10.0 AIR QUALITY AND CLIMATE

10.1 INTRODUCTION

AWN Consulting Ltd. were commissioned to undertake an air quality and climate assessment of the proposed power plant at Profile Park. The purpose of the assessment was to determine the air quality and climatic impact, in line with the Industrial Emissions Directive (2010/75/EU) and Best Available Techniques (BAT) Reference Document for Large Combustion Plants (2017), from the proposed plant in isolation and cumulatively with the existing licensed facilities at Profile Park.

The assessment of the emissions to air included other Industrial Emissions (IE) Licenced plants include Pfizer, Takeda and the Grange Castle BackUp power plant and these have been modelled alongside the proposed power plant.

The impact assessment consisted of the following components:

- Review of emission data and other relevant information needed for the modelling study;
- Summary of background NO_2 levels;
- Dispersion modelling of released substances under the following scenarios:
  - A scenario with six individual exhaust flues at the proposed plant;
  - An alternative scenario with one pseudo stack at the proposed power plant, where physical and emission characteristics of the six individual stacks were combined to produce one pseudo stack emission source;
  - The individual stacks scenario was found to be the more conservative scenario and as such the results are presented in this chapter. The alternative pseudo stack results are provided in Appendix 10.3.
- Cumulative assessment of the Profile Park Power plant and all existing IE Licenced emission points in the region for each scenario;
- Presentation of predicted ground level concentrations of released substances;
- Evaluation of the significance of these predicted concentrations, including consideration of whether these ground level concentrations are likely to exceed the relevant ambient air quality limit values;
- Assessment of the potential greenhouse gas (GHG) emissions associated with the proposed power plant; and
- Assessment of the potential impact of the plumes associated with the operational phase of the proposed station on aircraft, for both scenarios.

The natural gas engines may also be powered by diesel oil as back-up to the normal gas supply. Testing in this mode is expected to occur for a maximum of 18 hours per annum. Emergency operation and testing of the engines using diesel oil have been scoped out of this air modelling assessment as it is not expected that these operation modes would cause any significant effects on ambient air quality considering the infrequent and unpredictable usage of this back-up fuel.

Information supporting the conclusions has been detailed in the following sections. The assessment methodology and study inputs are presented in Section 10.2. The dispersion modelling results for the worst-case individual stacks scenario and assessment summaries are presented in Section 10.3. The model formulation is detailed in Appendix 10.1 and a review of the meteorological data used is detailed in Appendix 10.2. The dispersion modelling results for the pseudo stack scenario and assessment summaries are presented in Appendix 10.3. For a glossary of terms used in this chapter please refer to Appendix 10.1.

10.1.1 STATEMENT OF COMPETENCY

This chapter of the EIAR has been prepared by the following staff of AWN Consulting Ltd:

Dr. Jovanna Arndt (Senior Air Quality Consultant) holds a BSc (Hons) in Environmental Science, a PhD in Atmospheric Chemistry and is a member of the Institute of Air Quality Management. Jovanna has specialised in air quality since 2010 and has extensive knowledge of air dispersion modelling of a variety of infrastructure projects, including power plants, and is experienced in monitoring and managing the associated air quality effects.

Dr. Edward Porter (Director) holds a BSc (Hons) in Chemistry a PhD in Atmospheric Chemistry and is a member of the Institute of Air Quality Management. Edward has specialised in air quality since 1993 and has extensive knowledge of air dispersion modelling air monitoring and climate impact assessments.

10.2 METHODOLOGY

10.2.1 AIR QUALITY METHODOLOGY

Emissions from the Profile Park power plant and the existing air emission points at Pfizer, Takeda and the Grange Castle BackUp Power Facility have been modelled using the AERMOD dispersion model (Version 19191) which has been developed by the U.S. Environmental Protection Agency (USEPA) (USEPA, 2019) and following guidance issued by the EPA (EPA, 2020a). The model is a steady-state Gaussian plume model used to assess pollutant concentrations associated with industrial sources and has replaced ISCST3 (USEPA, 1995) as the regulatory model by the USEPA for modelling emissions from industrial sources in both flat and rolling terrain (USEPA, 1998, 2000a, 2017). The model has more advanced algorithms and gives better agreement with monitoring data in extensive validation studies (EPA, 2021; Schulman et al., 1998; Paine & lew, 1997a, 1997b; USEPA, 1999). An overview of the AERMOD dispersion model is outlined in Appendix 10.1.

The air dispersion modelling input data consisted of information on the physical environment (including existing and proposed building dimensions and terrain features), design details and process emissions data for the existing air emissions points and estimated process emissions data for the proposed power plant as well as five years of appropriate hourly meteorological data. Using this input data the model predicted ambient ground level concentrations beyond the site boundary for each hour of the modelled meteorological years. The model post-processed the data to identify the location and maximum of the worst-case ground level concentration. This worst-case concentration was then added to the background concentration to give the worst-case predicted environmental concentration (PEC). The PEC was then compared with the relevant ambient air quality limit value to assess the significance of effects associated with the existing and proposed emissions from the site.

The modelling aims to achieve compliance with the guidance outlined within the EPA AG4 Guidance for Air Dispersion Modelling (EPA, 2020a) for the maximum permissible process contribution:

> *"When modelling a facility, the uncertainty in the model should be considered. If the facility is operated continually at close to the maximum licenced mass emission rate (i.e. maximum concentration and maximum volume flow) the process contribution (PC) should be less than 75% of the ambient air quality standard and less than this where background levels account for a significant fraction of the ambient air quality standard based on the formula":*

Maximum Allowable Process Contribution= 0.75(AQS-BC)*

This approach allows for inherent uncertainty in air dispersion modelling to be taken into account in order to avoid a risk of exceeding the air quality standards. The modelling assessment has aimed to achieve a process contribution that is less than 75% of the ambient air quality standard at licenced conditions.

Throughout this study a worst-case approach was taken. This will most likely lead to an over-estimation of the levels that will arise in practice. The worst-case assumptions are outlined below:

- Maximum predicted concentrations were reported in this study, even if no residential receptors were near the location of this maximum;
- Conservative background concentrations were used;
- The effect of building downwash, due to on-site and any nearby off-site buildings, has been included in the model;
- All emission points were assumed to run continuously, every hour of the day, 365 days per year;
- The Ozone Limiting Method (OLM) was used to model NO_2 concentrations. The OLM is a regulatory option in AERMOD which calculates ambient NO_2 concentrations by applying a background ozone concentration and an in-stack NO_2/NO_X ratio to predicted NO_X concentrations. An in-stack NO_2/NO_X ratio of 0.1 and a background ozone concentration of 55 $\mu g/m^3$ were used for modelling the proposed Profile Park plant and all existing emission points for the purpose of this study even though the in-stack ratios are likely to be lower in reality;

The contour patterns shown in the figures in this chapter, which are a representation of the variation in ambient ground level pollutant concentrations beyond the site boundary, are a function of several interacting parameters. Wind speed and direction are important in determining offsite ambient concentrations. However, building downwash is also an important consideration and for each emission point the relative position of the stack to the dominant building will be important and will lead to variations in the offsite contour patterns which cannot be intuitively forecast in advance. Thus, the resultant pollutant contour pattern is a function of several parameters and will vary as a result of how all of these parameters interact with each other.

