Appendix 8.1 Baseline Monitoring Survey

ENERGY SYSTEM REPLACEMENT, MEDITE EUROPE DAC, CLONMEL

Appendix 8.1 Baseline Air Quality Monitoring Survey

Prepared for: Medite Europe DAC

SLR Ref: 501.00785.00001
Version No: v1.0
October 2023

SLR

BASIS OF REPORT

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1.0 INTRODUCTION

To complement existing monitoring sources and provide an indication of localised baseline pollutant conditions at sensitive locations, an ambient monitoring survey has been undertaken. The outputs will be used to characterise baseline pollutant conditions of relevance to the dispersion modelling assessment (**Appendix 8.2 Biomass Dispersion Modelling Assessment**).

This report forms a Technical Appendix to **Chapter 8: Air Quality**.

2.0 METHODOLOGY

2.1 Monitoring Method

The following pollutants (those relevant to the dispersion modelling exercise) were monitored with use of passive non-automatic monitors (diffusion tubes):

- Nitrogen dioxide (NO_2);
- Oxides of nitrogen (NO_x);
- Sulphur dioxide (SO_2); and
- Ammonia (NH_3).

Use of diffusion tubes is recommended within the Irish EPA's OEE Air Dispersion Modelling from Industrial Installations Guidance Note (AG4) as an appropriate monitoring method.

Diffusion tubes used to monitor concentrations of NO_2, SO_2 and NH_3 were supplied and analysed by Gradko International, an ISO accredited laboratory (ISO/IEC 17025: 2017). Whereas diffusion tubes used to monitor concentrations of NOx (and NO_2 simultaneously) were supplied and analysed by Passam AG, an ISO accredited laboratory (ISO/IEC 17025: 2017), via Gradko International.

Table 2-1 provides a summary of the monitoring methods and laboratories used.

Table 2-1
Monitoring Methods

Pollutant	Monitoring Method	Preparation Method	Supplier
NOx	Diffusion Tube	-	Passam AG
NO_2	Diffusion Tube	20% TEA in water	Gradko International
SO_2	Diffusion Tube	-	Gradko International
NH_3	Diffusion Tube	-	Gradko International

2.1.1 Locations

Monitoring was undertaken at nine locations across the modelled domain - representative of worst-case human and ecological receptor locations (based upon the availability of suitable on-street furniture) in relation to the site. The extent of the ecological monitoring exercise focussed on the Lower River Suir SAC – given its proximity in relation to the site, and likelihood of an effect from biomass emissions arising. All other sensitive ecological habitats assessed are >9km from the site.

Different pollutants were monitored across the nine locations – dependant on the receptor/output of the dispersion modelling exercise. The details of these locations are provided in Table 2-2 and illustrated in Figure 8.1.

Table 2-2
Air Quality Survey: Locations

Site ID	GPS Coordinates		Receptor	Type	Pollutants
	Latitude	Longitude			
AQ1	52.366068	-7.645351	Lower River Suir SAC	Ecological	NOx, NO_2, SO_2, NH_3
AQ2	52.367133	-7.654209	Residential Dwellings (Roadside of N24)	Human	NO_2, SO_2
AQ3	52.360504	-7.654062	Residential Dwellings (Roadside of N24)	Human	NO_2, SO_2
AQ4	52.373817	-7.647575	Lower River Suir SAC	Ecological	NOx, NO_2, SO_2, NH_3
AQ5	52.370277	-7.645338	Lower River Suir SAC	Ecological	NOx, NO_2, SO_2, NH_3
AQ6	52.371960	-7.664598	Powerstown National School	Human	NO_2, SO_2, NH_3
AQ8	52.362631	-7.663894	Residential Dwellings	Human	NO_2, SO_2
AQ9	52.378490	-7.651359	Residential Dwellings	Human	NO_2, SO_2
AQ10	52.360275	-7.671484	Residential Dwellings (Roadside of N24)	Human	NO_2, SO_2

Pollutants monitored at human receptors have been used to inform background concentrations in relation to the relevant AQALs assessed (i.e. those of relevance to the dispersion modelling exercise). AQ2, AQ3, AQ4, AQ6, AQ8, AQ9 and AQ10 represent human receptor locations at a series of differing environments (roadside of arterial and minor roads) to appropriately capture localised conditions and any possible variances. These locations relate to sensitive land uses and locations where the public might reasonably be expected to spend extended periods of time – in accordance with guidance prescribed within Defra's LAQM.TG(22).

Pollutants monitored at the Lower River Suir SAC have been used to characterise the relevant baseline concentrations and deposition loads in order to facilitate the ecological impact assessment in the absence of any existing information.

AQ1, AQ4 and AQ5 are all located along the western boundary of the Lower River Suir SAC – nearest to the site, at roadside locations. Application of these datasets for the whole of the Lower River Suir SAC is likely to be conservative as they represent roadside environments, where there is a greater influence from road traffic emissions. This approach will ensure worst-case impacts are understood – typically on the western boundary of the Lower River Suir SAC nearest to the site.

Given the spatial distribution of the monitoring survey, other off-site localised emission sources are considered to be appropriately represented within these datasets and accounted for within the dispersion modelling exercise. Furthermore, application of these datasets within the dispersion modelling exercise is believed to be conservative as existing emission sources already included within the AERMOD dispersion model are believed to be accounted for within the monitored baseline datasets already.

2.1.2 Duration

The duration of the monitoring survey spanned three-months (March 2022 – May 2022), the minimum amount of time in order to derive a suitable annual mean estimate, as per AG4. The individual exposure periods for each diffusion tube were based on the suppliers recommendations, practical constraints and guided by Defra's Diffusion Tube Calendar[1].

Table 2-3 provides details of the exposure dates.

[1] Defra, NO_2 Diffusion Tube Monitoring Calendar, Suggested Exposure Periods (2022), August 2022.

Table 2-3
Diffusion Tube Exposure Dates

Monitoring Period	Start Date	End Date
March 2022	04/03/2022	31/03/2022
April 2022	31/03/2022	04/05/2022
May 2022	04/05/2022	08/06/2022

3.0 BASELINE MONITORING SURVEY RESULTS

3.1 Ambient Concentrations

3.1.1 Correction

No co-location studies were undertaken throughout the duration of the survey and therefore publicly available correction factors have been utilised, where available.

NO_2 monitored concentrations analysed by Gradko International have been adjusted to account for bias with use of the UK's national bias adjustment factors reported by Defra[2]. No bias adjustment factors are available for all other pollutant/diffusion tubes, as confirmed by Gradko International.

The latest 2022 Defra bias adjustment factor specific to the laboratory and preparatory method is provided in Table 3-1.

Table 3-1
2022 (Round 2) Defra's Bias Adjustment Factors Gradko International (20% in TEA)

Year	Adjustment Factor	Number of Studies
2022	0.84	33

The 2022 bias adjustment factor (0.84) for NO_2 concentrations supplied and analysed by Gradko International (20% TEA in water) have been applied to all outputs.

3.1.2 Annualisation

As per AG4, annualisation is required to derive an annual mean estimate where a short term monitoring survey has been completed. This involves the analysis of concentrations recorded at nearby background monitoring locations – with reference to the monitoring survey period.

Automatic monitoring data is provided centrally by the Irish EPA[3] and European Environment Agency[4] (EEA) (which contains automatic monitoring data recorded from the Irish air quality network (and other Member States)). These datasets have been reviewed to determine their suitability for the annualisation exercise. The findings are as follows:

- EEA data is reported as statistics i.e. not at a suitable resolution to complete the annualisation exercise.
- Annual data published by the Irish EPA (annual monitoring reports) is reported as a summary i.e. not at a suitable resolution to complete the annualisation exercise.
- Downloadable data is provided by the Irish EPA via the Air Quality Index for Health interactive map. However, is yet to be validated. Use of this data could introduce uncertainty into the annualisation process which cannot be determined. This could affect the outcomes of the dispersion modelling exercise.

Based on the above, there is no suitable (ratified) data available to complete the annualisation exercise. Therefore, the annualisation process has not been undertaken.

3.1.3 Processed Concentrations

Table 3-2 provides details of the processed monitored concentrations.

2 Defra, https://laqm.defra.gov.uk/air-quality/air-quality-assessment/national-bias/.
3 https://www.epa.ie/environment-and-you/air/.
4 https://www.eea.europa.eu/themes/air.

Table 3-2
Monitored (Adjusted) Period Ambient Concentrations

Site ID	Receptor	NO_2		NOx		NH_3		SO_2	
		µg/m^3	Data Capture %	µg/m^3	Data Capture %	µg/m^3	Data Capture %	µg/m^3	Data Capture %
AQ1	Lower River Suir SAC	3.8	100.0	6.4	100.0	3.9	100.0	1.4	100.0
AQ2	Residential Dwellings (Roadside of N24)	6.0	100.0	-	-	-	-	2.1	100.0
AQ3	Residential Dwellings (Roadside of N24)	13.2	100.0	-	-	-	-	1.4	100.0
AQ4	Lower River Suir SAC	5.9	66.7	7.9	100.0	3.1	100.0	1.8	100.0
AQ5	Lower River Suir SAC	7.4	100.0	10.6	100.0	4.3	100.0	1.9	100.0
AQ6	Powerstown National School	5.6	100.0	-	-	6.8	100.0	1.4	100.0
AQ8	Residential Dwellings	5.2	66.7	-	-	-	-	1.4	66.7
AQ9	Residential Dwellings	4.9	100.0	-	-	-	-	1.4	100.0
AQ10	Residential Dwellings (Roadside of N24)	17.1	100.0	-	-	-	-	1.4	100.0

3.2 Deposition Rates

As discussed in Section 2.1.1, pollutant concentrations monitored at the Lower River Suir SAC have been used to quantify baseline deposition loads in relation to nutrient nitrogen and acidification in the absence of any existing information. Monitoring of all contributory pollutants was not possible due to practical constraints (such as import restrictions). Nonetheless, the approach undertaken is considered sufficient to derive characterise baseline conditions in the absence of any existing information.

Deposition rates were initially calculated using empirical methods prescribed in AG4. Dry deposition flux was calculated using the following equation:

Dry deposition flux (µg/m^2/s) = ground level concentration (µg/m^3) x deposition velocity (m/s)

The applied deposition velocities for the relevant chemical species are as shown in Table 3-3.

Table 3-3
Applied Deposition Velocities

Chemical Species	Recommended Deposition Velocity (m/s)	
NO_2	Grassland	0.0015
	Woodland	0.0030
SO_2	Grassland	0.0120
	Woodland	0.0240
NH_3	Grassland	0.0200
	Woodland	0.0300

To facilitate a conservative assessment, ‘Woodland’ deposition velocities have been used – which will result in a greater calculated deposition rate.

3.2.1 Nutrient Nitrogen

The critical loads for nutrient nitrogen deposition are recorded in units of kgN/ha/yr. The units are converted from µg/m^2/s to units of kgN/ha/year by multiplying the dry deposition flux by standard conversion factors summarised in Table 3-4.

Table 3-4
Dry Deposition Flux Conversion Factors for Nutrient Nitrogen Deposition

Chemical Species	Conversion Factor [µg/m^2/s to kgN/ha/year]
NO_2	95.9
NH_3	260

3.2.2 Acidification

The predicted deposition rates are converted to units of equivalents (keq/ha/year), which is a measure of how acidifying the chemical species can be, by multiplying the dry deposition flux (µg/m^2/s) by standard conversion factors presented in Table 3-5.

Deposition of sulphur and nitrogen compounds have been calculated separately – based upon the extent of pollutant species monitored, in recognition of the critical load function (Appendix 8.2).

