

Attachment 5.9

Appendix 8.13 Comparison of Predicted Emissions Profile with Existing WTE Facilities in Ireland

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Congener Profile

Operational data is available for the Carranstown waste to energy (WTE) facility over the period 2014 – 2026 for dioxin emission concentrations and congener profiles. The other operational WTE facility in Ireland (Dublin WTE facility) will not be expected to be similar as it employs a wet scrubber and thus this assessment has focussed on Carranstown WTE, which treats both hazardous and non-hazardous wastes and has a flue gas cleaning system comparable to the proposed development. As a result, the emissions would be expected to have a similar profile.

As shown in Table.1, the maximum emissions rate from the nearest comparable incinerator over the period 2014 – 2026 is 0.0078 ng/m³ based on the highest recorded individual value for each congener over a 12 year period. This is approximately 13% of the *BAT Conclusions for Waste Incineration (2019) for an Existing Plant* emission limit of 0.06 ng/m³ and 19.5% of the *BAT Conclusions for Waste Incineration (2019)* emission limit of 0.04 ng/Nm³ for new plants. The actual congener profile is shown in Figure.1 and shows that the congener profile varies relative to the default profile shown in Figure 8.26 of **Appendix 8.1** of the EIS.

Table.1 PCDD/PCDF Relative Emission Factors for Municipal Waste Incinerator (MB-Ref WS)

	Ringaskiddy WTE Emission Concentration (ng/m ³) Based On Maximum Level in IED	Ringaskiddy WTE Emission Factor (ng/sec) Based On Maximum Level in IED	Emission Concentration (ng/m ³) Based On Average Carranstown Data	Ringaskiddy WTE Emission Factor (ng/sec from stack) Based On Average Carranstown Data	Emission Concentration (ng/m ³) Based On Maximum Carranstown Data	Ringaskiddy WTE Emission Factor (ng/sec from stack) Based On Maximum Carranstown Data
Congener Group						
2,3,7,8-TCDD	0.0014	0.08091	0.000170	0.027145	0.000391	0.075176
1,2,3,7,8-PeCDD	0.0077	0.45007	0.000212	0.016966	0.001087	0.104481
1,2,3,4,7,8-HxCDD	0.0027	0.15590	0.000041	0.000656	0.000165	0.003181
1,2,3,6,7,8-HxCDD	0.0033	0.19054	0.000096	0.001541	0.000510	0.009817
1,2,3,7,8,9-HxCDD	0.0061	0.35613	0.000059	0.000948	0.000275	0.005288
1,2,3,4,6,7,8-HpCDD	0.0028	0.16454	0.000043	0.000068	0.000220	0.000423
OCDD	0.0005	0.02782	0.000007	0.000001	0.000026	0.000005
2,3,7,8-TCDF	0.0012	0.07321	0.000090	0.001445	0.000973	0.018710
1,2,3,7,8-PeCDF	0.0270	1.58311	0.000034	0.000271	0.000296	0.002850
2,3,4,7,8-PeCDF	0.0191	1.12206	0.000461	0.036852	0.002128	0.204635
1,2,3,4,7,8-HxCDF	0.0081	0.47757	0.000095	0.001511	0.000654	0.012570
1,2,3,6,7,8-HxCDF	0.0000	0.00000	0.000083	0.001325	0.000383	0.007368
1,2,3,7,8,9-HxCDF	0.0136	0.79963	0.000096	0.001540	0.000408	0.007837
2,3,4,6,7,8-HxCDF	0.0047	0.27458	0.000033	0.000530	0.000117	0.002243
1,2,3,4,6,7,8-HpCDF	0.0005	0.03168	0.000025	0.000039	0.000104	0.000200
1,2,3,4,7,8,9-HpCDF	0.0003	0.01680	0.000005	0.000007	0.000019	0.000036
OCDF	0.0014	0.08091	0.000001	0.000000	0.000006	0.000001
Total PCDD/PCDF	0.10 ng/m ³	5.86 ng/sec	0.00155 ng/m ³	0.0908 ng/sec	0.0078 ng/m ³	0.455 ng/sec

The ambient concentration of dioxins/furans, as detailed in Table.2 and Figure.2, based on the maximum emissions rate from Carranstown (adjusted to the Ringaskiddy volume flow) leads to an ambient level of 0.066 fg/m³ compared to the EIS result of 0.854 fg/m³ which is based on the maximum level detailed in the IED (2010/75/EC).

