Immingham Green Energy Terminal

9.58 Applicant's Response to the Examining Authority's Action Points from Compulsory Acquisition Hearing 1 (CAH1)

Infrastructure Planning (Examination Procedure) Rules 2010

Volume 9

May 2024

Planning Inspectorate Scheme Ref: TR030008

Document Reference: TR030008/EXAM/9.58

Table of contents

Chapter **Pages**

Introduction **1**

1. Compulsory Acquisition Hearing 1 (CAH1) Action Points **2**
Action Point 1 2
Action Point 2 2
Action Point 3 7
Action Point 4 7
Action Point 5 8
Action Point 6 8

2. Appendices **15**
Appendix 1: Summary of Gexcon Study 15

Introduction

Overview

1.1 This document has been prepared to accompany an application made to the Secretary of State for Transport (the Application") under section 37 of the Planning Act 2008 ("PA 2008") for a development consent order ("DCO") to authorise the construction and operation of the proposed Immingham Green Energy Terminal ("the Project").

1.2 The Application is submitted by Associated British Ports ("the Applicant"). The Applicant was established in 1981 following the privatisation of the British Transport Docks Board. **The Funding Statement [APP-010]** provides further information.

1.3 The Project as proposed by the Applicant falls within the definition of a Nationally Significant Infrastructure Project ("NSIP") as set out in Sections 14(1)(j), 24(2) and 24(3)(c) of the PA 2008.

The Project

1.4 The Applicant is seeking to construct, operate and maintain the Immingham Green Energy Terminal, comprising a new multi-user liquid bulk green energy terminal located on the eastern side of the Port of Immingham (the "Port").

1.5 The Project includes the construction and operation of a green hydrogen production facility, which would be delivered and operated by Air Products (BR) Limited ("Air Products"). Air Products will be the first customer of the new terminal, whereby green ammonia will be imported via the jetty and converted on-site into green hydrogen, making a positive contribution to the UK's net zero agenda by helping to decarbonise the United Kingdom's (UK) industrial activities and in particular the heavy transport sector.

1.6 A detailed description of the Project is included in **Chapter 2: The Project** of the **Environmental Statement ("ES") [APP-044]**.

Purpose of this Document

1.7 This document provides the Applicant's response to the actions arising from Compulsory Acquisition Hearing 1 (CAH1) held on 11 April 2024, which were collated in the Examining Authority's **Action Points from Compulsory Acquisition Hearing 1 [EV8-006]**, issued April 24 2024.

1. Compulsory Acquisition Hearing 1 (CAH1) Action Points

Action Point 1
Agenda Item 3 Strategic case for Compulsory Acquisition
Provide a summary of the Gexcon study.
The summary report prepared by Gexcon UK Ltd has been shared with NELC and is attached in **Appendix 1.**
Action Point 2
Agenda Item 4 draft Development Consent Order
Explain which parts of the draft Development Consent Order in relation to compulsory acquisition and temporary possession can be enacted by which party.

Power	ABP	AP
Article 22 (Compulsory acquisition of land)	Yes (see Article 46(2)).	No (see Article 46(2)).
Article 24 (Compulsory acquisition of rights)	Yes (see Article 46(2)).	No (see Article 46(2)).
Article 25 (Acquisition of subsoil or airspace only)	Yes (see Article 46(2)).	No (see Article 46(2)).
Articles 33(1)(a) and (b) (Statutory undertakers)	Yes (see Article 46(2).	No (see Article 46(2)).
Article 35 (Acquisition of part of certain properties)	Yes (see Article 46(2)).	No (see Article 46(2)).

Article 19 (Authority to survey and investigate the land)	Yes - in respect of any land within the Order limits except the land shaded yellow on the land plans and, where reasonably necessary, any land which is adjacent to but outside the Order limits or which may be affected by the authorised project (see Articles 46(3) and 46(4)); note various safeguards within the wording of the power itself.	Yes - but only in respect of plots 3/2, 4/5, 4/7, 4/8, 4/9, 4/16, 4/17, 4/18, 4/19, 4/20, 4/21, 4/22, 4/23, 4/26, 4/28, 4/29, 4/30, 4/32, 5/3, 5/4, 5/7, 5/8, 5/10, 5/11, 5/12, 5/13, 5/14, 5/15, 5/18, 5/20, 5/22, 5/23, 5/24, 5/25, 5/27, 5/28, 5/29, 5/30, 5/32, 5/33, 5/36, 5/37, 5/38, 5/39, 6/6, 6/14, 6/15, 6/16, 6/18, 7/1, 7/2, 7/3, 7/4, 7/5, 7/6, 7/7, 7/7, 7/8, 7/9, 7/10, 7/11, 7/12, 7/15, 7/16, 7/17, 7/18, 7/20, 7/21, 7/22 and 7/23 and, where reasonably necessary, any land which is adjacent to but outside the Order limits or which may be affected by the authorised project (see Articles 46(3) and 46(4) and the Applicant's response to parts (a) and (b) of written question Q1.18.3.15 in the **Applicant's Responses to the Examining Authority's First Written Questions (Responses to "Q1.18. Development Consent Order") [REP1-039]**. Note various safeguards within the wording of the power itself. In the event the ExA accepts the Applicant's change application into the Examination, it is proposed that this power would also be exercisable over the new plots of land over which temporary possession powers are sought in connection with construction on the West Site (namely 5/45 and 6/19).
Article 20 (Protective works)	Yes - in respect of any land, building, structure, apparatus or equipment, lying within the Order limits or which may be affected by the construction or operation of the authorised project outside of the Order limits (see Articles 46(3) and 46(4)); note	Yes – as per row above, i.e. only in respect of plots 3/2, 4/5, 4/7, 4/8, 4/9, 4/16, 4/17, 4/18, 4/19, 4/20, 4/21, 4/22, 4/23, 4/26, 4/28, 4/29, 4/30, 4/32, 5/3, 5/4, 5/7, 5/8, 5/10, 5/11, 5/12, 5/13, 5/14, 5/15, 5/18, 5/20, 5/22, 5/23, 5/24, 5/25, 5/27, 5/28, 5/29, 5/30, 5/32, 5/33, 5/36, 5/37, 5/38, 5/39, 6/6, 6/14,

	various safeguards within the wording of the power itself.	6/15, 6/16, 6/18, 7/1, 7/2, 7/3, 7/4, 7/5, 7/6, 7/7, 7/7, 7/8, 7/9, 7/10, 7/11, 7/12, 7/15, 7/16, 7/17, 7/18, 7/20, 7/21, 7/22 and 7/23 or in respect of any land, building, structure, apparatus or equipment which may be affected by the construction or operation of the authorised project outside of the Order limits (see Articles 46(3) and 46(4) and the Applicant's response to parts (a) and (b) of written question Q1.18.3.15 in the **Applicant's Responses to the Examining Authority's First Written Questions (Responses to "Q1.18. Development Consent Order") [REP1-039]**. Note various safeguards within the wording of the power itself. As above, should the ExA accept the Applicant's change application, it is proposed that this power would be exercisable over the new plots of land over which temporary possession powers are sought in connection with construction on the West Site (namely 5/45 and 6/19).
Article 31 (Temporary use of land for constructing the authorised project)	Yes - in respect of Plots 3/2, 4/26, 4/28, 4/29, 4/30, 4/32, 7/1, 7/2, 7,3, 7/4, 7/5, 7/6, 7/7, 7/8, 7/9, 7/10, 7/11 shown green on the **Land Plans [APP-015]**, listed in Schedule 13 (Land of which only temporary possession may be taken) of the dDCO and subject to temporary possession powers under Article 31(1)(a)(i) (Temporary use of land for constructing the authorised project). These cannot be subject to powers of compulsory acquisition of land or rights permanently. Yes also in respect of those plots which are either capable of being	Yes – as per row above, i.e. only in respect of plots 3/2, 4/5, 4/7, 4/8, 4/9, 4/16, 4/17, 4/18, 4/19, 4/20, 4/21, 4/22, 4/23, 4/26, 4/28, 4/29, 4/30, 4/32, 5/3, 5/4, 5/7, 5/8, 5/10, 5/11, 5/12, 5/13, 5/14, 5/15, 5/18, 5/20, 5/22, 5/23, 5/24, 5/25, 5/27, 5/28, 5/29, 5/30, 5/32, 5/33, 5/36, 5/37, 5/38, 5/39, 6/6, 6/14, 6/15, 6/16, 6/18, 7/1, 7/2, 7/3, 7/4, 7/5, 7/6, 7/7, 7/7, 7/8, 7/9, 7/10, 7/11, 7/12, 7/15, 7/16, 7/17, 7/18, 7/20, 7/21, 7/22 and 7/23 and, where reasonably necessary, any land which is adjacent to but outside the Order limits or which may be

	temporarily possessed and then permanently acquired under Article 22 (Compulsory acquisition of land), being plots 4/5, 4/6, 4/7, 4/9, 4/10, 4/16, 4/18, 4/19, 4/20, 4/21, 5/1, 5/3, 5/4, 5/36, 5/39, 7/15, 7/16, 7/17, 7/18, 7/19, 7/20, 7/21, 7/22 and 7/23 shaded pink on the Land Plans, or being subject to the compulsory acquisition of permanent new rights and restrictive covenants under Article 24 (Compulsory acquisition of rights), being plots 4/8, 4/17, 4/22, 4/23, 5/7, 5/8, 5/10, 5/11, 5/12, 5/13, 5/14, 5/15, 5/18, 5/20, 5/22, 5/23, 5/24, 5/25, 5/27, 5/28, 5/29, 5/30, 5/32, 5/33, 5/34, 5/37, 5/38, 6/6, 6/14, 6/15, 6/16, 6/18, 7/12 shaded blue or shaded and hatched blue on the Land Plans. See Articles 46(3) and 46(4) and the Applicant's response to parts (a) and (b) of written question Q1.18.3.15 in the **Applicant's Responses to the Examining Authority's First Written Questions (Responses to "Q1.18. Development Consent Order") [REP1-039]**. Note various safeguards within the wording of the power itself.	affected by the authorised project (see Articles 46(3) and 46(4) and the Applicant's response to parts (a) and (b) of written question Q1.18.3.15 in the **Applicant's Responses to the Examining Authority's First Written Questions (Responses to "Q1.18. Development Consent Order")** [REP1-039]. Note various safeguards within the wording of the power itself. As above, should the ExA accept the Applicant's change application, it is proposed that this power would be exercisable over the new plots of land over which temporary possession powers are sought in connection with construction on the West Site (namely 5/45 and 6/19).
Article 32 (Temporary use of land for maintaining the authorised project)	Yes – in respect of any land within the Order limits. See Articles 46(3) and 46(4).	Yes – as per row above, i.e. only in respect of plots 3/2, 4/5, 4/7, 4/8, 4/9, 4/16, 4/17, 4/18, 4/19, 4/20, 4/21, 4/22, 4/23, 4/26, 4/28, 4/29, 4/30, 4/32, 5/3, 5/4, 5/7, 5/8, 5/10, 5/11, 5/12, 5/13, 5/14, 5/15, 5/18, 5/20, 5/22, 5/23, 5/24, 5/25, 5/27, 5/28, 5/29, 5/30, 5/32, 5/33, 5/36, 5/37, 5/38, 5/39, 6/6, 6/14, 6/15, 6/16, 6/18, 7/1, 7/2, 7/3, 7/4, 7/5, 7/6, 7/7, 7/7, 7/8, 7/9, 7/10, 7/11, 7/12, 7/15, 7/16, 7/17, 7/18, 7/20, 7/21, 7/22 and 7/23 (see Articles 46(3)

