Preliminary Environmental Information Report

Chapter 16: Ground Conditions

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Future Energy Llanwern Limited

Contents

16.0 Ground Conditions

16.1 Introduction

16.1.1 This Chapter reports the outcome of the preliminary assessment of likely significant effects arising from the Proposed Development upon ground conditions receptors including soil resources (including agricultural land), geology, land contamination receptors (humans, the environment, ecology, property), and mineral resources. Following Scoping for the Proposed Development (see **Section 16.3**), the Planning Inspectorate agreed that effects on agricultural land, mineral resources, and geological receptors (geodiversity) could be scoped out of the assessment (see **Table 16-4** and the baseline in **Section 16.6**).

16.1.2 This Chapter (and its associated figures and appendices) is intended to be read as part of the wider Preliminary Environmental Information Report (PEIR). The preliminary assessment is based on information obtained to date. It should be read in conjunction with the description provided in **Chapter 2: Description of the Proposed Development** and with respect to the following chapters:

- **Chapter 6: Green House Gas Assessment**;
- **Chapter 7: Cultural Heritage and Archaeology**;
- **Chapter 8: Ecology**;
- **Chapter 10: Water Environment**;
- **Chapter 11: Landscape and Visual Amenity**; and
- **Chapter 14: Socio-Economics, Tourism and Recreation**.

16.1.3 This Chapter describes:

- The legislation, policy and technical guidance that has informed the assessment (**Section 16.2**);
- Limitations and assumptions (**Section 16.3**);
- Stakeholder Engagement (**Section 16.4**);
- Description of the methodology underpinning the ground conditions assessment (**Section 0**);

- Description of the Study Area (**Section 0**);
- Identification of the potential sensitive receptors within the vicinity of the Site (**Section 0**);
- Description of the EIA Significance Criteria (**Section 0**);
- Description of the baseline conditions (**Section16.6**);
- Embedded Design Mitigation (**Section 16.7**);
- Preliminary assessment of likely impacts and effects (**Section 16.8**);
- Consideration for the potential mitigation and enhancement measures to reduce the impact of the Proposed Development (**Section 16.9**);
- A summary of significant residual effects (**Section 16.10**);
- A summary of significant cumulative effects (**Section 16.11**);
- Summary (**Section 16.12**); and
- References (**Section 16.13**).

16.1.4 The figures supporting this Chapter are set out in **Table 16-1**.

Table 16-1 Figures that have informed Ground Conditions

Drawing number / Document reference	Drawing description
Figure 16-1	Ground Conditions Study Area
Figure 16-2	Potential Land Contamination Sources

16.1.5 There are no supporting appendices or figures for this Chapter.

16.2 Legislation, Planning Policy and Technical Guidance

Legislation and Policy

16.2.1 A summary of the relevant national and local planning policies to ground conditions is given in **Table 16-2**. The Policies summarised include overarching national policies and policies from Planning Policy Wales (PPW) and other relevant Technical Advice Notes (TANs) which form material considerations.

Table 16-2 Policy and legislation relevant to Ground Conditions

Policy/ Legislation	Context
National Policy	
Overarching National Policy Statement for Energy (NPS EN-1) (Ref 16-1) and National Policy Statement for renewable energy infrastructure (NPS EN-3) (Ref 16-2)	NPS EN-1 (Section 5.12) and NPS EN-3 (Paragraph 2.2.2). These NPSs explains how soil resources may be impacted by the construction, operation and decommissioning of energy infrastructure, and how pre-existing contamination within a development must be considered to ensure that the site is suitable for its intended use. NPS EN-1 also detail how to assess and mitigate harm, such as through the use of a Soil Management Plan, and say that development should seek to minimise impacts on soil health and consider opportunities for enhancement, such as considering opportunities for early remediation, if this is needed based on risk assessment findings.
Planning Policy Wales, Edition 12 (Ref 16-3)	The 2024 Planning Policy Wales Distinctive and Natural Places chapter, page 124, states that decisions on planning applications must consider the policy topics of the Distinctive and Natural Places theme, including *"opportunities in all areas to improve the resilience of ecosystems are taken by addressing problems such as, building on floodplains, diffuse pollution, soil compaction and sealing, ensuring the protection of peat resources" and "opportunities to improve health and well-being are taken, in particular, to… ensure water sensitive design, address soil carbon management… so as to improve capacity for adaptability to the challenges of climate change such as flood risk and increased temperatures".* Chapter 6, Section 6.4 Biodiversity and Ecological Networks states that development proposals must consider the need to:

Policy/ Legislation	Context
	"safeguard protected species and species of principal importance and existing biodiversity assets from direct, indirect or cumulative adverse impacts that affect their nature conservation interests and compromise the resilience of ecological networks and the components which underpin them, such as water, air and soil, including peat". Chapter 6, Section 6.9.16 Land Contamination states *"Whenever development or re-development potential exists the planning system will be the preferred means of addressing potential land contamination."* Section 6.9.17 states that where land potentially meets the definition of contaminated land under Part 2A, the onus will remain with the developer to ensure that the land is suitable for its proposed use and will not meet the legal definition of contaminated land under Part 2A. Section 6.9.19 states that *"Where land contamination issues arise, the planning authority will require evidence of detailed investigation and risk assessment prior to the determination of the application" as well as "If contamination cannot be overcome satisfactorily, the authority may refuse planning permission."*
Future Wales: The National Plan 2040 (February 2021) (Ref 16-4)	The National Development Framework Future Wales – the National Plan 2040, sets out the Welsh Government's land use priorities and provides a national land use framework. Policy 9 – Resilient Ecological Networks and Green Infrastructure states that the Welsh government will work with partners

Policy/ Legislation	Context
	"to identify areas which should be safeguarded and created as ecological networks for their importance for adaptation to climate change, for habitat protection, restoration or creation, to protect species, or which provide key ecosystems services, to ensure they are not unduly compromised by future development; and, identify opportunities where existing and potential green infrastructure could be maximised as part of placemaking, requiring the use of nature-based solutions as a key mechanism for securing sustainable growth, ecological connectivity, social equality and well-being". Protection of soil resources during development, in the context of protecting existing habitats or soil reuse for habitat restoration / improvement is therefore of relevance to the Proposed Development. Policy 17 – Renewable and Low Carbon Energy and Associated Infrastructure states that all proposals should demonstrate that *"they will not have an unacceptable adverse impact on the environment".* Policy 18 – Renewable and Low Carbon Energy Developments of National Significance states that the following criteria should be met for such developments: that *"there are acceptable provisions relating to the decommissioning of the development at the end of its lifetime, including the removal of infrastructure and effective restoration".*
Local Policy	

Policy/ Legislation	Context
Newport City Council Local Development Plan (adopted 2015) (Ref 16-5)	Local planning policy that highlights key objectives for the local council, which include the following policies relating to ground conditions: GP5 - General Development Principles) (Natural Environment), paragraph 3.31: *"Land identified as being of higher agricultural quality (Grades 1, 2 and 3a) will be protected from development unless there is no alternative site and the developer demonstrates that there is a proven need for the proposal."* GP7 – Environmental protection and Public Health, paragraph 3.45: *"The potential impact of a proposed development will be assessed against the appropriate standards set out in the relevant legislation and regulations where it is considered to be a material planning consideration,"* with material considerations including land contamination.
Monmouthshire County Council Adopted local development plan (adopted 2014) (Ref 16-6)	Local planning policy that highlights key objectives for the local council, which include the following policies relating to ground conditions: EP1 – Amenity and Environmental Protection: "seeks to prevent development proposals that will result in unacceptable risk or harm due to … water pollution, contamination or land instability." Paragraph 6.2.25: "Given the importance of agriculture to Monmouthshire's rural economy it is recognised that there is a need to protect the best and most versatile agricultural land from inappropriate development."
Legislation	

Policy/ Legislation	Context
The Environment (Wales) Act 2016 (Ref 16-7)	The Act makes provisions within Wales for the planning and managing of natural resources at national and local level.
Well-being of Future Generations (Wales) Act 2015 (Ref 16-8)	The Act does not refer explicitly to soils or land contamination; however, it requires public bodies in Wales to think about the long-term impact of their decisions. It requires them to act in accordance with sustainable development principles, with the aim of achieving well-being goals, including maintaining and enhancing a biodiverse natural environment with healthy functioning ecosystems that support social, economic, and ecological resilience and the capacity to adapt to change (for example climate change).
Environmental Protection Act 1990 (Ref 16-9)	Part 2 of the Act makes provision for the improved control of pollution arising from certain industrial and other processes. Part 2A of the Act provides the regulatory basis for the identification, designation, and remediation of contaminated land.
Water Resources Act 1991 (Ref 16-10) as amended by the Water Act 2003 (Ref 16-11)	The Water Resources Act 1991 states that it is an offence to cause or knowingly permit polluting, noxious, poisonous or any solid waste matter to enter controlled waters.
The Environmental Damage (Prevention and Remediation) (Wales) Regulations 2009 (as amended) (Ref 16-12)	Regulations implementing the European Union (EU) Directive on environmental liability setting out the principles for prevention and remedy of environmental damage. Construction and operational activities for the Proposed Development have the potential to cause pollution and the regulations place emphasis on businesses to proactively implement pollution prevention measures so that damage to the environment does not arise.

Policy/ Legislation	Context
Health and Safety at Work etc. Act 1974 (Ref 16-13)	The Health and Safety at Work etc. Act and regulations made under the Act place responsibilities upon employers to carry out a risk assessment for every work activity and to document it. Besides carrying out a risk assessment, employers also need to: make arrangements for implementing the health and safety measures identified as necessary by the risk assessment; appoint competent people to help them implement the arrangements; set up emergency procedures; provide clear information and training to employees; and work together with other employers sharing the same workplace. Land contamination poses a hazard to groundworkers and potentially others in proximity to the construction work. Appropriate risk assessments must be carried out and arrangements made to protect the health and safety of workers directly involved in groundworks for the Proposed Development and other human receptors who could be affected.
Construction (Design and Management) (CDM) Regulations 2015 (Ref 16-14)	CDM Regulations 2015 place specific duties on clients, designers, and contractors, so that health and safety is considered throughout the life of a construction project from its inception to its subsequent final demolition and removal. They include the requirement to appoint a Principal Designer and Principal Contractor to co-ordinate health and safety aspects during construction. Under the CDM Regulations 2015 (Ref 16-14), designers must avoid foreseeable risks so far as reasonably practicable by: eliminating hazards from the construction, cleaning, maintenance, and proposed use and demolition of a structure; reducing risks from any remaining hazard; and giving collective safety measures priority over individual measures.

Policy/ Legislation	Context
	Construction of the Proposed Development will fall under the requirements of the CDM Regulations requiring consideration of health and safety to be incorporated into the design of the Proposed Development components and at construction stage.
Control of Asbestos Regulations 2012	The Control of Asbestos Regulations 2012 (CAR 2012) apply to employers who carry out work which disturbs, or is likely to disturb, asbestos. This includes groundworks where there is asbestos present or suspected to be present in the ground as loose fibres or as asbestos containing materials (ACMs).

Technical Guidance Relevant to Ground Conditions

16.2.2 A summary of the relevant guidance on this topic is given in **Table 16-3**.

Table 16-3 Guidance relevant to Ground Conditions

Guidance	Context
Welsh Government, Guidance to Chief Planning Officers on Agricultural Land Classification Reports 2016 (Ref 16-15)	States that Local Planning Authorities are required to consult with the Welsh Government before granting planning permission for any proposals which do not accord with the Development Plan and will involve the loss (both permanent and temporary) of 20 hectares or more of best and most versatile (BMV) land. This includes losses which are less than 20 hectares but likely to lead to further losses amounting cumulatively to 20 hectares or more.
Welsh Government, Guidance to Chief Planning Officers on Best and most versatile agricultural land and Solar PV Arrays 2022 (Ref 16-16)	Clarifies that in accordance with Welsh Government policy, where BMV land is identified within a proposed solar development, considerable weight should be given to protecting such land from development, because of its special importance, and unless other significant material considerations indicate otherwise it will be necessary to refuse permission. This notes that the Provisional Agricultural Land Classification (ALC) map for Wales is not accurate at a site specific scale, and information should be obtained from a detailed ALC survey.
BRE Planning guidance for the development of large scale ground mounted Solar PV systems (Ref 16-17)	This document notes the planning advice provided by the Welsh Government in relation to the avoidance of solar farm developments on BMV land. It provides some relevant guidance for agricultural land being developed for solar energy production, such as allowing adequate spacing between rows of panels to avoid overshadowing and enable vegetation to grow between them, and advice on how grazing can be accommodated (with grazing of cows, horses, pigs and goats being generally avoided). It also provides advice on minimising environmental impacts, including impacts on soils, during construction.

Guidance	Context
Welsh Government, Guidance: Agricultural land classification: predictive map (Ref 16-18)	Explains that in Wales, agricultural land is categorised into one of the following grades: • grade 1: excellent quality agricultural land; • grade 2: good quality agricultural land; • grade 3a: good to moderate quality agricultural land; • grade 3b: moderate quality agricultural land; • grade 4: poor quality agricultural land; and • grade 5: very poor quality agricultural land. Planning policy defines grades 1 to 3a as the 'best and most versatile' agricultural land. This is about 10 to 15% of the land in Wales. Planning applications should include survey evidence when they cover grade 1, 2 or 3a land.
Environment Agency, Land Contamination Risk Management (LCRM) (Ref 16-19)	LCRM provides a technical framework for applying a risk management process when dealing with land affected by historic contamination.
Development of Land Affected by Contamination: A Guide For Developers, Version 4 (Ref (September 2023)16-20)	The guidance outlines the information planning authorities require on the land contamination status of proposed development sites and how associated planning conditions will be discharged. The document sets out best practice for land contamination management procedures, these follow a phased approach, and require the development and refinement of a conceptual model. The process starts at initial desk based assessment ('Phase 1' or 'Preliminary Risk Assessment'), then may progress to site investigation, to remediation options appraisal, development of a remediation strategy and implementation and verification of remediation, as set out in LCRM, which has been adopted by Natural Resources Wales. For sites where preliminary risk assessment identifies potentially unacceptable risks, site investigation is typically needed prior to construction. As a

Guidance	Context
	minimum, after the new development has been completed, the land should be suitable for its new use and not meet the legal definition of Contaminated Land under the Part 2A regime.
CAR-SOIL: Control of Asbestos Regulations 2012, Interpretation for Managing and Working with Asbestos in Soil (Ref 16-21)	Provides interpretation and guidance to all involved in the management of asbestos in both soils and construction and demolition arisings in accordance with the Control of Asbestos Regulations 2012 (CAR 2012). Requirements include the use of measures to prevent the spread of asbestos during construction work. The Proposed Development is mostly sited on undeveloped agricultural land and likely to be free of asbestos, however localised asbestos is possible on farmland where old farm buildings or structures have been present (and demolished or derelict and in poor conditions) or where unrecorded excavation and infilling of ground has taken place. If asbestos is encountered during ground disturbance then appropriate management measures are needed.
CL:AIRE, Definition of Waste: Development Industry Code of Practice (DoWCoP), Version 2, 2011 (Ref 16-22)	The Definition of Waste: Development Industry Code of Practice (DoWCoP) is a voluntary Code launched in September 2008 (applicable to England and Wales) and updated in 2011 to provide a clear, concise, and auditable process to enable the sustainable remediation and development of land and suitable reuse of recovered materials/resources, including topsoil, subsoil, and potentially contaminated soil, that may initially be classified as waste/contaminated, by the use of a Materials Management Plan (MMP). Use of an MMP and compliance with the DoWCoP can also enable the transfer of soils between donor and receptor sites to reduce the potential for soils to be sent to landfill.
Defra Construction Code of Practice for the Sustainable Use of Soils on Construction Sites	Outlines guidance and legislation concerning the use of soil in construction projects, before offering stage by stage guidance on the use, management, and movement of soil on site, and the completion of appropriate soil resource surveys to inform the site working strategy (e.g., Site Waste Management Plan or Material

Guidance	Context
September 2009 (Ref 16-23)	Management Plan) and for the construction phase preparation of a Soil Resource Plan. The document is out of date regarding the legislation and guidance it references, however it still a good source of best practice guidance for the protection of soil resources on construction projects.
CIRIA C665 Assessing risks posed by hazardous ground gases to buildings 2007 (Ref 16-24)	Provides guidance on ground gas monitoring and assessing the level of risk posed by ground gas, including mine gas, to developments. Ground gas can arise from natural sources such as peat deposits.
Welsh Government, Welsh Soil Evidence Review 2022 (Ref 16-25)	There is no Welsh guidance for the protection of soils in construction, however, this document identifies pressures on soils including loss of soil to development, and notes that there is a need to monitor the type, extent and location of soil sealing and land take in Wales and the impact of loss on soil functions and agricultural land capability.
Highways England, Design Manual for Roads and Bridges (DMRB) LA 109 - Geology and Soils Oct 2019 (Ref 16-26)	Sets out the approach to assessing and reporting the effects of highway projects on geology and soils used on Highways England (now National Highways) projects. As a published approach to assessing the effects of developments on soil in EIA, this can be adapted for use on other projects. The guidance stops short of providing a methodology to assess the effects of a project on agricultural land and soil functions.
Institute of Environmental Management & Assessment (IEMA) (2022) IEMA Guide: A New Perspective on Land and Soil in Environmental	Provides information and guidance on how the practical implications of soil functions, soil biodiversity, soil health, ecosystem services and natural capital should be applied within the overarching framework of climate change, to incorporate them effectively into the EIA process.

