10 GROUND CONDITIONS

10.1 Introduction

10.1.1 This Chapter reports the likely significant effects of the Proposed Development in terms of Ground Conditions in the context of the Site and surrounding area. In particular it considers the likely significant effects of the construction, operational, and decommissioning phases of the Proposed Development on ground conditions, and any pre-existing contamination present across the Site and surrounding area.

10.1.2 This Chapter (and its associated figures and appendices) is not intended to be read as a standalone assessment and reference should be made to ES Volume 1, (Chapter 1-6), as well as the final chapter, 'Summary of Residual and Cumulative Effects' ES Volume 1, (Chapter 23-24).

10.2 Legislation, Policy and Guidance

10.2.1 The relevant legislation, policy and guidance are listed below, with a summary provided in ES Volume 3, Appendix 10.1: Legislation, Policy and Guidance.

Legislative Framework

10.2.2 The applicable legislative framework is summarised as follows:

- Control of Pollution Act 1974;
- Health and Safety at Work Act 1974;
- Environmental Protection Act 1990;
- Water Resources Act 1991;
- Environment Act 1995;
- Management of Health and Safety at Work Regulations 1999;
- Pollution Prevention and Control Act 1999;
- Control of Substances Hazardous to Health Regulations 2002;
- Contaminated Land (Wales) Regulation, 2006;
- Control on Dangerous Substances and Preparations (Amendment) (No.2) Regulations 2007;
- Environmental Damage (Prevention and Remediation) (Wales) Regulations 2009;

- Groundwater (England & Wales) Regulations 2009;
- Control of Asbestos Regulations 2012;
- Construction (Design and Management) Regulations 2015;
- Water Environment (Water Framework Directive) (England & Wales) Regulations 2017;
- Water Supply (Water Quality) Regulations, 2018;
- The Water Resources (Control of Agricultural Pollution) (Wales), 2021; and
- Environment Act, 2021.

Planning Policy

10.2.3 The applicable planning policy is summarised as follows:

- National Planning Policy Framework, 2023
- Planning Policy Wales Edition 12, 2024
- National Development Framework "Future Wales – the National Plan 2040", 2021
- Caerphilly County Borough Council (CCBC) Local Development Plan, 2010
- Overarching NPS for Energy (EN-1), 2024 ;
- NPS for Renewable Energy Infrastructure (EN-3), 2024.

Guidance

10.2.4 The applicable guidance is summarised as follows:

- CIRIA C552 Contaminated Land Risk Assessment: A Guide to Good Practice, 2001;
- CIRIA C665 Assessing Risks Posed by Hazardous Ground Gases to Buildings, 2007;
- CIRIA C735 Good Practice on the Testing and Verification of Protection Systems for Buildings Against Hazardous Ground Gases, 2014;
- Guideline for Environmental Risk assessment and Management – Green Leaves III, 2011;
- Land Contamination Risk Management, 2023;
- Groundwater Protection Technical Guidance, 2017;
- Guiding Principles for Land Contamination, 2016;

- British Standards BS5930:2015+A1 2020. The Code of Practice for Site Investigation, 2020;
- British Standards BS 10175:2011+A2 2017. Investigation of Potentially Contaminated Sites – Code of Practice, 2017;
- British Standards BS 8485:2015+A1 2019. Code of Practice for the Design of Protective Measures for Methan and Carbon Dioxide Ground Gases for New Buildings, 2019;
- Land affect by Contamination, 2014;
- Normal Background Concentrations ('NBCs') of Contaminants in English and Welsh Soils, 2013;
- National Quality Mark Scheme for Land Contamination Management, 2017;
- Contaminated Land
- The Environment Agency's Approach to Groundwater Protection, 2017; and
- BRE211 Radon: Guidance on protective measures for new buildings, 2023.

10.3 Consultation Undertaken to Date

10.3.1 This section of the chapter summarises key stakeholder engagement undertaken to inform the assessment. It sets out the key matters raised by consultees in relation to the EIA on the topic of Ground Conditions. Table 10.1 provides a summary of the relevant responses to the EIA Scoping Report (ES Volume 3, Appendix 2.1: EIA Scoping Report), and how the assessment has responded to them.

TABLE 10.1: EIA SCOPING RESPONSE SUMMARY

Organisation	Consultee Comment	Consultant Response
Natural Resources Wales (18th December 2023)	*"We note that Section 8.3 sets out baseline conditions that will be used to inform the EIA. We recommend that the investigations, assessments and documents listed below are included to inform the EIA:* • *Phase I Desk Study for historical land use of the site to determine the extent of potential contamination of the soil and groundwater at the site*	A Phase I Desk Study has been progressed and its findings informed the assessment provided in this Chapter. The Phase I Desk Study is provided as ES Volume 3, Appendix 10.2: Phase I Desk Study.

TABLE 10.1: EIA SCOPING RESPONSE SUMMARY		
Organisation	**Consultee Comment**	**Consultant Response**
	• *Water Feature Survey with a radius of 300m* • *Construction Environmental Management Plan (CEMP)".*	A water feature survey has been undertaken as part of the Water Resources Chapter (ES Volume 1 Chapter 20). The features identified during the survey are detailed in the Phase I Desk Study (ES Volume 3, Appendix 10.2: Phase I Desk Study) and were used to inform the sensitive receptors as part of the assessment provided in this Chapter. An Outline Construction Environmental Management Plan ('OCEMP') has been produced to support this development consent and is provided as separate standalone document as part of the application package. The OCEMP details the best working practices and safe working procedures which all works during the Construction Phase must conform to. Additionally, the OCEMP will also detail any mitigation measures that will be required to protect and reduce the risk to sensitive receptors during the Construction Phase.
Coal Authority (8th December 2023)	"*We note that the Scoping Report acknowledges that land instability issues arising from past coal mining activity may pose a potential risk to the development. We are pleased to see that the authors of this report confirm that they intend to produce a Phase 1 Ground Conditions Desk Study and Coal mining Risk Assessment for inclusion within the ES to support any formal submission. We concur with this approach*".	Risks associated with land instability relating to geological features and past coal mining activity have been assessed as part of the Phase I Desk Study, and a Coal Mining Risk Assessment respectively. The findings of both risk assessments have been used to inform the assessment provided in this Chapter. The Phase I Desk Study (ES Volume 3, Appendix 10.2: Phase I Desk Study) and the Coal Mining Risk Assessment ('CMRA') (ES Volume 3, Appendix 10.3: CMRA).

10.4 Assessment Methodology and Significance Criteria

Scope of the Assessment

10.4.1 An assessment has been made of the potential issues relating to ground conditions associated with the Proposed Development for sensitive receptors identified within and in the vicinity of the Site during its construction, operational, and decommissioning phases.

10.4.2 The assessment scope includes a review of the following relevant documents:

- Wardell Armstrong Phase I Desk Study Report dated February 2024 (ref. BR10167-0013), (ES Volume 3, Appendix 10.2: Phase I Desk Study); and
- Wardell Armstrong Coal Mining Risk Assessment Report dated February 2024 (ref. BR10167-0012), (ES Volume 3, Appendix 10.3: CMRA).

Matters Scoped In

10.4.3 The following potential effects has been identified and are considered likely to be significant and are included within this chapter for assessment:

Construction Phase

- Human health relating to the potential exposure to contamination associated with current and / or historical land uses;
- Controlled water pollution from the leaching and off-site migration of contamination associated with current and / or historical land uses;
- Contamination of land and controlled water from activities progressed during the Construction Phase;
- Ground gas generation, migration and accumulation in confined spaces; and
- Land instability issues relating to current and / or historical land uses.

Operational Phase

- Human health relating to the potential exposure to contamination associated with current and / or historical land uses;
- Controlled water pollution from the leaching and off-site migration of contamination associated with current and / or historical land uses;
- Contamination of land and controlled water from activities progressed during the Operational Phase;
- Ground gas generation, migration and accumulation in confined spaces; and

- Land instability issues relating to current and / or historical land uses.

Decommissioning Phase

- Human health relating to the potential exposure to contamination associated with current and / or historical land uses;
- Controlled water pollution from the leaching and off-site migration of contamination associated with current and / or historical land uses;
- Contamination of land and controlled water from activities progressed during the Decommissioning Phase;
- Ground gas generation, migration and accumulation in confined spaces; and
- Land instability issues relating to current and / or historical land uses.

Effects Not Considered within the Scope

Mineral Resources

10.4.4 The potential effect of the construction / operational / decommissioning phases of the Proposed Development on potential mineral resources present beneath the Site has not been considered within the scope of this assessment.

10.4.5 The Site is covered by a Mineral Safeguarding Area ('MSA') as designed by Caerphilly County Borough Council. The MSA covers the site and the surrounding area, and protects the potential coal resource present that are, or may in the future be, of sufficient value to warrant protections for future generations. A MSA is taken into account in land use planning decisions to ensure that mineral resources are not unknowingly or needlessly sterilised.

10.4.6 The Proposed Development will not sterilise the potential resource as any coal present beneath the Site could be extracted (if required) following decommissioning of the Proposed Development.

Controlled Waters

10.4.7 The effect of the Proposed Development on controlled waters has been assessed in relation to contamination only. Other issues including water resource and flood risk are outside the scope of this assessment.

Extent of the Study Area

10.4.8 A study area of up to 250m surrounding the Site was defined using environmental data and historical, hydrogeological, geological and environmental mapping to identify potential contamination sources and receptors.

Establishing Baseline Conditions

Phase I Geo-Environmental Desk Study

10.4.9 Sources of information that were consulted and reviewed to establish the existing baseline conditions include:

- Environmental search data and historical, hydrogeological, geological and environmental mapping for the study area provided by Groundsure Ltd (ref. GSWA1-2VF-15B-DDL-WTF), dated 21st December 2023. Included within (ES Volume 3, Appendix 10.2: Phase I Desk Study).
- Published geological mapping for the Site, hosted electronically on the British geological Survey ('BGS') GeoIndex portal, accessed in January 2024.
- A review of nearby borehole records on the BGS GeoIndex portal, accessed in January 2024.
- BRE 211: Radon, accessed in January 2024.
- A review publicly accessible aerial and street view photography across the Site, accessed in January 2024; and
- Internet based searches regarding Site and local history, accessed in January 2024.

