

The Lighthouse Green Fuels Order

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Abbreviations

Abbreviation	In full
ALARP	As Low As Reasonably Practicable
BAT	Best Available Techniques
BGS	British Geological Survey
CCA	Civil Contingencies Act 2004
CCS	Carbon Capture and Storage
CDM Regulations	The Construction (Design and Management) Regulations 2015
CEMP	Construction Environmental Management Plan
CHP	Combined Heat and Power
COMAH Regulations	The Control of Major Accident Hazards Regulations 2015
CTMP	Construction Traffic Management Plan
CWTP	Construction Worker Travel Plan
DEMP	Decommissioning Environmental Management Plan
DSEAR	The Dangerous Substances and Explosive Atmospheres Regulations 2002
EC	European Commission
EHS	Environmental, Health and Safety
EIA	Environmental Impact Assessment
ENVID	Environmental impact identification
EPC Contractor	Engineering, Procurement and Construction Contractor
EU	European Union
fCEMP	Framework Construction Environmental Management Plan
FEED	Front End Engineering Design
GI	Ground Investigation
H&S	Health and Safety
HAZID	Hazard Identification
HAZOP	Hazard and Operability
HGV	Heavy Goods Vehicle
HSE	Health and Safety Executive
HSW Act	Health and Safety at Work etc. Act 1974
IEMA	Institute of Environmental Management and Assessment
ISEP	Institute of Sustainability and Environmental Professionals
ISO	International Standards Organisation
km	kilometre
kV	kilovolts

MA&D	Major Accidents and Disasters
MAH	Major Accident Hazard
MAPP	Major Accident Prevention Policy
NEP	Northern Endurance Partnership
NPPF	National Planning Policy Framework
NPS	National Policy Statement
NRR	National Risk Register
NSIP	Nationally Significant Infrastructure Project
PEIR	Preliminary Environmental Information Report
SAF	Sustainable Aviation Fuel
UXO	Unexploded Ordnance

19 Major Accidents and Disasters

19.1 Introduction

- 19.1.1 This chapter of the Environmental Statement (ES) presents the assessment of likely significant effects on Major Accidents and Disasters (MA&D) arising from construction, operation and decommissioning of the Proposed Development. This chapter sets out the relevant legislation, policy, standards and guidance applied to the assessment process; consultation undertaken to inform the assessment; assessment methodology; the relevant baseline conditions upon which the assessment is based; embedded mitigation considered in place before the assessment is undertaken; the likely significant effects that may arise as a result of the Proposed Development considering embedded mitigation; further mitigation proposals to reduce or remove identified likely significant effects wherever possible; likely remaining residual effects following further mitigation; and any monitoring proposals.
- 19.1.2 This Chapter presents an assessment of the vulnerability of the Proposed Development to MA&D and the potential for such events to result in likely significant effects on the following environmental receptors:
- members of the public and local communities;
 - infrastructure and the built environment;
 - the natural environment, including ecosystems, land and soil quality, air quality, surface and groundwater resources and landscape; and
 - the historic environment, including archaeology and built heritage.
- 19.1.3 The assessment considers:
- the risk of major accidents or disasters affecting the Proposed Development; and
 - the potential for the Proposed Development to give rise to major accidents that may affect environmental receptors.
- 19.1.4 The assessment has been undertaken for:
- the construction phase; and
 - the operational phase.
- 19.1.5 The Proposed Development comprises a commercial-scale Sustainable Aviation Fuel (SAF) production facility located at Seal Sands, Teesside. The facility will convert sustainably sourced biomass into SAF and renewable naphtha and includes:

- process plant (including gasification, syngas conditioning and Fischer–Tropsch synthesis);
- product upgrading and storage facilities;
- a biomass and waste wood-fired Combined Heat and Power (CHP) plant;
- pipeline infrastructure within the Main Site and Wider Site; and
- a new quay to support marine delivery of construction materials and feedstock/waste wood.

19.1.6 These characteristics mean the Proposed Development:

- involves handling and processing of hazardous substances;
- is located within an established major hazard industrial cluster; and
- interacts with existing infrastructure and environmental receptors, which are key considerations for MA&D.

19.1.7 In line with the EIA Regulations [Ref 2], the assessment focuses on:

- low probability/high consequence events; and
- events capable of resulting in the loss of life, permanent injury and temporary or permanent destruction of an environmental receptor which cannot be restored through minor clean-up and restoration.

19.1.8 Low consequence events (such as leaks and spills at construction sites), and high-likelihood/high-consequence events (such as uncontrolled release of hazardous substances) which would be deemed unacceptable risks are not considered in this assessment.

19.2 Legislation and planning policy context

19.2.1 This Section outlines the legislation and planning policy context for the Proposed Development with reference to MA&D. As requested as part of the Scoping Opinion, the relevant legislation and regulatory controls are confirmed and referenced below.

Table 19.1 Summary of key legislation, policy and guidance relevant to major accidents and disasters

Document	Relevance to assessment
Legislative Background	
The Infrastructure Planning (Environmental Impact Assessment) Regulations	The Infrastructure Planning (Environmental Impact Assessment (EIA)) Regulations 2017 cover the process of EIA in the 2008 Act regime. They implement amendments to Directive 2011/92/EU [Ref 3] made by Directive 2014/52/EU [Ref 4] to

Document	Relevance to assessment
2017 (the EIA Regulations) [Ref 2]	introduce the requirements for MA&D to be considered in the EIA process. Schedule 4 Paragraph 5(d) of the EIA Regulations requires: “A description of the likely significant effects of the Proposed Development on the environment resulting from the risks to human health, cultural heritage or the environment (for example due to accidents or disasters).” Schedule 4, Paragraph 8 of the EIA Regulations requires: “A description of the expected significant adverse effects of the Proposed Development on the environment deriving from the vulnerability of the Proposed Development to risks of major accidents and / or disasters that are relevant to the project concerned. Where appropriate, this description should include measures envisaged to prevent or mitigate the significant adverse effects of major accidents and / or disasters on the environment and details of the preparedness for and proposed response to such emergencies.” The MA&D requirements of this legislation are included in this chapter.
Health and Safety at Work etc. Act 1974 (the HSW Act) [Ref 3]	The HSW Act provides the framework for the regulation of workplace health and safety in the UK. It provides a legal framework for the provision of safe plant and equipment and prevention of harm to people from occupational hazards present in a workplace, including emergencies, which may affect those offsite or visiting the Proposed Development. The overriding principle is that foreseeable risks to persons in workplaces shall be reduced so far as is reasonably practicable (i.e. in accordance with the ALARP principle) and that adequate evidence shall be produced to demonstrate that this has been done.
The Construction (Design and Management) Regulations 2015 (the CDM Regulations) [Ref 6]	The CDM Regulations place legal duties on almost all parties involved in construction work, with specific duties on clients, designers and contractors, so that health and safety is considered throughout the life of a construction project from inception to demolition and removal. The client, designer(s) and contractor(s) must avoid foreseeable risks, so far as is reasonably practicable, by eliminating hazards associated with the design, construction, operation and maintenance of the Proposed Development. The CDM Regulations ensure that mechanisms are in place to continually identify, evaluate and manage safety risks throughout the design, construction and operation phases of the Proposed Development. Many of the risks identified and

Document	Relevance to assessment
	managed at the detailed design phase also serve to eliminate or reduce the risk of a major accident, and therefore environmental consequence, occurring during the construction and operation phases.
The Control of Major Accident Hazards (COMAH) Regulations 2015 [Ref 7]	The purpose of the COMAH Regulations is to prevent major accidents involving dangerous substances and limit the consequences to people and the environment of any accidents which do occur. Many of the risks identified and managed will serve to eliminate or reduce the risk of a major accident, and therefore environmental consequence, occurring during the construction and operation phases of the Proposed Development. The operation of the Proposed Development will be regulated through a COMAH licence issued by the HSE. Further information is provided in the Other Consents and Licences Statement. (Application Document Ref. 5.4).
The Planning (Hazardous Substances) Regulations 2015 [Ref 8]	The Planning (Hazardous Substances) Regulations transpose the land-use planning requirements of the European Seveso III Directive (2012/18/EU). They relate to the way hazardous substances consents operate, and the way in which the planning system reduces the likelihood and impact of major accidents. Hazardous substance consents focus on ensuring the safety of the public around the consented site from potential major accident hazards. Many of the risks identified and managed at the detailed design phase also serve to eliminate or reduce the risk of a major accident, and therefore environmental consequence, occurring during the construction, operation and decommissioning phases.
The Supply of Machinery (Safety) Regulations 2008 [Ref 9]	The Supply of Machinery (Safety) Regulations aim to remove technical barriers to trade, in particular products, by harmonising national health and safety provisions applicable to such products when they are first placed on the market or put into service in the European Economic Area. Many of the risks identified and managed in the design of machinery used in and associated with the Proposed Development will serve to eliminate or reduce the risk of a major accident, and therefore environmental consequence, occurring during the construction and operation phases of the Proposed Development.
The Dangerous Substances and Explosive Atmospheres Regulations 2002 (DSEAR) [Ref 10]	DSEAR implements the Chemical Agents Directive (98/24/EC) and the Explosive Atmospheres Directive (99/92/EC). DSEAR sets minimum requirements for the protection of staff from fire

Document	Relevance to assessment
	and explosion risks arising from dangerous substances and potentially explosive atmospheres. Under the regulations, the Proposed Development is required to have mechanisms in place to identify, evaluate and manage the risk of a major accident due to loss of containment to ALARP. Many of the risks identified and managed will serve to eliminate or reduce the risk of a major accident, and therefore environmental consequence, occurring during the construction and operation phases of the Proposed Development.
The Equipment and Protective Systems for Use in Potentially Explosive Atmospheres Regulations 2016 [Ref 11]	The Equipment and Protective Systems for Use in Potentially Explosive Atmospheres Regulations implement measures for safety and consumer protection with respect to electrical equipment and protective systems on the market, including provisions concerning the composition, labelling, marketing, classification or description of electrical equipment intended to be used in potentially explosive atmospheres. The use of the correct level of intrinsically safe equipment and protective systems will minimise the likelihood of a large-scale release of SAF or naphtha from the Proposed Development and therefore reduce the risk of a Major Accident.
The Pipelines Safety Regulations 1996 [Ref 12]	The purpose of The Pipelines Safety Regulations is to ensure that pipelines are designed, constructed and operated properly to ensure their integrity and reduce risks.
Marine and Coastal Access Act 2009 [Ref 13]	The Marine and Coastal Access Act 2009 provides the statutory framework for marine licensing and the protection of the marine environment, including controls over works within the marine area.
National Planning Policy Context	
The Overarching National Policy Statement (NPS) for Energy (EN-1) [Ref 15] Ref 13], NPS for Renewable Energy Infrastructure (EN-3) [Ref 15] and NPS for Gas Supply Infrastructure and Gas and Oil Pipelines 2024 (EN-4) [Ref 16]	Together these NPS (alongside other NPS as set out in the Planning Statement (Application Document Ref. 5.2.1)) provide the primary basis for decision making by the SoS on applications it receives for development consent which includes gas supply infrastructure and gas/oil pipelines. The NPS EN-1 does not contain any specific requirements in relation to a standard Environmental Impact Assessment (EIA) MA&D assessment. Section 4.13 of EN-1 addresses policy in respect of safety, which broadly covers health and safety and Major Accident matters. The policies within this section note the role of the Health and Safety Executive (HSE) as regulator for enforcement of health and safety legislation including COMAH and the role of local authorities in relation to hazardous substances consent. Section 4.14 of EN-1 separately addresses management of hazardous substances and the mitigation of major accidents which involve them. Section 4.13.8 states the Secretary of State should be satisfied that a safety assessment has been prepared and that HSE and the Environment Agency

