conjunction with the previously established sensitivity of the area (see Section 9.4.1). The major dust generating activities are divided into four types within the IAQM guidance to reflect their different potential impacts. These are:

- Demolition;
- Earthworks;
- Construction; and

Trackout (movement of heavy vehicles).

Demolition

There is no demolition required as part of the Proposed Development therefore this category is not relevant to the assessment.

Earthworks

Earthworks primarily involve excavating material, loading and unloading of materials, tipping and stockpiling activities. Activities such as levelling the site and landscaping works are also considered under this category. The dust emission magnitude from earthworks can be classified as small, medium or large based on the definitions from the IAQM guidance as transcribed below:

- **Large:** Total site area > 10,000 m^2, potentially dusty soil type (e.g. clay which will be prone to suspension when dry due to small particle size), >10 heavy earth moving vehicles active at any one time, formation of bunds > 8 m in height, total material moved >100,000 tonnes;
- **Medium:** Total site area 2,500 m^2 – 10,000 m^2, moderately dusty soil type (e.g. silt), 5 - 10 heavy earth moving vehicles active at any one time, formation of bunds 4 – 8 m in height, total material moved 20,000 – 100,000 tonnes;
- **Small:** Total site area < 2,500 m^2, soil type with large grain size (e.g. sand), < 5 heavy earth moving vehicles active at any one time, formation of bunds < 4 m in height, total material moved < 20,000 tonnes, earthworks during wetter months.

The site area of proposed works will be greater than 10,000 m^2. Therefore the dust emission magnitude for the proposed earthwork activities can be classified as large.

The sensitivity of the area, as determined in Section 9.3, is combined with the dust emission magnitude for each dust generating activity to define the risk of dust impacts in the absence of mitigation. As outlined in Table 9.8, this results in an overall medium risk of short-term dust soiling impacts and a low risk of short-term human health impacts as a result of the proposed earthworks activities.

Table 9.8 Risk of Dust Impacts – Demolition

Sensitivity of Area	Dust Emission Magnitude		
	Large	Medium	Small
High	High Risk	Medium Risk	Low Risk
Medium	Medium Risk	Medium Risk	Low Risk
Low	Low Risk	Low Risk	Negligible

Construction

Dust emission magnitude from construction can be classified as small, medium or large based on the definitions from the IAQM guidance as transcribed below:

- **Large**: Total building volume > 100,000 m^3, on-site concrete batching, sandblasting;
- **Medium**: Total building volume 25,000 m^3 – 100,000 m^3, potentially dusty construction material (e.g. concrete), on-site concrete batching;
- **Small**: Total building volume < 25,000 m^3, construction material with low potential for dust release (e.g. metal cladding or timber).

The dust emission magnitude for the proposed construction activities can be classified as small as the total building volume will be between 25,000 m^3 and 100,000 m^3.

The sensitivity of the area is combined with the dust emission magnitude for each dust generating activity. As outlined in Table 9.9, this results in an overall medium risk of short-term dust soiling impacts and low risk of short-term human health impacts as a result of the proposed construction activities

Table 9.9 Risk of Dust Impacts – Construction

Sensitivity of Area	Dust Emission Magnitude		
	Large	Medium	Small
High	High Risk	Medium Risk	Low Risk
Medium	Medium Risk	Medium Risk	Low Risk
Low	Low Risk	Low Risk	Negligible

Trackout

Factors which determine the dust emission magnitude are vehicle size, vehicle speed, number of vehicles, road surface material and duration of movement. Dust emission magnitude from trackout can be classified as small, medium or large based on the definitions from the IAQM guidance as transcribed below:

- **Large**: > 50 HDV (> 3.5 t) outward movements in any one day, potentially dusty surface material (e.g. high clay content), unpaved road length > 100 m;
- **Medium**: 10 - 50 HDV (> 3.5 t) outward movements in any one day, moderately dusty surface material (e.g. high clay content), unpaved road length 50 - 100 m;
- **Small**: < 10 HDV (> 3.5 t) outward movements in any one day, surface material with low potential for dust release, unpaved road length < 50 m.

The dust emission magnitude for the proposed trackout can be classified as medium, as at worst-case peak periods there will be between 10 and 50 outward HGV movements per day and there will be unpaved site roads 10 – 50 m long. As outlined in Table 9.10, this results in an overall medium risk of short-term dust soiling and low risk of short-term human health impacts as a result of the proposed trackout activities.

Table 9.10 Risk of Dust Impacts – Trackout

Sensitivity of Area	Dust Emission Magnitude		
	Large	Medium	Small
High	High Risk	Medium Risk	Low Risk
Medium	Medium Risk	Medium Risk	Low Risk
Low	Low Risk	Low Risk	Negligible

Summary of Dust Emission Risk

The risk of dust impacts as a result of the Proposed Development are summarised in Table 9.11 for each activity. The magnitude of risk determined is used to prescribe the level of site specific mitigation required for each activity in order to prevent significant impacts occurring.

While there is an overall low to medium risk of dust soiling or human health impacts associated with the Proposed Development, nevertheless best practice dust mitigation measures will be implemented on site in order to ensure that no dust nuisance occurs during the earthworks, construction and trackout activities.

Table 9.11 Summary of Dust Impact Risk used to Define Site-Specific Mitigation

Potential Impact	Dust Emission Risk			
	Demolition	Earthworks	Construction	Trackout
Dust Soiling	n/a	Medium Risk	Medium Risk	Medium Risk
Human Health	n/a	Low Risk	Low Risk	Low Risk

When the dust mitigation measures detailed in the mitigation section (Section 9.5.1) of this report are implemented, fugitive emissions of dust and particulate matter from the site will be negative, short-term and imperceptible in nature, posing no nuisance at nearby receptors.

There is also the potential for traffic emissions to impact air quality in the short-term over the construction phase. Particularly due to the increase in HGVs accessing the site. The construction stage traffic has been reviewed and a detailed air quality assessment has been scoped out as none of the road links impacted by the Proposed Development satisfy the DMRB assessment criteria in Section 9.1.2.1. It can therefore be determined that the construction stage traffic will have an imperceptible, neutral and short-term impact on air quality.

9.4.2.2 Climate

There is the potential for a number of greenhouse gas emissions to atmosphere during the construction of the development. Construction vehicles, generators etc., may give rise to CO_2 and N_2O emissions. The Institute of Air Quality Management document *Guidance on the Assessment of Dust from Demolition and Construction* (IAQM, 2014) states that site traffic and plant is unlikely to make a significant impact on climate. Therefore, in accordance with the EPA Guidelines[1], the impact will be short-term, neutral and imperceptible.

9.4.2.3 Human Health

Dust emissions from the construction phase of the Proposed Development have the potential to impact human health through the release of PM_{10} and $PM_{2.5}$ emissions. As per Table 9.7 the surrounding area is considered of medium sensitivity to dust related human health impacts. There is an overall worst-case medium risk of dust related human health impacts as a result of the construction of the Proposed Development (Table 9.11). Best practice mitigation measures are proposed for the construction phase of the Proposed Development which will focus on the pro-active control of dust and other air pollutants to minimise generation of emissions at source. The mitigation measures that will be put in place during construction of the Proposed Development will ensure that the impact of the development complies with all EU ambient air quality legislative limit values which are based on the protection of human health. Therefore, in accordance with the EPA Guidelines[1], the impact of construction of the Proposed Development is likely to be neutral, short-term and imperceptible with respect to human health.

9.4.2.4 Sensitive Ecosystems

There are no sensitive ecosystems within 50m of the Proposed Development during the construction phase. Therefore, there is no potential for significant impacts to sensitive ecosystems as a result of the Proposed Development.

9.4.3 Operational Phase

9.4.3.1 Air Quality

Operational phase traffic also has the potential to impact air quality and climate. The UK Highways Agency Design Manual for Roads and Bridges (DMRB) guidance[15], states that road links meeting one or more of the following criteria can be defined as being 'affected' by a proposed development and should be included in the local air quality assessment. The use of the UK guidance is recommended by the TII[16] in the absence of specific Irish guidance, this approach is considered best practice and can be applied to any development that causes a change in traffic.

- Annual average daily traffic (AADT) changes by 1,000 or more;
- Heavy duty vehicle (HDV) AADT changes by 200 or more;
- A change in speed band; or
- A change in carriageway alignment by 5m or greater.

The L3120 Kilshane Rd will be realigned as part of the proposed development – this new alignment increases the distance between existing adjacent residential receptors and the road and is therefore a slight beneficial impact. However, there is no additional operational phase traffic associated with the Proposed Development. Therefore, a detailed air quality modelling assessment has been scoped out as there is no potential for significant impacts to air quality during operation as a result of traffic emissions.

The potential impact to air quality during the operational phase of the Proposed Development is a breach of the ambient air quality standards as a result of air emissions from the existing and proposed emission points. However, the given stack heights ensure an adequate release height for all emission points to aid dispersion of the plume and ensure compliance with the ambient air quality limit values beyond the site boundary.

9.4.3.2 NO_2

The NO_2 modelling results are detailed in Table 9.12. The results indicate that the ambient ground level concentrations are below the relevant air quality standards for NO_2. Emissions from the existing and proposed emission points lead to an ambient NO_2 concentration (including background) which is 37% of the maximum ambient 1-hour limit value (measured as a 99.8th%ile) and 41% of the annual limit value at the worst-case receptor (see Figure 9.2 and Figure 9.3). The locations of the maximum concentrations for NO_2 are close to the boundary of the site with concentrations decreasing with distance from the facility.

Table 9.12 Dispersion Model Results for Nitrogen Dioxide (NO_2)

Pollutant/ Year	Averaging Period	Process Contribution NO_2 (µg/m^3)	Background Concentration (µg/m^3)	Predicted Environmental Concentration NO_2 (µg/m^3)	Limit Value (µg/m^3) Note 1	PEC as a % of Limit Value
NO_2 / 2017	Annual Mean	0.2	16	16.2	40	40%
	99.8th%ile of 1-hr means	21.0	32	53.0	200	26%
NO_2 / 2018	Annual Mean	0.4	16	16.4	40	41%
	99.8th%ile of 1-hr means	41.9	32	73.9	200	37%
NO_2 / 2019	Annual Mean	0.1	16	16.1	40	40%
	99.8th%ile of 1-hr means	9.8	32	41.8	200	21%
NO_2 / 2020	Annual Mean	0.2	16	16.2	40	40%
	99.8th%ile of 1-hr means	11.3	32	43.3	200	22%
NO_2 / 2021	Annual Mean	0.3	16	16.3	40	41%
	99.8th%ile of 1-hr means	27.8	32	59.8	200	30%

Note 1 Air Quality Standards 2011 (from EU Directive 2008/50/EC and S.I. 180 of 2011).

9.4.3.3 CO

The CO modelling results are detailed in Table 9.13. The results indicate that the ambient ground level concentrations are below the relevant air quality standards for CO. Emissions from the existing and proposed emission points lead to an ambient CO concentration (including background) which is 9% of the ambient 8-hour limit value (see Figure 9.4).

