Green Hill Solar Farm
EN010170

Environmental Statement
Appendix 10.7: Flood Risk Assessment and Drainage Strategy Annex F: Green Hill D

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Appendix 10.7: Annex F - Flood Risk Assessment and Drainage Strategy – Green Hill D

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Site: Green Hill D

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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.

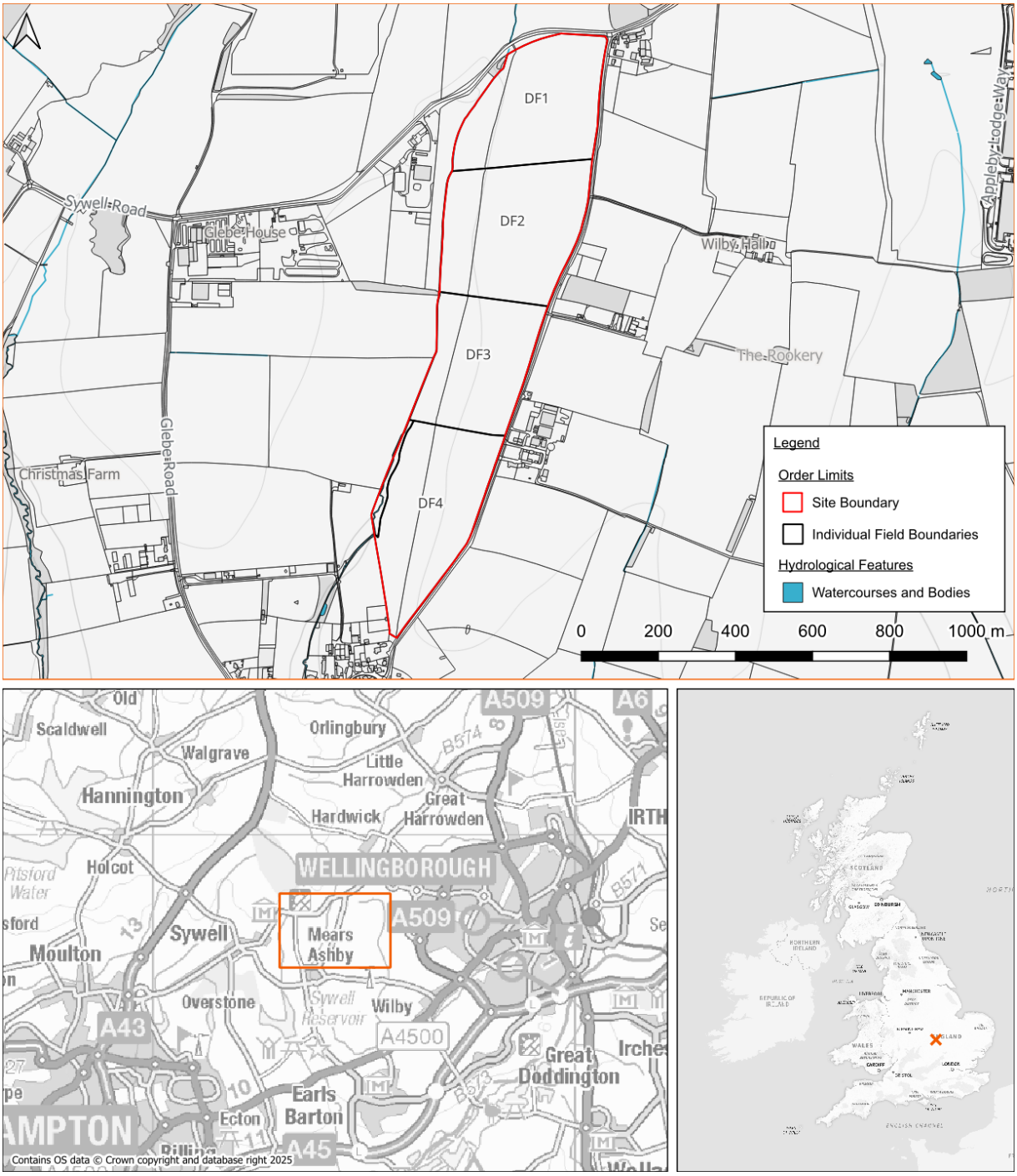

Figure 1: Site Location Plan

1.1 Site Location

1.1.1 Green Hill D is located directly north of Mears Ashby village in West Northamptonshire. Wellingborough Train Station is located 5.9km to the east of the Site. The National Grid Reference for Green Hill D is approximately 484430, 268550 in the north (DF1) to 484020, 266990 in the south (DF4).

1.2 Existing Site Conditions

1.2.1 Online mapping (including Google Maps / Google Streetview imagery accessed March 2025)[i] shows that the Site is greenfield comprising 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 the Site slopes from approximately 115m AOD in the east to approximately 100m AOD in the west (Figure 2).