10.2.2 AMBIENT AIR QUALITY STANDARDS

In order to reduce the risk to health from poor air quality, national and European statutory bodies have set limit values in ambient air for a range of air pollutants. These limit values or "Air Quality Standards" are health- or environmental-based levels for which additional factors may be considered. The applicable limit values in Ireland include the Air Quality Standards Regulations 2011, which incorporate EU Directive 2008/50/EC (see Table 10-1)

These limit values have been used in the current assessment to determine the potential impact of NO_X emissions from the proposed facility on air quality. Oxides of nitrogen (NO_X) is a term commonly used to describe a mixture of nitric oxide (NO) and nitrogen dioxide (NO_2), referred to collectively as NO_X. These are primarily formed from atmospheric and fuel nitrogen as a result of high temperature combustion. The major sources in most countries are road traffic and power generation. During the process of combustion, atmospheric and fuel nitrogen is partially oxidised via a series of complex reactions to NO. The process is dependent on the temperature, pressure, oxygen concentration and residence time of the combustion gases in the combustion zone. Most NO_X exhausting from a combustion process is in the form of NO, which is a colourless and tasteless gas. It is readily oxidised to NO_2, a more harmful form of NO_X, by chemical reaction with ozone and other chemicals in the atmosphere.

Modelling for NO_2 was undertaken in detail for the dual fuel gas engines. These engines (as per CRU requirements) are also required to have the capacity to operate on diesel oil in emergency scenarios. These operating scenarios are '*other than normal operating conditions*' (OTNOC) and therefore any emissions during these periods (i.e. NO_2, CO, SO_2 and particulate matter (PM_{10}/$PM_{2.5}$) are not subject to emissions limit values specified in the Industrial Emissions Directive (2010/75/EU) and Best Available Techniques (BAT) Reference Document for Large Combustion Plants (2017). Further detail on OTNOC is provided in Section 10.2.3.6.

No modelling for NO_2 was undertaken for the gas engines using diesel oil to for start up operations as this is also OTNOC and will occur for less than five minutes on start up. In relation to CO, SO_2, PM_{10} and $PM_{2.5}$ no detailed modelling was undertaken. Emissions of these pollutants are significantly lower than the NO_X emissions from the generators relative to their ambient air quality standards and thus ensuring compliance with the NO_2 ambient limit value will ensure compliance for all other pollutants. For example, the emission of CO from the generators is at least eight times lower than NO_X whilst the CO ambient air quality standard is 10,000 $\mu g/m^3$ compared to the 1-hour NO_2 standard of 200 $\mu g/m^3$. Similarly, levels of PM_{10}/$PM_{2.5}$ emitted from the generators will be 90 times lower whilst the ambient air quality standards are comparable. Emissions of SO_2 are approximately 55 times lower than emissions of NO_X.

Table 10-1: Air Quality Standards 2011 (Based on Directive 2008/50/EC)

Pollutant	Regulation Note 1	Limit Type	Value
Nitrogen Dioxide	2008/50/EC	Hourly limit for protection of human health - not to be exceeded more than 18 times/year	200 $\mu g/m^3$ NO_2
		Annual limit for protection of human health	40 $\mu g/m^3$ NO_2
		Critical level for protection of vegetation	30 $\mu g/m^3$ NO + NO_2

Note A EU 2008/50/EC – Clean Air For Europe (CAFÉ) Directive replaces the previous Air Framework Directive (1996/30/EC) and daughter directives 1999/30/EC and 2000/69/EC.

10.2.3 AIR DISPERSION MODELLING METHODOLOGY

The United States Environmental Protection Agency (USEPA) approved AERMOD dispersion model has been used to predict the ground level concentrations (GLC) of compounds emitted from the proposed power plant.

The modelling incorporated the following features:

- Three receptor grids were created at which concentrations would be modelled. Receptors were mapped with sufficient resolution to ensure all localised "hot-spots" were identified without adding unduly to processing time. The receptor grids were based on Cartesian grids with the site at the centre. The inner grid measured 3 km x 3 km with concentrations calculated at 125m intervals. The medium grid measured 10 km x 10 km with concentrations calculated at 250m intervals, whilst the outer grid measured 20 km x 20 km with concentrations calculated at 500m intervals. Boundary receptor locations were also placed along the ownership boundary of the site at 100 m intervals giving a total of 1,719 calculation points for the model.
- All on-site buildings and significant process structures were mapped into the computer to create a three dimensional visualisation of the site and its emission points. Buildings and process structures can influence the passage of airflow over the emission stacks and draw plumes down towards the ground (termed building downwash). The stacks themselves can influence airflow in the same way as buildings by causing low pressure regions behind them (termed stack tip downwash). Both building and stack tip downwash were incorporated into the modelling.
- Detailed terrain has been mapped into the model using SRTM data with 30 m resolution. All terrain features have been mapped in detail into the model using the terrain pre-processor AERMAP (USEPA, 2018a).
- Hourly-sequenced meteorological information has been used in the model. Meteorological data over a five year period (Casement Airport Meteorological Station, 2016 – 2020) was used in the model (see Figure 10-1).
- The source and emissions data, including stack dimensions, gas velocities, emission temperatures and pollutant emission rates have been incorporated into the model.
- A stack height determination study was also undertaken as part of the air dispersion modelling study to ensure that ambient levels of pollutants beyond the site boundary are below the maximum allowable process contribution (PC) based on the following formula for maximum operations outlined in AG4:

Maximum Allowable PC = 0.75*(AQS)
where there is no significant background concentration

Maximum Allowable PC = 0.75*(AQS – BC)
where there is a significant background concentration

This approach allows for the inherent uncertainty in air dispersion modelling to be taken into account in order to avoid a risk of exceeding the air quality limit values.

10.2.3.1 Terrain

The AERMOD air dispersion model has a terrain pre-processor AERMAP (USEPA, 2018) which was used to map the physical environment in detail over the receptor grid. The digital terrain input data used in the AERMAP pre-processor was obtained from SRTM. This data was run to obtain for each receptor point the terrain height and the terrain height scale. The terrain height scale is used in AERMOD to calculate the critical dividing streamline height, Hcrit, for each receptor. The terrain height scale is derived from the Digital Elevation Model (DEM) files in AERMAP by computing the relief height of the DEM point relative to the height of the receptor and determining the slope. If the slope is less than 10%, the program goes to the next DEM point. If the slope is 10% or greater, the controlling hill height is updated if it is higher than the stored hill height.

In areas of complex terrain, AERMOD models the impact of terrain using the concept of the dividing streamline (Hc). As outlined in the AERMOD model formulation (USEPA, 2019) a plume embedded in the flow below Hc tends to remain horizontal; it might go around the hill or impact on it. A plume above Hc will ride over the hill. Associated with this is a tendency for the plume to be depressed toward the terrain surface, for the flow to speed up, and for vertical turbulent intensities to increase.

AERMOD model formulation states that the model "captures the effect of flow above and below the dividing streamline by weighting the plume concentration associated with two possible extreme states of the boundary layer (horizontal plume and terrain-following). The relative weighting of the two states depends on: 1) the degree of atmospheric stability; 2) the wind speed; and 3) the plume height relative to terrain. In stable conditions, the horizontal plume "dominates" and is given greater weight while in neutral and unstable conditions, the plume traveling over the terrain is more heavily weighted" (USEPA, 2019).

The modelling domain is an area of generally moderate terrain to the east, north and west with complex terrain rising in the south due to the proximity of the Dublin Mountains within 5-10km of the site boundary.

10.2.3.2 Meteorological Data

The selection of the appropriate meteorological data has followed the guidance issued by the USEPA (USEPA, 2000a). Casement Aerodrome meteorological station, which is located approximately 9.5 km northwest of the site, collects data in the correct format and has data capture collection of greater than 90% for the required parameters. Long-term hourly observations at Casement Aerodrome meteorological station provide an indication of the prevailing wind conditions for the region (see Figure 10-1). Results indicate that the prevailing wind direction is from a westerly to south-westerly direction over the period 2016 - 2020. The mean wind speed is 5.5 m/s over the period 1981 – 2010. The data is provided by Met Éireann (source www.met.ie).

