Fferm Solar Larnog

Environmental Statement

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11. Other Environmental Effects

11.1. Introduction

11.1.1. Through the Environmental Impact Assessment (EIA) process, a range of environmental topics have been identified for detailed assessment within the Environmental Statement (ES) based on the characteristics of the Site, the nature of the Proposed Development and the surrounding environmental context. The approach to scoping and topic selection is described in **Chapter 2: Approach to the EIA**. The following topics are considerations within the EIA but are not reported as standalone ES chapters and are therefore considered within this chapter:

- Climate (Greenhouse Gases);
- Climate Resilience;
- Glint and Glare; and
- Hydrology, Hydrogeology and Geology.

11.1.2. As detailed within Table 2.1 of **Chapter 2: Approach to the EIA**, population and human health have been considered throughout the EIA process and is addressed within both the relevant technical chapters (including **Chapter 6: Landscape and Visual** and **Chapter 8: Noise and Vibration**), their supporting technical documents and the assessments provided in this ES Chapter.

11.1.3. This chapter summarises the findings of the relevant technical assessments and supporting evidence for environmental topics and impact pathways where significant effects are not anticipated. It brings together the available evidence and professional judgement to explain why further standalone detailed assessment is not required within this ES. The conclusions presented are informed by the detailed technical reports and supporting assessments, which remain the primary sources of assessment information.

11.2. Climate (Greenhouse Gases)

11.2.1. In accordance with the Scoping Report (**Appendix 1B: EIA Scoping Report**) and subsequent Scoping Opinion (**Appendix 1C: EIA Scoping Opinion**), climate change has been scoped out of requiring a standalone ES chapter. However, it has been considered through the EIA process and assessed within Carbon Balance Assessment (**Appendix 11A: Carbon Balance Assessment**). This section provides a summary of the assessment findings and conclusions, drawing on the evidence presented within **Appendix 11A: Carbon Balance Report** to consider the greenhouse gas (GHG) emissions and savings associated with the Proposed Development.

Policy and Legislative Context

11.2.2. Climate change is a global environmental issue driven by increasing concentrations of GHGs in the atmosphere. The UK and Welsh Governments have established legally binding commitments to achieve net zero GHG emissions by 2050, supported by a framework of carbon budgets[1] and emissions reduction targets[2]. The Proposed Development has therefore been considered within the context of national and regional decarbonisation objectives.

Baseline

11.2.3. The Site currently comprises predominantly agricultural land, classified as Grade 3b and 4 land which is not considered to constitute Best and Most Versatile (BMV)[3], as reported in **Chapter 3: Site and Surrounding Area**. The existing land use, agricultural operations and land management practices, is attributed with limited GHG emissions. The Site does not contain soils or vegetation with substantial carbon storage potential, such as peatland habitats, and therefore does not represent a significant carbon sink. The Site does not currently support any energy generation infrastructure and consequently does not contribute to the displacement of fossil fuel-derived electricity generation.

11.2.4. In the absence of the Proposed Development, the existing agricultural use of the Site would be expected to continue. GHG emissions associated with agricultural activities and land management practices would therefore remain broadly consistent with current conditions. As the Site does not currently support renewable energy generation infrastructure, it would not contribute to the displacement of fossil fuel-derived electricity generation and would not make a substantial contribution towards national or regional emissions reduction targets.

Mitigation

11.2.5. The principal measure by which GHG emissions are addressed is through the generation of renewable electricity by the Proposed Development. As identified in **Appendix 11A: Carbon Balance Report** and summarised below, the avoided emissions associated with renewable electricity generation substantially exceed the lifecycle emissions generated by the Proposed Development.

[1] UK Government. (2026) The Carbon Budget Order 2026. Available at: https://www.legislation.gov.uk/ukdsi/2026/9780348283815 (Accessed: September 2026).
[2] UK Government. (2019) The Climate Change Act 2008 (2050 Target Amendment) Order 2019. Available at: https://www.legislation.gov.uk/uksi/2019/1056/contents/made (Accessed: September 2026).
[3] Welsh Government (2025) Agricultural Land Classification: predictive map guidance. Available online at: https://www.gov.wales/agricultural-land-classification-predictive-map-guidance

Assessment

11.2.6. To inform the consideration of GHG emissions, a carbon balance assessment has been undertaken and is presented in **Appendix 11A: Carbon Balance Report**. The assessment quantifies lifecycle GHG emissions associated with the manufacture of materials and products, transport, construction, operation, maintenance, replacement and decommissioning of the Proposed Development, together with the carbon benefits associated with renewable electricity generation.

