Immingham Green Energy Terminal

TR030008

Volume 6

6.4 Environmental Statement Appendices

Appendix 19.C: In-Combination Climate Change Impact (ICCI) Assessment

Planning Act 2008

Regulation 5(2)(a)

Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009 (as amended)

September 2023

Infrastructure Planning

Planning Act 2008

The Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009 (as amended)

Immingham Green Energy Terminal

Development Consent Order 2023

6.4 Environmental Statement Appendices

Appendix 19.C: In-Combination Climate Change Impact (ICCI) Assessment

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Regulation Reference	APFP Regulation 5(2)(a)
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Revision 1	21 September 2023	DCO Application

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1. In-Combination Climate Change Impact Assessment

1.1. Introduction

1.1.1. This appendix presents the results of the in-combination climate change impact ("ICCI") assessment for the construction and operation phase of the Project in the form of a ICCI Assessment summary table. It should be read in conjunction with Environmental Statement ("ES") **Chapter 19: Climate Change [TR030008/APP/6.2]**.

1.1.2. The technical disciplines have reviewed the future climate projections as set out in the **ES Chapter 19: Climate Change [TR030008/APP/6.2]** and examined the sensitivity of assets before commenting on the combined impact of Climate Change and the Project on surrounding sensitive receptors (as identified by the relevant technical disciplines).

1.1.3. The parameters considered by the technical disciplines in the preparation of the ICCI assessment are:

a. Extreme weather events (heatwaves, storm surges, wildfire and drought).
b. Flood risk.
c. Sea level rise ("SLR").
d. Temperature changes.
e. Rainfall changes.

Table 1: ICCI assessment summary

Discipline	Climate hazard	Likelihood of climate hazard occurring	Likely ICCIs identified	Description of ICCI considering embedded environmental measures/good practice	Likelihood of ICCI occurring	Consequence	Significance of effects
Air Quality	Increase in seasonal maximum and annual maximum air temperature	Low to high	Reduction in growth rates of plant material at sensitive habitats	None specifically proposed for ICCI, but secondary benefit of local air-quality-related control measures would provide mitigation (e.g. emission release heights)	Moderate	Low	Not Significant
	Increase in frequency and intensity of heatwaves	Negligible to moderate					
	Increase in occurrences of droughts	Low to moderate					
	Increase in winter precipitation rate	Low to moderate					
	Increase in sea level	Low to moderate	Reduction in area of sensitive habitat		Moderate	Low	Not Significant
Noise and Vibration	No ICCIs identified						
Terrestrial Ecology	-	-	No ICCIs identified	The potential for sea level rise to result in overtopping of the existing flood defences and damage/destroy woodland habitats (within Long Strip woodland, within the Pipe Rack and Jetty Access Road site), and the potential for flooding of ditches supporting water vole (Ditches 4 (North Beck Drain), 6 and 7) was identified			

Discipline	Climate hazard	Likelihood of climate hazard occurring	Likely ICCIs identified	Description of ICCI considering embedded environmental measures/good practice	Likelihood of ICCI occurring	Consequence	Significance of effects
				as a potential pathway for ICCIs. The section of coastline between Immingham and Grimsby/Cleethorpes is currently protected by a hard sea defence. The coastline at this location falls within Policy Unit L (Western Section) East Immingham to Humberston Fitties of the Flamborough Head to Gibraltar Point Shoreline Management Plan ("SMP") (13.1.1a.ii.Ref 1-1), which states that for this unit the policy is to 'hold the line', i.e. to maintain the flood defences in their current position in the short term (present day to 2025), medium term (2025 – 2055) and long term (2055 – 2105). As this forms the baseline scenario for the coastal sea defence up to 2105, it is reasonable to conclude that there is no pathway for any ICCIs with the Project that could result in environmentally worse effects on the identified terrestrial ecology receptors.			
Marine Ecology	Increase in frequency and severity of storm surges	Negligible to low	Loss of functional habitat	Intertidal habitat loss due to SLR is predicted to occur regardless of the Project and is taken into consideration as part of the future baseline. The potential losses on the Humber Estuary arising through coastal squeeze are being addressed as part of the Humber Estuary Flood Risk Management Strategy (13.1.1a.ii.Ref 1-2). The scale of intertidal loss predicted as a result of the Project is considered to be insignificant.	Moderate	Low	Not Significant
Marine Ecology	Increase in sea level	Low to moderate	Intertidal habitat loss	Intertidal habitat loss due to SLR is predicted to occur regardless of the Project and is taken into consideration as part of the future baseline. The potential losses on	Moderate	Low	Not Significant

