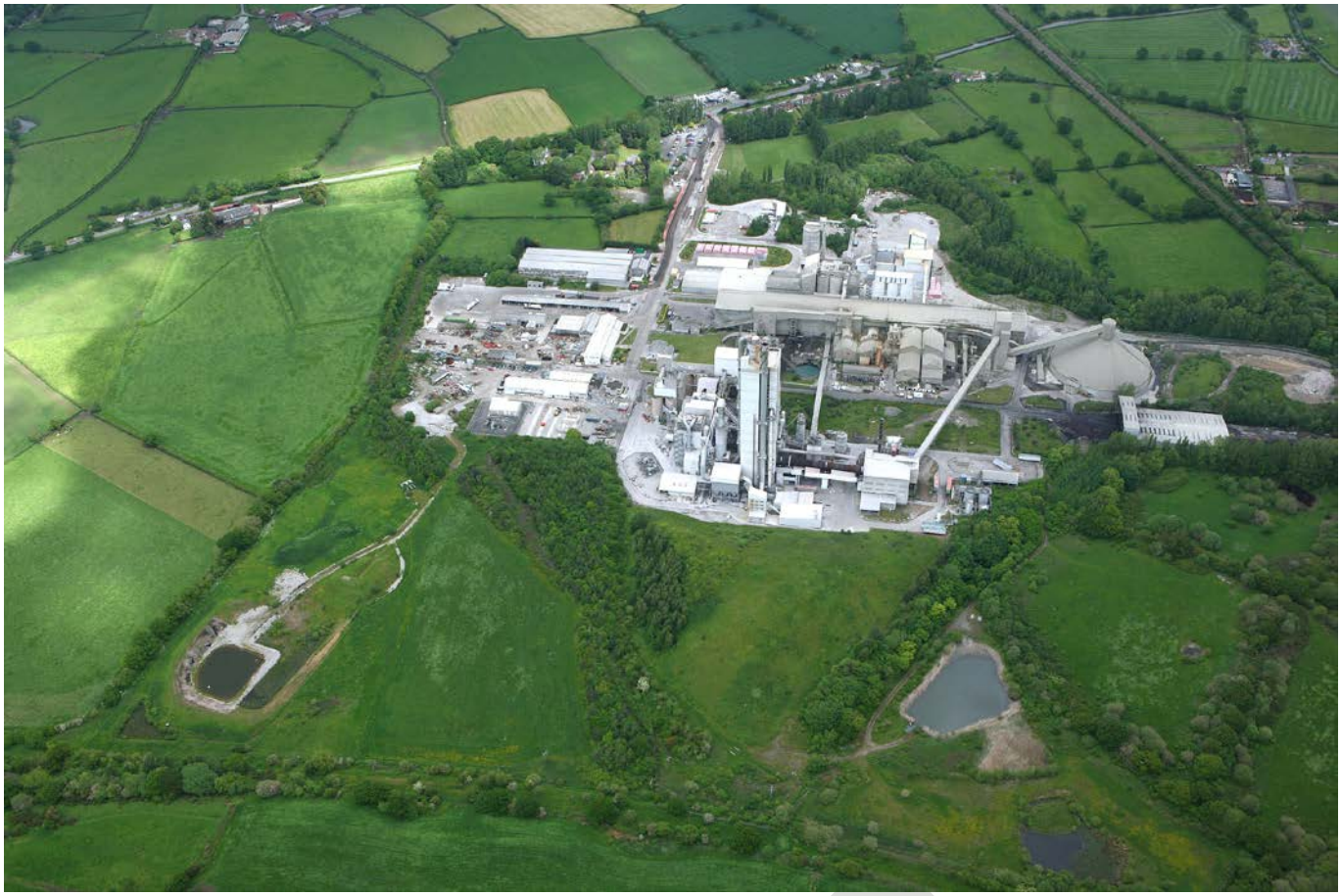

Castle Cement Limited

Carbon Capture and Storage Project – Padeswood, North Wales

Volume 2, Draft Environmental Statement

DNS CAS-02009-W1R1Z7

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JUNE 2024

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TABLES

1 INTRODUCTION

1.1 Background to Proposed Development

1.1.1 RSK Environment Limited (hereafter referred to as 'RSK') has been commissioned by Castle Cement Limited (hereafter referred to as the 'Applicant') to produce an Environmental Statement for a new Carbon Capture and Storage Project proposed at the Padeswood Cement Works, Flintshire, North Wales (hereafter referred to as the 'Proposed Development'). The planning application boundary (hereafter referred to as the 'Site') is shown in **Volume 3, Figure 1.1.**

1.1.2 The Site (as denoted) includes the entire boundary of the existing operational Padeswood Cement Works. This is to allow the required flexibility in terms of the location of enabling development and environmental enhancements; it does not imply that all the Site will be redeveloped.

1.1.3 Padeswood Cement Works is located to the south of Buckley, near Mold, Flintshire, CH7 4HB. The cement works is owned by Castle Cement Limited, part of the Heidelberg Materials group of companies, and operates under the trading name of Heidelberg Materials UK. Heidelberg Materials is one of the largest building materials manufacturers in the world and the global market leader in aggregates, having leading positions in asphalt, cement, concrete and other downstream activities. Heidelberg Materials UK is a leading supplier of low carbon heavy building materials to the UK construction industry including aggregates (crushed rock, sand and gravel), ready-mixed concrete, asphalt, cement and cement related materials.

1.1.4 The cement produced at the Padeswood Cement Works is used primarily in bulk for ready mix concrete, production of concrete products and bagged cement sold through builders' merchants. The Applicant is a national supplier and Padeswood Cement Works is connected to the rail network, enabling cement to be delivered to rail depots located in London, Glasgow and Avonmouth. Bulk and packed cements are also delivered to regional customers by road. The cement works currently directly employs approximately 175 people.

1.1.5 The Proposed Development aims to capture up to 800,000t of carbon dioxide (CO_2) per year from Padeswood Cement Works and will comprise the following main project components:

- A Carbon Capture Plant comprising;
  - A Combined Heat and Power (CHP) plant with 15MWe (minimum) and 83MW (minimum) thermal of installed capacity, to produce electricity and heat to power the carbon capture equipment; and
  - A Post Combustion Carbon Capture and Compression (PCCCC) plant, to extract CO_2 from waste gases and compress it for transport and storage.

1.1.6 A full list and description of the components that form the Proposed Development is presented in **Table 2.1** of this draft Environmental Statement.

1.1.7 Subject to planning permission, the Applicant intends to commence construction of the Proposed Development in 2025 with commercial operation estimated by 2029.

1.1.8 The aim of the Proposed Development is to integrate into the HyNet North West network through the capture of CO_2 from the cement works for transportation and subsequent storage in the Liverpool Bay storage facilities. HyNet North West will develop new and upgrade existing infrastructure to produce, transport and store low carbon hydrogen as well as capture, transport and store CO_2 across north west England and North Wales.

1.1.9 In September 2020, the Applicant entered into a memorandum of understanding with Liverpool Bay CCS Limited (a member of the Eni SpA group); the HyNet CO_2 transport and storage system provider. The Applicant also has a collaboration agreement with the HyNet Industrial Decarbonisation partners, allowing active involvement in the development of the overall HyNet project.

1.1.10 Liverpool Bay CCS Limited is leading on the development of the CO_2 pipeline transport system for the wider HyNet North West scheme. Liverpool Bay CCS Limited owns and operates the CO_2 pipeline network and storage sites that is being upgraded as part of the scheme. Liverpool Bay CCS Limited is responsible for the consenting, construction, and operation of the CO_2 pipeline connecting the Proposed Development through a new Above Ground Installation within the Proposed Development to the main HyNet CO_2 pipeline at Northop Hall. The project is currently progressing, with strategic routing assessment ongoing (as of May 2024) and planning application submission anticipated in early 2025. Information on the CO_2 pipeline route corridor is available on the HyNet hub website[1]. The construction programme is subject to the grant of planning permission and therefore subject to confirmation. Operation is anticipated by 2029 to coincide with that of the Proposed Development.

1.1.11 The CO_2 pipeline is inter-dependent with the Proposed Development and is considered within the inter-project cumulative effects assessment but does not form part of the Development of National Significance (hereafter referred to as 'DNS') application to which this draft Environmental Statement relates. The inter-project cumulative effects assessment for the CO_2 pipeline will use the pipeline route corridor that is available on the HyNet hub website.

1.1.12 This draft Environmental Statement has been prepared in accordance with the Town and Country Planning (Environmental Impact Assessment) (Wales) Regulations 2017[2] (hereafter referred to as the 'EIA Regulations 2017') and accompanies the Applicant's planning application.

1.1.13 The electrical power output from the Combined Heat and Power plant is 15MWe (minimum) and, when screening against The Developments of National Significance (Specified Criteria and Prescribed Secondary Consents) (Wales) Regulations 2016 (as amended)[3], surpasses the Combined Heat and Power plant power output threshold of 10MWe (Part 2; Regulation 4(1)). The Proposed Development is therefore classified as a DNS. The statutory basis for the DNS process is provided by the Planning (Wales) Act 2015[4], which amends the Town and Country Planning

[1] https://hynethub.co.uk/index.php?contentid=82

[2] https://www.legislation.gov.uk/wsi/2017/567/contents

[3] https://www.legislation.gov.uk/wsi/2016/53/contents/made

[4] https://www.legislation.gov.uk/anaw/2015/4/contents/enacted

Act 1990[5], and the Developments of National Significance (Wales) Regulations 2016 (as amended) and subsequent Regulations.

1.1.14 During an inception meeting between representatives from the Applicant, RSK and Planning and Environment Decision Wales (PEDW) on 14 July 2022, the Proposed Development was confirmed as a DNS by PEDW. Where required, the Applicant will refer to the Development of National Significance Procedural Guidance (Version 2.2, October 2019) (PEDW, 2019)[6].

1.1.15 On 04 November 2022, RSK on behalf of the Applicant submitted a request to PEDW under Regulation 33 of the EIA Regulations 2017[7] which was accompanied by Information to Support a Scoping Opinion Request (hereafter referred to as the 'Scoping Report') in relation to the Proposed Development. The Proposed Development was issued with case number CAS-02009-W1R1Z7. PEDW issued a Scoping Direction (titled 'EIA Scoping Direction DNS CAS-02009-W1R1Z7: Padeswood Carbon Capture and Storage Project') in response to the Scoping Report on behalf of the Welsh Ministers in accordance with the EIA Regulations 2017 on 21 April 2023. More information on Scoping can be found in **Volume 2, Chapter 4: Approach to EIA, Section 4.3** of this draft Environmental Statement.

1.1.16 On 06 April 2024, RSK on behalf of the Applicant submitted Notification of a Proposed DNS Development to PEDW under Article 5 of the Development of National Significance (Procedure) (Wales) Order 2016 (as amended)[8], and PEDW responded by issuing an official Notice of Acceptance under Article 6 of the Development of National Significance (Procedure) (Wales) Order 2016 (as amended)[9] on 14 April 2024.

1.2 Environmental impact assessment (EIA)

1.2.1 The term 'Environmental Impact Assessment' ('EIA') describes a procedure that must be followed for certain types of projects before it can be given 'consent'. The procedure is a means of drawing together, in a systematic way, an assessment of a project's likely significant environmental effects. This helps to ensure that the importance of the predicted effects and the scope for avoiding, preventing, reducing or, where practicable, offsetting them are properly understood by the public and the authority granting consent (the 'determining authority') before it makes its decision.

