significant limitations on future river restoration projects. Any potential construction, operational, and decommissioning phase impacts that the proposed scheme may have on the river must be subject to a WFD Assessment.

Geomorphologically dynamic behaviour is deemed likely to intensify in the next decades in line with Flood Estimation Handbook (Flood Estimation Handbook (FEH) | UK Centre for Ecology & Hydrology (ceh.ac.uk). Therefore, any infrastructure developments should also take some account of the likelihood for increased lateral and vertical river dynamics anticipated to result from continued hydro-climatic intensification (e.g. 'a flood-rich epoch') over the remainder of the 21st century (i.e., future proofed designs that are not just based on present-day baseline geomorphological configuration/behaviour).

Chapter 9 - Hydrology, Hydrogeology, Flood Risk &Drainage

Flood Risk

We acknowledge that flood risk during the construction and operation phases is scoped in, and that a Flood Risk Assessment (FRA) is to be completed at a later stage. However, it is not clear whether flood risk during the decommissioning phase has been scoped in.

The proposed scheme is classified as '*Essential Infrastructure'* as defined in Annex 3: Flood Vulnerability classification of the Planning Practice Guidance (PPG).

There are some areas of the site that are situated within Flood Zones 2 & 3 which have a higher probability of flooding from rivers and/ or the sea. The Sequential Test will therefore be required to be passed, as outlined in the National Policy Statement (NPS) EN-1, and the National Planning Policy Framework (NPPF).

A sequential approach should be applied to the layout of the site, with all buildings, substation, and anything considered to be critical infrastructure located outside of areas at risk of flooding (Flood Zone 1). However, if solar panels and equipment need to be situated in areas at risk of flooding (Flood Zone 2 & 3), then The Exception Test must also be applied and the FRA must assess flood risk from all sources of flooding.

Built development within the fluvial floodplain should be quantified to establish the need for compensatory flood storage. We understand that development within flood risk areas will predominantly be solar panel on supports, which would result in minimal loss of storage, however this should be demonstrated and quantified within the FRA.

Consideration of flood risk from the ordinary watercourses which bisect the site should be given. We do not hold any detailed hydraulic modelling for the ordinary watercourses such as the Catchwater Drain and Mother drain. The applicant should consider the associated fluvial flood risk from Ordinary Watercourses noting the fact that the Flood Map for Planning generally only represents flood risk for watercourses with a catchment area of greater than $3km^{2.}$. It may be that some form of detailed hydraulic modelling is required for these watercourses depending on what information the Lead Local Flood Authority hold for these or whether there are other dominant flood risk sources, such as the River Trent.

It is stated, in paragraph 4.5.1 of the Scoping Report, that the project has an operational lifetime of 40 years. Please note that the PPG (Paragraph: 006 Reference ID: 7-006-20220825) states that non-residential development should include an assessment of flood risk over at least 75 years.

In this location the River Trent is fluvially dominant rather than tidally dominant. Therefore, based on the guidance 'Flood Risk Assessment: Climate Change Allowances', the 100-year fluvial flood event, using the 2080s epoch, higher central climate change allowance should be used as the design flood event when assessing suitable flood mitigation measures. We would expect the solar panels and equipment to be raised 300mm above the design flood level.

The assessment of future flood risk should incorporate a Credible Maximum scenario and should also be able to demonstrate how proposals can be adapted over their predicted lifetimes to remain resilient to the credible maximum climate change scenario, as required by NPS EN-1. The Upper End scenario of a 62% climate change increase should be used for this.

The applicant will need to confirm operational needs for the site, i.e., will the site remain operational and will staff remain on site during a flood event. There will also need to be consideration given to access and egress from the site during flood event scenarios.

Further advice relating to specific sections of the flood risk chapter is detailed below.

Section 9.2.10 - Preliminary Baseline Conditions
The scoping report describes how new modelling undertaken for the Environment Agency (EA) of the tidal River Trent by Jacobs in 2023 shows a much-reduced area of the site being affected by Flood Zones 2 and 3. Please note this is not correct. Whilst the defended model outputs from the Jacobs (2023) model show reduced flooding, the undefended model outputs for the 1% (1 in 100) and 0.1% (1 in 1000) annual exceedance probability events are comparable to the existing published Flood Map for Planning in the vicinity of the site boundary. The Flood Map for Planning is designed to represent the residual risk of flooding and therefore does not include the presence of raised flood defences.

It will be important for the site-specific FRA to include a comparison of the published flood zones (Flood Map for Planning) and the equivalent 2023 model outputs (Jacobs 2023) i.e., for flood zone 3, the 1 in 100-year undefended scenario, and for flood zone 2, the 1 in 1000-year undefended scenario. This will confirm the baseline flood risk at the site. Model outputs showing the defended scenarios, including suitable climate change allowances, can then be used in further detailed assessments of the site.

Section 9.4.3 Assessment Methodology
For information, the latest available hydraulic model for the River Trent is the Tidal Trent model (Jacobs, 2023). This model uses recent fluvial and tidal boundary conditions, recent climate change allowances, and recent digital terrain model data captured using Light Detection and Ranging (LiDAR) which are considered representative, although please note that this is a strategic scale hydraulic model with a fairly course 2d grid cell resolution (25m x 25m). For future reference, it is sensible to check that any EA modelling is suitable for your needs and representing site specific flood risk in line with guidance on undertaking modelling for Flood Risk Assessments available online at: Using modelling for flood risk assessments - GOV.UK (www.gov.uk)

We do not hold any detailed hydraulic modelling for the Catchwater Drain or the Mother Drain although within the Tidal Trent hydraulic model (Jacobs, 2023) these watercourses are represented in the model digital terrain model using Tuflow elevation lines (z lines). In terms of historic outlines, the EA hold historical flood extents for 1932, March 1947, 1977, and November 2000 in this location. The East Midlands Area Team may also hold information, such as aerial photography, for more recent events on the River Trent such as Storm Henk (January 2024) which may be of use. The applicant could contact the East Midlands Area Team via EMDenquiries@environment-agency.gov.uk to obtain available modelling data and associated flood risk datasets.

Section 9.5.1 Cumulative Impacts
This project may also be of interest. North Humber to High Marnham - Project information (planninginspectorate.gov.uk).

Further information
It would be sensible to consider the residual risk to the development in the event of a breach of the Trent embankments. This would not be used as a design scenario, but it would help to understand the resilience of the development were a breach in the River Trent embankments to occur. As part of the Tidal Trent modelling (Jacobs, 2023) breach runs were undertaken for the 1 in 100 year and 1 in 100 year plus central (+29%) climate change scenarios. The nearest breaches to the development site are breach 28 West Burton and Breach 29 Cottam. New breach runs may be required considering the location of the existing breaches (28 and 29) in relation to the proposed development site.

Surface Water
We are pleased to see that surface water quality impacts have been scoped in and a Water Framework Directive (WFD) Assessment will be completed.

Groundwater
We note that impacts to groundwater have been scoped out, which we generally agree with as the aquifers underlying the site are not high sensitivity. It is proposed that groundwater impacts will be mitigated through the use of a CEMP. We have the following advice to offer to ensure groundwater is protected.

Table 1.1
It is stated that *"there is no known history of soil contamination on the site"* and soil will be scoped out. An assessment of historical land use and the potential presence of soil contamination is not presented in the Scoping Report, we so we are unable to ascertain how this conclusion has been reached. We would like to see the evidence used to support this claim and conclusion.

Section 9.2
The geological setting is discussed in this section and the description generally matches our records. However, it is stated that *"The western part of the Site has no mapped superficial deposits",* whilst the British Geological Survey (BGS) Geology Viewer shows two small areas of superficial Head deposits in the west of the site.

Paragraph 9.2.13
This paragraph notes that *"There is the limited potential for shallow groundwater to be encountered during groundworks particularly in the eastern part"*. However, historical borehole records from the eastern half of the site, freely available from the BGS, indicate that groundwater at less than 1.5m below ground level is possible. Given the proximity of the River Trent, this is not unexpected.

Paragraph 9.4.3
The baseline assessment list should include private groundwater abstractions.

Section 9.6
The use of Horizontal Directional Drilling (HDD) may be proposed. This work could involve the use of drilling muds and their use may require risk assessment to ensure they do not pose a risk to controlled waters. We would expect this assessment to be included in the CEMP. A drilling fluid breakout plan will also be required for any HDD activities.

Table 19.2
The table notes that *"the Site has always been in agricultural use".* However, the proposed substation connection for the site is within the site boundary of West Burton Power Station. In addition, there are two railway lines that pass through the site area. Therefore, it's possible that historical railway infrastructure, which has a high polluting potential, may be present within the order limits. We may request that a requirement for investigating unsuspected contamination is included on any Development Consent Order (DCO) granted for the site.

Further advice – Battery Energy Storage System (BESS)
A suite of management plans will be submitted with the DCO application. It is not clear whether firewater drainage from the BESS will be considered as part of the management plans. BESS have the potential to pollute the environment. The applicant should consider the impact to all environmental receptors during each phase of development. Particular attention should be applied in advance to the impacts on groundwater and surface water from the escape of firewater/foam and any contaminants that it may contain. Suitable environmental protection measures should be provided including systems for containing and managing water run-off. The applicant should ensure that there are multiple 'layers of protection' to prevent the source-pathway-receptor pollution route occurring.

Water Resources
Impacts on surface water resources due to abstraction during construction have been scoped out. However, there is insufficient reason to support this.

Consumptive uses of water during construction or operational phases of the development have not been identified in the report. These may include on site potable and domestic water, water used for dust suppression; and machinery/wheel wash down. Conversely, the report later states that *"the hydrology, hydrogeology, flood risk and drainage chapter of the ES will consider the likely significant effects of the proposed development during construction, operation and decommissioning on water resources with regard to water usage".*

We recommend that consumptive uses of water are considered in more detail and scoped into the EIA. This is to ensure potential problems can be identified and

solved early in the planning process in order to expedite future permitting applications and incorporate solutions, such as temporary (or permanent) water storage into designs if needed.

Further advice
There is water available for abstraction in the Lower Trent catchment, however a licence issued for the use of any local surface water will be subject to environmental protections which may prevent access to water during low flows. More information about water availability can be found here: Lower Trent and Erewash abstraction licensing strategy - GOV.UK (www.gov.uk). This may mean water is restricted when it is needed most in the summer.

Non-domestic water supply from the water undertaker may also be unavailable, we encourage early dialogue with the applicant if this is to be pursued.

Chapter 18 - Miscellaneous
Waste
We note that a Site Waste Management Plan will be secured via a DCO requirement which will be adhered to before the construction and decommissioning phases.

Yours faithfully

Mr[redacted]
Planning Specialist

Direct dial[redacted]
Direct e-mail[redacted]@environment-agency.gov.uk

creating a better place
for people and wildlife

Environment Agency

Appendix 1 – Environmental Permitting – advice to applicant

The guidance below should be followed to inform which permits may be necessary for this project. Due to the lengthy timescales currently involved in the determination process, we would encourage the applicant to engage with our permitting pre-application advice service at the earliest possible opportunity.

Flood Risk Activity Permit (FRAP)

The Environmental Permitting (England and Wales) Regulations 2016 require a permit or exemption to be obtained for any activities which will take place:

- on or within 8 metres of a main river (16 metres if tidal)
- on or within 8 metres of a flood defence structure or culverted main river (16 metres if tidal)
- on or within 16 metres of a sea defence
- involving quarrying or excavation within 16 metres of any main river, flood defence (including a remote defence) or culvert
- on the floodplain of a main river if the activity could affect flood flow or storage and potential impacts are not controlled by a planning permission

For further guidance please visit https://www.gov.uk/guidance/flood-risk-activities-environmental-permits or contact our National Customer Contact Centre on 03708 506 506 (Monday to Friday, 8am to 6pm) or by emailing enquiries@environmentagency.gov.uk

Water Resources - Abstraction and Impoundment

The proposals may require Water Resource Licences in respect of the construction activities required. Advice on regulated activities and licence requirements is given below.

Water Resource (Impoundment and Abstraction) Licences are issued by the EA under the terms of the Water Resources Act 1991 and the provisions of the Water Resources (Abstraction and Impounding) Regulations 2006. No other EA administered Regulatory Regime provides consent to create or modify an impoundment and / or abstracted water at volumes greater than 20m3/day. You should seek to fully understand the permissions required for your proposal and not assume consent for abstraction and impoundment activity is provided by other regulatory documents.

Abstraction licence requirement

If you intend to abstract more than 20 cubic metres of water per day from a surface water source e.g. a stream or from underground strata (via borehole or well) for any particular purpose, then you will need an abstraction licence from the EA. There is no guarantee that a licence will be granted as this is dependent on available water resources and existing protected rights.

Dewatering is the removal/abstraction of water (predominantly, but not confined to, groundwater) to locally lower water levels near the excavation. This can allow operations to take place, such as mining, quarrying, building, engineering works or other operations, whether underground or on the surface. If dewatering is required it may require an environmental permit if it doesn't meet the exemption in The Water Abstraction and Impounding (Exemptions) Regulations 2017 Section 5: Small scale dewatering in the course of building or engineering works. More information can be found using this link:

https://www.gov.uk/government/publications/temporary-dewatering-from-excavations-to-surface-water

If the exemption can not be met a full abstraction licence will be required. It is important to note that some aquifer units may be closed for new consumptive abstractions in this area. More information can be found via this link:
https://www.gov.uk/government/collections/water-abstraction-licensing-strategies-cams-process

Impounding licence requirement

If you intend to impound a watercourse then you are likely to need an impounding licence from the EA. An impoundment is any dam, weir or other structure that can raise the water level of a water body above its natural level. 'On-line' impoundments hold back water in rivers, stream, wetlands and estuaries, and consequently affect downstream flows, sediment transport and migration of fish. Impoundments could be created through works to modify or change existing watercourses. An Impoundment Licence could also be required if you amend, modify or remove existing in channel structures. More information is available on gov.uk: https://www.gov.uk/guidance/water-management-apply-for-a-water-abstraction-or-impoundment-licence

Discharge of trade effluent

Effluent discharged from any premises carrying on a trade or industry and effluent generated by a commercial enterprise where the effluent is different to that which would arise from domestic activities in a normal home is described as trade effluent. If you are not able to discharge effluent, it will be classed as waste, and you must then comply with your duty of care responsibilities.

If you wish to discharge effluent, after appropriately treating it, to groundwater or surface water a permit under the Environmental Permit Regulations will be required. Full characterisation of the effluent will be required, and modelling may be required at the planning stage to determine the impact of the effluent on the receiving watercourse.

A trade effluent consent or a trade effluent agreement with your water and sewerage company must be obtained before you discharge trade effluent to a public foul sewer or a private sewer that connects to a public foul sewer.

