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19. Summary of Likely Significant Residual Environmental Effects

19.1 Introduction

19.1.1 Chapters 6 to 18 of this Environmental Statement (ES) have considered the potential environmental impacts and effects of the Proposed Developments. This chapter provides a summary of those adverse and beneficial environmental effects that are considered to be significant (i.e., moderate and major effects).

19.2 Significant Environmental Effects and Proposed Mitigation Measures

19.2.1 Tables 19.1 and 19.2 summarise the significant environmental effects of the Proposed Developments that have been identified, following implementation of the embedded mitigation or impact avoidance measures included in the design of the Proposed Developments (as detailed in Chapters 6 to 18 (ES Volume I), where relevant). Tables 19.1 and 19.2 also summarise any additional mitigation measures that have been identified in the technical assessments contained in the ES.

19.2.2 For each topic, the reasonable worst-case scenario is assessed, including the construction programme scenario and design parameters. Further details on the reasonable worst case (or 'the Rochdale Envelope') are set out in Chapter 3: Proposed Developments Description, Need and Alternatives Considered and Chapter 4: Construction Programme and Management (ES Volume I). The specific worst-case for each assessment is described in Chapters 6 to 18 (ES Volume) as appropriate. Effects have been assessed for the construction, operation (including maintenance) and decommissioning scenarios.

19.2.3 As outlined in Chapter 1: Introduction and EIA Methodology (ES Volume I), for the purposes of this EIA an effect is considered to be 'significant' if it is assessed to be moderate (adverse or beneficial) or major (adverse or beneficial). Minor and negligible effects are only referenced in this chapter where a 'significant' (moderate or major) effect has been reduced to a 'not significant' effect following mitigation.

19.2.4 To provide further clarification on the nature of the effects, each has been identified for the purposes of this summary as:

- short term – effects occurring only over a short period of time, e.g., an effect that only lasts for the duration of the construction period, or one that lasts for only part of the operational phase;
- medium term – effects occurring for the operational duration of the Proposed Developments, but which cease when operations cease; or
- long term – effects occurring beyond the operation of the Proposed Developments, for example the permanent loss of habitat associated with the Proposed Developments;
- reversible – effects that are not permanent because the effect would no longer occur if the impact was removed within the relevant timescale (for example the visual amenity impact of construction structures would be described as short term, temporary as the impact does not continue when the structures are removed);
- permanent – effects that are permanent and cannot be readily reversed within the relevant timescale (for example an environmental feature that is lost and cannot be replaced until after decommissioning would be medium term, permanent. In the event that it could not be replaced at all, this would be long term, permanent); and

- direct – effects that result from a direct impact, for example, the loss of ecological habitat; or
- indirect – also known as secondary effects, effects that result indirectly, for example, increased traffic could indirectly impact on air quality.

Table 19.1: Summary of likely significant residual effects for Proposed Phillips 66 Development

Proposed Phillips 66 Development stage	Environmental effect (following development design and impact avoidance measures	Classification of effect prior to mitigation	Mitigation/ enhancement (if identified)	Classification of residual effect after mitigation	Nature of effect(s)
Chapter 6: Air Quality					
Construction	No significant effects are predicted to occur.				
Operation	No significant effects are predicted to occur.				
Decommissioning	No significant effects are predicted to occur.				
Chapter 7: Noise & Vibration					
Construction	Noise effects on three residential noise sensitive receptors (NSRs) (NSR 1 – Staple Road, NSR 2 – Clarkes Road and NSR 3 – Church Lane) during construction of the Proposed Phillips 66 Development (evening, weekend, night-time)	Up to major adverse (significant)	Further detailed assessment and implementation of CEMP once contractor appointed and appropriate mitigation is employed such that the BS 5228 ABC noise criteria are met and the mitigation guidance set out in Chapter 7, Section 7.5 is followed	Up to minor adverse (not significant)	Short term, reversible, direct
Operation	Noise effects on three residential noise sensitive receptors (NSRs) (NSR 1 – Staple Road, NSR 2 – Clarkes Road and NSR 3 – Church Lane) during operation of Proposed Phillips 66 Development (daytime)	Up to moderate adverse (significant)	Application of practical sound mitigation to reduce relevant noise at source to meet the operational noise criterion	Negligible adverse (not significant)	Long term, reversible, direct
	Noise effects on three residential noise sensitive receptors (NSRs) (NSR 1 – Staple Road, NSR 2 – Clarkes Road and NSR 3 – Church Lane) residential NSRs during operation of Proposed Phillips 66 Development (night-time)	Up to moderate adverse (significant)	Application of practical sound mitigation to reduce relevant noise at source to meet the operational noise criterion	Minor adverse (not significant) or less	Long term, reversible, direct
Decommissioning	Noise impacts during decommissioning of the Proposed Phillips 66 Development	As detailed above for construction effects.	Further detailed assessment and implementation of DEMP, particularly regarding working outside of daytime working hours.	Further assessment would need to confirm the potential level of effect at NSRs, although they may be	Short term, reversible, direct

Proposed Phillips 66 Development stage	Environmental effect (following development design and impact avoidance measures	Classification of effect prior to mitigation	Mitigation/ enhancement (if identified)	Classification of residual effect after mitigation	Nature of effect(s)
				expected to be similar to those during construction.	
Chapter 8: Traffic & Transport					
Construction	Pedestrian/ cyclist amenity effects (receptors on Rosper Road, A160 (near Killingholme PS and south of Phillips 66 Site), and Humber Road	Moderate adverse (significant)	Measures set out in Construction Worker Travel Plan (CWTP) (Appendix 8C, ES Volume II) including measures to reduce the level of traffic such as minibus and car sharing	Minor adverse (not significant)	Short term, reversible, indirect
Operation	No significant effects are predicted to occur.				
Decommissioning	No significant effects are predicted to occur.				
Chapter 9: Water & Flood Risk					
Construction	No significant effects are predicted to occur.				
Operation	Operational discharge of sulphate to watercourses affecting water quality at Rosper Road Pools	Moderate adverse (significant)	Desulphurisation (e.g. deSOx) of wet gas scrubber effluent. Monitoring and further assessment	Minor adverse (not significant)	Long term, reversible, indirect
Decommissioning	No significant effects are predicted to occur.				
Chapter 10: Geology, Hydrogeology & Land Contamination					
Construction	Direct contact with contamination and inhalation of dust and/or soil derived vapours – human health	Moderate adverse (significant)	Construction works will be carried out in accordance with a CEMP and environmental good practice on site.	Minor adverse (not significant)	Short term, reversible, direct
	Inhalation of dust and/ or soil derived vapours – off site residential users human health	Moderate adverse (significant)	Construction works will be carried out in accordance with a CEMP and environmental good practice on site.	Minor adverse (not significant)	Short term, reversible, direct
	Direct contact with contamination – development infrastructure	Moderate adverse (significant)	Buildings and services risks will be mitigated by using concrete and service pipes appropriate for any aggressive ground conditions.	Minor adverse (not significant)	Short term, reversible, direct