Document	Relevance to assessment
	(together the Competent Authority) has raised no safety objections. Section 4.16 of EN-1 provides advice in relation to security considerations, outlining the role of the Department for Energy Security and Net Zero (DESNZ) and other agencies in relation to terrorism and other national security threats and the role of government policy to ensure the design and protection of the most critical infrastructure assets. NPS EN-3 has been reviewed but does not contain applicable information for the Proposed Development in relation to MA&D.
National Planning Policy Framework (NPPF) 2024 [Ref 17]	As set out in Chapter 7 of the Environmental Statement, the NPPF is not the main policy against which the SoS must consider the Application, however, it can be a relevant consideration. The NPPF highlights that the purpose of the planning system is to contribute to the achievement of sustainable development by managing the use and development of land in the long-term public interest, through three overarching objectives: economic, social and environmental. The NPPF includes policies relating to public safety, the management of risks arising from natural and technological hazards, and ensuring that land is suitable for its proposed use having regard to land instability and contamination risks. These principles are relevant to the assessment of Major Accidents and Disasters and support the identification, assessment and management of risks to people, property and the environment.
UK Marine Policy Statement [Ref 18]	The UK Marine Policy Statement establishes high-level objectives for protecting marine ecosystems, maintaining water quality, and preventing pollution. The Statement promotes a precautionary, risk-based approach to development, including the need to avoid or minimise the risk of pollution incidents and other events that could adversely affect marine receptors.
Local Planning Policy Context	
Stockton-on-Tees Borough Council – Local Plan (2019) [Ref 19]	Policy SD 5 – Natural, Built and Historic Environment is applicable to the Proposed Development regarding considering risk acceptability: “Preventing both new and existing development from contributing to or being put at unacceptable risk from, or being adversely affected by unacceptable levels of ground, air, water, light or noise pollution or land instability. Wherever possible proposals should seek to improve ground, air and water quality.”
Redcar and Cleveland Borough Council - Local Plan (2018) [Ref 20]	Policy SD 4 - General Development Principles states that: “In assessing the suitability of a site or location, development will be permitted where it... [...] avoids locations that would put the environment, or human health or safety, at unacceptable risk.”

Document	Relevance to assessment
Other Guidance* *At present, there is no recognised standard methodology for the assessment of MA&D within EIA however, the following pieces of guidance have been used within the assessment, as set out in Section 19.3.	
IEMA: Major Accidents and Disasters in EIA: A Primer 2020 [Ref 1] (Note the Institute of Environmental Management and Assessment (IEMA) is now known as the Institute of Sustainability and Environmental Professionals (ISEP))	In September 2020, IEMA, in partnership with Arup, published, 'Major Accidents and Disasters in EIA: A Primer' ('the IEMA Primer'), which is a risk assessment using a source-pathway-receptor based approach. The purpose of the IEMA Primer is to increase awareness of the MA&D topic and its application within all stages of EIA. It outlines an assessment methodology based on known current practice within the UK and provides definitions of key terminology. Despite it being six years since the IEMA Primer's publication, its contents remain best known current practice. The IEMA Primer is structured around a typical assessment approach and provides a proportionate method for considering MA&D through the stages of EIA. The assessment of MA&D in relation to the Proposed Development has been based on a combination of the IEMA Primer and professional judgement.
'Green Leaves III' Guidelines for Environmental Risk Assessment and Management 2011 (Green Leaves III) [Ref 21]	Green Leaves III provides generic guidance for the assessment and management of environmental risks. A cyclical framework for risk management is presented that identifies four main components of risk assessment: • formulating the problem; • carrying out an assessment of the risk; • identifying and appraising the management options available; and • addressing the risk with a risk management strategy. A source-pathway-receptor model is suggested as a tool to assist in risk screening, and an example is provided of applying the following filters to prioritise significant hazards for further investigation: the plausibility of linkages between the source of a hazard and a receptor; the relative potency of a hazard, availability of a pathway, or vulnerability of a receptor; the likelihood of an event, based on historic occurrence or of changed circumstances; and a view on the performance of current risk management measures that, if they were to fail, may increase the potential for future harm.

Document	Relevance to assessment
Guideline – Environmental Risk Tolerability for COMAH Establishments 2013 [Ref 22]	The Environmental Risk Tolerability for COMAH Establishments Guidance provides generic guidance on how to undertake environmental risk assessments required by the COMAH Regulations. It provides a definition of the types of harm that should be considered in an environmental risk assessment, and how the harm should be characterised for the assessment. In this context, the level of environmental harm that would be considered serious has been defined for different receptor types in terms of the combination of the: - extent (the area / distance); - severity (the degree of harm within the area of impact); and - duration (the recovery period). For environmental harm to be considered serious then all parameters must exceed the receptor thresholds as defined in this guideline. The thresholds reflect expert opinion on levels of harm that would be considered serious, with consideration to various receptor specific areas of legislation, such as the Water Framework Directive [Ref 23], Conservation of Natural Habitats and of Wild Fauna and Flora Directive [Ref 24] and the Environmental Liability with regard to the Prevention and Remedying of Environmental Damage Directive [Ref 25]. The guideline also provides: - a definition of the risk criteria to be used in assessing the tolerability of the environmental risk from an establishment and, where appropriate, individual scenarios; and - guidance on how the risks may be evaluated.
ISO 31000:2018 Risk Management – Guidelines 2018 [Ref 26]	The ISO 31000 Risk Management Guidelines identify principles that need to be satisfied to make risk management effective. If the standards are adopted and applied, the management of any risk should help minimise losses, improve resilience, improve controls and improve the identification of opportunities and threats. The guidance includes that when defining risk criteria, the following factors should be considered: - the nature and types of causes and consequences that can occur and how they will be measured; - how likelihood will be defined; - the timeframe(s) of the likelihood or consequence(s); - how the level of risk is to be determined; - the views of stakeholders; - the level at which risk becomes acceptable or tolerable; and - whether combinations of multiple risks should be considered and, if so how, and which combinations should be considered.

Document	Relevance to assessment
HSE Guidance	There is no HSE guidance directly applicable to the Proposed Development. However, there is HSE guidance on comparable developments that are relevant to the assessment. This includes a considerable amount of information and guidance available to developers on the identification and control of major hazards associated with the design and operation of energy infrastructure, the storage and use of chemicals, and major accident hazard pipelines conveying high pressure gases. Comparable facilities have been in operation for many years and employ conventional, Comparable large scale energy vector production facilities have been in operation for many years and employ similar established technology to produce liquid fuels. The HSE publishes a number of applicable guidance notes on their website relating to these assets, including: Emergency planning for major accidents: Control of Major Accident Hazards Regulations 1999 (COMAH) [Ref 27]; Further guidance on emergency plans for major accident hazard pipelines (HSE, 1997) [Ref 29]; and The Control of Substances Hazardous to Health Regulations [Ref 30]. HSE guidance that is of relevance to the assessment of MA&D includes: Chemicals and Downstream Oil Industries Forum Guidelines, Environmental Risk Tolerability for COMAH Establishments [Ref 22]; Chapter 4 Local responder risk assessment duty, Cabinet Office's Emergency Preparedness, Guidance on part 1 of the Civil Contingencies Act 2004 ('CCA risk assessment framework') [Ref 31]; and Reducing Risks, Protecting People: HSE's decision making process [Ref 32].
Marine Management Organisation (MMO) guidance on Marine Licensing and EIA [Ref 28]	Guidance sets out the requirements for assessing and managing the environmental effects of activities within the UK marine area under the Marine and Coastal Access Act 2009. The guidance requires that projects likely to give rise to significant environmental effects (including accidental events) are subject to EIA and that appropriate mitigation are incorporated into project design. In particular, the guidance emphasises the implementation of pollution prevention controls, adherence to best practice during marine works, and the development of appropriate incident response measures where relevant.

19.3 Assessment methodology and significance criteria

Definitions

- 19.3.1 Key terms relevant to this chapter are defined in Table 19.2. These definitions have been developed with reference to those used in legislation

and guidance relevant to MA&D, as outlined in Section 19.2, as well as professional judgement in the context of the Proposed Development.

Table 19.2 Key definitions relevant to this assessment

Term	Definition
As low as reasonably practicable (ALARP)	A safety principle requiring risks to be reduced/controlled to the lowest level achievable without disproportionate cost, effort, or time.
Disaster	May be a natural hazard (e.g. earthquake) or a man-made/external hazard (e.g. act of terrorism) with the potential to cause an event or situation that meets the definition of a major accident.
Hazard	Anything with the potential to cause harm, including ill-health or injury, damage to property or the environment; or a combination of these.
Magnitude of impact	The magnitude of an impact is typically defined by the following factors: extent – the area over which an effect occurs; duration – the time for which the effect occurs; frequency – how often the effect occurs; severity – the degree of change relative to existing environmental conditions.
Major Accident	Events that threaten immediate or delayed serious environmental effects to human health, welfare and/or the environment and require the use of resources beyond those of the client or its appointed representatives to manage. Whilst malicious intent is not accidental, the outcome may be the same and therefore many mitigation measures will apply to both deliberate and accidental events.
Man made hazards	For example (but not limited to): structural collapse; building collapse; human error/management failure; design error; sabotage/arson; aircraft/rail/road/sea or river vessel disaster (crash/derailment/ collision/overloading/hull failure); terrorism cyber-attack; industrial/ technological accident; explosion (chemical, nuclear or other); pollution (oil, chemical or other); fire; conflict; displaced population; and crowd violence and disorder.
Natural hazards	For example (but not limited to): earthquake; flooding; dam collapse; volcanic eruption; avalanche; extreme temperature (heat wave, cold snap); fire; ground subsidence; tropical storm; storm surge; landslide; animal/insect infestation; sandstorm; high winds/storm; wildfire; tsunami/tidal wave; drought; biological hazard – epidemic, pandemic.
Pathway	The route by which the source can reach the receptor.
Reasonable worst-case scenario	Challenging but plausible outcomes, purposefully excluding highly improbable or extreme outlier events.
Receptor	The specific component of the environment that could be adversely affected if the source reaches it in a 'source-pathway-receptor' model. Environmental receptor is specifically defined as: features of the environment that are subject to assessment, namely population and human health, biodiversity, land, soil, water, air and climate, material assets, cultural heritage and landscape.

