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12 LAND AND SOILS

12.1 Introduction

12.1.1 This chapter reports the preliminary outcomes of the assessment of likely significant effects arising from the Proposed Development upon land and soils receptors during construction and operation.

12.1.2 This chapter (and its associated figures and appendices) is intended to be read as part of the wider draft Environmental Statement, with particular reference to the Preliminary Risk Assessment (PRA; as provided in **Volume 4, Technical Appendix 12.1**).

12.2 Consultation, scope and study area

Consultation undertaken to date

12.2.1 **Table 12.1** provides a summary of the consultation activities undertaken in support of the preparation of this assessment.

Table 12.1 Summary of consultation undertaken

Consultee	Key matters raised	Actions in response to consultee comments
Natural Resources Wales	Enquiry as to whether any details were available relating to recorded landfill site within site boundary.	Consult Flintshire County Council, as Natural Resources Wales did not hold any relevant records
Flintshire County Council	Enquiry as to whether any details were available relating to recorded landfill site within the site boundary	Information provided by Flintshire County Council confirmed that information relating to the landfill site was limited, with no additional information available

Scope of the assessment

12.2.2 The scope of this assessment has been established through an ongoing scoping process, and in accordance with relevant British Standards (BS) and authoritative technical guidance as referenced throughout the section. The assessment of the contamination status of the Site is in line with the technical approach presented in Land Contamination: Risk Management (LCRM) (Environment Agency, 2020)[1] and in general accordance with BS 10175: 2011 + A2 2017 (British Standards Institution, 2017)[2]. It is also compliant with relevant planning policy and guidance, as described

[1] https://www.gov.uk/government/publications/land-contamination-risk-management-lcrm

[2] https://standardsdevelopment.bsigroup.com/projects/2017-02021#/section

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in following sections. Further information can be found in **Volume 2, Chapter 4: Approach to EIA**.

12.2.3 This chapter considers the effects of the Proposed Development on land and soils, based on a comprehensive Geo-environmental Desk Study prepared for the Site (as provided in the PRA in **Volume 4, Technical Appendix 12.1**). The environment assessed in this chapter includes a review of designated geological sites, geology, soils, controlled waters (groundwater and surface water) and potential contamination present at the Site.

12.2.4 The assessment considers the potential direct or indirect effects that construction and operation of the Proposed Development could have on land and soils both beneath and immediately adjoining the Site; and details the measures by which these effects can be mitigated. It also considers the potential for existing ground conditions to cause impacts on the Proposed Development, for example in respect to contamination.

12.2.5 It should be noted that the factor of Water has been scoped out of further assessment (as proposed within the EIA Scoping Report and agreed through the Scoping Direction). Therefore, where there is some cross-over between the land and soils assessment and the water assessment (for example relating to groundwater), the fact that water has been scoped out is referenced where appropriate.

Receptors/matters scoped out of further assessment

12.2.6 **Table 12.2** presents the receptors/matters that are scoped out of further assessment, together with appropriate justification. Where a change has occurred since EIA scoping, this is clearly stated and justified.

Table 12.2 Receptor/matters scoped out of further assessment

Receptor/ matter	Phase	Justification	Change since EIA Scoping?
Designated geological sites	Construction and operation	DataMapWales[3] includes information relating to Geological Conservation Review site boundaries. No designated geological sites have been identified on or close to the Site.	No.
Mineral resources	Operation	There may be an effect on mineral resources during construction, which is scoped in, but there will be no subsequent changes during operation and is therefore proposed to be scoped out.	No.

[3] https://datamap.gov.wales/

Receptor/ matter	Phase	Justification	Change since EIA Scoping?
Geological units	Operation	There may be an effect on geological units during construction, which is scoped in, but there will be no subsequent changes during operation and is therefore proposed to be scoped out.	No.
Topsoil	Operation	There may be an effect on topsoil during construction, which is scoped in, but any subsequent potential effects during operation are not anticipated to be significant.	No.
Groundwater (within superficial and bedrock aquifers)	Construction and operation	The Scoping Direction confirms that the potable water supply within the area of the Proposed Development is derived from the Alwen Reservoir, and any increase in demand on potable water would not be experienced with respect to groundwater at the Site location.	No.
Surface water	Construction and operation	The Scoping Direction acknowledged that issues connected with water quality could be adequately addressed by the implementation of a Construction Environmental Management Plan (CEMP; refer to Volume 4, Appendix 2.1 for an outline CEMP), and therefore any impacts on surface water quality as a result of land and soils factors will be addressed through the CEMP and do not require consideration within this assessment.	No.
Site Drainage	Construction and operation	The Scoping Direction indicates that foul drainage can be scoped out of further assessment. Any issues relating to land and soils that have the potential to affect site drainage are therefore considered to be addressed by	No.

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Receptor/ matter	Phase	Justification	Change since EIA Scoping?
		the implementation of a CEMP.	

Receptors/matters scoped into further assessment

12.2.7 **Table 12.3** presents the receptors/matters that are scoped into further assessment, together with appropriate justification. Where a change has occurred since EIA scoping, this is clearly stated and justified.