Proposed Phillips 66 Development stage	Environmental effect (following development design and impact avoidance measures	Classification of effect prior to mitigation	Mitigation/ enhancement (if identified)	Classification of residual effect after mitigation	Nature of effect(s)
	Migration of ground gas – human health	Moderate adverse (significant)	Workers will adopt safe working practices under relevant health and safety legislation. Workers will comply with confined spaces regulations.	Minor adverse (not significant)	Short term, reversible, direct
	Migration of ground gas – development infrastructure	Moderate adverse (significant)	Ground gas protection measures will be implemented into design and build of permanent and temporary structures if required.	Minor adverse (not significant)	Short term, reversible, direct
	Lateral and vertical migration of contamination through leachate, groundwater or surface run-off (including as a result of piling) – superficial aquifers	Up to moderate adverse (significant)	Any piling works would be planned in accordance with best practice guidance (Environment Agency, 2001). Piling operations would be subject to foundation works risk assessment and any potential to cause pollution to the aquifer would be covered by measures to be detailed in piling method statements. Construction works will be carried out in accordance with a CEMP.	Negligible to minor adverse (not significant)	Short term, reversible, indirect
	Lateral and vertical migration of contamination through leachate, groundwater or surface run-off (including as a result of piling) – bedrock aquifers	Moderate adverse (significant)	Any piling works would be planned in accordance with best practice guidance (Environment Agency, 2001). Piling operations would be subject to foundation works risk assessment and any potential to cause pollution to the aquifer would be covered by measures to be detailed in piling method statements. Construction works will be carried out in accordance with a CEMP.	Minor adverse (not significant)	Short term, reversible, indirect
	Lateral and vertical migration of contamination through leachate, groundwater or surface run-off (including as a result of piling) – North Beck Drain catchment	Moderate adverse (significant)	All development will be undertaken in accordance with relevant pollution prevention guidance.	Minor adverse (not significant)	Short term, reversible, indirect

Proposed Phillips 66 Development stage	Environmental effect (following development design and impact avoidance measures	Classification of effect prior to mitigation	Mitigation/ enhancement (if identified)	Classification of residual effect after mitigation	Nature of effect(s)
Operation	Direct contact with contamination – development infrastructure	Moderate adverse (significant)	Buildings and services risks will be mitigated by using concrete and service pipes appropriate for any aggressive ground conditions.	Minor adverse (not significant)	Long term, reversible, direct
	Migration of ground gas – development infrastructure	Moderate adverse (significant)	Ground gas protection measures will be implemented into design and build of structures if occupied buildings are part of the final design.	Minor adverse (not significant)	Long term, reversible, direct
	Migration of ground gas – human health	Moderate adverse (significant)	Workers will adopt safe working practices under relevant health and safety legislation.	Minor adverse (not significant)	Long term, reversible, direct
Decommissioning	Direct contact with contamination and inhalation of dust and/or soil derived vapours – human health	Moderate adverse (significant)	Works will be carried out in accordance with environmental management plans and environmental good practice on site.	Minor adverse (not significant)	Short term, reversible, direct
	Inhalation of dust and/or soil derived vapours – off site residential users human health	Moderate adverse (significant)	Works will be carried out in accordance with environmental management plans and environmental good practice on site.	Minor adverse (not significant)	Short term, reversible, direct
	Migration of ground gas – Human health	Moderate adverse (significant)	Works will be carried out in accordance with environmental management plans and environmental good practice on site.	Minor adverse (not significant)	Short term, reversible, direct
	Lateral and vertical migration of contamination through leachate, groundwater or surface run-off – bedrock aquifers	Moderate adverse (significant)	Works will be undertaken in accordance with relevant pollution prevention guidance.	Negligible (not significant)	Short term, reversible, indirect
Chapter 11: Landscape & Visual Amenity					
Construction	No significant effects are predicted to occur.				
Operation	No significant effects are predicted to occur.				
Decommissioning	No significant effects are predicted to occur.				

Proposed Phillips 66 Development stage	Environmental effect (following development design and impact avoidance measures	Classification of effect prior to mitigation	Mitigation/ enhancement (if identified)	Classification of residual effect after mitigation	Nature of effect(s)
Chapter 12: Cultural Heritage					
Construction	Ancient foreshore and associated paleochannels and deposits **[A122]** Permanent loss of approximately 50% of the recorded extent of this asset as a result of the construction of the Proposed Phillips 66 Development.	Moderate adverse (significant)	If remains are deemed to have good potential to have survived then intrusive investigation and/or non-intrusive survey may be required, with findings published. If there is low potential for survival then monitoring of construction works will be undertaken as necessary.	Minor adverse (not significant)	Long term, permanent, direct
	Rectilinear crop mark **[A25]** Permanent loss of significant percentage (up to 100%) of the asset as a result of the construction of the Proposed Phillips 66 Development.	Major adverse (significant)	If remains are deemed to have good potential to have survived then intrusive investigation may be required, with findings published. If there is low potential for survival then monitoring of construction works will be undertaken as necessary, with findings published.	Minor adverse (not significant)	Long term, permanent, direct
	Previously unrecorded heritage assets Permanent loss of significant percentage of the asset as a result of the construction of the Proposed Phillips 66 Development.	Major adverse (significant)	If remains are deemed to have good potential to have survived then intrusive investigation and publication of findings may be required. If there is low potential for survival then non-intrusive survey will be undertaken as necessary, with findings published.	Minor adverse (not significant)	Long term, permanent, direct
Operation	No significant effects are predicted to occur.				
Decommissioning	No significant effects identified.				
Chapter 13: Ecology and Nature Conservation					
Construction	No significant effects are predicted to occur.				
Operation	Change in water quality due to elevated level of sulphate in effluent discharge to South Kililngholme Drain from Phillips 66 Site	Moderate adverse (significant)	Desulphurisation of flue gas to reduce effluent sulphate levels below 1,000mg/L	Negligible (not significant)	Long term, irreversible, indirect