1.2.2 The EIA Regulations 2017 require that, before consent is granted for certain types of development, an EIA must be undertaken. The EIA Regulations 2017 set out the types of development which must be subject to an EIA (referred to as Schedule 1 development) and other developments, which may be subject to an EIA depending on certain parameters and/or their potential to give rise to significant environmental effects (referred to as Schedule 2 development).

[5] https://www.legislation.gov.uk/ukpga/1990/8/contents

[6] https://gov.wales/developments-national-significance-dns-procedural-guide#description-block

[7] https://www.legislation.gov.uk/wsi/2017/567/regulation/33/made

[8] https://www.legislation.gov.uk/wsi/2016/55/article/5/made

[9] https://www.legislation.gov.uk/wsi/2016/55/article/6/made

1.2.3 As described in **Volume 2, Chapter 1: Introduction, Section 1.1.5**, the Proposed Development is expected to capture up to 800,000t of CO_2 per year, which does not exceed the 1.5Mt per year threshold for Schedule 1, Section 22 criteria. However, the Proposed Development does meet the description specified in Schedule 2; Section 3(j) of the EIA Regulations 2017. Therefore, the selection criteria outlined in Schedule 3 of the EIA Regulations 2017 need to be considered to determine whether the Proposed Development is likely to have significant effects on the environment by virtue of factors such as its nature, size or location.

1.2.4 Within Chapter 1, Section 1.4.2 of the Scoping Report, RSK reviewed the selection criteria and concluded that the Proposed Development qualifies as EIA development, and therefore, an Environmental Statement will be required to support the DNS application. A separate screening opinion from PEDW was not sought as this was unnecessary given the decision had already been taken to prepare an Environmental Statement.

1.2.5 It is a requirement of the EIA Regulations 2017 that an Environmental Statement be prepared to describe the likely significant effects of a proposed development on the environment.

1.2.6 This iteration of the Environmental Statement is in draft format, which will be used to inform statutory pre-application consultation, further information on statutory pre-application consultation is found in **Volume 2, Chapter 4: Approach to EIA, Section 4.2**. Once statutory pre-application consultation is completed, consultee feedback will be considered and documented and relevant changes to the draft Environmental Statement will be made. A final version of the Environmental Statement will be compiled and submitted, alongside other documents and reports, to PEDW pending a decision.

1.2.7 The final Environmental Statement will accompany the planning application and will report the formal process and outcomes of the EIA undertaken for the Proposed Development. Its purpose is to assess the Proposed Development and its predicted environmental effects in a concise, objective and non-promotional manner in order to provide PEDW, Flintshire Country Council, statutory consultees, interested bodies and the public with sufficient information to assess its likely environmental effects.

1.2.8 In accordance with Part 5; Regulation 17(4)(a) of the EIA Regulations 2017, this draft Environmental Statement has been prepared under the supervision of, and reviewed by, persons having suitable competency in environmental impact assessment, which is also a requirement of our continued registration on the Institute of Environmental Management and Assessment's (IEMA) 'EIA Quality Mark' scheme. Amongst other things, we define 'suitable competency' as sufficient relevant experience (e.g. a minimum of 5 years) in working on EIA projects and suitable professional standing as recognised by, for instance relevant professional memberships. The relevant expertise and qualifications of the experts involved in the preparation of this EIA report are detailed in **Table 1.1**.

Table 1.1 EIA team responsibilities

Name	Qualifications and memberships	Project role
EIA Project Management Team		
Rob Edwards	BSc, MSc, CEnv, MIEMA, MIEnvSci, MIAQM	Project manager
David Hoare	BSc, MSc, CEnv, PIEMA	EIA lead
Harry Cross	BSc, MSc	EIA Coordinator/Assistant project manager
Joanna Berlyn	BA (Hons), DipTP, MRTPI	Planning lead
EIA Factor Leads		
Will Holden Robert Regan	BSc (Hons), MSc, Cecol, MCIEEM BSc (Hons), MSc	Biodiversity Biodiversity
Charles Kwok	MSc, BEng (Hons), AMIEnvSc, AMIAQM	Air quality
Libby Robinson	BSc, PhD, FGS	Climate
Kit Byrom	BA (Hons), ACIfA	Cultural heritage
John Ingham Zachary Ford	BA (Hons), DipLA, CMLI BA (Hons), GradDip, MA, CMLI	Landscape and visual Landscape and visual
Mark Underhill	BSc (Hons), MIOA	Noise and vibration
Amy Friel	BSc, MSc, MCIHT, MTPS	Traffic and transport
Frances Clayton	BSc (Hons), MSc, FGS, CGeol, EurGeol	Land and soils
David Horrocks	BSc, MSc, PIEMA	Major accidents, and disasters
Andrew Sowerby	BSc (Hons), MCIWM	Material assets and waste

1.3 Structure of Draft Environmental Statement

1.3.1 The draft Environmental Statement is presented in four volumes:

- **Volume 1**: Non-technical Summary;
- **Volume 2**: Draft Environmental Statement;
- **Volume 3**: Figures; and

- **Volume 4**: Technical Appendices.

Volume 1

1.3.2 Volume 1 comprises the non-technical summary, which has been prepared as a separate document, in accordance with Part 4; Regulation 17(3)(a) of the EIA Regulations 2017[10].

Volume 2

1.3.3 Volume 2 is the draft Environmental Statement and comprises 15 chapters which are structured in the following manner.

1.3.4 **Chapter 1 Introduction** introduces the Proposed Development by providing a background to the project and outlines the EIA process, describing progress to date.

1.3.5 **Chapter 2 Description of the purpose and nature of the Proposed Development** sets the project objectives; establishes the nature and purpose of the Proposed Development by providing a full project description and information on the construction, operational and decommissioning phases and provides a description of the existing site setting within the Site and the surrounding environment.

1.3.6 **Chapter 3 Reasonable Alternatives Considered** summarises the reasonable technology and location alternatives that have been considered for the Proposed Development and emergence of a preferred design solution.

1.3.7 **Chapter 4 Approach to the EIA** summarises the Scoping process and outcomes, the general adopted approach to the EIA, summary of non-statutory consultation and statutory pre-application consultation during the EIA and modifications made to the EIA scope that have arisen during the development and assessment of the Proposed Development.

1.3.8 **Chapters 5 to 15 Environmental Factor Assessments** outline the format of the individual environmental factor assessments, report the findings of the detailed environmental assessments and the residual effects on the environment predicted to occur as a result of implementation of the Proposed Development, including inter- and intra-project cumulative effects.

1.3.9 **References** of documents used or considered during the EIA are provided at the end of each chapter, where relevant.

Volume 3

1.3.10 Volume 3 comprises figures that visually describe information provided in Volume 2.

Volume 4

1.3.11 Volume 4 comprises technical appendices (referred to in Volume 2) containing detailed reports of the individual environmental factor assessments and other relevant supporting documentation.

[10] https://www.legislation.gov.uk/wsi/2017/567/contents/made

1.4 References

HM Government (1990). Town and Country Planning Act 1990. Available at: https://www.legislation.gov.uk/ukpga/1990/8/contents

PEDW (2019). Developments of national significance (DNS): procedural guide. Available at: https://gov.wales/developments-national-significance-dns-procedural-guide#description-block

Welsh Government (2015). Planning (Wales) Act 2015. Available at: https://www.legislation.gov.uk/anaw/2015/4/contents/enacted

Welsh Government (2016). The Developments of National Significance (Specified Criteria and Prescribed Secondary Consents) (Wales) Regulations 2016. Available at: https://www.legislation.gov.uk/wsi/2016/53/contents/made

Welsh Government (2016). The Developments of National Significance (Procedure) (Wales) Order 2016. Available at: https://www.legislation.gov.uk/wsi/2016/55/contents/made

Welsh Government (2017). Town and Country Planning (Environmental Impact Assessment) (Wales) Regulations 2017. Available at: https://www.legislation.gov.uk/wsi/2017/567/contents

2 DESCRIPTION OF THE PURPOSE AND NATURE OF THE PROPOSED DEVELOPMENT

2.1 Site setting

Location and history

2.1.1 The Padeswood Cement Works is located to the south of Buckley, near Mold, Flintshire, North Wales, CH7 4HB at National Grid Reference SJ 29127 62227 and falls within the jurisdiction of Flintshire County Council. Currently, the Site is an operational cement works (as shown in **Volume 3, Figure 1.1, Figure 1.2** and **Figure 1.6**) and contains infrastructure, plant and machinery to enable operations that include but are not limited to cement kilns, griding mills and silos as well as several office buildings, workshops and vehicle parking.

2.1.2 The Site is approximately 70.9ha in size and is broadly rectangular in shape with the existing operations in a central belt stretching from the western edge to the eastern edge.

2.1.3 Padeswood Hall Farm, a property owned and leased to private tenants by the Applicant, is located within the Site towards the northern boundary. A second property, Padeswood Hall, is located approximately 100m west of Padeswood Hall Farm and is also located within the Site. Padeswood Hall was previously occupied as office accommodation but has been vacant for over a decade and is now derelict. Padeswood Drive, an unclassified residential road exiting from the A5118, is located within the northern perimeter of the Site and is home to 12 semi-detached residential dwellings, these properties are owned by the Applicant and let to private tenants. The site context is shown in **Volume 3, Figure 1.6**.

2.1.4 To the east of Padeswood Drive lies Bannel Farm, also owned by the Applicant and let to private tenants. Approximately 400m west of the northern corner of the Site and approximately 200m southwest of the southwestern corner of the Site are small farm holdings with several agricultural buildings and sheds. A small automotive industrial estate and a single dwelling are located immediately opposite the main Site access on the opposite side of the A5118. Otherwise, the land surrounding the Site comprises agricultural fields with hedgerow field boundaries and there are several small areas of woodland. Planting is established in areas of the Site close to nearby receptors, such as the A5118 along the northern boundary of the Site. Listed buildings within the local area are shown in **Volume 3, Figure 1.5.**

Landform and topography

2.1.5 The landform across the Site ranges from approximately 105.7m Above Ordnance Datum (AOD) in the west to approximately 107.1m in the east. There are some areas with a greater change in elevation to the east and south; however, they are not used in relation to the operation of the cement works. The area within which the Proposed Development will be constructed and operated is located to the southwest of the existing operational cement works, as shown in **Volume 3, Figure 1.2**.

Settlement and transportation pattern

2.1.6 The A5118 runs parallel to the northern boundary of the Site, where the junction for the main Site access is located. A bus stop is located on Padeswood Drive which services the X1 bus route between Ruthin and Chester via Mold. The eastern boundary of the Site is aligned with the Borderlands railway, running north to south, terminating at Wrexham General to the south and Bidston to the north, for onward connection to Liverpool. There is an unnamed ditch network spanning the perimeter of the Site boundary, with two small ponds located within the southwestern corner of the Site. There are no main rivers within close proximity to the Site.

2.1.7 Nearby places of note and their approximate distance and direction from the Site include:

- Penyffordd – 1km south east;
- Penymynydd – 1.5km east;
- Buckley – 2.1km north west;
- Pontblyddyn – 2.2km south;
- Llong – 2.9km west;
- Mold – 5.5km west;
- Broughton – 5km east;
- Llay – 7.5km south; and
- Chester – 12.1km north east.