Term	Definition
Risk	The likelihood of an impact occurring, combined with effect or consequence(s) of the impact on a receptor if it does occur.
Risk Event	An identified, unplanned event, which is considered relevant to the Proposed Development and has the potential to be a MA&D, subject to assessment of its potential to result in a significant adverse effect on a receptor.
Significant environmental effect (in the context of this assessment)	Loss of life, permanent injury, and temporary or permanent destruction of an environmental receptor that cannot be restored through minor clean-up and restoration. As a general rule, Tolerable and Tolerable (if ALARP) risks are considered as being not significant.
Source	The original cause of the hazard, which has the potential to cause harm.
Source-pathway-receptor model	For a risk to arise there must be hazard that consists of a 'source' (e.g. high rainfall); a 'receptor' (e.g. people, property, environment); and a pathway between the source and the receptor (e.g. flood routes).
Vulnerability	Describes the potential for harm as a result of an event, for example due to sensitivity or value of receptors. In the context of the EIA Directive [Ref 4], the term refers to the 'exposure and resilience' of the development to the risk of a major accident and/or disaster. Vulnerability is influenced by sensitivity, adaptive capacity and magnitude of impact.

Consultation

Scoping

- 19.3.2 The **EIA Scoping Opinion (Appendix 2B in ES Volume III, Application Document Ref. 6.3)**, was received by the Applicant from the Planning Inspectorate on behalf of the Secretary of State on 11 November 2025. The responses in relation to MA&D and how the requirements should be addressed by the Applicant are set out Table 19.3.

Table 19.3 Scoping Opinion comments and responses

Section ID	Applicant's Proposed Matters to Scope Out	Scoping Opinion Comments
3.15.1 Paragraphs 19.8.1 to 19.8.3	Low consequence events (regardless of likelihood) High likelihood and high consequence events	Low consequence events are proposed to be scoped out as these are unlikely to result in significant adverse effects because they do not fall into the definition of a major accidents and/or disasters risk. High likelihood and high consequence events are also proposed to be scoped out as it is assumed that existing legislation and regulatory controls would not permit the Proposed Development to be progressed under these circumstances.

Section ID	Applicant's Proposed Matters to Scope Out	Scoping Opinion Comments
		In line with the ISEP (formerly IEMA) guidance (IEMA: Major Accidents and Disasters in EIA: A Primer 2020 [Ref 1], the Inspectorate agrees including such events would not be proportionate to the assessment. The relevant legislation / regulatory controls should however be confirmed and referenced.
3.15.2 Paragraph 19.8.5	Occupational health and safety	The applicant proposes to scope out occupational health and safety. The Inspectorate agrees EIA of major accidents is not intended to replace or duplicate health and safety regulations that are in place to manage risks, and this matter can therefore be scoped out of the ES.

Statutory Consultation feedback

19.3.3 The relevant comments received as part of the Statutory Consultation are outlined in Table 19.4 below.

Table 19.4 Statutory Consultation feedback and responses

Consultee	Summary of consultee comment	Summary of Applicant response
HSE	Provided a list of Major Accident Hazard (MAH) sites and pipelines where the Proposed Development intercepts their consultation zones. Advised the Proposed Development should contact the operators of the MAH site to inform an assessment of whether or not the proposed development is vulnerable to a possible major accident. Also advised the Proposed Development should make the necessary approaches to MAH pipeline operators. Provided information of Hazardous Substances Consent and consideration of risk assessments. No comments on Explosive sites as the Proposed	These lists are noted and the site operators will be consulted with as part of the design process. Potential interactions with MAH sites and pipelines are considered within the assessment in Section 19.6. Information is noted. Information is noted.

Consultee	Summary of consultee comment	Summary of Applicant response
	Development falls 'slightly into the out safeguarding zone'.	
National Grid Electricity Transmission; Northern Gas; Sembcorp	Identified proximity to their existing/future assets and identified the requirement for mitigation measures and communication.	This is noted and will be considered as part of the design process. The interaction with existing infrastructure is considered as part of the assessment in Section 19.6. Potential interactions with future developments is considered in Chapter 22: Cumulative and Combined Effects (ES Volume I, Application Document Ref. 6.1).

Targeted Consultation feedback

19.3.4 Targeted consultation has also been undertaken in relation to some relatively minor red line boundary changes. The responses to this targeted consultation are summarised in Table 19.5 below.

Table 19.5 Targeted consultation feedback

Consultee	Summary of consultee comment	Summary of Applicant response
HSE	Provided an updated list of MAH sites and pipelines where the Proposed Development intercepts their consultation zones.	These updated lists are noted and the site operators will be consulted with as part of the design process. Potential interactions with MAH sites and pipelines are considered within the assessment in Section 19.6.
Navigator Terminals	It is important that any works within and/or adjacent to its site are planned and conducted in close liaison with Navigator Terminals, having regard to the existing complex infrastructure in the area and the status of the operation as an upper tier COMAH facility.	This is noted and as part of design and pre-construction activities, there will be communication with neighbouring sites. Potential interactions with neighbouring sites, in regard to MA&D, are assessed in Section 19.6.
National Grid Electricity Transmission; Sembcorp	As per their initial response, they identified proximity to their existing/future assets and identified the requirement for mitigation measures and communication.	This is noted and will be considered as part of the design process. The interaction with existing infrastructure is considered as part of the assessment in Section 19.6. Potential interactions with future developments is considered in Chapter 22: Cumulative and Combined Effects (ES Volume I, Application Document Ref. 6.1).

Overview

- 19.3.5 This section sets out the assessment methodology and significance criteria used for the MA&D assessment. This approach differs to the overall EIA assessment methodology set out in **Chapter 2: Assessment Methodology (ES Volume I, Application Document Ref. 6.1)**.
- 19.3.6 The assessment has been undertaken in line with the IEMA/ISEP 'Major Accidents and Disasters in EIA: A Primer' (the "Primer"), which provides a proportionate assessment approach for considering MA&D through a staged approach, and is based on a source–pathway–receptor model:
- Collate baseline information and identify then group hazards relevant for assessment (Section 0 to 0);
 - Identify the reasonable worst case impact as a result of the identified hazards (0);
 - Screen the hazards so only the ones with potential significant impacts remain (0 to 0);
 - Identification of additional mitigation measures (0); and
 - Identification of residual risks and concluding significance (0 to 0).
- 19.3.7 The objective is to identify whether there are credible MA&D risk events relevant to the Proposed Development that could result in likely significant effects on receptors (including population and human health and environmental receptors), and where not already managed ALARP through other processes such as regulatory controls, identify measures to prevent or mitigate significant adverse effects and describe emergency preparedness and response arrangements.

Scope of assessment

- 19.3.8 The assessment focuses on low likelihood (an event that could occur but is unlikely to) but potentially high consequence events.
- 19.3.9 Events that have a high likelihood of occurring and would be of high consequence are a high risk and would be unacceptable for any development. These are already managed or designed-out of the Proposed Development and not considered in this assessment.
- 19.3.10 At the other end of the scale, low-impact events whatever the likelihood, such as minor spills, are low risk and are unlikely to be considered a major accidents and/or disasters risk. These events would not threaten immediate or delayed serious environmental effects to human health, welfare and/or the environment that require the use of resources beyond those of the client

or its appointed representatives to manage. These are also therefore not considered in this assessment.

19.3.11 Consideration of occupational Health and Safety (H&S) is not incorporated into the assessment of MA&D.

19.3.12 The scope was confirmed by the **EIA Scoping Opinion (Appendix 2B in ES Volume III, Application Document Ref. 6.3)**, which was received by the Applicant from the Planning Inspectorate on behalf of the Secretary of State on 11 November 2025. The responses in relation to MA&D and how the requirements should be addressed by the Applicant are set out in Section 0.

19.3.13 The **EIA Scoping Report (Appendix 2A in ES Volume III, Application Document Ref. 6.3)** considered the following long list of possible MA&D sources of hazards to consider through assessment, deeming there was a potential for a source-pathway-receptor linkage:

- Unexploded Ordnance (UXO) – There is potential for UXO present within the Site to be disturbed during intrusive construction activities, which could trigger detonation and result in injury or fatality to construction workers.
- Major accident hazard chemical sites - There is potential for a loss of containment event at nearby COMAH-regulated facilities within the Teesside industrial cluster to result in fire, explosion or the release of hazardous substances, with thermal radiation or toxic dispersion pathways potentially affecting the Proposed Development.
- Major accident hazard pipelines - There is potential for rupture or leakage of major accident hazard pipelines within or adjacent to the Site during construction (e.g. from damage during excavation) or operation (e.g. from material failure or corrosion), leading to the release of hazardous substances that could disperse or ignite, resulting in fire, explosion or exposure risks impacting upon the Proposed Development and/or nearby environmental receptors.
- Fuel storage - The accidental release of flammable or toxic substances from on-site storage or process infrastructure could result in fire or explosion if ignited, or harmful vapour dispersion if not immediately ignited, with the potential to cause injury to nearby environmental receptors.
- Pollution accidents to land - There is potential for accidental spills or leaks of fuels, oils or chemicals during construction or operation to contaminate soils through direct deposition and infiltration pathways,

which could result in exposure risks to workers and harm to environmental receptors.

- Pollution accidents to water - There is potential for accidental release of contaminants to enter surface water or groundwater via runoff, drainage systems or subsurface migration pathways, which could result in pollution of receiving waterbodies and associated impacts on aquatic environments and downstream users.
- 19.3.14 Any hazards for which there was no credible source-pathway-receptor linkage are not considered in this assessment as there is no credible linkage to cause harm to an environmental receptor.
- 19.3.15 The assessment considers two scenarios:
- Construction phase, including construction of the Marine Infrastructure (**Work No. 6**), SAF Production Facility (**Work No. 1**) and CHP Plant (**Work No. 2**), the connections within the identified connection corridors (**Work Nos. 7, 8 and, 9**) and associated development; and
 - Operation phase of the Proposed Development.
- 19.3.16 Decommissioning of the Proposed Development is not specifically included in this assessment as not enough information is known in relation to decommissioning activities at this stage to inform a detailed assessment. Additionally, as outlined in the Scoping Report, decommissioning is anticipated to be no worse than that for the construction phase following the implementation of risk management plans for decommissioning. Construction and decommissioning are therefore considered together.

