Green Hill Solar Farm
EN010170

Environmental Statement
Appendix 10.8: Flood Risk Assessment and Drainage Strategy Annex G: Green Hill E

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Date: May 2025

Document Reference: APP/GH6.3.10.8

APFP Regulation 5(2)(e)

Appendix 10.8: Annex G - Flood Risk Assessment and Drainage Strategy – Green Hill E

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For: Green Hill Solar Farm Ltd

Site: Green Hill E

Date: 20/05/2025

Document Ref: 313532

Issue-04

Quality Assurance

Issue Record

Revision	Description	Date	Author	Reviewer	Approver
1.0	First Issue	04/09/2024	GH	LA	JR
2.0	Second Issue	24/10/2024	GH	LA	JR
3.0	Third Issue	11/04/2025	GO	IR	JR
4.0	Fourth Issue for submission of ES Chapter	20/05/2025	GO	IR	JR

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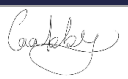
GO	Gabrielle O'Brien	BSc (Hons), Consultant	
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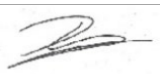
JR	Josh Rigby	BSc (Hons), Manager	

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1. Site Details

The aim of this section of the report is to outline key environmental information associated with the baseline environment.

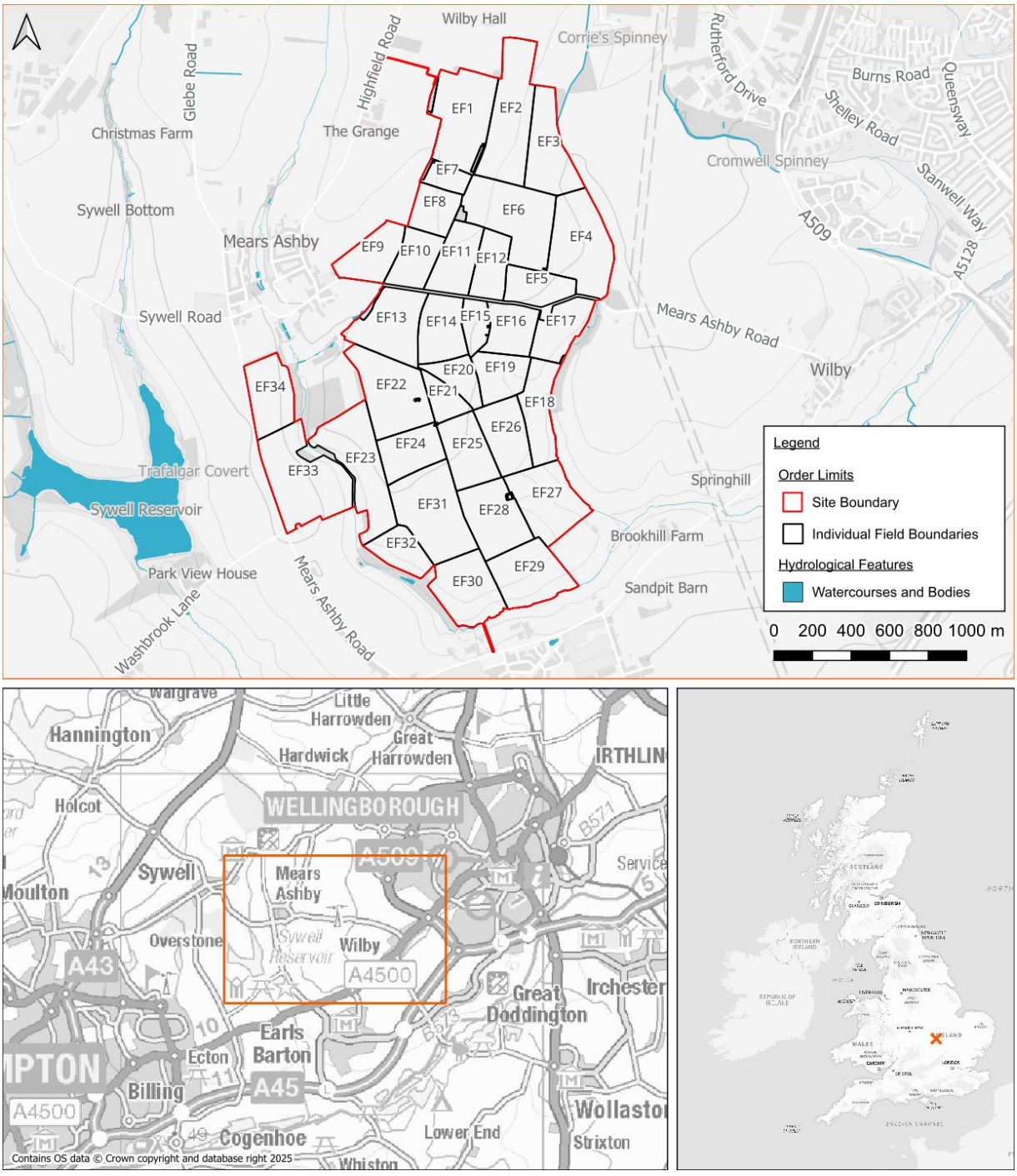


Figure 1: Site Location Plan

1.1 Site Location

1.1.1 Green Hill E is located to the north of Earls Barton village in North Northamptonshire. Wilby Village is

located 1.2km to the east and Sywell Village is located 1.7km to the north-west of Green Hill E. Wellingborough Train Station is located approximately 5km to the north-east of Green Hill E. The National Grid Reference for Green Hill E is approximately 485110, 267880 in the north (EF2) to 484950, 264880 in the south (EF30), and 483690, 266370 in the west (EF34) to 485570, 266590 in the east (EF4).

1.2 Existing Site Conditions

1.2.1 Online mapping (including Google Maps / Google Streetview imagery accessed March 2025) shows that Green Hill E comprises agricultural / arable fields.

1.3 Topography

1.3.1 Topographic levels to metres Above Ordnance Datum (m AOD) have been derived from a 1m resolution Environment Agency (EA) composite 'Light Detecting and Ranging' (LiDAR) Digital Terrain Model (DTM). A review of LiDAR ground elevation data shows that Green Hill E slopes from approximately 114m AOD in the north within Fields EF1 and EF2 to approximately 71 to 73m AOD in the south within Fields EF29 and EF30 (Figure 2).

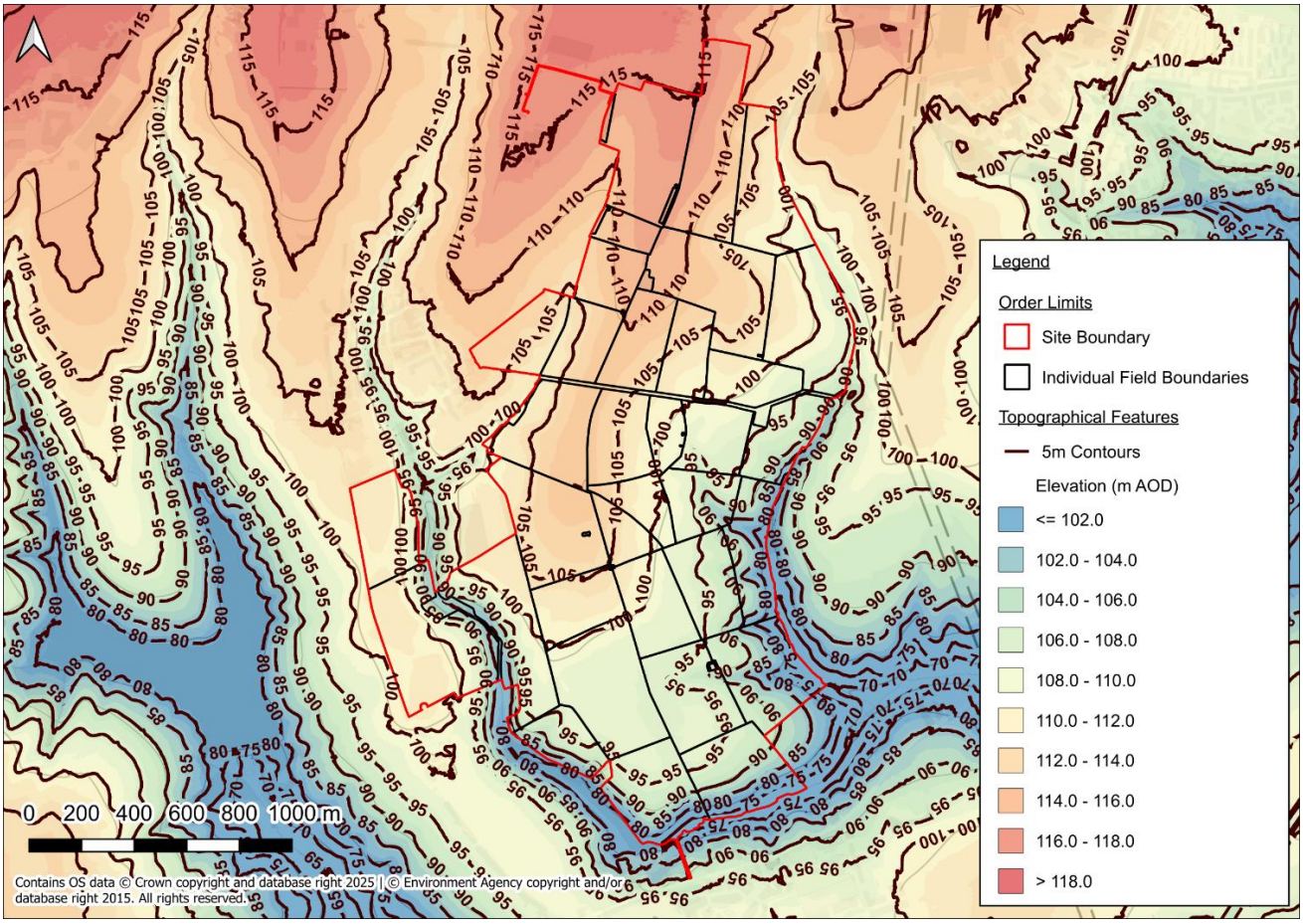


Figure 2: LiDAR Plan

1.4 Hydrology

1.4.1 The nearest watercourse to Green Hill E is an Unnamed Ordinary Watercourse which flows through Green Hill E southwards along the western boundary of Fields EF23 and EF32, and the eastern boundaries of

EF34 and EF33. The watercourse then flows in an easterly to north easterly direction along the south of Fields EF30 and EF29.