Land use

2.1.8 The land use immediately around Padeswood Cement Works is predominantly agricultural comprising fields varying in size and shape, in use for both arable and pastoral farming. There are large areas of tree planting and woodland. The eastern boundary of the Site is defined by a section of railway line running between Wrexham and Deeside and the southern boundary is defined by the line of a dismantled railway. The western edge of the site is defined by an outgrown field boundary hedgerow.

Hydrology

2.1.9 According to Natural Resources Wales mapping, the Site is located outside of the fluvial and coastal flood zones. However, there are significant areas within the Site which are shown to be at risk of flooding from surface water/small watercourses (Flood Zone 2 and 3 on the Flood Map for Planning[11]).

2.1.10 A north-south aligned field ditch runs the length of the western Site boundary. A series of field drains are also located in the non-operational parts of the site to the north, east and south of the cement works. The nearest designated main river is Black Brook which lies 325m to the south of the Site boundary. Black Brook is designated a Moderate Overall waterbody under the Water Framework Directive/River Basin Management Plan (Cycle 3 – 2021). Two ponds/wet areas are shown to lie in the southern section of the Site; the pond in the south western corner of the Site was a landfill cell and has been non-operational since its creation, and the remaining pond

[11] https://flood-map-for-planning.service.gov.uk/

in the southeastern corner is a works settling pond used to harvest rainwater and store process water for use in the existing operational cement works.

Environmental designations

2.1.11 There are two statutory designated sites within 2km of the Site boundary; these are Buckley Claypits and Commons Site of Special Scientific Interest (SSSI) and Deeside and Buckley Newt Sites Special Areas of Conservation (SAC). Both are in excess of 1km from the Site boundary and are designated due to their breeding populations of great crested newt (GCN), an Annex II species. There are a further five SACs, three Special Protection Areas (SPAs) and two Ramsar sites within 10km of the Site, although all are more than 6km away:

- River Dee and Bala Lake/Afon Dyfrdwy a Llyn Tegid SAC and SPA;
- Dee Estuary/Aber Dyfrdwy SAC and SPA;
- The Dee Estuary Ramsar;
- Alyn Valley Woods/Coedwigoedd Dyffryn Alun SAC;
- Berwyn a Mynyddoedd De Clwyd/Berwyn and South Clwyd Mountains SAC and Berwyn SPA;
- Halkyn Mountain/Mynydd Helygain SAC; and
- Midland Meres & Mosses Phase 2 Wetlands of International Importance designated under the Ramsar Convention (Ramsar).

2.1.12 There are 14 non-statutory designated sites within 2km of the Site, all of which are wildlife sites (WS). The closest of these is Black Brook Plantation WS located c.230m from the Site. The remaining sites are all more than 500m away:

- Bistre Wood WS;
- Padeswood Pool WS;
- Padeswood Marsh WS;
- Padeswood Pasture WS;
- Hartsheath WS;
- Price's Hill Wood WS;
- Coed Bryn Llys and Marsh WS;
- Optec Pond WS;
- Knowl Hill WS;
- Marleyfield Meadow and Copse WS;
- Plas Newydd Farm Lake WS;
- Pontblyddyn Marsh and Coppa Wood WS; and
- Garth Wood and Hartsheath WS.

2.1.13 Environmental assets/features classified or protected under international, national and local legislation and policy within the Site and the surrounding area are presented in the Environmental Features Plan in **Volume 3, Figure 1.4**.

2.2 Purpose of the Proposed Development

Proposed Development objectives

2.2.1 The Proposed Development objectives are as follows:

- To produce the UK's first net zero cement for use in the UK construction industry;
- Create and safeguard high skilled jobs;
- Bring over £600 million of investment into the region;
- Capture target of up to 95% of CO_2 emissions (up to 800,000t per year) from the existing Padeswood cement kiln and Combined Heat and Power plant ensuring that all captured CO_2 meets the specification set by HyNet North West;
- Use low grade waste heat from the kiln to reduce the energy consumption of the Carbon Capture Plant; and
- Reduce the low levels of sulphur dioxide (SO_2) and Hydrochloric acid (HCl) entering the Carbon Capture Plant using lime injection and reduce nitrogen oxides (NO_x) from the kiln and Combined Heat and Power plant using selective catalytic reduction.

Purpose of the Proposed Development

2.2.2 The UK Government is a signatory of the 2015 Paris Agreement (UNFCCC, 2018)[12] which commits the UK to measures aimed at keeping global temperature rise to well below 2°C compared with pre-industrial levels and to pursue best efforts to limit the increase to 1.5°C. As part of these targets, in June 2019, the UK became the first major economy in the world to commit to a 'net zero' carbon dioxide emission target, pledging to end the UK's contribution to global climate change by 2050 (HM Government, 2019)[13].

2.2.3 In November 2020, the UK Government announced a Ten Point Plan for a Green Industrial Revolution (DBEI, 2020)[14]. The plan laid the foundations for a green economic recovery following the impacts of COVID-19. The Ten Point Plan established a commitment to deploy Carbon, Capture, Usage and Storage (CCUS) in industrial cluster zones with a minimum of two (Track-1) by mid-2020 and four (Track-2) by 2030 at the latest; this was the Phase-1 CCUS cluster sequencing process. The UK Government pledged £1 billion through the Carbon Capture and Storage Infrastructure Fund to deploy CCUS technology at pace and at scale. Five industrial cluster consortiums bid for Phase-1 to become a Track-1 cluster (DBEI, 2021)[15].

[12] https://unfccc.int/documents/184656

[13] https://www.gov.uk/government/news/uk-becomes-first-major-economy-to-pass-net-zero-emissions-law

[14] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/936567/10_POINT_PLAN_BOOKLET.pdf

[15] https://www.gov.uk/government/publications/cluster-sequencing-for-carbon-capture-usage-and-storage-ccus-deployment-phase-1-expressions-of-interest/october-2021-update-track-1-clusters-confirmed

2.2.4 On 19 October 2021 HyNet North West along with East Coast Clusters were selected as Track-1 clusters (HyNet, 2021)[16].

2.2.5 As described in **Volume 2, Chapter 1: Introduction**, **Section 1**, HyNet North West is comprised of two main components; to produce, transport and store low carbon ('green') hydrogen across the North West and North Wales, and develop and upgrade new and existing infrastructure to capture, transport and permanently store CO_2 emissions from industry through the use of geological reservoirs under the sea, off the coast of North Wales.

2.2.6 Following the selection of HyNet North West as a Track-1 cluster, nearby industries that have the provision for industrial grade carbon capture were invited to supply CO_2 to HyNet North West in order to meet the ambitious target of capturing and storing 20-30Mt of CO_2 per year by 2030. In January 2022, Phase-2 CCUS cluster sequencing process began, allowing projects that met the relevant criteria to bid for funding to support, supply and connect to the HyNet North West project and in August 2022, 20 power CCUS and industrial CCUS projects were shortlisted; including the Padeswood Carbon Capture and Storage Project.

2.2.7 The shortlisted projects were assessed on deliverability, value for money and affordability, and their overall contribution across sector ambitions and to sectoral diversity, as well as strategic considerations, such as energy security. On 30 March 2023, the Padeswood Carbon Capture and Storage Project was selected for Phase-2 CCUS cluster sequencing project negotiation list (DBEI, 2023)[17].

2.2.8 Cement is essential to the UK's transition to net zero. It is fundamental to the development of everything from new offshore wind farms to nuclear power stations, to clean transport infrastructure, to schools, homes and hospitals and the thousands of jobs that these projects will create. However, the production of cement is currently carbon intensive. A large proportion of the carbon emissions produced by cement manufacture is derived from the chemical processes involved in making cement and cannot be addressed by using renewable fuel or energy sources. Likewise, there is no viable alternative to concrete in the construction industry. The only way to produce the cement that the UK needs, without large amounts of carbon emissions, is to use carbon capture and storage.

2.2.9 The Applicant, and its parent company, Heidelberg Materials, are global leaders in the race to decarbonise cement – the world's first full scale cement carbon capture and storage project is being built at Brevik, Norway with a number of other schemes being progressed globally. The Applicant's vision is now to develop the UK's first net zero carbon cement facility at Padeswood.

2.2.10 The Proposed Development will act as an exemplar for sustainable cement production across the UK and will support the transition of the construction industry to a net zero future, positively contributing to the UK's net zero targets.

[16] https://hynet.co.uk/hynet-selected-by-government-as-track-1-industry-cluster/

[17] https://www.gov.uk/government/publications/cluster-sequencing-phase-2-eligible-projects-power-ccus-hydrogen-and-icc/cluster-sequencing-phase-2-track-1-project-negotiation-list-march-2023

2.3 Nature of the Proposed Development

Full description of the Proposed Development

2.3.1 The layout of the Proposed Development is displayed in **Volume 3, Figure 1.2**. A description of each component that comprises the Proposed Development is provided in **Table 2.1**.

Table 2.1 A full description of the main Proposed Development's components

Proposed Development Component	Component Description
Temporary Enabling Development	
Carbon Capture Plant materials laydown and contractors' storage area	This area will be used by the appointed principal contractor for storage of materials, equipment and plant required for the construction phase of the Proposed Development. This area will also be used for the fabrication of large plant, such as the regenerator and absorber columns. This area will be reinstated post-construction.
Carbon Capture Plant contractor village and welfare	This area will be used by the appointed principal contractor for temporary welfare facilities for construction workers. The facilities will include toilet and washing provision, sheltered areas to change and rest and places for workers to prepare food.
Plant shutdown village	This is a temporary working area for use during shutdowns of the existing operational cement kiln.
Carbon Capture Plant laydown and construction offices	This area will be used by workers for vehicle parking during the construction phase of the Proposed Development. Temporary construction offices will be erected for the duration of the construction period. This area is part of the Landscape and Biodiversity Mitigation Proposals (shown as Proposed Landscape and Habitat Enhancements in **Volume 4, Technical Appendix 9.4**) and will be reinstated and improved post-construction.
Carbon Capture Plant laydown area	This area will be used by the appointed principal contractor for temporary storage and assembly of construction equipment, similar to the Carbon Capture Plant materials laydown and contractors' storage area.
Permanent Enabling Development	
Earth bunding	Earth bunding will be implemented on the northern section of the Site to screen the Proposed Development from residential properties on Padeswood Drive.

Proposed Development Component	Component Description
	Bunding will be created using the stripped soil during the construction phase and will be stabilised and landscaped by native planting.
Padeswood Hall	The derelict Padeswood Hall will be demolished as part of the Proposed Development.
Padeswood Hall Farm and all outbuildings	These buildings are set to be demolished as part of the Proposed Development. The Applicant will engage with current tenants at Padeswood Hall Farm to provide ample notice of the works to enable them to make plans for future housing arrangements. The Applicant will notify the tenants when a local property within the Applicant's company portfolio becomes available.
Carbon Capture Plant site access road	A permanent site access road will be constructed to allow for vehicle access to the Carbon Capture Plant from the A5118. The site access road will use the existing site access from the A5118 then follow the existing track immediately west past Padeswood Hall and Padeswood Hall Farm before following the western perimeter of the Site boundary, heading southwards for approximately 350m to the Carbon Capture Plant.
Site access improvements	Minor modifications will be carried out to the existing site access from the A5118 to facilitate access for construction equipment and vehicles.
Offices and joint control centre	A new building will be constructed and used during the operational phase of the Proposed Development as a base for workers to control the Carbon Capture Plant.
Storm water holding pond	A new storm water attenuation pond will be constructed to serve the Carbon Capture Plant.
General car park	A new car park area for staff, general contractors and visitors to the new Carbon Capture Plant and existing cement works will be constructed.
Pipeline connection point compound ground preparation	A 50m by 28m area located within the north western corner of the Carbon Capture Plant footprint and is designated for the construction of Liverpool Bay CCS Limited's Above Ground Installation (connection point) where the CO_2 transport pipeline will connect the Proposed Development to the HyNet connection point in Northop Hall. Ground will be prepared (vegetation clearance, cut and fill and levelling) to accommodate the installation of the Above Ground Installation.