Further guidance is available at: https://www.gov.uk/guidance/pollution-prevention-for-businesses

Discharge of groundwater

You may need to consider discharge of groundwater, following any treatment. More information can be found here: https://www.gov.uk/guidance/discharges-to-surface-water-and-groundwater-environmental-permits

It is worth considering the likely infrastructure required to meet any potential discharge permit requirements to ensure that there is sufficient space within the Order Limits. For example, infrastructure required to treat any contaminated groundwater which may need to be discharged to surface waters. Insufficient space is a common constraint which can result in permit non-compliance, non-permitted discharges or expensive/complex treatment methods.

Water Quality Permit requirements

You do not require a permit if you are only discharging uncontaminated surface runoff. If you intend to discharge to surface water for dewatering purposes, this may be covered by a Regulatory Position Statement (RPS) for water discharge activities. If you can comply with all the conditions within the RPS, then a permit is not required for this activity. Please find the RPS conditions here: https://www.gov.uk/government/publications/temporary-dewatering-from-excavations-to-surface-water

If any discharges do not fully comply with the RPS, then a bespoke discharge permit will be required. Please find guidance on applying for a bespoke water discharge permit here: https://www.gov.uk/guidance/discharges-to-surface-water-and-groundwater-environmental-permits

creating a better place
for people and wildlife

Environment Agency

Appendix 2 – Environmental betterment opportunities - advice to applicant

The 'Lower Trent and Erewash (LTE) Habitat Creation Opportunities' outlines habitat creation opportunities across the catchment which you could support.

Nottinghamshire County Council have been appointed the Responsible Authority to develop the Local Nature Recovery Strategy (LNRS). A Local Habitat Map has been produced as a component of the LNRS. We advise that you refer to these maps to inform decisions on where to site off-site BNG delivery and potential enhancements.

Alison Cadge

[redacted]

Subject: RE: EN010163 - Steeple Renewables Project - EA Scoping Response 6 August 2024

Follow Up Flag: Follow up
Flag Status: Flagged

Good afternoon, [redacted]

Sorry for the slight delay, we have been dealing with flood incidents and attending DCO hearings.

Please find our comments below.

Ecology / biodiversity
I had a phone conversation with [redacted] last week to discuss the EA's remit with regards to ecology and biodiversity.

It is positive to read that you are considering enhancing the ditch network across the site towards achieving Biodiversity Net Gain. We note that the measures outlined in Figures 2 and 3 would likely improve habitat quality and diversity. However, ordinary watercourses (the ditch network) and their enhancement is within the remit of the Lead Local Flood Authority, the Local Planning Authority (their ecologists), and possibly Natural England.

The EA lead on water dependant species and habitats associated with main rivers. We are also the lead for the Water Framework Directive.

The enhancement works proposed in the Eastern Mitigation Area are within the floodplain but do not cause us concerns regarding increased fluvial flood risk. A Flood Risk Activity Permit (FRAP) may be required depending on the distance from the main river. From the information you have provided below we have no further comments to make.

Fish survey requirement
We agree that potential impacts on fish should be scoped in, but the need for fish surveys is scoped out.

We wish to be consulted on the Outline Construction Environmental Management Plan (oCEMP), and for the CEMP requirement wording to include ***'submitted to and approved by the Local Planning Authority, in consultation with the Environment Agency'.*** This will ensure that we can review mitigation proposals/species protection plans and provide advice.

It's positive to read that clear span bridges are proposed instead of new culverts.

Flood Risk
Please can the EA confirm that the 1 in 100 year plus 23% climate change flood event (represented conservatively by the 1 in 100 year plus 29% climate change flood outputs from their flood model) can be considered as the design flood event?

We are satisfied that this can be used as the design flood event. The 29% figure represents the Central climate change allowance in the 2080's epoch. As stated, this is greater than the 23% Higher Central allowance in the 2050's epoch and is therefore a suitable proxy.

We acknowledge that operation of the site is proposed for a 40 year period, which will conclude in 2069. Therefore, the design flood event can be based on the 2050's epoch. We will however seek an appropriate DCO requirement stating that operation cannot extend beyond this period.

The development lifetime does not wholly fall within the 2050's epoch. Operation is proposed to cease no later than 2069, however decommissioning of the site will extend beyond this timeframe, and into the 2080's climate change epoch (2070-2125). Therefore, suitable reference and assessment of the Higher Central climate change allowance in the 2080's epoch should be included within the FRA. This does not need to form a design flood event, rather a sensitivity test which would identify residual impacts at the site during decommissioning which will need to be mitigated.

Please can the EA confirm that the Credible Maximum climate change scenario does not need to be considered for the Proposed Development?
We acknowledge that there are to be no safety critical elements to the development and that the site will not connect to the National Grid. Further, the site could be remotely shut down during a flood event beyond the design flood scenario, if required.

We also note that the proposed development layout will include no operational elements within the 100 year plus 29% climate change outline, and that all infrastructure will be raised to a minimum 300mm above that flood level. We therefore accept that, in line with guidance set out in National Policy Statement EN-1, a Credible Maximum scenario is not required to be assessed.

Please can the EA confirm that the breach flood extent shown in Figure 2 is appropriate as the basis for the breach assessment within the FRA and that no further breach modelling is required?
The breach extent shown in the map in figure 2 of letter 680819-R3(0) dated 18th November relates to breach 23 from the Tidal Trent (Jacobs, 2023) hydraulic model. This breach is further north in Gainsborough and hence does not present the greatest risk to the order limits for the development. We apologise for this as it appears that the breach extents which are most relevant to the order limits for the development have not been provided to you.

A review of the breach model data suggests that breaches 28, 29 and 34 present the greatest residual risk to the development area. Please find the link below to maps which show the location of these breaches along with the modelled flood extent for the 1% (1 in 100) annual exceedance probability (AEP) flow plus 29% climate change. It appears that breach 29 results in the largest flood extent within the order limits for the development. The extent and water levels from this scenario should be considered with regards to residual risk to the development area. Water level and depth data for these breaches are available on request from the East Midlands Area office. These can be requested via emdenquiries@environment-agency.gov.uk

[redacted]

NATIONAL INFRASTRUCTURE TEAM

Helping to deliver sustainable growth

From 1 April 2024 the Environment Agency will be implementing new legislative powers to recover its costs for all stages of the Nationally Significant Infrastructure Project (NSIP) consenting regime. Please contact us for details for what this means for your existing or proposed NSIP.

[redacted]

Subject: RE: EN010163 - Steeple Renewables Project - EA Scoping Response 6 August 2024

Hi [redacted],

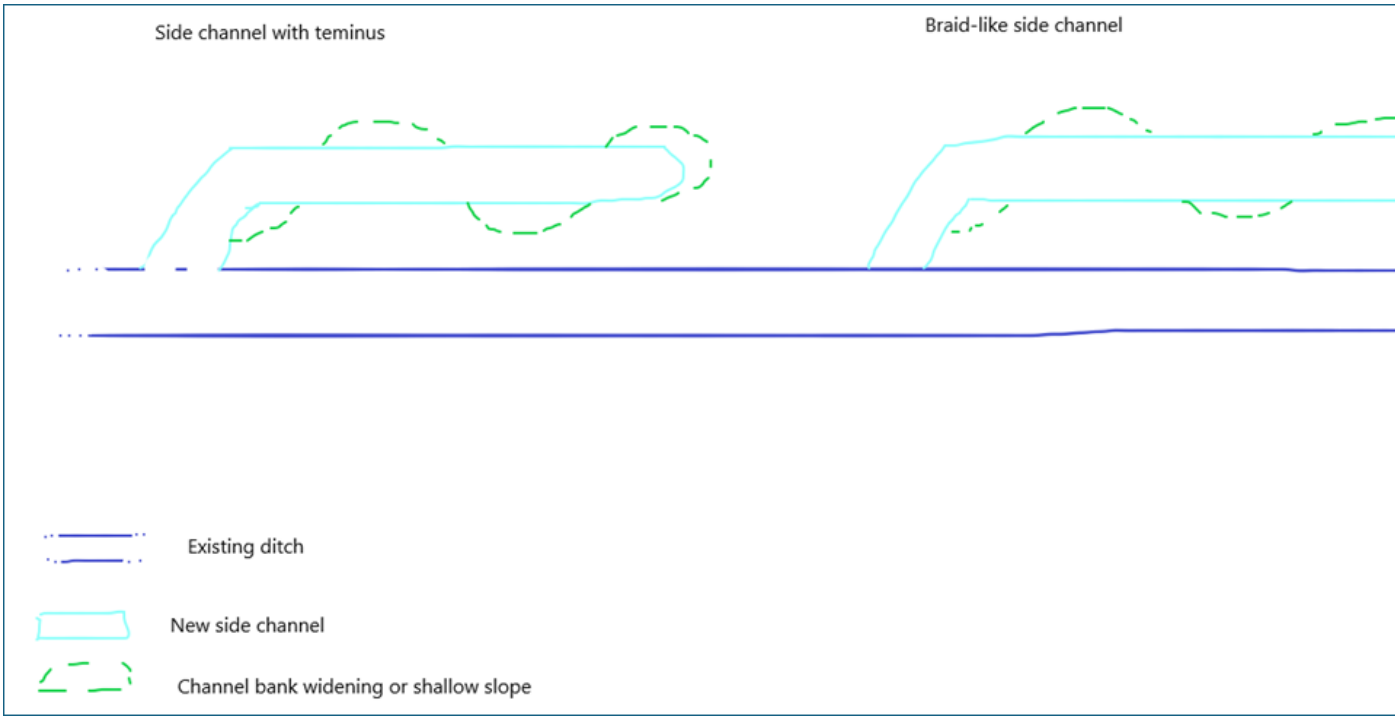
I hope you're well? Many thanks for providing the Scoping Response for the above project. We've reviewed this in detail and have compiled some responses specifically relating to the ecology / biodiversity and flood risk requirements as below / attached.

Ecology / biodiversity

We have compiled the following drawings and would appreciate if you could please provide any comments:

1. Figure 1 (attached) - Details of proposed ditch enhancements/management for biodiversity gain. We have identified an excess of ditches for enhancements to allow possible contingency in which ditches are treated but also to mitigate uncertainty whether the proposed measures will successfully result in a measurable enhancement (as measured by the Biodiversity metric criteria). We are also considering the possibility of adding side channels to create offline features that have physical structure/profiles that maximise biodiversity. Please see the sketch provided below – do you have any comments regarding this proposal?
2. Figure 2 (attached) - Possible ecological enhancements that could be made to the Eastern Biodiversity Mitigation Area (the coastal floodplain grazing marsh priority habitat) – as general ecological enhancements.

Sketch of possible offline ditch channels optimised for biodiversity (flow is left to right)



Fish survey requirement - response

In the EA scoping response dated 6 August 2024 (EA reference XA/2024/100119/01-L01), the EA commented on Chapter 8 of the Scoping report: *"It is recommended that fish surveys are conducted on ditches/drains across the site. The results should then form part of the baseline data for the EIA"*.

We continue to propose that fish surveys are not necessary to inform the EcIA, as no significant impact on fish is likely to arise with reasonable mitigation measures in place. All watercourses will be retained with habitat avoidance zones (minimum 5m avoidance to ditches and 10m avoidance of rivers and large land drains). Where watercourse crossings are required, these will be clear-span bridges (no new culverts). The EcIA will assume that European eel is present for the purpose of assessing risks and mitigation relating to potential barriers to movement, run-off, or electromagnetic fields. Details of the avoidance zones and mitigation measures will be specified in a CEMP that will include species protection plans. Surface runoff of pollutants and fine sediment will be controlled during the construction phase via standard measures such as sediment trapping, appropriate storage of materials, and control of plant-refuelling. No sediment or pollution inputs will be created during operation – it is anticipated that the operational stage of the development (permanent grassland) will have significantly lower sediment and pollution risk compared to the baseline environment (of agricultural use).

Noise from construction activities will be assessed and mitigated as appropriate taking into account distance from watercourses and duration of activities, and measures such as timing will be considered to ensure that significant behavioural impacts on fish do not arise. As suggested by the EA, potential impacts on fish are scoped in; but the need for survey is scoped out. This is consistent with the approach adopted for the Gate Burton, West Burton and Cottam Solar projects which all concluded that detailed freshwater fish surveys would not be proportionate.

Mitigation details will be included within the Construction Environmental Management Plan. It is considered that the avoidance zones, combined with standard practice measures to be included in the CEMP (regarding controls of silt run-off and habitat avoidance/protection), are sufficient to prevent significant impacts on fish.

Flood Risk

We have prepared the attached note (ref. 680819-R3(0)) which explains our proposed approach to the assessment of flood risk. Please could you review and provide any comments?

We would be very happy to discuss any of the above / attached and would welcome a call to talk through our proposals if you think that would be useful.

If you require any additional information or clarification on the information submitted please don't hesitate to contact me,

Kind regards,

[redacted]

Subject: EN010163 - Steeple Renewables Project - EA Scoping Response 6 August 2024

Good afternoon,

Please find our Scoping Response attached.

Best wishes,

[redacted]

NATIONAL INFRASTRUCTURE TEAM

Helping to deliver sustainable growth

From 1 April 2024 the Environment Agency will be implementing new legislative powers to recover its costs for all stages of the Nationally Significant Infrastructure Project (NSIP) consenting regime. Please contact us for details for what this means for your existing or proposed NSIP.

Information in this message may be confidential and may be legally privileged. If you have received this message by mistake, please notify the sender immediately, delete it and do not copy it to anyone else. We have checked this email and its attachments for viruses. But you should still check any attachment before opening it. We may have to make this message and any reply to it public if asked to under the Freedom of Information Act, Data Protection Act or for litigation. Email messages and attachments sent to or from any Environment Agency address may also be accessed by someone other than the sender or recipient, for business purposes.

creating a better place
for people and wildlife

Environment Agency

[info@steeplerenewablesproject.co.uk]

Our ref: XA/2025/100258/01-L01
Your ref: EN010163

Date: 10 March 2025

Dear Project Team

SECTION 42 CONSULTATION – PRELIMINARY ENVIRONMENTAL INFORMATION REPORT. STEEPLE RENEWBLES PROJECT. NEAR THE DECOMMISSIONED WEST BURTON POWER STATION, NOTTINGHAMSHIRE.

Thank you for consulting us on the Preliminary Environmental Information Report (PEIR) for the Steeple Renewables Project.

Further information is required for the Environment Agency (EA) to provide a definitive response to relevant environmental impacts. This is important so we can provide the best possible advice to the Planning Inspectorate. It is strongly recommended that any further reports, statements or surveys that require our review and/or agreement are submitted as soon as possible to resolve any issues before the Development Consent Order (DCO) is submitted.

We look forward to continuing to work with you as the detailed proposals continue to develop, and to reviewing and providing advice on relevant supporting documents as these are generated. If you have any questions about any of our advice, please contact us.