Proposed Phillips 66 Development stage	Environmental effect (following development design and impact avoidance measures	Classification of effect prior to mitigation	Mitigation/ enhancement (if identified)	Classification of residual effect after mitigation	Nature of effect(s)
Decommissioning	No significant effects are predicted to occur.				
Chapter 14: Climate Change					
Construction	No significant effects are predicted to occur.				
Operation	GHG emissions	Beneficial (significant)	N/A	Beneficial (significant)	Long term, permanent, direct
Decommissioning	Decommissioning is scoped out of assessment.				
Chapter 15: Materials and Waste					
Construction	No significant effects are predicted to occur.				
Operation	No significant effects are predicted to occur.				
Decommissioning	Decommissioning is scoped out of assessment				
Chapter 16: Major Accidents & Disasters					
Construction	No significant effects are predicted to occur.				
Operation	No significant effects are predicted to occur.				
Decommissioning	No significant effects are predicted to occur.				
Chapter 17: Socio-Economics					
Construction	Employment	Moderate beneficial (significant)	N/A	Moderate beneficial (significant)	Short term, permanent, direct and indirect
Operation	No significant effects are predicted to occur.				
Decommissioning	Employment	Moderate beneficial (significant)	N/A	Moderate beneficial (significant)	Short term, permanent, direct and indirect

Proposed Phillips 66 Development stage	Environmental effect (following development design and impact avoidance measures	Classification of effect prior to mitigation	Mitigation/ enhancement (if identified)	Classification of residual effect after mitigation	Nature of effect(s)
Chapter 18: Cumulative & Combined Effects					
Construction	Cumulative employment with Viking CCS Pipeline project	Moderate beneficial (significant)	N/A	Moderate beneficial (significant)	Short term, permanent, direct and indirect
	Cumulative employment with Gigastack project	Moderate beneficial (significant)	N/A	Moderate beneficial (significant)	Short term, permanent, direct and indirect
	Cumulative employment with Monopole Manufacturing Facility project	Moderate beneficial (significant)	N/A	Moderate beneficial (significant)	Short term, permanent, direct and indirect
	Cumulative employment with VPI Immingham OCGT project	Moderate beneficial (significant)	N/A	Moderate beneficial (significant)	Short term, permanent, direct and indirect
	Cumulative employment with Land Adjacent to the Westgate Entrance, Port of Immingham project	Moderate beneficial (significant)	N/A	Moderate beneficial (significant)	Short term, permanent, direct and indirect
	Cumulative employment with Enabling works on and adjacent to the Able Marine Energy Park site	Moderate beneficial (significant)	N/A	Moderate beneficial (significant)	Short term, permanent, direct and indirect
	Cumulative employment Humber Low Carbon Pipelines project	Moderate beneficial (significant)	N/A	Moderate beneficial (significant)	Short term, permanent, direct and indirect
	Cumulative employment with Able Marine Energy Park project	Moderate beneficial (significant)	N/A	Moderate beneficial (significant)	Short term, permanent, direct and indirect
	Cumulative employment with North Killingholme Power Project	Moderate beneficial (significant)	N/A	Moderate beneficial (significant)	Short term, permanent, direct and indirect
	Cumulative employment with Immingham Eastern Ro-Ro Terminal project	Moderate beneficial (significant)	N/A	Moderate beneficial (significant)	Short term, permanent, direct and indirect

Proposed Phillips 66 Development stage	Environmental effect (following development design and impact avoidance measures	Classification of effect prior to mitigation	Mitigation/ enhancement (if identified)	Classification of residual effect after mitigation	Nature of effect(s)
	Cumulative employment with Immingham Green Energy Terminal	Moderate beneficial (significant)	N/A	Moderate beneficial (significant)	Short term, permanent, direct and indirect
Operation	No significant effects are predicted to occur.				
Decommissioning	No significant effects have been identified at this stage.				

Table 19.2: Summary of likely significant residual effects for Proposed VPI Development

Proposed VPI Development stage	Environmental effect (following development design and impact avoidance measures	Classification of effect prior to mitigation	Mitigation/ enhancement (if identified)	Classification of residual effect after mitigation	Nature of effect(s)
Chapter 6: Air Quality					
Construction	No significant effects are predicted to occur.				
Operation	No significant effects are predicted to occur.				
Decommissioning	No significant effects are predicted to occur.				
Chapter 7: Noise & Vibration					
Construction	Noise effects on one residential NSR (NSR 3 – Church Lane) during construction of the Proposed VPI Development (evening, weekend, night-time)	Up to major adverse (significant)	Further detailed assessment and implementation of a CEMP once a contractor appointed and appropriate mitigation is employed such that the BS 5228 ABC noise criteria are met and the Section 7.5 mitigation guidance is followed (as per Chapter 7 ES Volume I).	Up to minor adverse (not significant)	Short term, reversible
Operation	Noise effects on one residential NSR (NSR 4 – Hazel Dene) during operation of Proposed VPI Development (daytime and night-time)	Up to moderate adverse (significant)	Application of practical sound mitigation to reduce relevant noise at source to meet the operational noise criterion	Minor adverse (not significant) or less	Long term, reversible, direct
Decommissioning	Noise impacts during decommissioning of the Proposed VPI Development	As detailed above for construction effects.	Further detailed assessment and implementation of DEMP, particularly regarding working outside of daytime working hours.	Further assessment would need to confirm the potential level of effect at NSRs, although they may be expected to be similar to those during construction.	Short term, reversible, direct
Chapter 8: Traffic & Transport					
Construction	Pedestrian/ cyclist amenity effects (receptors on Rosper Road, A160 (near Killingholme PS and south of Phillips 66 Site), and Humber Road	Moderate adverse (significant)	Measures set out in CWTP (Appendix 8C, ES Volume II) including measures to reduce the level of traffic such as minibus and car sharing	Minor adverse (not significant)	Short term