Proposed Development Component	Component Description
Carbon Capture Plant	
Instrument air system	Comprising air compressor and air dryer, to provide a clean supply of compressed air for use by various plant control instrumentation such as pneumatic equipment and electrical control valves.
Waste heat recovery system	Two heat exchangers will be installed within the existing cement works. One will be installed adjacent to the preheater tower and the second installed at the clinker cooler. They will be used to harvest waste heat for use in the Carbon Capture Plant.
Combined Heat Power plant and associated infrastructure	A Combined Heat Power plant comprising a gas burner and boiler to produce steam, for a steam turbine generator with 15MWe (minimum) and low pressure steam for heating in the PCCCC 83MW (minimum) thermal of installed capacity.
Integrated quencher	An integrated quencher tower will be constructed which cools the gas stream using water and removes particles and aerosols to optimise CO_2 absorption.
Gas-Gas heater	A type of heat exchanger which exchanges the heat from the untreated flue gas upstream of the Integrated quencher to treated flue gas from the Wash tower.
Absorber tower	The CO_2 in the gas stream reacts with the amine solution to capture the CO_2.
Wash tower	The wash tower collects liquid droplets that are transported in the gas stream from the Absorber tower to improve CO_2 capture efficiency and reduce emissions.
CO_2 regenerator column	A cylindrical pressure vessel where the rich amine (amine containing CO_2) is heated to release the CO_2 captured in the Absorber tower.
Compressor house	A building containing a multistage CO_2 compressor to increase pressure for CO_2 pipeline operation.
Pipeline connection point compound	This 50m by 28m area is located within the north western corner of the Carbon Capture Plant footprint and is designated for the construction of Liverpool Bay CCS Limited's Above Ground Installation (connection point) where the CO_2 transport pipeline will connect the Proposed Development to the HyNet connection point in Northop Hall. This Above Ground Installation will tie

Proposed Development Component	Component Description
	into the Proposed Development utilities mentioned above i.e. drainage and power. The Above Ground Installation does not form part of this DNS application as permission will be sought by Liverpool Bay CCS Limited at a later date. The land required for the Above Ground Installation is reserved on the planning drawings submitted with this DNS application. The construction area for the Above Ground Installation and related pipeline entry point will be the same as that presented for the Proposed Development, and will utilise the same access, contractor area, welfare and car parking. The Above Ground Installation construction will occur within the overall Carbon Capture Plant construction period, but with a later peak. Given the comparative scale of the two developments, the construction related effects will not exceed those assessed in this draft Environmental Statement for the Proposed Development overall.
Flue gas stack	The residual emissions will be released from the new Flue gas stack after the removal of up to 95% of the CO_2.
Hybrid cooling towers	Used to control water temperature to indirectly cool the amine solution sent to the Absorber tower and thus optimise CO_2 capture efficiency.
Piperack and air coolers	Process pipes and cable trays to transfer liquids and power around the Carbon Capture Plant are mounted on the piperack at lower levels. Air coolers are mounted on top of the piperack to reduce cooling water temperature.
Substation	The substation will distribute power to the Carbon Capture Plant from the Combined Heat and Power plant and grid electricity during start up and Combined Heat and Power plant outages.

Carbon Capture Process

2.3.2 A summary of the carbon capture process is provided in this section. This is not intended to be a full technical description of the process; the purpose is to provide sufficient information to inform the environmental assessment process.

2.3.3 The main function of the Proposed Development will be to take flue gas from the existing operational cement works and remove the CO_2 via an amine-based absorption process. Treated emissions will be discharged to atmosphere via a new flue gas stack to be constructed as part of the Proposed Development.

2.3.4 The carbon capture process will create a significant additional energy demand and will require the installation of a Combined Heat and Power plant to generate high pressure steam, which is fed to a steam turbine generator for power extraction. The emissions from the Combined Heat and Power plant will be treated in the same process for CO_2 removal prior to discharge via the flue gas stack.

2.3.5 The majority of the existing CO_2 emissions are generated by the operation of the existing cement kiln and the discharge of these emissions to air via the kiln stack. A tie-in connection between the existing kiln stack and the Proposed Development will facilitate the diversion of flue gas from the existing stack via large ducting.

2.3.6 Flue gas coming out of the cement works will enter a process of heat exchange in the quencher. This will bring the flue gas temperature down and allow treatment to reduce the amount of NO_x, SO_2 and particulates before it enters the absorber tower.

2.3.7 After entering the absorber tower, the treated flue gas will flow upwards, making contact with an amine based solvent, the properties of which provide an enhanced level of CO_2 solubility. Secondary treatment will be provided in the wash tower to collect liquid droplets contained in the gas stream from the absorber tower; this allows for further treatment and improves the efficiency of the capture facility. Hence, up to 95% of CO_2 in the flue gas is absorbed. The contacted solvent ('rich' solvent) is transferred to the CO_2 regenerator column and undergoes a process to remove the CO_2. The resulting 'lean' solvent is then treated to remove soluble solvent degradation products, heat stable salts, soluble metals and suspended solids, before reuse within the Carbon Capture Plant. The extracted degradation products will be removed from the process as waste for appropriate treatment and disposal. The removed CO_2 gas undergoes a process of conditioning and compression to remove oxygen and moisture, before being transferred to the pipeline connection point compound and metering station. It will then be transported by pipeline to the proposed connection point with the HyNet North West CO_2 pipeline for onwards downstream transport to the storage location in the Irish Sea. The pipeline network is being developed by Liverpool Bay CCS Limited and does not from part of the DNS application subject to this draft Environmental Statement.

2.3.8 The residual gas stream with the CO_2 removed then passes through a de-mister before it goes to a gas washing process. The Proposed Development provides opportunity for upgrade of the existing emissions treatment systems and hence it is anticipated that improved standards will be applied for nitrous oxides, sulphur dioxide and particulate emissions in comparison with the existing plant operation. Prior to CO_2 capture, a catalyst will be installed as part of the Combined Heat and Power plant for NO_x control and lime injection will also be used to reduce the already very low levels of SO_2. Existing particulate abatement will be upgraded to achieve a lower emission standard than that which applies to the existing cement works.

2.3.9 Post CO_2 capture, the wash tower will treat the flue gas further to collect solvent for reuse prior to release of the cleaned gas at the flue gas stack.

2.3.10 Waste heat will be recovered by two new heat exchangers; one will recover heat from kiln flue gases from the existing operational cement works pre-heating tower and the other will recover heat from the hot air leaving the existing clinker cooler. Heat Transfer Fluid will be used to recover the heat and produce low pressure steam that

can be used in the Carbon Capture Plant. This reduces the energy demand otherwise required from the Combined Heat and Power plant.

2.3.11 A block flow diagram of the Carbon Capture Process is provided in **Volume 3**, **Figure 1.3**.

Utilities supporting the Proposed Development

2.3.12 Cooling system: To limit water consumption, a combination of air cooling and water cooling will be used for process cooling. Air coolers will be supported on the pipe rack structure, whilst hybrid cooling towers will provide a limited amount of water cooling. This is required to balance the Carbon Capture Plant's water usage and allow it to meet the zero liquid discharge philosophy of the Proposed Development.

2.3.13 Fire Water: A Fire Water system is required to protect the Carbon Capture Plant from any risk of potential fires.

2.3.14 Steam: Low pressure steam is generated within the Combined Heat and Power plant to satisfy the heating requirements within the Carbon Capture Plant.

2.3.15 Wastewater Treatment Plant: Raw water is supplied to the existing cement works via pipeline from the Kinnerton boreholes. Wastewater will come from the Carbon Capture Plant, including from the hybrid cooling tower blowdown and boiler blowdown, which is treated in the Wastewater Treatment Plant.

2.3.16 The Carbon Capture Plant also includes other utilities such as Instrument Air, Plant Air, Boiler Feed Water, N_2 Packages, storm water and process drainage systems.

Construction Phase

Site Preparation

2.3.17 Following the granting of the planning permission and discharge of pre-commencement conditions, construction will commence with the access improvements to facilitate safe and efficient construction access. Internal accesses will then be established within the Site to allow access to and between the Carbon Capture Plant and the required construction areas.

2.3.18 Contractor car parking will be established on the areas shown in **Volume 3**, **Figure 1.3**, with measures also in place for bus transfer of contractors according with the proposed Travel Plan as **Volume 4, Technical Appendix 11.2.**

2.3.19 Some diversion of existing services on the construction site and site assembly areas will be required prior to site clearance. This comprises a combination of pole mounted overhead lines and below ground buried cables. These services will be diverted outside of the construction perimeter of the Carbon Capture Plant and diverted underground on the assembly areas. Where possible these works will be progressed with the utility provider under their permitted development rights in advance of the main works.

2.3.20 Padeswood Hall, Padeswood Hall Farm and its associated outbuildings will be demolished prior to construction, with resultant materials re-used on site where possible, and any surplus taken off site.

2.3.21 The construction boundary will be demarcated by a construction fence to physically segregate construction and operations personnel and activities. Topsoil will then be

stripped and vegetation removed as required. Soil from the temporary areas will be stored in bunds to the south of Padeswood Drive, and in an adjacent soil storage area as shown in **Volume 3, Figure 1.2.** The bunds to the south of Padeswood Drive are proposed to be permanent features. The soils in the adjacent soil storage area will be used for site restoration on completion of the temporary works. Any surplus soils that cannot be appropriately stored in these areas will be taken off site.

2.3.22 The stripped areas will be surfaced with compacted stone on a geogrid textile (to allow reinstatement on completion of the works).

2.3.23 Trees and hedges being retained including the trees subject to Tree Preservation Order adjacent to the northern Site boundary will be fenced and protected during site establishment.

2.3.24 Following site clearance, earthworks on the Carbon Capture Plant area will commence to establish a level development platform, 5m below that of the existing cement works. This will involve cut and fill, with levels at the northern end of the Carbon Capture Plant being reduced through excavation and the material used to fill the southern end. Surplus material will be removed from the Site.

2.3.25 The boundary between the levels will have sheet piled retaining walls with a ramped access road down to the site along the west boundary completed in advance of the main cut and fill operations.

2.3.26 Foundations for the main Carbon Capture Plant items will be piled. All services and foundations will then be established, and remaining civils works such as construction of the storm water holding pond will be completed. If there is a need for de-watering during the civils works this will be subject to abstraction and discharge licences which will be applied for separate to the DNS application at the appropriate time.

2.3.27 The site preparation works as described are anticipated to take approximately 7 months.

Construction

2.3.28 To maximise construction efficiency and to overcome space limitations on site, a number of plant items will be pre-fabricated off-site and brought to the Site by road. This is anticipated to include sections of the absorber tower, integrated quencher, flue gas stack sections, pipe rack sections and instrument rooms.

2.3.29 These components will be stored and assembled in the Carbon Capture Plant materials laydown and contractors' storage area, as shown in **Volume 3, Figure 1.2.** Erection of temporary buildings and cranes will be required in this area to safely store, assemble and move this equipment. Once equipment has been assembled to the required stage and is ready for mechanical installation it will be transported to the Carbon Capture Plant plot using the Carbon Capture Plant site access road.

