Connah's Quay Low Carbon Power

Environmental Statement Volume IV Appendix 20-D: In-combination Climate Change Assessment

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1. In-combination Climate Change Assessment

1.1 Summary of Likely Significant Residual Effects

In-Combination Climate Change Assessment

1.1.1 **Table 1** details in-combination climate change impacts (ICCI) risks identified for the Proposed Development. There were no ICCIs identified for Terrestrial Ecology, Aquatic Ecology, Marine Ecology, Terrestrial Heritage, Marine Heritage, Soils and Agricultural Land, Socio-Economics, Recreation and Tourism, Major Accidents and Disasters, Landscape and Visual Amenity, and Materials and Waste.

1.1.2 The embedded design and mitigation for Major Accidents and Disasters at detailed design stage will need to account for climate change (e.g. temperature changes, flooding) intrinsically for the design life of the assets under Control of Major Accident Hazards (COMAH) to satisfy the Health and Safety Executive (HSE) that the risks are reduced to As Low As Reasonably Practicable (ALARP). By assuming that this is already required, additional mitigation is not needed.

1.1.3 At the ES stage, all outstanding technical ICCIs associated with the Water Environment were identified to be submitted with the Development Consent Order (DCO) Application. Flood Risk accounts for climate change projections and this has been taken into account within **Appendix 13-C: Flood Consequences Assessment** (**EN010166/APP/6.4**). Hydraulic modelling was undertaken at the ES stage which provides further details on fluvial flood risk and inform mitigation measures.

Table 1: In-Combination Climate Change Assessment

Discipline / Receptor	Climate Hazard	Likelihood of hazard occurring	Likely ICCIs identified	Description of ICCI and embedded mitigation (where mitigation is not necessary, this has been specified)	Likelihood of ICCI occurring	Consequence	Significance
Air Quality							
Air Quality	Change in mean annual air temperature	Likely	Ambient weather conditions, including barometric pressure and temperature can slightly affect the amount of natural gas fuel burned within the combustion process for a given output. The consequence of an increase in fuel consumption would be a corresponding increase in stack mass flow rate and emission rates of trace pollutants in the stack plume.	An increase in stack gas mass flow rates is likely to lead to an increase in the residual CO_2 content and mass emission rate in the plume. Warmer conditions result in a slight decrease in fuel consumption, while cooler conditions generally result in a slight increase. The "reference" emissions case used for the air quality assessment considers a conservative scenario with upper range estimates of both stack mass flow and trace pollutant emission rate. The dispersion modelling assessment has used five years of meteorological data, which accounts for the full range of weather conditions experienced in the area	Low	Negligible	Not significant

Discipline / Receptor	Climate Hazard	Likelihood of hazard occurring	Likely ICCIs identified	Description of ICCI and embedded mitigation (where mitigation is not necessary, this has been specified)	Likelihood of ICCI occurring	Consequence	Significance
				around the Main Development Area.			
Noise and Vibration							
Noise and Vibration	Increase in mean summer air temperature	High	Increased temperatures may require greater cooling which would increase the number of cooling fans in operation, which could then result in potential increase in noise effects to receptors in the surrounding environment.	The assessment has been based on the worst-case scenario so there would be no further impact on noise effects impacting the surrounding environment.	Negligible	Negligible	Not significant
Noise and Vibration	Increase in mean summer air temperature	Very likely	Potential to exacerbate noise effects on communities in terms of individual dwellings and on a wider community, due to windows being open more often due to an	The noise assessment criteria assume windows are open and closing windows is a form of mitigation against noise. Consequently, there is no further impact on noise effects arising from the ICCI.	Negligible	Negligible	Not significant

Discipline / Receptor	Climate Hazard	Likelihood of hazard occurring	Likely ICCIs identified	Description of ICCI and embedded mitigation (where mitigation is not necessary, this has been specified)	Likelihood of ICCI occurring	Consequence	Significance
			increase in high temperatures.				
Noise and Vibration	Increase in mean summer air temperature	Very likely	Increases in temperature and humidity of the air reducing the atmospheric attenuation of noise.	Over distances of a few hundred meters, which covers the noise study area, atmospheric effects can be ignored. Consequently, increases in temperature and humidity is unlikely to affect noise sources during the construction phase and operational phase.	Negligible	Negligible	Not significant
Transport and Traffic							
Local Highway Network	Increase in winter precipitation rate	Likely	Increases in precipitation may increase the potential for disruption on the wider road network due to increased frequency of transport routes	The **Construction Traffic Management Plan** (**CTMP**) **(EN010166/APP/6.6)** considers vehicle routing options during the construction phase, including details of any planned road closures / diversions.	Low	Negligible	Not significant