Proposed VPI Development stage	Environmental effect (following development design and impact avoidance measures	Classification of effect prior to mitigation	Mitigation/ enhancement (if identified)	Classification of residual effect after mitigation	Nature of effect(s)
Operation	No significant effects are predicted to occur.				
Decommissioning	No significant effects are predicted to occur.				
Chapter 9: Water & Flood Risk					
Construction	No significant effects are predicted to occur.				
Operation	No significant effects are predicted to occur.				
Decommissioning	No significant effects are predicted to occur.				
Chapter 10: Geology, Hydrogeology & Land Contamination					
Construction	Direct contact with contamination and inhalation of dust and/or soil derived vapours – human health	Moderate adverse (significant)	Construction works will be carried out in accordance with a CEMP and environmental good practice on site.	Minor adverse (not significant)	Short term, reversible, direct
	Direct contact with contamination – development infrastructure	Moderate adverse (significant)	Buildings and services risks will be mitigated by using concrete and service pipes appropriate for any aggressive ground conditions.	Minor adverse (not significant)	Short term, reversible, direct
	Migration of ground gas – human health	Moderate adverse (significant)	Workers will adopt safe working practices under relevant health and safety legislation. Workers will comply with confined spaces regulations.	Minor adverse (not significant)	Short term, reversible, direct
	Migration of ground gas – development infrastructure	Moderate adverse (significant)	Ground gas protection measures will be implemented into design and build of permanent and temporary structures if occupied buildings are part of the final design.	Minor adverse (not significant)	Short term, reversible, direct
	Lateral and vertical migration of contamination through leachate, groundwater or surface run-off (including as a result of piling) – superficial aquifers	Up to moderate adverse (significant)	Any piling works would be planned in accordance with best practice guidance (Environment Agency, 2001). Piling operations would be subject to foundation works risk assessment and any potential to cause pollution to the aquifer would be	Negligible to minor adverse (not significant)	Short term, reversible, indirect

Proposed VPI Development stage	Environmental effect (following development design and impact avoidance measures	Classification of effect prior to mitigation	Mitigation/ enhancement (if identified)	Classification of residual effect after mitigation	Nature of effect(s)
			covered by measures to be detailed in piling method statements. Construction works will be carried out in accordance with a CEMP.		
	Lateral and vertical migration of contamination through leachate, groundwater or surface run-off (including as a result of piling) – bedrock aquifers	Moderate adverse (significant)	Any piling works would be planned in accordance with best practice guidance (Environment Agency, 2001). Piling operations would be subject to foundation works risk assessment and any potential to cause pollution to the aquifer would be covered by measures to be detailed in piling method statements. Construction works will be carried out in accordance with a CEMP.	Minor adverse (not significant)	Short term, reversible, indirect
	Lateral and vertical migration of contamination through leachate, groundwater or surface run-off (including as a result of piling) – North Beck Drain catchment	Moderate adverse (significant)	All development will be undertaken in accordance with relevant pollution prevention guidance.	Minor adverse (not significant)	Short term, reversible, indirect
	Loss of agricultural soils	Moderate adverse (significant)	The primary measures to mitigate the impacts on soil resources would be set out in a Soil Management Strategy, to be prepared during the detailed design stage. The Soil Management Strategy would include a Soil Resource Plan and Soil Handling Strategy which would confirm the different soil types (based on the soil surveys to be undertaken); the most appropriate re-use for the different types of soils; and the proposed methods for handling, storing and replacing soils onsite.	Moderate adverse (significant) but significantly less than 20 ha Grade 3 agricultural land	Long term, irreversible, direct
Operation	Direct contact with contamination – development infrastructure	Moderate adverse (significant)	Buildings and services risks will be mitigated by using concrete and service pipes appropriate for any aggressive ground conditions.	Minor adverse (not significant)	Long term, reversible, direct

Proposed VPI Development stage	Environmental effect (following development design and impact avoidance measures	Classification of effect prior to mitigation	Mitigation/ enhancement (if identified)	Classification of residual effect after mitigation	Nature of effect(s)
	Migration of ground gas – development infrastructure (both Proposed Developments)	Moderate adverse (significant)	Ground gas protection measures will be implemented into design and build of structures if occupied buildings are part of the final design.	Minor adverse (not significant)	Long term, reversible, direct
	Migration of ground gas – human health	Moderate adverse (significant)	Workers will adopt safe working practices under relevant health and safety legislation.	Minor adverse (not significant)	Long term, reversible, direct
Decommissioning	Direct contact with contamination and inhalation of dust and/or soil derived vapours – human health	Moderate adverse (significant)	Works will be carried out in accordance with environmental management plans and environmental good practice on site.	Minor adverse (not significant)	Short term, reversible, direct
	Migration of ground gas – Human health	Moderate adverse (significant)	Works will be carried out in accordance with environmental management plans and environmental good practice on site.	Minor adverse (not significant)	Short term, reversible, direct
	Lateral and vertical migration of contamination through leachate, groundwater or surface run-off – bedrock aquifers	Moderate adverse (significant)	Works will be undertaken in accordance with relevant pollution prevention guidance.	Negligible (not significant)	Short term, reversible, direct
Chapter 11: Landscape & Visual Amenity					
Construction	Impact on residential and recreational receptors at Viewpoint 3, Marsh Lane	Moderate adverse (significant)	None identified	Moderate adverse (significant)	Short term, reversible, indirect
Operation	Impact on residential and recreational receptors at Viewpoint 3, Marsh Lane	Moderate adverse (significant)	None identified	Moderate adverse (significant)	Long term, irreversible, indirect
Decommissioning	Impact on residential and recreational receptors at Viewpoint 3, Marsh Lane	Moderate adverse (significant)	None identified	Moderate adverse (significant)	Short term, reversible, indirect
Chapter 12: Cultural Heritage					
Construction	Ancient foreshore and associated paleochannels and deposits **[A122]** Permanent loss of approximately 50% of the recorded extent of this asset as a result of the construction of the Proposed VPI Development	Moderate adverse (significant)	Intrusive investigation and publication of findings.	Minor adverse (not significant)	Long term, permanent, direct

