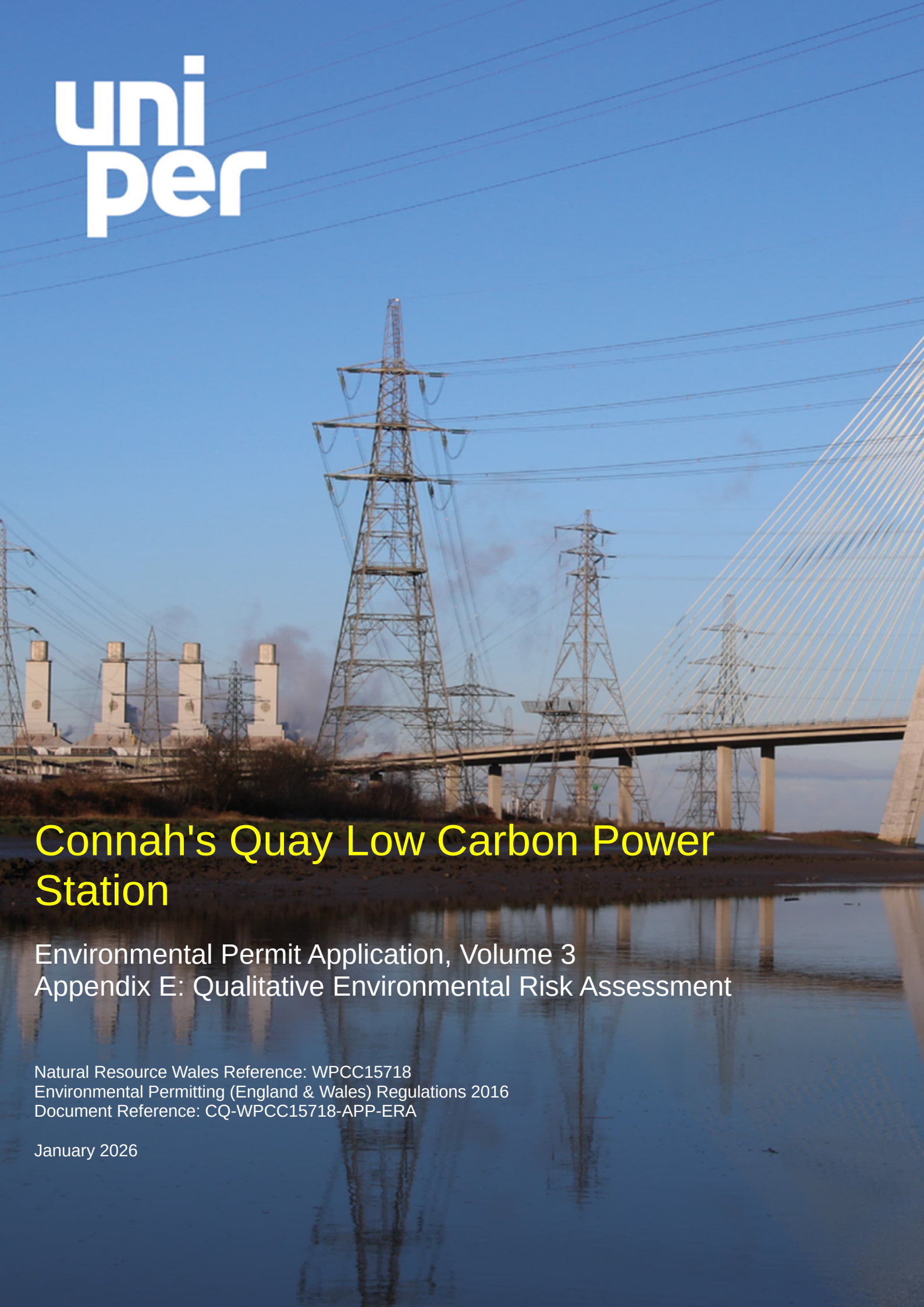

Connah's Quay Low Carbon Power Station

Environmental Permit Application, Volume 3
Appendix E: Qualitative Environmental Risk Assessment

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

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Prepared for:

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Prepared by:

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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

Abbreviation	Term
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

Abbreviation	Term
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 Carbon 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

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

1. Report Context

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 an Environmental Permit application for Connah's Quay Combined Cycle Gas Turbine (CCGT) with Carbon Capture (CPP) Project ("Proposed Installation").

This report is the qualitative environmental risk assessment which considers the environmental impact of potential fugitive or accidental releases, odour, fire risk, and climate risks, from the operational installation that fall under the remit of Environmental Permitting. Point source releases to air and water plus noise are discussed and reference out to relevant supporting assessments.

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, but 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), will 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 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 meet 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, carbon monoxide (CO) and residual CO_2. The CCP will be designed to be capable of capturing 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 emissions stack, and HRSG stack will meet the emission limits for LCP under the Industrial Emissions Directive (IED).

Other supporting infrastructure and plant to the proposed installation will include storage of solvent, caustic soda, sulphuric acid and water-treatment chemicals storage, 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 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 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 waste water from the site will also be discharged to the existing sites 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 maximising energy efficiency. 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. Impact Evaluation

2.1 Introduction

This section outlines the approach taken to evaluate the risks to the environment associated with the operation of the Proposed Installation. The impact evaluation process has referred to the appropriate guidance within the Natural Resource Wales (NRW) Guidance "How to carry out a Risk Assessment for your Environmental Permit".

2.2 Impact Evaluation Methodology

The evaluation methodology used involves three stages:

1. ***Source characterisation***, to identify the potential hazards and risks associated with the operation of the facility. This is covered in detail in Section 3 below, but broadly covers:
   a. Point source emissions to air, land and water;
   b. Fugitive emissions to air, land and water;
   c. Nuisance issues such as litter, odour, noise and vibration;
   d. Visible plumes
   e. Abnormal operations and accidents
   f. Fire Risk
   g. Climate Risk

   A separate assessment of point source releases to air from the installation and for noise has been prepared and is presented in Permit Application Volume III, Appendix G and Appendix I respectively.

2. ***Receptor evaluation***, to review the receptors which could be impacted by the hazards and risks from the operation of the facility Receptors are discussed in more detail in Section 4 below, but broadly covers:
   a. Residential, commercial and industrial human receptors;
   b. Habitat receptors associated with designated and other sensitive sites; and
   c. Location related receptors associated with site geology, hydrogeology and hydrology.

3. ***Risk assessment*** which evaluates the hazards and risks in terms of the probability of occurrence and the severity of the impact on the identified receptors. The risk assessment also summarises the management plan approach that will be used to mitigate the identified risks. Risk assessments are presented in Section 5.

3. Step 1 : Source Characterisation

3.1 Introduction

Assessments consider environmental risks, and this section provides a summary overview of the characterisation of the sources associated with:

- Point source emissions to air, land and water (Section 3.2) ;
- Fugitive emissions to air, land and water (Section 3.3);
- Odour emissions (Section 3.4);
- Noise and vibration (Section 3.5);
- Visible plumes (Section 3.6);
- Abnormal operations and accidents (Section 3.7);
- Fire risk (Section 3.8); and
- Climate risk (Section 3.9).

3.2 Point Source Emissions to Air, Land and Water

3.2.1 Point Source Releases to Air

The point source air emissions during the operational phase are as follows:

- HRSG stack x 2 (1x stack per train)
- Single absorber stack x 2 (1x stack per train)

During normal operation, the CCP absorber stack would be the primary source of emissions from both the combustion and carbon capture processes associated with the Proposed Installation as the exhaust gas from the CCGT plant will pass directly into the CCP for CO_2 removal. This emission during abated mode will therefore comprise the combustion emissions of NOx and CO from the CCGT plant, additional emissions of NH_3 slip from the SCR and amines and their degradation products from the CCP.