		and 46(4). Note various safeguards within the wording of the power itself. As above, should the ExA accept the Applicant's change application, it is proposed that this power would be exercisable over the new plots of land over which temporary possession powers are sought in connection with construction on the West Site (namely 5/45 and 6/19).
Article 26 (Private rights)	This standard power to variously extinguish or suspend third party rights, or cause them to cease to have effect, is not exercisable on its own by any party, as such, but is a power that acts automatically as part of other compulsory purchase or temporary possession powers under Article 22 (Compulsory acquisition of land), Article 24	
Article 27 Power to override easements and other rights	This standard power enables authorised activities under the Order to proceed where they interfere with various third party interests and rights (which it suspends rather than extinguishes). It is thus not dependent on the use of compulsory acquisition or temporary powers, as with Article 26 (Private rights) but acts automatically when the authorised activities are carried out. ABP alone controls the otherwise automatic action of this power – see Article 46(5).	

For completeness we note as follows:

The benefit of the above-mentioned Article 22 (Compulsory acquisition of land), Article 24 (Compulsory acquisition of rights), Article 25 (Acquisition of subsoil or airspace only), Articles 33(1)(a) and (b) (Statutory undertakers), Article 35 (Acquisition of part of certain properties), Article 19 (Authority to survey and investigate the land), Article 20 (Protective works), Article 31 (Temporary use of land for

constructing the authorised project) and Article 32 (Temporary use of land for maintaining the authorised project)) can only be transferred or granted to another person with Secretary of State approval, with one exception (see Articles 46(2), (3), (10) and (11)).

That exception is that the benefit of those powers can be transferred or granted without Secretary of State approval under Articles 46(7), (8) and (9) to the list of licence-holding statutory undertakers in Article 46(9) of the Article. This is necessary because such statutory undertakers may need to install apparatus comprised in the authorised project or to divert, replace or protect apparatus. DCOs commonly do not require them to obtain Secretary of State approval to take the benefit of such powers because they are of substantial covenant strength and have scope for exercising their own land-related powers, albeit it is more expeditious for them simply to avail themselves of relevant DCO powers.

Action Point 3

Agenda Item 5 Human Rights

Provide an "inset" map of the Queens Road section of the Land and Works Plans, including numbering.

The updated Land Plans **[TR030008/APP/4.5(2)]** forming part of the Change Application submitted at Deadline 3 includes two new inset plans enlarging the Queens Road properties so the property numbers are also visible:

- New inset 5C (inset sheet 2 of 5) shows 18 and 31 Queens Road (Plots 5/3 and 5/4, respectively).
- New inset 7C (inset sheet 5 of 5) shows 1 – 8 Queens Road (Plots 7/15 – 7/23, respectively).

Action Point 4

Agenda Item 6 Applicant's update on the Land Rights Tracker

Update land rights tracker font size so it is more legible.

The font size of the Land Rights Tracker (comprising three sheets – the Individual Landowners Compulsory Acquisition Schedule, the Statutory Undertakers Compulsory Acquisition Schedule, and the Crown Land Schedule) has been updated to be more legible in the updated version of the Land Rights Tracker submitted as part of the Deadline 3 submissions.

Action Point 5
Agenda Item 8 Consent for the inclusion of the Crown land
Clarify position in relation to Crown Land consent requirements.
At Compulsory Acquisition Hearing 1 ("CAH1") the Examining Authority noted that the letter of the Crown Estate dated 20 February 2024 granting ABP consent for works, being the Immingham Green Energy Terminal, for the purposes of the lease dated 1 January 1869 stated as follows: *"Associated British Ports is to indemnify The Crown Estate against all liabilities, actions, proceedings, costs, claims and demands arising from the exercise of the consent hereby given."* The Examining Authority asked how ABP proposes to provide the indemnity described. The answer is that the required indemnity is wholly set out on the face of the consent letter which The Crown Estate prepared and the terms of which ABP accepts. No further documentation is required.
Action Point 6
Agenda Item 9 Representations from Statutory Undertakers
Provide index of statutory undertaker responses to protective provisions.
Table 1 below provides an update on status of protective provisions with Statutory Undertakers.

Statutory Undertaker	dDCO includes protective provisions?	Status update	Matters not agreed / outstanding	Timescales for resolution
Statutory Conservancy and Navigation Authority for the Humber	Yes: Schedule 14, Part 1 **[REP1-016]**	Amendments made to the protective provisions contained in the revised dDCO to be submitted at Deadline 3. These amendments reflect comments received from Harbour Master Humber and resolve all outstanding points. This position is reflected in the **Draft Statement of Common Ground with the Harbour Master Humber [REP1-054]**. The dDCO submitted at Deadline 3 includes the final agreed protective provisions.	N/A	Protective provisions are Agreed.
Environment Agency (EA)	Yes: Schedule 14, Part 2 **[REP1-016]**	The protective provisions are based on those in favour of the EA in made DCOs and have been aligned further with the EA's current standard form and include specific mitigation measures requested by the EA in this case. On 5 April 2024 the Applicant and the EA met to discuss the general principles along with the principle of a flood defence agreement only in	• Ensuring the protective provisions align with or supersede the licences granted by ABP to the EA historically in respect existing flood defences in this location; • The application of the compensation provisions.	The Applicant considers it is likely to resolve matters prior to the close of Examination.

		respect of that part of the existing flood defences being crossed by the authorised project. Revised protective provisions together with a summary note on approach were provided to the EA on 10 April 2024 by the Applicant's solicitors and the EA's comments are awaited. The EA protective provisions contained in the dDCO submitted at Deadline 3 are unchanged from those contained in the **dDCO** submitted at Deadline 1 **[REP1-016]** while negotiations continue.		
Northern Powergrid Limited	Yes: Schedule 14, Part 3 **[REP1-016]**	Draft protective provisions and asset protection agreement provided to NPG solicitors on 15 February 2024. The draft protective provisions were subsequently updated and amended to reflect changes that are acceptable from the standard NPG protective provisions and provided to Northern Powergrid's solicitors on 3 April 2024 (together with a mark up of the draft Asset Protection Agreement provided by NPG on 13 March 2023). The IGET protective provisions otherwise mirror those submitted with the IERRT	• Provisions relating to Northern Powergrid consent to be obtained prior to any works	The Applicant considers it is likely to resolve matters prior to the close of Examination.

		DCO. Comments are awaited from NPG's solicitors. The Northern Powergrid protective provisions contained in the dDCO submitted at Deadline 3 are unchanged from those contained in the dDCO submitted at Deadline 1 **[REP1-016]** while negotiations continue.		
Anglian Water	Yes: Schedule 14, Part 4 **[REP1-016]**	Anglian Water provided its standard protective provisions to the Applicant on 11 January 2024. These were updated and returned to Anglian Water on 9 February 2024 together with explanation for the amendments. There has been ongoing engagement with Anglian Water relating to other matters raised in its relevant representation **[RR-001]** and minor comments in respect of the protective provisions were received on 29 April 2024 to which the Applicant responded on 30 April 2024. The Anglian Water protective provisions contained dDCO submitted at Deadline 3 are unchanged from those contained in the dDCO submitted at Deadline 1 **[REP1-016]** while negotiations continue.	• Discussion ongoing relating to the retained apparatus provision and determining whether works are deemed to be in land near Anglian Water apparatus	The Applicant considers it is likely to resolve matters prior to the close of Examination.

Network Rail	Yes: Schedule 14, Part 5 **[REP1-016]**	The Applicant had provided mark ups of the form of framework agreement and the form of protective provisions provided to solicitors for Network Rail on 9 February 2024 which were re-sent on 15 March 2024. Network Rail submitted written representations (and a summary of WRs) at Deadline 1 [**REP1-101** and **REP1-102**] including a draft set of its requested protective provisions. The Applicant provided a brief response to those WRs at D2 [**REP2-018**] and discussions are ongoing as to the protective provisions and associated agreements. The Applicant and Network Rail continue negotiations on the form of deed of easement to be granted relating to the installation and retention of the pipeline in Work No. 6. The Network Rail protective provisions contained in the dDCO submitted at Deadline 3 are unchanged from those contained in the dDCO submitted at Deadline 1 **[REP1-016]** while negotiations continue.	• Protective provisions requested which limit / curtail the use of DCO powers by Applicant • Request for “lift and shift” provisions in the Deed of Easement	Should agreement not be reached on the terms of the easement, further amendments to the protective provisions would be required which the Applicant would likely submit to the ExA, likely at Deadline 4.