Table 9.13 Dispersion Model Results for Carbon Monoxide (CO)

Pollutant/ Year	Averaging Period	Process Contribution CO (µg/m³)	Background Concentration (µg/m³)	Predicted Environmental Concentration CO (µg/m³)	Limit Value (µg/m³) Note 1	PEC as a % of Limit Value
CO / 2017	Maximum Daily 8-Hour Mean	0.14	0.5	0.6	10	6%
CO / 2018	Maximum Daily 8-Hour Mean	0.40	0.5	0.9	10	9%
CO / 2019	Maximum Daily 8-Hour Mean	0.10	0.5	0.6	10	6%
CO / 2020	Maximum Daily 8-Hour Mean	0.15	0.5	0.7	10	7%
CO / 2021	Maximum Daily 8-Hour Mean	0.25	0.5	0.8	10	8%

Note 1 Air Quality Standards 2011 (from EU Directive 2008/50/EC and S.I. 180 of 2011).

9.4.3.4 SO_2

The SO2 modelling results at the worst-case off-site receptor are detailed in Table 14. The results indicate that the ambient ground level concentrations are in compliance with the relevant air quality standards for SO_2. Emissions from the facility lead to an ambient SO_2 concentration (including background) which is 3% of the maximum 1-hour limit value (measured as a 99.7th%ile) and 8% of the maximum 24-hour limit value (measured as a 99.2th%ile) at the worst-case off-site receptor (see Figure 9.5 and Figure 9.6) for the worst-case year modelled (2018). The locations of the maximum concentrations for SO_2 are close to the boundary of the site with concentrations decreasing with distance from the facility.

Table 9.14 Dispersion Model Results for Sulphur Dioxide (SO_2)

Pollutant/ Year	Averaging Period	Process Contribution SO_2 (µg/m³)	Background Concentration (µg/m³)	Predicted Environmental Concentration SO_2 (µg/m³)	Limit Value (µg/m³) Note 1	PEC as a % of Limit Value
SO_2 / 2017	99.7th%ile of 1-hr means	0.003	10	10.003	350	3%
	99.2th%ile of 24-hr means	0.001	10	10.001	125	8%
SO_2 / 2018	99.7th%ile of 1-hr means	0.006	10	10.006	350	3%
	99.2th%ile of 24-hr means	0.003	10	10.003	125	8%
SO_2 / 2019	99.7th%ile of 1-hr means	0.002	10	10.002	350	3%
	99.2th%ile of 24-hr means	0.001	10	10.001	125	8%
SO_2 / 2020	99.7th%ile of 1-hr means	0.003	10	10.003	350	3%
	99.2th%ile of 24-hr means	0.001	10	10.001	125	8%
SO_2 / 2021	99.7th%ile of 1-hr means	0.004	10	10.004	350	3%
	99.2th%ile of 24-hr means	0.002	10	10.002	125	8%

Note 1 Air Quality Standards 2011 (from EU Directive 2008/50/EC and S.I. 180 of 2011).

9.4.3.5 PM_{10}

The PM_{10} modelling results are detailed in Table 9.15. The results indicate that the ambient ground level concentrations are below the relevant air quality standards for PM_{10}. Emissions from the existing

and proposed emission points lead to an ambient PM_{10} concentration (including background) which is 30% of the maximum ambient 1-hour limit value (measured as a 90.4th%ile) and 38% of the annual limit value at the worst-case receptor (see Figure 9.7 and Figure 9.8).

Table 9.15 Dispersion Model Results for Particulate Matter (PM_{10})

Pollutant/ Year	Averaging Period	Process Contribution PM_{10} ($\mu g/m^3$)	Background Concentration ($\mu g/m^3$)	Predicted Environmental Concentration PM_{10} ($\mu g/m^3$)	Limit Value ($\mu g/m^3$) Note 1	PEC as a % of Limit Value
PM_{10} / 2017	Annual Mean	0.001	15	15.001	40	38%
	90.4th%ile of 24-hr Mean	0.002	15	15.002	50	30%
PM_{10} / 2018	Annual Mean	0.001	15	15.001	40	38%
	90.4th%ile of 24-hr Mean	0.002	15	15.002	50	30%
PM_{10} / 2019	Annual Mean	0.001	15	15.001	40	38%
	90.4th%ile of 24-hr Mean	0.001	15	15.001	50	30%
PM_{10} / 2020	Annual Mean	0.001	15	15.001	40	38%
	90.4th%ile of 24-hr Mean	0.001	15	15.001	50	30%
PM_{10} / 2021	Annual Mean	0.001	15	15.001	40	38%
	90.4th%ile of 24-hr Mean	0.001	15	15.001	50	30%

Note 1 Air Quality Standards 2011 (from EU Directive 2008/50/EC and S.I. 180 of 2011).

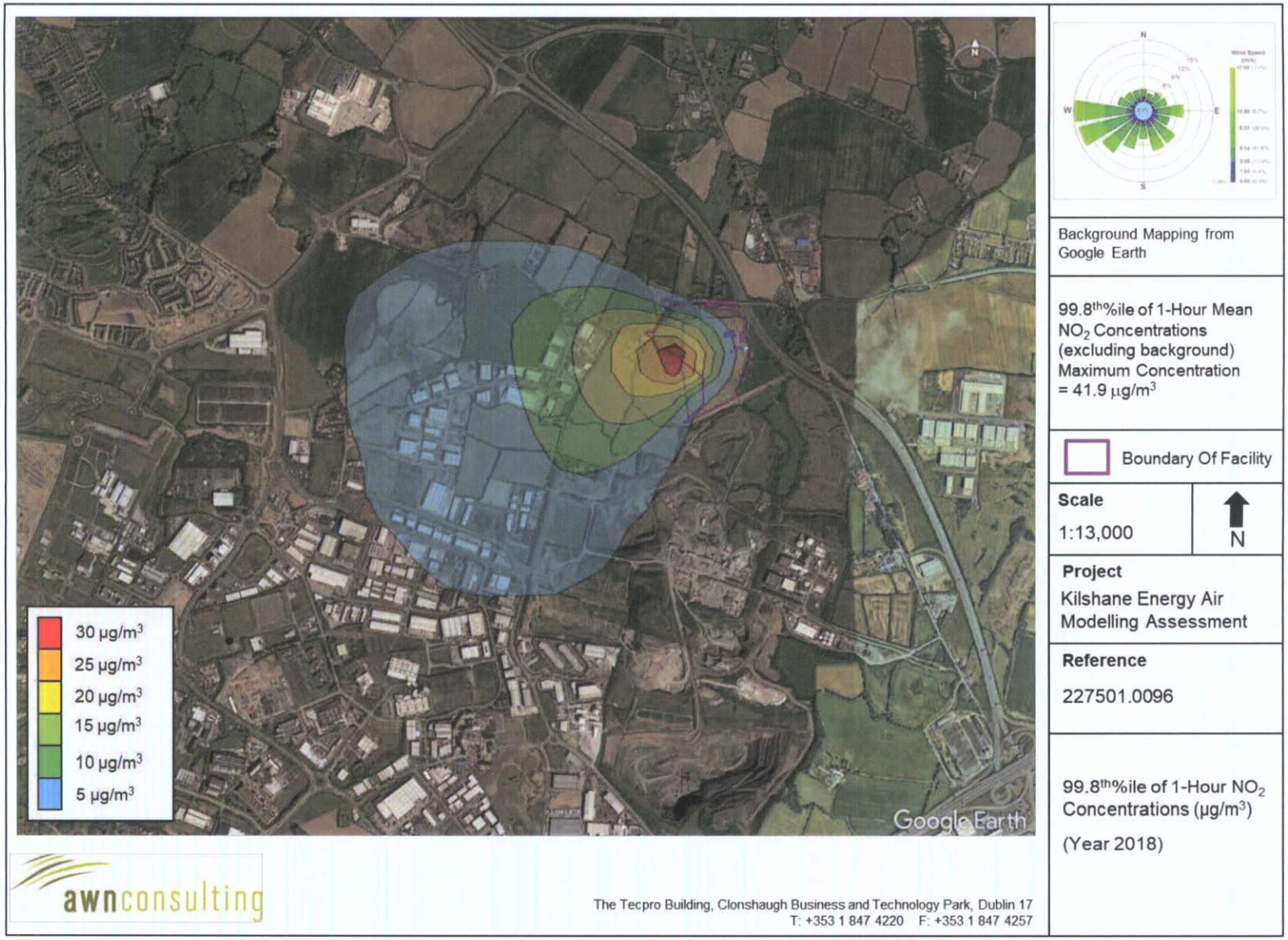

Figure 9.2 Maximum 1-Hour NO_2 Concentrations (as 99.9th%ile) (µg/m^3) 2018 (excluding background concentrations)

