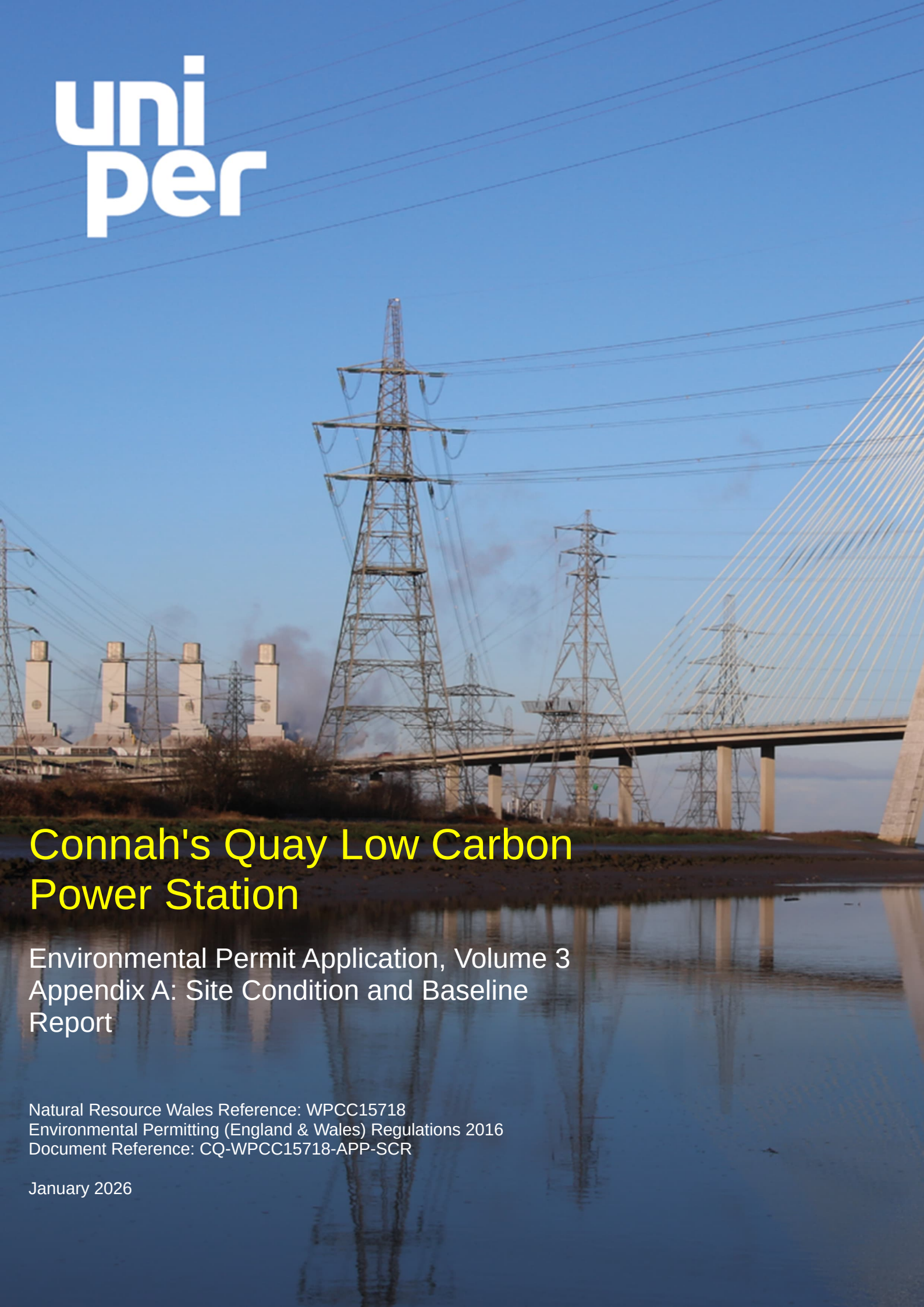

Connah's Quay Low Carbon Power Station

Environmental Permit Application, Volume 3 Appendix A: Site Condition and Baseline Report

Natural Resource Wales Reference: WPCC15718
Environmental Permitting (England & Wales) Regulations 2016
Document Reference: CQ-WPCC15718-APP-SCR

January 2026

Prepared for:

Uniper UK Limited

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Glossary

Abbreviation	Term
ADMS	Atmospheric Dispersion Modelling System
AEELs	Associated Energy Efficiency Levels
AELs	Associated Emission Levels
AEP	Annual Exceedance Probability
AGI	Above-Ground Installation
AMP	Accident Management Plan
AN	Absolute Non-hazardous
AoD	Above Ordnance Datum
AQAL	Air Quality Assessment Levels
ASME PTC	American Society of Mechanical Engineers Performance Test Codes
BAT	Best Available Techniques
BAT AEL	Best Available Technique-Associated Emission Level
BAT-AEEL	Best Available Technique Associated Energy Efficiency Level
BATc	Best Available Technique Conclusions
bgl	Below Ground Level
BGS	British Geological Survey
BRef	Best Available Techniques Reference Document
BS ISO	British Standards (BS) Versions of International Organization for Standardization (ISO) Standards
BS EN	British Standard (BS) Implementations of European Standards (EN)
CBM	Condition-Based Maintenance
CCGT	Combined Cycle Gas Turbine
CCP	Carbon Capture Plant
CCS	Carbon Capture Storage
CEMP	Construction Environmental Management Plan
CEMs	Continuous Emissions Monitors
CHP	Combined Heat and Power
C&IEA	Construction and Indicative Enhancement Area
CM	Corrective Maintenance
COO	Chief Operating Officer
CO	Carbon Monoxide
CO_2	Carbon Dioxide
CoPC	Contaminants of Potential Concern
CQPS	Connah’s Quay Power Station
CSM	Conceptual Site Model
DAHS	Data Acquisition and Handling System
DCC	Direct Contact Cooling
DCO	Development Consent Order
DCS	Distributed Control System

DLN	Dry Low-Nox
DPA	Dispatchable Power Agreement
ECP	Environmentally Critical Plant
ELV	Emission Limit Value
EMS	Environmental Management System
ENI	Operator of the CO_2 transport and storage network.
EPR	Environmental Permitting Regulations
EQS	Environmental Quality Standards
ES	Environmental Statement
ESOS	Energy Savings Opportunity Scheme
FCC	Flintshire County Council
FEED	Front-End Engineering Design
FEH	Flood Estimation Handbook
g	Gram
GC	Gas Chromatograph
GIS	Geographic Information System
GMIs	Generation Management Instructions
GT	Gas Turbine
GTP	Gas Treatment Plant
GW	Gigawatt
ha	hectare
HP	High Pressure
HRSGs	Heat Recovery Steam Generators
HSSE	Health, Safety, Security, Environment
HVO	Hydrotreated Vegetable Oil
IED	Industrial Emissions Directive
IP	Intermediate Pressure
ISO	International Organization for Standardization
Keq	Kiliequivalent
kg	Kilogram
km	Kilometre
kV	Kilovolt
kW	Kilowatt
LCP	Large Combustion Plant
LEL	Lower Explosive Limits
LHV	Lower Heating Value
LNB	Low NOx Burners
LoW	List of Waste
LP	Low Pressure
LWS	Local Wildlife Sites
m	Meters
m^3	Cubic Meter
MCERTs	Monitoring Certification Scheme

MCP	Medium Combustion Plant
MH	Mirror Hazardous
MSDS	Material Safety Data Sheet
MSUL	Minimum Start-Up Load
MW	Megawatt
MWe	Megawatt Electrical
MWth	Megawatt Thermal
N_2	Nitrogen
NGET	National Grid Electricity Transmission Plc
NH_3	Ammonia
Nm^3	Normal Cubic Meter
NOx	Oxides of Nitrogen
NRW	Natural Resources Wales
NTS	National Transmission System
NVZ	Nitrate Vulnerability Zones
O_2	Oxygen
OEM	Original Equipment Manufacturer
OTNOC	Other Than Normal Operating Conditions
PAH	Polycyclic Aromatic Hydrocarbons
PC	Process Contributions
PCB	Polychlorinated Biphenyls
PCC	Post Combustion Capture
PdM	Predictive Maintenance
PFA	Paraformaldehyde
PEIR	Preliminary Environmental Information Report
PM	Preventive Maintenance
RAMS	Risk Assessment and Method Statement
SAC	Special Area of Conservation
SAP	Systems, Applications, Products
SCR	Selective Catalytic Reduction
SECR	Streamlined Energy and Carbon Reporting
SOx	Sulphur Oxides
SPA	Special Protection Area
SPZ	Source Protection Zone
SSSI	Site of Special Scientific Interest
ST	Steam turbine
SuDS	Sustainable Drainage Systems
SVOC	Semi-Volatile Organic Compounds
TBC	To Be Confirmed
Te/Yr	Temperature Element per Year
T&S	Transport and Storage
TPH	Total Petroleum Hydrocarbons
UK	United Kingdom

VOC	Volatile Organic Compounds
WEEE	Waste Electrical and Electronic Equipment
WFD	Water Framework Directive
WWTP	Waste Water Treatment Plant

1. Introduction

1.1 Introduction

This report has been prepared by AECOM Limited ('AECOM') on behalf of Uniper UK Limited referred to as 'the Operator', in support of a new bespoke Environmental Permit application for the proposed Connah's Quay Combined Cycle Gas Turbine (CCGT) with Carbon Capture Plant (CCP) project ("Proposed Installation").This report has been prepared to support the permit application and details the Site Condition for the site at the time of the application. The report should be read in conjunction with other supporting permit application information, primarily the Supporting Statement (document reference: WPCC15718-APP-SS) which provides details of the Proposed Installation Activities. Records of the site and surrounding areas have been reviewed in order to describe the condition of the site and in particular, to identify any substance in, on or under the land that may constitute a pollution risk to the land. Pollution prevention measures have been identified where relevant.

1.2 Proposed Installation

The design of the Proposed Installation is subject to ongoing technical studies, to provide flexibility and to align with the current grid connection. It is expected to comprise the development of up to two CCGT units achieving a net electrical output capacity of up to 1,380 megawatts (MW; referred to as MWe for electrical output) (with CCP operational) onto the national electricity transmission network.

The Proposed Installation will generate electricity from combustion of natural gas within a CCGT. Hot exhaust gas from the combustion process will be used to drive the gas turbine (GT), and steam which will be generated from the heat of the exhaust gas, in the heat recovery steam generator (HRSG), which will then be used to drive the steam turbine (ST). The exhaust gas will then pass through pre-treatment stages, including selective catalytic reduction (SCR) using ammonia (NH_3) to reduce oxides of nitrogen (NOx) in the gas and subsequently cooled via a direct contact cooler (DCC), in the CCP. The CCP will use an amine-based solvent to absorb carbon dioxide (CO_2) from the exhaust gas within a packed column (absorber), via a weak acid-base reaction. The CO_2-depleted exhaust gas then passes through water and acid wash sections and is released to atmosphere via an absorber emissions stack. Continuous emissions monitoring (CEMs) equipment will be located within the stack to monitor pollutants to air.

The CO_2-rich solvent exits the absorber, and passes through a lean/rich heat exchanger, and then into the desorber. The CO_2 is liberated from the solvent by heat, supplied by low pressure steam from the HRSG in normal operation. This steam is supplied to the desorber reboiler. The now lean/rich solvent will be recirculated within the plant. The CO_2 rich vapour exits the top of the desorber, and passes through a reflux stage to maximise solvent-CO_2 separation. The CO_2 vapour is conditioned to reduce water and oxygen to the transport and storage network's specifications, after entering a low-pressure compressor to compress the gas to the export pipeline pressure (8-43 Bara). The CO_2 is then metered and exported to the transport and storage network's CO_2 pipeline which is operated by ENI. The solvent will accumulate impurities over time, and these will be removed via a solvent reclaiming process which will be a thermal process, either continuously via a slipstream or as a batch process.

The CCP emissions will be residual pollutants from the combustion and treatment processes, including NOx, NH_3, and carbon monoxide (CO). The CCP will be designed to capture a minimum of 95% of the CO_2 emissions from the CCP as an annual average of all normal operating conditions. There may also be trace pollutants within the flue gas, including trace levels of solvent and solvent break-down products from within the process. Emissions will be minimised using the water and acid wash steps on the absorber and monitored at the emission point within the abated flue gas stack prior to release. In addition to the CCP emission point, there will be an intermittent-use emission point from the stack serving the HRSG exhaust. Emissions from the CCP stack, and HRSG stack will meet the emission limits for LCP under the Industrial Emissions Directive (IED).

Other supporting infrastructure and plant for the Proposed Installation will include the storage of solvent, caustic soda, sulphuric acid and water-treatment chemicals, demineralisation water treatment plant to produce high-purity water for use in boilers, blending, closed loop cooling and other processes. It will include an electric auxiliary boiler for start-up and dispatchability support, emergency diesel generator(s) for safe shutdown during a power failure scenario, closed surface water drainage and appropriate treatment facilities, and infrastructure for natural gas import and conditioning and CO_2

conditioning and export. The number and thermal rating of the emergency generator(s) will be determined during detailed design and will be classed as medium combustion plant (MCP).

The Proposed Installation will also be supported by natural gas supply, existing potable water supply, existing water abstraction and discharge, electrical connections, utilities, access works and CO_2 export connection. The water abstraction for the Proposed Installation's cooling system will be in line with the extraction at the existing Connah's Quay Power Station and is not expected to exceed the current abstraction permit requirements. Process water and/or wastewater from the site will also be discharged to the existing Connah's Quay Power Station lagoon before being purged into the River Dee.

The Proposed Installation will make use of CO_2 transport and storage networks owned and operated by Liverpool Bay CCS Limited, currently under development as part of the HyNet Carbon Dioxide Pipeline Project (referred to as the 'HyNet CO_2 Pipeline Project'), which will transport CO_2 captured from existing and new industries in North Wales and North-West England, as well as from new hydrogen production facilities that are proposed as part of HyNet North West Project. The captured CO_2 will be stored in depleted offshore gas reservoirs in Liverpool Bay.

A high-level process flow diagram for the Installation is provided in Volume IV of the permit application.

The Proposed Installation will be designed to optimise the capture of CO_2 when operating in dispatchable mode, while minimising emissions and waste generation and maximizing energy efficiency. Best Available Techniques (BAT) assessments have been prepared to demonstrate the Proposed Installation will be designed and operated in accordance with BAT for Large Combustion Plant (LCP), Energy Efficiency (EE), Post-Combustion Carbon Capture (PCC) plant design and cooling.

2. Site Details

2.1 The Site

The details of the site are summarized in the table below:

Table 1: Details of the Installation

Name of the applicant	Uniper UK Limited
Name of the Installation	Connah's Quay Power Station
Activity address	Connah's Quay Power Station Kelsterton Road Connah's Quay Deeside Flintshire CH5 4BP
National grid reference	SJ 27215 71482

2.2 Application Document References

Table 2: Document References

Groundsure Report (Reference Number: GS-PPI-KDK-7N3-OYR)	August 2025	Site Condition Report, Annex A
Groundsure Maps (Reference: GS-3SM-FA3-CX4-XXV)	August 2025	Site Condition Report, Annex B
Coal Mining Report (Reference: GS-FTH-RUW-NIP-LKC)	August 2025	Site Condition Report, Annex C
MAGIC Search (July 2025)	July 2025	Site Condition Report, Annex D
Site Walkover Photos	March 2024	Site Condition Report, Annex E
Geotechnics Limited Ground Investigation at Connah's Quay CCGT Phase IIa	August 2025	Site Condition Report, Annex F
Geotechnics Limited Preliminary Ground Investigation – Groundwater	April 2025	Site Condition Report, Annex F
Terra97 Phase 2 Ground Investigation Report for Gateway to Wales, Queensferry	April 2021	Site Condition Report, Annex F
Arcadis Phase 1 Geoenvironmental Desk Study for Crumps Yard, Connah's Quay	March 2018	Site Condition Report, Annex F
Raw Materials List	June 2025	Site Condition Report, Annex G
Figure 1 – Site Location Plan	July 2025	Site Condition Report, Annex H

Figure 2 – Installation Boundary	July 2025	Site Condition Report, Annex H
Figure 3 – Site Layout	July 2025	Site Condition Report, Annex H
Figure 5 Human Receptor Plan	July 2025	Site Condition Report, Annex H
Figure 6 Ecological Receptor Plan	July 2025	Site Condition Report, Annex H
CQOLCP-ACM-XX-XX-DR-D-10-0501– Site Drainage Plan	July 2025	Site Condition Report, Annex H
Figure SCR-01 Surface Water Features	July 2025	Site Condition Report, Annex H
Figure SCR-02 Superficial Geology	July 2025	Site Condition Report, Annex H
Figure SCR-03 Bedrock Geology	July 2025	Site Condition Report, Annex H
Figure SCR-04 Superficial Aquifers	July 2025	Site Condition Report, Annex H
Figure SCR-05 Bedrock Aquifers	July 2025	Site Condition Report, Annex H
Figure SCR-06 Water Resources	July 2025	Site Condition Report, Annex H
Figure SCR-07 Flood Map Rivers and Seas	July 2025	Site Condition Report, Annex H
Figure SCR-08 Surface Water Flood Risk	July 2025	Site Condition Report, Annex H
ES Chapter 14: Geology and Soils	April 2025	Permit Application Volume V
ES Appendix 14-A Geoenvironmental Desk-Based Assessment.	March 2025	Permit Application Volume V

2.3 Site Location

The Proposed Installation, which has an indicative area of approximately 36.2 hectares (ha), is centred at NGR 327215, 371482. The existing Connah's Quay Power Station is located to the southeast and agricultural fields to the northwest. The Proposed Installation is situated approximately 1.8 km northwest of the Connah's Quay city centre.

2.4 Site Description

2.4.1 Existing Site

The existing Connah's Quay Power Station is owned and operated by the Applicant and accessed from the A548 via Kelsterton Road. The existing power station is a four-unit CCGT plant capable of providing 1,380 MWe of dispatchable power exported to the National Grid.

The existing gas-fired CCGT generating station also includes supporting infrastructure, including settlement ponds, cooling towers, and water treatment plant, in addition to buildings for storage and workshops, administration and staff welfare, security facilities, internal access roads, and parking. Cooling water abstraction and discharge points for the existing Connah's Quay Power Station are located in the Dee Estuary, within the proposed Water Connection Corridor, adjacent to the Site.

Construction and operation of the existing Connah's Quay Power Station was authorised via a Section 36 consent granted in 1993 under the Electricity Act 1989 ('the existing Connah's Quay Power Station S36 consent'). Operation of the existing Connah's Quay Power Station is controlled by a separate

Environmental Permit, under the jurisdiction of Natural Resources Wales (NRW) – permit number EPR/NP3037AF.

2.4.2 Proposed Installation

The design of the Proposed Installation is subject to ongoing technical studies, to provide flexibility and to align with the current grid connection, but it is expected to comprise the development of two CCGT units achieving a net electrical output capacity of up to 1,380 MWe onto the national electricity transmission network.

The Proposed Installation will comprise a number of key elements:

- Main CCGT plant including gas and steam turbines, HRSGs, and exhaust gas treatment on the absorber via SCR;
- Carbon capture plant;
- Supporting infrastructure comprising solvent and water-treatment chemicals storage, clean water treatment plant for generation of high-purity water for use in recirculated water circuits, an electric auxiliary boiler for start-up support, emergency diesel generators for safe-shutdown during a power failure scenario, closed surface water drainage and appropriate treatment facilities, and infrastructure for natural gas import and conditioning and CO_2 conditioning and export.

The Proposed Installation will also be supported by natural gas supply, water abstraction and discharge, electrical connections, utilities, access works and CO_2 export connection.

2.4.3 Site Setting

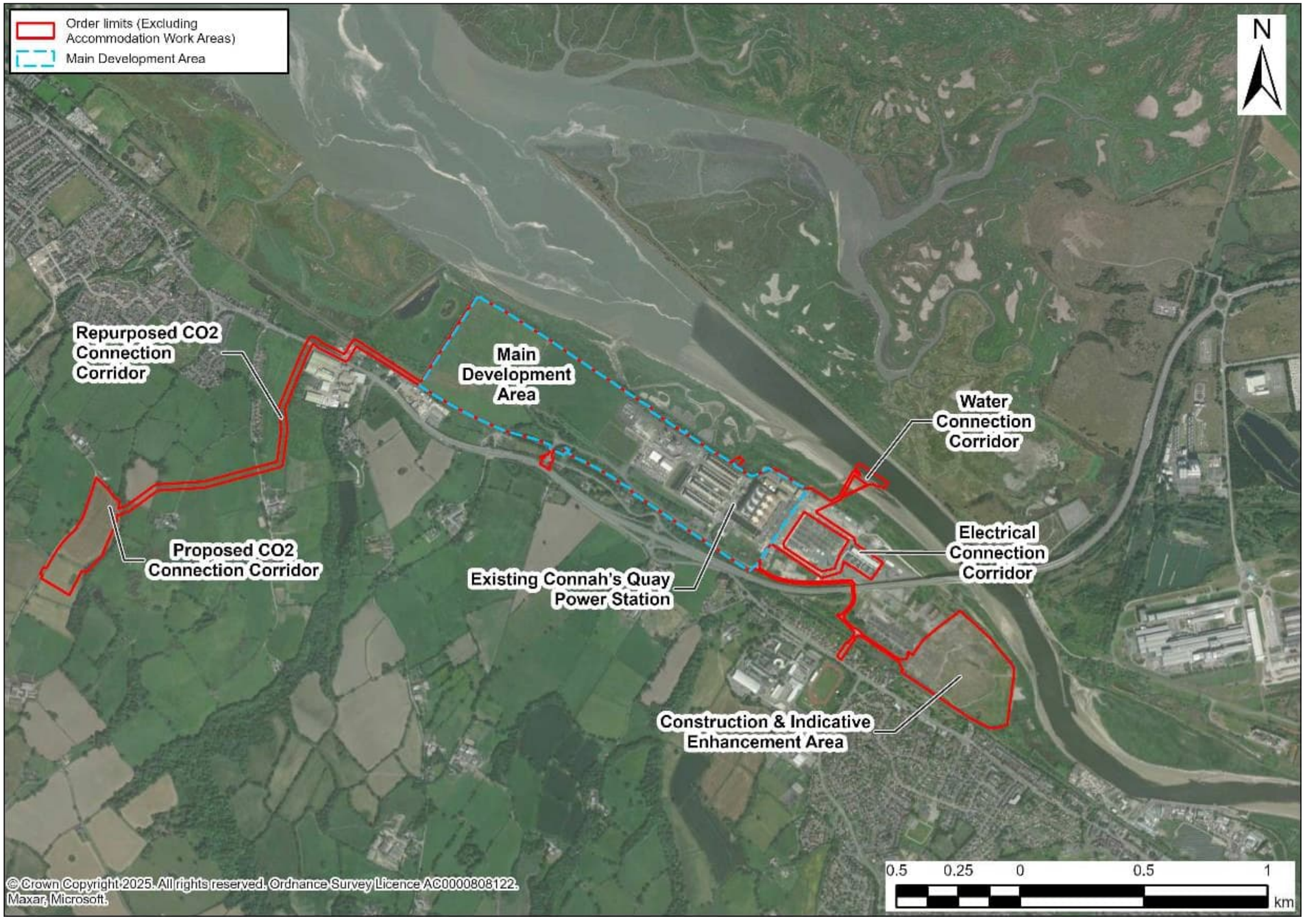
Figure 2 in Annex H shows the installation boundary of the Proposed Installation. Within its immediate surroundings:

- The existing Connah's Quay Power Station is located adjacent to the southeast;
- Agricultural fields are adjacent to the northwest;
- The River Dee and associated flood plain border the site to the northeast with the DCO Application (EN10166) Water Connection Corridor open grassland to the northwest;
- the existing National Grid 400 kilovolt (kV) Deeside Substation borders the site to the east and southeast;
- residential and commercial/ light industrial sites to the south and southwest;
- the Chester – Holyhead railway line, Chester Road / A548 road run approximately parallel to the southwestern boundary of the Site, with agricultural land beyond;
- the proposed DCO Application (EN10166) Electrical Connection Corridor, the Alternative Access to Main Site and Access to Construction and Indicative Enhancement Area (C&IEA) are located immediately to the east.

