NORTH LINCOLNSHIRE GREEN ENERGY PARK

Planning Act 2008

Infrastructure Planning (Applications Prescribed Forms and Procedure) Regulations 2009

APFP Regulation 5(2)(a)

Infrastructure (Environmental Impact Assessment) Regulations 2017

North Lincolnshire Green Energy Park

Volume 6

Environmental Statement

6.2.16 Major Accidents and Hazards

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Acronyms and Abbreviations

Name	Description
AGI	Above Ground Installation
ALARP	As Low As Reasonably Practicable
CCTV	Closed Circuit Television
CDM	Construction (Design and Management)
COMAH	Control Of Major Accident Hazards
CTMP	Construction Traffic Management Plan
CWTP	Construction Workers Travel Plan
DEMP	Decommissioning Environmental Management Plan
DSEAR	Dangerous Substances and Explosive Atmospheres Regulations
EIA	Environmental Impact Assessment
EV	Electric Vehicle
FEED	Front End Engineering Design
FGTr	Flue Gas Treatment Residue
HAZID	Hazard Identification
HSE	Health and Safety Executive
HSWA	Health and Safety at Work Act
IBA	Incinerator Bottoms Ash
IEMA	Institute of Environmental Management & Assessment
LoC	Loss of Containment
MA&D	Major Accidents and Disasters
MAH	Major Accident Hazard
NLGEP	North Lincolnshire Green Energy Park
NPS	National Policy Statement
NPSP	National Policy Statement for Ports
PEIR	Preliminary Environmental Information Report
PET	Polyethylene Terephthalate
PTD	Permanent Total Disability
RAF	Royal Air Force
RDF	Refuse Derived Fuel
SCR	Selective Catalytic Reduction
UK	United Kingdom

1. INTRODUCTION

1.1.1.1 This chapter of the Environmental Statement (ES) presents a review of potential Major Accidents and Disasters (MA&D) for the Project.

1.1.1.2 Following the requirements of The Infrastructure Planning (Environmental Impact Assessment) Regulation 2017 (as amended) (Infrastructure EIA Regulations 2017), the MA&D Assessment identifies and presents the potential significant adverse effects of the Project on safety and the environment deriving from the vulnerability of the Project to risks of major accidents and/or disasters.

1.1.1.3 The objective of the assessment is to demonstrate that all potential Major Accident Hazards (MAHs) associated with the Project have been considered and that the safety and environmental risks will be adequately managed in future phases.

1.1.1.4 The MA&D Assessment was carried out using the Hazard Identification (HAZID) study methodology which includes identification of sources/pathways/receptors, an assessment of the worst-case credible safety and environmental consequences and documenting of these planned measures to prevent or mitigate the undesirable events.

1.1.1.5 The objectives of the HAZID study are as follows:

- identification of potential MAHs;
- evaluation of the worst-case credible safety and environmental consequences;
- identification of measures envisaged to prevent or mitigate against the MAH;
- qualitative risk assessment before and after such measures are in place; and
- identification of any specific requirements to achieve the risk mitigation.

2. POLICY CONTEXT, LEGISLATION, GUIDANCE AND STANDARDS

2.1 Policy Context

2.1.1.1 The overarching National Policy Statements (NPS) for national infrastructure developments provide the primary policy framework within which the Project will be considered.

2.1.1.2 The designated NPSs relevant to the Project are the:

- Overarching Energy NPS (NPS EN-1); and
- NPS for Renewable Energy Infrastructure (NPS EN-3).

2.1.1.3 NPS EN-1 provides policy on safety and hazardous substances. Paragraph 4.11.1 states:

> *"HSE is responsible for enforcing a range of occupational health and safety legislation some of which is relevant to the construction, operation and decommissioning of energy infrastructure. Applicants should consult with the Health and Safety Executive (HSE) on matters relating to safety."*

2.1.1.4 Paragraphs 4.11.3 and 4.11.4 reference the need for energy infrastructure projects falling within the Control of Major Accident Hazards (COMAH) Regulations to meet the requirements of this separate legislation throughout the lifecycle of the facility and for applicants to consult early with the HSE (and Environment Agency as required). In the event a safety report is required, an applicant should consult on the type of information to be provided at the design and development stage. This is to allow the Competent Authority to assess whether the inherent features of the design are sufficient to prevent, control and mitigate major accidents before any significant construction work begins. In turn, the Planning Inspectorate must be satisfied that, for energy infrastructure projects falling within the COMAH Regulations, an assessment of safety considerations has been made and that the Competent Authority has assessed that it meets the safety objectives described in EN-1.

2.1.1.5 EN-1 also addresses the need (Paragraph 4.12.1) for facilities intending to hold stocks of certain hazardous substances above a threshold to obtain Hazardous Substances consent. An applicant is required to consult the Hazardous Substances Authority (NLC) and the HSE during the pre-application stage if a project is likely to need hazardous substances consent.

2.1.1.6 EN-1 goes on to set out HSE's role in assessing the risks based on the development consent application (Paragraph 4.12.2) and in setting consultation distances around sites with hazardous substances consent and notifying the relevant local planning authority accordingly (Paragraph 4.12.3). Paragraph 4.12.3 goes on to require an applicant to consult the local planning authority at preapplication stage as to whether its site is within the consultation distance of any site with hazardous substances consent and, in the event this is the case, to consult the HSE about locating development on the proposed site.

2.1.1.7 EN-3 does not add any material requirements on safety and hazardous substances to those contained in EN-1.

2.1.1.8 On 6 September 2021, BEIS published for consultation a suite of five draft National Policy Statements to guide energy development proposals. The new NPSs were subject to consultation until the end of November. The House of Commons BEIS Committee reported on the Revised (Draft) National Policy Statement for Energy on 22nd February 2022, providing recommendations in relation to the suite of revised draft NPSs. The expectation is that the suite of revised NPSs will be designated by Summer 2022.

2.1.1.9 The draft NPS EN-1 reiterates many of the considerations contained in NPS EN-1 but does go on to add in relation to Hazardous Substances Consent that:

> *"Hazardous substances consent can also be applied for subsequent to a DCO application. However, the guidance in 4.13.1 still applies i.e. the applicant should consult with HSE at the pre-application stage and include details in their DCO."*

2.1.1.10 The National Planning Policy Framework (NPPF) provides relevant considerations for MA&D assessment. Paragraph 45 requires that:

> *'Local planning authorities should consult the appropriate bodies when considering applications for the siting of, or changes to, major hazard sites, installations or pipelines, or for development around them'.*

2.1.1.11 Paragraph 97 notes that decisions:

> *'should promote public safety and take into account wider security and defence requirements by … anticipating and addressing possible malicious threats and natural hazards, especially in locations where large numbers of people are expected to congregate…this includes appropriate and proportionate steps that can be taken to reduce vulnerability, increase resilience and ensure public safety and security.'*

2.2 Legislation

2.2.1 EIA Legislation

2.2.1.1 The Infrastructure EIA Regulations 2017, implement the requirements of EU Directive 2014/52/EU, which requires a MA&D Assessment to be carried out as part of the EIA process.

2.2.1.2 The Infrastructure EIA Regulations 2017 require: 'A description of the expected significant adverse effects of the development on the environment deriving from the vulnerability of the development to risks of major accidents and/or disasters…' (Schedule 4, Paragraph 8).

2.2.1.3 Identification of MA&D and associated risks relevant to the Project is therefore required, together with the proposed measures to prevent or mitigate the significant adverse effects of such events on the environment.

2.2.2 Other Legislation

2.2.2.1 The Health and Safety at Work etc. Act 1974 (HSWA) places general duties on employers, people in control of premises, manufacturers and employees. Health and safety regulations made under this Act contain more detailed provisions. The Act provides the framework for the regulation of industrial health and safety in the UK. The overriding principle is that foreseeable risks to persons in workplaces shall be reduced so far as is reasonably practicable and that adequate evidence shall be produced to demonstrate that this has been done.

2.2.2.2 The Construction (Design and Management) (CDM) Regulations 2015 place specific duties on clients, designers and contractors so that health and safety is considered throughout the life of a construction development from its inception to its subsequent final demolition and removal. Under the CDM Regulations, designers are required to avoid foreseeable risks so far as reasonably practicable by eliminating hazards from the construction, cleaning, maintenance, and proposed use and demolition of a structure, reducing risks from any remaining hazard, and giving collective safety measures priority over individual measures.

2.2.2.3 The Planning (Hazardous Substances) Regulations 2015 implement land-use planning requirements under the Seveso III Directive (2012/18/EU) on the Control of Major Accident Hazards (COMAH). Hazardous substances consent is required for the presence of certain hazardous substances at or above controlled quantities specified. All applicable substances required for the construction and operation of the Project will be included in the Hazardous substances consent list.

2.2.2.4 The COMAH Regulations 2015 implement the Seveso III Directive (2012/18/EU), except for the land-use planning requirements. The COMAH Regulations aim to prevent and mitigate the effects of major accidents involving dangerous substances which can cause serious damage/harm to people and/or the environment. The competent authorities for the purposes of the COMAH Regulations in England is the Health and Safety Executive (HSE) and the Environment Agency.

2.2.2.5 If the installation falls within the COMAH Regulations, the Applicant as operator must meet the requirements of the regulations including:

- take all measures necessary to prevent major accidents and to limit their consequences for human health and the environment;
- demonstrate to the competent authority that it has taken all measures necessary as specified in the COMAH Regulations;
- provide the competent authority with such assistance as is necessary to enable the competent authority to perform its functions under the COMAH Regulations;
- prepare an on-site emergency plan (if upper tier); and
- notify any major accidents to the competent authority.

2.3 Guidance

2.3.1.1 The following documents have been used as guidance during the development of the MA&D Assessment:

- The Institute of Environmental Management and Assessment guidance document 'Major Accidents and Disasters in EIA: A Primer'
- Chemicals and Downstream Oil Industries Forum Guidelines, Environmental Risk Tolerability for COMAH Establishments;
- Guidelines for Environmental Risk Assessment and Management (Defra, 2011);
- Kletz, Trevor A. HAZOP and HAZAN: Identifying and Assessing Process Industry Hazards. Rugby, Warwickshire, UK: Institute Of Chemical Engineers, 1992, ISBN 978-1-560-32858-2
- Kletz. Trevor A. Process Plants – a Handbook for Inherently Safer Design. 2nd ed. USA: Centre for Chemical Process Safety; 2006
- ISO 31000:2009 Risk Management principles and guidelines (The International Standards Organization, 2009); and
- Reducing Risks, Protecting People: HSE's decision making process, (HSE, 1999).
- HSE Further guidance on emergency plans for major accident hazard pipelines (2006)
- Guidance on conveying carbon dioxide in pipelines in connection with carbon capture and storage projects (HSE, 2020);
- CO_2 Pipelines Good Practice Guidelines – Technical Report (HSE, 2013); and
- Assessment of the major hazard potential of Carbon Dioxide (HSE, 2011).