10.4.10 An initial review of the above listed sources of information was undertaken, with a Site walk over survey on the 17th January 2024.

10.4.11 A Phase I Desk Study Report (ES Volume 3, Appendix 10.2: Phase I Desk Study) was produced detailing the findings of the data review and site walkover surveys and established the geological conditions beneath the Site, identified areas of potentially contaminated land and land instability.

10.4.12 The Phase I Desk Study Report (ES Volume 3, Appendix 10.2: Phase I Desk Study) presented an initial CSM and preliminary qualitative risk assessment of the

potential hazards related to contaminated land and its effects on identified human health, controlled water, ecosystem and built environment receptors.

10.4.13 The recommendations of the Phase I Desk Study Report (ES Volume 3, Appendix 10.2: Phase I Desk Study) included undertaking an intrusive ground investigation.

Coal Mining Risk Assessment

10.4.14 Sources of information that were consulted and reviewed to establish the existing baseline conditions include:

- Coal Authority Consultants Mining Report Ref. 51003394437001. Included within (ES Volume 3, Appendix 10.3: CMRA).
- British Geological Survey (BGS) (England and Wales 1:50,000, Sheet 232 Abergavenny (1990) and Geological Survey of Great Britain National Grid Series 1:10 560 / 1:10 000 maps, Sheet SO00NE (1972) and Sheet SO10NW (1979)) British Geological Survey and Coal Authority Datasets available under the Open Government Licence v3.0.

10.4.15 The CMRA (ES Volume 3, Appendix 10.3: CMRA) was produced to identify the potential coal mining related hazards beneath the Site and assess the risk associated with each hazard. The CMRA was produced to inform the development proposals and provide recommendations for an appropriate phase of further scheme of investigation, if considered necessary.

Identifying Likely Significant Effects

Construction, Operational and Decommissioning Effects

10.4.16 The identification of likely significant effects was initially undertaken as part of the creation and refinement of the CSM and risk assessment presented in the Phase I Desk Study (ES Volume 3, Appendix 10.2: Phase I Desk Study) and CMRA (ES Volume 3, Appendix 10.3: CMRA). The process involved the following stages:

- Identification of the land contamination baseline conditions;
- Identification of potentially complete pollutant linkages between receptors and potentially contaminative sources that may already be present across the Site due to historical activities and / or potentially contaminative activities associated with the Project;
- Determination of each receptors' sensitivity;
- Determination of potential magnitude of impact on a receptor;

- Evaluation of the significance of the effect based upon its magnitude, and the affected receptor sensitivity;
- Establish the scale of the effect and if it is considered significant or not;
- Detail any additional mitigation measures that may be required during the Project; and
- Assessment of the significance of any residual impacts.

10.4.17 This approach was applied for the construction, operational and decommissioning phases of the Proposed Development. The time periods of the Proposed Development phases of which the potential effects were assessed against are as follows:

- The construction phase of the Project is expected to commence in 2025 and has an expected build period of c.6-8 months to complete;
- The operational lifespan of the Project is expected to be 30 years to 2055;
- The decommissioning phase of the Project is expected to take c.6 months to 2056.

Cumulative Effects

10.4.18 This chapter assessed the inter-cumulative effects on each identified receptor within a designated 250m radius Zone of Influence (ZoI) surrounding the Site.

10.4.19 The potential for interaction of construction / operation / decommissioning effects from the Project with other schemes set out in the Cumulative Developments (presented in ES Volume 1: Chapter 2 EIA Procedures) was considered. The Long List schemes were reviewed and scheme with the potential for spatial or temporal overlap in effects were identified, e.g., overlapping ZoIs, identification of common receptors/ receptor groups and the predicted scheme timelines. From the Cumulative Effects Scheme Table, no schemes were considered for further assessment in the cumulative effects assessment as none were identified with overlapping ZoIs.

Assessment Methodology

10.4.20 The assessment methodology defines the baseline conditions as the potential sources, pathways, and receptors present and then consider how these may affect current and future sensitive receptors during the lifespan of the Proposed Development.

10.4.21 The potential effects have been assessed with reference to standards and legislative guidance where available. Where quantifications of effects has not been

possible, qualitative assessment have been carried out based on progressional judgement and current knowledge.

10.4.22 The method of baseline data collection and assessment was undertaken following a tiered approach to risk assessment as recommended with the Environment Agency's Land Contamination Risk Management guidance that outlines the following:

- Preliminary risk assessment: an assessment of historical and published information in order to develop an initial conceptual site model and preliminary risk assessment;
- Generic quantitative risk assessment: an assessment of site-specific data using generic assessment criteria to screen the site and establish whether there are potential risks; and
- Detailed quantitative risk assessment: an assessment involving the generation of site-specific assessment criteria.

10.4.23 This tiered approach involves identification and investigation of potential hazards, pathways and sensitive receptors and the Proposed Development, and the refinement of a Conceptual Site Model ('CSM') to ultimately identify potential mitigation requirements.

Significance Criteria

10.4.24 Effects that are deemed to be significant for the purposes of this assessment are those that are described as being of a moderate or major beneficial or adverse level.

10.4.25 The significance of an effect on a given receptor is a product of sensitivity of the receptor, and the potential magnitude of the impact. In order to establish the significance, the assessment has evaluated the sensitivity of local receptors through the use of criteria in Table 10.2, and the magnitude of effect as described in Table 10.3.

Sensitivity of Receptor

10.4.26 The assessment process is based upon the sensitivity criteria for the receptors determined with consideration of the following guidance:

- CIRIA C552 Contaminated Land Risk Assessment: A Guide to Good Practice (2001); and
- Environment Agency: Land Contamination Risk Management (2023).

10.4.27 The sensitivity of receptors was considered on a scale of high, moderate, low or very low. The criteria for receptor sensitivity used in this assessment is provided in Table 10.2.

TABLE 10.2: RECEPTOR SENSITIVITY DESCRIPTORS

Value (Sensitivity)	Description	Receptor Example
High	Human health risk, where receptor characteristics promote exposure and/or vulnerability to soil contamination, or ground gas.	Residential and land uses where children are present, such as public recreation areas. Construction workers routinely exposed to soils and/or working in enclosed spaces, trenches, or excavations.
	Groundwater that is used for human consumption and/or is within geological units that display a high level of water storage.	Controlled waters receptors of national and / or strategic importance for the purposes of potable water supplies, e.g., groundwater source protection zone ('SPZ') 1, and Water Framework Directive surface water status High.
	Surface water body with statutory designation, or features possessing very significant biodiversity, social/community value and /or economic value at national level.	High sensitivity ecological receptors whose sensitivity is directly related to soil, or controlled water quality/conditions, e.g., Ramsar or Special Area of Conservation (SAC) site. Designated sites protected under International or UK wildlife legislation.
Moderate	Human health risk, where receptor characteristics provide limited potential for a significant contaminant linkage.	Workers in commercial premises (unless the buildings have features that lead to a high sensitivity in relation to gas accumulation). Construction / maintenance workers carrying out work that involves limited, infrequent ground disturbance. Users of adjacent land during the construction process, e.g., residents in adjacent developments.

	Groundwater that is not currently used for human consumption, but which is within geological units that display a high level of water storage and may support water supply and/or river base flow on a regional scale.	Principal aquifer outside groundwater SPZ or Groundwater SPZ 2 or 3.
	Groundwater that is used for agricultural purposes (e.g., field irrigation) or public amenity.	Agricultural assets whose quality may be affected by exposure to contamination.
	Non-designated surface water body of good chemical quality.	Water Framework Directive surface water status "Good" Sensitive ecological receptors under EU or UK wildlife legalisation whose sensitivity is directly related to soil or controlled water quality e.g., Areas of Outstanding Natural Beauty (AONB).
	Feature possessing significant biodiversity, social/community value and / or economic value at the regional level.	Sites of Special Scientific Interest (SSSIs). Regionally Important Geological Sites (RIGS).
Low	Human health risk, where receptor characteristics significantly minimise the likelihood of a significant contaminant linkage.	Users of car parks and access roads.
	Groundwater that is not currently used for human consumption, but which is either (a) within geological units capable of supporting water supplies at a local scale and/or low sensitivity industrial purposes, or (b) present as localised bodies of groundwater within generally non-water bearing strata.	Secondary A & B aquifers outside of groundwater SPZ.

	Feature possesses moderate biodiversity, social/community value and / or economic value at the local level. Feature not designated or only designated at a regional / local level.	Water Framework Directive surface water status "Moderate". Local habitat resources or sensitive ecological receptors associated with a Local Nature Reserve (LNR).
Very Low	Groundwater that does not contribute towards baseflow and not used or have the potential to be used for drinking water supply. Feature possesses low biodiversity, social/community value and / or economic value.	Unproductive strata, and no recorded abstractions. Water Framework Directive surface water status "Poor". Plants that have no economic value.

Magnitude of Impact

10.4.28 The criteria and example potential effects for the magnitude of impacts used in this assessment are detailed in Table 10.3.