Guidance	Context
Impact Assessment February 2022 (Ref 16-27)	
Institute of Civil Engineers (ICE), The Environmental Impact Assessment Handbook - A Practical Guide for Planners, Developers and Communities (3rd Edition) (Ref 16-28)	Provides an approach to assessing the potentially significant effects of development projects on soil and defines the sensitivity of different soil types to handling during construction projects. The guide notes that soil is a non-renewable resource, and that disturbance should be limited as far as possible, that soil is particularly prone to structural degradation if it is handled when too wet, and that adverse effects can be mitigated by following best practice guidance, such as the Defra 2009 Code of Practice for the Sustainable Use of Soils on Construction Sites.
Welsh Government, The Impact of Solar Photovoltaic Sites on Agricultural Soils and Land Quality (Ref 16-29)	This Welsh Government commissioned study is part of an evidence-based assessment of the impact of solar development on BMV agricultural land and associated soils. This provides information relating to the potential effects of solar farms on soil resources and can be used to inform the assessment of likely significant effects on agricultural land and soils in EIA.
CIRIA C809 Sustainable Management of Surplus Soil and Aggregates from Construction	CIRIA C809 provides guidance on the avoidance and management of surplus soils and aggregates arising during construction and development projects, to help projects comply with the principles of the Waste Hierarchy, circular economy, sustainability, zero landfill, and net zero objectives. As waste policy is devolved in the UK, CIRIA C809 sets out relevant legislation, guidance and tools for the sustainable management of surplus soils for the devolved administrations including Wales. In Wales (and England), a key element of sustainable management of surplus soils is compliance with the CL:AIRE (2011) Definition of Waste: Development Industry Code of Practice (DoWCoP) and the use of a Materials Management Plan (MMP), which must demonstrate: *"protection of human*

Guidance	Context
	health and the environment, suitability of the material's use, certainty of the material's use", and the *"quantity (minimum necessary) of material to be used"*. Where used in accordance with the DoWCoP, an MMP must be reviewed by a Qualified Person (listed as such by CL:AIRE).
Institute of Quarrying, (2021). Good Practice Guide for Handling Soils in Mineral Workings. (Ref 16-30)	Includes measures for successful soil management on mineral extraction sites that can be applied to other types of development to help ensure that excavated soils are retained in a suitable condition for successful reinstatement to enable land restoration back to agricultural or other sensitive uses soil reinstatement. Includes details of wetness tests to confirm that soils are suitably dry for handling, use of suitable machinery for soil handling.

16.3 Assessment Assumptions and Limitations

16.3.1 This Chapter has been informed by review of available baseline data on land contamination. For the Environmental Statement (ES), a Phase 1 Land Contamination Preliminary Risk Assessment (PRA) will be completed to confirm the baseline for land contamination and the baseline in the ES will be updated accordingly. This will include a Site walkover to confirm potential contamination sources and inform the preliminary conceptual site model (see assessment methodology in **Section 0**). Mitigation measures may also be updated to reflect recommendations in the PRA. The findings of the PRA are not expected to change the assessment conclusions.

16.3.2 The ALC grades used in the assessment are based on the Provisional (ALC) map for Wales rather than site-specific survey. This is in accordance with Welsh Government guidance[1] which confirms that ALC survey is not required where the Predictive Agricultural Land Classification Map does not indicate the presence of BMV land (see further information in the baseline in **Section 16.6**. This has been confirmed in the Applicant's Statement of Common Ground agreed with the Welsh

[1] Welsh Government (2021) Predictive Agricultural Land Classification Map (Wales) The Hollington Map 1 Guidance Note Version 2.1 - May 2021.

Government's Land Quality Advisory Service (LQAS).

16.4 Stakeholder Engagement

16.4.1 An EIA Scoping Report (**Appendix 1C**) for the Proposed Development and a request for an Environmental Impact Assessment (EIA) Scoping Opinion from the Planning Inspectorate was submitted in December 2024**. Table 16-4** presents a summary of comments provided by the Planning Inspectorate and consultees (**Appendix 1D**) as part of the scoping process and the Applicant's response, highlighting where relevant how these comments have been addressed within this Chapter.

16.4.2 No additional targeted consultation has been undertaken with stakeholders with regards to Ground Conditions for the PEIR.

Table 16-4 Main matters raised during consultation

Consultee	Main matter raised	How has the concern been addressed	Location of response in chapter
Planning Inspectorate	Effects on agricultural land are proposed to be scoped out on the basis that the Predictive Agricultural land Classification Map 2 provided by the Welsh Government indicates that the site is likely predominantly Agricultural Land Classification (ALC) grade 3(b) and 4. The Inspectorate notes that an ALC survey is proposed to be completed for the site to confirm this. Providing the results of the ALC survey confirm the grades indicated by the predictive map, this matter	Following confirmation of the Proposed Development boundary for PEIR, Welsh Government guidance has been consulted (Ref 16-31) and confirms that ALC survey is not required where the Predictive Agricultural Land Classification Map does not indicate the presence of BMV land (see baseline in **Section 16.6**). Additional consultation was undertaken with Land Quality Advice Service (LQAS) to confirm that ALC survey was not required for the planning submission, this is recorded in the Applicant's Statement of Common Ground. No ALC survey has therefore been completed, as agreed with the relevant consultee. Measures to protect the agricultural land and soils are included as embedded mitigation.	Measures to protect soil resources in agricultural land during construction, operation, and decommissioning of the Proposed Development are set out in **Section 16.7**.

Consultee	Main matter raised	How has the concern been addressed	Location of response in chapter
	can be scoped out from further assessment. However, should the ALC survey identify any Best and Most Versatile (BMV) agricultural land, the implications of this should be considered within the ES.		
Planning Inspectorate	The Planning Inspectorate agrees that effects on geology (geodiversity) can be scoped out on the basis that the site and study area does not contain any sensitive geological receptors.	The baseline in **Section 16.6** has been updated to reflect changes to the PEIR Assessment Boundary since Scoping and confirms that no sensitive geological receptors are present within the applicable study area.	See baseline in **Section 16.6**.
Planning Inspectorate	The Planning Inspectorate agrees that the Proposed Development is unlikely to have any significant effects	The baseline in **Section 16.6** has been updated to reflect changes to PEIR Assessment Boundary since Scoping and confirms that no sensitive mineral resource	See baseline in **Section 16.6**.

Consultee	Main matter raised	How has the concern been addressed	Location of response in chapter
	on minerals resources, on the basis that the superficial sand and gravel deposits located immediately southeast of the site are unlikely to be affected and no other mineral receptors are in proximity to the Proposed Development and that this matter can be scoped out of the ES.	receptors are present within the applicable Study Area.	
Planning Inspectorate	In regard to potential component degradation during operation of the Proposed Development, the Planning Inspectorate considers that the ES should consider the impact of the release and leaching of hazardous chemicals	The assessment in **Section 16.8** includes consideration of possible component degradation and impacts on land contamination receptors.	See assessment in **Section 16.8 and** embedded mitigation measures in **Section 16.7**.

Consultee	Main matter raised	How has the concern been addressed	Location of response in chapter
	through the degradation of solar farm componentry with use.		
Planning Inspectorate	The Inspectorate notes the intention to leave buried infrastructure such as cables in-situ. The ES should assess the potential for this infrastructure to degrade and release hazardous chemicals. The applicant's attention is drawn to the consultation response from NRW for further information (Appendix 2 of this Opinion).	The description of the Proposed Development now confirms that all cables will be removed from the ground during decommissioning.	See **Chapter 2: Description of the Proposed Development** and embedded mitigation measures in **Section 16.7**.
Natural Resources Wales	Assessment of the potential for the release of hazardous chemicals via component degradation and leaching from the solar farm	The assessment in **Section 16.8** includes consideration of possible component degradation and impacts on land contamination receptors.	See assessment in **Section 16.8** and embedded mitigation measures in **Section 16.7**.

Consultee	Main matter raised	How has the concern been addressed	Location of response in chapter
	infrastructure over the decades of operation into the local environment resulting in pollution of soils and groundwater.		
Natural Resources Wales	If infrastructure is left in the ground in perpetuity as part of decommissioning, such as buried cables installed within groundwater, that the potential for that infrastructure to slowly degrade and release hazardous chemicals into the environment is considered.	The description of the Proposed Development now confirms that all cables will be removed from the ground during decommissioning.	See **Chapter 2: Description of the Proposed Development** and embedded mitigation measures in **Section 16.7**.
Natural Resources Wales	Release of hazardous chemicals from buried cabling may take place through component degradation and chemical	The assessment in **Section 16.8** includes consideration of possible component degradation and impacts on land contamination receptors.	See assessment in **Section 16.8** and embedded mitigation measures in **Section 16.7**.

Consultee	Main matter raised	How has the concern been addressed	Location of response in chapter
	leaching over time. A Decommissioning Assessment should be drafted with estimated costs for various decommissioning actions/activities and estimated durations. The fate of the solar panels should also be considered, and alternatives found to landfilling the solar panels as this will likely result in the release of hazardous substances to the local environment.		
Natural Resources Wales	Consideration of the chemical composition of the different components proposed for the solar farm and choose those	The assessment in **Section 16.8** includes consideration of possible component degradation and impacts on land contamination receptors.	See assessment in **Section 16.8** and embedded mitigation measures in **Section 16.7**.

Consultee	Main matter raised	How has the concern been addressed	Location of response in chapter
	components that possess the least potential to cause environmental impacts either through a fire event or through component degradation and chemical leaching.		

16.5 Assessment Methodology

Scope of the Assessment

16.5.1 The scope of this assessment has been established through an ongoing scoping process. Further information can be found in **Chapter 5: EIA Methodology**. **Table 16-5** refines the scope of the assessment, following consultation with the Planning Inspectorate, and provides the evidence base for scoping in and out elements of the assessment.

Table 16-5: Elements scoped in or out ground conditions

Element	Phase	Scoped In	Scoped Out	Justification
Effects on soils	Construction, Operation and Decommissioning	✔		Potential for direct physical impacts during temporary construction activities, or due to permanent development. Potential for changes to soils as a result of the presence of the solar panels during the operational phase, or due to maintenance activities during operation (physical change to soil due to vehicles/plant causing compaction). Potential for leaks/spills of fuels or oils from vehicles/plant.
Effects on agricultural land (agricultural land as national /	Construction, Operation and Decommissioning	✔		Provisional ALC mapping indicates that no BMV land is present on the Site. However, the Proposed Development will have the potential to affect

Element	Phase	Scoped In	Scoped Out	Justification
regional / local resource)				a large area of potentially ALC grade 3b agricultural land.
Effects on land contamination	Construction, Operation and Decommissioning	✔		The Site is in an area with some surrounding industrial and commercial land uses which have the potential to have impacted soil and groundwater in the vicinity of the Site, with potential for onsite migration. Some localised potential contaminated land sources are present on the Site including a substation. Sensitive receptors including surface water and ecological receptors are present.
Effects on geology (geodiversity)	Construction, Operation and Decommissioning		✔	In the absence of Geological Conservation Review (GCR) sites and Regionally Important Geodiversity Sites (RIGS) within the Proposed Development or in the Study Area, it is considered that the project would have no direct impact on geological receptors or significant indirect effects on geological resources in the surrounding area.

Element	Phase	Scoped In	Scoped Out	Justification
Effects on geology (ground stability)	Construction, Operation and Decommissioning		✔	The stability of the ground, in so far as it affects land use, is a material consideration that is taken into consideration in planning application decisions. Land stability in relation to the ground conditions on the Site will be addressed throughout the design and construction process by compliance with the CDM Regulations 2015 (Ref 16-14) and will be informed by the geo-environmental desk study, and any further relevant surveys undertaken. It will not be considered further during the EIA process
Effects on mineral resources	Construction, Operation and Decommissioning		✔	The Proposed Development will not interact with river terrace deposits (superficial sand and gravel) immediately southeast of the Site in the Severn Estuary. Given this, and the absence of Mineral Safeguarding areas or existing mineral extraction sites within the PEIR Assessment Boundary and minerals Study Area, it is considered that the Proposed Development would have no direct impact on

Element	Phase	Scoped In	Scoped Out	Justification
				mineral resources or significant indirect effects on mineral resources in the surrounding area.

Study Area

16.5.2 This Chapter considers the likely effects of the Proposed Development on soil resources including agricultural land, geology and mineral receptors including temporary and permanent effects during construction, operation and decommissioning. Temporary effects can occur during construction activities including vehicle/plant movements, and soil excavation, storage, and reinstatement. Permanent effects can include removal of rock or soil for construction of buildings / infrastructure, covering of rock or soil with structures or hardstanding, or sterilization of mineral resources due to permanent development. In general, the type of effects described above will occur within the PEIR Assessment Boundary, as rock, minerals and soils are geographically discrete. However, an external zone of influence (ZoI) of 250m beyond the PEIR Assessment Boundary (onshore only), has been applied for soil resources. This ensures that potential effects on soil resources are considered. These effects could include the hydrogeological effects of construction activities such as dewatering excavations, which could extend beyond the PEIR Assessment Boundary to affect offsite soil resources. Consideration of hydrogeological effects is included in **Chapter 10: Water Environment**.

16.5.3 The Study Area for land contamination receptors includes the Proposed Development Site and a 500m ZoI beyond the boundary, including the Severn Estuary, to include assessment of potential effects on surface water and ecology in the estuary due to potential contaminant migration. This ZoI is selected as a likely maximum (worst-case) distance beyond which it is unlikely a receptor could potentially be significantly impacted by contaminants migrating from the Site, or that offsite land contamination could migrate to significantly impact land within the Site. The ZoI has been set with consideration of the potential for contaminant degradation, dilution and dispersion in the environment, using the baseline information in **Section**

16.6 to define an initial conceptual model, as explained below.

16.5.4 The assessment of potential effects on land contamination receptors is based on a conceptual model which considers:

- The environmental setting of the Proposed Development (including, but not limited to, geology, hydrogeology and hydrology);
- the nature and extent of identified potential contamination sources, potential receptors (e.g., humans - human health, groundwater or surface water - controlled waters, ecology - including designated conservation areas, or property - such as grazing livestock); and
- available pathways for receptors to be exposed to contaminants.

16.5.5 Land contamination receptors can be affected by development due to ground disturbance in areas where existing contamination is present, as changes to the ground can expose contaminants and result in the creation of new contaminant migration pathways. Changes in land use can also result in the introduction of new land contamination receptors. Land contamination can be caused by construction work, such as due to fuel or oil spills from construction plant or storage tanks, or by cross-contamination of excavated materials.

Methodology for Assessing Effects on Soils

16.5.6 The methodology for the assessment of effects on soil receptors is in general accordance with the IEMA (now known as ISEP) Guidelines for Assessing Impacts on Land and Soil (Ref 16-27), and other best practice guidance including the DMRB LA 109 guidance for geology and soils (Ref 16-26), as outlined below.

16.5.7 The magnitude / consequence of the loss or damage to soil resources is based upon the:

- Likely nature and scale of soils effects (positive, neutral or negative) during the construction, operation and decommissioning phases of the Proposed Development.
- Likelihood of the Proposed Development to result in significant effects.
- Issues requiring further assessment and the methods to be applied.

16.5.8 Regarding soil, the assessment considers impacts on soil functions. The sensitivity of soil functions to development impacts following mitigation is determined with

reference to likely changes in soil properties resulting from the development, such as the soil's physical properties (e.g., soil depth, structure, drainage), chemical properties (e.g., soil organic matter, stored carbon and pH), and biological properties (e.g., soil biota diversity and population).