In addition, there would be a HRSG stack associated with Proposed Installation's CCGT units (one per train), which would only be operational when the Proposed Installation is operating in an unabated mode (i.e. combustion emissions only, with no carbon capture taking place) These emissions will therefore comprise emissions of NOx, and CO as no SCR will be in use. The use of natural gas means that emissions of sulphur dioxide (SO_2) and particulates (PM) from the CCGT plant will be negligible. This mode of operation represents an abnormal mode of operation and will only occur for short periods of time, after unplanned shutdown of the carbon capture unit, estimated to be <5% of the year or during periods of CO_2 transport and storage (T&S) outages.

Emissions from each of the above release points are detailed Section 5.2 of the Supporting Statement (Document reference: WPCC15718-APP-SS). A separate screening assessment of point source releases to air using the H1 tool has been completed and is presented in permit Application, Volume III, Appendix F which showed that NOx emissions could not be screened as insignificant. As such a separate air dispersion assessment of point source releases to air from the Proposed Installation has been prepared and is presented in Volume III, Appendix G of the permit application. No further assessment of point source releases to air will be undertaken in this risk assessment.

3.2.2 Point Source Releases to Land

All areas on site will be covered in hardstanding, with the exception of any landscaped areas (which will be located away from process areas) and the parking areas which will be covered in permeable or porous paving, .

Filter drains or swales would provide initial treatment of road and/or building drainage. The drainage network could include oil interceptors and/or downstream defenders within each catchment to remove oils, suspended solids and sediment bound hydrocarbons, as necessary based on the development layout.

Oil interceptors and/or vortex separators would be provided within each drainage catchment to encourage the removal of oils, suspended solids and sediment bound hydrocarbons. Attenuation tank(s) are also included within the drainage network and would contain the majority of design storm water during tidal lock conditions.

There will be no soakaways on the site. Consequently, no direct emissions to land will occur as a result of the operation of the proposed installation. Regular inspections of the hardstanding areas and drainage systems will be carried out to identify and repair possible damage and prevent any potential releases to land.

3.2.3 Point Source Releases to Water

Point source releases to water from the site are described tin the sections to follow, with further detail provided in Section 4.3.9 of the Supporting Statement (Document reference: WPCC15718-APP-SS in Permit Application, Volume II). The releases to the River Dee are regulated under the existing Environmental Permit (EPR/NP3037AF) discharge conditions as detailed in Section 5.4 of the Supporting Statement (Document reference: WPCC15718-APP-SS in Permit Application, Volume II) and no changes are proposed to these conditions as part of this application. As such no assessment of the point source releases to water has been completed.

3.2.3.1 Discharge to Sewer

There are no point source releases to sewer. It is expected that the Proposed Installation would utilise a new system Sanitary Waste Plant for black and grey wastewater including foul drainage from permanent welfare facilities. The Sanitary Waste Plant will facilitate settling and the treated black and grey wastewater will be either discharged to the River Dee with main cooling water purge discharge (in accordance with the existing permit EPR/NP3037AF) or to be removed by specialist contractor.

3.2.3.2 Surface Water

The proposed installation has been designed to provide a drainage system that protects the environment from accidental discharges including segregation of clean water / rainwater from potentially contaminated water and / or firefighting chemicals.

Initial interception and attenuation of surface water runoff will be provided by SuDS measures. These will provide a degree of water quality treatment. The proposed SuDS include permeable or porous paving within the parking areas, designed to allow for the runoff from the parking and nearby adjacent areas to be intercepted and treated. Proposed filter drains or grassed swales would provide initial treatment of road and/or building drainage. Attenuation tank(s) are also included within the drainage network. Oil interceptors and/or vortex separators would be provided within each drainage catchment to encourage the removal of oils, suspended solids and sediment bound hydrocarbons. The attenuation tank(s) will contain the majority of design storm water during tidal lock conditions, with more extreme events being permitted to overtop and floodwater routed away from infrastructure. There would be a penstock immediately upstream of the new outfall.

Clean surface water would be appropriately segregated and directed for discharge. Following attenuation, clean surface water site drainage would be discharged to either the Old Rockcliffe Brook or the Oakenholt Brook culvert via a new surface water outfall (W4) adjacent to the existing outfall. The final design of the proposed outfall will be subject to various technical assessments to identify the most appropriate solution. Clean surface water discharges will be monitored prior to discharge to ensure

there is no visible oil or hydrocarbon present and for pH in line with the environmental permit (EPR/NP3037AF) for the existing Power Station.

Water quality monitoring will be regularly undertaken by the site operator to confirm the quality of any water in bunded areas, sumps or tanks to ensure that it is suitable for discharge or otherwise is taken by a tanker for off-site disposal at a suitably permitted wastewater facility.

3.2.3.3 Process Wastewater

A number of potential sources of wastewater would arise from the Proposed Installation including (but not limited to):

- neutralised effluent streams from the demineralisation plant;
- blowdown from the CCP and CCGT;
- treated effluent from the CCP; and
- contaminated surface water arising from process areas, that may contain chemicals such as oils or flue gas treatment products.

Wastewater treatment will be provided for process wastewaters to optimise the volume of water being recirculated. Process water that can't be recirculated will:

- need to meet the internal environmental quality criteria for transfer to the SDX tank A to allow discharge under the existing permitted discharge limits; or
- disposal of degraded amine or other contaminated wastewater not suitable for discharge will be removed via tanker for off-site disposal at a suitably permitted waste facility.

Any potentially contaminated process waters from the Proposed Installation or existing Power Station will be discharged to their respective SDX-tank . All inlet flow needs to be controlled for permit values. If values are exceeded, automatic penstock valves shuts-off the discharge to the common discharge chamber of the potentially contaminated SDX Tank, while the other plant can continue to operate, while using the second SDX tank.

3.2.3.4 Cooling Water Purge Discharge From Proposed Installation

Apart from drift and evaporation loss, cooling water will be discharged from the new cooling towers towards the two existing purge ponds (A & B). During normal operation, water from the Proposed Installation would discharge into purge pond A with cooling water from the existing Connah's Quay Power Station discharging to purge pond B. However, during abnormal operations for instance due to equipment failure or maintenance the cooling water from both the existing Power Station and the Proposed Installation can be discharged into the same purge pond.

Online analysers will control automated penstock valves, together preventing the discharge of out-of-spec waters to the purge ponds.

Cooling water from the Proposed Installation will be discharged back to the River Dee. Any discharge from Proposed Installation to the shared infrastructure will need to be permit compliant at all times. As all tanks and ponds are hydraulically connected via the "Common Discharge Chamber", the discharge will have to be coordinated based on level measurement to prevent mixing of the waters. It is anticipated to have a level prioritized discharge order. Ultimately once the existing power plant is fully decommissioned, the Proposed Installation will have full flexibility and can use the purge ponds and SDX tanks in a similar way to the existing site today.

The cooling water discharge would be consistent with the operation of the existing power station in terms of temperature and water quality, and would comply with the existing environmental permit limits. No changes are proposed to the existing permit (EPR/NP3037AF) limits

Cooling water discharges from the Proposed Installation will be continuously monitored for temperature, pH, conductivity/salinity, oil and total residual oxidant prior to discharge to the purge pond to ensure water discharged to the River Dee is always compliant with the permit discharge limits. If the inlet

analysers at the Proposed Installation detect values above permit limits, discharge to the purge pond and common discharge chamber automatically gets stopped.

3.2.3.5 Domestic and Sanitary Effluent

It is expected that the Proposed Installation will use a new underground septic tank for storage and settling (as treatment) system for black and grey wastewater including foul drainage from permanent welfare facilities. Treated black and grey wastewater will be discharged to the River Dee at W1 along with main cooling water purge discharge (in accordance with the existing permit EPR/NP3037AF). Connection to the closest public sewer is not considered feasible due to the presence of the railway line that would need to be crossed.