Table 3-5
Dry Deposition Flux Conversion Factors for Acidification Deposition

Chemical Species	Conversion Factor [$\mu g/m^2/s$ to $k_{eq}/ha/year$]
NO_2	6.84
NH_3	18.5
SO_2	9.84

3.2.3 Processed Deposition Rates

Table 3-6 provides details of the processed deposition rates for nutrient nitrogen and acidification.

Table 3-6
Monitored Deposition Rates

Site ID	Receptor	Nutrient Nitrogen (kgN/ha/year)	Acidification (keq/ha/year)	
			N	S
AQ1	Lower River Suir SAC	31.4	2.2	0.3
AQ4	Lower River Suir SAC	26.0	1.9	0.4
AQ5	Lower River Suir SAC	35.6	2.5	0.5

From review of the monitored acidification deposition rates, nitrogen is the principal contributor to acidification.

Appendix A – Processed Monitored Datasets

Table A-1
Monitored Human Receptor Datasets

Site ID	Receptor	GPS Coordinates		Annual Mean Concentration (µg/m^3)		
		Latitude	Longitude	NO_2	NH_3	SO_2
AQ2	Residential Dwellings (Roadside of N24)	52.367133	-7.654209	6.0	-	2.1
AQ3	Residential Dwellings (Roadside of N24)	52.360504	-7.654062	13.2	-	1.4
AQ6	Powerstown National School	52.371960	-7.664598	5.6	6.8	1.4
AQ8	Residential Dwellings	52.362631	-7.663894	5.2	-	1.4
AQ9	Residential Dwellings	52.378490	-7.651359	4.9	-	1.4
AQ10	Residential Dwellings (Roadside of N24)	52.360275	-7.671484	17.1	-	1.4

Table A-2
Monitored Ecological Receptor Datasets

Site ID	Receptor	GPS Coordinates		Annual Mean Concentration (µg/m^3)				Nutrient Nitrogen (kgN/ha/year)	Acidification (keq/ha/year)	
		Latitude	Longitude	NO_2	NOx	NH_3	SO_2		N	S
AQ1	Lower River Suir SAC	52.36607	-7.64535	3.8	6.4	3.9	1.4	31.4	2.2	0.3
AQ4	Lower River Suir SAC	52.37382	-7.64758	5.9	7.9	3.1	1.8	26.0	1.9	0.4
AQ5	Lower River Suir SAC	52.37028	-7.64534	7.4	10.6	4.3	1.9	35.6	2.5	0.5

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Appendix 8.2 Biomass Dispersion Modelling Assessment

ENERGY SYSTEM REPLACEMENT, MEDITE EUROPE DAC CLONMEL

Appendix 8.2 Emissions Modelling Assessment

Prepared for: Medite DAC Europe

SLR Ref: 501.00785.00001
Version No: v1.0
October 2023

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1.0 INTRODUCTION

The scope of the assessment is to quantitatively appraise the impact of emissions to air resulting from the phased replacement of two biomass boiler lines (Line 1 and Line 2) by comparison to relevant guidelines for the protection of human health and sensitive habitats. The dispersion modelling exercise has been informed by the Irish EPA Air Dispersion Modelling from Industrial Installations Guidance Note OEE AG4.

This report forms a Technical Appendix to **Chapter 7: Air Quality**.

2.0 EMISSIONS TO ATMOSPHERE

2.1 Process Description

A brief description of current vs. proposed processes relating to replacement of the energy systems serving Lines 1 and 2 is provided below. For further detail, see **Chapter 2: Description**.

2.1.1 Current Thermal Energy Infrastructure

Production Line 1 is served by two separate wood biomass fired boilers (18MW each), and a natural gas-fired Thermal Fluid Heater (TFH) (6MW). The steam generated by the boilers is used in the Line 1 refining stage, where it is directly injected into the wood chip. Steam is also used in the drying stage where it indirectly heats via heat exchanger the air stream in the Line 1 dryers. The flue gases from the boilers are used in the drying stage where they are directly added to the Line 1 dryer air stream, and released at the dryer vents (Core and Face dryers). In normal operating conditions, the flue gas emissions from the two boilers are mixed with and released with the dryer emissions via the Core and Face dryer vents. The TFH heats thermal fluid which is pumped to the Production Line 1 Press to heat a steel belt which is used in the pressing stage (where emissions to air are released via separate press vents). The TFH flue gases are released via a dedicated emission point.

Production Line 2 is served by a single wood biomass fired TFH (19MW). The flue gases from the TFH are used in the drying stage where they are directly added to the Line 2 dryer air stream to provide all the required thermal energy , and released at the dryer vent. The TFH heats thermal fluid which is pumped to the Production Line 2 Press to heat a steel belt which is used in the pressing stage (where emissions to air are released via separate press vents).

The flue gases from both the biomass boilers on Line 1 and the TFH on Line 2 pass through multicyclones to remove fly-ash.

2.1.2 Proposed Thermal Energy Infrastructure

The proposed development will replace the existing thermal energy systems serving Lines 1 and 2, specifically;

- Production Line 1:
    - 2 x wood biomass fired boilers (18MW each); and
    - natural gas fired TFH (6MW).
- Production Line 2:
    - wood biomass fired Thermal Fluid Heater (19MW).

The new thermal energy systems on each Production Line will comprise a wood biomass fired TFH, with a rated thermal input capacity of up to 60MW serving Production Line 1 and 30 MW for Production Line 2. The thermal energy systems serving Production Lines 1 and 2 will be replaced in a long-term phased manner (i.e. Line 1 and Line 2 separately). Therefore, the new thermal energy system serving Production Line 1 will be in operation with the existing thermal energy system serving Line 2, until Line 2 is fully commissioned.

The flue gas from the new wood biomass energy systems will be used directly in the drying stage of the respective production lines. This means that in normal operating conditions, that the flue gas emissions are mixed with and released with the dryer emissions, i.e., the top of the dryer cyclones. This is as per the existing approach with one minor change. Part of the thermal energy used for drying in Production Line 1 is delivered in the form of steam via heat exchanger. This will no longer be the case, 100% of the thermal energy used for drying in both production lines will be provided by flue gases from the new energy systems.

The new thermal energy systems will utilise existing emission release points established on each Production Line.

The replacement of the energy systems serving Production Lines 1 and 2 will change the emission release characteristics of the dryer emission points (Line 1 Face and Core Dryer and Line 2 Single Dryer). However, the physical characteristics of these emission points will not change (e.g. stack diameter, height and location), and the flue gas emission points associated with the new wood biomass fired TFH will continue to be the existing dryer emission points. The remaining emission points across the site will remain unchanged. Furthermore, no new emission release points will be introduced as a result of these proposed changes.

As the energy systems serving Production Lines 1 and 2 will be replaced with wood biomass fired TFH, the natural gas fired TFH (6MW) will not be required to be operated, with the exception of several hours a month for testing. This has been excluded from consideration in the future year scenarios.

2.2 Assessment Approach

To represent the long-term phased replacement of the energy systems serving Lines 1 and 2, the following scenarios have been considered within the dispersion modelling exercise:

- Scenario 0: Existing Baseline (existing line 1 and 2);
- Scenario 1: Phase 1 - Production Line 1 Energy System Replacement (with existing line 2); and
- Scenario 2: Phase 2 - Production Line 1 Energy System Replacement and Production Line 2 Energy System Replacement.

The extent and configuration of buildings and emission release characteristics within the site will change as a result of the phased replacement of the energy systems serving Production Lines 1 and 2. These changes have been reflected within each modelled scenario, respectively – discussed below. All other details/inputs (of relevance to dispersion modelling) remain unchanged.

2.2.1 Emission Release Characteristics

Table 2-1 details the emission sources considered in each scenario. Detailed emission release input parameters are provided in Appendix A - Model Inputs.

The existing sources included within the current Industrial Emissions Licence Directive[1] (IED) licence (P0027-04) have been considered within the modelling exercise, where relevant to facilitate a cumulative assessment with emissions from the new plant.

In addition, local monitored background datasets have been used to inform the total prediction conditions for assessment (see Section 5.1.6) – which are likely to include emission contributions from existing sources. Consideration of existing sources, alongside the application of local monitored background datasets is believed to be conservative, as could potentially contribute to the double counting of emission sources and overestimate predicted concentrations. Furthermore, application of these datasets for use within the Scenario 2 and 3 (replacement of Production Line 1 and 2) is likely to overestimate predicted concentrations – as will contain emission contributions from those existing sources which are proposed to be removed.

To account for the retirement of the natural gas fired TFH (6MW) serving Production Line 1, the volumetric flow rates at Line 1 Face and Core Dryer will increase.

Emission release characteristics relating to the existing emission sources are based upon the outcomes of the latest monitoring survey issued to the Irish EPA, conducted by accredited 3rd party sub-contractor in accordance with the existing IED licence (P0027-04). The maximum permitted volumetric flows have been adopted.

Emission release characteristics for the new biomass energy systems have been sourced from the manufacturer's design and specifications.

[1] Directive 2010/75/EU of the European Parliament and of the Council of 24 November 2010 on industrial emissions (integrated pollution prevention and control).

Table 2-1
Modelled Emission Points

Scenario	New / Existing	IED Reference	Process	Source Type Representation
Scenario 0 Existing Baseline	Existing	A2-5	Core Dryer	Point
	Existing	A2-6	Face Dryer	Point
	Existing	A2-21	Single Dryer	Point
	Existing	A1-1	Press Thermal Fluid Heater	Point
	Existing	A2-15	Press Extraction Scrubber	Point
	Existing	A2-12	Press Vent 1	Point
	Existing	A2-13	Press Vent 2	Point
	Existing	A2-22	Press Vent 1	Point
	Existing	A2-23	Press Vent 2	Point
	Existing	A2-1-4, A2-7-11, A2-16-20, A2-24-27	Various (Filters)	Volume
Scenario 1: Line 1 Replacement	New	A2-5	Core Dryer	Point
	New	A2-6	Face Dryer	Point
	Existing	A2-21	Single Dryer	Point
	Existing	A2-15	Press Extraction Scrubber	Point
	Existing	A2-12	Press Vent 1	Point
	Existing	A2-13	Press Vent 2	Point
	Existing	A2-22	Press Vent 1	Point
	Existing	A2-23	Press Vent 2	Point
	Existing	A2-1-4, A2-7-11, A2-16-20, A2-24-27	Various (Filters)	Volume
Scenario 2: Line 1 and 2 Replacement	New	A2-5	Core Dryer	Point
	New	A2-6	Face Dryer	Point
	New	A2-21	Single Dryer	Point
	Existing	A2-15	Press Extraction Scrubber	Point
	Existing	A2-12	Press Vent 1	Point
	Existing	A2-13	Press Vent 2	Point
	Existing	A2-22	Press Vent 1	Point
	Existing	A2-23	Press Vent 2	Point
	Existing	A2-1-4, A2-7-11, A2-16-20, A2-24-27	Various (Filters)	Volume

Various (Filters):
- A2-1, A2-2, A2-3, A2-4, A2-7, A2-8, A2-9, A2-10, A2-11, A2-16, A2-17, A2-18, A2-19, A2-20, A2-24, A2-25, A2-26, A2-27
- Represented as a single volume source covering their spatial extent across the site.

All emission sources have been represented as point sources. This is with the exception of the 18 dust filters (A2-1-4, A2-7-11, A2-16-20, A2-24-27) which have been represented as a singular volume source covering the graphical extent of the sources. This is possible, as all 18 dust filters have the same ELV (dust = 5mg/Nm^3). The volumetric flow rates (normalised) for these 18 dust filters have been aggregated to calculate a site wide (singular) emission rate for use within the dispersion modelling exercise.