Discipline / Receptor	Climate Hazard	Likelihood of hazard occurring	Likely ICCIs identified	Description of ICCI and embedded mitigation (where mitigation is not necessary, this has been specified)	Likelihood of ICCI occurring	Consequence	Significance
			becoming unviable or inaccessible.				
Aquatic Ecology							
Aquatic Ecology	Increase in winter rainfall	Very Likely	Increased winter rainfall combined with the Proposed Development could impact on receiving waterbodies' (ponds and drains) flow regime and water quality impacting on the aquatic environment.	Increased surface water runoff and sedimentation. The impact of climate change on expected flows will be accommodated in the design of drainage infrastructure to ensure appropriate treatment and attenuation of anticipated flows, as outlined above.	Low	Moderate	Not significant
Aquatic Ecology	Increased droughts/ reduced water levels in summer	Likely	Reduced water levels as a result of climate change and the Proposed Development could negatively impact on receiving waterbodies' (ponds and drains) flow regime and water quality impacting on	Prolonged drought periods in combination with higher temperatures could lead to dissolved oxygen crashes and fish mortalities. The impact of climate change on expected flows will be accommodated in the design of drainage infrastructure to ensure appropriate treatment	Low	Low	Not significant

Discipline / Receptor	Climate Hazard	Likelihood of hazard occurring	Likely ICCIs identified	Description of ICCI and embedded mitigation (where mitigation is not necessary, this has been specified)	Likelihood of ICCI occurring	Consequence	Significance
			the aquatic environment.	and attenuation of anticipated flows, as outlined above.			
Water Environment							
Flood risk	Increased rainfall intensity	Likely	Increased peak fluvial flows resulting in increased flood risk to the site, impacting the drainage network, and increasing potential loss of floodplain associated with land raising.	Flood consequence assessment has been based on flood risk incorporating estimated climate change over the life of the project.	Low	Moderate	Not Significant
Flood risk	Increase in winter rainfall	Very likely	Operation: Increased precipitation can impact the frequency and duration of flooding from all sources (e.g. tidal, fluvial, surface water, artificial sources, groundwater and infrastructure) – could lead to flooding off-site	Drainage infrastructure (including attenuation) will be designed to accommodate anticipated flows, with an appropriate allowance for increases in rainfall intensity due to climate change. The **Appendix 13-D: Outline Surface Water Drainage Strategy** (**EN010166/APP/6.4**) has considered the Supplementary Planning	Low	Moderate	Not significant

Discipline / Receptor	Climate Hazard	Likelihood of hazard occurring	Likely ICCIs identified	Description of ICCI and embedded mitigation (where mitigation is not necessary, this has been specified)	Likelihood of ICCI occurring	Consequence	Significance
				Guidance LPGN 29 – Management of Surface Water for New Development, adopted by Flintshire County Council (Ref 1). In accordance with this guidance, surface water runoff from the Proposed Development in undeveloped (greenfield) areas would be limited to the greenfield runoff rate. For any previously developed (brownfield) areas, surface water discharge would be limited to greenfield rates of runoff (or as close as reasonably practical). The drainage network will be designed so that there is no flooding in the 1 in 30-year Annual Exceedance Probability (AEP) simulated storm event, in accordance with the Supplementary Guidance LPGN 29. Attenuation would be appropriately sized to			

Discipline / Receptor	Climate Hazard	Likelihood of hazard occurring	Likely ICCIs identified	Description of ICCI and embedded mitigation (where mitigation is not necessary, this has been specified)	Likelihood of ICCI occurring	Consequence	Significance
				accommodate the 1 in 100-year AEP event, with a minimum 20% allowance for increases in rainfall intensity due to climate change, in accordance with Welsh Government guidance for climate change allowances. Both the central and upper (20% and 40%) climate change allowances have been assessed to understand the range of impact. The design will also consider the impacts of tide levels on new drainage infrastructure			
Flood risk	Increased sea levels and storm surges	Likely	Increased sea levels resulting in flooding to the site and impacts to the drainage network. The Proposed Development requires raising land levels and as it is located in a coastal flood plain, this could	**Appendix 13-C: Flood Consequences Assessment** (**EN010166/APP/6.4**) has been based on flood risk incorporating estimated climate change over the life of the project. Mitigation includes a **Framework Construction Environmental Management Plan (CEMP)** (**EN010166/APP/6.5**) to	Low	Moderate	Not Significant