In the event of a plant malfunction, or where a new contaminant stream is generated that is not authorised under the existing environmental permit, the material shall be removed by vacuum tanker and disposed of at an approved off-site facility.

3.2.3.6 Temporary Domestic and Sanitary Wastewater Management During Construction

A temporary on-site wastewater treatment system, comprising a Moving Bed Biofilm Reactor (MBBR), will be installed to treat black and grey wastewater from construction phase activities prior to discharge. This will ensure that untreated sewage is not discharged. Treated effluent will be discharged via the existing permitted outfall (W1) along with the main cooling water purge to the River Dee, in accordance with existing permit (EPR/NP3037AF) conditions.

Treated effluent quality will be managed to be comparable to that of nearby municipal wastewater treatment works, specifically the Flint and Queensferry treatment works. Target parameters are: biochemical oxygen demand (BOD_5) of less than 25 mg/L O_2 (or greater than 70% reduction), chemical oxygen demand (COD) of less than 125 mg/L O_2 (or greater than 75% reduction), and total suspended solids (TSS) of less than 60 mg/L.

The discharge volume will vary in line with construction workforce numbers. The temporary treatment and discharge arrangement will be in place from establishment of the temporary site facilities through to completion of commissioning and performance testing, after which it will be removed and permanent wastewater arrangements reinstated.

3.2.3.7 Ground Water

There are no point source releases to ground water associated with the proposed facility.

3.3 Fugitive Releases to Air, Land and Water

Fugitive releases will be minimal due to the nature of the site operations although the following potential release sources from the current operations have been considered:

- Windblown dust and particulates from external roads and surfaces;
- Venting of site storage tanks;
- Gas and vapour leaks from pipeline flanges;
- Spillage of liquid fuels, abatement chemicals (SCR and CCP), water treatment chemicals or maintenance materials resulting in contamination of surface run-off from pavements, roads and hardstanding or ingress to land/groundwater;
- Liquid leaks from storage tanks, containers, valves and pipework flanges.

Sources of fugitive emissions are outlined below and a risk assessment of these releases including proposed mitigation measures is presented in Section 5.3.1 below.

3.3.1 General Windblown Dust and Particulates

The risk of dust and particulate accumulation is low at the site given the nature of the activities and the materials handled. There is, however, potential for materials used in soft landscaping areas to become windblown and for windblown materials to deposit from agricultural areas which are external to the site.

3.3.2 Venting of site storage tanks

The site will store a number of materials within storage tanks including CCP abatement solvents, diesel for emergency generators, NH_3 for the SCR system and water treatment chemicals. Storage tanks will be specific to the material being stored, but there is potential for tanks to be equipped with vents.

3.3.3 Vapour Leaks From Pipeline Flanges

The site will handle a number of materials through pipelines including natural gas, CCP abatement solvents, diesel for emergency generators, NH_3 for the SCR system and water treatment chemicals. The pipeline routes will include flange joints and over time there is potential for these to deteriorate resulting in fugitive releases of vapours are the joints.

In addition, during maintenance, the pigging of the gas pipelines may result in the release of natural gas.

3.3.4 Spillage of Waste/Materials During Maintenance

During plant maintenance activities, there is potential for accidental releases of materials and/or waste which could impact ground and/or surface water runoff. The site will maintain appropriate maintenance procedures (e.g. drain down of systems), housekeeping standards and spill response procedures which show reduce the impact.

3.3.5 Liquid Leaks from Storage Tanks, Containers, Valves or Pipework

The site will store a number of materials within storage tanks including CCP abatement solvents, diesel for emergency generators, NH_3 for the SCR system and water treatment chemicals. The materials will be transported to the point of use via pipelines. Over time there is potential for these to deteriorate resulting in fugitive releases that could impact ground and/or surface water runoff.

In addition, maintenance materials may be stored in smaller containers and transported manually to the point of use. There is potential for leaks or small spills to occur.

3.4 Nuisance Issues

3.4.1 Litter

The site presents a low potential for litter to be generated and the only source would be windblown material from externally stored bins that are not secured properly.

3.4.2 Mud and Debris

The potential for mud and debris at the facility have been evaluated and as external surfaces, pathways and roads are hard surfaced there is minimal risk of this occurring.

3.4.3 Odour

There is a risk of odour from the storage of diesel, NH_3 for the SCR plant, and storage and use of amines within the CCP which may have the potential to generate odour. The design of tank and pipeline systems for these materials will be undertaken in accordance with the appropriate industry codes and standards. Therefore, no odour is expected apart from odour resulting from spillages or leaks of site liquid materials which would be treated as an abnormal operation. Odour considerations for any fugitive releases of these materials has been included in the risk assessment in Section 5.3.2

3.4.4 Noise and Vibration

The following have been identified as potential noise and vibration sources:

- Fans (including inlets, outlets, stacks, cooling system and enclosures);
- Pumps, drives and motors;

- Vent stacks;
- Turbines;
- Engines;
- Steam systems;
- Cooling towers and transformers; and
- The testing of emergency pressure relief valves.

General nuisance considerations from noise have been considered in the risk assessment in Section 5.3.2 for completeness. A separate detailed noise modelling assessment in accordance with NRW Guidance has been completed and is presented in Permit Application, Volume III Appendix I and a Noise Management Plan has been prepared and is presented in Permit Application Appendix J.

3.5 Visible Plumes

The proposed CCGT units would burn natural gas fuel, and water vapour would form part of the composition of the combustion gases released from the stacks. Under certain conditions this water vapour can cool and condense in close enough proximity to the stack exit to form a visible plume. This has been assessed as part of the Air Quality Assessment which has been prepared and is presented in Appendix G in Volume III of the permit application.

In addition, the condensation of steam exiting the steam turbine and cooling of the recirculating cooling water would be achieved using cooling towers which will be designed to minimise the formation of visible plumes, although it is recognised that some plume formation may occur dependent on the ambient weather conditions.

Backup power generators should not generate a visible plume because of efficient combustion and high exhaust temperatures. Any visible plumes will result in works ceasing and the generator being taken out of service until efficient combustion resumes and no longer visible plume. Risk assessment for visible plumes is presented in section 5.3.3.

3.6 Abnormal Operations and Accidents

The following abnormal operations and emergency situations have been identified for the operations:

- Transfer of substances including vessels overfilling, and emptying of vessels and containers;
- Failure of plant and equipment (for example over-pressure of vessels and pipework, blocked drains);
- Failure of containment (for example, bund failure, or drainage sumps overfilling);
- Making the wrong connections in drains or other systems;
- Extreme weather conditions, such as flooding or very high winds;
- Failure of main services (for example loss of power.);
- Operator error;
- Security breach;
- Major vehicle accident.

A risk assessment covering these issues is presented in Section 5.3.4.

3.7 Fire Risk

In addition to the above abnormal operations and emergency situations, specific considerations has been given to fire risk associated with the following:

- Arson and vandalism;

- Self-combustion;
- Plant and equipment failure;
- Electrical faults;
- Naked lights;
- Discarded smoking materials;
- Hot works;
- Industrial heaters;
- Ignition sources;
- Leaks and spills;
- Build-up of combustible materials; and
- Containment of fire water.

A risk assessment covering these issues is presented in Section 5.3.5.

3.8 Climate Risk

In line with the “Adapting to Climate Change: Risk Assessment for Your Environmental Permit” guidance on the www.gov.uk website, as the site has operations beyond 2050 and abstracts water from the River Dee, consideration has been given to risk associated with the impacts that need to be considered from a changing climate. These include:

- Increased temperatures in winter and summer;
- Increased peak rainfall events;
- Average winter rainfall increasing;
- Lower rainfall and drier summers;
- Sea level increases;
- Changes in peak river flows; and
- Changes in the frequency and intensity of storms.