2.2.2 Pollutant Emission Rates

Table A-3 details the extent of the emission concentration and mass emission rates applied within the assessment.

The maximum permitted Emission Limit Values (ELV) as prescribed within IED P0027-04 have been used in relation to the existing sources. It has been confirmed that the new biomass energy systems can similarly meet the permitted ELVs. This includes methylene diphenyl diisocyanate (MDI) - used in the production process, added to the wet fibre before drying.

The permitted ELVs have been reviewed against best available techniques-associated emission levels (BAT-AELs) which new facilities are expected to meet as required by the IED. The BAT-AELS are set out in The Production of Wood-based Panels BAT Reference Document (BREF)[2] and associated BATc document[3]. The Wood-based Panels BREF and BATc accounts for process-integrated on-site combustion plants and is consistent with the approach underpinning the existing licence decision by the Irish EPA. The permitted ELVs are lower than the maximum prescribed BAT-AELs. Combustion emissions will be continuously monitored and controlled in accordance with the sites Permit.

Pollutant specific details are provided below.

Particle Size

Particulate matter (PM) is classified in terms of its aerodynamic diameter; with PM_{10} relating to particles with an aerodynamic diameter of less than 10µm. Other smaller relevant fractions of particulate matter such as $PM_{2.5}$ (aerodynamic diameter less than 2.5µm) are a sub-fraction of the PM_{10} fraction i.e. PM_{10} includes $PM_{2.5}$.

For those sources which generate PM, there are no $PM_{2.5}$ ELVs set within the IED licence. To facilitate a complete assessment, the PM_{10} ELV has been adopted. No PM_{10} ELVs are set for the 18 dust filters. The dust ELV has been adopted for both PM_{10} and $PM_{2.5}$. This is considered conservative. Further details are provided in Appendix A - Model Inputs.

VOC Species

The volatile organic compounds (VOCs) considered within the assessment are formaldehyde (CH_2O) and methylene diphenyl diisocyanate (MDI). This is consistent with the approach adopted and accepted by the Irish EPA within the 2016 Air Quality Impact Assessment[4] prepared for the site which included a review of VOC species. There has been no significant changes to on-site operations since the 2016 assessment was undertaken which would change this position.

[2] European Commission. BAT Reference Document for the Production of Wood-based Panels. 2016.
[3] European Commission. Commission Implementing Decision (EU) 2015/2119 of 20 November 2015 Establishing BAT Conclusions, under Directive 2010/75/EU of the European Parliament and of the Council, for the Production of Wood-based Panels.
[4] Air Quality Impact Assessment. Medite – Ireland, ERM. 2016.

3.0 ENVIRONMENTAL STANDARDS

The environmental standards for air, taken from legislation and guidance, for the protection of human health and sensitive ecological receptors are presented in the sections below.

3.1 Standards for Protection of Human Health

The ambient air quality standards of relevance to human receptors in this assessment (collectively termed Air Quality Assessment Levels (AQALs) throughout this report) principally relate to the Irish Air Quality Standards Regulations (AQSR) 2011, which transpose the EU Ambient Air Quality Directive (2008/50/EC), within Irish legislation.

For those pollutants not covered by EU/Irish legislation, AQALs prescribed within the following recommended sources have been adopted for completeness, consistent with advice provided within AG4:

- UK Environment Agency's (EA) Air Emissions Risk Assessment (AERA); and
- UK Department for Environment, Food and Rural Affairs (Defra) Environmental Assessment Levels (EAL).

Table 3-1 sets out those AQALs that are relevant to the assessment with regard to human receptors.

Table 3-1
Relevant AQALs Applied

Pollutant		Averaging Period	AQAL (µg/m³)	Source
Nitrogen Dioxide	NO_2	Annual mean	40	AQSR
		1-hour mean (not to be exceeded more than 18 times per year)	200	AQSR
Particulates	PM_{10}	Annual mean	40	AQSR
		24-hour mean (not to be exceeded more than 35 times per year)	50	AQSR
Particulates	$PM_{2.5}$	Annual mean	20	AQSR
Formaldehyde	CH_2O	Annual mean	5	UK AERA
		30-minute mean	100	UK AERA
Carbon Monoxide	CO	8-hour rolling mean	10,000	AQSR
		1-hour mean	30,000	UK AERA
Isocyanates (as NCO)	NCO	Annual mean	0.2	UK Defra EAL
		1-hour mean	7	UK Defra EAL

Based on a review of relevant legislation/guidance, there are no AQALs for MDI. As such, the UK Defra's EAL for Isocyanates (as NCO) has been adopted for completeness.

3.1.1 Relevant Exposure

In accordance with the UK Department for Environment, Food and Rural Affairs' (Defra) technical guidance on Local Air Quality Management (LAQM.TG(22))[5], the AQALs presented in Table 3-1 should only be assessed at

[5] Local Air Quality Management Technical Guidance 22, Published by Defra in partnership with the Scottish Government, Welsh Assembly Government and Department of the Environment Northern Ireland. August 2022.

locations of relevant exposure i.e. where members of the public are regularly present and might reasonably be expected to be exposed to pollutant concentrations over the relevant averaging period. These AQALs do not apply to exposure at the workplace.

A summary of the typical relevant locations associated with each applicable AQAL assessed is detailed below in Table 3-2. LAQM.TG(22) does not provide an indication into relevant exposure locations with regard to AQALs with a 30 minute-mean averaging period. In recognition of this, the relevant exposure locations recommended with respect to 15-minute averaging periods have been adopted.

Table 3-2
Relevant Public Exposure

Averaging Period	Locations AQALs Should Apply At	Locations AQALs Should Not Apply At
Annual mean	Building facades of residential properties, schools, hospitals etc.	Facades of offices, hotels, gardens of residences and kerbside sites
24-hour mean	As above together with hotels and gardens of residential properties	Kerbside sites where public exposure is expected to be short term
8-hour mean	As above together with hotels and gardens of residential properties	Kerbside sites where public exposure is expected to be short term
1-hour mean	As above together with kerbside sites of regular access, car parks, bus stations etc.	Kerbside sites where public would not be expected to have regular access
15-minute mean	All locations where members of the public might reasonably be exposed for a period of 15 minutes or longer.	-

3.2 Standards for the Protection of Ecosystems and Vegetation

Sites of nature conservation importance are provided environmental protection with respect to air quality, through the application of standards known as Critical Levels for airborne concentrations and Critical Loads for deposition to land from air.

3.2.1 Critical Levels

Critical Levels are a quantitative estimate of exposure to one or more airborne pollutants in gaseous form, below which significant harmful effects on sensitive elements of the environment do not occur, according to present knowledge.

Critical Levels for the protection of vegetation and ecosystems apply irrespective of habitat type and are based on the concentration of the relevant pollutants in ambient air. The Critical Levels of relevance to this assessment are provided in Table 3-3. These are specified within relevant European air quality directives and corresponding Irish air quality regulations.

Table 3-3
Critical Levels for the Protection of Vegetation and Ecosystems

Pollutant		Critical Level (µg/m^3)	Habitat	Averaging Period
Nitrogen oxides	NO_x	30	All ecosystems	Annual mean
		75	All ecosystems	Daily mean

3.2.2 Critical Loads

Critical Loads are a quantitative estimate of exposure to deposition of one or more pollutants, below which significant harmful effects on sensitive elements of the environment do not occur, according to present knowledge. The Critical Loads of relevance to this assessment are provided in Table 3-4.

Table 3-4
Critical Loads for the Protection of Vegetation and Ecosystems

Pollutant	Environmental Standard	Averaging Period
Acidification	Depends on location	Annual mean
Nutrient Nitrogen	Depends on location	Annual mean

In relation to combustion emissions, Critical Loads for nutrient nitrogen and acidification are relevant which can both occur via wet and dry deposition. Wet deposition occurs due to rainout (within cloud) scavenging and washout (below cloud) scavenging, whereas dry deposition occurs when particles are brought to the surface by gravitational settling and turbulence. For the assessment of short range emissions, dry deposition is considered the predominant removal mechanism. Wet deposition can therefore be discounted from further assessment[6].

Critical Loads for the habitats and species of relevance to this assessment have been obtained from relevant guidance and literature based upon the known qualifying habitat type present (Annex 1). The most sensitive habitat listed has been used to facilitate a worst-case assessment. Further details are presented in Section 5.2.

[6] AQTAG06 – Technical Guidance on detailed modelling approach for an appropriate assessment for emissions to air. Environment Agency, March 2014 version.

4.0 DISPERSION MODELLING METHODOLOGY

For this assessment the United States (US) American Meteorological Society and Environmental Protection Agency Regulatory Model (AERMOD v10.2) dispersion model has been applied, consistent with advice provided within AG4.

Figure 8.2 provides an illustration of the dispersion model.

4.1 Receptors

The modelling has been undertaken using a nested receptor grid (i.e. receptor grids plotted at a series of defined spatial densities with distance from the Site) (titled gridded receptors). This method allows the maximum ground level concentration outside the Site boundary to be assessed.

A nested receptor grid of 5km by 5km centred upon the application site was applied as follows:

- 250m x 250m at 15m grid resolution;
- 500m x 500m at 25m grid resolution;
- 1,000m x 1,000m at 50m grid resolution;
- 2,000m x 2,000m at 250m grid resolution; and
- 5,000m x 5,000m at 500m grid resolution.

The spatial extent of the grid has been selected to ensure that all local receptors are within the gridded area and the resolution is such that the maximum impact will be identified.

4.1.1 Human Receptors

Human receptors considered in the assessment are shown in Table 4-1 and their locations are illustrated in Figure 8.3 (titled discrete receptors). These receptor locations are considered to capture worst-case relevant exposure relative to the application site, in accordance with LAQM.TG(22) presented in Table 3-2. Consideration has also been given to land uses with sensitive populations for inclusion within the model (e.g. schools etc.).

Table 4-1
Modelled Discrete Human Receptor Locations

Receptor	Details	Relevant Exposure	NGR		Height (m)
			X	Y	
R1	Residential	Long and Short Term	592502	5803443	1.5
R2	Residential	Long and Short Term	592630	5804340	1.5
R3	Residential	Long and Short Term	593383	5804330	1.5
R4	Residential	Long and Short Term	592174	5804333	1.5
R5	Residential	Long and Short Term	591748	5803950	1.5
R6	Residential	Long and Short Term	591516	5804083	1.5
R7	Residential	Long and Short Term	591344	5804119	1.5
R8	Residential	Long and Short Term	590537	5804416	1.5
R9	Residential	Long and Short Term	590469	5804040	1.5
R10	Residential	Long and Short Term	590660	5803443	1.5
R11	Powerstown School	Long and Short Term	591013	5803246	1.5
R12	Residential	Long and Short Term	591077	5803134	1.5
R13	Residential	Long and Short Term	591273	5803023	1.5
R14	Residential	Long and Short Term	591341	5802972	1.5

Receptor	Details	Relevant Exposure	NGR		Height (m)
			X	Y	
R15	Residential	Long and Short Term	591464	5802891	1.5
R16	Residential	Long and Short Term	591649	5802694	1.5
R17	Residential	Long and Short Term	591589	5802754	1.5
R18	Residential	Long and Short Term	591548	5802816	1.5
R19	Residential	Long and Short Term	591267	5802425	1.5
R20	Residential	Long and Short Term	591052	5802572	1.5
R21	Residential	Long and Short Term	590605	5802723	1.5
R22	Residential	Long and Short Term	590859	5802938	1.5
R23	Residential	Long and Short Term	590276	5802119	1.5
R24	Residential	Long and Short Term	590856	5801893	1.5
R25	St Joseph's School	Long and Short Term	591761	5801774	1.5
R26	Residential	Long and Short Term	591735	5801964	1.5
R27	Residential	Long and Short Term	592358	5802134	1.5
R28	Residential	Long and Short Term	592384	5802288	1.5
R29	Residential	Long and Short Term	592649	5801398	1.5
R30	Residential	Long and Short Term	593567	5802619	1.5
R31	Residential	Long and Short Term	593011	5802252	1.5
R32	Residential	Long and Short Term	592255	5802608	1.5
R33	Residential	Long and Short Term	592315	5802627	1.5
R34	Residential	Long and Short Term	592326	5802543	1.5
R35	Residential	Long and Short Term	591491	5803441	1.5
R36	Residential	Long and Short Term	591801	5803795	1.5
R37	Residential	Long and Short Term	591906	5803690	1.5
R38	Residential	Long and Short Term	592007	5803651	1.5
R39	Residential	Long and Short Term	592135	5803296	1.5
R40	Residential	Long and Short Term	592114	5803348	1.5
R41	Residential	Long and Short Term	592422	5803318	1.5
R42	Residential	Long and Short Term	592758	5803211	1.5

4.1.2 Ecological Receptors

In lieu of any domestic guidance, the UK EA's AERA guidance has been used to inform the extent of ecological designations considered within this assessment. The AERA guidance states the following ecological sites need to be considered:

- International designated sites within 10km of the application site; and
- National and local designated sites within 2km of the application site.