2.3.30 Mechanical installation of the Carbon Capture Plant will involve erection of the main structures and plant items. Methods will differ between the structures in question, with a summary by main items provided below.

2.3.31 Flue gas stack: It is anticipated that the stack will be delivered in pre-fabricated sections, each of which will be lifted into place by crane.

2.3.32 Integrated quencher and absorber tower: The quencher and absorber towers will be constructed from flat pack panel sections circa 3.5m by 10m and assembled into 7.5m by 7.5m by 10m high cubes in the assembly areas. Once four or five have been fabricated they will be transported to the Carbon Capture Plant on multi-wheeled transport to be erected into final position by crane.

2.3.33 CO_2 regenerator column: Unlike some other main plant items, the regenerator cannot be pre-fabricated in sections and instead will be assembled in the assembly area. After initial assembly and bolt-up, the regenerator will be clad in weather-proof scaffolding for final welding. Once assembled the structure will be jacked up onto stillages and transported to the Carbon Capture Plant for final installation.

2.3.34 Combined Heat and Power plant: The steel frame turbine building will be erected in advance of equipment installation to secure a weather proof interior for further installation of equipment including the steam generator turbines. The equipment will then be delivered to the site by road and assembled in situ.

2.3.35 Compressor house: Dependent on the selected vendor, the compressor may be built off-site and delivered in sections and the acoustic enclosure built around it followed by the building envelope. Alternatively, the building envelope will be constructed first, and the compressor assembled inside the building once a weathertight structure is established.

2.3.36 Ductwork: Ductwork will be delivered in pre-assembled box sections as transportable in size. It will be assembled/dressed at grade where required and lifted to the installation height by crane.

2.3.37 Waste heat recovery system and gas cooler: Two heat exchangers will be installed within the existing cement works. One will be installed adjacent to the preheater tower and the second installed at the clinker cooler. Both will require tie in. Tie ins will be installed during plant shutdown to avoid interrupting production. The gas cooler and associated support steel frame will be erected in the Carbon Capture Plant materials laydown and contractors storage area to the west of the existing cement works. Both heat exchangers will be used to harvest waste heat for use in the Carbon Capture Plant.

HyNet Above Ground Installation

2.3.38 The construction areas and programme for the HyNet Above Ground Installation and the related CO_2 pipeline entry point will be the same as that presented for the Proposed Development, and will utilise the same access, contractor area, welfare and car parking.

2.3.39 As these elements do not form part of the DNS application and will be progressed by other parties, their construction related effects are not specifically assessed in this draft Environment Statement. However, given the comparative scale of the two developments it is not anticipated that construction related effects associated with the Above Ground Installation and pipeline entry will exceed those assessed in this document for the Proposed Development overall.

Reinstatement

2.3.40 Following completion of the main construction works as described, the temporary areas will be reinstated through removal of temporary buildings and surfacing and

reinstatement will be either by re-seeding back to grassland, or for habitat creation purposes as shown on Landscape and Habitat Strategic Proposal (**Volume 4, Technical Appendix 9.4**). This will involve removal of temporary structure and buildings and the stone surface in the temporary areas.

2.3.41 The total construction programme is assumed to take place over an approximately 37-month period (including 7-month site preparation programme, as detailed above), with the Proposed Development estimated to be operational by 2029.

Operation

2.3.42 For the purposes of the EIA and individual environmental factor assessments, it is assumed that the operational lifespan of the Carbon Capture Plant is 25 years. The Applicant is not seeking a time restricted consent for or implying that the operational lifespan of the Proposed Development is 25 years however, where a timeframe for the operational phase assessment is required (i.e. climate), 25 years has been selected. This timeframe was advised by the Applicant as it is a comparable operational lifespan for large, complex, industrial-scale projects. In reality, once commissioned, the Carbon Capture Plant will operate for as long as the existing cement works is in existence.

Decommissioning

2.3.43 The Application does not seek planning permission for the decommissioning of the Proposed Development as the Proposed Development is intended to operate for the lifespan of the existing cement works. Periodic maintenance and replacement of plant will be required, and this has been considered within the draft Environment Statement as part of the existing maintenance routine for the wider cement works. On this basis, decommissioning nor minor ongoing maintenance is not expected to present any additional potential for environmental effects beyond that already assessed for the construction and operation phases.

2.3.44 The EIA Regulations 2017 do not require assessment of the decommissioning phase of a development. The Scoping Direction for the application did however request further clarity on decommissioning effects and therefore further consideration has been included in the technical assessments. Where assessed, it is expected that decommissioning works will be similar in nature to the construction phase but are likely to be of a reduced extent and therefore have a lower environmental impact.

2.3.45 It is noted that by the time the overall cement works may be decommissioned, the regulatory regime and associated guidance is likely to have been amended. Decommissioning will take account of the environmental legislation and technology available at that point in time, with notice being given to the relevant planning authorities in advance of commencing such works. It is recognised that baseline conditions may have changed as a result of climate change and further assessment of the environmental baseline may be necessary. All necessary licenses or permits would be acquired to authorise decommissioning phase works.

2.4 Environmental Management

2.4.1 The EIA has identified a number of impacts that are likely to arise as a result of progression of the Proposed Development. Mitigation measures have accordingly

been identified and developed to counter adverse impacts and reduce the significance of residual effects on the receiving environment.

2.4.2 Environmental mitigation measures identified during the EIA process, including monitoring of potentially significant effects, are reported in **Volume 2, Chapters 5** to **15** of this draft Environmental Statement. Subject to the granting of planning consent, these measures will form a mandatory schedule of commitments under the terms of any contract(s) for the construction and future maintenance of the Proposed Development.

2.4.3 An Outline Construction Environmental Management Plan (as provided in **Volume 4, Technical Appendix 2.1**) has been developed to demonstrate how the commitments will be translated, implemented and managed.

2.5 References

Department for Business, Energy & Industrial Strategy (2020). The Ten Point Plan for a Green Industrial Revolution. Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/936567/10_POINT_PLAN_BOOKLET.pdf

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3 REASONABLE ALTERNATIVES CONSIDERED

3.1.1 In line with the requirements of Regulation 17[18] and Schedule 4[19] to the EIA Regulations 2017, an outline of the reasonable alternatives should be considered and the reasons for selecting the preferred option should be presented. The reasonable alternatives focused on two main decision points:

- Alternative technologies; and
- Alternative locations.

3.2 Alternative Technologies

3.2.1 The cement process has two sources of CO_2 emissions. CO_2 from the combustion process contributes approximately 30-35% of the emissions. The remaining 65-70% of emissions comes from the calcination of calcium carbonate, which breaks down to yield calcium oxide, the essential ingredient in cement production. The chemical reaction of calcination liberates CO_2 gas as well as the end product. Whilst switching to a decarbonised fuel such as hydrogen or carbon neutral biomass fuel can help to reduce the amount of CO_2 emissions, cement production cannot be fully decarbonised by use of decarbonised fuels due to the chemical composition of the calcium carbonate and the unavoidable by-product of CO_2 from the calcination process. Currently, carbon capture and storage is the only known means of fully decarbonising cement production.

3.2.2 There are a number of potential carbon capture technologies being developed which are at low technology readiness levels. At present, post combustion carbon capture using amine is the only carbon capture technology already proven on an industrial scale in other industries. It is being applied in the cement industry at the Heidelberg Materials Brevik Plant in Norway and will be operational there in 2025. Selecting another technology would require between 5 and 10 years further development to enable carbon capture at the scale required at Padeswood Cement Works, thus resulting in the continued emission of CO_2 approximately 800,000t per year until the technology was proven.

[18] https://www.legislation.gov.uk/wsi/2017/567/regulation/17/made

[19] https://www.legislation.gov.uk/wsi/2017/567/schedule/4/made

Table 3.1 Alternatives studied to date and reasons for rejection

Option/ Description	When Rejected	Reasons for Rejection
Continue business as usual	The fall back alternative	Continued operation of Padeswood Cement Works without carbon capture and storage would not assist in the achievement of the Applicant's net zero ambitions. There would remain an annual CO_2 emission of approximately 800,000t.
Leilac carbon capture and storage (low emission intensity lime and cement) technology	Pre-feasibility	The Leilac process is under development by Calix and has been demonstrated at 1 tph scale at Heidelberg Materials Lixhe plant in Belgium. Leilac is a direct capture technology, but at present can only be applied to the calcination process and therefore would not achieve full decarbonisation of the cement process. Lielac operates by indirect heating of the raw materials which would need natural gas for heating that would require a separate post combustion Carbon Capture Plant in addition to the Lielac installation.
Oxyfuel technology or Oxycal (oxyfuel calciner and amine capture for kiln gases)	Pre-feasibility	Oxyfuel carbon capture and storage has not yet been demonstrated at an industrial scale. It is a more appropriate technology for a new cement kiln rather than existing, as it would require significant modification to the existing process unit configuration and the adoption of new equipment for onsite oxygen production. Oxygen production requires significant amounts of electrical power that exceeds the capacity of the current grid connection. The Distribution Network Operator has advised that the network near Padeswood Cement Works is not scheduled to be considered for reinforcement until 2037 at the earliest. This would result in at least ten years of unabated operation before Oxyfuel could be installed.
Waste to Energy Combined Heat and Power plant	Feasibility	A waste to energy plant to provide the heat and power for carbon capture and storage operation was considered during feasibility study. However, this was found to require more land area than available at the Site, require increased Heavy Goods Vehicle deliveries of waste and would increase the gas volume requiring treatment in the Carbon Capture Plant compared with the gas fired Combine Heat and Power plant thus increasing the size of the Carbon Capture Plant.

Option/ Description	When Rejected	Reasons for Rejection
Non-pipeline CO_2 transport	Pre-feasibility	Road (or rail) transport from Padeswood Cement Works to HyNet connection would require CO_2 liquefaction at the Site which requires additional electrical energy and a loading facility. In the case of road transport, this would require an additional estimated 28,500 vehicle movements to and from Padeswood Cement Works each year. At present, these would all consume diesel and thus not achieve the objective of net zero carbon production.

3.3 Alternative Locations

3.3.1 For the carbon capture process to be commercially viable at the scale proposed at the Site, it needs to be co-located with the source of CO_2 production. Otherwise, the need for intermediate transmission of emissions from the existing cement works prior to treatment would require significant additional infrastructure and technological challenge which would likely cause the Proposed Development to be unviable.

3.3.2 The sites considered for the Carbon Capture Plant location were therefore limited to land adjacent to the existing cement works and within the Applicant's ownership. Broadly, this corresponds to the areas northwest, northeast, southeast and southwest of the existing cement works. Commentary is provided on each of these locations below.

3.3.3 Location to the north west of the existing cement works was considered but the available land within the Applicant's ownership was too small to construct and operate the Carbon Capture Plant at this location without requiring relocation of the site offices, access and car parking. Location to the north west would bring the plant much closer to the site entrance and lead to close range views along the A5118 and properties to the north, without the benefit of screening by the existing cement works. Location here would also require transportation of emissions across the Site from the point of generation to the point of capture, with resulting operational, technology and safety related complexity.

3.3.4 Similar considerations applied to location north east of the existing cement works. The available site area here is larger so would overcome some of the constraints noted for the north west area but development at this location would bring the Carbon Capture Plant much closer to the properties at Padeswood Drive and increase the potential for landscape and visual, air quality and noise related effects to occur at these properties. Development at this location would also require the transfer of emissions from the source of generation, either around or through the existing cement works with the same constraints as noted above.