Table 12.3 Receptor/matters scoped into further assessment

Receptor/ matter	Phase	Justification	Change since EIA Scoping?
Mineral resources	Construction	The Site is within a Coal Authority Development High Risk Area. This could have resulted in issues relating to contamination of soil and geo-technical issues.	Yes. Land and soils was proposed to be scoped out of further assessment in the Scoping Report but scoped in following the PEDW Scoping Direction.
Geological units	Construction	A historical landfill site is known to be present within the Site boundary. This could have resulted in issues relating to contamination of land and soil.	Yes. Land and soils was proposed to be scoped out of further assessment in the Scoping Report but scoped in following the PEDW Scoping Direction.
Topsoil	Construction	The Scoping Direction indicates that the nature of local geo-environmental ground conditions has not been fully assessed.	Yes. Land and soils was proposed to be scoped out of further assessment in the Scoping Report but scoped in following the PEDW Scoping Direction.

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Extent of the study area

12.2.8 The study area incorporates the land that is within the Site boundary, depicted in **Volume 3, Figure 1.1**.

12.2.9 For the purpose of this assessment, the study area is variable, but the maximum study area is taken as the Site area within the Site boundary provided in **Volume 3, Figure 1.1** plus a 1km buffer. The 1km buffer was chosen to identify any existing assets or infrastructure (including landfills) that might not be directly within the Site boundary but may have the potential to be affected by the Proposed Development or its activities, or which may pose constraints on the Proposed Development.

12.2.10 For some features assessed by this Section, a narrower buffer of 500m has been applied around the Site area, as impacts are most likely to occur within this distance. These features are identified below:

- Geology (comprising artificial ground, superficial deposits and bedrock geology);
- Facilities where environmental permits are held;
- Locations where pollution incidents have occurred;
- Current and historical land use;
- Designated sites of geological conservation importance; and
- Natural hazards (natural ground subsidence, shrink-swell hazard, compressible ground hazard).

12.2.11 Due to the variable nature of the shallow geology, borehole log records within approximately 100m around the Site area have been considered as these are most likely to reflect the ground conditions within the footprint of the study area.

12.2.12 Mining (and the associated risk of subsidence) and natural hazards (natural ground subsidence, shrink-swell hazards, compressible ground) are potential concerns when designing foundations. The Site area may be affected by these hazards and a buffer of 100m has been applied to identify records of mining and natural hazards.

12.3 Approach and methodology

Applicable guidance

12.3.1 Natural Resources Wales undertakes environmental regulatory duties in Wales, and adheres to some Environment Agency guidance documents. Therefore this assessment makes reference to Environment Agency guidance where appropriate.

12.3.2 Guidance on the preparation of an EIA with regard to contamination issues is presented in *Handbook for Scoping Projects: Environmental Impact Assessment (2012)*[4], and there is a considerable body of guidance to assist both local planning authorities and practitioners in assessing the degree to which land is contaminated

[4] https://www.gov.uk/government/publications/handbook-for-scoping-projects-environmental-impact-assessment

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and deciding whether such land is contaminated within the meaning of Part IIA of the Environmental Protection Act 1990[5].

12.3.3 The Environment Agency document Land Contamination: Risk Management guidance (2020)[6] provides guidance on the risk assessment process.

12.3.4 The Environment Agency's Guiding Principles for Land Contamination (March 2010)[7] provides information for dealing with issues related to contamination and sets out clear guidance to encourage good practice and provide references to other relevant guidance.

12.3.5 Guidance was published in 2022 by the Institute of Environmental Management and Assessment (IEMA), A New Perspective on Land and Soil in Environmental Impact Assessment[8], which has been referenced in the undertaking of this assessment.

12.3.6 In addition, this assessment has been prepared in accordance with Planning Policy Wales 12[9], dated February 2024, as well as in accordance with the following relevant CIRIA Guidance Documents:

- Environmental good practice on site guide (C741)[10]; and
- Contaminated land risk assessment – a guide to good practice (C552)[11].

Data sources to inform the EIA baseline characterisation

12.3.7 The assessment has included a review of the following information:

- Geological maps (bedrock and superficial geology);
- Hydrogeological maps;
- Groundwater vulnerability maps;
- Soil survey maps;
- Site investigation report for the CCP area (EEG, 2023);
- Historical site investigation and assessment reports;
- Surface water or groundwater abstraction and discharge records;
- Aquifer designation and source protection zones;
- Natural Resources Wales and Flintshire County Council data on the location of waste sites, pollution incidents and potentially contaminated sites;
- Mineral sterilisation; and

5 https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/223705/pb13735cont-land-guidance.pdf

6 https://www.gov.uk/government/publications/land-contamination-risk-management-lcrm

7 https://www.gov.uk/government/publications/managing-and-reducing-land-contamination

8 https://www.iema.net/resources/reading-room/2022/02/17/a-new-perspective-on-land-and-soil-in-environmental-impact-assessment

9 https://www.gov.wales/planning-policy-wales

10 https://www.ciria.org/CIRIA/Training/Training_courses/Environmental_good_practice_on_site.aspx

11 https://www.ciria.org/CIRIA/ProductExcerpts/C552.aspx

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- Geological conservation review sites.

12.3.8 The information relating to many of these items is provided within an environmental database search report (Appendix C of the PRA; **Volume 4, Technical Appendix 12.1)**.

Surveys to inform the EIA baseline characterisation

12.3.9 A site walkover was undertaken as part of the PRA work completed for this factor (refer to **Volume 4, Technical Appendix 12.1**). Intrusive site survey work has been undertaken for the Proposed Development within the Carbon Capture Plant area in the south western corner. Previous site investigation data that has been made available is referred to where relevant to the Proposed Development.

Assessment methodology

12.3.10 An assessment of the potential effects of the Proposed Development on land and soils at the Site has considered the following phases of the development; pre-development (baseline), construction and operation.