North East Lincolnshire Council (NELC) as Lead Local Flood Authority (LLFA)	Yes: Schedule 14, Part 6 **[REP1-016]**	Revised protective provisions were provided to NELC as the LLFA on 8 April 2024 which largely reflect those recently agreed on the IERRT DCO. NELC has verbally confirmed the protective provisions are agreed and the Statement of Common Ground submitted at Deadline 3 has been updated to reflect this. The LLFA protective provisions contained in the dDCO submitted at Deadline 3 update those contained in the dDCO submitted at Deadline 1 **[REP1-016]** and are the final agreed provisions.	N/A	Protective provisions are Agreed.
Cadent Gas Limited	Yes: Schedule 14, Part 7 **[REP1-016]**	Cadent submitted written representations at Deadline 1 **[REP1-088]** including its proposed set of protective provisions. The Applicant provided a revised set of protective provisions provided to Cadent's solicitors on 22 March 2024 which takes into account some of these matters raised in Cadent's relevant representation. Further comments and mark up were received from Cadent's solicitors on 24 April 2024 which are currently being reviewed.	• Provisions relating to insurance and security • Updates to definition of Apparatus and Cadent's Undertaking • Provisions relating to application of the 1991 Act and stopped up streets • Indemnity provision	The Applicant considers it is likely to resolve matters prior to the close of Examination.

		The Cadent Gas protective provisions contained in the dDCO submitted at Deadline 3 are unchanged from those contained in the dDCO submitted at Deadline 1 **[REP1-016]** while negotiations continue.		
Operators of Electronic Communications Code Networks	Yes: Schedule 14, Part 8 **[REP1-016]**	There has been no engagement from any of the relevant telecommunications companies to date. The dDCO includes standard protective provisions for Operators of Electronic Communications Code Networks which reflects other made DCOs. The dDCO submitted at Deadline 3 includes what the Applicant considers the final protective provisions, absent any comments received from either BT or Virgin Media.	N/A	The Applicant considers the provisions settled.
North East Lindsey Drainage Board (NELDB)	No	NELDB has retained external counsel and the Applicant provided to a first draft of protective provisions to NELDB's solicitors on 12 April 2024. Comments are yet to be received. The dDCO submitted at Deadline 3 includes draft protective provisions for the NELDB which reflect the Applicant's iteration sent to NELDB's solicitors on 12 April 2024.	No comments received yet on the draft protective provisions.	The Applicant considers it is likely to resolve matters prior to the close of Examination.

2. Appendices

Appendix 1: Summary of Gexcon Study

Immingham Green Energy Terminal Land Use Planning Quantitative Risk Assessment Summary

Air Products
IMMINGHAM

FAO	Matthew Evans
Company	Air Products
Gexcon Project Number	202229
Report Number	03
Date of Issue	24.04.2024
Revision	00

Revision History

All projects are performed in accordance with the procedures given in Gexcon's Quality Management system that is based on the requirements given in ISO 9001:2015, and is certified according to the ISO standard. One of the main principles of the quality system is based on a three-level check, author QA, quality check by experienced personnel and independent approval by senior personnel, as documented below.

Revision	Date	Author	Checker	Approver	Notes
00	24.04.2024	Jake Kelsall	Jonathan Wiseman	Louise Black	First issue

Disclaimer:

Gexcon shall not be liable for damages which the assignor, or assignor's clients, vendors, consultants or other third party, suffers when applying or using the results of Gexcon's work, unless there is misconduct or gross negligence on the part of Gexcon or on the part of the persons used by Gexcon to carry out the work.

Executive Summary

Air Products are planning to develop the Immingham Green Energy Terminal (IGET) near the town of Immingham, UK, that will import ammonia by means of Very Large Gas Carrier (VLGC) via the Humber estuary for conversion to hydrogen. Imported ammonia will be stored and processed at the site to create liquefied hydrogen for onward road tanker transport.

Air Products engaged Gexcon Ltd to carry out a land use planning style Quantitative Risk Assessment (QRA) to develop representative consultation zones for the IGET. A QRA model has been developed in RISKCURVES software based on a systematic assessment of the processes and hazardous material inventories at the IGET. The primary source of input to the assessment has been the hazardous substance consent and the latest available design information such as Process Flow Diagrams (PFD) and Heat and Mass Balances (H&MB).

Using the QRA model, the inner, middle, and outer consultation zones have been estimated and impacted residential areas, buildings and areas of public use, major transport routes, recreational areas have been evaluated in accordance with the HSE's Planning Advice for Developments Near Hazardous Installations (PADHI) advice matrix.

This report presents the conclusions of the evaluation of the consultation zones associated with the IGET against current and potential land uses but does not present the estimated zones directly, for confidentiality reasons.

An evaluation of the surrounding areas affected by the consultation zones is performed in Section 5.2 of this report, where it is shown that the ten residential properties located on the west side of Queens Road would likely result in an Advise Against (AA) conclusion from the HSE. The sensitivity of these properties is not compliant with the location and hazard posed by the IGET, and measures must be implemented to prevent or mitigate the risks to these people. All other areas around the facility, which are predominantly industrial in nature, are likely to remain compliant with the HSE's decision making criteria.

Table of Contents

1. About Gexcon UK 1
2. Introduction 2
2.1 Overview 2
2.2 Objectives 2
2.3 Scope of Assessment 3
3. Facilities Overview 4
3.1 Site Location and General Layout 4
3.2 Project Phases 6
4. General Methodology 8
5. Results – Consultation Zones 9
5.1 Consultation Zones 9
5.2 Evaluation of Surrounding Developments 9
5.2.1 Impacted Areas 11
5.2.2 Review Against Future Development Plans 11
5.2.3 Summary of Impact on All Land Uses 12
6. Conclusions and Recommendations 15
6.1 Recommendations 15
7. References 16
8. Appendix A – Extended assessment of impact on land uses 17
9. Appendix B - General Methodology 22
9.1 Risk and Protection Based Methodologies 22
9.2 Dangerous Dose Limits 22
9.3 Consultation Zone Contour Development 23
9.4 Decision Making Criteria 23
10. Appendix C - Modelling Methodology 25
10.1 Software 25
10.2 Release Sections and Inventory 25
10.3 Frequency Assessment 26
10.4 Consequence Analysis 26
10.4.1 Discharge Modelling 27
10.4.2 Dispersion Modelling 27
10.4.3 Fires 27
10.4.4 BLEVE and Vessel Burst 27
10.5 Vapour Cloud Explosion 27
10.6 Weather 28
10.6.1 Ambient Conditions 28
10.6.2 Wind Rose 28
10.7 Vulnerability Rulesets 28
10.7.1 Toxic Vulnerability 28
10.7.2 Thermal Radiation Vulnerability 28

1. About Gexcon UK

Gexcon UK is a subsidiary of Gexcon (Global Explosion Consultants), a world-leading company in the field of safety and risk management and advanced dispersion, explosion, and fire modelling.

Gexcon have significant experience in risk assessment, particularly in development of quantified risk assessments (QRA) to support regulatory compliance in a range of contexts. The vast experience and technical expertise within the global business support Gexcon in providing comprehensive QRA's utilising detailed knowledge of explosion phenomena built up throughout decades of extensive research projects, carrying out safety assessments, performing accident investigations and performing physical testing at the company's own dedicated facilities (Sotra, Norway).

Further, Gexcon own, develop and maintain a number of consequence modelling and QRA tools, ensuring a thorough understanding of the underlying models to select the most appropriate tool for a facility and most importantly, identify where a tool may not be providing reasonable results. Consultants work closely with the R&D department, often identifying inaccuracies in the model and driving improvements. Gexcon's tools include EFFECTS and RISKCURVES, the tools used within this study, as well as FLACS-CFD tools. Gexcon also have an exclusive agreement with Shell to commercialise their in-house modelling tools, FRED, Shepherd and PIPA. Similarly, Gexcon work closely with the Shell tool developers, having expert knowledge on the use and limitations of these models.

Gexcon's wider experience in process safety, Regulatory compliance, consequence modelling and QRA, conducted in accordance with ISO 9001, ensure the work undertaken is in line with latest practices and knowledge and of high quality.

2. Introduction

2.1 Overview

Air Products are planning to develop the Immingham Green Energy Terminal (IGET) near the town of Immingham, UK, that will import ammonia by means of Very Large Gas Carrier (VLGC) via the Humber estuary for conversion to hydrogen. Imported ammonia will be stored and processed at the site to create liquefied hydrogen for onward road tanker transport. The IGET will qualify as an upper tier facility under the Control of Major Accidents Hazards (COMAH) Regulations and hence a Safety Report will need to be approved by the Competent Authority (CA).

In addition to COMAH compliance, hazardous substances consent will be required under the Planning (Hazardous Substances) Regulations (PHS Regulations). Consent is granted by the Hazardous Substances Authority (HSA), which is usually the local planning authority. The UK Health and Safety Executive (HSE) is a statutory consultee to the local authority on all hazardous substances consent applications and provides advice regarding the potential impact of the facility on the surrounding population, principally through application of their specific Land Use Planning (LUP) methodology. In application of their methodology, the HSE use the data in the hazardous substances consent form, along with supplementary input requests, to derive the inner, middle, and outer consultation zones around the facility. On derivation of the zones, the HSE use their decision making criteria to advise whether the level of risk to various offsite receptors is acceptable.

Prior to the HSE undertaking their LUP QRA, and to support the Development Consent Order (DCO), Gexcon have been requested by Air Products to conduct a LUP study for the facility to calculate the risk zones and understand the potential land use planning implications. This report presents a summary of the methodology, and conclusions of the LUP study.

2.2 Objectives

The primary objective of this LUP study is to develop a set of consultation zones for the IGET to further understand the offsite risks posed by the facility. This objective has been achieved via the following key steps:

- A LUP style Quantitative Risk Assessment (QRA) model has been developed based on the hazardous substances consent form, supplemented via a systematic assessment of the latest available design information for the IGET;
- Using the QRA model, the inner, middle, and outer consultation zones have been estimated; and
- Using the estimated consultation zones, the impacted residential areas, buildings and areas of public use, major transport routes, recreational areas and potential land development areas (as per North East Lincolnshire Local Plan) has been evaluated in accordance with the HSE decision making criteria.

The formal consultation zones will be calculated by the HSE using their own in-house consequence modelling tools and methodologies, which are not publicly available. Hence, the results in this report can only be considered a proxy for the formal consultation zones. To ensure the zones are as consistent as possible, Gexcon have arranged meetings with the HSE to further understand their approach. Additionally, a Freedom of Information request raised by Gexcon has resulted in the HSE sharing their guidance documentation for land use planning. These inputs have proved crucial to development of the results presented in this report. However, the results in this report can still only be considered an estimate, primarily due to the proprietary consequence modelling tools the HSE employ.