3.3.5 Development to the south east of the works was discounted as whilst there is sufficient land area available, development at this location would involve the greatest amount of habitat loss.

3.3.6 Development to the south west of the existing cement works provides sufficient land area to develop the Proposed Development, of limited ecological value and is also the closest location to the principal emission sources therefore minimising the amount of additional ducting required and maximising the efficiency of the carbon capture process. This land was therefore selected as the preferred option for the Proposed Development.

4 APPROACH TO EIA

4.1 Introduction

4.1.1 This chapter sets out the overall approach that has been taken to the EIA for the Proposed Development. The draft Environmental Statement will contain the information specified in Schedule 4 of the EIA Regulations 2017. The approach to the assessment has been informed by current best practice guidance.

4.1.2 An overview of the guidance and methodology adopted for each environmental factor is provided within the respective environmental factor assessment chapters of this draft Environmental Statement.

4.1.3 The environmental factors listed under Regulation 4(2) of the EIA Regulations 2017 are presented below:

- Population and human health;
- Biodiversity;
- Land and soils (factors combined for the purposes of reporting);
- Water;
- Air;
- Climate;
- Material assets (and waste added for the purposes of this draft Environmental Statement);
- Cultural heritage; and
- Landscape.

4.1.4 It should be noted that although not listed as specific environmental 'factors' under Regulation 4(2) of the EIA Regulations 2017, the following are also considered within this draft Environmental Statement:

- Noise and vibration;
- Traffic and transport; and
- Major accidents and disasters.

4.2 Consultation

4.2.1 As part of the DNS application process, a virtual inception meeting was held via Microsoft Teams on 14 July 2022 and included representatives from the Applicant, RSK and PEDW. The meeting discussed the outline proposals for the Proposed Development.

4.2.2 The Applicant and RSK outlined the consenting strategy within which the case for utilising the DNS process from a planning and legal perspective was presented. PEDW agreed that, due to the output from the Combined Heat and Power plant surpassing the 10MWe threshold, a DNS would be required. As each of the project components are inter-dependant, the Proposed Development would comprise a single development under one planning application.

4.2.3 Two pre-application drop-in events were held on 20 October 2022 at local venues within proximity to the Proposed Development. The drop-in events were used to launch and introduce the Proposed Development to the local community and invitations were issued via post to 13,000 addresses. The aims of the drop-in event were to:

- Explain the Proposed Development and build understanding as well as counter any misunderstanding; and
- Address local non-material or operational issues.

4.2.4 Non-statutory consultation was held between 25 January 2023 and 21 February 2023 and the aims of non-statutory consultation were to:

- Outline the broad parameters of the Proposed Development;
- Gather feedback on key issues and options;
- Understand and develop responses to key community and stakeholder concerns;
- Reassure concerned stakeholders; and
- Continue to build understanding of the Proposed Development with a wide range of stakeholders.

4.2.5 Copper Consultancy (appointed project communications consultants) used various means of communication to publicise the non-statutory consultation events including email notifications to stakeholders (local councillors, parish councillors and liaison groups), displayed posters in the local community and hard-to-reach areas, issued a press release and posted across social media platforms. Details of the events that took place are provided below:

Face-to-face events at publicly accessible venues

- Emmanuel Church Penyffordd, 10:00 to 19:00, 03 February 2023;
- Emmanuel Church Penyffordd, 10:00 to 13:00, 04 February 2023;
- Buckley Cross Methodist Church, 14:00 to 17:00, 04 February 2023; and
- Buckley Cross Methodist Church, 10:00 to 19:00, 10 February 2023.

Online webinar question and answer sessions

- Microsoft Teams, 07 February 2023, 19:00 to 20:00; and
- Microsoft Teams, 15 February 2023, 12:30 to 13:30.

4.2.6 Non-statutory consultation brochures and banners were produced and displayed at the face-to-face events that provided information about the Proposed Development. The events included staff from the Applicant, RSK, Progressive Energy (representing HyNet North West) and Copper Consultancy. Attendees could ask questions of the staff present. The face-to-face events included banners on the following topics:

- Welcome and Proposed Development layout;
- Achieving the UK's net zero target;
- What is Carbon Capture and Storage?;
- What will Padeswood CCS involve?;
- Carbon Capture and Storage explainer and infographic;
- HyNet activity map;

- HyNet CO_2 storage infographic;
- Environmental Impact Assessment;
- Our Proposed Development - Initial visualisations;
- Benefits; and
- Next steps.

4.2.7 More than 70 people attended the events. Using a tablet, digital feedback forms were made available at each of the face-to-face events where attendees could submit their views on the Proposed Development. For those who attended the online webinars, digital feedback forms were emailed to be completed and returned. All non-statutory consultation materials provided at the events were then made available on the project website[20].

4.2.8 Feedback from non-statutory consultation was collated and distributed to the project team and has been incorporated into the EIA. Respondents were asked to rank their priorities for assessing environmental impact. Air quality issues were given the highest priority followed by climate, landscape and visual, noise and vibration, biodiversity, traffic and transport and lastly cultural heritage.

4.2.9 A pre-application advice meeting was held with the Natural Resources Wales through their Discretionary Advice Service on 01 March 2023 via Microsoft Teams. The meeting included representatives from the Applicant, RSK and Natural Resources Wales. From the Applicant and RSK's perspective, the objectives of the meeting were to:

- Provide an overview of the Proposed Development and update Natural Resources Wales on progress made to date;
- Review and discuss Natural Resources Wales Scoping response focussing on biodiversity issues; and
- Agree and establish a plan and approach to EIA survey, great crested newt licensing requirements and biodiversity enhancement.

4.2.10 The first pre-application advice meeting with Flintshire County Council was held on 07 March 2023 at Flintshire County Council offices, Ty Dewi Sant, St. Davids Park, Ewloe, CH5 3FF. The meeting included representatives from the Applicant, RSK and Flintshire County Council. From the Applicant and RSK's perspective, the objectives of the meeting were to:

- Provide an overview of the Proposed Development and update Flintshire County Council on progress made to date;
- Gain an understanding of Flintshire County Council's role and responsibility in the DNS process; and
- Review and discuss Flintshire County Council's Scoping response with particular reference to; Biodiversity, landscape and visual, noise and vibration, traffic and transport and the footpath 301/56/20 diversion.

4.2.11 A pre-application advice meeting was held with PEDW on 19 April 2023 via Microsoft Teams. The meeting included representatives from the Applicant, RSK and PEDW. The Applicant and RSK provided an update on the current design of the Proposed Development, questioned PEDW on the degree of flexibility that can be afforded

[20] www.padeswoodccs.co.uk

through the DNS process and outlined the project programme. PEDW provided an overview of statutory timescales and their initial thoughts on the proposed consenting approach.

4.2.12 The Applicant, as part of HyNet North West, undertook project briefing sessions with Flintshire County Council councillors on 16 May 2023 via Microsoft Teams and on 17 May 2023 at Flintshire County Council offices (address provided above).

4.2.13 The second pre-application advice meeting with Flintshire County Council was held on 27 July 2023 via Microsoft Teams. The meeting included representatives from the Applicant, RSK and Flintshire County Council. The purpose of the meeting was to discuss the footpath 301/56/20 Diversion with Flintshire County Council's Public Rights of Way officer. The Applicant and RSK presented the diversion plans, Flintshire County Council provided their views and a discussion on DNS Secondary Consents Process between all parties followed.

4.2.14 The third pre-application advice meeting with Flintshire County Council was held on 02 August 2023 via Microsoft Teams. The meeting included representatives from the Applicant, RSK and Flintshire County Council. The purpose of the meeting was to outline the Planning Performance Agreement process and scope.

4.2.15 On 12 October 2023, the Applicant and RSK hosted Flintshire County Council on Site to walkover the area proposed for biodiversity mitigation. Representatives from Flintshire County Council provided the Applicant with feedback during the walkover which was then actioned in a revised version of the biodiversity mitigation proposals.

4.2.16 On 16 October 2023, a handover meeting for the new Flintshire County Council Planning Officer was held between RSK, the Applicant and Flintshire County Council via Microsoft Teams.

4.2.17 The first pre-application advice meeting with Flintshire County Council's Sustainable Urban Drainage Approval Body was held on 08 November 2023. The meeting included representatives from the Applicant, RSK and Flintshire County Council. The purpose of the meeting was to understand the requirements of the SuDS consent, outline the Sustainable Urban Drainage Approval Body's expectations and to present Applicant's initial plans and programme.

4.2.18 The second Discretionary Advice Service pre-application advice meeting with Natural Resources Wales was held via Microsoft Teams on 10 November 2023. The meeting included representatives from the Applicant, RSK and Natural Resources Wales. The purpose of the meeting was for the Applicant and RSK to present the Landscape and Biodiversity Mitigation Proposals to Natural Resources Wales from conception to current draft. The Applicant and RSK sought feedback from Natural Resources Wales on the proposals.

4.2.19 The second pre-application advice meeting with Flintshire County Council's Sustainable Urban Drainage Approval Body was held on 18 March 2024. The meeting included representatives from the Applicant, RSK, Worley and Flintshire County Council. The purpose of the meeting was to update Flintshire County Council on the project status and drainage proposals.

4.2.20 Statutory pre-application consultation will begin at 00:00 on 02 July 2024 and will end at 23:59 on 12 August 2024. Copper Consultancy will use various methods to ensure

the consultation is inclusive and accessible for all audiences. There will be four in-person and two online consultation events that will be open for anyone with an interest in the project to attend. Details of the events are provided in **Table 4.1**.

Table 4.1 Statutory pre-application consultation event details

Event	Date	Time
Buckley Cross Methodist Church, 3-7 Padeswood Road, Buckley, CH7 2JL	Saturday 13 July 2024	10:00 – 13:00
Emmanuel Church, 42 Vounog Hill, Penyffordd, Chester CH4 0EZ	Saturday 13 July 2024	14:00 – 17:00
Online webinar 1	Tuesday 16 July 2024	12:30 – 13:30
Buckley Cross Methodist Church, 3-7 Padeswood Road, Buckley, CH7 2JL	Wednesday 17 July 2024	13:00 – 20:00
Emmanuel Church, 42 Vounog Hill, Penyffordd, Chester CH4 0EZ	Thursday 18 July 2024	10:00 – 17:00
Online webinar 2	Thursday 25 July 2024	18:00 – 19:00

4.2.21 To ensure consistency between non-statutory consultation and statutory pre-application consultation, the same venues for face-to-face events have been selected.

4.2.22 The aims of statutory pre-application consultation are to:

- Set out current proposals, demonstrating how issues identified during earlier consultation have been accounted for and considered within the Proposed Development design;
- Demonstrate how the proposals have evolved since non-statutory consultation, and how feedback has influenced this process;
- Gain insight through listening to the views of local communities and other stakeholders about the updated proposals;
- Ensure that the potential impacts of the Proposed Development have been taken into account as mitigation strategies are finalised;
- Provide a robust evidence base for the DNS application, to demonstrate how community and stakeholder feedback has influenced the Proposed Development, where possible; and
- Meet DNS criteria for adequacy of consultation.

4.2.23 Details on environmental factor-specific consultation is presented in the 'consultation' sections of **Chapter 5** to **Chapter 14** of this draft Environmental Statement.