12.3.11 Pre-development/Baseline: characterisation of existing land and soils receptors, i.e. the existing "baseline conditions";

- During construction: the potential short term environmental impacts of the construction of the Proposed Development on human health and the environment, i.e. geology, soils and groundwater beneath the Site; and
- During operation: the potential long term environmental impacts arising from the installation of the Proposed Development and its operation.

12.3.12 Underpinning all sets of guidance on contamination issues is a hazard-pathway-receptor methodology which is used to identify significant pollutant linkages. In order for there to be a "pollutant linkage" all three; "hazard", "receptor" and "pathway", must be present. Without all three, there is considered to be no significant pollutant linkage. Without a significant pollutant linkage, the contamination may be a hazard, but does not constitute a risk to human health or the environment. Therefore, in assessing the potential for contamination to cause a significant effect, the extent and nature of the potential source or sources of contamination must be assessed, pathways identified, and sensitive receptors or resources identified and appraised, to determine their value and sensitivity to contamination related impacts.

Significance criteria

12.3.13 The criteria presented in this section are based on the guidance provided in CIRIA 552, Contaminated Land Risk Assessment, A Guide to Good Practice (2001).

Receptor sensitivity

12.3.14 The presence of receptors and their sensitivity to risks from hazards associated with land and soils can be assessed by consideration of surrounding land uses, proposed

end-use, type of construction operations necessary as part of the Proposed Development, surrounding sites of conservation importance and the geology, hydrogeology and hydrology of the Site and its surroundings. The sensitivity of a receptor to an impact is based on the relative importance of the receptor and the ability of the receptor to adapt to or absorb the change.

12.3.15 The sensitivity of potential receptors can be described qualitatively according to the categories in **Table 12.4**.

Table 12.4 Criteria for determining receptor sensitivity

Sensitivity	Definition
High	The receptor is of high sensitivity and is of importance at a national or regional level. The receptor is vulnerable to the effects of the Proposed Development and recovery would be slow and/or costly (e.g. remedial measures to groundwater may be required to prevent a wider impact).
Moderate	The receptor is of moderate value and is likely to be of local importance. The receptor is slightly vulnerable to impacts from the Proposed Development and would be expected to recover over a moderate timescale (e.g. up to 5 years for groundwater to return to its current or an improved condition).
Low	The receptor is of low value and has little contribution to local, regional or national resources. The receptor is not generally vulnerable to impacts that may arise from the Proposed Development and/or will recover over a short timescale (e.g. up to 1 year before groundwater returns to its current or improved condition).
Negligible	The receptor is of negligible positive value. The receptor is not vulnerable to impacts that may arise from the Proposed Development and/or will recover quickly.

Magnitude of effect

12.3.16 The magnitude of effect (degree of change) can be described according to the categories shown in **Table 12.5**.

Table 12.5: Criteria for determining magnitude of effect

Magnitude	Definition
Major	Risk of immediate and significant pollution of sensitive water resources. Total loss or substantial alteration of features of national geological importance.

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Magnitude	Definition
Moderate	Pollution of sensitive water resources. Significant changes to features of national geological importance.
Minor	Pollution of non-sensitive water resources. A minor change in baseline conditions; detectable but not material. The underlying character of the affected feature will be similar to the pre-development situation.
Negligible	Very little change from baseline conditions. Changes are barely discernible, similar to a 'no change' situation.

Significance of effect

12.3.17 Where an effect is considered to be present, the significance will generally be classified as negligible, minor, moderate or major, as determined from the effect significance matrix below (**Table 12.6**). Effects can be beneficial or adverse.

Table 12.6 Effect significance matrix

Magnitude of effect	Sensitivity		
	High	Moderate	Low
Major	Major Adverse/Beneficial	Major – Moderate Adverse/Beneficial	Moderate – Minor Adverse/Beneficial
Moderate	Major – Moderate Adverse/Beneficial	Moderate – Minor Adverse/Beneficial	Minor Adverse/Beneficial
Minor	Moderate – Minor Adverse/Beneficial	Minor Adverse/Beneficial	Minor Adverse/Beneficial - Negligible
Negligible	Negligible	Negligible	Negligible

12.3.18 **Major** effects are likely to be important considerations at a regional or district scale, and if adverse, are potential concerns to the Proposed Development, depending upon the relative importance attached to the issue during the decision-making process. Mitigation measures and detailed design work are unlikely to remove all of the effects upon the affected communities or interests.

12.3.19 **Moderate** effects, if adverse, while important at a local scale, are not likely to be key decision-making issues. The cumulative effect of such issues may lead to an increase in the overall effects on a particular area or on a particular resource. They represent issues where effects will be experienced but mitigation measures and detailed design work may ameliorate/enhance some of the consequences upon affected communities or interests. Some residual effects will still arise.

12.3.20 **Minor** effects may be raised as local issues but are unlikely to be of importance in the decision-making process. Nevertheless, they are of relevance in the detailed design of the Proposed Development and consideration of mitigation or compensation measures.

12.3.21 **Negligible** effects represent no change or a barely perceptible change from the baseline position.

12.3.22 A **Major** or **Moderate** effect is considered **significant**. A **Minor** or **Negligible** effect is considered **not significant**.

12.4 Baseline conditions

12.4.1 A desk study report or PRA has been prepared to support this assessment and is provided as **Volume 4, Technical Appendix 12.1**. Baseline conditions are summarised in this chapter, but further details are provided in the desk study.