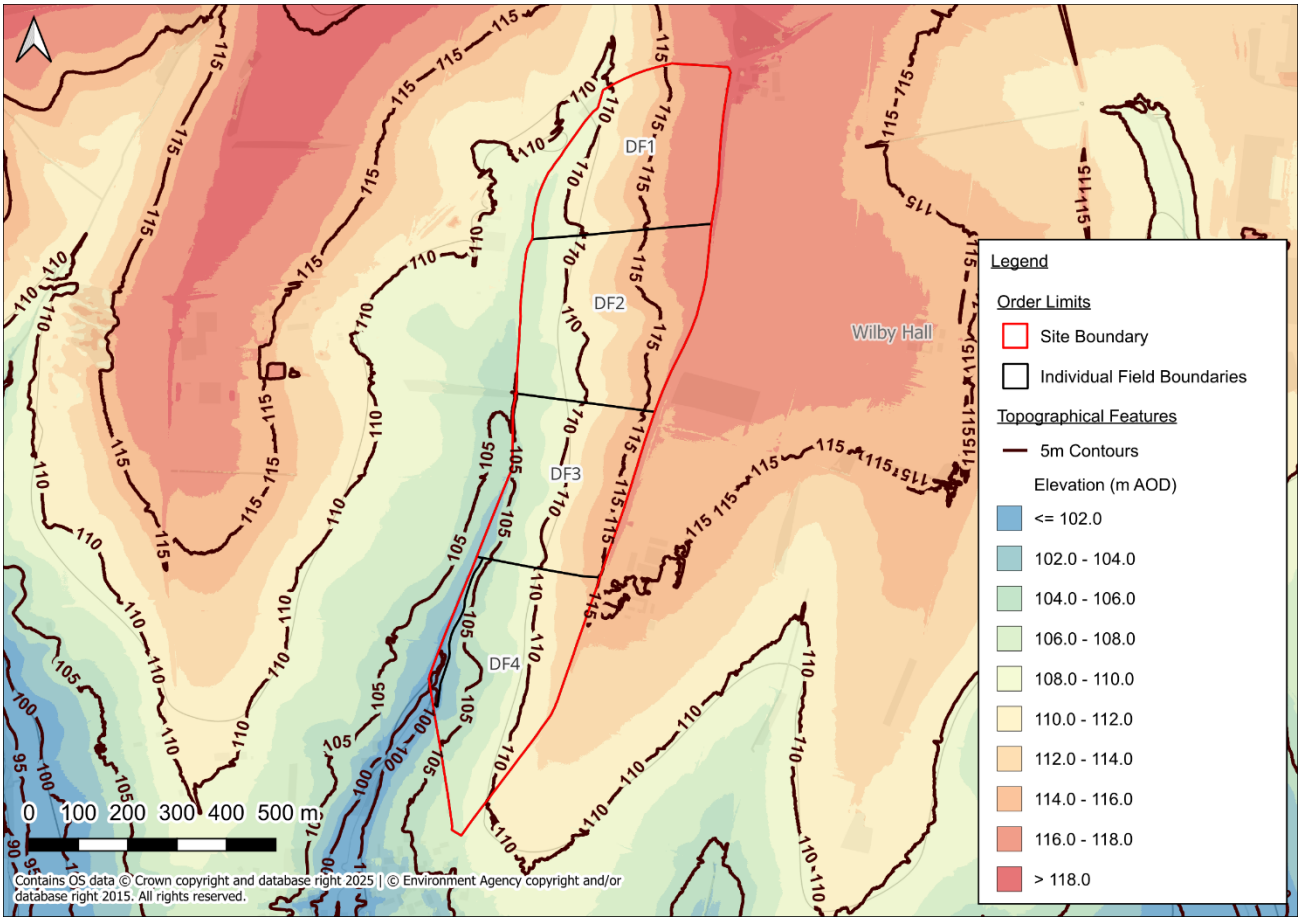

Figure 2: LiDAR Plan

1.4 Hydrology

1.4.1 The nearest watercourse is an unnamed ordinary watercourse which is located along the western

boundary of the Site, flowing in a southernly direction, where it later becomes a main river, Swanspool Brook approximately 2.6km south-east of the Site, before discharging into the River Nene 6.2 km south-east of the Site.

1.5 Water Framework Directive Status

1.5.1 The Site is located within the Nene Catchment, specifically the Swanspool Brook Water Bodyii.

1.5.2 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).

1.5.3 A summary of the Water Body Classifications for the catchment is included as Annex A.

1.6 Geology

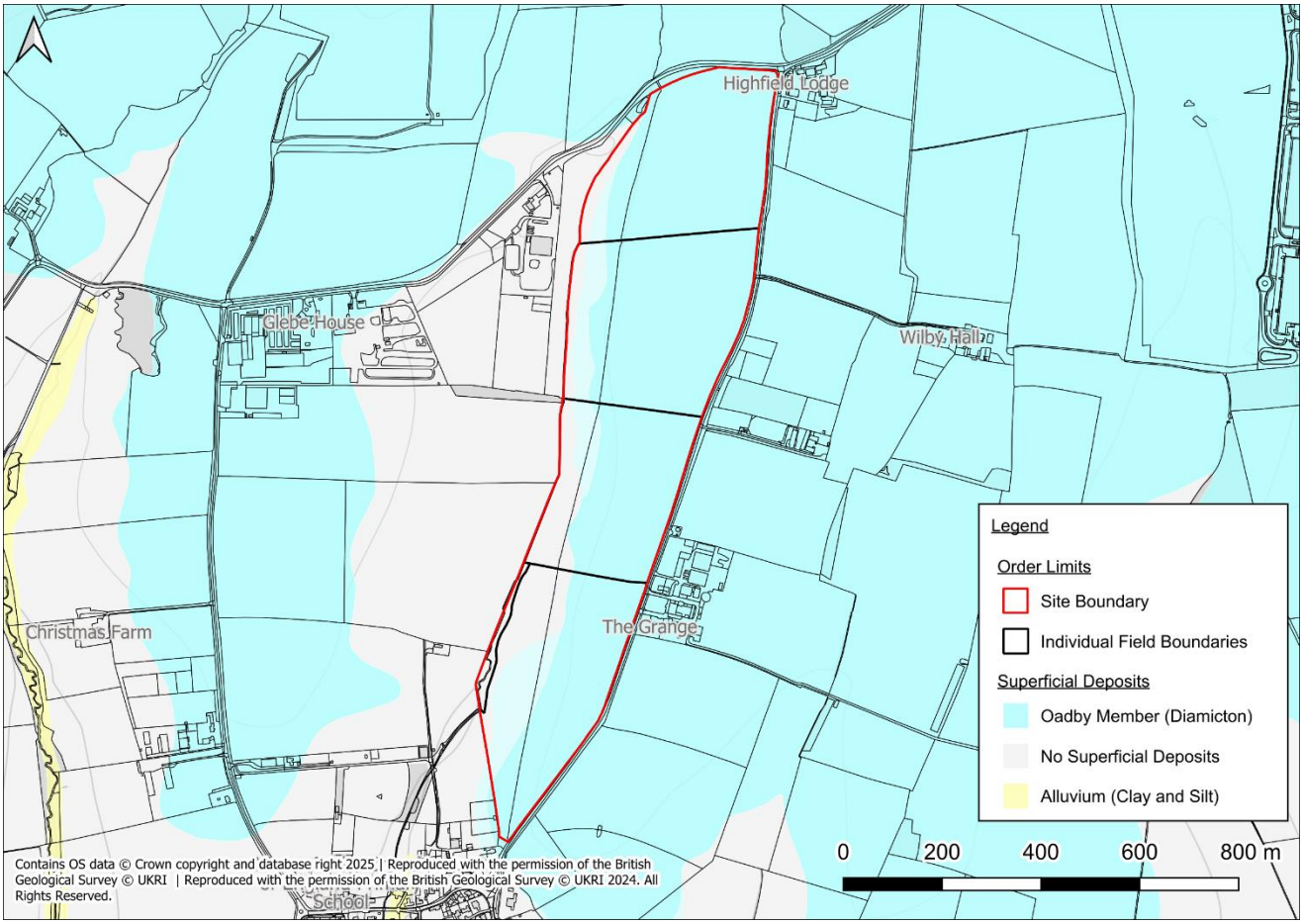

Figure 3: Superficial Deposits

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

- Oadby Member, generally comprising Diamicton; and
- Bozeat Till, consisting of Diamicton.