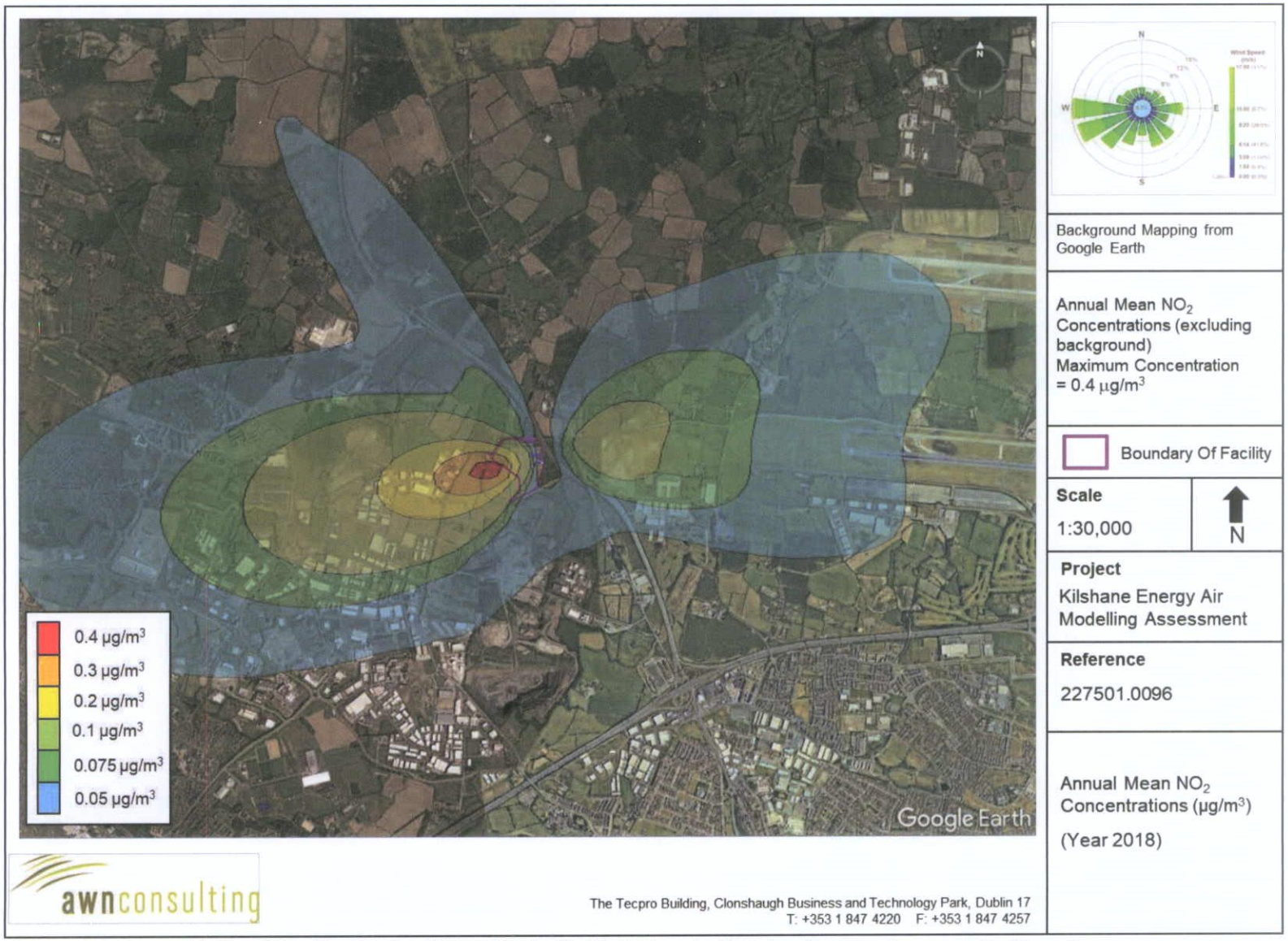

Figure 9.3 Annual Mean NO_2 Concentrations (µg/m³) 2018 (excluding background concentrations)

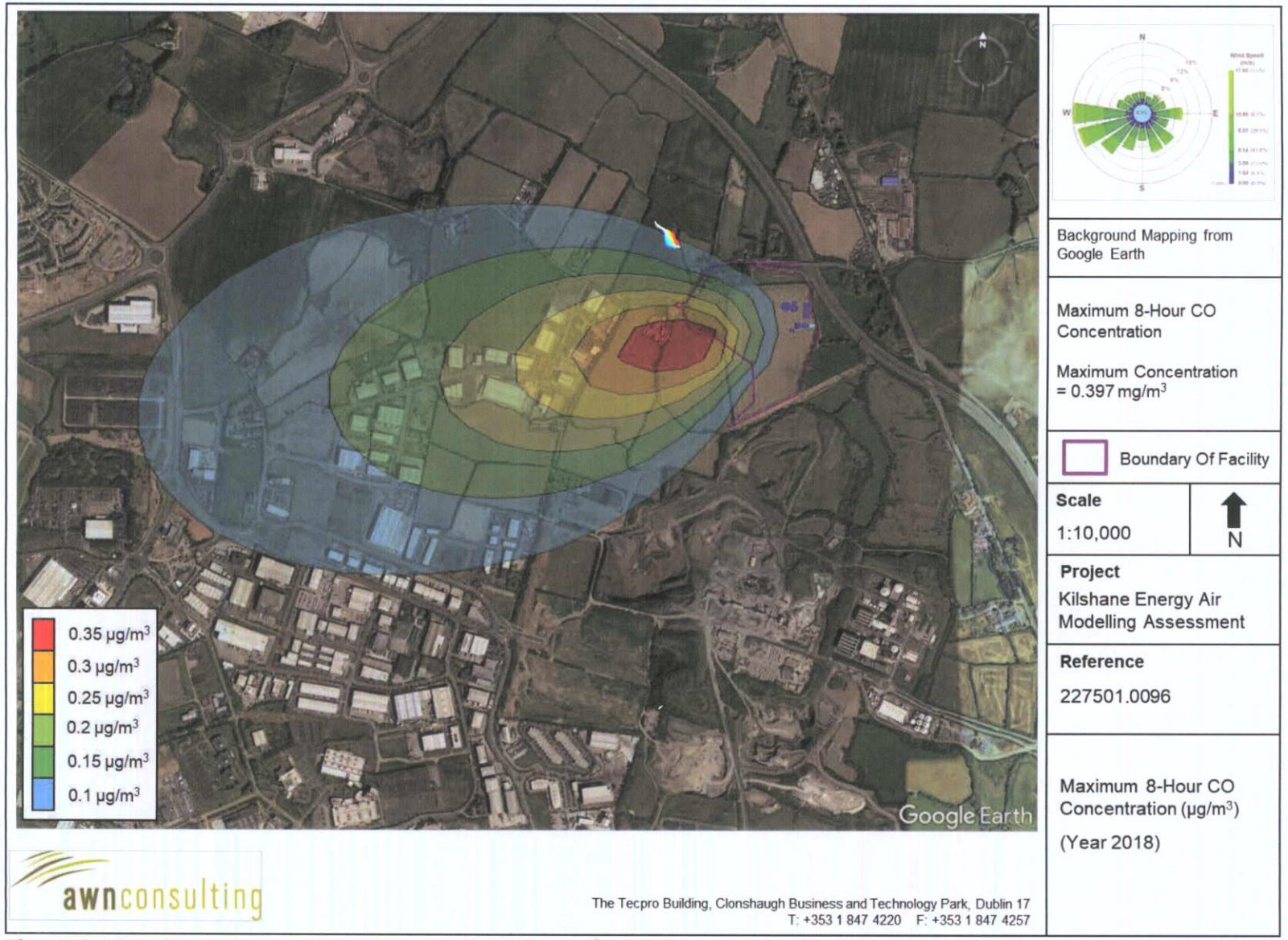

Figure 9.4 Maximum 8-Hour CO Concentrations (µg/m³) 2018 (excluding background concentrations)

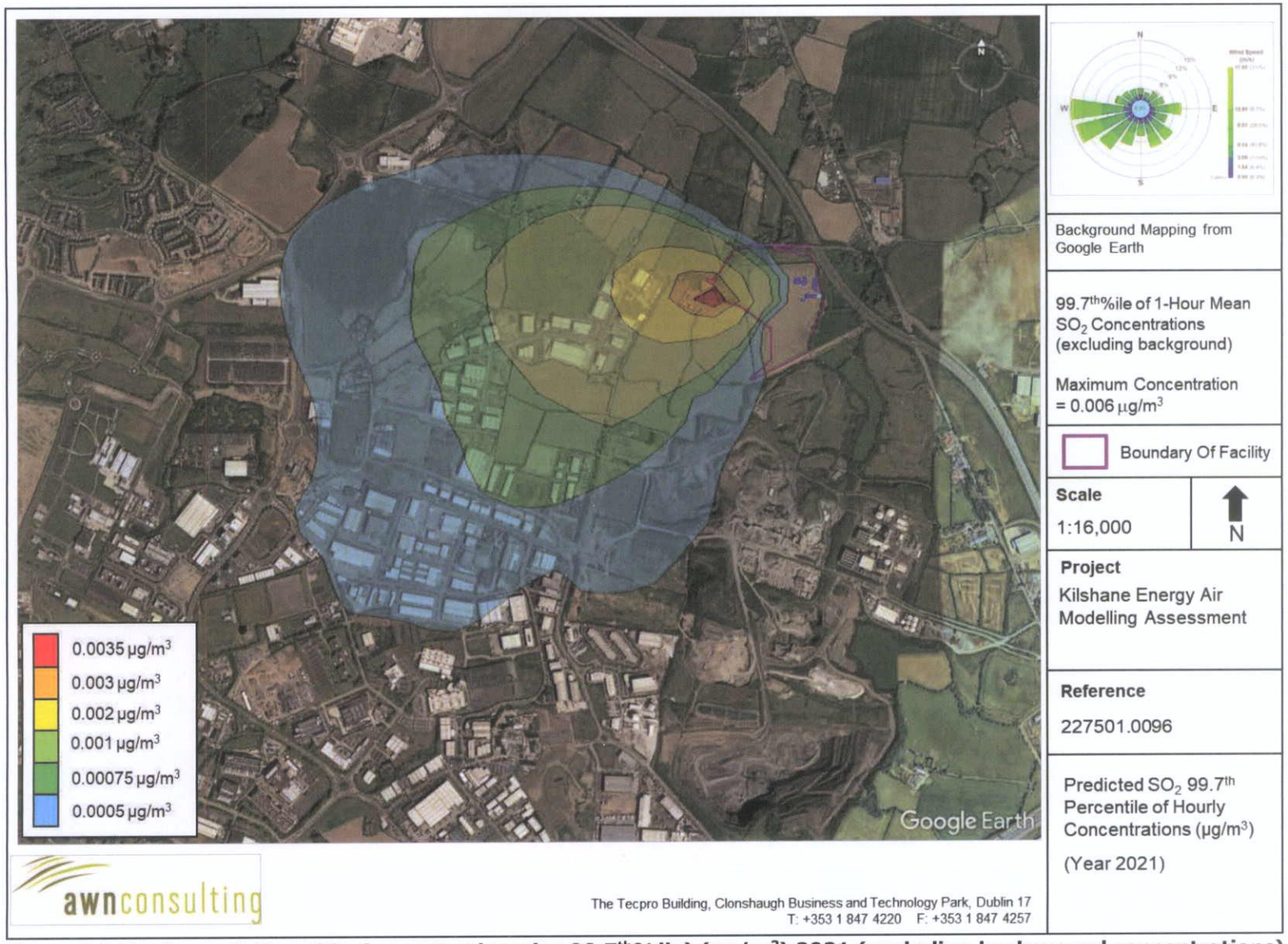

Figure 9.5 Maximum 1-Hour SO_2 Concentrations (as 99.7th%ile) (µg/m^3) 2021 (excluding background concentrations)