1.4.2 A second Unnamed Ordinary Watercourse flows along the whole eastern boundary of Green Hill E before converging with the first Unnamed Ordinary Watercourse 130m south-east of Field EF27. Once converged, the watercourse becomes Swanspool Brook, a main river, which flows in a north-easterly then southernly direction before joining the River Nene 5.5km east of Green Hill E.

1.5 Water Framework Directive Status

1.5.1 Green Hill E is located within the Nene Catchment, largely within the Swanspool Brook Water Body Catchment and partially within the Sywell Brook Water Body Catchment[i].

1.5.2 The Sywell Brook Water Body catchment has a Cycle 3 Ecological status of Poor in 2019 and 2022 and a Failing chemical status in 2019 (no data in 2022).

1.5.3 The Swanspool Brook Water Body has a Cycle 3 Ecological status of Moderate in 2019 and 2022 and a Failing chemical status in 2019 (no data in 2022).

1.5.4 A summary of the Water Body Classifications for the catchments are included as Annex A.

1.6 Geology

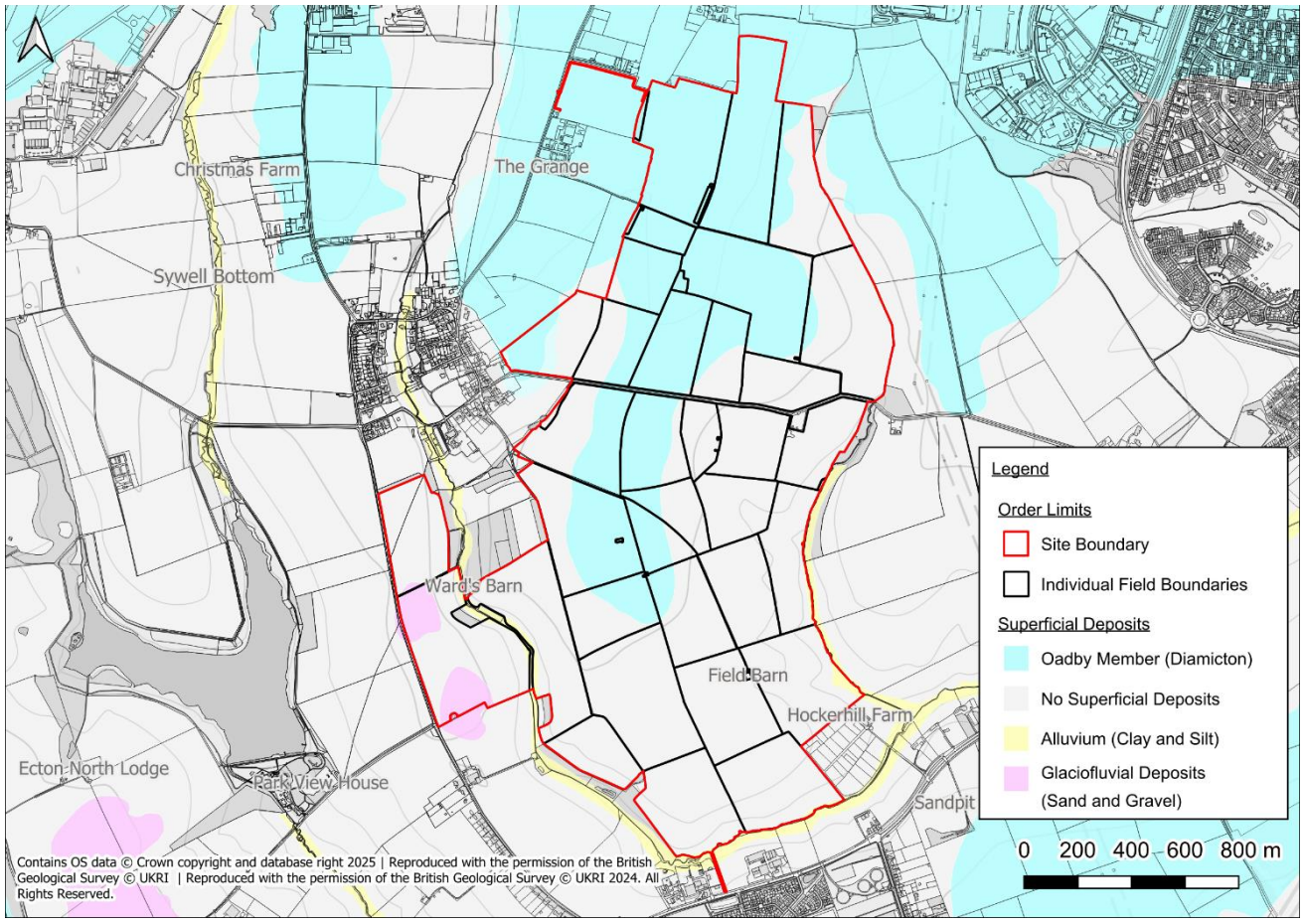


Figure 3: Superficial Deposits

1.6.1 Reference to the British Geological Survey (BGS) online mappingii (1:50,000 scale) indicates that Green Hill E is underlain by the following superficial deposits (see Figure 3 for the locations of the varying deposits):

- Oadby Member generally comprising Diamicton;
- Alluvium, comprising Clay and Silt; and
- Glaciofluvial Deposits (mid Pleistocene) consisting of Sand and Gravel;

1.6.2 There are also areas on the Site identified as not being underlain by any superficial deposits.

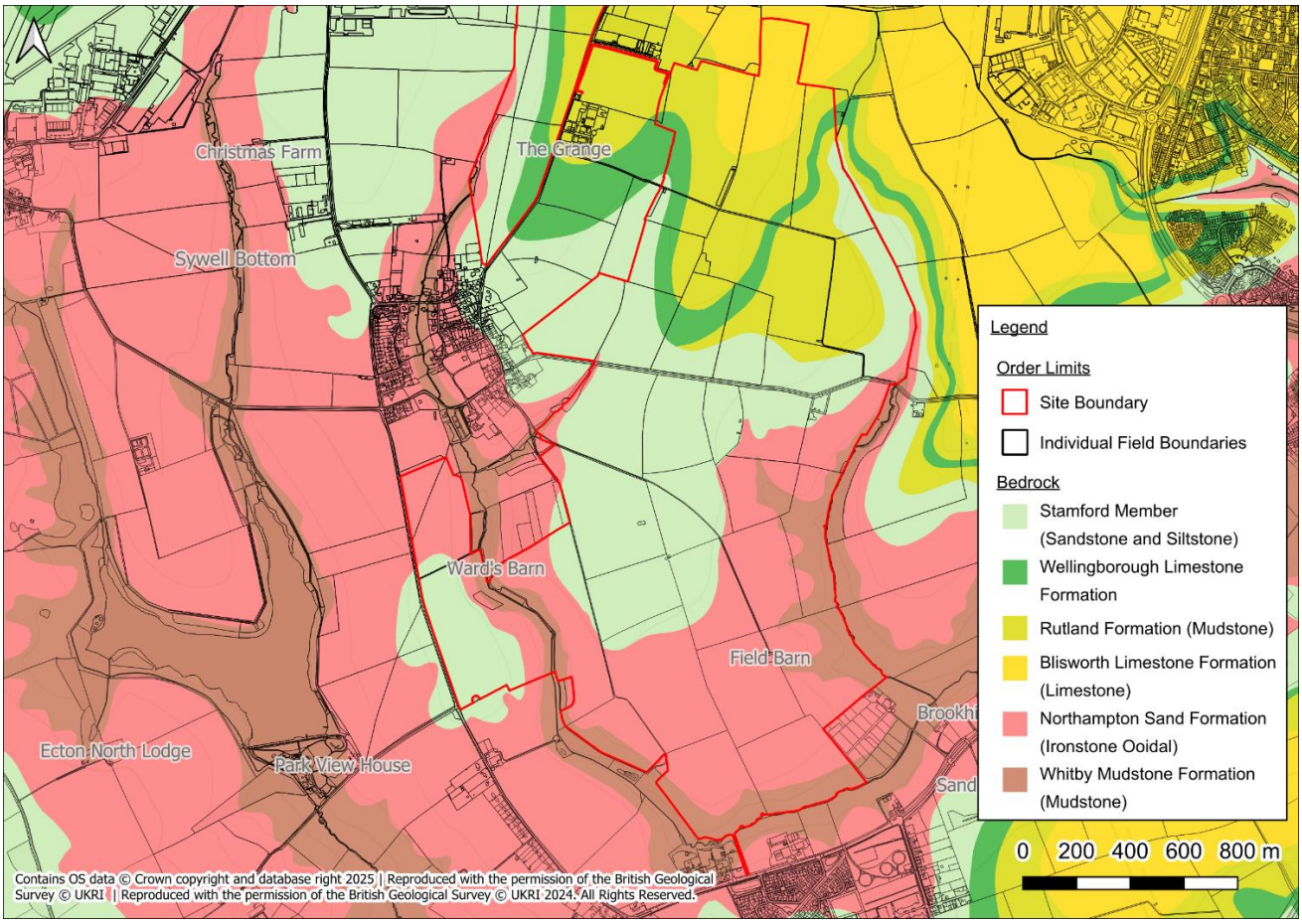


Figure 4: Bedrock Deposits

1.6.3 The Site is identified as being underlain by the following bedrock deposits (see Figure 4 for the locations of the varying deposits):

- Stamford Member, comprising Sandstone and Siltstone (interbedded);
- Rutland Formation, comprising Mudstone;
- Wellingborough Limestone Member, consisting of Limestone and Mudstone;
- Blisworth Limestone Formation, comprising Limestone.
- Northampton Sand Formation, consisting of Ironstone (ooidal); and

- Whitby Mudstone Formation, comprising Mudstone.