The DCO Application (EN10166) areas are shown in Plate 1 on the following page for context.

The Site is accessed via Kelsterton Road from the A548 Chester Road leading to internal access roads around the Site. These internal access roads are located between the structures of the existing Connah's Quay Power Station, between the agricultural fields to the northwest within the Site, and along the northeast boundary of the Site to give access to the existing wildlife hides and are comprised of tarmac/asphalt.

Plate 1. DCO Application (EN10166) Areas



3. Condition of the Land at Permit Issue

The following sections detail the sources of desk study information searched in order to describe the condition of the site and, in particular, to determine the potential for substances to be present in, on or under the land associated with present and past uses of the site and its surrounding areas.

3.1 Environmental Consents, Permits and Designations

A Groundsure Report (Reference Number: GS-PPI-KDK-7N3-OYR) for the site is reproduced in Annex A . This report provides extensive information and details on:

- waste management licences;
- environmental permits;
- discharge consents;
- groundwater vulnerability;
- trade effluent consents;
- records of any land pollution incidents associated with the site; and
- sensitive land uses

The Multi-Agency Geographic Information for the Countryside (MAGIC) website was searched to provide details of any:

- European Nature Conservation Sites;
- Special Protection Areas (SPAs);
- Special Areas of Conservation (SACs);
- Ramsar sites; and
- Sites of Special Scientific Interest (SSSIs).

The summary of the MAGIC search is presented at Annex D.

3.2 Environmental Setting

3.2.1 Geology

The Environmental Statement Chapter 14: Geology and Ground Conditions, Volume II Appendix 14-A Geo-environmental Desk-Based Assessment dated July 2025 (See Permit Application Volume V) presented the geological information based on a review of the BGS Geoindex website (Ref 4) and published 1:50,000 scale geological map of the area (Sheet 108, Flint) and associated memoir, (Ref 5) alongside reviewing the borehole records available from the Site. The historic ground investigations for the site are discussed in detail in Section 3.5.8 and the results of the most recent investigation undertaken by Geotechnics Limited (Ref 6) are described in detail in Section 3.6.

An overview of the geological succession across the Site is reported in Table 3 and the breakdown of expected geology from borehole records is presented in Table 4. The published geology and historical boreholes used for the review are presented in Figures SCR- 01– SCR-05 inclusive (See Annex H). The British Geological Survey Sheet 108, indicate the bedrock to dip approximately 25° to the east.

Table 3: Summary of anticipated Geology

Geology	Lithological Description	Expected Location
Made Ground	Made Ground is an area where the pre-existing (natural or artificial) land surface is raised by artificial deposits. The purpose of the Made Ground is unspecified.	Present across of the Proposed Installation.
Superficial Deposits		
Till	Unsorted and unstratified drift, generally over consolidated, deposited directly by and underneath a glacier without subsequent reworking by water from the glacier. It consists of a heterogenous mixture of clay, sand, gravel, and boulders varying widely in size and shape (diamicton).	Present at the across the site and a small area north of it.
Tidal Flat Deposits	Tidal flat deposits, including mud flat and sand flat deposits, form extensive nearly horizontal marshy land in the intertidal zone that is alternately covered and uncovered by the rise and fall of the tide. These deposits consist of unconsolidated sediment, mainly mud and/or sand and may form the top surface of a deltaic deposit.	All of the area except small portions of the Proposed Installation area and Access to Proposed Installation area.
Bedrock		
Pennine Lower Coal Measures Formation - mudstone, siltstone and sandstone	Interbedded grey mudstone, siltstone and pale grey sandstone, commonly with mudstones containing marine fossils in the lower part, and more numerous and thicker coal seams in the upper part	Majority of the Proposed Installation area
Gwespyr Sandstone - sandstone and argillaceous rocks, interbedded	Fine-grained, feldspathic and micaceous sandstones, cross-stratified on a variety of scales, with conglomerate-lined scours and intercalated siltstone and mudstone beds. Intertongues with Craven Group mudstones in its lower part and Pennine Lower Coal Measures Formation in its upper part. The Gwespyr Sandstone records the entry and southwards advance of a northerly derived "Millstone Grit" deltaic facies into the North Wales area.	Western portion of the Proposed Installation area.
Etruria Formation - mudstone, sandstone and conglomerate	Red, purple, brown, ochreous, green, grey and commonly mottled mudstone, with lenticular sandstones and conglomerates referred to as 'espleys'. Common pedogenic horizons, but coal seams are rare. Subordinate, lenticular sandstones and conglomerates commonly consist mostly of volcanic and lithic clasts. Intrusions of dolerite sills and dykes and extrusion of a small volume of volcaniclastic rocks are present in south Staffordshire and south Nottinghamshire	Eastern Portion of the site

Table 4: Geological Succession from Published Mapping and Historical Borehole Logs

Area	Made Ground	Superficial Geology	Bedrock	Selected Historical Borehole Records (located within approximately 50 m of the area)	Selected Borehole Records from Geotechnical Limited Study (April 2025)
Proposed Installation Area	BGS mapping indicates that Made Ground is present across the majority of the area. According to Geology of the Country Around Flint: Memoir for 1:50 000 Geological Sheet 108 (England and Wales), fly-ash, a by-product of coal-burning for power generation, forms part of the made ground in the vicinity of Connah's Quay Power Station.	Tidal Flat Deposits (Clay, Silt and Sand), except for a small area in proximity of the Access to Main Installation Area.	Western and eastern areas: Pennine Lower Coal Measures Formation (mudstone, siltstone and sandstone, up to 180 m thick) with 4 no. inferred coal seams. Central area: Etruria Formation (mudstone, sandstone and conglomerate), up to 300 m thick Interbedded in the western and central areas with Gwespyr Sandstone (sandstone and argillaceous rocks), up to 260 m thick. 6 no. north-south trending faults are mapped in the area. 4 no. inferred coal seams subcropping below the superficial deposits across the Main Installation Area.	Two borehole records available on site: Ref. SJ27SE16, eastern part of the area: Fly-ash to the depth of 1.50 metres below ground level (m bgl), followed by black organic silty sand to 2.70 m bgl, and grey silty clayey sand with organic matter to a depth of 5.80 m bgl, stiff to hard blue grey and red-brown mottled shaley fissured clay to 9.10 m bgl. Mudstone interbedded with siltstone and occasional sandstone beds from 10.06 to 34.90 m bgl, with suspected faults (indicated by presence of gouge*) at 10.70 and 27.60 m bgl and a coal layer noted at 30.70 m bgl; sandstone bed below, up to 54.70 m bgl, underlain by mudstone to 55.80 m bgl (maximum borehole depth). Water strike recorded at 11.6 m bgl. Ref. SJ27SE23, west of the area: Fly ash to 1.80 m bgl, followed by series of silty organic clays, black organic sandy silt and black organic silty sand to 5.20 m bgl, grey brown sand to the depth of 9.45 m bgl, followed by gravel and cobbles to 10.06 m bgl. Siltstone with varying shale partings to the depth of 38.70 m bgl, changing to mudstone and with a recorded fault at 41.30 m (noted due to presence of gouge*), with more mudstone-dominated beds to 65.80 m bgl, siltstone and sandstone beds to 71.30 m bgl (maximum borehole depth). Water strike at 0.91 m bgl.	***BH01 (northwest boundary)*** Grass over topsoil to 0.2m bgl, followed by dark grey slightly gravelly clayey fine to coarse SAND with occasional rootlets. Gravel is angular to subangular fine to coarse of various lithologies including mudstone to 4.0 m bgl. Next is light greyish brown to coarse sand with occasional shell fragments to 18.3m m bgl followed by Firm brown slightly sandy slightly gravelly CLAY. Gravel is angular to subangular fine to coarse of various lithologies including mudstone to 19.8m bgl underlain by moderately weak to medium strong medium bedded grey mudstone to 23.5m bgl (maximum borehole depth). Water strike recorded at 2.5 m bgl. ***BH02 (southern boundary - central)*** Grass over topsoil: soft dark brown sandy clay with many rootlets to 0.2 m bgl, followed by dark brown silty fine to medium sand to 0.5m bgl and then dark grey locally black very silty fine to medium sand to 4.5m bgl. This is followed by dark grey locally black sandy silt to 5.9 m bgl, then greyish brown slightly silty fine to medium sand to 8.1 mbgl, underlain by strong to very strong thinly bedded locally flow banded grey fine-grained siltstone to 13.5m bgl (maximum borehole depth). Water strike recorded at 0.5 m bgl. ***BH03 (central to Proposed Installation)*** Grass over topsoil: soft dark brown sandy clay with many rootlets to 0.2 m bgl, Loose to medium dense grey slightly gravelly sandy silt. Gravel is fine to medium subangular to subrounded of various lithologies to 5.0 m bgl. Medium dense grey slightly gravelly slightly silty fine to medium sand to 14.0 m bgl (note becomes greyish brown at 5.2 m, then light yellowish brown, slightly silty at 6.7 m and occasional shell fragments present from 7.5 m). Then dense grey slightly silty, slightly sandy subangular to rounded fine to coarse gravel of sandstone to 14.m bgl, followed by firm to stiff brown, slightly sandy slightly gravelly clay to 15.0 m bgl (gravel is subangular to rounded fine to coarse of various lithologies, predominantly sandstone), followed by extremely weak to very weak thinly laminated grey weathered mudstone to 15.7 m bgl. This is underlain by weak to moderately weak thinly laminated grey siltstone to 20.5 m bgl (maximum borehole depth). Water strike recorded at 1.2 m bgl. dense ***BH04A (north area adjacent to existing CO2 above ground infrastructure (AGI)*** Grass over topsoil: firm dark greyish brown slightly gravelly sandy clay with many rootlets. Gravel is angular to subrounded fine to coarse of various lithologies predominantly mudstone to 0.1 m bgl followed by loose to medium dense dark brownish grey very gravelly clayey to very clayey fine to coarse sand with occasional rootlets. Gravel is angular to subrounded fine to coarse of various lithologies predominantly mudstone to 9.5 m bgl. The medium strong, medium bedded fine to medium-grained sandstone to 12.7m bgl underlain by strong thickly laminated dark reddish grey very fine-grained mudtone to 15.5 m bgl (maximum borehole depth). Water strike recorded at 2.2 m bgl. ***BH05D (southeastern corner adjacent to existing power station)*** Grass over topsoil: firm dark greyish brown slightly gravelly sandy clay with many rootlets. Gravel is angular to subrounded fine to coarse of various lithologies predominantly mudstone to 0.6 m bgl followed by medium dense to dense light brown gravelly slightly silty sand to 4.0m bgl and firm dark brown sandy clay to 5.0 m bgl. The medium dense dark grey clayey fine to coarse sand with occasional shell fragments to 8.5 m bgl underlain by medium strong to strong

Area	Made Ground	Superficial Geology	Bedrock	Selected Historical Borehole Records (located within approximately 50 m of the area)	Selected Borehole Records from Geotechnical Limited Study (April 2025)
					thinly bedded grey finr to medium-grained sandstone with occasional veins to 14.5 m bgl (maximum borehole depth). Water strike recorded at 3.0 m bgl.
Proposed Installation Area Access Works	Not present on BGS mapping.	Till (Devensian) in the southern portion of the area; no superficial deposits mapped in the northern portion.	Gwespyr Sandstone – sandstone and interbedded argillaceous rocks. Pennine Lower Coal Measures Formation – mudstone, siltstone and sandstone in the western corner. 2. no faults trending north-south on eastern and western sides of the area.	No borehole records available for review within boundary nor within close proximity.	None
Alternative Access to Proposed Installation Area and Access to C&IEA	BGS mapping indicates that Made Ground is present across majority of the area.	Tidal Flat Deposits (Clay, Silt and Sand) in the northern portion of the area; no superficial deposits mapped in the southern portion.	Predominantly Pennine Lower Coal Measures Formation – sandstone. Pennine Lower Coal Measures Formation – mudstone, siltstone and sandstone. 2. no faults, one trending northwest-southeast, and one trending east-west.	Two borehole records available 50 m south of the area: Ref. SJ27SE374: topsoil to 0.40 m bgl, followed by Made Ground comprising of dense sandstone fill to 0.70 m bgl. Clays with varying sand and silt contents to 6.70 m bgl, followed by weathered mudstone to 7.10 m bgl (maximum base of borehole). Water seepage at 2.80 m bgl. Ref SJ27SE375: topsoil to 0.20 m bgl, silty slightly sandy clay with gravel and occasional sand partings (potential Made Ground) to a depth of 0.80 m bgl. Firm to stiff silty slightly sandy clay with little gravel was recorded to a depth of 7.20 m bgl. Very weak silty mudstone to a depth of 7.60 m bgl. Water seepage at 2.50 m bgl.	None

The Etruria Formation (sandstone) was not mapped beneath the Proposed Installation but has been mapped approximately 190 m southwest of the Main Installation Area.

3.2.2 Mining and Ground Workings

3.2.2.1 Coal Mining

The Environmental Statement Chapter 14: Geology and Ground Conditions, Volume II, Appendix 14-A Geo-environmental Desk-Based Assessment dated March 2025 (Permit Application Volume V) identified that according to the BGS mapping (Ref 30) there are four inferred coal seams subcropping below the superficial deposits across the Site. These are identified as the Llwyneinion Half Yard coal seam in the central portion of the Site (although one linear feature mapped as conjectural) and the Premier seam, in the eastern portion and at the western most corner of the Site.

According to the BGS memoir, the Llwyneinion Half Yard coal seam can be up to 1 m thick in the Flintshire coalfield area, and regionally the Premier coal seam can be up to 2 m thick, suggesting that those seams are of workable thickness. As the seams are within the Lower Coal Measures strata which are constrained to parts of the Site via folding/faulting, they do not dip underneath large parts of the site.

According to The Mining Remediation Authority Map Viewer, the site lies within a Coal Mining Reporting Area. The southeastern part of the main Site, the alternative access to the main Site area and access to C&IEA, lie within a Surface Coal Resource Area. This defines areas of coal resources capable of being extracted by surface mining methods, often referred to as 'opencast'. A copy of 'The Coal Mining Report (Reference: GS-FTH-RUW-NIP-LKC) is presented in Annex C.

Two small areas of the Site are indicated to be within a Development High Risk Area approximately 65 m to the south of the main Site. These correspond to recorded mine entries and their potential zone of influence. These entries also correspond to underground workings presented in the Groundsure GIS database, and to an unspecified old shaft and coal pits shown on historical mapping.

According to the BGS Geoindex online viewer(REF3), the Site is indicated to have shallow coal present including: buried coal resource overlain by up to 50 m overburden and noted to be in a primary opencast coal resource area within the western portion of the site, secondary opencast coal resource area and tertiary opencast coal resource area within the eastern portion of the site.

3.2.2.2 Non-Coal Mining

Table 5 summarises the non-coal mining potential of the Site, based on the BGS data presented within the Groundsure GIS database.

Table 5: Non-coal Mining Potential

Area	Commodity Type
Proposed Installation Area	Mineral Vein Iron Ore (bedded) Baryte (a mineral consisting of barium sulphite), in the eastern part of the area
Access to Proposed Installation Area	Mineral Vein Iron Ore (bedded) in the western corner of the area
Alternative Access to Proposed Installation Area and Access to C&IEA	Iron Ore (bedded)

With regard to the past or current underground workings for the aforementioned mineral commodities, the Groundsure dataset indicates that:

- underground workings for the extraction of Iron 'may have occurred in the past or current mines may be working at significant depth to modern engineering standards. Potential for difficult ground conditions are unlikely and are at a level where they need not be considered.'
- with regard to vein minerals, these are indicated to be 'uncommon, although the geology is similar to that worked elsewhere. Potential for difficult ground conditions are unlikely and are at a level where they need not be considered.'

- baryte underground workings ‘may have occurred in the past, or current mines may be operating to modern engineering standards. Potential for difficult ground conditions should be considered’.

The Groundsure dataset indicates the presence of several ground workings within 250 m from the Site which appear to be associated to surface quarrying only:

- Gravel pits 100 to 190 m, and an unspecified old quarry 180 m west of the Repurposed CO_2 Connection Corridor;
- Unspecified quarry 170 m southeast of the C&IEA; and
- ‘Sand pit’ and ‘Old Sand Pit’ 100 m east of the Proposed CO_2 Connection Corridor.

It is noted that the latter appears to be associated with the Historical Mineral Planning Area titled “Little Leadbrook Farm” comprising sand and gravel, which extends further west and overlaps within the Proposed CO_2 Connection Corridor. However, historical mapping does not provide evidence that actual quarrying works occurred within the Site boundaries.

3.2.3 Hydrogeology

3.2.3.1 Aquifer Classification

The Environmental Statement Chapter 14: Geology and Ground Conditions, Volume II, Appendix 14-A Geo-environmental Desk-Based Assessment dated March 2025 (Permit Application, Volume V) recorded the information on hydrogeology which is summarized in this section.

NRW aligns with the Environment Agency’s Groundwater Protection Policy which adopts aquifer designations that are consistent with the Water Framework Directive, namely:

- Principal Aquifer: ‘layers of rock or drift deposits that have high intergranular and/or fracture permeability - meaning they usually provide a high level of water storage. They may support water supply and/or river base flow on a strategic scale’.
- Secondary A: ‘permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers.
- Secondary undifferentiated: ‘layers previously designated as both minor and non-aquifer in different locations due to the variable characteristics of the rock type’.

According to this system:

- The Tidal Flat Deposits and the Till present on site are classified as Secondary (Undifferentiated) Aquifers. The Tidal Flat Deposits are classified as an Unproductive Aquifer.
- The Pennine Lower Coal Measures Formation, the Gwespyr Sandstone and Eturia Formation are classed as Secondary A Aquifers: these are permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers.

3.2.3.2 Groundwater Vulnerability

The definition of the groundwater vulnerability to pollution is as follows;

- High: ‘Areas able to easily transmit pollution to groundwater. They are characterised by high leaching soils and the absence of low permeability superficial deposits’.
- Medium: ‘Areas that offer some groundwater protection. Intermediate between high and low vulnerability’.
- Low: ‘Areas that provide the greatest protection to groundwater from pollution. They are likely to be characterised by low leaching soils and/or the presence of low permeability superficial deposits’.

Mapping provided by the BGS included within the Groundsure GIS dataset outlines the combined vulnerability of groundwater to pollution and has been classified as medium and high.

3.2.3.3 Groundwater Source Protection Zones

According to NRW (Ref 12), the Site does not lie within a Source Protection Zone (SPZ) and there are no SPZ within 1 km of the Site.

3.2.3.4 Groundwater Quality

According to the Groundsure GIS dataset, the Site and study area overlie the Dee Carboniferous Coal Measures WFD groundwater body, which was classified as being of 'poor' overall quality in 2017.

3.2.3.5 Groundwater Abstractions

Groundsure GIS dataset does not report any licensed groundwater abstraction recorded within the Site and none within the extended 1km study area for groundwater abstractions. According to the NRW online map viewer there are no groundwater abstractions within 1 km of the Site.

3.2.3.6 Groundwater Levels

Groundwater levels were identified within the borehole records summarized in Table 6 **Error! Reference source not found.**. These indicate generally shallow groundwater levels mostly within the superficial geology. Based on the historical records from the above-mentioned boreholes (see Table 4) groundwater strikes were recorded at depths from 2.50 to 2.80 m bgl in proximity to the Alternative Access to the Site. A water strike at 0.90 m bgl was recorded within Made Ground at the Site. There is one record of groundwater strikes within the bedrock geology, at the depth of approximately 11.60 m bgl on the Site.

With respect to the 2025 Geotechnical Limited report (Annex F), groundwater strikes were also recorded in superficial geology and follow on monitoring in February and March 2025 showed similar readings as shown in Table 6.

Table 6. Groundwater Levels

Borehole	Location	Groundwater Strike	Feb 2025		Mar 2025	
			1	2	1	2
BH01	NW boundary	2.5	2.64	2.91	2.64	2.97
BH02	S boundary (central)	0.5	1.08	0.46	1.34	0.46
BH03	Central	1.2	2.34	2.5	2.23	2.53
BH04A	N area adjacent to existing AGI	2.2	3.13	3.16	2.93	3.15
BH05D	Central adjacent to existing power station	3.0	1.68	3.68	1.76	2.34

Based on the most recent monitoring, this suggests that these levels are generally representative of the groundwater across the Proposed Installation area.

In terms of the wider existing power station area, the 2025 Geotechnical Limited investigation (Annex F) also installed boreholes to the east of the Proposed Installation to establish groundwater levels at the existing power station. These boreholes included:

- BH06B (northeast boundary) – water strike at 6.0m bgl. Jan – Mar 2025 monitoring showed levels ranging from 3.95 – 4.2 m bgl.
- BH07 (southeast boundary) - water strike at 1.03m bgl. Jan – Mar 2025 monitoring showed levels ranging from 1.34 – 2.32 m bgl.
- BH08A (eastern boundary of CI&EA) - water strikes at 1.2m, 6.0m and 13.5 mbgl. Jan – Mar 2025 monitoring showed levels ranging from 1.68 -1.73 m bgl.