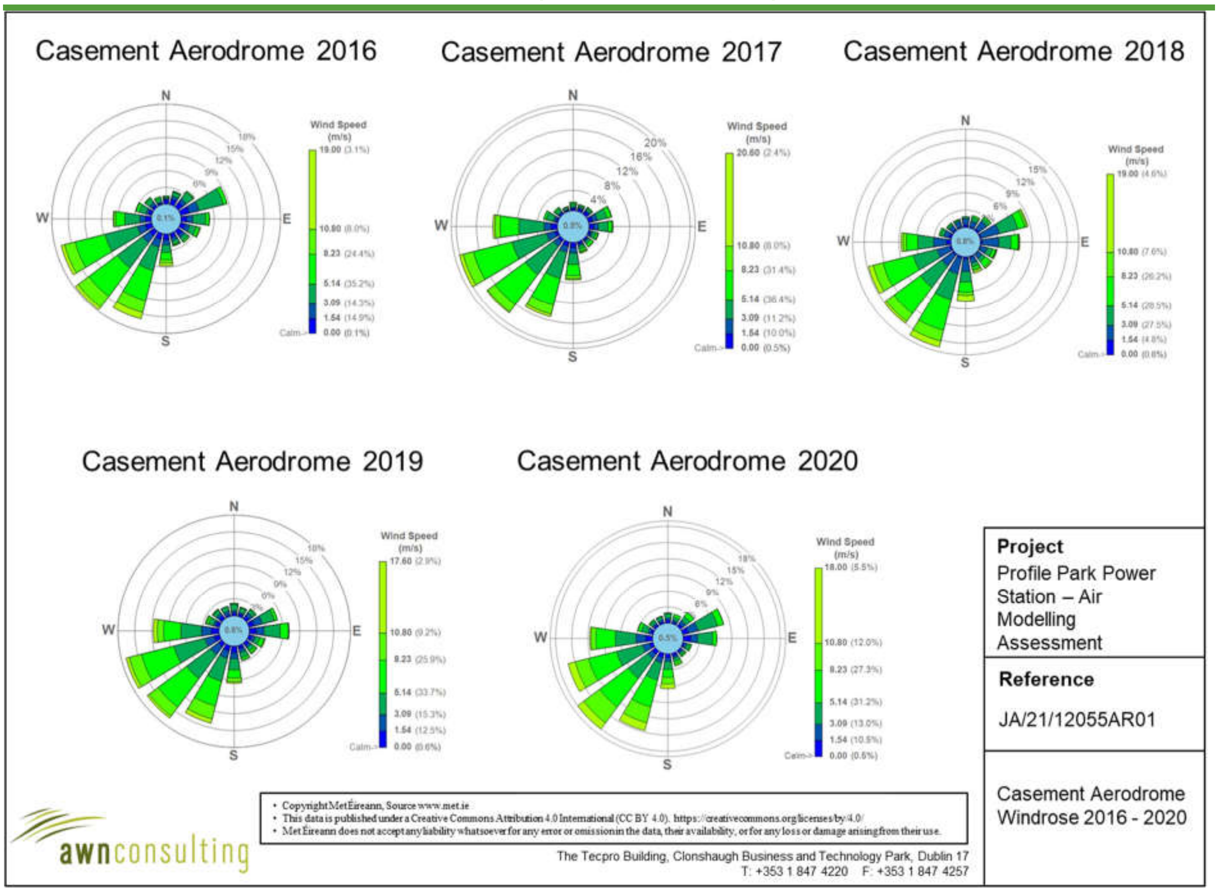

Figure 10-1: Casement Aerodrome Meteorological Station Windrose 2016 to 2020 (Met Éireann 2021)

10.2.3.3 Geophysical Considerations

AERMOD simulates the dispersion process using planetary boundary layer (PBL) scaling theory (USEPA, 2019). PBL depth and the dispersion of pollutants within this layer are influenced by specific surface characteristics such as surface roughness, albedo and the availability of surface moisture. Surface roughness is a measure of the aerodynamic roughness of the surface and is related to the height of the roughness element. Albedo is a measure of the reflectivity of the surface whilst the Bowen ratio is a measure of the availability of surface moisture.

AERMOD incorporates a meteorological pre-processor AERMET (USEPA, 2018) to enable the calculation of the appropriate parameters. The AERMET meteorological pre-processor requires the input of surface characteristics, including surface roughness (z_0), Bowen Ratio and albedo by sector and season, as well as hourly observations of wind speed, wind direction, cloud cover, and temperature. The values of albedo, Bowen Ratio and surface roughness depend on land-use type (e.g., urban, cultivated land etc.) and vary with seasons and wind direction. The assessment of appropriate land-use type was carried out to a distance of 10 km from the meteorological station for Bowen Ratio and albedo and to a distance of 1 km for surface roughness in line with USEPA recommendations (USEPA, 2014, 2018).

In relation to AERMOD, detailed guidance for calculating the relevant surface parameters has been published (ADEC, 2008). The most pertinent features are:

- The surface characteristics should be those of the meteorological site (Casement Aerodrome Meteorological Station) rather than the installation;
- Surface roughness should use a default 1 km radius upwind of the meteorological tower and should be based on an inverse-distance weighted geometric mean. If land use varies around the site, the land use should be sub-divided by sectors with a minimum sector size of 30º;
- Bowen ratio and albedo should be based on a 10 km grid. The Bowen ratio should be based on an un-weighted geometric mean. The albedo should be based on a simple un-weighted arithmetic mean.

AERMOD has an associated pre-processor, AERSURFACE (USEPA, 2014), which has representative values for these parameters depending on land use type. The AERSURFACE pre-processor currently only accepts NLCD92 land use data which covers the USA. Thus, manual input of surface parameters is necessary when modelling in Ireland. Ordnance survey discovery maps (1:50,000) and digital maps such as those provided by the EPA, National Parks and Wildlife Service (NPWS) and Google Earth® are useful in determining the relevant land use in the region of the meteorological station. The Alaska Department of Environmental Conservation has issued a guidance note for the manual calculation of geometric mean for surface roughness and Bowen ratio for use in AERMET (ADEC, 2008). This approach has been applied to the current site.

10.2.3.4 Building Downwash

When modelling emissions from an industrial installation, stacks which are relatively short can be subjected to additional turbulence due to the presence of nearby buildings. Buildings are considered nearby if they are within five times the lesser of the building height or maximum projected building width (but not greater than 800 m).

The USEPA has defined the "Good Engineering Practice" (GEP) stack height as the building height plus 1.5 times the lesser of the building height or maximum projected building width. It is generally considered unlikely that building downwash will occur when stacks are at or greater than GEP (USEPA, 1985).

When stacks are less than this height, building downwash will tend to occur. As the wind approaches a building it is forced upwards and around the building leading to the formation of turbulent eddies. In the lee of the building these eddies will lead to downward mixing (reduced plume centreline and reduced plume rise) and the creation of a cavity zone (near wake) where re-circulation of the air can occur. Plumes released from short stacks may be entrained in this airflow leading to higher ground level concentrations than in the absence of the building.

The Plume Rise Model Enhancements (PRIME) (Paine & Lew, 1997, Schulman et al., 1998) plume rise and building downwash algorithms, which calculates the impact of buildings on plume rise and dispersion, have been incorporated into AERMOD. The building input processor BPIP-PRIME produces the parameters which are required in order to run PRIME. The model takes into account the position of each stack relative to each relevant building and the projected shape of each building for 36 wind directions (at 10° intervals). The model determines the change in plume centreline location with downwind distance based on the slope of the mean streamlines and coupled to a numerical plume rise model (Paine & lew, 1997).

10.2.3.5 Process Emissions

Dispersion modelling of NO_2 has been undertaken to determine the following:

- A scenario with six individual stacks from the proposed power plant;
- A scenario with one pseudo stack from the proposed power plant;
- Process contributions from the proposed plant for each scenario; and
- Cumulative effects (proposed power plant + Pfizer + Takeda + Grange BackUp Power + background concentrations) for each scenario.