4.3 Scoping

4.3.1 An underlying principle of the EIA process is that it should concentrate on environmental issues where effects associated with a development proposal are likely to be significant; this is known as 'scoping'. Although scoping is not mandated by the EIA Regulations 2017, it was completed for the Proposed Development in

order to determine issues that should be addressed in the EIA and the form individual assessments should take.

4.3.2 The scoping exercise was undertaken in accordance with Regulation 14(2)(a) of the EIA Regulations 2017 and Information to Support a Scoping Opinion Request was prepared. The purpose of the Scoping Report was to propose the scope of this draft Environmental Statement in accordance with the EIA Regulations 2017, and to seek the views of PEDW and statutory consultees on that proposed scope.

4.3.3 As well as identifying elements to be considered in the EIA, the Scoping Report also identifies those elements that are not considered necessary to assess further. This approach is in line with the general aim to undertake proportionate EIA, as advocated by sector best practice.

4.3.4 Scoping concluded that the following environmental factors were relevant for investigation in the EIA owing to the potential for significant environmental effects to arise and were therefore proposed to be scoped in to the EIA:

- Biodiversity;
- Air quality;
- Climate;
- Cultural heritage;
- Landscape and visual;
- Noise and vibration; and
- Traffic and transport.

4.3.5 The following environmental factors were reviewed and proposed to be scoped out of the EIA based on the limited potential for environmental effects to arise:

- Material assets;
- Population and human health;
- Major accidents and disaster;
- Land and soils; and
- Water.

4.3.6 The Scoping Report was submitted to PEDW via email on 04 November 2022 (DNS reference CAS-02009-W1R1Z7, available to view and download from the Welsh Government website)[21].

4.3.7 PEDW engaged the following consultees as part of the scoping process who all provided formal written comment in response to the Scoping Report:

- Flintshire County Council;
- Natural Resources Wales;
- Welsh Government Transport;
- Health and Safety Executive;
- Coal Authority;
- Cadw; and

[21] https://planningcasework.service.gov.wales/api/documents/download/A42765597?hash=099c77b0e29308f6d188a39aaf3e7b50be72aa72529f74b1a6432512584f6263

- Dŵr Cymru.

4.3.8 PEDW issued the Scoping Direction[22] to the Applicant on 21 April 2023. The Scoping Direction incorporated comment from the consultees outlined above with PEDW providing overarching feedback on all aspects of the Scoping Report. Feedback provided in the Scoping Direction determined the final scope of the EIA and resulted in modifications to the scope of individual environmental factors already proposed to be included in the EIA.

4.3.9 Subsequent changes to the scope of individual environmental factor assessments after commencement of the EIA process are as follows:

- Materials assets now scoped into the draft Environmental Statement (discussed further in **Volume 2, Chapter 14: Material assets and waste**) (in response to Natural Resources Wales and PEDW request);
- Land and soils now scoped into the draft Environmental Statement (in response to Natural Resources Wales, Coal Authority and PEDW request);
- Major accidents and disasters now scoped into the draft Environmental Statement (in response to Natural Resources Wales and PEDW request);
- Great crested newt presence during operational phase assessment now scoped into the Biodiversity draft Environmental Statement chapter (in response to Natural Resources Wales and PEDW request);
- Search area for heritage assets extended to 5km for Cultural Heritage environmental factor assessment (in response to Cadw and PEDW request);
- Additional viewpoints at the layby on Padeswood Lake Road opposite The Old Barn and a more distant viewpoint from the Mold bypass (SJ233626) to be included in the Landscape and visual environmental factor assessment (in response to Flintshire County Council and PEDW request).
- High level assessment of the construction of the connection pipeline between the Proposed Development and HyNet connection point in Northop Hall has been included in the inter-project assessment of cumulative effects in the draft Environmental Statement (in response to PEDW request);
- SuDS Consent will be obtained as a separate legislative requirement from the DNS permission (in response to Flintshire County Council and PEDW request); and
- A Habitats Regulations Screening Assessment will be produced and submitted as part of the DNS application (in response to PEDW request, as provided in **Volume 4**, **Technical Appendix 5.3**).

4.3.10 The scope of the individual assessments has been reviewed regularly throughout the EIA process to take account of new published guidance and assessment methodologies, stakeholder and consultee feedback, new environmental data and ongoing design changes.

4.3.11 Explanations of the methods of assessment adopted and the issues identified are provided in **Volume 2, Chapters 5** to **15** of this draft Environmental Statement, which detail the findings in relation to the various environmental factors considered in the EIA.

22 https://planningcasework.service.gov.wales/api/documents/download/A44971688?hash=e9f797eaf86e718078c628d82a7133727fe5e66f6d0bf60c259ca697cd1bd505

4.3.12 Once operational, decommissioning of the Carbon Capture Plant is not anticipated for as long as the existing cement works is in operation, as detailed in **Volume 2, Chapter 2**: **Description of the purpose and nature of the Proposed Development, Section 2.3**.

4.4 EIA delivery

Assessment reporting

4.4.1 Each individual environmental factor assessment follows a comparable format to ensure consistency in reporting the existing environmental conditions and the likely significant effects on them arising from implementation of the Proposed Development.

- **Introduction** introduces the environmental factor under assessment;
- **Consultation, scope and study area** summarises the consultation activities undertaken in support of the environmental factor assessment, provides an evaluation and update to the scope of the assessment following Scoping and outlines the defined factor-specific study area(s);
- **Approach and methodology** identifies and describes the scope of the assessment, the methods and significance criteria adopted, applicable guidance followed and data sources to inform the EIA baseline characterisation;
- **Baseline conditions** describes the features and characteristics associated with the existing environment (on a receptor-by-receptor basis) and future environment;
- **Relevant legislation and planning policy** outlines statutes, guidance, policies and plans relevant to the environmental interests forming the focus of the environmental factor assessment;
- **Difficulties and uncertainties** outline any details of difficulties and uncertainties encountered in compiling the required information, the main uncertainties involved in the environmental factor assessment and how these have been overcome;
- **Assessment of likely significant effects, additional mitigation and residual effects** describes the predicted likely significant effects, the proposed additional (secondary and tertiary) mitigation and the residual effects and monitoring (where applicable) on the baseline and future baseline environment during the construction and operational phases for each receptor;
- **Opportunities for environmental enhancement** discusses where potential feasible enhancement opportunities (where applicable) have been identified that go above and beyond the proposed mitigation measured outlined in the assessment of likely significant effects, additional mitigation and residual effects sections; and
- **Assessment summary** provides a summary of the findings of the environmental factor assessment.

EIA guidance

4.4.2 This EIA has been undertaken with regard to the following published best-practice guidance:

- Environmental Impact Assessment Guide to: Delivering Quality Development[23], published by IEMA (2016); and
- Delivering Proportionate EIA[24], published by IEMA (2017).

4.4.3 Other factor-specific best practice guidance that has been followed is summarised in the relevant sections of the factor-specific draft Environmental Statement chapters.

Defining the study area

4.4.4 Study areas have been defined individually for each environmental factor within the respective chapter, taking into account the geographic scope of the potential impacts relevant to that environmental factor and the information required to assess those impacts.

Establishing baseline conditions

4.4.5 Environmental impacts from the Proposed Development will be described in relation to the extent of changes to the existing baseline environment as a result of the construction and operation of the Proposed Development. The baseline environment will comprise the existing environmental characteristics and conditions, based upon desk-top studies, site visits and field surveys undertaken and information available at the time of the assessment.

4.4.6 The baseline conditions for each environmental factor are set out within the respective assessment chapters.

4.4.7 There is potential that data obtained from third parties is not up to date, as identified in **Volume 2, Chapter 4: Approach to EIA, Section 4.6** of this draft Environmental Statement. The origin of all third-party data used will be clearly identified, alongside any difficulties and uncertainties.

Establishing future baseline conditions

4.4.8 Schedule 4(3) of the EIA Regulations 2017 requires consideration of the likely evolution of the current state of the environment (baseline) in the absence of the Proposed Development, as far as natural changes from the baseline can be assessed with reasonable effort on the basis of the availability of environmental information and scientific knowledge (the 'future baseline'). Whilst there are considerable limitations to the predictions that can be made about natural baseline conditions at a future point in time, reasonable effort will be made to characterise the future baseline in the absence of the Proposed Development in each environmental factor assessment. In addition, some assessments require projections to account for future change, such as traffic growth within the assessment of likely significant effects associated with the Proposed Development.

Impact prediction and assessment

4.4.9 Effects comprise identifiable changes to the baseline environment. They are formulated as a function of the receptor/resource value and sensitivity, and the predicted magnitude of impact. Factor-specific significance criteria has been outlined in the relevant assessment chapters derived from prevailing factor-specific guidance (e.g. ecological impact assessment), established standards and thresholds (e.g. EU

[23] https://www.iema.net/articles/iema-launches-quality-development-guide-for-eia

[24] https://www.iema.net/resources/reading-room/2017/07/18/delivering-proportionate-eia

limit values for air emissions) or professional judgement have been used to report the environmental effects of impacts, which can be referred to as either being prior to, or following establishment of, environmental mitigation.

4.4.10 Environmental resources are defined as those environmental aspects that support and are essential to natural or human systems. These include areas or elements of population, ecosystems, watercourses, air and climatic factors, landscape, and material assets.

4.4.11 Environmental receptors were defined as people (i.e. occupiers of dwellings and users of recreational areas, places of employment and community facilities) and elements within the environment (e.g. flora and fauna) that rely on environmental resources.

4.4.12 Effects can be either beneficial (e.g. improved local air quality) or adverse (e.g. loss of an attractive environmental component), and can take the following forms:

- Direct [primary] (e.g. loss of habitat to accommodate the Proposed Development);
- Indirect [secondary] (e.g. pollution downstream arising from silt deposition during earthworks, or as a result of development required to support a scheme, e.g. nearby road improvement;
- Short-term/temporary (e.g. dust generated during construction);
- Medium-term (e.g. cutting back of planting which is subsequently allowed to regenerate);
- Long-term/permanent (e.g. improvement in air quality); and
- Cumulative (e.g. incremental changes caused by other past, present or reasonably foreseeable actions together with those associated with the Proposed Development, or where a receptor or resource is subject to a combination of individual impacts such as air pollution, noise and visual impact associated with the Proposed Development in isolation).

4.4.13 In each environmental factor assessment, a study area has been identified as outlined in **Volume 2, Chapter 4: Approach to EIA**. Each study area falls entirely within the Welsh border and therefore transboundary effects are not considered as part of the EIA.

4.4.14 Assessments have been undertaken for the period of construction and assumed 25 year operational lifespan of the Proposed Development, as detailed in **Volume 2, Chapter 2**: **Description of the purpose and nature of the Proposed Development**, **Paragraph 2.3.42**.

Assessment of likely significant effects

4.4.15 This draft Environmental Statement will report on the likely significant environmental effects for the construction (e.g. site preparation, earthworks and construction) and operational (e.g. once completed and open to use) phases of the Proposed Development.

4.4.16 The method for assessing significance of effects varies between environmental factors but, in principle, is based on the environmental sensitivity (or value/importance) of a receptor/resource and the magnitude of change from the baseline conditions. The approach to assessing the significance of effects for each

individual environmental factor is outlined within **Volume 2, Chapter 5** to **Chapter 14** of this draft Environmental Statement.