Table.2 Dispersion Model Summary of Combined Vapour and Particulate Concentrations – PCCD/PCDFs

Pollutant / Scenario	Annual Mean Background⁽¹⁾ (fg/m³)	Averaging Period	Process Contribution (fg/m³)	Predicted Emission Concentration (fg/Nm³)
PCCD/PCDFs / Maximum Operation Ringaskiddy EIS	31	Annual Average	0.854	31.85
PCCD/PCDFs / Maximum Carranstown Emission Rate	31	Annual Average	0.066	31.07
PCCD/PCDFs / Average Carranstown Emission Rate	31	Annual Average	0.013	31.01

Note 1 Baseline results for dioxins given as sum of cumulative effects (in the absence of the proposed facility) and baseline monitoring data as Non-detects = limit of detection.

The ambient deposition level of dioxins/furans (not including background), as detailed in Table.3 and Figure.3, based on the maximum emissions rate from Carranstown (adjusted to the Ringaskiddy volume flow) leads to an ambient deposition level of 0.108 pg/m²/day compared to the EIS result of 0.824 pg/m²/day which is based on the maximum level detailed in the IED (2010/75/EC).

Table.3 Deposition Model Summary of Combined Particulate & Gaseous Deposition Flux

Pollutant / Scenario	Averaging Period	Background Particulate Deposition Flux (pg/m²/day)	Process Contribution (pg/m²/day)	Predicted Total Particulate Deposition Flux (pg/m²/day)
PCCD/PCDFs / Maximum Operation Ringaskiddy EIS	Annual Average	30	0.824	30.82
PCCD/PCDFs / Maximum Carranstown Emission Rate	Annual Average	30	0.108	30.11
PCCD/PCDFs / Average Carranstown Emission Rate	Annual Average	30	0.021	30.02

Figure.1 Default Municipal Waste Incinerator Congener Profile Corrected To Maximum Carranstown Emission Rate Over 2014 - 2026