16.5.9 The sensitivity of the soil on the PEIR Assessment Boundary, based on the desk-based information and classifications in **Table 16-6**, is assessed to be medium for the soil resources assessment. The land is a designated Site of Special Scientific Interest (SSSI), which based on **Table 16-6** would be high sensitivity. However, review of the SSSI citation reveals that the designation relates primarily to the plant species and aquatic invertebrate fauna in the reens (and reen banks in relation to terrestrial invertebrates), also the hedgerows and the occurrence of nationally rare plant species in peaty ditches in the northern part of the SSSI and at the ditches bordering the sea wall. Soils in the PEIR Assessment Boundary will support the water quality in the reens, notably through their water filtration, storage, and purification function, which is dependent on soil structure, and the existing grassland will also control surface run-off to the reens. However, the SSSI designation does not refer to the presence of specific plant or animal species within most of the field areas. Additionally, in some areas of the PEIR Assessment Boundary, arable agriculture takes place, meaning that soils in the PEIR Assessment Boundary and within the SSSI are regularly disturbed and stripped of vegetation for harvesting and cultivation, as well as potentially being affected by additions such as pesticides and fertilizers. On this basis, the soil sensitivity has been reduced to medium. Effects of the Proposed Development on terrestrial ecology receptors, including effects on hedgerows, are considered in **Chapter 8 Ecology**, and effects on water quality and water availability in the reens are considered in **Chapter 10: Water Environment**. Potential contamination of water in the reens is considered in this chapter in relation to land contamination sources.

16.5.10 There are interactions between soils and receptors covered in other PEIR chapters, including, **Chapter 6: Greenhouse Gas Assessment**, **Chapter 7: Cultural Heritage and Archaeology**, **Chapter 8: Ecology** and **Chapter 10: Water Environment**,.

Table 16-6 Sensitivity classifications for soils

Value / Sensitivity	Description example
Very high	**Biomass production**: ALC Grades 1 & 2 or LCA Classes 1 & 2 (for Wales all BMV [Grade 1, 2 and 3a] is considered Very High*). **Ecological habitat, soil biodiversity and platform for landscape**: Soils supporting protected features within a European site (e.g., SAC, SPA, Ramsar); Peat soils; Soils supporting a National Park, or Ancient Woodland. **Soil carbon**: Peat soils, soils with potential for ecological/landscape restoration.
High	**Biomass production**: ALC Grade 3a (for Wales all BMV is considered as Very high*), or LCA Grade 3.1. **Ecological habitat, soil biodiversity and platform for landscape**: Soils supporting protected features within a UK designated site (e.g., UNESCO Geoparks, SSSI or national landscapes, Special Landscape Area, and Geological Conservation Review sites); Native Forest and woodland soils; Unaltered soils supporting semi-natural vegetation (including UKBAP Priority habitats or Section 6 habitats in Wales). **Soil carbon**: Organo-mineral soils (e.g., peaty soils).
Medium	**Biomass production**: ALC Grade 3b or LCA Grade 3.2. **Ecological habitat, soil biodiversity and platform for landscape**: Soils supporting protected or valued features within non-statutory designated sites (e.g. Local Nature Reserves (LNR), Local Geological Sites (LGSs), Sites of Nature Conservation Importance (SNCIs), Special Landscape Areas; Non-Native Forest and woodland soils. **Soil carbon**: Mineral soils.
Low	**Biomass production**: ALC Grades 4 & 5 or LCA Grades 4.1 to 7 or Urban soils. **Ecological habitat, soil biodiversity and platform for landscape**: Soils supporting valued features within non-designated notable or priority habitats/landscapes. Agricultural soils. **Soil carbon**: Mineral soils.
Negligible	As for low sensitivity, but with only indirect, tenuous, and unproven links between sources of impact and soil functions.

*All BMV land in Wales is considered 'Very High' sensitivity due to the Planning Policy Wales (Ref 16-32) '…considerable weight should be given to protecting such land [BMV] from development'.

16.5.11 The classification of impact magnitude on soil, geology or mineral receptors is defined in **Table 16-7**

Table 16-7 Magnitude classifications soils

Magnitude	Description example
Major	Permanent, irreversible loss of one or more soil functions or soil volumes (including permanent sealing or land quality downgrading), over an area of more than 20ha or loss of soil-related features set out in **Table 16-6** above, as advised by other topic specialists in EIA team (including effects from 'temporary developments'*). or Potential for permanent improvement in one or more soil functions or soil volumes due to remediation or restoration over an area of more than 20ha, or gain in soil-related features set out in **Table 16-6** above, as advised by other topic specialists in EIA team (including effects from 'temporary developments'*).
Moderate	Permanent, irreversible loss of one or more soil functions or soil volumes, over an area of between 5 and 20ha or loss of soil-related features set out in **Table 16-6** above, as advised by other topic specialists in EIA team (including effects from 'Temporary Developments'*). or Potential for improvement in one or more soil functions or soil volumes due to remediation or restoration over an area of between five and 20ha, or gain in soil-related features set out in **Table 16-6** above, as advised by other topic specialists in EIA team.
Minor	Permanent, irreversible loss over less than 5ha or a temporary, reversible loss of one or more soil functions or soil volumes), or temporary, reversible loss of soil-related features set out in **Table 16-6** above, as advised by other topic specialists in EIA team. or Potential for permanent improvement in one or more soil functions or soil volumes due to remediation or restoration over an area of less than five ha or a temporary improvement in one or more soil functions due to

Magnitude	Description example
	remediation or restoration or off-site improvement, or temporary gain in soil-related features set out in **Table 16-6** above, as advised by other topic specialists in EIA team.
Negligible	No discernible loss or reduction or improvement of soil functions or soil volumes that restrict current or proposed land use.
No change	No loss / reduction (or gain / improvement) of soil function(s).

* Temporary developments can result in a permanent impact if resulting disturbance or land use change causes permanent damage to soils.

16.5.12 The matrix used to evaluate the significance of potential effects on soil, geology or mineral receptors based on the receptor sensitivity compared to the impact (effect) magnitude, as shown in **Table 16-8**.

Table 16-8 Soil, geology and minerals significance evaluation matrix

		Nature of impact (magnitude/ probability/ reversibility)				
		No change	**Negligible**	**Minor**	**Moderate**	**Major**
Sensitivity	**Very high**	Neutral	Slight	Moderate or large	Large or very large	Very large
	High	Neutral	Slight	Slight or moderate	Moderate or large	Large or very large
	Medium	Neutral	Neutral or slight	Slight	Moderate	Moderate or large
	Low	Neutral	Neutral or slight	Neutral or slight	Slight	Slight or moderate
	Negligible	Neutral	Neutral	Neutral or slight	Neutral or slight	Slight

16.5.13 Significant effects are those identified as ‘very large’ or ‘large’. ‘Moderate’ effects have the potential to be significant, and indeed they will normally be deemed to be significant. However, there may be some exceptions, depending on the environmental topic and the application of professional judgment.

16.5.14 The likely significant effects on ground conditions receptors to be taken forward for assessment are summarised in **Table 16-9**.

Table 16-9 Likely Significant Ground Conditions Effects

Receptor	Stage	Potential changes and effects
Soil	Construction	Permanent development (e.g., substation) requiring land take, soil removal / soil sealing. Permanent loss of soil and associated soil functions due to construction of the Proposed Development.
Soil	Construction, Operation and Decommissioning	Compaction of soil by vehicles/ construction plant during temporary development/ maintenance activities and compaction of soil during soil handling (e.g., excavation, stockpiling, reinstatement) leading to damage to soil structure and damage to/loss of soil functions.
Soil	Construction, Operation and Decommissioning	Erosion of soil during temporary development/ maintenance activities, leading to loss of organic matter in runoff (and potential impacts on surface water quality).
Soil	Operation	Presence of Solar Panels on land and changes to soil health / soil structure and soil function
Soil and land contamination receptors	Construction, Operation and Decommissioning	Mobilisation of contaminants due to ground disturbance e.g., dust generation, contaminated run-off, creation of new pollutant migration pathways during excavation or construction, failure to manage and segregate excavated materials appropriately.
Soil and land contamination receptors	Construction, Operation and Decommissioning	Spills or leaks of fuels, oils or chemicals from plant, vehicles and equipment resulting in releases of pollutants to ground (and potential impacts on surface water quality)
Soil and land contamination receptors	Construction, Operation and Decommissioning	Degradation of or damage to the PV Modules and associated above and below ground infrastructure resulting in release of hazardous chemicals to ground resulting in pollution of soils and

Receptor	Stage	Potential changes and effects
		groundwater (and potential impacts on surface water quality).

16.5.15 Where effects are identified in **Table 16-9** as being possible during construction, operation and decommissioning phases, potentially significant effect will be more likely to occur during construction, as this is when most temporary development activities will take place (largest scale and longest duration). Decommissioning effects are likely to be similar to the construction effects but are not expected to be larger than during the construction phase. Disturbance to soils during operation should be infrequent and localised by comparison. The permanent loss of soil resources due to 'hard development' (e.g., covering of soil or removal of soil to construct a substation) is only assessed once as an effect that occurs during construction.

16.5.16 **Table 16-10** summarises the receptors/effects that have been scoped in or out of the assessment, from the ground conditions assessment because the potential effects are not considered likely to be significant. This has taken into consideration the Scoping Opinion, as detailed in **Section 16.4**.

Table 16-10 Elements Scoped in or Out of Further Assessment

Element	Phase	Scoped In	Scoped Out	Justification
Effects on soils	Construction, Operation and Decommissioning	✔		Potential for direct physical impacts during temporary construction activities, or due to permanent development. Potential for changes to soils as a result of the presence of the solar panels during the operational phase, or due to maintenance activities during operation (physical change to soil due to vehicles/plant

Element	Phase	Scoped In	Scoped Out	Justification
				causing compaction). Potential for leaks/spills of fuels or oils from vehicles/plant.
Effects on agricultural land (agricultural land as national / regional / local resource)	Construction, Operation and Decommissioning	✔		Provisional ALC mapping indicates that no BMV land is present on the Site. The effects on soil resources within land of lower ALC grades are considered in the assessment for soil resources. Effects on agricultural land use are to be considered in Section 14.8 of **Chapter 14: Socio-Economics, Tourism and Recreation.**
Effects on land contamination	Construction, Operation and Decommissioning	✔		The Site is in an area with some surrounding industrial and commercial land uses which have the potential to have impacted soil and groundwater in the vicinity of the Site, with potential for onsite migration. Made ground is possible on the site due to historical land reclamation and existing electricity infrastructure. Sensitive receptors including surface water and ecological receptors are present.

Element	Phase	Scoped In	Scoped Out	Justification
Effects on geology (geodiversity)	Construction, Operation and Decommissioning		✔	In the absence of Geological Conservation Review (GCR) sites and Regionally Important Geodiversity Sites (RIGS) within the Proposed Development or in the Study Area, it is considered that the project will have no direct impact on geological receptors or significant indirect effects on geological resources in the surrounding area.
Effects on geology (ground stability)	Construction, Operation and Decommissioning		✔	The stability of the ground, in so far as it affects land use, is a material consideration that is taken into consideration in planning application decisions. Land stability in relation to the ground conditions on the Site will be addressed throughout the design and construction process by compliance with the CDM Regulations 2015 (Ref 16-14) and will be informed by the geo-environmental desk study, and any further relevant surveys undertaken. It will not be considered further during the EIA process.

Element	Phase	Scoped In	Scoped Out	Justification
Effects on mineral resources	Construction, Operation and Decommissioning		✔	The Proposed Development will not interact with river terrace deposits (superficial sand and gravel) immediately southeast of the Site in the Severn Estuary. Given this, and the absence of Mineral Safeguarding areas or existing mineral extraction sites within the Proposed Development Site and minerals Study Area, it is considered that the Proposed Development will have no direct impact on mineral resources or significant indirect effects on mineral resources in the surrounding area.

Land contamination approach

16.5.17 The effect of the Proposed Development will be assessed through desk-based studies to understand the baseline environment relevant to soil, geology and contamination status. Consultations with NRW and the Local Planning Authorities (LPAs) will be undertaken to obtain more local detailed information.

Risk assessment

16.5.18 With respect to potential contaminated land, the process of managing land contamination, as set out in the Environment Agency guidance Land Contamination: Risk management (LCRM) (Ref 16-19), is based on risk assessment. The assessment of risks from contaminated land is based upon the identification and subsequent assessment of a contaminant linkage. A contaminant linkage requires the presence of a:

- source of contamination;
- receptor that can be adversely affected by the contamination; and
- pathway capable of exposing a receptor to the contaminant.

16.5.19 The risk assessment aims to assess the significance of each potential contaminant linkage. The key to the classification is that the designation of risk is based upon the consideration of both of the following.

- The magnitude of the potential consequence (for instance, severity). It takes into account both the potential severity of the hazard and the sensitivity of the receptor.
- The magnitude of probability (for instance, likelihood). It takes into account both the presence of the hazard and receptor and the integrity of the pathway.

16.5.20 The definitions for the qualitative risk assessment have been taken from "Guidance for the Safe Development of Housing on Land Affected by Contamination" Annex 4 R&D Publication 66: 2008 Volume 2 (Ref 16-33). These are based upon CIRIA C552 (Ref 16-34).

16.5.21 The likelihood classifications for the contaminant linkages being realised is presented in **Table 16-11**.

Table 16-11 Likelihood classifications for contaminant linkages

Classification	Definition	Examples
High Likelihood	There is contaminant linkage and an event will appear very likely in the short-term and almost inevitable over the long-term, or there is evidence at the receptor of harm or pollution	a) Elevated concentrations of toxic contaminants are present in soils in the top 0.5m in a residential garden.
Likely	There is contaminant linkage and all the elements are present and in the right place, which means that it is probable that an event will occur. Circumstances are such that an event is not inevitable,	a) Elevated concentrations of toxic contaminants are present in soils at depths of 0.5-1.0m in a residential garden, or the top 0.5m in public open space.

Classification	Definition	Examples
	but possible in the short-term and likely over the long-term.	
Low Likelihood	There is contaminant linkage and circumstances are possible under which an event could occur. However, it is by no means certain that even over a long period such an event will take place and is less likely in the shorter term.	a) Elevated concentrations of toxic contaminants are present in soils at depths >1m in a residential garden, or 0.5-1.0m in public open space.
Unlikely	There is contaminant linkage, but circumstances are such that it is improbable that an event will occur even in the very long-term.	a) Elevated concentrations of toxic contaminants are present below hardstanding.

16.5.22 The magnitude of the potential consequence of a contaminant linkage gives an indication of the sensitivity of a given receptor to a particular source or contaminant of concern under consideration. It is based on full exposure via the linkage being examined. The classification of consequence is presented in **Table 16-12**.

Table 16-12 Classification of consequence

Classification	Human Health	Controlled Water	Ecology	Property / Structures/ Crops and animals	Examples
Severe	Highly elevated concentrations likely to result in "significant harm" to human health as defined by the EPA 1990, Part 2A, if exposure occurs.	Equivalent to Environment Agency Category 1 pollution incident including persistent and/or extensive effects on water quality; leading to closure of a potable abstraction point; major impact on amenity value or major damage to agriculture or commerce.	Major damage to aquatic or other ecosystems, which is likely to result in a substantial adverse change in its functioning or harm to a species of special interest that endangers the long-term	Catastrophic damage to crops, buildings or property.	Significant harm to humans is defined in the Contaminated Land Statutory Guidance as death, life threatening diseases (e.g. cancers), other diseases likely to have serious impacts on health, serious injury, birth defects, and impairment of reproductive functions. Major fish kill in surface water from large spillage of contaminants from site. Highly elevated concentrations of Hazardous or priority substances present in groundwater close to small potable abstraction (high sensitivity). Explosion, causing

Classification	Human Health	Controlled Water	Ecology	Property / Structures/ Crops and animals	Examples
			maintenance of the population.		building collapse (can also equate to immediate human health risk if buildings are occupied).
Medium	Elevated concentrations which could result in “significant harm” to human health as defined by the EPA 1990, Part 2A if exposure occurs.	Equivalent to EA Category 2 pollution incident including significant effect on water quality; notification required to abstractors; reduction in amenity value or significant damage to agriculture or commerce.	Significant damage to aquatic or other ecosystems, which may result in a substantial adverse change in its functioning or harm to a species of special	Significant damage to crops, buildings or property.	Significant harm to humans is defined in the Contaminated Land Statutory Guidance as death, life threatening diseases (e.g. cancers), other diseases likely to have serious impacts on health, serious injury, birth defects, and impairment of reproductive functions. Damage to building rendering it unsafe to occupy e.g. foundation damage resulting in instability.