11.2.7. The assessment estimates that the total lifecycle GHG emissions associated with the Proposed Development would be approximately 22,688 tCO_2e over the lifetime of the Proposed Development. These GHG emissions would principally arise from the manufacture of the project components, including solar PV modules, Battery Energy System Storage (BESS) infrastructure and associated electrical equipment. Operational emissions associated with maintenance and component replacement represent the second largest source of emissions. However, the carbon emissions will be offset through the generation of renewable electricity (see **paragraphs 11.2.8** to **11.2.10**).

11.2.8. The Proposed Development is expected to generate approximately 39.2 GWh of renewable electricity annually over a 40-year operational life. Through the displacement of electricity that would otherwise be generated from more carbon-intensive sources, the Carbon Balance Assessment estimates that the Proposed Development would avoid approximately 661,696 tCO_2e of GHG emissions over its lifetime.

11.2.9. The assessment demonstrates that the GHG emissions associated with the construction, operation and decommissioning of the Proposed Development would be substantially outweighed by the emissions avoided through renewable energy generation, with net emissions of -639,008 tCO_2e.

11.2.10. The Carbon Balance Assessment identifies a carbon payback period of approximately 1.2 years. This represents the period required for the renewable electricity generated by the Proposed Development to offset the GHG emissions associated with its lifecycle. Following this period, the Proposed Development would continue to provide a net carbon benefit for the remainder of its operational life. Therefore, the assessment indicates that the Proposed Development will provide a net carbon benefit and will contribute to wider electricity sector decarbonisation in support of both Welsh and UK Government net zero ambitions.

Conclusion

11.2.11. Climate change effects were scoped out as a standalone EIA topic on the basis that construction and decommissioning effects are expected to be temporary and minor, whilst the operational phase would result in an overall beneficial effect through the generation of renewable electricity.

11.2.12. The findings of **Appendix 11A: Carbon Balance Report** concludes that GHG emissions associated with construction and decommissioning would be temporary and limited in nature, while the operational phase would result in a net reduction in GHG emissions through the generation of renewable electricity and displacement of fossil fuel-derived generation. Consequently, no significant adverse effects are anticipated, and the Proposed Development is expected to make a beneficial contribution to climate change mitigation over its operational lifetime.

11.3. Climate Resilience

11.3.1. Climate change is expected to influence the frequency and intensity of weather-related events, including extreme rainfall, flooding, drought, and heatwaves. Infrastructure developments therefore need to demonstrate resilience to the potential effects of future climatic conditions over their operational lifetime.

11.3.2. In accordance with the Scoping Report (**Appendix 1B: EIA Scoping Report**) and subsequent Scoping Opinion (**Appendix 1C: EIA Scoping Opinion**), the vulnerability of the Proposed Development to climate change has been considered through the design process and within the relevant environmental assessments, including **Chapter 5: Project Description**, **Chapter 6: Landscape and Visual**, and **Chapter 7: Biodiversity**. Measures to improve the resilience of the Proposed Development to future climatic conditions have been incorporated into the scheme design and are summarised within **Appendix 11A: Carbon Balance Report**.

Baseline

11.3.3. UK climate projects indicate that the effects of climate change are likely to include increased rainfall intensity, more frequent extreme weather events, rising temperatures, prolonged periods of drought and changing seasonal weather patterns. In the near future, (next few years), variations in average temperature and precipitation are likely to represent the most noticeable changes in climatic conditions. Over subsequent decades, anthropogenic climate change is expected to become increasingly evident, resulting in more pronounced changes in rainfall patterns, temperatures and the frequency and severity of extreme weather events.

11.3.4. According to the latest State of the UK Climate Report[4], the UK's climate is changing. In general, climate change in the UK is projected to lead to:

- Hotter drier summers with increased frequency and duration of heatwaves and droughts;
- Warmer, wetter winters with reduced frequence of snow and ice, however such events and extreme cold snaps remain a risk; and
- Increased frequency of extreme events such as heavy rainfall, resultant flooding, high winds and, potentially, lighting strikes.

Mitigation

11.3.5. Climate resilience has been embedded within the Proposed Development through the application of flood risk avoidance and sustainable drainage principles. The drainage strategy has been developed to maintain existing hydrological conditions as far as practicable whilst accommodating future climate change allowances, as demonstrated within **Appendix 11E: Flood Consequence Assessment and Outline Drainage Statement**.

11.3.6. Climate resilience has also been incorporated through landscape and ecological management measures identified within **Appendix 6G: Outline Landscape and Ecological Management Plan (LEMP)**, including habitat creation, enhancement planting, use of native species and monitoring. The oLEMP includes provisions for monitoring habitat establishment and reviewing management prescriptions in response to observed climatic conditions and ecological performance.