Following application of these distance thresholds, Table 4-2 provides details of ecological receptors considered within this assessment, whilst their locations are illustrated in Figure 8.4. All receptors have been assumed to have a height of 0m and are represented in the model using gridded and polygon boundary receptors.

Table 4-2
Designated Ecological Sites of Relevance

ID	Site Name	Designation
ER1	Lower River Suir	SAC
ER2	Comeragh Mountains	SAC
ER3	Nier Valley Woodlands	SAC

4.2 Topography

Topography has been incorporated within the AERMOD dispersion model using 30m resolution Shuttle Radar Topography Mission (SRTM) terrain data files. Data was processed by the AERMAP function within AERMOD to calculate terrain heights (see Figure 8.5). These ground level elevations were also applied to all receptors included within the AERMOD dispersion model, however, were entered manually for buildings and sources.

4.3 Building Downwash

The integrated Building Profile Input Programme (BPIP) module within AERMOD has been used to incorporate buildings within the model, in line with guidance, where:

- the maximum height of the building is equivalent to at least 40% of the emission height; and
- are within a distance defined as five times the lesser of the height or maximum projected width of the building (referred to as 5L)).

Details of the buildings included within the dispersion modelling assessment are illustrated in Figure 8.2.

4.4 Meteorological Data

Numerical Weather Prediction (NWP) meteorological data have been utilised for the study. Five consecutive years of hourly-sequential NWP data covering the period 2017 – 2021, inclusive, was acquired based on the application site location and applied in the assessment. A wind rose for the datafile is presented in Figure 4-1 showing south-westerlies as the predominate wind direction in the area, alongside north-easterlies. Clonmel is located upwind of the application site.

The meteorological data were obtained in .met format from the data supplier and converted to the required surface and profile formats for use in AERMOD using AERMET View meteorological pre-processor. Details specific to the site location were used to define surface roughness, albedo and bowen ratio in the conversion (see Table 4-3).

Table 4-3
Applied Surface Characteristics

Zone (Start and End Sectors)	Albedo	Bowen	Surface Roughness
0 – 30°	0.17	0.64	0.277
30 – 60°	0.17	0.64	0.293
60 - 90°	0.17	0.64	0.213
90 - 120°	0.17	0.64	0.217
120 - 150°	0.17	0.64	0.271
150 - 180°	0.17	0.64	0.379
180 - 210°	0.17	0.64	0.372
210 - 240°	0.17	0.64	0.176
240 - 270°	0.17	0.64	0.155
270 - 300°	0.17	0.64	0.166
300 - 330°	0.17	0.64	0.158

Zone (Start and End Sectors)	Albedo	Bowen	Surface Roughness
330 - 0°	0.17	0.64	0.124

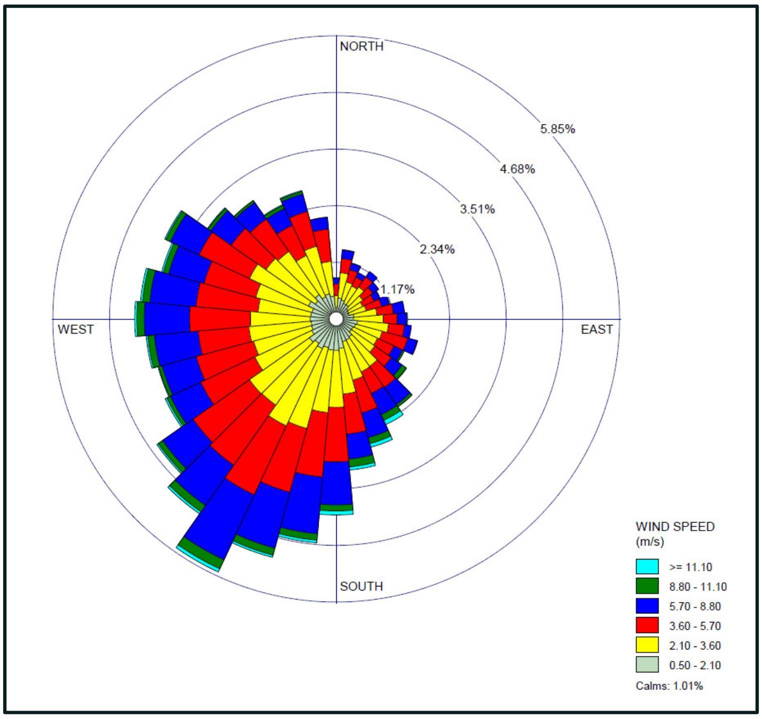

Figure 4-1
2017-2021 NWP Meteorological Data - Clonmel

4.5 Advanced Dispersion Parameters

4.5.1 Dispersion Coefficients

Urban locations are prone to higher temperatures, specifically during night-time periods, in comparison to surrounding rural areas. This phenomenon is known as the 'urban heat island effect' and is largely attributed to the enhanced thermal heating capacities of urban surfaces, alongside anthropogenic sources of heat emissions prevalent in urban areas. As such, rural areas often experience stable conditions in comparison to urban locations which experience convective turbulence during night-time conditions. This can ultimately impact dispersion and subsequent ground level concentrations.

In recognition of this, AERMOD enhances the rate of turbulence for urban night-time conditions, relative to that of the adjacent rural, stable boundary layer and also defines an urban boundary layer height to account for limited mixing that may occur under these conditions. This is determined through specifying the local environment (i.e. 'urban' or 'rural'). AERMOD also uses population as a surrogate to define the magnitude of the differential heating effect at urban locations.

In accordance with AERMOD guidance, 'rural' was selected given the surrounding environment of the site.

4.6 Model Outputs

Predicted pollutant concentrations are summarised in the following formats:

- process contribution (PC) – the change in pollutant conditions; and
- predicted environmental concentration (PEC) – the resultant predicted concentration (total model output + background).

To take into account the simultaneous retirement and introduction of plant proposed for both Production Lines 1 and 2 separately, modelled outputs for each proposed scenario (Scenario 1 and 2) have been compared against baseline outputs (Scenario 0), respectively to isolate the relevant PC for each phase. Where required, the cumulative resultant predicted concentration associated with all (existing and new) sources for each proposed scenario (Scenario 1 and 2) has been combined with the relevant background dataset to calculate the relevant PEC. The application of local background datasets to inform the PEC could lead to double counting of sources already contained within the AERMOD dispersion model and overestimate predicted concentrations. Furthermore, application of these datasets for use within the Scenario 1 and 2 (replacement of Production Line 1 and 2) is likely to overestimate predicted concentrations – as will contain emission contributions from those existing sources which are proposed to be removed. This approach is believed to be conservative – however will ensure the local background conditions are appropriately accounted for, increasing the confidence of the assessment outcomes.

Table 4-4 presents the averaging periods considered within this assessment and application of background datasets. Baseline concentrations for short-term averaging periods have been converted from annual mean in accordance with AERA guidance and LAQM.TG(22).

Table 4-4
Model Outputs

Averaging Period	Model Output	Background
30-minute mean	Maximum 1-hour mean x 1.3 (A)	2 x annual mean background
1-hour maximum mean	Maximum 1-hour mean	2 x annual mean background
1 hour mean. Not to be exceeded more than 18 times a calendar year	99.79%ile of 1-hour means	2 x annual mean background
8-hour rolling mean (maximum daily)	Maximum 8-hour mean	2 x annual mean background
24 hour mean	Maximum 24-hour mean	2 x annual mean background
24 hour mean. Not to be exceeded more than 35 times a calendar year	Maximum 24-hour mean	Annual mean background
Calendar year	Annual mean	Annual mean background

Table Notes:
(A) Factor of 1.3 based upon the UK's EA AERA guidance.

4.6.1 Operational Envelope

All plant equipment is assumed to be operational for 8,760 hours per year (i.e. continuously). This has been replicated within the AERMOD dispersion model, whereby no adjustment has been made to the model output. This is precautionary, as the plant will undergo downtime/maintenance on occasions throughout the year resulting in lower output than has been modelled.

4.6.2 Conversion of NO_x to NO_2

Consistent with the UK EA's AERA guidance, the assessment has used a NO_x to NO_2 ratio of:

- 70% for long-term average concentrations; and
- 35% for short-term average concentrations.

4.6.3 Calculation of PC to Deposition Rates

Deposition rates were calculated using empirical methods recommended in AQTAG06 consistent with AG4. Dry deposition flux was calculated using the following equation:

Dry deposition flux (µg/m^2/s) = ground level concentration (µg/m^3) x deposition velocity (m/s)

The applied deposition velocities for the relevant chemical species are as shown in Table 4-5.

Table 4-5
Applied Deposition Velocities

Chemical Species	Applied Deposition Velocities (m/s)	
NO_2	Grassland	0.0015
	Woodland	0.0030

Nutrient Nitrogen

The nutrient nitrogen Critical Loads are recorded in units of kgN/ha/yr.

Standard conversion factors detailed in Table 4-6 have been used to calculate the predicted nutrient nitrogen deposition rates from the dry deposition flux.

Table 4-6
Applied Nutrient Nitrogen Conversion Factors

Chemical Species	Conversion Factor
NO_2	95.9

Critical Loads – Acidification

The acid Critical Loads are recorded in units of keq/ha/yr.

Standard conversion factors detailed in Table 4-7 have been used to calculate the predicted acid deposition rates from the dry deposition flux.

Table 4-7
Applied Acidification Conversion Factors

Chemical Species	Conversion Factor
NO_2	6.84

PCs have been considered within the acid Critical Load function, in accordance with APIS guidance[7].

4.7 Uncertainty

Model validation studies[8] for AERMOD generally suggest that these dispersion models are for the vast majority of cases able to predict maximum short-term high percentiles concentrations well within a factor of two, and the latest evaluation study for AERMOD version 19191 shows the composite (geometric mean) ratio of predicted to observed short-term averages from 'test sites' (where real-time monitoring data is available to validate model performance), to be between 0.96 and 1.2.

[7] https://www.apis.ac.uk/clf-guidance
[8] AERMOD: Latest Features and Evaluation Results, EPA-454/R-03-003, June 2003 (United States Environmental Protection Agency).