Classification	Human Health	Controlled Water	Ecology	Property / Structures/ Crops and animals	Examples
			interest that may endanger the long-term maintenance of the population.		Ingress of contaminants through plastic potable water pipes.
Mild	Exposure to human health unlikely to lead to “significant harm”.	Equivalent to EA Category 3 pollution incident including minimal or short-lived effect on water quality; marginal effect on amenity value, agriculture or commerce.	Minor or short-lived damage to aquatic or other ecosystems, which is unlikely to result in a substantial adverse	Minor damage to crops, buildings or property.	Exposure could lead to slight short-term effects (e.g. mild skin rash). Surface spalling of concrete.

Classification	Human Health	Controlled Water	Ecology	Property / Structures/ Crops and animals	Examples
			change in its functioning or harm to a species of special interest that will endanger the long-term maintenance of the population.		
Minor	No measurable effects on humans.	Equivalent to insubstantial pollution incident with no observed effect on water quality or ecosystems.	Equivalent to insubstantial pollution incident with no observed effect on water quality	Repairable effects of damage to buildings, structures and services.	The loss of plants in a landscaping scheme. Discoloration of concrete.

Classification	Human Health	Controlled Water	Ecology	Property / Structures/ Crops and animals	Examples
			or ecosystems.		

16.5.23 A matrix is then used to generate a risk level based on the likelihood compared to the classification of consequence, as shown in **Table 16-13**.

Table 16-13 Risk matrix

		Likelihood			
		Unlikely	**Low likelihood**	**Likely**	**High likelihood**
Potential consequence	**Severe**	Moderate/low risk	Moderate Risk	High Risk	Very High Risk
	Medium	Low	Moderate/low risk	Moderate Risk	High Risk
	Mild	Very low risk	Low Risk	Moderate/low risk	Moderate Risk
	Minor	Very low risk	Very low risk	Low Risk	Low Risk

16.5.24 The overall risk definitions are summarised in **Table 16-14**.

Table 16-14 Risk definitions

Risk	Definition
Very High	There is a high probability that severe harm could arise to a designated receptor from an identified hazard at the site without remediation action OR there is evidence that severe harm to a designated receptor is already occurring. Realisation of that risk is likely to present a substantial liability to be site owner/or occupier. Investigation is required as a matter of urgency and remediation works likely to follow in the short-term.
High	Harm is likely to arise to a designated receptor from an identified hazard at the site without remediation action. Realisation of the risk is likely to present a substantial liability to the site owner/or occupier. Investigation is required as a matter of urgency to clarify the risk. Remediation works may be necessary in the short-term and are likely over the longer term.
Moderate	It is possible that harm could arise to a designated receptor from an identified hazard. However, it is either relatively unlikely that any such harm will be severe, and if any harm were to occur it is more likely, that the harm will be relatively mild. Further investigative work is normally required to clarify the risk and to determine the potential liability to site owner/occupier. Some remediation works may be required in the longer term.

Risk	Definition
Low	It is possible that harm could arise to a designated receptor from identified hazard, but it is likely at worst, that this harm if realised will normally be mild. It is unlikely that the site owner/or occupier will face substantial liabilities from such a risk. Further investigative work (which is likely to be limited) to clarify the risk may be required. Any subsequent remediation works are likely to be relatively limited.
Very Low	It is a low possibility that harm could arise to a designated receptor, but it is likely at worst, that this harm if realised will normally be mild or minor.

16.5.25 Where a risk classification of moderate or greater has been determined, it is considered that the source–pathway–target contaminant linkage requires some form of risk management or intervention.

16.5.26 As the first step, such risk management or intervention will normally take the form of either further investigation, with the additional knowledge gained allowing the risk to be more accurately assessed and potential for the classification to be lowered. However, if the risk classification remains at moderate or above then remediation, in the form of embedded mitigation, may be required to reduce or remove the source of contamination or disrupt the pathway to the target or receptor.

Significance Evaluation Methodology

16.5.27 To use risk assessment as the basis for the evaluation of the significance of effects in relation to land contamination, it is necessary to evaluate the change in risk from baseline conditions to those during and following the Proposed Development. In order to define the baseline risk the initial assessment and classification of risk is carried out for the Study Area in its pre-development state. A separate assessment of risk will then be conducted for the Proposed Development post-development (including environmental measures inherently embedded in the development) to enable an evaluation of the change in risk due to the Proposed Development.

16.5.28 **Table 16-15** uses the risk classification pre- and post-development as the basis for a significance evaluation matrix for the purposes of EIA.

*Table 16-15 Land quality (contamination) significance evaluation matrix**

		Risk post-development (including embedded measures)					
		Very low	**Low**	**Moderate / Low**	**Moderate**	**High**	**Very high**
Risk pre-development – existing receptors	**Very high**	Major Positive (Significant)	Major Positive (Significant)	Moderate Positive (Potentially Significant)	Moderate Positive (Potentially Significant)	Minor Positive (Not Significant)	Negligible (Not Significant)
	High	Major Positive (Significant)	Moderate Positive (Potentially Significant)	Moderate Positive (Potentially Significant)	Minor Positive (Not Significant)	Negligible (Not Significant)	Minor Negative (Not Significant)
	Moderate	Moderate Positive (Potentially Significant)	Moderate Positive (Potentially Significant)	Minor Positive (Not Significant)	Negligible (Not Significant)	Minor Negative (Not Significant)	Moderate Negative (Potentially Significant)
	Moderate / Low	Moderate Positive (Potentially Significant)	Minor Positive (Not Significant)	Negligible (Not Significant)	Minor Negative (Not Significant)	Moderate Negative (Potentially Significant)	Moderate Negative (Potentially Significant)
	Low	Minor Positive (Not Significant)	Negligible (Not Significant)	Minor Negative (Not Significant)	Moderate Negative (Potentially Significant)	Moderate Negative (Potentially Significant)	Major Negative (Significant)
	Very low	Negligible (Not Significant)	Minor Negative (Not Significant)	Moderate Negative	Moderate Negative	Major Negative (Significant)	Major Negative (Significant)

		Risk post-development (including embedded measures)					
		Very low	**Low**	**Moderate / Low**	**Moderate**	**High**	**Very high**
				(Potentially Significant)	(Potentially Significant)		
No receptor present pre-development	**N/A**	Minor Negative (Not Significant)	Moderate Negative (Potentially Significant)	Moderate Negative (Potentially Significant)	Major Negative (Significant)	Major Negative (Significant)	Major Negative (Significant)

*Risks that remain at moderate, high or very high post-development are unlikely to be considered acceptable and further mitigation will be required to enable the development to proceed.

16.5.29 If the embedded measures are effective the risks post development should be less than moderate or the risks from the Proposed Development are likely to be considered unacceptable.

16.5.30 However, there may be circumstances where development can proceed, and moderate and above risks remain, e.g. groundwater contamination where cost benefit analysis indicates that remediation is not warranted.

16.5.31 Guidance on the protection of the environment will be used to assist with the development of mitigation e.g. NRW and CIRIA. The assessment will be based on the implementation of those mitigation measures identified, which will feed into the construction environmental management plan (CEMP), method statements and procedures for the Proposed Development.

16.5.32 The construction phase will be controlled by a detailed CEMP which will be produced by the appointed construction contractor following the making of the DCO and prior to the start of construction (for example, as part of a Requirement of the DCO). An outline CEMP (oCEMP) (**Appendix 2A**) has been produced to support this PEIR. An oCEMP which will be updated following appointment of a construction contractor and prior to commencement of construction, will be provided with the ES.

16.5.33 The ES chapter will summarise the findings of the desk study and any relevant ground investigation / surveys, this forming the baseline against which the potential impact of the Proposed Development, alone and cumulatively with other developments, will be assessed. The assessment will be based on both receptor importance and the nature and magnitude of the impact because of the Proposed Development and all mitigation considered necessary will be identified and residual effects with this in place will be determined.

16.6 Baseline Conditions

16.6.1 Data sources consulted to inform the description of baseline conditions are detailed in **Table 16-16**.

Table 16-16 Data sources

Data provider	Data source	Description of data
British Geological Survey (BGS)	Onshore GeoIndex (Ref 16-35)	Includes superficial and bedrock geology maps and borehole records, aquifer classifications, information on mineral extraction.
Mining Remediation Authority	Mining Remediation Authority Interactive Map (Ref 16-36)	Shows whether sites are in a Coal Mining Reporting Area and provides information on former mining features.
Welsh Government	DataMap Wales (Ref 16-37)	Provides publicly available data for Wales including maps and downloadable spatial data including peat, agricultural land classification, aggregate resources areas, ecological and geological conservation sites. In regard to agricultural land classification, the Welsh Government advises that where the Predictive Agricultural Land Classification (ALC) Map 2 shows the potential presence of best and most versatile land (Grades 1, 2 or 3a), an agricultural land classification survey will typically be required to support a planning application.
National Library of Scotland	Digital Resources: Map Images (Ref 16-38)	Viewable historical Ordnance Survey maps for Wales from 1800s up to c.1970s.
Cranfield Environment Centre	Land Information System (LandIS) Soilscapes Viewer (Ref 16-39)	Soil map with information on soil texture, soil carbon and drainage.
UK Soil Observatory (UKSO)	UKSO Map Viewer	Soil map with data including soil carbon content, moisture, texture, chemistry and geophysics.
Google	Google Earth Pro	Aerial imagery – current and historical.

Data provider	Data source	Description of data
Defra	MAGIC Interactive Map	Provides details of statutory and non-statutory designated sites in Wales, including nature conservation designations, and groundwater source protection zones.

Land Use

16.6.2 The Site is entirely within the Gwent Levels, a flat and low-lying landscape, typically at <10m above Ordnance Datum (AOD), created by reclamation of marshland and intertidal areas, used for agriculture, and drained by reens (ditches). The land is predominantly pasture. Ecological surveys completed for the Proposed Development identifies this as mainly improved grassland (Ref 16-40), with some land used for cereal production (including maize, ryegrass ley, and barley[1]). In addition to crop growing, other agricultural activities within the PEIR Assessment Boundary and / or Study Area are likely to include dairy farming, sheep and cattle rearing, and horse grazing (Ref 16-41). Historical aerial photography viewed on Google Earth Pro confirms sheep grazing has taken place within the Site.

16.6.3 The Wales Coast Path runs along the coastline southwest to northeast, immediately southeast of the Site, and beyond this there is a seawall along the Severn Estuary.

16.6.4 The National Grid Substation and an associated existing grid yard are in the north of the PEIR Assessment Boundary. The existing grid yard serves the Llanwern Solar Farm, located c.250m southeast of the National Grid Substation. Although most of the existing solar farm is offsite, its south-eastern extent is intersected by the PEIR Assessment Boundary. Sheep grazing takes place within the Llanwern Solar Farm.

16.6.5 A sewage works is immediately east of the eastern extent of the Proposed Development. The Llanwern Works complex is 530m north of the northwestern extent of the PEIR Assessment Boundary within the former Llanwern steelworks.

Agricultural Land Classification

16.6.6 The Welsh Government Predictive Agricultural Land Classification (ALC) Map 2 confirms that no BMV is anticipated to be present on the Site and presented in **Figure 16-3**. Most of the land in the Proposed Development boundary is shown as

Subgrade 3B, and there are small areas of Grade 4.

Soils

16.6.7 The LandIS Soilscapes map indicates the soil type within the PEIR Assessment Boundary predominantly comprises loamy and clayey soils of coastal flats with naturally high groundwater (type Soilscape 21), these soils have medium carbon storage potential and support wet brackish coastal flood meadow habitat. They are typically drained to enable agricultural use. The lighter (textured) soils can support a wide range of crops and are highly productive as they contain much available water and are stoneless and flat. Heavier soils (such as clays) are less easily worked and favour grass.

16.6.8 The UK Soil Observatory 1:50,000 scale soil texture map (Ref 16-42) shows that soils across the Site are deep, have a clayey loam to silty loam texture, and a slightly acidic pH of around 6.07.

16.6.9 The Welsh Government Peatlands of Wales map (Ref 16-43) does not show any peatland within the Study Area for soils (see **Section 0**). In Wales deep peat is defined as having a thickness of >0.4m organic material in the upper 0.8m of a soil profile, or >0.3m thickness of organic material resting directly on bedrock (Ref 16-44). The Proposed Development is likely to avoid peat defined as deep peat (see soils descriptions from **paragraph 16.6.13**). Some peat is likely to be present locally at depth, as layers within alluvial deposits. Given the recorded depths and limited extent across the site, this peat is generally unlikely to be disturbed by the Proposed Development, with the exception that Solar Panel and inverter piles may extend locally into subsurface peat, as these can go to 3m deep.

Geology

16.6.10 The BGS 1:50,000 scale mapping on the GeoIndex (Ref 16-45) shows no artificial or made ground in the PEIR Assessment Boundary, however, reworked natural materials and potentially imported material are likely to be present within parts of the PEIR Assessment Boundary given the historical land reclamation activity and the extensive artificial drainage network 1 and access tracks serving the Gwent Levels farmland. Made ground is also likely at the existing National Grid Substation in the northwest of the PEIR Assessment Boundary (see **Figure 16-2**).

16.6.11 Superficial geology shown across the PEIR Assessment Boundary, and within most of the 250m ZoI, comprises Holocene era tidal flat deposits. These are mainly mud flat and sand flat deposits, forming extensive nearly horizontal marshy land in the intertidal zone that is alternately covered and uncovered by the rise and fall of the tide. They consist of unconsolidated sediment, mainly mud and/or sand.

16.6.12 Bedrock is the Mercia Mudstone Group (Mudstone), comprising usually red, less commonly green-grey, mudstones and subordinate siltstones with thick halite-bearing units in some basinal areas. Thin beds of gypsum/anhydrite are widespread, and thin sandstones are also present.

16.6.13 Review of BGS borehole records within the PEIR Assessment Boundary confirms some localised subsurface peat layers of up to approximately 4m in thickness. The subsurface peat encountered can be several metres in thickness but appears to be localised and to occur between three to four metres below ground level i.e., excavations required for the Proposed Development will generally not encounter it, however, there will be some potential for solar panel piles to encounter peat. No made ground was recorded, however, the presence of made ground was recorded south of the PEIR Assessment Boundary near the seawall. The Mercia Mudstone Group bedrock was encountered at depths ranging from 10.67m below ground level (bgl). to 14.0m bgl. A summary of the logs reviewed is provided below.

16.6.14 A BGS borehole record in a field close to the Wales Coast Path in the southwest of the PEIR Assessment Boundary (Ref 16-46) encountered topsoil and silty clay to 3.7m bgl, underlain by peat to 5.5m bgl (1.8m thickness), then silty clay to 12.2m bgl, silt and gravel to 14.0m bgl, where the 'red marl' Mercia Mudstone Group bedrock was encountered.

16.6.15 A BGS borehole approximately 25m southeast of the southeast area of the PEIR Assessment Boundary (Ref 16-47), close to the seawall, records made ground extending to 5.6m bgl. The made ground comprised clay with gravel to 0.5m bgl, sandy silty clay with some concrete content to 2.5m bgl, and sandy silty clay with pockets of find sand and occasional organic pockets to 5.6m bgl. This made ground is likely to be associated with the construction of the seawall and coast path.

16.6.16 A BGS borehole record in the north of the below ground level (bgl) east of the

National Grid Substation and adjacent to Parish Reen dating from the 1950s (Ref 16-48) went to 30.48m bgl, encountering 0.15m of topsoil, underlain by clay to around 4.72m bgl, a 4.12m thick layer of brown fibrous peat was then encountered, extending to 8.84m bgl, the peat was underlain by clay (described as estuarine alluvium) to 10.6, which was directly underlain by bedrock of the Mercia Mudstone Group (referred to in the log as Keuper Marl). This log records groundwater at 4.2m (bgl).

Geodiversity

16.6.17 Information on DataMap Wales confirms that there are no Geological Conservation Review (GCR) (Ref 16-49) sites or Regionally Important Geodiversity Sites (RIGS) (Ref 16-50) within the PEIR Assessment Boundary or Study Area.

Minerals

16.6.18 The BGS GeoIndex does not identify mineral extraction sites within the PEIR Assessment Boundary or Study Area. The river terrace deposits (superficial sand and gravel) immediately southeast of the PEIR Assessment Boundary in the Severn Estuary are identified as a mineral resource.

16.6.19 The Monmouthshire County Council Local Plan and Newport City Council Local Plan show the PEIR Assessment Boundary and Study Area are not within a Mineral Safeguarding area.

16.6.20 The Mining Remediation Authority Interactive Map (Ref 16-51) confirms that the PEIR Assessment Boundary and Study Area are not within a Coal Mining Reporting Area.