TABLE 10.3: MAGNITUDE OF IMPACT DESCRIPTORS

Impact Magnitude	General Impact	Geology & Soils	Contaminated Land	Groundwater
High	Significant, permanent loss / irreversible changes, to key characteristics, features or function. Impact may occur over a significant area (>50% of site).	An internationally or nationally designated site, such as an SSSI or a significant area of high quality or rare soil type that will be significantly damaged or destroyed by the proposed development.	Impacts from contamination and disturbance will affect the surrounding built and natural environment during construction and operation. Extensive, long term mitigation measures required to avoid adverse impacts.	Pollution, damage or destruction of an aquifer within a Source Protection Zone (SPZ), public water supply or Principal Aquifer.
Medium	Damaging significant changes to key characteristics or features	A locally designated or proposed site of geological interest,	Impacts that effect the surrounding natural	Pollution or damage to Secondary A

	or function, over a moderate area (15%-50% of site). Likely to last for more than 2 years.	such as a RIG, an area of high-quality soil type. Loss of good agricultural land (1, 2, 3A) that will be significantly damaged.	environment will be prevalent during construction but are unlikely to affect the operation of the scheme. Moderate / short term mitigation measures to be incorporated.	Aquifer providing local resource / base flow to rivers.
Low	Noticeable but not significant changes (temporary/potentially reversible), over a partial area (<15% of site), to key characteristics or features.	Slight damage to a designated site of geological interest of damage to soils or good agricultural land (Grade 1, 2, 3A). Any other prominent but undesignated geological feature that will be damaged.	An area where contaminated zones are possible but where it is considered very unlikely that contamination will affect the environment during construction or operation. No mitigation measures anticipated. Minor site investigation may be required.	Pollution or damage to a Secondary B aquifer or Secondary A aquifer that is used for industrial or agricultural purposes.
Negligible	Noticeable temporary/reversible changes for less than 6 months, or barely discernible changes for any length of time, over a small area, to key characteristics or features of an environmental parameter.	Slight damage to other sites of geological interest, soils or poor agricultural land (Grade 3B, 4, 5) that is in the vicinity of the site but will not be affect by the development.	Potentially contaminated site in the study area that is sufficiently distant from the development that it will not affect or be affect by its construction or operation.	Minor pollution of Secondary B aquifer and/or where these is no significant ground water resource.

Assessing Significance

10.4.29 The sensitivity and magnitude criteria are used to establish the significance of the effect in accordance with the matrix detailed in Table 10.4.

TABLE 10.4: ASSESSTMENT OF LEVEL OF EFFECT (SIGNIFICANCE OF EFFECTS)				
Receptor Sensitivity	**Magnitude of Impact**			
	High	Medium	Low	Very Low
High	Major	Major	Moderate	Minor
Moderate	Major	Moderate	Minor	Negligible
Low	Moderate	Minor	Negligible	Negligible
Very Low	Minor	Negligible	Negligible	Negligible

10.4.30 The following terms were used to define the significance of effects identified:

- Major effect: where the Proposed Development is likely to cause a considerable change from the baseline conditions and the receptor of high or moderate sensitivity. A major adverse outcome would result in significant environmental effects. A major beneficial outcome would be achieved through the remediation of a currently high-risk contaminated site.
- Moderate effect: where the Proposed Development is likely to cause either a considerable change from the baseline conditions on the receptor of a low sensitivity or less than considerate change from baseline conditions on a receptor of high or moderate sensitivity. A moderate adverse outcome would result in potentially significant, temporary effects on local environmental receptors. A moderate beneficial outcome would be achieved through reducing a high to moderate risk contaminated site to low risk.
- Minor effect: where the Proposed Development is likely to cause a small but measurable change from the baseline conditions on a receptor that is high sensitivity, or where the Proposed Development is likely to cause a less than considerable change from the baseline conditions on a receptor of moderate or lower sensitivity. A minor adverse outcome would be represented by a temporary, minor increase in risk related to land contamination on environmental receptors effects. A slight improvement in the contamination status of a site or risk to a low to medium sensitivity receptor would represent a minor beneficial outcome.
- Negligible effect: where the Proposed Development is unlikely to cause a measurable change on a receptor of a moderate or lower sensitivity receptor.

10.4.31 Effects assessed as moderate or major were considered to be 'Significant' for the purposes of this assessment (i.e., additional mitigation is required to mitigate their effect), whilst those assessed as minor or negligible were considered to be 'Not Significant' (i.e., no additional mitigation is required to be implemented to mitigate their effect). Although, measures to reduce these to negligible were considered, in line with good practice, where practicable.

10.4.32 Those effects assessed as pertaining specifically to the Site (i.e. where the source or the receptor are present on-Site) were considered direct, whilst those where the source or receptor are present off-Site were considered to be indirect effects.

10.4.33 Best practice guidance, including Contaminated Land Risk Assessment: A Guide to Good Practice (2001) and LCRM, for the assessment of contamination on human health or controlled waters is based on there being significant harm or the significant possibility of significant harm to sensitive receptors. The guidance does not include an assessment of whether an effect is temporary or permanent; therefore, the assessment was based on professional judgement.

10.5 Limitations and Assumptions

Basis of Assessment

10.5.1 This assessment was based upon the following list of plans prepared for the development of the Proposed Development, and the Project Description provided in ES Volume 1, Chapter 5: Project Description.:

- Site Layout Plan (BR10167-01 RevD Site Layout).

Assumptions

10.5.2 The list below details the key assumptions of this chapter with regards to the construction, operation, and decommissioning of the Proposed Development:

Construction Phase

- Construction works are provisionally expected to commence in 2025 and be fully complete in 2025.
- Construction activities are likely to take place continuously over the c.20 week period, albeit at different levels of intensity across the Site.
- Enabling, site preparation and civil engineering works are expected to take approximately 6 weeks.

- Groundworks and erection of the wind turbines are expected to take approximately 8 weeks.
- Construction of the Project Substation is expected to take place over a period of 14 weeks.
- Drilling and installation of the cable link between the wind turbines and Solar PV Arrays to the substation and Convatec manufacturing facility expected to take approximately 8 weeks.
- Demobilisation, commissioning and site restoration/landscaping expected to take approximately 5 weeks.

Operational Phase

10.5.3 For the purposes of this assessment, the Proposed development comprises a series of temporary structures with an operational lifespan of up to 30 years.

Decommissioning Phase

10.5.4 The decommissioning programme is expected to be as follows:

- Decommissioning activities are expected to take approximately 6-months.
- Decommissioning activities are likely to take place continuously over the 6-month period, albeit at different levels of intensity across the Site.

Limitations

10.5.5 The information reviewed should not be considered exhaustive and is considered to constitute the best available data pertaining to and representative of the ground conditions.

10.5.6 The site walkover survey were planned and undertaken using the Site boundary and proposed layout at the time and may not be reflective of the finalised Order Limits.

10.5.7 It is assumed that the existing baseline conditions, ground conditions and contaminative status of the Site as detailed in the Phase I Desk Study Report (see (ES Volume 3, Appendix 10.2) and used as part this of this assessment are reflective of those at the commencement of the Proposed Development. The contamination status is not expected to significantly alter prior to development.

10.6 Baseline Conditions

10.6.1 This section summarises the baseline conditions as outlined within the Phase I Desk Study Report (see (ES Volume 3, Appendix 10.2) and the CMRA (see (ES Volume 3, Appendix 10.3).

Site Description

10.6.2 A detailed description of the Site is provided in ES Volume 1, Chapter 4: Site Description.

Site History

10.6.3 The Sites history has been reviewed with reference to editions of County Series and OS mapping provided within the Groundsure data included as part of the Phase I Desk Study Report (see ES Volume 3, Appendix 10.2).

10.6.4 The Site was historically located within an area of coal workings both at surface and at depth. The map records indicate a series of mining features such as shafts, engine house, surface workings, earthworks/tips, surface ponds/reservoirs, and the Rhymney Limestone Railway, all present across the Site from the earliest OS records c.1875 and 1960. Mapping from circa 1972 onwards no longer present the mining features across the site and surrounding area except for disused tips.

10.6.5 The historic OS mapping of the land surrounding the Site also indicates intensive coal mine workings from the earliest records c.1875 as well as Brick and Tile Works, London & North-Western Railway line, Ironstone workings and Farmland until c.1960. Modern development in the locality such as the Heads of the Valley Industrial Estate was present on OS maps from c.1982.

Current Site Use

10.6.6 The key findings of the site walkover survey undertaken on 17th January 2024 are as follows:

- The Site is comprised of open and fenced grass field used primarily for sheep grazing.
- The Site was accessed through a metal gate in the northeast corner of the site via an unnamed tarmac road southwest of the A469.
- Topography was varied across the site, generally declining in elevation to the north and south with a higher topography across the centre of the site.

- No flowing water courses were observed on site, with dry and vegetated ditches were recorded along the northeast track and the southern boundary of the Site.
- Several small areas of frozen pooling surface water were recorded randomly distributed along the northeastern track.
- The majority of the Site is covered in short grass with pockets of tall grass (<0.75m in height) observed. Two mature trees were recorded in the southeast of the Site.
- No overhead or evidence of underground services were recorded on site; however, overhead telephone pylons were observed 60m west of the Site.
- An approximate 1,000m^2 area of waste material was observed in the centre of the site, immediately south of the proposed central wind turbine. The material consisted of rubber tyres, plastic bags, tarpaulin, rusted metal sheets, rope, wood, and barbed wire.

Geological and Hydrogeological Setting

10.6.7 The initial assessment of the geological setting across the Site is based on a review of data sources such as (but not limited to) British Geological Survey ('BGS') GeoIndex interactive viewer and the Groundsure data.

Artificial Deposits

10.6.8 The Groundsure data identified artificial deposits across the majority of the Site with the exception of an area approximately 2.5Ha is size located in the southeast corner. The BGS 50,000 mapping records indicate that the majority of the artificial deposits across the Site is Made Ground with a band of Worked Ground present along the northern boundary. These artificial deposits are expected to be associated with the historic coal mine workings across the Site and surrounding area.

Superficial Deposits

10.6.9 BGS mapping records indicate two areas of Devensian Till in the northeastern corner (approximately 1.5Ha) and northwestern corner (approximately 2.6Ha). The BGS map describes the Devensian Till as "*unsorted and unstratified drift, generally overconsolidated heterogenous mixture of clay, sand, gravel, and boulders varying widely in size and shape*".

Bedrock Geology

10.6.10 According to the BGS mapping records the Site is underlain by the South Wales Low and Middle Coal Measures Formations, both are described by the BGS as "*Grey*

productive coal-bearing mudstones/siltstones, with seatearths and minor sandstones".

10.6.11 The northern third of the site is underlain by the South Wales Lower Coal Measures Formation, and the southern two thirds of the Site is underlain by the South Wales Middle Coal Measures Formation.