2.3 Scope of Assessment

A summary of the facility location, layout and process are outlined in Section 3 of this report. The general scope of the LUP QRA can be summarised as follows:

- The ammonia inventory held on the VLGC;
- New VLGC offloading jetty, including connecting arms and consideration of leaks from the ship cargo tanks in the case of loss of containment.
- Refrigerated ammonia storage and associated boil-off gas handling;
- Hydrogen Production Units (HPU);
- Hydrogen Liquefaction Units (HLU);
- Transfer pipelines between the jetty, and east and west sites;
- Liquid hydrogen storage facilities; and
- Road tanker loading bays for both gaseous and liquid hydrogen export.

The study scope covers the ammonia terminal facilities at two stages: as completed at the end of Phase 1, and at the full extent of the proposed future scope (end of Phase 6), which represents the maximum amount of processing infrastructure intended for the location (see Section 3.2).

The scope excludes risks to the environment and of business interruption / remediation / reputation.

The scope covers the project facilities in normal operation, for a representative set of continuous operating conditions and excludes construction, commissioning, and maintenance turnaround activities.

It is outside the scope of this study to identify risk-reduction measures and demonstrate that risks are As Low As Reasonably Practicable (ALARP). The ALARP demonstration and assessment of potential risk-reduction measures shall be presented in support of the COMAH Safety Report.

3. Facilities Overview

This section provides a high-level overview of the IGET and the associated development phases. A more detailed description of the facility can be found in the Environmental Statement Chapter 2 of the DCO (APP-044) [1].

3.1 Site Location and General Layout

The site is in Northeast Lincolnshire on the south bank of the Humber Estuary to the east of the existing Port, as shown in Figure 3-3-1. The site layout, including a mark-up of the key process areas is shown in Figure 3-3-2.

Figure 3-3-1 – Google Aerial Image of Immingham Green Energy Terminal

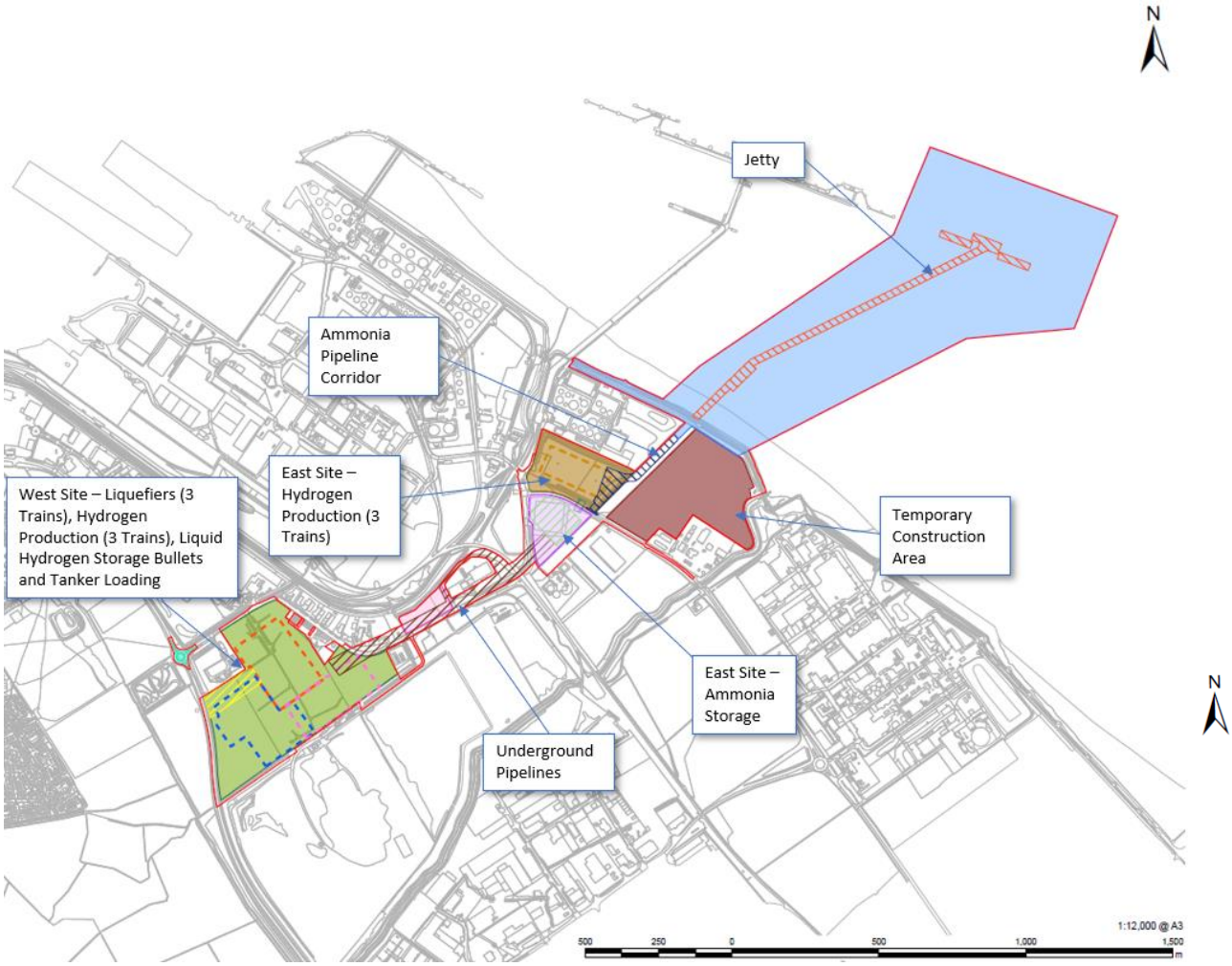

Figure 3-3-2 – Site Layout Identifying the Key Process Areas

As shown in Figure 3-3-2, the new VLGC offloading jetty will be located to the southeast of the existing oil terminal jetty, with ship connection handled by articulated marine hard arms. Two 16" transfer pipelines shall be routed along the topside of the jetty to the ammonia tank. The East Site consists of two plots of land, with the refrigerated ammonia storage tank located on the southern, approximately triangular plot and the (future) HPUs located to the north. The East Site also houses boil off gas handling, ammonia transfer supply pumps and future hydrogen production units.

At the northern boundary of the future HPU plot is a set of large petroleum storage tanks associated with the ABP / Associated Petroleum Terminals. To the west are other facilities within the Port of Immingham boundary.

The West Site comprises the initial HPUs, all hydrogen liquefaction trains, storage bullets for the liquefied hydrogen and road tanker filling stations. The ammonia transfer pipeline enters the West Site at the northeast corner via a buried pipeline from the east site.

3.2 Project Phases

A phased approach is planned for the development of the IGET, as shown in Figure 3-3-4. The LUP QRA assesses the facility as it is expected to be installed at the end of Phase 1, and for the full infrastructure at the end of Phase 6.

Phase 1, which is targeting completion in 2027, consists of the following packages / units:

- Ammonia import jetty, including two hard arms and 16" transfer pipelines (Jetty Area);
- Main ammonia storage (East Site);
- A single buried ammonia pipeline from East Site to West Site;
- Two Hydrogen Production Units (West Site);
- One Hydrogen Liquefaction Unit (West Site);
- Five liquid hydrogen storage bullets (West Site);
- Four liquid hydrogen trailer loading bays (West Site);
- Ten venting spaces (West Site); and
- One conditioning bay (West Site).

Phases 2 through 6 will follow by 2035, including the following additional equipment:

- Four Hydrogen Production Units (three at the East Site, one at the West Site) (total 6);
- A single buried hydrogen pipeline from East Site to West Site;
- Three Hydrogen Liquefaction Units (West Site) (total 4);
- Three liquid hydrogen storage bullets (West Site) (total 8);
- Eight liquid hydrogen trailer loading bays (West Site) (total 12); and
- Hydrogen refuelling station, including compression and 15 trailer loading bays.