In terms of the wider Connah's Quay area beyond the installation boundary, the publicly available borehole records were very limited. There is insufficient information to conclude at this stage whether the levels recorded on site are representative of true groundwater levels across the wider area. Given the proximity to the River Dee estuary, tidal influence on groundwater levels is possible. NRW does not hold any groundwater level monitoring data within a 1 km radius from the Site Boundary.

3.2.4 Hydrology

3.2.4.1 Surface Water Courses

There are numerous surface water features located within the study area. These are presented in Table 7.

Table 7: Surface Water Features

Surface Water Feature	Closest Distance to the Area and Direction
River Dee / Dee Estuary	60 m northeast at closest point.
Kelsterton Brook	Parallel to the northern and southern boundaries, crossing the Site (culverted beneath cooling towers); discharging into River Dee.
Lead Brook (and associated drains further to the west, and Oakenholt reservoir to the south)	200 m to the northwest.
Old Rockcliffe Brook	200 m to the south
Oakenholt Brook	125 m south
Unnamed brooks/drains	30 – 200 m to the south.
Network of ponds/marshes	Adjacent to the northern boundary of the Site.
Three ponds	Within 50 – 150 m to the west.
Unnamed brook / drain	23 m north of the alternative access to the Site
Unnamed pond	170 m south of the alternative access to the Site

The River Dee is listed as having the following River Quality classification:

- Moderate – overall;
- Fail – chemical; and
- Moderate – biological.

3.2.4.2 Surface Water Abstractions

The Groundsure GIS dataset does not report any surface water abstractions within 250 m of the Site.

According to the NRW online map viewer, there is one surface water abstraction permit, located within the footprint of the Water Connection Corridor, on the River Dee. The permit is effective from 2017 for abstraction from the River Dee Estuary associated with Connah's Quay Power Station, operated by Uniper UK Limited for energy production.

3.2.4.3 Nitrate Vulnerable Zones

According to the Groundsure dataset, there are no nitrate vulnerability zones (NVZ) within 250m of the Site.

3.2.4.4 Drinking Water Protected Areas

The Groundsure GIS dataset does not report any Drinking Water Protected Area (surface water) for the Site and the study area.

3.2.5 Flood Risk

The Site is situated on the south bank of the River Dee. These sites are potentially at risk from fluvial, tidal and, to a lesser extent, surface water flooding.

Based on the NRW Flood Risk Check webpage (accessed on 4 June 2025), the site and area within 10 m of the site has very low risk (risk less than 0.1% chance each year) of flooding from rivers and from the sea, and medium risk (risk between 1% and 3.3% chance each year) of flooding from surface water and small watercourses. The area of the site located does not benefit from flood defenses.

A summary of flood risk is provided in the Table 8.

Table 8: Flood risk zone

	Development Advice Map (DAM) flood zones	Flood Map for Planning (FMP) flood zones (Rivers and Sea)	FMP flood zones (surface water and minor watercourses)
Main Installation Area	Flood Zone C1 and Flood Zone B	Flood Zone 3 (sea) and Flood Zone 2 (sea)	Flood Zone 3 and Flood Zone 2
Alternative Access to Installation Area and Access to C&IEA	Flood Zone C1 and Flood Zone B	Flood Zone 3 (sea)	Flood Zone 3, and Flood Zone 2

3.3 Sensitive Land Uses

The nearest residential receptors to the Site are located along Kelsterton Road, with the closest receptor being approximately 20 m from the Site. Land to the south and south-west is predominantly rural in nature, with interspersed residential properties and agricultural land.

A number of nationally designated ecological sites are situated within close proximity of the site; including Dee Estuary Site of Special Scientific Interest (SSSI)/ Special Protection Area (SPA)/ Ramsar site located immediately of the Site. Details are summarised in Table 9.

Table 9: Summary of Sensitive Land Uses

Sensitive land use	Distance and direction from the Site
SPA – The Dee Estuary	Located within the Water Connection and slightly overlapping the Main Installation Area to the north and west, and adjacent to the Repurposed CO_2 Connection Corridor and the C&IEA.
SAC – Dee Estuary	Located within the Water Connection Corridor and adjacent to the northern boundaries of the Main Installation Area (slightly overlapping along the western boundary), the Repurposed CO_2 Connection Corridor and the C&IEA.
SSSI – River Dee and Dee Estuary	Located within the Water Connection Corridor and adjacent to the northern boundaries of the Main Installation Area (slightly overlapping along the western boundary), the Repurposed CO_2 Connection Corridor the C&IEA.
Conserved Wetland Sites (RAMSAR)	Located within the Water Connection Corridor, slightly overlapping the Main Installation Area to the north and west, and adjacent to the northern boundaries of the Repurposed CO_2 Connection Corridor and the C&IEA.
Connah's Quay Power Station Nature Reserve (non-statutory)	Located within Water Connection Corridor and to the west and north of the Main Installation Area and in association with River Dee and its plains
Green Wedge	Located approximately 35 m south of the Access to the Main Installation Area

A further four European designated sites are located within 15km of the Site:

- River Dee and Bala Lake/ Afon Dyfrdwy a Llyn Tegid, a Special Areas of Conservation (SAC) located 520m north.
- Deeside and Buckley Newt Sites, an SAC located 2.1 km south.
- Halkyn Mountain / Mynydd Helygain, an SAC located 5.3km west.
- Alyn Valley Woods / Coedwigoedd Dyffryn Alun, an SAC located 8.5 km south west.

There are number of Local Wildlife Sites within 2 km of the sites: Leadbrook Wood LWS, Top-y-fron Dingle and Kelsterton Brook LWS, Llwyn-onn LWS, Caeau Alt-vois LWS, Cheshire Farm LWS.

There are no National Parks, National Nature Reserves, Local Nature Reserves, Biosphere Reserves, Forest Parks, Marine Conservation Zones, National Landscapes or Conservation Areas in and around the Site.

The whole of the Site is located within a SSSI Impact Risk Zone.

3.4 Pollution History

3.4.1 Pollution Incidents Which May Have Affected the Land

There are numerous entries detailed within the Groundsure report (Reference Number: GS-PPI-KDK-7N3-OYR) associated with pollution incidents located within the Site and these have been summarized below.

Two pollution incidents located in the central part of the Site occurred in 2002 and 2003. The former was related to pollution by 'unidentified oil (oils and fuel)' and the latter by 'insulating and cable oil (oils and fuel)'. Both were of a minor (category 3) impact to land and no impact (category 4) to water and air.

Two pollution incidents also located in the central part of the Site related to pollution by chemical odour. Both of them were of minor (category 3) impact to air and no impact (category 4) on water and land and occurred in 2002.

According to Site records, an additional incident occurred at Connah's Quay Power Station in 2013, and this was classified as Category 3; this is related to the loss of hydrochloric acid to the ground. It is noted that this incident is not reported within the Groundsure report (Reference Number: GS-PPI-KDK-7N3-OYR) datasets.

There are multiple pollution incidents located within 500 m of the Site (outside the installation boundary) and those which resulted in an impact to land or water are summarised below:

- one pollution incident located approximately 200 m south of the Access to the Site and caused by 'general biodegradable materials and waste'. This was of minor (category 3) impact on air, land and water and occurred in 2001;
- twenty-two pollution incidents associated with Oakenholt Paper Mill, which is located adjacent to the northern portion of the Repurposed CO_2 Connection Corridor. There were two contaminated water pollution incidents associated with firefighting runoff, varying from minor (category 3) to no impact (category 4) on land and occurred in 2013
- one pollution incident located approximately 200 m north of the C&IEA, within the River Dee. No details are provided.

3.4.2 Historical Land Uses

Historical mapping has been reviewed to evaluate the potential for past activities, both on and adjacent to the Site, to have impacted upon its environment and land quality. Historical Ordnance Survey (OS) maps of the Site were obtained from Groundsure Insights and are presented in **Annex B**. The available mapping dates were between 1869 – 2024. Where dates are given in the text, these refer to dates of maps on which the features appear, and do not necessarily refer to exact dates of construction, or operation of any facility.

Table 10: Historical Development

Area	On-site	Within 250 m of the boundary
Main Installation Area	Northern part of the area is indicated to be covered by water (River Dee) with railway cuttings along the southern site boundary (1869-1871). A historical tank is indicated in the southern part of the area between 1898 and 1959. Ground workings indicated in the southern part of the area (1909). Northern and western parts covered by sand, coal pit / shaft mapped as disused open pit adjacent to the southern site boundary, south of railway tracks (1912). Works mapped in the central and eastern parts (1959). Development of Power Station in the east, pond and an electrical pylon mapped in the southern part of the site, majority of the area indicated to be covered by rough grassland and mud (1962). Saltings, drain and cuttings mapped along the northern boundary, roads and pylons mapped in the central part of the Site (1959-1964). Three pylons mapped in central / southern area (1973). Area seems to have been infilled or levelled; 'works' are mapped in the central portion of the area (1981). Electrical substation mapped in the area formerly mapped as 'works' (1986). Current Power Station constructed between 1993 and 1995. Further development of Power Station's infrastructure in the west (2001), and no significant changes observed since.	Coal shaft mapped approximately 50 m south of the southern boundary, Oakenholt Mill is noted 200 m to the west, and agricultural fields to the south-east of the Site (1869-1871). Marshes indicated along the southern boundary, sand in the central part and beyond northern boundary. Oakenholt Mill for paper was mapped 200 m to the west of the south-western corner of the Site, and a reservoir mapped approximately 300 m to the west, likely associated with the mill (1889). Unspecified tank mapped approximately 75 m south-west of the area (1989). Brewery and farms noted south of the area (1938). Car garage mapped to the south, in proximity to where open pit used to be, further development of properties to the west of the south-western corner of the area (1959). Marshes mapped to the north of the boundary (1962). A pond orientated parallel to the area's southern boundary mapped adjacent to the railway line between 1962 and 1993. Complex network of marshes beyond the northern boundary (1979). Glantraeth Fam mapped immediately south (2010)
Access to Main Installation Area	Area comprises part of the road in the southernmost part, and a bridge in the central and northern part; railway line is mapped adjacent to the east and west of the Site, with a tunnel feature below the bridge (1869-1870). No significant changes observed since.	Rockcliff Hall and House present to the north-east and agricultural fields present beyond the southern boundary, with a residential property approximately 200 m to the west (1869-1870). Mud and sand mapped beyond Rockcliff Hall (1870-1912). Unspecified tank mapped approximately 225 m south-east of the area (1989). A pond, and various buildings, mapped adjacent to the northern boundary (1962). Area beyond Rockcliff Hall appears to have been infilled/levelled (1959-1964). Expansion to the road to the south, Chester Road (1981). Rockcliff Hall and House no longer mapped (1986). Wave Crest no longer mapped (1993). Development of road network adjacent to the northern boundary (2001). No significant changes observed since.
Alternative Access to Main Installation Area and Access to C&IEA	Site is mostly undeveloped, and partially offshore, with a bridge over the railway line, and the southernmost part of the Site is located to the south of the railway track; rifle range located on-site (1869-1870).	A road and agricultural fields beyond the southern extent of the area, with northern and western extents noted to be within flood plain, and the eastern area covered by marshes. Rifle range located in proximity of the area (1869).

Area	On-site	Within 250 m of the boundary
	Elevated road, crossing the area, is constructed; overbridge over the railway occupies the southernmost spur of the area (1969-1970). No significant changes to the area since the removal of railway tracks crossing the area.	Saltings surrounding the western part of the area, channel network mapped to the north (1913). Park Farm and brewery located 100 m southeast (1869-1938). Buildings present to the east and west of the southernmost extent of the Site (1953). Further residential development to the south-east and residential properties to the east and west (1962-1966). Power Station and associated infrastructure to the north, east and west, technical college to the south-west (1969-1970). Railway infrastructure to the north, east and west mapped between 1962 and 1993. Further development to the Power Station infrastructure surrounding the Site, further development to the college and playing fields in the south-west and south respectively, more residential properties to the south-east of the Site (1981). Reduction of buildings associated with the Power Station to the east within the C&IEA (2001). Further development to the college in the south-west (2010, 2024).

3.4.3 Historical Land Uses and Possible Associated Contaminants

The Site was formerly occupied by saltings, areas of coastal land that are regularly covered by the tide. Reclamation commenced in 1950 and included the dredging and pumping of 800,000 tons of sand from the river to lift the ground level to around 2.5 m AOD, thereby creating the development platform for the original coal-fired power station. It was constructed in three 60 MW phases over eight years, with completion in 1958.

Embankments were created on land currently occupied by the Site to provide settlement lagoons and storage for the slurried pulverised fuel ash (PFA) arising from the coal station. As well as three cooling towers, the original station was also served by a dedicated railhead, running from the North Wales coastline to the west of the Site.

The original coal-fired station ceased operating in 1984. Demolition started in 1992 and the proposed Indicative Enhancement Area was cleared of all standing structures. Subsurface holes and pits were filled in and waste was disposed of to landfill.

The current four-unit combined CCGT and associated infrastructure (including GTP) was constructed between 1993 and 1996 in the south-east of the Site. The plant was constructed on the former PFA settlement lagoons which raised the site to its current height (maximum 7 m AOD) and the former coal-fired station site, formed part of the laydown area. The station was initially owned by Powergen/ E.ON UK and transferred to the Uniper UK Limited in 2015.

Table 11 summarizes the potential on-site and off-site sources of contamination identified in the Geo-environmental Phase 1 desk-based assessment, along with the possible contaminants associated with each source.

Table 11: Potential Sources of contaminants

Potential Source	Associated Contaminants of Potential Concern (CoPC)
Connah's Quay Power Station (formerly coal-fired, currently gas fired), including tanks, Made Ground and capped asbestos landfill	Potential for metals and semi-metals; inorganics (ammonia, sulphate, sulphide, asbestos, acids and alkalis, pH); organics (oil/ fuel hydrocarbons, PAH, volatile (VOC) and SVOC, PCB, TPH, glycols. Potential for ground gases including methane, hydrogen sulphide and carbon dioxide.
Potentially infilled pits, unspecified ground workings and quarries (on-site and off-site)	Potential for ground gases including methane, hydrogen sulphide and carbon dioxide.
Former landfill sites (on-site and off-site)	Various deposited wastes including inert, industrial and commercial waste. Potential for a range of inorganic and organic contaminants including but not limited to heavy metals, acids, organic compounds, inorganic compounds, asbestos, TPH, PAH, VOC, SVOC, solvents, lubricants, fuel oils, alkalis, PCB. Potential for ground gases including methane, hydrogen sulphide and carbon dioxide.
Infilled land: old sand pits, potentially infilled land, historical heaps (on-site and off-site)	Potential for a range of inorganic and organic contaminants including but not limited to PFA and other coal by-products, which may contain heavy metals, acids, organic compounds, inorganic compounds, asbestos, TPH, PAH, VOC, SVOC, solvents, lubricants, fuel oils, alkalis, PCB. Potential for ground gases including methane, hydrogen sulphide and carbon dioxide.

3.4.4 Visual And Olfactory Evidence of Existing and Historic Contamination

An external inspection of the wider Site was completed by AECOM Engineers on the 25th March 2024 and 24th July 2024. The aim of the visits was to review the range of activities carried out at the existing Site and to record any visible potential sources of ground contamination or ground related constraints. Site walkover photos are provided in Annex E.

During the site visit, the AECOM Engineer was accompanied by representatives of the Applicant who provided a tour of the operational parts of the existing Connah's Quay Power Station site. Areas excluded from the walkover due to safety and access constraints included the Electrical Connection Corridor, Water Connection Corridor, the Alternative Access to Main Installation Area and Access to C&IEA, and the Surface Water Outfall Area. Permission was only available for observation of the Proposed CO_2 Connection Corridor from public areas e.g. the adjacent road.

Within the Proposed Installation Area it was not possible to access the westernmost two fields. The wider site incorporates both the existing Power Station and the proposed CCGT and CCP sites to the west of the current Power Station.

3.4.4.1 Existing Power Station Area

The existing Power Station is a gas turbine Power Station; the main features of the infrastructure are the four gas turbines located on the eastern end of the Main Installation Area, with four associated cooling tower runs located to the west of the turbines (Photos 2 to 7).

Three large water reservoirs are located at the existing Power Station, all above ground with sloped sides of either gravel or grassed materials. This is presumed to be reworked natural material. One reservoir is located to the immediate south of the turbines. The other two are connected and located to the west of the cooling tower runs (Photos 3, 19, 29, 32, 34).

The main offices and control rooms are located to the north-east of the turbines (Photo 11); with the entrance and security buildings located to the south, off of the access road which forms the southern boundary.

To the west of the Power Station is a 'contractor's yard' which includes a hardstanding carpark to its south (Photos 33, 35, 36). The contractor's yard has a gravelled laydown area for contractor portacabins with designated spaces each with a power point (Photo 37) and an asphalt roadway running east to west through the centre. An underground tank with plastic cover (Photo 35) is present in the south-eastern end of this area between the carpark and laydown area, and a cess pit is noted to be below ground on the western side of the contractor's yard just outside of the fence within an area of gravel (Photo 40).

While the existing Power Station is primarily above ground level, the turbine halls have machine and service pits that run throughout the building and across the Main Installation Area, and the cooling tower runs also have approximately 3 m drops in topography between the runs, which are gravel lined, and presumed to be associated with services and functioning as a bund (Photos 2, 5, 6, 7 and 9).

In the south-eastern end of the area is a toilet block and storage for hazardous materials and waste materials including units for storing used and full oils containers, gas cylinders and other potentially contaminative waste (Photo 21). The area also includes a laydown area for site equipment including scaffolding and barriers.

On the southern side of the southernmost cooling tower run a leak was noted during the walkover which has left black staining of the side of the towers building and the gravel below. This may be associated with a drainage pipe at this point (Photo 28).

There are a number of large tanks on site. Three large tanks are located on the north side of the turbine halls (Photo 10 and 11), and the three smaller tanks are located on the western side, off the Main Installation Area through road (Photo 8). These as well as the other smaller tanks noted onsite are bunded with concrete walled bunds.

3.4.4.2 Proposed Installation Area

The fields to the west of the existing Power Station, are open level grassland (Photos 41 to 47). The eastern field, which was the only field able to be accessed during the site inspection, is separated from the other fields by a chain link fence with a gated access from a site road north of the contractor's yard (Photo 54).

The eastern field comprises rough grassland with exposed areas of gravelly soils. In the south-eastern end of the field are a series of service covers, some almost entirely overgrown. The northern end of the field has been used as a laydown area, the ground is largely bare and has had plastic grass matting placed down (Photos 5 to 59). A stockpile of soils is located at the western end of this laydown area where soils have been stripped this includes some damaged matting of the same type as the laydown area and other plastic sheeting (Photos 52 and 53).

3.4.4.3 Access to the Proposed Installation Area

This area is located south of the Main Installation Area, approximately 320 m west of the existing Power Station. This area is predominantly the landscaping area between the main access road to the Power Station (Kelsterton Road), and a narrow asphalt pathway leading from the A548 to this road, and it comprises part of the access road to the Power Station entrance.

The landscaped portion of this area is dominated by mature shrubs and trees with long grasses. The southern side comprises the footpath of the A548, a glass and metal bus shelter and street lighting. The area is crossed by powerlines from north to south.

3.4.5 Other Regulated Processes

3.4.5.1 Licenced Discharges to Controlled Waters and Pollutant Release

Table 12 summarises information on licenced discharges which has been collated from the Groundsure GIS dataset. Due to the shape of the Order limits, some of the entries are valid for more than one area. The overlap between them is noted with a superscript number to indicate the corresponding entry.

Table 12: Summary of Licensed Discharges to Controlled Waters

Area	Number present in relation to the Site		Details
	On-site	0-250m	
Main Installation Area	1	13	*On-site:* one expired consent associated with unspecified discharge to the River Dee, for 'Connah's Quay Rockcliffe residential properties'. *Off-site:* • two expired consents for unspecified trade discharge to the River Dee for 'Connah's Quay Power Station', located approximately 2 m off the western boundary. • one effective consent for sewage discharge of final/treated effluent into the River Dee estuary located approximately 110 m south, associated with a household waste recycling centre. • five revoked / elapsed consents for unspecified trade discharge into Lead Brook (culverted section) associated with Henry Cooke Makin Oakenholt Mill, located within 250 m to the south-west and west[4].

Area	Number present in relation to the Site		Details
	On-site	0-250m	
			• one expired consent for sewage discharge of final/treated effluent into an unnamed ditch associated with Oakenholt STW flint, located within 250 m to the south-west and west. • one effective consent for discharge of sewage associated with a pumping station into Kelsterton Brook, located approximately 120 m south[6]. • one expired consent for sewage discharge of final/treated effluent into Kelsterton Brook associated with Kelsterton storm water located approximately 150 m south-east. • one consent revoked under EPR 2010 for trade discharge – site drainage discharged to the River Dee, associated with Deeside Substation, Kelsterton Road, 110 m northeast. • one Licensed Pollutant Release Part A2 B current permit for use of bulk cement, associated with Dependable Concrete, located approximately 75 m south.
Access to Installation Area	0	1	• one expired consent associated with unspecified discharge to River Dee, for Connah's Quay Rockcliffe residential properties, located approximately 70 m east.
Alternative Access to Installation Area and Access to C&IEA	0	4	• one effective consent for discharge of sewage associated with a pumping station into Kelsterton Brook, located approximately 120 m south. • one expired consent for sewage discharge of final/treated effluent into Kelsterton Brook associated with Kelsterton storm water located approximately 150 m south-east. • one effective sewage discharge consent (ref. CM0165601) into Golftyn Brook, associated with a pumping station, located approximately 90 m south. • one effective storm overflow discharge consent (ref. CM0165601) into Golftyn Brook, associated with a storm tank, located approximately 90 m south.

3.4.5.2 Historical Licensed Industrial Activities

Table 13 summarises information on historical licensed industrial activities which has been collated from Groundsure GIS dataset for the relevant areas. Due to the shape of the Order limits, some of the entries are valid for more than one area. The overlap between them is noted with a superscript number to indicate the corresponding entry.

No records have been identified on or within 250 m of the Access to Installation Area.