10.6.12 The BGS map records an inferred normal fault orientated north to south that splits into two faults that intersect the eastern quarter of the site. Additionally, the map records indicate that the bedrock strata is inclined to the south to southeast between 3 and 6°.

10.6.13 The following coal seams are inferred to outcrop within the site, as well as an additional unnamed seam:

- Two Feet Nine (0.81-1.45m)
- Four Feet (0.76-0.91m)
- Upper Six Feet (Six Feet combined 2.23-3.09m)
- Lower Nine Feet (Nine Feet combined 2.84-3.35m)
- Bute (0.86-1.07m)
- Yard (0.71m)
- Seven Feet (1.02-1.37m)
- Five Feet Gellideg (1.37-2.01m)
- Garw (0.7m)

10.6.14 The Vanderbeckei (Amman) Marin Band is also recorded as present beneath the Site, located between the Yard and Bute coal seams, which represent the boundary between the Lower and Middle South Wales Coal Measures Formations.

10.6.15 There are no publicly available borehole records on site. The details of the closest two borehole records are as follows:

10.6.16 Borehole SO10NW429, located 750m north of the site, (ID: "A465 BERGAVENNY TO HIRWAUN 143") encountered the following ground conditions:

- – 0.50mbgl: Made Ground
- 0.50 – 2.50mbgl: Firm, grey, brown slightly silty sandy CLAY with occasional gravels and cobbles of quarzitic sandstone.
- 2.50 – 4.40mbgl: Firm to stiff, light grey slightly silty sandy CLAY with occasional gravels of coal and mudstone.

- 4.40 – 4.90mbgl: Very stiff brown grey locally orange, brown slightly silty sandy CLAY with some gravels of mudstone.

10.6.17 Borehole SO10NE343, located 750m north of the site, (ID: "A465 BERGAVENNY TO HIRWAUN DUALLING TP50") encountered the following ground conditions:

- – 0.20mbgl: Topsoil
- 0.20 – 0.40mbgl: Stiff light brown and grey sandy SILT with some rootlets.
- 0.40– 1.50mbgl: Firm light grey and light brown slightly silty CLAY with occasional gravel and cobbles of mudstone and sandstone.
- 1.50– 2.70mbgl: Soft grey and brown grey slightly silty vey sandy CLAY.
- 2.70-3.30mbgl: Very stiff brown and brown grey slightly silty CLAY with some gravels of mudstone and sandstone and occasional cobbles and boulders of sandstone.

Radon

10.6.18 The BRE 'Guidance on Protective Measures for New Dwellings' (BR 211) was consulted to review the geological radon potential of the Site. The BRE guidance document indicates that no radon protective measures are required for any new buildings or structures on the Site.

10.6.19 The radon data provided within the Phase I Desk Study Report (see (ES Volume 3, Appendix 10.2) has indicated that the Site is situated in an area within which less than 1% of properties exceed the Radon Action Level, and therefore no radon protection measures are required.

Hydrogeology

10.6.20 The Devensian Till superficial deposits present at the north-eastern and north-western corners of the Site are classified as a Secondary Undifferentiated aquifer.

10.6.21 A Secondary Undifferentiated aquifer is described as an aquifer that is assigned where it is not possible to attribute either category A or B to a rock type. In general, these layers have previously been designated as both minor and non-aquifer in different locations due to the variable characteristics of the rock type.

10.6.22 The Lower and Middle South Wales Coal Measures Formations are both classified as Secondary A bedrock aquifers.

10.6.23 Secondary A aquifers consists of permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important

source of base flow to rivers. These generally aquifers formerly classified as minor aquifers.

10.6.24 The BGS groundwater vulnerability data indicated the Lower and Middle Coal Measures Formations are described as "*secondary bedrock aquifer of low permeability with well-connected fractures*", and the Devensian Till located across the north-eastern and the south-eastern corners of the Site are described as a "*secondary superficial aquifer of medium permeability*".

10.6.25 The Site is situated in within an area which is covered by a groundwater body area managed by the Water Framework Directive (WFD), detailed as follows:

- SE Valleys Carboniferous Coal Measures groundwater body (ID. GB40902G201900) assessed in 2017 with overall rating of "Poor" and a chemical rating of "Poor".

10.6.26 There are no records of groundwater abstraction licenses or source protection zones associated with the site or the land within a 250m radius of the Site.

Hydrology

10.6.27 There are 97no records of water network features according to the OS MasterMap water network dataset provided within the Phase I Desk Study Report (see (ES Volume 3, Appendix 10.2) including the Rhymney River which is located approximately 176m to the east of the Site. The details of the on-site records are as follows:

- 14no. records pertaining to an inland river not influenced by normal tidal action on site at ground level. The watercourse contains water year-round (normal circumstances).
- 2no. records pertaining to an inland river not influenced by normal tidal action on site underground. The watercourse contains water year-round (normal circumstances).
- 1no. record pertaining to a marsh area on the ground surface that is predominantly waterlogged by freshwater. The watercourse contains water year-round (normal circumstances).

10.6.28 The Site is situated within an area which is designated as a surface water body catchment managed under the WFD. The surface water body catchment is as follows:

- Rhymney River – source to conf Nant Bargod Rhymni (GB109057033130) within the Rhymney operational catchment and the South East Valleys management catchment.

10.6.29 The site is located within 250m of a surface water body managed under the WFD. The details of the surface water body are as follows:

- Rhymney River, located 180m west (ID. GB109057033130) classified in 2016 with overall rating of "Good", consisting of a "Good" chemical rating and "Good" ecological rating.

10.6.30 There are no active surface water abstraction licences or potable abstractions located on or within 250m of the Site.

Environmental Permits

10.6.31 Environmental permitting records data provided within the Phase I Desk Study Report (see (ES Volume 3, Appendix 10.2) identified a series of permits relating to industrial activities across the Site and the surrounding 250m area.

Licensed Industrial Activities

10.6.32 A total of 10no. records of Licensed Industrial Activities (Part A(1)) were identified within 250m of the site. The licences are recorded as the following:

- 5no. records are associated with the Convatec Ltd pertaining to the Gelling Fibre Plant and the process of producing pharmaceutical products (using chemical/biological processes).
- 4no. records are associated with the Convatec Ltd pertaining to the Rhymney Alginate Fibres Plant and the process of producing organic chemicals such as plastic materials (polymers, synthetic fibres, and cellulose based fibres).
- 1no. record is associated with Dragon Recycling Solutions Limited pertaining to the production, melting, or recovery of cadmium or mercury (or any alloy containing more than 0.05% by weight of either of these metals or both in aggregate).

Licensed Discharges

10.6.33 A total of 2no. records of Licensed Discharges to controlled waters permits were identified within 250m of the site, these records are as follows:

- Permit number AF4012104 relates to unspecified trade discharges into the Nant Carno River at Trecatty Occs, located 112m west of the Site, issued on the 25th November 1974 and revoked 19th November 1992.

- Permit number AN0093901 relates to sewage discharge (storm sewer overflow) into the River Rhymney at Tywn Carno Bute House by a water company, located 168m east of the Site, issued on 8th September 2010.

Pollution Incidents

10.6.34 A total of 6no. NRW records of Pollution Incidents were identified within 250m of the site, pertaining to the following information:

- 2no. pollution incidents were identified 21m northeast and 77m southeast of the site relating to specified waste materials (household waste and vehicles/vehicle parts) in April and July 2003. The pollution incidents resulted in a Category 3 (Minor) water and land impact (incident identification 150564 & 178078).
- 1no. pollution incident was identified 22m northwest of the site relating to oils and fuels in April 2003. The pollution incident resulted in a Category 3 (Minor) water impact (incident identification 148376).
- 1no. pollution incident was identified 98m northeast of the site relating to organic chemicals/products in July 2020. The pollution incident resulted in a Category 1 (Major) water impact (incident identification 2005438).
- 2no. pollution incidents were identified 221m east of the site relating to atmospheric pollutants in May 2012. The pollution incidents resulted in a Category 2 (significant) air impact (incident identification 995460 & 996425).

Environmental Designations

10.6.35 There is 1no. record of Designated Ancient Woodland within 250m of the Site which is described as ancient, semi-natural woodland located 82m southeast of the Site.

10.6.36 There are no other environmental designations (e.g. Ramsar sites, Special Areas of Conservation, green belts) within 250m of the Site.

Mining and Quarrying

10.6.37 There are 20no. records of non-coal mining on-site based upon OS mapping and Coal Authority archives, which pertain to Iron Ore (Bedded) in which underground mine workings may have occurred.

10.6.38 The Coal Authority Consultants report included as part of the Coal Mining Risk Assessment see (ES Volume 3, Appendix 10.3) identified records of underground coal

mine workings beneath the Site of 8no. coal seams at depths of 0mbgl to 235mbgl, the worked coal seams are as follows:

- Upper 6ft Rider (ref. 4A81, 4A81A & 4WFU) at ground level, extraction thickness 120cm.
- Red Vein (ref. 4ZCY) at ground level, extraction thickness 100cm.
- Upper 6ft (ref. 4ZCZ) at ground level, extraction thickness 120cm.
- Four Foot (ref. 4A83, 4WFS, 4WFT, 4ATZ & 4ZDO) at ground level to 235mbgl extraction thickness 100-180cm.
- Lower 9ft (ref. 4A7X, 4WGF & 4WGE) at 10 to 27mbgl, extraction thickness 100-165cm.
- Lower 7ft Bottom Leaf (ref. 4WGN & A0US) at 21 to 71mbgl, extraction thickness 78cm.
- Five Foot (ref. 4A7N, 4WGT, 4WGR, 4WGQ, 7H0V, 4A7L, 4A7J, & 4A7K) at 32 to 78mbgl, extraction thickness 70-110cm.
- Five Foot Gellideg (ref. 4WGX, 4A7F, 4WGY, 4A7H, 4A7G, 7HOY, 4ZCM, 4AUE & 4AUD) at 34 to 103mbgl, extraction thickness 84-115cm.