2.3.1.2 The UK HSE uses the principles of As Low as Reasonably Practicable (ALARP) in risk management. At the core of ALARP is the concept of "reasonably practicable"; this involves weighing a risk against the trouble, time and money needed to control it. Thus, ALARP describes the level to which the HSE expect to see workplace risks controlled. The concept of ALARP has been aligned with the assessment criteria in Section 5.2 to provide an initial review of the mitigated risk levels. However, ensuring that risks are mitigated to ALARP will be reviewed in significantly more detail during hazard studies at later stages of the Project (i.e. during detailed design).

2.3.1.3 The HSE does not currently provide Land Use Planning (LUP) advice for CO_2 capture, transport or storage, and the status of the Proposed Development relating to the Control of Major Accident Hazards (COMAH) Regulations has not been confirmed (although likely to be lower tier or below).

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3. CONSULTATION

3.1.1.1 Table 1 and Table 2 below respectively present excerpts from the scoping opinion received from the Planning Inspectorate and consultation responses on the PEIR specific to the Major Accidents and Disasters assessment. The tables describe how each response has been addressed, and, as appropriate where more information can be found in the ES.

Table 1: Scoping Consultation Responses

PINS ID	Issue	Inspectorate's comments	Response / Action	Reference within this document
4.12.1	Proposed to be scoped out: Risks of major accidents and/or disasters	Insufficient information has been provided to evidence that there is no risk that major accidents and/ or disasters would arise. Therefore, the Inspectorate does not agree that this matter can be scoped out of the ES. The ES should include an assessment of risk of major accidents and disasters relevant to the Project, which makes it clear which components of the Project and associated development have been included in the assessment.	Chapter 17 of the PEIR (this chapter) presents a MA&D Assessment for the Project.	Chapter 17
N/A	Consideration of risk assessments	Health and Safety Executive (HSE) response. Regulation 5(4) of the Infrastructure Planning (Environmental Impact Assessment) Regulations 2017 requires the assessment of significant effects to include, where relevant, the expected significant effects arising from the proposed development's vulnerability to major accidents.	The assessment has been carried out using the Hazard Identification (HAZID) study methodology which includes identification of the proposed development's vulnerability to major accidents.	Section 7

3.1.1.2 Table 2 below sets out the key stakeholder comments from the pre-application statutory consultation specific to Traffic and Transport. The table describes how each response has been or will be addressed by the Project. Responses have been included when they are directly relevant to the Infrastructure Planning (Environmental Impact Assessment) Regulations 2017 (the Infrastructure EIA Regulations 2017), have required a technical clarification and / or further impact assessment. The full set of responses is contained in the Consultation Report (**Document Reference: 7.1** Appendix I-1).

3.1.1.3 The consultee types for the purposes of statutory consultation under the 2008 Act are as follows:

- s42(a) is with prescribed consultees;
- s42(b) is with local authorities;
- s44 is with consultees with an interest in land; and
- s47 is with the local community.

Table 2: Section 42 and Section 47 Consultation Responses on the PEIR

Consultee type	Consultee	Comments	Response / Action	Reference within this document
S24(a)	Burton upon Stather Parish Council	There are still strong memories of NYPRO and many residents are still affected by it. This development will bring many of their concerns to the forefront again.	We recognise the importance of industrial health and safety to the community in the context of the 1974 Nypro disaster. The Project provides an ERF, which is for a different process than that undertaken at the Nypro UK chemical plant, and is designed to be safe and minimise the risk of accidents. The design has been informed and reinforced by an assessment of major accidents and disasters in Chapter 16: Major Accidents and Hazards of the Environmental Statement (**Document Reference 6.2.16).** We have also consulted with relevant statutory consultees such as Humberside Fire and Rescue and The Health and Safety Executive (HSE).	N / A
S24(a)	The Health and Safety Executive	Hazardous Substance Consent The presence of hazardous substances on, over or under land at or above set threshold quantities (Controlled Quantities) will probably require Hazardous Substances Consent (HSC) under the Planning (Hazardous Substances) Act 1990 as amended. The substances, alone or when aggregated with others for which HSC is required, and the associated Controlled Quantities, are set out in The Planning (Hazardous Substances) Regulations 2015 as amended. HSC would be required to store or use any of the Named Hazardous Substances or	This is noted. Further information on Hazardous Substances Consent will be sought from the relevant Hazardous Substances Authority.	N / A

Consultee type	Consultee	Comments	Response / Action	Reference within this document
		Categories of Substances at or above the controlled quantities set out in Schedule 1 of these Regulations. Further information on HSC should be sought from the relevant Hazardous Substances Authority.		
S24(a)	The Health and Safety Executive	Will the proposed development fall within any of HSE's consultation distances? According to HSE's records the proposed DCO application of where people will be potentially located in this Nationally Significant Infrastructure Project is not within the consultation zones of any major accident hazard site or major accident pipeline. This is based on the current configuration as illustrated in, for example, the Masterplan within the document 'North Lincolnshire Green Energy Park, Summer 2021 Public Consultation Information'. HSE would not advise against the current proposal.	This is noted. We can confirm that the development does not fall within any of HSE's consultation distances.	N / A
S24(a)	The Health and Safety Executive	Explosives sites HSE has no comment to make as there are no licensed explosives sites in the vicinity.	This is noted.	N / A
S24(a)	The Health and Safety Executive	Electrical Safety No comment from a planning perspective.	This is noted.	N / A
S47	Local Community	Don`t you think the people of Amcotts have suffered enough in the past with the biggest peace time explosion ever experienced, surely storing Hydrogen on site will raise major concerns, considering every house in	We recognise the importance of industrial health and safety to the community in the context of the 1974 Nypro disaster. The Project provides an Energy Recovery Facility (ERF), which involves a different process than that	Section 6, Section 7 and Section 8

Consultee type	Consultee	Comments	Response / Action	Reference within this document
		Amcotts hasn`t got a roof older than 1974 when the Flixborough disaster blew them all off, you`re probably too young to remember this, but I`m not and this news is very concerning to say the least.	undertaken at the Nypro UK chemical plant. It is also our intention to provide Hydrogen, heat and battery storage as part of the Project. H_2 as a fuel is recognised as being significantly safer than petrol or diesel to store and there are now a large number of refuelling stations deployed in city centres. Energy storage, whether in the form of a battery for electricity, steam accumulators for heat, or compressed gas cylinders for biogas or hydrogen, is highly regulated and additional safeguards are deployed in areas such as H_2 re-fuelling stations. Local planning and permitting requirements govern all installations, which include the fire regulations pertaining to each installation. The design has been informed and reinforced by an assessment of the potential for major accidents and hazards in Chapter 16: Major Accidents and Hazards of Environmental Statement **(Document Reference 6.2.16)** to assure the risk of major accidents or hazards (including environment) identified through the assessment is appropriately managed by the proposed mitigation embedded within the Project design. We have also consulted with relevant statutory consultees such as Humberside Fire and Rescue and The Health and Safety Executive as part of the process	
S47	Local Community	Whilst it is appreciated that the development will be on an industrial site, since the Flixborough (Nypro) disaster the units and	We recognise the importance of industrial health and safety to the community in the context of the 1974 Nypro disaster.	Section 6, Section 7 and Section 8

Consultee type	Consultee	Comments	Response / Action	Reference within this document
		businesses which have been located on this site are small scale or medium concerns with little or no impact upon the surrounding area. Residents are conscious that any breach of regulations (be it discharge of harmful chemicals into the atmosphere, noise or accidents associated with transportation of waste) will take an unacceptable amount of time to solve with regard to breach of regulations.	The Project provides an ERF, which involves a different process than that undertaken at the Nypro UK chemical plant. It is also our intention to provide H_2, heat and battery storage as part of the Project. H_2 as a fuel is recognised as being significantly safer than petrol or diesel to store and there are now a large number of H_2 refuelling stations deployed in city centres. Energy storage, whether in the form of a battery for electricity, steam accumulators for heat, or compressed gas cylinders for biogas or H_2, is highly regulated and additional safeguards are deployed in areas such as re-fuelling stations. Local planning and permitting requirements govern all installations, which include the fire regulations pertaining to each installation. The design has been informed and reinforced by an assessment of the potential for major accidents and hazards in Chapter 16: Major Accidents and Hazards of Environmental Statement **(Document Reference 6.2.16)** to assure the risk of major accidents or hazards including environmental incidents) identified through the assessment is appropriately managed by the proposed mitigation embedded within the Project design. The detailed design will implement specific measures in line with recognised and recommended practices to prevent, reduce and mitigate risk of hazardous conditions such as uncontrolled discharge of substances which have a potential for health, safety or environmental impact.	

Consultee type	Consultee	Comments	Response / Action	Reference within this document
			The monitoring of these risks and aspects will be implemented in line with competent authority requirements (emissions monitoring for example), recommended practices (e.g. waste management and transportation) and in collaboration with the relevant competent authorities. Please refer to the next section with regards to noise control related measures. We have also consulted with relevant statutory consultees such as Humberside Fire and Rescue and The Health and Safety Executive as part of the process The Project's emissions will comply with the requirements of the Environment Agency, under the Environmental Permitting (England and Wales) Regulations 2016 (as amended). This will require an application for a new Environmental Permit and compliance with established and emerging Best Available Techniques conclusions and guidance. Once operational, emissions from the Project will be regulated by the Environment Agency accordingly.	
S47	Local Community	We were promised after the Nypto disaster that certain chemicals would never be stored and used in that vicinity again. Im assuming there will be many different chemicals involved in this. This incinerator is not a good idea.	We recognise the importance of industrial health and safety to the community in the context of the 1974 Nypro disaster. The Scheme provides an ERF, which involves a different process than that undertaken at the Nypro UK chemical plant. It is also our intention to provide H_2, heat and battery storage as part of the Scheme. H_2 as a fuel is recognised as being significantly safer than petrol or diesel to store and there are	Section 6, Section 7 and Section 8

Consultee type	Consultee	Comments	Response / Action	Reference within this document
			now a large number of H_2 refuelling stations deployed in city centres. Energy storage, whether in the form of a battery for electricity, steam accumulators for heat, or compressed gas cylinders for biogas or H_2, is highly regulated and additional safeguards are deployed in areas such as re-fuelling stations. Local planning and permitting requirements govern all installations, which include the fire regulations pertaining to each installation. The design has been informed and reinforced by an assessment of the potential for major accidents and hazards in Chapter 16: Major Accidents and Hazards of Environmental Statement **(Document Reference 6.2.16)** to assure the risk of major accidents or hazards (including environment) identified through the assessment is appropriately managed by the proposed mitigation embedded within the Project design. We have also consulted with relevant statutory consultees such as Humberside Fire and Rescue and The Health and Safety Executive as part of the process Please note that the Project meets the R1 energy efficiency criteria set out in the Waste Framework Directive 2008/98/C (WFD) to qualify as an energy recovery operation and is therefore an Energy Recovery Facility rather than an incinerator.	
S47	Local Community	I would like to know if precautions have been included for the worst case scenario of the effects of fire or explosions.	The design has been informed and reinforced by an assessment of the potential for major accidents and hazards in Chapter 16: Major Accidents and	Section 6, Section 7 and Section 8