A risk assessment covering these issues is presented in Section 5.3.6.

4. Step 2 – Receptor Evaluation

Potential receptors which could be impacted by the operations of the proposed facility include:

- Residential, commercial and industrial human receptors;
- Habitat receptors associated with designated and other sensitive sites; and
- Location related receptors associated with site geology, hydrogeology and hydrology.

4.1.1 Human Receptors

The receptors are selected to be representative of residential dwellings, recreational areas, schools and commercial/industrial buildings in the area around the Proposed Installation.

The existing Connah's Quay Power Station is located adjacent to the Proposed Installation to the southeast with the Chester – Holyhead railway line, Chester Road / A548 road running approximately parallel to the southwestern boundary of the Site, with agricultural land beyond;

The nearest residential receptor is located approximately 20 m from the Proposed Installation along Kelsterton Road, which also includes a travellers site.

The nearest main settlement is the town of Connah's Quay. Its approximate centre is located approximately 2.1 km south-east of the Proposed Installation, though residential areas of the settlement reach to within approximately 90 m of the Proposed Installation.

Other nearby settlements to the Proposed Installation include the village of Oakenholt, with the closest residential property approximately 375 m west and several scattered residential areas and individual residential properties, including farmsteads, are located within 1 km.

A list of specific human receptors within 2km of the Proposed Installation are shown in Table 3-4 of the Air Quality Dispersion Assessment (Permit Application, Volume III, Appendix G). The sensitive human receptors are also shown on Figure 5 in Permit Application, Volume IV, Figures and Plans.

4.1.2 Sensitive Environmental Habitats

NRW guidance requires that the effects of stack emissions on designated ecological sites be assessed where they fall within set distances of the source, up to 10km for European designated sites and up to 2km for nationally designated sites.

Statutory designated sites have been identified through a desk study of the Defra Magic mapping website, which identifies SSSIs, Ramsar sites, SPAs and SACs.

A number of nationally designated ecological sites are situated within close proximity to the site; including:

- Dee Estuary Site of Special Scientific Interest (SSSI)/ Special Protection Area (SPA)/ Ramsar site located immediately of the Site to the north and northwest.
- The River Dee and Bala Lake / Afon Dyfrdwy a Llyn Tegid SAC, which is located approximately 3.8km to the southeast;
- Deeside and Buckley Newt sites SAC, which is located approximately 3.1 km to the 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.

Sensitive nature conservation receptors within 10km of the site boundary are identified in Table 3-5 in the Air Quality Dispersion Assessment (Permit Application, Volume III, Appendix G The sensitive human receptors are also shown on Figure 6b in Permit Application, Volume IV, Figures and Plans.

4.1.3 Hydrology

There are numerous surface water features located within the study area. These are presented in table 1 below.

Table 1 Surface Water Features

Surface Water Feature	Closest Distance to the Area and Direction
River Dee / Dee Estuary	120 m northeast at closest point.
Kelsterton Brook	Parallel to the northern and southern boundaries, crossing the Main 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 north-west.
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.

4.1.4 Geology

The BGS Geoindex website and published 1:50,000 scale geological map of the area (Sheet 108, Flint) and associated memoir have been reviewed, alongside the historical borehole records available from the Site. The geological strata for the Proposed Installation area are:

- Made ground is present across the area;
- Superficial deposits comprising till and tidal flat deposits across the area:
- Bedrock comprising Gwespyr Sandstone in the western portion of the site.

A more detailed description of the geology is provided in the Site Condition and Baseline Report in Volume III, Appendix A of the permit application.

4.1.5 Hydrogeology

NRW aligns with the Environment Agency's Groundwater Protection Policy which adopts aquifer designations that are consistent with the Water Framework Directive and confirms the:

- Tidal flat deposits are classified as Secondary (undifferentiated)/Unproductive Aquifers
- Gwespyr Sandstone are classed as Secondary A Aquifer

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

A more detailed description of the geology is provided in the Site Condition and Baseline Report in Volume III, Appendix A of the permit application.

4.2 Pathways for Pollution

In order for a pollution risk to occur, there has to be a source – pathway – receptor (S-P-R) linkage.

Pathways to sensitive receptors primarily include, but are not limited to, the following:

- Chemicals required for the operation of the proposed installation might leach into the ground and be washed into surface water or groundwater through the underlying soils.
- Chemicals required for the operation of the proposed installation could be accidentally released and discharged into surface water.
- Emissions to air from the proposed installation will be dispersed in the air to sensitive receptors.

5. Step 3 - Risk Assessment

The risk assessments have been completed by considering each of the risks identified in section 3 above in terms of:

- Frequency of occurrence;
- Nature and quantity of substance released;
- Pathways and receptors involved;
- Environmental consequence(s) of the event;
- Overall risk and its significance to the environment; and
- Control and mitigation measures needed to prevent or reduce the risk.

5.1 Scoring Methodology

The risk assessment methodology has been developed using a scoring mechanism, whereby scores are assigned to:

- The probability of hazard occurring without the use of protective measures;
- The consequences of the hazard to the environment or human health; and
- The effectiveness of the control/mitigation used to prevent the hazard occurring.

The scoring system used for the assessment is shown in Table 2 below.

Table 2. Risk Assessment Scoring System

Frequency of Occurrence		
Frequency	**Comment**	**Score**
Unlikely	Incident occurs once every 10+ years or for climate risk it is improbable the event would occur even in the long term.	1
Low Unlikely	Incident occurs once every 1 to 10 years or for climate risk circumstances are such that an event could occur, but it is not certain even in the in the long term that an event would occur, and it is less likely in the short term.	2
Likely	Incident occurs at least once per year or for climate risk circumstances are such that an event could occur, but it is not certain even in the in the long term that an event would occur, and it is less likely in the short term.	3
Highly Likely	Incident occurs at least once per month or for climate risk it is probable but not inevitable that an event will occur in the long term.	4
Consequence of Hazard to Environment or to Human Health		
Consequence	**Comment**	**Score**
Minor	Onsite nuisance only no outside complaint No breach of permit Short or long-term climate impact to operations resulting in additional measures for compliance.	1
Mild	Nuisance noticeable off-site Potential for 1 – 2 complaints Reportable breach of permit Minor plant damage Health and safety 'near miss' Short-term, acute climate impact to operations resulting in single temporary compliance breach.	2

Medium	Sustained nuisance Significant plant damage Injury requiring on-site medical treatment Sustained breach of environmental permit Multiple public complaints Regulator involved Short-term, acute climate impact to operations resulting in multiple temporary compliance breaches.	3
Severe	Hospital treatment required for injured persons Site evacuation required (partial or full) Partial plant shutdown required Replacement of part of plant Widespread but temporary damage to land Hazardous substance release to water course, land or air with widespread but temporary on people or the environment Off-site emergency services involved Regulatory prosecution likely Public warning and off-site emergency plan implemented Short-term, acute climate impact to operations resulting in permanent compliance breaches.	4

Risk Categories

Score is 1 to 3	Low
Score is 4 to 6	Low - Moderate
Score is 8 to 9	Moderate - High
Score is 12 to 16	High

The impacts are scored using the scoring matrix above and the risk is then scored using the risk scoring matrix (Table 6 below) by:

Risk = Likelihood x Severity

Table 3. Risk Scoring Matrix

		Severity			
		Severe Impact (Score 4)	**Medium Impact (Score 3)**	**Mild Impact (Score 2)**	**Minor Impact (Score 1)**
Likelihood	**High Likely (Score 4)**	16	12	8	4
	Likely (Score 3)	12	9	6	3
	Low Likelihood (Score 2)	8	6	4	2
	Unlikely (Score 1)	4	3	2	1