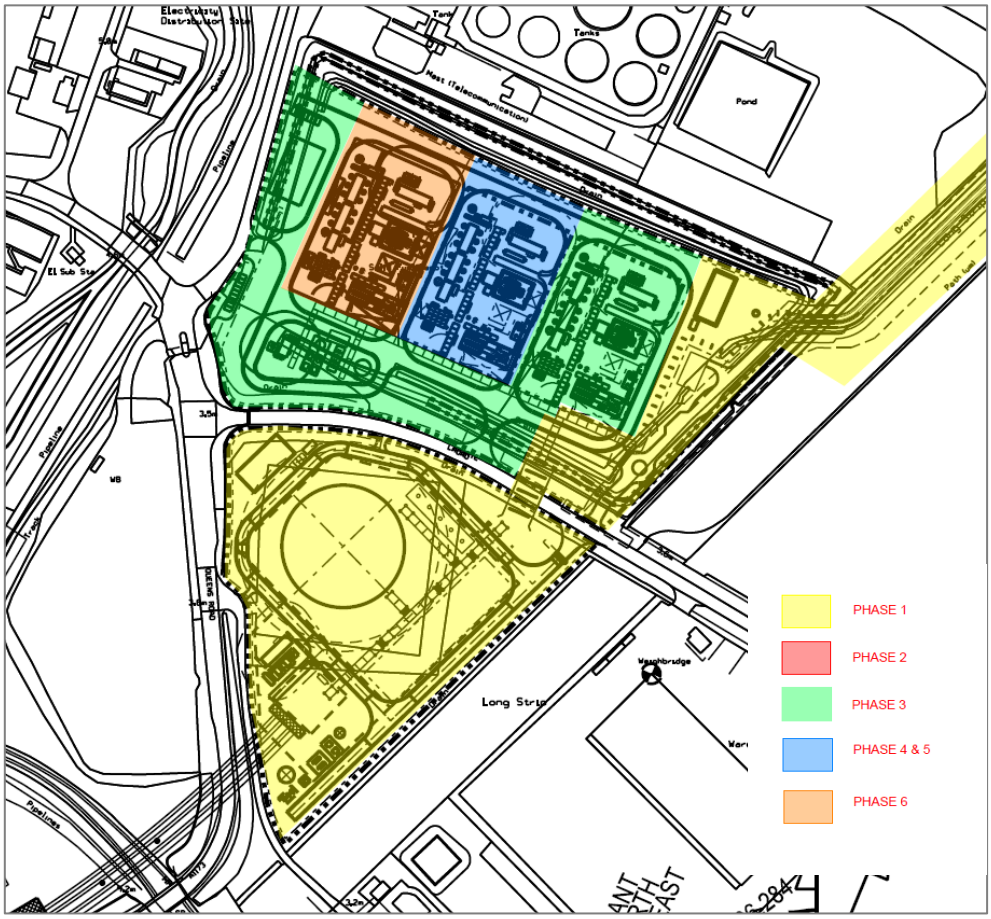

Figure 3-3-3 – East Site Project Phases

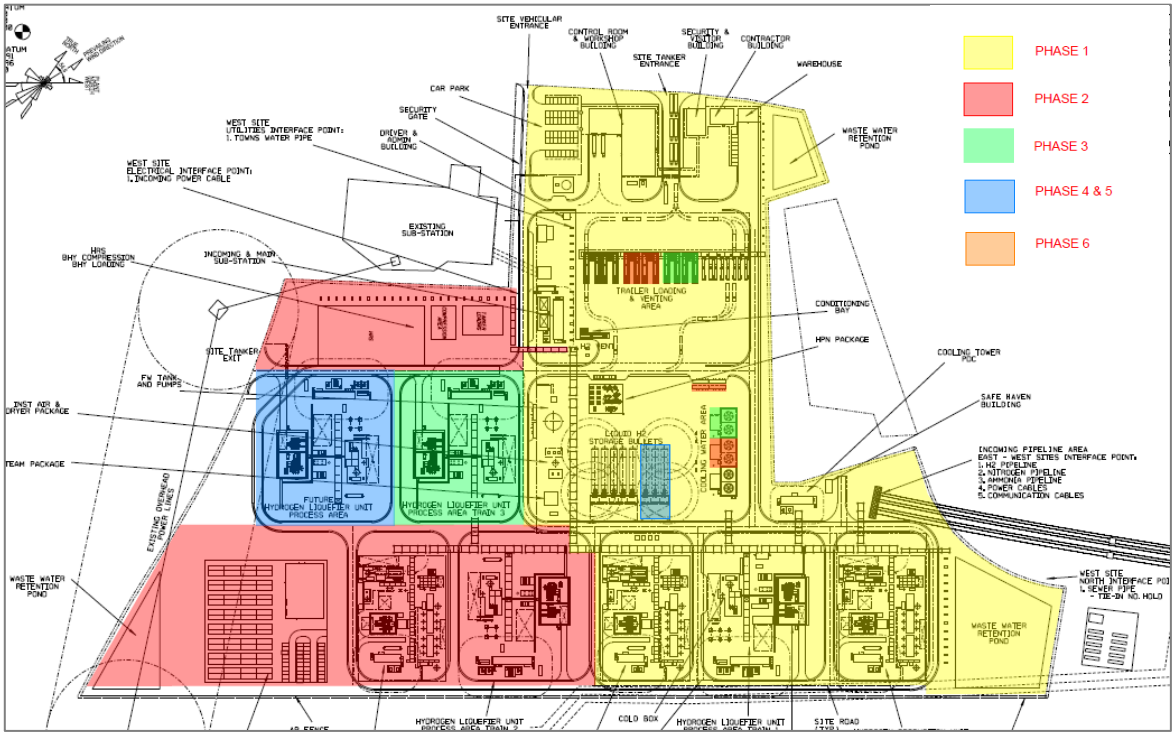

Figure 3-3-4 – West Site Project Phases

4. General Methodology

The HSE assesses an application for hazardous substances consent to establish three consultation zones; inner, middle, and outer, which are zones representing exposure to a major hazard from the facility. The HSE will use the information included in the hazardous substances consent form, along with any requested supplemental information (e.g. equipment locations, process flow diagrams etc.) to derive the consultation zones.

In development of this study, Gexcon have communicated with the HSE to further understand their methodologies and obtained guidance documentation which provides further inputs and assumptions.

Further explanation of the key specific requirements of the HSE methods are outlined in Appendix B and further explanation of the modelling is given in Appendix C.

5. Results – Consultation Zones

5.1 Consultation Zones

The resultant consultation zones show that toxic risks are observed to bound the extent of all three zones for the East Site and jetty, whilst flammable consequences are main the contributor for the West Site.

An evaluation of the developments affected by the resultant consultation zones has been undertaken in Section 5.2, in accordance with the HSE's "planning advice for developments near hazardous installations" PADHI approach.

5.2 Evaluation of Surrounding Developments

A detailed assessment of the nearby developments is presented in this section, split by each of the main areas (i.e. East Site and West Site). The only area impacted at the Jetty is the adjacent Immingham Oil Terminal Jetty (Sensitivity Level 1) for which the HSE will likely conclude a result of "Do Not Advise Against (DAA)" due this being an existing industrial area.

Table 5-1 provides a summary of the assessment, along with the likely advice to be provided by the HSE. Note that the advice is positioned from the perspective that the IGET is an existing facility, and the surrounding developments are going through planning. This is the inverse of the actual situation, however structuring the assessment in this manner enables a targeted approach to specific developments.

As can be seen in Table 5-1, only the ten residential properties located on the west side of Queens Road is likely to result in an advise against (AA). These are further discussed in Section 5.2.1.

All other areas, being primarily of commercial nature (Sensitivity Level 1), are likely to receive a "Do Not Advise Against (DAA)" conclusion. Note that the ABP Ro-Ro Terminal passenger waiting area has conservatively been applied a Sensitivity Level 2 status (with other areas of the Ro-Ro terminal being sensitivity level 1). The Queens Road Community Recycling Centre has also been assigned Sensitivity level 1 on the basis that this site already resides inside an inner zone.

Table 5-1 - Receptor Evaluation

IGET Area	Development Description	Sensitivity Level	Consultation Zone	Likely Decision
West Site	Immingham Day Nursery	4	Outside Zoned Areas	DAA
	Ten residential properties located on the west side of Queens Road as follows: Houses at Numbers 1-5 and 31 Queens Road (six houses in total). Number 6 Queens Road (two flats in total). Numbers 7-8 (one flat) and 18 Queens Road (one flat), with these flats on the upper floors above commercial interests on the ground floors (two flats in total).	2	Inner Zone	AA
	Queens Road Community Recycling Centre	1	Inner Zone (straddling)	DAA

IGET Area	Development Description	Sensitivity Level	Consultation Zone	Likely Decision
	Residential properties on the eastern edge of Immingham approximately 460m and 480m west of the West Site.	2	Outside Zoned Areas	DAA
	Mauxhall Farm off Stallingborough Road, located approximately 1km south-west of the West Site.	2	Outside Zoned Areas	DAA
	Associated British Ports (ABP) have submitted plans for a new ferry terminal – "a new four-berth ro-ro harbour facility designed to service the embarkation and disembarkation of principally commercial and automotive traffic, possibly with provision for a small element of passenger use during quiet periods" [2].	2	Middle Zone	DAA
	Kings Road Power Station	1	Inner Zone	DAA
	Kauf UK Immingham	1	Inner Zone	DAA
	FCC Environment (Waste Disposal)	1	Inner Zone	DAA
	Queens Road Power Station	1	Inner Zone	DAA
	Queens Road Commercial Properties	1	Inner Zone	DAA
	The A1173, bordering the western edge of the West Site is a single carriageway and therefore not believed to come under the definition of a "major transport link".	1	Inner Zone	DAA
East Site	Associated British Ports (ABP) have submitted plans for a new ferry terminal – "a new four-berth ro-ro harbour facility designed to service the embarkation and disembarkation of principally commercial and automotive traffic, possibly with provision for a small element of passenger use during quiet periods" [2].	2	Middle Zone	DAA
	PD ports who are located close to the east site ammonia tank.	1	Inner Zone	DAA
	Immingham Docks operated by ABP which comprises several discrete operational areas, some of which are COMAH Installations.	1	Outside Zoned Areas	DAA
	Immingham Oil Terminal operated by Associated Petroleum Terminals (APT), directly adjacent to the Project Site.	1	Inner Zone	DAA
	New development being constructed, believed to be a warehouse, to the west of the East Site.	1	Middle Zone	DAA
	Exolum Immingham Limited (formerly Inter Terminals Ltd) located 1.5 km (east terminal) and 2 km (west terminal) in a westerly direction from the Project Site.	1	Outside Zoned Areas	DAA
	Tronox Pigment UK Ltd operate a chemical manufacturing facility located approximately 1 km south-east of the Project Site.	1	Outer Zone	DAA
	The South Humber Bank Power Station owned by EP UK Ltd which is a combined cycle gas turbine (CCGT) facility supplied by a high pressure gas pipeline, located approximately 2.5 km south-east of the Project Site.	1	Outside Zoned Areas	DAA
	Railway lines bordering the West Site is a transient population, small period of time exposed to risk.	1	Inner Zone	DAA

5.2.1 Impacted Areas

The ten residential properties located on the west side of Queens Road (marked QR on Figure 6-2), which are Sensitivity Level 2, reside within the inner zone. This would result in a Advise Against (AA) conclusion from the HSE. The main contributory hazards to this area are the flammable consequences (i.e. thermal radiation, explosion, and flash fire). The other areas residing in the inner zone are Sensitivity Level 1 (workplaces) and hence the HSE's advice to these areas would likely be Do Not Advise Against (DAA).

All other areas of Sensitivity Level 2 and above (i.e. Immingham residential areas and Immingham Day Nursery also shaded blue fill on Figure 5-2) would likely result in Do Not Advise Against (DAA) from the HSE since they reside outside all consultation zones.

All developments in areas around the East site (Works 2,3 and 5) are either commercial or industrial in nature and hence are Sensitivity Level 1. PD Ports and Immingham Oil Terminal are predicted to reside within the inner zone at the end of Phase 1.
There is a Local Wildlife Site (LWS) and Site of Nature Conservation and Interest (SNCI) within the consultation zones, however assessment of these areas is out with the scope of this study.

5.2.2 Review Against Future Development Plans

North East Lincolnshire Council (NELC) have published a local plan for development [3] to outline their plans for creating new jobs and homes. The plan outlines the requirement for more than 13,000 homes to meet future demands.