Hydrogeology

16.6.21 The BGS aquifer classification mapping for Wales (BGS GeoIndex) shows that the tidal flat deposits underlying the PEIR Assessment Boundary are classed as unproductive strata, indicating they generally have low permeability, and the bedrock underlying the Site is classed as a secondary B aquifer. The secondary B aquifer classification indicates mainly lower permeability layers that may store and yield limited amounts of groundwater through characteristics like thin cracks (called fissures) and openings or eroded layers.

16.6.22 The Study Area lies within the Severn groundwater body for the Usk Devonian Old Red Sandstone. Cycle 3 monitoring from 2015 reported on DataMap Wales (Ref 16-53) records that the overall quality of the aquifer was good.

16.6.23 Information on DataMap Wales (Ref 16-53) confirms that the PEIR Assessment Boundary and Study Area is not within a groundwater source protection zone (SPZ).

Hydrology

16.6.24 There are numerous reens within the PEIR Assessment Boundary and in the Study Area, typically running in a grid pattern along field boundaries. The reens are man-made drainage channels, managed by the Caldicot and Wentlooge Levels Internal Drainage Board. Named reens within the Site include Elver Pill Reen, Windmill Reen, Daycroft Reen, Cold Harbour Reen, Mill Reen and Prat Reen running generally northwest to southeast and discharging to the Severn Estuary at Portland Ground.

16.6.25 'Monks Ditch – Wainbridge to mouth' running northwest to southeast through the PEIR Assessment Boundary was classed as having overall moderate water quality in 2024 (interim) i.e., not meeting the target of 'good' status). The 'Mill Reen - source to River Severn Estuary', also in the Usk management catchment, was also classed by Natural Resources Wales as having overall moderate water quality in 2024 (interim) (Ref 16-54).

16.6.26 The flood risk of the PEIR Assessment Boundary and study area is described in **Chapter 10: Water Environment**.

Ecology

16.6.27 The presence of ecological receptors with potential to be impacted by the Proposed Development is discussed in detail in **Chapter 8: Ecology**.

16.6.28 The PEIR Assessment Boundary is located within the Gwent Levels, which are designated as a SSSI (Gwent Levels - Redwick and Llandevenny). The citation states that:

"The Gwent Levels constitute the lowlands between Cardiff and Chepstow and are drained by an ordered network of drainage ditches. They are an example of one of

the most extensive areas of reclaimed wet pasture in Great Britain…The Gwent Levels reens are rich in plant species and communities, many of which are rare or absent in other Levels systems. This is due to the variety of reen types and their management regimes and the timing of the management which results in a staggered programme across the Levels. The regular maintenance of some reens provides conditions for submerged species… and openwater emergents… to flourish. Others are less intensively managed and some have become completely overgrown by weeds and hedges."

16.6.29 The Severn Estuary SSSI is immediately beyond the southern boundary of Gwent Levels SSSI. The Severn Estuary is also designated as a Ramsar Site, a Special Area of Conservation (SAC) and a Special Protection Area (SPA). The Ramsar citation includes that:

"The Severn Estuary is a large estuary with extensive intertidal mudflats and sandflats, rocky platforms and islands. Saltmarsh fringes the coast backed by grazing marsh with freshwater ditches and occasional brackish ditches. The seabed is rock and gravel with subtidal sandbanks."

16.6.30 DataMap Wales records no Local Nature Reserves (LNR) or National Nature Reserves (NNR) within the PEIR Assessment Boundary or the Study Area.

Land Contamination

16.6.31 To date, Monmouthshire County Council has not declared any land to be "Contaminated" under Part IIA of the Environmental Protection Act 1990 (Ref 16-55). A 2016 report on contaminated land in Wales (Ref 16-56) records that two sites were determined as statutory contaminated land in Newport in 2011, however, no further details of the sites are provided, and none can currently be obtained via the Newport City Council website.

16.6.32 Recent and historical land uses have been identified in the PEIR Assessment Boundary and in the Study Area (see **Section 0**) that have the potential to have resulted in land contamination. These are summarised below.

16.6.33 Most of the PEIR Assessment Boundary comprises agricultural fields. Although fields are generally likely to be free of significant contamination, agricultural activities

can result in contaminants being released to ground due to the use of fuels and oils, chemicals, sewage sludge application, herbicides and pesticides, or ad hoc waste disposal / tipping to ground. Farm buildings or sheds with asbestos content can be a potential source of contamination if in poor condition, derelict or demolished on the site (though none are known to be present). Where they occur, contaminants on agricultural land will typically only be present as small-scale localised contamination, or as diffuse low-level contamination.

16.6.34 The National Grid Substation is in the northwest of the PEIR Assessment Boundary. According to aerial imagery on Google Earth Pro the substation was present by 1985, oil-filled equipment and oil filled cables are likely to be present. The substation site is old enough to have used oils with polychlorinated biphenyl (PCB) content.

16.6.35 A substation is present southeast of the National Grid Substation, within the PEIR Assessment Boundary (ST 37573 85248) associated with the existing Llanwern solar farm to its south and southeast, adjacent to the Site. Based on aerial photography (Google Earth Pro) this dates from 2020 and relates to the adjacent existing solar farm immediately southwest of the PEIR Assessment Boundary which was present by 2021.

16.6.36 Part of the Grid Connection Corridor for the Proposed Development runs adjacent to a solar farm in the west of the Site (at ST 38739 84163).

16.6.37 Land approximately 35m northeast of the PEIR Assessment Boundary and the National Grid Substation was historically part of the Llanwern Steelworks (ponds and open storage of stockpiled raw material or wastes are visible on aerial photography from 2004). Part of North Row, included in the north of the PEIR Assessment Boundary, is immediately southeast of land that appears to have been used as former ponds associated with the steelworks. The main steelworks process was north of Queen's Way (the A4810) (now 'Llanwern Works' with various commercial operations present) and is outside the Study Area for land contamination, except for its southeastern corner, however, industrial developments south of the road are connected to that site by pipelines (a pipe bridge is visible). Although the steelworks is largely demolished, the area is still in industrial use, operators south of the A4810 road include Air Products, Newport Galvanisers, Tarmac Llanwern (concrete plant) and Hanson Cement. North of the A4810 was the main operational area of the

steelworks. Some steel production is still undertaken. TATA Steel produce strip steel for UK and European markets via the pickle line and cold mill at Llanwern Steelworks. Processes undertaken by TATA include pickling and oiling of hot rolled coils of steel, cold rolling of hot rolled pickled steel, galvanising and an automotive finishing line. Newport City Council planning application information indicates contaminated land remediation has taken place on a former coking works area in the west of the steelworks, northwest of the Study Area for land contamination. Contaminants associated with steelworks and coking works include heavy metals, inorganic compounds such as fluoride, ammoniacal liquor, cyanide, sulphates and phosphates, and organic compounds such as phenols, tars, fuels and oils.

16.6.38 A sewage works is immediately east of the PEIR Assessment Boundary (at ST 43705 84991).

16.6.39 Mead Farm which includes large sheds and outbuildings is 25m north of the PEIR Assessment Boundary (at ST 40715 83916). Large farms with outbuildings are located at Sea St Lane 65m northeast north of the PEIR Assessment Boundary (at ST 41321 83939) and S Row immediately northwest of the Site (at ST 41742 84030). A commercial site, South Wales Sports Grounds Limited (sports grounds contractor), is immediately east of the PEIR Assessment Boundary at Pill St (at ST 42710 85011), and agricultural and/or commercial land uses are visible at Mill Reen north of the Site (at ST 43372 85407). Long Porton Farm immediately southwest of the PEIR Assessment Boundary includes a small area of ground disturbance within the Site (ST 38939 82746).

Unexploded Ordnance

16.6.40 The Zetica Unexploded Bomb Risk Map shows the PEIR Assessment Boundary to be in a low risk area in relation to World War II (WWII) bombing. However, the Zetica map shows military decoy sites in or close to the Site: one near Whitson, one near the sewage works east of the PEIR Assessment Boundary and offsite at the former Llanwern steel works. Whilst this historical activity is unlikely to pose significant land contamination risks, there may be areas where any future intrusive works for the Proposed Development could require UXO mitigation measures. A Pre-desk Study Assessment (PDSA) was therefore requested from Zetica to provide further information on military activity in the area and will be included with the ES.

16.6.41 The PDSA confirms that a UXO desk study will be needed to inform suitable mitigation measures to enable safe digging within the PEIR Assessment Boundary. This will apply to any intrusive ground works, including ground investigation, excavation, or piling.

16.7 Embedded Design Mitigation

16.7.1 A range of embedded design mitigation measures for the Proposed Development are outlined in **Table 16-17** which outlines how these embedded measures will influence the Ground Conditions assessment.

Table 16-17 Embedded Design Mitigation Measures

Receptor	Potential changes and effects	Embedded measures	Compliance mechanism
Soil	**Construction** Permanent development (e.g., substation) requiring land take, soil removal / soil sealing. Permanent loss of soil and associated soil functions due to construction of the Proposed Development.	Elements of the Proposed Development which require soil sealing or removal of topsoil during construction and where topsoil cannot be reinstated will be kept to the minimum footprint required for the safe operation of the Proposed Development. The use of pile foundations for the modules and inverters will minimise ground disturbance during operation and decommissioning of the modules and inverters. Existing tracks will be used wherever possible, for temporary and permanent access routes. Storage and handling of soil will be informed by the Defra (2009) Construction Code of Practice for the Sustainable Use of Soils on Construction Sites to avoid damage to soil structure and help to minimise soil compaction. This measure and other good practice for the protection of soil resources during construction forms the Outline Soil Management Plan (oSMP) included in the outline oCEMP which will be submitted to support the ES. Permanently displaced soil will be reused within the PEIR Assessment Boundary where practicable. Soils that cannot be reused in the PEIR Assessment Boundary will be protected from damage during handling and storage to enable their potential use offsite.	oCEMP

Receptor	Potential changes and effects	Embedded measures	Compliance mechanism
Soil	**Construction, Operation (maintenance) and decommissioning** Compaction of soil by vehicles/ construction plant during temporary development/ maintenance activities and compaction of soil during soil handling (e.g., excavation, stockpiling, reinstatement) leading to damage to soil structure and damage to/loss of soil functions.	During temporary development work or maintenance activities in fields, vehicles with low ground pressure will be used wherever possible. The piling rig used for construction of the modules will be a compact tracked rig to minimise ground pressure. Wherever possible, vehicles will use defined temporary or permanent access routes where topsoils have been removed to protect them from damage. In fields, where vehicle or plant access is necessary, and if ground conditions require it (e.g., in response to wet weather conditions), a temporary trackway of either metal, wood, or plastic, will be used to access the working areas. This will be removed once construction/ maintenance/ decommissioning was complete. Storage and handling of soil will be informed by the Defra (2009) Construction Code of Practice for the Sustainable Use of Soils on Construction Sites to avoid damage to soil structure and help to minimise soil compaction. This measure and other good practice for the protection of soil resources during construction forms the Outline Soil Management Plan (oSMP) included in the oCEMP which will be submitted to support the ES..	oCEMP

Receptor	Potential changes and effects	Embedded measures	Compliance mechanism
Soil	**Construction, Operation (maintenance) and decommissioning** Erosion of soil during temporary development/ maintenance activities (bare soils exposed to weather effects or stockpiled), leading to loss of organic matter in runoff (and potential impacts on surface water quality).	Topsoil stripping for temporary access roads will occur in phases and be timed to minimise the period where subsoils are left exposed. Where topsoils require temporary storage in stockpiles, excess vegetation should be removed prior to stripping; for grassland it should be cut or grazed short and arable crops should have been harvested. Reinstatement of temporarily excavated soils will be completed on a phased basis to minimise the period of temporary soil storage in stockpiles. Where it is known that topsoils will need to be stored for longer than six months, stockpiles should be seeded with a suitable seed mix. During temporary development work or maintenance activities in fields, vehicles with low ground pressure will be used wherever possible. The piling rig used for construction of the modules will be a compact tracked rig to minimise ground pressure. Wherever possible, vehicles will use defined temporary or permanent access routes where topsoils have already been removed to protect them from damage. In fields, where vehicle or plant access is necessary, and if ground conditions require it, a temporary trackway of either metal, wood, or plastic, will be used to	oCEMP

Receptor	Potential changes and effects	Embedded measures	Compliance mechanism
		access the working areas. This will be removed once construction/ maintenance/ decommissioning was complete.	
Soil	**Operation** Presence of Solar Panels on land and changes to soil health / soil structure and soil function	Vegetation will be maintained around the Solar Panels in accordance with the outline Landscape and Ecological Management Plan (oLEMP). Some fields within the Proposed Development have been used for arable agriculture. Regular disturbance of the topsoil through agricultural activities such as tilling and cultivating will cease during the operational phase. This will support the maintenance of soil health and soil biodiversity and good soil structure. Sheep grazing will be possible amongst the Solar Panels , this will provide further organic inputs to soils and a means of managing the field vegetation without the use of vehicles or plant.	oLEMP and oCEMP
Soil and land contamination receptors	**Construction, Operation (maintenance) and decommissioning** Mobilisation of contaminants due to ground disturbance e.g., dust generation,	A Phase 1 Preliminary Risk Assessment (PRA) will be completed for the PEIR Assessment Boundary. This ensures that the ground conditions, including the presence and location of known or potential land contamination, are well understood and communicated to those with design input to the Proposed Development at a sufficiently early stage of the design and that the site is suitable for its intended use.	oCEMP

Receptor	Potential changes and effects	Embedded measures	Compliance mechanism
	contaminated run-off, creation of new pollutant migration pathways during excavation or construction, failure to manage and segregate excavated materials appropriately.	Compliance with industry good practice including LCRM for the assessment of risks from contaminated land is an embedded measures for all stages of the Proposed Development. Temporarily excavated soils will be stored local to the point of excavation wherever possible to enable soils to be returned to where they came from. The oCEMP, which will be submitted to support the ES, will include an unexpected contamination protocol so that any materials suspected to be contaminated are segregated from other soils to enable testing and appropriate risk assessment.	
Soil and land contamination receptors	**Construction, Operation (maintenance) and decommissioning** Spills or leaks of fuels, oils or chemicals from plant, vehicles and equipment resulting	During construction, vehicle maintenance and refuelling of machinery will be undertaken within designated areas where spillages can be easily contained, and machinery will be routinely checked to ensure it is in good working condition. These areas at risk of spillage or containing hazardous materials, such as vehicle maintenance areas and hazardous substance stores (including fuel, oils and chemicals) will comply with industry good practice, be bunded, have appropriate containment and segregation. Additionally, the bunded areas will have impermeable bases to limit the potential for migration of contaminants into groundwater following any leakage/spillage. If fluids are required for horizontal	oCEMP

Receptor	Potential changes and effects	Embedded measures	Compliance mechanism
	in releases of pollutants to ground.	directional drilling these will be restricted to bentonite-based muds which are not classed as environmentally hazardous. All aspects of the Proposed Development from construction to operation and decommissioning will comply with the Health and Safety at Work etc. Act 1974 and regulations made under the Act, and The CDM Regulations 2015 (Ref 16-14). Risks to construction workers will be managed through compliance with the requirement for risk assessments and method statements for all construction related activities and the use of appropriate working methods, training and Personal Protective Equipment (PPE). The design for the Proposed Development will comply with good practice in structural design including compliance with the Eurocodes and relevant British Standards. The design will account for the expected ground conditions and design loads, accounting for the effects of climate change. The design of the Proposed Development will be completed in accordance with CDM Regulations 2015 (Ref 16-14).	
Soil and land contamination receptors	**Construction, Operation and decommissioning**	Materials selected for the PV Modules and associated above and below ground infrastructure will be suitably resistant to weather and ground conditions and have	N/A

Receptor	Potential changes and effects	Embedded measures	Compliance mechanism
	Degradation of or damage to the PV Modules and associated above and below ground infrastructure resulting in release of hazardous chemicals to ground resulting in pollution of soils and groundwater (and potential impacts on surface water quality).	sufficient anticipated lifespan to ensure that they are unlikely to significantly degrade during the operational phase. The design of the Proposed Development will be in compliance with the Eurocodes and relevant British Standards, and will account for the expected ground conditions and design loads suitability. During the operational phase, the solar equipment will be located within security fencing, and a network of CCTV cameras will be used to enable the condition of the solar equipment to be visually monitored remotely. It is anticipated that 11 to 22 full or part-time operation and maintenance staff, increasing during seasonal vegetation or inspection cycles, will work on site, replacing and checking equipment, as well as remotely, to undertake remote monitoring of the site's data and performance. Sheep grazing will be possible around the solar equipment however larger livestock or livestock likely to cause damage to the solar equipment will not be grazed during the operational phase. Cables running above ground will be located/ protected to avoid potential damage by grazing animals.	