Our headline comments are listed below – more detailed advice on key issues is listed in the various appendices to this letter.

Topic	Headline Comments
Ecology and biodiversity	Ecological impacts have not been appropriately assessed. The scope of assessments needs to be expanded. Additional consideration must be given regarding impacts on ecological receptors.
Flood risk	It is not currently possible to fully review and assess the risk of flooding to and from the proposed development as the relevant information is yet to be submitted.
Groundwater and contaminated land	Not all potential risks have been identified and assessed. The scope of assessments needs to be expanded. Further information is needed to support

	the scoping out of this topic.
Water resources	The water demand for the project is unclear. A water resources strategy needs to be supplied

Any requests to disapply any permits or consents should be sent to us in writing as soon as possible, to allow us sufficient time for their consideration (minimum 6 months).

Please note this response does not represent our final view in relation to any future DCO, or any environmental permit applications made to us. Our final views will be based on all relevant information including applications and guidance available at the time of submission.

Our advice has been provided under our chargeable service agreement: ENVPAC/1/NIT/00049.

Appendix A – Reviewed Documents

Appendix B: Ecology and Biodiversity

Appendix C: Flood Risk Assessment and Modelling

Appendix D – Groundwater and Contaminated Land

Appendix E – Water Resources

Appendix F – Informative Comments

Yours faithfully

[redacted]

Planning Specialist
National Infrastructure Team

E-mail: NITeam@environment-agency.gov.uk

Appendix A – Reviewed Documents

Document Name	Date
Preliminary Environmental Information Report Volume 1, Chapter 2: Environmental Impact Assessment Methodology	January 2025
Preliminary Environmental Information Report Volume 1, Chapter 4: The Proposed Development	January 2025
Preliminary Environmental Information Report Volume 1, Chapter 7: Ecology and Biodiversity	January 2025
Preliminary Environmental Information Report Volume 1, Chapter 8: Hydrology, Hydrogeology, Flood Risk and Drainage	January 2025
Preliminary Environmental Information Report Volume 1, Chapter 17: Miscellaneous Issues	January 2025
Appendix 2.2: Phase 1 Geoenvironmental Desk Study	December 2024
Appendix 7.12: Preliminary Biodiversity Gain Report	DRAFT

Appendix B: Ecology and Biodiversity

B1

Document Reference(s): PEIR, Chapter 7.6, Table 7.1	
Issue	Surveys have not included relevant protected species such as water voles and otters.
Impact	Inadequate surveys undermine mitigation and environmental enhancements on site.
Solution	Include the Biodiversity Mitigation Areas (Eastern and Western) in surveys for otter and water vole. Survey results will also give a wider picture of the population in the area to help with providing mitigation for these species.

B2

Document Reference(s): PEIR, Chapter 7, Section 7.6.24	
Issue	Not all relevant protected species have been included in assessments. River lamprey and sea lamprey have not been noted as forming part of the designation of the Humber Estuary Special Area of Conservation (SAC).
Impact	Protected species may be harmed due to lack of assessment and appropriate mitigation being put in place. The River Trent (and associated tributaries) is functionally linked to this SAC in terms of habitat for both lamprey species. The impacts on these species and the conservation objectives of the SAC have not been considered.
Solution	Include river lamprey and sea lamprey in the Environmental Impact Assessment (EIA) and ensure that mitigation is in place to protect them where impact pathways are identified.

B3

Document Reference(s): PEIR, Chapter 7; paragraph 7.8.173

Issue	There is insufficient mitigation information in order to protect fish during construction and decommissioning.
Impact	Certain construction activities in relation to watercourse crossings, such as open cut trenching, may have a negative impact on notable fish populations
Solution	Robust mitigation measures to control pollution and fine sediment runoff into waterbodies need to be included in the CEMP.
Additional narrative/ explanation Where open trench crossings are proposed, it is assumed that waterbodies will be flumed, or coffer dammed and thus require over-pumping. It may be necessary for a fish rescue and relocation to take place and for key spawning and migration periods to be avoided. Any over-pumping should ensure that screens are fitted on inlets and outlets of pumps and that they are compliant with the Eels (England and Wales) Regulations 2009.	

B4

Document Reference(s): PEIR, Chapter 7, Sections 7.8.192 & 7.8.193	
Issue	INNS have not been appropriately considered in proposals. This section mentions that no works are intended to take place in the water and the spread of Canadian pondweed is therefore highly unlikely to take place.
Impact	Any new watercourse crossings are likely to require access to the water environment.
Solution	Provide an INNS Management Plan for all INNS species present. Please also consider the INNS species at risk of being introduced.
Additional narrative/ explanation Eradication of INNS will help to achieve Watercourse Metric units. Please include American mink, especially with the water vole population on site.	

B5

Document Reference(s): PEIR, Appendix 7.12: Preliminary Biodiversity Gain Report, Section 4.22	
Issue	New open span bridges are proposed
Impact	These proposed watercourse crossing would be extra encroachment which would impact the unit score
Solution	Consider this extra encroachment. Provide the River Condition Assessment results and Watercourse Metric report to the EA to review.

Informative Comment

Document Reference(s): PEIR, Appendix 7.12 Preliminary Biodiversity Gain Report, Sections 4.25 – 4.28 – [assessment of watercourse Biodiversity Net Gain (BNG) options]	
Advice	The watercourse Metric is an opportunity to deliver watercourse enhancements. BNG should be aligned with River Basin Management Plans, Local Nature Recovery Strategies (LNRSs), Water Framework Directive (WFD) objectives/mitigation measures, and Catchment Plans. Please consider using the Technical Guidance – BSI Standards Publication BS 8683:2021 – Process for designing and implementing Biodiversity Net Gain – Specification.

Appendix C: Flood Risk Assessment and Modelling

C1

Document Reference(s): PEIR, Chapter 8, Section 8.1.4	
Issue	No Flood Risk Assessment (FRA) has been submitted for review in support of the PEIR.
Impact	It is not possible to fully review and assess the risk of flooding to and from the proposed development. We are unable to comment on the conclusions made within the PEIR.
Solution	Following the comments we provided on the submitted Scoping Opinion an FRA and relevant supporting documents should be prepared and submitted for review. It should fully consider flood risk impacts both to and resulting from the proposed development.
Additional narrative/ explanation It is noted that the Environmental Statement (ES) will be supported by an FRA and separate Sequential Test assessment.	

C2

Document Reference(s): PEIR, Chapter 8, Section 8.3.6	
Issue	It is not possible to confirm whether a '*high-level assessment of any displacement of floodwater resulting from development*' will be suitable as additional detail has not been provided.
Impact	Flood risk impacts to third parties could be inaccurate or underestimated if appropriate analytical techniques are not undertaken.
Solution	Within the FRA, please provide a quantification of any impacts on flood risk to third parties and appropriate mitigation where increases in flood risk due to loss of floodplain storage is identified. Key locations where loss of floodplain storage could be apparent (depending on final locations) include the Battery Energy Storage System (BESS) and substation areas. In terms of the solar panel support stands their impact on flood risk to third parties should be quantified where these are placed in areas of fluvial flood risk. Typically, this can be achieved by either testing their

	impact using hydraulic modelling or alternatively assessing the volume of storage lost up to the design flood level.

C3

Document Reference(s): PEIR, Chapter 8, Section 8.4.1	
Issue	Further modelling and investigation may be required for ordinary watercourses which bisect the site. This section notes that the EA confirmed that their modelling represents the best available data and is appropriate to support the assessment of flood risk. This is reasonable although for clarity this was only in reference to the Tidal Trent hydraulic modelling (Jacobs, 2023)
Impact	Some of the flood modelling in this area outside of the Tidal Trent is based on strategic scale hydraulic modelling and could be inaccurate if used for site specific assessment without checking its suitability.
Solution	For clarity the EA are happy that the Tidal Trent (Jacobs, 2023) hydraulic modelling is a good starting point for the assessment of risk from the River Trent in this area. Other modelling and investigation may be required for some of the smaller ordinary watercourses which bisect the site where no detailed hydraulic modelling is available, for example the Catchwater Drain which runs adjacent to the BESS and substation. It is also noted that several of the solar panel areas fall within areas of potential fluvial flood risk associated with ordinary watercourses. The Risk of Flooding from Surface Water (RoFSW) mapping provides an initial indication of this. If the RoFSW is being used to inform fluvial flood risk and the design flood level for any solar panel modules, supporting evidence should be provided within the FRA showing that this is suitable or hydraulic modelling undertaken.

C4

Document Reference(s): PEIR, Chapter 8, Section 8.6.14	
Issue	The RoFSW dataset has recently been updated. Further information is available online at: Updates to national flood and coastal erosion risk information - GOV.UK

Impact	The assessment of flood risk could be inaccurate due to the publication of the updated RoFSW dataset in January 2025.
Solution	Please refer to the updated RoFSW dataset when considering surface water flood risk as part of the Flood Risk Assessment. The updated RoFSW dataset can be downloaded from the Defra Data Services Platform: Defra data services platform.

C5

Document Reference(s): PEIR, Chapter 8, Section 8.7.11	
Issue	New watercourse crossings are proposed.
Impact	It is not clear whether these crossings will be temporary (during construction and decommissioning phases only and removed for the operational phase) or permanent.
Solution	Culverting of watercourses must be avoided. Open span structures such as bridges should be designed so that the soffit level sits above the design flood level. The design flood level for permanent crossings in this case would be the 1% (1 in 100) annual exceedance probability (AEP) plus higher central climate change scenario. For temporary crossings as part of the construction phase of the scheme the present day (without climate change) 1% (1 in 100) AEP scenario can be used.

C6

Document Reference(s): PEIR, Chapter 8, Sections 8.7.27 and 8.7.28	
Issue	The location of the BESS and substation area as shown in figure 2.2 *Operational Phase Parameter Plan* is crossed by both Flood Zone 2 and Flood Zone 3 and is bounded by the Catchwater Drain and smaller drains.
Impact	Flood risk to the BESS and substation could be underestimated. Flood risk impacts from the BESS and substation could be underestimated. The impact to the development and from development with regards to fluvial flood risk could be inaccurate or underestimated if further assessment is not undertaken as there is currently an evidence gap regarding fluvial flood risk for some of the smaller ordinary watercourses which cross the site.

Solution	Careful consideration should be given to the placement of sensitive infrastructure such as the BESS and substation within the FRA. Based on the current location of the BESS and substation as shown in Figure 2.2 it is recommended that detailed hydraulic modelling is undertaken for the Catchwater Drain and associated tributaries which border the BESS site to determine the risk from these watercourses.

C7

Document Reference(s): PEIR, Chapter 8, Section 8.7.29	
Issue	In the absence of the FRA it is not clearly established where flood mitigation will be required and to what extent the site is at risk under the design flood event. The PEIR proposes the mitigation solution for the site without the background assessment to describe the extent of the impact of flood risk to and from the development.
Impact	As the FRA has not been submitted for review it is not possible to determine whether proposed mitigation within the PEIR is suitable and appropriate.
Solution	The relevant assessments should be submitted for review. Please refer to the comments above regarding the designed flood level for further details.

Appendix D – Groundwater and Contaminated Land

We note that impacts to groundwater have been scoped out. However, the below advice needs to be considered and further assessment provided within the Environmental Statement to justify the scoping out of this topic.

D1

Document Reference(s): PEIR Chapter 2, Section 2.2.6, Table 2.2 *and* Appendix 2.2	
Issue	Not all sources of contamination have been assessed. The Conceptual Site Model (CSM) is not sufficient.
Impact	If the CSM is not sufficient, then any further investigations which use the CSM as a guide are unlikely to be sufficient. This may mean that land and groundwater contamination is not identified. This could lead to risks to future site users and controlled waters. There is an additional likelihood of encountering previously unknown and unexpected contamination during construction works. This can lead to significant delays and additional cost. Based on the information supplied to date, the risk of soil and groundwater contamination cannot be ruled out.
Solution	The following sources of contamination cannot be ruled out without further assessment and should be included in the CSM: • Farming activities • Two railway lines crossing the site, at least one of which has been present since before 1885 • A former coal fired power station within the site boundary (11ha) • Pulverised fuel ash landfill site less than 500m from the northeast of the DCO application boundary • Potential contaminants of concern listed in Section 4.2 of the desk study (these are not mentioned or modelled in the CSM). Desk study to be reviewed and updated as necessary. Full appendices and conclusions from the updated desk study to be supplied.
Additional narrative/ explanation PEIR Section 8.11.2 Table 8.6 in the row for construction risks mitigation for hydrogeology, it states: "*The findings of the Phase 1 Geoenvironmental Desk Study will be taken into account to ensure any historical contamination is not mobilised*".	

The implication of this phrasing is that the presence of historical contamination has not been ruled out. The desk study report supplied does not include appendices B or C, comprising historical maps and Groundsure reports. Without these, we have not been able to verify the data used for some of the information supplied in Section 3.0 of the main report. We request sight of these appendices. Chemical testing of soils should include samples from across the site, including areas not considered likely to be affected by contamination. This is useful to develop a baseline of natural conditions. Relevant British Standards and other industry best practice guidance should be followed when designing and conducting the site investigation works.

D2

Document Reference(s): PEIR Chapter 4, Section 4.6.7	
Issue	If cables to be left in situ are not cut and sealed adequately, they could be a risk to controlled waters.
Impact	Cables and cable ducting can deteriorate over time, especially if left unmonitored in the subsurface. Some cable housing contains PFAS. Therefore, there is a pollution risk to controlled waters.
Solution	An assessment needs to be carried out to assess the risks posed by residual underground cable infrastructure post-decommissioning, and to identify any mitigation measures to reduce the potential for impact to occur. Site-specific conditions should be assessed. Allowance should be made for removal of all cables and infrastructure in the Decommissioning and Environmental Management Plan (DEMP) and other decommissioning designs, in case this is the preferred solution at the time. The detailed DEMP should be reviewed and updated prior to decommissioning.
Additional narrative/ explanation At the time of decommissioning, approved best practice might be to remove all cables. There may be local variations, such as chemical composition of soil or groundwater, which mean removal of all cables is the more environmentally appropriate option.	

D3

Document Reference(s): PEIR Chapter 8, sections 8.3.7 and 8.5.1	
Issue	Firewater runoff may pose a risk to groundwater, as well as to surface water.
Impact	Failure to consider groundwater in any drainage design may lead to unacceptable risks. For example, diverting contaminated water from surface watercourses may result in infiltration to groundwater.
Solution	Ensure that risks to groundwater are considered in any water management plans. Groundwater needs to be considered within the Surface Water Drainage Strategy.
Additional narrative/ explanation In Appendix 2.2, it suggests "*shallow mudstone bedrock is unlikely to be suitable for soakaway drainage systems … within the BESS*". The desk study recommendations include soil infiltration testing. Therefore, allowance for SuDS which do not rely on soakaway drainage should be made.	