Proposed VPI Development stage	Environmental effect (following development design and impact avoidance measures	Classification of effect prior to mitigation	Mitigation/ enhancement (if identified)	Classification of residual effect after mitigation	Nature of effect(s)
	Bronze Age – Roman settlement activity **[A11 – A13]** and **[A16]** Permanent loss of significant percentage of the asset as a result of the construction of the Proposed VPI Development	Moderate adverse (significant)	Intrusive investigation and publication of findings.	Minor adverse (not significant)	Long term, permanent, direct
	Iron age – Roman settlement **[A20]** Permanent loss of significant percentage (up to 100%) of the asset as a result of the construction of the Proposed VPI Development	Moderate adverse (significant)	Intrusive investigation and publication of findings.	Minor adverse (not significant)	Long term, permanent, direct
	Previously unrecorded heritage assets Permanent loss of significant percentage of the asset as a result of the construction of the Proposed VPI Development	Major adverse (significant)	Intrusive investigation and publication of findings.	Minor adverse (not significant)	Long term, permanent, direct
Operation	No significant effects are predicted to occur.				
Decommissioning	No significant effects are predicted to occur.				
Chapter 13: Ecology and Nature Conservation					
Construction	Loss of Open Mosaic Habitat	Moderate adverse (significant)	Creation of new habitat under Biodiversity Net Gain (BNG) strategy.	Moderate beneficial (significant)	Short term, reversible, indirect
	Loss of grassland/ scrub habitat (collectively as habitat for small heath butterfly, nesting birds and foraging bats)	Moderate adverse (significant)	Creation of new habitat under BNG strategy.	Moderate beneficial (significant)	Short term, reversible, indirect
	Loss of small heath butterfly colony	Moderate adverse (significant)	Creation of new habitat under BNG strategy. Possible translocation of pupa/ eggs.	Moderate beneficial (significant)	Short term, reversible, indirect
Operation	No significant effects are predicted to occur.				
Decommissioning	No significant effects are predicted to occur.				

Proposed VPI Development stage	Environmental effect (following development design and impact avoidance measures	Classification of effect prior to mitigation	Mitigation/ enhancement (if identified)	Classification of residual effect after mitigation	Nature of effect(s)
Chapter 14: Climate Change					
Construction	No significant effects are predicted to occur.				
Operation	GHG emissions	Beneficial (significant)	N/A	Beneficial (significant)	Long term, permanent, direct
Decommissioning	Decommissioning is scoped out of assessment				
Chapter 15: Materials and Waste					
Construction	No significant effects are predicted to occur.				
Operation	No significant effects are predicted to occur.				
Decommissioning	Decommissioning is scoped out of assessment				
Chapter 16: Major Accidents & Disasters					
Construction	No significant effects are predicted to occur.				
Operation	No significant effects are predicted to occur.				
Decommissioning	No significant effects are predicted to occur.				
Chapter 17: Socio-Economics					
Construction	Employment	Moderate beneficial (significant)	N/A	Moderate beneficial (significant)	Short term, permanent, direct and indirect
Operation	No significant effects are predicted to occur.				
Decommissioning	Employment	Moderate beneficial (significant)	N/A	Moderate beneficial (significant)	Short term, permanent, direct and indirect
Chapter 18: Cumulative & Combined Effects					
Construction	Cumulative cultural heritage effect with Viking CCS Pipeline project Effect during construction on the known (and suspected) remains of a Settlement site with remains dating	Major adverse (significant)	Mitigation measures for archaeology as set out above and similar mitigation that will be required for the Viking CCS Pipeline project.	Major adverse (significant)	Long term, permanent, direct

Proposed VPI Development stage	Environmental effect (following development design and impact avoidance measures	Classification of effect prior to mitigation	Mitigation/ enhancement (if identified)	Classification of residual effect after mitigation	Nature of effect(s)
	from the Bronze through to the Roman period (assets **[A11] – [A13], [A16]** and [**A26]**)				
	Cumulative employment with Viking CCS Pipeline project	Moderate beneficial (significant)	N/A	Moderate beneficial (significant)	Short term, permanent, direct and indirect
	Cumulative cultural heritage effect with Land Adjacent to the Westgate Entrance, Port of Immingham project Effect during construction on the known (and suspected) remains of a Settlement site with remains dating from the Bronze through to the Roman period (assets **[A11] – [A13], [A16]** and **[A26**])	Major adverse (significant)	Mitigation measures for archaeology as set out above and similar mitigation that will be required for the Land Adjacent to the Westgate Entrance, Port of Immingham project.	Major adverse (significant)	Long term, permanent, direct
	Cumulative employment with Land Adjacent to the Westgate Entrance, Port of Immingham project	Moderate beneficial (significant)	N/A	Moderate beneficial (significant)	Short term, permanent, direct and indirect
	Cumulative employment with Gigastack project	Moderate beneficial (significant)	N/A	Moderate beneficial (significant)	Short term, permanent, direct and indirect
	Cumulative employment with Monopole Manufacturing Facility project	Moderate beneficial (significant)	N/A	Moderate beneficial (significant)	Short term, permanent, direct and indirect
	Cumulative employment with VPI Immingham OCGT project	Moderate beneficial (significant)	N/A	Moderate beneficial (significant)	Short term, permanent, direct and indirect
	Cumulative employment with Enabling works on and adjacent to the Able Marine Energy Park site	Moderate beneficial (significant)	N/A	Moderate beneficial (significant)	Short term, permanent, direct and indirect
	Cumulative employment with Humber Low Carbon Pipelines project	Moderate beneficial (significant)	N/A	Moderate beneficial (significant)	Short term, permanent, direct and indirect