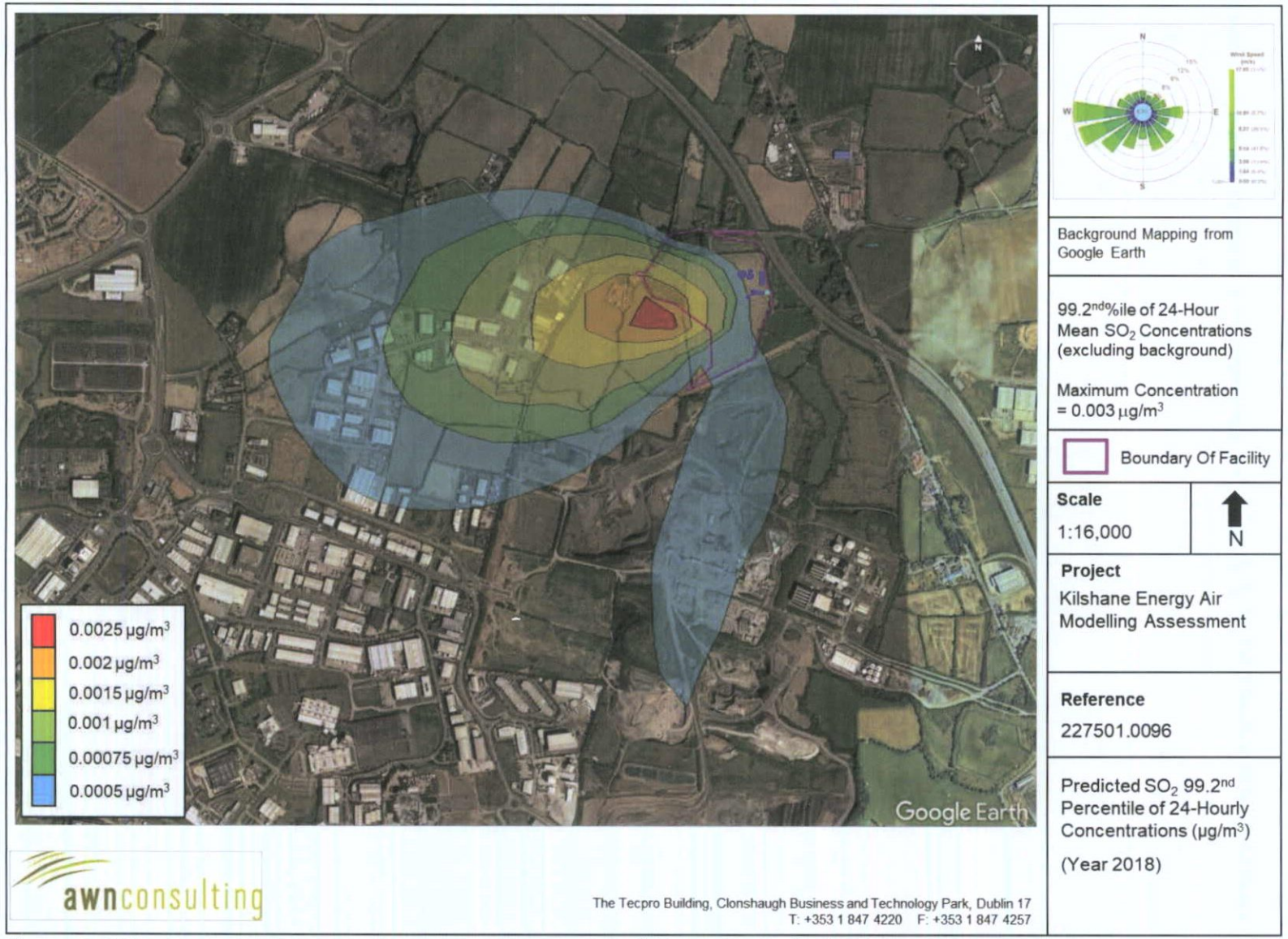

Figure 9.6 Maximum 24-Hour SO_2 Concentrations (as 99.2th%ile) (µg/m^3) 2018 (excluding background concentrations)

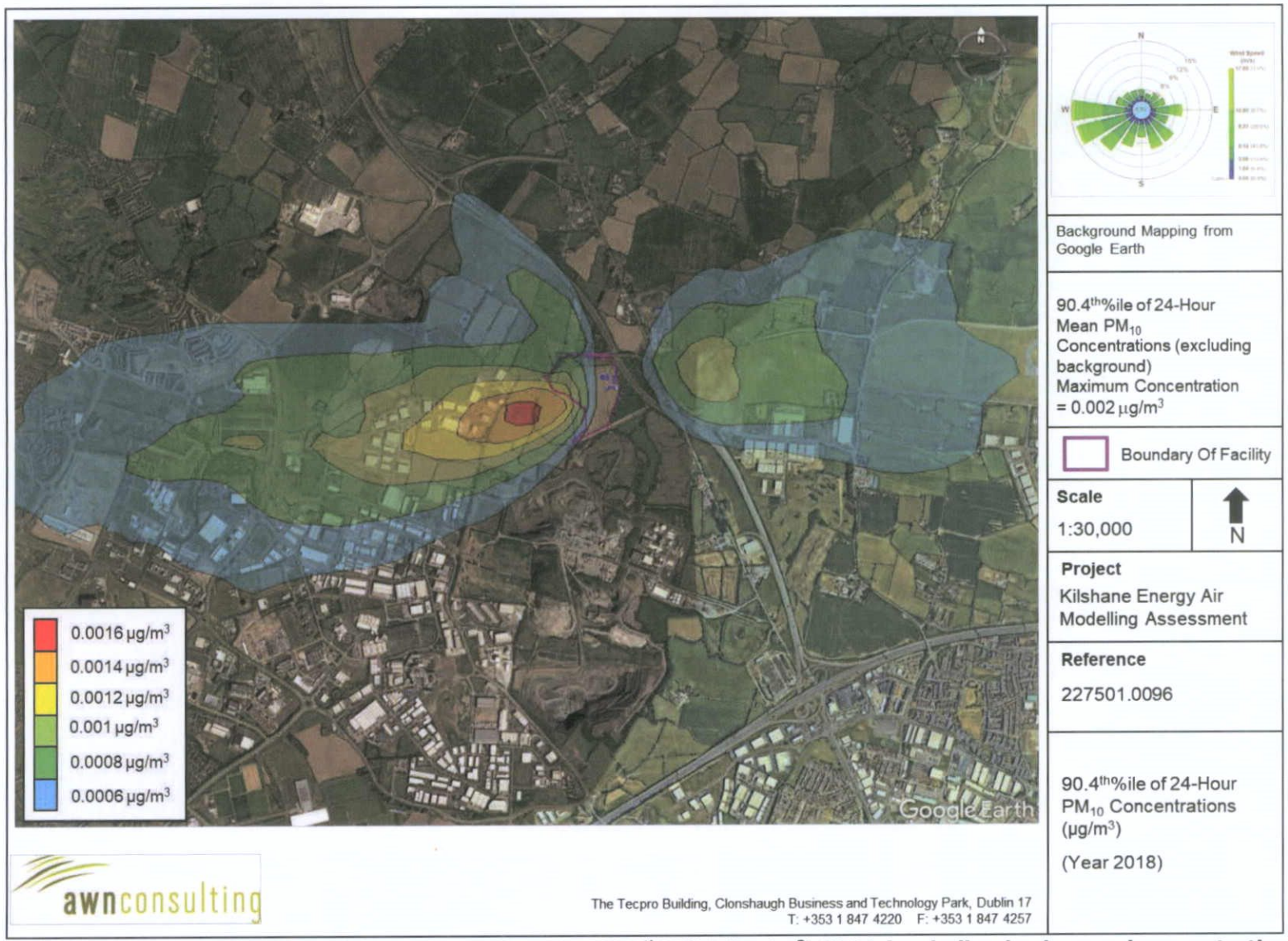

Figure 9.7 Maximum 24-Hour PM_{10} Concentrations (as 90.4th%ile) (µg/m^3) 2021 (excluding background concentrations)

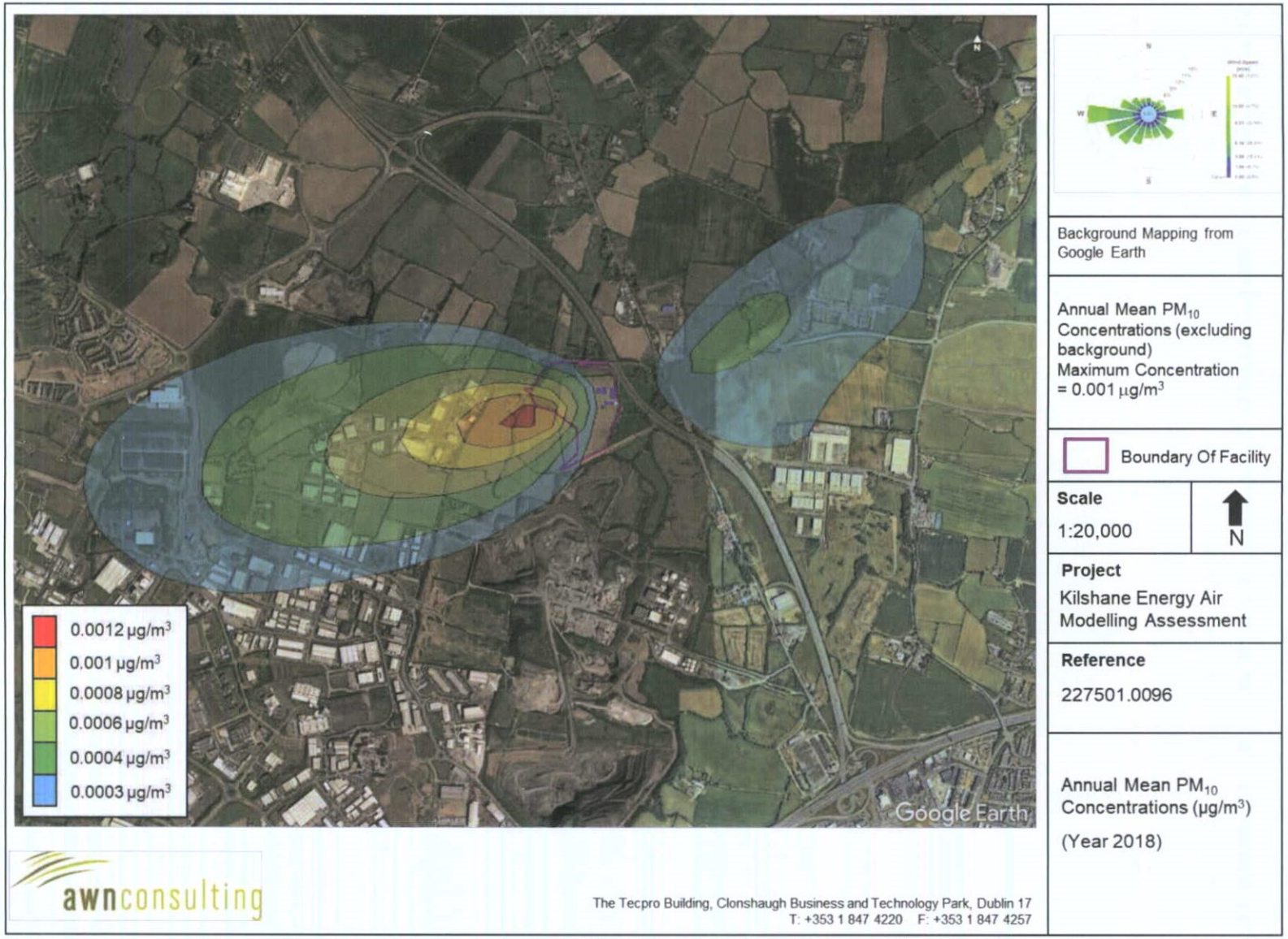

Figure 9.8 Annual Mean PM_{10} Concentrations (as 99.7th%ile) (µg/m^3) 2021 (excluding background concentrations)

9.4.3.6 Summary of Modelling Assessment

The results of the modelling assessment based on the proposed development have found that ambient concentrations of NO_2, CO, SO_2 and PM_{10} due to emissions from the gas turbine, scheduled testing of the turbine in liquid fuel mode and emergency operations of the turbine on liquid fuel are below the air quality limit values. In accordance with the EPA Guidelines[1] the impacts of the prosed development on air quality are predicted to be long-term, negative and imperceptible.