Information on the gas fired engines to be used at thew power plant were provided by the engine supplier. Information on the Pfizer, Takeda and Grange backup power IE Licensed facilities in the area has been taken from their IE Licences and from Grange Backup Power Air Dispersion Modelling Report (document ID: IE0311313-22-RP-0005). For the purposes of this assessment all plants were assumed to be operating at full load continuously all year round.

The physical stack information for the proposed power plant emission points and existing air emission points is provided in Table 10-2 and the process emission information used in the dispersion model for the emission points operating on natural gas is shown in

Table 10-2: Physical Stack Information for the Proposed Profile Park Power Plant Emission Points and Existing Air Emission Points

Stack Reference	Stack Co-ordinates (UTM) Note A, B	Height Above Ground Level (m) Note B	Exit Diameter (m) Note B
Profile Park Individual Stacks	670355 E 5910344 N 670359 E 5910346 N 670357 E 5910340 N 670361 E 5910342 N 670359 E 5910367 N 670362 E 5910338 N	31.8	1.704
Profile Park Pseudo Stack	670359 E 5910341 N	31.8	4.17
Takeda Facility	669804 E 5911743 N	15	0.56
Grange Backup Power Stack 1	670173 E 5911957 N	25	2.77
Grange Backup Power Stack 2	670148 E 5911958 N	25	3.2
Pfizer Stack 1	670750 E 5911546 N	45	0.85
Pfizer Stack 2	670751 E 5911544 N	45	0.85
Pfizer Stack 3	670752 E 5911543 N	45	0.85
Pfizer Stack 4	670753 E 5911543 N	45	0.85
Pfizer Stack 5	670752 E 5911546 N	45	2.0

Note A Stack locations are in UTM Zone 29 and are approximate to nearest 5m.

Note B Taken from IE Licences and Grange Backup Power Air Dispersion Modelling Report (document ID: IE0311313-22-RP-0005).

Table 10-3: Process Emissions Information for the Proposed Profile Park Power Plant Emission Points and Existing Air Emission Points

Stack Reference	Temp (K) Note A	Volume Flow (Nm^3/hr)	Exit Velocity (m/sec actual) Note A	NO_X Mass Emission (g/s) Note A, B
Profile Park Individual Stacks	595.2	133,862	29.54	2.79
Profile Park Pseudo Stack	595.2	803,174	29.54	16.73
Takeda Facility	533.15	1,181,880	12.88	0.23
Grange Backup Power Stack 1	663.15	594,360	27.6	6.72
Grange Backup Power Stack 2	663.15	594,360	27.6	6.72
Pfizer Stack 1	441	22,320	10.9	0.29
Pfizer Stack 2	441	22,320	10.9	0.29
Pfizer Stack 3	441	22,320	10.9	0.29
Pfizer Stack 4	441	95,040	9.15	1.33
Pfizer Stack 5	441	95,040	9.15	1.33

Note A Taken from Grange Backup Power Air Dispersion Modelling Report (document ID: IE0311313-22-RP-0005).

Note B Emissions from Profile Park Power plant engines staring-up on diesel oil have been scoped out of modelling as they will occur for 5 minutes or less.

10.2.3.6 Other Than Normal Operating Conditions (OTNOC)

As per Section 3.1.16 of the Best Available Techniques (BAT) Reference Document for Large Combustion Plants (2017), it is important to identify OTNOC as they may affect the level of emissions and can include, among others, periods corresponding to the use of emergency fuels for a very short period due to the lack of availability of normally used fuels (serious shortage or sudden interruption) or to disturbances in fuel feeding.

Dispersion modelling of OTNOC has been scoped out of this assessment due to their infrequent occurrence. However, for the emissions that do occur a management plan as part of the environmental management system may be implemented to reduce these emissions, and can include measures such as:

- appropriate design of systems considered to cause OTNOC and that may have an impact on emissions (e.g. low load design concepts for reducing the minimum start-up and shutdown loads for stable generation in gas turbines);
- drawing up of specific preventive maintenance plans for these relevant systems, where needed;
- review and recording of emissions caused by OTNOC;
- implementation of corrective actions to return to normal operating conditions (NOC);
- periodic assessment of overall emissions during OTNOC (e.g. frequency of events, duration, emissions quantification/estimation) and implementation of corrective actions if necessary.

10.2.4 CLIMATE METHODOLOGY

The impact of the construction phase of the development on climate is determined by a qualitative assessment of the nature, scale and duration of greenhouse gas generating construction activities associated with the proposed power plant.

The proposed power plant, as an electricity provider, forms part of the EU-wide Emission Trading Scheme (ETS) and thus greenhouse gas emission from this electricity generator is not included when determining compliance with Ireland's targeted 20% reduction in the non-ETS sector by 2020 i.e. electricity associated greenhouse gas emissions will not count towards the Effort Sharing Decision (406/2009/EC) target (European Parliament and Council of Europe, 2009).

In terms of future obligations under the "*2030 Climate and Energy Policy Framework*", the European Council (EC, 2014) endorsed a binding EU target of at least a 40% domestic reduction in greenhouse gas emissions by 2030 compared to 1990. The target will be delivered collectively by the EU in the most cost-effective manner possible, with the reductions in the ETS sector amounting to 43% by 2030 compared to 2005. Thus, the EU policy of operating the ETS (on an EU-wide basis) for large industrial emitters including electricity generators will continue up to 2030 as a minimum and thus electricity generation will have no impact on the non-ETS targets up to 2030.

10.2.5 CLIMATE AGREEMENTS

Ireland is party to both the United Nations Framework Convention on Climate Change (UNFCCC) and the Kyoto Protocol. The Paris Agreement, which entered into force in 2016, is an important milestone in terms of international climate change agreements and includes an aim of limiting global temperature increases to no more than 2°C above pre-industrial levels with efforts to limit this rise to 1.5°C. The aim is to limit global GHG emissions to 40 gigatonnes as soon as possible whilst acknowledging that peaking of GHG emissions will take longer for developing countries. Contributions to GHG emissions will be based on Intended Nationally Determined Contributions (INDCs) which will form the foundation for climate action post 2020. Significant progress was also made in the Paris Agreement on elevating adaption onto the same level as action to cut and curb emissions.

In order to meet the commitments under the Paris Agreement, the EU enacted *Regulation (EU) 2018/842 on binding annual greenhouse gas emission reductions by Member States from 2021 to 2030 contributing to climate action to meet commitments under the Paris Agreement and amending Regulation (EU) No. 525/2013* (the Regulation). The Regulation aims to deliver, collectively by the EU in the most cost-effective manner possible, reductions in GHG emissions from the Emission Trading Scheme (ETS) and non-ETS sectors amounting to 43% and 30%, respectively, by 2030 compared to 2005. Ireland's obligation under the Regulation is a 30% reduction in non-ETS greenhouse gas emissions by 2030 relative to its 2005 levels.

In 2015, the Climate Action and Low Carbon Development Act 2015 (No. 46 of 2015) (Government of Ireland, 2015) was enacted (the Act). The purpose of the Act was to enable Ireland *'to pursue, and achieve, the transition to a low carbon, climate resilient and environmentally sustainable economy by the end of the year 2050'* (3.(1) of No. 46 of 2015). This is referred to in the Act as the 'national transition objective'.

The Act makes provision for a national mitigation plan, and a national adaptation framework. In addition, the Act provided for the establishment of the Climate Change Advisory Council with the function to advise and make recommendations on the preparation of the national mitigation and adaptation plans and compliance with existing climate obligations.