D4

Document Reference(s): PEIR Chapter 8, Section 8.3.12	
Issue	The reference made to guidance and best practice to support assessments does not include some guidance which may be beneficial.
Impact	Using all available guidance will enable the applicant to make a more thorough assessment of the site and the risks. Failure to do so may mean some matters are overlooked or not given appropriate consideration.
Solution	Review the following: EA Land contamination risk management (LCRM) • https://www.gov.uk/government/publications/land-contamination-risk-management-lcrm LCRM guidance provides a good baseline for characterising any site. The Environment Agency's approach to groundwater protection • https://www.gov.uk/government/publications/groundwater-protection-position-statements

	This explains how the EA carries out government policy for groundwater and adopts a risk-based approach where legislation allows. DoE Industry Profiles: Power stations excluding nuclear power stations • https://claire.co.uk/useful-government-legislation-and-guidance-by-country/198-doe-industry-profiles This was withdrawn in 2014 but may still contain relevant information, given the presence of a former coal-fired power station within the DCO site boundary. Consider if any changes need to be made to the assessments produced so far. Include these as a revision within the ES and subsequent documents. Where changes are made, either in existing documents or changes to proposed scope for future documents, it is highly beneficial for a summary of changes to be supplied alongside the document.
Additional narrative/ explanation We are pleased to note that LCRM is referenced in Appendix 2.2. In The Environment Agency's approach to groundwater protection, we would like to draw awareness to note C5. The Environment Agency will normally object to fluid filled cables that transport pollutants, particularly hazardous substances that are below the water table in secondary aquifers. Given the potential for shallow groundwater on the site, if fluid-filled cables are proposed then the risks must be assessed.	

D5

Document Reference(s): PEIR Chapter 8, Section 8.6.20	
Issue	WFD has not been appropriately assessed. This section states: "*No local groundwater bodies have a classification under the WFD*". This is incorrect. There are two WFD Groundwater bodies underlying the site. Another body is <500m from the eastern extent. All three have "Good" status (quantitative and chemical).
Impact	Failure to identify WFD Groundwater bodies undermines the assessment process.

	If the bodies are not identified and screened, potential risks will not be adequately assessed. Other parties may use this report for information about the site, and this error would propagate further.
Solution	We expect these to be considered in the WFD report (referred to in 8.15, 8.7.4, 8.7.15, and elsewhere).
Additional narrative/ explanation Information about WFD Groundwater bodies in the Humber GW Management Catchment is available on the Environment Agency's Catchment Data Explorer: https://environment.data.gov.uk/catchment-planning/ManagementCatchment/1006	

D6

Document Reference(s): PEIR Chapter 8, sections 8.6.24 Table 8.5, 8.7.8, 8.7.23, 8.7.24, 8.11.2 Table 8.6 and possibly elsewhere	
Issue	The significance of risk to this sensitive receptor is not reported correctly. Sensitivity for secondary aquifers in Table 8.1 is defined as "Medium". Throughout Chapter 8, this sensitivity is not used, and a "Low" sensitivity is assigned to these receptors instead. An absence of nearby groundwater abstractions and uses does not mean the applicant can disregard aquifers, which are receptors in their own right. Shallow groundwater is expected and should be protected. As defined in Table 8.3, Medium sensitivity and Low magnitude are "Minor" significance. The applicant has assigned a "Negligible" significant, based on the incorrect use of Low sensitivity.
Impact	Groundwater has incorrectly been screened out of further assessment. This could lead to insufficient mitigation to protect controlled waters, potentially leading to unacceptable harm to this the water environment.
Solution	Review the assessment, Significant and Residual Effects using the correct sensitivity classification.
Additional narrative/ explanation	

Note that we are satisfied with the sensitivity, magnitude and significance criteria defined in tables 8.1 to 8.3. We expect these to be used when the existing assessment is revised.

D7

Document Reference(s): PEIR Chapter 8, section 8.7.2 and 8.7.7 to 8.7.9	
Issue	HDD is proposed during construction of the scheme and is mentioned in the context of hydrology, but it also needs to be mentioned in terms of hydrogeology.
Impact	Drilling fluid breakout can pose a risk to soil and groundwater.
Solution	Ensure that risks to soil and groundwater are considered in the drilling fluid breakout plan, to be included with the Construction Environmental Management Plan (CEMP).

D8

Document Reference(s): PEIR Chapter 8, sections 8.6.9 and 8.7.23, and Appendix 2.2	
Issue	There is no discussion of anticipated groundwater flow within the superficial and bedrock aquifers, and potential connectivity between groundwater and surface water bodies. In Section 8.7.23, a strong reliance is placed on historical borehole records for anticipated groundwater depth. The study of borehole records summarised as 8.6.9 is limited and does not mention conditions in all available borehole records. It is unclear if all available records within the vicinity of the site were reviewed. Some of these logs are over 40 years old; the quality of information is highly variable and cannot be relied upon. The Executive Summary in Appendix 2.2 mentions a high water-table present in the eastern area of the site. In Appendix 2.2, Section 3.3 there is reference to “numerous springs and well” on historical Ordnance Survey maps in the west.

Impact	A sufficient understanding of the hydrogeological setting of the site has not been demonstrated. Therefore, all potentially significant risks posed by the development may not have been adequately identified. Logs should not be relied on for an assessment of current groundwater conditions. The potential for shallow groundwater cannot be ruled out anywhere on the site. This may affect construction works and operation of the scheme. Allowance must be made for construction phase dewatering.
Solution	An independent targeted investigation and monitoring programme to determine groundwater conditions and flow over time is required. This investigation should utilise a greater sampling frequency than the sparse historical records available. Given that shallow groundwater is recorded on some of the site, its presence across the whole development area cannot be ruled out.
Additional narrative/ explanation Dewatering may require a permit or formal exemption issued by the Environment Agency. The timescales for obtaining these can be several months, and we recommend very early liaison with the EA National Permitting Service.	

D9

Document Reference(s): PEIR Chapter 8, sections 8.7.23 to 8.7.26, and Section 8.11.2, Table 8.6	
Issue	Sections 8.7.23 to 8.7.26: a potential risk to groundwater from firewater and other contaminated runoff (for example, from the BESS) is not acknowledged. Shallow groundwater is possible, and the site is underlain by secondary aquifers (medium sensitivity). Section 8.11.2, Table 8.6: water quality impacts for groundwater are not given as a potential effect during Operation. We consider there are risks, such as from firewater and contaminated runoff.
Impact	Failure to identify a potential risk or effect may mean that insufficient mitigation is put in place to protect the sensitive receptors.
Solution	A potential risk to groundwater from firewater must be considered, and mitigation be put in place. Refer to 8.7.13, where a risk to surface water is discussed.

	A proposed Battery Safety Management Plan is discussed in operations-phase mitigation for risks to hydrology (Table 8.6). We consider it should also be mentioned with respect to hydrogeology.
Additional narrative/ explanation Table 8.6 has no discussion on Decommissioning effects. These are discussed elsewhere; however, we feel it would be appropriate them to be included within this table. “Minor adverse significance of effect” is possible during decommissioning (Section 8.7.33), so we would expect these effects to be discussed. We suggest that the table be updated to include decommissioning effects.	

D10

Document Reference(s): PEIR Chapter 8, Section 8.8.1	
Issue	The mitigation measures outlined in the CEMP, Operational Environmental Management Plan (OEMP) and Decommissioning Environmental Management Plan (DEMP do not include a procedure for actions to take if unexpected contamination is identified on site. There is also no mention of a procedure in case of a new pollution event occurring.
Impact	If contamination is encountered, and no procedure is in place, it may not be managed appropriately. This could lead to unacceptable risks to human health and the natural environment including controlled waters.
Solution	Include a procedure for managing suspected and unexpected contamination identified during construction, operation, and decommissioning as applicable. This is likely to be secured by a Requirement. Include a process for managing a pollution event that occurs during construction, operation, or decommissioning as applicable.
Additional narrative/ explanation (if necessary) We recommend that actions to take in the event of identifying suspected contamination should include as a minimum: • ceasing all works within the bounds of the affected area and employing an appropriately qualified specialist to undertake further investigation.	

- results of the investigation and any proposed remediation will need to be agreed with the local authority and Environment Agency prior to commencing remediation.
- remediation must be signed off by the local authority and EA prior to construction works recommencing.

The CEMP, OEMP and DEMP should also have a specification for storage and handling of fuels, oils, and other similar materials. This should include refuelling and management of spillages and leakages. Various standard industry guidance is available, and we expect this to be referred to.

D11

Document Reference(s): PEIR Chapter 17 (and whole report)	
Issue	Heat is a groundwater pollutant, mentioned in the Environmental Permitting Regulations via amendments in 2023. The potential for heating of surface and groundwater due to the development, such as thermal transmission from cables, is not mentioned in the PEIR.
Impact	Underground cables, such as the High Voltage (HV) grid connection cables, generate heat that dissipates naturally to the surrounding ground during power transmission. The levels of heat loss and dissipation will be dependent on numerous factors including cable design, soil structure, transmission voltage and engineering design. Where underground cables interact with groundwater bodies this could result in local degradation of groundwater quality via the generation of a heat plume.
Solution	This potential impact should be considered. This should be assessed further when the ground conditions and the thermal characteristics of the cables to be installed are better understood. An informative about thermal emissions from buried cables is provided below.

Additional narrative/ explanation (if necessary)

Heat as a groundwater pollutant was introduced in 2023 via the Environmental Permitting (England and Wales) (Amendment) (England) Regulations 2023 SI No.2023/651:

““pollutant”, in relation to England, means any—

a. *substance,*

b. *heat, or*

c. *biological entity or micro-organism,*

which is liable to cause pollution;"

We are mindful that work is being carried out in this area in relation to heating of groundwater from ground source heating and cooling systems but there is currently no guidance relating to the potential thermal implications of high voltage buried electricity cables. The Environment Agency's Chief Scientist's Group has published a report for Ground Source Heating and Cooling (GSHC) systems (Environmental Impacts of Temperature Changes from Ground Source Heating and Cooling Systems). In this study, a 'thermal plume' was defined as the region around a GSHC system that experiences a 1 degree C temperature change or greater. While the study is not directly applicable to thermal emission from underground cables, an equivalent benchmark could be considered when assessing heat pollution from underground HV cables.

The Chief Scientist's Group states that the environmental factors with the greatest influence on thermal plume development include groundwater flow and bulk thermal conductivity. It identifies that impacts may occur by direct (temperature change) and indirect (e.g. changes in water chemistry) means.

At this stage we require the potential thermal implications of buried cables, in relation to risks to groundwater, to be considered further via desk-based assessment.

D12

Document Reference(s): PEIR Chapter 17, Section 17.6	
Issue	Possible construction waste identified in 17.6.17 does not include surplus soil from earthworks. While the volumes generated may be small, all waste must be handled appropriately and legally. Contaminated soil will need additional control measures.
Impact	Failure to handle waste correctly may be an offence.
Solution	We recommend reference to Definition of Waste: Code of Practice (DoW:CoP): https://claire.co.uk/projects-and-initiatives/dow-cop
Additional narrative/ explanation (if necessary)	
Soil movement and storage, especially for reuse, may require environmental permits. The applicant must ensure that they are aware of permitting requirements for these activities. We recommend that the Environment Agency's National	

Permitting Service is contacted at a very early stage so that this can be understood and allowed for in work plans.

D13

Document Reference(s): PEIR Chapter 17, sections 17.7.6 Table 17.2 and 17.7.7	
Issue	Receptors for fire need to include land, surface water and groundwater.
Impact	Failure to identify a receptor may mean that insufficient mitigation is put in place to protect it from harm.
Solution	Include risks to land, surface water and groundwater in consideration of risks from fire. This should include secondary and tertiary effects, such as firewater and other contaminated runoff.
Additional narrative/ explanation (if necessary) When discussing the design of the energy storage facility (sections 17.7.23 to 17.7.32), there is no reference to any specific guidance to support the proposals. We recommend reference to National Fire Chief's Council (NFCC) guidance for BESS: https://nfcc.org.uk/wp-content/uploads/2023/10/Grid-Scale-Battery-Energy-Storage-System-planning-Guidance-for-FRS.pdf (note that this is currently under review and subject to change).	

D14

Document Reference(s): Appendix 2.2, Section 3.1	
Issue	The review of historical maps mentions access roads for power station, but not appearance of the power station itself. We would expect this information to be included. Given that the maps have not been supplied with the report, we have been unable to cross-reference the data. The site history in the Executive Summary suggests it was constructed in the 1960s, but this is not reiterated in the main body of the report. The executive summary should not include information which is not in the main report. Information about the power station is freely and readily available online.

Impact	Important information about the site history not been included. This could lead to errors and omissions in site characterisation and the conceptual site model.
Solution	Review the desk study to identify errors and omissions. Reissue the report following the review. Supply all appendices with the reissued report.

D15

Document Reference(s): Appendix 2.2, Section 3.3	
Issue	Not all pollution incidents have been included in the Desk Study. Section 3.3 states that no pollution incidents have been recorded within 500m of the site. We have multiple records of closed incidents in this area, including one within the DCO boundary. As the supporting data has not been supplied, we cannot cross-reference with the data used.
Impact	The effect of historical pollution incidents on the site have not been considered in its characterisation, and the CSM.
Solution	Review pollution incident data and update the report if required. If the data search shows no pollution incidents, supply copies to the EA to confirm.

Appendix E – Water Resources

E1

Document Reference(s): PEIR, Chapter 8, Section 8.7.5	
Issue	The water demand for the project is unclear. This section identifies dust suppression and wheel washing but does not acknowledge water demands for Bentonite Clay mixing and HDD during the construction phases of the development.
Impact	All potential water requirements need to be considered to ensure this is not underestimated.
Solution	All water demands need to be considered carefully through a water resources strategy if appropriate solutions are to be found.

Additional narrative/ explanation

We are pleased to see that a more detailed water supply assessment will be included with the ES. Solutions like re-use and rainwater harvesting as described in this section are very much encouraged. For larger volumes, temporary storage of abstracted water would also buffer supply during periods of prolonged dry weather in the case that licensed abstraction is restricted.

Any abstraction licences required would be determined using the National Permitting Service which is separate to the DCO planning process. However, considering water demands at the planning stage enables design/processes and programming to adapt to the problems that water unavailability can pose. This can avoid costly delays pre commencement and may expedite the permitting process later.

creating a better place
for people and wildlife

Environment Agency

Appendix F – Informative Comments (advice to applicant)

Flood Risk Activity Permit (FRAP)

The Environmental Permitting (England and Wales) Regulations 2016 require a permit or exemption to be obtained for any activities which will take place:

- on or within 8 metres of a main river (16 metres if tidal)
- on or within 8 metres of a flood defence structure or culverted main river (16 metres if tidal)
- on or within 16 metres of a sea defence
- involving quarrying or excavation within 16 metres of any main river, flood defence (including a remote defence) or culvert
- on the floodplain of a main river if the activity could affect flood flow or storage and potential impacts are not controlled by a planning permission

For further guidance please visit https://www.gov.uk/guidance/flood-risk-activities-environmental-permits or contact our National Customer Contact Centre on 03708 506 506 (Monday to Friday, 8am to 6pm) or by emailing enquiries@environmentagency.gov.uk

Water Resources - abstraction and impoundment

The proposals may require Water Resource Licences in respect of the construction activities required. Advice on regulated activities and licence requirements is given below.