Figure 5-1 below presents the local plan around the establishment and all impacted developments on the plan are for employment purposes only (hence Sensitivity Level 1). The HSE advice for these new developments, if the IGET was operating, would therefore be do not advise against (DAA). Further details of all land areas around the site are given in Figure 5-2.

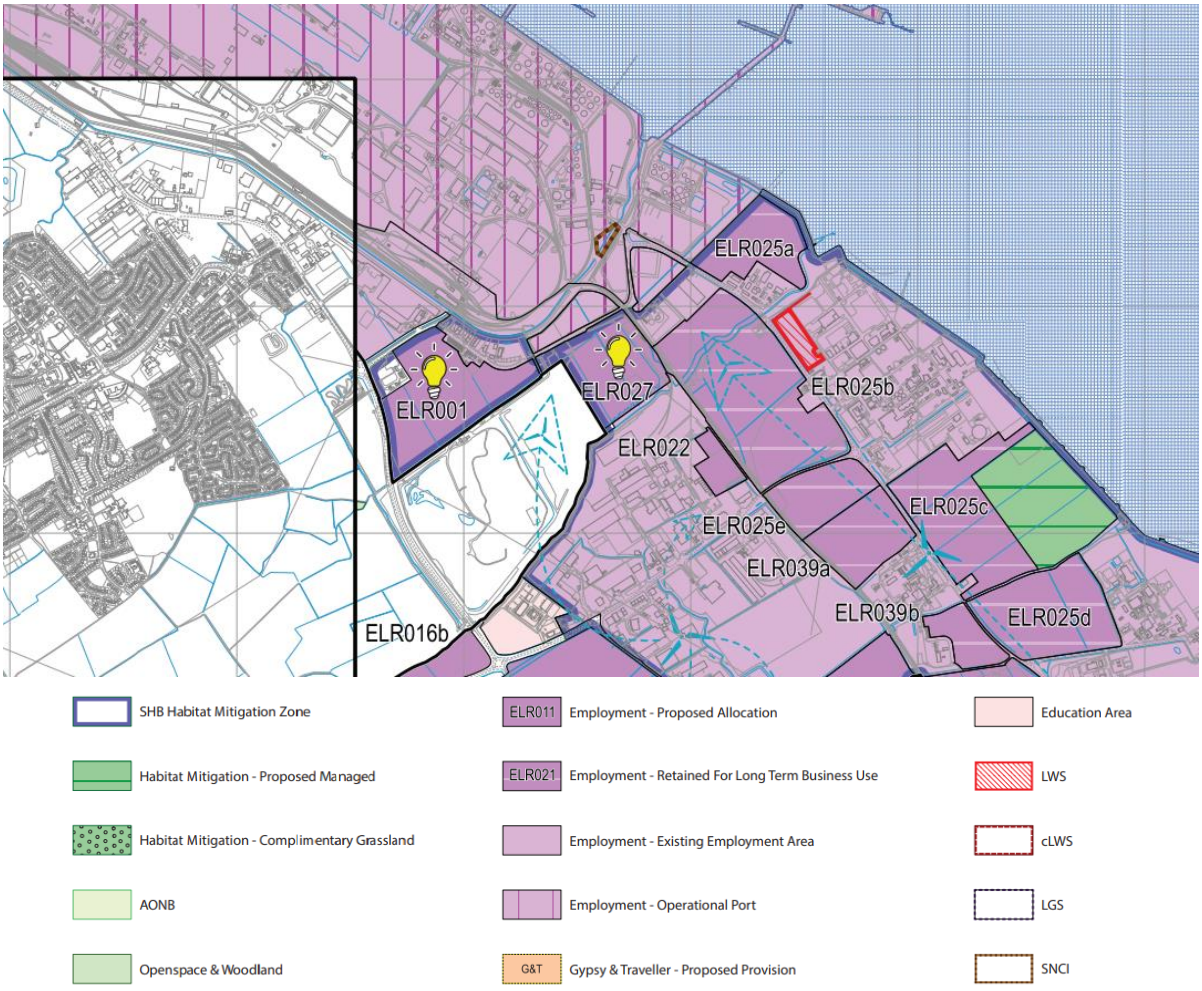

Figure 5-1 – NELC Local Plan 2013 to 2032

5.2.3 Summary of Impact on All Land Uses

Figure 5-1, below, shows land plots and land users immediately surrounding the IGET Facility sites:

- Red boundary – IGET Facility site areas;
- Orange Borders – land identified in NELC local plans;
- Blue borders – existing industrial land uses;
- Solid Blue – Existing residential areas;
- Purple Borders – land not in current NELC plans; and
- Green Borders – land not in current NELC plans / not suitable for future use.

Table 5-1 below present a summary of all the land plots and land users adjacent to the IGET facility (identified in Figure 5-2) showing how they would be affected by the estimated land use planning zones created by the IGET facility.

A wider assessment of land uses within North East Lincolnshire local plans including planning consents and applications is given in Appendix A.

Figure 5-2 – Plan of land adjacent to IGET facility

Table 5-1 – Summary of IGET impact on land uses

No	NELLP No	Current land use	Planned future land use	IGET consultation zone	Impact
1	ELR025a	Agricultural	Employment	Inner/middle	Note 1
2	ELR025b	Agricultural	Employment	Middle/outer	Note 1
3	ELR027	Agricultural	Extant Planning for Energy Recovery Facility	middle	No impact
4	ELR022	Agricultural	Employment	outer	Note 1
5	n/a	Gypsum lagoon (not in use)	Gypsum lagoon (not in use)	Inner/middle	No impact
6	n/a	Landfill	Landfill	Inner/middle/outer	No impact
7	n/a	Agricultural	Solar	Inner	No impact
8	n/a	Motorbike track	Motorbike track	Inner	No impact
9	ELR41	Agricultural	Employment	Inner/middle/outer	Note 1
10	ELR37	Agricultural	Employment	Outer/not in zone	Note 1
11	n/a	Agricultural	Agricultural	Inner/middle/outer	No impact
12	n/a	Agricultural	Agricultural	Inner/middle/outer	No impact
13	n/a	Agricultural	Agricultural	Inner/middle/outer	No impact
14	n/a	Agricultural	Agricultural	outer	No impact
15	n/a	Agricultural	Agricultural	Not in zone	No impact
16	n/a	Agricultural	Agricultural	Not in zone	No impact
17	ELR025e	Agricultural	Employment	Not in zone	No Impact
18	n/a	Existing employment	Employment	Inner/middle/outer	Note 2
A	n/a	Kings Road Power station and substation		Inner	No impact
B	n/a	Knauf UK Ltd		Inner/middle/outer	No impact
C	n/a	Queens Road Commercial Properties		inner	No impact
D	n/a	Queens Road power station		inner	No impact
E	n/a	Community recycling centre		Inner/middle	No impact
F	n/a	PD Ports		Inner/middle	No impact

No	NELLP No	Current land use	Planned future land use	IGET consultation zone	Impact
G	n/a	APT Immingham Oil Terminal		Inner/middle	No impact
H	n/a	Polynt		middle	No impact
I	n/a	FCC Environmental Waste Disposal		inner	No impact
J	n/a	Immingham Power Limited		middle	No impact
K	n/a	Sewage Works		Inner/middle	No impact
L	n/a	Border Control Post		middle	No impact
QR	n/a	Existing residential and employment	Employment	Inner	See 5.2.1
KR	n/a	Existing residential	Residential	Outer	No impact
Imm	n/a	Existing residential	Residential	Not in zone	No impact

Notes

1. Future employment use is acceptable but must be compatible with HSE Land Use Planning Criteria (see Table 9.1)
2. Existing employment uses are acceptable. Any future uses must be compatible with HSE Land Use Planning Criteria (see Table 9.1)

6. Conclusions and Recommendations

This report presents the results of a land use planning style QRA that has been undertaken to develop representative consultation zones for the IGET. A QRA model has been developed in RISKCURVES software based on a systematic assessment of the processes and hazardous material inventories at the IGET. The primary source of input to the assessment has been the hazardous substance consent [4] and any available supporting information such as PFDs and H&MBs.

Using the QRA model, the inner, middle, and outer consultation zones have been estimated and impacted residential areas, buildings and areas of public use, major transport routes, recreational areas have been evaluated in accordance with the HSE's Planning Advice for Developments Near Hazardous Installations (PADHI) advice matrix.

An evaluation of the surrounding areas is performed in Section 5.2, where it is shown that the ten residential properties located on the west side of Queens Road area have been identified for which the HSE would likely Advise Against (AA) development. All other areas are compliant with the HSE's decision matrix and would there likely result in a Do not Advise Against (DAA) recommendation.

6.1 Recommendations

This report has been developed with the intention to replicate, as closely as possible, the conclusions that will likely be identified from the HSE's land use planning assessment of the IGET, based on the current hazardous substances consent form.

Based on the analysis and associated conclusions in this study, it is recommended that measures are taken to prevent continued residential use of properties on Queens Road.

7. References

[1] Air Products, Immingham Green Energy Terminal, Volume 6, 6.2 Environmental Statement, Chapter 2: The Project, Revision 1, September 2023.

[2] ABP, Immingham Eastern Ro-Ro Terminal, “Initial Information Report for PINS”, TR030007-000006, August 2021.

[3] N. E. L. Council, “Local Plan 2013 to 2032, Planning for Growth”.

[4] Air Products, Application for Hazardous Substances Consent.

[5] UK HSE, https://www.hse.gov.uk/landuseplanning/methodology.htm.

[6] UK HSE, https://www.hse.gov.uk/chemicals/haztox.htm.

[7] RISKCURVES Software, Version 12, 2023.

[8] EFFECTS Software, Version 12, 2023.

[9] UK Health & Safety Executive (HSE), “Failure Rate and Event Data, Chapter 6k, Version 14,” 2017.

[10] International Association of Oil and Gas Producers, Riser and Pipeline Release Frequencies, September 2019.

[11] Gexcon, Technical Note: The Use of EFFECTS for Hydrogen Modelling, 2023.

[12] Health and Safety Authority, Guidance on technical land use planning advice, 2023.

[13] Iowa State University, Iowa Environmental Mesonet, GB_ASOS [EGNJ] Humberside, https://mesonet.agron.iastate.edu/sites/site.php?station=EGNJ&network=GB__ASOS, accessed December 2023.