Consultee type	Consultee	Comments	Response / Action	Reference within this document
		I don't know what connections you have between the various facilities but as you are dealing with power I believe there should be means of containing any problem to the area it starts. For instance, are the areas connected by conveyor systems or cable tunnels? These are ways that any problems can migrate quickly. It would be good to have cut off systems built in. It looks as though areas 13, 14, 15 are fairly close together and obviously all are dealing with aspects of power.	Hazards of Environmental Statement **(Document Reference 6.2.16)** to assure the risk of major accidents or hazards (including environment) identified through the assessment is appropriately managed by the proposed mitigation embedded within the Project design. The detailed design will implement specific measures to ensure that in case of developing fire or explosion capable scenarios the necessary measures (which may include appropriately engineered cut-off/safe shutdown systems) and actions are taken to achieve a safe state. In the case of the risks identified, the mitigation measures include the installation of fire suppression systems and fire walls, and the siting of critical equipment beyond the 'separation distances' mandated by design codes and regulatory standards. Whilst some equipment is connected by cables, pipework or conveyors where required for operation, the equipment will be designed such that each component can be isolated if required, both for maintenance and safety. The ERF contains both active and passive fire protection, including sprinkler and water cannons within the fuel storage area, gaseous suppression systems to electrical rooms, and fire walls to prevent the spread of fires. H_2 production and storage has been located outdoors to minimise the risk of build-up of explosive atmosphere. The indicative design shows	

Consultee type	Consultee	Comments	Response / Action	Reference within this document
			a blast wall which surrounds the H_2 storage, providing passive fire protection. The battery storage facility will also be designed with passive fire protection. Containers will be located a safe distance from each other to prevent the spread of fires. Where this is not possible, fire walls will be used to ensure separation between containers.	
S47	Local Community	The general feeling is that this is a totally inappropriate proposal, and you could not have picked a worst location for this development given that the people of Flixborough and the surrounding area were victims of the major Nypro disaster which was located on this industrial estate. Whilst acknowledging that it was 45 years ago, it is still within living memory, lives were sadly lost, homes damaged, people displaced, and we were witness to something that resembled a war zone.	We recognise the importance of industrial health and safety to the community in the context of the 1974 Nypro disaster. The Project provides an Energy Recovery Facility (ERF), which involves a different process than that undertaken at the Nypro UK chemical plant. It is also our intention to provide H_2, heat and battery storage as part of the Project. H_2 as a fuel is recognised as being significantly safer than petrol or diesel to store and there are now a large number of H_2 refuelling stations deployed in city centres. Energy storage, whether in the form of a battery for electricity, steam accumulators for heat, or compressed gas cylinders for biogas or H_2, is highly regulated and additional safeguards are deployed in areas such as re-fuelling stations. Local planning and permitting requirements govern all installations, which include the fire regulations pertaining to each installation. The design has been informed and reinforced by an assessment of the potential for major accidents and hazards in Chapter 16: Major Accidents and	Section 6, Section 7 and Section 8

Consultee type	Consultee	Comments	Response / Action	Reference within this document
			Hazards of Environmental Statement **(Document Reference 6.2.16)** to assure the risk of major accidents or hazards (including environment) identified through the assessment is appropriately managed by the proposed mitigation embedded within the Project design. We have also consulted with relevant statutory consultees such as Humberside Fire and Rescue and The Health and Safety Executive.	
S47	Local Community	Residents were of the belief that promises were made for steps to be taken which would prevent any such disaster (or similar) happening again by industrial processes such as these NOT being permitted next to the village of Flixborough. We firmly believe that no amount of promises or legal assurances from yourselves that this particular processing plant is different – safe – compliant with COMAH will serve to completely re-assure them on the absolute safety of this proposed development. This proposal is insensitive at best, and at worst another disaster/accident waiting to happen. For instance, residents are duly concerned regarding the storage of liquid hydrogen having to be kept at minus 250 degrees – what if any of the intended fail safes FAIL. The term 'Major Accident Plan' in itself is enough to cause enormous fear and concern to residents. We therefore have to assume that the mental health and wellbeing of	We recognise the importance of industrial health and safety to the community in the context of the 1974 Nypro disaster. The Project provides an Energy Recovery Facility (ERF), which involves a different process than that undertaken at the Nypro UK chemical plant. It is also our intention to provide H2, heat and battery storage as part of the Project. H2 as a fuel is recognised as being significantly safer than petrol or diesel to store and there are now a large number of H2 refuelling stations deployed in city centres. Energy storage, whether in the form of a battery for electricity, steam accumulators for heat, or compressed gas cylinders for biogas or H2, is highly regulated and additional safeguards are deployed in areas such as re-fuelling stations. Local planning and permitting requirements govern all installations, which include the fire regulations pertaining to each installation. The design has been informed and reinforced by an assessment of the potential for major accidents	Section 6, Section 7 and Section 8

Consultee type	Consultee	Comments	Response / Action	Reference within this document
		residents is already being negatively impacted by these proposals.	and hazards in Chapter 16: Major Accidents and Hazards of Environmental Statement **(Document Reference 6.2.16)** to assure the risk of major accidents or hazards (including assessment is appropriately managed by the proposed mitigation embedded within the Project design. We have also consulted with relevant statutory consultees such as Humberside Fire and Rescue and The Health and Safety Executive.	
S47	Local Community	Has the fact that the storage of thousands of litres of highly inflammable solvents at JOTUN paints (which is located next to the proposed development) been taken into account when assessing risks. Can any mitigation measures completely negate any potential combustion event? We are well aware that the Nypro explosion was a result of a flammable mixture coming into contact with a source of ignition.	We recognise the importance of industrial health and safety to the community in the context of the 1974 Nypro disaster. The Project provides an Energy Recovery Facility (ERF), which involves a different process than that undertaken at the Nypro UK chemical plant. It is also our intention to provide H_2, heat and battery storage as part of the Project. H_2 as a fuel is recognised as being significantly safer than petrol or diesel to store and there are now a large number of H_2 refuelling stations deployed in city centres. Energy storage, whether in the form of a battery for electricity, steam accumulators for heat, or compressed gas cylinders for biogas or H_2, is highly regulated and additional safeguards are deployed in areas such as re-fuelling stations. Local planning and permitting requirements govern all installations, which include the fire regulations pertaining to each installation.	Section 6, Section 7 and Section 8

Consultee type	Consultee	Comments	Response / Action	Reference within this document
			The design has been informed and reinforced by an assessment of the potential for major accidents and hazards in Chapter 16: Major Accidents and Hazards of Environmental Statement **(Document Reference 6.2.16)** to assure the risk of major accidents or hazards (including environment) identified through the assessment is appropriately managed by the proposed mitigation embedded within the Project design. We have also consulted with relevant statutory consultees such as Humberside Fire Informal discussions have taken place with Jotun Paints – both parties are keen to work together to minimise overall risk.	
S47	Local Community	Back in the 1970s, in fact the date was 1st june 1974, the production plant for CAPROLACTUM was also at the Flixborough site , on the date mentioned the plant exploded and the blast range was felt over thirty miles away , at this plant was also a Hydrogen production plant .Now what iam asking is the proposed North Lincolnshire green energy park is it as dangerous because there is Hydrogen production and storage facility on your site and everybody knows that Hydrogen is very explosive and dangerous .	We recognise the importance of industrial health and safety to the community in the context of the 1974 Nypro disaster. The Project provides an Energy Recovery Facility (ERF), which involves a different process than that undertaken at the Nypro UK chemical plant. It is also our intention to provide H_2, heat and battery storage as part of the Project. H_2 as a fuel is recognised as being significantly safer than petrol or diesel to store and there are now a large number of H_2 refuelling stations deployed in city centres. Energy storage, whether in the form of a battery for electricity, steam accumulators for heat, or compressed gas cylinders for biogas or H_2, is highly regulated and additional safeguards are deployed in areas such as re-fuelling stations.	Section 6, Section 7 and Section 8

Consultee type	Consultee	Comments	Response / Action	Reference within this document
			Local planning and permitting requirements govern all installations, which include the fire regulations pertaining to each installation. The design has been informed and reinforced by an assessment of the potential for major accidents and hazards in Chapter 16: Major Accidents and Hazards of Environmental Statement **(Document Reference 6.2.16)** to assure the risk of major accidents or hazards (including environment) identified through the assessment is appropriately managed by the proposed mitigation embedded within the Project design. We have also consulted with relevant statutory consultees such as Humberside Fire.	

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4. ASSESSMENT PARAMETERS

4.1 Assessment Scope

4.1.1.1 The MA&D Assessment covers all aspects of the Project that could have potential significant adverse effects on people and the environment.

4.1.1.2 Three COMAH sites within 5 km of the ERF were identified from a review of the Control of Major Accident Hazards (COMAH) Regulations 2015 public register. Of these, only Jotun Paints (Europe) Limited was in close proximity; the other two sites were circa 1.5 km and 4 km away.

4.1.1.3 The MA&D Assessment covers both construction and operational phases of the Project. However, only significant adverse safety or environmental impacts have been considered. For example, typical safety hazards associated with construction have not been included in the assessment.

4.1.1.4 Hazards arising during the decommissioning phase of the Project are considered comparable to those that would be experienced during the construction period. Appropriate best practice mitigation measures will be applied during any decommissioning works and documented in a future Decommissioning Environmental Management Plan (DEMP) that will be developed in accordance with legislative requirements that prevail at the time of decommissioning and other factors such as the proposed after use of the site.

4.1.1.5 The elements of the Project were screened to focus on those with potential for significant adverse safety or environmental impacts. The following elements were included within the MA&D Assessment following the screening:

- Energy Recovery Facility (ERF);
- Carbon capture utilisation and storage facility;
- Carbon dioxide pipeline connecting to the Humber Low Carbon pipeline;
- Water treatment facility;
- Residue handling and treatment facility;
- Concrete block manufacturing facility;
- Plastic Recycling facility;
- Electric vehicle and hydrogen refuelling station;
- Hydrogen and natural gas above ground installation;
- Hydrogen production and storage facility;
- Switchyard; and
- Utilities.

4.2 Assessment Limitations

4.2.1.1 This assessment is a preliminary review based on information available at this stage. The assessment provides a summary of the significant MA&D

hazards from the Project, the potential worst-case consequences these could pose and any required mitigation. Further hazard and risk analysis will be undertaken throughout the lifecycle of the Project in accordance with the requirements of applicable legislation and industry good practice guidance.

4.2.1.2 This assessment has applied Rochdale Envelope principles, which involves assessment of the worst-case credible MA&D risks and consequences associated with the Project. This conservative methodology establishes the worst-case scenarios, the risk of which should be reduced to a level that is ALARP during the detailed design, construction planning and operation of the Project.