Discipline / Receptor	Climate Hazard	Likelihood of hazard occurring	Likely ICCIs identified	Description of ICCI and embedded mitigation (where mitigation is not necessary, this has been specified)	Likelihood of ICCI occurring	Consequence	Significance
			have an impact on off-site receptors due to changes to flow pathways.	manage fluvial and tidal flood risk during the construction phase as part of embedded mitigation. For operation, **Appendix 13-C: Flood Consequences Assessment** (**EN010166/APP/6.4**) includes results of the hydraulic modelling, providing further details on fluvial flood risk and inform mitigation measures. This includes the proposal to raise critical infrastructure within the Main Development Area buildings to 7.7m AOD which is 600 mm above the 1 in 200 year (0.5% AEP) plus 2100 climate change event level in the Dee Estuary.			
Water quality	Increase in winter rainfall	Very likely	Operation: Increased precipitation can impact peak discharge rates for surface water runoff,	The impact of climate change on expected flows has been accommodated in the design of drainage infrastructure to ensure appropriate treatment	Low	Negligible	Not significant

Discipline / Receptor	Climate Hazard	Likelihood of hazard occurring	Likely ICCIs identified	Description of ICCI and embedded mitigation (where mitigation is not necessary, this has been specified)	Likelihood of ICCI occurring	Consequence	Significance
			which can impact receiving waterbodies (receptors) if the capacity of the drainage infrastructure is exceeded in extreme events. If this results in the storage capacity of attenuation features being exceeded, then there is potential for the River Dee to receive untreated water. This could lead to a deterioration in water quality.	and attenuation of anticipated flows, as outlined above.			
Water quality	Increased sea temperature	Likely	Discharge of cooling water with increased sea temperature due to climate change could result in impacts to marine environments.	Any increases in discharge temperature, in addition to climate change increases could result in increased temperatures locally and regionally across the River Dee SSSI, potentially	Low	Negligible	Not significant

Discipline / Receptor	Climate Hazard	Likelihood of hazard occurring	Likely ICCIs identified	Description of ICCI and embedded mitigation (where mitigation is not necessary, this has been specified)	Likelihood of ICCI occurring	Consequence	Significance
				impacting on habitats. However, the operational discharge temperature of cooling water discharges would comply with the existing Environmental Permit with no changes proposed to the permitted levels.			
Water resources	Increased droughts	Likely	Reduction in water availability for abstraction and impact on nearby existing abstractions	Increases in abstraction from surface water and groundwater sources could reduce availability of water for other users. However, there is no change proposed to the existing abstraction volume from the River Dee for cooling water, and no new additional abstractions from other sources required. As such, no additional pressures on abstraction would result from the Proposed Development. The existing levels will have been factored into forecasting with Dwr Cymru Welsh Water's Water Resources	Low	Negligible	Not significant

Discipline / Receptor	Climate Hazard	Likelihood of hazard occurring	Likely ICCIs identified	Description of ICCI and embedded mitigation (where mitigation is not necessary, this has been specified)	Likelihood of ICCI occurring	Consequence	Significance
				Management Plan 2024 (Ref 2).			
Flood risk	Increase in winter precipitation rate	Likely	Increased peak discharge rates for surface water runoff, impacting receiving waterbodies if the capacity of the drainage infrastructure is exceeded in extreme events. If this results in attenuation storage capacity being exceeded then there is potential for the Dee Estuary Water Framework Directive (WFD) water body to receive untreated and polluted water, potentially leading to a deterioration in water quality.	The impact of climate change on expected flows will be accommodated in the design of drainage infrastructure to ensure appropriate attenuation and storage for anticipated flows.	Low	Low	Not significant