Discipline	Climate hazard	Likelihood of climate hazard occurring	Likely ICCIs identified	Description of ICCI considering embedded environmental measures/good practice	Likelihood of ICCI occurring	Consequence	Significance of effects
				the Humber Estuary arising through coastal squeeze are being addressed as part of the Humber Estuary Flood Risk Management Strategy (Ref 1-2). The scale of intertidal loss predicted as a result of the Project is considered to be insignificant.			
Marine Ecology	Increase in mean annual maximum air temperature	Low to high	Change in species distribution and behaviours	The 2020 Marine Climate Change Impacts Partnership (MCCIP) report card (Ref 1-3) highlighted the following changes to marine ecology receptors could potentially occur during the operational phase of the Project as a result of climate change. These have been factored in to the future baseline. Changing sea temperatures resulting in range shifts for both benthic species and mobile species (such as fish, marine mammals). This could result in a decline of some cold-water species around certain parts of the UK and an increase in the prevalence of non-native species. Changing temperatures affecting spawning in some marine species	Moderate	Low	Not Significant
	Increase in maximum summer air temperature	Low to high					
	Increase in mean winter minimum air temperature	Low to moderate					

Discipline	Climate hazard	Likelihood of climate hazard occurring	Likely ICCIs identified	Description of ICCI considering embedded environmental measures/good practice	Likelihood of ICCI occurring	Consequence	Significance of effects
				as well as the timings of migrations. Changes in prey distribution and availability, resulting in range shifts in some regional populations of marine mammals and fish. The scale of predicted effects on these features arising from this Project is insignificant to minor with mitigation in place.			
Ornithology	Increase in sea level	Low to moderate	Loss of supporting habitat	Loss of intertidal habitat (which supports birds) due to SLR is predicted to occur regardless of the Project and is taken into consideration as part of the future baseline. The potential losses on the Humber Estuary arising through coastal squeeze are being addressed as part of the Humber Estuary Flood Risk Management Strategy (13.1.1a.ii.Ref 1-2). The scale of intertidal loss predicted as a result of the Project is considered to be insignificant.	Moderate	Low	Not Significant

Discipline	Climate hazard	Likelihood of climate hazard occurring	Likely ICCIs identified	Description of ICCI considering embedded environmental measures/good practice	Likelihood of ICCI occurring	Consequence	Significance of effects
Ornithology	Increase in mean annual maximum air temperature	Low to high	Change in species distribution	The 2020 MCCIP report card (13.1.1a.ii.Ref 1-3) highlighted the following changes to ornithology receptors could potentially occur during the operational phase of the Project as a result of climate change. These have been factored in to the future baseline. Coastal waterbirds showing north-easterly shifts in the winter distributions in Europe. Changes in prey distribution and availability, resulting in range shifts in some regional populations of birds. The scale of predicted effects on birds arising from this Project is insignificant to minor with mitigation in place.	Moderate	Low	Not Significant
	Increase in maximum summer air temperature	Low to high					
	Increase in mean winter minimum air temperature	Low to moderate					
Traffic and Transport	No ICCIs identified						
Marine Transport and Navigation	No ICCIs identified						

Discipline	Climate hazard	Likelihood of climate hazard occurring	Likely ICCIs identified	Description of ICCI considering embedded environmental measures/good practice	Likelihood of ICCI occurring	Consequence	Significance of effects
Landscape and Visual	Increased occurrence of heatwaves and droughts	Frequent	Reduction in growth rates of plant material	Landscape species to be selected and maintained in accordance with the Landscape and Ecology Management Plan ("LEMP") and the detailed specification for the soil growing medium to be in accordance with **Appendix B: Outline Soils Management Plan** of the **Outline Construction Environmental Management Plan [TR030008/APP/6.5]**.	Low	Very Low	Not Significant
		Frequent	Increased likelihood of plant failure	Planting areas to be regularly monitored and maintained in accordance with the **Outline LEMP [TR030008/APP/6.9]**.	Low	Very Low	Not Significant
Historic Environment (Terrestrial)	No ICCIs identified						
Historic Environment (Marine)	Increase in sea level	Low to moderate	Submergence of intertidal heritage receptors. Increased water depth of marine heritage receptors.	During the operation phase, some receptors may become submerged or become located at a greater water depth, affecting their environmental conditions.	Moderate	Very Low	Not Significant