1.6.4 The geological mapping is available at a scale of 1:50,000 and as such may not be accurate on a Site-specific basis.

1.6.5 There are no BGS boreholes located at the Site.

1.7 Hydrogeology

1.7.1 According to the EA's Aquifer Designation data, obtained from MAGIC Map's online mapping[iii] [accessed 14/05/24], the Alluvium and the Glaciofluvial Deposits are classified as Secondary A Aquifers. The Oadby Member is described as a Secondary Undifferentiated Aquifer.

1.7.2 The underlying Rutland Formation is described as a Secondary B Aquifer, whereas the Blisworth Limestone Formation is described as a Principal Aquifer. The Wellingborough Limestone Member, Stamford Member and Northampton Sand Formation are classified as Secondary A Aquifers. The Whitby Mudstone Formation is detailed as an Unproductive Aquifer.

1.7.3 The EA's 'Source Protection Zones' data, obtained from MAGIC Map's online mapping[iv] [accessed 14/05/24], indicates that Green Hill E is not located within a Groundwater Source Protection Zone.

1.8 Proposed Site Conditions

1.8.1 The Scheme at Green Hill E is for a ground mounted solar photo-voltaic plant and associated substations and access road.

1.8.2 Final development plans for Green Hill E detail that the vast majority of the Site is proposed to be utilised for solar panels, supporting infrastructure, internal access and peripheral areas will comprise landscaped buffers in line with the embedded mitigation described throughout the ES.

2. Assessment of Flood Risk

The aim of this section of the report is to assess and summarise the existing flood risk at Green Hill E.

2.1 Fluvial Flood Risk

2.1.1 A network of land drainage ditches is oriented north–south between Fields EF33 and EF23, and east–west through the centre of Green Hill E. The north–south ditch flows southwards, and the east–west ditch flows westwards before joining the north–south ditch. All land drains within the Site are classified as ordinary watercourses and therefore fall under the regulatory remit of the LLFA rather than the EA. The LLFA holds permissive powers to manage flood risk but is not responsible for routine maintenance, which remains with riparian landowners. By contrast, Main Rivers are managed by the EA.

2.1.2 Fluvial flooding could occur if the land drains overtopped their banks during or following an extreme rainfall event.

2.1.3 According to the EA's updated Flood Map for Planning[v], the majority of Green Hill E is situated in Flood Zone 1. However, an area associated with local land drains that bisects Fields EF23 and EF33 along the southern and eastern boundaries, and an area that bisects Fields EF9 and EF10, are indicated to be within Flood Zone 3. The Flood Zones are largely shown to remain outside the extents of the proposed development, with the exception of Field EF10, where Flood Zone extents are shown to encroach into the proposed panelled areas.

2.1.4 The Environment Agency has advised that, for any development located within Flood Zone 3a (i.e. the 1 in 100-year plus climate change flood extent), floodplain storage compensation should be incorporated into the design. Compensation should be provided on a level-for-level and volume-for-volume basis, ensuring direct replacement of any lost storage. In line with this, calculations have been undertaken in accordance with Section A3.3.10 of CIRIA Guide C624: *Development and Flood Risk – guidance for the construction industry*.

2.1.5 Flood volume loss has been conservatively estimated based on the cross-sectional area of the proposed panel supports (28.65 cm^2), multiplied by the number of supports located within Flood Zones 2 and 3 across the Site (assumed as 10 piles per 100 m of panels, equating to approximately 2,200 piles – see Annex B for information on the cross-section), and applying a worst-case flood depth of 1.2 m. This results in a total displaced volume of just 8 m^3 across the entire submission area.

2.1.6 The floodplain area within the Green Hill E catchment has been calculated as approximately 27,000 m^2, with a downstream boundary defined approximately 180 m south of Wilby Road, where a land drain appears to be culverted beneath Wilby Road. When the conservatively estimated displaced volume of 8 m^3, representing the total potential flood storage displacement across the entire DCO application area, is spread across the full floodplain extent, the theoretical increase in flood depth is approximately 0.296 mm. This is considered negligible, well within the natural variability of floodplain behaviour, and would result in no perceptible change in flood levels or flow routes. It therefore represents a highly conservative assessment of worst-case impacts.

2.1.7 Given the extremely limited displacement, the conservative assumptions applied, and the imperceptible

increase in flood depth, the impact on flood storage capacity is considered de minimis. On this basis, it is concluded that further consideration or provision of compensatory flood storage resulting from panelled areas encroaching into the flood extents is not necessary or proportionate for the proposed development.

Table 1: Fields Impacted by Fluvial Flood Risk

Field	Boundary
EF9	Eastern
EF33	Eastern
EF27	Eastern
EF18	Eastern
EF17	Eastern
EF23	Western
EF7	Western
EF8	Western
EF23	Western
EF30	Southern
EF29	Southern

2.1.8 The EA 'Historical Flood Map' indicates that Green Hill E is not in the near vicinity of any previous flood events.

2.1.9 The flood extents (Figure 5) that run between the Fields and along the Field boundaries reflect the location of the drainage ditches. Therefore, it could be considered that the EA modelling is identifying topographic depressions rather than fluvial extents.

2.1.10 The 2017 SFRA indicates that there have been past flooding incidents approximately 250m west of the Site in Mears Ashby and another incident adjacent to the east next to Mears Asby Road. The flood extents that run between Fields EF33 and EF23 are located within a Flood Alert Area according to the SFRA.

2.1.11 In the absence of modelled flood data, surface water flood maps can be used as a proxy to provide an understanding of potential fluvial flood risk. Surface water mapping indicates multiple flow routes are present which bound and bisect Green Hill E. The flow routes are largely retained within existing ditches with the exception of the flow route which bisects Fields EF9 and EF1.

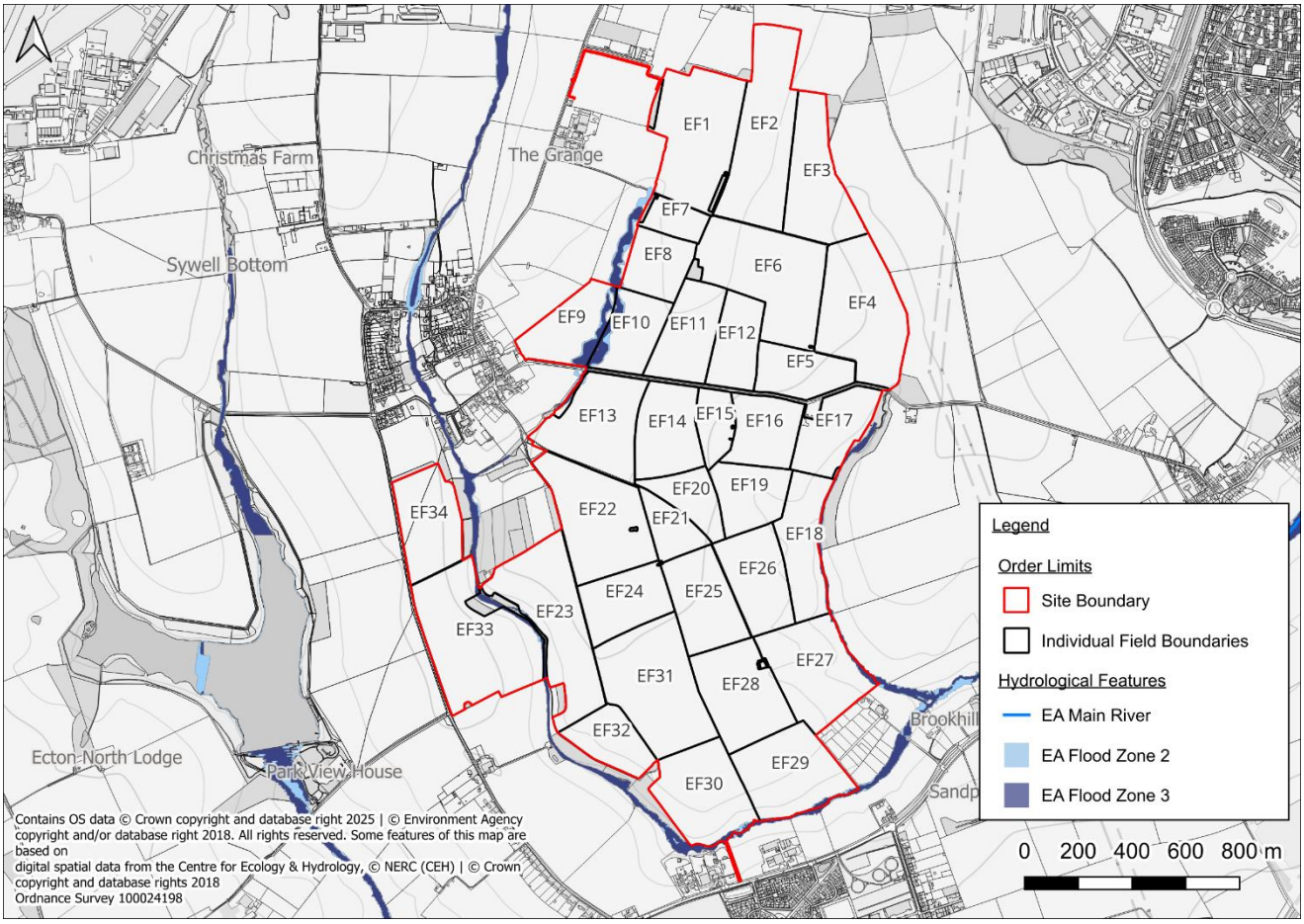


Figure 5: EA's Flood Map for Planning

2.1.12 Additionally, in the absence of modelled flood data, the Manning's open channel flow formula has been used to demonstrate and quantify potential fluvial flood risk to the Site during a 1% AEP +36% CC fluvial event. Cross sections of existing watercourses and the wider floodplain have been extracted from EA LiDAR data (flown Q1 2020) and used to inform the calculations. More detail on these calculations is provided in Annex C. The flood levels estimated by the calculations suggest that the flood extent is low and that flood extents on Site would be similar to or smaller than the EA surface water flood extents, which could therefore be used as a conservative proxy for fluvial flood risk. Surface water flooding is assessed in Section 2.4 below.

