Environmental Permit Application – Supporting Documentation Appendix D – Air Emissions Risk Assessment

Ellesmere Port Active Chemicals

Innospec Limited

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1.0 Introduction

This Air Emissions Risk Assessment (AERA) has been prepared in support of an application for substantial variation of Environmental Permit (EP) number EPR/BU4112IK for the Ellesmere Port Active Chemicals Installation.

The Operator is Innospec Limited, and the site is located on Oil Sites Road, Ellesmere Port, Cheshire, CH65 4EY (the 'Site').

The variation is required due to the installation of new production equipment in the PC3 building which will include a new reactor with an associated wet chemical (caustic) scrubber emissions abatement system. The new plant will be operated as a multipurpose plant under a multiproduct protocol. The new scrubber is referred to as Emission Point A14.

The Site location is illustrated in Figure 1-1, showing the indicative locations of the emission release points.

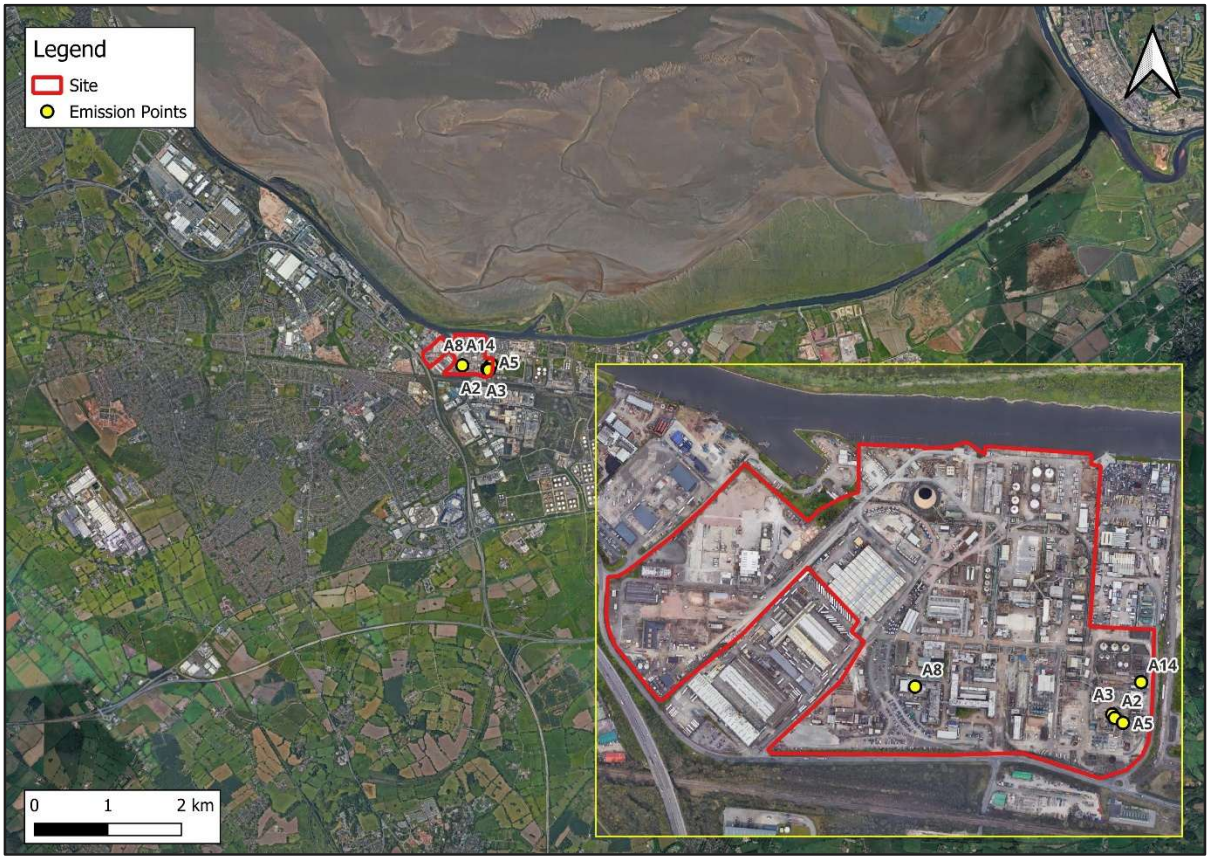


Figure 1-1: Site Context

1.1 Assessment Scope

The purpose of this AERA is to quantify potential impacts associated with process emission releases to the environment. A risk-based approach has been adopted focusing on the following volatile organic compounds (VOCs) potentially emitted from A14, and cumulative impact with other sources on the Site:

- Naphthalene (from Aromatic/Naphtha 150);
- Epichlorohydrin;
- Isopropyl Alcohol (IPA);

- Toluene; and
- Xylene.