Proposed VPI Development stage	Environmental effect (following development design and impact avoidance measures	Classification of effect prior to mitigation	Mitigation/ enhancement (if identified)	Classification of residual effect after mitigation	Nature of effect(s)
	Cumulative employment with Able Marine Energy Park	Moderate beneficial (significant)	N/A	Moderate beneficial (significant)	Short term, permanent, direct and indirect
	Cumulative employment with North Killingholme Power Project	Moderate beneficial (significant)	N/A	Moderate beneficial (significant)	Short term, permanent, direct and indirect
	Cumulative employment with Immingham Eastern Ro-Ro Terminal project	Moderate beneficial (significant)	N/A	Moderate beneficial (significant)	Short term, permanent, direct and indirect
	Cumulative employment with Immingham Green Energy Terminal project	Moderate beneficial (significant)	N/A	Moderate beneficial (significant)	Short term, permanent, direct and indirect
Operation	No significant effects are predicted to occur				
Decommissioning	No significant effects have been identified at this stage.				

Table 19.3: Summary of likely significant residual effects for both Proposed Developments

Proposed Combined Developments stage	Environmental effect (following development design and impact avoidance measures	Classification of effect prior to mitigation	Mitigation/ enhancement (if identified)	Classification of residual effect after mitigation	Nature of effect(s)
Chapter 6: Air Quality					
Construction	No significant effects are predicted to occur.				
Operation	No significant effects are predicted to occur.				
Decommissioning	No significant effects are predicted to occur.				
Chapter 7: Noise & Vibration					
Construction	Noise effects on four residential NSRs (NSR 1 – Staple Road, NSR 2 – Clarkes Road, NSR 3 – Church Lane, and NSR 4 – Hazel Dene during construction of the Proposed Developments as a whole (evening, weekend, night-time)	Up to major adverse (significant)	Further detailed assessment and CEMP once contractor appointed and appropriate mitigation is employed such that the BS 5228 ABC noise criteria are met and the section 7.5 mitigation guidance is followed	Up to minor adverse (not significant)	Short term, reversible, direct
Operation	Noise effects on four residential NSRs (NSR 1 – Staple Road, NSR 2 – Clarkes Road, NSR 3 – Church Lane, and NSR 4 – Hazel Dene during operation of the Proposed Developments (daytime and night-time)	Moderate adverse (significant)	Application of practical sound mitigation to reduce relevant noise at source to meet the operational noise criterion in Table 7.23 (Chapter 7, ES Volume I)	Minor adverse (not significant)	Long-term, reversible, direct
Decommissioning	Noise impacts during decommissioning of the Proposed Developments as a whole	Up to major adverse (significant).	Further detailed assessment and Decommissioning Environmental Management Plan (DEMP), particularly regarding working outside of daytime working hours.	Further assessment would need to confirm the potential level of effect at NSR, although they may be expected to be similar to those during construction.	Short-term, reversible, direct
Chapter 8: Traffic & Transport					
Construction	Pedestrian/ cyclist amenity effects (receptors on Rosper Road, A160	Moderate adverse (significant)	Measures set out in CWTP (Appendix 8C, ES Volume II) including measures to	Minor adverse (not significant)	Short term, reversible, indirect

Proposed Combined Developments stage	Environmental effect (following development design and impact avoidance measures	Classification of effect prior to mitigation	Mitigation/ enhancement (if identified)	Classification of residual effect after mitigation	Nature of effect(s)
	(near Killingholme PS and south of Phillips 66 Site), and Humber Road		reduce the level of traffic such as minibus and car sharing.		
Operation	No significant effects are predicted to occur.				
Decommissioning	Decommissioning is scoped out of assessment.				
Chapter 9: Water & Flood Risk					
Construction	No significant effects are predicted to occur.				
Operation	Operational discharge of sulphate to watercourses from Proposed Phillips 66 Development affecting water quality at Rosper Road Pools	Moderate adverse (significant)	Desulphurisation (e.g. deSOx) of wet gas scrubber effluent. Monitoring and further assessment..	Minor adverse (not significant)	Long term, reversible, indirect
Decommissioning	No significant effects are predicted to occur.				
Chapter 10: Geology, Hydrogeology & Land Contamination					
Construction	Direct contact with contamination and inhalation of dust and/or soil derived vapours – human health	Moderate adverse (significant)	Construction works will be carried out in accordance with a CEMP and environmental good practice on site.	Minor adverse (not significant)	Short term, reversible, direct
	Inhalation of dust and/ or soil derived vapours – off site residential users human health (Phillips 66 Site only)	Moderate adverse (significant)	Construction works will be carried out in accordance with a CEMP and environmental good practice on site.	Minor adverse (not significant)	Short term, reversible, direct
	Direct contact with contamination – development infrastructure	Moderate adverse (significant)	Buildings and services risks will be mitigated by using concrete and service pipes appropriate for any aggressive ground conditions.	Minor adverse (not significant)	Short term, reversible, direct
	Migration of ground gas – human health	Moderate adverse (significant)	Workers will adopt safe working practices under relevant health and safety legislation. Workers will comply with confined spaces regulations.	Minor adverse (not significant)	Short term, reversible, direct