2.1.13 The mapping indicates that the watercourses reach depths of up to 1.2m, with some adjacent river extents reaching depths of up to 0.9m. However, the majority of the remaining depths on the Site are not expected to exceed 0.6m.

Consultation

2.1.14 The EA were consulted in January 2024, a response was received in August 2024 and is included in Annex D.

2.1.15 The North Northamptonshire LLFA was contacted in February 2024. A response was received in April 2024 and is included in Annex E.

2.1.16 Further to this, the EA and LLFA were consulted with throughout the pre-application process, with

guidance complied with where required.

2.1.17 Green Hill E is not located within an IDB.

Summary

2.1.18 Green Hill E is therefore considered to be at **Low** risk of fluvial flooding, the proposed solar panels will be raised above surrounding ground levels with associated power infrastructure appropriately located out of the flood zone and waterproofed.

2.2 Surface Water Flood Risk

2.2.1 The EA's National Flood Risk Assessment Mapping (NaFRA), known as the Long Term Flood Risk Map (Surface Water)vi was updated in January 2025.

2.2.2 The NaFRA mapping provides an updated view of surface water flooding across the sites, however it should be noted that at the time of writing, the NaFRA mapping only delivers climate change insight up to the year 2060.

2.2.3 The previous EA Risk of Flooding from Surface Water (RoFSW) mapping indicates that the majority of Green Hill E is at Very Low risk of surface water flooding, meaning it has a <0.1% annual probability of flooding. However, there are areas of Low to High risk in different Fields which are identified below:

Table 2: Fields Impacted by Surface Water Flooding

Field	Risk	Area of Sub Section at Risk
EF3	High	North and South
EF4, EF5, EF17, EF12, EF33 and EF9	High	Eastern boundary
EF18	High	Eastern boundary and two central streams
EF19, EF26, EF28, EF16 and EF31	High	Through centre
EF15	Low	Through centre
EF5, EF7, EF10, EF13 and EF23	High	Western boundary
EF22	Low	Northwest corner
EF27	High	Eastern boundary and areas in the north and centre
EF29 and EF30	High	Southern boundary
EF1	High	West of the area

2.2.4 Low risk of surface water flooding means it has between a 1% and 0.1% annual probability of flooding and High risk of surface water flooding means it has a >3.3% annual probability of flooding.

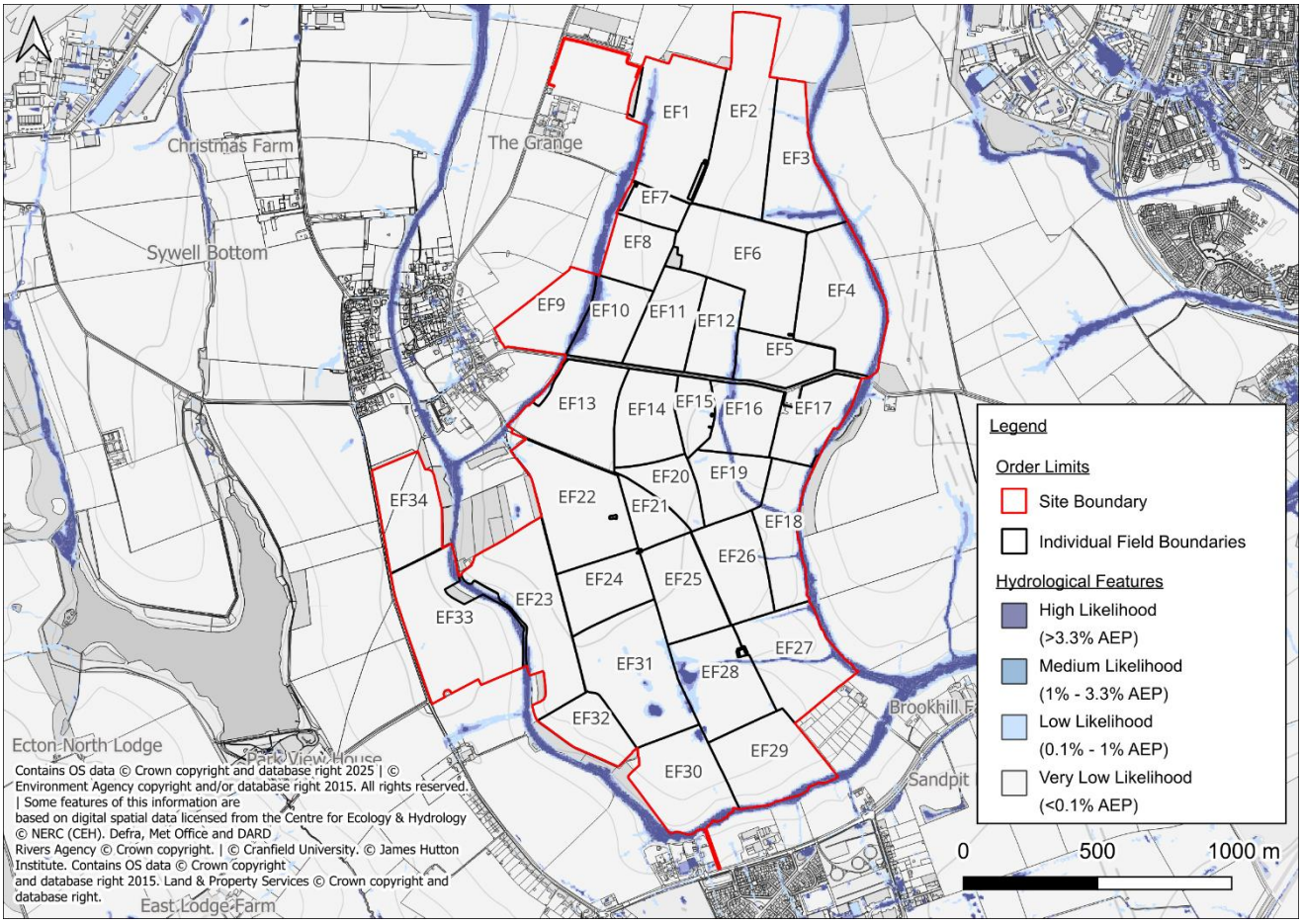


Figure 6: EA's Long-Term Flood Risk Map (Flood Risk from Surface Water)

2.2.5 The updated NaFRA mapping (Figure 6) has been assessed and indicates that there is no visible change in surface water risk across Green Hill E. As described in the fluvial section above, the surface water flooding extents largely correspond with the land drainage ditches which flow through and along the boundaries of Green Hill E.

2.2.6 During the Low risk scenario, floodings depths along the western and southern boundaries (Fields encroached by surface water flooding are indicated in the above table) are above 0.9m. However, this is likely exaggerated due to the flood risk reflecting the drainage ditches (as stated above). The areas through Green Hill E that are impacted by surface water flooding, have flood depths of below 0.3m, with the exception of Fields EF18 and EF19 that have flood depths of between 0.6m and 0.9m.

2.2.7 Surface water depths of less than 0.3m are typically passable by both vehicles and pedestrians. Therefore, the majority of Green Hill E is deemed passible. Additionally, the Low risk scenario is a residual risk and is unlikely to occur.

2.2.8 There is no indication within relevant third-party reports (listed in 'Sources of Information' on the Covering Report) to suggest that Green Hill E has historically experienced surface water flooding.

2.2.9 Based on the above and considering the embedded mitigation as part of the design of the solar panels, the overall risk of surface water flooding is considered to be **Low**. The proposed solar panels will be raised above surrounding ground levels and will be appropriately located out of the flood zone and waterproofed

thereby reducing the potential to be impacted in the event of surface water flooding.

2.2.10 The impact of the development on surface water risk is covered in Section 5.0 of the Covering Report to ensure that surface water risk is not exacerbated through appropriate SuDS measures.

2.3 Groundwater Flood Risk

2.3.1 The geology is identified above in Section 1.0. There were no illegible boreholes in the near vicinity.

2.3.2 There is no information within relevant third party reports (listed 'Sources of Information' on the Covering Report) to suggest that the Site has experienced historical groundwater flooding. The 2017 SFRA indicates that Green Hill E is within an area at Low risk of groundwater flooding.

2.3.3 The Scheme does not include any basement structures or buildings requiring permanent occupation. Only unstaffed, above-ground supporting infrastructure is proposed, which would not be sensitive to low-level groundwater seepage.

2.3.4 Soilscapes indicates that the south of Green Hill E is 'freely draining' and the north is indicated as having 'Slightly Impeded Drainage'.

2.3.5 It can be concluded that the risk of groundwater flooding is **Low** and no specific mitigation measures are required.

2.4 Sewer Flooding

2.4.1 No Site-specific incidents of sewer flooding have been identified from relevant third-party reports. On the basis of the Site's rural setting the presence of sewerage infrastructure is unlikely. Utility records have been checked and no sewers are identified within the Site. There are gas pipes that bisect several Fields within the Site, however these have been respected in the Scheme design.

2.4.2 It can therefore be concluded that the risk of sewer flooding is **Low.**

2.5 Reservoir and Canal Flooding

2.5.1 There are no canals within the vicinity of Green Hill E, therefore there is negligible associated flood risk.

2.5.2 The EA 'Flood Risk from Reservoirs' map shows that Green Hill E is not at risk of flooding from reservoirs.

2.5.3 It can therefore be concluded that there is a **Negligible** risk of flooding from artificial sources.

2.6 Residual Flood Risks

2.6.1 A residual risk is an exceedance event, such as the 1 in 1000 year (0.1% AEP) flood event that would overtop the land drains and potentially impact the Site. As the probability of a 1 in 1000 year flood event occurring is 0.1% in any given year, the probability is low and, therefore, no further mitigation beyond what is proposed is required.

2.6.2 In the event of the defences failing or an exceedance event occurring, the residual risk to people working within the Site can be managed through the implementation of an appropriate Site management plan,

which recognises the residual risks and details what action is to be taken by staff in the event of a flood to put occupants in a place of safety

2.7 Summary of Flood Risk and Mitigation

2.7.1 It can be concluded that the risk to Green Hill E from all sources of flooding is Negligible to Low, however it would be prudent to include the below mitigation measures.