[14] International Oil & Gas Producers (IOGP), Risk Assessment Data Directory, Report No. 434, Version 3, September 2019.

[15] UK HSE, “Reducing Risks, Protecting People (R2P2),” 2001.

[16] VROM, Publication Series on Dangerous Substances (PGS 3), Guidelines for Quantitative Risk Assessment.

[17] E. 1. (. 2015), 9th Report of the European Gas Pipeline Incident Data Group (period 1970 – 2013).

[18] H. Boot, “Us of EFFECTS for Hydrogen modelling,” Gexcon, Utrecht, 2023.

[19] HSE, “Reducing Risks Protecting People”.

[20] DNV, “LUP QRA report”.

8. Appendix A – Extended assessment of impact on land uses

A wider assessment of land uses within North East Lincolnshire local plans including planning consents and applications is given below.

North East Lincolnshire Local Plan 2013 to 2032
Policy Map Plan Area - https://www.nelincs.gov.uk/assets/uploads/2018/05/20180322-PolicyMapPlanArea-WEB.pdf
Immingham Inset Map - https://www.nelincs.gov.uk/assets/uploads/2018/05/20180322-PolicyMapInsetMaps-WEB-1.pdf

Table 8-1 – North East Lincolnshire Local Plan 2013 to 2032

Allocation	Local Plan Ref.	Outside Consultation Distance (Outer Zone)	Anticipated IGET Inner Zone	Anticipated IGET Middle Zone	Anticipated IGET Outer Zone
Housing	HOU001	✓			
Housing	HOU301	✓			
Employment	ELR007	✓			
Employment	ELR037	✓			✓
Employment	ELR027			✓	
Employment	ELR022				✓
Employment	ELR025a		✓	✓	
Employment	ELR025b			✓	✓
Employment	ELR025c	✓			
Employment	ELR025e	✓			
Employment	ELR039a	✓			
Employment	ELR016b	✓			
Employment	ELR016a	✓			

North East Lincolnshire Local Plan Review Draft Plan with options (20th December 2023)

Local Plan Review – Draft Local Plan - https://www.nelincs.gov.uk/assets/uploads/2024/01/2023-LocalPlanReview-DraftPlanWithOptions-Accessible.pdf

Figure 9.1 Employment sites – Page 118

Figure 10.1 Housing sites – Page 135

Table 8-2 – North East Lincolnshire Local Plan Review Draft Plan with options (20th December 2023)

Allocation	Local Plan Ref.	Outside Consultation Distance (Outer Zone)	Anticipated IGET Inner Zone	Anticipated IGET Middle Zone	Anticipated IGET Outer Zone
Housing – Under Construction	HOU301	✓			
Housing - Other	HOU378	✓			
Employment – Call for Sites Identified	ELR041	✓	✓	✓	✓
Employment – 2018 Local Plan Proposed Employment Site	ELR007	✓			
Employment – 2018 Local Plan Proposed Employment Site	ELR037	✓			✓
Employment – 2018 Local Plan Proposed Employment Site	ELR027		✓	✓	
Employment – 2018 Local Plan Proposed Employment Site	ELR022				✓
Employment – 2018 Local Plan Proposed Employment Site	ELR025a		✓	✓	
Employment – 2018 Local Plan Proposed Employment Site	ELR025b			✓	✓
Employment – 2018 Local Plan Proposed Employment Site	ELR025c	✓			
Employment – 2018 Local Plan Proposed Employment Site	ELR025e	✓			
Employment – 2018 Local Plan Proposed Employment Site	ELR039a	✓			
Employment – 2018 Local Plan Proposed Employment Site	ELR016b	✓			
Employment – 2018 Local Plan Proposed Employment Site	ELR016a	✓			

Existing Extant Planning Permissions (excluding alterations, existing allocations and facilities under construction)

Table 8-3 – Existing Extant Planning Permissions (excluding alterations, existing allocations and facilities under construction)

Description	Planning Ref.	Outside Consultation Distance (Outer Zone)	Anticipated IGET Inner Zone	Anticipated IGET Middle Zone	Anticipated IGET Outer Zone
Erect new warehouse (B8) office and trade counter – Land off Kings Road	DM/0374/23/FUL	✓			
Erect an Energy Recovery Facility – Land South of Queens Road	DM/0026/18/FUL			✓	

Applications Under Consideration

Table 8-4 – Applications Under Consideration

Allocation/ Description	Planning Ref.	Outside Consultation Distance (Outer Zone)	Anticipated IGET Inner Zone	Anticipated IGET Middle Zone	Anticipated IGET Outer Zone
Temp change of use C3 to site office (E(g))	DM/1213/23/FUL		✓		
Construction of solar farm and battery energy storage system	DM/0108/24/FUL	✓			
Construction of green energy HGV and LGV refuelling and recharging facility	DM/0122/24/FUL	✓			
Immingham Eastern Ro-Ro Terminal (DCO)	TR030007	✓	✓	✓	✓

Existing Land Use

Table 8-5 – Existing Land Use

Area	Outside Consultation Distance (Outer Zone)	Anticipated IGET Inner Zone	Anticipated IGET Middle Zone	Anticipated IGET Outer Zone
Knauf (North of West Site)		✓	✓	✓
Kings Road Power Station		✓		
Immingham Motor Cycle Project (West of Kings Road)		✓		
Residential Use South of Queens Road		✓		
Employment Use South of Queens Road		✓		
Employment Use North of Queens Road		✓		
Queens Road Power Station		✓		
Community Recycling Centre		✓	✓	
Border Control Post			✓	
Immingham Power Limited			✓	
Sewage Works		✓	✓	
Operational Area – Port of Immingham	✓	✓	✓	✓
APT – Immingham Oil Terminal		✓		
PD Ports		✓	✓	
Polynt Composites UK Ltd			✓	
Tronox Ltd	✓		✓	✓
Kiln Lane Industrial Estate – North of Kiln Lane	✓		✓	✓
Industrial Estate – South of Kiln Lane	✓			
Immingham Landfill Site, Queens Road	✓	✓	✓	✓
Catch Facility	✓			
HETA	✓			
myenergi	✓			
SHIIP	✓			
Mauxhall Farm Solar Farm	✓			
Residential Use – East Immingham (Off Somerton Road)	✓			
Battery Street Woodland	✓			✓

Area	Outside Consultation Distance (Outer Zone)	Anticipated IGET Inner Zone	Anticipated IGET Middle Zone	Anticipated IGET Outer Zone
Residential Use – Waterworks Street/ Chestnut Avenue	✓			
Residential Use – No. 94 & 96 Kings Road				✓
Employment Use – Chapel House & Marlin House, Kings Road	✓			✓
Residential Use – No.60 – 42 Kings Road	✓			
Employment Use – Middleplatt Road	✓			

Note that in relation to extant permissions, many have not been included as they are extensions to existing facilities or already allocated so the principle of their use remains the same. Furthermore, the 'under consideration' planning applications is a live list as there may be more planning applications coming forward prior to determination of the DCO.

9. Appendix B - General Methodology

9.1 Risk and Protection Based Methodologies

The approach for derivation of the consultation zones adopts fundamentally different methodologies dependent on the hazard, as follows:

- Flammable inventories (primarily hydrogen) have been assessed by adopting the “protection concept” whereby the zones are defined from worst case consequences, typically as a result of catastrophic rupture and / or full-bore releases; and
- Toxic releases have adopted a probabilistic (or QRA) based approach to determine the risk zones. To this end, the toxic sections of the facility have been assessed in additional detail to incorporate leak frequency and windrose data as outlined in Appendix C.

Where a protection concept assessment is carried out, the three zones are set so that there is almost complete protection from lesser but likely events and worthwhile protection against unlikely but foreseeable large-scale events. It is generally not practicable to protect against toxic hazards, hence a risk based methodology is adopted.

9.2 Dangerous Dose Limits

The consultation zones are based on a person experiencing a dangerous dose (https://www.hse.gov.uk/landuseplanning/methodology.htm) [5], which can be qualitatively described as one of the following:

- Severe distress to all;
- A substantial number requiring medical attention;
- Some requiring hospital treatment; or
- Some (about 1%) fatalities.

The dangerous dose concept is one of the key aspects of the HSE’s LUP methodology and represents a significant deviation from a typical QRA (and indeed other land use planning approaches applied in Europe) which assesses risk in terms of fatality probability.

The dangerous dose criteria are outlined in https://www.hse.gov.uk/chemicals/haztox.htm. For toxic materials the HSE use the Specified Level of Toxicity Dangerous Toxic Load (SLOT DTL) value [6]. The SLOT DTL is equivalent to 1% of the population experiencing a fatality from the toxic dose.

For jet fires, pool fires and fireballs, the limits of the middle and outer zones are normally where 1000 and 500 TDU respectively would be received. These thermal doses are the dangerous doses for normal and vulnerable populations respectively. The inner zone is usually defined as the distance at which a dose of 1800 TDU would be received.

For explosion scenarios, the HSE uses peak overpressures of 600, 140 and 70 mbar. At 140 mbar, which is taken to be the dangerous dose, a degree of structural damage will occur to typical domestic dwellings, which might lead to some fatalities amongst building occupants. At 70 mbar, structural damage is very unlikely, although windows will be broken, and other minor damage may occur. It is

assumed that at overpressures below 70 mbar, there will be no fatalities even amongst vulnerable populations.

The flammable concentration of interest is taken to be the Lower Flammability Limit (LFL), ensuring that a suitable averaging time is used within the dispersion model and that the assessment takes account of the worst-case event that may occur.

The toxic and thermal radiation dangerous dose levels are dependent on exposure duration, and hence it is necessary to apply further assumptions regarding the intensity / concentration and time of exposure.

9.3 Consultation Zone Contour Development

The risk-based zone boundaries, which are applied to toxic hazards, correspond to levels of individual risk of dangerous dose or worse, as given at HSE: Land use planning - HSE's land use planning methodology:

- Inner Zone: 10 chances per million per year (cpm) or greater individual risk of dangerous dose or worse;
- Middle Zone: Between 10 cpm and 1 cpm individual risk of dangerous dose or worse; and
- Outer Zone: Between 1 cpm and 0.3 cpm individual risk of dangerous dose or worse.