Furthermore, to provide certainty with respect to the assessment outcomes, wherever possible, this assessment has incorporated a number of conservative assumptions, which will result in an overestimation of predicted ground level concentrations. As such, the actual predicted ground level concentrations are expected to be lower than this and, in some cases, significantly lower, with the operation of the new thermal energy systems. These include:

- assumed continuous operational profile (i.e. 8,760 hours per year), not accounting for any plant down time;
- assumed 35% and 70% for short term and long term NO_x to NO_2 conversion rates, respectively;
- for the purposes of the cumulative assessment, it is assumed all existing plant will operate at the maximum permitted emission limit concentrations, despite monitoring reports showing that actual pollutant concentrations are observed to be lower (where available);
- consideration of existing sources, alongside the application of a local monitored background datasets could potentially lead to the double counting of emission sources and overestimate predicted concentrations. Furthermore, application of these datasets for use within the Scenario 2 and 3 (replacement of Production Line 1 and 2) is likely to overestimate predicted concentrations – as will contain emission contributions from those existing sources which are proposed to be removed;
- 100% of the total PM_{10} ELV has been assumed to be $PM_{2.5}$ on all relevant sources. 100% of the dust ELV for the 18 filters has been assumed to be both PM_{10} and $PM_{2.5}$ (in lieu of any other relevant ELVs);
- initial consideration of the location of maximum (off-site) ground level impact for the purposes of the human health assessment, irrespective of relevant exposure – representing a conservative outlook, as concentrations predicted at all other locations, including human receptor locations would be lower;
- the precautionary approach with respect to ecological impact assessment by assuming that the most sensitive relevant feature is present at the location of maximum impact achieved through the:
  - adoption of the minimum critical loads and levels where variability across the designation occurs; and
  - consideration of the location of maximum impact across the assessed ecological – representing a conservative outlook relative to the wider site.
- use of five years of meteorological data to account for inter-annual variation.

5.0 BASELINE ENVIRONMENT

The characterisation of the existing environment has been undertaken using publicly available data sources not impacted by the COVID-19 pandemic. Pollutant concentrations monitored during 2020 and 2021 are expected to be atypical, and not representative of the local environment.

5.1 Human Health

A review of relevant air quality networks recommended in AG4 has been undertaken for the purposes of characterising baseline conditions with respect to the ambient pollutants of relevance to the human health dispersion modelling exercise.

Four air quality zones have been defined in Ireland for air quality management and assessment purposes, accounting for the differing localities across the country. Dublin is defined as Zone A and Cork as Zone B. Zone C is composed of 23 towns with a population of greater than 15,000. The remainder of the country represents rural Ireland, and includes all towns with a population of less than 15,000 – defined as Zone D. The Site is located within Zone C, however on the boundary of Zone D (Figure 8.6). Consistent with the approach adopted and accepted by the Irish EPA within the 2016 Air Quality Impact Assessment prepared for the site – Zone D has been assumed to be the most appropriate for the site.

AG4 states that it is reasonable to assume that background concentrations recorded across each zone would be comparable, given the zonal assignment of land based upon population. Furthermore, to minimise influence of local factors when sourcing background data stations outside of the modelling domain an average of at least two and preferably more representative stations should be used. Similarly, data should be averaged over the most recent 2-3 years. In recognition of the atypical conditions experienced during 2020 and 2021, 2017 – 2019 has been considered.

To complement existing monitoring sources and provide an indication of localised baseline pollutant conditions at sensitive locations, an ambient monitoring survey has been undertaken. For further information see **Appendix 8.1 Baseline Monitoring Survey**.

5.1.1 Nitrogen Dioxide

Table 5-1 presents the results of the NO_2 diffusion tube monitoring survey at locations relevant for human health.

Table 5-1
Monitored NO_2 Survey Processed Results

Site ID	Receptor	GPS Coordinates		Monitored Concentration	
		Latitude	Longitude	Data Capture (%)	(µg/m^3)
AQ2	Residential Dwellings (Roadside of N24)	52.367133	-7.654209	100	6.0
AQ3	Residential Dwellings (Roadside of N24)	52.360504	-7.654062	100	13.2
AQ6	Powerstown National School	52.371960	-7.664598	100	5.6
AQ8	Residential Dwellings	52.362631	-7.663894	66.7	5.2
AQ9	Residential Dwellings	52.378490	-7.651359	100	4.9
AQ10	Residential Dwellings (Roadside of N24)	52.360275	-7.671484	100	17.1

5.1.2 Particulate Matter

Details of the three nearest Irish EPA PM monitoring locations within Zone D relative to the Site are presented in Table 5-2, whilst monitored PM_{10} and $PM_{2.5}$ concentrations relating to the latest three years of data available prior to 2020 are presented in Table 5-3 and Table 5-4, respectively.

Table 5-2
Three Nearest PM_{10} and $PM_{2.5}$ Background Monitors Within Zone D Relative to the Site

Site ID	Location	Distance to Site (km)	Latitude	Longitude
IE0137A	Cahirguillamore	66	53.62944	-8.19444
IE001DM	Enniscorthy	70	52.49850	-6.57075
IE002DP	Roscommon	150	52.50349	-8.59194

Table 5-3
Relevant PM_{10} Monitored Annual Mean Monitored Concentrations

Site ID	2017	2018	2019	Average
	Annual Mean PM_{10} Concentration (µg/m^3)			
IE0137A	15.8	15.8	18.0	16.5
IE002DP	-	12.1	11.9	12.0
IE001DM	-	17.6	18.3	18.0
Average (2017-2019)				**15.5**

An annual mean background PM_{10} concentration of 15.5µg/m^3 has been used, as represents the average recorded concentration from the three nearest monitors within Zone D relative to the Site, from the last three years of representative data.

The 24-hour mean (90.41%ile) background concentration has assumed to be equal to the annual mean PM_{10} background concentration, consistent with AG4 guidance.

Table 5-4
Relevant $PM_{2.5}$ Monitored Annual Mean Monitored Concentrations

Site ID	2017	2018	2019	Average
	Annual Mean $PM_{2.5}$ Concentration (µg/m^3)			
IE0137A	10.6	10.1	16.0	12.3
IE002DP	-	8.8	8.6	8.7
IE001DM	-	12.9	14.1	13.5
Average (2017-2019)				**8.2**

An annual mean background $PM_{2.5}$ concentration of 8.2µg/m^3 has been used, as represents the average recorded concentration from the three nearest monitors within Zone D relative to the Site, from the last three years of representative data.

5.1.3 Carbon Monoxide

From review of the Irish EPA monitoring network, CO monitoring has only been undertaken at one location within Zone (IE001DM) between 2014 and 2016. Monitoring results are presented in Table 5-5.

Table 5-5
Background CO Monitors Within Zone D

Site ID	Location	Distance to Site (km)	Latitude	Longitude	2014	2015	2016	Average
					Annual Mean CO Concentration (µg/m^3)			
IE001DM	Enniscorthy	70	52.49850	-6.57075	1395.0	146.4	653.8	**731.8**

An annual mean background CO concentration of 731.8µg/m^3 has been used, as represents the average recorded concentration from the last three years of representative data at the only CO monitor in Zone D.

Short term background CO concentrations have assumed to be double the annual mean value (1,463.5µg/m^3).

5.1.4 Formaldehyde

CH_2O is not routinely measured in Ireland or in the UK. Background concentrations are assumed to be negligible. Existing emissions of CH_2O released from the site have been considered within the modelling exercise to represent baseline conditions.

5.1.5 NCO

NCO is not routinely measured in Ireland or in the UK. Background concentrations are assumed to be negligible. Existing emissions of NCO released the site have been considered within the modelling exercise represent baseline conditions.

5.1.6 Applied Background Concentrations

The applied backgrounds are provided in Table 5-6 below. Baseline concentrations for short-term averaging periods have been converted from annual mean in accordance with the AERA guidance and LAQM.TG(22).

Table 5-6
Applied Background Concentrations

Pollutant	Background Concentration (µg/m^3)		Data Source
	Short Term	Annual	
NO_2	10.6 – 37.2	4.9 – 17.1	Project specific NO_2 monitoring survey covering worst-case human receptor locations in relation to the Site. See **Appendix 8.1 Baseline Monitoring Survey**.
PM_{10}	15.5	15.5	Based upon Zone D monitoring undertaken between 2017 and 2019.
$PM_{2.5}$	-	8.2	Based upon Zone D monitoring undertaken between 2017 and 2019.
CO	1,463.5	-	Based upon Zone D monitoring undertaken between 2017 and 2019.
CH_2O	-	-	Not monitored in Ireland/UK - local sources have been modelled, background assumed to be negligible
NCO	-	-	Not monitored in Ireland/UK - local sources have been modelled, background assumed to be negligible

Local baseline datasets have not been adjusted to remove any local existing source included within the dispersion modelling exercise – potentially causing emissions to be double counted. Furthermore, these baseline datasets have not been adjusted for use within the future year scenarios to remove emission contributions from those existing sources which are proposed to be removed.

5.2 Sensitive Ecosystems

Details of the qualifying interests for each assessed ecological designation have been obtained from the National Parks and Wildlife Service Conservation Objectives Series[9]. The most sensitive habitat in relation to each Critical Levels / Critical Loads has been used to provide a worst case assessment.

[9] https://www.npws.ie/protected-sites/conservation-management-planning/conservation-objectives

In the absence of any existing information an ambient monitoring survey has been undertaken to inform the baseline conditions at affected sensitive ecosystems. The ecological monitoring exercise focussed on the Lower River Suir SAC – given its proximity in relation to the Site, and likelihood of an effect from biomass emissions arising. All other sensitive ecological habitats assessed are >9km from the Site. Monitoring was undertaken at three worst-case locations across the Lower River Suir SAC, relative to the site and other prominent sources (road traffic). For further information see **Appendix 8.1 Baseline Monitoring Survey**.

The maximum monitored conditions have been used to characterise baseline conditions at all ecological designations as a precautionary approach.

Monitored pollutant concentrations have been used to calculate baseline deposition loads in relation to nutrient nitrogen and acidification in the absence of any existing information, with use of empirical methods recommended in AG4.

5.2.1 Critical Levels

The relevant Critical Levels and baseline conditions are summarised in Table 5-7 below.

Table 5-7
Relevant Critical Levels and Baseline Conditions at Ecological Receptors

Site	Type	NO_x	
		Critical Level (µg/m^3)	Maximum Annual Mean Concentration (µg/m^3)
ER1	SAC	30	10.6
ER2	SAC	30	10.6
ER3	SAC	30	10.6

5.2.2 Critical Loads

Nutrient Nitrogen

Critical Loads and baseline deposition rates in relation to nutrient nitrogen are provided in Table 5-8.

Nutrient nitrogen Critical Loads are habitat/species specific (derived from a range of experimental studies). Nutrient nitrogen Critical Loads for use within this assessment has been derived from the published research conducted by the Irish EPA[10]. Where nutrient nitrogen Critical Loads are reported in ranges (representing the variation in ecosystem responses) those values which facilitate a worst-case assessment have been used (i.e. min Critical Loads for nutrient nitrogen deposition).

Table 5-8
Nutrient Nitrogen Critical Loads and Baseline Deposition Rates

Site	Type	Habitat Type (Most Sensitive)	Critical Load Range (Min – Max)	Critical Load Adopted	Baseline
			(kgN/ha/yr)		
ER1	SAC	Soft water lakes (permanent oligotrophic waters)	3-10	3	35.6
ER2	SAC	Alpine and subalpine acid grasslands	5-10	5	35.6
ER3	SAC	Acidophilous Quercus-dominated woodland (oak)	10-15	10	35.6

[10] Irish EPA: Critical Loads and Soil-Vegetation Modelling: https://www.epa.ie/publications/research/climate-change/Research_Report_323.pdf

Acidification

Critical Loads and baseline deposition rates in relation to acidification are provided in Table 5-9.