General Site Setting

12.4.2 Details of the Site and Proposed Development are provided in **Volume 2, Chapter 2: Description of the Proposed Development**. The Site covers an area of approximately 72ha and is occupied by a large cement works. The main cement works buildings and infrastructure are located in the central area of the Site, with some areas of the Site used as fields and former sports pitches, and wooded areas present in some parts. A row of residential houses is present along Chester Road within the north eastern section of the Site and Padeswood Hall is located in the north west section (formerly used as offices, but currently derelict). A residential building (Padeswood Hall Farm) is located between the main car park and Padeswood Hall. The Site boundaries are defined to the east by the Wrexham to Connah's Quay railway line and to the north by Chester Road. The line of a disused railway forms the southern boundary. The surrounding land is predominantly in agricultural use.

Geology

12.4.3 The Site is underlain by superficial deposits of Devensian Till (clay, sand, gravel and boulders) across most of the Site, with small areas of Head Deposits (clays, silt, sand and gravel) in a discrete area on the southern boundary (near the western side of the Site). Bedrock strata comprise the Pennine Lower Coal Measures, which are made up of interlayered mudstone, siltstone, sandstone and coal seams. Small areas of the Site are underlain by bedrock from the Gwespyr Sandstone unit, which are fine grained sandstones with some siltstone and mudstone layers (these are present in the south east and south west of the Site). Geological faulting is evident within units of the Pennine Lower Coal Measures.

12.4.4 Made ground (material containing anthropogenic elements) is present in four areas across the Site: the southern section along the disused railway, the centre north area, centre south area and towards the centre of the eastern boundary of the Site.

12.4.5 The environmental database report indicates that the Site is partly within higher and intermediate probability radon areas. A higher probability radon area is defined as

having 10% to 30% of homes estimated to be above the radon action level. An intermediate area has 3% to 5% of homes estimated above the action level. Although the radon data used in production of the ukradon.org indicative atlas comes from measurements in homes, the maps indicate the likely extent of the local radon hazard in all buildings.

Mineral Resources

12.4.6 Geological records[12] show that coal seams are present subcropping beneath the superficial units within the northern and central sections of the Site. As indicated on the Coal Authority Interactive Viewer[13], the Site lies within a Coal Authority Consultation Area and includes several Development High Risk Areas. It is therefore a requirement to prepare Coal Mining Risk Assessments for any development in High Risk Areas. Accordingly, a Coal Mining Risk Assessment has been prepared and is provided as **Volume 4, Technical Appendix 12.2**.

12.4.7 Four coal mine entries (mine shafts) are present within the Site boundary and there are recorded past shallow coal workings present within the Site.

12.4.8 There are no other recorded current or historical mineral sites within the study area.

Hydrogeology

12.4.9 The bedrock deposits beneath the Site are classified as a secondary A aquifer. The superficial deposits are classified as a secondary undifferentiated aquifer. The Envireau Water report (May 2022) indicates that groundwater was estimated to be present within 25m of the surface of the site. There was evidence of waterlogging along the southern boundary during the site walkover. The main watercourse passing the Site is culverted in the central area beneath the operational cement works.

12.4.10 The Site is not within a source protection zone for groundwater.

Site walkover findings

12.4.11 The operational area of the Site is mainly limited to the central area. Within the northern section of the Site are some residential properties in the north eastern corner and Padeswood Hall and Padeswood Hall Farm in the north west, with an area of woodland around Padeswood Hall. Fields are present on the western side of the Site in the centre, with a wooded area and pond further south. The eastern area of the Site is occupied by fields, with a wooded area close to the main unnamed watercourse used as an Eco Centre. The south eastern area is generally fields, with a settling pond, a number of smaller ponds and areas of overgrown vegetation and mature trees. The central southern area is also woodland and fields, with a public right of way passing from the western boundary towards the centre of the southern boundary.

[12] https://mapapps2.bgs.ac.uk/geoindex/home.html?_ga=2.234838622.1192279213.1688043668-1800072289.1688043668

[13] https://mapapps2.bgs.ac.uk/coalauthority/home.html

12.4.12 South of the main operational area is a large mound which is a former landfill site managed by the Applicant. This is a closed site which has been capped in accordance with Natural Resources Wales requirements. In the absence of a distinctive reference, this landfill is referred to within this document as Landfill 1. The Applicant has monitored groundwater in designated groundwater monitoring wells in line with Natural Resources Wales conditions. The landfill forms a significant raised area, which was designed to provide some visual screening of the taller cement works buildings from surrounding viewpoints.

12.4.13 Levels are fairly even across the northern and central areas of the Site, except for along the line of the unnamed watercourse, where some mounds of made ground are evident, along with steep banks in places. The southern section of the Site generally slopes downwards towards the southern boundary.

12.4.14 There were some locations where waterlogging was noted along lower-lying parts of the Site, including along the foot of the slope in the centre of the southern boundary.

12.4.15 Discoloured standing water was noted in a channel to the east of the operational cement works buildings, but this did not appear to be connected to the unnamed watercourse.

12.4.16 Further details of the findings from the site walkover are provided in the PRA (**Volume 4, Technical Appendix 12.1**), including site photographs.