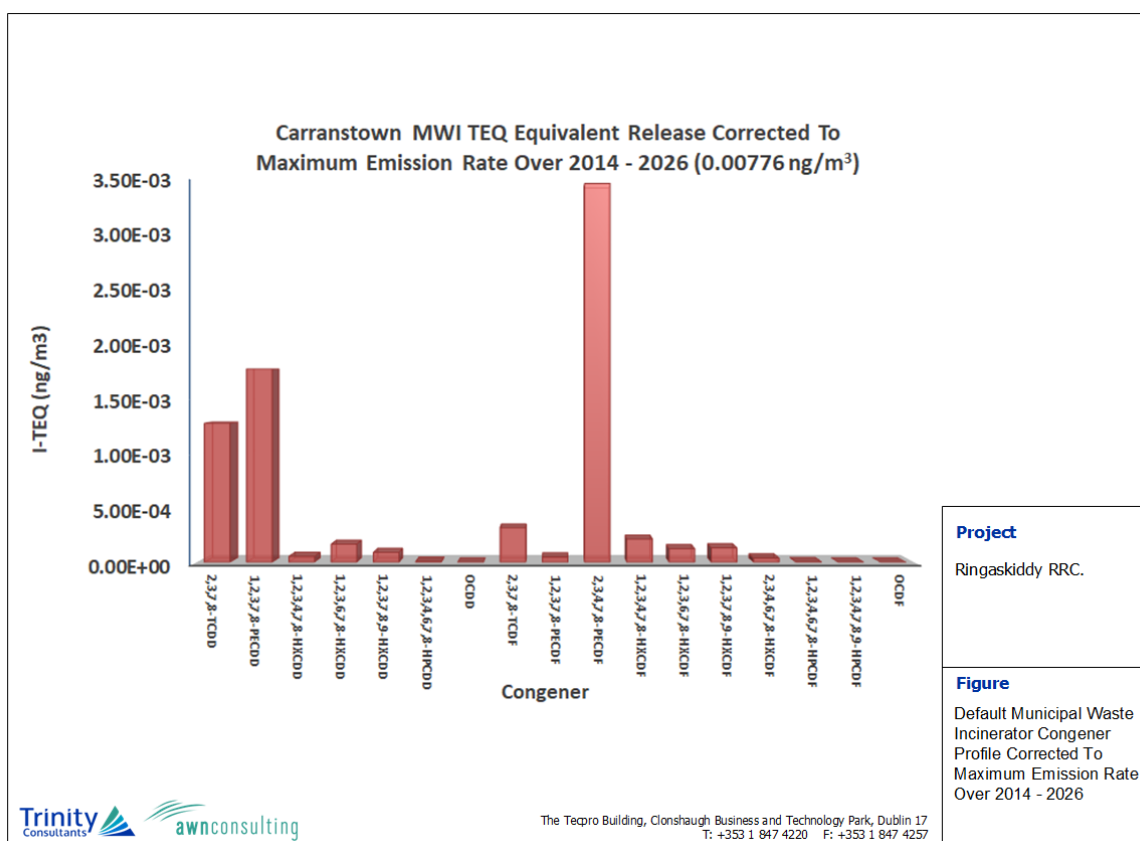


Figure.2 Vapour & Particulate Dioxin Congener Concentration (fg/m³) – Maximum Operations