The flammable consequence thresholds for each zone are outlined in the previous section.

Where both flammable and toxic hazards exist, the consultation zones shall be derived based on the risk or consequence effect which results in the furthest extent.

9.4 Decision Making Criteria

In making decisions on proposed developments near existing hazardous facilities, the HSE has established a procedure to assess the compatibility of developments proposed within the derived zones (as described in the previous section), which includes the following considerations:

- Vulnerability of the exposed population;
- Proportion of time spent by any individual in the development;
- Size of the building or infrastructure;
- Ease of evacuation or other emergency measures; and
- Characteristics of buildings (number of storeys).

Based on these factors, the HSE have developed an advice matrix (termed Planning Advice for Developments Near Hazardous Installations (PADHI)), that allows assessment of the calculated risk zone with a development (public) sensitivity level. The advice matrix is available on the HSE website (https://www.hse.gov.uk/landuseplanning/methodology.htm) [5] and summarised in Table 9-1 below. This criterion shall be applied in the study to assess the acceptability of risks to the population surrounding the IGET and to gauge HSE's advice to the planning authority.

Table 9-1 - HSE Criteria for Evaluating Development Near a Facility

Sensitivity Level	Land-use developments (examples)	Outer zone	Middle zone	Inner zone
1	Workplace buildings with less than 100 occupants and less than 3 occupied storeys, and stand-alone car parks (e.g., factories, warehouses and offices).	DAA	DAA	DAA
2	Residential areas of up to 30 dwelling units at a density of no more than 40 units per hectare Hotels up to 100 beds, camping up to 33 pitches.	DAA	DAA	AA
3	Indoor public spaces with over 5,000 m^2 total floor space (e.g., retail and leisure centres) Outdoor public spaces with over 100 people but up to 1,000 at any one time.	DAA	AA	AA
4	Highly vulnerable or very large facilities (e.g., hospital or nursing home larger than 0.25 hectares, school larger than 1.4 hectares and stadium).	AA	AA	AA

AA: Advise Against
DAA: Do not Advise Against

10. Appendix C - Modelling Methodology

10.1 Software

The QRA model has been developed in the RISKCURVES software, version 12 [7]. RISKCURVES incorporates the EFFECTS consequence modelling software [8] to perform the physical effects modelling. A high level description of each tool is provided below.

EFFECTS can model complex releases by linking individual models in such a way that they describe all relevant physical phenomena that may occur during that release. For example a liquid release will consist of a release model, connected to an evaporation model, which is then linked to a dispersion model that calculates the concentration profiles in the environment. The dispersion model may then be linked to an explosion model to calculate the ultimate effects due to peak overpressures or heat radiation if the chemical is flammable and ignites.

RISKCURVES is a full-featured computer program which is used to perform QRA. It can calculate geographical risk, off-site societal risk, dangerous dose risk, societal risk, and personal individual risk. RISKCURVES can analyse risk by means of the most dominant contributor, construct all types of societal and individual risk curves, display risk contours, and calculate transport risk per kilometre of route. Crucially, the software is capable of deriving “Consequence Risk” results which facilitates development of hazard frequency contours to defined consequence levels in accordance with the HSE’s dangerous dose concept.

10.2 Release Sections and Inventory

The initial stage of analysis consists of defining the system as a set of release scenarios to be addressed in the study. In accordance with the assumptions underpinning the HSE’s methodology for land use planning (https://www.hse.gov.uk/landuseplanning/methodology.htm) [5], the quantities, and properties of the hazardous substances at the facility were primarily determined from the hazardous substances consent form [4]. Where gaps exist in this data (especially where the full risk-profile is necessary for toxic releases) further information based on the following sources has been applied:

- Process Flow Diagrams (PFDs);
- Heat and Material Balance (H&MB);
- Plot plans;
- Design Pressure Temperature data; and
- Piping and Instrumentation Diagrams (for line sizes only).

For release sections covering multiple process parameters (e.g., multiple pressures and temperatures), the most conservative parameter has been selected to provide a worst-case assessment.

In accordance with HSE LUP methodologies, the maximum inventories as declared in the application for hazardous substances consent form shall be used. Specifically, ammonia, liquid hydrogen and diesel storage shall be assessed assuming 100% fill. The HSE suggest the maximum release duration associated with any pipework release is 30 minutes, on the basis that the emergency services can provide protection to the affected off-site population within this time. They identified that remotely operable shut-off valves have a typical closure time of 5 minutes; accordingly releases have been modelled assuming a duration of 5 minutes for successful automatic isolation, 20 minutes for successful manual isolation and 30 minutes where isolation is not possible.

10.3 Frequency Assessment

The hole sizes for releases from the UK HSE's Failure Rate and Event Data (FRED) for use within risk assessments guidance document [9] was used. This data was developed as a generic dataset by the HSE specifically for LUP style QRAs and is still currently applied.

The major items of plant shall be determined from the hazardous substances consent form. Where necessary (i.e. for the toxic sections), additional information has been drawn from the PFDs and P&IDs as to more accurately quantify the cumulative risk. The equipment, and hence hole sizes, shall be categorised as per the equipment in the HSE FRED document, as follows:

- Refrigerated vessels;
- Pressure vessels;
- Reactors;
- Pumps;
- Pipework;
- Pipelines;
- Compressors;
- Tanker loading hoses;
- Road tankers; and
- Ship hard arms.

In addition to the above count, it was (conservatively) assumed that each of the above major equipment items had 25 m of pipework and 25 gaskets associated with the section.

The following has been assumed for equipment that is in temporary operation:

- VLGCs are assumed to be offloading for 3 days per month;
- The jetty transfer pipelines are assumed to be in operation for 3 days per month; and
- It shall be assumed that there are 12 ship hard arm operations per year (per hard arm)

In accordance with the HSE land use planning methodologies, frequency assessment was only performed for the toxic inventories. The flammable inventories adopted the "protection concept" approach whereby the worst-case distances to the levels of harm as outlined in Section were determined. The release frequency data for the toxic releases were determined from HSE FRED [9] and OGP 434-04 [10] as required for major items of equipment only.

Given the narrow range of flammability (between 15% and 28% by volume) for Ammonia and relatively high minimum ignition energy, Ammonia releases was assumed to not ignite. This can be considered conservative given the toxic risk posed by unignited Ammonia.

10.4 Consequence Analysis

The EFFECTS software tool [8], which is integrated in RISKCURVES [7] was used to develop the consequence models. A supporting technical note [11] has been developed regarding the use of EFFECTS when modelling hydrogen scenarios, the recommendations of which have been implemented into the study.

10.4.1 Discharge Modelling

Discharge parameters were calculated in EFFECTS based on the defined release scenario parameters (pressure, temperature, fluid) with most leaks treated as continuous at a representative release rate, until the depletion of the estimated inventory. When modelling a hydrogen gas release, the discharge expansion type was set to “isothermal” to account for the negative Joule-Thompson effect [11].

All release sources are assumed to be at 1m above ground level, with effect height also at 1m to represent the most likely impact on personnel. All releases are modelled as horizontal un-impinged.

10.4.2 Dispersion Modelling

The dispersion averaging times for flammable and toxic releases have adopted the EFFECTS default values of 20 seconds and 600 seconds respectively.

Dispersion modelling used the environmental and surface parameters detailed in Section 10.6.1. All releases will be over land except for releases from the ammonia carrier ship which was assumed to be over water.

Releases from the VLGC were allowed to spread in an unconstrained manner over water.

10.4.3 Fires

Flash fires associated with flammable gas dispersion are assumed to occur for the full extent of the vapour cloud as defined by the vulnerability ruleset in Section 10.7.2 (i.e., LFL and 0.5 LFL as required).

Gaseous and 2-phase jet fires were modelled using the default models in EFFECTS.

Pool fires were modelled using the two-zone fire model which, in the event of a LH2 pool fire, automatically adjusts the Surface Emissive Power (SEP) [11].

10.4.4 BLEVE and Vessel Burst

For instantaneous releases from vessels containing flammable vapour (e.g. gaseous hydrogen tube trailers), the Gas Fireball model was used to calculate the fireball consequences. The Gas Blast Model was used to model the overpressure effects of such scenarios.

For vessel that are prone to Boiling Liquid Expanding Vapour Explosions (BLEVE) (e.g. liquid hydrogen storage) the default (dynamic) BLEVE Fireball and BLEVE Blast models in EFFECTS was used.

10.5 Vapour Cloud Explosion

Overpressures generated by Vapour Cloud Explosions (VCEs) were assessed using the TNO multi-energy model in the EFFECTS. The TNO multi-energy model consists of a family of blast curves for peak overpressures to determine positive overpressure and impulse as a function of distance from the explosion source.

As per the HSA TLUP methodology [12] for modelling hydrogen VCEs, it was assumed that 40% of the total flammable mass of a release shall define an explosion source with TNO curve 7. The explosion source was located at the centre of extent of the flammable cloud (i.e., down to the LFL concentration). This is consistent with VCE modelling in other land use planning regimes, and accounts for the potential

of a hydrogen cloud to detonate irrespective of the whether the cloud resides within an area of congestion.

10.6 Weather

Local climate conditions were considered for the modelling and are presented in the sections below.

10.6.1 Ambient Conditions

The ambient conditions used in the study were based on the average ambient temperatures for the area [13]

10.6.2 Wind Rose

The wind rose presents the proportion of time the wind blows *from* a particular direction. This data was used to derive the toxic risk contours.

The wind speed and directional frequencies based on data for the nearby Humberside airport weather station (1975-2023) [13].

10.7 Vulnerability Rulesets

10.7.1 Toxic Vulnerability

The degree of harm caused by exposure to toxic gas is related to the concentration of the toxic gas and the duration of exposure (i.e. the toxic dose). This can be expressed as a mathematical relationship, termed probit function.

10.7.2 Thermal Radiation Vulnerability

When assessing the effects of thermal radiation on people, HSE assumes that they are in the open and wearing normal levels of clothing. For setting land-use planning zones for jet fires, pool fires and fireballs, the limits of the middle and outer zones are normally where 1000 and 500 TDU respectively would be received. These thermal doses are the dangerous doses for normal and vulnerable populations respectively. The inner zone is usually defined as the distance to where a dose of 1800 TDU would be received.