Site investigation reports

Contaminated Land Assessment, Cement Mill 5, Golder Associates, May 2017

12.4.17 This report summarises ground conditions based on earlier work, with shallow ground conditions comprising glacial till (sandy, gravelly clay), with made ground composed of kiln dust, silty sand, clayey silt, gravel, brick, plastic, wood, concrete, coal and shale. Coal seams were identified during works in 2007 at around 26m to 29m below ground level (bgl). This work was specific to the area of the Site around Cement Mill 5.

Ground Investigation in the Areas of Raised Made Ground and Railway Track, Golder Associates, June 2017

12.4.18 This work was completed as part of planned re-profiling works to facilitate a new development area within the operational area in the centre of the Site. The report assessed the made ground material in the area and determined that it was appropriate for re-use on-site.

12.4.19 The report also mentioned a diverted watercourse in the north eastern section of the Site, with the original channel having potentially been infilled.

Updated Site Characterisation and Baseline Report, WSP Golder, May 2022

12.4.20 As a requirement of the environmental permit for the Site, nine monitoring wells were installed in boreholes. Slight contamination was observed in soil and groundwater (hydrocarbon odours, chemical and organic odours and some chemical impacts to

groundwater). Groundwater was reported to be present at depths varying from 0.5m to 3.3m bgl. Based on information provided in the Envireau Water report (May 2022, see below), this shallow groundwater could represent perched groundwater, with the main aquifer expected to be at greater depth.

Padeswood Water Supply Feasibility, Envireau Water, May 2022

12.4.21 The purpose of the water supply feasibility study was to consider possible options for water abstraction as part of the CCS scheme. The feasibility study assessed potential for abstraction from existing boreholes located at Kinnerton (4.5km to the east of the subject site) or for new boreholes to be located within the Padeswood site boundary. With respect to the Padeswood site, the geology is indicated to be Pennine Coal Measures and Millstone Grit Group, with complex faulting. Groundwater in the Coal Measures bedrock is indicated to have limited recharge due to the presence of overlying low permeability superficial deposits. Based on an aerial assessment, with a potential recharge area of 0.6km^2 and effective rainfall of approximately 400mm/year, recharge into the faulted block of Coal Measures strata (the area of site to the west between the two main north to south faults) was estimated to be approximately 250,000m^3 per year. Groundwater levels were estimated to be within 25m of the ground surface. Within the Millstone Grit Bedrock deposits, the Gwespyr Sandstone Formation forms a layer of lower permeability due to the fine-grained nature of the strata, with groundwater movement mainly via fracture flow. The report concluded that a water abstraction borehole into Millstone Grit deposits may be the most effective. A borehole in Coal Measures strata could deliver water if historical workings were intersected, but the quality of water would be low.

Ground Investigation Report, Tier Consult, October 2022

12.4.22 This work focused on an area to the south east of the main operational buildings. The investigation identified clay over sandstone bedrock, with deep made ground in some locations (gravel and clay) and some layers of possible relict topsoil.

Site Investigation Report, Padeswood Works, Part B, July 2023

12.4.23 The EEG 2023 report relates to the area of land in the south west corner of the Padeswood Site only. Contamination and geotechnical data is provided. There is no ground gas monitoring or groundwater monitoring data, but the soils all appeared to be natural and no obvious sources of contamination were identified. Some leachate analysis was completed on soil samples, which indicates there is unlikely to be a concern in terms of groundwater contamination (or migration of contamination into surface water).

Historical Site Use

12.4.24 Key historical features identified within the Site include:

- a former colliery in the centre of the Site, with coal shafts in the central and north eastern areas;
- gravel pits and lagoons in the area south of the main cement works buildings, which have been infilled;

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- embankments along the lines of railway tracks and changes to natural ground levels to construct surface water features in the south of the Site;
- railway lines were present along eastern and southern Site boundaries; and
- a cement works present within the central section of the Site.

12.4.25 The land surrounding the Site has been predominantly in agricultural usage since the earliest available editions of historical mapping (1867), with little change evident on subsequent maps. The only off-site development of significance to this chapter is the sewage works present to the west, approximately 500m from the Site at its closest point.

Unexploded ordnance

12.4.26 A review of publicly available unexploded ordnance (UXO) risk maps indicates that the Site is located in an area with low potential for wartime bombs to be present.

Environmental database information

12.4.27 The Applicant holds a current environmental permit for cement/lime manufacture and associated processes. The nearest off-site permit is located 13m to the north east for waste oil burners at a 4 x 4 centre. Any other permits on or close to the Site are no longer operational.

12.4.28 One currently licensed landfill site (Landfill 1) is recorded as being present within the Site boundary, but this has recently been classified as closed by Natural Resources Wales. There is also one historical on-site landfill, which is shown on mapping to be in the centre of the northern part of the Site (hereon referred to as 'Landfill 2'). Off-site historical landfill sites are over 100m from the Site boundary. Areas of potentially infilled land have been identified within the Site boundary.

Summary of potential sources of contamination

12.4.29 The sources of contamination identified at the Site are summarised below:

- Cement works, including storage of materials, chemicals and fuels required for processes and storage of waste products and a number of substations made ground across parts of the Site (infill in pits, quarries or former ponds, made ground around areas of current or historical buildings and farm tracks);
- Made ground (i.e. fill material) across the Site, including in areas of railway embankments and where water features have been constructed;
- Agricultural land within the Site boundary;
- Landfill sites (Landfills 1 and 2) and infilled land;
- Historical colliery (including spoil heaps and shafts);
- Infilled gravel pits and lagoons in the area south of the main cement works buildings; and
- Railway lines within the Site in the centre, along southern and eastern boundaries and in the south eastern corner.