9.4.3.7 Climate

Climate change has the potential to alter weather patterns and increase the frequency of rainfall in future years. As a result of this there is the potential for flooding related impacts on site in future years. However, adequate attenuation and drainage have been provided for to account for increased rainfall in future years as part of the design of this development.

The UK Highways Agency has published an updated DMRB guidance document in relation to climate impact assessments *LA 114 Climate*[36]. The following scoping criteria are used to determine whether a detailed climate assessment is required for a proposed project during the operational stage. If any of the road links impacted by the Proposed Development meet or exceed the below criteria, then further assessment is required.

- A change of more than 10% in AADT;
- A change of more than 10% to the number of heavy duty vehicles; and
- A change in daily average speed of more than 20 km/hr.

The Proposed Development will not increase traffic by more than 10% AADT on any nearby road links, therefore, none of the above scoping criteria are met and a detailed climate assessment is not required as there is no potential for significant impacts to climate as a result of traffic emissions.

The direct CO_2 emissions from electricity generation at the facility will not be significant in relation to Ireland's national annual CO_2 emissions. The Sustainable Energy Authority of Ireland[35] states on its website that the average CO_2 emission factor for electricity generated from natural gas in Ireland was 202.2 gCO_2/kWh in 2020. On the basis that the proposed power generation facility will generate a maximum of 293 MW of electricity using natural gas this equates to 2,515 GWh annually, which translates to approximately 508,603 tonnes of CO_2eq per year. This scenario assumes that the facility will operate for 98% of the year, with approx. 2% maintenance time. However, this "baseload" scenario would only occur in the highly improbable event of approx. 75% of all installed power generation across the market being unavailable, as described in Annex A of the AFRY assessment of the impact of the facility on the overall level of carbon emissions from the Irish power generation sector (Appendix 9.3 – "*A comparison of future carbon emissions within the SEM with and without the Kilshane GT*"). As described in Ch 4 - Project Description and Appendix 9.3, the facility is forecast to operate considerably less than this with a projected annual average of 46 hours. In both scenarios, the facility would replace operations of higher emitting power plants (particularly oil-fired units) resulting in an overall reduction of carbon emissions in the SEM.

Electricity providers form part of the EU-wide Emission Trading Scheme (ETS) and thus greenhouse gas emissions from these electricity generators are not included when determining compliance with the targeted 42% reduction in the non-ETS sector i.e. electricity associated greenhouse gas emissions will not count towards the Effort Sharing Decision target. Thus, any necessary increase in electricity generation will have no impact on Ireland's obligation to meet the EU Effort Sharing Decision. Under this scenario, as outlined in the Regulation, the new electricity provider will be treated as a "new entrant" under Phase IV of the ETS (i.e. an electricity generator obtaining a greenhouse gas emissions permit for the first time after 30th June 2018). The new electricity provider will be required to purchase allocations in the same manner as existing players in the market using the European Energy Exchange. EU leaders have also decided that during Phase IV (2021-2030) 90% of the revenue from the auctions will be allocated to the Member States on the basis of their share of verified emissions with 10% allocated to the least wealthy EU member states. The revised EU ETS

Directive has enshrined in law the requirement that at least 50% of the auctioning revenues or the equivalent in financial value should be used for climate and energy related purposes.

In 2018, the market reported a fall of 4.1% (73 million tonnes CO_2eq) from 2017, the EU noted that much of the revenue raised by the cap and trade scheme is going towards climate and energy objectives (European Commission, 2019):

> *"In 2018, a strengthened carbon price signal led to a record amount of revenues for Member States from the selling of ETS allowances. The generated amount equalled some EUR 14 billion - more than doubling the revenues generated in 2017. Member States spent or planned to spend close to 70% of these revenues on advancing climate and energy objectives - well above the 50% required in the legislation"*

In terms of the current project, as the facility is over 20 MW, a greenhouse gas emission permit will be required which will be regulated under the ETS scheme also. Thus the emissions are not included when determining compliance with the targeted 42% reduction in the non-ETS sector. In addition, on an EU-wide basis, where the ETS market in 2021 was approximately 1,355 million tonnes CO_2eq, the impact of the emissions associated with the maximum running hours or "baseload" of the proposed development will be less than 0.04% of the total EU-wide ETS market. Appendix 9.3 *("A comparison of future carbon emissions within the SEM with and without the Kilshane GT")* describes the impact of the forecast operational hours (projected annual average of 46 hours) of the facility on the carbon emissions associated with the Single Electricity Market (SEM). It estimates a reduction on average of 10kt CO_2 by 2040, as the facility is expected to replace higher emitting power plants, particularly oil fired units. Reduction of carbon emissions would also be expected in the maximum operations scenario, as the same displacement of higher emitting plants would occur. The emissions associated with both the "baseload" maximum operation scenario and the predicted operation scenario of the proposed development will have a direct, long-term, positive and slight impact on climate.

In terms of wider energy policy, as outlined in the EPA publication "Ireland's Greenhouse Gas Projections 2020-2040"[10] under the With Additional Measures scenario, emissions from the energy industries sector are projected to decrease by 25% to 6.3 Mt CO_2eq over the period 2020 to 2030 including the proposed increase in renewable energy generation to approximately 70% of electricity consumption:

- "In this scenario it is assumed that for 2020 there is a 40% share of renewable energy in electricity generation. In 2030 it is estimated that renewable energy generation increases to approximately 70% of electricity consumption. This is mainly a result of further expansion in wind energy (comprising 3.5 GW offshore and approximately 8.2 GW onshore). Expansion of other renewables (e.g. solar photovoltaics) also occurs under this scenario;
- Under the With Additional Measures scenario The operation of three peat plants used for electricity generation until the end of 2020 only are included in the assumptions underpinning the energy projections following which just one plant continues to operate. One peat station continues to operate until planning permission expires in 2023, cofiring with 30% biomass;
- In this scenario the Moneypoint power station is assumed to operate in the market up to end 2024 at which point it no longer generates electricity from coal as set out in the 2019 Climate Action Plan; and
- In terms of inter-connection, it is assumed that the Greenlink 500MW interconnector to the UK to come on stream in 2025 and the Celtic 700MW interconnector to France to come on stream in 2026".

As emissions from the proposed power generation facility will form part of the EU-wide ETS scheme, the relevant cumulative impact would be the EU as a whole rather than Ireland. However, as highlighted above, the facility's impact will be less than 0.04% of the total EU-wide ETS market which is not significant and thus an EU-wide cumulative assessment is not merited.

Overall, the emissions associated with the proposed development will have a direct, long-term, positive and slight impact on climate.

9.4.3.8 Regional Air Quality

Directive (EU) 2016/2284 *"On The Reduction Of National Emissions Of Certain Atmospheric Pollutants And Amending Directive 2003/35/EC And Repealing Directive 2001/81/EC"* was published in December 2016. The Directive will apply the 2010 National Emission Ceiling Directive limits until 2020 and establish new national emission reduction commitments which will be applicable from 2020 and 2030 for SO_2, NO_X, NMVOC, NH_3 and $PM_{2.5}$ as detailed in Section 9.1.1.3.

A maximum of 293 MW electricity will be generated by the power generation facility using natural gas. The NO_X emissions associated with this electricity over the course of one year (i.e. 2,515 GWh based on 293 MW for 8,585 hours per annum) will equate to 723 tonnes per annum which is 1.1% of the National Emission Ceiling limit for Ireland from 2020 onwards. Similarly, SO_2 emissions associated this electricity over the course of one year (2,515 GWh) will equate to 197 tonnes per annum which is 0.5% of the National Emission Ceiling limit for Ireland from 2020. Additionally, NMVOC emissions associated the natural gas usage over the course of one year (2,515 GWh) will equate to 1,038 tonnes per annum which is 1.9% of the National Emission Ceiling limit for Ireland from 2020. Thus, the NO_X, SO_2 and NMVOC direct emissions associated with the operation of the proposed power generation facility are direct, long-term, negative and slight with regards to regional air quality.

9.4.3.9 Human Health

Traffic related air emissions have the potential to impact human health if they do not comply with the ambient Air Quality Standards detailed in Table 9.1. However, there is no additional traffic generated by the Proposed Development during the operational phase and therefore there is no potential for significant impacts. The air dispersion modelling was undertaken to assess the impact of the development with reference to EU ambient air quality standards which are based on the protection of human health. As demonstrated by the dispersion modelling results, emissions from the site assuming scheduled testing as well as emergency operation of the standby generators are compliant with all National and EU ambient air quality limit values and, therefore, will not result in a significant impact on human health. Conservative assumptions were made when determining the input data for the air modelling assessment and the approach used in the study leads to an over-estimation of the actual levels that will arise. In relation to the spatial extent of air quality impacts from the site, ambient concentrations will decrease significantly with distance from the site boundary.

9.4.3.10 Sensitive Ecosystems

The potential impact to sensitive ecosystems during the operational phase of the Proposed Development is a breach of the ambient air quality standards as a result of air emissions from the Proposed Development.

The impact of emissions of NO_X within 20 km of the Proposed Development and existing emission points on ambient ground level concentrations within the following designated habitat sites was assessed using AERMOD. The 20km distance was selected based on maximum extent of the impact zone from the air emissions onsite. After 20km, the ambient air concentration of NO_X due to emissions from the facility are imperceptible.

- **Proposed Natural Heritage Areas (pNHA)** – Baldoyle Bay pNHA, Bog Of The Ring pNHA, Booterstown Marsh pNHA, Dalkey Coastal Zone And Killiney Hill pNHA, Dodder Valley pNHA, Dolphins, Dublin Docks pNHA, Feltrim Hill pNHA, Fitzsimon's Wood pNHA, Glenasmole Valley pNHA, Grand Canal pNHA, Howth Head pNHA, Ireland's Eye pNHA, Knock Lake pNHA, Liffey Valley pNHA, Lugmore Glen pNHA, Malahide Estuary pNHA, North Dublin Bay pNHA, Portraine Shore pNHA, Rogerstown Estuary pNHA, Royal Canal pNHA, Rye Water Valley/Carton pNHA, Santry Demesne pNHA, Slade Of Saggart And Crooksling Glen pNHA, Sluice River Marsh pNHA, South Dublin Bay pNHA,; and
- **Special Areas of Conservation (SAC)** – Baldoyle Bay SAC, Glenasmole Valley SAC, Howth Head SAC, Ireland's Eye SAC, Malahide Estuary SAC, North Dublin Bay SAC, Rockabill to Dalkey Island SAC, Rogerstown Estuary SAC, Rye Water Valley/Carton SAC and South Dublin Bay SAC.