Discipline / Receptor	Climate Hazard	Likelihood of hazard occurring	Likely ICCIs identified	Description of ICCI and embedded mitigation (where mitigation is not necessary, this has been specified)	Likelihood of ICCI occurring	Consequence	Significance
Groundwater aquifers	Decrease in summer precipitation rate	Possible	Reduction in precipitation could reduce aquifer storage and groundwater levels. Construction: construction activities such as dewatering can reduce groundwater levels. This potential impact would be localised and unlikely to impact the surrounding environment.	Reduction in groundwater levels could reduce water availability for water dependent receptors and water users (i.e. groundwater abstractions). Dewatering during construction would be kept to a minimum and only undertaken where required to limit any reduction in groundwater recharge.	Low	Low	Not significant
Groundwater aquifers	Increase in winter precipitation rate	Possible	Changes in groundwater flow and levels. Construction and operation: An increase in groundwater level may increase the	Potential for increase in groundwater levels and associated groundwater flooding. **Appendix 13-C: Flood Consequences Assessment** (**EN010166/APP/6.4**) has been based on flood risk incorporating estimated	Low	Low	Not significant

Discipline / Receptor	Climate Hazard	Likelihood of hazard occurring	Likely ICCIs identified	Description of ICCI and embedded mitigation (where mitigation is not necessary, this has been specified)	Likelihood of ICCI occurring	Consequence	Significance
			possibility of groundwater levels rising closer to the ground surface/mixing with potential shallower contamination (within Made Ground) which would otherwise not be encountered. This would increase the likelihood of potential impact on groundwater quality locally.	climate change over the life of the project. The assessment states that groundwater ingress during construction will be undertaken, and this will be managed following standard construction techniques detailed within the **Framework CEMP** (**EN010166/APP/6.5**) including dewatering where required. Likewise for operation, **Appendix 13-C: Flood Consequences Assessment** (**EN010166/APP/6.4**) states that any vulnerable equipment will be raised 300 mm above proposed ground levels and any infrastructure within the Repurposed CO_2 Connection Corridor and Electrical Connection Corridor will be designed to prevent water ingress.			

Discipline / Receptor	Climate Hazard	Likelihood of hazard occurring	Likely ICCIs identified	Description of ICCI and embedded mitigation (where mitigation is not necessary, this has been specified)	Likelihood of ICCI occurring	Consequence	Significance
Groundwater aquifers	Sea Level rise	Possible	Changes in groundwater flow and levels. And potential to move saline interface landward. Construction and operation: An increase in groundwater level may increase the possibility of groundwater levels rising closer to the ground surface/mixing with potential shallower contamination (within Made Ground) which would otherwise not be encountered. Dewatering activities can lead to the saline interface being drawn in land. This potential impact would be localised and unlikely to impact the	Potential for saline interface to move landward. Dewatering during construction would be kept to a minimum and only undertaken where required to limit saline intrusion. It is likely that the potential saline intrusion would remain localised and of relatively low magnitude.	Low	Low	Not significant

Discipline / Receptor	Climate Hazard	Likelihood of hazard occurring	Likely ICCIs identified	Description of ICCI and embedded mitigation (where mitigation is not necessary, this has been specified)	Likelihood of ICCI occurring	Consequence	Significance
			surrounding environment.				
Groundwater aquifers	Storm surges	Unlikely	Changes in groundwater flow and levels. Construction and operation: An increase in groundwater level may increase the possibility of groundwater levels rising closer to the ground surface/mixing with potential shallower contamination (within Made Ground) which would otherwise not be encountered. Dewatering activities can lead to the saline interface being drawn in land. This potential impact would be localised and unlikely to impact the	Potential for increase in groundwater levels and associated groundwater flooding. **Appendix 13-C: Flood Consequences Assessment** (**EN010166/APP/6.4**) has been based on flood risk incorporating estimated climate change over the life of the project. The assessment states that groundwater ingress during construction will be undertaken, and this will be managed following standard construction techniques detailed within the **Framework CEMP** (**EN010166/APP/6.5**) including dewatering where required. Likewise for operation, **Appendix 13-C: Flood Consequences Assessment**	Low	Low	Not significant

Discipline / Receptor	Climate Hazard	Likelihood of hazard occurring	Likely ICCIs identified	Description of ICCI and embedded mitigation (where mitigation is not necessary, this has been specified)	Likelihood of ICCI occurring	Consequence	Significance
			surrounding environment.	(**EN010166/APP/6.4**) states that any vulnerable equipment will be raised 300 mm above proposed ground levels and any infrastructure within the Repurposed CO_2 Connection Corridor and Electrical Connection Corridor will be designed to prevent water ingress.			
Groundwater aquifers	Increase in occurrences of drought	Possible	Reduction in precipitation could reduce groundwater levels. Summer droughts could also reduce water quality from reduced dilution of pollutants during the summer therefore increasing pollutants when precipitation events occur. This potential impact would be localised and unlikely to impact the	Reduction in groundwater levels could reduce water availability for water dependent receptors and water users (i.e. groundwater abstractions). Dewatering during construction would be kept to a minimum and only undertaken where required to limit any reduction in groundwater recharge. Construction works would have a negligible impact on water quality due to mitigation measures implemented through the **Framework**	Low	Low	Not significant