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

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

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

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

1.6.4 There are no BGS boreholes located at the Site or within the Site's near vicinity.

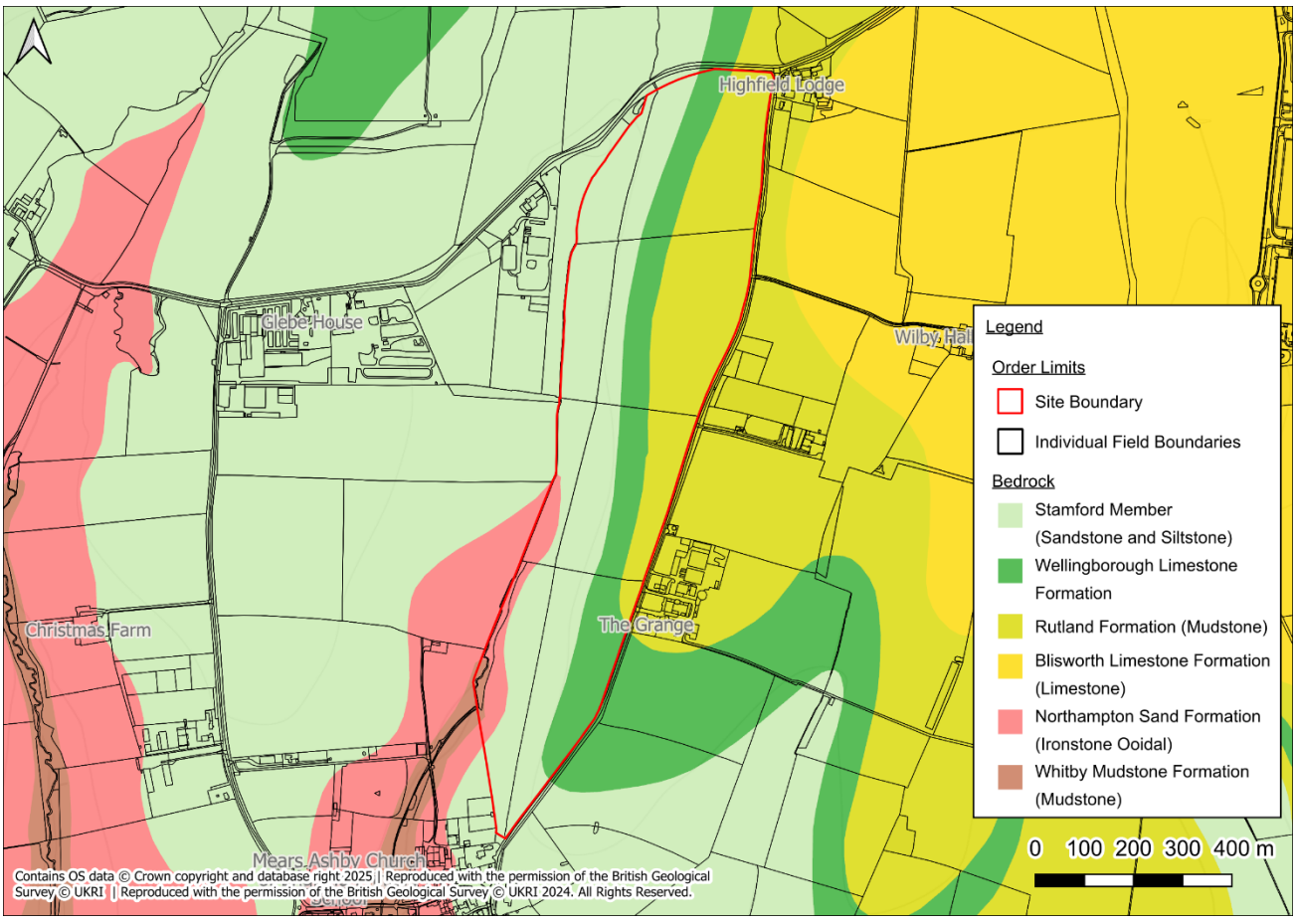

Figure 4: Bedrock Deposits

1.7 Hydrogeology

1.7.1 According to the EA's Aquifer Designation data, obtained from MAGIC Map's online mappingiv [accessed 5/1/24], the Oadby Member is classified as a Secondary Undifferentiated Aquifer.

1.7.2 The underlying Rutland Formation, Wellingborough Limestone Member, Stamford Member and Northampton Sand Formation are described as Secondary A Aquifers. The Whitby Mud Formation is described as an Unproductive Aquifer.

1.7.3 The EA's 'Source Protection Zones' data, obtained from MAGIC Map's online mapping [accessed 5/1/24], indicates that the Site is not located within a Groundwater Source Protection Zone.

1.8 Proposed Site Conditions

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

1.8.2 Final development plans for Green Hill D 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 outline key environmental information associated with the baseline environment.

2.1 Fluvial Flood Risk

2.1.1 There is an unnamed ordinary watercourse located along the western boundary of the Site, flowing in a south-westerly direction. Ordinary Watercourses fall under the regulatory remit of the LLFA, which has permissive powers to manage flood risk but is not responsible for routine maintenance. Maintenance responsibilities lie with the riparian landowners. By contrast, Main Rivers fall under the responsibility of the EA.

2.1.2 Fluvial flooding could occur if the ordinary watercourse overtopped its banks during or following an extreme rainfall event.