11.3.7. The embedded mitigation measures are detailed in Table 1.5 of **Appendix 11A: Carbon Balance Assessment** and include:

- Consideration of existing flood risk areas and future climate projections into the design of the Proposed Development (i.e. siting substation outside flood risk areas, incorporating climate change allowances in drainage design, and retaining existing drainage features);
- Fire safety has been considered as part of **Appendix 5D: Outline Battery Fire Safety Management Plan (oBSFMP),** which includes fire detection, suppression, monitoring, emergency response and maintenance procedures;
- Management proposals for the replacement or enhancement planting set out within **Appendix 6G: oLEMP**;
- Designing operational infrastructure in accordance with relevant engineering standards to withstand anticipated future climatic conditions and extreme weather events; and

[4] Met Office (2026). State of the UK Climate. Available at: https://www.metoffice.gov.uk/research/climate/maps-and-data/about/state-of-climate (Accessed: October 2026).

- Maintaining ongoing inspection, monitoring and operational management regimes to identify and respond to emerging climate-related risks.

Assessment

11.3.8. The Proposed Development has been designed with consideration to the potential effects of future climate change throughout its anticipated 40-year operational lifetime. In particular, informing the design of the drainage strategy, the siting of key infrastructure, landscape and ecological management proposals and operational safety measures.

11.3.9. The **Appendix 11E: FCA and Outline Drainage Statement** concludes that flood risk from fluvial, coastal, groundwater, sewerage and artificial sources is low or negligible and is not expected to represent a significant constraint to the Proposed Development. It also shows that the outline drainage strategy incorporates appropriate climate change allowances and will ensure the Proposed Development has resilience against increased rainfall intensity and future flood risk.

11.3.10. The Proposed Development has also considered the potential effects of increased temperatures and more frequent extreme weather events on the long-term performance of infrastructure. Solar PV arrays, mounting structures, electrical infrastructure and the BESS would be designed and operated in accordance with relevant industry standards and manufacturer specifications to ensure resilience to future climatic conditions over the anticipated 40-year operational lifetime. **Appendix 5D: oBFSMP** has also considered fire resilience for the operation of the BESS.

11.3.11. Climate resilience has also been integrated into the landscape and ecological strategy. **Appendix 6G: oLEMP** includes measures to establish and maintain a diverse network of grassland, hedgerow, scrub, woodland and orchard habitats, supported by adaptive management and periodic review. This approach is intended to improve ecological resilience, habitat connectivity and would consider the ability of landscape/ecological features to adapt to changing climatic conditions, including increasing temperatures and periods of drought.

11.3.12. Taking account of the embedded mitigation and adaptation measures incorporated within the Proposed Development, including the siting of key infrastructure in low flood risk areas, drainage strategy, landscape and ecological management measures, infrastructure design standards and battery safety measures, the vulnerability of the Proposed Development to future climate change is considered to be low.

Conclusion

11.3.13. The findings of these assessments indicate that the Site is generally at low risk from flooding and that the Proposed Development can be designed, operated and managed to remain resilient to the anticipated effects of climate change over its 40-year operational lifetime. The combination of sustainable drainage measures, climate-resilient landscape and ecological management, infrastructure design standards and battery fire safety measures is expected to support the long-term resilience of the Proposed Development.

11.4. Glint and Glare

11.4.1. Ground-mounted solar photovoltaic (PV) developments have the potential to give rise to solar reflections, resulting in glint and glare effects experienced by nearby receptors. Sensitive receptors can include aviation receptors, road users and residential properties where reflected sunlight may affect visibility or visual amenity. In accordance with the EIA Scoping Opinion (see **Appendix 1C: EIA Scoping Opinion**), the Glint and Glare Technical Report has been prepared and considered as part of the EIA process and can be found in **Appendix 11B: Glint and Glare Assessment**.

Baseline

11.4.2. The glint and glare assessment identified sensitive receptors within the vicinity of the Site, including the following:

- **Aviation receptors**: aviation receptors (airports, airfields, and heliports) within 30 km of the Site were identified, including Cardiff Airport (9.25 km), Cardiff ATCT (10.2 km), Cardiff Heliport (6.86 km), St Athans Airfield (15.7 km), St Athan Airfield (17.2 km), RAF Llandow (21.1 km) and Flat Holm Helipad (5.1 km). Aviation receptors within 10 km of the Site were considered for further assessment[5];
- **Road receptors**: the assessment identified 17 road receptors within approximately 1 km of the Site that have potential views towards the Site, including St Mary's Well Bay Road, Fort Road, Lavernock Road, Beach Road, South Road, other minor roads and the consented active travel route (2025/00493/RG3);
- **Residential receptors**: the assessment identified 39 residential receptors within 1 km of the Site. The nearest receptors included The Bay Caravan Park, dwellings along Fort Road (including Ty Orsaf), a dwelling along Lavernock Road, and Dros-y-Mor; and
- **Railway receptors**: no operational railways were identified within 0.5 km of the Site.