12.4.30 Off-site potential sources of contamination include:

- Railway, along eastern and southern Site boundaries; and
- Agricultural land.

Assessment again future baseline

12.4.31 If the Proposed Development does not go ahead, it is anticipated that the majority of the Site would continue to be used for the current purposes, including a cement works, agricultural land and Eco Centre. It is not anticipated that there would be any significant change to the current site conditions compared to the existing baseline over the short, medium or long-term period.

12.5 Relevant legislation and planning policy

12.5.1 The key legislation and planning policy relevant to this topic are stated below:

Relevant legislation

- Environmental Protection Act 1990[14] - A wide-ranging act incorporating numerous issues, but primarily making provision for the improved control of pollution. Part IIA deals with the identification and remediation of contaminated land.
- Environment (Wales) Act 2016[15] – this legislation provides a framework for planning and managing national resources with a sustainable and comprehensive approach.
- The Environmental Permitting Regulations (England & Wales) 2016[16] - These regulations provide a consolidated framework for environmental permits and exemptions for industrial activities, mobile plant, waste operations, mining waste operations, water discharge activities, groundwater activities and radioactive substances activities.

Relevant planning policy

- 'Planning Policy Wales', Edition 12, dated February 2024;
- Overarching National Policy Statement for Energy (NPS EN-1)[17]; and
- Local Planning Policy: Flintshire Local Development Plan (LDP) for the period from 2015 to 203018.

[14] https://www.legislation.gov.uk/ukpga/1990/43/contents

[15] https://www.legislation.gov.uk/anaw/2016/3/contents/enacted

[16] https://www.legislation.gov.uk/uksi/2016/1154/contents/made

[17] https://www.gov.uk/government/publications/overarching-national-policy-statement-for-energy-en-1

[18] https://www.flintshire.gov.uk/en/Resident/Planning/Flintshire-Local-Development-Plan.aspx#:~:text=The%20LDP%20will%20focus%20on,employment%20and%20other%20land%20uses

12.6 Assessment of potential effects, additional mitigation and residual effects

12.6.1 The majority of mitigation measures recommended are standard good practice for construction projects, and as such will be incorporated into the CEMP for the Proposed Development, an 'outline' of which will be submitted in support of the DNS application.

12.6.2 Specific measures relating to land and soils that will be incorporated into the OCEMP are as follows:

- Construction site layout will be designed to reduce the likelihood of environmental issues or nuisance and good housekeeping should be maintained at all times;
- If appropriate, fencing or screening will be employed to segregate excavated materials prior to re-use or removal from the Site;
- A pollution incident control and emergency preparedness plan will be maintained by the construction contractor and this will consider sensitive receptors identified at the Site;
- The pollution incident control and emergency preparedness plan will include a list of measures and processes to be implemented in the event of environmental incidents;
- Control measures relating to prevention of impact from fuels or chemicals will include, but not necessarily be limited to, the following:
    - static plant will be used with secondary containment measures, such as plant nappies, to retain any leakage of fuel or oil and reduce the risk of pollution;
    - spill kits will be provided where appropriate to reduce the risk of pollution; and
    - oil interceptors will be used at site offices and work compounds
- Contaminated soils that need to be excavated, or contaminated groundwater encountered from the Site, will be separated from other materials and, wherever reasonably practicable, be treated to remove or reduce the risk. Where practical, material will be reused within the Site where it is needed and suitable for use. Contaminated soil disposed of off-site will be taken to a soil treatment facility or an appropriately permitted landfill site;
- All waste will be managed in accordance with the waste hierarchy which aims to reduce waste at source and to reduce the quantity that requires final disposal to landfill. This applies to excavated material arising on-site, which will be reused within the site as far as reasonably practicable;

12.6.3 A Materials Management Plan will be developed in accordance with the Definition of Waste: Development Industry Code of Practice[19] to set out the processes to be adopted in respect of the reuse of excavated materials;

[19] https://www.claire.co.uk/projects-and-initiatives/dow-cop/28-framework-and-guidance/111-dow-cop-main-document

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- In the event that excavated material is to be sent for disposal, testing and classification will be undertaken by the contractor in line with industry guidance (including Dispose of Waste to Landfill[20] and WM3 – Guidance on the classification and assessment of waste[21]).

12.6.4 In addition to the CEMP, a Soil Management Plan will be required, which will include methods to protect soil resources. These should conform to the Construction Code of Practice for the Sustainable Use of Soils on Construction Sites (Defra, 2009)[22]. The Soil Management Plan will include, but not necessarily be limited to, the following:

- Details relating to the separate storage of different types of topsoil, subsoil and mineral substrate should be agreed and defined in advance;
- A requirement that, prior to removal and storage, the topsoil should be either bare or with short surface vegetation;
- Soil stripping should follow the guidance in the Defra Code of Practice (2009);
- Soil stockpiles should be constructed in accordance with Defra guidance, and not be within 8m of surface water features;
- Stockpiles should be maintained by seeding to protect against erosion, minimise nutrient loss and maintain biological activity; and
- Soil reinstatement should be completed to restore the land to the original quality by returning the soil elements in the correct order and ensuring that drainage and root development will be optimised.