Receptors

- 19.3.17 The assessment of significant adverse effects will consider factors defined in Regulation 5(2) of The EIA Regulations 2017, i.e. population and human health, biodiversity, land, soil, water, air and climate and material assets, cultural heritage and landscape and visual receptors. For the purpose of assessment, an environmental receptor will therefore be considered to be any of these.
- 19.3.18 The following topic chapters in **ES Volume I (Application Document Ref. 6.1)** have been used to identify potential receptors relevant to the MA&D assessment:
- **Chapter 8: Air Quality;**
 - **Chapter 9: Noise and Vibration;**
 - **Chapter 10: Terrestrial Ecology;**

- **Chapter 11: Freshwater and Marine Ecology;**
- **Chapter 12: Water Environment and Flood Risk;**
- **Chapter 15: Climate Change Resilience;**
- **Chapter 17: Socio-economics** (includes human health);
- **Chapter 18: Traffic and Transport;** and
- **Chapter 20: Marine Navigation.**

19.3.19 For the purposes of assessment, receptors have then been grouped into a broad type rather than individually identified and include:

- members of the public and local communities;
- infrastructure and the built environment; and
- the natural environment, including ecosystems, land and soil quality, air quality, surface and groundwater resources and landscape.

19.3.20 Certain receptors will be excluded from the assessment, for the reasons described in Table 19.6

Table 19.6 Excluded receptors

Excluded receptors	Reason for exclusion
Employees and visitors of the Proposed Development and/or its suppliers, whether during construction, operation or maintenance of the Proposed Scheme	Protected by existing health and safety legislation.
Members of the public who are wilfully trespassing	The safety and security of the Proposed Development from trespassers will be set out in the Construction Environmental Management Plan, and a secure boundary is expected to be maintained (and secured by Schedule 2 (Requirements) of the draft DCO (Application Document Ref, 3.1)). On the basis that the risk has been managed to be ALARP through these measures to prevent trespassers, it is assumed that any members of public who are wilfully accessing unauthorised areas are not considered as receptors for the purposes of this assessment.
The historic environment, including archaeology and built heritage.	Cultural heritage was scoped out of the EIA as the closest designated heritage asset is 1.5km away from the Site. Therefore, the historic environment is not likely to be affected by the hazards associated with the Proposed Development and is excluded from further assessment.

Study Area

19.3.21 The following distances from the Site were adopted for setting the Study Area. These capture the internal and external influencing factors that could pose a hazard to the Proposed Development:

- Manmade features:
 - i. Airports and airfields within 13km (the general safeguarding zone);
 - ii. COMAH facilities within 5km (COMAH 2015 Public Information Search distance);
 - iii. Major accident hazard pipelines within 1km;
 - iv. Nuclear installations within 3km (distance to The Land Use Planning Outer Consultation Zone);
 - v. Fuel retail sites, including Liquefied Natural Gas and Liquefied Petroleum Gas, within 1km;
 - vi. Rail infrastructure within 0.5km; and
 - vii. Transmission of gas, electricity, oil/fuels, crossing the Site.
- Natural features with the potential to create risks within:
 - i. 3km, chiefly hydrological and geological, for example dam failure and seismic activity; and
 - ii. 1km, chiefly hydrological and geological, for example flood risk and unstable ground conditions.

Baseline

- 19.3.22 In line with the EIA Directive, existing sources of risk assessment and existing baseline data have been used to inform the assessment, including publicly available desktop sources.
- 19.3.23 Baseline information collated for other topic chapters included in the Environmental Statement (ES) (**Air Quality; Noise and Vibration; Terrestrial Ecology; Freshwater and Marine Ecology; Water Environment and Flood Risk; Climate Change Resilience; Socioeconomics** (includes human health); **Traffic and Transport; and Marine Navigation**) (**ES Volume I, Application Document Ref. 6.1**) has been pertinent to this assessment.
- 19.3.24 Information has also been reviewed on features external to the Proposed Development which could contribute a potential source of hazard to the

Proposed Development. This information is obtained from a desk based study. Such features include:

- Presence of COMAH sites;
- Potentially hazardous ground conditions; and
- Proximity to other infrastructure (road, rail, aviation, energy).

19.3.25 The data sources in Table 19.7 have been used to inform the baseline.

Table 19.7 Data sources used to inform the MA&D assessment

Source of data	Baseline data	Ref
National Risk Register of Civil Emergencies	National risk register information	[Ref 33]
Cleveland Community Risk Register	Local risk register information	[Ref 34]
British Geological Survey (BGS) GeoIndex Onshore	Borehole and geological information	[Ref 34]
Tsunamis Hazard Map	Tsunami information relating to climate changes	[Ref 36]
The International Disaster Database	Mass disasters and disaster preparedness	[Ref 37]
HSE's Planning Advice Web App	Planning guidance support	[Ref 38]
HSE's COMAH 2015 Public Information Search	COMAH sites	[Ref 39]
Google aerial and street view maps	Road, rail, waterway, property information	[Ref 40]
Technical topic Chapters (Chapter 8: Air Quality to Chapter 20: Marine Navigation).	Technical topic Chapters 'Baseline Conditions' information.	ES Volume I (Application Document Ref. 6.1)
HSE consultation response	List of COMAH sites and high hazard pipelines	Further information provided in Section 0.

Identifying relevant hazards for assessment

19.3.26 Using the baseline information, the hazards to be assessed have been identified and collated in a hazard identification record. Hazards have been grouped into risk events that have the same potential consequence.

19.3.27 The grouped risk events have then been reviewed and assigned to relevant environmental receptors that may experience an impact.

Identifying the reasonable worst-case impact

- 19.3.28 A reasonable worst-case environmental impact(s) has been identified for each risk event which remains in scope using the following approach:
- Could the grouped Risk Event reasonably constitute a major accident and/or natural disaster in terms of the definitions provided in Table 19.2?
- 19.3.29 For example, a reasonable worst-case for harm to member of the public, would be whether that harm could constitute a fatality, multiple fatalities or permanent injury – all of which are likely to classify it as a major accident and/or disaster.
- 19.3.30 Similarly, a reasonable worst-case on the natural environment considers whether this could cause widespread or irreversible harm.
- 19.3.31 The hazard identification record sets out the outcomes of this stage.

Risk events that need further assessment

- 19.3.32 The following risk events have been excluded from further assessment –
- There is no source-pathway-receptor linkage;
 - The receptor is not within scope, as defined through scoping;
 - The reasonable worst-case does not meet the criteria of a significant environmental effect, and therefore the grouped Risk Event is not a potential major accident and/or disaster; or
 - The consequence and likelihood of the risk is high, to the extent that it is considered unacceptable to the development and has therefore been designed-out or otherwise managed.
- 19.3.33 The risk events remaining have then been assessed to determine whether potential significant effects on receptors are already managed and/or mitigated to be ALARP (as defined in Table 19.2). Or to identify if there are gaps in embedded mitigation that need to be addressed through additional mitigation that will ensure the risk event is ALARP.

Risk likelihood

- 19.3.34 The possibility of the reasonable worst-case environmental impact occurring has then been evaluated considering:
- the likelihood of the grouped Risk Event occurring considering the measures already embedded into the design and best practice (embedded mitigation); and

- the likelihood that an environmental receptor is affected by the reasonable worst-case grouped Risk Event following embedded mitigation.
- 19.3.35 This has been undertaken qualitatively to identify whether the reasonable worst-case identified is a realistic outcome of the grouped Risk Event therefore requiring further mitigation, or whether this outcome has already been adequately addressed by embedded and best practice mitigation measures.

Additional mitigation

- 19.3.36 The outcome of the above has identified risk events for which existing embedded and best practice measures do not provide sufficient mitigation to reduce the risk to an acceptable level, and therefore significant effects could occur. Where this is the case, additional measures would be required to be identified.

Residual assessment

- 19.3.37 The residual assessment focuses on demonstrating how additional mitigation reduces the likelihood and/or significance of the reasonable worst-case impact occurring to an acceptable level, ALARP.
- 19.3.38 The hazard identification risk record documents the residual assessment (as presented in Section 19.6).

Tolerability and significance criteria

- 19.3.39 The tolerability of the residual risks are categorised using professional judgement. The risks are categorised as:
- **Tolerable.** The levels of risk are generally regarded as adequately controlled and comparable to those that people regard as trivial in their daily lives. Further action to reduce risks is not normally required, as such they are generally considered to be broadly acceptable;
 - **Tolerable (if ALARP).** People are prepared to tolerate this level of risk in order to secure benefits, such as employment or infrastructure. The expectation is that risks are properly assessed and kept as low as reasonably practicable (ALARP) through the application of appropriate mitigation, and risks are kept under review; and
 - **Intolerable.** A risk falling into this region is regarded as unacceptable, whatever the level of benefits associated with the activity. Typically this would include loss of life, permanent injury, and/or temporary or permanent destruction of an environmental receptor that cannot be restored through minor clean-up and restoration.

- 19.3.40 The definitions of the above terms are contained in the document, “Reducing Risks, Protecting People” [Ref 32].
- 19.3.41 As a general rule, Tolerable and Tolerable (if ALARP) risks are considered as being not significant. Intolerable risks are considered to be significant and unacceptable.

Domino effects

- 19.3.42 Domino effects have been considered as part of the assessment (in Table 19.11), in accordance with the requirements of the COMAH Regulations, which require the potential for interactions between neighbouring major hazard installations to be identified and assessed. The Proposed Development is located within the Teesside industrial cluster, where multiple COMAH-regulated facilities and major accident hazard pipelines are present, and therefore the potential for domino effects has been explicitly incorporated into the assessment.
- 19.3.43 For the purposes of this assessment, domino effects are defined as a sequence of events whereby an initial major accident at the Proposed Development or an external installation could trigger one or more secondary events, resulting in an escalation of consequences beyond those associated with the initial event alone. In this context, domino effects may occur both within the Proposed Development (intra-site) and between the Proposed Development and neighbouring installations and infrastructure (inter-site).

Limitations and Assumptions

- 19.3.44 The MA&D assessment has been undertaken on the basis of the design of the Proposed Development for planning and the Rochdale Envelope (as described in **Chapter 4: The Proposed Development in ES Volume I, Chapter 4 (Application Document Ref. 6.1)**), recognises that detailed safety, monitoring and control systems and procedures will continue to evolve through design development and subsequent regulatory processes. Where detailed information is not available, the assessment adopts conservative assumptions consistent with the objective of identifying reasonable worst-case scenarios.
- 19.3.45 An Engineering, Procurement and Construction (EPC) Contractor(s) and therefore Principal Contractor under the CDM Regulations, has not yet been appointed, and a detailed Construction Environmental Management Plan (CEMP) has not been developed (a **Framework CEMP** (fCEMP) is provided in **Appendix 5A (ES Volume III, Application Document Ref. 6.3)**). It has been assumed that standard industry practices to manage risk

to ALARP will be used and therefore risks will be continuously refined and reappraised as the project design develops.