The scope of the assessment is based on the approach prescribed within the EA's AERA guidance[1].

As per the EA's AERA guidance, VOC emission releases are not listed as a primary or secondary pollutant that requires consideration of ecological impacts. Therefore, the objective of this assessment is to determine the extent of potential air quality effects on human health.

[1] https://www.gov.uk/guidance/air-emissions-risk-assessment-for-your-environmental-permit

2.0 Environmental Standards

Environmental standards for the VOC pollutants considered in this assessment have been established from guidance.

The AERA guidance provides environmental ambient thresholds for the protection of health, based on relevant legislation and Environmental Assessment Levels (EALs) defined by the EA.

Where no EALs are provided within the EA's AERA guidance, a review of available research and information for each substance has been conducted to derive an EAL. This was relevant for Epichlorohydrin only, whereby a published DMEL (Derived Minimum Effect Level) derived using the European Chemicals Agency (ECHA) REACH guidance has been applied.

Table 2-1 sets out the environmental standards applied in the assessment. These are collectively termed Air Quality Assessment Levels (AQALs) throughout this report.

Table 2-1: Applied AQALs

Pollutant	AQAL		Derivation Method or Source
	Averaging Period	µg/m^3	
Aromatic 150, as Naphthalene	24-hour Mean (Long-term)	3	Hazard characterisation method for determining TCA (2021)
Epichlorohydrin	Annual Mean	23	DMEL derived using ECHA REACH Guidance[2]
IPA, as 2-propanol	Annual Mean	9,990	Old EAL derivation method from EH40/2001 OEL
	1-hour Mean	125,000	
Toluene	1 week (Long-term)	260	World Health Organisation Air Quality Guidelines for Europe (WHO 2000)
	1-hour Mean	8,000	Old EAL derivation method from EH40/2001 OEL
Xylene	Annual Mean	4,410	Old EAL derivation method from EH40/2001 OEL
	1-hour Mean	66,200	

[2] ECHA Reach Dossier: 1-chloro-2,3-epoxypropane (EC number 203-439-8) Accessed at: https://chem.echa.europa.eu/100.003.128/dossier-view/2a389aa2-3b75-4d26-bc62-ccfdffa665a2/c113d85a-bc46-4041-a921-958d733ab143_3cd28a3a-5688-46bb-8a95-f93ca5666958?searchText=203-439-8

3.0 Assessment Methodology

The assessment has been undertaken based on the approach prescribed within the EA AERA guidance.

3.1 Effective Release Height and Dispersion Factors

Table 3-1 provides the effective release height and dispersion factors used for each emission release point in the assessment. The emission point locations are displayed in Figure 1-1.

Table 3-1: Effective Release Height and Applied Dispersion Factors

ID	Stack Height AGL (m)	Maximum Building Height AGL (m)	Stack Height Above Building (m)	Effective Release Height (m)	Dispersion Factor (µg/m³/s)	
					Long-Term	Short-Term
A2	13	14	-1	0	148	3,900
A3	14	14	0	0	148	3,900
A5	4	14	-10	0	148	3,900
A8	18.3	9.7	8.6	14.3	20	402
A14	11.5	13	-1.5	0	148	3,900

In accordance with the AERA guidance, process contributions (PCs) calculated on an hourly mean basis have been multiplied by the following conversion factors where relevant:

- 1.34 to convert it into a short term 15-minute mean; and
- 0.31 to convert it to a long-term weekly mean.

In the case of 8-hour mean and 24-hour mean long-term PCs; the long-term dispersion factors are applied and no factoring for operational hours (% across the year) should be applied.

3.2 Background Datasets

Widespread monitoring of the assessed VOCs (Table 2-1) is not routinely undertaken across the UK. Baseline data sources have been reviewed to provide an indication of potential background concentrations of the VOCs.

3.2.1 Toluene

Toluene baseline data has been obtained from the UK AIR website[3] and monitors within the Automatic Hydrocarbon network.

The Liverpool Speke monitor, located approximately 7km north of the Site, was historically part of this network and represents a comparable setting to the Site. The most recent available annual mean toluene concentration is from 2000, with a recorded concentration of 5.6µg/m³.

[3] https://uk-air.defra.gov.uk/.

More recent data is available from a very limited number of monitors across the UK. The 2024 annual mean toluene concentration recorded at the London Marylebone Road monitor was 1.5µg/m^3.

The annual mean concentration of 5.6µg/m^3 from the Liverpool Speke monitor has been applied in the assessment.