Water Resource (Impoundment and Abstraction) Licences are issued by the Environment Agency under the terms of the Water Resources Act 1991 and the provisions of the Water Resources (Abstraction and Impounding) Regulations 2006. No other Environment Agency administered Regulatory Regime provides consent to create or modify an impoundment and / or abstracted water at volumes greater than 20m3/day. You should seek to fully understand the permissions required for your proposal and not assume consent for abstraction and impoundment activity is provided by other regulatory documents.

Abstraction licence

If dewatering is required, you may require an abstraction licence if it doesn't meet the exemption in The Water Abstraction and Impounding (Exemptions) Regulations 2017 Section 5: Small scale dewatering in the course of building or engineering works.

If you do not meet the exemption and requires a full abstraction licence, they should be aware that some aquifer units may be closed for new consumptive abstractions in this area. More information can be found on our website: Abstraction licensing

strategies (CAMS process) - GOV.UK (www.gov.uk) and Apply for a water abstraction or impounding licence - GOV.UK (www.gov.uk)

Please note that the typical timescale to process a licence application is 9-12 months. You may wish to consider whether a scheme-wide dewatering application rather than individual applications would be beneficial. We suggest talking to our National Permitting Service early in the project planning.

Temporary dewatering of wholly or mainly rainwater that has accumulated in an excavation may be exempt from an Environmental Permit for a Water Discharge Activity. More information can be found on our website: https://www.gov.uk/government/publications/temporary-dewatering-from-excavations-to-surface-water. Note that this does not permit discharge of groundwater from a passive or active dewatering activity or permit the abstraction of groundwater.

You may also need to consider discharge of groundwater, especially if it is contaminated. More information can be found on our website: https://www.gov.uk/guidance/discharges-to-surface-water-and-groundwater-environmental-permits

The use of drilling muds for any necessary directional drilling may require a groundwater activity permit unless the 'de minimis' exemption applies. Early discussion about this is also recommended.

It is worth considering the likely infrastructure required to meet any potential discharge permit requirements to ensure that there is sufficient space within the Order Limits. For example, infrastructure required to treat any contaminated groundwater which may need to be discharged to surface waters. Insufficient space is a common constraint which can result in permit non-compliance, non-permitted discharges or expensive/complex treatment methods.

Impounding licence requirement

If you intend to impound a watercourse then you are likely to need an impounding licence from the Environment Agency. An impoundment is any dam, weir or other structure that can raise the water level of a water body above its natural level. 'On-line' impoundments hold back water in rivers, stream, wetlands and estuaries, and consequently affect downstream flows, sediment transport and migration of fish. Impoundments could be created through works to modify or change existing watercourses. An Impoundment Licence could also be required if you amend, modify or remove existing in channel structures. More information is available on gov.uk: https://www.gov.uk/guidance/water-management-apply-for-a-water-abstraction-or-impoundment-licence

Discharge of trade effluent
Effluent discharged from any premises carrying on a trade or industry and effluent generated by a commercial enterprise where the effluent is different to that which would arise from domestic activities in a normal home is described as trade effluent. If you are not able to discharge effluent, it will be classed as waste, and you must then comply with your duty of care responsibilities.

If you wish to discharge effluent, after appropriately treating it, to groundwater or surface water a permit under the Environmental Permit Regulations will be required. Full characterisation of the effluent will be required, and modelling may be required at the planning stage to determine the impact of the effluent on the receiving watercourse.

A trade effluent consent or a trade effluent agreement with your water and sewerage company must be obtained before you discharge trade effluent to a public foul sewer or a private sewer that connects to a public foul sewer.
Further guidance is available at: https://www.gov.uk/guidance/pollution-prevention-for-businesses

Water Quality Permit requirements
You do not require a permit if you are only discharging uncontaminated surface runoff. If you intend to discharge to surface water for dewatering purposes, this may be covered by a Regulatory Position Statement (RPS) for water discharge activities. If you can comply with all the conditions within the RPS, then a permit is not required for this activity. Please find the RPS conditions here:

https://www.gov.uk/government/publications/temporary-dewatering-from-excavations-to-surface-water

If any discharges do not fully comply with the RPS, then a bespoke discharge permit will be required. Please find guidance on applying for a bespoke water discharge permit here:

https://www.gov.uk/guidance/discharges-to-surface-water-and-groundwater-environmental-permits

Waste
If materials that are potentially waste are to be used on-site, you will need to ensure they can comply with the exclusion from the Waste Framework Directive (WFD) (article 2(1) (c)) for the use of, 'uncontaminated soil and other **naturally** occurring material excavated in the course of construction activities, etc.' in order for the material not to be considered as waste. Meeting these criteria will mean waste permitting requirements do not apply.

Where you cannot meet the criteria, they will be required to obtain the appropriate

waste permit or exemption from the EA.

A deposit of waste to land will either be a disposal or a recovery activity. The legal test for recovery is set out in Article 3(15) of WFD as:

- any operation the principal result of which is waste serving a useful purpose by replacing other materials which would otherwise have been used to fulfil a particular function, or waste being prepared to fulfil that function, in the plant or in the wider economy.

We have produced guidance on the recovery test which can be viewed at https://www.gov.uk/government/publications/deposit-for-recovery-operators-environmental-permits/waste-recovery-plans-and-deposit-for-recovery-permits#how-to-apply-for-an-environmental-permit-to-permanently-deposit-waste-on-land-as-a-recovery-activity.

More information on the Waste Framework Directive can be found at: https://www.gov.uk/government/publications/environmental-permitting-guidance-the-waste-framework-directive

More information on the use of waste in exempt activities can be found at: Waste exemption guides - GOV.UK

Non-waste activities are not regulated by the EA (i.e. activities carried out under the CL:ARE Code of Practice), however you will need to decide if materials meet End of Waste or By-products criteria (as defined by the Waste Framework Directive). The 'Is it waste' tool, allows you to make an assessment and can be found at: https://www.gov.uk/government/publications/isitwaste-tool-for-advice-on-the-by-products-and-end-of-waste-tests

The Environmental Protection (Duty of Care) Regulations 1991 for dealing with waste materials are applicable to any off-site movements of wastes.

The code of practice applies to you if you produce, carry, keep, dispose of, treat, import or have control of waste in England or Wales.

The law requires anyone dealing with waste to keep it safe and make sure it's dealt with responsibly and only given to businesses authorised to take it. The code of practice can be found here: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/506917/waste-duty-care-code-practice-2016.pdf

If you need to register as a carrier of waste, please follow the instructions here: https://www.gov.uk/register-as-a-waste-carrier-broker-or-dealer-wales

-

In order to meet the applicant's objectives for the waste hierarchy and obligations

under the duty of care, it is important that waste is properly classified. Some waste (e.g. wood and wood based products) may be either a hazardous or non-hazardous waste dependent upon whether or not they have had preservative treatments. Proper classification of the waste both ensures compliance and enables the correct onward handling and treatment to be applied. In the case of treated wood, it may require high temperature incineration in a directive compliant facility. More information on this can be found here: https://www.gov.uk/how-to-classify-different-types-of-waste

Waste to be taken off site (contaminated land)

Contaminated soil that is, or must be disposed of, is waste. Therefore, its handling, transport, treatment and disposal is subject to waste management legislation, which includes:

- Duty of Care Regulations 1991
- Hazardous Waste (England and Wales) Regulations 2005
- Environmental Permitting (England and Wales) Regulations 2010
- The Waste (England and Wales) Regulations 2011

You should ensure that all contaminated materials are adequately characterised both chemically and physically in line with British Standards BS EN 14899:2005 'Characterisation of Waste - Sampling of Waste Materials - Framework for the Preparation and Application of a Sampling Plan' and that the permitting status of any proposed treatment or disposal activity is clear. If in doubt, the Environment Agency should be contacted for advice at an early stage to avoid any delays.

If the total quantity of waste material to be produced at or taken off site is hazardous waste and is 500kg or greater in any 12-month period, you will need to register with us as a hazardous waste producer. Refer to our website at www.gov.uk/government/organisations/environment-agency for more information.

If you require any local advice or guidance please contact the East Midlands Area Waste Team.

creating a better place
for people and wildlife

Environment Agency

[redacted]
[redacted]co.uk]

Our ref: XA/2025/100334/01-L01
Your ref: 680819-R5(01)-FRA

Date: 10 April 2025

Dear [redacted]

DRAFT FLOOD RISK ASSESSMENT (FRA) - ENVIRONMENT AGENCY REVIEW. STEEPLE RENEWABLES PROJECT NSIP.

Thank you for consulting us on the draft FRA (680819-R5(01)-FRA, March 2025).

Our response identifies issues within the assessment and ensures that our concerns are clearly outlined in an Issue, Impact, Solution format. Appendix A serves as a detailed review focusing on Ordinary Watercourse channel and structure capacity.

Document Reference(s): *Steeple Renewables Project Draft FRA 680819-R5(01)-FRA (March 2025). Section 4.2*	
Issue	The Sequential Test has been referred to with note of a separate supporting document. However, this has not been submitted for review.
Impact	The Sequential Test cannot be assessed and deemed to be satisfied at this stage.
Solution	The FRA should be updated and supporting documents submitted for review.

Document Reference(s): *Steeple Renewables Project Draft FRA 680819-R5(01)-FRA (March 2025). Section 5.2*	
Issue	This section references the Environment Agency Flood Zone mapping. A plan is shown in figure 5.1 showing the Flood Map for Planning with regards to the order limits for the development. Please note, the Flood Map for Planning was updated on the 25th of March 2025.
Impact	The assessment of flood risk could be inaccurate and outdated.
Solution	Please assess the latest updated Flood Map for Planning published on the 25th March 2025 and distinguish between Flood Zone 3a and 3b.

	Represent this on a map with the Order Limits for the development.
Additional narrative/ explanation Further information is available online at: Updates to national flood and coastal erosion risk information - GOV.UK	

Document Reference(s): *Steeple Renewables Project Draft FRA 680819-R5(01)-FRA (March 2025). Section 5.2.1*	
Issue	The FRA confirms use of the fluvial 100 year plus 29% climate change scenario as the design flood event, with all infrastructure proposed outside of this flood extent. This assesses the 2050's climate change epoch due to the site being proposed for operation to 2069 and not beyond.
Impact	Based on the proposed operational lifetime of the site, the 2080's climate change epoch has not been assessed. No operation of the site beyond 2069 has therefore been assessed.
Solution	As previously advised, the Environment Agency will seek a suitably worded DCO Requirement to ensure that the development dues not remain operational beyond 2069. This will be due to flood risk not having been assessed or accounted for in the site design beyond 2069.

Document Reference(s): *Steeple Renewables Project Draft FRA 680819-R5(01)-FRA (March 2025). Section 5.2.1*	
Issue	Section 5.2.1 states that a credible maximum climate change scenario is not required as the site will not be connected to the grid. However, the description of proposed development within Section 2.2 includes '*grid connection infrastructure'*. These two sections of the FRA appear to contradict each other.
Impact	Where power generation is proposed to connect to the National Grid network, it is expected that the FRA should consider a credible maximum climate change scenario as a sensitivity test.
Solution	Confirmation is needed regarding connection of the site to the National Grid network in order to establish whether the FRA is complete.

Document Reference(s): *Steeple Renewables Project Draft FRA 680819-R5(01)-FRA (March 2025). Section 5.2.1*	
Issue	The FRA does not set out the criteria and process for shutdown of the site during an extreme flood event.
Impact	It is not possible to assess how and when shutdown of the site would occur, and what actions would be taken to ensure site safety.
Solution	The FRA should include a description of the process for shutdown of the site. i.e. how would flooding at the site be monitored, what would trigger shutdown at the site, the sequence of actions taken to shutdown and ensure site safety during a flood event.

Document Reference(s): *Steeple Renewables Project Draft FRA 680819-R5(01)-FRA (March 2025). Section 5.2.1*	
Issue	This section notes that historic flood outlines were not provided as part of the Product 4 request. Please note, recorded flood extents can be downloaded from the Defra Data Services Platform.
Impact	The assessment of flood risk may be incomplete.
Solution	Please consider historical flooding in the context of your development.
Additional narrative/ explanation Recorded flood outlines can be downloaded from the Defra Data Services Platform here: Recorded Flood Outlines	

Document Reference(s): *Steeple Renewables Project Draft FRA 680819-R5(01)-FRA (March 2025). Section 8.3*	
Issue	Watercourse crossings are discussed and it is noted that new culverts have been agreed with the IDB and LLFA for non main-rivers.
Impact	New culverts have the potential to impact flood risk and flow routes. These will need to be designed and sized to ensure that there is no increase in flood risk.
Solution	Details of all new watercourse crossings should be submitted in the FRA to show there is no increase in flood risk.

Document Reference(s): *Steeple Renewables Project Draft FRA 680819-R5(01)-FRA (March 2025). Section 8.6*	
Issue	To alleviate flooding issues within Sturton Le Steeple two large detention basis are proposed. This is welcomed. There is limited detail on their design within the Draft FRA. The FRA references a Drainage Strategy Report although this was not provided for review
Impact	Insufficient information at this stage to appraise the proposed flood mitigation scheme
Solution	Hydraulic modelling should be undertaken to ensure the detention basins work effectively and will not increase risk to others. It will also be important to consider the storage volumes within the proposed basins and whether these will impound water above existing ground levels or will be below existing ground levels. Please note that any storage of water above existing ground levels at or above 25,000 m3 will come under the requirements of the Reservoirs Act 1975.

Document Reference(s): *Steeple Renewables Project Draft FRA 680819-R5(01)-FRA (March 2025). Appendix G Mannings Assessment of Ordinary Watercourses. ReFH2 summary sheets*	
Issue	Climate change has been applied incorrectly within the Revitalised Flood Hydrograph method (ReFH2). For fluvial flows, climate change should be applied to the peak flows and not the rainfall. There is an option to apply the climate change uplift to rainfall within ReFH2, however, this is not the correct approach for uplifting fluvial flows to account for climate change. Rainfall scaling for climate change should only be used when undertaking direct rainfall modelling or modelling surface water flood risk
Impact	This issue is not a concern for this study as the calculated peak flows are conservative with regards to the application of climate change. This comment is for information and future reference
Solution	For future reference, climate change should be applied by scaling the peak flows and not the rainfall for conventional fluvial hydrological assessments. Please see the additional narrative section below for further details.
Additional narrative/ explanation	

For the Catchwater Drain the 1% (1 n 100) annual exceedance probability (AEP) peak flow without climate change to the catchment outlet based on FEH22 rainfall, a storm duration of 18 hours (catchment descriptors), and a time step of 2 hours is 12.61 m^3/s. If this is scaled by 23% (1.23) this results in a slightly lower peak flow of 15.51 m^3/s when compared to scaling the rainfall (15.78m^3/s).