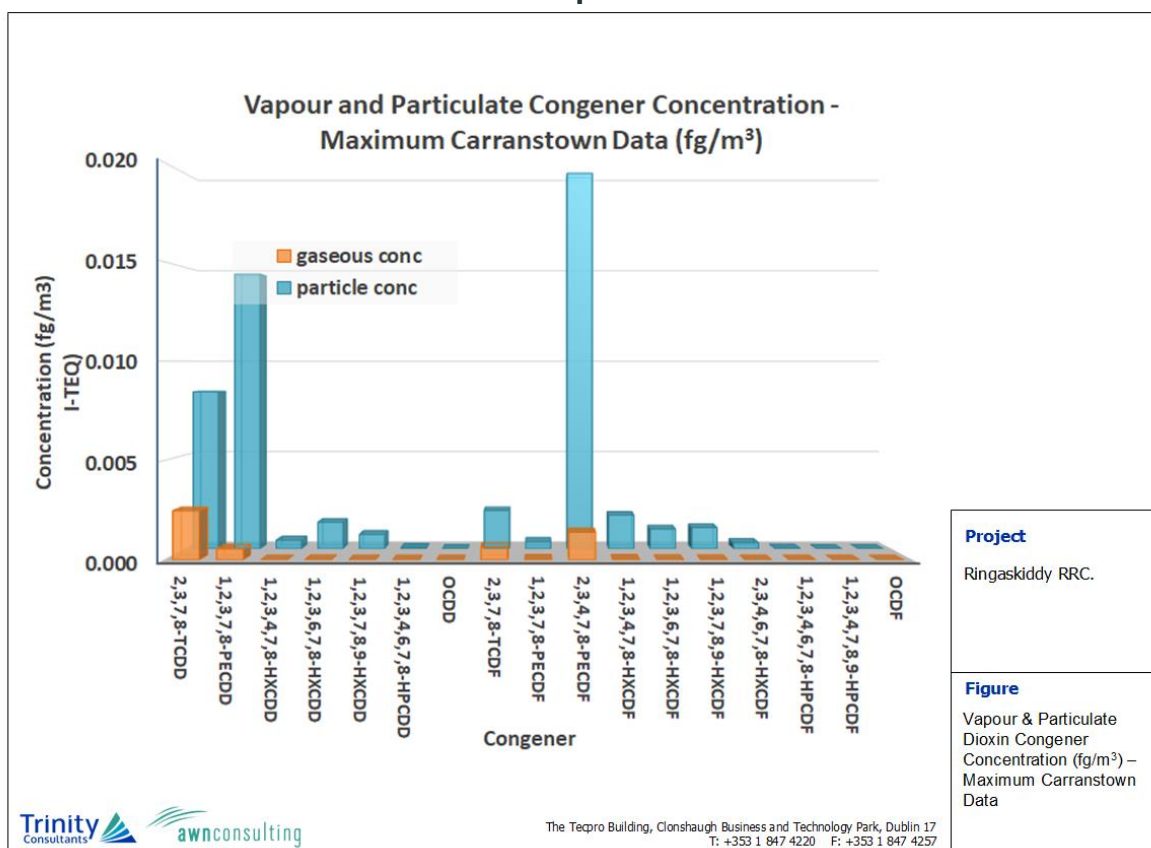
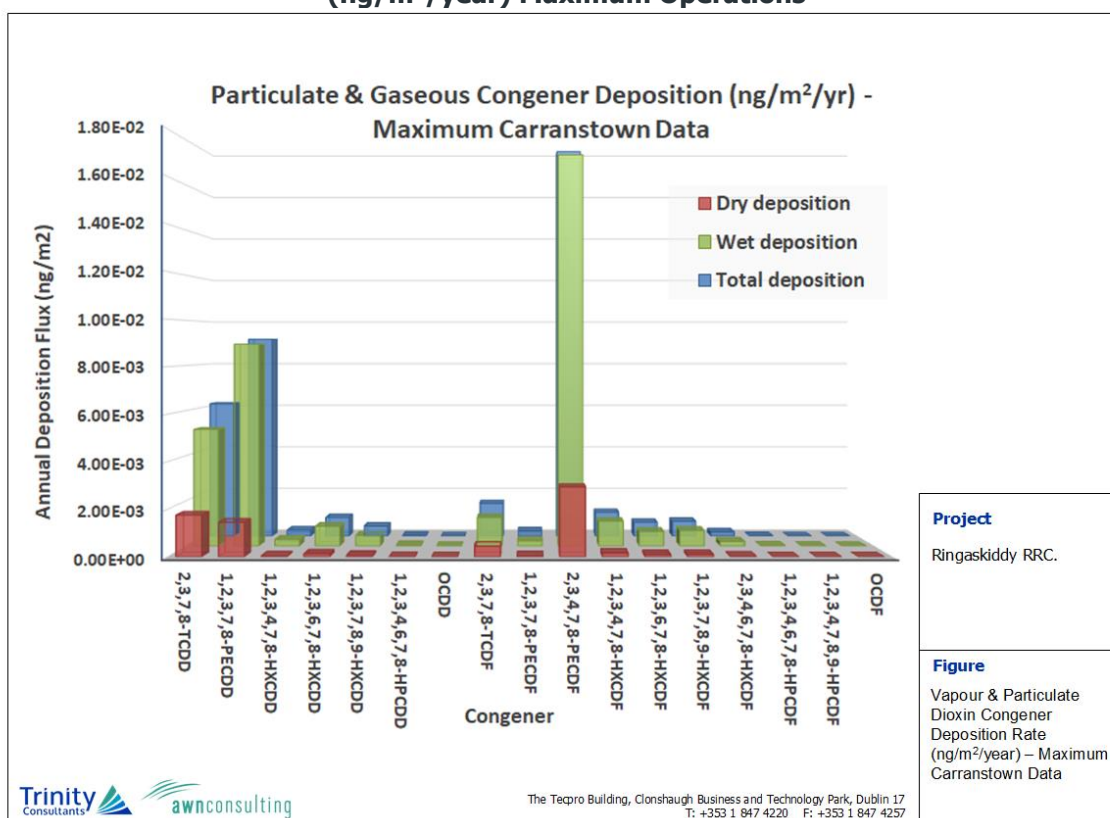


Figure.3 Vapour & Particulate Dioxin Congener Deposition Rate (ng/m²/year) Maximum Operations



As shown in Table.1, the average emissions rate from the nearest comparable incinerator over the period 2014 – 2026 is 0.00155 ng/m³ based on the average recorded value for each congener over a 12 year period. This is approximately 2.6% of the *BAT Conclusions for Waste Incineration (2019)* emission limit of 0.06 ng/Nm³ for existing plants and 3.9% of the *BAT Conclusions for Waste Incineration (2019)* emission limit of 0.04 ng/Nm³ for new plants. The actual congener profile is shown in Figure.4 and shows that the congener profile varies relative to the default profile shown in Figure 8.26 of **Appendix 8.1** of the EIS.