10.6.39 The Coal Authority Consultants Report also identified records of underground non-coal mine workings beneath the site in at depths of 0mbgl to 131mbgl, last worked in 1871. These records pertain to the following:

- Black Pins Ironstone (ref. 4A7Z, 4ZD3, & 4WG7) at ground level to 9mbgl, extraction thickness 120cm.
- Gawr Rider Ironstone (ref. 4E59, 4E55 & 4E5B) at 12 to 20mbgl, extraction thickness 447cm.
- Gawr No.1 Ironstone (ref.4E53, 4E5A & 4E54) at 14 to 33mbgl, extraction thickness 780cm.
- Botton Vein Ironstone (ref. 4E56, 4E57, 4E5D & 4E5C) at 21 to 51mbgl, extraction thickness 227-337cm.
- Rosser Ironstone (ref. 4E58, 4WH4, 4E5E & 4ATQ) at 14 to 131mbgl, extraction thickness 78-780cm.

10.6.40 The Consultant Report identified records of 15no. mine adits and 19no. mine shafts on-site, with an additional 7no.adits and 11no. shafts identified within 100m of

the site. The majority of the mine entry records do not contain detailed treatment plans.

10.6.41 The OS mapping records provided within the Groundsure Report identified a total of 143no. records of surface ground working features across the Site, and a further 289no. records within 250m. These features include the following:

- Unspecified Ground Workings
- Unspecified Disused Tip
- Unspecified Pit
- Opencast Working
- Cuttings
- Unspecified Old Quarry
- Unspecified Heap(s)
- Old Coal Level
- Coal Level
- Reservoir
- Pond
- Water Body
- Ironstone Pit
- Disused Reservoir

10.6.42 The OS mapping records also identified a total of 20no. records of underground workings present across the Site, with an additional 50no. records in the surrounding 250m. The records of features identified are as follows:

- Old Coal Level.
- Unspecified Old Shaft
- Disused Air Shaft
- Unspecified Disused shaft.
- Old Air Shaft.
- Air Shaft.

10.6.43 The BritPits database managed by the BGS records sites of currently active or closed surface and underground mineral workings. The Groundsure report identified

46no. BritPit records across and within 250m of the Site. The relevant on-site records have been summarised as follows:

- 2no. records associated with the extraction (now ceased) of sandstone at Blaen-Carno and Bryn Pyllog.
- 8no. records associated with the extraction (now ceased) of deep coal at Nant-llesg, Twyn-Carno, and Penyfeddw.
- 1no. record associated the extraction (now ceased) of ironstone at Bryn Pyllog Pit.

Future Baseline

10.6.44 If the Site is to remain unchanged, the existing baseline conditions (with respect to ground conditions) are not expected to change. The nature of the current Site land-use is unlikely to result in significant contamination of the land and controlled waters.

10.6.45 It is widely accepted that climate change will result in more variable weather conditions across the United Kingdom, and the increased potential of extreme events. These events may affect controlled water receptors (groundwater and surface waters); however, it is considered unlikely that their sensitivity will change.

10.6.46 ***Sensitive Receptors***

10.6.47 The sensitive receptors which have been considered as part of this assessment are summarised in **Table 10.5**.

TABLE 10.5: SUMMARY OF RECEPTOR SENSITIVITY	
Receptor	**Sensitivity (Value)**
Existing Only	
Construction Workers (human Health)	High
Existing & Future	
Adjacent Site Users (Human Health)	Low
Groundwater Aquifers – Secondary A Lower & Middle Coal Measures Formation (Controlled Waters(	Low
Groundwater Aquifer – Secondary Undifferentiated Devensian Till Superficial Deposits (Controlled Waters)	Very Low
Surface Water Feature including Rhymney River (WFD rating good) and on-site streams/land drains (Controlled Waters)	Moderate

Flora and Fauna – No sensitive land designations (Ecosystem)	Very Low
Future only	
Maintenance Workers Decommissioning Workers (Human Health)	Moderate
Project structures/buildings (Built Receptors)	Moderate

10.7 Assessment of Effects

Embedded Mitigation

10.7.1 This section sets out the primary/design solutions and tertiary mitigation measures that have been considered as part of the assessment of effects.

Construction Phase – Pollution Prevention (Human Health)

10.7.2 An Outline Construction Environmental Management Plan ('OCEMP') (standalone supporting document to the planning application) has been developed for the Proposed Development which will provide details of the mitigation measures throughout the construction phase to suitable protect sensitive receptors from existing hazards or those arisings from construction phase activities.

10.7.3 The OCEMP is submitted alongside the Environmental Statement and provides the framework for detailed Environmental Management Plans to be produced following the granting of the development order.

10.7.4 The OCEMP will detail how all works will be carried out in accordance with the relevant CDM Regulations 2015 to manage the health, safety and welfare of site workers during the construction of the Proposed Development; and the requirement for all site workers to wear task-appropriate personal protective clothing and equipment (PPE).

10.7.5 All the workers on-Site will be made aware of potential contamination issues, if applicable, on the Site during the induction and will use best practice techniques during all construction activities.

10.7.6 Excavated materials are to be segregated to ensure no cross-contamination of any potentially contaminated and clean excavated materials, and to minimise the long-term storage and management of excavated materials.

10.7.7 All service trenches are to be backfilled with certified clean materials to protect future maintenance workers from contact with contaminated materials. Additionally, a marker membrane will be installed within service trenches where the presence of contaminated ground beneath has been confirmed.

Construction Phase – Pollution Prevention (Controlled Waters & Ecosystem)

10.7.8 Vehicles and plant will be well maintained to prevent accidental pollution from leaks. Static machinery and plant will include drip trays beneath oil tanks / engines / gearboxes / hydraulics, which will be checked and emptied regularly via a licensed waste disposal operator.

10.7.9 Areas at risk of spillage, such as vehicle maintenance areas and hazardous substance stores (including fuel, oil and chemicals) will be adequately bunded and secure areas with impervious walls and floor, with a capacity of 110% of substance volume, are to be provided for the temporary storage of fuel, oil and chemicals on site during construction.

10.7.10 Machinery will be routinely checked to ensure it is in good working condition to reduce the risk of leaks.

10.7.11 Any tanks and associated pipe work containing oils and fuels will be double skinned and be provided with intermediate leak detection equipment.

10.7.12 A spill procedure will be documented, and spill kits kept in the vicinity of potentially hazardous materials storage areas. All staff will be trained on the use of these spill kits.

10.7.13 Store all construction, oil, fuel and diesel materials as far from the nearby water bodies and drainage as possible.

10.7.14 The appropriate utility company will be consulted on the potential requirement for an oil interceptor and sediment trip at the point where Site surface water run-off enters the sewerage network, if at all.

10.7.15 Piling will be carried out in accordance with EA Guidance Note on Piling / Penetrative Ground Improvement Methods on Land Affected by Contamination and

ground investigations will inform the Foundation / Piling Works Risk Assessment which will define the appropriate piling methods and foundation design to mitigate risk.

10.7.16 The OCEMP will also include mitigation measures based upon best industry practice to minimise the risk the groundwater aquifers beneath the Site during the cable laying.

Construction Phase – Ground Stability Issues (Built Receptors)

10.7.17 The civil engineering and foundation design for the built structures of the Proposed Development are to be design by an appropriately qualified structural engineer.

10.7.18 During the construction phase, construction workers shall remain vigilant to the possible risk of encountering areas of unanticipated ground conditions that may affect the planned civil engineering and foundation design. Any hotspots or areas of soft ground across the Site are to be removed and replaced with inert and geotechnically suitable imported material. Laboratory testing of all imported material to confirm their chemical and geotechnically suitability for use.

10.7.19 Construction materials to be of a specification to mitigate the potential for chemical attack to sub-surface concrete structure due to aggressive ground conditions.

Operational Phase – Pollution Prevention (Human Health)

10.7.20 Maintenance workers will be required to wear task-appropriate PPE including gas monitoring and respiratory protection equipment for works entering and working in confined spaces.

Operational Phase – Pollution Prevention (Controlled Waters and Ecosystem)

10.7.21 The design, maintenance and operation of the Project Substation should be in line with the best practice, and guidance with mitigation measures in place for the appropriate storage and management of potentially polluting substances, emergency spill response and fire procedures, collection, and control of any potentially contaminated surface water run-off.

10.7.22 A surface water drainage strategy will be designed by suitably qualified engineers and will detail the proposed drainage strategy for the Proposed

Development and any specific measures for the Project Substation, and Inverter stations.

Operational Phase – Pollution Prevention (Built Receptors)

10.7.23 Any inverter stations and substation control units are to be containerised units with active ventilation systems that will be founded on concrete slabs or suspended off the ground thereby reducing the potential for migration into and accumulation of potential explosive and/or asphyxiant ground gases.

Decommissioniong Phase – Pollution Prevention (Human Health Receptors)

10.7.24 All the workers on-Site will be made aware of potential contamination issues, if applicable, on the Site during the induction and will use best practice techniques during all construction activities.

10.7.25 Excavated materials are to be segregated to ensure no cross-contamination of any potentially contaminated and clean excavated materials, and to minimise the long-term storage and management of excavated materials.

Decommissioniong Phase – Pollution Prevention (Controlled Waters & Ecosystem)

10.7.26 Vehicles and plant will be well maintained to prevent accidental pollution from leaks. Static machinery and plant will include drip trays beneath oil tanks / engines / gearboxes / hydraulics, which will be checked and emptied regularly via a licensed waste disposal operator.

10.7.27 Areas at risk of spillage, such as vehicle maintenance areas and hazardous substance stores (including fuel, oil and chemicals) will be adequately bunded and secure areas with impervious walls and floor, with a capacity of 110% of substance volume, are to be provided for the temporary storage of fuel, oil and chemicals on site during construction.

10.8 Assessment of Effects

Construction Phase

Human Health – Construction Workers

10.8.1 The Phase I Desk Study Report (see (ES Volume 3, Appendix 10.2) identified the presence of site-wide artificial deposits, associated with the historic coal mine workings, and therefore pose a risk to construction workers that could potentially interact with potentially contaminated materials, ground gases and vapours via dermal contact, ingestion, and/or inhalation pathways.