4.2.1.3 At this stage, safety and control systems have not yet been fully designed for the Project. However, good practice industry approaches to managing risk will be used. In addition, equipment such as process monitoring, safeguarding systems and other mitigation will be provided as required.

4.2.1.4 Modelling of potential releases will need to be carried out as part of the next phase of the design of the site – i.e. in the detailed design phase. The results of this exercise can then be used to inform the future detailed hazard studies which need to be undertaken. The results of this work will also be a key input required for the development of emergency plans to cope with credible major accident scenarios.

5. ASSESSMENT METHODOLOGY AND SIGNIFICANCE CRITERIA

5.1 Approach to the Assessment

5.1.1.1 The objective of the MA&D assessment is to demonstrate that all potential MAHs associated with the Project and their likely significant effects have been considered at this early stage and that the safety and environmental risks will be adequately managed in future phases.

5.1.1.2 The MA&D assessment identifies the reasonably foreseeable worst-case consequence of each hazard on human health and the environment on the basis of its potential severity of harm and duration. However, all MA&D hazards and threats could result in some form of serious damage and therefore the assessment then considers the likelihood of a significant hazard or threat occurring.

5.1.1.3 In identifying the potential for the Project to create or alter the existing baseline MA&D risks for receptors, the assessment is conducted using an adapted Hazard Identification (HAZID) methodology. The following HAZID steps are explained in more detail in Section 5.3:

- select a hazard category from the checklist which is based on the concept design work completed to date and in accordance with industry standard approaches to hazard identification;
- identify sources, pathways and receptors;
- develop 'worst-case credible' consequences;
- risk ranking by estimating the severity & likelihood without mitigations in place;
- identify prevention, minimisation and/or mitigation measures;
- risk ranking with mitigation measures in place; and
- define requirements to achieve mitigations or any further actions required.

5.2 Assessment Criteria

5.2.1.1 Taking into account The Institute of Environmental Management and Assessment (2020) Major Accidents and Disasters in EIA Guide, the factors that are considered in determining whether potential adverse effects are 'significant' include:

- the geographic extent of the effects. Effects beyond the Project boundaries are more likely to be considered significant;
- the duration of the effects. Effects which are permanent (i.e. irreversible) or long lasting are considered significant;
- the severity of the effects in terms of number, degree of harm to those affected and the response effort required. Effects which trigger the mobilisation of substantial civil emergency response effort are likely to be considered significant;

- the sensitivity of the identified receptors; and
- the effort required to restore the affected environment. Effects requiring substantial clean-up or restoration efforts are likely to be considered significant.

5.2.1.2 The assessment has used a high-level risk matrix to categorise threats and hazards, based on the severity of the consequence and likelihood. The risk matrix used in the assessment was developed based on a review of sources listed in Section 2.3. The risk matrix is presented in Appendix B Figure 1.

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5.2.1.3 Severity of the consequence of a hazard or threat is determined on the basis of the reasonably foreseeable worst-case safety and environmental effects of the event. The likelihood of the hazard or threat occurring is determined based on the likelihood of the cause, taking into account the source-pathway-receptor linkage.

5.2.1.4 The combination of severity and likelihood provide an estimate of the risk. The risk is estimated first without proposed mitigation. The risk is then estimated with proposed mitigation in place. The risk is categorised using the matrix in terms of '1 - Low risk', '2 - Medium risk', '3 - High Risk', '4 - Extreme Risk'. These are aligned with the ALARP principle as follows:

- Risks categorised as 'Low risk' are assumed to be 'broadly acceptable'.
- Risks categorised as 'Medium' or 'High' (when including mitigations) would generally sit within the 'tolerable if ALARP' region and require a more detailed review of mitigations in order to demonstrate that the risk is ALARP.
- Risks categorised as 'Extreme' (when including mitigations) are generally considered as 'intolerable' and require further mitigations in order to reduce the risk to ALARP.

5.2.1.5 Risks categorised as 'broadly acceptable' and 'tolerable if ALARP' (with mitigation in place) are not considered to have significant environmental effects; a risk categorised as extreme (with mitigation in place) would have a significant environmental effect.

5.2.1.6 It is noted that this assessment does not constitute a formal ALARP demonstration and any inferred alignment between the ALARP regions and the levels of risk claimed is purely indicative, due to the early stage of the design

5.3 Assessment Methodology

5.3.1.1 The MA&D Assessment was carried out using the HAZID methodology. The following sections describe the key steps in the HAZID study process.

5.3.2 Step 1: Divide the Project into Nodes or Stages

5.3.2.1 The Project was divided into the construction and operation phases for the HAZID study assessment.

5.3.3 Step 2: Select a Hazard Category and Guideword from the Checklist

5.3.3.1 Each node was analysed to determine the potential undesirable events. A checklist of hazard categories and guidewords has been developed based on the concept design work completed to date and in accordance with industry standard approaches to hazard identification, presented in Table 3.

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Table 3: Hazard Categories and Guidewords

Hazard Category	Guideword
Dangerous Substance	Hydrogen
Dangerous Substance	Natural Gas
Dangerous Substance	Diesel
Dangerous Substance	Oxygen
Dangerous Substance	Ammonia Solution
Dangerous Substance	Refuse Derived Fuel (RDF)
Dangerous Substance	Amine Solution
Dangerous Substance	Water Treatment Chemicals
Dangerous Substance	Carbon Dioxide (CO_2) – In storage and in pipelines.
Dangerous Substance	CO_2 Capture Effluent
Dangerous Substance	Incinerator Bottom Ash (IBA)
Dangerous Substance	Flue Gas Treatment Residue (FGTr)
Dangerous Substance	Miscellaneous
Natural Hazards	Extreme Weather
Natural Hazards	Lightning
Natural Hazards	Seismic Activity
Natural Hazards	Subsidence / Erosion
Natural Hazards	Flooding
Natural Hazards	Fire
Natural Hazards	Pandemic
External and third-party Hazards	Aircraft / Drone Crash
External and Third-Party Hazards	Structural / Building Collapse
External and Third-Party Hazards	Sabotage / Vandalism / Arson
External and Third-Party Hazards	Road Traffic Accident
External and Third-Party Hazards	Rail accident
External and Third-Party Hazards	Shipping accident
External and Third-Party Hazards	Impact from Adjacent Industrial Sites
External and Third-Party Hazards	Spillage / Leak of Pollutants / Storage of Materials
External and Third-Party Hazards	Release of Asbestos

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5.3.4 Step 3: Identify Sources, Pathways & Receptors

5.3.4.1 For each hazard category/guideword, all potential sources (i.e. cause of the hazard, which has the potential to cause harm) with potential to cause significant harm were identified. Pathways (i.e. the route by which the source can reach the receptor) and receptors (i.e. specific component of the environment that could be adversely affected) were also documented.

5.3.4.2 Receptors considered in the assessment include:

- population and human health including public and local communities;
- biodiversity;
- land, soil, water, air and climate; and
- property and material assets, cultural heritage and the landscape.

5.3.4.3 At this stage, screening was carried out to assess whether the source and pathway could result in a hazard which was deemed significant and therefore whether it was required to be assessed further as part of the MA&D Assessment. Where there was no potential for a significant hazard, the assessment was stopped with no risk assessment and the next checklist item was assessed.

5.3.4.4 The process of identifying MA&D hazards included a review of previous incidents and is based on the experience of technical safety consultants with experience in each of the sectors relevant to the Project.

5.3.5 Step 4: Develop Consequences

5.3.5.1 The 'worst-case credible' consequences of the undesirable event were evaluated and recorded. The unmitigated consequences (without giving credit to mitigations) were documented; however, inherently safer design features were considered when developing the consequences.

5.3.6 Step 5: Risk Rank without Mitigations

5.3.6.1 A risk ranking was calculated by combining the severity and estimated likelihood using the risk matrix in Figure 1 of Appendix B.

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5.3.6.2 The risk ranking was initially assigned without safeguards to assess the unmitigated risk.

5.3.7 Step 6: Identify Mitigations

5.3.7.1 Mitigation measures which the Project has committed to were documented for the identified sources and consequences.

5.3.8 Step 7: Risk Rank with Mitigations

5.3.8.1 A risk ranking was calculated with mitigations in place to determine the mitigated risk.

5.3.9 Step 8: Define Specific Requirements to Secure Mitigation Measures

5.3.9.1 Where the HAZID team identified a requirement that would need to be developed into mitigation in the subsequent phases (e.g. detailed design) of the Project, these were documented.

5.3.10 HAZID Study Meeting

5.3.10.1 The HAZID study was conducted on the 23rd April 2021 using Microsoft Teams and recorded using ProSET® v.6.2.0.0.

6. BASELINE AND RECEPTORS

6.1 Baseline

6.1.1.1 This section presents a description of the baseline environmental characteristics within the study area. The baseline relevant to this topic comprises:

- a description of potential natural hazards which may impact the Application Land, including meteorological hazards, geological hazards and other types of hazards;
- existing major accident hazard sources that may impact the Application Land; and
- sensitive environmental receptors within the study area at risk of MA&D hazards associated with the Project.

6.1.2 Natural Hazards

Meteorological Hazards

6.1.2.2 The Project is to be undertaken in North Lincolnshire. This is not an area associated with unusual meteorological hazards.

6.1.2.3 The Application Land however is located in an area at risk of flooding from the tidal River Trent. The potential impacts of flooding have been considered in Chapter 9 of the ES (**Document Reference 6.2.9**), and the standalone Flood Risk Assessment presented in Annex 3 (**Document Reference 6.3.3**).

Geological and Ground Related Hazards

6.1.2.4 The EnviroCheck report (Chapter 8 Appendix B of the ES (**Document Reference 6.2.8**)), states that there is no risk/ very low to low risk of hazards associated with ground stability, such as landslides, ground collapse, sinkholes, running sand and shrinking or swelling of clay at the Project Site.

6.1.2.5 The Phase 1 Desk Based Assessment (Chapter 8 Appendix D of the ES (**Document Reference 6.2.8**)) presents the geology underlying the Project and considers the potential for natural deposits to present ground related hazards. Further details are presented in Chapter 8 (**Document Reference 6.2.8**).

Seismic Hazards

6.1.2.6 North Lincolnshire is not an area associated with a high prevalence of seismic or other hazards; the Lincolnshire Earthquake occurred on 27 February 2008. According to the British Geological Survey, the earthquake registered a reading of 5.2 on the Richter scale, with its epicentre 2.5 miles (4 km) north of Market Rasen and 15 miles (24 km) southwest of Grimsby. This would have been felt in the area of the Project, but no hazardous consequences would be envisaged for such an event. There are currently no gas fracking sites in North Lincolnshire. There have been a number of

applications for experimental drilling, but as yet, no indication of shale gas deposits that would result in future fracking activities.

6.1.3 Existing Major Accident Hazards

6.1.3.1 The Project is located just to the South of an existing Upper Tier COMAH site – Jotun Paints. It would be necessary to liaise with this establishment as part of the detailed design stage, to verify if there are any potential major accident hazards associated with this site.