Residual risk is determined by the same method and residual risk category applied

5.2 Risk Reduction and Management

With respect to risk reduction and management, Uniper will:

- Ensure that as the design of the facility is developed, that risk reduction is embedded where practicable to ensure BAT standards are met;
- Ensure where a risk can't be avoided appropriate controls and mitigations are employed during plant operation. These will be supported by site operating procedures and management plans as appropriate;
- Undertake regular site inspections to assess odour, noise, fugitive emissions, housekeeping and security; corrective action will be undertaken as necessary;
- Keep an up-to-date record of all accidents, incidents, near misses, changes to procedures, abnormal events, and the findings of maintenance inspections;
- Investigate accidents, incidents, near misses and abnormal events and recording actions taken to prevent a reoccurrence;
- Maintaining an inventory of substances, which are present (or likely to be) and which could have environmental consequences if they escape;
- Carry out daily plant checks. Routine inspections and maintenance will take place on bunded and impermeable surfacing where there is a potential for accidents to occur due to loss of containment. The operator shall ensure procedures are in place to implement any necessary remedial measures; and
- Develop an emergency and business continuity plan which will include dealing with environmental incidents and cover site plans and information for emergency services.

5.3 Risk Assessments

The risk assessments for the site are presented as follows:

- Section 5.3.1 Fugitive Releases
- Section 5.3.2 Nuisance Issues
- Section 5.3.3 Visible Plumes
- Section 5.3.4 Abnormal Operations and Accidents
- Section 5.3.5 Fire Risk
- Section 5.3.6 Climate Risk

Each risk assessment is completed for each risk identified in Section 3 above, scores applied in line with the scoring methodology (section 5.1) and the relevant mitigations and controls identified.

5.3.1 Fugitive Releases

The fugitive releases outlined in section 3.3 above have been risk assessed in the table below.

Event	Pathway	Receptor	Risk Assessment			Controls and Mitigations	After Mitigation		Residual Risk
			Probability	Severity	Risk		Probability	Severity	
A.1 *Releases to Air*									
General windblown dust from external roads, pathways and other surfaces	Air	• Public • Staff • Sensitive ecological sites	4	2	8	• A hard surfaced access road is provided from the installation entrance. • Road and yard surfacing will be subject to routine inspection and maintenance – any accumulation of materials is removed promptly. • Speed restrictions of 5, 10 and 20 mph dependent on site area are imposed for all vehicles driving on the site, in order to minimise emissions of dust from internal road surfaces	3	1	Low
Tank vent releases covering diesel, CCP solvents, NH_3 and water treatment chemicals	Air	• Public • Staff • Sensitive ecological sites	3	2	6	• Emissions to atmosphere will be minimised through appropriate tank design to relevant industry standard. Design of each tank will consider the properties of the material being stored and will meet the relevant BAT requirements. • For materials where there is potential for release of an environmentally harmful vapour the design will include application of vent scrubbers.	2	1	Low
Vapour leaks from valves and flanges on pipelines handling feed gas, diesel, CCP solvents, NH3 and water treatment chemicals	Air	• Public • Staff • Sensitive ecological sites	3	2	6	• No onsite gas storage minimising the likelihood of a large release of the feed fuel • Flanged connections have been kept to a minimum on all pipeline routes. • All pipes, flanges and valves are designed to appropriate industry standards and will meet BAT requirements. • All pipes, flanges and valves will have a preventative maintenance programme to ensure ongoing integrity and effectiveness. • Preventative maintenance will be undertaken in accordance with defined procedures to minimise fugitive releases. • Site will implement a leak detection and repair (LDAR) plan.	2	1	Low
A.2 Releases to Land and Water									
Spillage of waste and materials during the maintenance	Water Land	• Surface water • Ground water • Sewer system • Sensitive ecological sites	3	2	6	• Operator checks daily for signs of leak and repairs will be dealt with promptly if identified. • High standards of housekeeping are maintained across the site. • Spill kits are available to deal with any leaks. • All waste storage areas will be clearly marked and signed, and storage containers are secure and clearly labelled. • Operator will ensure procedures are in place to implement any necessary remedial measures. • Storage arrangements appropriate to materials being stored; impermeable surfacing across the Site; bunded storage containers with closed drainage systems; and inspection and maintenance at regular intervals.	2	1	Low
Liquid leaks (diesel, CCP solvents, NH3 and water treatment chemicals) from storage tanks, containers, valves or pipework	Water Land	• Surface water • Ground water • Sensitive ecological sites	3	3	9	• Main storage tanks will be connected to the DCS which can monitor, provide alarms and trips to protect the tanks. • Storage tanks and unloading points will be located within bunded areas that are designed to store 110% of the maximum capacity of the tanks. • Bunded areas will drain to the potentially contaminated drains to ensure contaminated fluids do not reach environment. • Storage tanks and bunded areas will be regularly inspected to ensure integrity. • As well as automated monitoring, alarms, and trips, main storage tanks will have local indicators to provide local monitoring for unloaders.	2	1	Low

Event	Pathway	Receptor	Risk Assessment			Controls and Mitigations	After Mitigation		Residual Risk
			Probability	Severity	Risk		Probability	Severity	
						• Flanged connections have been kept to a minimum. • All tanks, pipes and valves are designed to appropriate industry standards. • All tanks, pipes and valves will have a preventative maintenance programme to ensure ongoing integrity and effectiveness. • Operator checks daily for signs of leak and repairs will be taken promptly . • Emergency procedure in place to manage any accidental situation. Spill kits are available to deal with any leaks. • All delivery drivers to be suitably qualified and experienced and to provide a watching brief. Spill kits to be onboard the delivery truck.			
Contaminated surface run-off	Water Land	• Surface water • Ground water • Sewer system • Sensitive ecological sites	4	4	16	• Engineered site drainage system. • Drainage system equipped with separators. • Drainage system subject to routine inspection along with a preventative maintenance regime. • Emergency spills kits used in conjunction with a site emergency plan will help mitigate the effects of any contamination. • Site surfacing for all areas accessed by delivery vehicles will be concrete designed to an appropriate Standard. • Operator daily checks for signs of leak. • High standards of housekeeping will be maintained • In line with site management system procedures site staff and contractor trained to report and respond appropriately depending on nature/significance of spill.	3	2	Low - Moderate
Groundwater Contamination or land	Water Land	• Ground water • Sensitive ecological sites	4	4	16	• Site surfacing for all areas accessed by delivery vehicles are concrete designed to an appropriate standard. • Site has adequate drainage, and areas that could have potential contamination are segregated to ensure contaminated fluids do not contaminate the environment. • Emergency spills kits used in conjunction with a site emergency plan will help mitigate the effects of any contamination. • In line with site management system procedures site staff and contractor trained to report and respond appropriately depending on nature/significance of spill.	3	2	Low - Moderate

5.3.2 Nuisance Issues

The nuisance issues outlined in section 3.4 above have been risk assessed in the table below.