Acidification Critical Loads are dependent on soil chemistry, as well as habitat type. The Critical Loads of acidification are defined by a critical load function, which describes the relationship between the relative contributions of sulphur and nitrogen to the total acidification. The critical load function is defined by the following parameters:

- CLmaxS: the maximum critical load of acidity for sulphur, assuming there is no nitrogen deposition;
- CLminN: the critical load of acidity due to nitrogen removal processes in the soil only (i.e. independent of deposition); and
- CLmaxN: the maximum critical load of acidity for nitrogen assuming there is no sulphur deposition

Acidification Critical Loads for use within this assessment derive from the published research[11]. Baseline sulphur and nitrogen deposition rates have been compared against the relevant Critical Loads to inform the sensitivity of the area and method for calculating exceedance of the acidity critical load function (Section 4.6.3).

Table 5-9
Relevant Acidification Assessment Input Parameters

Site	Type	Critical Load			Baseline (Max)		Sensitivity (Critical Load Function)
		CLminN	CLmaxS	CLmaxN	N	S	
		(keq/ha/yr)					
ER1	SAC	0.216	0.644	1.157	2.5	0.5	N
ER2	SAC	0.216	0.644	1.157	2.5	0.5	N
ER3	SAC	0.216	0.644	1.157	2.5	0.5	N

[11] Coordination Centre for Effects National Institute of Public Health and the Environment: Calculation and Mapping of Critical Thresholds in Europe.

6.0 PREDICTED AIR QUALITY IMPACTS

Predicted air quality impacts for each potential scenario (replacement of Line 1/2) have been discussed in turn.

Within the context of human receptors, results presented herein relate to the maximum ground level PC predicted across the entirety of the gridded receptors irrespective of relevant exposure. This represents a conservative outlook. PCs predicted at all other locations, including human receptor locations would be lower. Therefore, if impacts can be screened out as insignificant at the location of maximum ground level PC, impacts at other areas can also be screened out as insignificant.

Within the context of ecological receptors, results presented herein relates to the maximum modelled impact of each individual ecological designation requiring assessment, and as such, represents a conservative outlook.

6.1 Phase 1: Replacement of Line 1

The results presented below relate to the replacement of the Line 1 energy system (with existing line 2).

6.1.1 Human Health

Long Term Impacts

Predicted long-term impacts in relation to the replacement of the Line 1 energy system are summarised in Table 6-1. Maximum modelled ground level PCs are less than 1% of the AQAL for all pollutants. Impacts can therefore be described as insignificant at all relevant exposure locations.

Table 6-1
Predicted Maximum Ground Level Long-Term Impacts: Line 1

AQAL			PC (µg/m³)	PC as % AQAL	PEC (µg/m³)	PEC as % AQAL
Pollutant	Period	µg/m³				
PM_{10}	Annual	40	<0.1	<0.1	n/c	n/c
$PM_{2.5}$	Annual	20	<0.1	<0.1	n/c	n/c
CH_2O	Annual	5	<0.1	0.2	n/c	n/c
MDI	Annual	0.2	<0.1	<0.1	n/c	n/c
NO_2	Annual	40	0.1	0.1	n/c	n/c
Table Notes: n/c = not calculated: following UK EA guidance the PEC has only been calculated where the PC is 1% or above.						

Short-Term Impacts

Predicted short-term impacts are summarised in Table 6-2. Maximum modelled ground level PCs are less than 10% of the AQAL for all pollutants. Impacts can therefore be described as insignificant.

Table 6-2
Predicted Maximum Ground Level Short-Term Impacts: Line 1

AQAL			PC (µg/m³)	PC as % AQAL	PEC (µg/m³)	PEC as % AQAL
Pollutant	Period	µg/m³				
CH_2O	1-Hour	100	7.3	7.3	n/c	n/c
MDI	1-Hour	7	<0.1	<0.1	n/c	n/c
CO	1-Hour	10,000	213.4	2.1	n/c	n/c

AQAL			PC (µg/m³)	PC as % AQAL	PEC (µg/m³)	PEC as % AQAL
Pollutant	Period	µg/m³				
CO	8-Hour (Rolling)	30,000	89.8	0.3	n/c	n/c
NO_2	1-Hour (99.79%ile)	200	7.3	3.7	n/c	n/c
PM_{10}	24-Hour (90.41%ile)	50	<0.1	0.1	n/c	n/c
Table Notes: n/c = not calculated: following UK EA guidance the PEC has only been calculated where the PC is 10% or above.						

6.1.2 Sensitive Ecosystems

Critical Levels

Table 6-3 details the predicted impacts on long term and short term Critical Levels, respectively, at the identified ecological sites. All short and long-term PCs are below the relevant designation-specific assessment criteria. Impacts can therefore be considered insignificant.

Table 6-3
Predicted Impacts on Critical Levels

Site	NOx 24-Hour Mean Critical Level (75µg/m³)		NOx Annual Mean Critical Level (30µg/m³)	
	PC (µg/m³)	PC as % Critical Level	PC (µg/m³)	PC as % Critical Level
ER1 (SAC)	<0.1	<0.1	<0.1	<0.1
ER2 (SAC)	3.2	4.3	<0.1	0.1
ER3 (SAC)	0.4	0.5	<0.1	<0.1

Critical Loads

The predicted nutrient nitrogen and acid deposition Critical Loads impacts at the identified ecological sites are presented in Table 6-4 and Table 6-5, respectively. All long-term PCs are below the relevant designation-specific assessment criteria. Impacts can therefore be considered insignificant.

Table 6-4
Maximum Predicted Nutrient Nitrogen Deposition Impacts at Ecological Receptors

Site	Applied Critical Load (Min)	PC	PC as % Critical Load (Min)
	kg/ha/yr		
ER1 (SAC)	3	<0.1	<0.1
ER2 (SAC)	10	<0.1	0.1
ER3 (SAC)	5	<0.1	<0.1

Table 6-5
Maximum Predicted Acid Deposition Impacts at Ecological Receptors

Site	Applied Critical Load (CLmaxN)	PC	PC as % Critical Load (CLmaxN)
	keq/ha/yr		
ER1 (SAC)	1.157	<0.1	<0.1
ER2 (SAC)	1.157	<0.1	<0.1
ER3 (SAC)	1.157	<0.1	<0.1

6.2 Phase 2: Replacement of Line 1 and 2

6.2.1 Human Health

Long Term Impacts

Predicted long-term impacts in relation to the replacement of the Line 2 energy system are summarised in Table 6-1. Maximum modelled ground level PCs are less than 1% of the AQAL for all pollutants. Impacts can therefore be described as insignificant.

Table 6-6
Predicted Maximum Ground Level Long-Term Impacts: Line 2

AQAL			PC (µg/m³)	PC as % AQAL	PEC (µg/m³)	PEC as % AQAL
Pollutant	Period	µg/m³				
PM_{10}	Annual	40	<0.1	<0.1	n/c	n/c
$PM_{2.5}$	Annual	20	<0.1	<0.1	n/c	n/c
CH_2O	Annual	5	<0.1	0.3	n/c	n/c
MDI	Annual	0.2	<0.1	<0.1	n/c	n/c
NO_2	Annual	40	0.1	0.2	n/c	n/c
Table Notes: n/c = not calculated: following UK EA guidance the PEC has only been calculated where the PC is 1% or above.						

Short-Term Impacts

Predicted short-term impacts are summarised in Table 6-2. Maximum modelled ground level PCs are less than 10% of the AQAL for all pollutants. This is with the exception of CH_2O, however, the calculated PEC is well below the AQAL. Impacts can therefore be described as insignificant.

Table 6-7
Predicted Maximum Ground Level Short-Term Impacts: Line 2

AQAL			PC (µg/m³)	PC as % AQAL	PEC (µg/m³)	PEC as % AQAL
Pollutant	Period	µg/m³				
CH_2O	1-Hour	100	10.6	10.6	35.3	35.3
MDI	1-Hour	7	<0.1	<0.1	n/c	n/c
CO	1-Hour	10,000	258.4	2.6	n/c	n/c
CO	8-Hour (Rolling)	30,000	127.5	0.4	n/c	n/c
NO_2	1-Hour (99.79%ile)	200	12.2	6.1	n/c	n/c
PM_{10}	24-Hour (90.41%ile)	50	0.1	0.1	n/c	n/c
Table Notes: n/c = not calculated: following UK EA guidance the PEC has only been calculated where the PC is 10% or above.						

6.2.2 Sensitive Ecosystems

Critical Levels

Table 6-8 details the predicted impacts on long term and short term Critical Levels, respectively, at the identified ecological sites. All short and long-term PCs are below the relevant designation-specific assessment criteria. Impacts can therefore be considered insignificant.

Table 6-8
Predicted Impacts on Critical Levels

Site	NOx 24-Hour Mean Critical Level (75µg/m³)		NOx Annual Mean Critical Level (30µg/m³)	
	PC (µg/m³)	PC as % Critical Level	PC (µg/m³)	PC as % Critical Level
ER1 (SAC)	<0.1	<0.1	<0.1	<0.1
ER2 (SAC)	4.8	6.4	<0.1	0.2
ER3 (SAC)	0.4	0.5	<0.1	<0.1

Critical Loads

The predicted nitrogen and acid deposition Critical Load impacts at the identified ecological sites are presented in Table 6-9 and Table 6-10, respectively. All long-term PCs are below the relevant designation-specific assessment criteria. Impacts can therefore be considered insignificant.

Table 6-9
Maximum Predicted Nutrient Nitrogen Deposition Impacts at Ecological Receptors

Site	Applied Critical Load (Min)	PC	PC as % Critical Load (Min)
	kg/ha/yr		
ER1 (SAC)	3	<0.1	<0.1
ER2 (SAC)	10	<0.1	0.1
ER3 (SAC)	5	<0.1	<0.1

Table 6-10
Maximum Predicted Acid Deposition Impacts at Ecological Receptors

Site	Applied Critical Load (CLmaxN)	PC	PC as % Critical Load (CLmaxN)
	keq/ha/yr		
ER1 (SAC)	1.157	<0.1	<0.1
ER2 (SAC)	1.157	<0.1	0.1
ER3 (SAC)	1.157	<0.1	<0.1

7.0 CONCLUSIONS

The conclusions of the detailed dispersion modelling assessment are as follows:

- maximum ground level PCs will have an insignificant impact on human health; and
- predicted impacts on designated sensitive habitats are considered insignificant.

Effects associated with the phased replacement of two biomass boiler lines (Line 1 and Line 2) are therefore considered to be ‘not significant’.