6.1.4 Sensitive Environmental Receptors

6.1.4.1 Chapter 3 (**Document Reference 6.2.3**) provides a description of the Project within the context of the nearby Sensitive Environmental Receptors. These include residential receptors, Public Rights of Way (PRoW), sensitive ecological receptors including the River Trent and Humber estuary, which contain sites of international and national importance for nature conservation), and the location of designated and non-designated heritage assets in proximity to the Project.

6.1.4.2 Further details related to sensitive ecological, heritage and human receptors are included in the technical chapters of this Environmental Statement (Chapters 5-17) (**Document References 6.2.5 to 6.2.17**).

7. HAZARD AND RISK ASSESSMENT

7.1.1.1 The tables from the HAZID study are presented in Table 4, showing the identified MAHs, source-pathway-receptor linkages, worst case credible consequences, mitigation measures and estimated risk before and after mitigation measures have been applied. The risk rankings are calculated using the HAZID risk matrix set out in Appendix B Figure 1 of this chapter.

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7.1.1.2 The likely significance of environmental effects derives from the risk categorisation set out in Table 4 as follows (see also matrix below):

- Risks categorised as 'broadly acceptable' and 'tolerable if ALARP' (with mitigation in place) are not considered to have significant environmental effects.
- A risk categorised as extreme (with mitigation in place) would have a significant environmental effect.

1 - Low Risk	**Acceptable**	**Environmental effect - Not significant**
2 - Medium Risk	Tolerable if ALARP	Environmental effect - Not significant
3 - High Risk	Tolerable if ALARP	Environmental effect - Not significant
4 - Extreme Risk	Unacceptable	Environmental effect - Significant

Table 4: Project HAZID Study Tables

Node ID	Project - Construction Phase
Node Description	Project Construction Phase, incorporating: (i) Energy Recovery Facility (ii) Carbon capture utilisation and storage facility (iii) Water treatment facility (iv) Residue handling and treatment facility (v) Concrete block manufacturing facility (vi) Plastic recycling facility (vii) Hydrogen production and storage facility (viii) Electric vehcile and hydrogen refuelling station (ix) Hydrogen and Natural Gas AGI (Above Ground Installation - pressure reducing station)
Mode Of Operation	Continuous for much of the plant.

Hazard Category / Guideword	Source and/or Pathways	Receptor(s)	Consequence		Risk Ranking Before			Mitigation		Risk Ranking After			Mechanisms for Securing Mitigation		
			Consequence	Cat	S	L	R	Mitigation	Tag	S	L	R	ID	Specific Requirements	Assignee
Dangerous Substance - Hydrogen	Discussed and will not cause a hazard during the construction phase.	N/A													
Dangerous Substance - Natural Gas	Discussed and will not cause a hazard during the construction phase.	N/A													
Dangerous Substance - Diesel	Diesel will be used on site to provide fuel for miscellaneous plant and equipment. Loss of containment of diesel considered.	None identified	Safety consequence considered. Volume in storage during the construction phase is likely to be low, therefore no MAH envisaged.	S									3	A philosophy for the storage/stock piling/control of all materials used in the construction phase will be developed by the construction contractor in accordance with best environmental / containment practice as part of the CEMP (see Code of Construction Practice, CoCP (**Document Reference 6.3.7**).	Construction Team
		Environment (Water, Biodiversity)	Spillage of diesel with the potential to cause an environmental incident. Diesel is an H411 substance, "toxic to aquatic life with long lasting effects". The site is adjacent to the River Trent therefore there could be environmental consequences. Volume of diesel stored during the construction phase is likely to be low, therefore consequence is limited.	E	2	B	2	Storage of diesel during the construction phase will need to be carefully managed through the provisions to be set out in the CEMP to meet secondary containment requirements (see also CoCP, **Document Reference 6.3.7**). Prior to commencement of the construction phase, a plan as part of the CEMP will be developed for management/recovery of spilt materials (see also Spill Response Plan appendix to the CoCP, **Document Reference 6.3.7**).	N/A N/A						
Dangerous Substance - Oxygen	Use of O2 cylinders for burning/welding activities during construction phase considered.	None identified	Very low quantities likely to be used. No MAH identified.	S											
Dangerous Substance - Ammonia Solution	Discussed and will not cause a hazard during the construction phase.	N/A													

Hazard Category / Guideword	Source and/or Pathways	Receptor(s)	Consequence		Risk Ranking Before			Mitigation		Risk Ranking After			Mechanisms for Securing Mitigation		
			Consequence	Cat	S	L	R	Mitigation	Tag	S	L	R	ID	Specific Requirements	Assignee
Dangerous Substance - Refuse Derived Fuel (RDF)	Discussed and will not cause a hazard during the construction phase.	N/A													
Dangerous Substance - Amine solution	Discussed and will not cause a hazard during the construction phase.	N/A													
Dangerous Substance - Water Treatment Chemicals	Discussed and will not cause a hazard during the construction phase.	N/A													
Dangerous Substance - Carbon Dioxide (CO2)	Discussed and will not cause a hazard during the construction phase.	N/A													
Dangerous Substance - CO2 capture effluent	Discussed and will not cause a hazard during the construction phase. The proposal includes installation of a Dense Phase CO_2 pipeline in a DHPWN trench buried to a depth of 1.5m.	N/A													
Dangerous Substance - Incinerator Bottom Ash	Discussed and will not cause a hazard during the construction phase.	N/A													
Dangerous Substance - Flue Gas Treatment Residue (FGTr)	Discussed and will not cause a hazard during the construction phase.	N/A													
Dangerous Substance - Miscellaneous	N/A	N/A													
Natural Hazards - Extreme Weather	Extremely high temperatures/drought conditions.	None identified	Team discussed and do not believe this will have a significant impact on the construction phase of the Project.					N/A							
	Extremely cold temperatures/freezing conditions.	None identified	Team discussed and this may at worse cause delays to construction process i.e. if roads are blocked due to snowfall. No MAH scenarios envisaged and as a result not considered further.					N/A							
Natural Hazards - Lightning	The area around the Project is very flat, therefore lightning strikes are not considered to be a high risk.	N/A													

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Hazard Category / Guideword	Source and/or Pathways	Receptor(s)	Consequence		Risk Ranking Before			Mitigation		Risk Ranking After			Mechanisms for Securing Mitigation		
			Consequence	Cat	S	L	R	Mitigation	Tag	S	L	R	ID	Specific Requirements	Assignee
Natural Hazards - Seismic Activity	There is a history of mild seismic activity in this area (e.g. the Market Rasen earthquake). Nothing has been experienced that is likely to cause significant harm/damage on the Application Land.	N/A													
Natural Hazards - Subsidence / Erosion	Construction activity generating disturbance / vibration which could cause ground instability / collapse / settlement.	Site Personnel	Localised collapse could lead to uncontrolled movement of plant and equipment with the potential to cause injury/fatality to personnel on the site. A secondary consequence could be damage to buildings/utilities in the area which could also have negative consequences.	S	4	B	3	Utilisation of construction industry methods to assess the likelihood and mitigate against ground instability on the construction site.	N/A	4	A	2	4	Carry out a detailed survey of the Application Land to identify areas where subsidence/ground collapse would be a concern.	Design Team
Natural Hazards - Flooding	Flooding from adjacent river (River Trent).	Site Personnel	Flooding of the site could lead to significant asset damage and potential to cause injury/fatality to personnel on the site.	S	4	C	3	The Project has been designed based on detailed flood modelling. The Construction Flood Management Plan to be set out in detail in the CEMP will assess the likelihood and mitigate against flood risk on the construction site (see also outline Flood Management Plan appendix to the CoCP, **Document Reference 6.3.7**).	N/A	3	B	2	22	Detailed Construction phase Flood Management Plan to be developed as part of the CEMP including flood risk and emergency planning (see also outline plan in appendix to the CoCP, **Document Reference 6.3.7**).	Design Team
Natural Hazards - Fire	Application Land is surrounded by farmland - crop fires have been noted in this area.	Site Personnel	Potential for smoke affecting site operations considered and not likely to generate a MAH that would affect the construction phase of the Project.	N/A											
Natural Hazards - Pandemic	Risk of pandemic causing a civil emergency.	Site Personnel	Risk of pandemic occurring which may cause civil emergency and large numbers of people to fall ill, including construction workers. Risk of loss of control of construction site. Considered and most likely outcome would be a delay rather than any form of MAH.	N/A											
External and third party hazards - Aircraft/drone crash	Risk of aircraft crash/collision with tall construction machinery was considered. The Application Land is not located under normal aircraft routes, therefore the probability of a crash during the construction phase is very low.	Site Personnel	Worst case consequence could be multiple fatalities and significant asset damage.	S	5	A	3	No Safeguards identified.	N/A	5	A	3	5	Consult with the civil aviation authority to verify the low density of commercial air traffic in the area.	Design Team
													6	Consult with local RAF site to verify the density of military air traffic in the area.	Design Team
External and third party hazards - Structural / Building Collapse	Building collapse during demolition activities.	Site Personnel	The development will require demolition of the disused existing buildings on the site (e.g. PET Polymer Plant). Potential to cause serious injury/fatality to people involved in demolition process.	S	4	B	3	Adherence to industry standard demolition techniques.	N/A	4	A	2			
	Structural collapse during construction activities.	Site Personnel	Potential to cause serious injury/fatality to people involved in construction process.	S	4	B	3	Adherence to industry standard construction techniques.	N/A	4	A	2			