For the Mother Drain the 1% (1 in 100) AEP peak flow without climate change to the catchment outlet based on FEH22 rainfall, a storm duration of 27 hours (catchment descriptors), and a time step of 3 hours is 4.20 m^3/s. If this is scaled by 23% (1.23) this results in a slightly lower flow of 5.17 m^3/s when compared to scaling the rainfall (5.38 m^3/s).

For the New Ings Drain the 1% (1 in 100) AEP peak flow without climate change to the catchment outlet based on FEH22 rainfall, a storm duration of 27 hours (catchment descriptors), and a time step of 3 hours is 3.49 m^3/s. If this is scaled by 23% (1.23) this results in a slightly lower flow of 4.29 m^3/s when compared to scaling the rainfall (4.48 m^3/s).

Document Reference(s): *Steeple Renewables Project Draft FRA 680819-R5(01)-FRA (March 2025). Appendix G Mannings Assessment of Ordinary Watercourses*	
Issue	The channel capacity calculations presented in Appendix G of the draft Flood Risk Assessment significantly over-estimate channel capacity for the Catchwater Drain, Mother Drain, and New Ings Drain. Based on the channel geometry and the 1% (1 in 100) plus 23% annual exceedance probability (AEP) design flows presented, there is the potential for channel capacity to be exceeded at cross sections within reaches of the Catchwater Drain and for the New Ings Drain, for example Catchwater Drain 1 and Catchwater Drain 2 and New Ings Drain 1 and 2. It is difficult to evaluate the channel cross sections in detail as the location polygons shown in figure 1 on page 182 of the draft FRA are quite large. It is therefore difficult to know exactly where the channel cross sections are on the respective watercourses. Furthermore, it is difficult to know the orientation of the sections, for example are these drawn from left bank to right bank in the direction of flow for each watercourse. Mother Drain 1 is repeated twice in Appendix G. No calculations are presented for Mother Drain 2.
Impact	Flood risk to the development could be underestimated from the Ordinary Watercourses

Solution	Please review and correct the calculations on channel capacity presented in Appendix G of the draft FRA. Please see further information and checks which are included in Appendix A of our response. Given the potential for channel capacity to be exceeded on the Catchwater Drain and New Ings Drain, an assessment of flood risk to the development should be undertaken. This could be undertaken by either: 1. Correcting the channel capacity calculations and reviewing the in-channel water levels for the Catchwater Drain and New Ings drain for the design flood and assessing these against ground elevations within the development area based on the latest composite 1 metre resolution Lidar data available from the Defra Data Services Platform (Defra Data Services Platform). This will likely provide a conservative assessment of flood risk for the development. Or: 2. Constructing hydraulic models for the Catchwater Drain and New Ings drain. These should incorporate channel cross sections, structures, and a representation of the floodplain within the vicinity of the proposed development. Please provide a plan within the FRA which shows the location of the channel cross sections used in the calculations which are shown in Appendix G of the draft FRA. It is noted that screen shots of the survey drawings are provided but these are not at a suitable scale to accurately determine cross section locations. Please confirm the orientation of the cross sections, for example are these drawn from left bank to right bank in the direction of flow. Please make this clear in the FRA. Please include the calculations and cross sections for Mother Drain 2
Additional narrative/ explanation Please see Appendix A (below) of our response for further details and checks on the calculations. We welcome further engagement on this issue if you require further support.	

Yours sincerely

Mr [redacted]
Planning Specialist

creating a better place
for people and wildlife

Environment Agency

Direct dial: [redacted]
[redacted]@environment-agency.gov.uk

Appendix A - Environment Agency Ordinary Watercourse channel and structure capacity review.

With regards to the channel capacity calculations in Appendix G of the draft Flood Risk Assessment (FRA) the resultant capacities calculated for the channels do not appear to be correct. Further details are provided in the calculations below. In some cases, based on the calculated design flood flow, channel capacity would be exceeded based on the discharge capacity calculated using the Mannings equation. This is further corroborated by creating a simple 1d Flood Modeller model which incorporates the watercourse cross sections presented in Appendix G of the draft FRA.

For the Catchwater Drain a channel capacity of 166.28 m^3/s has been established for section 1, 176.29m^3/s for section 2, and 244.71m^3/s for section 3. These capacities appear too large given the channel dimensions presented within the draft Flood Risk Assessment.

Catchwater Drain 1

A peak flow has been calculated for the Catchwater Drain of 15.78m^3/s. This is based on the Revitalised Flood Hydrograph methodology (ReFH2). An ReFH2 summary sheet has been included within the draft Flood Risk Assessment. A check reveals that the catchment that has been used for the Catchwater Drain is the catchment to the outlet with the River Trent. This is downstream of the area of interest. Climate change has been applied to the rainfall within ReFH2 rather than the resultant peak flow. This is not the correct approach when scaling peak flows calculated using ReFH2 to represent the effects of climate change. In these cases, the scaling should be applied to the flows and not the input rainfall. In the context of this assessment, applying the scaling to the rainfall results in slightly larger peak flows. On this basis no further action is deemed necessary based on conservatism.

The channel slope for Catchwater 1 appears to be overestimated. The calculated slope is shown in the screen shot on page 206 of the draft FRA as 0.039 metres per metre. Based on the cross sections presented on page 205 of the draft FRA and the distance between them, the slope would be more in the region of 0.0004 metres/metre. For example, 4.05 metres – 3.95 metres = 0.1 metre. 0.1m/276.84m = 0.00036m/m. Considering this and the channel geometry and roughness, it is evident that the channel could be close to overtopping in the design event. For example, if we consider the Mannings equation for the second cross section shown on page 205 for Catchwater Drain 1, the calculated flow to top of bank is 16.15m^3/s. Further details are shown in the calculations below. This is significantly less than the calculated carrying capacity of 166.28 m^3/s quoted in the draft FRA. This is further

corroborated by adding the cross sections for Catchwater Drain 1 to Flood Modeller and running a steady state simulation with a peak flow of 15.78m^3/s (figure 1)

Mannings equation for calculating flow

$Q = 1/n\ AR^{2/3}\ S^{1/2}$

Parameters for the cross section shown on page 205 with a left bank top elevation of 7.07 mAOD (see figure 1(a) below)
Wetted permitter = 12.198 metres

Hydraulic Radius (R) = 18.986/12.198 = 1.56

Channel Depth = 3.060 metres

Area (A) = 18.986m2

Mannings roughness (n) = 0.03

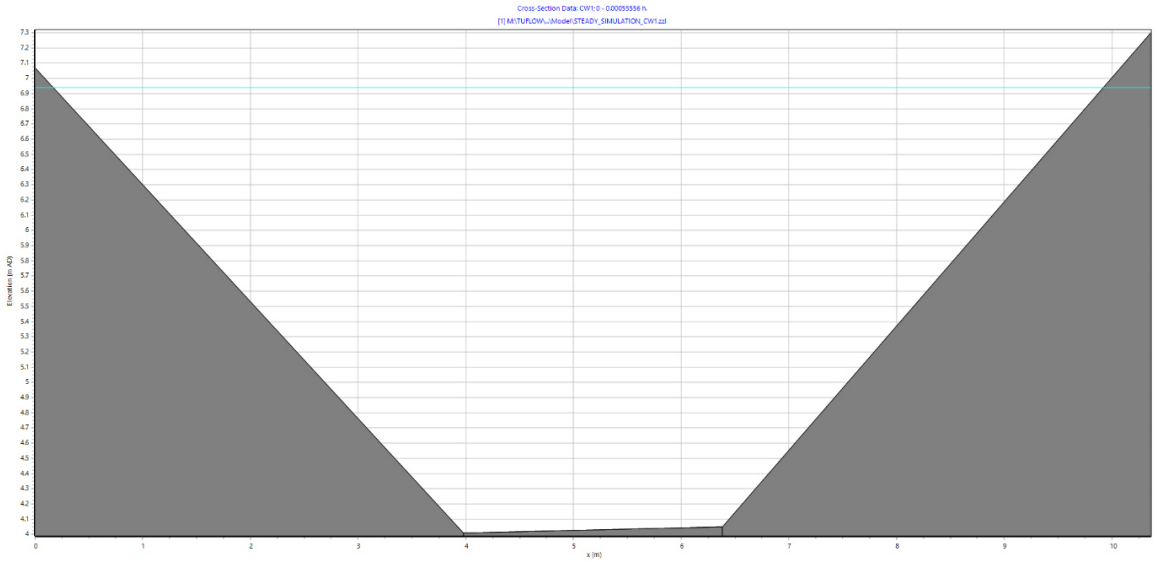
Channel slope (S) = 0.00036 metres/metre

Q (flow m^3/s) = (1/0.03) *18.986 * 1.56 ^(2/3) * 0.00036 ^(1/2)

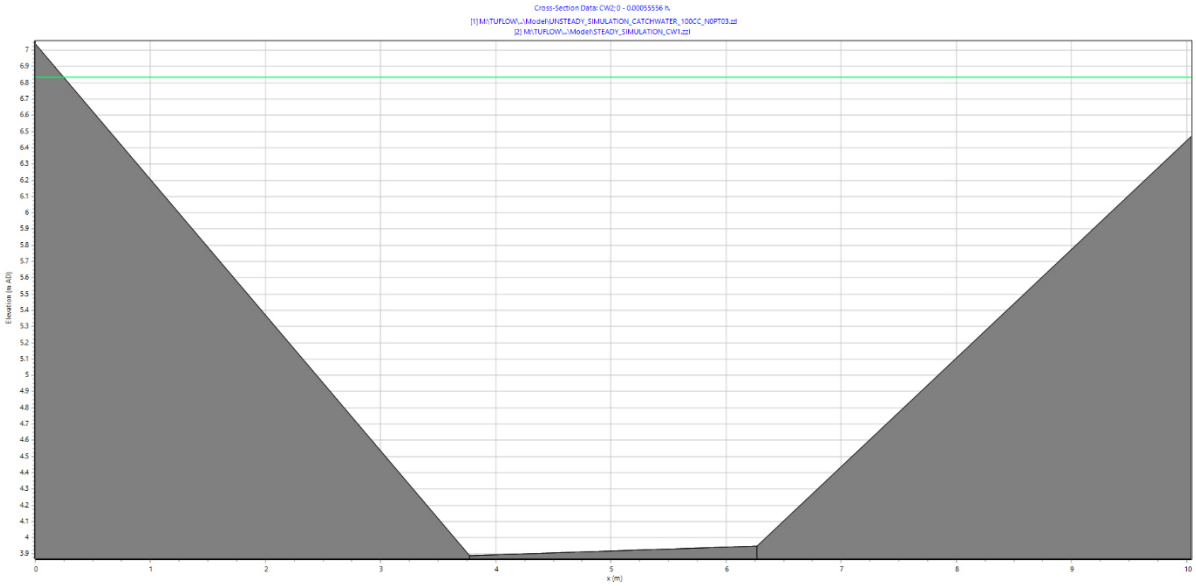
Q = 16.15 m^3/s.

Figure 1: Maximum calculated stage at the cross sections shown on page 205 of the FRA (Catchwater Drain 1) based on a peak flow for the 1% (1 in 100) plus 23% climate change scenario of 15.78m³/s. NOTE – channel capacity on the right bank is exceeded in the second cross section (B).

A)



B)



Catchwater Drain 2.

The Channel slope for Catchwater 2 appears to be overestimated. The calculated slope is shown in the screen shot on page 209 of the draft FRA as 0.029 metres per metre. Based on the cross sections presented on page 208 of the draft FRA and the distance between them, the slope would be more in the region of 0.00021 metres/metre. For example, 3.55 metres – 3.45 metres = 0.1 metres. 0.1m/478.36m = 0.000209m/m. Considering this and the channel geometry and roughness, it is evident that the channel could overtop in the design event. For example, if we consider the Mannings equation for the second cross section shown on page 208 for Catchwater Drain 2, the calculated flow to top of bank is 15.73m^3/s. Further details are shown in the calculations below. This is significantly less than the calculated carrying capacity of 176.29 m^3/s quoted in the draft Flood Risk Assessment. This is further corroborated by adding the cross sections for Catchwater Drain 2 to Flood Modeller and running a steady state simulation with a peak flow of 15.78m^3/s (figure 2)

Mannings equation for calculating flow

$Q = 1/n\ AR^{2/3}\ S^{1/2}$

Parameters for the cross section shown on page 208 with a left bank top elevation of 6.6 mAOD (see figure 2(a) below)
Wetted permitter = 13.977 metres

Hydraulic Radius (R) = 23.213/13.977 = 1.6608

Channel Depth = 3.17 metres

Area (A) = 23.213m2

Mannings roughness (n) = 0.03

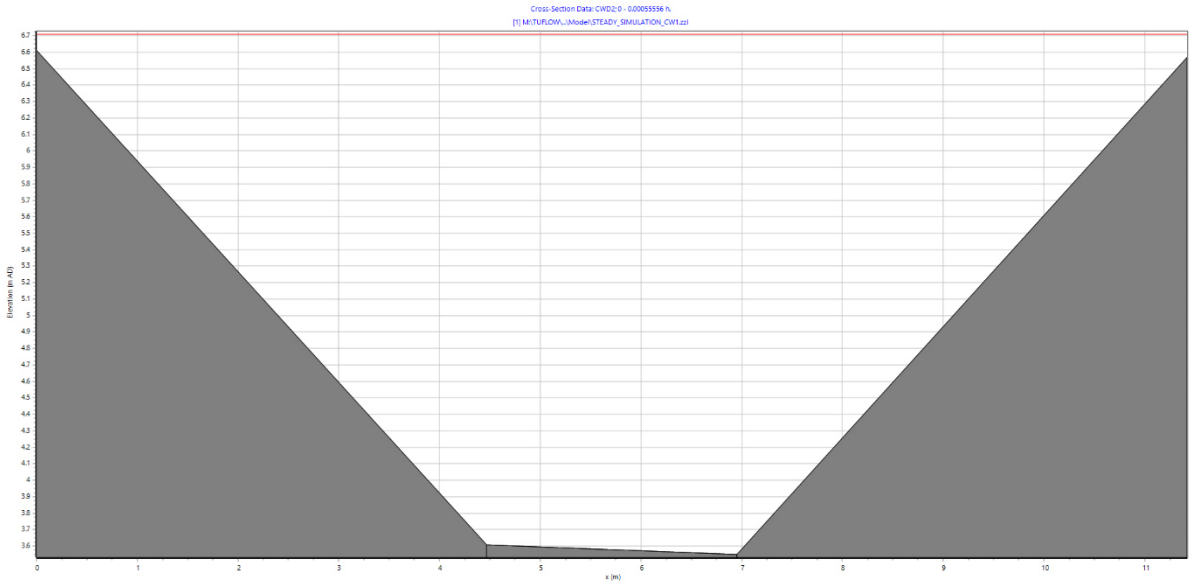
Channel slope (S) = 0.00021 metres/metre