Appendix A - Model Inputs

Table A-1
Emission Release Characterises (Point Sources): Inputs

Scenario	New / Existing	Emission Reference	UTM 29N		Diameter (m)	Height (AGL m)	Volumetric Flow Rate		Temperature (°C)	Oxygen (Wet %)	Moisture (%)	Efflux Velocity (m/s)
			X	Y			Normalised (Nm^3/s)	Actual (Am^3/s)				
Scenario 1	Existing	A2-5	592034.4	5802793.7	2.8	39.0	174,400	232,919	52.0	-	10.9	10.9
	Existing	A2-6	592044.4	5802797.8	2.8	39.0	174,400	239,492	57.5	-	11.9	11.2
	Existing	A2-21	592009.5	5802860.3	2.6	39.9	174,160	236,122	52.0	-	12.2	12.3
	Existing	A1-1	592063.8	5802769.1	0.8	11.0	360	811	284.2	2.6	10.0	0.4
	Existing	A2-15	592039.6	5802782.7	1.2	12.5	43,200	52,238	33.0	-	7.3	12.0
	Existing	A2-12	592091.4	5802753.3	1.0	15.0	50,000	56,108	33.0	-	0.1	19.8
	Existing	A2-13	592070.5	5802791.2	1.0	10.0	50,000	56,491	35.0	-	0.2	20.0
	Existing	A2-22	592016.5	5802936.4	1.0	12.0	50,000	53,968	21.0	-	0.2	19.1
	Existing	A2-23	592023.6	5802925.5	1.0	12.0	50,000	54,478	20.0	-	1.5	19.3
Scenario 2	New	A2-5	592034.4	5802793.7	2.8	39.0	177,644	252,944	73.0	-	11.0	11.8
	New	A2-6	592044.4	5802797.8	2.8	39.0	177,644	252,944	73.0	-	11.0	11.8
	Existing	A2-21	592009.5	5802860.3	2.6	39.9	174,160	236,122	52.0	-	12.2	12.3
	Existing	A2-15	592039.6	5802782.7	1.2	12.5	43,200	52,238	33.0	-	7.3	12.0
	Existing	A2-12	592091.4	5802753.3	1.0	15.0	50,000	56,108	33.0	-	0.1	19.8
	Existing	A2-13	592070.5	5802791.2	1.0	10.0	50,000	56,491	35.0	-	0.2	20.0
	Existing	A2-22	592016.5	5802936.4	1.0	12.0	50,000	53,968	21.0	-	0.2	19.1
	Existing	A2-23	592023.6	5802925.5	1.0	12.0	50,000	54,478	20.0	-	1.5	19.3
Scenario 3	New	A2-5	592034.4	5802793.7	2.8	39.0	177,644	252,944	73.0	-	11.0	11.8
	New	A2-6	592044.4	5802797.8	2.8	39.0	177,644	252,944	73.0	-	11.0	11.8
	New	A2-21	592009.5	5802860.3	2.6	39.9	174,160	246,550	71.0	-	11.0	12.8
	Existing	A2-15	592039.6	5802782.7	1.2	12.5	43,200	52,238	33.0	-	7.3	12.0
	Existing	A2-12	592091.4	5802753.3	1.0	15.0	50,000	56,108	33.0	-	0.1	19.8

Scenario	New / Existing	Emission Reference	UTM 29N		Diameter (m)	Height (AGL m)	Volumetric Flow Rate		Temperature (°C)	Oxygen (Wet %)	Moisture (%)	Efflux Velocity (m/s)
			X	Y			Normalised (Nm^3/s)	Actual (Am^3/s)				
	Existing	A2-13	592070.5	5802791.2	1.0	10.0	50,000	56,491	35.0	-	0.2	20.0
	Existing	A2-22	592016.5	5802936.4	1.0	12.0	50,000	53,968	21.0	-	0.2	19.1
	Existing	A2-23	592023.6	5802925.5	1.0	12.0	50,000	54,478	20.0	-	1.5	19.3

Reference Conditions:

- **A1-1**: Temperature: 237.15K, Moisture Content: Dry (0%), Oxygen Content: 3%.
- **All Other Sources**: Temperature: 237.15K, Moisture Content: Dry (0%), Oxygen Content: No Correction.

Table A-2
Emission Release Characterises (Volume Sources): Inputs

Scenario	New / Existing	Emission Reference	UTM 29N		Height (AGL m)	Lateral Dimension (m)	Vertical Dimension (m)	Aggregated Normalised Volumetric Flow Rate (Nm^3/s)
			X	Y				
Scenario 1	Existing	Various (Filters)	591998.9	5802845.6	17.35	68.21	3.26	859,735
Scenario 2	Existing	Various (Filters)	591998.9	5802845.6	17.35	68.21	3.26	859,735
Scenario 3	Existing	Various (Filters)	591998.9	5802845.6	17.35	68.21	3.26	859,735

Various (Filters):

- A2-1, A2-2, A2-3, A2-4, A2-7, A2-8, A2-9, A2-10, A2-11, A2-16, A2-17, A2-18, A2-19, A2-20, A2-24, A2-25, A2-26, A2-27.
- Volumetric flow rates for all 18 dust filers have been aggregated to calculate a site-wide emission rate.

Table A-3
Modelled Pollutant Emission Rates

Scenario	New / Existing	Emission Reference	Emission Release Concentration (mg/Nm^3)							Mass Emission Rate (g/s)						
			NOx	PM_{10}	$PM_{2.5}$	TVOC	CH_2O	CO	NCO	NOx	PM_{10}	$PM_{2.5}$	TVOC	CH_2O	CO	NCO
Scenario 1	Existing	A2-5	110	5	5	120	15	600	0.06	5.32889	0.24222	0.24222	5.81333	0.72667	29.06667	0.00291
	Existing	A2-6	110	5	5	120	15	600	0.06	5.32889	0.24222	0.24222	5.81333	0.72667	29.06667	0.00291
	Existing	A2-21	110	5	5	120	15	300	0.06	5.32156	0.24189	0.24189	5.80533	0.72567	14.51333	0.00290
	Existing	A1-1	110	-	-	-	-	-	-	0.01100	-	-	-	-	-	-
	Existing	A2-15	100	3.75	3.75	20	10	100	0.06	1.20000	0.04500	0.04500	0.24000	0.12000	1.20000	0.00072
	Existing	A2-12	110	5	5	120	15	-	0.06	-	0.05208	0.05208	1.38889	0.06944	-	0.00083
	Existing	A2-13	-	3.75	3.75	100	5	-	0.06	-	0.05208	0.05208	1.38889	0.06944	-	0.00083
	Existing	A2-22	-	3.75	3.75	100	6	-	0.06	-	0.05208	0.05208	1.38889	0.08333	-	0.00083
	Existing	A2-23	-	3.75	3.75	100	6	-	0.06	-	0.05208	0.05208	1.38889	0.08333	-	0.00083
	Existing	Various (Filters)	-	5	5	-	-	-	-	-	1.19408	1.19408	-	-	-	-
Scenario 2	New	A2-5	110	20	20	120	15	600	0.06	5.42801	0.24673	0.24673	5.92147	0.74018	29.60733	0.00296
	New	A2-6	110	20	20	120	15	600	0.06	5.42801	0.24673	0.24673	5.92147	0.74018	29.60733	0.00296
	Existing	A2-21	110	5	5	120	15	300	0.06	5.32156	0.24189	0.24189	5.80533	0.72567	14.51333	0.00290
	Existing	A2-15	100	3.75	3.75	20	10	100	0.06	1.20000	0.04500	0.04500	0.24000	0.12000	1.20000	0.00072
	Existing	A2-12	110	5	5	120	15	-	0.06	-	0.05208	0.05208	1.38889	0.06944	-	0.00083
	Existing	A2-13	-	3.75	3.75	100	5	-	0.06	-	0.05208	0.05208	1.38889	0.06944	-	0.00083
	Existing	A2-22	-	3.75	3.75	100	6	-	0.06	-	0.05208	0.05208	1.38889	0.08333	-	0.00083
	Existing	A2-23	-	3.75	3.75	100	6	-	0.06	-	0.05208	0.05208	1.38889	0.08333	-	0.00083
	Existing	Various (Filters)	-	5	5	-	-	-	-	-	1.19408	1.19408	-	-	-	-
Scenario 3	New	A2-5	110	20	20	120	15	600	0.06	5.42801	0.24673	0.24673	5.92147	0.74018	29.60733	0.00296
	New	A2-6	110	20	20	120	15	600	0.06	5.42801	0.24673	0.24673	5.92147	0.74018	29.60733	0.00296
	New	A2-21	110	20	20	120	15	300	0.06	5.32156	0.24189	0.24189	5.80533	0.72567	14.51333	0.00290
	Existing	A2-15	100	3.75	3.75	20	10	100	0.06	1.20000	0.04500	0.04500	0.24000	0.12000	1.20000	0.00072
	Existing	A2-12	110	5	5	120	15	-	0.06	-	0.05208	0.05208	1.38889	0.06944	-	0.00083

Scenario	New / Existing	Emission Reference	Emission Release Concentration (mg/Nm^3)							Mass Emission Rate (g/s)						
			NOx	PM_{10}	$PM_{2.5}$	TVOC	CH_2O	CO	NCO	NOx	PM_{10}	$PM_{2.5}$	TVOC	CH_2O	CO	NCO
	Existing	A2-13	-	3.75	3.75	100	5	-	0.06	-	0.05208	0.05208	1.38889	0.06944	-	0.00083
	Existing	A2-22	-	3.75	3.75	100	6	-	0.06	-	0.05208	0.05208	1.38889	0.08333	-	0.00083
	Existing	A2-23	-	3.75	3.75	100	6	-	0.06	-	0.05208	0.05208	1.38889	0.08333	-	0.00083
	Existing	Various (Filters)	-	5	5	-	-	-	-	-	1.19408	1.19408	-	-	-	-

Various (Filters):

- A2-1, A2-2, A2-3, A2-4, A2-7, A2-8, A2-9, A2-10, A2-11, A2-16, A2-17, A2-18, A2-19, A2-20, A2-24, A2-25, A2-26, A2-27 are represented as a single volume source (Table A-2)

Reference Conditions:

- **A1-1**: Temperature: 237.15K, Moisture Content: Dry (0%), Oxygen Content: 3%.
- **All Other Sources**: Temperature: 237.15K, Moisture Content: Dry (0%), Oxygen Content: No Correction.

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Appendix 8.3 Construction Dust Assessment

ENERGY SYSTEM REPLACEMENT, MEDITE EUROPE DAC CLONMEL

Appendix 8.3 Construction Dust Assessment

Prepared for: Medite Europe DAC

SLR Ref: 501.00785.00001
Version No: v1.0
October 2023

BASIS OF REPORT

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1.0 CONSTRUCTION DUST ASSESSMENT

The scope of the assessment is to qualitatively understand potential impacts associated with dust/particulate matter (PM_{10}) generated by construction activities on the surrounding environment – in accordance with the latest 2023 IAQM guidance. The outcomes of this exercise have been used to inform the air quality assessment and the recommendation of suitable construction phase dust controls to be applied.

This report forms a Technical Appendix to **Chapter 8: Air Quality**.

1.1 Approach

The proposed development relates to the replacement of all four existing aging thermal energy systems serving both of Medite's two production lines. It is understood that the thermal energy systems serving Production Lines 1 and 2 will be replaced in a long-term phased manner (i.e. Line 1 and Line 2 separately), over a ten-year period. The proposed development will be located within three discrete primary development areas, within the confines of the existing Medite site – where specific and separate works will take place. The Applicant is seeking a ten-year permission for the development to facilitate a phased development process which will allow existing manufacturing operations at the site for the duration of the construction phase. Detail regarding the description of the proposed development is provided in **Chapter 6: Project Description** and been used to inform the extent of construction activities.

To facilitate a conservative assessment, all proposed construction activities supporting the replacement of both lines have been assessed cumulatively i.e. assuming they occur concurrently. Furthermore, the planning application boundary has been used for the purposes of defining potential dust sources – to ensure the spatial extent of works and interactions with sensitive receptors is understood. This approach will increase the opportunity for greater derived sensitivities and dust emission magnitudes, impacts and ultimately the extent of mitigation recommended to be applied. This approach will increase the confidence in the assessment outcomes.

Where figures relating to area of the site, volume of the site, approximate number of construction vehicles or distances to receptors are given, they relate to thresholds as defined in the IAQM guidance to guide the assessor to define the dust emissions magnitude and sensitivity of the area.