19.4 Baseline conditions

19.4.1 This section provides a description of the environmental baseline characteristics within the Study Area. The baseline relevant to this topic comprises:

- Hazards and threats identified within the UK National Risk Register (NRR) [Ref 33] and the Cleveland Community Risk Register [Ref 34];
- A description of potential natural hazards which may impact the Site; and
- Existing major accident hazard source that may impact the Site.

19.4.2 For the purposes of grouping of risks, following groups are used:

- Natural hazards;
- Major hazard sources;
- Ground conditions; and
- Transport infrastructure.

Existing baseline

Existing national and local risk register risks

19.4.3 The NRR is based on information from the National Security Risk Assessment, which is the Government's assessment of the most serious risks facing the UK. The risks that meet the threshold for inclusion in the NRR would have a substantial impact on the UK's safety, security and/or critical systems at a national level. The risk register classifies risks into categories including terrorism; cyber; state threats; geographic and diplomatic; accidents and systems failures; natural and environmental hazards; human, animal and plant health; societal; and conflict and instability.

19.4.4 The NRR states that for risks that are most relevant to a local area, a review of the relevant Community Risk Register should be undertaken. Key local hazards within the Cleveland Community Risk register include:

- Flooding;
- Major industrial accidents (COMAH / petrochemical);
- Hazardous transport incidents;

- Marine pollution;
 - Utility/infrastructure failure;
 - Extreme weather (heatwave and winter events);
 - Pandemic/health emergencies;
 - Cyber threats;
 - Social disruption (disorder / industrial action); and
 - Terrorism.
- 19.4.5 These local risks, together with those on the NRR inform the identification of the grouped risk events the Proposed Development may be vulnerable to.
- Natural hazards***
- 19.4.6 Considering the risks identified in the Cleveland Community Risk register detail on natural hazards has been limited to flooding and extreme weather as these are the only natural hazards expected to be material to the Study Area.
- 19.4.7 The majority of the Main Site falls within Flood Zone 1 and is at low fluvial and tidal flood risk (Flood Zone 1). Some sections of the Proposed Development boundary are situated within higher-risk areas classified as Flood Zones 2 and 3. These include: the initial 800 m of Seal Sands Road east of Seal Sands Roundabout; the intertidal area along the River Tees; and areas along the north bank of Dabholm Gut in South Tees. There are several flood defence assets within the Study Area one of which intersects the Site boundary. This feature is natural high ground that functions as a flood defence, providing partial protection against fluvial and tidal flooding from the River Tees.
- 19.4.8 The current baseline climate for the Study Area, informed by Met Office observational data (1980–2010 baseline) and supported by UKCP18 evidence, indicates that the UK is already experiencing a changing climate characterised by increasingly frequent and variable extreme weather events.
- 19.4.9 Baseline conditions relevant to extreme weather include:
- The area experiences a temperate maritime climate, with seasonal variability in temperature and precipitation, including historically moderate summers (average ~14.7°C) and cool winters (average ~3.9°C).

- Extreme weather events are already part of the baseline climate, including:
 - i. Periods of heavy rainfall, particularly in winter months, which can give rise to surface water and fluvial flood events;
 - ii. Storm events and high winds, which can cause localised disruption and damage, particularly in exposed coastal and estuarine locations;
 - iii. Hot weather events and short-duration heatwaves, occurring intermittently during summer periods;
 - iv. Dry spells, typically during summer, which can affect water availability and ground conditions.
- The baseline also reflects increasing variability in seasonal patterns, with evidence indicating:
 - i. A tendency towards wetter winter conditions and drier summer periods;
 - i. A gradual increase in the frequency of heatwave conditions and prolonged dry periods; and
 - ii. Emerging evidence that storm events may become more intense and frequent over time, particularly during winter months.

19.4.10 The Site's location adjacent to the tidal River Tees means that the baseline environment is inherently sensitive to hydrological and coastal influences, including the interaction between heavy precipitation, tidal conditions and flood risk.

19.4.11 Overall, the current baseline demonstrates that extreme weather events (including heavy rainfall, heatwaves, storms and drought conditions) are already experienced within the Study Area, with observable trends indicating increasing frequency, intensity and seasonality shifts.

Major hazard sources

19.4.12 The Site lies within the Teesside industrial cluster, one of the UK's most concentrated areas of heavy industry, energy infrastructure and petrochemical activity. The area includes:

- Multiple COMAH-regulated facilities, including Upper Tier sites storing hazardous chemicals and fuels; and

- Large-scale storage terminals and processing plants handling flammable, toxic and pressurised substances.

19.4.13 Facilities include:

- petrochemical complexes;
- gas processing plants;
- fuel terminals (road, rail, marine loading); and
- chemical manufacturing installations.

19.4.14 The Main Site itself (centred on postcode TS2 1UB) is located within 3 miles¹ (4.8km) of 21 COMAH sites [Ref 41], including:

Table 19.8 COMAH sites within 3 miles of the Site

Establishment Name	Operator Name	Postcode	COMAH Tier
Cargo Fleet - Middlesbrough	Univar Solutions UK Limited	TS3 8BD	Upper tier
Central Area Transmission System (CATS)	Wood Group PSN Limited	TS2 1UB	Upper tier
Hartlepool	Natara Global Limited	TS25 2DT	Lower tier
Hartlepool	Exwold Technology Limited	TS25 2BT	Upper tier
Hartlepool	Qualitech Environmental Services Limited	TS25 2BQ	Lower tier
Hartlepool	Tioxide Materials Ltd	TS25 2DD	Upper tier
Hartlepool Power Station	EDF Energy Nuclear Generation Limited	TS25 2BZ	Lower tier
Middlesbrough	BOC Limited	TS6 7RT	Upper tier
Middlesbrough	Chemoxy International Limited	TS3 6AF	Upper tier
Middlesbrough	MP Storage and Blending Limited	TS3 8AS	Lower tier
Middlesbrough	Air Products (BR) Limited	TS2 1UE	Lower tier
North Tees	CF Fertilisers UK Limited	TS18 2RF	Upper tier
North Tees	SABIC UK Petrochemicals Limited	TS2 1UB	Upper tier

¹ Miles is used as this is the radius used in the COMAH 2015 Public Information Search (<https://notifications.hse.gov.uk/COMAH2015/Search.aspx>)

Establishment Name	Operator Name	Postcode	COMAH Tier
North Tees Road Rail Terminal	Navigator Terminals North Tees Limited	TS2 1TT	Upper tier
Port Clarence	Calor Gas Limited	TS2 1SF	Upper tier
Port Clarence Works	Industrial Chemicals Limited	TS2 1SD	Upper tier
Seal Sands	Fine Organics Limited	TS2 1UB	Upper tier
Seal Sands Terminal	ConocoPhillips (U.K.) Teesside Operator Limited	TS2 1UH	Upper tier
Stockton on Tees	Navigator Terminals Seal Sands Limited	TS2 1UA	Upper tier
Stockton-on-Tees	Tees Valley Net Zero Limited	TS23 1PZ	Lower tier
Teesside Gas Processing Plant - Seal Sands	px (TGPP) Limited	TS2 1FB	Upper tier

19.4.15 Of the COMAH sites listed in Table 19.8 one, SABIC UK Petrochemicals Ltd, is within the Site:

19.4.16 In addition, there is one COMAH site within 250m of the Main Site operated by px (TGPP) Ltd located 45m to the west and one historical COMAH site recorded within Main Site.

19.4.17 The Site is also located within a dense network of pipelines, including:

- high-pressure gas pipelines;
- fuel/product pipelines; and
- carbon dioxide (CO₂) pipelines associated with Carbon Capture and Storage (CCS) infrastructure

19.4.18 Some of these pipelines include Major Accident Hazard (MAH) pipelines regulated in accordance with the Pipelines Safety Regulations and COMAH-related controls. This includes the 'Link Line' and other cross-country pipelines for transporting natural gas and chemicals.

19.4.19 Both above and below ground electrical distribution and transmission infrastructure, including 400kV overhead lines and pylons are also located within the Study Area.

19.4.20 Hartlepool Nuclear Power Station is also located within the Study Area, approximately 2km from the Site boundary.

Ground conditions

- 19.4.21 The Main Site is located on predominantly brownfield land within the Teesside industrial cluster, with a history of intensive industrial use including former chemical manufacturing and areas of historic landfill. Ground conditions are therefore variable and locally complex, comprising made ground, historic fill materials and underlying natural deposits. These conditions introduce potential hazards associated with ground instability, settlement, and the presence of residual contamination.
- 19.4.22 Given the industrial legacy of the Site and surrounding area, there is the potential for contaminants to be present within soils and groundwater, which could be mobilised through intrusive activities or disturbance of ground layers. In addition, the presence of former historic landfill areas and reclaimed land may give rise to geotechnical risks, including differential settlement and reduced ground bearing capacity, particularly where heavy structures (e.g. plant, storage tanks or quay infrastructure) are supported.
- 19.4.23 The Site's proximity to the River Tees and estuarine environment further increases the sensitivity of ground conditions, with potential pathways for contaminant migration to controlled waters via surface runoff or subsurface flow.

Transport infrastructure

- 19.4.24 The Main Site is connected to the public highway network via Seal Sands Road which joins Seaton Carew Road (A178) at Seal Sands Roundabout. From this roundabout, Seaton Carew Road (A178) runs north to Hartlepool and south to Port Clarence. The western arm of this roundabout links to the A1185 which connects to the trunk road network via the A689 and A19 north of Billingham. The A19 and A1(M) provide north-south links into the strategic road network. The A19 links to Hartlepool, Peterlee and Sunderland to the north, and to Thirsk and York and the A1(M) to the south.
- 19.4.25 No operational or publicly accessible train stations are within the Study Area however the Tees Valley Line railway runs close to the Study Area in South Tees.
- 19.4.26 There are no major airports within 13km of the Proposed Development Site.

Future baseline

- 19.4.27 The future baseline is not anticipated to differ significantly from the existing baseline with regards to the vulnerability of the Proposed Development to the risk of major accident(s) and/or disaster(s), as it is considered that the current industrial land use within the Study Area would remain largely the same.