Event	Pathway	Receptor	Risk Assessment			Controls and Mitigations	After Mitigation		Residual Risk
			Probability	Severity	Risk		Probability	Severity	
A.1 General Nuisance Issues									
Mud/litter carried onto highway	Water Land	• Public	3	2	6	• All internal roads, storage and processing areas will be hard surfaced with concrete or tarmac. • All waste storage areas will be clearly marked and signed, and storage containers are secure and clearly labelled • High standards of housekeeping will be maintained across the site.	1	2	Low
Pest, vermin and scavengers	Land	• Staff • Public	3	2	6	• Not likely to be attracted by activity but use of registered pest control contractors and rodenticide will be considered if required.	1	2	Low
A.2 Odour Nuisance									
Odour from leaks and fugitive releases from pipes and storage systems for liquid fuels, CCP solvents, NH_3 and water treatment chemicals.	Air	• Staff • Public	3	2	6	• Operator checks daily for signs of leak and repairs are dealt with promptly if identified. • All tanks, pipes and valves will have a preventative maintenance programme to ensure ongoing integrity and effectiveness • Spill kits are available to deal with any leaks.	2	1	Low
Odour associated with leaks from natural gas delivery pipework.	Air	• Staff • Public	3	2	6	• No onsite gas storage minimising the likelihood of a large release. • Flanged connections have been kept to a minimum. • All pipes and valves will have a preventative maintenance programme to ensure ongoing integrity and effectiveness.	2	2	Low
A.3 Noise and Vibration Nuisance									
Noise from vehicle movements onsite	Air	• Public • Staff • Sensitive ecological sites	4	2	8	• The additional vehicle footfall will be minimal for installation. The site is an active power station with varied workflow. This would not be considered out of the ordinary activity. •	4	1	Low to moderate
Noise from operation	Air	• Public • Staff • Sensitive ecological sites	4	2	8	• Noise management Plan (Permit Application, Volume III, Appendix J) will be implemented • If complaints are raised, they will be reported on the site's accident reporting software and rectified via onsite incident reporting procedures. These form part of the sites Environmental Management System/Safety Management System	4	1	Low to moderate
Vibration from installation and operation	Air	• Public • Staff • Sensitive ecological sites	4	2	8	• Though vibration will occur by using the plant, it is not anticipated to be noticeable to humans or animals. • Vibrations will not be felt beyond the site boundary.	4	1	Low to moderate

5.3.3 Visible Plumes

Event	Pathway	Receptor	Risk Assessment			Controls and Mitigations	After Mitigation		Residual Risk
			Probability	Severity	Risk		Probability	Severity	
Plumes from the operation CCGT	Dispersion by Wind	• Public	3	2	6	• GT operates on natural gas. and so is unlikely to lead to visible plume. Efficient combustion that is monitored and controlled will reduce likelihood of any visible plume. • Any visible plume will be reported via the local accident/incident reporting process which includes an investigation.	1	2	Low
Plumes from Cooling System	Dispersion by Wind	• Public	3	2	6	• Cooling towers will be designed in accordance with appropriate industry standards and to meet BAT. • If visible plume formation is expected to be a significant issue then further design mitigation is possible at detailed design.			
Plumes from Mobile Generators	Dispersion by Wind	• Public	1	3	3	• Backup power generators – the plume should not be visible due to efficient combustion and the high exhaust temperatures. Any visible plume will result in works ceasing and the generator being taken out of service until r efficient combustion resumes and there is no long a visible plume. • As each generator is only operational for testing or to support maintenance, no plume will be occurring during normal operations.	1	2	Low

5.3.4 Abnormal Operations and Accidents

Event	Pathway	Receptor	Risk Assessment			Controls and Mitigations	After Mitigation		Residual Risk
			Probability	Severity	Risk		Probability	Severity	
Flooding	• Water	• Surface or ground water	3	4	12	• Site drainage strategy has been designed taking the 1:30 year plus climate change flood event into account • A Flood Consequences Assessment (Document Appendix 13-C of the Environmental Statement) identified that Proposed Installation is in a sea flood zone 3 and a river (fluvial) flood zone 1. It concluded that the risk of flood from surface water and groundwater was medium and the risk of tidal flood was low. • Mitigation measures proposed include: a) Raising the development platform to 7.4 m AOD to mitigate against tidal water flood. b) Raising vulnerable equipment 300mm above proposed ground levels to mitigate against groundwater and surface water flood.. c) Site wide rainwater run-off will be collected through a series of SuDs features. d) Implement an attenuation strategy incorporating a grassed swale and attenuation tank (s). e) Install a new surface water outfall into Old Rockcliffe Brook alongside the existing outfall on the north-eastern boundary. • Drains will be inspected and maintained. Any identified as blocked will be rectified by the estates team.	2	3	Low to moderate
Main services failure	• Air • Water	• Staff • Public	2	4	8	• Failure of mains electrical services will result in an emergency back-up generator (s) being utilised. • Failure of the natural gas supply will result in plant shutdown.	2	2	Low to moderate
Operator Error	• Air • Water • Land	• Staff • Public	3	4	12	• All staff will be trained and competent to undertake their roles, in line with licence conditions for this site. • Emergency backup power – the new generating plant is designed with automation as the preference, which reduces scope for operator error. This is to ensure that the generators can deliver their intended goal in an emergency. Generator will automatically start when power is lost to maintain critical systems, thus removing some human element. • Internal operational control procedures. • Strict compliance with site integrated management system.	1	2	Low
Site Security Breach: • entry by intruders • damage to equipment • theft • fly-tipping • arson	• Air • Water • Land	• Staff • Public • Surface or ground water	3	3	9	• Wider site secured by a security chain link fence around the perimeter of the site, with security buildings located at the south, off of the access road. • Site covered by CCTV. • Only employees can gain access unless permission is given by security personnel and site employees. There are security personnel and buildings on site.	2	1	Low
Major vehicle accident – leading to a significant loss of waste/raw material loads and vehicle fuels and lubricants.	• Air • Water • Land	• Staff • Public	2	4	8	• Site speed restrictions in place and compliance with highway speed restrictions. • Site adopts Highway Code requirements for road markings, speed and prohibiting use of hand held devices. • Trained hauliers will deliver fuels and raw materials. • Material clean-up arrangements in place. • Road vehicles are robust and designed to withstand high speed collisions that may occur on public highways. • Suitable barriers to prevent moving vehicles damaging static equipment and pipework	1	2	Low
Failure of plant and equipment	• Air • Water • Land	• Staff • Public • Surface or groundwater	4	4	16	• Plant/equipment is designed in accordance with relevant design and fabrication standards. • Preventative maintenance includes regular inspection and maintenance regimes. • Plant is subject to a pre-checks before start-up and regular maintenance inspections to facilitate defect detection and reporting.	2	3	Low to Moderate
Wrong connections in drains or other systems	• Water • Land	• Surface or ground water	3	4	12	• Drainage design undertaken by suitably qualified engineers • Drainage design has been completed using appropriate modelling software • Construction of drainage undertaken in accordance with the specified designs	1	3	Low