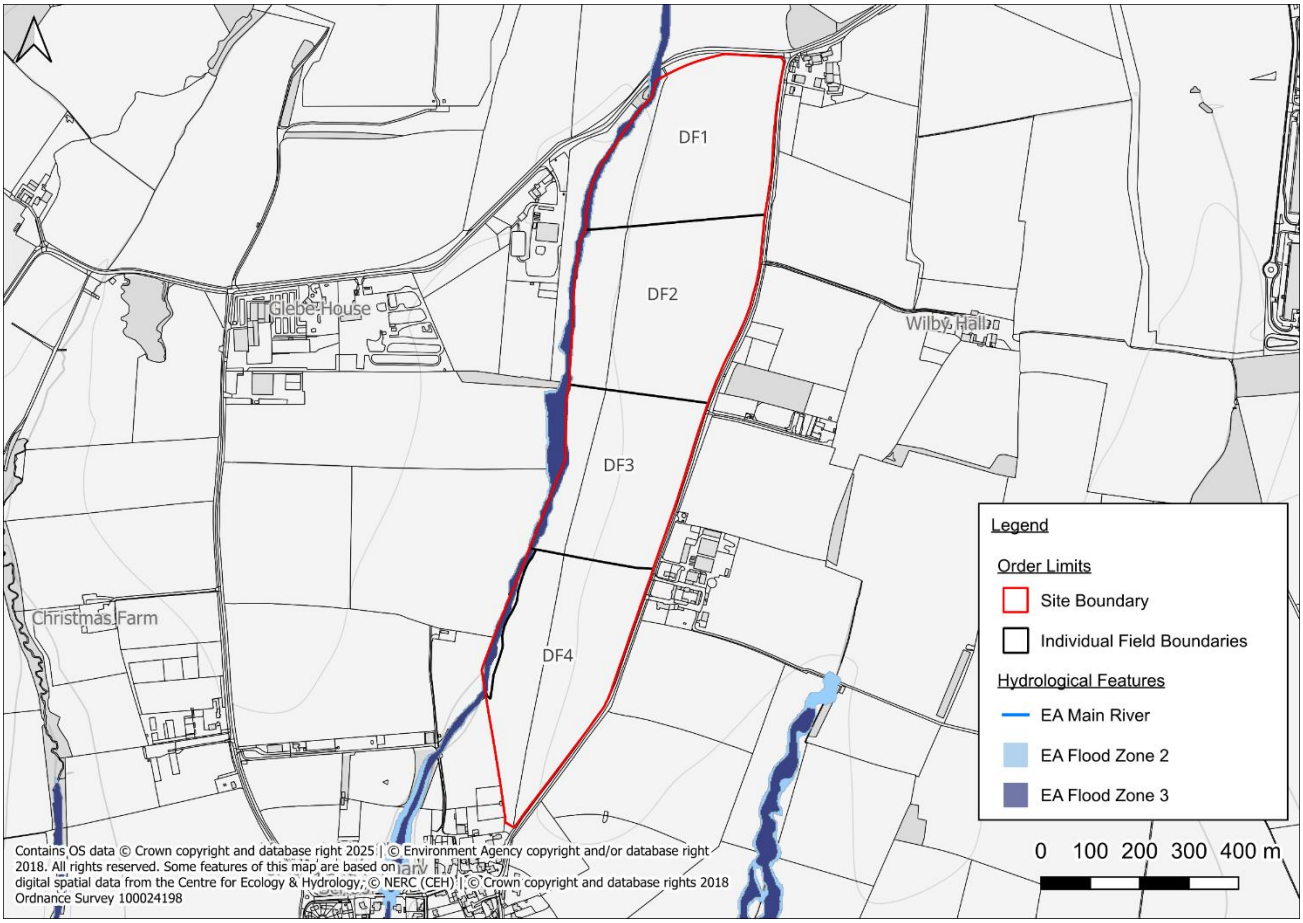

Figure 5: EA's Flood Map for Planning

2.1.3 According to the EA's Flood Map for Planning[v] (updated March 2025), Green Hill D is largely situated in Flood Zone 1 (less than a 1 in 1,000 annual probability of river or sea flooding), however Flood Zones 2 (has between a 1 in 100 and a 1 in 1000 annual probability of river or sea flooding) and 3 (greater than 1 in 100 annual probability of river or sea flooding) encroach the western boundary. These extents remain

outside of any areas of proposed development.

2.1.4 The EA 'Historical Flood Map' indicates that Green Hill D has not historically flooded and neither has the area in the near vicinity.

2.1.5 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. There are no formal flow routes picked up by the surface water mapping.

2.1.6 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 B. 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.

2.1.7 The mapping indicates that the ordinary watercourse to the west reaches depths of 1.2m and greater, while the remainder of the Site is not expected to exceed depths of 0.3m.

Consultation

2.1.8 The EA were consulted in January 2024. The data provided was for the River Nene 2013 Model which does not cover Green Hill D's area therefore further consultation was undertaken in August 2024, the EA then response with the following:

2.1.9 '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.'

2.1.10 It is noted that following the March 2025 update to the EA's Flood Map for Planning, the above consultation is now outdated. It has not been considered necessary to obtain Product Data for Green Hill D, given that the areas proposed for development are shown to remain in Flood Zone 1.

2.1.11 The North Northamptonshire LLFA was contacted in February 2024. A response was received in April 2024 and is included in Annex C. Further to this, the EA and LLFA were consulted with throughout the pre-application process, with guidance complied with where required.

Summary

2.1.12 Green Hill D is therefore considered to be at **Low** risk of fluvial flooding, the proposed solar panels are located within Flood Zone 1.

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 Site, 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 Site is largely at a at Very Low risk of surface water flooding (<0.1% annual probability of flooding). The risk increases to Low (between a 1% and 0.1% annual probability), Medium (between a 3.3% and 1% annual probability) and High risk (>3.3% annual probability) of flooding associated with the ordinary watercourse that runs along the western boundary of Green Hill D.

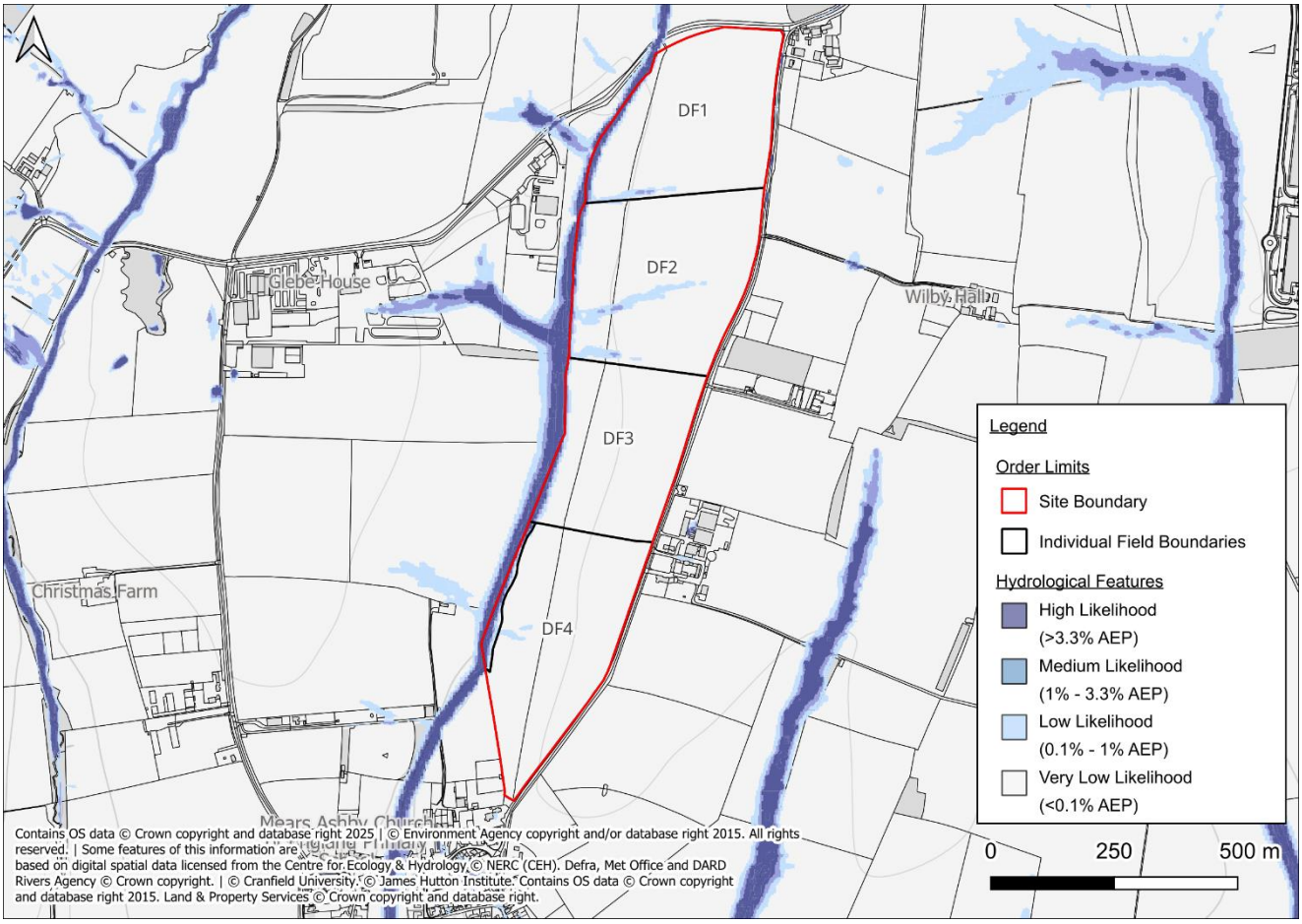

Figure 6: EA's Long-Term Flood Risk Map (Flood Risk from Surface Water)

2.2.4 The updated NaFRA mapping (Figure 6) has been assessed against the previous mapping and indicates

that there is no visible change in surface water risk across Green Hill D. As described in Section 2.2, the surface water flooding extents largely correspond with the ordinary watercourse which flows along the western Site boundary.