Table 13: Summary of Historical Industrial Activities

Area	Number present in relation to the Site		Details
	On-site	0-250m	
Main Installation Area	0	2	Two entries located 250 m south-west of the southern boundary: • North Wales Tissue Ltd for paper and pulp manufacturing process (revoked, now IPPC), and • Billerud Beetham Ltd for paper and pulp manufacturing process (revoked).
Alternative Access to Main Installation Area and Access to C&IEA	0	7	Seven entries located adjacent to the Alternative Access to Main Installation Area and Access to C&IEA. All entries are associated with E.ON UK Plc for combustion processes and gasification. Six of these have been superseded by variations and one revoked in 2004 (now IPC).

3.4.5.3 Licensed Industrial Activities

Table 14 summarises information on current licensed industrial activities which has been collated from the Groundsure GIS dataset for the relevant areas. Due to the shape of the Order limits, some of the entries are valid for more than one area. The overlap between them is noted with a superscript number to indicate the corresponding entry.

No records have been identified on or within 250 m of the Access to Main Installation Area.

Table 14: Licensed Industrial Activities

Area	Number present in relation to the Site		Details
	On-site	0-250m	
Main Installation Area	0	8	All entries located 250 m south-west, located at Oakenholt Mill and associated with: • SCA Hygiene Products UK Ltd: o One effective permit (BJ9681IX) for disposal of non-hazardous waste involving biological treatment, and paper, pulp and board production. o Six superseded permits for disposal of non-hazardous waste involving biological treatment, and paper, pulp and board production. • North Wales Tissue Limited: o One superseded permit (BJ9681IX) for paper, pulp and board production).
Alternative Access to Main Installation Area and Access to C&IEA	0	9	Nine entries located adjacent to the Alternative Access to Main Installation Area and Access to C&IEA associated with: • Uniper: o One effective permit (NP3037AF) for refining gas and burning any fuel, and one effective permit (MP3337SH), however no further details are provided.

Area	Number present in relation to the Site		Details
	On-site	0-250m	
			• E.ON: o Six superseded permits for gasification, liquefaction and refining and combustion of any fuel, and one effective permit (RP3933ZS) for gasification, liquefaction and refining and combustion of any fuel.

3.4.5.4 Recent Industrial Land Uses

The Groundsure GIS dataset includes recent industrial land uses present on and within 250 m of the Site and these are summarised in the **Table 15** below.

Table 15: Summary of Recent Industrial Land Uses

Category	Location
Pylons	On-site and in multiple locations off-site
Electrical substation	One on-site, within the Main Installation Area Four off-site: One enclosed by the footprint of the Electrical Connection Corridor, Two located approximately 60 m and 115 m south of the C&IEA, one approximately 200 m to the north-east of the eastern boundary of the C&IEA, beyond River Tee.
Power Station	Located in the Main Installation Area, however marked in Groundsure as associated with the electrical substation enclosed by the footprint of Electrical Connection Corridor.
Tanks (recent)	Four located in the central part of the Main Installation Area within the existing Power Station footprint. Two off-site – one located approximately 200 m to the south-west of the Proposed CO_2 Connection Corridor, and one located approximately 250 m to the north-east of the northern boundary of the C&IEA, beyond the River Dee. The contents of the tanks are unknown.
Telecommunication mast	Located in the north-eastern part of the Main Installation Area, two off-site located approximately 100 m south and 245 m to the north-east of the northern boundary of the C&IEA, beyond the River Dee.
Recycling facility	Located off-site approximately 110 m to the south of the southern site boundary of the Main Installation Area, and 160 m southeast of the northern portion of the Repurposed CO_2 Connection Corridor.
Distribution and haulage	Located off-site adjacent to the Alternative Access to the Main Installation Area and Access to C&IEA.
Chimneys	Two located in the central part of the Main Installation Area, associated with the Power Station.
Water pumping station	Two located off-site 75 and 100 m south of the Main Installation Area and one 125 m south of the Alternative Access to Main Installation Area and Access to C&IEA.

3.4.5.5 Waste Management Facilities

Table 16 summarises information on licensed and historical waste management facilities present on and within 250 m of the Site collated from the Groundsure GIS dataset.

Table 16: Waste Management Processes

Subject	Number present in relation to the Site		Details
	On-Site	0-250m	
Active / recent landfill	0	1	Industrial waste infill (factory curtilage) located 245 m to the north-west of the C&IEA . The site is operated by Tata Steel UK Ltd. No further details are provided.
Licensed waste sites	0	1	Oakenholt household recycling centre located approximately 25 m south-west of the southern border of the Main Installation Area and 90 m east of the Repurposed CO_2 Connection Corridor. License was issued in 2018 for 25,000 tonnes of waste.
Historical landfill sites	4	4	<u>EA and NRW recorded landfills:</u> *On-site* • Connah's Quay Power Station landfill located in the western part of the Main Installation Area, expanding further off-site 250 m to the west and on the Repurposed CO_2 Connection Corridor. Operated by Central Electricity Generating Board and identified as having received inert, industrial and commercial waste, with the first waste input in 1977, and the last in 1991, both dates coinciding with license issue and surrender respectively. According to information provided by the FCC, the landfill was extended in 1979 and associated with pulverized fuel ash. • Connah's Quay Power Station 3 landfill located within the western and central part of the Main Installation Area, encroaching slightly off-site in the south-western corner. Operated by Central Electricity Generating Board and identified as having received inert and industrial waste, with the first waste input in 1962. • Connah's Quay Power Station 1 landfill site located in the eastern part of the Electrical Connection corridor, and extending off-site a further 190 m to the east. Operated by Central Electricity Generating Board and identified as having received inert and industrial waste, with the first waste input in 1954. According to information provided by FCC, the landfill is associated with boiler bottom ash. *Off-site* • Shotton Works – Area On North West Side of Interconnecting Road/ Shotton Works Number 1, located approximately 240 m north-east of the C&IEA, and 240 m west of the Water Connection Corridor. Operated by British Steel Plc and identified as having received inert,

Subject	Number present in relation to the Site		Details
	On-Site	0-250m	
			industrial, household waste and liquid sludge. First input was in 1945, and last in 1995. • Shotton Works landfill, located approximately 240 m to the north-east of the C&IEA. Operated by Corus UK Limited and identified as having accepted industrial and household waste. License was issued in 1993 and surrendered in 2006. Last input was noted to take place in 1995. According to information provided by FCC, this landfill area coincides with a 10-hectre landfill from 1985 with hazardous, inert, general and industrial wastes. • J. and J. Makin, located approximately 90 m west of the Repurposed CO_2 Connection Corridor. Operated by J. and J. Makin and identified as having accepted industrial, commercial, and household waste. Last input was noted to take place in 1969. <u>BGS recorded landfills:</u> *On-site* • Connah's Quay Power Station no. 3, ash lagoon, located in the western part of the Main Installation Area. No further details are provided. *Off-site* • Connah's Quay Power Station no. 1, ash lagoon, located adjacent to the eastern boundary of Electrical Connection Corridor. No further details are provided.

With regards to the on-site landfills the Applicant has advised that there is no evidence of trade or industrial waste having been deposited within the landfills associated with the Power Station. These are believed to be associated with the use of PFA as engineering fill for construction.

3.4.5.6 Hazardous Substances Storage

There is one historical Hazardous Substances Storage consent located within the study area. This is located within the Main Installation Area and it concerns the storage of up to 21 tonnes of flammable gas. No further details are provided.

3.4.5.7 Radioactive Substance Authorisations

There is one Radioactive Substance Authorisations record located 180 m south-east of the Site. The entry is associated with Glyndwr University for disposal of radioactive waste. However, its status is indicated as cancelled, effective from 19/07/1995.

3.4.5.8 Control of Major Accidents Hazards

There are no records of Control of Major Accidents Hazards (COMAH) sites or licenses present on the Site. One active listing is located within 250 m of the eastern side of the Order limits, associated with Tata Steel UK Limited.

3.4.6 Historical Tanks

According to the Groundsure GIS database, there are twelve historical tanks located within the Main Installation Area (nine within the current footprint of the Connah's Quay Power Station and three in proximity of the southern boundary).

The following historical tanks were noted outside the installation boundary:

- four historical tanks are mapped within the C&IEA.
- one tank adjacent to the north of the Main Installation Area;
- three historical tanks in the area between the Electrical Connection Corridor and C&IEA;
- two historical tanks 20 m and 220 south of Main Installation Area;
- three historical tanks 5 m south of the Repurposed CO_2 Connection Corridor;
- two unspecified located approximately 140 m and 180 m, respectively, to the south of the C&IEA; and
- eight located approximately 130 to 200 m south of the northern portion of the Repurposed CO_2 Connection Corridor; all are unspecified except one which refers to being a gasometer.

3.4.6.1 Evidence Of Damage To Pollution Prevention Measures

There was no evidence of damage to pollution prevention measures at the site during the site walkover on the 24th March and 25th July 2024.

3.5 Relevant Previous Site Investigation Reports

This section summarises thirteen previous reports relating to the Site as reported in the ES Appendix 14-A Geoenvironmental Desk-Based Assessment (Permit Application Volume V).. These have been summarised in chronological order (from the oldest to the most recent).

It should be noted that the Connah's Quay site was formally occupied by saltings (coastal land regularly covered by the tide). The C&IEA was developed in the 1950s for a coal-fired power station. Embankments were created on land currently occupied by the Main Installation Area to create settlement lagoons and storage for the slurried Pulverised Fuel Ash (PFA) arising from the coal station (mapping indicates this land was reclaimed by around the mid-1960s). The coal-fired plant ceased operations in 1984 and was demolished in the early 1990s. The current 4-unit Combined Cycle Gas Turbine (CCGT) was constructed between 1993 and 1996 on the southern part of the Main Installation Area. It comprises cooling water abstraction and discharge points in the River Dee, settlements ponds, cooling towers, water treatment plant, turbo generators and associated infrastructure. The station was initially owned by Powergen, who became E.ON UK in 2004, and was transferred to Uniper Technologies Limited in 2015.

It should be noted that many of the existing site investigation reports pre-date the existing Connah's Quay Power Station and, in some cases, coincide with the site reprofiling / reclamation works and hence the ground conditions / groundwater regimes documented in those reports will not be representative of present-day conditions.

3.5.1 Terresearch Limited (1962): 'Report on Investigation of Site Conditions at Connah's Quay for Central Electricity Generating Board'

Introduction

The aim of the investigation was to obtain data on strata succession and its physical characteristics.

Site works took place between March and May 1962, drilling 11 no. boreholes using four auger drilling rigs and one diamond rotary drill.

It should be noted that drilling locations were impossible to be inferred within the present-day layout of the Site.

Summary of Key Information

Alluvial deposits related to the River Dee were reported to cover the whole investigation area, and at shallow depths these frequently consisted of soft silty clays, and in some cases contained some organic material, and occasional thin beds of peat. However, the main part of the alluvial deposits consisted of sand, in parts silty with bands of silty clay and occasional gravel beds. Locally, thin beds of boulder clay were noted.

Superficial deposits were overlying sandstones, shales and mudstones of the productive Coal Measures. Overall, it was emphasised that considerable variations between strata across boreholes existed, particularly in the level of the bedrock, indicating intense glacial action to have taken place. Millstone Grit and the Carboniferous Limestone were indicated to underlie Coal Measures.

The water table was observed to be at the surface at some parts of the Site. The maximum depth to the water table was recorded as approximately 4.42 m bgl. Generally, water strikes were recorded at depths from approximately ground level to 9.75 m bgl.

At the surface of two of the boreholes, fly-ash deposits were noted and of a thickness of approximately 2.44 m to 3.66 m respectively.

The ground at the south-eastern end of the site was described as soft.

No specific information is provided with regards to groundwater monitoring/sampling/testing with the exception of groundwater levels/observations reported on the exploratory hole records and a brief summary of the groundwater regime in the main report text. Chemical testing was undertaken on groundwater samples but was limited to sulphur/pH testing.

3.5.2 Foundation Engineering Ltd (1963): 'Central Electricity Generating Board North West Region – Connah's Quay 400kV Substation Report on Site Investigation'

A site investigation consisting of 16 no. boreholes was undertaken between 3rd April and 4th May 1963. The investigation covered areas in proximity of the Electrical Connection Corridor, the Water Connection Corridor and northern and eastern parts of the Main Installation Area.

The aim was to inform foundation design at the site for a proposed substation adjacent to the historical main power station at Connah's Quay. The site was indicated to be built up by the placing of a hydraulic fill consisting of pulverised fuel ash (PFA).

The PFA covered the site to a depth of approximately 1.52 m bgl, overlying alluvial silty sands and sandstone, of which levels varied across the site.

Driven cast in-situ piles were determined as the best piling solution for the site.

3.5.3 Soil Mechanics Ltd (1963): 'Site investigation for proposed 400kV transmission line towers between Connah's Quay, Flintshire and Kirkby, Lancashire'

This report factually summarises a geotechnically-focussed ground investigation undertaken for a proposed 400 kV Quad transmission line between Connah's Quay and Kirkby. A discussion of the ground conditions and a foundation appraisal is provided. The report relates to the first section of the proposed transmission line from Connah's Quay to Shotwick. Therefore, only some of the investigation discussed relates to the existing Power Station area.

25 no. boreholes and 50 no. Dutch Deep Soundings tests (CPT testing) were put down at the proposed site of twenty transmission towers, along the whole line. Boreholes 33 to 37 and BN5 relate to the present-day site, referred to as 'Section 1' in the report.

Within Connah's Quay Power Station, Made Ground containing brick, coal and PFA, to depths of approximately 5.33 m bgl was encountered.

Across the Site, Upper Alluvium comprising silty clay or clayey silt with occasional organic matter were encountered in the boreholes close to the River Dee. Dense to very dense silty fine sands with occasional thin clayey seams were noted to be fairly unform across the whole area.

No specific information is provided with regards to groundwater monitoring/sampling/testing with the exception of groundwater levels/observations reported on the exploratory hole records and a brief summary of the groundwater regime in the main report text (which alludes to tidal influences on groundwater close to the River Dee). Chemical testing was limited to sulphate/pH testing. The water table was in general noted close to, or at the upper surface of the alluvial stratum, and close to the River Dee was where the water levels were affected by tidal influence. Carboniferous weathered fine and medium grained sandstone and siltstone were observed in borehole 37.

At the time of the reporting, extensive quantities of chemical waste (blast furnace slag) formed as by-products of steel manufacturing were discharged from John Summers Steelworks (present day Tata Steel), which were suggested to be corrosive in relation to embedded concrete and steel. Moreover, special consideration was advised as to the presence of organic matter in the Upper Alluvium clays and silts.

Generally, problems associated with foundations were considered and design data suggested the selection of piled or shallow pad foundations.

3.5.4 Ground Explorations Ltd (1966): 'Report on Exploration of Ground Conditions for C.E.G.B Bangor – Connah's Quay 400kV Line'

The report summarises the findings of a ground investigation which was designed to determine the ground conditions for the proposed erection of pylons for the 400kV line between Bangor and Connah's Quay.

The report references multiple sites across that line, however due to missing pages within the received report, and the lack of figures and exact references to the site's locations, it was not possible to make references to the site conditions. It is understood that sites 249, 251, 252, 253, 2K and 3K refer to Connah's Quay area, however there is no further information to the exact site location.

The ground conditions on sites 249, 251, 252 and 253 were noted to be similar, however, at site 251 Made Ground consisting of fly ash was noted to a depth of approximately 1.83 m bgl, and this Made Ground was not present at other sites. Soft alluvial silty clays frequently with organic content, fine sands and silts were observed above the bedrock of sandstone or marls. The water table was observed at or just below the ground surface.

3.5.5 C.S. Allott & Son (1968): 'Central Electricity Generating Board proposed 2,500 MW Nuclear Power Station at Connah's Quay, Flintshire, North Wales – A Civil Engineering Appreciation of the Site Volume 1'

Introduction

The report assesses the suitability of the land located next to the coal-fired power station at Connah's Quay for the proposed 2,500 MW nuclear power station. This multidisciplinary report considers many aspects of the feasibility for the site, including location, topography, access, marine and estuarine features, geology and ground conditions. The area considered for development roughly included the Main Installation Area, the Electrical Connection Corridor, the Alternative Access to Main Installation Area and Access to C&IEA, and the C&IEA.

Summary of Key Findings

The report makes references to the previous site investigation reports and points out all of them only investigated the superficial deposits and upper most part of the Carboniferous strata, as no deep drilling into rock was undertaken for the conventional power station, transmission lines and switch-stations.

The report assesses land suitability for a proposed nuclear power station which required higher bearing capacities comparing to conventional construction.

Generally, the site investigation focused on the area located between the two main faults in the area, the first one close to Oakenholt Hall, and the second one passing close to Kelsterton. No references to

the site location map with boreholes locations are present within the report, hence only the general sequence of strata found across the whole area can be summarised below:

- fill of hydraulically placed estuarine sand or pulverised fly ash to an average depth of 2.40 m bgl;
- alluvial sands overlain by organic silty clays in the area of old saltings, with varying depths between 3 m and 16.80 m bgl towards the River Dee; and
- carboniferous strata of variable material including shales, mudstones, siltstones, sandstones, coal and marls, showing great variability between boreholes.

The report indicated that groundwater level observations confirmed the tidal influence around the site.

The report discusses in detail the complexity of faulting present on site and suggests that minor faulting in the area cannot be eliminated.

It was concluded that despite the bedrock underlying the site being well suited for the support of a heavy concrete pressure vessel foundation, it was faulted and of variable quality. It was recommended that the results of a further detailed investigation are obtained to inform on secondary faults locations before the proposed layout is confirmed. Due to the presence of shallow groundwater (within approximately 3.05 m below the surface level), dewatering difficulties and weakening of strata were recommended to be considered.

3.5.6 The Cementation Co. Ltd (1968): 'Report on a site investigation at Connah's Quay Power Station for the Central Electricity Generating Board'

Introduction

The report was prepared to establish geotechnical considerations during construction of a further power station at Connah's Quay. It assesses ground conditions as a part of the feasibility study for the project and provides an assessment of possible foundation design.

The ground investigation programme comprised of drilling 13 no. boreholes using shell and auger technique, with the exception of borehole no. 3, which was extended from approximately 24.40 m to 76.20 m using rotary core drilling techniques during summer 1967. The investigated area roughly corresponds to the Main Installation Area.

Summary of Key Information

The Main Installation Area was confirmed to be underlain by variable alluvial soils, with two zones of glacial boulder clays in boreholes 10 and 11 (approximately in the central part of the Main Installation Area). Surface soils were indicated to contain a significant organic content. Fly ash was recorded in Made Ground to depths from approximately 0.30 m to 3.80 m bgl.

Surface soils were reported to overlie Carboniferous bedrock comprising shales, mudstones, siltstones, sandstones and marls. These rocks were reported to be associated with fault zones. Coal bands were recorded in the borehole logs.

Water strikes were recorded at depths from approximately 0.90 m to 6.50 m bgl.

The report summarises geotechnical parameters of the tested soils and rocks. Pile foundations were deemed to be suitable, however, a further investigation was recommended before finalising any designs.

3.5.7 Soil Mechanics Ltd (1991): 'Site Investigation Connah's Quay for Powergen Plc'

A site investigation was undertaken for a proposed CCGT power station development, at a site of a disused power station on Connah's Quay. The investigated area corresponds to the eastern portion of the Main Installation Area, with some investigation locations located north of the Electrical Connection Corridor.

The investigation comprised of 10 no. cable tool drilled boreholes, 8 no. on land and 2 no. on water, with 5 no. rotary coring follow on drilling and 23 no. trial pits. No engineering appraisal nor interpretation was provided.

The geology encountered included Made Ground comprising of PFA, overlying alluvial sands. These were underlain locally by Glacial Till. Bedrock comprised Upper and Middle Coal Measures. Apart from the presence of PFA, rare slag and clinker, no other descriptions of any contamination were observed in the log descriptions.

3.5.8 National Grid Company Plc (1994): 'Connah's Quay CCGT Banking Compound Site Investigation'

The report describes the ground investigations undertaken to inform the design of the foundations for a banking compound for the Power Station.

The programme of works comprised of four static cone penetration tests undertaken at the eastern end of the Connah's Quay CCGT Power Station site, adjacent to the existing Deeside 400kV substation (eastern end of the Main Installation

Area). The report references the 1991 site investigation conducted by Soil Mechanics Ltd and refers to the boreholes located in proximity to the banking compound, the area where CPTs were undertaken by Fugro Limited.

The tests estimated the soil types are sands of varying density with layers of clay. The depth of the tests varied from approximately 11 to 16 m bgl.

3.5.9 Uniper Technologies (2005): 'Connah's Quay Site Report for PPC Application- MP3337SH'

Introduction

The site report was submitted as part of an application to the Environment Agency for a permit to operate Connah's Quay Power Station under Regulation 10 of the Pollution Prevention and Control (England and Wales) Regulations 2000. The report reviews records of the site and its surroundings to describe the site condition with a focus on identifying any substance on or under the land that may constitute a pollution risk to the land. Pollution prevention measures are identified and an assessment of pollution potential to land is presented.

The report was based on geotechnical and contamination studies of the Site carried out by Powergen (later renamed E.ON UK), prior to construction the of the plant. The site owned by E.ON UK comprised of the western part (with power station and gas treatment plant, and 11 hectares of nature conservation 'mitigation area' further to the west) and the eastern part (comprising former Connah's Quay power station site). These two parts were separated by land with a 400 kV substation, owned by the National Grid Company.

Summary of Key Information

Existing site investigation undertaken by Soil Mechanics (1991), WS Atkins (2000) and groundwater sampling and analysis data from Parsons Brinckerhoff (2005) is referenced. The conceptual site model includes for various groundwater monitoring information from between 1997 and 2005.

The report includes a list of chemicals stored on site and comments on the storage safety. The chemicals noted on site include diesel fuel, oil, antifreeze, lubricant oil, 15% sodium hypochlorite, sulphuric acid, sodium hydroxide, ammonium, hydrazine solution, tri-sodium phosphate, phosphate ester oil, heat transfer liquid (30% monoethylene glycol).

All hard standing areas associated with storage were checked and no evidence of damage or staining were observed. The report notes that two rounds of groundwater sampling were undertaken during 2005 and concluded that sodium/chloride concentrations indicate probable hydraulic continuity of groundwater with the tidal river water; however, it is stated that water levels recorded since 1997 show that the tidal cycle has no significant effect on groundwater levels in the superficial deposits.

During the 2005 rounds of groundwater monitoring no significant concentrations of List I substances (Groundwater Regulations 1998) were detected; it was suggested that arsenic (marginally elevated) and molybdenum concentrations may reflect the extensive use of PFA as a fill material at the site.