Event	Pathway	Receptor	Risk Assessment			Controls and Mitigations	After Mitigation		Residual Risk
			Probability	Severity	Risk		Probability	Severity	
Tank (Fuel or chemical) overflow	• Air • Water • Land	• Staff • Public • Surface or groundwater	3	4	12	• Tank design is in accordance with appropriate design, fabrication and safety standards • Tanks fitted will be with trips on level that will cause filling operation into tank to be automatically stopped • There will be a delivery procedure in place with checks which will ensure that the receiving tank has sufficient capacity to accept the load • Systems will be subject to routine planned preventative maintenance and inspections in line with manufacturer's recommendations. • Emergency procedures will be in place which staff are trained to implement, • Emergency spill kits will be provided at site to contain and address any spillage. • Site drainage will be checked for signs of ingress and if necessary, interceptor will be isolated, and material removed by suction plant for offsite disposal. • Total site inventory limited to lowest practicable volumes to run the plant safely and efficiently. • Secondary containment to 110% of single tank volume will be provided. • Minimum of flanged connections • Training in chemical and fuel unloading practices • Size of deliveries to reduce number of deliveries and unloading operations	1	3	Low
Containment failure	• Air • Water • Land	• Staff • Public • Surface or groundwater	4	3	12	• Containment designed to the appropriate volume and standards • Operator will carry out routine plant checks. Containment will have routine inspections and maintenance. •	1	2	Low
Rupture of Tank (diesel, CCP solvents, NH3 and water treatment chemicals) due to accidental damage or spontaneous rupture of tank.	• Air • Water • Land	• Staff • Public • Surface or groundwater	3	4	12	• Tank design in accordance with appropriate design, fabrication and safety standards for the material being contained • Vents on tanks are designed to minimise back-pressure problems • If tank has excessive risk of overpressure then will be fitted with appropriate relief device • Routine inspection and maintenance of tanks • Tanks will be either elevated above vehicle manoeuvring areas or within enclosures • Emergency procedures will be in place which staff are trained to implement – specific procedures have been developed for each reagent/fuel to address the specific hazard properties. • Emergency spill kits will be provided at site to contain and address any spillage. • Site drainage is checked for signs of ingress and if necessary, interceptor will be isolated, and material removed for offsite disposal by an appropriately licenced contractor. • Total site inventory limited to lowest practicable volumes to run the plant safely and efficiently.	1	3	Low
Leak of diesel, CCP solvents, NH3 and water treatment chemicals leading to ingress of liquid fuels / chemicals to ground/water or gas to air	• Water • Land	• Staff • Public • Surface or groundwater	3	3	9	• Bunded tanks for liquid fuels and chemicals • Tank design is in accordance with appropriate design, fabrication and safety standards • For natural gas, pipelines designed in accordance with current standards • Routine plant checks and maintenance and implementation of a LDAR plan should identify leaks of vapours by odour, by instruments or visually for liquid fuels. • Emergency procedures are in place which staff are trained to implement – specific procedures will be developed for final chosen fuel to address the specific hazard properties. • Emergency spill kits are provided at site to contain and address any spillage. • Site drainage is checked for signs of ingress of liquid fuel/chemical and if necessary, interceptor will be isolated, and material removed by suction plant for offsite disposal. • Total site inventory limited to lowest practicable volumes to run the plant safely and efficiently. • Secondary containment to 110% of liquid fuel /chemical tank volume to be provided. • Minimum of flanged connections on tanks and pipework.	1	2	Low
Steam leak to process buildings	• Air • Noise	• Staff • Public	3	4	12	• Appropriate design, fabrication and inspection standards for steam systems are employed • Statutory inspection and maintenance programme in place	1	2	Low

Event	Pathway	Receptor	Risk Assessment			Controls and Mitigations	After Mitigation		Residual Risk
			Probability	Severity	Risk		Probability	Severity	
						• Automated control system has controls, alarms and trips or pressure • Routine operator checks should identify increased noise and/or visual leak • Initiate emergency evacuation procedures			
Steam safety valve failure	• Air • Noise	• Staff • Public	3	3	9	• Appropriate design, fabrication and inspection standards for steam systems are employed • Statutory inspection and maintenance programme in place • Automated control system has controls and alarms for pressure • Routine operator checks should identify increased noise and/or visual leak	1	2	Low
Major vibration due to rotating machinery being out of balance	• Noise	• Staff • Public	4	2	8	• Use of anti-vibration mountings • Vibration monitors installed and automatic plant shutdown for turbine generator • Routine operator checks	2	1	Low
Increased noise due to steam leak or operation of safety valves.	• Noise	• Staff • Public	3	4	12	• Statutory design, fabrication and inspection standards for steam systems • Minimum of flanged connections • Controls and alarms for pressure • Routine operator checks	1	2	Low
Fire causing emissions to air or water	• Air • Water • Land	• Staff • Public • Surface or groundwater	2	4	8	• All other fuels/chemicals will be stored within fire rated tanks designed for material being held and are in an external environment. • In the event of a fire, the site drainage discharge points will be isolated to contain fire waters on site. These will then be removed by licensed contractors in line with site emergency procedures.	1	2	Low

5.3.5 Fire Risk

Event	Pathway	Receptor	Risk Assessment			Controls and Mitigations	After Mitigation		Residual Risk
			Probability	Severity	Risk		Probability	Severity	
Fire due to ignition of fuels	• Air • Water • Land	• Staff • Public • Surface or groundwater	3	4	12	• Contained site storage liquid fuels / chemicals with tanks, pipelines and containment designed in accordance with oil storage regulations • For natural gas pipelines designed in accordance with current gas supply regulations • Appropriate fire detection and protection systems for the fuel chosen – these will be confirmed following detailed design. • Routine plant checks and maintenance should identify leaks of gas by odour, instrumentation or visually for liquid fuels. • Fire water / foams will be contained within the process water system prior to removal by tanker for offsite disposal by appropriately licensed contractors. • In the event that there is risk of overflow to ground surfaces, temporary barriers (e.g.. booms or nets) may be deployed to limit spread if it is safe to do so. • Removal of foam from ground surfaces will need to be facilitated by external contractors and may include techniques such as use of water sprays for water based foams, defoaming agents, specialised chemical removers or scraping for cured foams. During such cleaning activities the site drainage system will be isolated to prevent offsite release and wastes/waste liquids will be removed from site by appropriately licensed third party contractors for disposal.	1	2	Low
Arson and Vandalism	• Air	• Public • Staff • Infrastructure •	3	3	9	• Wider site secured by a security chain link fence around the perimeter of the site, with security buildings located at the south, off of the access road. • Site covered by CCTV. • Only employees can gain access unless permission is given by security personnel and site employees. There are security personnel and buildings on site.	2	1	Low
Equipment or plant faults	• Air • Water • Land	• Staff • Public • Surface or groundwater	3	3	9	• Plant/equipment is designed in accordance with relevant design and fabrication standards. • Preventative maintenance includes regulator inspection and maintenance regimes. • The site will have fire protection systems that can detect, control, and supress fire. This system will be designed to the relevant codes and standards. Plant is subject to a pre-use check before start-up and regular maintenance inspections to facilitate defect detection and reporting.	2	1	Low
Electrical faults	• Air • Water • Land	• Staff • Public • Surface or groundwater	3	3	9	• Plant/equipment is designed in accordance with relevant design and fabrication standards. • Preventative maintenance includes regular inspection and maintenance regimes. • Portable appliances subject to PAT testing; • Electrical systems will be designed, installed, and maintained to all relevant codes and standards. This will include relevant fire safety codes and standards .• The site will have fire protection systems that can detect, control, and supress fire. This system will be designed to the relevant codes and standards .	2	1	Low
Naked lights or flames	• Air • Water • Land	• Staff • Public • Surface or groundwater	3	3	9	• No naked lights or flames will be permitted on site and all lights is be protected by appropriate coverings.	2	1	Low
Discarded smoking materials	• Air • Water • Land	• Staff • Public • Surface or groundwater	4	3	12	• Smoking to take place only at designated smoking areas which are equipped with suitable receptacles for extinguishing and disposal of smoking materials.	2	1	Low
Hot works	• Air • Water • Land	• Staff • Public • Surface or groundwater	3	3	9	• All such works will be planned and undertaken in accordance with a defined risk assessment and method statement (RAMS which is subject to approval by the job sponsor before the work commences. Hot works will be completed in line with a Hot Works Procedure which includes: • A permit to work (PTW) system to ensure appropriate controls will be in place before, during and after any hot works;	2	1	Low