2.8 Embedded Mitigation

2.8.1 Embedded Mitigation is detailed in Section 3.2 of the covering report

2.9 Impact on Off-Site Flood Risk

2.9.1 The solar panels will be mounted on frames and raised above ground level allowing flood water to flow freely underneath. Therefore, there will be no loss of floodplain volume as a result of the Scheme and no increase in flood risk elsewhere.

2.9.2 The supporting infrastructure is insignificant in size and will not increase flood risk elsewhere.

2.9.3 Surface water management has been considered in Section 5.0 of the Covering Report.

3. Conclusions and Recommendations

3.1 Conclusions

3.1.1 The Scheme is for a ground mounted solar farm and associated infrastructure and access roads.

Flood Risk

3.1.2 Green Hill E is located within Flood Zone 1 on the Environment Agency (EA) 'Flood Map for Planning (Rivers and Sea)' – an area considered to have the lowest probability of fluvial and tidal flooding.

3.1.3 The risk of flooding from all sources has been assessed and the flood risk is considered to be **Negligible to Low** and therefore does not require Site-specific mitigation measures.

3.1.4 The solar panels will be mounted on raised frames and therefore raised above surrounding ground level allowing flood water to flow freely underneath. Therefore, there will be no loss of floodplain volume as a result of the Scheme.

3.2 Recommendations

3.2.1 Embedded Mitigation is detailed in Section 3.2 of the covering report.

Annex A – Water Body Catchment Classifications Summaries

The Sywell Brook Water Body catchment Classification Summary

Classification Item	2019 Classification		2022 Classification	Cycle 3 Objectives		
	Cycle 2	Cycle 3	Cycle 3	Status	Year	Reasons
Ecological	Poor	Poor	Poor	Good	2027- Low confidence	Disproportionately expensive: Disproportionate burdens
Biological Quality Elements	Poor	Poor	Poor	Good	2027- Low confidence	Disproportionately expensive: Disproportionate burdens
Invertebrates	Moderate	Moderate	Moderate	Good	2027- Low confidence	Disproportionately expensive: Disproportionate burdens
Macrophytes and Phytobenthos Combined	Poor	Poor	Poor	Good	2027- Low confidence	Disproportionately expensive: Disproportionate burdens
Physio-Chemical Quality Elements	High	High	High	Good	2015	
Ammonia (Phys-Chem)	High	High	High	Good	2015	
Dissolved Oxygen	High	High	High	Good	2015	
Phosphate	High	High	High	Good	2015	
Temperature	High	High	High	Good	2015	
pH	High	High	High	Good	2015	
Hydromorphological Supporting Elements	Supports Good	Supports Good	Supports Good	Supports Good	2015	
Supporting Elements (surface Water)	N/A	N/A	N/A	N/A	2015	
Mitigation Measures Assessment	N/A	N/A	N/A	N/A	2015	
Chemical	Fail	Fail	N/A	Good	2063	Natural conditions: Chemical status recovery time; Technically infeasible: No known technical solution is available
Priority Hazardous Substances	Fail	Fail	N/A	Good	2063	Natural conditions: Chemical status recovery time; Technically infeasible: No known technical solution is available
Benzo(a)pyrene	Good	Good	N/A	Good	2015	
Dioxins and dioxin-like compounds	Good	Good	N/A	Good	2015	
Heptachlor and cis-Heptachlor Epoxide	Good	Good	N/A	Good	2015	
Hexachlorobenzene	Good	Good	N/A	Good	2015	
Hexachlorobutadiene	Good	Good	N/A	Good	2015	
Mercury and Its Compounds	Fail	Fail	N/A	Good	2040	Natural conditions: Chemical status recovery time
Perfluorooctane sulphonate (PFOS)	Fail	Fail	N/A	Good	2039	Technically infeasible: No known technical solution is available
Polybrominated diphenyl ethers (PBDE)	Fail	Fail	N/A	Good	2063	Natural conditions: Chemical status recovery time
Priority substances	Good	Good	N/A	Good	2015	
Cypermethrin (Priority)	Good	Good	N/A	Good	2015	
Fluoranthene	Good	Good	N/A	Good	2015	
Other Pollutants	N/A	N/A	N/A	N/A	2015	

The Swanspool Brook Water Body Catchment Classification Summary

Classification Item	2019 Classification		2022 Classification	Cycle 3 Objectives		
	Cycle 2	Cycle 3	Cycle 3	Status	Year	Reasons
Ecological	Moderate	Moderate	Moderate	Good	2027- Low confidence	Disproportionately expensive: Disproportionate burdens
Biological Quality Elements	Moderate	Moderate	Moderate	Good	2027- Low confidence	Disproportionately expensive: Disproportionate burdens
Invertebrates	Moderate	Moderate	Moderate	Good	2027- Low confidence	Disproportionately expensive: Disproportionate burdens
Macrophytes and Phytobenthos Combined	Moderate	Moderate	Moderate	Good	2027- Low confidence	Disproportionately expensive: Disproportionate burdens
Physio-Chemical Quality Elements	Moderate	Moderate	Good	Good	2027	Disproportionately expensive: Disproportionate burdens
Acid Neutralising Capacity	High	High	N/A	Good	2015	
Ammonia (Phys-Chem)	High	High	High	Good	2015	
Dissolved Oxygen	Moderate	Moderate	N/A	Good	2015	
Phosphate	Moderate	Moderate	Good	Good	2027	Disproportionately expensive: Disproportionate burdens
Temperature	Good	Good	N/A	Good	2015	
pH	High	High	N/A	Good	2015	
Hydromorphological Supporting Elements	Supports good	Supports good	Supports good	Supports good	2015	
Chemical	Fail	Fail	N/A	Good	2063	Natural conditions: Chemical status recovery time; Technically infeasible: No known technical solution is available
Priority Hazardous Substances	Fail	Fail	N/A	Good	2063	Natural conditions: Chemical status recovery time; Technically infeasible: No known technical solution is available
Benzo(a)pyrene	Good	Good	N/A	Good	2015	
Dioxins and dioxin-like compounds	Good	Good	N/A	Good	2015	
Heptachlor and cis-Heptachlor Epoxide	Good	Good	N/A	Good	2015	
Hexachlorobenzene	Good	Good	N/A	Good	2015	
Hexachlorobutadiene	Good	Good	N/A	Good	2015	
Mercury and Its Compounds	Fail	Fail	N/A	Good	2040	Natural conditions: Chemical status recovery time
Perfluorooctane sulphonate (PFOS)	Fail	Fail	N/A	Good	2039	Technically infeasible: No known technical solution is available
Polybrominated diphenyl ethers (PBDE)	Fail	Fail	N/A	Good	2063	Natural conditions: Chemical status recovery time
Priority substances	Good	Good	N/A	Good	2015	
Cypermethrin (Priority)	Good	Good	N/A	Good	2015	
Fluoranthene	Good	Good	N/A	Good	2015	
Other Pollutants	N/A	N/A	N/A	N/A	2015	

Annex B – Cross Section of Solar Panel Supports

Cross-Section Properties

W 8x15

Geometry

Depth	h	206.0	mm
Width	b	102.1	mm
Web thickness	t_w	6.2	mm
Flange thickness	t_f	8.0	mm
Inner depth between flanges	h_i	190.0	mm
Root fillet radius	r_1	7.6	mm
Depth of straight portion of web	d	174.8	mm
Design distance	k_{des}	15.6	mm
Detailing distance	k_{det}	20.6	mm
Distance	k_1	14.3	mm

Sectional Area

Sectional area	A	28.65	cm^2

Bending

Area moment of inertia about y-axis	I_y	1997.91	cm^4
Area moment of inertia about z-axis	I_z	141.93	cm^4
Polar area moment of inertia	I_p	2139.85	cm^4
Radius of gyration about y-axis	i_y	83.6	mm
Radius of gyration about z-axis	i_z	22.3	mm
Polar radius of gyration	i_p	86.5	mm
Maximum statical moment of area about y-axis	$\max S_y$	108.81	cm^3
Maximum statical moment of area about z-axis	$\max S_z$	10.45	cm^3
Elastic section modulus about y-axis	W_y	193.37	cm^3
Elastic section modulus about z-axis	W_z	27.86	cm^3

Shear

Shear area in y-direction	A_y	13.64	cm^2
Shear area in z-direction	A_z	11.72	cm^2

Torsion

Torsional constant	I_t	5.70	cm^4
Secondary torsional constant	$I_{t,s}$	1335.65	cm^4
Section modulus for torsion	W_t	7.13	cm^3

Warping

Warping ordinate with respect to shear center	$\max \omega$	50.39	cm^2
Warping constant with respect to shear center	I_ω	13910.16	cm^6
Warping radius of gyration with respect to shear center	i_ω	25.5	mm
Warping section modulus with respect to shear center	W_ω	276.07	cm^4
Maximum warping statical moment with respect to shear center	$\max S_\omega$	102.81	cm^4

Plasticity

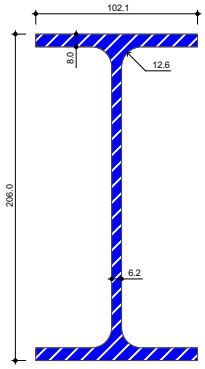
Plastic section modulus about y-axis	$W_{pl,y}$	222.86	cm^3
Plastic section modulus about z-axis	$W_{pl,z}$	43.75	cm^3
Plastic warping section modulus with respect to shear center	$W_{pl,\omega}$	412.91	cm^4
Plastic section modulus of webs about y-axis	$W_{pl,y,webs}$	56.16	cm^3
Plastic section modulus of flanges about z-axis	$W_{pl,z,flanges}$	41.71	cm^3
Plastic shape factor about y-axis	$\alpha_{pl,y}$	1.153	--
Plastic shape factor about z-axis	$\alpha_{pl,z}$	1.571	--
Plastic shape factor with respect to shear center	$\alpha_{pl,\omega}$	1.500	--
Plastic shear area in y-direction	$A_{pl,y}$	16.34	cm^2
Plastic shear area in z-direction	$A_{pl,z}$	12.32	cm^2
Plastic limiting axial force	N_{pl}	673.601	kN
Plastic limiting shear force in y-direction	$V_{pl,y}$	221.688	kN
Plastic limiting shear force in z-direction	$V_{pl,z}$	167.169	kN
Plastic limiting bending moment about y-axis	$M_{pl,y}$	52.31	kNm
Plastic limiting bending moment about z-axis	$M_{pl,z}$	10.29	kNm

Other

Ultimate resistance to axial force	N_u	673.601	kN

W 8x15

- AISC 15
- --



Weight	G	22.5	kg/m
Surface area per unit length	A_m	0.795	m^2/m
Volume	V	2864.51	cm^3/m
Section factor	A_m/V	277.497	1/m
Web area	A_w	11.82	cm^2

Annex C - Manning's Open Channel Flow Mapping

313532 Green Hill Solar Farm

Manning's Open Channel Flow Calculation - Option Area E

Methodology

Cross-sections of the channel and floodplain were extracted from Environment Agency (EA) LiDAR DTM data (flown Q1 2020) at the locations shown in Figure 1. These cross-sections can be considered representative of the channel and general floodplain adjacent to the site and at the location of the proposed development. Due to the nature of LiDAR, volume and conveyance of the main channels will likely be underestimated, providing a conservative assessment of fluvial flood risk.