2.2.5 Surface water mapping indicates that the majority of Green Hill D has flood depths of below 0.3m. Surface water depths of less than 0.3m are typically passable by both vehicles and pedestrians. Only along the eastern boundary are depths expected to be greater than 0.3m, which is associated with topographic depressions and Swanspool Brook.

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

2.2.7 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 at Green Hill D 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.

2.2.8 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 A description of the Site's geology is included within Section 1.0.

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.

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 It can therefore 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 is a water main located across Field DF4, however these have been respected in the Scheme design. 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 D, therefore there is negligible associated flood risk.

2.5.2 The EA 'Flood Risk from Reservoirs' map shows that Green Hill D 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 greater than 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 greater than 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 B from all sources of flooding is Negligible to Low, however it would be prudent to include the below mitigation measures.

Flood Warnings and Evacuation

2.7.2 Flood Warnings / Flood Alerts[vii] do partly cover this area therefore Site management should sign up to the free EA Floodline service to receive flood alerts.

2.7.3 Access to the Site will be required relatively infrequently, typically by technicians for maintenance and inspection works or Site management. Such works can be scheduled as to avoid the Site during times of flood.

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

2.8 Impact on Off-Site Flood Risk

2.8.1 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.

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

2.8.3 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 D is predominately 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. However the south-western boundary is shown to clip Flood Zones 2 and 3, associated with the Unnamed Ordinary Watercourse which flows along the western Site boundary.

3.1.3 The risk of flooding from all sources has been assessed and the flood risk to the Site 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 – Swanspool Brook Water Body Catchment Classification Summary

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 – Manning's Open Channel Flow Mapping

313532 Green Hill Solar Farm

Manning's Open Channel Flow Calculation - Option Area D

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

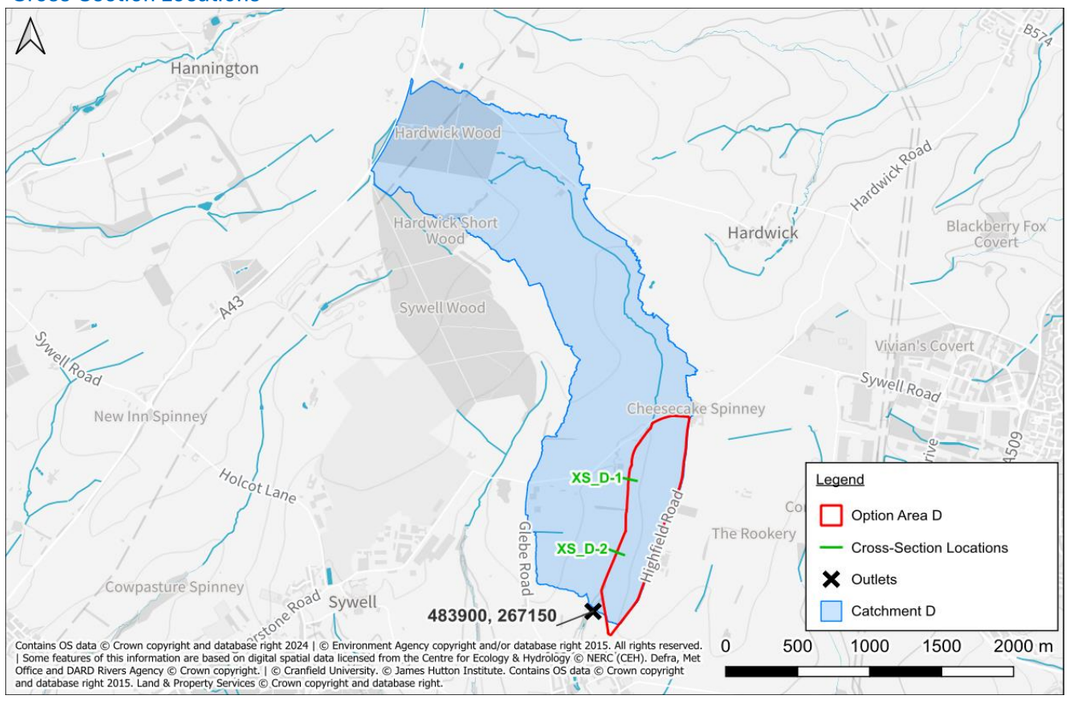

Figure 1: Cross-section locations

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)
D-1	3.42	106.67	5.13	106.73 (+59mm)
D-2	3.42	103.30	5.13	103.40 (+100mm)

Tabulated Cross-Section Properties | D-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
D-1	0.000	105.731	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.0034
D-1	0.003	105.807	0.076	0.159	0.262	0.019	0.051	0.490	0.513	0.0034
D-1	0.019	105.882	0.151	0.253	0.294	0.074	0.322	0.980	1.026	0.0034
D-1	0.055	105.958	0.227	0.332	0.314	0.167	0.950	1.470	1.539	0.0034
D-1	0.119	106.034	0.303	0.402	0.330	0.297	2.046	1.960	2.051	0.0034
D-1	0.156	106.066	0.335	0.431	0.335	0.363	2.682	2.153	2.255	0.0034
D-1	0.277	106.145	0.414	0.505	0.348	0.549	4.755	2.556	2.689	0.0034
D-1	0.438	106.224	0.493	0.572	0.359	0.767	7.513	2.959	3.122	0.0034
D-1	0.643	106.303	0.572	0.633	0.367	1.016	11.023	3.363	3.556	0.0034
D-1	0.895	106.382	0.651	0.690	0.375	1.298	15.346	3.766	3.990	0.0034
D-1	1.048	106.424	0.693	0.716	0.379	1.463	17.971	4.008	4.248	0.0034
D-1	1.217	106.467	0.736	0.743	0.382	1.639	20.870	4.251	4.506	0.0034
D-1	1.286	106.483	0.752	0.750	0.415	1.714	22.043	5.150	5.411	0.0034
D-1	1.331	106.493	0.762	0.751	0.457	1.772	22.818	6.430	6.695	0.0034
D-1	1.354	106.498	0.767	0.749	0.500	1.807	23.225	7.896	8.163	0.0034
D-1	1.385	106.504	0.773	0.743	0.574	1.864	23.743	10.899	11.169	0.0034
D-1	1.390	106.505	0.774	0.741	0.584	1.875	23.834	11.395	11.666	0.0034
D-1	1.390	106.505	0.774	0.741	0.584	1.875	23.834	11.395	11.666	0.0034
D-1	1.395	106.506	0.775	0.740	0.592	1.887	23.926	11.861	12.132	0.0034
D-1	1.424	106.511	0.780	0.730	0.606	1.949	24.411	13.153	13.426	0.0034
D-1	1.530	106.527	0.796	0.702	0.600	2.180	26.235	15.641	15.921	0.0034
D-1	1.538	106.528	0.797	0.700	0.598	2.195	26.365	15.705	15.985	0.0034
D-1	1.585	106.534	0.803	0.692	0.587	2.291	27.179	16.198	16.481	0.0034
D-1	1.615	106.538	0.807	0.685	0.594	2.358	27.696	17.415	17.699	0.0034
D-1	1.678	106.545	0.814	0.676	0.581	2.482	28.777	17.949	18.236	0.0034
D-1	1.739	106.551	0.820	0.671	0.571	2.591	29.815	18.434	18.722	0.0034
D-1	1.760	106.553	0.822	0.669	0.575	2.629	30.174	19.028	19.317	0.0034
D-1	1.803	106.557	0.826	0.666	0.580	2.707	30.922	20.122	20.412	0.0034
D-1	1.995	106.573	0.842	0.656	0.562	3.043	34.212	21.891	22.186	0.0034
D-1	2.006	106.574	0.843	0.655	0.562	3.065	34.404	22.144	22.439	0.0034
D-1	2.064	106.579	0.848	0.649	0.571	3.181	35.386	24.213	24.510	0.0034
D-1	2.561	106.611	0.880	0.645	0.520	3.974	43.922	25.378	25.684	0.0034
D-1	3.115	106.640	0.909	0.658	0.501	4.733	53.406	26.948	27.263	0.0034
D-1	3.821	106.671	0.940	0.684	0.489	5.585	65.528	28.026	28.350	0.0034
D-1	4.029	106.679	0.948	0.693	0.489	5.811	69.080	28.355	28.681	0.0034
D-1	4.256	106.688	0.957	0.701	0.489	6.069	72.977	29.006	29.334	0.0034
D-1	4.282	106.689	0.958	0.702	0.498	6.098	73.419	30.132	30.460	0.0034
D-1	4.282	106.689	0.958	0.702	0.507	6.098	73.419	31.161	31.489	0.0034
D-1	4.547	106.699	0.968	0.709	0.508	6.416	77.971	32.348	32.677	0.0034
D-1	4.678	106.704	0.973	0.711	0.512	6.581	80.214	33.552	33.882	0.0034
D-1	4.705	106.705	0.974	0.711	0.513	6.614	80.677	33.793	34.124	0.0034
D-1	4.706	106.707	0.976	0.704	0.516	6.683	80.694	35.225	35.556	0.0034
D-1	5.419	106.730	0.999	0.721	0.510	7.513	92.917	36.910	37.244	0.0034