Receptor	Potential changes and effects	Embedded measures	Compliance mechanism
		In the event that damage to above ground solar equipment was observed, appropriate action will be taken to investigate any potential impacts to ground (soils and groundwater) in accordance with LCRM (Ref 16-19). Ground investigation in accordance with British Standards Institution (BS) 5930 (Ref 16-57) will be used to determine whether aggressive ground conditions are present, to confirm the resistivity of materials to the substances present. If aggressive ground is identified, a suitably resistant barrier material will be applied e.g., around cables or the piled PV Module Mounting Structures. Or, alternatively, ground remediation measures will be used to treat or remove substance(s) of concern. Underground electrical cables installed for the Project will not be oil-filled. Buried cables will be protected from damage/ deterioration by the use of sand/ soil cushioning to avoid them being in contact with sharp stones/ objects, and placement of marker tape above the cables will help to alert anyone digging to their presence.	

Receptor	Potential changes and effects	Embedded measures	Compliance mechanism
		Good drainage will be maintained around buried cables to prevent them being regularly or continuously waterlogged. This will lower the risk of leaching or release of contaminants from the cables during operation. All underground cables will be removed from the ground during decommissioning. This removes the potential for degradation of the cable materials and possible release of hazardous substance to ground beyond the operational lifespan of the Proposed Development.	

16.8 Assessment of Likely Impacts and Effects

16.8.1 The process of assessing using a parameter-based design envelope approach means that the assessment considers a maximum design scenario whilst allowing the flexibility to make improvements in the future in ways that cannot be predicted at the time of submission of the planning application.

16.8.2 The maximum design scenario parameters that have been identified to be relevant to ground conditions are outlined in **Table 16-18** and are in line with the Proposed Development's design envelope (**Chapter 2: Description of the Proposed Development**).

16.8.3 The terms 'hard' and 'soft' development are used below to denote areas where development results in the naturally occurring soils being covered (typically by hardstanding, buildings or aggregates) and / or lost (for instance, soils are excavated and not restored), and areas where despite a land use change, the natural soil reprofile can be retained (for example, change from an agricultural field to area of permanent habitat).

Table 16-18 Maximum design scenario

Item	Details	Area (m2)	Total area (ha)
Permanent Land Take (maximum footprint of land take – soil removal/ soil sealing)			
Proposed connection options to the National Grid Substation	Four connection options to the National Grid Substation: Options 1 – 4 are proposed. Of these, the maximum area of land take is associated with Option 2, comprised as follows:		
	North Compound 1	2,228	
	North Compound 3	2,454	
	North Compound 2	2,386	
	Switchroom	808	
	Point of Connection 1	0 (within existing hard development area)	
Combined Option 2 land take area:		**7,876**	**0.79**
Permanent access tracks	Topsoil will be removed to form new access tracks and some improvements to existing tracks will be needed as follows:		
	20.2km of new construction tracks (up to 4.5m wide)	90,863	9.09
	2.7km of new field access tracks (up to 3m wide)	8,044	0.80
	5.5km of existing track to be upgraded (assume 1m each side where topsoil may need to be removed)	11,000	1.10
Combined access track land take area:		**108,907**	**10.9**

Item	Details	Area (m2)	Total area (ha)
Transformer stations	54 (transformers, inverters, switchgear substations), each with an area of 5.8 x 2.2m, combined area:	689	0.07
Other items	Solar Panel foundations	11,381	1.1
	Inverter foundations	87	0.009
	Fence foundations (0.6 x 0.6m) x ~9,495	3,418	0.34
TOTAL PERMANENT LAND TAKE:		**132,358**	**13.2**
Temporary development areas (maximum footprint of soil disturbance and/ or excavation)			
Temporary development areas (maximum footprint of soil disturbance and/ or excavation)	The temporary development area relative to soil excavation and disturbance will include the following items: • construction of temporary and permanent access roads • construction of temporary compounds including a primary compound and up to 11 secondary compounds, and a possible temporary car park area • installation of security fencing and CCTV • construction of the PV arrays (including piling for module mounting structures to a maximum depth of 3m and trenching to install underground cables) • construction of foundations to install transformer stations		

Item	Details	Area (m2)	Total area (ha)
	• construction of the onsite electrical infrastructure (grid connections option and compounds) • construction of cable route between grid connection compounds and National Grid Substation (trenching with temporary stockpiling of topsoil and subsoil) • horizontal directional drilling (HDD) and associated entry and exit compounds for cables crossing reens, roads, farm tracks or pedestrian pathways. It is assumed that soils could be disturbed (e.g., by vehicle or plant movements) anywhere within the PEIR Assessment Boundary.		
TOTAL DEVELOPMENT AREAS (WITHIN WHICH TEMPORARY SOIL DISTURBANCE COULD OCCUR):		**5,473,764**	**547.4**
The areas where soil excavation will take place include:	Trenches to install cables (Phase 1, Phase 2 and Phase 3) – 144850m length x 1.8m wide (1.0m deep)	260,730	26.1
	Cable trench (between grid connection compounds and National Grid Substation) – approximately 80,805m long x 1.8m wide	4,284	0.4

Item	Details	Area (m2)	Total area (ha)
	HDD in/out compounds (Phase 1 – 3) NB/ overlap with cable trenches not removed i.e. the total area of temporary disturbance is likely to be overestimated	80,000	8.0
	Temporary construction compounds and possible temporary car park areas:		
	Potential temporary compound	6,795	0.7
	Temporary construction compound 1	4,683.5	0.5
	Temporary construction compound 2	3,392	0.3
	Temporary construction compound 3	5,360	0.5
	Temporary construction compound 4	4,299	0.4
	Temporary construction compound 5	3,709	0.4
	Temporary construction compound 6	3,375.5	0.3
	Temporary construction compound 7	4,327.5	0.4
	Temporary construction compound 8	4,511.5	0.5
	Temporary construction compound 9	5,302.5	0.5
	Temporary construction compound 10	4724	0.5
	Temporary construction compound 11	4,490.5	0.4
	Potential temporary car park area	2,961	0.3
	Total temporary compound and car park area:	**57,931**	**5.8**
ESTIMATED TOTAL DEVELOPMENT AREAS OF SOIL EXCAVATION (WHERE SOIL CAN BE REINSTATED DURING CONSTRUCTION PHASE):		**402,943**	**40.3**

Soil resources: Construction – Land take, soil removal / soil sealing.

16.8.4 This section considers construction, including permanent development (e.g., substation) requiring land take, soil removal / soil sealing. Permanent loss of soil and associated soil functions due to construction of the Proposed Development.

16.8.5 The maximum assessment scenario relating to permanent development on soils is detailed in **Table 16-18** and in combination amounts to an area of 13.4ha, comprised of the selected grid connection option, transformer stations, new permanent access tracks, and improvements to existing access tracks (based on an estimated 2m additional width of land take where tracks are already present).

16.8.6 The predicted effect has been assessed based on the methodology provided in **Section 0**. The magnitude of change, and hence the significance of potential effects has been assessed on the assumption that the embedded environmental measures from **Table 16-7** have been implemented.

Sensitivity or value of receptor

16.8.7 The sensitivity of the soils, based on the land based on the criteria in **Table 16-6**, and discussion of the SSSI in the assessment methodology in **Section 0**, is considered to be medium, no BMV agricultural land is present (which for Wales would result in the sensitivity being very high).

Magnitude of impact

16.8.8 The Proposed Development will involve the permanent loss of up to 13.2ha of soils within agricultural land for hard development (defined in **Section 16.8**). As set out in **Table 16-7** this will result in a minor magnitude of change. This is a maximum design scenario, as the Proposed Development is committed to minimising the permanent footprint of the proposed connection option to the National Grid Substation and to using existing tracks wherever possible (measure GR01 in **Table 16-17**). This is the only measure that can minimise the magnitude of impact by minimising the area of soil sealing or where soils are permanently removed, by minimising the permanent development footprint to that required for the safe operation of the Proposed Development. The use of pile foundations for the modules and inverters will minimise

ground disturbance during their construction, operation and decommissioning.

16.8.9 Where soils are disturbed or excavated, relevant embedded environmental measures in **Table 16-17** include protecting soils from damage during construction, soil excavation, storage and reinstatement / reuse, soil handling in accordance with the Construction Code of Practice for the Sustainable Use of Soils on Construction Sites (Ref 16-58) (GR02 and GR03), which will enable the potential reuse of displaced soils within the Proposed Development or offsite. This measure does not lower the magnitude of impact but reflects the Applicant's commitment to the sustainable use of soil resources. These measures will lower the impact on soils. These measures will be secured by the oCEMP which will be submitted to support the ES.

Significance of effect

16.8.10 With the implementation of the embedded environmental measures (**Table 16-17**), the magnitude of the impact associated with construction of the permanent infrastructure (hard development) for the Proposed Development on soils is **moderate**. With the sensitivity of the receptor medium, and the magnitude moderate, the effect is assessed to be of **moderate adverse significance**, which is potentially significant in EIA terms using the IEMA methodology (see **Table 16-8**). With the embedded mitigation measures defined in **Table 16-17**, the total area is likely to be smaller, however it is still likely to exceed the lower 5ha threshold for a moderate magnitude. Due to the nature of the Proposed Development the total area is comprised of linear elements (access roads) across a large area, and small areas needed for the proposed grid connection and transformer stations local to the solar equipment. In combination the 13.2ha is equivalent to around 2.4% of the 547ha PEIR Assessment Boundary, and 1.4% of the 940ha Gwent Levels (Ref 16-61) - Redwick and Llandevenny SSSI. On this basis, and given that agricultural activity can continue during the operational phase, it is concluded that the effect is **not significant** in EIA terms.

Soil resources: Construction, operation (maintenance) and decommissioning – Compaction and erosion

16.8.11 During all phases of development, compaction of soil by vehicles/ construction plant

during temporary development/ maintenance activities and compaction of soil during soil handling (e.g., excavation, stockpiling, reinstatement) leading to damage to soil structure and damage to/loss of soil functions; and, Erosion of soil during temporary development/ maintenance activities (bare soils exposed to weather effects or stockpiled), leading to loss of organic matter in runoff (and potential impacts on surface water quality).

16.8.12 The maximum assessment scenario relating to construction of the Proposed Development includes: PV Modules, PV Module Mounting Structures, Inverter units, Transformers, high voltage (HV) switchgear and control equipment, onsite cabling, electrical compound comprising a substation and transformer housing (option to be confirmed), converter station and associated infrastructure (option to be confirmed), fencing and security measures, drainage, new internal access roads and bridges, upgrades to existing access tracks, temporary construction access tracks, and temporary construction compounds. This is detailed in **Chapter 2: Description of the Proposed Development** and summarised in **Table 16-18**.

16.8.13 The maximum area used in the assessment includes land where soil handling, storage, reinstatement, or disturbance to soils due to the use of construction vehicles or plant, will take place, and therefore the maximum area is considered to be the PEIR Assessment boundary. Where predicted effects are identified, an assessment of the magnitude of change for each effect has been completed based on the methodology provided in **Section 0**. The magnitude of change, and hence the significance of potential effects has been assessed on the assumption that the embedded environmental measures from **Table 16-17** have been implemented as part of the Proposed Development.

16.8.14 Damage to land drainage (including existing field drains) during construction can also result in impacts on soils and could occur in areas where excavation takes place, consideration of effects relating to impacts on the existing land drainage regime is included in **Chapter 10: Water Environment**.

Sensitivity or value of receptor

16.8.15 The sensitivity of the soils, based on the land based on the criteria in **Table 16-6**, and discussion of the SSSI in the assessment methodology in **Section 0**, is

considered to be medium, no BMV agricultural land is present (which for Wales would result in the sensitivity being very high).

Magnitude of impact

16.8.16 There is the potential for damage to soils to occur wherever soils are excavated or otherwise disturbed (such as by the use of construction vehicles / plant in fields) over a maximum area of >40ha. This potentially results in a very high magnitude of change based on **Table 16-7**. However, relevant embedded environmental measures (**Table 16-17**) that will influence the magnitude of change include: management of excavated soils in accordance with an oSMP (GR02), detailed in the oCEMP which will be submitted to support the ES. Additionally, soil handling in accordance with the Construction Code of Practice for the Sustainable Use of Soils on Construction Sites (Defra, 2009), protection of soft or wet ground from compaction by construction traffic or plant (GR05, **Table 16-17**), storing topsoil and subsoil separately, not handling soils when they are too wet, minimising the length of time soils are temporarily stockpiled, and storing soils locally to the point of excavation so that they can be restored in the same area they came from (GR11, **Table 16-17**)).

16.8.17 In addition, it is noted that construction will take place over four years with three construction phases rather than occurring across the entire PEIR Assessment Boundary at one time. This reduces the potential for a significant impact. The area of soil excavation (and where excavated soils can be reinstated following construction) will be much smaller than the total working area. This will be limited to the cable trenches, temporary construction compounds, temporary access tracks, and a possible temporary car parking area. This is estimated at least the area of permanent development plus the temporary development, which is 53.5ha in total. The mitigation measures will be secured by the oCEMP which will be submitted to support the ES.

16.8.18 With the implementation of these embedded environmental measures and the phased construction, the magnitude of the impact that temporary development activities relating to the Proposed Development will have on soils is considered to be reduced to **minor**.

Significance of effect

16.8.19 With the implementation of the embedded environmental measures (as shown in **Table 16-17**), the magnitude of the impact the Proposed Development will have on soil resources is minor. With the sensitivity of the receptor being medium, and the magnitude **minor**, the effect is **slight adverse** which is **not significant** in EIA terms.

Soil resources: Operation – Presence of Solar Panels on land and changes to soil health / soil structure and soil function

16.8.20 Most existing soils will be retained within the Proposed Development in and around the solar equipment. Where soils are excavated, they will generally be restored (e.g., reinstatement over buried cables) and seeding will take place at the earliest opportunity to support the recovery of the placed soils. This will enable soil functions other than agricultural functions (biomass production) to continue. During the operational phase of the Proposed Development there could be benefits to soil health, and as a result some soil functions could improve. Factors that could improve soil health include cessation of agricultural inputs such as pesticides, less disturbance to soils and vegetation by agricultural activities such as tilling, and less compaction of soils by farm vehicles. Soil health improvements could include improvements in soil biodiversity, which is integral to good soil structure and soil carbon storage.

Sensitivity or value of receptor

16.8.21 The sensitivity of the soils, based on the land based on the criteria in **Table 16-6**, and discussion of the SSSI in the assessment methodology in **Section 16.5 0**, is considered to be medium, no BMV agricultural land is present (which for Wales will result in the sensitivity being very high).

Magnitude of impact

16.8.22 Welsh Government research has concluded that there is insufficient data to confirm that a change of land use from arable agriculture to grassland with solar panels during the operational phase of a solar development will result in significant improvements in soil organic matter (SOM). SOM is beneficial to soil structure, resistance of soil to erosion, plant / crop available water and nutrients, earthworms, soil biodiversity, and soil carbon storage. Based on most of the land in the PEIR

Assessment Boundary already being grassland and given that soil disturbance will take place during construction and decommissioning, the change to soil health during the operational phase compared to the baseline is expected to be **negligible**.

Significance of effect

16.8.23 The magnitude of the impact the Proposed Development will have on soil health / soil structure and soil function, based on the sensitivity of the receptor being medium, and the magnitude negligible (beneficial or adverse), the effect is **neutral** or **slight adverse** and **not significant** in EIA terms.

Land contamination receptors: Construction, operation (maintenance) and decommissioning –

16.8.24 Mobilisation of contaminants due to ground disturbance e.g., dust generation, contaminated run-off, creation of new pollutant migration pathways during excavation or construction, failure to manage and segregate excavated materials appropriately.

16.8.25 Most of the Site, is in agricultural use and is expected to be generally free from land contamination posing a significant risk to human health, environmental, or property receptors.

16.8.26 However, potential sources of contamination that have the potential to impact on human health receptors, the water environment (groundwater and surface water), property (agricultural crops or grazing livestock, and building / infrastructure or utilities), and / or ecological receptors have been identified within the Study Area (mainly offsite). The risk levels to relevant land contamination receptors will be confirmed in the PRA for the assessment in the ES.

16.8.27 The maximum assessment scenario relating to the changes to the level of risk associated with land contamination during construction of the Proposed Development change of land use, introduction of new receptors, and / or changes to ground cover (for example, removal of vegetation, excavation and placement of soils) are presented in **Table 16-18**. Where predicted effects are identified, an assessment of the magnitude of change for each effect will be completed based on the methodology provided in **Section 0** for the ES. The magnitude of change, and

hence the significance of potential effects will be assessed in the ES on the assumption that the embedded environmental measures from **Table 16-17** have been implemented as part of the Proposed Development.

