Appendix 15.1
Flood Depth Analysis

Rosefield Solar Farm

Preliminary Environmental Information Report

Volume 3
Appendix 15.1: Flood Depth Analysis

May 2023

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1. Introduction

1.1 Background

1.1.1 AECOM has been commissioned by Rosefield Energyfarm Limited (the 'Applicant') to carry out an assessment of the flooding depths for an event with 1 in 100 chance of flooding to occur in any one year (1% AEP[1]) to locate the key infrastructure above this flood level, for the Rosefield Solar Farm.

1.1.2 The Proposed Development Rosefield Solar Farm is a proposed solar photovoltaic (PV) electricity generating and battery storage facility with associated infrastructure, located in Buckinghamshire, to the southwest of Winslow, Buckinghamshire.

1.1.3 Rosefield Solar Farm comprises of a large-scale solar and battery storage facility located on areas of agricultural farmland across four distinct parcels of land.

1.1.4 Based on the Environment Agency (EA) Flood Map for Planning[2], two potential subsites – Parcel 1a and 3 are partially located within the Flood Zone 3[3]. There is no tidal influence at these subsites.

1.1.5 Hydraulic model outputs from the EA were not available at the time of starting this assessment. Therefore, the flood depths have been assessed using freely available datasets. The outputs became available at a later date and this report has been updated to include a comparison with the EA model outputs.

1.1.6 The purpose of this Technical Note is to outline the methodology adopted to carry out the assessment and provide a summary of the flooding depths across the subsites.

1.2 Details of the Subsites

1.2.1 The two potential subsites at risk of flooding are:

- Parcel 1a - Parcel 1a is approximately centred on National Grid Reference (NGR) SP708230 and is located approximately 2 km to the south-east of the village of Calvert. The subsite is located between Sheephouse Wood and Romer Wood and is represented by a solid red line in Figure 1. It covers an area of approximately 14.4 ha. The north- western edge of Parcel 1a is near Muxwell Brook, a tributary of River Roy.
- Parcel 3 - Parcel 3 is approximately centred on NGR SP75331 and located approximately 1.1 km to the east of the village of East Claydon and 1km to the north-west of Granborough (solid red line in Figure 2). It covers an area of approximately 53.6 ha. The East Claydon National Grid Substation is present to the west of the site. An unnamed tributary of Claydon Brook flows along the eastern boundary of the site.

1.2.2 Parcel 1a has elevation values ranging from 77 metres Above Ordnance Datum (mAOD) to 87 mAOD. Parcel 3 has elevation values ranging from 85 mAOD to 98 mAOD.

[1] AEP stands for Annual Exceedance Probability.

[2] Environment Agency (EA). 'Flood map for Planning'. Available: https://flood-map-for-planning.service.gov.uk/. Last Accessed: 23/05/2022.

[3] Flood Zone 3 is defined as areas of land at risk of flooding, when the presence of flood defences is ignored and covers land with a 1 in 100 (1%) or greater chance of flooding each year from Rivers; or with a 1 in 200 (0.5%) or greater chance of flooding each year from the Sea.

2. Assessment of Flood Depths

2.1.1 The following set of data was used for the assessment:

- Flood Zone 3 – ESRI shapefile of the flood extent released in May 2023, downloaded from the EA website.
- Digital Terrain Model (DTM) - captured by Light Detecting and Ranging (LiDAR) technique to represent the topography of the Site. A 1 m grid resolution of the DTM undertaken in 2020 and obtained from the Department for Environment Food and Rural Affairs (DEFRA) website[4].

2.1.2 The assessment has been carried out using GIS analysis techniques; and a combination of industry standard GIS packages – QGIS 3.30 and ArcMap 10.8 were used.

2.1.3 The assessment has been based on the principle that along the boundary of the flood extent, the flood depths are approximately equal to zero and the water level would be equal to the ground level. The water surface is then assumed to be flat across the cross-sectional length of the flooded area.