1.2 Assessment Screening

As shown in **Error! Reference source not found.**8.7, there are human receptors within 250m of the application site as well as a designated habitat site (Lower River Suir SAC) within 50m of the application boundary. Therefore, an assessment of construction dust on both human and ecological receptors is required.

1.3 Potential Dust Emissions Magnitude

1.3.1 Demolition

The extent of demolition activities associated with the proposed development relate to the dismantlement of equipment (e.g. thermal fluid heater) and L2 building. Demolition activities are expected to be small – largely relating to material with a low potential for dust release (e.g. metal). The total building volume requiring demolition is expected to be <12,000m^3. Therefore, the dust emission magnitude for demolition is considered to be 'small'.

1.3.2 Earthworks

The total aggregated extent of the three development areas is <110,000m^3 (assuming construction activities occur concurrently). In reality, the areas will be developed separately; the dust emission magnitude potential will be less. Furthermore, earthworks will not be required across the full extent of these areas. The site is already well-established and operational, therefore proposed construction activities will not comprise major earthwork activities (soil stripping, ground levelling, excavation and/or landscaping). <5 heavy earth moving vehicles are likely to be active at any one time.

In recognition of the above, despite the size of the site, it is likely that there will be limited earthwork activities that require assessment or mitigation. However, for completeness, the dust emission magnitude for earthworks is considered to be 'small'. This is considered conservative.

1.3.3 Construction

The proposed development comprises the construction of minor buildings and supporting infrastructure associated with the new thermal energy systems serving Production Lines 1 and 2 (e.g. conveyors, pipes and ducts). As such, the total building volume is <75,000m^3. Construction materials are expected to have a low potential for dust release (i.e. metal). The dust emission magnitude for construction is therefore considered to be 'small'.

1.3.4 Trackout

Construction vehicles would access the site via the two existing site entrances on the eastern boundary of the site, which connects via an unnamed road to the N24. The site is already well-established and operational – therefore, the extent of unpaved road lengths are expected to be <50m if required at all. Given the scale of the demolition, earthworks and construction, it is considered unlikely that >20 HDV outward movements will occur in any worst-case day. Furthermore, phasing would reduce the number of daily HDV movements. Therefore, the dust emission magnitude for trackout is considered to be 'small'.

1.3.5 Summary

A summary of the dust emission magnitude for the four activities is detailed in Table 1-1.

Table 1-1
Potential Dust Emission Magnitude

Activity	Dust Emission Magnitude
Demolition	Small
Earthworks	Small
Construction	Small
Trackout	Small

1.4 Sensitivity of the Area

1.4.1 Dust Soiling Impacts

The site is situated within a largely rural setting (comprising agricultural fields) on the eastern extent of Clonmel. There are <10 high sensitivity (residential) receptors within 50m of the application boundary. Furthermore, there are <100 high sensitivity (residential) receptors within 100m of the application boundary. In the case of trackout, there are no sensitive receptors within 50m of the access routes up to 50m of the application site entrance – commensurate of a small site[1].

The sensitivity of the area with respect to dust soiling effects on people and property in relation to demolition, earthworks, and construction is therefore considered to be 'low' whilst in relation to trackout there is no exposure and therefore no sensitivity.

1.4.2 Human Health Impacts

As detailed in **Appendix 8.2 Biomass Dispersion Modelling Assessment**, an annual mean background PM_{10} concentration of 15.5µg/m^3 has been used to characterise baseline conditions (i.e. falls into the <24µg/m^3 class).

Given the above information regarding the quantum of receptors within proximity of the application site boundary, the sensitivity of the area with respect to human health impacts in relation to demolition, earthworks and construction is therefore considered to be 'low' whilst in relation to trackout there is no exposure and therefore no sensitivity.

1.4.3 Ecological Impacts

The Lower River Suir SAC is located approximately within 20m of the application boundary and trackout routes. The sensitivity of the area with respect to ecological impacts in relation to demolition, earthworks, construction, and trackout is therefore considered to be 'high'.

1.4.4 Summary

A summary of the sensitivity of the surrounding area is detailed in Table 1-2, whereas the spatial densities of receptors discussed in relation to the site boundary are illustrated in **Error! Reference source not found.**8.7.

Table 1-2
Sensitivity of the Area

Potential Impact	Sensitivity of Surrounding Area			
	Demolition	Earthworks	Construction	Trackout
Dust Soiling	Low	Low	Low	-
Human Health	Low	Low	Low	-
Ecological	High	High	High	High

1.5 Risk of Impacts (Unmitigated)

The outcome of the assessment of the potential 'magnitude of dust emissions', and the 'sensitivity of the area' are combined in Table 1-3 below to determine the risk of impact (unmitigated) which is used to inform the selection of appropriate mitigation.

[1] As per the IAQM's 'Guidance on the Assessment of Dust from Demolition and Construction', without site-specific mitigation, trackout may occur along the public highway up to 500m from large sites, 200m from medium sites and 50m from small sites (determined by the calculated trackout dust emission magnitude), as measured from the site exit.

Table 1-3
Risk of Dust Impacts (Unmitigated)

Potential Impact	Risk			
	Demolition	Earthworks	Construction	Trackout
Dust Soiling	Negligible	Negligible	Negligible	-
Human Health	Negligible	Negligible	Negligible	-
Ecological	Medium	Low	Low	Medium

1.6 Mitigation

Following the construction dust assessment, the application site is found to be at worst 'low risk' in relation to dust soiling effects on people and property and human health impacts in the absence of mitigation and 'medium risk' in relation to ecological impacts. Moreover, potential dust effects during the construction phase are considered to be temporary in nature and may only arise at particular times (i.e. certain activities and/or meteorological conditions).

Nonetheless, commensurate with the above designation of dust risk, mitigation measures, as identified by IAQM guidance are required to ensure that any potential impacts arising from the construction phase of the proposed development are reduced and, where possible, completely removed. These measures are grouped into those which are highly recommended and those which are desirable. These measures are presented within Table 1-4 and represents an edited version of based upon practical constraints and professional judgement.

With the effective application of the dust mitigation measures, construction dust effects are considered to be not significant.

Table 1-4
Construction Dust Mitigation Measures

Site Application	Mitigation Measures
Highly Recommended	
Communications	Develop and implement a stakeholder communications plan that includes community engagement before work commences on site.
	Display the name and contact details of person(s) accountable for air quality and dust issues on the site boundary. This may be the environment manager/engineer or the site manager.
	Display the head or regional office contact information.
	Develop and implement a Dust Management Plan (DMP), which may include measures to control other emissions, approved by the Local Authority. The level of detail will depend on the risk and should include as a minimum the highly recommended measures in this document. The desirable measures should be included as appropriate for the site.
Demolition	Ensure effective water suppression is used during demolition operations. Handheld sprays are more effective than hoses attached to equipment as the water can be directed to where it is needed. In addition, high volume water suppression systems, manually controlled, can produce fine water droplets that effectively bring the dust particles to the ground.
	Avoid explosive blasting, using appropriate manual or mechanical alternatives.
	Bag and remove any biological debris or damp down such material before demolition.
Monitoring	Carry out regular site inspections to monitor compliance with the DMP, record inspection results, and make an inspection log available to the local authority when asked.

Site Application	Mitigation Measures
	Increase the frequency of site inspections by the person accountable for air quality and dust issues on site when activities with a high potential to produce dust are being carried out and during prolonged dry or windy conditions.
Operating Vehicle / Machinery and Sustainable Travel	Ensure all vehicles switch off engines when stationary - no idling vehicles.
	Avoid the use of diesel- or petrol-powered generators and use mains electricity or battery powered equipment where practicable.
	Produce a Construction Logistics Plan to manage the sustainable delivery of goods and materials.
Operations	Only use cutting, grinding or sawing equipment fitted or in conjunction with suitable dust suppression techniques such as water sprays or local extraction, e.g., suitable local exhaust ventilation systems.
	Ensure an adequate water supply on the site for effective dust/particulate matter suppression/mitigation, using non-potable water where possible and appropriate.
	Use enclosed chutes and conveyors and covered skips.
	Minimise drop heights from conveyors, loading shovels, hoppers and other loading or handling equipment and use fine water sprays on such equipment wherever appropriate.
	Ensure equipment is readily available on site to clean any dry spillages and clean up spillages as soon as reasonably practicable after the event using wet cleaning methods.
Preparing and Maintaining the Site	Plan site layout so that machinery and dust causing activities are located away from receptors, as far as is possible.
	Erect solid screens or barriers around dusty activities or the site boundary that are at least as high as any stockpiles on site.
	Fully enclose site or specific operations where there is a high potential for dust production and the site is active for an extensive period.
	Avoid site runoff of water or mud.
	Keep site fencing, barriers and scaffolding clean using wet methods.
	Remove materials that have a potential to produce dust from site as soon as possible, unless being re-used on site. If they are being re-used on-site cover as described below.
	Cover, seed or fence stockpiles to prevent wind whipping.
Site Management	Record all dust and air quality complaints, identify cause(s), take appropriate measures to reduce emissions in a timely manner, and record the measures taken.
	Make the complaints log available to the local authority when asked.
	Record any exceptional incidents that cause dust and/or air emissions, either on- or offsite, and the action taken to resolve the situation in the logbook.
	Hold regular liaison meetings with other high risk construction sites within 500m of the site boundary, to ensure plans are co-ordinated and dust and particulate matter emissions are minimised. It is important to understand the interactions of the off-site transport deliveries which might be using the same strategic road network routes.
Trackout	Use water-assisted dust sweeper(s) on the access and local roads, to remove, as necessary, any material tracked out of the site. This may require the sweeper being continuously in use.
	Avoid dry sweeping of large areas.
	Ensure vehicles entering and leaving sites are covered to prevent escape of materials during transport.

Site Application	Mitigation Measures
	Inspect on-site haul routes for integrity and instigate necessary repairs to the surface as soon as reasonably practicable.
	Record all inspections of haul routes and any subsequent action in a site logbook.
	Install hard surfaced haul routes, which are regularly damped down with fixed or mobile sprinkler systems, or mobile water bowsers and regularly cleaned.
	Implement a wheel washing system (with rumble grids to dislodge accumulated dust and mud prior to leaving the site where reasonably practicable).
	Ensure there is an adequate area of hard surfaced road between the wheel wash facility and the site exit, wherever site size and layout permits.
	Access gates to be located at least 10m from receptors where possible.
Waste Management	Avoid bonfires and burning of waste materials.
Desirable	
Construction	Avoid scabbling (roughening of concrete surfaces) if possible.
	Ensure sand and other aggregates are stored in bunded areas and are not allowed to dry out, unless this is required for a particular process, in which case ensure that appropriate additional control measures are in place.
Demolition	Soft strip inside buildings before demolition (retaining walls and windows in the rest of the building where possible, to provide a screen against dust).
Monitoring	Undertake daily on-site and off-site inspection, where receptors (including roads) are nearby, to monitor dust, record inspection results, and make the log available to the local authority when asked. This should include regular dust soiling checks of surfaces such as street furniture, cars and windowsills within 100m of site boundary, with cleaning to be provided if necessary.
Operating vehicle/machinery and sustainable travel	Impose and signpost a maximum-speed-limit of 15mph on surfaced and 10mph on unsurfaced haul roads and work areas (if long haul routes are required these speeds may be increased with suitable additional control measures provided, subject to the approval of the nominated undertaker and with the agreement of the local authority, where appropriate).
	Implement a Travel Plan that supports and encourages sustainable travel (public transport, cycling, walking, and car-sharing).

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