The *Climate Action Plan* (CAP) (Government of Ireland, 2019), published in June 2019, outlines the current status across key sectors including Electricity, Transport, Built Environment, Industry and Agriculture and outlines the various broadscale measures required for each sector to achieve ambitious decarbonisation targets. The CAP also details the required governance arrangements for implementation including carbon-proofing of policies, establishment of carbon budgets, a strengthened Climate Change Advisory Council and greater accountability to the Oireachtas. The CAP has set a built environment sector reduction target of 40 - 45% relative to 2030 pre-NDP (National Development Plan) projections.

Following on from Ireland declaring a climate and biodiversity emergency in May 2019 and the European Parliament approving a resolution declaring a climate and environment emergency in Europe in November 2019, the Government approved the publication of the General Scheme for the Climate Action (Amendment) Bill 2019 in December 2019 (Government of Ireland, 2020a). The General Scheme was prepared for the purposes of giving statutory effect to the core objectives stated within the CAP. The Climate Action and Low Carbon Development (Amendment) Bill 2021 (the Bill) was published in March 2021.

The purpose of the 2021 Climate Bill is to provide for the approval of plans '*for the purpose of pursuing the transition to a climate resilient and climate neutral economy by the end of the year 2050*'. The 2021 Climate Bill will also '*provide for carbon budgets and a decarbonisation target range for certain sectors of the economy*'. The 2021 Climate Bill removes any reference to a national mitigation plan and instead refers to both the Climate Action Plan, as published in 2019, and a series of National Long Term Climate Action Strategies. In addition, the Environment Minister shall request each local authority to make a 'local authority climate action plan' lasting five years and to specify the mitigation measures and the adaptation measures to be adopted by the local authority. The Bill has set a target of a 51% reduction in the total amount of greenhouse gases over the course of the first two carbon periods ending 31 December 2030 relative to 2018 annual emissions. The 2021 Climate Bill defines the carbon budget as 'the total amount of greenhouse gas emissions that are permitted during the budget period'.

Individual county councils in Ireland have also published their own Climate Change Strategies which outline the specific climate objectives for that local authority and associated actions to achieve the objectives. South Dublin's County Council's Climate Change Action Plan 2019 - 2024 was published by South Dublin County Council in 2019 and includes the following actions which relate to the Energy and Buildings:

- Energy Planning – E1: "Create Energy Master Plan for the Dublin Region.";
- Energy Planning – E4: "Evidence-based Climate Change Chapter in County Development Plan 2022-2028."; and
- Research & Innovation – E20: "Identify sites for trialling renewable energy projects, including solar PV and geothermal technologies."

10.3 BASELINE ENVIRONMENT

10.3.1 BACKGROUND CONCENTRATIONS OF POLLUTANTS

Air quality monitoring programs have been undertaken in recent years by the EPA and Local Authorities (EPA, 2020, 2021). The most recent annual report on air quality "Air Quality in Ireland 2019" (EPA, 2020), details the range and scope of monitoring undertaken throughout Ireland. As part of the implementation of the Framework Directive on Air Quality (1996/62/EC), four air quality zones have been defined in Ireland for air quality management and assessment purposes (EPA, 2020). 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, which represents rural Ireland but also includes all towns with a population of less than 15,000 is defined as Zone D. In terms of air monitoring, Profile Park is categorised as Zone A (EPA, 2020).

With regard to NO_2, continuous monitoring data from the EPA (EPA, 2020), at suburban (non-road) Zone A locations in Rathmines, Ringsend, Dun Laoghaire, Swords and Ballyfermot show that current levels of NO_2 are below both the annual and 1-hour limit values, with annual average levels ranging from 15 – 24 µg/m^3 in 2019 (see Table 10-4). Sufficient data is available for the stations in Rathmines, Dún Laoghaire, Swords, Ballyfermot and Ringsend and to observe the long-term trend since 2015 (EPA, 2020) (see Table 10-4), with results ranging from 14 – 24 µg/m^3 and few exceedances of the one-hour limit value, normally transport related, and with an average annual mean for Swords for this period (2015 - 2019) of 14.7 µg/m^3. Based on these results, and the highest concentration recorded at Swords between 2015 – 2019, a conservative estimate of the background NO_2 concentration in the region of the proposed power plant in 2019 is 16 µg/m^3.

Table 10-4: Annual Mean NO_2 Concentrations In Representative Zone A Locations 2015 - 2019 (µg/m^3)

Year	Rathmines	Dún Laoghaire	Swords	Ballyfermot	Ringsend
2015	18	16	13	16	-
2016	20	19	16	17	-
2017	17	17	14	17	22
2018	20	19	16	17	27
2019	22	15	15	20	24
Average	**19.4**	**17.1**	**14.7**	**17.4**	**24.3**

In summary, existing baseline levels of the pollutants based on extensive long-term data from the EPA are expected to be below ambient air quality limit values in the vicinity of the proposed power plant.

The Ozone Limiting Method (OLM) was used to model NO_2 concentrations. The OLM is a regulatory option in AERMOD which calculates ambient NO_2 concentrations by applying a background ozone concentration and an in-stack NO_2/NOX ratio to predicted NO_X concentrations. An in-stack NO_2/NO_X ratio of 0.1 and a conservative ozone value of 55 µg/m^3 was used in the assessment based on the maximum annual average levels recorded over a 5-year period (2015 – 2019) at EPA Zone A locations.

In relation to the annual averages, the ambient background concentration was added directly to the process concentration.

In relation to the short-term peak concentrations, for NO_2 these were assumed to have an ambient background concentration of twice the annual mean background concentration.

10.4 POTENTIAL FOR SIGNIFICANT EFFECTS

10.4.1 DO NOTHING SCENARIO

If the power plant does not proceed, the site and surrounding areas would remain as they currently are (i.e. artificial surfaces made up of industrial, commercial and transport units). The site would fall under the industrial management at Profile Park. This would result in no effect to air quality or climate. However given the zoning of the site it is likely that another industrial or commercial development would occur on the site.

10.4.2 CONSTRUCTION PHASE – AIR QUALITY

The greatest potential impact on air quality during the construction phase of the proposed power plant is from construction dust emissions as a result of excavation works, infilling and landscaping activities and storage of soil in stockpiles. This leads to the potential for nuisance dust. While construction dust tends to be deposited within 350 m of a construction site, the majority of the deposition occurs within the first 50 m (IAQM, 2014). The extent of any dust generation depends on the nature of the dust (soils, peat, sands, gravels, silts etc.) and the nature of the construction activity. In addition, the potential for dust dispersion and deposition depends on local meteorological factors such as rainfall, wind speed and wind direction.

Initial commissioning activities will involve testing of the power plant engines with low sulphur diesel oil on site i.e. the first testing sequence will be commissioning of the standby generators.

10.4.3 CONSTRUCTION PHASE – CLIMATE

Construction traffic is be expected to be the dominant source of greenhouse gas emissions as a result of the proposed power plant. Construction vehicles and machinery will give rise to CO_2 and N_2O emissions during construction of the proposed power plant. 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.

10.4.4 OPERATIONAL PHASE – AIR QUALITY

The potential impact to air quality during the operational phase of the proposed power plant is a breach of the ambient air quality standards as a result of air emissions from the power plant engines. An iterative stack height determination was undertaken as part of the air dispersion modelling study to ensure that an adequate release height was selected for all emission points to aid dispersion of the plume and ensure compliance with the ambient air quality limit values beyond the site boundary.

The back-up diesel oil will only be used in the event of a power failure at the site. During normal operations at the facility, the electricity will be supplied from the national grid. Electricity to operate the facility will be purchased from the available energy suppliers including power plants and renewable generation sources such as wind power. The Electricity Supplier for the site currently holds a Commission for Regulation of Utilities (CRU) certified fuel mix disclosure, guaranteeing every megawatt-hour (MWh) that they supply in the market is generated from renewable sources.

10.4.5 OPERATIONAL PHASE – CLIMATE

The potential impact to climate during the operational phase of the proposed power plant is an increase in GHG emissions associated with the generation of electricity.