3.2.2 Naphthalene

Naphthalene baseline data has been obtained from a monitoring study undertaken to support the London Luton Airport Expansion Development Consent Order (DCO) application[4].

A continuous monitor (LA001) was set up in 2018 to support the application, in addition to several scheme-specific diffusion tubes, five of which monitored naphthalene (V1 to V5).

At monitor LA001, annual mean naphthalene concentrations of 0.02µg/m^3 and 0.03µg/m^3 were recorded in 2019 and 2020 respectively.

The maximum naphthalene concentration recorded at the diffusion tubes was an annual mean concentration of 0.4µg/m^3 in 2018. This has been applied in the assessment.

3.2.3 Epichlorohydrin

Epichlorohydrin monitoring data is not readily available, and no baseline data could be sourced.

It is not a commonly used chemical and therefore background levels are expected to be very low (near zero). Epichlorhydrin is not used in any other processes on site.

To provide a conservative assessment of potential impacts, this assessment has assessed the emissions of epichlorohydrin from the new emission point at the IED Annex VII Emission Limit Value (ELV) to allow flexibility under the Multi Product Protocol (MPP), whereas actual emissions have been calculated to be vastly lower.

3.3 Outputs

Predicted pollutant concentrations are summarised in the following formats:

- PC – the predicted contributions from the Site; and
- Predicted environmental concentration (PEC) – the resultant predicted concentration (i.e. PC + ambient background concentration value).

3.3.1 Operational Envelope

The AERA has considered long- and short-term mean impacts associated with VOC emission releases (Section 2.0).

The emission calculations focus on determining the maximum release for each emission point. With regards to the treatment of the modelled outputs:

- **Short Term**: The assessment considers the actual maximum hourly emissions from each emission point, collectively assuming that emissions could be released simultaneously. This approach represents a composite worst-case scenario assuming simultaneous operation; and

[4] London Luton Airport Expansion Development Consent Order, Preliminary Environmental Information Report, Volume 3: Appendix 7.2: Air Quality Baseline Data. Statutory Consultation 2022.

- **Long Term**: The assessment assumes the actual maximum hourly emissions from each emission point occur continuously across the year, without adjustment e.g. 100%. This is a conservative approach because all emission points do not release emissions continuously.

This methodology results in a conservative, worst-case assessment of potential impacts.

3.4 Assessment Criteria

Table 3-2 provides details of the AERA screening assessment criteria. It is conducted in two separate stages.

Table 3-2: AERA Screening Assessment Criteria

AQAL	Stage 1	Stage 2
Long Term AQAL	PC <1% the AQAL	PEC <70% of the AQAL
Short Term AQAL	PC <10% the AQAL	PC is <20% of the difference between the short-term AQAL minus twice the long-term background concentration

If emissions cannot be screened out at Stage 1, the assessor must proceed to Stage 2. If both Stage 1 and Stage 2 screenings fail, detailed modelling of emissions should be conducted.

4.0 Emission Quantification

Emission input data has been provided by Innospec Limited. Table 4-1 details the emission sources considered within the AERA. These are based on the emission points with a known VOC release.

Table 4-1: Summary of Emission Sources

Emission Point	Detail	VOC
A2	R1 and R2 vacuum and effluent neutralisation tank vents through scrubber (GC6)	VOCs, total Class A
A3	R3 reactor vent (GC7)	VOCs, total Class A
A5	OMA500 Manufacture: off gases from R2/R3 and ISO Bay vents. Through same scrubber used for STADIS (C8401) but reconfigured as water scrubber	Formalin (Class A VOC) Ethylenediamine (Class B VOC)
A8	Reactor vents through scrubber (PP1)	VOCs, total Class A
A14 – New	Reactor vents through scrubber	VOCs, total Class A

To determine release limits for each emission point, the relevant Best Available Techniques (BAT) Conclusions (BATc) document prepared by the European Commission has been reviewed. Of relevance to the emission points is the Common Waste Gas Management and Treatment Systems in the Chemical Sector 2022 (WGC BATc).

The WGC BATc serves as the reference for establishing permit conditions and includes BAT-associated emission levels (BAT-AELs) relevant processes are expected to meet (Table 4-2). The IED Annex VII ELV also applies to certain CMR substances, including Epichlorohydrin.