- 19.4.28 The Environment Agency (EA) predict all of the land within this area may become Flood Zone 2 and/or 3 by 2070 when accounting for climate change.
- 19.4.29 The baseline for extreme weather has been informed by UK Met Office observations and UKCP18 climate projections, adopting a conservative high-emissions scenario (RCP8.5) to characterise future conditions over the operational lifetime of the Proposed Development. A clear trend towards increasing frequency and intensity of extreme weather events is noted, with the following key changes anticipated:
- Hotter summers and increased heatwaves: Summer temperatures are projected to rise by up to approximately +3.9°C by the 2080s, with heatwave events increasing from around 0.7 events per year in the baseline period to approximately 4.5 events per year. This represents a substantial increase in extreme heat exposure.
 - Wetter winters and increased heavy rainfall events: Winter precipitation is projected to increase by up to approximately 21% by the 2080s, indicating a greater likelihood of intense rainfall events and associated flood risk.
 - Drier summers and increased drought conditions: Summer precipitation is projected to decrease by up to approximately 23% by the 2080s, alongside a gradual increase in prolonged dry spells, indicating higher drought risk.
 - Increased flood risk (including tidal influence): The Site's proximity to the tidal River Tees introduces exposure to combined fluvial, coastal and tidal flooding, with sea level rise projected to increase by approximately 0.16 m in the 2030s to up to 0.55 m (central estimate) by the 2080s.
 - Storms and high winds: While historical trends are uncertain, projections indicate that winter storms are likely to increase in frequency and intensity from around the 2050s, with associated increases in wind speeds during winter months.
 - Secondary hazards (lightning): An increase in lightning frequency is expected in summer and spring, contributing to potential operational and infrastructure risks.
- 19.4.30 In future the Main Site will be within the COMAH site boundaries for Northern Endurance Partnership (NEP)'s CO₂ Gathering Network pipeline.

19.5 Embedded mitigation

19.5.1 The Applicant has committed to constructing and managing the Proposed Development in accordance with a range of recognised standards and management systems, some of which will be secured through secondary consents, including COMAH and Environmental Permit requirements. These include:

- A programme of hazard studies to demonstrate that risks can be managed to be As Low As Reasonably Practicable (ALARP);
- Environmental, Health and Safety (EHS) management systems for the operational facility;
- A CDM Health and Safety Plan (construction phase);
- Supplier environmental, health and safety standards (e.g. Construction Skills Certification Scheme); and
- Environmental permitting to regulate the operation of the plant.

19.5.2 In addition, a range of measures will be embedded into the design, construction, operation and decommissioning of the Proposed Development, as set out below.

Design phase

19.5.3 Embedded mitigation will be incorporated during the detailed design process through the application of process safety and safety-in-design principles, as set out in Section 4.7.3 of **Chapter 4: The Proposed Development (ES Volume I, Application Document Ref. 6.1)**. This includes consideration of:

- process hazards and safeguarding;
- vessel and pipeline isolation measures;
- emergency shutdown and, where required, depressurisation systems; and
- the layout of the Proposed Development, including the location of facilities to manage on-site and off-site risks.

19.5.4 A design hazard management plan will be developed and maintained, supported by hazard identification (HAZID), environmental impact identification (ENVID) and hazard and operability (HAZOP) and, where required, Quantitative Risk Assessment (QRA) studies undertaken throughout the design process, including Front-End Engineering Design

(FEED). These studies inform the identification and reduction of hazards through iterative design and will be secured via a COMAH licence.

- 19.5.5 Further major accident assessments will be undertaken post Final Investment Decision, and a Major Accident Prevention Policy (MAPP) will be prepared to support the COMAH Safety Case for the operational facility.

Construction

- 19.5.6 During construction, the risk of accidental scenarios will be minimised through the use of suitably experienced contractors, supported by robust risk assessments, method statements, operating procedures and workforce training, in accordance with CDM Regulations.
- 19.5.7 Detailed CEMP(s) will be implemented to control environmental effects and ensure compliance with relevant legislation, permits, consents and licences (which is secured via Schedule 2 (Requirements) of the **draft DCO (Application Document Ref. 3.1)**). A **fCEMP** is provided in **Appendix 5A (ES Volume III, Application Document Ref. 6.3)**.

Operation

- 19.5.8 The operation of the Proposed Development will be regulated through a COMAH licence issued by the HSE and an Environmental Permit issued by the EA. These regulatory regimes require the implementation and ongoing management of appropriate control measures, including:
- process safety systems and operational procedures;
 - environmental and safety management systems; and
 - monitoring and control measures designed to prevent accidents and minimise their consequences.
- 19.5.9 The Environmental Permit will require the application of Best Available Techniques (BAT) for the control of emissions and accident risks

Decommissioning

- 19.5.10 During decommissioning, risks will be managed through the use of suitably experienced contractors, supported by appropriate risk assessments, method statements, operating procedures and training, in accordance with CDM Regulations.
- 19.5.11 Decommissioning Environmental Management Plan(s) (DEMP) will be prepared prior to decommissioning to ensure that demolition and decommissioning activities are managed in compliance with relevant legislation, permits and licences (which is secured via Schedule 2 (Requirements) of the **draft DCO (Application Document Ref. 3.1)**). A

Decommissioning Plan will be agreed with the EA prior to the commencement of decommissioning works.

19.6 Assessment of effects, additional mitigation and residual assessment

19.6.1 An initial screening exercise was presented for statutory consultation in the Preliminary Environmental Information Report (PEIR) to identify the potential hazards relevant to the Proposed Development and to determine whether they should be taken forward for further consideration in this assessment. Table 19.9 presents the risks that were considered during the PEIR for the construction and operation stages of the Proposed Development.

Table 19.9 Hazards considered as in scope for the PEIR

Risk event	Construction & Decommissioning	Operation
Hydrological, Coastal and fluvial flooding	Yes	No
Hydrological, Pluvial flooding	Yes	Yes
Climatological and meteorological, Wave surges	Yes	Yes
Industrial and Urban Accidents, Major Accident Hazards Chemical Sites	Yes	Yes
Industrial and Urban Accidents, Major Accident Hazards Pipelines	Yes	Yes
Industrial and Urban Accidents, Fuel Storage	Yes	Yes
Transport Accidents, Rail	No	Yes
Transport Accidents, Waterways	Yes	Yes
Pollution Incidents, Land	No	Yes
Pollution Incidents, Water	No	Yes
Malicious Attacks, Unexploded Ordnance (UXO)	Yes	No

19.6.2 Using this initial screening, the assessment has been furthered (as assessed in Table 19.10 and Table 19.11). This section details the assessment of the vulnerability of the Proposed Development to the risk of MA&D during both the construction/ decommissioning and operation phases.

19.6.3 The construction phase assessment is provided within Table 19.10.

19.6.4 The operation phase assessment is provided within Table 19.11.

Table 19.10 Hazard identification record (construction)

Grouped risk event	Hazard source	Pathway	Receptor	Reasonable worst-case if event did occur	Embedded mitigation	Is this ALARP with embedded mitigation?	Is Additional mitigation required?
Natural hazards							
Extreme weather (including flooding, storm, heat, drought)	There is the potential for pluvial, fluvial and tidal flooding associated with the River Tees and the estuary. There may be storm surges which may adversely impact the construction of the quay and intertidal works. There may be an increase in extreme rainfall and high winds which could affect temporary works, cranes and the installation of large modules. Heatwaves may affect exposed construction activities and temporary systems.	There are flood routes to the Site and flood events may overtop temporary drainage systems during extreme weather events. Extreme weather may be surface water runoff from exposed ground and construction laydown areas. Temporary works may be unstable or fail due to extreme weather events. Extreme weather may damage installed infrastructure prior to commissioning. Extreme weather may mobilise sediments within the estuary.	Key receptors include: public and local communities; infrastructure; and the natural environment (including River Tees, Tees Estuary and designated habitats).	Flooding or storm event during construction leading to failure of temporary works or damage to partially installed plant. This may result in loss of containment of fuels, oils or chemicals, and/or sediment-laden or contaminated runoff entering the River Tees or estuarine habitats. This could cause widespread or persistent environmental harm. For human receptors, the worst case is loss of life and/or permanent injury	Mitigation will be included within the CEMP (details of this are included in the fCEMP). Temporary drainage (as outlined in the Drainage Strategy) and sediment control measures will be implemented throughout construction. The programming of construction works (including the quay construction and heavy lifting activities) will avoid adverse weather conditions where practicable. The Construction Contractor will monitor the weather conditions/ predictions and flood alerts. Temporary works will be designed and inspected in line with the relevant standards and guidance (as outlined in Section 19.2). Site compounds and laydown areas will be located to minimise flood risk.	ALARP (Tolerable) — the likelihood of the reasonable worst case occurring, through the embedded mitigation measures outlined within this row, is low. Therefore, this risk is not significant .	No
Major hazard sources							
Industrial and urban accident – external (COMAH and nuclear sites)	Potential for a major accident at nearby COMAH-regulated facilities (as outlined in Section 19.4) within the Teesside industrial cluster and/or Hartlepool Nuclear Power Station (within the MA&D Study Area), during periods of peak construction activity (e.g. during the quay works and module installation).	Accidents at nearby COMAH sites may lead to: Thermal radiation/ overpressure; Toxic dispersion; and Radiological dispersion (for nuclear accidents). There is also the potential for other COMAH-site's emergency response constraints to affect the Proposed Development's construction site access and evacuation.	Key receptors include: the public and local communities; construction site infrastructure; and the natural environment (including controlled waters and designated estuarine habitats).	An off-site major accident could result in off-site effects reaching the Proposed Development's construction site. For example, a toxic plume/thermal radiation may cause an escalation (e.g. fire, damage to partially installed plant or temporary stores) and/or contamination of land or controlled waters.	The Proposed Development will rely on COMAH and nuclear regulatory regimes (which include prevention and emergency planning). Site emergency arrangements will be implemented and the Proposed Development will interface with local responder plans. The Applicant will liaise and coordinate with neighbouring operators as required. Site controls and mitigation measures will be included within the CEMP and the CDM (this includes the control	ALARP (Tolerable) – the residual risk for external industrial and urban accidents are low due to the regulatory controls and emergency planning interface in place throughout construction. Therefore, this risk is not significant .	No