[5] Cardiff Airport ATCT is located marginally beyond the 10 km radius for further assessment. However, given its proximity to this threshold and the potential visibility of the Site from the ATCT due to the relative altitude of the Site and airport, it was included within the assessment as a precautionary measure based on professional judgement.

Mitigation

11.4.3. The following mitigation measures have been identified within **Appendix 11B: Glint and Glare Assessment** to minimise potential glint and glare effects, which would be secured through the LEMP:

- Strengthening existing hedgerows and incorporating additional planting along sensitive boundaries, including along Fort Road; and
- Specific sections of hedgerow adjacent to Sutton Farm and The Bay Caravan Park will be allowed to establish and grow above 3 m where required to provide effective screening of the solar panels from affected receptors.

Assessment

11.4.4. The assessment presented in **Appendix 11B: Glint and Glare Assessment** was undertaken using the ForgeSolar modelling software, which incorporates the methodology of the Federal Aviation Administration's Solar Glare Hazard Analysis Tool (SGHAT)[6]. The assessment considered potential reflections from the proposed PV arrays on a minute-by-minute basis throughout the year using a three-dimensional model of the Site and surrounding area. A conservative worst-case approach was adopted whereby existing vegetation, buildings and other obstructions were not included within the model. Following modelling, existing vegetation and embedded mitigation measures were qualitatively considered in assessing potential effects.

11.4.5. The assessment considered aviation receptors, route receptors and residential receptors surrounding the Site. The findings are summarised below:

- **Aviation receptors**: No significant effects are predicted for airport flight paths, heliports or helicopter flight paths. Limited periods of glare were identified for the Cardiff Airport Air Traffic Control Tower (ATCT) and, whilst limited in duration, further detailed glint and glare assessment will be undertaken as part of the final ES, which will consider both existing and proposed screening within the modelling. Should the detailed assessment identify the need for additional mitigation beyond that currently proposed, appropriate mitigation measures will be refined and incorporated into the Proposed Development;
- **Road receptors**: For route receptors, most roads were assessed as experiencing either no impact or low impacts due to existing screening from mature trees, buildings or the timing of glare events occurring when the sun is at a low angle. However, Fort Road was identified as requiring mitigation due to limited existing screening and the potential for glare. To address this, the proposed landscaping strategy includes the reinforcement and enhancement of existing boundary hedgerows along Fort Road. The oLEMP (please refer to **Appendix 6G: oLEMP**)

[6] ForgeSolar tool, based on the Solar Glare Hazard Analysis Tool ("SGHAT") licensed from Sandia National Laboratories.

includes strengthening of the hedgerows along Fort Road and increasing the height to 2 m, screening views of the panels from road users. Given that Fort Road is a minor road with relatively low traffic volumes, the implementation of the proposed mitigation measures is expected to reduce effects on road users to low; and

- **Residential receptors**: For residential receptors, the majority of dwellings were assessed as having either no impact or a low impact due to existing vegetation, buildings and landscape features screening views of the PV arrays. Mitigation was identified for properties on Fort Road, properties on the south-western edge of the Site and parts of the adjacent caravan park where glare could occur over a more prolonged period and existing screening is limited or partial. As mitigation, specific sections of planting and hedgerow along sensitive boundaries and receptors would be allowed to establish and be maintained at a height of at least 3 m where required to provide effective screening. The implementation of the proposed mitigation measures is expected to reduce effects on road users to low.

Conclusion

11.4.6. The findings of **Appendix 11B: Glint and Glare Assessment** demonstrate that no significant glint and glare effects are predicted for road users, residential receptors, flight paths or heliport receptors, taking account of existing screening and embedded mitigation incorporated within the Proposed Development.

11.4.7. The potential for green glare effects has been identified at Cardiff Airport ATCT when no mitigation is considered under the conservative assessment assumptions applied. Further assessment will be undertaken as part of the ES process to refine the understanding of these effects and determine whether any additional measures are required.