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
D-1	5.629	106.736	1.005	0.728	0.512	7.736	96.527	37.511	37.845	0.0034
D-1	6.141	106.750	1.019	0.742	0.515	8.272	105.305	38.986	39.322	0.0034
D-1	6.722	106.765	1.034	0.758	0.518	8.869	115.269	40.608	40.945	0.0034
D-1	6.887	106.769	1.038	0.762	0.519	9.032	118.085	40.999	41.337	0.0034
D-1	7.094	106.774	1.043	0.768	0.521	9.239	121.641	41.733	42.071	0.0034
D-1	7.307	106.779	1.048	0.773	0.522	9.449	125.289	42.280	42.619	0.0034
D-1	10.000	106.835	1.104	0.844	0.517	11.855	171.476	43.680	44.025	0.0034
D-1	12.854	106.886	1.155	0.910	0.519	14.118	220.415	45.048	45.398	0.0034
D-1	14.951	106.920	1.189	0.954	0.523	15.669	256.370	46.194	46.547	0.0034
D-1	15.200	106.924	1.193	0.959	0.523	15.854	260.648	46.367	46.721	0.0034
D-1	18.807	106.978	1.247	1.022	0.528	18.410	322.483	48.278	48.635	0.0034
D-1	19.155	106.983	1.252	1.027	0.529	18.652	328.454	48.526	48.883	0.0034
D-1	21.019	107.009	1.278	1.055	0.532	19.930	360.418	49.821	50.178	0.0034
D-1	23.825	107.045	1.314	1.096	0.535	21.744	408.536	50.940	51.300	0.0034
D-1	26.738	107.080	1.349	1.136	0.539	23.545	458.483	51.993	52.355	0.0034
D-1	29.409	107.111	1.380	1.168	0.542	25.177	504.280	53.273	53.638	0.0034
D-1	30.223	107.120	1.389	1.178	0.544	25.658	518.238	53.613	53.977	0.0034
D-1	31.211	107.132	1.401	1.186	0.547	26.308	535.178	54.784	55.150	0.0034
D-1	37.264	107.193	1.462	1.255	0.553	29.704	638.982	56.543	56.913	0.0034
D-1	37.678	107.197	1.466	1.259	0.553	29.930	646.069	56.669	57.039	0.0034
D-1	43.015	107.246	1.515	1.314	0.558	32.740	737.599	58.033	58.407	0.0034
D-1	50.939	107.313	1.582	1.389	0.565	36.682	873.465	59.627	60.008	0.0034
D-1	51.679	107.319	1.588	1.395	0.566	37.040	886.157	59.772	60.152	0.0034
D-1	59.269	107.379	1.648	1.457	0.571	40.674	1016.310	61.364	61.749	0.0034
D-1	62.227	107.403	1.672	1.476	0.574	42.162	1067.032	62.656	63.042	0.0034
D-1	63.595	107.413	1.682	1.486	0.575	42.790	1090.478	62.892	63.280	0.0034
D-1	73.705	107.484	1.753	1.558	0.581	47.316	1263.839	64.588	64.982	0.0034
D-1	76.767	107.505	1.774	1.577	0.583	48.679	1316.351	65.247	65.642	0.0034
D-1	81.208	107.535	1.804	1.603	0.585	50.652	1392.497	66.243	66.640	0.0034
D-1	88.938	107.584	1.853	1.649	0.589	53.927	1525.058	67.461	67.861	0.0034
D-1	95.365	107.622	1.891	1.688	0.592	56.505	1635.254	68.218	68.623	0.0034
D-1	102.603	107.665	1.934	1.725	0.596	59.468	1759.373	69.595	70.004	0.0034
D-1	107.074	107.692	1.961	1.745	0.599	61.364	1836.026	70.843	71.253	0.0034
D-1	110.200	107.711	1.980	1.757	0.601	62.720	1889.641	71.886	72.297	0.0034
D-1	110.688	107.714	1.983	1.759	0.601	62.935	1898.001	72.061	72.473	0.0034
D-1	118.889	107.757	2.026	1.800	0.603	66.051	2038.638	72.815	73.232	0.0034
D-1	127.373	107.800	2.069	1.841	0.606	69.198	2184.105	73.570	73.992	0.0034
D-1	139.237	107.860	2.129	1.890	0.609	73.654	2387.552	74.957	75.387	0.0034
D-1	144.748	107.886	2.155	1.914	0.610	75.609	2482.050	75.421	75.853	0.0034
D-1	157.843	107.947	2.216	1.967	0.614	80.251	2706.586	76.789	77.227	0.0034
D-1	165.790	107.983	2.252	1.997	0.616	83.031	2842.864	77.628	78.070	0.0034
D-1	175.868	108.028	2.297	2.032	0.619	86.550	3015.667	78.817	79.262	0.0034
D-1	182.792	108.058	2.327	2.056	0.621	88.926	3134.390	79.592	80.039	0.0034
D-1	195.920	108.113	2.382	2.099	0.624	93.341	3359.507	80.948	81.400	0.0034
D-1	202.460	108.140	2.409	2.119	0.626	95.537	3471.654	81.657	82.111	0.0034
D-1	214.822	108.188	2.457	2.160	0.628	99.478	3683.632	82.535	82.996	0.0034
D-1	231.587	108.252	2.521	2.210	0.631	104.802	3971.099	83.856	84.325	0.0034
D-1	244.699	108.302	2.571	2.244	0.633	109.026	4195.940	85.113	85.589	0.0034
D-1	256.651	108.347	2.616	2.274	0.635	112.884	4400.883	86.348	86.830	0.0034
D-1	261.988	108.365	2.634	2.289	0.636	114.440	4492.391	86.623	87.108	0.0034
D-1	285.949	108.443	2.712	2.359	0.640	121.238	4903.271	87.663	88.166	0.0034
D-1	296.232	108.480	2.749	2.379	0.642	124.502	5079.597	88.789	89.299	0.0034
D-1	317.016	108.546	2.815	2.431	0.645	130.402	5435.982	89.991	90.515	0.0034
D-1	331.556	108.593	2.862	2.462	0.647	134.659	5685.295	91.143	91.677	0.0034
D-1	342.372	108.629	2.898	2.482	0.648	137.960	5870.766	92.266	92.808	0.0034
D-1	355.342	108.670	2.939	2.507	0.650	141.766	6093.173	93.403	93.952	0.0034
D-1	372.365	108.714	2.983	2.553	0.653	145.879	6385.063	93.518	94.076	0.0034
D-1	389.711	108.758	3.027	2.598	0.655	149.996	6682.500	93.633	94.199	0.0034
D-1	422.096	108.838	3.107	2.680	0.660	157.478	7237.821	93.805	94.388	0.0034
D-1	455.532	108.918	3.187	2.761	0.665	164.974	7811.165	93.976	94.577	0.0034
D-1	490.004	108.998	3.267	2.841	0.670	172.483	8402.270	94.148	94.767	0.0034
D-1	525.495	109.077	3.346	2.919	0.675	180.005	9010.845	94.319	94.956	0.0034
D-1	561.999	109.157	3.426	2.997	0.679	187.542	9636.778	94.491	95.145	0.0034
D-1	599.499	109.237	3.506	3.073	0.683	195.092	10279.807	94.662	95.334	0.0034
D-1	632.747	109.306	3.575	3.138	0.687	201.629	10849.924	94.798	95.486	0.0034
D-1	666.724	109.375	3.644	3.203	0.691	208.174	11432.543	94.934	95.639	0.0034
D-1	701.423	109.444	3.713	3.267	0.694	214.729	12027.539	95.069	95.791	0.0034
D-1	736.838	109.513	3.782	3.330	0.697	221.294	12634.805	95.205	95.943	0.0034
D-1	772.961	109.582	3.851	3.392	0.701	227.868	13254.225	95.341	96.096	0.0034
D-1	810.873	109.653	3.922	3.455	0.707	234.678	13904.306	96.509	97.284	0.0034
D-1	813.567	109.658	3.927	3.460	0.711	235.163	13950.514	97.548	98.324	0.0034
D-1	841.332	109.709	3.978	3.503	0.714	240.145	14426.607	97.819	98.614	0.0034
D-1	869.505	109.760	4.029	3.547	0.716	245.141	14909.688	98.090	98.905	0.0034
D-1	906.994	109.829	4.098	3.601	0.719	251.896	15552.533	98.662	99.494	0.0034
D-1	945.214	109.897	4.166	3.654	0.723	258.691	16207.910	99.235	100.083	0.0034
D-1	984.154	109.966	4.235	3.706	0.726	265.525	16875.617	99.807	100.672	0.0034