2.1.4 The following procedure was adopted to generate a water surface raster:

- Points were sampled at an interval of 5m-20m along the boundary of the flood extent and elevation was assigned to the points based on the DTM.
- At these points, transect lines perpendicular to the direction of flow were generated, using the GIS tools.
- As a flat surface has been assumed, each end of the transect line were assigned with points having the same elevation as the other end.
- Using the Triangulated Irregular Network (TIN) interpolation technique, a water surface raster has been generated.

2.1.5 Then, the flood depth has been derived by subtracting the DTM/LiDAR elevation from water surface elevation at each grid cell.

3. Outcomes of the assessment

3.1.1 The Flood Zone 3 extent (1% AEP) shows that a small portion of the subsite at the north-western boundary is likely to be inundated from the Muxwell Brook watercourse (Figure 1). The assessment shows that the flooding depths are likely to be less than 10cm.

3.1.2 For Parcel 3, the maximum flood depths vary up to 80cm (Figure 2). The highest flood depths are noticed close to the East Claydon substation, due to its proximity to the confluence of the Claydon Brook and its tributary. The water surface elevation is approximately 87.5 mAOD. The area closest to the Claydon Brook (at the western most edge) could experience flooding depths in excess of 1m. However, given the high-level nature of this assessment, the accuracy is limited, and further modelling will be needed to ascertain this.

[4] Department for Environment Food and Rural Affairs (DEFRA). DEFRA survey Download. Available: https://environment.data.gov.uk/DefraDataDownload/?Mode=survey. Last Accessed: 23/05/2023

3.1.3 The areas further south of this are likely to experience up to 50cm flooding depths. The water surface elevation increases as it moves south, from 87.6 mAOD to 89.3 mAOD.

3.1.4 Based on the Upper Ouse broadscale flood model outputs provided by the EA for Parcel 3, the flooding depths and water surface elevation are similar to those predicted by this assessment. It should be noted that the Flood Zone 3 has been derived from this broadscale model, which has a square grid resolution of 10m and may not represent the local hydraulics accurately. Therefore, to enhance the understanding of the local flooding mechanisms and to improve the confidence in the assessment, a site-specific flood risk assessment and further detailed hydraulic modelling exercise is to be carried out at the ES stage to support the DCO application.

4. Limitations and Assumptions

4.1.1 The following assumptions and limitations have been included as part of this assessment:

- The EA flood zone maps have been assumed to be the best available source of information to represent flood risk at the time of start of the assessment.
- It should be noted that this is a high-level assessment based on the available data and does not replace the need for a detailed hydraulic model outputs and a site-specific assessment is suggested to be carried out.
- The assessment does not include any allowance for climate change. Considering a lifetime of approximately 40 years for the infrastructure, an uplift of 4%-30% for river flows is expected for the Upper Bedford and Ouse Management catchment[6].
- It should be noted that the assessment has been limited to assess the depths from Flood Zone 3 only. Flood Zone 2[7] has not been included in this assessment and is likely to have higher flooding depths.
- The flood zone maps have been developed from modelling studies for large scale mapping. Based on the information provided by the EA, Parcel 1a flood extents have been derived from the JFLOW model that has a square grid resolution between 5-100m. Give the broad scale nature of these studies, they may not represent the local flood mechanisms accurately. Therefore, the accuracy of the outputs generated from the flood extents may be limited.
- The analysis has employed spatial interpolation techniques such as linear interpolation and TIN. However, these techniques do not account for the local ground conditions that may affect the hydraulics of floodplain flows. Therefore, it should be noted that the accuracy of the outputs is limited, and the assessment is likely to only provide an indication of the flood depths. It is advised that the maps are not used to interpret absolute values of flood depths at any specific location.
- It should be noted that the LIDAR data used has a vertical accuracy of +/-15cm root mean square deviation (RMSE).

Figure 1: Map of Maximum Flood Depth at Parcel 1a (1% AEP).