An annual limit value of 30 µg/m^3 for NO_X is specified within EU Directive 2008/50/EC for the protection of ecosystems. The NO_X limit value is applicable only in highly rural areas away from major sources of NO_X such as large conurbations, factories and high road vehicle activity such as a dual carriageway or motorway. Annex III of EU Directive 2008/50/EC identifies that monitoring to demonstrate compliance with the NO_X limit value for the protection of vegetation should be carried out distances greater than:

- 5 km from the nearest motorway or dual carriageway;
- 5 km from the nearest major industrial installation;
- 20 km from a major urban conurbation.

There are sections of designated sites which are near the Proposed Development that are within an urban setting, so the limit value for NO_X for the protection of ecosystems is not technically applicable at these sites. Regardless, the annual average concentrations for NO_X from all emission points at the Proposed Development were predicted at receptors within the designated sites for all five years of meteorological data modelled (2017 – 2021). The receptor spacing ranged from 25 m to 100 m with 1,677 discrete receptors modelled in total within the sensitive ecosystems.

The NO_X modelling results are detailed in Table 9.24. Emissions from the facility lead to an ambient NO_X concentration (excluding background) which ranges from 0.12 – 0.15% of the annual limit value at the worst-case location within the designated sites over the five years of meteorological data modelled. In addition, modelling results based on conservative assumptions indicate that the Proposed Development including background concentrations will contribute at most 63% of the limit value at the worst-case location in the worst-case year modelled.

Table 9.16 NOx Dispersion Model Results at Worst Case Ecological Receptor – Process Contributions Under Normal Operations

Pollutant/ Met Year	Averaging Period	Process Contribution (µg/m^3)	Annual Mean Background (µg/m^3)	Predicted Environmental Concentration (µg/m^3)	Standard (µg/m^3)	% of Limit Value
NO_X/2017	Annual Mean	0.04	19	19.04	30	63%
NO_X/2018	Annual Mean	0.04	19	19.04	30	63%
NO_X/2019	Annual Mean	0.04	19	19.04	30	63%
NO_X/2020	Annual Mean	0.04	19	19.04	30	63%
NO_X/2021	Annual Mean	0.04	19	19.04	30	63%

Note 1 Air Quality Standards 2011 (from EU Directive 2008/50/EC and S.I. 180 of 2011).

In order to consider the effects of nitrogen deposition owing to emissions from the Proposed Development on the designated habitat sites, the NO_X concentrations determined above in Table 9.24 must be converted firstly into a dry deposition flux using the equation below which is taken from UK Environment Agency publication "AGTAG06 – Technical Guidance On Detailed Modelling Approach For An Appropriate Assessment For Emissions To Air" (UKEA, 2014):

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

The deposition velocities for NO_X are outlined in AQTAG06 (UKEA, 2014). A deposition velocity of 0.0015 m/s for grassland has been used. The dry deposition flux is then multiplied by a conversion factor of 95.9 (taken from AQTAG06) to convert it to a nitrogen (N) deposition flux (kg/ha/yr).

The N deposition flux for the worst-case year is 0.006 kg/ha/yr and is below the range in worst-case critical loads for the various vegetation types of 5-10 kg/ha/yr (UNECE, 2010). Consultation with the

ecologist confirms that the effects of nitrogen deposition on designated sites due to the Proposed Development are not significant.

In accordance with the EPA Guidelines[1] the impact associated the operational phase of the Proposed Development on designated habitat sites is considered long-term, localised, negative and imperceptible.

9.5 MITIGATION AND MONITORING MEASURES

9.5.1 CONSTRUCTION PHASE

The objective of dust control at the site is to ensure that no significant nuisance occurs at nearby sensitive receptors. In order to ensure that no dust nuisance occurs a series of measures drawing on will be implemented, drawing on best practice guidance from Ireland, the UK and the USA based on the following publications:

- 'Guidance on the Assessment of Dust from Demolition and Construction'[14];
- 'Planning Advice Note PAN50 Annex B: Controlling The Environmental Effects Of Surface Mineral Workings Annex B: The Control of Dust at Surface Mineral Workings'[30];
- 'Controlling the Environmental Effects of Recycled and Secondary Aggregates Production Good Practice Guidance'[31];
- 'Controlling Particles, Vapours & Noise Pollution From Construction Sites'[32];
- 'Fugitive Dust Technical Information Document for the Best Available Control Measures[33]; and
- 'Compilation of Air Pollutant Emission Factors, AP-42, Fifth Edition' (periodically updated)[34]

In summary the measures which will be implemented include:

- Hard surface roads will be swept to remove mud and aggregate materials from their surface while any un-surfaced roads will be restricted to essential site traffic;
- Any road that has the potential to give rise to fugitive dust shall be regularly watered, as appropriate, during dry and/or windy conditions;
- Vehicles using site roads will have their speed restricted, and this speed restriction must be enforced rigidly. On any un-surfaced site road, this will be 20kph, and on hard surfaced roads as site management dictates;
- Public roads outside the site will be regularly inspected for cleanliness and cleaned as necessary;
- Material handling systems and site stockpiling of materials will be designed and laid out to minimise exposure to wind. Water misting or sprays will be used as required if particularly dusty activities are necessary during dry or windy periods; and
- During movement of materials both on and off-site, trucks will be stringently covered with tarpaulin at all times. Before entrance onto public roads, trucks will be adequately inspected to ensure no potential for dust emissions.

At all times, these procedures will be strictly monitored and assessed. In the event of dust nuisance occurring outside the site boundary, movements of materials likely to raise dust would be curtailed and satisfactory procedures implemented to rectify the problem before the resumption of construction operations.

9.5.2 OPERATIONAL PHASE

The stack height of the gas fired power generation facility has been designed to ensure that an adequate height has been selected to aid dispersion of the emissions and achieve compliance with the EU ambient air quality standards beyond the site boundary (including background concentrations). No additional mitigation measures are proposed for the operational phase of the Proposed Development.

9.6 RESIDUAL IMPACTS

Once the mitigation measures outlined in Section 9.5 are implemented, the residual impacts on air quality or climate from the construction of the proposed development will be short-term and imperceptible. The residual impacts on air quality for the operational phases of the proposed development will be long-term, negative and range from imperceptible to slight, while the impacts on climate will be long-term, positive and slight.

9.7 CUMULATIVE IMPACTS

9.7.1 CONSTRUCTION PHASE

According to the IAQM guidance[14] should the construction phase of the Proposed Development coincide with the construction phase of any other development within 350m then there is the potential for cumulative construction dust impacts. However, best practice dust mitigation measures will be implemented across the site which will avoid significant dust emissions. Provided these mitigation measures are in place for the duration of the construction phase cumulative dust related impacts to nearby sensitive receptors are not predicted to be significant. Cumulative impacts to air quality will be short-term, localised, negative and imperceptible.

9.7.2 OPERATIONAL PHASE

9.7.2.1 Air Quality

The cumulative impact of NO_2 emissions from proposed normal operations and emissions from existing licenced facilities within 1 km of the proposed facility are detailed in Table 9.17. The results indicate that the ambient ground level concentrations are below the relevant air quality standards for NO_2. Emissions from the existing and proposed emission points lead to an ambient NO_2 concentration (including background) which is 37% of the maximum ambient 1-hour limit value (measured as a 99.8th%ile) and 42% of the annual limit value at the worst-case receptor (see Figure 9.2 and Figure 9.3)). The locations of the maximum concentrations for NO_2 are close to the boundary of the site with concentrations decreasing with distance from the facility.

In accordance with the EPA Guidelines[1] the impacts to air quality are predicted to be long-term, negative and imperceptible.

Table 9.17 Dispersion Model Results for Nitrogen Dioxide (NO_2) – Cumulative Assessment

Pollutant/ Year	Averaging Period	Process Contribution NO_2 (µg/m^3)	Background Concentration (µg/m^3)	Predicted Environmental Concentration NO_2 (µg/m^3)	Limit Value (µg/m^3) Note 1	PEC as a % of Limit Value
NO_2 / 2017	Annual Mean	0.4	16	16.4	40	41%
	99.8th%ile of 1-hr means	29.5	32	61.5	200	31%
NO_2 / 2018	Annual Mean	0.7	16	16.7	40	42%
	99.8th%ile of 1-hr means	42.7	32	74.7	200	37%
NO_2 / 2019	Annual Mean	0.3	16	16.3	40	41%
	99.8th%ile of 1-hr means	26.7	32	58.7	200	29%
NO_2 / 2020	Annual Mean	0.4	16	16.4	40	41%
	99.8th%ile of 1-hr means	20.6	32	52.6	200	26%
NO_2 / 2021	Annual Mean	0.5	16	16.5	40	41%
	99.8th%ile of 1-hr means	30.4	32	62.4	200	31%

Note 1 Air Quality Standards 2011 (from EU Directive 2008/50/EC and S.I. 180 of 2011).

9.7.2.2 Sensitive Ecosystems

The NO_X modelling results are detailed in Table 9.18. Emissions from the facility lead to an ambient NO_X concentration (excluding background) which ranges from 0.5 – 3.4% of the annual limit value at the worst-case location within the designated sites over the five years of meteorological data modelled. In addition, modelling results based on conservative assumptions indicate that the Proposed Development including background concentrations will contribute at most 67% of the limit value at the worst-case location in the worst-case year modelled.

Table 9.18 NOx Dispersion Model Results at Worst Case Ecological Receptor – Process Contributions Under Normal Operations

Pollutant/ Met Year	Averaging Period	Process Contribution (µg/m³)	Annual Mean Background (µg/m³)	Predicted Environmental Concentration (µg/m³)	Standard (µg/m³)	% of Limit Value
NO_X/2017	Annual Mean	0.17	19	19.17	30	64%
NO_X/2018	Annual Mean	1.03	19	20.03	30	67%
NO_X/2019	Annual Mean	0.18	19	19.18	30	64%
NO_X/2020	Annual Mean	0.16	19	19.16	30	64%
NO_X/2021	Annual Mean	0.15	19	19.15	30	64%

Note 1 Air Quality Standards 2011 (from EU Directive 2008/50/EC and S.I. 180 of 2011).

The N deposition flux for the worst-case year is 0.148 kg/ha/yr and is below the range in worst-case critical loads for the various vegetation types of 5-10 kg/ha/yr (UNECE, 2010). Consultation with the ecologist confirms that the effects of nitrogen deposition on designated sites due to the Proposed Development are not significant.