11.5. Hydrology, Hydrogeology and Geology

Baseline

Hydrology and Flood Risk

11.5.1. No statutory main rivers are present within the Site. Sully Brook is located approximately 250 m north of the Site, while several ordinary watercourses, drainage ditches and field drainage features are present within and adjacent to the Site. These include field ditches in the southern and south-eastern parts of the Site and a possible drainage ditch along St Mary's Well Bay Road. Surface water runoff generally follows the local topography towards these drainage features and ultimately towards St Mary's Well Bay and the Bristol Channel.

11.5.2. There are limited areas of Flood Zones 2 and 3 situated within the Site, associated with areas of surface water and ordinary watercourse flood risk. These areas are generally confined to the outer edges of the Site boundary. The FCA indicates that the Site is generally at low risk of flooding and that flood risk does not represent a significant constraint to the Proposed Development (see **Appendix 11E: Flood Consequences Assessment and Outline Drainage Statement (FCAODS)).**

Geology, Hydrogeology and Ground Conditions

11.5.3. The geological and hydrogeological characteristics of the Site have been reviewed as part of the Flood Consequences Assessment (FCA) (see **Appendix 11E: FCAODS**). The Site comprises predominantly agricultural land located between Penarth and Sully, and is underlain by a mixture of soil types, including freely draining slightly acid but base-rich soils (Soilscapes 7), slowly permeable seasonally wet loamy and clayey soils (Soilscapes 18).[7]

11.5.4. The underlying geology consists of a sequence of mudstone, limestone, conglomerate and interbedded limestone and mudstone formations, including the Mercia Mudstone Group, Penarth Group, Blue Anchor Formation, Lavernock Shale Member, St Mary's Well Bay Member, Friars Point Limestone Formation and Gully Oolite Formation. No superficial deposits are mapped beneath the Site, although beach deposits and alluvium are present within the surrounding area.

11.5.5. The Site is underlain by Principal, Secondary A and Secondary B aquifers and is located within an area identified as having high groundwater vulnerability due to the absence of superficial deposits and the presence of sensitive bedrock aquifers. The Site lies within the Thaw and Cadoxton Jurassic Lias Water Framework Directive groundwater body, which is classified as having good overall status. No Source Protection Zones are present within or adjacent to the Site.

11.5.6. According to DataMapWales, no licensed water abstractions are identified within 250 m of the Site. The closest licensed water abstraction is a borehole at Glamorganshire Golf Club approximately 910 m to the northeast[8]. If further Private Water Supplies (PWS) are identified during the PAC process they will be incorporated into the Baseline.

[7] Cranfield University (2026) LandIS: Soilscapes Viewer. Available at: landis.org.uk (Accessed: October 2026).
[8] Welsh Government (2026) DataMapWales: Licenced Water Abstractions (Accessed: October 2026).

11.5.7. The Site has a history of agricultural use, although historical quarrying, lime kilns, refuse heaps, former buildings and a historic landfill adjacent to the north-eastern boundary have been identified through **Appendix 11C: Preliminary Risk Assessment (PRA)**. While published geological mapping does not identify Artificial or Made Ground within the Site, historical mapping indicates that localised Made Ground may be present in association with former quarries, lime kilns and other historical features. The PRA identified two areas of potential Made Ground within the wider land ownership boundary but outside the Site Boundary. These areas will therefore be avoided by the Proposed Development.

11.5.8. Information obtained from the Groundsure Report as part of the PRA also identified an unspecified former quarry within the eastern part of the main Site parcel, likely associated with historic limestone extraction. Evidence of this former quarry comprised areas of overgrown vegetation with rock and waste material present within surrounding soils, indicating historical backfilling (**Appendix 11C: PRA**).

Mineral Safeguarding

11.5.9. **Appendix 11D: Mineral Resource Assessment (MRA)** identifies limestone, brick clay and sandstone resources within the Site. Parts of the Site fall within Mineral Safeguarding Areas associated with Limestone 1 and Limestone 2 resources (see **Figure 9A – C** of the ES). The Limestone 1 resources comprise relatively small areas of Carboniferous limestone in the west of the Site, while the more extensive Limestone 2 resource is associated with the St Mary's Well Bay Member, comprising interbedded limestone and mudstone in the southern and eastern parts of the Site.

Key Receptors

11.5.10. A list of the key receptors identified and assessed in relation to Hydrology, Hydrogeology and Geology is provided below:

- **Surface watercourses**: Sully Brook and field/drainage ditches;
- **PWS:** within 250 m of the Site;
- **Groundwater bodies**: Principal Aquifer, Secondary A and Secondary B aquifers;
- **Human receptors**: within and adjacent to the Site; and
- **Mineral resources**: Mineral Safeguarding Area.