The ambient concentration of dioxins/furans, as detailed in Table.2 and Figure.5, based on the average emissions rate from Carranstown (adjusted to the Ringaskiddy volume flow) leads to an ambient level of 0.013 fg/m³ compared to the EIS result of 0.854 fg/m³ which is based on the maximum level detailed in the IED (2010/75/EC) which is equivalent to 1.5% of the ambient level predicted in **Chapter 8** of the EIS.

The ambient deposition level of dioxins/furans (not including background), as detailed in Table.3 and Figure.6, based on the average emissions rate from Carranstown (adjusted to the Ringaskiddy volume flow) leads to an ambient level of 0.021 pg/m²/day compared to the EIS result of 0.824 pg/m²/day which is based on the maximum level outlined in the IED (2010/75/EC).

The congener profile and actual emissions measured from the Carranstown facility demonstrate that a very conservative approach has been taken in the EIS for the proposed development and that an even more stringent BAT AEL for Dioxins of 0.04 ng/Nm³ for the proposed development will be imposed by the IE Licensing process.

Figure.4 Default Municipal Waste Incinerator Congener Profile Corrected To Average Carranstown Emission Rate Over 2021 - 2026

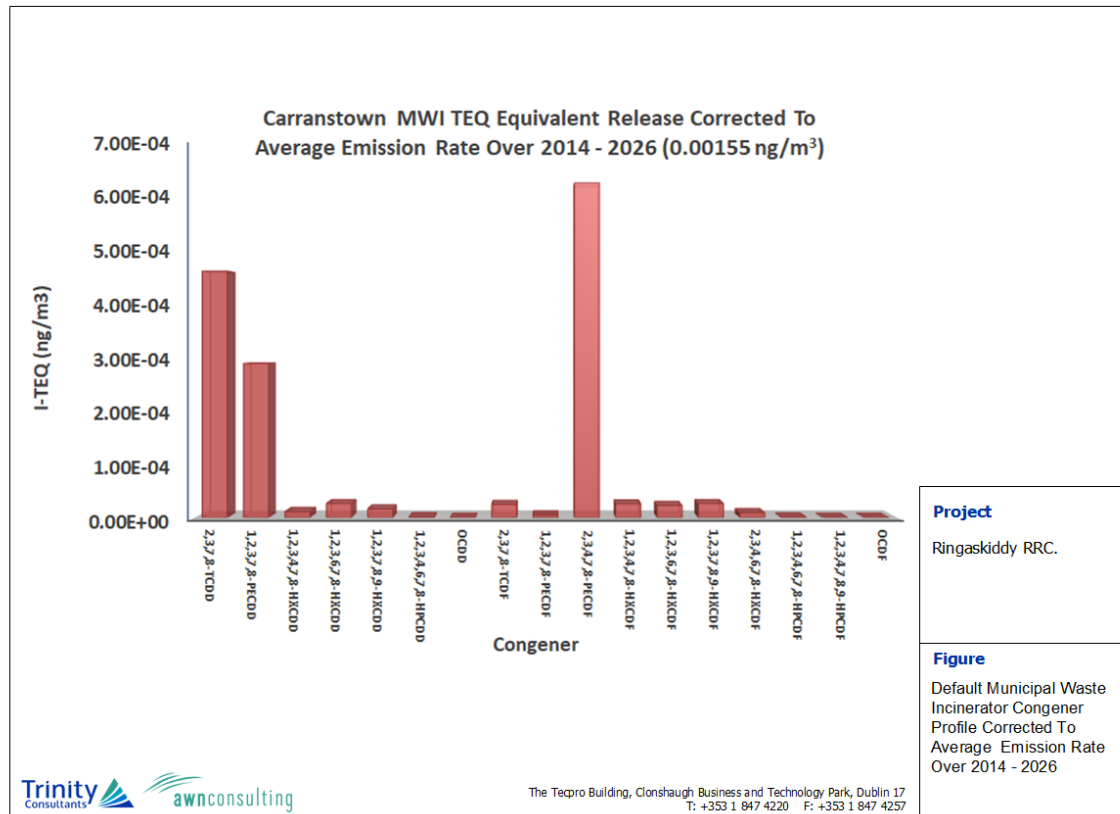


Figure.5 Vapour & Particulate Dioxin Congener Concentration (fg/m³) – Average Operations