Hazard Category / Guideword	Source and/or Pathways	Receptor(s)	Consequence		Risk Ranking Before			Mitigation		Risk Ranking After			Mechanisms for Securing Mitigation		
			Consequence	Cat	S	L	R	Mitigation	Tag	S	L	R	ID	Specific Requirements	Assignee
External and third party hazards - Sabotage / Vandalism / Arson	Vandalism/sabotage/arson leading to fires or explosions on site.	Public	Potential for injury/fatality to members of the public i.e. those causing the damage.	S	4	B	3	Adherence to CDM regulations and appropriate security measures e.g. site security presence and fencing to prevent trespassers.	N/A	4	A	2	7	Appropriate security measures will be installed on the construction site (see CoCP, **Document Reference 6.3.7**).	Design Team
		Environment (Land, Soil, Water, Biodiversity)	Potential for damage to environmental receptors if vandalism leads to Loss of Containment (LoC) of environmentally sensitive substances.	E	3	B	2	Adherence to CDM regulations and appropriate security measures e.g. site security presence and fencing to prevent trespassers.	N/A	3	A	2	8	Secure material on site that is capable of causing environmental harm e.g. diesel (see CoCP, **Document Reference 6.3.7**).	Design Team
External and third party hazards - Road Traffic Incident	Movement of construction/delivery vehicles on public roads leading to an increased risk of road traffic accident.	Public	Injury/fatality to members of the public offsite.	S	4	B	3	Construction Traffic Management Plan to be prepared in detail (see also Outline Construction Logistics Plan at Appendix D to ES Chapter 13 (**Documents Reference 6.2.13**).	N/A	4	A	2	9	Establish construction traffic management plan (CTMP) and a Construction Workers Travel Plan (CWTP) for the Project with the local authority (see also Outline Construction Logistics Plan at Appendix D to ES Chapter 13 (**Documents Reference 6.2.13**)).	Design Team
External and third party hazards - Rail Incident	Discussed and no issues identified during the construction phase of the Project	N/A													
External and third party hazards – Shipping Incident	Discussed and no issues identified during the construction phase of the Project	N/A													
External and third party hazards - Impact from Adjacent Industrial Sites	Incident on adjacent upper tier COMAH site (Jotun paints)	Site Personnel	Potential for fire / explosion / toxic gas release considered. This could lead to injury/fatality to personnel on the construction site.	S	4	B	3	Jotun Paints is an upper tier COMAH site and will therefore have a detailed emergency plan.	N/A	4	A	2	10	Establish a plan as part of the CEMP to determine the risk to personnel working on the construction of the Project from nearby site Jotun Paints.	Design Team
External and third party hazards - Spillage / Leak of Pollutants / Storage of Materials	Spillage/leak of material to ground during construction activities.	Environment (Land, Soil, Water, Biodiversity)	Potential to contaminate ground/groundwater/River Trent.	E	3	B	2	Storage of materials with the potential to have an adverse effect on the environment will need to be carefully controlled during the construction phase (see also CoCP, **Document Reference 6.3.7**).	N/A	3	A	2	3	A philosophy for the storage/stock piling/control of all materials used in the construction phase will be developed to acordance with best environmental practice as part of the CEMP (see CoCP, **Document Reference 6.3.7**).	Construction Team
External and third party hazards - Release of Asbestos	Demolition of polymer plant - plant and equipment may be contaminated with asbestos material.	Site Personnel or Public	Uncontrollable release of asbestos during demolition, which could lead to unnecessary exposure to members of the construction team and possibly members of the public.	S	4	B	3	An Asbestos Management Plan for dealing with any asbestos contamination will be developed in detail in the CEMP (see also outline Asbestos Management Plan provided as an appendix to the CoCP, **Document Reference 6.3.7**).	N/A	4	A	2	11	Carry out detailed survey of disused buildings and the site in general for the presence of asbestos contamination. If identified, risk to be managed according to the requirements of the Control of Asbestos Regulations 2012 (see outline Asbestos Management Plan, CoCP, **Document Reference 6.3.7**).	Design Team

Node ID	Project - Operational Phase
Node Description	Project Operational Phase, incorporating: (i) Energy Recovery Facility (ii) Carbon Captureutilisation and storage facility including pipleine. (iii) Residue Handling and Treatment Facility and Concrete Block Manufacturing facility (iv) Plastics Recycling Facility (v) Battery Storage (vi) Hydrogen Production and Storage Facility (vii) Electric Vehicle and hydrogen refuelling station (viii) New Access Road Incorporating District Heat and Private Wire Networks (ix) Reinstated railway and railhead
Mode Of Operation	Continuous for much of the plant.

Hazard Category / Guideword	Source / Pathway	Receptor(s)	Consequence		Risk Ranking Before			Mitigation		Risk Ranking After			Mechanisms for Securing Mitigation		
			Consequence	Cat	S	L	R	Mitigation	Tag	S	L	R	ID	Specific Requirements	Assignee
Dangerous Substance - Hydrogen	Release of hydrogen gas from production distribution or storage plant	Site Personnel or Public	Fire/Explosion potentially leading to injury/fatality to personnel or members of the public in the vicinity at the time.	S	5	C	4	Designed to relevant standards to maintain containment (including firewalls around the Hydrogen storage facility).	n/a	5	A	3	1	Produce a detailed engineering design incorporating a demonstration of adoption of accepted good engineering practices for hazardous systems including formal hazard identification.	Design Team
								Process Design will include provision for members of the public to be kept at a safe distance from inventories of dangerous substances.	n/a				2	A full Dangerous Substances and Explosive Atmospheres Regulations (DSEAR) assessment is to be carried out at an early stage in the detailed design to minimise the sources of ignition in the area.	Design Team
								Control of ignition sources	n/a				12	Design layout of the Project to keep members of the public as far away as possible from	Design Team

Hazard Category / Guideword	Source / Pathway	Receptor(s)	Consequence		Risk Ranking Before			Mitigation		Risk Ranking After			Mechanisms for Securing Mitigation		
			Consequence	Cat	S	L	R	Mitigation	Tag	S	L	R	ID	Specific Requirements	Assignee
														potential flammable gas leak points.	
		Environment (Land, Soil, Water, Biodiversity)	Fire/Explosion potentially leading to damage to environmental receptors in the vicinity.	E	2	D	3	Designed to relevant standards to maintain containment (including firewalls around the Hydrogen storage facility).	n/a	2	B	2	13	Emergency plans for identified MAH scenarios to be developed as part of the COMAH pre-construction safety report (if required) and updated for the operational phase.	Design Team
								Control of ignition sources	n/a				14	Within the COMAH pre-construction safety report (if required), identify listed buildings in the area that could be damaged by a LoC event. Design can be modified to move the location of the flammable gas inventory or protect the listed building if a problem is identified	Design Team
													15	Within the COMAH pre-construction safety report (if required) identify environmental receptors (ecological sites/watercourses) that could be impacted by a LoC event.	Design Team
Dangerous Substance - Natural Gas	Release of natural gas from distribution or use	Site Personnel or Public	Fire/Explosion potentially leading to injury/fatality to personnel or members of the public in the vicinity at the time.	S	5	C	4	Designed to relevant standards to maintain containment	n/a	5	A	3	1	Detailed engineering design incorporating formal hazard identification/hazard study process.	Design Team

Hazard Category / Guideword	Source / Pathway	Receptor(s)	Consequence		Risk Ranking Before			Mitigation		Risk Ranking After			Mechanisms for Securing Mitigation		
			Consequence	Cat	S	L	R	Mitigation	Tag	S	L	R	ID	Specific Requirements	Assignee
								Process Design will include provision for members of the public to be kept at a safe distance from inventories of dangerous substances.	n/a				2	A full DSEAR assessment is to be carried out at an early stage in the design to minimise the sources of ignition in the area.	Design Team
								Control of ignition sources	n/a				12	Design layout of Project to make sure members of the public are kept as far away as possible from potential flammable gas leak points.	Design Team
		Environment (Land, Soil, Water, Biodiversity)	Fire / Explosion potentially leading to damage to environmental receptors in the vicinity.	E	2	D	3	Designed to relevant standards to maintain containment	n/a	2	B	2	13	Emergency plans for identified MAH scenarios to be developed as part of the COMAH pre-construction safety report (if required) and updated for the operational phase.	Design Team
								Control of ignition sources	n/a				14	Within the COMAH pre-construction safety report (if required) identify listed buildings in the area that could be damaged by a LoC event. Design can be modified to move the location of the flammable gas inventory or protect the listed building if a problem is identified	Design Team
Dangerous Substance - Carbon Dioxide (CO_2)	LoC of liquid CO_2 from onsite storage container.	Site Personnel	Liquid CO_2 would rapidly vaporise generating a cloud of cold dense gas. This is likely to disperse slowly and therefore could be an asphyxiant. Potential for injury/fatality to personnel onsite.	S	4	B	3	Designed to relevant standards to maintain containment	n/a	4	A	2	1	Produce a detailed engineering design incorporating a demonstration of adoption of accepted good	Design Team

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Hazard Category / Guideword	Source / Pathway	Receptor(s)	Consequence		Risk Ranking Before			Mitigation		Risk Ranking After			Mechanisms for Securing Mitigation		
			Consequence	Cat	S	L	R	Mitigation	Tag	S	L	R	ID	Specific Requirements	Assignee
														engineering practices for hazardous systems including formal hazard identification.	
													19	Design layout of the Project to keep members of the public as far away as possible from potential CO_2 leak points.	Design Team
	LoC of liquid CO2 from pipeline	Site Personnel / Public	Liquid CO2 would rapidly vaporise generating a cloud of cold dense gas. This is likely to disperse slowly and therefore could be an asphyxiant. Potential for injury/fatality to personnel onsite or offsite.	S	5	B	3	Designed to relevant standards to maintain containment Pipeline is small – 2" to 4" max. Pipeline is buried to a depth of 1.5m. Pipeline material of construction chosen suitable for duty.	n/a	4	A	2	1	Produce a detailed engineering design incorporating a demonstration of adoption of accepted good engineering practices for hazardous systems including formal hazard identification.	Design Team
													19	Design layout of the Project to keep members of the public as far away as possible from potential CO_2 leak points.	Design Team
													23	Develop a suite of Emergency Plans to cover the Operational phase of the project. The plan should as a minimum identify how to determine when there is a CO2 leak and how to warn people – both onsite and offsite.	Operations Team

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Hazard Category / Guideword	Source / Pathway	Receptor(s)	Consequence		Risk Ranking Before			Mitigation		Risk Ranking After			Mechanisms for Securing Mitigation		
			Consequence	Cat	S	L	R	Mitigation	Tag	S	L	R	ID	Specific Requirements	Assignee
		Environment (Air and Climate)	Release of CO2 i.e. a greenhouse gas to the atmosphere.	E	2	B	2	Designed to relevant standards to maintain containment	n/a	2	A	1			
Dangerous Substance - CO2 capture effluent	Carbon capture effluent contains MEA (monoethanolamine) and traces of inorganic (Ammonia and Urea) and Organic chemicals. The volumes of effluent produced are low – initial design estimates are of the order of 10.2 tonnes of effluent per hour. Most of this will be re-used in the process. Any surplus will be dealt with in the site effluent treatment system. No major accident hazards are envisaged from this material.														
Dangerous Substance - Incinerator Bottom Ash	Team discussed and believe that based on a typical composition of IBA there are no MAH associated with IBA. Low risk environmental concerns are not considered as part of the MA&D assessment.														
Dangerous Substance - Flue Gas Treatment Residue (FGTr)	The process is expected to generate up to 17,355 tonnes per annum of FGTr based on an operating time of 8000 hours per year. This material is composed of fly ash (the same as bottom ash, but non-hazardous), unreacted reagent (lime), reaction products (calcium chloride, calcium fluoride, calcium sulphite/sulphate) and activated carbon. The activated carbon can contain traces of adsorbed material. FGTr is hazardous due to the lime content, which gives it a high pH. However, the design of the flue gas residue handling and treatment facility will ensure that the hazards to people and the environment is minimised, primarily by containment of the material.														
Dangerous Substance - Miscellaneous	Nothing identified yet.	N/A													
Natural Hazards - Extreme Weather	Extremely high temperatures/drought conditions.	None identified	Team discussed and do not believe this will have a significant impact on the operational phase of the Project.	N/A											
	Extremely cold temperatures/freezing conditions.	None identified	Potential for freezing was discussed. This could lead to a loss of water in key parts of the plant. Team discussed and could not identify any MAH associated with this.	N/A											
	High winds	None identified	Team discussed and plant should be designed to cope with anticipated weather conditions in this part of the UK.	N/A											
Natural Hazards - Lightning	Team discussed and believe that the design will incorporate adherence to relevant lightning protection standards (BS-EN-62305).	N/A													
Natural Hazards - Seismic Activity	There is a history of mild seismic activity in this area (e.g. the Market Rasen earthquake). Nothing has been experienced that is likely to cause significant harm/damage on the Applicaiton Land.	N/A													
Natural Hazards - Subsidence / Erosion	Refer to the construction phase - any possibility of ground movement/subsidence should have been identified and remediated before the operation of the Project.	N/A													
Natural Hazards - Flooding	Flooding from adjacent river (River Trent).	Site Personnel	Potential for injury/fatality to site personnel	S	4	B	3	The Project has been designed to raise operational levels above the 0.5% AEP flood level as required by legislation.	n/a	2	A	1	22	Flood management plan to be developed (see also Flood Risk Assessment at Annex 3 of the ES, **Document Reference 6.3.3**).	Design Team