10.8.2 At present there is no site-specific data to produce a quantitative risk assessment of the contaminative risk to construction workers posed by the artificial deposits, and therefore a worst-case scenario has been applied.

10.8.3 The inclusion of the embedded mitigation measures in the OCEMP (standalone supporting document) will reduce the exposure to construction workers (high sensitivity receptors) from the risks of inhalation, ingestion, and dermal contact of potentially contaminated materials and ground gas reduce the magnitude of impact to medium. Therefore, the significance of effect is **Major Adverse (Significant).**

Human Health – Adjacent Site Users

10.8.4 The Phase I Desk Study Report (see (ES Volume 3, Appendix 10.2) identified the presence of site-wide artificial deposits, associated with the historic coal mine workings, and therefore pose a risk to adjacent site users that could potentially interact with potentially contaminated airborne dust, ground gases and vapours via ingestion, and/or inhalation pathways.

10.8.5 At present there is no site-specific data to produce a quantitative risk assessment of the contaminative risk to adjacent site users posed by the artificial deposits, and therefore a worst case scenario has been applied.

10.8.6 The inclusion of the embedded mitigation measures in the OCEMP will reduce the exposure to adjacent site users (low sensitivity receptors) from the risks of inhalation and ingestion of potentially contaminated materials and ground gas/vapours reduce

the magnitude of impact to medium. Therefore, the significance of effect is **Minor Adverse (Not Significant).**

Controlled Waters – Groundwaters (South Wales Coal Measures Formation – Secondary A Aquifer)

10.8.7 The Phase I Desk Study Report (see (ES Volume 3, Appendix 10.2) identified the presence of site-wide artificial deposits, associated with the historic coal mine workings, and therefore pose a risk to controlled waters that could potentially interact with increased production of contaminated leachate that migrate vertically into the bedrock aquifer during earthwork activities.

10.8.8 At present there is no site-specific data to produce a quantitative risk assessment of the contaminative risk to controlled waters posed by the artificial deposits, and therefore a worst-case scenario has been applied.

10.8.9 There is the potential for spillages and leakages of hazard chemicals, fuels, and oils used and/or stored on Site during the construction activities that may migrate vertically into the bedrock aquifer.

10.8.10 The inclusion of the embedded mitigation measures as detailed in OCEMP (standalone supporting document) such as leak and spill prevention from vehicles / storage, and the safe working safe working procedures for the cabling laying, will reduce the likelihood of the migration and / or discharge of leached and mobile contaminants from leakages or spills into the South Wales Coal Measures Formations Secondary A groundwater aquifer (Low sensitivity receptor) underlying the Site (Medium magnitude of impact). Therefore, the significance of effect is **Minor Adverse (Not Significant).**

Controlled Waters – Groundwaters (Devensian Till – Secondary Undifferentiated Aquifer)

10.8.11 The Phase I Desk Study Report (see (ES Volume 3, Appendix 10.2) identified the presence of site-wide artificial deposits, associated with the historic coal mine workings, and therefore pose a risk to controlled waters that could potentially interact

with increased production of contaminated leachate that migrate vertically into the bedrock aquifer during earthwork activities.

10.8.12 At present there is no site-specific data to produce a quantitative risk assessment of the contaminative risk to controlled water receptors posed by the artificial deposits, and therefore a worst case scenario has been applied.

10.8.13 There is the potential for spillages and leakages of hazard chemicals, fuels, and oils used and/or stored on Site during the construction activities that may migrate vertically into the superficial deposits aquifer.

10.8.14 The inclusion of the embedded mitigation measures as detailed in OCEMP (standalone supporting document) such as leak and spill prevention from vehicles / storage, and the safe working procedures for the cabling laying, will reduce the likelihood of the migration and / or discharge of leached and mobile contaminants from leakages or spills into the Devensian Till Secondary Undifferentiated superficial deposits groundwater aquifer (Very Low sensitivity receptor) underlying the Site (Medium magnitude of impact). Therefore, the significance of effect is **Negligible (Not Significant).**

Controlled Waters – Surface Water (Rhymney River)

10.8.15 The Phase I Desk Study Report (see (ES Volume 3, Appendix 10.2) identified the presence of site-wide artificial deposits, associated with the historic coal mine workings, and therefore pose a risk to controlled waters that could potentially interact with increased generation of contaminated surface water run-off that migrate laterally and via streams into Rhymney River during earthwork activities.

10.8.16 At present there is no site-specific data to produce a quantitative risk assessment of the contaminative risk to controlled water receptors posed by the artificial deposits, and therefore a worst case scenario has been applied.

10.8.17 There is the potential for spillages and leakages of hazard chemicals, fuels, and oils used and/or stored on Site during the construction activities that may migrate laterally and via streams into Rhymney River.

10.8.18 The inclusion of the embedded mitigation measures as detailed in the OCEMP (standalone supporting document), such as silt traps; and preparation of incident response plans, will reduce the likelihood of the migration of contaminated surface water run-off, as well as leached and mobile contaminants from leakages or spills into

the surface water features (Rhymney River) (Moderate sensitivity receptors) present across and in the vicinity of the Site (Low magnitude of impact). Therefore, the significance of effect is **Minor Adverse (Not Significant).**

Ecosystem

10.8.19 There are no areas of designated environmentally sensitive land across the Site. The Site is used as pastureland with limited agricultural value.

10.8.20 The inclusion of the embedded mitigation measures as detailed in the OCEMP (standalone supporting document), such as watching brief during earthworks and leak and spill prevention from vehicles / storage, will reduce the likelihood of contamination affecting the local ecosystem (very low sensitivity receptors) across the Site (low magnitude of impact). Therefore, the significance of effect is **Negligible (Not Significant).**

Built Environment

10.8.21 The Coal Mining Risk Assessment (see (ES Volume 3, Appendix 10.3) detailed significant quantity of surface and shallow coal mine workings, and mine entries that are present across the Site and across the surrounding area which would present a ground stability hazard to the built environment receptors of the Proposed Development.

10.8.22 At present a detailed review of site specific mine abandonment plans, or intrusive ground investigation works, the presence of shallow mine working and mine entries cannot be discounted.

10.8.23 Furthermore, the presence of surface and shallow coal mine workings, and mine entries, and artificial deposits across the Site present a hazard through the generation of ground gases. These hazardous gases have the potential to migrate to surface and accumulate in built structure where they pose an explosive risk. Suspended containerised inverters and substation structures with active ventilation are less likely to be affected by potentially hazardous gases.

10.8.24 At present there is no site-specific data to produce a quantitative hazardous gas risk assessment posed by the historic mine workings and/or the artificial deposits, and therefore a worst case scenario has been applied.

10.8.25 The legacy of historic coal mining (surface and shallow working, mine entries, and artificial deposits) across the Site presents high magnitude of impact effect on

built environment and human health receptors (high sensitivity receptors). Therefore, the significance of effect is **Major Adverse (Significant)**.

Operational Phase

Human Health – Maintenance Workers

10.8.26 The Phase I Desk Study Report (see (ES Volume 3, Appendix 10.2) identified the presence of site-wide artificial deposits, associated with the historic coal mine workings, and therefore pose a risk to maintenance workers that could potentially interact with potentially contaminated materials, ground gases and vapours via dermal contact, ingestion, and/or inhalation pathways.

10.8.27 At present there is no site-specific data to produce a quantitative risk assessment of the contaminative risk to maintenance workers posed by the artificial deposits, and therefore a worst-case scenario has been applied.

10.8.28 The inclusion of the embedded mitigation measures such as the use of appropriate PPE and safe storage and use of any potentially hazardous chemicals reduce the exposure to maintenance workers (moderate sensitivity receptors) from the risks of inhalation, ingestion, and dermal contact of potentially contaminated materials and ground gas reduce the magnitude of impact to medium. Therefore, the significance of effect is **Moderate Adverse (Significant).**

Human Health – Adjacent Site Users

10.8.29 During the Operational Phase, earthworks activities likely to potentially generate airborne contaminated materials are expected to be minimal and therefore pose a low risk to adjacent site users via ingestion, and/or inhalation pathways.

10.8.30 The inclusion of the embedded mitigation measures such as the safe storage and use of any potentially hazardous chemicals reduce the exposure to adjacent site users (low sensitivity receptors) from the risks of inhalation and ingestion of potentially airborne contaminated materials and ground gas/vapours reduce the

magnitude of impact to low. Therefore, the significance of effect is **Negligible (Not Significant).**

Controlled Waters – Groundwaters (South Wales Coal Measures Formation – Secondary A Aquifer)

10.8.31 During the Operational Phase, earthworks activities likely to potentially generate contaminated leachate are expected to be minimal and therefore pose a low risk to controlled waters.

10.8.32 There is the potential for spillages and leakages of hazard chemicals, fuels, and oils used and/or stored on Site during the construction activities that may migrate vertically into the bedrock aquifer.

10.8.33 The inclusion of the embedded mitigation measures such as leak and spill prevention from vehicles / storage will reduce the likelihood of the migration and / or discharge of leached and mobile contaminants from leakages or spills into the South Wales Coal Measures Formations Secondary A groundwater aquifer (Low sensitivity receptor) underlying the Site (Low magnitude of impact). Therefore, the significance of effect is **Negligible (Not Significant).**

Controlled Waters – Groundwaters (Devensian Till – Secondary Undifferentiated Aquifer)

10.8.34 During the Operational Phase, earthworks activities likely to potentially generate contaminated leachate are expected to be minimal and therefore pose a low risk to controlled waters.

10.8.35 There is the potential for spillages and leakages of hazard chemicals, fuels, and oils used and/or stored on Site during the construction activities that may migrate vertically into the superficial deposits aquifer.