Discipline	Climate hazard	Likelihood of climate hazard occurring	Likely ICCIs identified	Description of ICCI considering embedded environmental measures/good practice	Likelihood of ICCI occurring	Consequence	Significance of effects
Historic Environment (Marine)	Increase in frequency and severity of storm surges	Negligible to low	Storm surges acting on marine and intertidal heritage receptors and their environment.	During the operation phase, some receptors, if exposed to increased storm surges, may be subject to increased physical erosion processes, and/or may become exposed or buried during a surge event.	Low	Low	Not Significant
Physical Processes	The physical processes assessment evaluates the potential 'exposure to change' as opposed to impact significance. This is because whilst the Project has the potential to cause changes to hydrodynamic and sedimentary processes, these changes are not, in themselves, generally recognised as environmental features/receptors and, therefore, do not equate to 'effects'. The effects would instead be the consequence of these changes on other environmental features.						
Marine Water and Sediment Quality	Increase in sea level	Low to moderate	Flood waters result in increased Suspended Sediment Contaminant ("SSC") and contaminants in water column	Flood waters may result in increased SSC and contaminants in water column affecting water quality. The scale of predicted effects on water quality arising from this Project is minor adverse.	Moderate	Low	Not Significant
	Increase in mean annual maximum air temperature	Low to high	Temperature changes resulting in water quality changes	In the absence of the Project, water and sediment quality will be influenced by climate change, such as changes in sea pH and temperature, which in turn can have an impact on water quality	Moderate	Low	Not Significant
	Increase in maximum summer air temperature	Low to high					

Discipline	Climate hazard	Likelihood of climate hazard occurring	Likely ICCIs identified	Description of ICCI considering embedded environmental measures/good practice	Likelihood of ICCI occurring	Consequence	Significance of effects
	Increase in mean winter minimum air temperature	Low to moderate		(e.g. dissolved oxygen concentrations). The scale of predicted effects on water quality arising from this Project is minor adverse.			
	Rainfall changes	Negligible to low	Increased river discharge results in increased SSC and contaminants in water column	Increased river discharges may result in increased SSC and contaminants in water column affecting water quality. The scale of predicted effects on water quality arising from this Project is minor adverse.	Moderate	Low	Not Significant
Water Quality, Coastal Protection, Flood Risk and Drainage - Surface water drainage	Increase in winter precipitation rate	Low to moderate	Increased occurrence of larger storm events due to increased winter precipitation	During the operation phase, increased winter precipitation increases the risk of larger storm events occurring and flooding the Site. This consequence would be minimised through a design accounting for climate change (1 in 100-year event +40% CC, in line with UK Government guidance). This means no flooding occurs on site during this event and all water is stored within the drainage system.	Moderate/Low	Low	Not Significant
Water Quality, Coastal Protection,	Increase in winter precipitation rate	Low to moderate	An increase in the frequency and duration of	Climate change influence expected flows will be accommodated in the design of	Moderate	Very Low	Not Significant

Discipline	Climate hazard	Likelihood of climate hazard occurring	Likely ICCIs identified	Description of ICCI considering embedded environmental measures/good practice	Likelihood of ICCI occurring	Consequence	Significance of effects
Flood Risk and Drainage - Flood risk (Site, surrounding receptors and site occupants)			flooding from all sources	drainage infrastructure to ensure appropriate storage for anticipated flows (e.g. in attenuation tanks in the surface water drainage system).			
Water Quality, Coastal Protection, Flood Risk and Drainage - Flood risk (Site, surrounding receptors and site occupants)	Increase in sea level	Low to moderate	Increase in frequency and severity of tidal and fluvial (tide locking) flood events in the future. Low frequency return period flood events today expected to become regular events in the future as higher sea levels will increase annual probability of coastal flood events occurring	Tidal and fluvial flood risk in association with climate change has been considered and flood resilience measures incorporated into the design to minimise the potential for damage and reduce recovery time. During construction, the opportunity would be taken to adopt flood resilient design techniques where possible, including placement/protection of flood sensitive equipment to above the 0.1% AEP flood level, plus an allowance for climate change, Flood Warning and Emergency Response Plans and closure/shutdown of the Site. Further details are included within **Appendix 18.A: Flood Risk Assessment [TR030008/APP/6.4]**.	Moderate	Low	Not Significant