The cross-sections were imported into Flood Modeller and the "tabulate cross section properties" tool was utilised to establish the level-flow relationship for the channel and wider floodplain. This tool utilises the Manning's open channel flow equation. Manning's 'n' roughness was set to 0.03s/m$^{1/3}$ for the channel and 0.04s/m$^{1/3}$ for the floodplain based on aerial imagery. The bed slope was set for each cross-section based on underlying LiDAR. Catchment descriptors for the catchments upstream of the outlet locations shown in Figure 1 were imported into ReFH2 and used to provide an estimate of flows within the channel during the 1% AEP +36%CC event. These flows were scaled by area as required.

Within this excel workbook, the xlookup function has been used along with the Flood Modeller level-flow relationship for the cross-sections to determine the equivalent water level for the calculated flow, rounding up where a direct match is not found. To provide additional confidence in the assessment, a second xlookup has been used to determine the estimated flood level should an additional 50% flow be applied.

Cross-sections have been located at suitable locations throughout the proposed development. Whilst it is acknowledged that the Manning's open channel flow equation used to determine the level-flow relationship does not constitute detailed hydraulic modelling, the calculation can still be considered suitable to demonstrate the scale of the changes in water level that can be expected when considering a +36% uplift in flows (Nene Catchment, 2080's higher allowance).

Cross-Section Locations

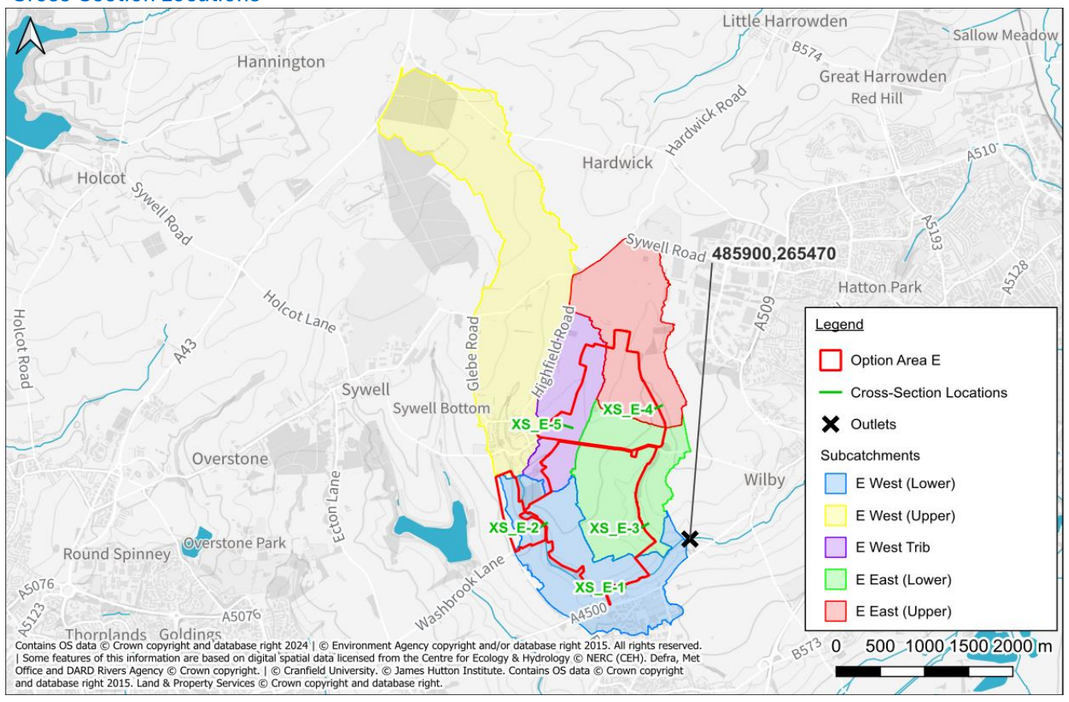


Figure 1: Cross-section locations

Calculated Flows and Levels

Cross-Section	ReFH2 Peak Flow - 1% AEP +36%CC (m^3/s)	Equivalent Flood Level (m AOD)	Sensitivity Flow - ReFH2 +50% (m^3/s)	Equivalent Flood Level (m AOD)
E-1	3.29	72.71	4.93	72.84 (+126mm)
E-2	2.37	84.06	3.55	84.20 (+135mm)
E-3	1.59	73.04	2.38	73.10 (+59mm)
E-4	0.81	95.08	1.22	95.20 (+120mm)
E-5	0.49	103.11	0.74	103.19 (+87mm)

Tabulated Cross-Section Properties | E-1

(Calculated by Flood Modeller)

Node	Flow (m^3/s)	Stage (m AOD)	Depth (m)	Velocity (m/s)	Froude no.	Area (m^2)	Conveyance (m^3/s)	Width (m)	W Perim. (m)	Slope
E-1	0.000	71.905	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.0042
E-1	0.000	71.906	0.001	0.010	0.146	0.001	0.000	1.034	1.034	0.0042
E-1	0.019	71.965	0.060	0.201	0.307	0.096	0.295	2.188	2.204	0.0042
E-1	0.100	72.041	0.136	0.348	0.351	0.287	1.539	2.861	2.900	0.0042
E-1	0.241	72.117	0.212	0.454	0.374	0.530	3.703	3.534	3.596	0.0042
E-1	0.524	72.213	0.308	0.589	0.398	0.890	8.060	3.980	4.081	0.0042
E-1	0.905	72.308	0.403	0.701	0.414	1.292	13.921	4.425	4.566	0.0042
E-1	1.386	72.404	0.499	0.798	0.427	1.737	21.306	4.870	5.051	0.0042
E-1	1.703	72.460	0.555	0.844	0.432	2.019	26.179	5.203	5.403	0.0042
E-1	2.058	72.516	0.611	0.887	0.438	2.319	31.639	5.536	5.754	0.0042
E-1	2.782	72.613	0.708	0.964	0.446	2.885	42.770	6.062	6.316	0.0042
E-1	3.630	72.711	0.806	1.037	0.454	3.501	55.805	6.587	6.878	0.0042
E-1	4.226	72.765	0.860	1.087	0.489	3.888	64.972	7.728	8.034	0.0042
E-1	5.118	72.837	0.932	1.141	0.513	4.487	78.678	8.906	9.231	0.0042
E-1	5.721	72.881	0.976	1.167	0.533	4.903	87.955	10.027	10.363	0.0042
E-1	6.639	72.940	1.035	1.204	0.535	5.514	102.060	10.662	11.016	0.0042
E-1	7.657	72.999	1.094	1.243	0.537	6.161	117.717	11.297	11.668	0.0042
E-1	8.158	73.026	1.121	1.261	0.539	6.470	125.420	11.579	11.957	0.0042
E-1	10.278	73.122	1.217	1.343	0.561	7.655	158.010	13.102	13.493	0.0042
E-1	11.314	73.164	1.259	1.377	0.568	8.218	173.940	13.735	14.131	0.0042
E-1	13.883	73.258	1.353	1.452	0.578	9.563	213.429	14.872	15.284	0.0042
E-1	15.951	73.326	1.421	1.506	0.584	10.593	245.226	15.650	16.075	0.0042
E-1	18.206	73.393	1.488	1.559	0.591	11.675	279.890	16.428	16.865	0.0042
E-1	18.619	73.405	1.500	1.568	0.593	11.874	286.245	16.645	17.084	0.0042
E-1	21.575	73.486	1.581	1.624	0.606	13.284	331.688	18.168	18.615	0.0042
E-1	23.666	73.539	1.634	1.657	0.617	14.280	363.835	19.431	19.883	0.0042
E-1	24.116	73.550	1.645	1.664	0.619	14.496	370.751	19.703	20.156	0.0042
E-1	25.823	73.591	1.686	1.684	0.631	15.332	396.998	21.087	21.544	0.0042
E-1	28.987	73.659	1.754	1.724	0.636	16.812	445.643	22.452	22.915	0.0042
E-1	30.093	73.681	1.776	1.738	0.638	17.310	462.635	22.851	23.318	0.0042
E-1	35.505	73.781	1.876	1.804	0.643	19.681	545.838	24.554	25.032	0.0042
E-1	37.369	73.813	1.908	1.825	0.645	20.475	574.507	25.095	25.577	0.0042
E-1	41.554	73.882	1.977	1.868	0.649	22.250	638.836	26.356	26.846	0.0042
E-1	45.416	73.941	2.036	1.906	0.651	23.834	698.208	27.319	27.816	0.0042
E-1	50.047	74.007	2.102	1.950	0.654	25.671	769.408	28.358	28.863	0.0042
E-1	55.402	74.079	2.174	1.996	0.658	27.758	851.731	29.610	30.124	0.0042
E-1	57.996	74.111	2.206	2.020	0.660	28.712	891.615	30.064	30.583	0.0042