Table 4-2: Review of BAT-AELs for VOCs

Pollutant	BAT-AEL (mg/Nm^3)
Total VOC (VOC substances that do not have a Carcinogenic, Mutagenic, Reprotoxic (CMR) classification)	< 1 – 20 (1)
Where VOCs classified as CMR substances are present, the following limits would apply to those substances:	
Sum of VOCs classified as CMR 1A or 1B	< 1 – 5 (2)
	2 (IED Annex VII ELV) (3)
Toluene	< 0.5 – 1 (4)

Table Notes:

(1) The BAT-AEL does not apply to minor emissions (i.e. when the VOC mass flow is below 100gC/h) if no CMR substances are identified as relevant in the waste gas stream.

(2) The BAT-AEL does not apply to minor emissions (i.e. when the mass flow of the sum of the VOCs classified as CMR 1A or 1B is below e.g. 1 g/h).

(3) Limit only applies where the mass emission is >10g/h.

(4) The BAT-AEL does not apply to minor emissions (i.e. when the mass flow of the substance concerned is below e.g. 50 g/h). Note, the upper end of the BAT-AEL range may be higher and up to 20 mg/Nm^3 when using techniques to recover toluene if the abatement efficiency of the waste gas treatment system is 95%.

Based on the above, the upper limit of the Total VOC BAT-AEL, 20mg/Nm^3, has been applied in the assessment. Except the assessment of Epichlorohydrin, where the IED Annex VII ELV of 2mg/Nm^3 has been applied.

The emission release characteristics are presented in Appendix A.

5.0 Assessment Results

5.1 Toluene, Xylene and IPA

Predicted toluene, xylene and IPA impacts are summarised in Table 5-1.

This assessment has applied the upper limit of the BAT-AEL for Total VOC (20mg/Nm^3), assessed against the toluene AQALs, which are the most stringent.

Table 5-1: Toluene Impacts

AQAL			PC (µg/m^3)	PC % of AQAL	PEC (µg/m^3)	PEC % of AQAL
Pollutant	Period	µg/m^3				
Toluene	1 week (Long-term)	260	58.2	22.4	63.8	24.5
	1-hour Mean	8,000	187.7	2.3	-	-

The long-term PC cannot be classified as insignificant; however, the PEC is <70%. The short-term PC is insignificant.

Based on these results and the application of the stringent toluene AQALs, the xylene and IPA impacts are also considered to be insignificant. No further assessment or detailed modelling is therefore required.

5.2 Naphthalene

Predicted naphthalene (from aromatic/naphtha 150) impacts are summarised in Table 5-2.

This assessment has applied the upper limit of the BAT-AEL for Total VOC (20mg/Nm^3), assessed against the naphthalene AQAL. Naphthalene constitutes approximately 9.9% of Aromatic 150. The PC has been factored to account for this.

Table 5-2: Naphthalene Impacts

AQAL			PC (µg/m^3)	PC % of AQAL	PEC (µg/m^3)	PEC % of AQAL
Pollutant	Period	µg/m^3				
Naphthalene	24-hour Mean (Long-term)	3	0.8	25.9	1.2	39.2

The PC cannot be classified as insignificant; however, the PEC is <70%. No further assessment or detailed modelling is therefore required.

5.3 Epichlorohydrin

Predicted epichlorohydrin impacts are summarised in Table 5-3. This assessment has applied the IED ELV (2mg/Nm^3).

Table 5-3: Epichlorohydrin Impacts

AQAL			PC (µg/m^3)	PC % of AQAL	PEC (µg/m^3)	PEC % of AQAL
Pollutant	Period	µg/m^3				
Epichlorohydrin	Annual Mean	23	0.8	3.4	0.8	3.4

The PC cannot be classified as insignificant. As epichlorohydrin background levels are anticipated to be near zero, the PEC is <70%, with a large amount of headroom to the

AQAL. No further assessment or detailed modelling is therefore required. It is also noted that the actual emissions of epichlorohydrin from the new plant have been calculated to be well below the IED ELV (2mg/Nm^3).

6.0 Conclusions

This AERA has quantified and assessed the potential air quality impacts from the Site using Environment Agency approved techniques against AQALs for the protection of human health.

The following summary points are noted:

- Toluene, xylene and IPA impacts are considered insignificant when assessed against the more stringent toluene AQALs.
- Naphthalene (from aromatic/naphtha 150) impacts are considered insignificant.
- Epichlorohydrin impacts are considered insignificant.