Grouped risk event	Hazard source	Pathway	Receptor	Reasonable worst-case if event did occur	Embedded mitigation	Is this ALARP with embedded mitigation?	Is Additional mitigation required?
				For human receptors, the worst case is loss of life and/or permanent injury.	of temporary fuel and chemical storage)		
Industrial and urban accident – infrastructure interaction (including overhead lines)	There is the risk of interactions between the Proposed Development's construction plant/lifting operations and existing electrical distribution/transmission infrastructure (including overhead lines and pylons) and other utilities within/adjacent to the Main Site and utility corridors. The interaction is considered most likely during heavy lifts, use of abnormal indivisible loads, and during enabling works.	If an interaction was to occur, there is a risk of electrical strike/arc ignition. There may also be damage to utilities causing loss of control of temporary systems. Secondary fire events may also affect temporary fuel/chemical stores or partially installed equipment within the Site.	Key receptors include: construction site infrastructure; the natural environment (via firewater/runoff); the public and local communities where off-site consequences arise.	Strike/damage may lead to fire and escalation (e.g. ignition of temporary stores/plant). Contaminated runoff may enter site drainage and potentially reaching the River Tees/estuarine environment. For human receptors, the worst case is loss of life and/or permanent injury.	During construction, the Proposed Development will implement safe working distances and exclusion zones from other infrastructure (this will be informed by guidance and through consultation with asset owners). Lifting plans and method statements will be implemented through the CDM. This will consider utility mapping/marketing and permits-to-work. The CEMP will be implemented which contains controls for firewater/runoff management and temporary storage/housekeeping.	ALARP (Tolerable) – the risks associated with potential interactions with existing infrastructure will be managed through established CDM controls, use of safe working distances and site management (as outlined within the fCEMP) to reduce likelihood of strike and escalation. Therefore, this risk is not significant .	No
Industrial and urban accident – MAH pipeline strike	There is the risk of excavation/piling activity and construction plant to interact with existing buried pipelines within/adjacent to the Site (this includes works for connections such as gas tie-in/AGI and other utility corridor works)	A MAH pipeline strike may lead to a loss of containment, vapour dispersion and ignition (including fire/explosion). There is the potential for contaminated firewater/runoff reaching drainage systems and controlled waters.	Key receptors include: public/local communities; construction site infrastructure; the natural environment (including controlled waters and designated estuarine habitats).	A major release may lead to fire/explosion or harmful gas clouds. There may be contaminated firewater/runoff which may reach controlled waters/estuarine habitats. For human receptors, the worst case is loss of life and/or permanent injury.	Prior to construction, there will be utility searches and verification activities. As part of the design and pre-construction consultation, there will be liaison with pipeline operators. This (alongside relevant legislation and guidance) will help inform exclusion zones and controlled excavation methodology. The methodology will be included within the CDM method statement. This will be produced post DCO consent and prior to construction starting. The CEMP will include controls for runoff containment and incident response.	ALARP (Tolerable) – through the implementation of standard industry controls and the embedded mitigation measures outlined, the risks associated with MAH pipeline strikes are considered low. Therefore, this risk is not significant .	No
Ground conditions							

Grouped risk event	Hazard source	Pathway	Receptor	Reasonable worst-case if event did occur	Embedded mitigation	Is this ALARP with embedded mitigation?	Is Additional mitigation required?
Pollution accident (construction activity)	There is the potential for spills/leaks of fuels, oils, chemicals (including from construction plant, temporary storage, refuelling, and marine construction activities for the quay). During construction, there is the potential to disturb contaminated ground associated with historic industrial use and historic landfill areas within the Main Site.	If contaminated land is disturbed, there is the potential for runoff via temporary drainage; infiltration to soil; discharge via site drainage/attenuation; and mobilisation of contaminated sediments to the River Tees (especially during riverside/quay works)	Key receptors include: land/soil; surface waters and groundwater; estuarine environment; and public receptors via downstream pathways.	Potential for a significant pollution incident to result in contaminated runoff or sediment-laden discharge reaching controlled waters and/or designated estuarine habitats. This could cause widespread or prolonged environmental harm. For human receptors, the worst case is loss of life and/or permanent injury.	The CEMP will contain control (for example, pollution prevention, refuelling controls, spill kits/response). Temporary drainage and sediment controls will be implemented. There will be bunding/containment for temporary stores. Construction method statements will outline mitigation measures and training will be provided to construction workers (this will include incident response arrangements).	ALARP (Tolerable) – through the implementation of the embedded mitigation measures, the risk associated with pollution accidents are low. Therefore, this risk is not significant .	
Ground risk/collapse	There are variable ground conditions across the brownfield Main Site (this includes previously developed industrial land and historic landfill). In addition, the quay construction (involving piled/combi-wall/setback options) and heavy module installation loading.	Risk of ground movement, instability, and/or collapse. There may be structural failure of temporary works or permanent structures under construction. There is also a risk of mobilisation of contaminants from disturbed ground.	Key receptors include: The public; construction site infrastructure; natural environment (including controlled waters/ designated habitats).	Ground/ structural failure (including quay instability) causes injury and/or damages to plant or temporary storage. This may lead to secondary loss of containment and/or mobilisation of contamination with runoff to the estuary.	Ground investigation will be undertaken and will inform the design development. There will be foundation/temporary works improve ground conditions where required. The quay will be designed to withstand appropriate construction and operational loads. The CEMP will contain controls for contaminated ground and runoff management.	ALARP (Tolerable) – the risk will be managed through appropriate design and controls included in the CEMP. Therefore, this risk is not significant .	No
UXO	Potential for UXO presence within a historically industrial/ brownfield setting, disturbed during intrusive works (including ground investigation, piling, excavation, and trenching within the Main Site and corridors)	The detonation of UXO may result in: blast/shockwaves; debris; secondary ignition; potential for localised contamination; and emergency response requirements.	Key receptors include: Construction site infrastructure; the natural environment; the public (only where credible off-site pathway exists).	Detonation causes structural damage and/or secondary release (e.g. ignition of stored fuels/ chemicals or damage to plant), with potential pollution via runoff pathways. For human receptors, the worst case is loss of life and/or permanent injury.	A specialist UXO risk assessment has been undertaken by Zetica UXO (included in Geoenvironmental Preliminary Risk Assessment (Appendix 21A (ES Volume III, Application Document Ref. 6.1))). The assessment concluded that there is a low UXO risk for intrusive works within the post-WWII made ground, increasing to a moderate risk for works extending beneath the made ground into underlying natural deposits.	ALARP (Tolerable) – The standard UXO risk management outlined reduces likelihood and consequence of the UXO risk to low. Therefore, this risk is not significant .	No

Grouped risk event	Hazard source	Pathway	Receptor	Reasonable worst-case if event did occur	Embedded mitigation	Is this ALARP with embedded mitigation?	Is Additional mitigation required?
					If required, survey/clearance works will be undertaken prior to intrusive works. There will be safe systems of work and exclusion zones implemented. Emergency procedures will be included within the CDM risk assessment. The CEMP will contain mitigation measures for secondary pollution response.		
Transport infrastructure							
Transport accident (road)	Construction HGV movements via Seal Sands Road and the local network (including Abnormal Indivisible Loads (AIL) and daily logistics). Further information is provided in Chapter 18: Traffic and Transport (ES Volume I, Application Document Ref. 6.1)	There is a risk of vehicle collision. This could result in the loss of containment; spillage to land/water; potential ignition/fire; and disruption leading to secondary incidents.	Key receptors include: The public and local communities; transport infrastructure; the natural environment	Major road accident causes release (e.g. fuel/ chemical spill to waterbody) with persistent environmental harm and/or fire. For human receptors, the worst case is loss of life and/or permanent injury.	Detailed construction Traffic Management Plan(s) (CTMP) will be produced detailing measures to reduce the risk of collisions. AIL will be subject to routing controls (which will be in accordance with the framework Construction Traffic Management Plan (fCTMP) (Appendix 18D, ES Volume III, Application Document Ref. 6.3)).	ALARP (Tolerable) – through the use of embedded mitigation measures, the risk associated with road traffic accidents is low. Therefore, this risk is not significant .	No
Transport accident (marine)	Marine vessel movements for construction materials and prefabricated plant modules via the proposed quay and River Tees navigation (further information on marine navigation is provided in Chapter 20: Marine Navigation (ES Volume I, Application Document Ref. 6.1)).	Collision or grounding could result in the loss of containment; spillage to land/water; potential ignition/fire; and/or disruption leading to secondary incidents	Key receptors include: the public; transport infrastructure; the natural environment (River Tees/estuary and designated habitats)	Major marine accident causes release (e.g. fuel/ chemical spill to waterbody) with persistent environmental harm and/or fire For human receptors, the worst case is loss of life and/or permanent injury.	As described in Chapter 20: Marine Navigation (ES Volume I), a deconfliction plan will be produced to minimise navigation risk with other operators in the area. The deconfliction plan should consider availability of pilotage and towage resources. It will be the responsibility of the Proposed Development to ensure the plan is agreed with other terminals and the Harbour Master on a weekly basis. A Navigation Risk Assessment will be undertaken. There will be consultation and coordination with the harbour/port authorities for	ALARP (Tolerable) – through the use of embedded mitigation measures, the risk associated with marine traffic accidents is low. Therefore, this risk is not significant .	No

Grouped risk event	Hazard source	Pathway	Receptor	Reasonable worst-case if event did occur	Embedded mitigation	Is this ALARP with embedded mitigation?	Is Additional mitigation required?
					vessel movements and berth operations.		

Table 19.11 Hazard identification record (Operation)

Grouped risk event	Hazard source	Pathway	Receptor	Reasonable worst-case if event did occur	Embedded mitigation	Is this ALARP with embedded mitigation?	Is secondary mitigation required?
Natural hazards							
Extreme weather (including flooding, storm, heat, drought)	There is the potential for pluvial, fluvial and tidal flooding associated with the River Tees and the estuary. There may be storm surges which could affect the quay and intertidal interface. There may be an increase in extreme rainfall and high winds which would affect large-scale plant (including CHP plant, stacks up to 140m in height, storage tanks and conveyors). Heatwaves may affect cooling systems and process stability during operation.	There is the potential for water inundation of the Site and exceedance of site drainage/attenuation systems. There may be structural loading and wind damage to tall structures. There may be loss of utilities or cooling leading to process upset. There is the potential for contaminated runoff via site drainage systems to the River Tees.	Key receptors include: The public and local communities; operational infrastructure and process plant; and natural environment (including the River Tees and designated estuarine habitats).	Extreme weather event results in damage to plant or utilities (e.g. CHP, pipelines, and/or storage). This may lead to loss of containment of fuels, chemicals or process materials, potentially causing fire/explosion or contaminated discharge to controlled waters or designated sites. This may then result in widespread or persistent environmental harm. For human receptors, the worst case is loss of life and/or permanent injury.	The Proposed Development will consider extreme weather through climate-resilient design (Chapter 15: Climate Change Resilience, ES Volume 1, Application Document Reference 6.1). For example, structural design of the infrastructure to withstand wind/load conditions. The Proposed Development will include site drainage and attenuation ponds with controlled discharge (as outlined in the Drainage Strategy (Applicant Document Ref. 5.7)). As part of operational management of the Proposed Development, the weather will be monitored and systems in place (e.g. shutdown procedures) if necessary.	ALARP (Tolerable) – the risk is reduced through embedded design, operational procedures and monitoring such that residual risk is low. Therefore, this risk is not significant.	No
Major hazard sources							
Industrial & urban accident – on-site (process failure)	The Proposed Development involves high temperature and pressure processes (i.e. gasification, CHP combustion ~750–900°C, syngas processing) and large-scale biomass storage (approximately 230,000 tonnes) and product storage. There is therefore the potential for process upsets and/or equipment failure.	A loss of control of process could lead to overpressure and therefore: explosion/fire; release of flammable/toxic gases; firewater runoff via drainage systems to the estuary; and/or vapour dispersion off-site.	Key receptors include: The public; operational workforce (where off-site pathways exist); infrastructure; the natural environment (including designated	Major process failure results in fire/explosion or harmful gas release (e.g. syngas/chemicals), with contaminated firewater runoff reaching the River Tees or designated sites. This could	The Proposed Development will be regulated by the COMAH regime and will have a BAT-compliant design. During operation there will be process control and monitoring systems in place as well as pressure relief and safety systems. Throughout operation there will be preventative maintenance and inspection regimes implemented.	ALARP (Tolerable) – potential risks will be controlled through COMAH, BAT-compliant design and the mitigation measures outlined. Therefore, this risk is not significant.	No