Tabulated Cross-Section Properties | D-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
D-2	0.000	102.713	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.0093
D-2	0.003	102.742	0.029	0.143	0.379	0.020	0.030	1.383	1.385	0.0093
D-2	0.062	102.815	0.102	0.389	0.486	0.160	0.645	2.442	2.456	0.0093
D-2	0.190	102.881	0.168	0.556	0.530	0.342	1.974	3.049	3.078	0.0093
D-2	0.388	102.948	0.235	0.687	0.559	0.564	4.026	3.657	3.700	0.0093
D-2	0.661	103.014	0.301	0.799	0.580	0.827	6.864	4.264	4.322	0.0093
D-2	0.699	103.022	0.309	0.811	0.582	0.861	7.255	4.345	4.405	0.0093
D-2	0.879	103.063	0.350	0.836	0.586	1.052	9.131	5.080	5.146	0.0093
D-2	1.104	103.103	0.390	0.867	0.592	1.273	11.464	5.816	5.887	0.0093
D-2	1.521	103.152	0.439	0.957	0.647	1.590	15.797	7.132	7.208	0.0093
D-2	1.521	103.152	0.439	0.957	0.694	1.590	15.797	8.208	8.284	0.0093
D-2	1.959	103.193	0.480	1.008	0.687	1.944	20.342	8.866	8.949	0.0093
D-2	2.482	103.235	0.522	1.067	0.689	2.326	25.772	9.524	9.613	0.0093
D-2	2.697	103.250	0.537	1.092	0.692	2.470	28.007	9.735	9.827	0.0093
D-2	3.528	103.302	0.589	1.178	0.702	2.995	36.630	10.431	10.534	0.0093
D-2	4.488	103.354	0.641	1.262	0.713	3.555	46.604	11.128	11.242	0.0093
D-2	5.447	103.402	0.689	1.323	0.731	4.119	56.565	12.350	12.472	0.0093