10.5 ASSESSMENT OF SIGNIFICANT EFFECTS

10.5.1 CONSTRUCTION PHASE

10.5.1.1 Air Quality

It is important to note that the potential effects associated with the construction phase of the proposed power plant are short-term in nature. When the dust mitigation measures detailed in the mitigation section of this chapter 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.

10.5.1.2 Climate

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. Based on the scale and temporary nature of the construction works and the intermittent use of equipment, the potential impact on climate change and transboundary pollution from the proposed power plant is deemed to *be short-term, negative and imperceptible in relation to Ireland's obligations under the EU 2030* target.

10.5.1.3 Human Health

Best practice mitigation measures are proposed for the construction phase of the proposed power plant 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 power plant 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, the impact of *construction of the proposed power plant is likely to be neutral, short-term and imperceptible with respect* to human health.

10.5.2 OPERATIONAL PHASE

10.5.2.1 Air Quality

The NO_2 modelling results for the power plant individual stacks scenario are detailed in Table 10-5. The NO_2 modelling results for the pseudo stack scenario can be found in Appendix 10.3. The results indicate that the ambient ground level concentrations are below the relevant air quality limit values for NO_2. Emissions from the facility including background lead to an ambient NO_2 concentration which is 74% of the maximum 1 hour limit value (measured as a 99.8th%ile) for the worst-case year modelled (2020) and 70% of the annual limit value at the worst-case off-site receptor for the worst-case year modelled (2018).

Table 10-5: Modelled NO_2 ($\mu g/m^3$) Concentrations for the Profile Park Power plant

Pollutant/ Year	Averaging Period	Process Contribution NO_2 ($\mu g/m^3$)	Background Concentration ($\mu g/m^3$)Note A	Predicted Emission Concentration - PEC NO_2 ($\mu g/Nm^3$)	Limit Values ($\mu g/Nm^3$)Note B	PEC as a % of Limit Value
NO_2/2016	Annual Mean	8.0	16	24.0	40	60%
	99.8th%ile of 1-hr means	106.8	32	138.8	200	69%
NO_2/2017	Annual Mean	6.6	16	22.6	40	57%
	99.8th%ile of 1-hr means	105.3	32	137.3	200	69%
NO_2/2018	Annual Mean	7.8	16	23.8	40	59%
	99.8th%ile of 1-hr means	115.9	32	147.9	200	74%
NO_2/2019	Annual Mean	7.6	16	23.6	40	59%
	99.8th%ile of 1-hr means	105.3	32	137.3	200	69%
NO_2/2020	Annual Mean	12.0	16	28.0	40	70%
	99.8th%ile of 1-hr means	106.3	32	138.3	200	69%

Note A The short-term peaks are assumed to have an ambient background concentration of twice the annual mean background concentration.
Note B Air Quality Standards 2011 (from EU Directive 2008/50/EC and S.I. 180 of 2011).

The geographical variations in ground level NO_2 concentrations beyond the facility boundary for the worst-case years modelled are illustrated as concentration contours in Figure 10-2 and *Figure 10-3*. 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.

The operational phase impact of the proposed power plant is considered long-term, localised, negative and slight.

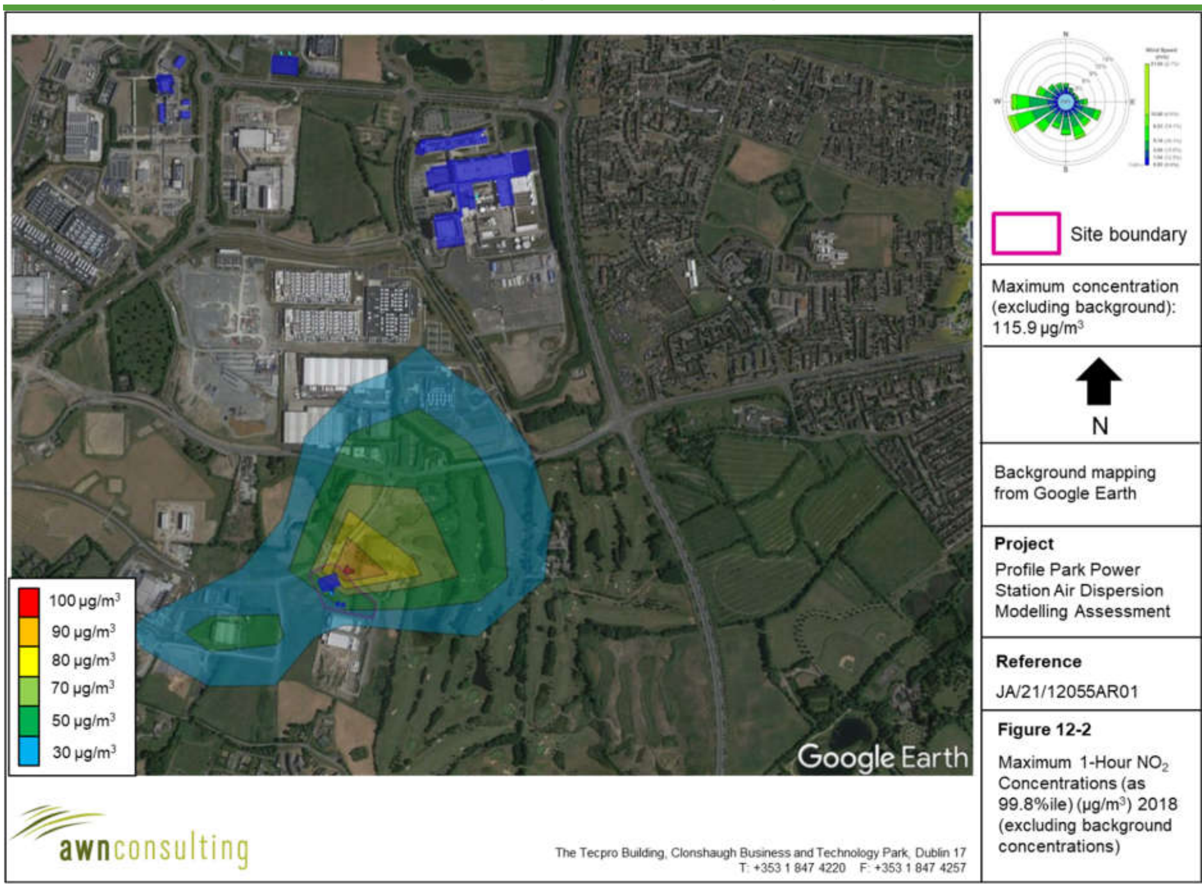

Figure 10-2: Profile Park Power Plant: Predicted NO_2 99.8th Percentile of Hourly Concentrations (2018)