The conceptual site model concludes that shallow groundwater within the alluvium forms a potential receptor; given the brackish nature of the receptor and its continuity with the River Dee, the main significance of groundwater may therefore be as a potential pathway to the salt marshes and river.

3.5.10 RPS (2015): 'Contaminated Land Due Diligence, Connah's Quay Power Station Summary Report'

Introduction

RPS was commissioned by E.ON to undertake a Phase 1 Contaminated Land Due Diligence Assessment of Connah's Quay Power Station and surrounding areas under E.ON's land holding. The purpose of the assessment was to establish the locations of known and potential sources of contamination and the need for further action and/or investigation and likely remedial costs.

The assessment included zoning of the whole Site and included: Zone 1 – Nature Conservation and Surrounding area (part of Main Installation Area), Zone 2 – Cooling Towers, Water Processing and Gas Plant (Main Installation Area), Zone 3 – Power Station Turbine and Boiler Houses (Main Installation Area and Water Connection Corridor) and Zone 4 – Former Demolished Power Station Site (C&IEA). The determination of exact borehole locations in relation to the Site mentioned in this report was not possible.

Summary of Ground Conditions

It was reported that Made Ground ranged from 1.6 m to 4.0 m bgl in Zones 1-3, with noted bands of PFA. It was suggested that crushed material from the demolition of the former Connah's Quay Power Station in Zone 4 may have been used to raise site levels in depressions within Zone 4, supported by upper layers of granular Made Ground with occasional concrete, brick and ash.

Zones 1-3 are predominantly underlain by superficial deposits of Alluvium at depths of between 9.7 to 19.7 m bgl. Boreholes drilled within the channel of River Dee were reported to contain Glacial Till below the alluvial deposits, at depths of between 11.8 m to 20.2 m bgl.

The Pennine Lower Coal Measures comprised interbedded mudstones, siltstones and sandstones present at varying depths below the superficial geology, with rockhead between 9.7 m and 20.2 m bgl. Rockhead in Zone 4 comprising siltstone and mudstone was reported to be present from 9 m bgl in southern areas, deepening to 12-15 m in central parts and deepest near River Dee to depths of 17 m bgl or more.

The report recommended further intrusive investigation to provide greater certainty on the extent of contamination and associated levels of risk from contamination and the need for remedial measures.

Summary of Key Information

Previous reports have been summarised and indicated the following issues:

- elevated (at the time of the reporting in 2000) arsenic, nickel, boron and sulphate in soil samples, and elevated sulphate and arsenic in groundwater samples;
- 9no. reportable incidents of land contamination have been reported to the EA, in addition to two losses of contaminants within stock control and 7 incidents of loss of containment or loss to land;
- a range of asbestos containing materials (bagged asbestos debris, cement board, insulating board, cloth, gasket and chrysotile and amosite fibers) were detected to a consistent depth of 2m in the far northern area of Zone 4, underneath a concrete slab, comprising approximately 55% of the area. The waste materials extended beyond the concrete slab, particularly in south-eastern areas of deposit, which was observed to be eroded by The River Dee. General refuse materials comprising rubber tubing, concrete, metal, fabric, plastic, ceramic, glass and polystyrene were found adjacent and to the north-west of the asbestos tip, indicating general additional landfill use in this area. Additional site investigation work was recommended to further delineate the extent of asbestos in soils in areas south-east of the slab;

- investigation detected asbestos containing material in one trial pit within the south-western area of Zone 4 at 0.5m bgl. Elevated concentrations of mercury (0.1 – 2.7 µg/l) were detected in groundwater across all 6 boreholes in the western part of the Zone 4 – considered to be attributable to former process waters. Chloride, selenium and total polycyclic aromatic hydrocarbons (PAH) exceeded the screening criteria for groundwater at the time of reporting. Ground gases were insignificant and required no special precautions;
- WSP identified asbestos fibers and lagging (amosite and chrysotile) within the central and eastern sides of Zone 4 at 12 locations (55% of samples) and they considered these materials to be distributed site wide. A Moderate–High Risk was assigned to the presence of asbestos, but it is noted in the report that the proposed site was to be elevated by 1-1.5m with fresh imported material to alleviate flooding risks and therefore the capping was expected to lower the risk of exposure once constructed. Investigation positions covered central areas of the site not previously investigated. Isolated elevated ground gas conditions were detected in BH3 elevated gas (characteristic situation 3 as per CIRIA 665 Guidance). Semi-volatile organic compounds (SVOCs) total petroleum hydrocarbons (TPH) were above UK Water Industry Research guidance locally and it was considered that this may result in contaminant ingress into potable water supply pipes. The report also concluded that the Site would unlikely be classed as Part IIA contaminated land; and
- marginally elevated concentrations of arsenic and molybdenum were detected in groundwater under the permitted installation site, which was thought to be attributable to the presence of historical PFA deposits. The report concluded that the PFA is unlikely to be a significant source of environmental risk and that there is no need for further site investigation or additional gathering of reference data.

A site walkover undertaken on 17th April 2015 identified potential sources of contamination, which included various hydrocarbons, inorganics, polychlorinated biphenyls (PCBs), metal and asbestos. All these contaminants are associated with the existing and former Power Station infrastructure.

Ground gas data was available for Zone 4 only. An isolated peak of methane up to 14.5% was detected in BH3 and 4.9% of carbon dioxide was detected in BH14. Depleted oxygen levels to 1.1% (BH13) and flow rates between -40.3 (BH11) and +13.6 (BH3) were also reported in previous investigations. Conclusions from the PB 2011 and WSP 2012 investigations concluded that gas protection measures were not considered necessary.

Conclusions and Recommendations

Two areas within Zone 4 (the former Power Station due to presence of asbestos, and an asbestos tip within the grounds of the former power station) were highlighted as having a higher potential for attracting liability and or risk and therefore required further action or investigation to avoid future liabilities. It is understood that an investigation was underway, and appropriate action was being considered by E.ON to address these issues.

In relation to residual risk and quantification of liability, the report notes that, where groundwater contamination may have resulted from historical activities prior to environmental permit issue, the need for any direct groundwater remediation (e.g. pump and treat or permeable reactive barriers) will need to be determined by further detailed risk assessments possibly supported by intrusive investigations and sampling.

3.5.11 Uniper (2021): '2017 Remediation of Connah's Quay A Power Station Report'

This report provides an overview of the work undertaken between July 2017 and May 2018 on the Connah's Quay A station site; a former coal fired station which was demolished in 1992. Ground investigation comprising of 16 no. trial pits, asbestos litter pick of the whole site, and laboratory testing, was undertaken in August 2017 to identify the extent of buried asbestos containing material that had previously been identified in 2015 by the RPS Contaminated Land Due Diligence report.

Remediation work was undertaken between November 2017 and September 2018 and included the extension of the capping provided by the existing concrete slab, reinstating fencing and notification to the public. An inspection of a culvert sluice chamber was also undertaken.

No scope relevant to groundwater monitoring/sampling/testing was undertaken.

3.5.12 Uniper Technologies Limited (2022): 'Connah's Quay Power Station Systematic Appraisal of the Risk of Contamination in Response to Environmental Permit Condition 3.1.3'

This technical information publication relates to the risk assessment which outlines the rationale and justification for groundwater monitoring having not been undertaken in accordance with the IPPC permit conditions. It forms a systematic appraisal of the risk of contamination, which has been undertaken by engagement with the Environment Representative at Connah's Quay Power Station, through a data gathering exercise and subsequent risk assessment.

The document summarises historic (pre-permit) incidents, which included seven incidents involving loss of containment or release of potentially polluting substances which were noted in the permit application, and nine notifications to the Environment Agency associated with land pollution incidents within the site boundary. It also states that the Site was fully remediated before construction in 1995/1996.

It was reported that on 16th September 2013, a weekly bund inspection identified a breach of the hydrochloric acid bund. The resulting acid attacked the concrete around the bund sump and made its way onto the ground outside the bund. The total loss of acid from the tank was calculated to be 1.9 tonnes. The immediate response to the incident involved analysis of soils and off-site disposal by a specialist contractor. A civil inspection and structural repairs were carried out to provide appropriate containment. The contaminated materials were excavated and removed from the Site; hence it was concluded that no contaminant linkage remained from the incident. Since then, regular bund inspections were reported to have been taking place on the Site.

The document notes that no significant residual risks to soils or groundwater have been identified in the period since issue of the current environmental permit. Uniper note that based upon the assessment there is limited value in conducting soil and groundwater sampling when each site maintains a robust management of its risks and any incidents that have arisen since permit issue have been dealt with appropriately. It notes that any pre-permit/legacy contamination will be sufficiently characterised (and remediated if required) as part of the Environmental Permit surrender process.

The report recommended a periodic review in accordance with the mandated five-yearly and ten-yearly frequencies for groundwater and soils respectively. It is noted that this should occur five years and ten years, respectively, from the publication date of the report.

Appendix included in the report lists substances stored at the site, and these include various: hydrochloric acids, sodium hydroxide, diesel fuel, sodium hypochlorite, sulphuric acid, ammonia solution, sulphuric acid, heat transfer liquids, transformer insulating oil, waste lube oil, molecular sieve material, mineral oil, activated carbon absorbent, di-ethylene glycol monobutyl ether and control fluid / hydraulic fire-resistant fluid. Only one entry recorded significant pollution, and it was associated with cooling water biocide – sodium hypochlorite 15%.

3.5.13 Uniper Technologies (2022): 'Connah's Quay Hydrogen – North Site Evaluation Report'

Introduction

Uniper Technologies was commissioned to undertake a baseline study of the Connah's Quay North Site (parts of Installation Area) to identify available land for hydrogen development, and potential constraints and risks. The work was undertaken through a review of documentation and consultation with key staff from the Site and Uniper's Land Management Team.

The report summarises the Power Station infrastructure, discussing options for various power and gas related infrastructure options and recommendations. Site planning status and permitting were also discussed.

Environmental constraints included in the report related to flooding, noise conditions, water abstraction and discharges, aquatic and terrestrial ecology and air quality.

Summary of Key Information and Recommendations

The report includes information on the location of culverts present on site: one goes below the eastern part of Main Installation Area, one in the south-eastern corner of the C&IEA, and one adjacent to the

eastern boundary of Electrical Connection Corridor. Off-site culverted drains south of the Main Installation Area are also reported.

Preliminary studies indicated that power, water and gas will continue to be available after the CCGT has closed and that supply infrastructure was in good condition. It was assumed that infrastructure could be retained in their current form, subject to standard life extending engineering works and compliance with contemporary regulatory requirements.

Environmentally, the site was bounded to the north and east by sensitive designations associated with the Dee Estuary, which was considered a significant risk requiring consideration as part of future design activities. It was recommended that a qualified ecologist is appointed to advise on how the Site can be developed in an ecologically sensitive manner. Site flood risk was also recommended to be taken into account, and it was noted that this is the subject of ongoing discussions with the local council. Early consultation with the environmental regulatory authorities, in particular NRW and FCC, was recommended, as it was stated that this could impact on the selection of technology, site layouts and plant sizing.

The report notes that groundwater has been encountered within the alluvial materials at depths between 4 m and 5 m below ground level (bgl) and that the regime within the alluvial deposits is controlled by tidal influences, confirmed by E.ON groundwater monitoring results from July 2005, which identified concentrations of sodium and chloride within groundwater samples. The report also notes that concentrations of marginally elevated arsenic and molybdenum were also reported and are believed to reflect the extensive use of PFA as a fill material in the Made Ground under the Power Station.

It was noted that water abstraction is controlled by NRW under an abstraction license (and that the site does not abstract or use groundwater), but that in 2023 abstraction licensing will be moved into the environmental permitting regime. The report also notes that the main water discharge from the site is controlled by NRW through the station environmental permit.

No further specific information is provided with regards to groundwater monitoring/sampling/testing.

Ground investigation was recommended following the completion of the feasibility studies to characterise land quality for the specific proposed development within the study area.

3.6 Baseline soil and groundwater reference data

A geotechnical and geoenvironmental investigation was undertaken by Geotechnics Limited (Ref 6) at the site of a proposed Low Carbon Combined Cycle Gas Turbine (CCGT) Generating Station with Carbon Capture Plant within the existing Connah's Quay Power Station.

A site investigation was conducted from January 2025 to March 2025 to inform the design of the project, and information gathered has been used to assist the establishment of baseline conditions at the Site to inform the assessment of the installations impacts and effects. The Geotechnics Preliminary Ground Investigation – Groundwater is presented in the Annex F.

The objectives were met by undertaking a site investigation that comprised:

- Combined dynamic sample and rotary boreholes;
- Rotary open hole borehole;
- Groundwater monitoring installations;
- Trial pits;
- In situ testing;
- Laboratory testing; and
- Installation monitoring.

The groundwater level monitoring was assessed using different methods in all geological units beneath the Site. Fourteen boreholes were sunk to depths of between 11.50 m and 23.50 m below ground level utilizing a combination of 100 mm diameter dynamic sample and 90 mm rotary coring techniques. Refusal was encountered at depths ranging between 0.30 m and 0.70 m depth within the service

inspection pits in boreholes BH05, BH05A, BH05B, BH05C, BH06 and BH06A due to encountering concrete obstructions.

No groundwater was encountered in the eastern part of the Site. In the western and central part of the Site monitoring data indicates that groundwater is present beneath the Site.

Groundwater levels within Made Ground varied between ground level and 6.0m bgl.

Groundwater was analyzed to assess the concentrations of various gases, including methane, carbon dioxide, oxygen, carbon monoxide, and hydrogen sulphide. During the monitoring process, an elevated level of methane was recorded on one occasion at BH01, indicating a potential source or localized increase in gas concentration. Additionally, higher levels of carbon dioxide were observed at BH07 on several occasions, suggesting periodic fluctuations in gas composition at this location.

The Factual Preliminary Ground Investigation presented the baseline values for soil and groundwater. The baseline investigation results for soil, where determinants exceeded the limits of detection, are summarized in Table 17 below.

Table 17: Baseline Values for Contaminants in Soil

Contaminant	Limit of Detection	No. of Detections / No. of Samples Analysed	Range of Concentrations Detected	Location of maximum concentration
Exchangeable Ammonia as N	<12 mg/kg	7/18	13 - 101	BH04A - 4.0
Phenol	<0.01 mg/kg	4/9	0.023 - 0.0484	BH08A - 2.0
Cresols	<0.01 mg/kg	4/7	0.0833 - 0.121	BH08A - 2.0
Xylenol	<0.015 mg/kg	1/5	0.0242	BH08A - 2.0
Phenols, total detected monohydric	<0.035 mg/kg	4/7	0.115 - 0.194	BH08A - 2.0
Organic Carbon, Total	<0.2%	19/22	0.204 - 11.7	BH02 - 0.1
Sulphur, Total	<0.2%	20/23	0.0207 - 0.693	BH06B - 4.0
SOM	<0.35%	19/23	0.352 - 20.2	BH02 - 0.1
Sulphur, Elemental	<10 mg/kg	15/24	8.35 - 2680	BH02 - 5.0
Cyanide, Total (low level)	<0.5 mg/kg	2/9	1.1 - 4.41	BH07 - 0.3
Cyanide, Complex (low level)	<0.5 mg/kg	2/6	0.736 - 4.34	BH07 - 0.3
Thiocyanate (low level)	<0.5 mg/kg	1 / 4	0.52	BH07 - 0.3
Sulphide, easily liberated	<15 mg/kg	5/12	19.3 - 783	BH07 - 4.5
Chromium, Trivalent	<0.9 mg/kg	17/20	3.8 - 35.5	BH07 - 0.3
Arsenic	<0.6 mg/kg	24/24	4.84 - 99.7	BH03 - 1.0
Boron	<0.7 mg/kg	24/24	3.77 - 46.1	BH02 - 2.0
Cadmium	<0.02 mg/kg	9/24	0.0487 - 0.817	BH07 - 4.5
Chromium	<0.9 mg/kg	20/24	3.8 - 35.5	BH07 - 0.3
Copper	<1.4 mg/kg	24/24	1.7 - 135	BH04A - 0.5

Contaminant	Limit of Detection	No. of Detections / No. of Samples Analysed	Range of Concentrations Detected	Location of maximum concentration
Lead	<0.7 mg/kg	24/24	8.75 - 217	BH07 - 4.5
Mercury	<0.1 mg/kg	7/24	0.131 - 107	BH04A - 0.5
Nickel	<0.2 mg/kg	23/24	4.94 - 79.4	BH06B - 4.0
Selenium	<1 mg/kg	26/24	1.02 - 11.7	BH01 - 1.5
Zinc	<1.9 mg/kg	24/24	22.7 - 571	BH04A - 4.0
Sulphate, Total	<48 mg/kg	23/24	157 - 51400	BH06B - 1.2
Water soluble Sulphate as SO4 2:1 extract	<0.004 g/l	24/24	0.0145 - 1.92	BH06B - 4.0
Nitrate as NO3, 2:1 water soluble	<1 mg/kg	14/24	1.06 - 22.5	BH02 - 2.0
PAH, total + Coronene	<318 µg/kg	5/24	740 - 3530	BH07 - 0.3
Naphthalene	<9 µg/kg	7/12	12.7 - 209	BH06B - 1.2
Acenaphthylene	<12 µg/kg	1 / 4	22.8	BH04A - 4.0
Acenaphthene	<8 µg/kg	2/10	14.5 - 52.6	BH07 - 0.3
Fluorene	<10 µg/kg	3/10	12.9 - 23.5	BH04A - 4.0
Phenanthrene	<15 µg/kg	10/16	20.5 - 411	BH07 - 0.3
Anthracene	<16 µg/kg	2/10	23.8 - 43.4	BH04A - 4.0
Fluoranthene	<17 µg/kg	8/14	33.3 - 599	BH07 - 0.3
Pyrene	<15 µg/kg	9/14	31 - 540	BH07 - 0.3
Benz(a)anthracene	<14 µg/kg	8/14	17.2 - 331	BH07 - 0.3
Chrysene	<10 µg/kg	9/14	19.2 - 295	BH07 - 0.3
Benzo(b)fluoranthene	<15 µg/kg	9/14	22 - 406	BH07 - 0.3
Benzo(k)fluoranthene	<14 µg/kg	4/14	39.4 - 156	BH07 - 0.3
Benzo(a)pyrene	<15 µg/kg	7/14	21.3 - 323	BH07 - 0.3
Indeno(1,2,3-cd)pyrene	<18 µg/kg	4/14	52 - 198	BH07 - 0.3
Benzo(g,h,i)perylene	<24 µg/kg	5/14	34.5 - 220	BH07 - 0.3
PAH, total	<118 µg/kg	8/14	120 - 3530	BH07 - 0.3
Phenol	<1 µg/kg	1/1	23.1	BH07 - 0.3
2,4-Dimethylphenol	<1 µg/kg	1/1	18.6	BH06B - 1.2
Sum of detected phenol	<9 µg/kg	2/2	18.6 - 23.4	BH07 - 0.3
2-Methylnaphthalene	<100 µg/kg	1/1	627	BH06B - 1.2
Aliphatics >C5-C6	<10 µg/kg	5/11	12.1 - 29.8	BH08A - 8.5
Aliphatics >C6-C8	<10 µg/kg	11/19	14.9 - 258	BH08A - 8.5

Contaminant	Limit of Detection	No. of Detections / No. of Samples Analysed	Range of Concentrations Detected	Location of maximum concentration
Aliphatics >C8-C10	<10 µg/kg	11/19	47.3 - 5050	BH08A - 2.0
Aliphatics >C10-C12	<1000 µg/kg	2/8	1030 - 1430	BH06B - 1.2
Aliphatics >C12-C16	<1000 µg/kg	2/6	1540 - 5930	BH06B - 1.2
Aliphatics >C16-C21	<1000 µg/kg	5/9	3550 - 35700	BH07 - 1.5
Aliphatics >C21-C35	<1000 µg/kg	17/21	1450 - 74000	BH06B - 1.2
Aliphatics >C35-C44	<1000 µg/kg	9/13	1120 - 37000	BH06B - 1.2
Total Aliphatics >C10-C44	<5000 µg/kg	14/17	5070 - 130000	BH06B - 1.2
Total Aliphatics & Aromatics >C10-C44	<10000 µg/kg	13/16	10000 - 164000	BH07 - 0.3
Aromatics >EC7-EC8	<10 µg/kg	1/3	11.6	BH06B - 1.2
Aromatics >EC8-EC10	<10 µg/kg	10/16	31.9 - 3370	BH08A - 2.0
Aromatics > EC12-EC16	<1000 µg/kg	1/3	6130	BH06B - 1.2
Aromatics > EC16-EC21	<1000 µg/kg	4/9	2610 - 4890	BH06B - 1.2
Aromatics > EC21-EC35	<1000 µg/kg	15/21	1060 - 75200	BH07 - 0.3
Aromatics >EC35-EC44	<1000 µg/kg	6/10	1030 - 23700	BH07 - 0.3
Aromatics > EC40-EC44	<1000 µg/kg	1/3	6330	BH07 - 0.3
Total Aromatics > EC10-EC44	<5000 µg/kg	10/15	7690 - 102000	BH07 - 0.3
Total Aliphatics & Aromatics >C5-C44	<10000 µg/kg	13/16	10000 - 164000	BH07 - 0.3
Total Aliphatics >C5-C10	<50 µg/kg	11/19	69.5 - 1090	BH01 - 5.5
Total Aromatics >EC5-EC10	<50 µg/kg	8/19	52.2 - 3370	BH08A - 2.0
GRO >C5-C10	<20 µg/kg	11/19	69.5 - 8540	BH08A - 2.0
Chloroform	<3 µg/kg	1/1	291	BH06B - 1.2
Benzene	<1 µg/kg	2/4	2.43 - 2.73	BH06B - 22.0
Carbon Disulphide	<1 µg/kg	2/2	1.32 - 1.99	BH05D - 5.5
Dichloromethane	<5 µg/kg	1/1	35	BH01 - 5.5
Toluene	<1 µg/kg	2/4	4.06 - 4.44	BH04A - 0.5
MTBE	<0.5 µg/kg	2/2	4.19 - 4.36	BH04A - 0.5

The baseline investigation results for groundwater samples are summarized in Table 18 below.