Node	Flow (m^3/s)	Stage (m AOD)	Depth (m)	Velocity (m/s)	Froude no.	Area (m^2)	Conveyance (m^3/s)	Width (m)	W Perim. (m)	Slope
E-1	63.957	74.180	2.275	2.075	0.663	30.830	983.254	30.875	31.407	0.0042
E-1	70.259	74.250	2.345	2.129	0.666	33.004	1080.145	31.686	32.231	0.0042
E-1	76.975	74.322	2.417	2.179	0.671	35.327	1183.384	32.846	33.402	0.0042
E-1	78.389	74.337	2.432	2.188	0.672	35.822	1205.129	33.115	33.672	0.0042
E-1	85.860	74.414	2.509	2.234	0.677	38.429	1319.985	34.611	35.178	0.0042
E-1	94.306	74.493	2.588	2.289	0.680	41.208	1449.835	35.730	36.308	0.0042
E-1	99.787	74.541	2.636	2.324	0.683	42.937	1534.091	36.338	36.925	0.0042
E-1	108.918	74.617	2.712	2.382	0.686	45.732	1674.467	37.200	37.800	0.0042
E-1	118.503	74.693	2.788	2.439	0.689	48.592	1821.830	38.061	38.676	0.0042
E-1	122.024	74.720	2.815	2.459	0.690	49.624	1875.959	38.363	38.982	0.0042
E-1	130.543	74.785	2.880	2.505	0.693	52.123	2006.935	39.151	39.781	0.0042
E-1	139.403	74.849	2.944	2.550	0.696	54.674	2143.133	39.940	40.580	0.0042
E-1	147.174	74.904	2.999	2.587	0.698	56.890	2262.611	40.656	41.305	0.0042
E-1	159.571	74.988	3.083	2.644	0.702	60.351	2453.204	41.734	42.396	0.0042
E-1	175.962	75.095	3.190	2.711	0.707	64.901	2705.194	43.307	43.985	0.0042
E-1	176.582	75.099	3.194	2.714	0.707	65.074	2714.720	43.371	44.049	0.0042
E-1	188.924	75.174	3.270	2.763	0.710	68.385	2904.469	44.334	45.024	0.0042
E-1	201.777	75.250	3.345	2.812	0.713	71.768	3102.058	45.298	46.000	0.0042
E-1	204.994	75.268	3.363	2.824	0.714	72.585	3151.515	45.499	46.204	0.0042
E-1	216.051	75.330	3.425	2.864	0.717	75.432	3321.500	46.329	47.044	0.0042
E-1	227.459	75.392	3.487	2.904	0.719	78.330	3496.885	47.158	47.883	0.0042
E-1	239.359	75.454	3.549	2.945	0.722	81.278	3679.838	47.919	48.654	0.0042
E-1	255.315	75.535	3.630	2.997	0.725	85.201	3925.134	48.956	49.704	0.0042
E-1	276.974	75.639	3.734	3.065	0.729	90.355	4258.110	50.164	50.929	0.0042
E-1	291.538	75.706	3.801	3.110	0.732	93.742	4482.023	50.921	51.698	0.0042
E-1	305.961	75.771	3.866	3.153	0.734	97.050	4703.758	51.650	52.438	0.0042
E-1	320.782	75.835	3.930	3.195	0.737	100.404	4931.608	52.379	53.179	0.0042
E-1	330.555	75.877	3.972	3.221	0.738	102.615	5081.847	52.878	53.685	0.0042
E-1	346.299	75.944	4.039	3.261	0.741	106.187	5323.905	53.748	54.566	0.0042
E-1	362.495	76.011	4.106	3.301	0.743	109.817	5572.883	54.618	55.446	0.0042
E-1	365.147	76.022	4.117	3.307	0.744	110.419	5613.665	54.773	55.602	0.0042
E-1	381.987	76.090	4.186	3.345	0.746	114.203	5872.554	55.725	56.564	0.0042
E-1	399.319	76.159	4.254	3.383	0.748	118.053	6139.009	56.677	57.526	0.0042
E-1	402.457	76.171	4.266	3.390	0.749	118.734	6187.252	56.832	57.683	0.0042
E-1	416.874	76.227	4.322	3.419	0.751	121.940	6408.893	57.684	58.543	0.0042
E-1	431.634	76.283	4.378	3.448	0.753	125.195	6635.816	58.536	59.402	0.0042
E-1	444.905	76.331	4.426	3.475	0.754	128.020	6839.833	59.168	60.042	0.0042
E-1	471.637	76.427	4.522	3.526	0.757	133.766	7250.804	60.554	61.441	0.0042
E-1	484.429	76.473	4.568	3.547	0.759	136.569	7447.472	61.320	62.212	0.0042
E-1	503.215	76.537	4.632	3.581	0.761	140.524	7736.279	62.266	63.167	0.0042
E-1	522.673	76.601	4.696	3.617	0.763	144.505	8035.414	63.113	64.024	0.0042
E-1	542.584	76.664	4.759	3.653	0.765	148.540	8341.524	63.960	64.882	0.0042
E-1	543.479	76.667	4.762	3.654	0.765	148.731	8355.283	64.011	64.933	0.0042
E-1	562.282	76.723	4.818	3.691	0.767	152.330	8644.351	64.513	65.438	0.0042
E-1	581.472	76.779	4.874	3.728	0.769	155.957	8939.371	65.016	65.944	0.0042
E-1	613.858	76.867	4.962	3.796	0.772	161.701	9437.265	65.532	66.467	0.0042
E-1	647.125	76.955	5.050	3.864	0.775	167.491	9948.712	66.048	66.991	0.0042
E-1	682.128	77.045	5.140	3.933	0.778	173.458	10486.838	66.564	67.515	0.0042
E-1	718.054	77.135	5.230	4.001	0.781	179.472	11039.150	67.080	68.038	0.0042
E-1	747.274	77.208	5.303	4.053	0.783	184.388	11488.369	67.596	68.559	0.0042
E-1	777.116	77.281	5.376	4.104	0.786	189.341	11947.151	68.112	69.081	0.0042
E-1	813.186	77.366	5.461	4.167	0.789	195.152	12501.673	68.628	69.604	0.0042
E-1	850.080	77.451	5.546	4.229	0.792	201.008	13068.879	69.144	70.127	0.0042

Tabulated Cross-Section Properties | E-2

(Calculated by Flood Modeller)

Node	Flow (m^3/s)	Stage (m AOD)	Depth (m)	Velocity (m/s)	Froude no.	Area (m^2)	Conveyance (m^3/s)	Width (m)	W Perim. (m)	Slope
E-2	0.000	83.500	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.0066
E-2	0.006	83.543	0.043	0.157	0.343	0.036	0.070	1.690	1.692	0.0066
E-2	0.052	83.602	0.102	0.322	0.409	0.162	0.639	2.559	2.574	0.0066
E-2	0.229	83.696	0.196	0.485	0.453	0.472	2.803	4.038	4.071	0.0066
E-2	0.696	83.812	0.312	0.717	0.497	0.971	8.536	4.574	4.660	0.0066
E-2	1.376	83.928	0.428	0.897	0.523	1.533	16.870	5.111	5.249	0.0066
E-2	2.455	84.063	0.563	1.089	0.546	2.255	30.102	5.566	5.779	0.0066
E-2	3.806	84.199	0.699	1.252	0.563	3.039	46.674	6.022	6.310	0.0066
E-2	5.429	84.334	0.834	1.398	0.576	3.884	66.583	6.478	6.840	0.0066
E-2	7.328	84.469	0.969	1.530	0.588	4.791	89.874	6.933	7.370	0.0066
E-2	9.190	84.577	1.077	1.647	0.616	5.579	112.703	7.655	8.131	0.0066
E-2	10.541	84.642	1.142	1.721	0.672	6.125	129.267	9.159	9.643	0.0066
E-2	12.197	84.714	1.214	1.789	0.694	6.817	149.585	10.068	10.564	0.0066
E-2	12.678	84.734	1.234	1.805	0.707	7.024	155.482	10.578	11.076	0.0066
E-2	12.703	84.735	1.235	1.806	0.747	7.035	155.783	11.817	12.315	0.0066
E-2	12.727	84.736	1.236	1.806	0.749	7.047	156.086	11.902	12.400	0.0066
E-2	13.615	84.770	1.270	1.807	0.863	7.535	166.975	16.844	17.347	0.0066
E-2	13.671	84.772	1.272	1.806	0.867	7.569	167.660	17.115	17.619	0.0066
E-2	13.897	84.780	1.280	1.802	0.902	7.714	170.432	18.988	19.493	0.0066
E-2	13.897	84.780	1.280	1.802	0.930	7.714	170.432	20.176	20.681	0.0066
E-2	13.921	84.781	1.281	1.800	0.932	7.734	170.724	20.358	20.863	0.0066
E-2	13.921	84.781	1.281	1.800	0.932	7.734	170.724	20.358	20.863	0.0066
E-2	13.943	84.783	1.283	1.793	0.958	7.776	170.988	21.779	22.285	0.0066
E-2	14.317	84.795	1.295	1.779	0.969	8.047	175.581	23.426	23.933	0.0066
E-2	15.120	84.820	1.320	1.749	0.941	8.647	185.433	24.541	25.049	0.0066
E-2	15.877	84.840	1.340	1.736	0.926	9.148	194.708	25.568	26.076	0.0066
E-2	16.474	84.855	1.355	1.727	0.918	9.538	202.035	26.460	26.970	0.0066
E-2	16.639	84.859	1.359	1.725	0.943	9.648	204.051	28.318	28.828	0.0066
E-2	16.860	84.866	1.366	1.712	0.942	9.849	206.767	29.278	29.788	0.0066
E-2	17.529	84.881	1.381	1.703	0.930	10.295	214.973	30.158	30.669	0.0066
E-2	18.715	84.906	1.406	1.691	0.915	11.069	229.520	31.774	32.285	0.0066
E-2	19.175	84.915	1.415	1.688	0.908	11.357	235.158	32.220	32.731	0.0066
E-2	23.462	84.988	1.488	1.702	0.856	13.782	287.729	34.211	34.728	0.0066
E-2	24.761	85.008	1.508	1.711	0.848	14.473	303.662	34.870	35.388	0.0066
E-2	27.485	85.047	1.547	1.734	0.834	15.854	337.068	35.967	36.488	0.0066
E-2	35.984	85.151	1.651	1.827	0.810	19.700	441.294	37.984	38.517	0.0066
E-2	36.522	85.157	1.657	1.833	0.809	19.928	447.896	38.096	38.629	0.0066
E-2	46.469	85.260	1.760	1.939	0.803	23.969	569.888	40.378	40.920	0.0066
E-2	46.780	85.263	1.763	1.942	0.803	24.091	573.701	40.448	40.990	0.0066
E-2	50.388	85.300	1.800	1.967	0.805	25.618	617.939	42.104	42.648	0.0066