12.6.5 Intrusive ground investigation work is required as part of the Proposed Development to provide an assessment of contamination status of the land and soils, and to provide geotechnical information for the Proposed Development (this will be additional to the investigation that has already been completed in the south western corner of the Site, as reported by EEG, 2023). The intrusive ground investigation work would typically be a condition of the planning approval process, and would be completed after submission of the Environmental Statement. The intrusive investigation will allow data to be collected relating to contamination and will obtain geotechnical data to inform elements of the design. A detailed scope of work has been prepared, which incorporates the following elements:

- Sink up to 19 window sample boreholes to provisional depth of 5m bgl;
- Undertake in situ geotechnical testing within window sample boreholes;
- Obtain soil samples from boreholes to submit for laboratory analysis (chemical and geotechnical);
- Install six groundwater monitoring wells to provisional depths of 5m;
- Complete one monitoring visit to record groundwater levels and obtain groundwater samples for laboratory analysis;
- Undertake laboratory analysis of soil samples (chemical and geotechnical analysis);

[20] https://www.gov.uk/guidance/dispose-of-waste-to-landfill

[21] https://www.gov.uk/government/publications/waste-classification-technical-guidance

[22] https://www.gov.uk/government/publications/code-of-practice-for-the-sustainable-use-of-soils-on-construction-sites

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- Undertake laboratory analysis of groundwater samples (chemical analysis). If shallow groundwater is not present in all locations, leachate sampling may be scheduled as an alternative; and
- Complete associated sampling and on site testing, including Clegg Hammer tests to obtain CBR values at borehole locations.

12.6.6 The Coal Mining Risk Assessment report (**Volume 4, Technical Appendix 12.2**) prepared in support of the DNS application has concluded that intrusive investigation work is not required to assess risks from coal mining infrastructure such as mine shafts and shallow coal workings. This is because the areas of the Proposed Development do not directly overlie recorded mine shaft locations or areas of recorded shallow coal working

12.6.7 No additional mitigation measures would be required for the operational phase.

Construction phase

12.6.8 The potential effects of the construction phase of the Proposed Development on land and soils are assessed in this section. **Table 12.9** provides details of the anticipated effects, alongside the magnitude of the impact, the sensitivity of the receptor and the significance of effect that have been calculated based on the definitions provided in **Table 12.4, Table 12.5** and **Table 12.6**.

Table 12.7 Assessment of potential effects, additional mitigation, residual effects and monitoring during construction

Receptor	Potential Effects/ Additional (Secondary and Tertiary) Mitigation/ Residual Effects and Monitoring	
Mineral resources	Potential effects	The Proposed Development has the potential to result in loss of mineral resources. The Coal Mining Risk Assessment (**Volume 4, Technical Appendix 12.2**) indicated that there are no recorded plans for future underground coal mining.
	Additional (secondary and tertiary) mitigation	No additional mitigation is required.
	Residual effects and monitoring	The sensitivity of the mineral resources is **low**, as although some coal reserves may remain, shallow deposits have already been extracted in this area. The magnitude of effect is assessed as being **minor**, as site selection generally avoided mineral resources. The significance of the effect on mineral resources is assessed as **minor adverse**, which is considered to be **not significant**.

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Receptor	Potential Effects/ Additional (Secondary and Tertiary) Mitigation/ Residual Effects and Monitoring	
		No monitoring is required.
Geological units	Potential effects	Excavations for buildings and infrastructure affecting superficial and bedrock deposits will require extraction of some soil, superficial geology or bedrock material. Potential mobilisation of known existing contamination from on-site or off-site sources. Potential release of previously unknown contamination due to construction operations. Incorrect storage and handling of materials/oils/chemicals (including refuelling) resulting in contamination.
	Additional (secondary and tertiary) mitigation	Additional mitigation is not required with respect to excavations. Appropriate mitigation will be incorporated into the CEMP to address mobilisation of contamination and correct storage of materials/oils/chemicals.
	Residual effects and monitoring	The sensitivity of the geological units is **low**, as the deposits present are widespread across Wales and England. Superficial deposits and bedrock would not be affected to a significant degree, so the magnitude of effect is **minor**. After additional mitigation measures, the significance of the effect on geological units is assessed as **minor adverse to negligible**, which is considered to be **not significant**. If required, monitoring could include collection and laboratory analysis of subsoil samples for an appropriate contamination suite.
Soil resources	Potential effects	Removal of soil from construction areas. Potential mobilisation of known existing contamination from on-site or off-site sources. Potential release of previously unknown contamination due to construction operations.

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Receptor	Potential Effects/ Additional (Secondary and Tertiary) Mitigation/ Residual Effects and Monitoring	
		Incorrect storage and handling of materials/oils/chemicals (including refuelling) resulting in contamination affecting topsoil or geological units.
	Additional (secondary and tertiary) mitigation	The CEMP will include procedures for handling topsoil from construction areas, preventing mobilisation of contamination and correct storage of materials/oils/chemicals.
	Residual effects and monitoring	The sensitivity of the topsoil is assessed to be **low**, as the site has been operated as a cement works for many years and does not include significant areas of valuable soil resources in the areas to be affected by the Proposed Development. The magnitude of effect is considered to be **minor**. After additional mitigation measures, the significance of the effect on topsoil is assessed as **minor adverse to negligible**, which is considered to be **not significant**. If required, monitoring could include collection and laboratory analysis of topsoil samples for an appropriate contamination suite.

Operational phase

12.6.9 The potential effects of the operational phase of the Proposed Development on land and soils are assessed in this section. **Table 12.10** provides a list of the anticipated effects, alongside the magnitude of the impact, the sensitivity of the receptor and the significance of effect based on the definitions provided in **Table 12.4**, **Table 12.5** and **Table 12.6**.