Sensitivity or value of receptor

16.8.28 The sensitivity of land contamination receptors varies, depending on the receptor type (for example, human health, the water environment, ecological receptors or property), and the land use context (for example, in a residential use there are sensitive receptors such as young children who may come into direct contact with soil, as opposed to a commercial site use where only adults are likely to be present and they are unlikely to come into contact with soil due to the presence of buildings and hard paving or roads). The assessment methodology therefore considers whether there is potential for a change in the baseline risk level to a sensitive receptor due to the Proposed Development, as explained in **Section 0**.

Magnitude of impact

16.8.29 Relevant embedded environmental measures (**Table 16-17**) that will influence the magnitude of change (in this case an adverse change in risk level to a potential land contamination receptor) include:

16.8.30 The Applicant's commitment to ensuring that the land used for the Proposed Development is suitable for the proposed use with respect to the potential for soil and groundwater contamination and, where necessary, risk-based remediation is undertaken in line with statutory guidance (LCRM) (Ref 16-19); will use of the findings of the PRA (to be included with ES, embedded mitigation measure GR09) to inform an intrusive ground investigation to be undertaken during pre -construction for the Proposed Development, to ensure that the land is suitable for the intended future use.

16.8.31 An unexpected contamination protocol will be included in the oCEMP (GR12) which will be submitted to support the ES. In line with UK statutory guidance (LCRM) (Ref 16-19), to minimise the potential risks to human health and the water environment from any unexpected ground contamination. The oSMP in the oCEMP which will be submitted to support the ES, will also state the requirement during ground works to ensure that any excavated material suspected to be contaminated is segregated (to

avoid cross contamination with other soils) until suitable testing, and risk assessment, has been completed to confirm its suitability for reuse or suitable disposal options.

16.8.32 The above measures will be secured by the oCEMP which will be submitted to support the ES.

Significance of effect

16.8.33 Whilst the probability of encountering contamination during construction increases by passing through or in proximity to potential sources of contamination, the result of the embedded environmental measures is that the probability of a pollutant linkage being realised is reduced. As such, with the implementation of the embedded environmental measures, there should be no increase in the risk level as compared to baseline (current levels of risk to receptors from the identified sources – to be confirmed in the PRA to be included with the ES). The Proposed Development is therefore expected to have a **Negligible** effect on land contamination receptors, which is **Not Significant** in EIA terms.

Land contamination receptors: Construction, operation (maintenance) and decommissioning – Spills or leaks

16.8.34 During all phases of development, spills or leaks of fuels, oils or chemicals from plant, vehicles and equipment resulting in releases of pollutants to ground.

16.8.35 The construction activities for the Proposed Development include the setup of temporary compounds and access roads, construction of the PV Modules (including piling), construction of the grid connection, and trenchless crossing compounds, trenching to install the cables, and the creation of temporary and permanent vehicle access routes (see also maximum design scenario in **Table 16-18)**. At temporary compounds, it is likely that there will be a requirement for the storage of fuels for refuelling of plant and machinery, this has the potential to result in accidental fuel losses either because of loss of bulk containment minor leaks / spills during filling, or leaks and spills from vehicles or plant. Accidental spills or leaks could take place anywhere within the Proposed Development where vehicles or plant are being operated.

16.8.36 In addition, trenchless crossings will require the use of drilling fluids which will be stored at the trenchless crossing compound(s) with the potential for a release to ground due to loss of bulk containment.

16.8.37 The maximum assessment scenario relating to the release of contaminants to ground (soil and / or groundwater) or to surface water during (accidental spills or leaks of fuel / oil leakages from vehicles / plant, spills or leaks during storage of fuels / oils, release of contaminants from wastes by runoff or windblown dust) is presented in **Table 16-18**. Where predicted effects are identified, an assessment of the magnitude of change for each effect will be undertaken for the ES based on the methodology provided in **Section 0**. The magnitude of change, and hence the significance of potential effects has been assessed on the assumption that the embedded environmental measures from **Table 16-17** have been implemented.

Sensitivity or value of receptor

16.8.38 The sensitivity of land contamination receptors varies, depending on the receptor type (for example, human health, the water environment, ecological receptors or property), and the land use context (for example, in a residential use there are sensitive receptors such as young children who may come into direct contact with soil, as opposed to a commercial site use where only adults are likely to be present and they are unlikely to come into contact with soil due to the presence of buildings and hard paving or roads). The assessment methodology therefore considers whether there is potential for a change in the baseline risk level to a sensitive receptor due to the Proposed Development, as explained in **Section 0**.

Magnitude of impact

16.8.39 Relevant embedded environmental measures (**Table 16-17**) that will influence the magnitude of change by limiting the potential for accidental spillages and leaks or contamination caused by runoff or migration of dusts during construction include GR13 and GR14 presented in **Table 16-17**. These relate to the implementation of best practice for storage of potentially polluting substances (such as fuels) or materials (such as excavated soils), set up of construction work (to ensure compliance with The CDM Regulations 2015 (Ref 16-14), the Health and Safety at Work Act etc.1974 and CAR 2012), control of construction activities and drainage, including incident management, and compliance with legislation and SEPA guidance

for pollution prevention.

16.8.40 Drilling fluids, if used during trenchless crossings, will be bentonite-based muds which are not classified as environmentally hazardous and do not contain groundwater hazardous substances and, therefore, a loss of containment will be mild at worst.

16.8.41 Whilst construction will introduce potential contamination sources, implementation of the embedded environmental measures reduces the potential for an impact on land contamination receptors, with any spillage or other release expected to be a mild impact at most, which will represent a very low risk.

Significance of effect

16.8.42 With the implementation of the embedded environmental measures, there should be no increase in the risk level as compared to baseline (current levels of risk to receptors from the identified sources). Based on the significance evaluation in **Table 16-9** the result is a **Negligible** effect, which is **Not Significant** in EIA terms.

Land contamination receptors: Construction, operation and decommissioning

Degradation of or damage to the PV Modules

16.8.43 During all phases of development, there is the potential for degradation of or damage to the PV Modules and associated above and below ground infrastructure resulting in release of hazardous chemicals to ground resulting in pollution of soils and groundwater (and potential impacts on surface water quality).

16.8.44 With implementation of the embedded mitigation measures (**Table 16-17**), the potential for release of hazardous substances to ground during the lifespan of the Proposed Development should be reduced such that any impact will be **negligible**, and there will not be potential for land contamination to result that could pose a potentially unacceptable risk to human health, the water environment, ecological receptors or property receptors.

16.8.45 Key embedded mitigation measures include the commitment for the Proposed Development to comply with good practice in structural design including compliance

with the Eurocodes and relevant British Standards (**Table 16-17**). The design will account for the expected ground conditions and design loads, accounting for the effects of climate change. Materials selected for the PV Modules and associated above and below ground infrastructure will be suitably resistant to weather and ground conditions and have sufficient anticipated lifespan to ensure that they are unlikely to significantly degrade during the operational phase (**Table 16-17**). The solar equipment will be secure during operation to limit the potential for vandalism and will be monitored both in person by staff and remotely using CCTV (**Table 16-17**). This means that prompt action can be taken in the unlikely event of damage to above ground solar equipment Appropriate action will be taken to investigate any potential impacts to ground (soils and groundwater) in accordance with LCRM (**Table 16-17**). The galvanised coating of the piles for the PV Modules will involve a zinc coating of 0.3 to 3.5mm thickness to provide corrosion protection for the steel. Significant release of zinc to the environment should be unlikely based on the use of suitably tested and durable materials.

16.8.46 The 54 electrical transformers will be located within containers located throughout the Site, within containers which will serve as bunds for oils used within the transformers, lowering the potential for a leakage of oil to reach the ground.

Sensitivity or value of receptor

16.8.47 The sensitivity of land contamination receptors varies, depending on the receptor type (for example, human health, the water environment, ecological receptors or property), and the land use context (for example, in a residential use there are sensitive receptors such as young children who may come into direct contact with soil, as opposed to a commercial site use where only adults are likely to be present and they are unlikely to come into contact with soil due to the presence of buildings and hard paving or roads). The assessment methodology therefore considers whether there is potential for a change in the baseline risk level to a sensitive receptor due to the Proposed Development, as explained in **Section 0**.

16.8.48 Grazing by sheep will be possible around the solar equipment which enables vegetation control without the use of plant and machinery. The Proposed Development will be designed to avoid damage to the solar equipment during grazing e.g., by ensuring that above ground cabling is protected from possible

damage by livestock (GR19, **Table 16-17**).

Magnitude of impact

16.8.49 The relevant embedded environmental measures (**Table 16-17**) that will influence the magnitude of change by limiting the potential for uncontrolled releases of contaminants to ground from the above or below ground infrastructure during the operational phase of the Proposed Development (GR15, GR16, GR19, and GR20, **Table 16-17**). These relate to the implementation of best practice for storage of potentially polluting substances (such as fuels) or materials (such as excavated soils), set up of construction work (to ensure compliance with The CDM Regulations 2015 (Ref 16-14), the Health and Safety at Work Act etc.1974 and CAR 2012), control of construction activities and drainage, including incident management, and compliance with legislation and SEPA guidance for pollution prevention.

16.8.50 Drilling fluids, if used during trenchless crossings, will be bentonite-based muds which are not classified as environmentally hazardous and do not contain groundwater hazardous substances and, therefore, a loss of containment will be mild at worst.

16.8.51 Whilst construction will introduce potential contamination sources, implementation of the embedded environmental measures presented in **Table 16-17** reduces the potential for an impact on land contamination receptors, with any spillage or other release expected to be a mild impact at most, which will represent a very low risk.

Significance of effect

16.8.52 With the implementation of the embedded environmental measures, there should be a low likelihood of the release of contaminants, including hazardous substances, from the solar equipment to the ground. Based on the significance evaluation in **Table 16-15** the result is a **Negligible** effect, which is **Not Significant** in EIA terms.

16.9 Additional Mitigation and Enhancement Measures

16.9.1 No additional mitigation measure or enhancement measures beyond the embedded measures in **Table 16-17** are required for Ground Conditions.

16.10 Residual Effects and Conclusions

16.10.1 As no additional mitigation and enhancement measures are proposed, the residual effects are assessed as per the overall assessment of significance and are described further in **Table 16-19**. No residual effects have been identified for the operational phase of the Proposed Development.

Table 16-19 Summary of Residual Effects (Construction and Decommissioning Phases)

Receptor	Description of impact	Significance of effect without mitigation	Mitigation/Enhancement measure	Residual effect after mitigation
Soil resources (Medium sensitivity)	Construction – Land take, soil removal / soil sealing.	Moderate (adverse) Not significant	None required	Moderate (adverse) Not Significant
Soil resources (Medium sensitivity)	Compaction of soil by vehicles/ construction plant during temporary development/ maintenance activities and compaction of soil during soil handling (e.g., excavation, stockpiling, reinstatement) leading to damage to soil structure and damage to/loss of soil functions; and Erosion of soil during temporary development/ maintenance activities (bare soils exposed to weather effects or stockpiled), leading to loss of organic matter in runoff (and potential impacts on surface water quality).	Slight (adverse) Not significant	None required	Slight (adverse) Not Significant

Receptor	Description of impact	Significance of effect without mitigation	Mitigation/Enhancement measure	Residual effect after mitigation
Soil resources (Medium sensitivity)	Operation – Presence of Solar Panels on land and changes to soil health / soil structure and soil function	Neutral or slight (adverse) Not Significant	None required	Neutral or Slight (adverse) Not Significant
Land contamination receptors (variable sensitivity)	Mobilisation of contaminants due to ground disturbance e.g., dust generation, contaminated run-off, creation of new pollutant migration pathways during excavation or construction, failure to manage and segregate excavated materials appropriately.	Negligible Not Significant	None required	Negligible Not Significant
Land contamination receptors (variable sensitivity)	Construction, operation (maintenance) and decommissioning – Spills or leaks	Negligible Not Significant	None required	Negligible Not Significant
Land contamination receptors (variable sensitivity)	Construction, operation and decommissioning – Degradation of or damage to the PV Modules	Negligible Not Significant	None required	Negligible Not Significant

16.11 Cumulative Effects

16.11.1 The cumulative assessment considers the effect of the Proposed Development on the permanent loss of soil resources and farmland in combination with other developments within the ground conditions ZoI. For soils a 250m buffer has been applied to the PEIR Assessment Boundary.

16.11.2 The ISEP (formerly IEMA) guidance, A New Perspective on Land and Soil in Environmental Impact Assessment guidance (IEMA, 2022b) provides an outline methodology for assessing the cumulative effects of land loss for undeveloped agricultural land at the national and local scale. This considers annual average land losses, and whether a Proposed Development is likely to change the annual average land loss, when it occurs in combination with other developments. The assessment in this chapter is based on the IEMA approach as outlined below. Where the effect of the Proposed Development and other development could result in the loss of more than one per cent of the estimated annual average land loss for Wales, this is considered to be potentially significant, as advised in the A New Perspective on Land and Soil in Environmental Impact Assessment guidance.

16.11.3 Available statistics (Welsh Government, 2016 (Ref 16-58) state that Wales includes some 2.1 million hectares of land, of which 1.8 million ha is comprised of farms and common land (88% of the total). The agricultural land is described as dominated by grass permanent pasture, rough grazing and grassland re-sown in the last 5 years. This relates to the wet but mild climate, with generally poorer soil quality, and with large areas at relatively high altitude or with severe slopes. It is also noted by the Welsh Government that there are many small farms, compared to a small number of large ones.

16.11.4 Information is available on the loss of BMV (Ref 16-32) land over time in Wales in a report from 2020 This records that

"Historically the area of BMV land in Wales has decreased from 318,235 hectares in 1939 to 296,960 hectares in 2011. The total loss of BMV land over the period 1939 to 2011, was 21,275 hectares (~0.10% loss per year)… equivalent in size to approximately 21,100 rugby fields or 440 Welsh farms…", based on an average farm size of 48ha, and that "The conversion of land for urban development purposes has

been a key driver of BMV land loss in Wales. The area of land classified as Urban grew from 22,372 hectares in 1939 to 84,986 hectares in 2011, with significant growth occurring in 1965 (2.5% across all Wales) and 1980 (2.8% across all Wales). The total growth in Urban area from 1939 to 2011 is equivalent in size to approximately all of Monmouthshire County. The predicted annual loss of BMV land to urbanisation over the next five decades is expected to be minimal when compared to historical loses. An estimated 125 hectares, on average, of BMV land will be lost to urbanisation per annum over the period 2018 to 2065. By 2065, under a high urban growth scenario, the total area of BMV land in Wales is predicted to decline to around 290,214 hectares."

16.11.5 There are no equivalent figures for the loss of lower grade agricultural land over the same period. As BMV land is considered to be a nationally significant resource in Wales and is protected in planning policy, the annual average loss of lower grade agricultural land is likely to be higher. The Proposed Development avoids BMV land and will therefore not have any cumulative effect on BMV land.

16.11.6 The total area of agricultural land in 2016 was recorded as 1,857,377ha, and in 2023, the total area of agricultural land was recorded as 1,775,200ha (Ref 16-59), a reduction of 82,177ha over this seven-year period (equivalent to an average annual loss of around 11,740ha between 2016 and 2023). It is unclear whether this loss is genuine (i.e., agricultural land converted to urban land) due to the survey methodology which is reliant on responses from farmers. Using predictive modelling, the area of BMV land in Wales was estimated by ADAS in 2018 as 296,897ha (Ref 16-32), if this area remains largely unchanged (given the protection of BMV land in planning policy), based on the total agricultural land area in Wales in 2024 being 1,775,200ha, the area of lower grade agricultural land is likely to be in the region of 1,478,303ha. Using the total agricultural area recorded in 2016 (1,857,377ha (Ref 16-59) compared to the total agricultural area 2024 (1,775,200ha), an average annual loss of agricultural land to urban development or other factors can be calculated as 0.6%, or approximately 11,740ha, per year.

16.11.7 **Table 16-17** presented the embedded mitigation measures in place to minimise the impacts of the Proposed Development on soils due to their temporary disturbance during construction. The main potential for significant cumulative effects on soils is

therefore associated with the permanent loss of naturally occurring in situ soil resources for hard development (meaning development including construction of buildings, removal of soils and replacement with engineered fill materials or structures, or sealing of soils below hardstanding). Review of other developments on agricultural land within the ZoI for soil resources confirms that these include mitigation measures to limit impacts on soils, such as separate storage of excavated topsoil and subsoil for reuse in reinstatement. These measures will limit the potential for significant cumulative effects in relation to damage to soils.