Proposed Combined Developments stage	Environmental effect (following development design and impact avoidance measures	Classification of effect prior to mitigation	Mitigation/ enhancement (if identified)	Classification of residual effect after mitigation	Nature of effect(s)
	Migration of ground gas – development infrastructure	Moderate adverse (significant)	Ground gas protection measures will be implemented into design and build of permanent and temporary structures if occupied buildings are part of the final design.	Minor adverse (not significant)	Short term, reversible, direct
	Lateral and vertical migration of contamination through leachate, groundwater or surface run-off (including as a result of piling) – superficial aquifers	Up to moderate adverse (significant)	Any piling works would be planned in accordance with best practice guidance (Environment Agency, 2001). Piling operations would be subject to foundation works risk assessment and any potential to cause pollution to the aquifer would be covered by measures to be detailed in piling method statements. Construction works will be carried out in accordance with a CEMP.	Negligible to minor adverse (not significant)	Short term, reversible, indirect
	Lateral and vertical migration of contamination through leachate, groundwater or surface run-off (including as a result of piling) – bedrock aquifers	Moderate adverse (significant)	Any piling works would be planned in accordance with best practice guidance (Environment Agency, 2001). Piling operations would be subject to foundation works risk assessment and any potential to cause pollution to the aquifer would be covered by measures to be detailed in piling method statements. Construction works will be carried out in accordance with a CEMP.	Minor adverse (not significant)	Short term, reversible, indirect
	Lateral and vertical migration of contamination through leachate, groundwater or surface run-off (including as a result of piling) – North Beck Drain catchment	Moderate adverse (significant)	All development will be undertaken in accordance with relevant pollution prevention guidance.	Minor adverse (not significant)	Short term, reversible, indirect
	Loss of agricultural soils (VPI Site only)	Moderate adverse (significant)	The primary measures to mitigate the impacts on soil resources would be set out	Moderate adverse (significant) but less	Long term, permanent, direct

Proposed Combined Developments stage	Environmental effect (following development design and impact avoidance measures	Classification of effect prior to mitigation	Mitigation/ enhancement (if identified)	Classification of residual effect after mitigation	Nature of effect(s)
			in a Soil Management Strategy, to be prepared during the detailed design stage. The Soil Management Strategy would include a Soil Resource Plan and Soil Handling Strategy which would confirm the different soil types (based on the soil surveys to be undertaken); the most appropriate re-use for the different types of soils; and the proposed methods for handling, storing and replacing soils onsite.	than 20 ha Grade 3 agricultural land	
Operation	Direct contact with contamination – development infrastructure	Moderate adverse (significant)	Buildings and services risks will be mitigated by using concrete and service pipes appropriate for any aggressive ground conditions.	Minor adverse (not significant)	Long term, reversible, direct
	Migration of ground gas – development infrastructure	Moderate adverse (significant)	Ground gas protection measures will be implemented into design and build of structures if occupied buildings are part of the final design.	Minor adverse (not significant)	Long term, reversible, direct
	Migration of ground gas – human health	Moderate adverse (significant)	Workers will adopt safe working practices under relevant health and safety legislation.	Minor adverse (not significant)	Long term, reversible, direct
Decommissioning	Direct contact with contamination and inhalation of dust and/or soil derived vapours – human health	Moderate adverse (significant)	Works will be carried out in accordance with environmental management plans and environmental good practice on site.	Minor adverse (not significant)	Short term, reversible, direct
	Inhalation of dust and/or soil derived vapours – off site residential users human health	Moderate (significant)	Works will be carried out in accordance with environmental management plans and environmental good practice on site.	Minor adverse (not significant)	Short term, reversible, direct
	Migration of ground gas – human health	Moderate adverse (significant)	Works will be carried out in accordance with environmental management plans and environmental good practice on site. Workers will comply with confined spaces regulations.	Minor adverse (not significant)	Short term, reversible, direct

Proposed Combined Developments stage	Environmental effect (following development design and impact avoidance measures	Classification of effect prior to mitigation	Mitigation/ enhancement (if identified)	Classification of residual effect after mitigation	Nature of effect(s)
	Lateral and vertical migration of contamination through leachate, groundwater or surface run-off – bedrock aquifers	Moderate adverse (significant)	Works will be undertaken in accordance with relevant pollution prevention guidance.	Negligible (not significant)	Short term, reversible, indirect
Chapter 11: Landscape & Visual Amenity					
Construction	Impact on residential and recreational receptors at Viewpoint 3, Marsh Lane (Proposed VPI Development only)	Moderate adverse (significant)	None identified	Moderate adverse (significant)	Short term, reversible, indirect
Operation	Impact on residential and recreational receptors at Viewpoint 3, Marsh Lane (Proposed VPI Development only)	Moderate adverse (significant)	None identified	Moderate adverse (significant)	Long term, permanent, indirect
Decommissioning	Impact on residential and recreational receptors at Viewpoint 3, Marsh Lane (Proposed VPI Development only)	Moderate adverse (significant)	None identified	Moderate adverse (significant)	Short term, reversible, indirect
Chapter 12: Cultural Heritage					
Construction	Ancient Foreshore and associated paleochannels and deposits **[A122]** Permanent loss of approximately 50% of the recorded extent of this asset as a result of construction	Moderate adverse (significant)	If remains are deemed to have good potential to have survived then intrusive investigation and/or non-intrusive survey may be required, with findings published. If there is low potential for survival (within the Phillips 66 Site) then monitoring of construction works will be undertaken as necessary.	Minor adverse (not significant)	Long term, permanent, direct
	Bronze Age – Roman settlement activity **[A11 – A13]** and **[A16]** Permanent loss of significant percentage of the asset as a result of the construction of the Proposed VPI Development	Moderate adverse (significant)	Intrusive investigation and publication of findings.	Minor adverse (not significant)	Long term, permanent, direct
	Iron age – Roman settlement **[A20]** Permanent loss of significant percentage (up to 100%) of the asset	Moderate adverse (significant)	Intrusive investigation and publication of findings.	Minor adverse (not significant)	Long term, permanent, direct