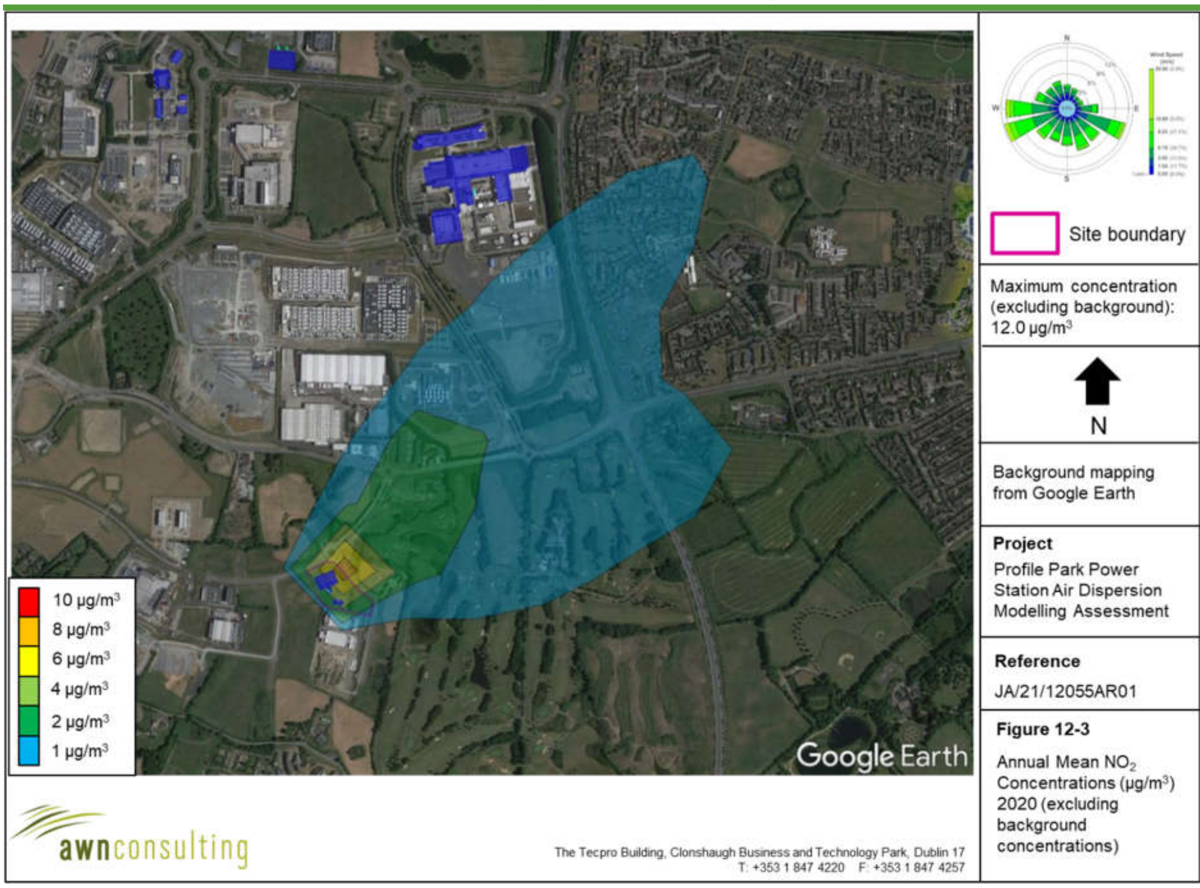

Figure 10-3: Profile Park Power Plant: Predicted Annual Mean NO_2 Concentrations (2020)

10.5.2.2 Climate

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 30% 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 CO2eq) 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 30% reduction in the non-ETS sector. In addition, on an EU-wide basis, where the ETS market in 2018 is approximately 1,655 million tonnes CO2eq, the impact of the emissions associated with the proposed power plant will be less than 0.03% of the total EU-wide ETS market which is imperceptible.

In terms of wider energy policy, as outlined in the EPA publication *"Ireland's Greenhouse Gas Projections 2019-2040"* (EPA, 2020e) under the With Additional Measures scenario, emissions from the energy industries sector are projected to decrease by 34% to 7 Mt CO2eq over the period 2019 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 36.3% 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 two peat stations are assumed to run on 100% peat to the end of 2020 but PSO support finishes at the end of 2019. For 2020 the operation of the peat plants is determined by the electricity market. The third peat station operates to the end of 2023 with 30% co-firing;
- In this scenario the Moneypoint power plant 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 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". (EPA, 2020e)

As emissions from the proposed power plant 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 0.03% of the total EU-wide ETS market which is not significant and thus an EU-wide cumulative assessment is not merited.

The direct CO_2 emissions from electricity to operate the facility will not be significant in relation to Ireland's national annual CO_2 emissions. A Report titled 'Energy Related CO_2 Emissions In Ireland 2005 – 2018 (2019 Report)' published by the Sustainable Energy Authority of Ireland (SEAI, 2020) states the average CO_2 emission factor for electricity generated from natural gas in Ireland was 366 gCO_2/kWh in 2018. On the basis that the proposed power plant will generate 125 MW of power this equates to 1,095 GWh annually. This translates to approximately 400,000 tonnes of CO_2eq per year. This will have a *direct*, *long-term*, *negative* and *slight* impact on climate.

10.5.2.3 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 $PM_{2.5}$

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Natural gas will be used to generate 125 MW by the power plant. The NO_X emissions associated with this electricity over the course of one year (i.e. 1,095 GWh based on 125 MW for 8,760 hours per annum) will equate to 365 tonnes per annum which is 0.56% of the National Emission Ceiling limit for Ireland from 2020 onwards. Similarly, SO_2 emissions associated this electricity over the course of one year (1,095 GWh) will equate to 138 tonnes per annum which is 0.33% of the National Emission Ceiling limit for Ireland from 2020. Additionally, NMVOC emissions associated this electricity over the course of one year (1,095 GWh) will equate to 415 tonnes per annum which is 0.75% 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 plant are *direct*, *long-term*, *negative* and *not significant* with regards to regional air quality.

10.5.2.4 Human Health

Air dispersion modelling was undertaken to assess the impact of the proposed power plant 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 are compliant with all National and EU ambient air quality limit values and, therefore, will not result in a significant impact on human health. In relation to the spatial extent of air quality effects from the site, ambient concentrations will decrease significantly with distance from the site boundary. Further details of the potential effects on human health associated with the proposed power plant are discussed in Chapter 7 of this EIA Report.

10.5.2.5 Impact of NO_X on Sensitive Ecosystems

The impact of emissions of NO_X from the proposed plant and existing emission points on ambient ground level concentrations within the Dodder Valley pNHA, Glenasmole Valley SAC/pNHA, Grand Canal pNHA, Kilteel Wood pNHA, Liffey Valley pNHA, Lugmore Glen pNHA, Royal Canal pNHA, Rye Water Valley/Carton SAC/pNHA, Slade of Saggart and Crooksling Glen pNHA and Wicklow Mountains SPA/SAC was assessed using AERMOD. 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.

As the sections of the designated sites which are near the power plant are within an urban setting and, more specifically, an industrial area, the limit value for NO_X for the protection of ecosystems is not technically applicable. Regardless, the annual average concentrations for

NO_X from all emission points from the power plant were predicted at receptors within the designated sites for all five years of meteorological data modelled (2016 – 2020). The receptor spacing ranged from 25 m to 100 m with 8,360 discrete receptors modelled in total within the sensitive ecosystems.

The Profile Park Power plant NO_X modelling results are detailed in Table 10-6. Emissions from the facility lead to an ambient NO_X concentration (excluding background) which ranges from 2 – 3% of the annual limit value at the worst-case location within the designated sites over the five years of meteorological data modelled. No background value has been added to the results as the background concentration of NO_X exceeds the limit value for the protection of ecosystems at most urban and suburban locations in Dublin based on a review of the EPA NO_X monitoring data (EPA, 2019 and 2020). As previously discussed, 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. Therefore, the NO_X limit value is not applicable at Profile Park due to the urban and industrial nature of the environs of the proposed site. In addition, modelling results based on conservative assumptions indicate that the proposed power plant in isolation will have an imperceptible impact on NO_X concentrations within the sensitive ecosystems contributing at most 3% of the limit value at the worst-case location in the worst-case year modelled.