Mitigation

11.5.11. A range of measures has been incorporated into the design of the Proposed Development to protect hydrological, hydrogeological, geological and mineral resources, including the following:

- The Proposed Development has been designed to minimise impacts on existing hydrological processes. New impermeable areas have been limited where practicable. An Outline Drainage Strategy and design have also been developed to detail how surface water will be managed on-site, taking account of climate change allowances. The strategy incorporates sustainable drainage measures (including an attenuation basin, see **Figure 5.1: Indicative Site Layout** of the ES) to maintain existing hydrological conditions and ensure that runoff generated by the Proposed Development does not increase flood risk elsewhere. Further details of the Outline Drainage Strategy are provided in **Appendix 11E: FCAODS**;
- The design and layout of the Proposed Development have taken account of existing public sewers and watermains within and adjacent to the Site, with infrastructure sited to avoid or minimise encroachment on these assets and maintain access for inspection, maintenance and repair;
- During construction, existing drainage pathways will be retained where practicable and runoff will be managed within the same hydrological catchments. Temporary drainage measures will be implemented as required to control surface water runoff and minimise erosion. This is detailed within the oCEMP (see **Appendix 5A: oCEMP**);
- The oCEMP details a range of sediment and erosion control measures to be implemented through the construction period to minimise the mobilisation and transport of sediment and protect water quality. This includes locating soil, spoil and material stockpiles at least 20 m from waterbodies wherever practicable; installing measures such as silt fencing, sediment traps, earth bunds or filter media where required; avoiding the creation of preferential flow pathways; and progressively stabilising and reinstating disturbed ground (see **Appendix 5A: oCEMP**);
- A Pollution Prevention Plan will be prepared as part of the detailed CEMP before construction commences. The oCEMP includes the pollution prevention measures to be included within the Pollution Prevention Plan and implemented during the construction phase (see **Appendix 5A: oCEMP**);
- Groundwater protection has been incorporated into the conceptual drainage design, with runoff from the Project Substation Compound subject to appropriate treatment and pollution control measures prior to infiltration or discharge. Measures would include containment systems for transformers, oil interception, filtration and additional treatment infrastructure where required (see **Appendix 11E: FCAODS**);
- Further site-specific ground investigation, groundwater monitoring and infiltration testing will be undertaken at the detailed design stage to confirm ground conditions, groundwater levels and the suitability of the proposed drainage measures. These investigations will also inform the detailed CEMP;

- If previously unidentified contamination is encountered during construction, work in the affected area will cease and the material will be subject to appropriate risk assessment. Where necessary, contaminated material will be removed, treated or otherwise managed in accordance with an agreed remediation strategy before construction recommences;
- Effects on safeguarded mineral resources will be limited by minimising excavation and permanent ground disturbance. The Project Substation Compound has been positioned outside the mapped limestone resource areas, and the predominantly ground-mounted nature of the solar infrastructure will limit disturbance across the remainder of the Site. Excavated materials will be reused for reinstatement and landscaping where practicable, subject to their environmental and geotechnical suitability, thereby reducing the need to import or export material; and
- Temporary construction compounds and other working areas will be reinstated following the completion of construction. Stripped topsoil and subsoil will be stored separately and reinstated in the correct sequence, with disturbed land restored to its pre-construction condition as far as reasonably practicable. Reinstatement will take place as soon as practicable to reduce the period of soil storage and the risk of erosion. Soil stripping and storage will be managed in accordance with best practice measures, as detailed within the Outline Soil Management Plan (oSMP) (see **Appendix 5C: oSMP**).

Assessment

Hydrology and Flood Risk

Flood Risk

11.5.12. As noted in **paragraph 11.5.2**, the Site is generally at low risk from flood-related hydrological effects. The Site lies outside mapped fluvial and coastal flood zones, with localised areas of surface water flood risk primarily associated with existing drainage corridors, field boundaries and overland flow routes.

11.5.13. The solar panels would be 80 cm above ground level (AGL) and therefore, would not cause any blockage of the existing flow pathways across the Site or impact the local capacity of the floodplain to store water. The Project Substation Compound, however, would comprise an impermeable area of 0.324 ha. Whilst relatively small in comparison to the overall development area, these features have the greatest potential to generate concentrated runoff and therefore require specific consideration for surface water management.