Discipline	Climate hazard	Likelihood of climate hazard occurring	Likely ICCIs identified	Description of ICCI considering embedded environmental measures/good practice	Likelihood of ICCI occurring	Consequence	Significance of effects
Water Quality, Coastal Protection, Flood Risk and Drainage - Flood Risk (Site, surrounding receptors and site occupants)	Increase in frequency and severity of storm surges	Negligible to low	Increase in the frequency and severity of storm surge occurrences. Storm surge events today expected to become more regular events in the future as higher sea levels will increase annual probability of coastal flood events occurring	Tidal flood risk in association with climate change has been considered and flood resilience measures incorporated into the design to minimise the potential for damage and reduce recovery time. During construction, the opportunity would be taken to adopt flood resilient design techniques where possible, including placement/protection of flood sensitive equipment to above the 0.1% AEP flood level, plus an allowance for climate change, Flood Warning and Emergency Response Plans and closure/shutdown of the Site, details are included within **Appendix 18.A: Flood Risk Assessment [TR030008/APP/6.4]**.	Moderate	Low	Not Significant
Material Assets and Waste	No ICCIs identified						
Ground Conditions and Land Quality	Decrease in annual precipitation rate	Negligible to low	Soil erosion	For natural and undisturbed agricultural soils, drier conditions could affect their quality and capability, with currently droughty soils being downgraded but wet	Low	Moderate	Not Significant
	Increase in winter precipitation rate	Low to moderate					

Discipline	Climate hazard	Likelihood of climate hazard occurring	Likely ICCIs identified	Description of ICCI considering embedded environmental measures/good practice	Likelihood of ICCI occurring	Consequence	Significance of effects
	Increase in sea level			soils potentially upgraded (with respect to Agricultural Land Classification ("ALC"). For restored soils, these effects could be exacerbated by compaction and damage to soil structures during soil handling. Wetter conditions could increase the area of lower quality and marginal land on reinstatement, where the soils have heavier textures. Seasonality changes to rainfall/temperature could also be important.			
	Increase in frequency and severity of storm surges	Negligible to low					
	Increase in mean annual maximum air temperature; Increase in maximum summer air temperature	Low to high	Loss of Best and Most Versatile Agricultural Soils (ALC Grades 1 – 3a)	More extreme weather events (e.g. localised high-intensity rainfall), particularly on moderately steep to steep gradients, and where the soils have heavier textures with deep cracking. Dry topsoils exposed to more-frequent high winds by ploughing and cultivation. Increased loss of soils because of flooding.	Low	Moderate	Not Significant
	Increase in mean winter minimum air temperature	Low to moderate					
	Decrease in annual precipitation rate; Decrease in summer precipitation rate	Negligible to low					

Discipline	Climate hazard	Likelihood of climate hazard occurring	Likely ICCIs identified	Description of ICCI considering embedded environmental measures/good practice	Likelihood of ICCI occurring	Consequence	Significance of effects
	Increase in winter precipitation rate; Increase in sea level	Low to moderate					
	Increase in frequency and severity of storm surges; Increase in the intensity or extreme windstorms	Negligible to low					
	Increase in frequency and intensity of heatwaves	Negligible to moderate					
	Increase in wildfire hazard	Low					
	Increase in occurrences of drought	Low to moderate					
	Decrease in annual precipitation rate; Decrease in summer precipitation rate; Increase in	Negligible to low	Loss of Woodland and woodland soils	Loss of trees because of drought, and consequent exposure of soils to surface water erosion. Increased risk of tree loss due to greater frequency of storms/high	Low	Moderate	Not Significant