Grouped risk event	Hazard source	Pathway	Receptor	Reasonable worst-case if event did occur	Embedded mitigation	Is this ALARP with embedded mitigation?	Is secondary mitigation required?
			habitats and controlled waters).	cause significant and potentially irreversible environmental harm. For human receptors, the worst case is loss of life and/or permanent injury.			
Industrial & urban accident – external (COMAH/ nuclear sites)	There is the potential for a major accident at nearby COMAH-regulated facilities within the Teesside industrial cluster and/or Hartlepool Nuclear Power Station within the Study Area.	There is the potential pathway for thermal radiation, blast overpressure and/or toxic/radiological dispersion reaching the Site. This could cause a potential constraint on emergency response or evacuation.	Key receptors include: The public; site infrastructure; the natural environment (including controlled waters and designated habitats).	Off-site major accident results in thermal, blast or plume effects reaching the Site, causing damage to infrastructure and triggering a secondary accident (e.g. fire, loss of containment or contamination event) For human receptors, the worst case is loss of life and/or permanent injury.	This risk is managed through land-use planning controls (PADHI) and COMAH regulation (including off-site emergency planning and separation distances).	ALARP (Tolerable) – risk managed through external regulatory regimes, spatial separation and communication with neighbouring operators. Therefore, this risk is not significant .	No
Industrial & urban accident – power/ infrastructure failure (including overhead lines)	There is the potential for failure of external electrical infrastructure (including overhead lines and grid supply) which would affect the Site's auxiliary power supply (including ~5 MWe connection)	Loss of power leading to shutdown or upset of SAF production, the CHP and associated systems. There is the potential for failure of safety-critical control systems if they are not adequately backed up.	Key receptors include: The public; infrastructure; the natural environment (via secondary effects)	Loss of external power results in failure of process control/safety systems, leading to plant upset and potential loss of containment, fire or escalation event affecting environmental receptors. For human receptors, the worst case is loss of life and/or permanent injury.	Redundant systems and backup power arrangements (emergency diesel generators and diesel fuel tanks) will be in place throughout operation. There will be emergency shutdown systems in place alongside process safety controls. The electrical systems will be monitored and maintained throughout operation.	ALARP (Tolerable) – the risks are reduced to low through the mitigation measures outlined. Therefore, this risk is not significant .	No
Major accident hazard pipelines (on/off-site)	Due to the presence of high-pressure gas, product and CO ₂ pipelines within and adjacent to the Site, there is the potential for	Loss of containment could lead to vapour dispersion or ignition; fire/explosion; potential migration via	Key receptors include: The public; infrastructure;	Pipeline failure could result in fire/explosion or toxic gas release, affecting receptors	The pipelines will be designed to the appropriate standards and will follow regulatory controls under pipeline safety and COMAH frameworks.	ALARP (Tolerable) – risks tightly regulated and managed to reduce risk to low.	No

Grouped risk event	Hazard source	Pathway	Receptor	Reasonable worst-case if event did occur	Embedded mitigation	Is this ALARP with embedded mitigation?	Is secondary mitigation required?
	rupture, corrosion or operational failure.	drainage leading to environmental contamination.	the natural environment (including designated habitats).	and potentially causing secondary incidents or cascading failures within the Site or wider network. For human receptors, the worst case is loss of life and/or permanent injury.	Throughout operation there will be regular inspection and maintenance.	Therefore, this risk is not significant .	
Dust explosion	Dust explosion associated with the handling, processing, drying or storage of combustible particulate materials during operation. Under certain conditions, fine particulate matter suspended in air can ignite and rapidly combust, generating overpressure, thermal radiation and secondary explosions.	Dust suspension and ignition could lead to overpressure/structural failure and secondary fires.	Key receptors include: the public; infrastructure; the natural environment (including designated habitats).	Dust explosion could result in fire/explosion, potential loss of containment and potential damage to infrastructure. For human receptors, the worst case is loss of life and/or permanent injury.	The Proposed Development will comply with regulatory controls including DSEAR 2002 the COMAH frameworks. This also includes emergency response planning. Throughout operation there will be dust management and housekeeping procedures implemented to prevent accumulation of explosive atmospheres. There will be fire detection and suppression systems in place throughout operation.	ALARP (Tolerable) – risks tightly regulated and managed to reduce risk to low. Therefore, this risk is not significant .	No
Fuel storage accident	Above-ground storage of SAF/naphtha (~60,000 tonnes), biomass feedstock storage in silos and stores, and storage of methanol.	Tank/silo failure or ignition source can lead to fire/explosion or vapour cloud and runoff via drainage systems to surface waters.	Key receptors include: public; infrastructure; the natural environment (including the River Tees and designated sites).	Storage failure could result in large-scale fire/explosion or vapour cloud, with potential for widespread environmental contamination via runoff or plume dispersion. For human receptors, the worst case is loss of life and/or permanent injury.	Compliance with environmental permitting and COMAH where applicable. Process controls, including monitoring systems, (temperature/oxygen) will be in place throughout operation. There will be bunding and secondary containment in place	ALARP (Tolerable) – risks tightly regulated and managed to reduce risk to low. Therefore, this risk is not significant .	No
Pollution accident – gas release	Loss of containment of process gases (e.g. CO ₂ , H ₂ S, HCN, ammonia, nitrogen) from plant systems and pipelines	Potential for atmospheric dispersion and potential accumulation in low-lying areas or enclosed spaces.	Key receptors include: the public; infrastructure; the natural environment (where indirect effects arise)	Release of gas results in toxic or asphyxiant cloud affecting off-site receptors, potentially causing serious health impacts.	The Proposed Development, including gas containment, will be designed to the appropriate standards and will be subject to inspection/maintenance regimes. Throughout operation, gas detection systems and containment/process controls will be in place.	ALARP (Tolerable) – risks tightly regulated and managed to reduce risk to low. Therefore, this risk is not significant .	No

Grouped risk event	Hazard source	Pathway	Receptor	Reasonable worst-case if event did occur	Embedded mitigation	Is this ALARP with embedded mitigation?	Is secondary mitigation required?
Pollution accident – liquid release	Loss of containment of liquids (SAF, naphtha, chemicals, methanol, fuel for ancillaries) from storage, process plant or pipelines	Potential for runoff via hardstanding and drainage systems; infiltration to ground; and discharge to controlled waters and estuary.	Key receptors include: The natural environment (surface water, groundwater, designated habitats); the public (via downstream exposure).	Loss of containment leads to pollution of the River Tees, groundwater or designated habitats, causing persistent environmental damage. For human receptors, the worst case is loss of life and/or permanent injury.	As part of the Proposed Development detailed design, bunding, kerbing and impermeable surfaces will be used. There will also be segregated drainage and retention ponds. The Proposed Development will be compliant with the Environmental Permit and BAT-compliant systems.	ALARP (Tolerable) – physical containment and drainage controls break pathways. Therefore, this risk is not significant .	No
Thermal / radiation release	Emissions of heat from flare (up to 140 m), CHP plant and process systems.	Radiant heat transfer or thermal plume affecting nearby infrastructure or areas.	Key receptors include: The public; infrastructure; the natural environment (indirectly via escalation).	Excessive thermal exposure results in damage to infrastructure or ignition of materials, leading to secondary loss of containment or a fire event. For human receptors, the worst case is loss of life and/or permanent injury.	Engineering design of flare and plant will comply with regulatory standards. Appropriate separation distances will be implemented and process control systems in place There will be regular inspection and maintenance of infrastructure.	ALARP (Tolerable) – risks tightly regulated and managed to reduce risk to low. Therefore, this risk is not significant .	No
Domino effects (inter-site escalation)	Incident at the Proposed Development or neighbouring COMAH installations within the Teesside industrial cluster.	There is the potential for sequential escalation between installations via heat, pressure or toxic release pathways.	Key receptors include: the public; infrastructure; the natural environment.	Initial incident escalates across installations, resulting in increased magnitude and spatial extent of harm to environmental and human receptors. For human receptors, the worst case is loss of life and/or permanent injury.	The Proposed Development will align with the COMAH regulatory regime, and will coordinate with regulators and neighbouring COMAH operators The risk is also mitigated through land-use planning and implementation of appropriate separation distances.	ALARP (Tolerable) – risks tightly regulated and managed to reduce risk to low. Therefore, this risk is not significant .	No
Transport infrastructure							
Transport accident (marine)	Marine movements associated with product export via River Tees and associated infrastructure; loading/unloading operations	Collision or vessel incident could lead to loss of containment, release to water/land, and ignition	Key receptors include: The natural environment	Transport incident results in major release (e.g. fuel spill to water or	The risk will be mitigated through regulatory controls and implementation of appropriate operational procedures.	Yes – risks managed through established operational frameworks	No

Grouped risk event	Hazard source	Pathway	Receptor	Reasonable worst-case if event did occur	Embedded mitigation	Is this ALARP with embedded mitigation?	Is secondary mitigation required?
			(including River Tees and designated habitats)	fire/explosion) causing significant pollution or safety impacts.	Navigation risk will be managed through coordination with port/harbour authorities and through implementation of the measures outlined within the Navigational Risk Assessment.		

19.7 Summary of significant effects

- 19.7.1 Various risks associated with natural hazards, major hazard sources, ground conditions and transport infrastructure have been identified and assessed.
- 19.7.2 Considering regulatory processes and embedded mitigation measures for the Proposed Development, it is considered that the potential MA&D events identified as having the potential to occur during the construction, operation and decommissioning phases will all be managed to be ALARP (tolerable). Therefore, the Proposed Development is not anticipated to give risk to any significant MA&D adverse effects during construction, operation or decommissioning.

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