Event	Pathway	Receptor	Risk Assessment			Controls and Mitigations	After Mitigation		Residual Risk
			Probability	Severity	Risk		Probability	Severity	
						• Ensuring that fire extinguishers are present at the point of any hot work so that they can be used immediately should a fire occur. Extinguishers will be stationed adjacent to the pathway of escape from the work area and operators undertaking hot works will be trained in the use of fire extinguishers; • Sources of combustible material will be removed from the area where hot works is taking place before work commences and where this is not possible then such materials including mobile plant hydraulic lines will be covered by a fire blanket/screen and/or damped down with water before work commences; and • A fire watch will be present during all hot works and for a minimum of 30 minutes after such hot works have ceased to ensure that sparks from works are not smouldering.			
Industrial heaters	• Air • Water • Land	• Staff • Public • Surface or groundwater	3	3	9	• All heaters on site are subject to inspection and maintenance. • Combustible and flammable materials will not be stored in close proximity to heaters.	2	1	Low
Ignition sources	• Air • Water • Land	• Staff • Public • Surface or groundwater	3	3	9	• No naked flames, heaters or other ignition sources will be permitted within 10m of potentially flammable materials.	1	2	Low
Leaks and spills	• Air • Water • Land	• Staff • Public • Surface or groundwater	3	2	6	• Lubricants for maintenance will be stored on containment pallets in designated storage areas. • Equipment and plant will be subject to routine maintenance in line with manufacturer's recommendations as well as pre-use checks. • Housekeeping standards will be monitored and maintained as part of the site daily inspection, • Emergency spill kits are located around the site and will be used in accordance with the site spill procedures.	2	1	Low
Build-up of combustible material	• Air • Water • Land	• Staff • Public • Surface or groundwater	3	2	6	• Lubricants for maintenance will be stored on containment pallets in designated storage areas. • Housekeeping standards will be monitored and maintained as part of the site daily inspection, • Speed limits are restricted to limit the potential for dust production and dispersal.	2	1	Low
Fire spreading	• Air • Water • Land	• Staff • Public • Surface or groundwater	3	4	8	• Fire detection measures will be in place • Firefighting water supply and extinguishers available • Good communication between other site neighbouring activities, during shift changes and after maintenance or engineering works • Measurement and control devices needed in an emergency will be easy to access and ready to operate.	2	1	Low

5.3.6 Climate Risk

Potential changing climate variable	Impact	Risk Assessment			Mitigation	After Mitigation		
		Probability	Severity	Risk		Probability	Severity	Residual risk
Summer daily maximum temperature may be around 5.9°C higher compared to average summer temperatures now.	Increases in cooling water temperatures	2	1	2	• Review operations and consider cessation if ambient temperatures exceed critical operating temperatures for equipment. • Site will monitor all discharges to water for temperature and will comply with the existing site abstraction licence and environmental permit discharge limits	2	1	Low
	Overheating or failure of Critical Equipment	2	1	2	• Plant subject to planned preventative maintenance • Ventilation of enclosed spaces around critical plant will be kept under review.	1	1	Low
Winter daily maximum temperature could be 4°C more than the current average, with the potential for more extreme temperatures, both warmer and colder than present	Higher temperature leads to overheating	N/A	N/A	N/A	• N/A to power plant	N/A	N/A	N/A
	Externally situated plant or equipment freezing	2	3	6	• Monitor temperatures. • Use lagging and anti-icing measures where appropriate • Implement the site winterisation procedures.	1	3	Low
The biggest rainfall events are up to 40% more intense than current extremes (peak rainfall intensity)*.	Flash flood or overloading of surface water system	1	3	3	• Drainage has been designed considering appropriate rainfall events. • Inspection and maintenance of site drainage systems. • If necessary, in future, emergency pumps can be provided and additional protection for control and electrical systems will be considered	1	2	Low
	Bunding capacity reduced due to flooding	1	2	2	• Containment designed to the appropriate capacity and standards. • Bunds subject to visual inspections to ensure that containment volume is not compromised.	1	2	Low
Average winter rainfall may increase by29% on today's averages.	Flash flood or overloading of surface water system	1	3	3	• Drainage has been designed considering appropriate rainfall events. • Inspection and maintenance of site drainage systems. • If necessary, in future, emergency pumps can be provided and additional protection for control and electrical systems will be considered	1	2	Low
	Bunding capacity reduced due to flooding	1	2	2	• Containment designed to the appropriate capacity and standards. • Bunds subject to visual inspections to ensure that containment volume is not compromised.	1	2	Low
Sea level could be as much as 1.23m higher compared to today's level.	Increased risk of tidal flooding.	1	3	3	• Identify process equipment and services at greatest risk from flooding and develop a Flood Plan if needed. • provision of emergency pumps to remove floodwater if required.	1	2	Low
	Site surface water systems may become overwhelmed	1	3	3	• Drains maintained in area. Any identified as blocked are rectified by appropriate team. • Site is located beside the River Dee which does not benefit from flood defences. • Tanks will be secured to the ground • Develop a Flood Plan if needed.	1	2	Low
Drier summers, potentially up to 40% less rain than now.	Cooling water restrictions	1	4	4	• Site will comply with the existing site abstraction and discharge limits. • Fire/emergency plan reviewed more frequently • Keep management Plans Under Review	1	2	Low
Greater intensity rainfall or snowfall	Flash flood or overloading of surface water system	1	3	3	• Drainage has been designed considering appropriate rainfall events. • Inspection and maintenance of site drainage systems. • If necessary, in future, emergency pumps can be provided and additional protection for control and electrical systems will be considered	1	2	Low
	Could damage building and other site structures	2	3	6	• Buildings and site infrastructure will be subject to inspection and maintenance. • Design of tall structures will include review of wind loading calculations.	1	2	Low
Increased river temperatures during summer	Increases in cooling water temperatures	2	1	2	• Review operations and consider cessation if ambient temperatures exceed critical operating temperatures for equipment.	2	1	Low

Potential changing climate variable	Impact	Risk Assessment			Mitigation	After Mitigation		
		Probability	Severity	Risk		Probability	Severity	Residual risk
					• Site will comply with the existing site abstraction licence and environmental permit discharge limits			
	Difficulty meeting the site temperature differentials for discharge.	2	1	2	• Increased monitoring to ensure compliance with the existing site environmental permit discharge limits • Discharges may need to be restricted until compliance can be met.	2	1	Low
	Greater evaporation leading to lower water levels	2	1	2	• Increased monitoring to ensure compliance with the existing site abstraction licence. • Cooling water may need to be supplemented with water from another source.	2	1	Low
River Flow: the flow in watercourses could be up to 45% more than it is now at its peak, and at its lowest it could be 5% less than now.	Impact on volumes permitted in discharge consents	1	3	3	• site will comply with the existing site abstraction and discharge limits.	1	2	Low
	Fluvial flood risk	1	3	3	• Site drainage strategy has been designed taking the 1:30 year plus climate change flood event into account • A Flood Consequences Assessment (Document Appendix 13-C of the Environmental Statement) identified that Proposed Installation is in a sea flood zone 3 and a river (fluvial) flood zone 1. It concluded that the risk of flood from surface water and groundwater was medium and the risk of tidal flood was low. • Mitigation measures proposed include: f) Raising the development platform to 7.4 m AOD to mitigate against tidal water flood. g) Raising vulnerable equipment 300mm above proposed ground levels to mitigate against groundwater and surface water flood.. h) Site wide rainwater run-off will be collected through a series of SuDs features. i) Implement an attenuation strategy incorporating a grassed swale and attenuation tank (s). j) Install a new surface water outfall into Old Rockcliffe Brook alongside the existing outfall on the north-eastern boundary. • Drains will be inspected and maintained. Any identified as blocked will be rectified by the estates team • Identify process equipment and services at greatest risk from flooding and develop a Flood Plan if needed.	1	2	Low
Storms: frequency and intensity can increase.	Could damage building and other site structures	2	3	6	• Buildings and site infrastructure will be subject to inspection and maintenance. • Design of tall structures will include review of wind loading calculations.	1	2	Low

5.4 Conclusion

The following risks have been assessed within this document:

- Fugitive emissions to air, land and water;
- Nuisance issues such as litter, odour, noise and vibration;
- Visible plumes
- Abnormal operations and accidents
- Fire Risk
- Climate Risk

The assessment concluded that the implementation of the proposed controls and mitigation measures are designed to meet the relevant BAT requirements and will reduce the residual risk to low or low to moderate.