Discipline	Climate hazard	Likelihood of climate hazard occurring	Likely ICCIs identified	Description of ICCI considering embedded environmental measures/good practice	Likelihood of ICCI occurring	Consequence	Significance of effects
	frequency and severity of storm surges; Increase in the intensity or extreme windstorms			winds, and consequent exposure of soils to surface water erosion.			
	Increase in frequency and intensity of heatwaves	Negligible to moderate					
	Increase in wildfire hazard	Low					
	Increase in occurrences of drought	Low to moderate					
	Decrease in annual precipitation rate; Decrease in summer precipitation rate	Negligible to low	Disruption to re-instated drainage / water supply systems	Damage to drainage/water supply systems where the soils have heavier textures with deep cracking. Increased need to drain lower-lying areas of land within receiving sites during wetter winters and during periods of intense heavy rainfall. Failure of drainage system could lead to the flooding of agricultural land. Loss	Low	Moderate	Not Significant
	Increase in winter precipitation rate; Increase in sea level	Low to moderate					

Discipline	Climate hazard	Likelihood of climate hazard occurring	Likely ICCIs identified	Description of ICCI considering embedded environmental measures/good practice	Likelihood of ICCI occurring	Consequence	Significance of effects
	Increase in frequency and severity of storm surges	Negligible to low		of woodland biodiversity because of drought, and consequent exposure of soils to surface water erosion.			
	Increase in frequency and intensity of heatwaves	Negligible to moderate					
	Increase in occurrences of drought	Low to moderate					
	Decrease in annual precipitation rate; Decrease in summer precipitation rate	Negligible to low	Runoff	Increased runoff in winter due to wetter conditions. Also, in summer with intense localised rainfall events with potential rapid penetration of soils through deep cracks in heavy soils. Could see reduced runoff and infiltration rates during drought conditions.	Low	Moderate	Not Significant
	Increase in winter precipitation rate; Increase in sea level	Low to moderate					
	Increase in frequency and severity of storm surges; Increase in the intensity or	Negligible to low					

Discipline	Climate hazard	Likelihood of climate hazard occurring	Likely ICCIs identified	Description of ICCI considering embedded environmental measures/good practice	Likelihood of ICCI occurring	Consequence	Significance of effects
	extreme windstorms						
	Increase in frequency and intensity of heatwaves	Negligible to moderate					
	Increase in occurrences of drought	Low to moderate					
Major Accidents and Disasters	Increase in frequency and severity of storm surges	Negligible to low	Site flooding leading to equipment damage and potential for loss of containment of flammable gas which leads to fire and/or explosion causing harm to people and the environment via contaminated floodwater	During the lifecycle of the Project, an increase in volumes of stormwater which cannot be accommodated by site drainage infrastructure, could result in structural damage of equipment via buoyancy and pressure impacts. This is mitigated via the design of drainage systems to accommodate predicted storm flows and the design of structures such as foundations and supports in accordance with international engineering standards.	Negligible	High	Negligible

Discipline	Climate hazard	Likelihood of climate hazard occurring	Likely ICCIs identified	Description of ICCI considering embedded environmental measures/good practice	Likelihood of ICCI occurring	Consequence	Significance of effects
	Increase in mean annual maximum air temperature; Increase in maximum summer air temperature	Low to high	Damage to temperature sensitive electrical distribution equipment leading to potential for fire causing harm to people	Electrical equipment such as circuit breakers and switchgear is sensitive to high temperatures and increased humidity levels which can cause failure. Malfunctions can result in a loss of power supply to critical equipment leading to the risk of fire and/or explosion. This is mitigated by the design of equipment and installation within enclosures provided with ventilation, filtration and other climate control systems.	Negligible	High	Negligible
	Increase in mean winter minimum air temperature	Low to moderate					
	Increase in frequency and intensity of heatwaves	Negligible to moderate					
Socio-Economics	No ICCIs identified						
Human Health and Wellbeing	No ICCIs identified						
Cumulative Effects	No ICCIs identified						

1.2. References

Ref 1-1 Scott Wilson (2010). Humber Estuary Coastal Authorities Group. Flamborough Head to Gibraltar Point Shoreline Management Plan.

Ref 1-2 Environment Agency (2008). Humber Estuary Flood Risk Management Strategy.

Ref 1-3 Marine Climate Change Impacts Partnership (2020). Marine Climate Change Impacts Report Card 2020.