10.8.36 The inclusion of the embedded mitigation measures such as leak and spill prevention from vehicles / storage will reduce the likelihood of the migration and / or discharge of leached and mobile contaminants from leakages or spills into the Devensian Till Secondary Undifferentiated superficial deposits groundwater aquifer

(Very Low sensitivity receptor) underlying the Site (Low magnitude of impact). Therefore, the significance of effect is **Negligible (Not Significant).**

Controlled Waters – Surface Water (Rhymney River)

10.8.37 During the Operational Phase, earthworks activities likely to potentially generate contaminated surface water run-off are expected to be minimal and therefore pose a low risk to controlled waters.

10.8.38 There is the potential for spillages and leakages of hazard chemicals, fuels, and oils used and/or stored on Site during the construction activities that may migrate laterally and via streams into Rhymney River.

10.8.39 The inclusion of the embedded mitigation measures such as appropriate designed and installed surface water drainage system will reduce the likelihood of the migration of contaminated surface water run-off, as well as leached and mobile contaminants from leakages or spills into the surface water features (Rhymney River) (Moderate sensitivity receptors) present across and in the vicinity of the Site (Low magnitude of impact). Therefore, the significance of effect is **Minor Adverse (Not Significant).**

Ecosystem

10.8.40 There are no areas of designated environmentally sensitive land across the Site. The Site is used as pastureland with limited agricultural value.

10.8.41 The inclusion of the embedded mitigation measures such as watching brief during earthworks and leak and spill prevention from vehicles / storage, will reduce the likelihood of contamination affecting the local ecosystem (very low sensitivity receptors) across the Site (low magnitude of impact). Therefore, the significance of effect is **Negligible (Not Significant).**

Built Environment

10.8.42 The built environment receptors are expected to involve sub-surface concrete structures such as foundations that may be affected by aggressive ground conditions relating to artificial deposits.

10.8.43 Embedded measures include specifying the concrete design class to be used for sub—surface structures in order to be suitably resistant to the ground conditions across the Site. These measures limit the potential for expediate sub-surface concrete

degradation (very low magnitude of impact) posing a risk to the built environment (moderate sensitivity receptor). Therefore, the significance of effect is **Negligible (Not Significant)**.

Decommissioning Phase

Human Health – Decommissioning Workers

10.8.44 The Phase I Desk Study Report (see (ES Volume 3, Appendix 10.2) identified the presence of site-wide artificial deposits, associated with the historic coal mine workings, and therefore pose a risk to decommissioning workers that could potentially interact with potentially contaminated materials, ground gases and vapours via dermal contact, ingestion, and/or inhalation pathways.

10.8.45 At present there is no site-specific data to produce a quantitative risk assessment of the contaminative risk to decommissioning workers posed by the artificial deposits, and therefore a worst-case scenario has been applied.

10.8.46 The inclusion of the embedded mitigation measures including appropriate PPE will reduce the exposure to decommissioning workers (moderate sensitivity receptors) from the risks of inhalation, ingestion, and dermal contact of potentially contaminated materials and ground gas reduce the magnitude of impact to medium. Therefore, the significance of effect is **Moderate Adverse (Significant).**

Human Health – Adjacent Site Users

10.8.47 The Phase I Desk Study Report (see (ES Volume 3, Appendix 10.2) identified the presence of site-wide artificial deposits, associated with the historic coal mine workings, and therefore pose a risk to adjacent site users that could potentially interact with potentially contaminated airborne dust, ground gases and vapours via ingestion, and/or inhalation pathways.

10.8.48 At present there is no site-specific data to produce a quantitative risk assessment of the contaminative risk to adjacent site users posed by the artificial deposits, and therefore a worst-case scenario has been applied.

10.8.49 The inclusion of the embedded mitigation measures will reduce the exposure to adjacent site users (low sensitivity receptors) from the risks of inhalation and ingestion of potentially contaminated materials and ground gas/vapours reduce the

magnitude of impact to medium. Therefore, the significance of effect is temporary, **Minor Adverse (Not Significant).**

Controlled Waters – Groundwaters (South Wales Coal Measures Formation – Secondary A Aquifer)

10.8.50 The Phase I Desk Study Report (see (ES Volume 3, Appendix 10.2) identified the presence of site-wide artificial deposits, associated with the historic coal mine workings, and therefore pose a risk to controlled waters that could potentially interact with increased production of contaminated leachate that migrate vertically into the bedrock aquifer during earthwork activities.

10.8.51 At present there is no site-specific data to produce a quantitative risk assessment of the contaminative risk to controlled waters posed by the artificial deposits, and therefore a worst-case scenario has been applied.

10.8.52 There is the potential for spillages and leakages of hazard chemicals, fuels, and oils used and/or stored on Site during the decommissioning activities that may migrate vertically into the bedrock aquifer.

10.8.53 The inclusion of the embedded mitigation measures such as leak and spill prevention from vehicles / storage, and the safe working safe working procedures for the cabling laying, will reduce the likelihood of the migration and / or discharge of leached and mobile contaminants from leakages or spills into the South Wales Coal Measures Formations Secondary A groundwater aquifer (Low sensitivity receptor) underlying the Site (Medium magnitude of impact). Therefore, the significance of effect is temporary, **Minor Adverse (Not Significant).**

Controlled Waters – Groundwaters (Devensian Till – Secondary Undifferentiated Aquifer)

10.8.54 The Phase I Desk Study Report (see (ES Volume 3, Appendix 10.2) identified the presence of site-wide artificial deposits, associated with the historic coal mine workings, and therefore pose a risk to controlled waters that could potentially interact

with increased production of contaminated leachate that migrate vertically into the superficial deposits aquifer during earthwork activities.

10.8.55 At present there is no site-specific data to produce a quantitative risk assessment of the contaminative risk to controlled water receptors posed by the artificial deposits, and therefore a worst-case scenario has been applied.

10.8.56 There is the potential for spillages and leakages of hazard chemicals, fuels, and oils used and/or stored on Site during the decommissioning activities that may migrate vertically into the superficial deposits aquifer.

10.8.57 The inclusion of the embedded mitigation such as leak and spill prevention from vehicles / storage, and the safe working procedures for the cabling laying, will reduce the likelihood of the migration and / or discharge of leached and mobile contaminants from leakages or spills into the Devensian Till Secondary Undifferentiated superficial deposits groundwater aquifer (Very Low sensitivity receptor) underlying the Site (Medium magnitude of impact). Therefore, the significance of effect is **Negligible (Not Significant).**

Controlled Waters – Surface Water (Rhymney River)

10.8.58 The Phase I Desk Study Report (see (ES Volume 3, Appendix 10.2) identified the presence of site-wide artificial deposits, associated with the historic coal mine workings, and therefore pose a risk to controlled waters that could potentially interact with increased generation of contaminated surface water run-off that migrate laterally and via streams into Rhymney River during earthwork activities.

10.8.59 At present there is no site-specific data to produce a quantitative risk assessment of the contaminative risk to controlled water receptors posed by the artificial deposits, and therefore a worst-case scenario has been applied.

10.8.60 There is the potential for spillages and leakages of hazard chemicals, fuels, and oils used and/or stored on Site during the decommissioning activities that may migrate laterally and via streams into Rhymney River.

10.8.61 The inclusion of the embedded mitigation measures such as silt traps; and preparation of incident response plans, will reduce the likelihood of the migration of contaminated surface water run-off, as well as leached and mobile contaminants from leakages or spills into the surface water features (Rhymney River) (Moderate sensitivity receptors) present across and in the vicinity of the Site (Low magnitude of

impact). Therefore, the significance of effect is temporary, **Minor Adverse (Not Significant).**

Ecosystem

10.8.62 There are no areas of designated environmentally sensitive land across the Site. The Site is used as pastureland with limited agricultural value.

10.8.63 The inclusion of the embedded mitigation measures such as leak and spill prevention from vehicles / storage, will reduce the likelihood of contamination affecting the local ecosystem (very low sensitivity receptors) across the Site (low magnitude of impact). Therefore, the significance of effect is **Negligible (Not Significant).**

10.9 Mitigation

10.9.1 An intrusive ground investigation phase is proposed to assess the key areas of uncertainty regarding potential ground conditions, the legacy of historic coal mining and contamination. The ground investigation will provide a better understanding of the underlying ground conditions, including the identification of any artificial deposits and their lateral and vertical extent.

10.9.2 The ground investigation will also address the potential contaminative linkages identified in the CSM detailed within the Phase 1 Desk Study Report and will inform the production of a generic quantitative risk assessment. The ground investigation works should include, but not be limited to, the following:

- A programme of exploratory holes providing targeted coverage of the identified areas of uncertainty within the Proposed Development to allow for assessment of ground conditions, identification of surface and shallow coal mine working beneath and in the vicinity of the proposed development area, sample collection and in-situ testing for geo-environmental and geotechnical purposes.
- Analysis of soil samples, collected from the shallow sub-surface and at depth to test for a range of contaminants including those identified within the Phase 1 Desk Study Report.
- Identification of any ground conditions that are considered to have the potential to generate ground gas. Where required, subsequent gas monitoring should be undertaken. The scope of the gas monitoring will be established in consultation with

the relevant statutory consultees and will be progressed in line with CIRIA C665 guidance.

10.9.3 The findings of the ground investigation and any supplementary investigatory phase will also be important in relation to the specific design details such as

- Potential revision (micro-siting) to the design layout of the of the wind turbines and PV panels to avoid identified coal mine workings.
- The requirement for ground stabilisation works through a drill and grout programme.
- The requirement for ground gas protection measures.
- Specification of sub-surface concrete structures.

10.9.4 If the ground investigation works identify significant contamination, and the potential for completed contamination linkages, the findings will help to inform the requirement for any remedial works across the Proposed Development and the subsequent verification process. In this case, any remediation and subsequent verification works would be subject to DCO requirements and approval would be achieved via submission of relevant reports to the relevant local authority.

10.9.5 The determination of the risks through ground investigation and risk assessment, and the potential remediation of areas of the Site may result in the reduction of the significance, or even removal, of some of the potential effects identified. Should any contaminated material that is considered to pose a risk be identified it will be treated and/or disposed of appropriately.