Proposed Combined Developments stage	Environmental effect (following development design and impact avoidance measures	Classification of effect prior to mitigation	Mitigation/ enhancement (if identified)	Classification of residual effect after mitigation	Nature of effect(s)
	as a result of the construction of the Proposed VPI Development				
	Previously unrecorded heritage assets Permanent loss of significant percentage of the asset as a result of construction	Major adverse (significant)	If remains are deemed to have good potential to have survived then intrusive investigation and publication of findings may be required. If there is low potential for survival (within the Phillips 66 Site) then non-intrusive survey will be undertaken as necessary, with findings published.	Minor adverse (not significant)	Long term, permanent, direct
	Rectilinear crop mark [A25] Permanent loss of significant percentage (up to 100%) of the asset as a result of the construction of the Proposed Phillips 66 Development	Major adverse (significant)	If remains are deemed to have good potential to have survived then implementation of options 1 and 4 as appropriate. If there is low potential for survival then option 2, as necessary, then 4.	Minor adverse (not significant)	Long term, permanent, direct
Operation	No significant effects are predicted to occur.				
Decommissioning	Decommissioning is scoped out of assessment				
Chapter 13: Ecology and Nature Conservation					
Construction	Loss of Open Mosaic Habitat within VPI Site	Moderate adverse (significant)	Creation of new habitat under BNG strategy.	Moderate beneficial (significant)	Short term, reversible, direct
	Loss of grassland/ scrub habitat (collectively as habitat for small heath butterfly, nesting birds and foraging bats) within VPI Site	Moderate adverse (significant)	Creation of new habitat under BNG strategy.	Moderate beneficial (significant)	Short term, reversible, direct
	Loss of small heath butterfly colony within VPI Site	Moderate adverse (significant)	Creation of new habitat under BNG strategy. Possible translocation of pupa/ eggs.	Moderate beneficial (significant)	Short term, reversible, direct
Operation	No significant effects are predicted to occur.				
Operation	Change in water quality due to elevated level of sulphate in effluent	Moderate adverse (significant)	Desulphurisation of flue gas to reduce effluent sulphate levels below 1,000mg/L	Negligible (not significant)	Long term, irreversible, indirect

Proposed Combined Developments stage	Environmental effect (following development design and impact avoidance measures	Classification of effect prior to mitigation	Mitigation/ enhancement (if identified)	Classification of residual effect after mitigation	Nature of effect(s)
	discharge to South Kililngholme Drain from Phillips 66 Site				
Decommissioning	No significant effects are predicted to occur.				
Chapter 14: Climate Change					
Construction	No significant effects are predicted to occur.				
Operation	GHG emissions	Beneficial (significant)	N/A	Beneficial (significant)	Long term, permanent, direct
Decommissioning	Decommissioning is scoped out of assessment				
Chapter 15: Materials and Waste					
Construction	No significant effects are predicted to occur.				
Operation	No significant effects are predicted to occur.				
Decommissioning	Decommissioning is scoped out of assessment.				
Chapter 16: Major Accidents & Disasters					
Construction	No significant effects are predicted to occur.				
Operation	No significant effects are predicted to occur.				
Decommissioning	No significant effects are predicted to occur.				
Chapter 17: Socio-Economics					
Construction	Employment	Moderate beneficial (significant)	N/A	Moderate beneficial (significant)	Short term, permanent, direct and indirect
Operation	No significant effects are predicted to occur.				
Decommissioning	Employment	Moderate beneficial (significant)	N/A	Moderate beneficial (significant)	Short term, permanent, direct and indirect
Chapter 18: Cumulative & Combined Effects					

Proposed Combined Developments stage	Environmental effect (following development design and impact avoidance measures	Classification of effect prior to mitigation	Mitigation/ enhancement (if identified)	Classification of residual effect after mitigation	Nature of effect(s)
Construction	Cumulative cultural heritage effect with Viking CCS Pipeline project Effect during construction on the known (and suspected) remains of a Settlement site with remains dating from the Bronze through to the Roman period (assets [**A11] – [A13], [A16]** and **[A26]**)	Major adverse (significant)	Mitigation measures for archaeology as set out above and similar mitigation that will be required for the Viking CCS Pipeline project.	Major adverse (significant)	Long term, permanent, direct
	Cumulative employment with Viking CCS Pipeline project	Moderate beneficial (significant)	N/A	Moderate beneficial (significant)	Short term, permanent, direct and indirect
	Cumulative cultural heritage effect with Land Adjacent to the Westgate Entrance, Port of Immingham project Effect during construction on the known (and suspected) remains of a Settlement site with remains dating from the Bronze through to the Roman period (assets **[A11] – [A13], [A16]** and **[A26]**)	Major adverse (significant)	Mitigation measures for archaeology as set out above and similar mitigation that will be required for the Land Adjacent to the Westgate Entrance, Port of Immingham project.	Major adverse (significant)	Long term, permanent, direct
	Cumulative employment with Land Adjacent to the Westgate Entrance, Port of Immingham project	Moderate beneficial (significant)	N/A	Moderate beneficial (significant)	Short term, permanent, direct and indirect
	Cumulative employment with Gigastack project	Moderate beneficial (significant)	N/A	Moderate beneficial (significant)	Short term, permanent, direct and indirect
	Cumulative employment with Monopole Manufacturing Facility project	Moderate beneficial (significant)	N/A	Moderate beneficial (significant)	Short term, permanent, direct and indirect
	Cumulative employment with VPI Immingham OCGT project	Moderate beneficial (significant)	N/A	Moderate beneficial (significant)	Short term, permanent, direct and indirect

Proposed Combined Developments stage	Environmental effect (following development design and impact avoidance measures	Classification of effect prior to mitigation	Mitigation/ enhancement (if identified)	Classification of residual effect after mitigation	Nature of effect(s)
	Cumulative employment with Enabling works on and adjacent to the Able Marine Energy Park site	Moderate beneficial (significant)	N/A	Moderate beneficial (significant)	Short term, permanent, direct and indirect
	Cumulative employment Humber Low Carbon Pipelines project	Moderate beneficial (significant)	N/A	Moderate beneficial (significant)	Short term, permanent, direct and indirect
	Cumulative employment with Able Marine Energy Park project	Moderate beneficial (significant)	N/A	Moderate beneficial (significant)	Short term, permanent, direct and indirect
	Cumulative employment with North Killingholme Power Project	Moderate beneficial (significant)	N/A	Moderate beneficial (significant)	Short term, permanent, direct and indirect
	Cumulative employment Immingham Eastern Ro-Ro Terminal project	Moderate beneficial (significant)	N/A	Moderate beneficial (significant)	Short term, permanent, direct and indirect
	Cumulative employment with Immingham Green Energy Terminal project	Moderate beneficial (significant)	N/A	Moderate beneficial (significant)	Short term, permanent, direct and indirect
Operation	No significant effects are predicted to occur.				
Decommissioning	No significant effects are predicted to occur.				