Q (flow m^3/s) =(1/0.03)*23.213*1.6608^(2/3)*0.00021^(1/2)

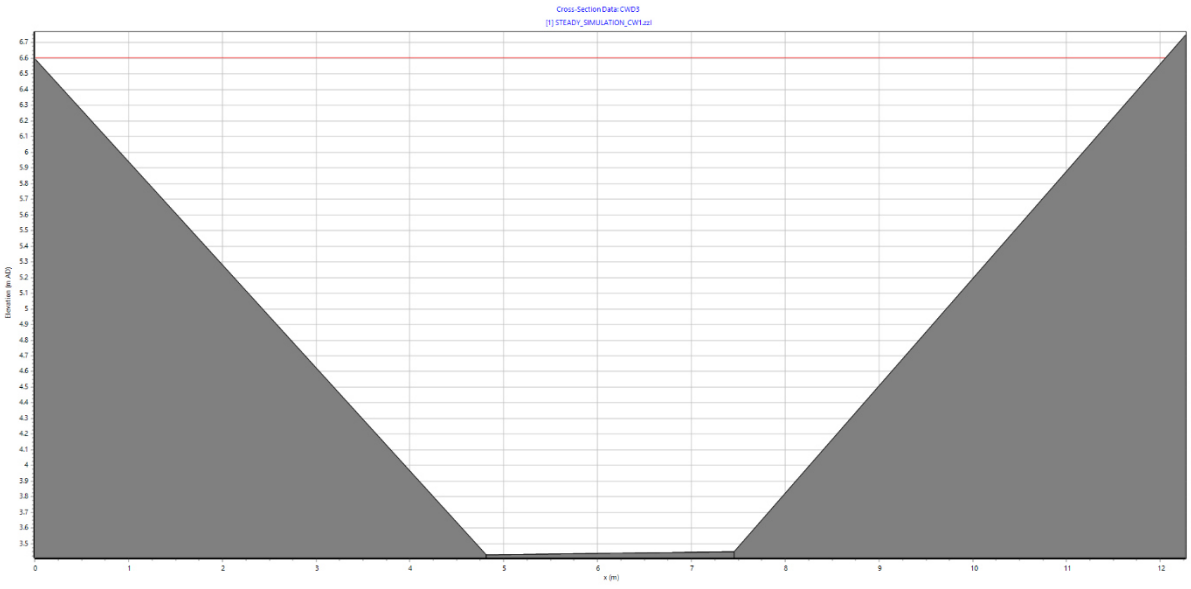
Q = 15.73 m^3/s.

Figure 2: *Maximum calculated stage at the cross sections shown on page 208 of the FRA (Catchwater Drain 2) based on a peak flow for the 1% (1 in 100) plus 23% climate change scenario of 15.78m³/s. NOTE – channel capacity is exceeded in the first cross section (A) and close to being exceeded in the second cross section (B)*

A)



B)



Catchwater Drain 3.

The channel slope for Catchwater 3 appears to be overestimated. The calculated slope is shown in the screen shot on page 212 of the draft FRA as 0.035 metres per metre. Based on the cross sections presented on page 211 of the draft FRA and the distance between them, the slope would be more in the region of 0.00047 metres/metre. For example, 2.8 metres – 2.64 metres = 0.16 metres. 0.16m/341.83m = 0.000468m/m. Considering this and the channel geometry and roughness there may be capacity within the channel at this location to convey the design flood. For example, if we consider the Mannings equation for the second cross section shown on page 211 for Catchwater Drain 3, the calculated flow to top of bank is 26.53m^3/s. Further details are shown in the calculations below. This suggests that the channel may have capacity to convey the design flow at this location. This is further corroborated by adding the cross sections for Catchwater Drain 3 to Flood Modeller and running a steady state simulation with a peak flow of 15.78m^3/s (figure 3)

Mannings equation for calculating flow

$Q = 1/n\ AR^{2/3}\ S^{1/2}$

Parameters for the cross section shown on page 211 with a left bank top elevation of 5.81 mAOD (see figure 3(a) below)
Wetted permitter = 14.755 metres

Hydraulic Radius (R) = 25.497/14.755 = 1.728

Channel Depth = 3.17 metres

Area (A) = 25.497m2

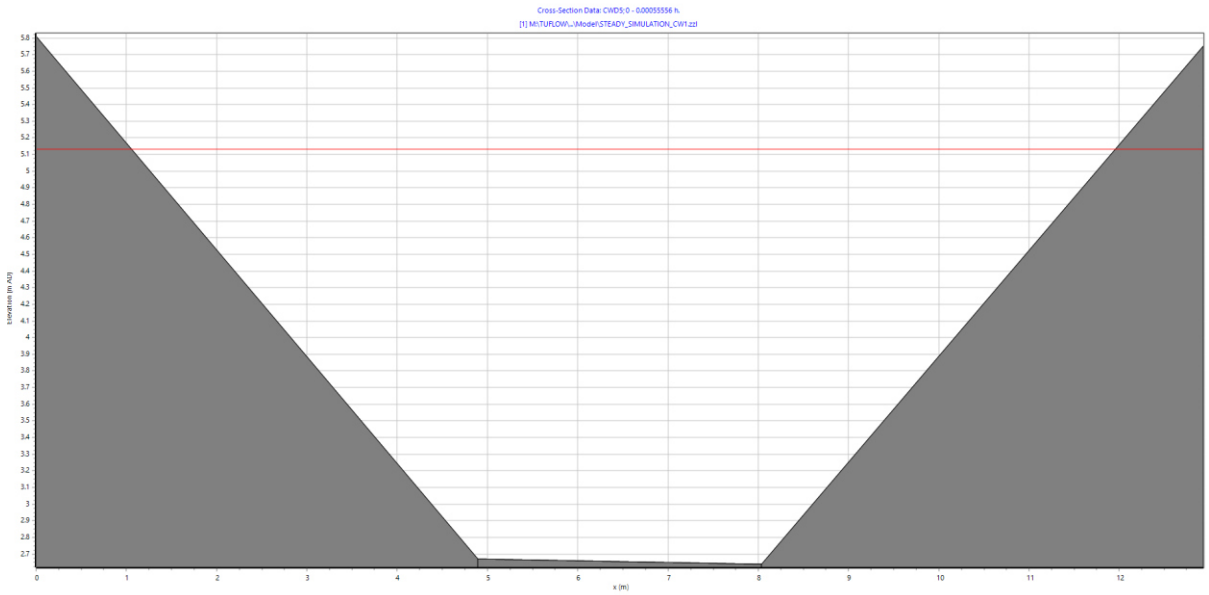
Mannings roughness (n) = 0.03

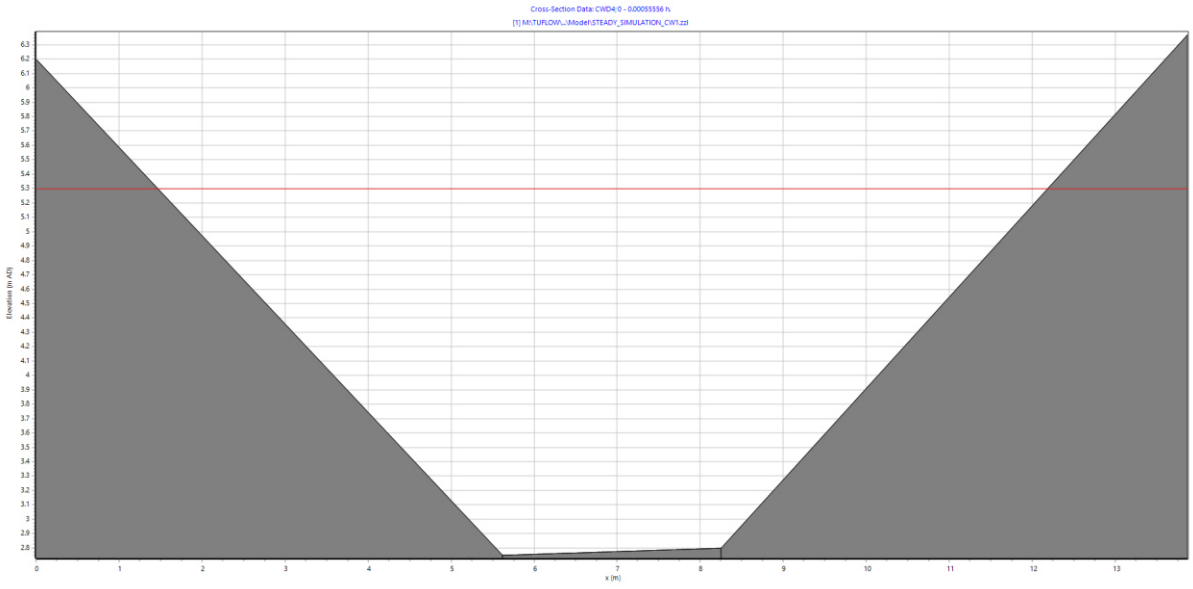
Channel slope (S) = 0.00047 metres/metre

Q (flow m^3/s) =(1/0.03)*25.497*1.728^(2/3)*0.00047^(1/2)

Q = 26.53 m^3/s.

Figure 3: *Maximum calculated stage at the cross sections shown on page 211 of the FRA (Catchwater Drain 3) based on a peak flow for the 1% (1 in 100) plus 23% climate change scenario of 15.78m³/s.*





Mother Drain 1

The channel slope for Mother Drain 1 appears to be overestimated. The calculated slope is shown in the screen shot on page 215 of the draft FRA as 0.0074 metres per metre. Based on the cross sections presented on page 214 of the draft FRA and the distance between them, the slope would be more in the region of 0.00047 metres/metre. For example, 2.8 metres – 2.64 metres = 0.16 metres. 0.16m/341.83m = 0.00026m/m. Considering this and the channel geometry and roughness there may be capacity within the channel at this location to convey the design flood. For example, if we consider the Mannings equation for the second cross section shown on page 214 for Mother Drain 1, the calculated flow to top of bank is 9.63m^3/s. Further details are shown in the calculations below. This suggests that the channel may have capacity to convey the design flow at this location. This is further corroborated by adding the cross sections for Mother Drain 1 to Flood Modeller and running a steady state simulation with a peak flow of 5.38m^3/s (figure 4)

Mannings equation for calculating flow

$Q = 1/n\ AR^{2/3}\ S^{1/2}$

Parameters for the cross section shown on page 214 with a left bank top elevation of 3.27 mAOD (see figure 4(a) below)
Wetted permitter = 11.392 metres

Hydraulic Radius (R) = 14.955/11.392 = 1.312

Channel Depth = 2.18 metres

Area (A) = 14.955m2

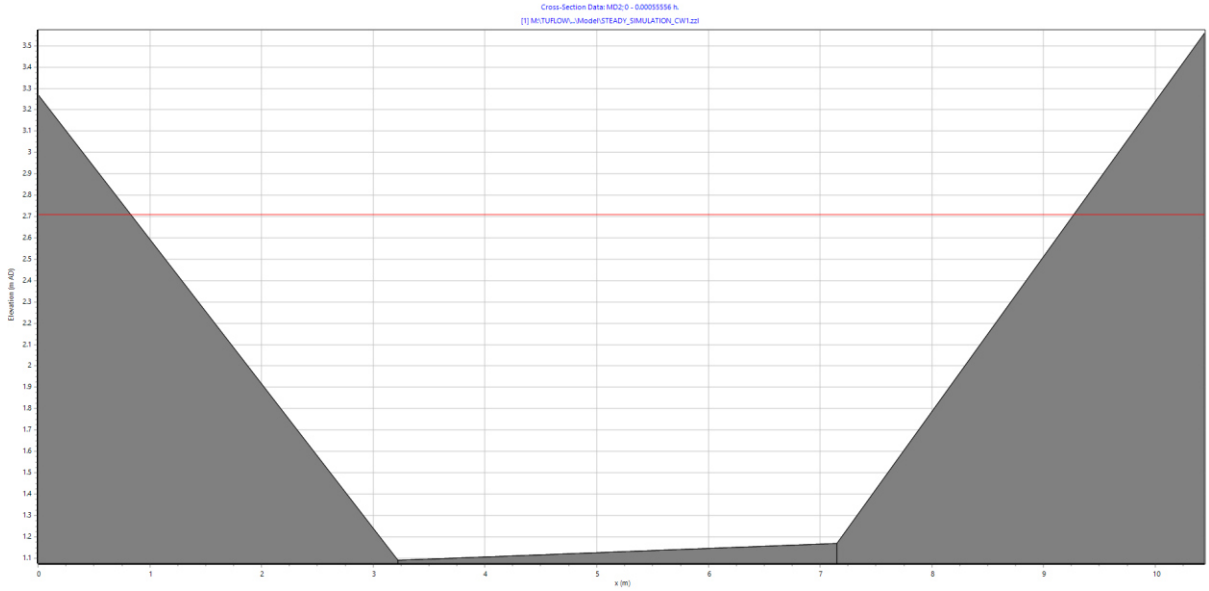
Mannings roughness (n) = 0.03

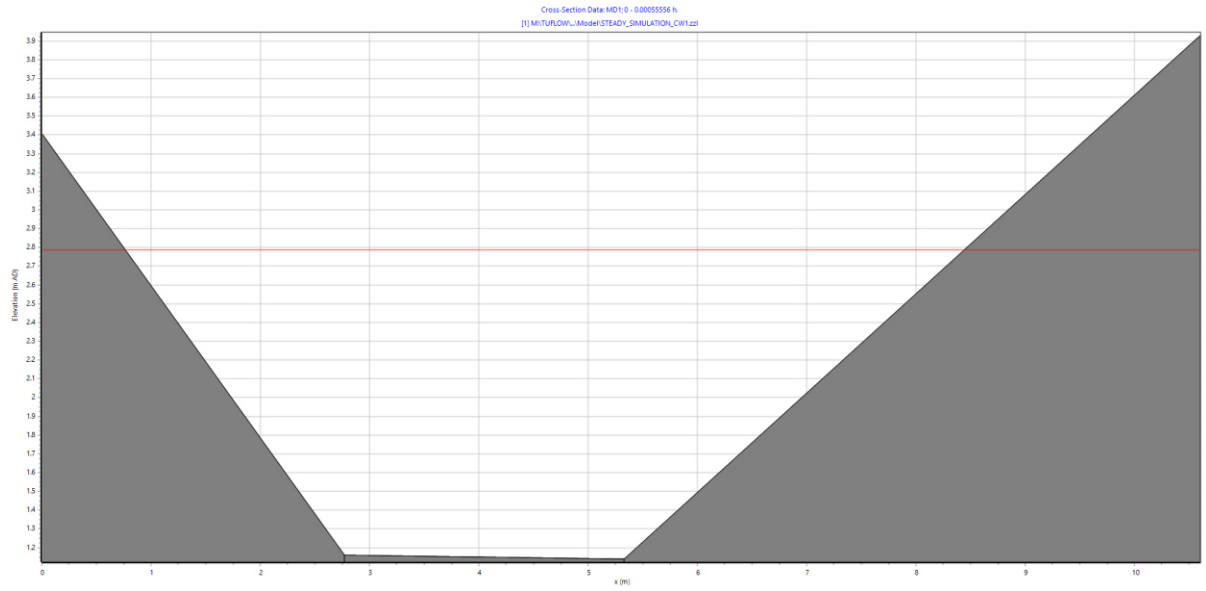
Channel slope (S) = 0.00026 metres/metre

Q (flow m^3/s) =(1/0.03)*14.955*1.312^(2/3)*0.00026^(1/2)

Q = 9.63 m^3/s.