Table 12.8 Assessment of potential effects, additional mitigation, residual effects and monitoring during operation

Receptor	Potential Effects/Additional (Secondary and Tertiary) Mitigation/Residual Effects and Monitoring	
Geological units and Topsoil	Potential effects	Incorrect storage and handling of materials/oils/chemicals (including refuelling) resulting in contamination affecting geological units or topsoil.
	Additional (secondary and tertiary) mitigation	Appropriate mitigation will be incorporated into the soil management plan.

Receptor	Potential Effects/Additional (Secondary and Tertiary) Mitigation/Residual Effects and Monitoring	
	Residual effects and monitoring	The geological units and topsoil receptors are classed as being of **low** sensitivity, as detailed above. Based on professional judgement, the magnitude of effect is considered to be **minor**. After additional mitigation measures, the significance of the effect on land and soil is assessed as **minor adverse to negligible**, which is considered to be **not significant**. Monitoring may be required, dependent on the nature of contamination of ground or water body. This could include collecting topsoil or subsoil samples and submitting them for laboratory analysis of a relevant suite of contaminants. The specific requirements would be determined based on the details of the contamination incident.

Decommissioning phase

12.6.10 As discussed in the introductory sections of the draft Environmental Statement, the Carbon Capture Plant is intended to operate for as long as the existing operational cement works, and therefore decommissioning is not proposed until the ultimate decommissioning of the cement works site. However, as per the request in PEDW's Scoping Direction to consider decommissioning effects, a brief consideration is provided in the event that decommissioning on an earlier timescale were to be required.

12.6.11 The majority of the effects associated with decommissioning would be similar in nature to, but at a reduced scale to construction phase effects. There would be fewer materials, plant, labour and vehicles required during decommissioning when compared to construction. Decommissioning would take place over a shorter duration, and activities would be focused on areas of the Site which at that point would already be developed. Consequently, the magnitude and significance of effects associated with decommissioning would not differ in nature from nor exceed those assessed elsewhere in this chapter in respect of construction. It is therefore not considered necessary to provide a separate detailed assessment of decommissioning related effects.

12.6.12 Decommissioning, if required, would be conducted in accordance with the regulatory and policy environment in place at the time with all required permits and consents being obtained prior to commencement.

Assessment against future baseline

12.6.13 In the absence of the Proposed Development, it is not anticipated that there would be any significant change to the current site conditions over the short, medium or long-term period.

12.7 Opportunities for environmental enhancement

12.7.1 No opportunities for environmental enhancement for this topic have been identified as part of this assessment.

12.8 Difficulties and uncertainties

12.8.1 Intrusive works have been carried out as part of this assessment within the area of the site in the south western corner. Although there have been some previous intrusive investigations elsewhere at the Site, these generally related to specific phases of development for the cement works, so information from these is not considered to be directly relevant to the Proposed Development. This relates to the car parks and laydown areas, where site investigation works are proposed in order to progress with the development of this project.

12.8.2 Data on site history has been obtained from historical maps, and there may be developments that occurred between map editions that are not evident.

12.8.3 There is limited information available relating to one recorded historical landfill site within the Site boundary (Landfill 2). Attempts to locate additional information have ascertained that more detailed records would not have been kept at the time the landfill site was operational, and therefore no additional information exists.

12.8.4 Despite these assumptions, uncertainties and limitations, it is considered that the data available is sufficient for completing the assessment that is presented in this chapter relating to land, soil and groundwater.

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12.9 Assessment summary

12.9.1 **Table 12.12** provides a summary of the findings of the assessment.

Table 12.9 Summary of land and soils effects

Receptor	Potential Effects	Additional (Secondary and Tertiary) Mitigation	Residual Effects	Monitoring
Construction Phase				
Mineral resources	Loss of mineral resources	None required, no significant mineral resources identified	**Minor adverse (not significant)** P / D / LT	None required
Geological units	Impacts from excavations for buildings and infrastructure	None required, no sensitive geological units identified	**Minor to negligible adverse (not significant)** P / D / LT	None required
Topsoil	Removal of topsoil from construction areas	Optimise project design to minimise areas of topsoil affected. Additional mitigation provided in the CEMP	**Minor to negligible adverse** (not significant) P / D / LT	None required
Geological units and topsoil	Potential mobilisation of known existing contamination from on-site or off-site sources	Additional mitigation provided in the CEMP	**Minor to negligible adverse (not significant)** T / D / ST	Dependent on contamination assessment and foundation type

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Receptor	Potential Effects	Additional (Secondary and Tertiary) Mitigation	Residual Effects	Monitoring
Geological units and topsoil	Potential release of previously unknown contamination due to construction operations	Additional mitigation provided in the CEMP	**Minor to negligible adverse (not significant)** T / D / ST	Dependent on contamination assessment
Geological units and topsoil	Incorrect storage and handling of materials/oils/chemicals (including refuelling)	Additional mitigation provided in the CEMP	**Negligible adverse (not significant)** T / D / ST	Dependent on contamination assessment
Operational Phase				
Geological units and topsoil	Contamination due to incorrect storage and handling of materials/ oils/ chemicals	Additional mitigation provided in the CEMP	**Minor to negligible adverse (not significant)** T / D / ST	Dependent on contamination assessment

Key to table:

P/T = Permanent or Temporary, D/I = Direct or Indirect, ST/MT/LT = Short Term, Medium Term or Long Term, N/A = Not Applicable

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