In accordance with the EPA Guidelines[1] the impact associated the operational phase of the Proposed Development on designated habitat sites is considered long-term, localised, negative and imperceptible

9.7.2.3 Climate

As discussed in Section 9.4.3.2, the cumulative impact of carbon emissions from the proposed power generation facility will form part of the EU-wide ETS scheme. The facility's impact will be less than 0.04% of the total EU-wide ETS market which is not significant and thus an EU-wide cumulative assessment is not merited

9.8 INTERACTIONS

Air quality does not have a significant number of interactions with other topics. The most significant interactions are between population and human health and air quality. An adverse impact due to air quality in either the construction or operational phase has the potential to cause health and dust nuisance issues. The mitigation measures that will be put in place at the proposed development will ensure that the impact of the proposed development complies with all ambient air quality legislative limits and therefore the predicted impact is short-term, negative and imperceptible with respect to the construction phase and long-term, neutral and imperceptible with respect to the operational phase in terms of human health impacts.

Interactions between air quality and traffic can be significant. With increased traffic movements and reduced engine efficiency, i.e. due to congestion, the emissions of vehicles increase. The impacts of

the proposed development on air quality are assessed by reviewing the change in annual average daily traffic on roads close to the site. In this assessment, the impact of the interactions between traffic and air quality are considered to be imperceptible.

Construction phase activities such as land clearing, excavations, stockpiling of materials etc. have the potential for interactions between air quality and land and soils and the water environment (hydrology) in the form of dust emissions. With the appropriate mitigation measures to prevent fugitive dust emissions, it is predicted that interactions between air quality and land and soils and hydrology will be short-term and imperceptible.

Dust emissions have the potential to settle on plants causing impacts to local ecology. Mitigation measures during the construction phase of the proposed development will ensure that dust generation is minimised and the effect on biodiversity will be short term, imperceptible and neutral.

9.9 REFERENCES

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10 NOISE & VIBRATION

10.1 INTRODUCTION/METHODOLOGY

As detailed in Chapter 1 Introduction, this EIA Report has been prepared to accompany an application for the development of a gas-fired power plant including ancillary equipment and associated ancillary development on lands at Kilshane, Co. Dublin. The Proposed Development is on lands to the south of the Kilshane Road at to the west of the N2. The subject site is illustrated in Figures 4.1 to 4.4. (See chapter 4 and accompanying document set for more detailed drawings)

The nearest noise-sensitive locations (NSLs) are located to the west, north and east of the development lands on sections of the Kilshane Road; the majority of the NSLs are residential dwellings, and the remainder are commercial buildings.

10.1.1.1 Proposed Approach

The following methodology has been adopted for this assessment:

- Review appropriate guidance, typical local authority planning conditions, etc. in order to identify appropriate noise criteria for the site operations;
- Carry out noise monitoring (e.g. in the vicinity of nearest sensitive properties/boundaries) to identify existing levels of noise in the vicinity of the development;
- Development of a detailed 3D noise model to consider the proposed development; and
- Comment on predicted levels against the appropriate criteria and existing noise levels and outline required mitigation measures (if any).

Appendix 10.1 of this document presents a glossary of the acoustic terminology used throughout this document. In the first instance it is considered appropriate to review some basic fundamentals of acoustics.

10.1.1.2 Fundamentals of Acoustics

In order to provide a broader understanding of some of the technical discussion in this report, this section provides a brief overview of the fundamentals of acoustics and the basis for the preparation of this noise assessment.

A sound wave travelling through the air is a regular disturbance of the atmospheric pressure. These pressure fluctuations are detected by the human ear, producing the sensation of hearing. In order to take account of the vast range of pressure levels that can be detected by the ear, it is convenient to measure sound in terms of a logarithmic ratio of sound pressures. These values are expressed as Sound Pressure Levels (SPL) in decibels (dB).

The audible range of sounds expressed in terms of Sound Pressure Levels is 0dB (for the threshold of hearing) to 120dB (for the threshold of pain). In general, a subjective impression of doubling of loudness corresponds to a tenfold increase in sound energy which conveniently equates to a 10dB increase in SPL. It should be noted that a doubling in sound energy (such as may be caused by a doubling of traffic flows) increases the SPL by 3dB.

The frequency of sound is the rate at which a sound wave oscillates, and is expressed in Hertz (Hz). The sensitivity of the human ear to different frequencies in the audible range is not uniform. For example, hearing sensitivity decreases markedly as frequency falls below 250Hz. In order to rank the SPL of various noise sources, the measured level has to be adjusted to give comparatively more weight to the frequencies that are readily detected by the human ear. Several weighting mechanisms have been proposed but the 'A-weighting' system has been found to provide one of the best correlations with perceived loudness. SPL's measured using 'A-weighting' are expressed in terms of

dB(A). An indication of the level of some common sounds on the dB(A) scale is presented in Figure 10.1.

The 'A' subscript denotes that the sound levels have been A-weighted. The established prediction and measurement techniques for this parameter are well developed and widely applied. For a more detailed introduction to the basic principles of acoustics, reference should be made to an appropriate standard text.

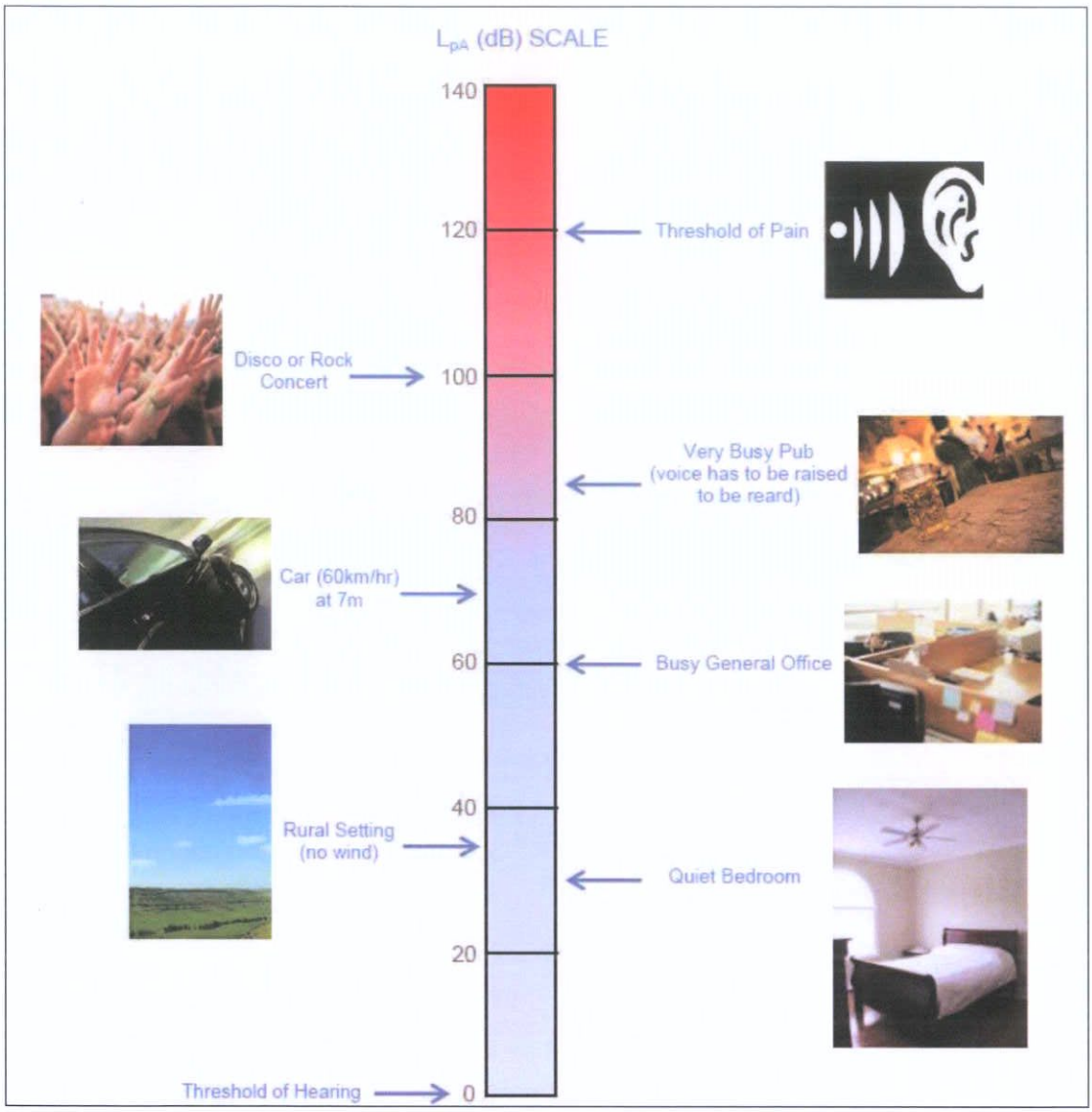

Figure 10.1 dB(A) Scale & Indicative Noise Levels – (EPA: Guidance Note for Noise: Licence Applications, Surveys and Assessments in Relation to Scheduled Activities (NG4 – 2012))

10.1.1.3 Significance of Impacts

The significance of noise and vibration impacts has been assessed in accordance with the EPA Guidelines EIA Reports (2022); see Tables 10.1 to 10.3. As these guidelines do not quantify the impacts in decibel terms further reference has been made to the draft 'Guidelines for Noise Impact Assessment' produced by the Institute of Acoustics/Institute of Environmental Management and Assessment Working Party.

With regard to the quality of the impact, ratings may have positive, neutral or negative applications where:

Table 10.1 Quality of Potential Effects

Quality of Impact	Definition
Negative	A change which reduces the quality of the environment (e.g. by causing a nuisance).
Neutral	No effects or effects that are imperceptible, within the normal bounds of variation or within the margin of forecasting error.
Positive	A change that improves the quality of the environment (e.g. by removing a nuisance).

The significance of an impact on the receiving environment are described as follows:

Table 10.2 Significance of Effects

Significance of Impact on the Receiving Environment	Description of Potential Effect
Imperceptible	An effect capable of measurement but without significant consequences.
Not Significant	An effect which causes noticeable changes in the character of the environment but without significant consequences.
Slight	An effect which causes noticeable changes in the character of the environment without affecting its sensitivities.
Moderate	An effect that alters the character of the environment in a manner that is consistent with existing and emerging baseline trends.
Significant	An effect which, by its character, magnitude, duration or intensity alters a sensitive aspect of the environment.
Very Significant	An effect which, by its character, magnitude, duration or intensity significantly alters a sensitive aspect of the environment.

The duration of effects as described in the EPA Guidelines are:

Table 10.3 Duration of Effects

Duration	Definition
Momentary	Effects lasting from seconds to minutes
Brief	Effects lasting less than a day
Temporary	Effects lasting one year or less
Short-term	Effects lasting one to seven years
Medium-term	Effects lasting seven to fifteen years
Long-term	Effects lasting fifteen to sixty years
Permanent	Effects lasting over sixty years
Reversible	Effects that can be undone, for example through remediation or restoration

10.1.1.4 Construction Phase Guidance

Criteria for Rating Noise Impacts

There is no published statutory Irish guidance relating to the maximum permissible noise level that may be generated during the construction phase of a project. Local authorities normally control construction activities by imposing limits on the hours of operation and consider noise limits at their discretion.