Table 18: Baseline Values for Contaminants in Groundwater

Contaminant	Limit of Detection	No. of Detections / No. of Samples Analysed	Range of Concentrations Detected	Location of maximum concentration
Manganese II	<0.2mg/l	16/34	0.43 - 18	BH06BP1 - 5.00
Dissolved solids, Total (gravimetric)	<40mg/l	38/38	343 - 18500	BH07P2 -10.00
Suspended solids, total	<2mg/l	38/38	37.2 - 1922000	BH07P1-3.00
Carbon, Organic (diss.filt)	<3mg/l	29/36	3.04 - 10.6	BH07P1-3.00
Organic Carbon Total	<3mg/l	27/35	3.18 - 13.6	BH07P1-3.00
Ammoniacal Nitrogen as N (low level)	<0.01mg/l	38/38	0.09 - 6.52	BH02P1-3.00
Ammoniacal Nitrogen Low as NH3	<0.01mg/l	38/38	0.119 - 7.92	BH02P1-3.00
Sulphide	<0.01mg/l	2/11	0.0186 - 0.0545	BH08A1-3.0
Iron, Ferrous	<0.1mg/l	14/35	0.13 - 80.4	BH06BP1-5.00
Chromium, Trivalent (Low)	<0.003mg/l	1/36	0.00608	BH04AP1-5.0
Arsenic (diss.filt)	<0.1 µg /l	36/38	0.617 - 167	BH07P1-3.00
Boron (diss.filt)	<10 µg/l	38/38	0.883 - 51579	BH06BP2-0.05
Cadmium (diss.filt)	<0.08 µg/l	3/35	0.0803-0.335	BH04AP2-14.00
Chromium (diss.filt)	<1µg/l	2/35	2.2 - 11.6	BH04AP1-5.0
Copper (diss.filt)	<0.3µg/l	33/38	0.38 - 12.8	BH04AP1-5.0
Lead (diss.filt)	<0.2µg/l	21/34	0.278 - 2.32	BH05DP1
Nickel (diss.filt)	<0.4µg/l	36/37	0.495 - 38.9	BH06BP1 - 0.03
Selenium (diss.filt)	<1µg/l	14/35	1.1 - 84.8	BH04AP1D1-7.00
Zinc (diss.filt)	<1µg/l	38/38	3.28 - 42	BH07P1-3.00
Tin (Diss.Filt)	<1µg/l	7/33	1.03 - 4.87	BH01-P2-3.0
Calcium (Dis.Filt)	<0.2mg/l	36/37	39.3 - 587	BH06BP1-5.00
Iron (Dis.Filt)	<0.019mg/l	34/37	0.0373 - 80.7	BH06BP1-5.00
Hardness, Total as CaCO3 unfiltered	<0.35mg/l	38/38	207 - 13200	BH06BP1 - 0.03
Sulphate	<2mg/l	38/38	12 - 1720	BH06BP1-5.00
Chloride	<2mg/l	38/38	8.8 - 9560	BH07P2-10.00
Nitrite as N	<0.0152mg/l	11/33	0.0177 - 1.22	BH04AP1D1-7.00
Nitrate as N	<0.07mg/l	13/35	0.104 - 1.12	BH08A1-3.0
Phenol (low level)	<0.5µg/l	7/30	0.56 - 1.79	BH04AP1-5.0

Contaminant	Limit of Detection	No. of Detections / No. of Samples Analysed	Range of Concentrations Detected	Location of maximum concentration
Cresols (low level)	<0.5µg/l	2/31	0.55 - 1	BH03P1-8.00
Sum of Detected Monohydric Phenols	<0.5µg/l	7/31	0.56 - 2.13	BH03P1-8.00
pH	<1pH units	38/38	6.67 - 11.9	BH04AP1
Conductivity @ 20 deg.C	<0.2mS/cm	38/38	0.692 - 25.7	BH07P2-8.00
Cyanide, Total (low level)	<5µg/l	2/35	8.64 - 8.73	BH07P1-3.00
Low Level Hexavalent Chromium	<0.003mg/l	2/35	0.00552- 0.0182	BH04AP1
Naphthalene (aq)	<0.01µg/l	10/36	0.0059 - 3.24	BH07P1-3.00
Acenaphthene (aq)	<0.005µg/l	11/36	0.0059 - 0.787	BH07P1-3.00
Acenaphthylene (aq)	<0.005µg/l	8/31	0.0743 - 859	BH05DP1-3.00
Fluoranthene (aq)	<0.005µg/l	29/37	0.00502 - 20.7	BH02P1-3.00
Anthracene (aq)	<0.005µg/l	9/36	0.0103 - 1.11	BH07P1-3.00
Phenanthrene (aq)	<0.005µg/l	25/33	0.00566-8.12	BH02P1-3.00
Fluorene (aq)	<0.005µg/l	14/36	0.00626 - 1	BH07P1-3.00
Chrysene (aq)	<0.005µg/l	25/37	0.00508 - 11.7	BH07P1-3.00
Pyrene (aq)	<0.005µg/l	31/37	0.00543 - 22.3	BH02P1-3.00
Benzo(a)anthracene (aq)	<0.005µg/l	20/37	0.00784 - 10	BH07P1-3.00
Benzo(b)fluoranthene (aq)	<0.005µg/l	28/37	0.00502 - 22	BH07P1-3.00
Benzo(k)fluoranthene (aq)	<0.005µg/l	21/37	0.00667 - 9.61	BH07P1-3.00
Benzo(a)pyrene (aq)	<0.002µg/l	31/38	0.00279 - 17.3	BH07P1-3.00
Dibenzo(a,h)anthracene (aq)	<0.005µg/l	13/36	0.00679 - 2.19	BH07P1-3.00
Benzo(g,h,i)perylene (aq)	<0.005µg/l	21/36	0.00709 - 12.5	BH07P1-3.00
Indeno(1,2,3-cd)pyrene (aq)	<0.005µg/l	22/37	0.00994 - 12.2	BH07P1-3.00
PAH, Total Detected USEPA 16 (aq)	<0.082µg/l	22/37	0.0949 - 144	BH07P1-3.00
4-methylphenol	<0.5µg/l	1/8	0.99	BH07P2-10.00
bis(2-Ethylhexyl) phthalate (aq)	<1µg/l	2/10	2.51 - 4.46	BH01A-P1-13.0
n-Dibutyl phthalate (aq)	<1µg/l	1/9	1.52	BH01A-P1-13.0

Contaminant	Limit of Detection	No. of Detections / No. of Samples Analysed	Range of Concentrations Detected	Location of maximum concentration
GRO Surrogate % recovery**	%	38/38	3 - 102	BH03-P2-13.0
GRO >C5-C12 (HS_1D_TOTAL)	<50µg/l	1/35	60	BH04AP2-14.00
Aliphatics >C8-C10 (HS_1D_AL)	<10µg/l	2/35	10-14	BH04AP1-7.00
Aliphatics >C10-C12 (HS_1D_AL)	<10µg/l	2/35	16-19	BH04AP1-7.00
Aliphatics >C12-C16 (aq) (SPECD_AL1_W)	<10µg/l	2/35	228 - 471	BH04AP1D1-7.00
Aliphatics >C16-C21 (aq) (SPECD_AL2_W)	<10µg/l	7/36	17.3 - 3180	BH0506BP1-5.00
Aliphatics >C21-C35 (aq) (SPECD_AL3_W)	<10µg/l	14/36	14.4 - 14400	BH06BP1-5.00
Total Aliphatics >C12-C35 (aq) (EPHAL12_35T_GC_W)	<10µg/l	14/36	14.4 - 15300	BH06BP1-5.00
Aromatics >EC10-EC12	<10µg/l	2/35	10-13	BH04AP1-7.00
Aromatics >EC12-EC16 (aq) (SPECD_AROM1_W)	<10µg/l	3/35	386-528	BH04AP1D1-7.00
Aromatics >EC16-EC21 (aq) (SPECD_AROM2_W)	<10µg/l	8/35	18.6 - 2000	BH04AP1-5.00
Aromatics >EC21-EC35 (aq) (SPECD_AROM3_W)	<10µg/l	17/36	10.9 - 5540	BH04AP1-5.00
Total Aromatics >EC12-EC35 (aq) (EPHAR12_35T_GC_W)	<10µg/l	17/36	10.9 - 7980	BH04AP1-5.00
Total Aliphatics & Aromatics >C5-35 (aq)	<10µg/l	18/36	14.4 - 17300	BH06BP1-5.00
Dibromofluoromethane**	%	11/11	85.6 - 121	BH01-P1
Toluene-d8**	%	11/11	95.6 - 101	BH08A-1
4-Bromofluorobenzene**	%	11/11	79.1 - 101	BH01-P1-13.0
Carbon disulphide	<1µg/l	1/11	27.6	BH06BP1 - 0.03

A further Phase II A geotechnical and geoenvironmental investigation was completed by Geotechnics in August 2025 (Ref 7) at the Site of a proposed Low Carbon Combined Cycle Gas Turbine (CCGT) Generating Station with Carbon Capture Plant within the existing Connah's Quay Power Station.

The investigation was carried out throughout March, April and May 2025. The fieldwork was temporarily halted by Uniper at the end of March due to permitting issues relating to locations within the Site boundary. It recommenced on the 28th April before being halted again by Uniper during the week ending 23rd May due to the presence of nesting birds. The remaining fieldwork is provisionally due to be completed in the Autumn of 2025.

The object of the investigation was to obtain information on the ground and groundwater conditions relating to the design of the proposed works within the limitations posed by trial hole numbers, locations, depths, methods adopted and the scope of approved in situ and laboratory testing.

Similarly to the initial site investigation, the investigation comprised:

- Boreholes,
- Groundwater monitoring installations,
- Trial pits,
- In situ testing,
- Laboratory testing and
- Installation monitoring.

As a result of the further investigation, Table 17 and Table 18 above have been updated to ensure that all ranges of concentrations have been included.

A Phase B investigation is proposed to be completed prior to construction commencing and the results of this additional investigation will be provided as an Addendum to the SCR as a pre-operational condition.

4. Permitted Activities

4.1 Site Permitted Activities

This environmental permit application is made under the Environmental Permitting (England and Wales) Regulations 2016 (as amended) (the EP Regulations'). The Operator will made an application for a DCO, under Section 37 of the Planning Act 2008, and this application for an Environmental Permit is submitted in parallel to the DCO application.

The activities proposed under the environmental permit (permitted activities and non-permitted activities) are summarized in Table 19 below.

Table 19: Permitted Activities

Activity Ref No	Activity under EPR 2016 Schedule 1	Description of specified activity	Limits of specified activity
A1	Section 1.1 A(1) (a): Burning any fuel in an appliance with a rated thermal input of 50 megawatts or more	Operation of two CCGT plants, each comprising one gas turbine, fired on natural gas, with a Heat Recovery Steam Generator (HRSG), steam turbine and generators for the production of electricity Emergency backup generator.	Combustion of natural gas in a CCGT. From receipt of natural gas to discharge of exhaust gases and wastes, raw materials to and supply of electricity, and from water intake to water discharge. Permitted to operate in single or double two-shifting mode. From fuel supply to the generator to flue gas emissions
A2	Schedule 1, Part 1, Chapter 6, Section 6.10, Part A Carbon capture and storage: Capture of carbon dioxide streams from an installation for the purposes of geological storage.	Operation of a carbon capture plant involving the treatment of exhaust gas from the HRSG into the capture plant using an amine-based solvent to extract CO_2 followed by compression, oxygen removal and dehydration of the CO_2 for off-site transportation and long-term storage, and release of CO_2-abated flue gas to atmosphere.	From receipt of exhaust gases from the HRSG in the carbon capture plant to the treatment of exhaust gas prior to export of CO_2 from the installation or release to atmosphere of CO_2.
Directly Associated Activity			
A3	Directly Associated Activity	Surface water drainage. Handling and storage of site drainage until discharge to the site surface water system.	Generation and handling of water to the point of discharge into the current final discharge lagoon.
A4	Directly Associated Activity	Raw water treatment, storage and delivery. De-ionising and/or other treatment of cooling water	From receipt of abstracted water to point of use, handling, to dispatch to cooling water purge system.

Activity Ref No	Activity under EPR 2016 Schedule 1	Description of specified activity	Limits of specified activity
A5	Directly Associated Activity	Raw materials handling and storage - receipt, storage and handling of amine solvent, water treatment chemicals, ammonia, fuel and lubricating oils, turbine cleaning chemicals and all other raw materials.	From receipt of raw materials to their point of use.
A6	Directly Associated Activity	Solvent reclaiming or regeneration	TBC
A7	Directly Associated Activity	Operation of a Wastewater Treatment Plant. Treatment of wastewater (e.g. cooling water, etc)	From receipt of effluent from process to the point of release to discharge point.
A8	Directly Associated Activity	Effluent Discharge. Discharge to existing final discharge lagoon of cooling water blow-down, steam condensate, and treated direct contact cooler effluent.	From release of effluents from process and/or wastewater treatment plant to discharge at emission point W1 into the lagoon.
A9	Directly Associated Activity	Waste Management. Waste generation and handling.	From generation of waste to dispatch from the installation
A10	Directly Associated Activity	Operation of electrical transformers to support the installation. Generator step-up transformer: one per generating unit. Station transformers: multiple smaller units for local distribution. Unit auxiliary transformer: one per generating unit supplying auxiliaries.	Transformers and associated equipment contain insulating oil and potentially gas insulation stored within secondary containment systems sized to hold at least 110% of the largest volume Operation maintained within manufacturer's limits for voltage, load, and temperature Regular inspections and maintenance to prevent oil or gas leaks or spills
A11	Directly Associated Activity	Operation of an electric auxiliary boiler	

4.2 Potentially Hazardous Substances

In accordance with IED requirements, the potentially hazardous substances that may be present on site have been identified and are presented in the Table 20 below. These materials represent raw materials used and/or products for the site and broadly comprise:

- Process catalysts;
- CO_2 absorption solvents;
- Gases including natural gas, H_2, O_2 and N_2;
- Generator and pump fuels;

- Boiler and cooling water treatment chemicals;
- SCR catalyst; and
- Firefighting Foam.

MSDS sheets have been provided separately for these materials.

4.3 Assessment of Relevant Hazardous Substances (RHS)

RHS in relation to IED are defined as:

'*those substances or mixtures defined within Article 3 of Regulations (EC) No1272/2008, which, as a result of their hazardousness, mobility, persistence and biodegradability (as well as other characteristics), are capable of contaminating soil or groundwater and are used, produced and/or released by the installation.*'

The MSDS sheets for the materials on the inventory have been reviewed and we have recorded the hazardous properties where relevant on the inventory table in Table 20 The RHS for the site based on the assessment are outlined below.

4.3.1 Diesel, and Lubricating Oils

Diesel and lubricating oils are used by the back-up emergency generators and the firewater pumps.

Both are capable of contaminating soil and groundwater should they be released into the environment. These oil-based substances are toxic to the water environment and although they are biodegradable in particular conditions, larger volumes of these substances are likely to be relatively persistent in the environment.

Diesel is stored in sufficiently large quantities to be considered a RHS for the purposes of this assessment.

Lubricating oil will only be stored in small quantities on the site and will be brought onto the site as needed for maintenance purposes. Any waste oil generated during maintenance will be removed from site as it is produced. On this basis lubricating oil and waste lubricating oil have been discounted as RHSs for the purposes of this baseline assessment of soils and groundwater

4.3.2 CO2 Absorption Solvent

This will be a proprietary solvent selected by the individual Technology Licenser which is an amine based solvent used for CO_2 capture and which will be stored on site. We have reviewed the solvent options from each Licenser and each solvent is the hazardous primarily in relation to human health, and adsorption and mobility in soil is not accepted.

Given the volume to be held on site and the risk to human health, we are treating this as an RHS.

4.3.3 Water treatment Chemicals

Boiler water will be treated via ion exchange, the typical chemicals used are expected to include caustic soda, hydrochloric acid, trisodium phosphate and an oxygen scavenger or similar proprietary boiler water chemicals. Some of these chemicals will be hazardous to the environment, however they be stored and used in very small quantities. As such we don't consider them as RHS at this time although we have included them in the environmental risk assessment in table 27 below.

4.3.4 Ammonia

Ammonia solution will be used as a flue gas treatment chemical and is considered a hazardous substance as it is very toxic to aquatic life.

Given its hazardous nature and potential volume stored on site, this is considered as a RHS.

4.3.5 Process Catalysts

Process catalysts are retained on site as catalyst beds within the CCGT and abatement processes which are contained. These substances may be toxic to the water environment and in larger volumes these substances are likely to be relatively persistent in the environment.

The volumes of the materials held on site have yet to be confirmed but are expected to be relatively low. Exposure risk is highest during the time of bed replacement (every 1 – 4 years) which will be undertaken by specialist contractors who will bring the replacement catalyst to site and remove the waste catalyst to an offsite facility for regeneration. Given the potential hazard to the aquatic environment we have classed these materials as RHS. ``

4.3.6 Assessment of the Likelihood of land Pollution

An assessment of the potentially polluting substances identified in Table 20 taking into consideration the proposed management and control arrangements has been completed and is presented in Table 20 on the following page.

Table 20: Assessment of Potentially Hazardous Substances at the Proposed Installation

Substances	Relevant Activity	Potential for Pollution from the Relevant Activity	Existence of Pollution Prevention Measures	Nature of Primary Containment	Testing and Inspection of Primary Containment	Nature Of Secondary Containment	Testing And Inspection Of Secondary Containment	Nature Of Tertiary Containment	Testing And Inspection of Tertiary Containment	Adequacy of Pollution Prevention Measures Yes/No	Are the Proposed Integrity Testing of Pollution Prevention Measures Adequate Yes/No	Is there an Adequate Documented Management System to Demonstrate Operator Management and Competence with the Relevant Activity	Likelihood of Pollution
Proprietary Amine Solvent (Cansolv DC103) or (SLB Capturi "S10") 99% wt. (as delivered)	CO2 Capture Plant	Leak from bulk storage tankage by overfilling or mechanical damage to tank infrastructure (tank, pipelines, pumps)	Yes	3,300 m^3 storage tank.	Above ground storage tanks to be situated outdoors. Level detection alarms and trips tested routinely. Will be subject to routine visual checks and inspection in line with manufacturer guidance.	the tank will be installed in a concrete bund in compliance with CIRIA C736 guidelines, with level alarms to identify high levels of accumulated water and / or leakage. Bund capacity 110% of largest tank or 25% of tankage within the bund.	Regular visual inspection of bunding, and testing of alarms. Tank is on a tank inspection and maintenance register, as per industry practice.	Site hardstanding with an impermeable concrete surface and kerbed edging. Isolation valves in drainage system. Spill kits available on site.	Concrete hardstanding and drainage are subject to scheduled inspection and maintenance / repair if required.	Yes	Yes	Yes	Very Low
	Delivery by vehicle to site – once site system is charged the delivery is very infrequent as only to top up system.	Spillage during off-loading e.g. flex hose/ connection failure	Yes	Road tanker fitted with dry-break couplings Delivery hoses on a register that covers inspections, change frequency etc. Offloading points plugged or blanked off when not in use. Potential to install non return valve (NRV) to prevent backflow on disconnection.	Visual inspection of road tanker and delivery hoses to be carried out. Deliveries via reputable supplier using vehicles which are fit for purpose.	Concrete hardstanding for delivery vehicle, including kerbed area draining via a blind sump for the collection of spilt materials	Visual inspection of concrete hardstanding, and the blind sump to ensure they are in good working condition. Empty sump of rainwater periodically.	Spill kits to be available on site	Scheduled inspections of spill kits / containment provisions	Yes	Yes	Yes	Very low
Caustic soda 20% wt.	Delivery by vehicle to site – once site system is charged the delivery is very infrequent as only to top up system.	Spillage during off-loading e.g. flex hose/ connection failure	Yes	Road tanker fitted with dry-break couplings Delivery hoses on a register that covers inspections, change frequency etc. Offloading points plugged or blanked off when not in use. Potential to install non return valve (NRV) to prevent backflow on disconnection.	Visual inspection of road tanker and delivery hoses to be carried out. Deliveries via reputable supplier using vehicles which are fit for purpose.	Concrete hardstanding for delivery vehicle, including kerbed area draining via a blind sump for the collection of spilt materials	Visual inspection of concrete hardstanding, and the blind sump to ensure they are in good working condition. Empty sump of rainwater periodically.	Spill kits to be available on site	Scheduled inspections of spill kits / containment provisions	Yes	Yes	Yes	Very low

Substances	Relevant Activity	Potential for Pollution from the Relevant Activity	Existence of Pollution Prevention Measures	Nature of Primary Containment	Testing and Inspection of Primary Containment	Nature Of Secondary Containment	Testing And Inspection Of Secondary Containment	Nature Of Tertiary Containment	Testing And Inspection of Tertiary Containment	Adequacy of Pollution Prevention Measures Yes/No	Are the Proposed Integrity Testing of Pollution Prevention Measures Adequate Yes/No	Is there an Adequate Documented Management System to Demonstrate Operator Management and Competence with the Relevant Activity	Likelihood of Pollution
	Storage Tanks	Leak from bulk storage tankage by overfilling or mechanical damage to tank infrastructure (tank, pipelines, pumps)	Yes	250 m^3 above ground bulk storage tank feeding the process. Tank fitted with level measurement and alarms to prevent overfilling.	Above ground storage tanks to be situated outdoors. Level detection alarms and trips tested routinely. Will be subject to routine visual checks and inspection in line with manufacturer guidance.	The tank will be installed in a concrete bund in compliance with CIRIA C736 guidelines, with level alarms to identify high levels of accumulated water and / or leakage. Bund capacity 110% of largest tank or 25% of tankage within the bund.	Regular visual inspection of bunding, and testing of alarms. Tank is on a tank inspection and maintenance register, as per industry practice.	Site hardstanding with drainage system . All areas potentially contaminated with ammonia will drain to an ammonia detection and treatment sump	Concrete hardstanding and drainage are subject to scheduled inspection and maintenance / repair if required.	Yes	Yes	Yes	Very Low
Hydrogen 99/5% wt.	Oxygen removal + Generator cooling	Leak of gas from Pressurised tank	Yes	200 bottles at 165 barg	Routine visual checks and inspections of tanks and pipework.	N/A	N/A	N/A	N/A	Yes	Yes	Yes	Negligible
Aqueous Ammonia 24.5% wt.	Delivery by vehicle to site	Spillage during off-loading e.g. flex hose/ connection failure	Yes	Road tanker fitted with dry-break couplings Delivery hoses on a register that covers inspections, change frequency etc. Offloading points plugged or blanked off when not in use. Potential to install non return valve (NRV) to prevent backflow on disconnection.	Visual inspection of road tanker and delivery hoses to be carried out. Deliveries via reputable supplier using vehicles which are fit for purpose.	Concrete hardstanding for delivery vehicle including kerbed area draining via a blind sump for the collection of spilt materials	Visual inspection of concrete hardstanding, and the blind sump to ensure they are in good working condition. Empty sump of rainwater periodically.	Spill kits to be available on site	Scheduled inspections of spill kits / containment provisions	Yes	Yes	Yes	Very low
	SCR Plant and associated storage	Leak from bulk storage tankage by overfilling or mechanical damage to tank infrastructure (tank, pipelines, pumps)	Yes	195 m^3 above ground bulk storage tank feeding the process. Tank fitted with level measurement and alarms to prevent overfilling.	Above ground storage tanks to be situated outdoors. Level detection alarms and trips tested routinely. Will be subject to routine visual checks and inspection in line with manufacturer guidance.	The tank will be installed in a concrete bund in compliance with CIRIA C736 guidelines, with level alarms to identify high levels of accumulated water and / or leakage. Bund capacity 110% of largest	Regular visual inspection of bunding, and testing of alarms. Tank is on a tank inspection and maintenance register, as per industry practice.	Site hardstanding with drainage system . All areas potentially contaminated with ammonia will drain to an ammonia detection and treatment sump	Concrete hardstanding and drainage are subject to scheduled inspection and maintenance / repair if required.	Yes	Yes	Yes	Very Low