Discipline / Receptor	Climate Hazard	Likelihood of hazard occurring	Likely ICCIs identified	Description of ICCI and embedded mitigation (where mitigation is not necessary, this has been specified)	Likelihood of ICCI occurring	Consequence	Significance
			surrounding environment.	**Construction CEMP** (**EN010166/APP/6.5**).			
Geology and Ground Conditions							
Groundwater	Increase to winter rainfall	Very likely	An increase in groundwater level may increase the possibility of groundwater levels rising closer to the ground surface / mixing with potential shallower contamination (within Made Ground) which would otherwise not be encountered. This would increase the likelihood of potential impact on groundwater quality	During construction, groundwater quality may be temporarily adversely affected due to potential ground disturbance/dewatering. The potential rise in groundwater level may require additional dewatering considerations, which may decrease groundwater quality through mobilising existing contamination. However, these would be incorporated into the design works. Contamination which may be encountered during construction would have been removed, remediated or mitigated to some extent. Maintenance and operation of the Proposed Development would be in accordance with environmental legislation and	Moderate	Low	Not significant

Discipline / Receptor	Climate Hazard	Likelihood of hazard occurring	Likely ICCIs identified	Description of ICCI and embedded mitigation (where mitigation is not necessary, this has been specified)	Likelihood of ICCI occurring	Consequence	Significance
				good practice. Therefore, it is unlikely that there would be an increased risk to groundwater quality, should levels rise.			
Human Health	Increase in annual temperature	Very likely	Increase in dust generation which may increase potential exposure to dust/contaminants impacting human health	During the construction phase, extended dry spells may cause increased dust production. This consequence is minimised as far as reasonably practicable, through the measures incorporated into the **Framework CEMP** (**EN010166/APP/6.5**) (e.g. reduce dust emissions through the effective transportation and storage of materials).	Moderate	Low	Not significant
Physical Processes							
Physical Processes	Sea level rise	Possible	Due to sea level rise and increased storminess associated with climate change the estuary morphology	During construction, the decision to replace the existing intake screens rather than installing new infrastructure elsewhere in the water connection corridor, means that the Proposed	Low	Negligible	Not significant

Discipline / Receptor	Climate Hazard	Likelihood of hazard occurring	Likely ICCIs identified	Description of ICCI and embedded mitigation (where mitigation is not necessary, this has been specified)	Likelihood of ICCI occurring	Consequence	Significance
			may change over time. Section 16.4.6 of **Chapter 16: Physical Processes** (**EN010166/APP/6.2.16**) states that despite there being no defined receptor for the physical environment, and instead the physical processes act as a pathway which has the potential to impact other receptors. Despite this, estuary morphology has been considered a receptor in its own right.	Development will maintain the baseline conditions and therefore not exacerbate potential future sea level rise-related change to the estuary morphology.			

Discipline / Receptor	Climate Hazard	Likelihood of hazard occurring	Likely ICCIs identified	Description of ICCI and embedded mitigation (where mitigation is not necessary, this has been specified)	Likelihood of ICCI occurring	Consequence	Significance
Human Health							
Human Health	Increase in mean annual maximum air temperature.	Possible (Construction)	Increased dust production during construction due to more hot days, impacting human health.	During construction, an increase in air temperatures may cause increased dust pollution which could affect human receptors suffering from respiratory conditions. This consequence would be minimised as far as is reasonably practicable, through measures required by the **Framework CEMP** (**EN010166/APP/6.5**) (e.g. reduce dust emissions through the effective transportation and storage of materials), including the proposed monitoring regime.	Low	Low	Not significant

References

Ref 1. Flintshire County Council. (2017). Management of Surface Water for New Development: Supplementary Planning Guidance Note 29. Retrieved from https://www.flintshire.gov.uk/en/PDFFiles/Planning/AdoptedSP-GNs/SPGN-No-29.-Management-of-Surface-Water-for-New-Development.pdf (Accessed 23/07/2025)

Ref 2. Dwr Cymru Welsh Water's Final Water Resources Management Plan. (2024).