Hazard Category / Guideword	Source / Pathway	Receptor(s)	Consequence		Risk Ranking Before			Mitigation		Risk Ranking After			Mechanisms for Securing Mitigation		
			Consequence	Cat	S	L	R	Mitigation	Tag	S	L	R	ID	Specific Requirements	Assignee
Natural Hazards - Fire	Discussed and not considered to be a major issue during the operational phase of the Project.	N/A,													
Natural Hazards - Pandemic	Risk of pandemic causing a civil emergency.	Site Personnel	Risk of pandemic occurring which may cause civil emergency and large numbers of people to fall ill, including site employees. Considered and most likely outcome would be an operational upset rather than any form of MAH.	N/A											
External and third party hazards - Aircraft/drone crash	Risk of aircraft crash/collision with operational plant was considered. The Application Land is not located under normal aircraft routes, therefore the probability of a crash during the operational phase is very low.	Site Personnel	Worst case consequence could be multiple fatalities and significant asset damage.	S	5	A	3	None identified		5	A	3	5	Consult with the civil aviation authority to verify the low density of commercial air traffic in the area.	Design Team
													6	Consult with local RAF site to verify the density of military air traffic in the area.	Design Team
External and third party hazards - Structural / Building Collapse	Team discussed and this is considered relevant during the construction phase where demolition of old buildings is necessary. Not considered further.	N/A													
External and third party hazards - Sabotage / Vandalism / Arson	Vandalism/sabotage/arson leading to fires or explosions on site.	Site Personnel or Public	Fire/Explosion potentially leading to injury/fatality to personnel or members of the public in the vicinity at the time.	S	4	B	3	Adherence to appropriate security measures e.g. site security presence and fencing to prevent trespassers.	N/A	4	A	2	20	Design Project so that access to dangerous substances by members of the public is not possible e.g. by security / CCTV and fencing.	Design Team
													21	During detailed design carry out a full site security risk assessment - including both physical and cybersecurity.	Design Team
	Vandalism/sabotage/arson leading to fires or explosions on site.	Site Personnel or Public	Loss of containment of liquid CO2. Liquid CO2 would rapidly vaporise generating a cloud of cold dense gas. This is likely to disperse slowly and therefore could be an asphyxiant. Potential for injury/fatality to personnel onsite or offsite.	S	5	B	3	Adherence to appropriate security measures e.g. site security presence and fencing to prevent trespassers.	N/A	5	A	2	21	During detailed design carry out a full site security risk assessment - including both	Design Team

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Hazard Category / Guideword	Source / Pathway	Receptor(s)	Consequence	Risk Ranking Before				Mitigation		Risk Ranking After				Mechanisms for Securing Mitigation		
			Consequence	Cat	S	L	R	Mitigation	Tag	S	L	R	ID	Specific Requirements	Assignee
								Pipeline will be buried to a depth of 1.5 m.						physical and cybersecurity.	
													23	Develop a suite of Emergency Plans to cover the Operational phase of the project. The plan should as a minimum identify how to determine when there is a CO2 leak and how to warn people – both onsite and offsite.	Operations Team
External and third party hazards - Road Traffic Incident	Discussed and not relevant to the operational phase of the Project. The aim is to minimise road transport by the creation of better rail and waterway links.	N/A														
External and third party hazards - Rail Incident	Rail accident – leading to damage to adjacent plant and equipment.	Site Personnel or Public	The area of most concern would be impacted with a high pressure natural gas pipe or the site natural gas pressure reducing station. This could lead to a significant loss of containment of gas with subsequent major fire or explosion.	S	5	B	3	Design will avoid having gas pipework/equipment close to railway lines.	N/A	5	A	3			
External and third party hazards – Shipping Incident	Shipping accident	River/Estuary	Damage to vessels leading to loss of containment of material which could impact on the estuary habitat (i.e. fuel oil – the vessels are to handle freight, not directly handling major accident hazard materials)	E	3	A	2	None identified		3	A	2			
External and third party hazards - Impact from Adjacent Industrial Sites	Incident on adjacent upper tier COMAH site (Jotun paints)	Site Personnel	Potential for fire / explosion / toxic gas release considered. This could lead to injury/fatality to personnel on the site.	S	4	B	3	Jotun Paints is an upper tier COMAH site and will therefore have a detailed emergency plan. Initial discussions with Jotun suggest limited scenarios with a potential to cause harm offsite. Fires could generate smoke.	N/A	4	A	2	10	Establish a plan during detailed design to determine the risk to personnel working on the Project site from nearby site Jotun Paints.	Design Team
External and third party hazards - Spillage / Leak of Pollutants / Storage of Materials	Spillage/leak of material to ground during operational activities.	Environment (Land, Soil, Water, Biodiversity)	LoC of any liquid pollutants has the potential to cause damage to the ground or the aquatic environment if it reaches the River Trent.	E	3	B	2	Storage of materials with the potential to have an adverse effect on the environment will need to be carefully controlled during the operational phase in accordance with the Environmental Permit.	N/A	3	A	2	18	Design the drainage system so that is engineered to allow capture of spillages prior to discharge to the	Design Team

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Hazard Category / Guideword	Source / Pathway	Receptor(s)	Consequence		Risk Ranking Before			Mitigation		Risk Ranking After			Mechanisms for Securing Mitigation		
			Consequence	Cat	S	L	R	Mitigation	Tag	S	L	R	ID	Specific Requirements	Assignee
														outside environment (e.g. by the use of interceptors or equivalent).	
													16	Design Project during detailed design to include adequate secondary containment around any liquid storage areas - i.e. minimum bund capacity to be 110% of the inventory of the largest tank, or 25% of the total liquid inventory (whichever is largest).	Design Team
													13	Emergency plans for identified MAH scenarios to be developed as part of the COMAH pre-construction safety report (if required) and updated for the operational phase.	Design Team
External and third party hazards - Release of Asbestos	Team discussed and no asbestos containing products will be used in the Project.	N/A													

8. SPECIFIC REQUIREMENTS TO ACHIEVE MITIGATION

8.1.1.1 Where the HAZID team identified a requirement that would need to be developed in the subsequent phases of the Project, these were documented.

8.1.1.2 The specific requirements are summarised in Appendix A alongside the worst-case risk ranking with embedded safeguards in place in order to provide a priority level.

9. CONCLUSIONS

9.1.1.1 The HAZID study tables in Table 4 demonstrate that with the mitigation measures committed to by the Project in place, there are no residual risks in the 'Extreme risk' category. Therefore, all MAHs can be judged to be 'Tolerable if ALARP' or 'Broadly Acceptable', and the environmental effects will be not significant.

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9.1.1.2 As discussed in previous sections, this assessment is a review based on information available at this stage and has adopted a worst-case approach. As is normal practice, further hazard and risk analysis will be undertaken throughout the lifecycle of the Project in accordance with the requirements of applicable legislation and industry good practice guidance, to ensure risks continue to be managed to a level that is considered ALARP during the detailed design, construction planning and operation of the Project.

10. REFERENCES

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APPENDIX A SUMMARY OF MITIGATION

Table 5: Specific Requirements to Secure Mitigation Summary Table

ID	Specific Requirements to Secure Mitigation	Assignee	Overall Worst-Case Risk Ranking	Node ID		Hazard Category / Guideword	Source / Pathway	Worst Case Risk Ranking Per Source / Pathway
1	Produce a detailed engineering design incorporating a demonstration of adoption of accepted good engineering practices for hazardous systems including formal hazard identification.	Design Team	3	Project - Operational Phase		Dangerous Substance - Hydrogen	Release of hydrogen gas from production distribution or storage plant	3
				Project - Operational Phase		Dangerous Substance – Natural Gas	Release of natural gas from distribution or use	3
				Project - Operational Phase		Dangerous Substance - Diesel	Major LoC of diesel	2
				Project - Operational Phase		Dangerous Substance - Ammonia Solution	LoC of ammonia solution (used for NOx removal in the flue gas SCR plant)	N/A
				Project - Operational Phase		Dangerous Substance - Amine solution	LoC of amine solution	1
				Project - Operational Phase		Dangerous Substance - Carbon Dioxide (CO2)	LoC of liquid CO2 from onsite storage container.	2
2	A full DSEAR assessment is to be carried out at an early stage in the	Design Team	3	Project - Operational Phase		Dangerous Substance - Hydrogen	Release of hydrogen gas from production distribution or storage plant	3

ID	Specific Requirements to Secure Mitigation	Assignee	Overall Worst-Case Risk Ranking	Node ID		Hazard Category / Guideword	Source / Pathway	Worst Case Risk Ranking Per Source / Pathway
	design to minimise the sources of ignition in the area.			Project - Operational Phase		Dangerous Substance – Natural Gas	Release of natural gas from distribution or use	3
				Project - Operational Phase		Dangerous Substance - Diesel	Major LoC of diesel	2
3	Detailed measures for the storage/stockpiling/control of all materials used in the construction phase will need to be developed in the CEMP to meet best environmental practice (see also CoCP, **Document Reference 6.3.7**)	Construction Team	2	Project - Construction Phase		Dangerous Substance - Diesel	Diesel will be used on site to provide fuel for miscellaneous plant and equipment. Loss of containment of diesel considered.	N/A
				Project - Construction Phase		External and third party hazards - Spillage / Leak of Pollutants / Storage of Materials	Spillage/leak of material to ground during construction activities.	2
4	Carry out a detailed survey of the Application Land to identify areas where subsidence/ground collapse would be a concern.	Design Team	2	Project - Construction Phase		Natural Hazards - Subsidence / Erosion	Construction activity generating disturbance / vibration which could cause ground instability / collapse / settlement.	2
5	Consult with the civil aviation authority to verify the low density of commercial air traffic in the area.	Design Team	3	Project - Construction Phase		External and third-party hazards - Aircraft/drone crash	Risk of aircraft crash/collision with tall construction machinery was considered. The Application Land is not located under normal aircraft routes, therefore the	3