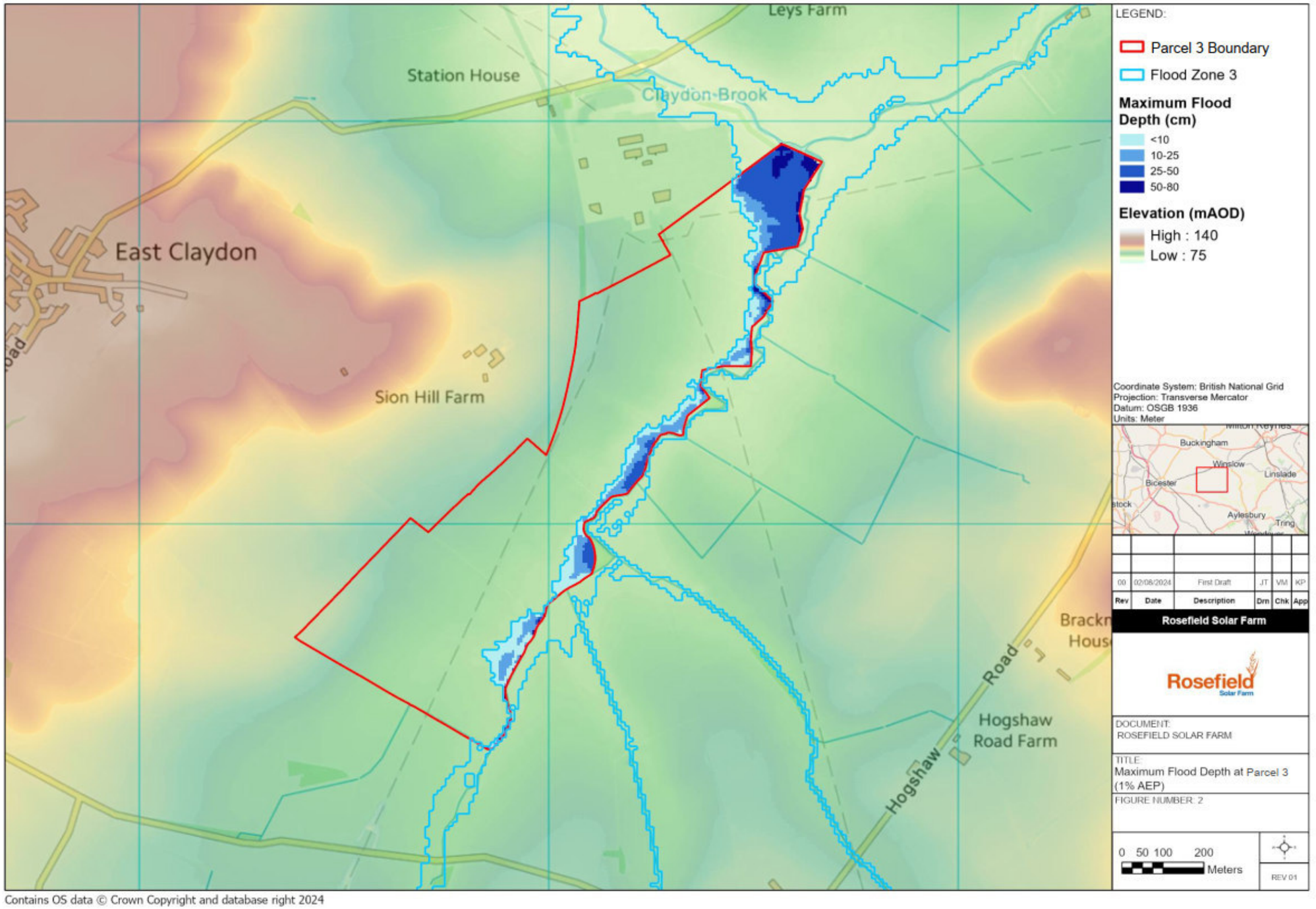

Figure 2: Map of Maximum Flood Depth at Parcel 3 (1% AEP)

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