16.11.8 Only one other development is identified within the ZOI for soil resources, which is also a solar farm. This is the proposed British Solar Renewables (BSR Energy) Rush Wall Solar Park (DNS/3220457) located north of the Proposed Development in 123ha of land which is mainly ALC grade 3b farmland (and within the same SSSI as the Proposed Development). The planning application boundary covers approximately 136.2ha, however, the available planning documentation (Ref 16-60) does not quantify the total area of permanent development within this area. Therefore, to provide a conservative assessment it is assumed that the Rush Wall Solar Park will require a similar permanent development footprint to that of the Proposed Development. The combined 26.4ha of permanent development is equivalent to 0.002% of the estimated area of lower grade agricultural land (1,478,303ha) in Wales, or 0.2% of the estimated average annual loss (11,740ha) of agricultural land. As the worst-case combined area is less than 1% of the estimated annual loss of agricultural land this is not considered to be significant in EIA terms.

16.11.9 Other developments within the 500m ZOI applied for land contamination comprise: the BSR Energy Rush Wall Solar Park (DNS/3220457), the Magor Net Zero renewable energy project comprising green hydrogen production, ground-mounted Solar Panels, wind turbines, hydrogen electrolysers, hydrogen and energy storage and ancillary and associated infrastructure and cabling, a proposed agricultural building on land off Norton Lane, Whitewall, Undy, and a development (ref. 25/0052) south of Queen's Way on land at the TATA Llanwern Works.

16.11.10 In relation to land contamination, it is assumed that the other developments will be designed and constructed in accordance with the applicable legislative

requirements and statutory guidance (LCRM) (Ref 16-19) for land contamination.

16.11.11 Additionally, during construction work, it can reasonably be assumed that good and standard construction practices and actions, secured by the oCEMP which will be submitted to support the ES. The oCEMP will be undertaken to meet the legislative requirements under The Construction (Design and Management) CDM Regulations 2015 (Ref 16-14) and the Health and Safety at Work Act etc. by the 'other developments' such that the risk of pollution incidents will be low, and unexpected contamination found during construction of the 'other developments' will be managed in line with the statutory guidance (LCRM) (Ref 16-19). With the Proposed Development and the other developments following the LCRM guidance (Ref 16-19) there should not be potential for a significant cumulative effect.

16.12 Summary

16.12.1 The Proposed Development will result in a moderate (adverse) effect on soil resources due to the requirement for land take involving permanent soil removal or soil sealing, to construct the grid connection infrastructure, transformer stations, new permanent access tracks, and improve existing access tracks. Given that the total area required is comprised of linear elements (access roads) across a large area, with smaller areas needed for the proposed grid connection and transformer stations local to the solar equipment and given that agricultural activity can continue during the operational phase, it is concluded that the effect is **Not Significant** in EIA terms.

16.12.2 During construction, and decommissioning, and potentially during operation (maintenance), there will be a requirement for soil disturbance and temporary soil removal. With implementation of the embedded measures, the magnitude of the impact that temporary development activities relating to the Proposed Development on soil resources will be reduced and the effect is slight adverse which is **Not Significant**.

16.12.3 The potential for effects on land contamination receptors has been considered in relation to the creation of new contaminant migration pathways due to ground disturbance during construction, operation, or maintenance, and the potential release of hazardous chemicals to ground from the materials or substances used in the Proposed Development (e.g., through their accidental damage, or wear and

tear). With the embedded mitigation measures, effects on land contamination receptors should be negligible, and **Not Significant** in EIA terms.

16.13 References

Ref 16-1 Department for Energy Security & Net Zero (2023) Overarching National Policy Statement for Energy (EN-1), [Online], available at: https://www.gov.uk/government/publications/overarching-national-policy-statement-for-energy-en-1 [Accessed October 2025].

Ref 16-2 Department for Energy Security & Net Zero (2023) National Policy Statement for renewable energy infrastructure (EN-3), [Online], available at: https://www.gov.uk/government/collections/national-policy-statements-for-energy-infrastructure [Accessed October 2025].

Ref 16-3 Welsh Government (2024) Planning Policy Wales, Edition 12. Online. Available at: https://gov.wales/planning-policy-wales [Accessed January 2025].

Ref 16-4 Welsh Government (2021) Future Wales: The National Plan 2040. Online. Available at: https://www.gov.wales/future-wales-national-plan-2040. [Accessed October 2025].

Ref 16-5 Newport City Council (2015) Newport Local Development Plan 2011-26 Adopted Plan. Online. Available at: https://www.newport.gov.uk/documents/Planning-Documents/LDP-2011-2026/LDP-Adopted-Plan-January-2015.pdf [Accessed October 2025].

Ref 16-6 Monmouthshire County Council (2014) Monmouthshire County Council Adopted Local Development Plan: 2011-2021. Online. Available at: https://www.monmouthshire.gov.uk/app/uploads/2017/05/Adopted-Local-Development-Plan-with-PDF-tags.pdf [Accessed October 2025].

Ref 16-7 UK Government (2016). Environment (Wales) Act 2016. (Online). Available at: https://www.legislation.gov.uk/anaw/2016/3/contents/enacted. [Accessed October 2025].

Ref 16-8 UK Government (2015). Well-being of Future Generations (Wales) Act 2015. (Online). Available at: https://www.gov.wales/well-being-future-generations-act-essentials-html. (Accessed October 2025).

Ref 16-9 UK Government (1990). Environmental Protection Act 1990. (Online). Available at: https://www.legislation.gov.uk/ukpga/1990/43/contents. [Accessed October 2025].

Ref 16-10 UK Government (1991). Water Resources Act 1991. (Online). Available at: https://www.legislation.gov.uk/ukpga/1991/57/contents. [Accessed October 2025].

Ref 16-11 UK Government (2003). Water Act 2003. (Online). Available at: https://www.legislation.gov.uk/ukpga/2003/37/contents. [Accessed October 2025].

Ref 16-12 Welsh Government (2015). (Online). Available at: https://www.legislation.gov.uk/wsi/2015/1394/made. [Accessed October 2025].

Ref 16-13 UK Government (1974). (Online). Available at: https://www.legislation.gov.uk/ukpga/1974/37/contents. [Accessed October 2025].

Ref 16-14 UK Government (2015). (Online). Available at: https://www.legislation.gov.uk/uksi/2015/51/contents/made. [Accessed October 2025].
Ref 16-15 Welsh Government (2016). Agricultural Land Classification Reports. (Online). Available at: https://www.gov.wales/agricultural-land-classification-reports. [Accessed October 2025].
Ref 16-16 Welsh Government (2022). Best and most versatile agricultural land and solar PV arrays. (Online). Available at: https://www.gov.wales/best-and-most-versatile-agricultural-land-and-solar-pv-arrays. [Accessed October 2025].
Ref 16-17 BRE (2025) Planning guidance for the development of large scale ground mounted solar PV systems. (Online). Available at: https://www.bre.co.uk/filelibrary/nsc/Documents%20Library/NSC%20Publications/NSC-publication-planning-guidance.pdf. [Accessed October 2025].
Ref 16-18 Welsh Government (2019). Guidance: Agricultural land classification: Predictive Agricultural Land Classification (ALC) Map 2. (Online). Available at: https://www.gov.wales/agricultural-land-classification-predictive-map. [Accessed October 2025].
Ref 16-19 Environment Agency (2020) Land contamination risk management (LCRM) How to assess and manage the risks from land contamination, 8 October 2020, last updated June 2025. (Online). Available at: https://www.gov.uk/government/publications/land-contamination-risk-management-lcrm. [Accessed October 2025].
Ref 16-20 Welsh Land Contamination Working Group (2023) Development of Land Affected by Contamination: A Guide For Developers, Version 4, September 2023. Available at: https://naturalresources.wales/guidance-and-advice/business-sectors/planning-and-development/advice-for-developers/land-contamination/?lang=en. [Accessed October 2025].
Ref 16-21 Joint Industry Working Group (JIWG) (2016). CAR-SOIL. Control of Asbestos Regulations 2012. Interpretation for Managing and Working with Asbestos in Soil and Construction and Demolition Materials. Industry Guidance. (Online). Available at: https://www.claire.co.uk/projects-and-initiatives/asbestos-in-soil. [Accessed October 2025].
Ref 16-22 CL:AIRE (2011) The Definition of Waste: Development Industry Code of Practice, Version 2, March 2011. Available at: https://www.claire.co.uk/projects-and-initiatives/dow-cop. [Accessed October 2025].
Ref 16-23 Defra (2009) Construction Code of Practice for the Sustainable Use of Soils on Construction Sites. Available at https://www.gov.uk/government/publications/code-of-practice-for-the-sustainable-use-of-soils-on-construction-sites. [Accessed October 2025].
Ref 16-24 CIRIA (2007) Assessing risks posed by hazardous ground gases to buildings (C665).
Ref 16-25 Welsh Government (2022) Welsh Soil Evidence Review. (Online). Available at: https://www.gov.wales/sites/default/files/publications/2022-08/review-welsh-soil-evidence_0.pdf. [Accessed October 2025].

Ref 16-26 DMRB (2019) LA 109 Geology and soils. Online. Available at: https://www.standardsforhighways.co.uk/search/adca4c7d-4037-4907-b633-76eaed30b9c0. [Accessed October 2025].
Ref 16-27 Institute of Environmental Management & Assessment (IEMA) (2022) IEMA Guide: A New Perspective on Land and Soil in Environmental Impact Assessment. (online) Available at: https://www.iema.net/media/3xejdu0u/2022-iema_land_and_soils_guidance.pdf. [Accessed October 2025].
Ref 16-28 Institute of Civil Engineers (ICE) (2019). The Environmental Impact Assessment Handbook - A Practical Guide for Planners, Developers and Communities (3rd Edition). ICE Publishing; London, UK
Ref 16-29 Welsh Government (2023) The impact of solar photovoltaic (PV) sites on agricultural soils and land. (Online). Available at: https://www.gov.wales/soils-policy-evidence-programme-all-documents. [Accessed October 2025].
Ref 16-30 Institute of Quarrying, (2021). Good Practice Guide for Handling Soils in Mineral Workings. Online. Available at: https://www.quarrying.org/soils-guidance. [Accessed October 2025].
Ref 16-31 Welsh Government (2024) Planning Policy Wales, Edition 12, February 2024. Online. Available at: https://www.gov.wales/planning-policy-wales. [Accessed October 2025].
Ref 16-32 ADAS (2020) Scoping Report - Sustainability of Best and Most Versatile (BMV) Agricultural Land (Wales). (online). Available at: https://www.gov.wales/sites/default/files/publications/2021-04/sustainability-best-most-versatile-bmv-agricultural-land-scoping-report.pdf. [Accessed October 2025].
Ref 16-33 Missing Reference
Ref 16-34 CIRIA (2001) C552 Contaminated Land Risk Assessment, A Guide to Good Practice.
Ref 16-35 BGS. GeoIndex. Online. Available at: https://www.bgs.ac.uk/map-viewers/geoindex-onshore/. [Accessed October 2025].
Ref 16-36 Mining Remediation Authority (2025) Mining Remediation Authority Map Viewer. (online) Available at: https://datamine-cauk.hub.arcgis.com/. Accessed October 2025.
Ref 16-37 Welsh Government (2019) Available at: https://datamap.gov.wales/layers/inspire-wg:wg_predictive_alc2. [Accessed October 2025].
Ref 16-38 National Library of Scotland. Digital Resources: Map Images. Online. Available at: https://www.nls.uk/digital-resources/. [Accessed October 2025].
Ref 16-39 Cranfield Environment Centre. LandIS Soilscapes Viewer. Online. Available at: http://www.landis.org.uk/soilscapes/. [Accessed October 2025].
Ref 16-40 GE Consulting (2024) Figure: Future Energy Llanwern PEA Update 2023.
Ref 16-41 Natural Resources Wales (2014). National Landscape Character: NLCA34, Gwent Levels.
Ref 16-42 UKSO (2025) UK Soil Observatory. (online) Available at: https://www.ukso.org/. [Accessed October 2025].

Ref 16-43 Welsh Government (2022) Peatlands of Wales. Online. Available at: https://datamap.gov.wales/layers/geonode:peatlands_of_wales_scg8. [Accessed October 2025].
Ref 16-44 Natural Resources Wales (2020) National Peatland Action Programme,2020-2025. Online. Available at: https://cdn.cyfoethnaturiol.cymru/media/692545/national-peatlands-action-programme.pdf. [Accessed October 2025].
Ref 16-45 BGS (2025) GeoIndex. (online) Available at: https://mapapps2.bgs.ac.uk/geoindex/home.html. [Accessed October 2025].
Ref 16-46 BGS. BGS ID: 385304: BGS Reference: ST38SE2, British National Grid (27700): 339560, 182910. Available at: https://api.bgs.ac.uk/sobi-scans/v1/borehole/scans/items/385304. [Accessed October 2025].
Ref 16-47 BGS. BGS ID: 387087: BGS Reference: ST48SW4, British National Grid (27700): 343290, 184430. Online. Available at: https://api.bgs.ac.uk/sobi-scans/v1/borehole/scans/items/387087. [Accessed October 2025].
Ref 16-48 BGS. BGS ID: 385034: BGS Reference: ST38NE12, British National Grid (27700): 337448, 185496. Online. Available at: https://api.bgs.ac.uk/sobi-scans/v1/borehole/scans/items/385034. [Accessed October 2025].
Ref 16-49 Natural Resources Wales (2022) DataMap Wales: Geological Conservation Review (GCR) Site Boundaries. (online) Available at: https://datamap.gov.wales/layers/inspire-nrw:NRW_GCR_SITES. [Accessed October 2025].
Ref 16-50 Natural Resources Wales (2022) DataMap Wales: Regionally Important Geodiversity Sites (RIGS). (online) Available at: https://datamap.gov.wales/layers/inspire-nrw:NRW_RIG_SITES. [Accessed October 2025].
Ref 16-51 Mining Remediation Authority (2025) Mining Remediation Authority Map Viewer. (online) Available at: https://datamine-cauk.hub.arcgis.com/. [Accessed October 2025].
Ref 16-52 Natural Resources Wales (XXXX) DataMap Wales. (online) Available at: https://datamap.gov.wales/maps/new?layergroup=geonode:nrw_wfd_cycle_3_classifications#/. [Accessed October 2025].
Ref 16-53 Natural Resources Wales (2024) DataMap Wales: Source Protection Zones (SPZ) Merged. (online) Available at: https://datamap.gov.wales/layers/inspire-nrw:NRW_Source_Protection_Zones. [Accessed October 2025].
Ref 16-54 Natural Resources Wales (2025) Water Framework Directive (WFD) Regulations Cycle 3 Classification (Interim 2024). (online) Available at: https://datamap.gov.wales/layergroups/geonode:nrw_wfd_c3_2024_interim. [Accessed October 2025].
Ref 16-55 Monmouthshire County Council. Contaminated Land. Online. Available at: https://www.monmouthshire.gov.uk/contaminated-land/. [Accessed October 2025].
Ref 16-56 Natural Resources Wales (2016) The State of Contaminated Land in Wales. Online. Available at:

https://naturalresourceswales.gov.uk/search?lang=en&query=contaminated%20land. [Accessed October 2025].
Ref 16-57 British Standards Institution (BSI), (2020). Code of practice for ground investigations (BS 5930:2015+A1:2020). [online] Available at: https://knowledge.bsigroup.com/products/code-of-practice-for-ground-investigations. [Accessed October 2025].
Ref 16-58 Welsh Government (2016) Welsh Agricultural Statistics 2016. (online) Available at: https://www.gov.wales/welsh-agricultural-statistics-2016. [Accessed October 2025].
Ref 16-59 Welsh Government (2024) Survey of agriculture and horticulture: June 2024, Data for agricultural land use, livestock on farms and the number of people working on agricultural holdings in June 2024. (online) Available at: https://www.gov.wales/survey-agriculture-and-horticulture-june-2024-html. [Accessed October 2025].
Ref 16-60 Welsh Government (2025) Planning casework: Reference: DNS/3220457 - Rush Wall Solar Park Ltd. (online) Available at: https://planningcasework.service.gov.wales/case/CAS-01267-G7G6C5. [Accessed October 2025].
Ref 16-61 Countryside Council for Wales (1989) Site of Special Scientific Interest Citation, Newport/Monmouthshire: Gwent Levels – Redwick and Llandevenny. (online) Available at: http://citations.lercwales.org.uk/sssi/563.pdf. [Accessed October 2025].