Table 10-6: Modelled NO_X Concentrations (μg/m³) excluding background within the Dodder Valley pNHA, Glenasmole Valley SAC/pNHA, Grand Canal pNHA, Kilteel Wood pNHA, Liffey Valley pNHA, Lugmore Glen pNHA, Royal Canal pNHA, Rye Water Valley/Carton SAC/pNHA, Slade of Saggart and Crooksling Glen pNHA and Wicklow Mountains SPA/SAC for all Emission Points at Profile Park Power plant

Pollutant/ Year	Averaging Period	Process Contribution (μg/m³)	Limit Value (μg/Nm³) Note A	Process Contribution as a % of Limit Value
NO_x/2016	Annual Mean	0.71	30	2%
NO_x/2017	Annual Mean	0.79	30	3%
NO_x/2018	Annual Mean	0.66	30	2%
NO_x/2019	Annual Mean	0.71	30	2%
NO_x/2020	Annual Mean	0.94	30	3%

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

10.6 MITIGATION AND MONITORING MEASURES

10.6.1 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 develop a workable and transparent dust control strategy, the following management plan has been formulated by 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' (IAQM, 2014);
- 'Planning Advice Note PAN50 Annex B: Controlling The Environmental Effects Of Surface Mineral Workings Annex B: The Control of Dust at Surface Mineral Workings' (The Scottish Office, 1996);

- 'Controlling the Environmental Effects of Recycled and Secondary Aggregates Production Good Practice Guidance' (UK Office of Deputy Prime Minister, 2002);
- 'Controlling Particles, Vapours & Noise Pollution From Construction Sites' (BRE, 2003);
- 'Fugitive Dust Technical Information Document for the Best Available Control Measures' (USEPA, 1997); and
- 'Compilation of Air Pollutant Emission Factors, AP-42, Fifth Edition' (periodically updated) (USEPA, 1986).

The construction phase is predicted to have a 'Negligible to Low Risk' in terms of dust soiling and PM_{10} effects with no mitigation in place. Best practice mitigation measures for the proposed power plant as outlined in guidance from the IAQM are presented below. These mitigation measures should be incorporated into the proposed power plant's Construction Environment Management Plan (CEMP).

- Communication and Site Management
  - Display the name and contact details of person(s) accountable for air quality and dust issues on the site boundary;
  - Display the head or regional office contact information; and
  - It is recommended that community engagement be undertaken before works commence on site explaining the nature and duration of the works to local residents.
  - Record all dust and air quality complaints, identify causes and take appropriate measures to reduce emissions in a timely manner and record the measures taken;
  - Make a complaint log available to the local authority, when requested; and
  - Record any exceptional incidents that cause dust and or air emissions, either on or off site, and the action taken to resolve the situation in the log book.
- 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 requested; and
  - 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
- Preparing and maintaining the site
  - Plan site layout so that machinery and dust causing activities are located away from receptors as far as possible;
  - Erect solid screens or barriers around dusty activities or the construction site boundary that are at least as high as any stockpiles;
  - 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 reused on site, cover as described below;

  - Cover seed or fence stockpiles to prevent wind whipping;
  - 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; and
  - Impose and signpost a maximum-speed limit of 15mph on surfaced and 10mph on unpaved surface haul roads and work areas
- Operations
  - Only use cutting, grinding or sawing equipment fitted or in conjunction with suitable dust suppression techniques such as water sprays or local extraction;
  - 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 available; and
  - 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
  - Measures specific to construction
  - 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 controls measures are in place
- Measures specific to trackout;
  - Use water-assisted dust sweepers on the access and local roads to remove as necessary any material tracked out of site;
  - Avoid dry sweeping of large areas;
  - Ensure vehicles entering and leaving sites are covered to prevent escape of materials during transport;
  - 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
  - Implement a wheel washing system (with rumble grids to dislodge accumulated dust and mud prior to leaving the site where reasonably practicable)

10.6.2 OPERATIONAL PHASE

For the operational scenarios associated with the proposed power plant (either operating on natural gas or oil backup), no mitigation measures in addition to those already inherent to the design of the proposed plant are required. These inherent design features are considered within the dispersion modelling which demonstrates compliance with BAT associated emission levels, Industrial Emissions Directive (IED) emission limits and appropriate stack height. The stack heights of the proposed power plant emission points have been designed in an iterative fashion 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). It should be noted that the proposed power plant will be licensed by the EPA under the industrial emissions licensing process. The licence will state the limits for atmospheric emissions that the proposed power plant will be required to comply with.

10.7 CUMULATIVE EFFECTS

10.7.1 AIR QUALITY

The cumulative impact of NO_2 emissions from the power plant and emissions from Pfizer, Takeda and the Grange Castle BackUp Power Facility are detailed in Table 10-7 below. The results indicate that the ambient ground level concentrations are below the relevant air quality standards for NO_2. For the worst-case year, emissions from the sites lead to an ambient NO_2 concentration (including background) which is 74% of the maximum 1 hour limit value (measured as a 99.8th%ile) for the worst-case year modelled (2020) and 71% of the annual limit value at the worst-case off-site receptor for the worst-case year modelled (2018).

Table 10-7: Modelled NO_2 (µg/m^3) Concentrations for the Cumulative Assessment

Pollutant/ Year	Averaging Period	Process Contribution NO_2 (µg/m^3)	Background Concentration (µg/m^3)Note A	Predicted Emission Concentration - PEC NO_2 (µg/Nm^3)	Limit Values (µg/Nm^3)Note B	PEC as a % of Limit Value
NO_2/2016	Annual Mean	8.4	16	24.4	40	61%
	99.8th%ile of 1-hr means	106.8	32	138.8	200	69%
NO_2/2017	Annual Mean	6.9	16	22.9	40	57%
	99.8th%ile of 1-hr means	105.3	32	137.3	200	69%
NO_2/2018	Annual Mean	8.1	16	24.1	40	60%
	99.8th%ile of 1-hr means	115.9	32	147.9	200	74%
NO_2/2019	Annual Mean	7.9	16	23.9	40	60%
	99.8th%ile of 1-hr means	105.3	32	137.3	200	69%
NO_2/2020	Annual Mean	12.3	16	28.3	40	71%
	99.8th%ile of 1-hr means	106.3	32	138.3	200	69%

Note A The short-term peaks are assumed to have an ambient background concentration of twice the annual mean background concentration.

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

10.7.1.1 Impact of NO_X on Sensitive Ecosystems

The NO_X modelling results for the cumulative assessment are detailed in Table 10-8. Emissions from the facility lead to an ambient NO_X concentration (excluding background) which ranges from 15 – 18% 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 power plant in isolation will have a small impact on NO_X concentrations within the sensitive ecosystems contributing at most 18% of the limit value at the worst-case location in the worst-case year modelled.

Table 10-8: Modelled NO_X Concentrations (µg/m³) excluding background within the Dodder Valley pNHA, Glenasmole Valley SAC/pNHA, Grand Canal pNHA, Kilteel Wood pNHA, Liffey Valley pNHA, Lugmore Glen pNHA, Royal Canal pNHA, Rye Water Valley/Carton SAC/pNHA, Slade of Saggart and Crooksling Glen pNHA and Wicklow Mountains SPA/SAC for the Cumulative Assessment

Pollutant/ Year	Averaging Period	Process Contribution (µg/m³)	Limit Value (µg/Nm³) Note A	Process Contribution as a % of Limit Value
NO_x/2016	Annual Mean	4.65	30	15%
NO_x/2017	Annual Mean	5.45	30	18%
NO_x/2018	Annual Mean	4.74	30	16%
NO_x/2019	Annual Mean	5.02	30	17%
NO_x/2020	Annual Mean	5.54	30	18%

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

10.7.2 CLIMATE

Cumulative climatic effects due to the proposed power plant and nearby facilities are considered to be not significant.

10.8 DECOMMISSIONG

In relation to the decommissioning phase, the same measures as outlined for construction phase in Section 10.6.1 would apply.

10.9 RESIDUAL EFFECTS

Once the mitigation measures are implemented, the residual impact on air quality from the construction of the proposed power plant will be short-term and imperceptible and for the operational phases of the proposed power plant will be long-term, negative and slight.

The residual impact on climate from the construction of the proposed power plant will be short-term and imperceptible and for the operational phases of the plant will be long-term, negative and slight.