4.4.17 Summaries of the likely significant effects associated with each of the environmental factors are provided at the end of each chapter. These summaries outline potential impacts, sensitive receptors, likely significant effects, additional mitigation measures, residual effects and proposed monitoring, where relevant. A distinction is made between direct, indirect, secondary, short-term, medium-term and long-term, permanent and temporary, positive and negative effects. Cumulative effects are considered as a single coordinated assessment; provided in **Volume 2: Chapter 15**, **Cumulative effects.**

Approach to mitigation

4.4.18 Mitigation can be relied on to reduce or avoid any potential likely significant effects from the Proposed Development. The sequential steps of the mitigation hierarchy are as follows:

- Avoidance – take measures to avoid creating impacts from the outset;
- Minimisation – measure taken to reduce the duration, intensity and extent of the impact if they cannot be avoided;
- Restoration – measures taken to improve ecosystems following exposure to unavoidable impacts; and
- Offset – measure taken to compensate for any residual effects.

4.4.19 The IEMA Environmental Impact Assessment Guide to Shaping Quality Development[25] (2015) refers to three distinct forms of mitigation:

- Primary - an inherent part of the Proposed Development design;
- Secondary - typically described within the environmental factor chapters of the Environmental Statement, but often are secured through planning conditions and/or management plans; and
- Tertiary - required regardless of any EIA, as it is imposed, for example, as a result of legislative requirements and/or standard sectoral practices.

4.4.20 For the purposes of this draft Environmental Statement, embedded 'primary' mitigation measures will be inherent to the design of the Proposed Development for which planning permission is sought. **Table 4.2** describes the currently known embedded (primary) environmental mitigation measures. It should be noted that these will likely evolve over the course of the design evolution, up to submission of the DNS application.

4.4.21 These embedded (primary) environmental mitigation measures should not be confused with additional (secondary and tertiary) mitigation measures proposed in order to avoid, prevent or reduce and, where practicable, offset likely significant adverse effects on the environment, which are described under the 'Additional (Secondary and Tertiary) Mitigation Measures' section within each of the environmental factor assessment chapters.

[25] https://www.iema.net/resources/iema-essential-reading#sts=EIA%20Guide%20to%20Shaping%20Quality%20Development

Table 4.2 Embedded (primary) environmental mitigation measures

Environmental Factor to which the Embedded (Primary) Environmental Mitigation Measure Relates	Embedded (Primary) Environmental Mitigation Measure and Associated Benefit
Biodiversity	• Biodiversity net benefit (as provided in **Volume 4, Technical Appendix 9.**4) will be delivered so that any protected habitat of ecological importance lost by areas of permanent works will be replaced, on-site, on a like-for-like basis in accordance with Planning Policy Wales[26] (2024).
Air quality	•Gas cleaning stage of the carbon capture and storage process to reduce pollutant emission rates.
Climate	•The cement works energy consumption and fuel mix have been optimised (i.e. the quantity of biomass in the fuel mix is as high as possible whilst still producing a quality clinker product) to minimise the quantity of CO_2 arising from the production of cement. •The post combustion Carbon Capture process design uses waste heat from the existing operational cement works to reduce natural gas consumption in the Combined Heat and Power plant that is required to regenerate the amine solution in order for the Carbon Capture process to function. •The Combined Heat and Power plant will use the kiln gases instead of fresh air as a source of oxygen for combustion. In turn, this will reduce the diameter of the absorber, reducing the volume of materials used to construct the PCCCC thus reducing the embodied carbon. Using the kiln gases as a source of oxygen will also reduce the gas flow through the absorber thus reducing the energy required to transport gases through the PCCCC.
Cultural heritage	•Construction tracks sited to avoid non-designated heritage assets. •The exterior of the new structures will be sympathetic to the existing structures within the existing cement works.
Landscape and visual	•Bunding to act as visual screening is incorporated into the overall Proposed Development Masterplan to reduce the visual impact from all phases of the Proposed Development on nearby sensitive receptors. Bunding would be designed sympathetically

[26] https://www.gov.wales/planning-policy-wales

Environmental Factor to which the Embedded (Primary) Environmental Mitigation Measure Relates	Embedded (Primary) Environmental Mitigation Measure and Associated Benefit
	within the landscape and softened with additional planting. •The exterior of the new structures will be sympathetic to the existing structures within the existing cement works.
Noise and vibration	•Design layout considers the location of noise-emitting plant and equipment, being placed as far away as reasonably possible to minimise noise for nearby sensitive receptors. This will be balanced alongside other technical and environmental considerations such as noise level limits and energy consumption. •Further detail on primary mitigation is provided in **Volume 2, Chapter 10; Noise and vibration, Section 10.7**.
Land and soils	•No embedded mitigation has been incorporated into the design in relation to this environmental factor.
Water	•The incorporation of a surface water drainage network into the Proposed Development's design, which will have appropriate surface water treatment such as SuDS features and pollution prevention measures (e.g. oil interceptors), where possible. • The design of the Carbon Capture Plant has been developed to eliminate process discharges to water and to minimise water abstraction from the carbon capture system. This has been achieved by using air cooling where possible to reduce cooling water requirements for the Carbon Capture Plant including cooling the amine used by the absorber and the CO_2 compressor. The production of steam in the Combined Heat and Power plant and the cooling water system requires demineralised water to avoid corrosion and scaling of the boiler tubes and plate heat exchangers. The volume of mineral rich waste water arising from the water purification plant has been limited to the same volume as the existing cement works consumes for evaporative cooling. •A stormwater holding pond has been included in the design of the Carbon Capture Plant to store and discharge rainwater run-off to reduce the risk of flooding on and off-site.
Population and human health	•Recreational routes and paths are to remain useable throughout the construction and operation of the Proposed Development. However, there will be a need to divert footpath

Environmental Factor to which the Embedded (Primary) Environmental Mitigation Measure Relates	Embedded (Primary) Environmental Mitigation Measure and Associated Benefit
	301/56/20, which currently crosses the Site. The details of a diversion have been developed in consultation with Flintshire County Council and will be submitted for approval as a secondary consent as part of the DNS application.

4.5 Opportunities for enhancing the environment

4.5.1 Where practicable, there is a commitment to identify opportunities for enhancement within the relevant environmental factor assessments. Enhancement is defined as *'a measure that is over and above what is required to mitigate the adverse effects of a project*'. Therefore, any identified enhancement measures have not been taken into account when determining the significance of effects. Enhancement opportunities are outlined in the relevant environmental factor assessment chapters.

4.5.2 Enhancement measures are assessed in accordance with steps set out in the Planning Policy Wales[27] (2024).

4.6 Difficulties and uncertainties

4.6.1 Factor-specific difficulties and uncertainties are set out in the environmental factor assessment chapters of this draft Environmental Statement. The following key general difficulties and uncertainties apply to a number of environmental factors:

- The Applicant engaged two pre-FEED contractors to develop the design for the Proposed Development alongside the EIA, Planning and Technical Services workstream that RSK is leading on. All aspects of the Proposed Development (both during construction and operation phases), except the design and layout of the Carbon Capture Plant, have been fixed since March 2023, which has allowed those factors that are not specific to the final Carbon Capture Plant design to progress and be drafted. Those factors were Biodiversity, Climate, Cultural heritage, Traffic and transport, Land and soils, Major accidents and disasters and Material assets. The detailed design of the Carbon Capture Plant was still emerging as the EIA was progressing however a single FEED contactor was selected in September 2023 which allowed those factors reliant on final Carbon Capture Plant design to finalise their assessments. Those factors were Air quality, Noise and vibration and Landscape and visual.
- As the precise location and scale of the components that the Proposed Development comprises is not yet fixed, there is potential for uncertainty regarding the scope of assessment for each environmental factor. The description of the Proposed Development details the maximum parameters of the Proposed Development components, therefore outlining the 'worst case scenario'. This 'worst case scenario' is the scenario that will be assessed within the draft Environmental Statement and therefore whatever location or

[27] https://www.gov.wales/planning-policy-wales

footprint is decided and applied, the draft Environmental Statement will ensure that the maximum level of significant effects is considered.

- The EIA was undertaken, and the resulting draft Environmental Statement has been compiled using the material made available to the EIA team by the Applicant and members of their project team, together with other readily available and publicly accessible material including existing literature and studies. To the best of our knowledge, the information used as a basis for the assessment is accurate and up to date. The team is not aware of any limitations of the underlying information or of any constraints that would materially affect the evaluations.
- We have also carried out our own site visits, surveys and investigations at or in the vicinity of the Site to provide more information for the assessments and to fill data gaps. This has resulted in a more complete and up to date set of baseline data to use as the basis for assessment. Although the data have been collected over a period of time, we are of the opinion that the data is relevant and valid at the time of reporting. It should be noted that the surveys and investigations are conducted on a sampling basis and this places a limit on the certainty of the data set.
- Assumptions adopted in the evaluation of impacts are reported in each of the relevant environmental factor assessment chapters. However, these assumptions are often implicit and rely on expert judgement. Any assumptions and known technical deficiencies have been documented.
- Data from third parties relied upon for the baseline, against which any effects were assessed, could potentially be out of date or inaccurate. Any such data was procured from reputable and industry standard sources, and reviewed and used by competent and experienced professional consultants. The combination of appropriate data sources being used by competent and experienced professionals helped to ensure that the data is suitable for its purpose, and provides an appropriate evidence base from which the existing environmental baseline will be informed.

4.7 Environmental Permitting

4.7.1 The Proposed Development is subject to the requirement of Environmental Permitting. This application process will be progressed independently of the EIA process but is likely to have some common requirements in terms of baseline data and assessment methods. It is understood that variation of an existing Environmental Permitting Regulations permit is required to authorise the operation of the Proposed Development and will be progressed in parallel with this DNS application.

4.8 Additional Development of National Significance application assessments, reports and consents

4.8.1 The following environmental assessments and reports do not form part of the draft Environmental Statement but will be submitted as part of the DNS application:

- Planning, design and access statement;
- Written statement of secondary consent;
- Planning drawings;

- Outline construction environmental management plan (as provided in **Volume 4**, **Technical Appendix 2.1**);
- Flood consequences assessment;
- Arboricultural impact assessment report;
- Socio-economic statement;
- Green infrastructure statement;
- Soil resource assessment and outline soil resource management;
- Habitats Regulations Assessment screening assessment (in response to PEDW request in Scoping Direction, as provided in **Volume 4**, **Technical Appendix 5.3**); and
- Habitat creation and management plan.

4.8.2 The footpath diversion consent that is required to divert footpath 301/56/20 will be sought as a DNS Secondary and Related Consent in support of the DNS application.

4.8.3 A SuDS consent application (in response to PEDW request in Scoping Direction) will be submitted alongside the DNS application. It will not form part of this DNS application.

4.9 References

Hanson Heidelberg Cement Group (2023). *Padeswood CCS.* Available at: www.padeswoodccs.co.uk

IEMA (2015). *Environmental Impact Assessment Guide to Shaping Quality Development.* Available at: https://www.iema.net/resources/iema-essential-reading#sts=EIA%20Guide%20to%20Shaping%20Quality%20Development

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PEDW (2023). *EIA Scoping Direction DNS CAS-02009-W1R1Z7: Padeswood Carbon Capture and Storage Project.* Available at: https://planningcasework.service.gov.wales/api/documents/download/A44971688?hash=e9f797eaf86e718078c628d82a7133727fe5e66f6d0bf60c259ca697cd1bd505

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Welsh Government (2024). *Planning Policy Wales.* Edition 12. Available at: https://www.gov.wales/planning-policy-wales