ID	Specific Requirements to Secure Mitigation	Assignee	Overall Worst-Case Risk Ranking	Node ID		Hazard Category / Guideword	Source / Pathway	Worst Case Risk Ranking Per Source / Pathway
							probability of a crash during the construction phase is very low.	
				Project - Operational Phase		External and third party hazards - Aircraft/drone crash	Risk of aircraft crash/collision with operational plant was considered. The Application Landis not located under normal aircraft routes, therefore the probability of a crash during the operational phase is very low.	3
6	Consult with local RAF site to verify the density of military air traffic in the area.	Design Team	3	Project - Construction Phase		External and third-party hazards - Aircraft/drone crash	Risk of aircraft crash/collision with tall construction machinery was considered. The Application Land is not located under normal aircraft routes, therefore the probability of a crash during the construction phase is very low.	3
				Project - Operational Phase		External and third-party hazards - Aircraft/drone crash	Risk of aircraft crash/collision with operational plant was considered. The Application Land is not located under normal aircraft routes, therefore the probability of a crash during the operational phase is very low.	3
7	Design to include provision for appropriate security measures to be installed on the construction site.	Design Team	2	Project-Construction Phase		External and third party hazards -	Vandalism/sabotage/arson leading to fires or explosions on site.	2

ID	Specific Requirements to Secure Mitigation	Assignee	Overall Worst-Case Risk Ranking	Node ID		Hazard Category / Guideword	Source / Pathway	Worst Case Risk Ranking Per Source / Pathway
						Sabotage / Vandalism / Arson		
8	Detailed CEMP to include provision for secure storage of material capable of causing environmental harm e.g. diesel (see also CoCP, **Document Reference 6.3.7**).	Design Team	2	Project - Construction Phase		External and third party hazards - Sabotage / Vandalism / Arson	Vandalism/sabotage/arson leading to fires or explosions on site.	2
9	Establish detailed construction traffic management plan (CTMP) and a Construction Workers Travel Plan (CWTP) for the Project with the local authority (see also Outline Construction Logistics Plan, Appendix D to ES Chapter 13 (**Documents Reference 6.2.13**)).	Design Team	2	Project - Construction Phase		External and third-party hazards - Road Traffic Incident	Movement of construction/delivery vehicles on public roads leading to an increased risk of road traffic accident.	2
10	Establish measures in the CEMP to determine the risk to personnel working on the NLGEP site from nearby site Jotun Paints.	Design Team	2	Project - Construction Phase		External and third-party hazards - Impact from Adjacent Industrial Sites	Incident on adjacent upper tier COMAH site (Jotun paints)	2
				Project - Operational Phase		External and third-party hazards -	Incident on adjacent upper tier COMAH site (Jotun paints)	2

ID	Specific Requirements to Secure Mitigation	Assignee	Overall Worst-Case Risk Ranking	Node ID		Hazard Category / Guideword	Source / Pathway	Worst Case Risk Ranking Per Source / Pathway
						Impact from Adjacent Industrial Sites		
11	Carry out detailed survey of disused buildings and the site in general for the presence of asbestos contamination as part of the CEMP Asbestos Management Plan (see also CoCP, **Document Reference 6.3.7**). If identified, risk to be managed according to the requirements of the Control of Asbestos Regulations 2012.	Design Team	2	Project-Construction Phase		External and third-party hazards - Release of Asbestos	Demolition of polymer plant - plant and equipment may be contaminated with asbestos material.	2
12	Design layout of the Project to keep members of the public as far away as possible from potential flammable gas leak points.	Design Team	3	Project - Operational Phase		Dangerous Substance - Hydrogen	Release of hydrogen gas from production distribution or storage plant	3
				Project - Operational Phase		Dangerous Substance – Natural Gas	Release of natural gas from distribution or use	3
13	Emergency plans for identified MAH scenarios to be developed as part of the COMAH pre-construction safety report (if required) and updated for the operational phase.	Design Team	3	Project - Operational Phase		Dangerous Substance - Hydrogen	Release of hydrogen gas from production distribution or storage plant	3
				Project - Operational Phase		Dangerous Substance – Natural Gas	Release of natural gas from distribution or use	3

ID	Specific Requirements to Secure Mitigation	Assignee	Overall Worst-Case Risk Ranking	Node ID		Hazard Category / Guideword	Source / Pathway	Worst Case Risk Ranking Per Source / Pathway
				Project - Operational Phase		External and third party hazards - Spillage / Leak of Pollutants / Storage of Materials	Spillage/leak of material to ground during operational activities.	2
14	Within the COMAH pre-construction safety report (if required) identify listed buildings in the area that could be damaged by a LoC event. Design can be modified to move the location of the flammable gas inventory or protect the listed building if a problem is identified	Design Team	3	Project-Operational Phase		Dangerous Substance - Hydrogen	Release of hydrogen gas from production distribution or storage plant	3
				Project - Operational Phase		Dangerous Substance – Natural Gas	Release of natural gas from distribution or use	3
15	Within the COMAH pre-construction safety report (if required) identify environmental receptors (ecological sites/watercourses) that could be impacted by a LoC event.	Design Team	3	Project - Operational Phase		Dangerous Substance - Hydrogen	Release of hydrogen gas from production distribution or storage plant	3
				Project - Operational Phase		Dangerous Substance – Natural Gas	Release of natural gas from distribution or use	3
				Project - Operational Phase		Dangerous Substance - Ammonia Solution	LoC of ammonia solution (used for NOx removal in the flue gas SCR plant)	N/A

ID	Specific Requirements to Secure Mitigation	Assignee	Overall Worst-Case Risk Ranking	Node ID		Hazard Category / Guideword	Source / Pathway	Worst Case Risk Ranking Per Source / Pathway
				Project - Operational Phase		Dangerous Substance - Amine solution	LoC of amine solution	1
16	Detailed design to include adequate secondary containment around any liquid storage areas - i.e. minimum bund capacity to be 110% of the inventory of the largest tank, or 25% of the total liquid inventory (whichever is largest).	Design Team	2	Project - Operational Phase		Dangerous Substance - Diesel	Major LoC of diesel	2
				Project - Operational Phase		Dangerous Substance - Ammonia Solution	LoC of ammonia solution (used for NOx removal in the flue gas SCR plant)	N/A
				Project - Operational Phase		Dangerous Substance - Amine solution	LoC of amine solution	1
				Project - Operational Phase		External and third party hazards - Spillage / Leak of Pollutants / Storage of Materials	Spillage/leak of material to ground during operational activities.	2
17	Review the requirement for a fixed fire-fighting / sprinkler system in the main diesel storage tanks.	Design Team	2	Project - Operational Phase		Dangerous Substance - Diesel	Major LoC of diesel	2

ID	Specific Requirements to Secure Mitigation	Assignee	Overall Worst-Case Risk Ranking	Node ID		Hazard Category / Guideword	Source / Pathway	Worst Case Risk Ranking Per Source / Pathway
18	Design the drainage system for the Project to be engineered to allow capture of spillages prior to discharge to the outside environment (e.g. by the use of interceptors or equivalent) (see also Indicative Drainage Strategy at Annex 5 of the ES, **Document Reference 6.3.5**).	Design Team	2	Project - Operational Phase		Dangerous Substance - Diesel	Major LoC of diesel	2
				Project - Operational Phase		Dangerous Substance - Ammonia Solution	LoC of ammonia solution (used for NOx removal in the flue gas SCR plant)	N/A
				Project - Operational Phase		Dangerous Substance - Amine solution	LoC of amine solution	1
				Project - Operational Phase		External and third party hazards - Spillage / Leak of Pollutants / Storage of Materials	Spillage/leak of material to ground during operational activities.	2
19	Design layout of the Project to keep members of the public as far away as possible from potential CO_2 leak points.	Design Team	2	Project - Operational Phase		Dangerous Substance - Carbon Dioxide (CO2)	LoC of liquid CO2 from onsite storage container.	2
20	Design Project so that access to dangerous substances by members of the public is not possible e.g. by security / CCTV and fencing.	Design Team	2	Project - Operational Phase		External and third party hazards - Sabotage /	Vandalism/sabotage/arson leading to fires or explosions on site.	2

ID	Specific Requirements to Secure Mitigation	Assignee	Overall Worst-Case Risk Ranking	Node ID		Hazard Category / Guideword	Source / Pathway	Worst Case Risk Ranking Per Source / Pathway
						Vandalism / Arson		
21	Carry out a full site security risk assessment - including both physical and cybersecurity.	Design Team	2	Project - Operational Phase		External and third party hazards - Sabotage / Vandalism / Arson	Vandalism/sabotage/arson leading to fires or explosions on site.	2
22	Flood management plan to be developed (see also CoCP, **Document Reference 6.3.7**)	Design Team	2	Project - Construction Phase		Natural Hazards - Flooding	Flooding from adjacent river (River Trent).	2
23	Develop a suite of Emergency Plans to cover the Operational phase of the project. The plan should as a minimum identify how to determine when there is a CO2 leak and how to warn people – both onsite and offsite.	Operations Team	3	Project - Operational Phase		Dangerous Substance - Carbon Dioxide (CO2)	LoC of liquid CO2 from onsite storage container. Loss of liquid CO2 from pipeline Vandalism / Sabotage leading to loss of liquid CO2 from pipeline.	2

APPENDIX B FIGURES

Date: May 2022

Figure 1: HAZID Risk Matrix

Severity	Consequences				Increasing Likelihood				
					A	B	C	D	E
	Safety (S)	Environmental (E)	Financial (F)	Reputation (R)	Never heard of in the industry	Heard of in the industry	Has happened in the Organisation or more than once per year in the industry	Has happened at the Location or more than once per year in the Organisation	Has happened more than once per year at the location
0	No injury or health effect	No effect	No damage	No impact	1 - Low Risk	1 - Low Risk	1 - Low Risk	1 - Low Risk	1 - Low Risk
1	Slight injury or health effect	Slight effect	Slight damage	Slight impact	1 - Low Risk	1 - Low Risk	2 - Medium Risk	2 - Medium Risk	2 - Medium Risk
2	Minor injury or health effect	Minor effect	Minor damage	Minor impact	1 - Low Risk	2 - Medium Risk	2 - Medium Risk	3 - High Risk	3 - High Risk
3	Major injury or health effect	Moderate effect	Moderate damage	Moderate impact	2 - Medium Risk	2 - Medium Risk	3 - High Risk	3 - High Risk	4 - Extreme Risk
4	Permanent Total Disability (PTD) or up to 3 fatalities	Major effect	Major damage	Major impact	2 - Medium Risk	3 - High Risk	3 - High Risk	4 - Extreme Risk	4 - Extreme Risk
5	More than 3 fatalities	Massive effect	Massive damage	Massive impact	3 - High Risk	3 - High Risk	4 - Extreme Risk	4 - Extreme Risk	4 - Extreme Risk

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