10.9.6 Where required, a watching brief will be maintained during construction and decommissioning works to confirm the absence of potential sources of contamination such as Made Ground, visual or olfactory evidence of contamination.

10.10 Residual Effects

Human Health Receptors

10.10.1 The recommended mitigation measures will allow for the collection of site-specific data to inform a generic quantitative human health risk assessment of contamination present across the Site. The risk assessment will confirm whether the contamination poses significant risk to human health receptors, and if so will recommend remedial works that will reduce the risk, and thereby reduce the magnitude of impact to very low for Construction Workers (High sensitivity receptors), Adjacent Site Users (Low sensitivity receptors), Maintenance and Decommissioning

Workers (Moderate sensitivity receptors). Therefore, the resulting significance of effects are reduced to **Minor Adverse (Not Significant)** for Construction Workers and **Negligible (Not Significant)** for Adjacent Site Users, Maintenance and Decommissioning Workers.

Controlled Waters Receptors

10.10.2 The recommended mitigation measures will allow for the collection of site-specific data to inform a generic quantitative controlled waters risk assessment of contamination present beneath the Site. The risk assessment will confirm whether the contamination poses significant risk to controlled waters through vertical and/or lateral migration of contaminated leachate, and if so will recommend remedial works that will remove the contamination source, and thereby reduce the magnitude of impact to very low for the South Wales Coal Measures Formations -Secondary A bedrock aquifer (Low sensitivity receptor), Devensian Till superficial deposits Secondary Undifferentiated (Very Low sensitivity receptor), and Surface Waters (Moderate sensitivity receptors). Therefore, the resulting significance of effects are reduced to **Negligible (Not Significant)** for all Controlled Waters receptors.

Built Environment Receptors

10.10.3 The ground investigation works to identify the potential presence of historic coal mining features, and any requirement for subsequent ground improvement works and/or Proposed Development layout revision will reduce the risk of potential ground instability and the resulting magnitude of impact to very low. Furthermore, the site-specific data collected during the ground investigation works will inform the requirement for ground gas protection measures, and the specification of concrete for sub-surface structures. Therefore, the significance of effect will be reduced to **Negligible (Not Significant)** for Built Environment receptors.

10.11 Assessment of Cumulative Effects

10.11.1 When two or more major schemes are developed in close proximity to each other, there is a potential for cumulative ground related impacts such as increase ground contamination.

10.11.2 Cumulative effects related to ground conditions are most likely during periods of earthworks activities i.e. temporal overlap of construction and/or decommissioning phases. Contamination from neighbouring schemes could migrate onto the Site,

increasing the risks posed to sensitive human health, controlled waters and ecosystem receptors.

10.11.3 However, it is likely that, as a result of strict planning guidance and regulation, any nearby scheme would require the application of relevant risk assessments and the implementation of appropriate mitigation measures in order to reduce or eliminate potential environmental impacts.

10.11.4 The schemes considered in the assessment of cumulative effects are presented in ES Volume 1: Chapter 2 EIA Procedures.

10.11.5 None of the schemes detailed in the cumulative scheme list are considered to be within the Proposed Development ZoI and are located over 1km from of the Site. Therefore, it is very unlikely that any cumulative effects would arise from the interaction between these schemes and the Proposed Development.

10.12 Conclusion

10.12.1 This Chapter details the assessment that has been undertaken of the potential effects between Proposed Development during the Construction, Operational, and Decommissioning phases and Ground Conditions with respect to potential ground contamination and legacy of historic coal mining present across the Site and the surrounding area.

10.12.2 The Phase I Desk Study Report and Coal Mining Risk Assessment has been produced to inform this chapter in particular the baseline data and the sensitive receptors considered as part of the assessment.

10.12.3 The identified sensitive receptors have been grouped as human health receptors, controlled waters receptors, ecological receptors and built environment receptors.

10.12.4 The human health receptors and potential contamination pathways include:

- Construction and Decommissioning Workers who may potentially encounter contaminated soils, dust and/or groundwater and ground gas during the excavation works or installation/removal of the wind turbines, PV arrays and associated infrastructure;
- Adjacent site users that may be affected by airborne contaminated soil dust generated during the construction and decommissioning phase, ground gases and /or from potential spill and leaks from plant and machinery; and

- Operational and Maintenance Staff may come into contact with contaminated soils, dust and groundwater and/or ground gas within services runs.

10.12.5 The controlled water receptors and potential contamination pathways include:

- Groundwater Secondary A bedrock aquifer (South Wales Coal Measures Formations) may be affected by vertical migration of contaminated leachate generated during earthworks activities and/or any spillage/leaks from plant, machinery, and infrastructure.
- Groundwater Secondary Undifferentiated superficial aquifer (Devensian Till) may be affected by vertical migration of contaminated surface water run-off and/or any spillage/leaks from plant, machinery, and infrastructure.
- Surface Waters (Rhmyney River) may be affected by the lateral migration of contaminated surface water run-off and/or contaminated groundwaters, and/or any spillage/leaks from plant, machinery, and infrastructure.

10.12.6 The ecological receptors and associated potential contamination pathways include:

- On-site pastural field land that forms habitat for local fauna and flora that may be affected by contamination surface run-off and leak and spill prevention from plant, machinery, and infrastructure.

10.12.7 The built environment receptors and associated potential contamination pathways include:

- Proposed Development buildings and structures that may be affected by the accumulation of ground gas that has the potential to be generated by artificial deposits and/or associated with shallow coal mine workings, and/or the potential for aggressive ground conditions that may affect sub-surface concrete structures. Surface and shallow coal mine workings, and mine entries pose a significant land instability risk to the built environment.

10.12.8 As part of the Phase I Desk Study Report, a review of available data and reports was undertaken and found that the Site and surrounding area had been historically mined for coal and ironstone and is currently used as pastural land. British Geological Survey 1:50,000 scale mapping data indicated that the Site was underlain in part by a combination of one or more of the following geological layers:

- Artificial deposits believed to be associated with the historic coal mining.

- Devensian Till superficial deposits (Secondary Undifferentiated aquifer), described as "*heterogenous mixture of clay, sand, gravel, and boulders varying widely in size and shape*".
- South Wales Lower and Middle Coal Measures Formations (Secondary A aquifer) described as "*Grey productive coal-bearing mudstones/siltstones, with seatearths and minor sandstones*".

Construction Phase

10.12.9 The significant effects considered as part of the assessment were:

- Human health receptors coming in to contact with contaminated soils, waters and/or dust, and/or spillages/leaks from plant and machinery; and the inhalation of ground gas.
- Controlled water receptors affected by vertical and/or lateral migration of contaminated ground waters / surface water run-off and/or spillages/leaks from plant and machinery.
- Ecosystem receptor that may be affected by lateral migration of contaminated surface water run-off, and/or spillages/leaks from plant and machinery.
- Built environment receptors may be affected by land instability hazards related to historic coal mining across the Site and surrounding area.

10.12.10 The embedded mitigation measures detailed pollution prevention measures, and all works to be undertaken in line with best practice and guidance during the construction phase, will reduce the likelihood of impacts on the human health and controlled waters receptors during the construction.

10.12.11 Additional mitigation measures include the undertaking of intrusive ground investigation across the Proposed Development area to confirm the presence and extent of artificial deposits, the presence of contamination, and the presence of shallow coal mine workings. The results of the ground investigation works will confirm

the ground conditions pose low risk to sensitive receptors or will inform the design of necessary remedial works to allow the Proposed Development.

10.12.12 Therefore, the residual significance of effects during the construction phase is considered to be Negligible to Minor Adverse (Not Significant) to identified receptors.

Operational Phase

10.12.13 The potential effects arising from the operational phase of the Proposed Development include the following:

- Human health receptors coming in to contact with contaminated soils, waters and/or dust within service trenches, and/or spillages/leaks from plant, machinery, and infrastructure; and the inhalation of accumulated ground gas within service trenches and Proposed Development structures.
- Controlled water receptors affected by vertical and/or lateral migration of contaminated ground waters / surface water run-off and/or spillages/leaks from plant, machinery, and infrastructure.
- Ecosystem receptor that may be affected by lateral migration of contaminated surface water run-off, and/or spillages/leaks from plant, machinery and infrastructure.
- Built Environment receptors that may be affected by the accumulation of ground gases within Proposed Development structures that may pose an explosive risk, and the chemical attack on sub-surface structures due to aggressive ground conditions.

10.12.14 The embedded mitigation measures detailed pollution prevention measures, and all works to be undertaken in line with best practice and guidance during the construction phase, will reduce the likelihood of impacts on the human health and controlled waters receptors during the construction.

10.12.15 Additional mitigation measures include the undertaking of intrusive ground investigation across the Proposed Development area to confirm the presence and extent of artificial deposits, and the presence of contamination. The results of the ground investigation works will either confirm that the ground conditions pose low

risk to sensitive receptors or will inform the design of necessary remedial works to allow the Proposed Development.

10.12.16 Therefore, the residual significance of effects during the operational phase are considered to be Negligible to Minor Adverse (Not Significant) to identified receptors.

Decommissioning Phase

10.12.17 The potential effects arising from the decommissioning phase of the Proposed Development include the following:

- Human health receptors coming in to contact with contaminated soils, waters and/or dust, and/or spillages/leaks from plant and machinery; and the inhalation of ground gas.
- Controlled water receptors affected by vertical and/or lateral migration of contaminated ground waters / surface water run-off and/or spillages/leaks from plant and machinery.
- Ecosystem receptor that may be affected by lateral migration of contaminated surface water run-off, and/or spillages/leaks from plant and machinery.

10.12.18 Additional mitigation measures include the undertaking of intrusive ground investigation across the Proposed Development area to confirm the presence and extent of artificial deposits, and the presence of contamination. The results of the ground investigation works will either confirm the ground conditions pose low risk to sensitive receptors or will inform the design of necessary remedial works to allow the Proposed Development.

10.12.19 Therefore, the residual significance of effects during the decommissioning phase are considered to be Negligible to Minor Adverse (Not Significant) to identified receptors.