Figure 4: *Maximum calculated stage at the cross sections shown on page 214 of the FRA (Mother Drain 1) based on a peak flow for the 1% (1 in 100) plus 23% climate change scenario of 5.38m³/s*





New Ings Drain 1

The channel slope for New Ings Drain appears to be overestimated. The calculated slope is shown in the screen shot on page 221 of the draft FRA as 0.031metres per metre. Based on the cross sections presented on page 220 of the draft FRA and the distance between them, the slope would be more in the region of 0.00031 metres/metre. For example, 2.11 metres – 1.99 metres = 0.12 metres. 0.12m/386.64m = 0.00031m/m. Considering this and the channel geometry and roughness the channel capacity would be exceeded in the design flood event. For example, if we consider the Mannings equation for the second cross section shown on page 220 for New Ings Drain 1, the calculated flow to top of bank is 2.63m^3/s. Further details are shown in the calculations below. This suggests that the channel would not have capacity to convey the design flow (4.48m3/s) at this location. This is further corroborated by adding the cross sections for New Ings Drain 1 to Flood Modeller and running a steady state simulation with a peak flow of 4.48m^3/s (figure 5). Channel capacity is clearly exceeded for both cross sections.

Mannings equation for calculating flow

$Q = 1/n\ AR^{2/3}\ S^{1/2}$

Parameters for the cross section shown on page 220 with a left bank top elevation of 3.27 mAOD (see figure 4(a) below)
Wetted permitter = 6.389 metres

Hydraulic Radius (R) = 5.171/6.389 = 0.809

Channel Depth = 1.69 metres

Area (A) = 5.171 m2

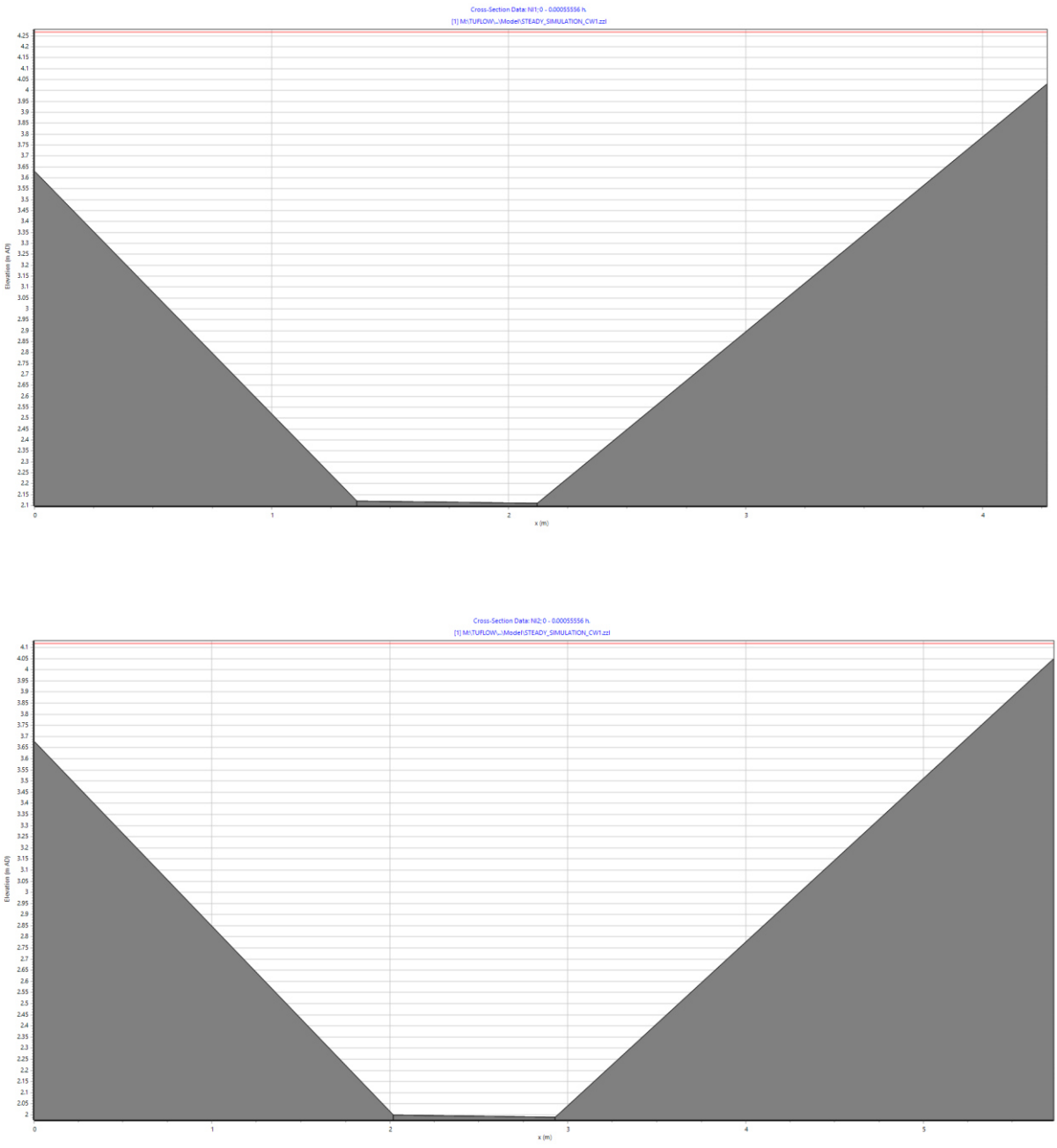
Mannings roughness (n) = 0.03

Channel slope (S) = 0.00031 metres/metre

Q (flow m^3/s) =(1/0.03)*5.171*0.809^(2/3)*0.00031^(1/2)

Q = 2.63 m^3/s.

Figure 5: *Maximum calculated stage at the cross sections shown on page 220 of the FRA (New Ings Drain 1) based on a peak flow for the 1% (1 in 100) plus 23% climate change scenario of 4.48m³/s*



New Ings Drain 2

The channel slope for New Ings Drain appears to be overestimated. The calculated slope is shown in the screen shot on page 224 of the draft FRA as 0.019 metres per metre. Based on the cross sections presented on page 223 of the draft FRA and the distance between them, the slope would be more in the region of 0.00027 metres/metre. For example, 2.62 metres – 2.55 metres = 0.07 metres. 0.07m/258.17m = 0.00027m/m. Considering this and the channel geometry and roughness the channel capacity would be exceeded in the design flood event. For example, if we consider the Mannings equation for the second cross section shown on page 223 for New Ings Drain 2, the calculated flow to top of bank is 1.13m^3/s. Further details are shown in the calculations below. This suggests that the channel would not have capacity to convey the design flow (4.48m3/s) at this location. This is further corroborated by adding the cross sections for New Ings Drain 2 to Flood Modeller and running a steady state simulation with a peak flow of 4.48m^3/s (figure 6). Channel capacity is clearly exceeded for both cross sections.

Mannings equation for calculating flow

$Q = 1/n\ AR^{2/3}\ S^{1/2}$

Parameters for the cross section shown on page 223 with a left bank top elevation of 3.27 mAOD (see figure 6(a) below)
Wetted permitter = 4.779 metres

Hydraulic Radius (R) = 2.891/4.779 = 0.605

Channel Depth = 1.29 metres

Area (A) = 2.891 m2

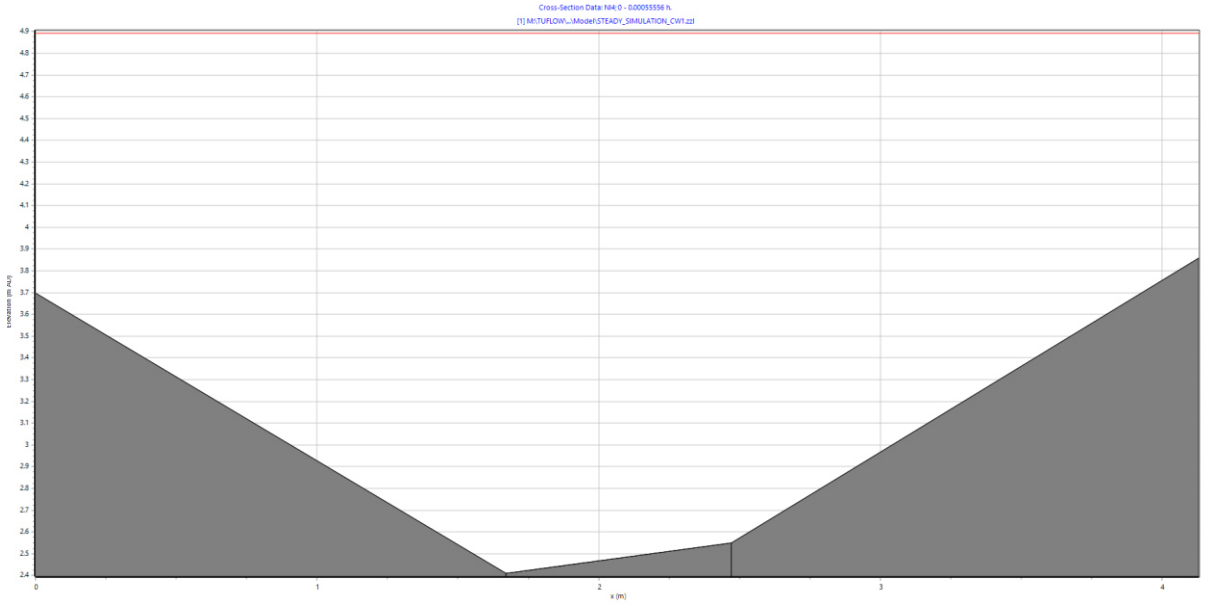
Mannings roughness (n) = 0.03

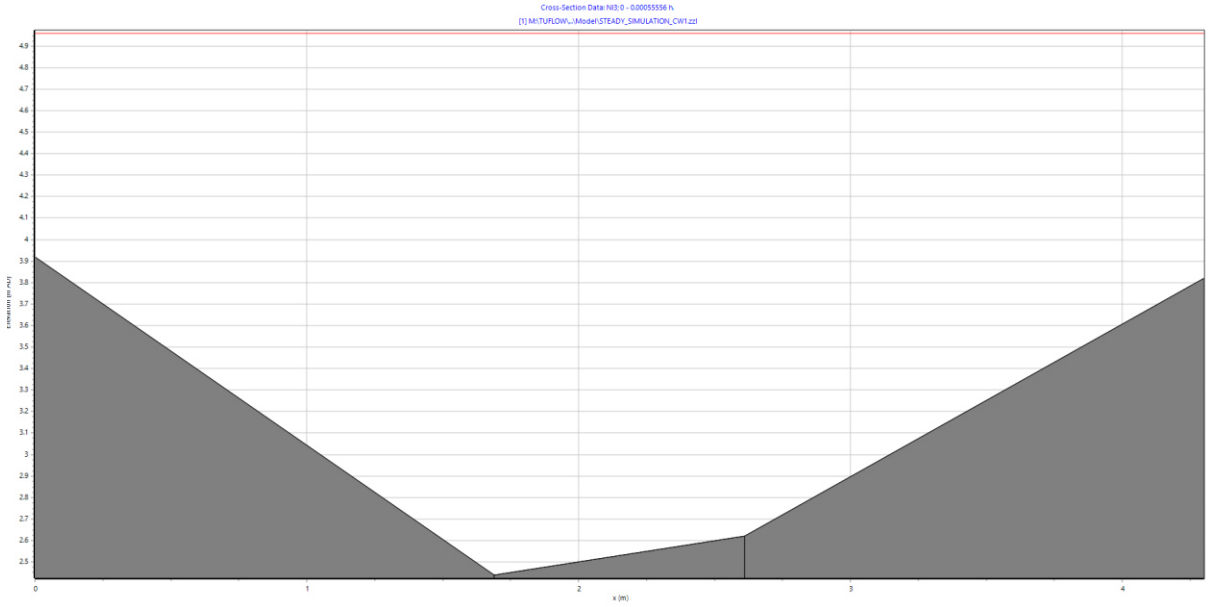
Channel slope (S) = 0.00027 metres/metre

Q (flow m^3/s) =(1/0.03)*2.891*0.605^(2/3)*0.00027^(1/2)

Q = 1.13 m^3/s.

Figure 6: Maximum calculated stage at the cross sections shown on page 223 of the FRA (New Ings Drain 2) based on a peak flow for the 1% (1 in 100) plus 23% climate change scenario of 4.48m³/s





Catchwater Drain 1 Bridge (Common Lane) capacity review

The draft FRA notes that the Common Lane Bridge over Catchwater Drain has a capacity of 64.3 m^3/s. The Mannings roughness value for the bridge is set at 0.015 in the draft FRA. This may be reasonable for the underside of the bridge but would be too low for the channel bed. As part of the review of the draft FRA, the bridge cross section shown on page 226 was added to Flood Modeller and an unsteady simulation was undertaken with a peak flow of 15.78m^3/s. It should be noted that the dimensions and in particular the bridge springing and soffit levels were estimated as there was not enough information on the drawing on page 226 to determine these in detail. The peak water level from this simulation is shown in figure 7 below. Whilst the bridge is not shown to surcharge this clearly shows that a capacity of 64.3m^3/s is significantly overestimated.

Figure 7: Modelled 1% (1 in 100) AEP plus 23% climate change water level at Catchwater Drain Bridge 1 (Common Lane) based on a peak flow of 15.78m3/s. NOTE: Bridge dimensions estimated from drawing shown on page 226 of the draft FRA