Substances	Relevant Activity	Potential for Pollution from the Relevant Activity	Existence of Pollution Prevention Measures	Nature of Primary Containment	Testing and Inspection of Primary Containment	Nature Of Secondary Containment	Testing And Inspection Of Secondary Containment	Nature Of Tertiary Containment	Testing And Inspection of Tertiary Containment	Adequacy of Pollution Prevention Measures Yes/No	Are the Proposed Integrity Testing of Pollution Prevention Measures Adequate Yes/No	Is there an Adequate Documented Management System to Demonstrate Operator Management and Competence with the Relevant Activity	Likelihood of Pollution
						tank or 25% of tankage within the bund.							
Diesel	Delivery by vehicle	Spillage during off-loading e.g. flex hose/ connection failure	Yes	Road tanker fitted with dry-break couplings Delivery hoses on a register that covers inspections, change frequency etc. Offloading points plugged or blanked off when not in use. Potential to install non return valve (NRV) to prevent backflow on disconnection.	Visual inspection of road tanker and delivery hoses to be carried out. Deliveries via reputable supplier using vehicles which are fit for purpose	Concrete hardstanding for delivery vehicle, including kerbed area draining via a blind sump for the collection of spilt materials	Visual inspection of concrete hardstanding, and the blind sump to ensure they are in good working condition. Empty sump of rainwater periodically.	Spill kits to be available on site	Scheduled inspections of spill kits / containment provisions	Yes	Yes	Yes	Very Low
	Storage	Leak from bulk storage tankage by overfilling or mechanical damage to tank infrastructure (tank, pipelines, pumps)	Yes	Anticipated to be 90 m^3 double skinned tank (with integral 110% bund). Leak detection within interstitial area between walls (bund). Level measurement to prevent overfilling.	The tank will be subject to routine visual checks and inspection in line with manufacturer guidance. Level measurement, alarms and trips will be on a routine testing regime.	The tank will be double skinned with integral bunding. The bund will have leak detection.	Regular visual inspection of bunding, and testing of the leak detection system	Site hardstanding and surface water drainage. Isolation valves in drainage system.	Concrete hardstanding and drainage are subject to scheduled inspection and maintenance / repair if required.	Yes	Yes	Yes	Very Low
Sulphuric acid 98% wt.	Delivery by vehicle to site – once site system is charged the delivery is very infrequent as only to top up system.	Spillage during off-loading e.g. flex hose/ connection failure	Yes	Road tanker fitted with dry-break couplings Delivery hoses on a register that covers inspections, change frequency etc. Offloading points plugged or blanked off when not in use. Potential to install non return valve (NRV) to prevent backflow on disconnection.	Visual inspection of road tanker and delivery hoses to be carried out. Deliveries via reputable supplier using vehicles which are fit for purpose.	Concrete hardstanding for delivery vehicle, including kerbed area draining via a blind sump for the collection of spilt materials	Visual inspection of concrete hardstanding, and the blind sump to ensure they are in good working condition. Empty sump of rainwater periodically.	Spill kits to be available on site	Scheduled inspections of spill kits / containment provisions	Yes	Yes	Yes	Very low
	pH control	Leak from bulk storage tankage by overfilling or mechanical	Yes	95 m^3 above ground bulk storage tank feeding the process. Tank fitted	Above ground storage tanks to be situated outdoors. Level	The tank will be installed in a concrete bund in compliance with CIRIA C736	Regular visual inspection of bunding, and testing of alarms.	Site hardstanding with drainage system . All areas	Concrete hardstanding and drainage are subject to	Yes	Yes	Yes	Very Low

Substances	Relevant Activity	Potential for Pollution from the Relevant Activity	Existence of Pollution Prevention Measures	Nature of Primary Containment	Testing and Inspection of Primary Containment	Nature Of Secondary Containment	Testing And Inspection Of Secondary Containment	Nature Of Tertiary Containment	Testing And Inspection of Tertiary Containment	Adequacy of Pollution Prevention Measures Yes/No	Are the Proposed Integrity Testing of Pollution Prevention Measures Adequate Yes/No	Is there an Adequate Documented Management System to Demonstrate Operator Management and Competence with the Relevant Activity	Likelihood of Pollution
		damage to tank infrastructure (tank, pipelines, pumps)		with level measurement and alarms to prevent overfilling.	detection alarms and trips tested routinely. Will be subject to routine visual checks and inspection in line with manufacturer guidance.	guidelines, with level alarms to identify high levels of accumulated water and / or leakage. Bund capacity 110% of largest tank or 25% of tankage within the bund.	Tank is on a tank inspection and maintenance register, as per industry practice.	potentially contaminated with ammonia will drain to an ammonia detection and treatment sump	scheduled inspection and maintenance / repair if required.				
Sodium Hypochlorite	Delivery by vehicle to site – once site system is charged the delivery is very infrequent as only to top up system.	Spillage during off-loading e.g. flex hose/ connection failure	Yes	Road tanker fitted with dry-break couplings Delivery hoses on a register that covers inspections, change frequency etc. Offloading points plugged or blanked off when not in use. Potential to install non return valve (NRV) to prevent backflow on disconnection.	Visual inspection of road tanker and delivery hoses to be carried out. Deliveries via reputable supplier using vehicles which are fit for purpose.	Concrete hardstanding for delivery vehicle, including kerbed area draining via a blind sump for the collection of spilt materials	Visual inspection of concrete hardstanding, and the blind sump to ensure they are in good working condition. Empty sump of rainwater periodically.	Spill kits to be available on site	Scheduled inspections of spill kits / containment provisions	Yes	Yes	Yes	Very low
	Biocide treatment	Leak from bulk storage tankage by overfilling or mechanical damage to tank infrastructure (tank, pipelines, pumps)	Yes	10 m^3 above ground bulk storage tank feeding the process. Tank fitted with level measurement and alarms to prevent overfilling.	Above ground storage tanks to be situated outdoors. Level detection alarms and trips tested routinely. Will be subject to routine visual checks and inspection in line with manufacturer guidance.	The tank will be installed in a concrete bund in compliance with CIRIA C736 guidelines, with level alarms to identify high levels of accumulated water and / or leakage. Bund capacity 110% of largest tank or 25% of tankage within the bund.	Regular visual inspection of bunding, and testing of alarms. Tank is on a tank inspection and maintenance register, as per industry practice.	Site hardstanding with drainage system . All areas potentially contaminated with ammonia will drain to an ammonia detection and treatment sump	Concrete hardstanding and drainage are subject to scheduled inspection and maintenance / repair if required.	Yes	Yes	Yes	Very Low
Water Treatment Chemicals	Storage in drums and IBCs connected to the ancillary process operations (i.e. water	Leak from storage containers	Yes	Storage in drums and IBC's. Up to 4 m^3 storage	Storage containers will be subject to routine visual checks and inspection.	IBC's and drums will be stored on top of secondary containment bunds, for	Regular visual inspection of storage and bund provisions.	Site hardstanding and surface water drainage. Isolation valves in drainage system.	Concrete hardstanding and drainage are subject to scheduled inspection and	Yes	Yes	Yes	Negligible

Substances	Relevant Activity	Potential for Pollution from the Relevant Activity	Existence of Pollution Prevention Measures	Nature of Primary Containment	Testing and Inspection of Primary Containment	Nature Of Secondary Containment	Testing And Inspection Of Secondary Containment	Nature Of Tertiary Containment	Testing And Inspection of Tertiary Containment	Adequacy of Pollution Prevention Measures Yes/No	Are the Proposed Integrity Testing of Pollution Prevention Measures Adequate Yes/No	Is there an Adequate Documented Management System to Demonstrate Operator Management and Competence with the Relevant Activity	Likelihood of Pollution
	preparation, BFW preparation)					collection of drips and spills.			maintenance / repair if required.				
Small quantities of waste chemicals and oils (e.g. fresh lube oils / cleaning solvents)	Generated from maintenance activities, e.g. waste oils / cleaning solvent, or storage. Storage of raw lube oils and cleaning reagents (e.g. solvents)	Leak from storage containers. Not bulk storage but drums and IBC's.	Yes	Dedicated waste containers, with segregated storage of hazardous and non-hazardous waste. Storage quantities to be confirmed during FEED stage. Raw materials in drums and IBC's.	Storage containers will be subject to routine visual checks and inspection.	IBC's and drums will be stored on top of secondary containment bunds, for collection of drips and spills.	Regular visual inspection of storage and bund provisions.	Site hardstanding and surface water drainage. Isolation valves in drainage system.	Concrete hardstanding and drainage are subject to scheduled inspection and maintenance / repair if required.	Yes	Yes	Yes	Negligible
Catalysts (O2 removal and SCR)	Charged to process vessels and changed every one to four years	Loss on charging or removing spent catalyst from vessels	Yes	Storage of catalyst material will be minimised with catalyst being ordered ahead of change-out events. Catalyst materials loading/removal to be completed by specialist contractor. Placed in vessels under hygiene dust extraction.	Drums of catalyst inspected. Catalyst containing vessels subject to inspection and maintenance	Plant areas containing vessels are concreted. Catalysts are solids and therefore not very mobile on spillage.	Concrete hardstanding is subject to inspection and maintenance / repair if required.	Mixture of concrete and surface water drainage. Isolation valves in drainage system.	Concrete hardstanding and drainage are subject to scheduled inspection and maintenance / repair if required.	Yes	Yes	Yes	Very low

5. Initial Conceptual Model

5.1 Introduction

This section is aimed at identifying possible risks, if any, arising from substances used or deposited on the Site, or from other sources of land contamination. Both past and current potentially contaminative land uses have been considered. It is based on the Proposed Installation as a Low Carbon CCGT Generating Station

The risk assessment process for environmental contaminants is based on a source-pathway-receptor analysis. These terms can be defined as follows:

- source: a contaminant or pollutant that is in, on or under the land and that has the potential to cause harm or pollution; and
- pathway: a route by which a receptor is or could be affected by a contaminant: examples include ingestion of contaminated soil and leaching of contaminants from soil into watercourses; and
- receptor: something that could be adversely affected by a contaminant: examples include human occupants / users of Site, water resources (surface waters or groundwater), or structures.

For a risk to be present, there must be a relevant / viable contaminant linkage; i.e. a mechanism whereby a source can reasonably impact on a sensitive receptor via a pathway.

The following sections detail the initial CSM which has been developed for the Proposed Installation with a view to assessing the potential risks / liabilities and constraints associated with the Site in its current condition prior to the Proposed Installation taking place. Risks associated with the Proposed Installation have also been assessed based on an industrial future land use scenario, including any potential sources of contamination, potential receptors and potential contaminant pathways identified during this desk-based assessment.

5.2 Sources of Potential Contamination

This section highlights those former and current on-site and off-site activities that have been identified as potential sources of contamination for the Site. These activities may have in turn impacted on soil, soil leachate and groundwater.

Table 21 indicates potential on-site and off-site sources of contamination identified from the Phase 1 desk-based assessment. With reference to Annex 3 of the National House Building Council (NHBC), Chartered Institute of Environmental Health (CIEH) and Environment Agency Guidance for the Safe Development of Housing on Land Affected by Contamination, R&D Publication 66: 2008 (Ref 14), Table 21 also indicates the potential contaminants that may be associated with the potential sources identified.

Table 21: Potential Sources

Potential Source	Location	Associated Contaminants of Potential Concern (CoPC)
Connah's Quay Power Station (formerly coal-fired, currently gas fired), including tanks, Made Ground and capped asbestos landfill	Main Installation Area C&IEA Water Connection Corridor	Potential for metals and semi-metals; inorganics (ammonia, sulphate, sulphide, asbestos, acids and alkalis, pH); organics (oil/ fuel hydrocarbons, PAH, volatile (VOC) and SVOC, PCB, TPH, glycols. Potential for ground gases including methane, hydrogen sulphide and carbon dioxide.
Potentially infilled pits, unspecified ground workings and quarries (on-site and off-site)	Recorded on Main Installation Area and within 250 m from the Adjacent to Repurposed CO_2 Connection Corridor.	Potential for ground gases including methane, hydrogen sulphide and carbon dioxide.

Potential Source	Location	Associated Contaminants of Potential Concern (CoPC)
Historical mine workings and mine shafts (on-site and off-site)	Recorded overlapping the Repurposed CO_2 Connection Corridor; 65 m south of the Main Installation Area, and 140 m east.	Potential for mine gases in bulk including methane and cardon dioxide.
Current railway line (on-site); former railway line associated with former power station (off-site); former railway off River Dee	Adjacent to the southern boundary of the Main Installation Area Within the Repurposed CO_2 Connection Corridor. Historical railway adjacent to the eastern boundary of Electrical Connection Corridor and western part of C&IEA. Historical railway sidings off the River Dee.	Potential for metals and semi-metals; inorganics (sulphate, asbestos); organics (PAH, chlorinated aliphatic hydrocarbons, PCB).
Former landfill sites (on-site and off-site)	Two located on site (Main Installation Area) and extending further to the west. Four off-site, one located adjacent to the Electrical Connection Corridor and 80 m north-east of the C&IEA. One located 90 m west of the Repurposed CO_2 Connection Corridor (J. and J. Makin). Two located north of the Site, beyond the River Dee (Shotton Works Landfill and Tata Steel Historical landfill and Refuse Tip), within 250 m of the Site.	Various deposited wastes including inert, industrial and commercial waste. Potential for a range of inorganic and organic contaminants including but not limited to heavy metals, acids, organic compounds, inorganic compounds, asbestos, TPH, PAH, VOC, SVOC, solvents, lubricants, fuel oils, alkalis, PCB. Potential for ground gases including methane, hydrogen sulphide and carbon dioxide.
Oakenholt Paper Mill (SCA Hygiene Products), including tanks and electrical substation (off-site)	Adjacent to the Repurposed CO_2 Connection Corridor Located approximately 180 m to the south-west of the Main Installation Area.	Potential for range of compounds including but not limited to inorganics, metals, organics, solvents, alkalis and acids, oils and PCB.
Marshland, peat (on-site and off-site)	Within soils on-site and off-site.	Potential low levels of ground gas – methane and carbon dioxide.
Oakenholt Household Waste Recycling Centre and light industrial properties (on-site and off-site)	Located 20 m south of the Main Installation Area and on Repurposed CO_2 Connection Corridor.	Potential for metals, inorganic compounds, acids, alkalis, asbestos, organic compounds including fuels, oils, solvents, PCB, asbestos.
Infilled land: old sand pits, potentially infilled land, historical heaps (on-site and off-site)	On-site: southern and western parts of Main Installation Area, Electrical Connection Corridor. Off-site: 200 m east of the Proposed CO_2 Connection	Potential for a range of inorganic and organic contaminants including but not limited to PFA and other coal by-products, which may contain heavy metals, acids, organic compounds, inorganic compounds, asbestos, TPH,

Potential Source	Location	Associated Contaminants of Potential Concern (CoPC)
	Corridor; multiple within 250 m east of the Repurposed CO_2 Connection Corridor.	PAH, VOC, SVOC, solvents, lubricants, fuel oils, alkalis, PCB. Potential for ground gases including methane, hydrogen sulphide and carbon dioxide.
Various historical tanks (off-site)	Multiple locations, within 250 m of the Site.	Unknown contents of tank, but suspected potential compounds including but not limited to fuels, oils or solvents.
Car garages (off-site)	Multiple locations, 50-100 m south of the C&IEA, 90 m south of the Main Installation Area.	Potential for range of compounds including but not limited to metals, acids and alkalis, asbestos, organic compounds including fuel and hydrocarbons, detergents, solvents, and PAH
Breweries (off-site)	Multiple locations, 250 m south of the Main Installation Area.	Potential for range of compounds including but not limited to metals and inorganic compounds, elevated BOD and COD.

5.3 Potential Pathways

Potential pathways associated with the Site are shown in Table 22, below.

Table 22: Potential Pathways

Pathway Reference	Pathways
P1	Direct contact / ingestion of contaminants within Made Ground / soils, together with soil derived dust and groundwater.
P2	Inhalation of organic vapours from Made Ground / soils, soil derived dust, and groundwater.
P3	Leaching of soluble contaminants and migration of mobile contaminants into shallow groundwater.
P4	Vertical groundwater flow through Made Ground and superficial deposits to underlying bedrock aquifer.
P5	Lateral groundwater flow and direct run-off to surface waters.
P6	Vertical migration of ground gases to indoor and outdoor air and migration of ground and potential mine gases into enclosed spaces (inhalation/ asphyxiation/ explosion).
P7	Inhalation of asbestos fibres.
P8	Direct contact of buried concrete with contaminated soils (i.e. hydrocarbons) and aggressive ground conditions (pH and sulphate)/ direct contact of services and supply pipes with contaminated soils.
P9	Indirect Pathway: Ground and mine gas accumulation and potential explosion risk

5.4 Potential Receptors

Potential receptors associated with the Site are shown on Table 23, below.

Table 23: Potential Receptors

Receptor Reference	Receptors
R1	Human health (on-site users): Current commercial users (workers at Connah's Quay Power Station and at the Proposed CO_2 Connection Corridor)
R2	Human health (on-site users): Current public open space users / trespassers (predominantly C&IEA) / bird watchers
R3	Human health (on-site users): Future commercial users (workers at Connah's Quay Power Station)
R4	Human Health (off-site users): Current and future commercial and public open space users (surrounding)
R5	Current and future residential users (Kelsterton and Golftyn adjacent to south)
R6	Groundwater: superficial geology Glaciofluvial Deposits are classified as a Secondary A aquifer Tidal Flat Deposits and Till are classified as a Secondary Undifferentiated aquifer
R7	Groundwater: bedrock geology (Pennine Lower Coal Measures Formation (sandstone, siltstone, mudstone), Etruria Formation (mudstone, sandstone and conglomerate), Gwespyr Sandstone (sandstone and argillaceous rocks, interbedded) are all classified as a Secondary A aquifer.
R8	Surface Waters: located on-site and off-site (various unnamed drains, River Dee, Kelsterton Brook, Lead Brook, ponds) Surface water abstractions located within Water Connection Corridor (not potable)
R9	Building and infrastructure: located on-site and off-site: infrastructure at risk from ignition of gas in confined space, below ground infrastructure at risk from aggressive ground conditions
R10	Ecological designated sites adjacent to the Site: Ramsar site, SSSI, SPA and SAC – River Dee, ancient woodland (approximately 50 m east of Proposed CO_2 Connection Corridor)
R11	Non-statutory designated ecological sites: Connah's Quay Power Station Nature Reserve (non-statutory) – Dee Estuary

6. Environmental Risk Assessment

6.1 Risk Assessment Principles

Current best practice recommends that the determination of hazards due to contaminated land is based on the principle of risk assessment, as outlined in the Environment Agency's published revised online guidance for the management of land contamination 'LCRM' (Ref 1).

For a risk to be present, there must be a viable contaminant linkage; i.e. a mechanism whereby a source impacts on a sensitive receptor via a pathway.

Assessment of risks associated with each of these potential contaminant linkages are discussed in the following sections.

Using criteria broadly based on those presented in NHBC/CIEH/EA publication R&D 66 (Ref 15) the magnitude of the risk associated with potential contamination at the Site has been assessed. To do this, an estimate is made of:

- the magnitude of the potential consequence (i.e. severity); and
- the magnitude of probability (i.e. likelihood).

The severity of the risk is classified according to the criteria in Table 24, below.

Table 24: The Severity of Risk

Severity	Definition and Examples
Severe	• highly elevated concentrations likely to result in significant harm to human health. • catastrophic damage to crops, buildings or property (e.g., by explosion). • equivalent to EA Category 1 pollution incident including persistent and / or extensive effects of water quality. • major damage to aquatic or other ecosystems.
Medium	• elevated concentrations which could result in significant harm to human health. • significant damage to crops, buildings or property (e.g., damage to building rendering it unsafe). • equivalent to EA Category 2 pollution incident including significant effect on water quality. • significant damage to aquatic or other ecosystems
Mild	• exposure to human health unlikely to lead to significant harm. • minor damage to crops, buildings or property (e.g., surface spalling to concrete). • equivalent to EA Category 3 pollution incident including minimal or short-lived effect on water quality. • minor or short-lived damage to aquatic or other ecosystems.
Minor	• no measurable effect on humans. • repairable effects of damage to buildings, structures and services. • equivalent to insubstantial pollution incident with no observed effect on water quality of ecosystems.

The probability of the risk occurring is classified according to the criteria in Table 25, below.

Table 25: Probability of Risk

Probability	Definition and Examples
High	There is a pollutant linkage, and an event would appear very likely in the short-term and almost inevitable over the long-term, or there is evidence at the receptor of harm or pollution.
Likely	There is a pollutant linkage, and all the elements are present and in the right place which means that it is probable that an event will occur. Circumstances are such that an event is not inevitable, but possible in the short-term and likely over the long-term.
Low	There is a pollutant linkage and circumstance are possible under which an event could occur. However, it is by no means certain that even over a long period such an event would take place and is less likely in the shorter term.
Unlikely	There is a pollutant linkage, but circumstances are such that it is improbable that an event would occur even in the very long-term.

An overall evaluation of the level of risk is gained from a comparison of the severity and probability, as shown in Table 26, below.