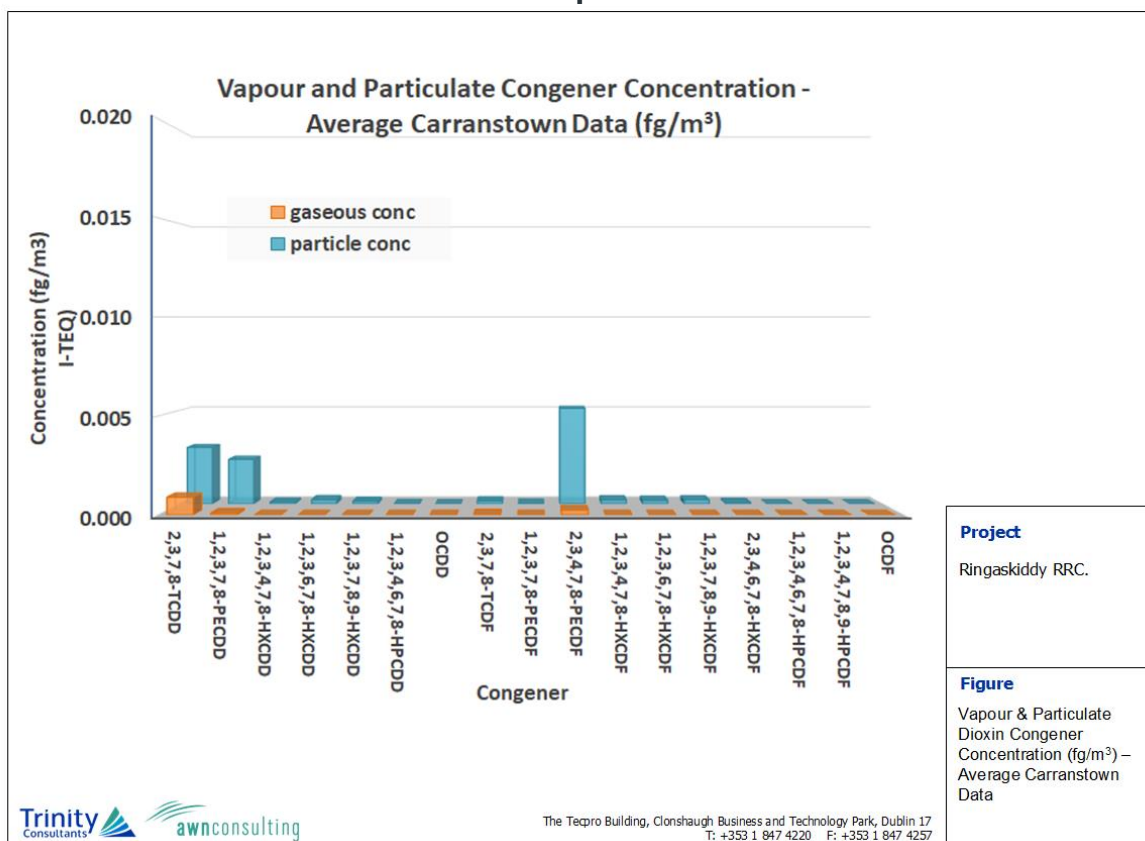
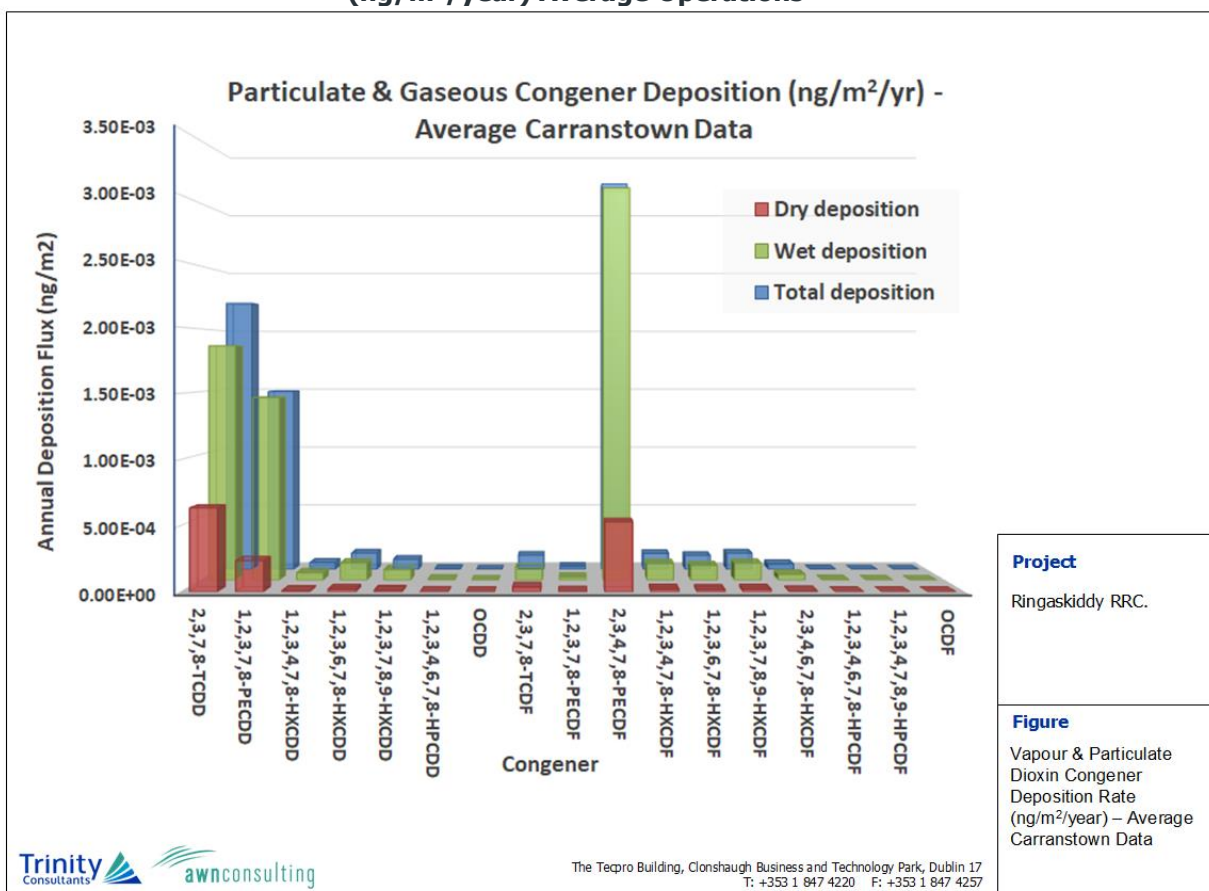