Node	Flow (m^3/s)	Stage (m AOD)	Depth (m)	Velocity (m/s)	Froude no.	Area (m^2)	Conveyance (m^3/s)	Width (m)	W Perim. (m)	Slope
E-2	56.425	85.354	1.854	2.020	0.806	27.933	691.979	43.642	44.190	0.0066
E-2	58.938	85.375	1.875	2.043	0.807	28.854	722.793	44.132	44.683	0.0066
E-2	77.694	85.513	2.013	2.214	0.811	35.088	952.811	46.202	46.770	0.0066
E-2	80.626	85.533	2.033	2.239	0.812	36.015	988.773	46.527	47.098	0.0066
E-2	98.634	85.649	2.149	2.375	0.820	41.532	1209.618	48.601	49.185	0.0066
E-2	100.940	85.663	2.163	2.391	0.821	42.214	1237.901	48.851	49.437	0.0066
E-2	122.310	85.785	2.285	2.532	0.831	48.304	1499.976	50.984	51.583	0.0066
E-2	124.929	85.799	2.299	2.549	0.832	49.020	1532.089	51.203	51.804	0.0066
E-2	154.733	85.948	2.448	2.723	0.843	56.814	1897.596	53.421	54.042	0.0066
E-2	156.683	85.957	2.457	2.735	0.844	57.295	1921.517	53.527	54.150	0.0066
E-2	176.160	86.044	2.544	2.841	0.851	61.996	2160.370	54.547	55.185	0.0066
E-2	196.755	86.131	2.631	2.946	0.858	66.786	2412.951	55.567	56.220	0.0066
E-2	211.324	86.191	2.691	3.013	0.863	70.147	2591.619	56.454	57.116	0.0066
E-2	226.426	86.251	2.751	3.078	0.868	73.561	2776.823	57.346	58.018	0.0066
E-2	250.572	86.340	2.840	3.182	0.875	78.738	3072.942	58.329	59.017	0.0066
E-2	275.904	86.430	2.930	3.284	0.881	84.002	3383.608	59.312	60.016	0.0066
E-2	281.295	86.449	2.949	3.304	0.882	85.131	3449.720	59.569	60.276	0.0066
E-2	322.844	86.588	3.088	3.452	0.892	93.527	3959.262	61.228	61.959	0.0066
E-2	365.454	86.718	3.218	3.598	0.901	101.564	4481.822	62.425	63.185	0.0066
E-2	406.127	86.836	3.336	3.726	0.909	108.998	4980.627	63.571	64.354	0.0066
E-2	450.196	86.960	3.460	3.849	0.916	116.969	5521.075	64.998	65.804	0.0066
E-2	470.870	87.016	3.516	3.904	0.919	120.627	5774.618	65.637	66.453	0.0066
E-2	506.959	87.111	3.611	3.996	0.925	126.880	6217.197	66.686	67.519	0.0066
E-2	544.388	87.205	3.705	4.086	0.930	133.231	6676.215	67.735	68.585	0.0066
E-2	545.205	87.207	3.707	4.088	0.930	133.366	6686.237	67.755	68.606	0.0066
E-2	607.740	87.360	3.860	4.224	0.939	143.885	7453.152	69.745	70.620	0.0066
E-2	639.495	87.432	3.932	4.294	0.943	148.932	7842.577	70.439	71.328	0.0066
E-2	700.867	87.572	4.072	4.410	0.949	158.919	8595.229	72.244	73.157	0.0066
E-2	727.774	87.630	4.130	4.461	0.952	163.128	8925.208	72.900	73.824	0.0066
E-2	782.061	87.744	4.244	4.560	0.958	171.515	9590.971	74.216	75.161	0.0066
E-2	855.370	87.886	4.386	4.696	0.965	182.140	10490.009	75.435	76.412	0.0066
E-2	939.617	88.046	4.546	4.835	0.973	194.348	11523.188	77.177	78.185	0.0066
E-2	944.977	88.057	4.557	4.841	0.973	195.198	11588.924	77.370	78.380	0.0066
E-2	996.741	88.158	4.658	4.908	0.977	203.090	12223.738	78.894	79.920	0.0066
E-2	1092.390	88.322	4.822	5.054	0.984	216.152	13396.753	80.398	81.459	0.0066
E-2	1144.280	88.412	4.912	5.121	0.988	223.440	14033.120	81.567	82.643	0.0066
E-2	1174.962	88.465	4.965	5.158	0.990	227.783	14409.390	82.313	83.396	0.0066
E-2	1270.427	88.618	5.118	5.282	0.996	240.498	15580.145	83.900	85.014	0.0066
E-2	1336.268	88.723	5.223	5.358	1.000	249.375	16387.602	85.184	86.316	0.0066
E-2	1368.969	88.774	5.274	5.395	1.002	253.736	16788.637	85.803	86.944	0.0066
E-2	1439.470	88.879	5.379	5.478	1.006	262.758	17653.246	86.869	88.030	0.0066
E-2	1511.817	88.983	5.483	5.560	1.010	271.891	18540.477	87.935	89.117	0.0066
E-2	1513.891	88.986	5.486	5.563	1.010	272.155	18565.920	87.969	89.151	0.0066
E-2	1571.414	89.071	5.571	5.619	1.013	279.681	19271.363	89.118	90.313	0.0066
E-2	1630.237	89.156	5.656	5.674	1.015	287.305	19992.746	90.268	91.475	0.0066
E-2	1637.170	89.165	5.665	5.682	1.016	288.118	20077.771	90.327	91.535	0.0066
E-2	1710.227	89.258	5.758	5.766	1.019	296.591	20973.723	90.921	92.136	0.0066
E-2	1784.840	89.352	5.852	5.850	1.023	305.120	21888.754	91.515	92.737	0.0066
E-2	1907.240	89.496	5.996	5.990	1.029	318.387	23389.832	92.109	93.349	0.0066
E-2	2033.261	89.641	6.141	6.129	1.034	331.739	24935.320	92.704	93.961	0.0066
E-2	2114.715	89.744	6.244	6.195	1.037	341.350	25934.246	93.892	95.154	0.0066
E-2	2237.651	89.879	6.379	6.321	1.043	354.018	27441.898	94.486	95.763	0.0066

Annex D - Environment Agency Data Response

From: PSOWN <PSOWN@environment-agency.gov.uk>
Sent: 14 August 2024 14:04
To: [redacted]mabbett.eu>
Cc: Lincs & Northants, Customer Enquiries <LNenquiries@environment-agency.gov.uk>
Subject: RE: Green Hill Solar (313532) CCN/2024/371736 (prev ref CCN/2024/345098)

[redacted]

> You don't often get email from[redacted]

Dear [redacted]

The flood zones for your site have been produced based on national scale generalised modelling and not from local scale detailed modelling. We are therefore unable to provide detailed information such as flood levels. The national scale generalised modelling covers all watercourses with a catchment greater than 3km^2. It also includes dry valleys so the flood map may show a flood extent where there is no watercourse.

Please note, any map supplied of non-main river flood zones may include flood zones covering adjacent main rivers which may be different to the Flood Map for Planning flood zones. This is due to flood zones on main rivers being updated through local detailed modelling, whereas the non-main river national generalised model was a one off run in 2004.

This information will be updated in 2024 in line with the new national model.

Kind regards,

[redacted]

FCRM Officer, Partnerships and Strategic Overview (Welland & Nene) | Lincolnshire and Northamptonshire
Environment Agency | Nene House, Pytchley Lodge Road, Kettering, NN15 6JQ
+44[redacted]
[redacted]environment-agency.gov.uk |Team Email: PSOWN@environment-agency.gov.uk

Annex E – North Northamptonshire LLFA Response

From: [redacted]kier.co.uk>
Sent: Monday, June 17, 2024 3:29 PM
To: [redacted]mabbett.eu>;[redacted]@mabbett.eu>
Cc: [redacted]northnorthants.gov.uk>; Surface water <swplanning@northnorthants.gov.uk>
Subject: RE: Green Hill Solar Farm - contact/response

> You don't often get email from[redacted]

Hi [redacted]

Please see in red answers to your queries.

- Instances of historic flooding at or near this location; We are pulling this data together and will forward on to you shortly.
- Details of flood defences in the area; Flood defence information is available from the EA here - https://flood-map-for-planning.service.gov.uk/
- Information regarding maintenance of land drains and management of flood risk in the area; Much of this information can be found in our local standards and guidance document (attached) and at [redacted]
- Any restrictions in developing near a IDB owned watercourse; and - You must apply for Land Drainage Consent if you want to: Do work on, over, under or near an ordinary watercourse (within 9 metres of the landward toe of the bank), or make changes to any structure that helps control water.
- Do you have specific requirements for discharge rates to land drains and could you please provide these? – Details of discharge rate requirements can be found in the attached standards and guidance document.

We're happy to arrange a call to discuss your proposals in greater detail. We have availability Wednesday or Thursday this week, I then go on leave and have availability from the 3rd of July onwards.

Kind regards,

[redacted]
Environment Team Leader

E: [redacted]kier.co.uk

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[i] England | Catchment Data Explorer
[ii] GeoIndex (onshore) - British Geological Survey
[iii] GeoIndex (onshore) - British Geological Survey
[iv] MAGIC
[v] Get flood risk information for planning in England - Flood map for planning - GOV.UK
[vi] Where do you want to check? - Check your long term flood risk - GOV.UK