11.5.14. The Outline Drainage Strategy for the management of surface water runoff has been developed to ensure that runoff rates and volumes are not impacted due to the Proposed Development, which is detailed in **Appendix 11E: FCAODS**. The strategy proposes a filter drain network within the Project Substation Compound to collect and convey runoff to a proposed infiltration basin located immediately north of the compound. This approach accords with the SuDS hierarchy by promoting infiltration at source and minimising the need to convey runoff away from the Site. The infiltration basin would provide temporary storage during larger rainfall events while allowing runoff to infiltrate into the underlying ground. Appropriate pollution control measures would be incorporated upstream of the infiltration basin to protect surface water, underlying groundwater resources and local aquifers.

11.5.15. The detailed drainage design will take into account the measures detailed within **Appendix 11E: FCAODS** and will be submitted and approved by the Sustainable Drainage Approving Body (SAB) prior to commencement of construction. The detailed drainage design will be secured via planning condition.

11.5.16. Therefore, implementation of the Outline Drainage Strategy, including the provision of infiltration-based SuDS and associated pollution control measures, will ensure that runoff generated by the Proposed Development is appropriately managed. As a result, the Proposed Development will not materially increase flood risk within the Site or elsewhere in the surrounding catchment, resulting in a negligible effect on flood risk receptors.

Water Quality

11.5.17. During construction, activities including localised topsoil stripping, material stockpiling, establishment of the construction compound, earthworks (including the substation and BESS), and the upgrading of informal access tracks have the potential to result in temporary increases in surface water run-off, soil erosion and sediment mobilisation. There is also potential for localised accidental contamination arising from construction plant, refuelling activities and the movement of machinery.

11.5.18. Construction impacts would be managed in accordance with the principles and measures set out within the oCEMP, including pollution prevention and drainage measures to ensure that the potential for any temporary effects on water quality and flood risk is reduced as far as reasonably practicable (see **Appendix 5A: oCEMP**). These measures include; minimising the extent and duration of exposed or disturbed ground; locating soil, material and spoil stockpiles away from waterbodies wherever practicable; implementing sediment control measures such as silt fencing, sediment traps and earth bunds where required; managing construction plant and activities to avoid the creation of preferential flow pathways; providing appropriate site access and wheel-washing facilities where necessary; and progressively stabilising and reinstating disturbed ground following construction through reseeding, revegetation or other suitable erosion-control measures.

11.5.19. As outlined in **paragraph 1.5.13**, the operational drainage design incorporates appropriate mitigation measures to manage surface water runoff and protect water quality associated with the Project Substation Compound. This includes the provision of a filter drain network and infiltration basin, together with appropriate pollution control measures, to ensure runoff is attenuated, treated and discharged in accordance with the principles of sustainable drainage.

11.5.20. During decommissioning, localised soil disturbance, mobilisation of sediment and accidental pollution would be managed through mitigation measures comparable to those set out within the oCEMP. An Outline Decommissioning Plan will be submitted as part of the application and would set out the overall strategy for decommissioning the Proposed Development, including measures to protect surface water and groundwater receptors, control sediment-laden runoff, manage pollution risks and ensure the appropriate reinstatement of land following removal of infrastructure.

11.5.21. Therefore, taking into account the nature of the Proposed Development and the implementation of embedded and standard good-practice mitigation measures during construction, operation and decommissioning, no significant effects on water quality are anticipated.

Geology, Hydrogeology and Ground Conditions

11.5.22. The PRA identified potential contaminative sources associated with historic land uses of the old quarry within the Site Boundary; however, the Site avoids areas of identified made ground (ground that has been artificially created or significantly modified by human activity) or known contamination, and the risk posed to controlled waters and human health is low.

11.5.23. During construction, activities including topsoil stripping, excavation for the Project Substation Compound, cable installation, material storage and the movement of construction vehicles and plant have the potential to result in the mobilisation of existing contaminants, generation of contaminated dust or runoff, and accidental pollution (i.e. due to spills and leaks of contaminants). These activities have the potential to affect groundwater bodies, any private water supplies (where present), nearby surface water receptors and human receptors within or adjacent to the Site.

11.5.24. Potential effects during construction would be managed through the implementation of the CEMP, which would include measures for pollution prevention, sediment control, surface water management, management of excavated materials and emergency spill response (see **Appendix 5A: oCEMP**). A Pollution Prevention Plan would be prepared prior to commencement of construction, and any previously unidentified contamination encountered during works would be subject to appropriate investigation, risk assessment and remediation before construction recommences. Through implementation of these measures, the potential for contaminant mobilisation and migration to sensitive receptors would be minimised.