Appendix A Emission Release Information

Environmental Permit Application – Supporting Documentation Appendix D – Air Emissions Risk Assessment

Ellesmere Port Active Chemicals

Innospec Limited

SLR Project No.: 410.067515.00001

30 January 2026

Table A-1: Emission Inputs

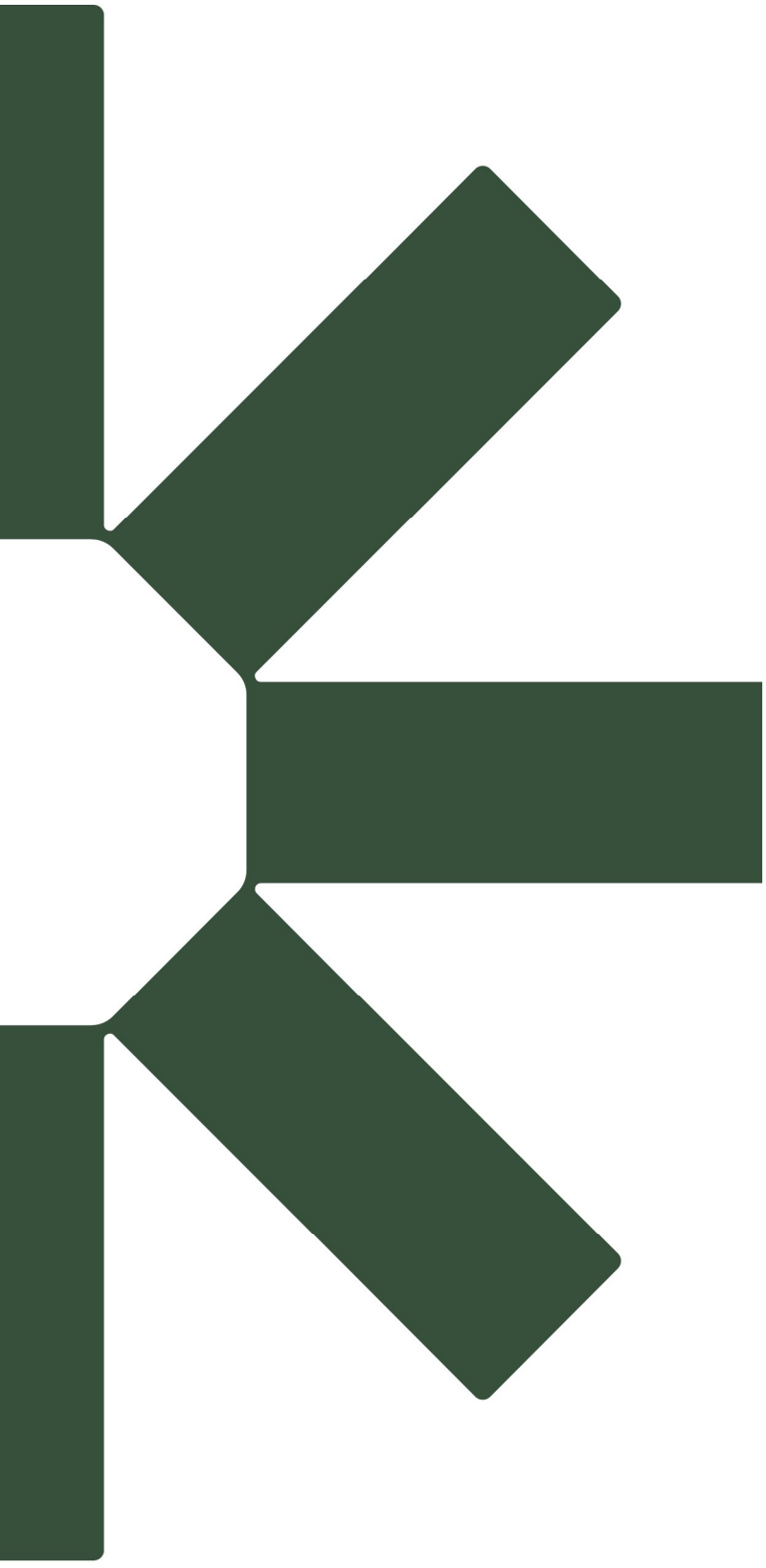
Emission ID	Vent Diameter (m)	Temperature (°C)	Volumetric Flow [A]		Emission Rate (g/s) at Emission Concentration of 20mg/Nm^3 [B]	Emission Rate (g/s) at Emission Concentration of 2mg/Nm^3 [C]
			Actual (Am^3/s)	Ref (Nm^3/s)		
A2	0.05	40	0.01	0.01	0.00024	0.000024
A3	0.05	40	0.01	0.005	0.000097	0.0000097
A5	0.17	20	0.50	0.47	0.0093	0.00093
A8	0.8	20	7.54	7.03	0.14	0.014
A14	0.17	20	1.29	1.20	0.024	0.0024

Table Notes:

[A] Normalised Conditions: Temperature: 273.15K.

[B] Applied in the assessment of Toluene, Xylene, IPA and Naphthalene.

[C] Applied in the assessment of Epichlorohydrin.



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