Figure.6

**Vapour & Particulate Dioxin Congener Deposition Rate
(ng/m²/year) Average Operations**



Particle Size Distribution

The IED (2010/75/EC) outlines a Total Dust emission rate of 30 mg/m³ as a 30-minute average and an emission rate of 10 mg/m³ as a daily average. In contrast, Directive (EU) 2024/2881 has set ambient air quality standards in the form of ambient limit value for PM₁₀ and PM_{2.5} as detailed in Table 8.1 of **Appendix 8.1** of the EIS.

Data reviewed from Carranstown WTE, and summarised below in Table.4, shows that data is collected in the form of Total Dust in line with the IED and in line with the BAT Conclusions for Waste Incineration (2019).

Data is not available from Carranstown WTE in terms of the particle size distribution of dust or other particles emitted from the facility as there is no requirement in the Industrial Emission Licence (W167-04) for the facility to undertake this form of assessment.

However, as a worst-case scenario, it has been assumed that when comparing emissions from the Ringaskiddy WTE to the ambient air quality standards for PM₁₀, all Total Dust emissions have been assumed to be PM₁₀ or less, thus ensuring a worst-case assessment.

Similarly, as a worst-case scenario, it has been assumed that when comparing emissions from the Ringaskiddy WTE to the ambient air quality standards for PM_{2.5}, all Total Dust emissions have been assumed to be PM_{2.5} or less, thus ensuring a worst-case assessment.