11.5.25. During operation, the principal potential source of contamination would be associated with the Project Substation Compound and BESS. However, the Outline Drainage Strategy incorporates a range of measures to protect groundwater and surface water receptors, including drainage controls, treatment measures and pollution containment systems prior to infiltration or discharge (see **Appendix 11E: FCAODS**). In addition, the oBFSMP includes measures to contain firewater and any contaminated runoff generated during an emergency incident, preventing uncontrolled discharge to surrounding land, watercourses or groundwater (see **Appendix 5D: Outline Battery Fire Safety Management Plan**). The detailed firewater management strategy would be developed during the detailed design stage of the Proposed Development. Therefore, potential effects resulting from the mobilisation of contaminants during the operational phase are not anticipated to be significant.

11.5.26. During decommissioning, potential effects would be similar in nature to those identified during construction and would principally relate to temporary ground disturbance, removal of above-ground infrastructure, excavation associated with foundation removal and the movement of plant and machinery. Underground cables would generally be left *in situ*, thereby reducing the extent of excavation required. An Outline Decommissioning Plan would be submitted as part of the application and would set out the approach to decommissioning, including measures for pollution prevention, material management, groundwater protection, contaminated land management and site reinstatement.

11.5.27. Taking account of the limited extent of identified contamination, the implementation of embedded mitigation and good practice measures during construction and decommissioning, and the incorporation of operational drainage, pollution control and firewater containment measures, no significant effects on geology, hydrogeology and ground conditions receptors are anticipated.

Mineral Safeguarding

11.5.28. **Appendix 11D: Mineral Resource Assessment (MRA)** identifies that the Site falls partly within Limestone 1 and Limestone 2 Mineral Safeguarding Areas. However, the Limestone 1 resources occupy small, isolated areas, while the Limestone 2 resource comprises interbedded limestone and mudstone rather than a laterally extensive and homogeneous limestone deposit. Faulting, fragmented geological units and lithological variability further constrain the potential workability and commercial viability of these resources.

11.5.29. The Proposed Development would have a limited physical effect on the mineral resources because ground disturbance would be restricted across most of the Site. The solar panels would be ground-mounted, limiting the extent of excavation, while the Project Substation Compound, where more substantial excavation may be required, is located outside the mapped limestone mineral resource areas.

11.5.30. The Proposed Development would also be temporary and reversible in mineral safeguarding terms. Following its operational lifetime, the Proposed Development would be decommissioned and the land restored to agricultural use. It would therefore not permanently sterilise the safeguarded mineral resources or prevent their possible consideration for extraction following decommissioning.

11.5.31. **Appendix 11D: MRA** concludes that prior extraction is unlikely to be necessary or economically viable due to the temporary nature of the Proposed Development, the limited and fragmented extent of the resources, the interbedded nature of the limestone and mudstone deposits and the local planning context relating to dormant mineral sites. Consultation undertaken with a local limestone quarry operator also indicated that the quantity and geological characteristics of the resource are unlikely to support commercially viable extraction.

Conclusion

11.5.32. Overall, the Proposed Development can be accommodated without giving rise to significant adverse effects relating to hydrology, hydrogeology, geology, ground conditions or safeguarded mineral resources.

11.5.33. While the Site contains a number of hydrological and geo-environmental sensitivities, including localised areas of surface water flood risk, sensitive groundwater receptors, historical quarrying activities and areas of potential contamination, these have informed the design and layout of the Proposed Development and can be appropriately managed through embedded mitigation, good practice measures and detailed design.

11.5.34. During construction and decommissioning, potential effects associated with soil disturbance, sediment mobilisation, contaminant migration and accidental pollution would be managed through the implementation of the measures detailed within the oCEMP (see **Appendix 5A: oCEMP**), oSMP (**Appendix 5C: oSMP**) and Outline Decommissioning Plan. During operation, the measures contained within the Outline Drainage Strategy (**Appendix 11E: FCAODS)** and oBFSMP (**Appendix 5D: oBFSMP**) would ensure that runoff, water quality and potential pollution risks are appropriately controlled and contained.

11.5.35. The Proposed Development avoids areas of Made Ground and incorporates measures to protect surface watercourses, groundwater bodies, private water supplies, human receptors and existing drainage infrastructure. In addition, the Proposed Development would not materially increase flood risk within the Site or elsewhere in the surrounding catchment.

11.5.36. Parts of the Site lie within Limestone 1 and Limestone 2 Mineral Safeguarding Areas; however, the safeguarded resources are limited, fragmented and of constrained commercial viability. The temporary and reversible nature of the Proposed Development, together with its limited excavation requirements, means it would not permanently sterilise the safeguarded resources or prevent their potential consideration for future extraction following decommissioning.

11.5.37. Taking account of the nature of the Proposed Development, embedded mitigation, and standard good-practice construction measures, the residual effects on Hydrology, Hydrogeology and Geology would not be significant across all phases.