Table 26: Probability and Severity Matrix

		Severity			
		Severe	**Medium**	**Mild**	**Minor**
Probability	**High**	Very High	High	Moderate	Moderate/ low
	Likely	High	Moderate	Moderate/ low	Low
	Low	Moderate	Moderate/ low	Low	Very Low
	Unlikely	Moderate/ low	Low	Very Low	Very Low

6.2 Preliminary Risk Assessment

In accordance with the risk assessment principles outlined above, a preliminary evaluation of the potential risks associated with all the identified sources at the Site (Table 21), through the potential pathways (P1 to P9) to the various potential receptors (R1 to R11) is discussed and presented in Table 27, below. The level of risk is determined based on the current condition of the Site (i.e. the effects of mitigation measures are not included). Mitigation is then proposed based on the level of risk. In some cases, a degree of mitigation is assumed as part of legislative requirements or standard construction practice. This is acknowledged where these assumptions are made.

It should be noted that the preliminary mine gas risk assessment (presented in Section 4.4) assigns risk in accordance with the CL:AIRE 2021 guidance; this determines the risk of mine gas being present and is distinct from the R&D 66 risk assessment approach presented in this section which assesses risk to receptors.

Table 27: Preliminary Risk Assessment

Pathway	Receptor	Potential severity	Likelihood of occurrence	Potential risk (R&D 66)	Linkage reference	Justification
P1: Direct contact/ingestion of contaminants within Made Ground/soils, together with soil derived dust and groundwater	R1: Current commercial site users R2: Current public open space users / trespassers (predominantly C&IEA)	Medium	Low	Moderate/ low	L1	The Site has the potential for contamination from various sources, predominantly including the former coal fired power station and the current Connah's Quay power station and a number of on-site and nearby off-site former landfills. However, it is noted that there is reference to the site having been remediated in 1995/1996 prior to construction of the current site layout and also remediation having taken place concerning asbestos picking and extension of capping between November 2017 and September 2018. There has also been localised remediation in response to pollution incidents to land. Off-site sources associated with historical tanks, filter beds, car garages, petrol filling station, pumping stations and breweries, as well as on-site historical rifle range are not considered to pose an unacceptable risk to the receptors due to distance away from the Site and the generally low contaminative nature of the sources. L1: The potential risk to current on-site users from direct contact / ingestion of contaminants has been assessed as moderate/low. The current Connah's Quay Power Station area is currently hardstanding and buildings, reducing exposure risk. Areas of exposed ground are not routinely used by members of the public beyond the immediate Power Station footprint; the risk is therefore considered to be moderate/low as they are temporary site users and their time on-site will be transient. L2: The potential risk to future on-site users from direct contact/ ingestion of contaminants has been assessed as low due to proposed hardstanding and buildings limiting the potential exposure to CoPC and hence reducing exposure risk. Furthermore, wind-blown particulates are unlikely to be mobilised due to future development cover. L3: The potential for direct contact/ingestion of contaminants on-site is considered to be low based on the distance of the off-site users from the on-site sources.
	R3: Future commercial Site users	Medium	Unlikely	Low	L2	
	R4 and R5: Current and future off-site users	Medium	Unlikely	Low	L3	
	R10: Ecological sites: Ramsar site, SSSI and SAC – Dee Estuary and Dee River	Medium	Low	Moderate/ low	L4	L4: The risk to the SPA, SAC, Ramsar site and SSSI which encompass the River Dee at the locations of the proposed cooling water abstraction and outfall for the Proposed Development is considered to be moderate/low based on the sensitivity of this designated ecological site.
	R11: Connah's Quay Power Station Nature Reserve (non-statutory) – Dee Estuary	Mild	Low	Low	L5	L5: The risks to the identified non-statutory designated ecological sites (Nature Reserve) area considered to be low. If phytotoxic contaminants are found to be present within the Made Ground, these can normally be mitigated through suitable topsoil/ subsoil cover.
P2: Inhalation of organic vapours from Made Ground/ soils, soil derived dust and groundwater	R1: Current commercial site users R2: Current public open space users / trespassers (predominantly C&IEA)	Medium	Low	Moderate/ low	L6	L6/L7: The level of risk with regards to potential vapours emanating from within Made Ground is considered to be moderate/low due to the severity of the hazard rather than the likelihood of occurrence for the current and future Site users. Hardstanding across some of the Main Development Area again reduces the risk to a degree. L8: There is a potential for organic soil contamination to be present on-site. The risk to confined spaces located in off-site areas from accumulation of site-derived vapour and potential inhalation is considered to be low. Measures to control the generation of soil derived dust/vapours should be outlined in the Construction Environmental Management Plan taking into account CIRIA C741 4th Edition 'Environmental Good Practice On Site' (2015).
	R3: Future commercial Site users	Medium	Low	Moderate/ low	L7	

Pathway	Receptor	Potential severity	Likelihood of occurrence	Potential risk (R&D 66)	Linkage reference	Justification
	R4 and R5: Current and future off-site users	Medium	Unlikely	Low	L8	
P6: Vertical migration of ground gases to indoor and outdoor air and migration of ground and potential mine gases into enclosed spaces (inhalation/ asphyxiation/ explosion)	R1: Current commercial site users R2: Current public open space users / trespassers (predominantly C&IEA)	Severe	Low	Moderate	L9	L9: Ground gases may be present due to the extent of former landfills and infilled land on-site and off-site, and marshland/peat. Previous investigation noted elevated concentrations of methane and carbon dioxide. L10: Ground gases may be present due to the extent of former landfills and infilled land on-site and off-site. Mine gases might be present due to the recorded shallow coal mining works in the area. If ground gases and mine gases are found to be present, these will need to be mitigated as part of any future building design. The risks from ground and mine gases are considered to be moderate for the future workers within the Proposed Development. L11: Ground gas may be generated within the Proposed Development due to the extent of Made Ground expected as a result of the former landfills. There is potential for ground gas (if present) to migrate off-site and affect nearby properties although there is no evidence this is happening currently. L9/L10/L11: Coal mining and potential shallow workings have occurred on-site (albeit mapped in localised areas within the Repurposed CO_2 Connection Corridor); several mine entries were identified in proximity to the Site and associated with a number of coal seams mapped in the area. Mine gases from abandoned coal mining can enter buildings where they may accumulate to present a risk to human health through asphyxiation and explosion. A Detailed assessment of mine gas risk is recommended.
	R3: Future commercial Site users	Severe	Low	Moderate	L10	
	R4 and R5: Current and future off-site users	Severe	Unlikely to low	Moderate/ low to Moderate	L11	
P7: Inhalation of asbestos	R1: Current commercial site users R2: Current public open space users / trespassers (predominantly C&IEA)	Severe	Unlikely to low	Moderate/ low to moderate	L12	L12: There Is potential for asbestos to be present in any Made Ground on-site and potentially within buildings (depending on their age). Moreover, Asbestos has been confirmed to be present within soils, with particular reference to the C&IEA. It is understood these have been partially remediated through capping; the presence of asbestos fibres within shallow soils is considered to be unlikely to low and in the absence of controls there is the potential for air-borne dispersion if soils containing asbestos are disturbed. As asbestos presents a risk if it is disturbed, it is considered that the likelihood of this risk being realised is unlikely and therefore the overall risk moderate/low has been concluded. If asbestos is encountered during future redevelopment, it must be managed in accordance with the Control of Asbestos Regulations 2012. L13: It is understood asbestos at the C&IEA has been partially remediated through capping, the presence of asbestos fibres within shallow soils affecting public is considered to be unlikely. L14: While it is understood that C&IEA have been partially remediated through capping, the presence of asbestos fibres within shallow soils is considered to be unlikely to low. Any Made Ground found to be contaminated with asbestos or buildings containing asbestos will require suitable management if it is to be retained on-site.
	R4 and R5: Current and future off-site users	Severe	Unlikely	Moderate/ low	L13	
	R3: Future commercial Site users	Severe	Unlikely to low	Moderate/ low to moderate	L14	

Pathway	Receptor	Potential severity	Likelihood of occurrence	Potential risk (R&D 66)	Linkage reference	Justification
P3: Leaching of soluble contaminants and migration of mobile contaminants into shallow groundwater	R6 and R7: Groundwater: Secondary A aquifers (superficial – Glaciofluvial Deposits, bedrock–- Pennine Coal Measures Formation, Etruria Formation, Gwespyr Sandstone) Secondary Undifferentiated aquifer (superficial–- Tidal Flat Deposits and Till)	Medium	Low	Moderate/ low	L15	L15: Groundwater levels within the historical borehole records indicate shallow groundwater levels within the superficial geology of between 0.9 m – 2.80 m bgl. Lateral and vertical migration through preferential pathways within the Made Ground may facilitate infiltration to the underlying superficial Secondary A aquifer. The extent to which the groundwater in the superficial deposits is connected to groundwater in the underlying Pennine Coal Measures (Secondary A aquifer) is not confirmed. Tidal influence, if present, could facilitate mobilisation of contaminant within soils into the aquifer. It is considered that there is a moderate/ low risk for contamination to impact the groundwater within the superficial deposits and potentially bedrock. Monitoring would be required to confirm the current groundwater quality regime. The majority of the off-site sources associated with historical tanks, filter beds, car garages, petrol filling station, pumping stations and breweries, as well as on-site historical rifle range are not considered to pose risk to the receptors due to distance away from the Site and low contaminative nature of the sources.
P4: Vertical groundwater flow through Made Ground and superficial deposits to underlying bedrock aquifer						
P5: Lateral groundwater flow and direct run-off to surface waters	R8: Surface Waters: located on-site and off-site Surface water abstraction located on-site (not potable)	Medium	Low to likely	Moderate/ low to moderate	L16	L16: On-site surface water receptors are culverted and may reduce the likelihood of direct impact by contaminated soil or groundwater, subject to the culverts' condition. However, the nature of the Site and its surrounding area, including the indicated naturally high groundwater levels and the proximity of numerous surface water features, indicates a potential for the groundwater to provide base flow to off-site surface water receptors, predominantly the River Dee. Previous reports suggest the potential for tidal influence on the River Dee and groundwater beneath the Site, and hydraulic continuity between groundwater at the Site and the river water; tidal influence, if present, could facilitate mobilisation of contaminant within soils into the aquifer. There is no information on surface water quality. Therefore, there is considered to be a moderate/low to moderate potential risk to surface watercourses and the surface water abstractions (not potable).
P8: Aggressive attack through direct contact with natural ground or contaminants within Made Ground/ soils, leachate and groundwater	R9: Building and infrastructure: located on-site and off-site	Mild	Likely	Moderate/ low	L17	L17: The risk to foundations and services is considered to be moderate/low based on the potential for on-site contamination within the Made Ground/soils, leachate and groundwater. L18: Ground gases may be present due to the extent of former landfills on-site and off-site and so there is the potential for ground gas migration and build-up in confined spaces. Where methane is identified at certain levels, there is the potential for explosion to occur, albeit unlikely. If ground gases are found to be present, these will need to be mitigated as part of the future Proposed Development design. Coal mining shallow workings have occurred on-site (albeit mapped in localised areas within the Repurposed CO_2 Connection Corridor); several mine entries were identified in proximity to the Site and associated with a number of coal seams mapped in the area. Mine gases from abandoned coal mining can enter buildings where they may accumulate into buildings to present a risk of explosion. A Detailed assessment of mine gas risk is recommended.
P9: Ground and mine gas accumulation and potential explosion risk		Severe	Low	Moderate	L18	

7. Conclusion

The assessment presented in this Appendix has identified that:

- the Site is currently occupied by the existing Connah's Quay Power Station (in the central and eastern parts of the Main Installation Area) and land associated with former Connah's Quay coal-fired Power Station (now demolished) and agricultural land. The existing Connah's Quay Power Station is gas-fired. Extensive historical landfilling has been identified on-site and off-site in close proximity (to the west);
- based on a review of current and historical mapping and identification a number of potential sources (the aforementioned coal-fired power station and associated infrastructure and the former landfills being potentially the most significant), encountering ground contamination is considered to be likely;
- a number of existing reports have been reviewed; these covered a period between the early 1960s and 2022; in general, during the ground investigations, the investigated areas were found to be underlain by fill of the estuarine sands or PFA, and natural strata comprising alluvial sands underlain by carboniferous strata;
- most of the existing site investigation reports pre-date the current Power Station construction and, in some cases, coincide with the site reprofiling/reclamation works and hence the ground conditions and groundwater regimes documented will not be representative of current day conditions; the majority of the ground investigations carried out at the Site were geotechnically focused; reports undertaken since the turn of the century document various groundwater monitoring and associated risk assessments undertaken;
- The 2025 Geotechnics Limited investigation confirmed that groundwater was generally present in the superficial geology across the site and provided further information on the geological stratigraphic sequence beneath the Site. A further Phase II A and B investigation is proposed to be completed prior to construction commencing and the results of this additional investigation will be provided as an Addendum to the SCR as a pre-operational condition;
- ground gas sources exist from the underlying Made Ground (depending on its thickness and composition) and from historical landfills. The geological stratigraphic sequence beneath the Site is likely to comprise Made Ground, overlying superficial deposits. These superficial deposits are composed of Alluvium, Glaciofluvial Deposits, Till and Tidal Flat Deposits. The Site may also be subject to risk from mine gas associated with mine shafts located 65 m south of the Main Installation Area, however, detailed assessment is required;
- the bedrock is predominantly Lower Pennine Coal Measures, which lies at approximate depths varying from 9.70 to 20.20 m bgl;
- the superficial deposits are mostly classified as a Secondary Undifferentiated and as Secondary A aquifer. The solid geology is classified as a Secondary A aquifer. Groundwater is likely to be present near surface (1 m to 3 m bgl) located mostly within the superficial deposits. This may affect temporary and permanent works;
- there are numerous surface watercourses on-site and within the study area. The Dee River and Estuary is located on the northern-most extent of the Site and adjacent to the north. This is a designated Ramsar Site, SSSI, SPA and SAC. Connah's Quay Power Station Nature Reserve, non-statutory site, has also been identified in proximity to the Site; and
- based on the initial CSM and preliminary risk assessment, the Site represents a generally low to moderate risk in terms of the risk to the human health of current and future on-site occupants in the absence of mitigation and a low to moderate/low risk to the human health of off-site users. A moderate/low risk for contamination to impact the groundwater within the superficial deposits and bedrock, and a moderate/low to moderate potential risk to surface water receptors has been assigned. The risk to the Dee River and Estuary statutory ecological designations is considered to be low to moderate/low based on the sensitivity of this designated ecological site. The risks to the non-statutory Nature Reserve site are considered to be low.

The risk ratings are mainly related to the potential for contamination to be present at elevated concentrations which may pose harm to receptors because of the type of land use (heavy industrial and

landfilling) undertaken at the Site. However, generally the likelihood of the linkage being realised was mainly assigned as low rating. The overall risk rating of low to moderate is not uncommon for industrial and brownfield sites.

The contaminative risks can be mitigated by further assessment through intrusive ground investigation and risk assessment at the detailed design stage, and if necessary, the inclusion of routine construction measures for example, ground gas protection measures within buildings, dewatering of excavations, drainage, support to excavations, removal of below ground obstructions and the design of foundations appropriate to the conditions.

The Installation will maintain an incident register throughout the lifetime of the operations which will log any losses of containment or near misses, and record whether the loss was contained to the site systems (as expected) or managed to enter the underlying soil and groundwater, in which case the clean-up and remediation activities undertaken will be recorded.

The Installation will also maintain an infrastructure monitoring log to record the scheduled inspection and maintenance of containment systems e.g. amine tank and bunding, and any significant maintenance or repair activities required. Details of the routine inspection and maintenance activities will be developed prior to commencement of operations.

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Annex A Groundsure Report

Annex B Groundsure Maps

Annex C Coal Mining Report

Annex D MAGIC Report

Annex E Site Walkover Photos

Annex F Site Investigation Reports

Annex G Raw Materials Inventory

Material	Use on Site	Hazard Properties	Hazard Identification[b]	Annual Usage	Comment
Proprietary Amine Solvent (Cansolv DC103) 99% wt. (as delivered)	CO2 absorption solvent	Health Hazard Corrosive Toxic	**H302 –** Harmful if swallowed **H315 –** Causes Skin Irritation **H318 –** Causes serious eye damage **H334 –** May cause allergy or asthma symptoms or breathing difficulties if inhaled **H317 –** May cause an allergic skin reaction **H361f –** Suspected of damaging fertility **H361d –** Suspected of damaging the unborn child	Amine-based solvent – 644 tonnes[a] per train	Estimated storage capacity for: Amine-based solvent – 1,711 T
SLB Capturi "S10" Proprietary Solvent	CO2 absorption solvent	Health Hazard Corrosive Toxic	**H302 –** Harmful if swallowed **H315 –** Causes Skin Irritation **H318 –** Causes serious eye damage **H334 –** May cause allergy or asthma symptoms or breathing difficulties if inhaled **H317 –** May cause an allergic skin reaction **H361f –** Suspected of damaging fertility **H361d –** Suspected of damaging the unborn child	Amine-based solvent – 767 tonnes[a] per train	Estimated storage capacity for: Amine-based solvent – 2,155T [b]
Caustic soda 46% wt for Technology Licensor 1 20% wt for Technology Licensor 2	pH control (various)	Hazardous Corrosive Toxic	**H290 –** Corrosive to metals **H314** – Causes severe skin burns and eye damage	Technology Licensor 1 = 364 T per train Technology Licensor 2 = 2,425 T per train	61T Tank for Technology Licensor 1 68T for Technology Licensor 2
Hydrogen 99/5% wt.	Oxygen removal + Generator cooling	Hazardous Highly flammable	**H220 –** Extremely flammable gas **H280 –** contains gas under pressure, may explode if heated	3T per train for Technology Licensor 1 not counting consumption of generated H_2 12 T per train for Technology Licensor 2	0.1T per train for Technology Licensor 1 0.25 T per train for Technology Licensor 2
Aqueous ammonia 19% wt for Technology Licensor 1 24.5% wt for Technology Licensor 2	SCR	Corrosive Harmful Environmental Hazard	**H314** – Causes severe skin burns and eye damage **H318** – Causes serious eye damage **H335** – May cause respiratory irritation **H411 H412 –** Toxic to aquatic life with long lasting effects	3,586 per train t for Technology Licensor 1 7,184 t per train for Technology Licensor 2	98T tank for Technology Licensor 1 99T tank for Technology Licensor 2
Diesel/HVO	Emergency diesel generator	Health Hazard Harmful	**H304** – May be fatal when swallowed and enters airways **H315** – Causes skin irritation **H332** – Harmful if inhaled **H351** – Suspected of causing cancer **H373** – May cause damage to organs through prolonged or repeated exposure (bone marrow, liver, thymus) **H411 –** Toxic to aquatic life with long lasting effects	3.2 tonnes/hour based on a 72 hour grid resilience run case	205 T tank for Technology Licensor 1. 236 T tank for Technology Licensor 2. Once site system is charged the delivery is very infrequent diesel is only used in emergency situations
Sulphuric Acid	pH control (various)	Corrosive Irritant Toxic	**H314** – Causes severe skin burns and eye damage	1,725 T per train for Technology Licensor 1 4,000 T per train for Technology Licensor 2	100T bunded tank for both Technology Licensors
Sodium Hypochlorite	Biocide treatment	Corrosive Environmental Hazard	**H290** – May be corrosive to metals **H314** – Causes severe skin burns and eye damage **H318 –** Causes serious eye damage **H400 -** Very toxic to aquatic life. **H411** - Very toxic to aquatic life with long lasting effects.	142 T per train	116 T bunded tank serving both trains
Water Treatment Chemicals	Boiler / cooling water treatment	Corrosive Harmful	**H315** - Causes skin irritation **H319** – Causes serious eye damage or eye irritation **H332** – Harmful if inhaled	TBC	TBC
Antifoam		Irritant	**H319 –** Eye irritant	TBC	TBC

Material	Use on Site	Hazard Properties	Hazard Identification[b]	Annual Usage	Comment
Activated Carbon	Emissions control	-	Not generally classified to be confirmed when product selected.	TBC	TBC
Sodium Carbonate	Water treatment	Irritant	**H319 –** Eye irritant	TBC	TBC
Argon	System purging	Explosive	**H280 –** contains gas under pressure, may explode if heated	TBC	TBC
Carbon Dioxide	Compressor priming	Asphyxiant	**H280 –** contains gas under pressure, may explode if heated (not applicant site as not stored under pressure.)	TBC	TBC
Gas Turbine Detergent	Gas turbine cleaning	Irritant	**H319 –** Eye irritant	TBC	TBC
Support Balls for catalyst/dessicant beds		-	Not generally classified to be confirmed when product selected.	TBC	TBC
Oxygen Removal Catalyst	Compressors	Corrosive Harmful Environmental Hazard	**H317 –** May cause an allergic skin reaction **H318 –** Causes serious eye damage **H334 –** May cause allergy or asthma symptoms or breathing difficulties if inhaled **H341** – category 2 mutagen **H350** – Suspected of causing cancer **H360 –** Suspected of damaging fertility **H372** – May cause damage to lungs **H411 –** Toxic to aquatic life with long lasting effects	TBC	TBC
Dryer Dessicant	Dryers	-	Not generally classified to be confirmed when product selected.	TBC	TBC
SCR catalyst	SCR System	-	Not generally classified to be confirmed when product selected.	TBC	TBC
Monoethylene Glycol	Antifreeze	Health hazard harmful	**H302 –** Harmful if swallowed **H332** – Harmful if inhaled	TBC	TBC
Filter Media		-	Not generally classified to be confirmed when product selected.	TBC	TBC
Hydraulic Oils	High pressure applications	Aspiration hazard Harmful Environmental hazard	**H304** – May be fatal when swallowed and enters airways **H332** – Harmful if inhaled **H412 –** Toxic to aquatic life with long lasting effects	TBC	TBC
Transformer Oils	Transformers	Aspiration hazard	**H304** – May be fatal when swallowed and enters airways	TBC	TBC
Seal Oils	Equipment seals	Aspiration hazard Irritant Toxic Environmental hazard	**H225** - flammable **H304** – May be fatal when swallowed and enters airways **H319 –** Causes serious eye damage **H336 –** specific target organ toxicity **H412 –** Toxic to aquatic life with long lasting effects	TBC	TBC
Lube Oils	Equipment lubrication	-	Not generally classified to be confirmed when product selected.	TBC	TBC
Control Oils	Equipment lubrication	Toxic	**H332** – Harmful if inhaled	TBC	TBC
Antifreeze	Equipment Protection	Toxic	**H302 –** Harmful if swallowed	TBC	TBC

(a) Amine- based Solvent to be confirmed after FEED.
(b) Example SDS provided – hazard properties will be confirmed once final product selected.

Annex H Figures and Plans