Key Pollutant Concentrations

Operational data is available for the Carranstown WTE over the period 2021 – 2026 for continuously monitored emission concentrations is detailed in Table.4. The other operational WTE facility in Ireland (Dublin WTE facility) will not be expected to be similar as it employs a different abatement system including a wet scrubber and thus this assessment has focussed on Carranstown WTE, which treats both hazardous and non-hazardous wastes and has a flue gas cleaning system comparable to the proposed development. As a result, the emissions would be expected to have a similar profile.

As detailed in Table.4 the maximum measured results are below the Industrial Emission Licence emission limit values, which are based on the BAT Conclusions for Waste Incineration (2019) for an *Existing Plant*. All results are less than 100% of the limit value, with the exception of SO₂, at 100.8% of the SO₂ emission limit. When assessing compliance with the emission limit value, the associated measurement uncertainty (confidence interval) associated with the monitoring technique needs to be allowed for. This typically ranges from 10 – 30% at the 85% confidence limit as outlined in the IED (Directive 2010/50/EC). Thus, when the appropriate confidence level is taken into account all measurements are well within the appropriate emission limit values.

Similarly, as detailed in Table.4 the average results are all below the Industrial Emission Licence emission limit values ranging from 98.1% for NO_x emission limit to 3.7% in relation to the emission limit for TOC.

Thus, the long-term average and maximum values since the introduction of the *BAT Conclusions for Waste Incineration (2019) for an Existing Plant* in November 2023 shows that Carranstown WTE facility is complying with the BAT Conclusions for Waste Incineration (2019) whilst all results over the period November 2023 - 2026 are in compliance with the limits outlined in Council Directive 2010/50/EC.

In terms of Ringaskiddy WTE, modelling is based on the IED emission limits as a worst-case and under this scenario all ambient levels are predicted to be in compliance with the ambient air quality standards.

Table.4 Measured Averages From Carranstown WTE 2021 – 2026 Compared To IED Limits

Daily Average Values	Industrial Emission Licence Concentration Limit Value	Daily Maximum 2021 - 2026	Daily Average 2021 - 2026	Daily Maximum 2021 - 2026	Daily Average 2021 - 2026
Total Dust	5 mg/m ³	0.65	0.19	13.0%	3.8%
Gaseous & vaporous organic substances expressed as total organic carbon (TOC)	10 mg/m ³	1.47	0.37	14.7%	3.7%
Hydrogen Chloride (HCl)	8 mg/m ³	3.38	1.51	42.3%	18.9%
Hydrogen Fluoride (HF)	1 mg/m ³	0.31	0.17	31.0%	17.0%
Sulphur Dioxide (SO ₂) [2021.01 – 2023.11]	50 mg/m ³	50.38 ¹	42.88	100.8%	85.8%
Sulphur Dioxide (SO ₂) [2023.11 – 2026.08]	40 mg/m ³	39.23	38.19	98.1%	95.5%
Nitrogen Oxides (as NO ₂) [2021.01 – 2023.11]	200 mg/m ³	191.64	180.23	95.8%	90.1%
Nitrogen Oxides (as NO ₂) [2023.11 – 2026.08]	180 mg/m ³	179.16	176.61	99.5%	98.1%
Average Values	Concentration	Quarterly Maximum 2021 - 2026	Quarterly Average 2021 - 2026	Quarterly Maximum 2021 - 2026	Quarterly Average 2021 - 2026
Cadmium (as Cd) and thallium (as TI), and their compounds	0.02 mg/Nm ³	0.0011	0.00083	5.5%	4.1%
Mercury (as Hg) and its compounds	0.02 mg/Nm ³	0.0120	0.0024	60.0%	12.0%
Sum of Metals	0.3 µg/Nm ³	0.078	0.024	25.9%	8.0%
Carbon Monoxide	50 mg/m ³	39.3	5.7	78.6%	5.7%
Ammonia	15 mg/m ³	7.8	3.9	52.0%	26.0%

¹ This single daily maximum value recorded remains in compliance with the IE Licence as it is well within the tolerances for the measurement uncertainty associated with this parameter as outlined in Directive 2010/50/EC.