In the absence of specific noise limits, appropriate criteria relating to permissible construction noise levels for a development of this scale may be found in the British Standard BS 5228 – 1: 2009+A1:2014: Code of practice for noise and vibration control on construction and open sites – Noise.

The approach adopted here calls for the designation of a noise sensitive location into a specific category (A, B or C) based on existing ambient noise levels in the absence of construction noise. This then sets a threshold noise value that, if exceeded at this location, indicates a significant noise impact is associated with the construction activities.

The BS 5228 document sets out guidance on permissible noise levels relative to the existing noise environment. Table 10.4 sets out the values which, when exceeded, signify a significant effect at the facades of residential receptors as recommended by BS 5228 – 1.

Table 10.4 Example Threshold of Significant Effect at Dwellings

Assessment category and threshold value period (LAeq)	Threshold value, in decibels (dB)		
	Category A Note A	Category B Note B	Category C Note C
Night-time (23:00 to 07:00hrs)	45	50	55
Evenings and weekends Note D	55	60	65
Daytime (07:00 – 19:00) and Saturdays (07:00 – 13:00)	65	70	75

Note A) Category A: threshold values to use when ambient noise levels (when rounded to the nearest 5dB) are less than these values.
Note B) Category B: threshold values to use when ambient noise levels (when rounded to the nearest 5dB) are the same as category A values.
Note C) Category C: threshold values to use when ambient noise levels (when rounded to the nearest 5dB) are higher than category A values.
Note D) 19:00 – 23:00 weekdays, 13:00 – 23:00 Saturdays and 07:00 – 23:00 Sundays.

It should be noted that this assessment method is only valid for residential properties.

For the appropriate periods (i.e. daytime, evening and night time) the ambient noise level is determined and rounded to the nearest 5dB. Baseline monitoring carried out at the nearest noise sensitive locations (See Section 10.3) and considered in this assessment indicate that Category A applies based on the measured levels at UN1 and Category B applies based on the measured levels at UN2, as detailed in Table 10.5 is appropriate in this instance.

Table 10.5 Rounded Baseline Noise Levels and Associated Categories

Period	Baseline Noise Category	Construction Noise Threshold Value $L_{Aeq,1hr}$ (dB)
Daytime (07:00 – 19:00) and Saturdays (07:00 – 13:00)	A-B	65-70

See Section 10.4.1 for the assessment in relation to the proposed development. If the construction noise level exceeds the appropriate category value, then a potential significant effect is deemed to occur.

This assessment process determines if a significant construction noise impact is likely.

Notwithstanding the outcome of this assessment, the overall acceptable levels of construction noise set out in the Transport Infrastructure Ireland (TII) publication Guidelines for the Treatment of Noise and Vibration in National Road Schemes. The noise levels in Table 10.6 should not be exceeded at noise sensitive locations during the construction phase of the proposed development.

Table 10.6 Maximum Permissible Noise Levels at the Facade of Dwellings during Construction

Days and Times	Noise Levels (dB re. $2x10^{-5}$ Pa)	
	$L_{Aeq(1hr)}$	L_{Amax}
Monday to Friday 07:00 to 19:00hrs	70	80
Monday to Friday 19:00 to 23:00hrs	60*	65*
Saturdays 07:00 to 13:00hrs	65	75
Sundays & Bank Holidays 08:00 to 16:30hrs	60*	65*

Based on the above the following construction noise criteria are proposed for the site:

70dB $L_{Aeq,1hr}$ at noise sensitive locations

75dB $L_{Aeq,1hr}$ at commercial locations

It will be required that noise-generating external construction activities associated with development shall take place between the hours of:

- Mondays to Fridays – 7am to 7pm
- Saturday – 7am to 2pm
- On Sundays and Public Holidays; no activity on the site.

If it is deemed necessary to conduct works outside these times, prior written approval will be sought from the relevant local authority.

Criteria for Rating Vibration Impacts

There are two aspects to the issue of vibration that are addressed in the standards and guidelines: the risk of cosmetic or structural damage to buildings; and human perception of vibration. In the case of this development, vibration levels used for the purposes of evaluating building protection and human comfort are expressed in terms of Peak Particle Velocity (PPV) in mm/s.

There is no published statutory Irish guidance relating to the maximum permissible vibration level. The following standards are the most widely accepted in this context and are referenced here in relation to cosmetic or structural damage to buildings:

British Standard BS 5228-2 Code of Practice for noise and vibration control of construction and open sites - Part 2: Vibration (BSI 2014); and
British Standard BS 7385-2 Evaluation and measurement for vibration in buildings Part 2: Guide to damage levels from ground borne vibration (BSI 1993)

BS 5228-2 and BS 7385-2 define the following thresholds for cosmetic damage to residential or light commercial buildings: PPV should be below 15 mm/s at 4 Hz to avoid cosmetic damage. This increases to 20 mm/s at 15 Hz and to 50 mm/s at 40 Hz and above. At frequencies below 4 Hz, a maximum displacement of 0.6 mm (zero to peak) is not to be exceeded. This is summarised in Table 10.7.

Table 10.7 Allowable Vibration during Construction Phase

Type of building	**Peak component particle velocity in frequency range of predominant pulse**	
	4 Hz to 15 Hz	**15 Hz and above**
Unreinforced or light framed structures. Residential or light commercial buildings.	15 mm/s at 4 Hz increasing to 20 mm/s at 15 Hz	20 mm/s at 15 Hz increasing to 50 mm/s at 40 Hz and above

Note 1: Values referred to are at the base of the building.
Note 2: At frequencies below 4 Hz, a maximum displacement of 0.6 mm (zero to peak) is not to be exceeded.

Furthermore, BS 5228-2 and BS 7385-2 state that minor structural damage can occur at vibration magnitudes greater than twice those in Table 10.7 and major structural damage can occur at vibration magnitudes greater than four times those in Table 10.7.

BS 5228-2 also provides guidance relating to the human response to vibration. Guidance is again provided in terms of PPV in mm/s since this parameter is routinely measured when monitoring the structural effects of vibration. The potential human response at different vibration levels, as set out in BS 5228-2, is summarised in Table 10.8.

Table 10.8 Guidance on human response to vibration levels

Vibration level Note A) B) C) (mm/s)	Effect
0.14	Vibration might be just perceptible in the most sensitive situations for most vibration frequencies associated with construction. At lower frequencies, people are less sensitive to vibration.
0.3	Vibration might be just perceptible in residential environments.
1.0	It is likely that vibration of this level in residential environments will cause complaint, but can be tolerated if prior warning and explanation has been given to residents.
10	Vibration is likely to be intolerable for any more than a very brief exposure to this level in most building environments.

Note A The magnitudes of the values presented apply to a measurement position that is representative of the point of entry into the recipient.

Note B A transfer function (which relates an external level to an internal level) needs to be applied if only external measurements are available.

Note C Single or infrequent occurrences of these levels do not necessarily correspond to the stated effect in every case. The values are provided to give an initial indication of potential effects, and where these values are routinely measured or expected then an assessment in accordance with BS 6472-1 or -2, and/or other available guidance, might be appropriate to determine whether the time varying exposure is likely to give rise to any degree of adverse comment.

Construction Phase Traffic

Vehicular movement to and from the construction site for the Proposed Development will make use of the existing road network. In order to assess the potential impact of additional traffic on the human perception of noise, the following two guidelines are referenced DMRB Noise and Vibration (UKHA 2020) and the EPA Guidelines (EPA, 2022). For construction traffic, due to the short-term period over which this impact occurs, the magnitude of impacts is assessed against the 'short term' period in accordance with the DMRB Noise and Vibration (UKHA 2020) document.

Table 10.9 sets out the classification of changes in noise level to impact on human perception based on the guidance contained in these documents.

Table 10.9 Classification of magnitude of traffic noise changes in the short-term

Change in Sound Level (dB)	Subjective Reaction	DMRB Magnitude of Impact (Short-term)	EPA Significance of Effect
Less than 1 dB	Inaudible	Negligible	Imperceptible
1 – 2.9	Barely Perceptible	Minor	Not Significant
3 – 4.9	Perceptible	Moderate	Slight, Moderate
≥ 5	Clearly perceptible	Major	Significant

10.1.1.5 Operational Phase - Noise Guidance

EPA NG4

It is understood that the development will operate under the provisions of an Environmental Protection Agency (EPA) Industrial Emissions (IE) license. The discussion of appropriate IE License noise emission criteria for the overall facility will be conducted in accordance with the NG4 document. This approach is summarized below in accordance with guidance detailed in Section 4 of the (EPA) document Guidance

Note for Noise: Licence Applications, Surveys and Assessments in Relation to Scheduled Activities (NG4) 2016.

Quiet Area Screening

The proposed development is not considered a quiet area in this instance as it fails to meet any of the criteria outlined in EPA's Guidance. The most stringent of these criteria are noted in bullet point and commented on below.

At least 3km from urban area with a population >1,000 people;

- The site within the Dublin agglomeration and is therefore located less than 3km from a population significantly greater than 1,000.

At least 3km away from any local industry;

- Other industrial sites operate within 3km of the site.

At least 5km away from any National Primary Route;

- A section of the N2 national road is located along the western boundary of the site.

Low Background Noise Area Screening

In order to establish whether the noise sensitive locations in the vicinity of the site would be considered 'low background noise' areas, the noise levels measured during the environmental noise survey need to satisfy all three of the following criteria:

- Arithmetic Average of L_{A90} During Daytime Period ≤40 dB L_{A90}, and;
- Arithmetic Average of L_{A90} During Evening Period ≤35 dB L_{A90}, and;
- Arithmetic Average of L_{A90} During Night-time Period ≤30 dB L_{A90}.

Table 10.10 Comparison of Measurement Results with NG4 Low Background Noise Area Criteria

Location	Period	$L_{A90,T}$, dB	NG4 Screening (dB $L_{A90,T}$)	Satisfies All Criteria for Low Background Noise Area?
UN1	Daytime	60	≤40	No
	Evening	57	≤35	
	Night-time	50	≤30	
UN2	Daytime	65	≤40	No
	Evening	61	≤35	
	Night-time	52	≤30	

The arithmetic average L_{A90} results at the monitoring location considered here (see Section 10.3) are compared against the criteria in Table 10.10. The locations UN1 and UN2 would not be considered a 'Areas of Low Background Noise' as the measured noise levels do not satisfy the criteria.

Determining Appropriate Noise Criteria

Based on the EPA NG4 guidance, the following noise criteria are appropriate at the nearest NSL's to the facility:

- Daytime (07:00 to 19:00hrs) 55dB $L_{Ar,15min}$
- Evening (19:00 to 23:00hrs) 50dB $L_{Ar,15min}$
- Night time (23:00 to 07:00hrs) 45dB $L_{Aeq,15min}$