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
D-2	6.573	103.449	0.736	1.394	0.740	4.715	68.259	13.031	13.163	0.0093
D-2	7.824	103.496	0.783	1.464	0.749	5.344	81.248	13.712	13.854	0.0093
D-2	9.087	103.539	0.826	1.528	0.757	5.946	94.358	14.301	14.452	0.0093
D-2	9.428	103.550	0.837	1.543	0.794	6.112	97.902	15.876	16.030	0.0093
D-2	10.176	103.573	0.860	1.566	0.827	6.499	105.667	17.804	17.963	0.0093
D-2	10.345	103.578	0.865	1.570	0.840	6.590	107.420	18.514	18.674	0.0093
D-2	10.586	103.585	0.872	1.575	0.853	6.722	109.924	19.342	19.503	0.0093
D-2	10.724	103.589	0.876	1.577	0.875	6.802	111.357	20.533	20.696	0.0093
D-2	11.033	103.597	0.884	1.583	0.872	6.967	114.563	20.738	20.901	0.0093
D-2	12.530	103.633	0.920	1.621	0.865	7.730	130.109	21.616	21.782	0.0093
D-2	12.973	103.643	0.930	1.631	0.896	7.956	134.713	23.569	23.736	0.0093
D-2	13.292	103.650	0.937	1.636	0.907	8.124	138.029	24.463	24.631	0.0093
D-2	14.206	103.670	0.957	1.648	0.904	8.623	147.517	25.450	25.619	0.0093
D-2	15.109	103.688	0.975	1.662	0.905	9.090	156.894	26.463	26.633	0.0093
D-2	15.368	103.693	0.980	1.666	0.926	9.226	159.584	27.948	28.119	0.0093
D-2	16.320	103.711	0.998	1.676	0.917	9.735	169.463	28.580	28.752	0.0093
D-2	17.428	103.730	1.017	1.695	0.912	10.284	180.973	29.221	29.394	0.0093
D-2	19.209	103.759	1.046	1.723	0.910	11.150	199.472	30.531	30.707	0.0093
D-2	21.478	103.793	1.080	1.759	0.907	12.211	223.029	31.883	32.062	0.0093
D-2	23.698	103.824	1.111	1.793	0.907	13.220	246.079	33.210	33.391	0.0093
D-2	25.269	103.844	1.131	1.819	0.903	13.888	262.395	33.568	33.751	0.0093
D-2	28.992	103.889	1.176	1.880	0.897	15.419	301.059	34.457	34.645	0.0093
D-2	33.038	103.934	1.221	1.945	0.896	16.989	343.071	35.346	35.539	0.0093
D-2	34.665	103.952	1.239	1.966	0.898	17.632	359.964	36.050	36.243	0.0093
D-2	36.343	103.971	1.258	1.983	0.899	18.325	377.384	36.937	37.131	0.0093
D-2	37.549	103.986	1.273	1.988	0.903	18.889	389.915	38.279	38.473	0.0093
D-2	40.232	104.013	1.300	2.018	0.904	19.935	417.769	39.209	39.405	0.0093
D-2	44.385	104.050	1.337	2.074	0.906	21.403	460.898	40.097	40.297	0.0093
D-2	50.933	104.105	1.392	2.154	0.912	23.648	528.888	41.569	41.774	0.0093
D-2	58.278	104.162	1.449	2.236	0.918	26.060	605.166	43.054	43.265	0.0093
D-2	58.411	104.163	1.450	2.238	0.918	26.103	606.540	43.083	43.294	0.0093
D-2	64.887	104.211	1.498	2.300	0.923	28.207	673.791	44.572	44.787	0.0093
D-2	72.564	104.264	1.551	2.371	0.929	30.610	753.513	46.127	46.346	0.0093
D-2	75.269	104.282	1.569	2.394	0.931	31.446	781.594	46.686	46.906	0.0093
D-2	80.084	104.313	1.600	2.434	0.935	32.908	831.601	47.632	47.855	0.0093
D-2	84.109	104.340	1.627	2.459	0.939	34.211	873.391	48.939	49.163	0.0093
D-2	88.846	104.370	1.657	2.489	0.943	35.700	922.579	50.272	50.499	0.0093
D-2	95.726	104.408	1.695	2.544	0.946	37.625	994.018	51.078	51.308	0.0093
D-2	104.464	104.455	1.742	2.608	0.951	40.052	1084.761	52.194	52.429	0.0093
D-2	112.178	104.497	1.784	2.653	0.955	42.277	1164.865	53.737	53.974	0.0093
D-2	112.068	104.501	1.788	2.637	0.957	42.494	1163.722	54.859	55.096	0.0093
D-2	112.870	104.505	1.792	2.642	0.957	42.713	1172.044	54.965	55.203	0.0093
D-2	125.897	104.570	1.857	2.716	0.962	46.354	1307.315	57.040	57.281	0.0093
D-2	126.085	104.571	1.858	2.717	0.962	46.411	1309.274	57.091	57.332	0.0093
D-2	132.120	104.601	1.888	2.744	0.965	48.144	1371.941	58.446	58.690	0.0093
D-2	140.807	104.641	1.928	2.788	0.970	50.511	1462.150	59.940	60.186	0.0093
D-2	148.548	104.674	1.961	2.829	0.973	52.505	1542.533	60.887	61.136	0.0093
D-2	154.646	104.700	1.987	2.859	0.975	54.099	1605.854	61.735	61.986	0.0093
D-2	166.511	104.749	2.036	2.913	0.979	57.165	1729.057	63.381	63.634	0.0093
D-2	168.221	104.756	2.043	2.920	0.980	57.609	1746.810	63.633	63.886	0.0093
D-2	180.360	104.805	2.092	2.968	0.984	60.774	1872.862	65.533	65.790	0.0093
D-2	182.206	104.813	2.100	2.972	0.985	61.300	1892.034	65.987	66.244	0.0093
D-2	186.914	104.832	2.119	2.988	0.987	62.562	1940.925	66.922	67.180	0.0093
D-2	208.003	104.904	2.191	3.084	0.994	67.444	2159.914	68.673	68.937	0.0093
D-2	215.324	104.928	2.215	3.116	0.996	69.099	2235.932	69.242	69.509	0.0093
D-2	230.978	104.979	2.266	3.179	1.001	72.665	2398.480	70.627	70.897	0.0093
D-2	240.440	105.012	2.299	3.205	1.003	75.021	2496.740	72.127	72.399	0.0093
D-2	240.440	105.012	2.299	3.205	1.003	75.021	2496.740	72.127	72.399	0.0093
D-2	260.137	105.072	2.359	3.276	1.009	79.400	2701.278	73.849	74.125	0.0093
D-2	273.327	105.112	2.399	3.318	1.012	82.382	2838.240	75.237	75.516	0.0093
D-2	274.883	105.117	2.404	3.322	1.013	82.758	2854.398	75.463	75.742	0.0093
D-2	290.104	105.163	2.450	3.363	1.016	86.271	3012.451	77.245	77.527	0.0093
D-2	294.833	105.178	2.465	3.372	1.017	87.435	3061.563	77.985	78.267	0.0093
D-2	300.834	105.197	2.484	3.383	1.018	88.926	3123.872	78.972	79.255	0.0093
D-2	313.338	105.231	2.518	3.420	1.021	91.631	3253.716	80.094	80.379	0.0093
D-2	324.908	105.264	2.551	3.446	1.023	94.298	3373.861	81.588	81.875	0.0093
D-2	332.056	105.282	2.569	3.467	1.025	95.771	3448.081	82.082	82.370	0.0093
D-2	353.088	105.336	2.623	3.522	1.029	100.254	3666.483	83.954	84.246	0.0093
D-2	353.504	105.337	2.624	3.523	1.029	100.338	3670.804	83.981	84.273	0.0093
D-2	364.181	105.366	2.653	3.543	1.031	102.794	3781.673	85.416	85.709	0.0093
D-2	379.836	105.405	2.692	3.578	1.034	106.156	3944.235	86.976	87.272	0.0093
D-2	387.917	105.423	2.710	3.601	1.036	107.725	4028.146	87.407	87.704	0.0093
D-2	409.654	105.473	2.760	3.653	1.039	112.137	4253.859	89.062	89.363	0.0093
D-2	421.262	105.498	2.785	3.683	1.042	114.372	4374.404	89.721	90.023	0.0093
D-2	441.625	105.544	2.831	3.726	1.045	118.539	4585.854	91.476	91.780	0.0093

Annex C – 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 Joshua,

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] Google Maps
[ii] England | Catchment Data Explorer
[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
[vii] Flood alerts and warnings - GOV.UK