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AN BORD PLEANALA ORAL HEARING INTO THE

DUBLIN WASTE TO ENERGY FACILITY

BRIEF OF EVIDENCE

PCDD/F CONCENTRATION IN SOIL AND PCDD/F INTAKE

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AWN CONSULTING

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1.0 QUALIFICATIONS AND EXPERIENCE

1.1 I hold a 2.1 honours degree of Bachelor of Science in Chemistry (1991) from the University of Limerick, where I majored in Environmental Chemistry and a Ph.D. in Chemical Engineering from the University of Birmingham (1998), where I specialised in the Chemistry and Degradation of waste materials. I am a Member of the UK Dioxin Network, an associate member of the Institute of Chemical Engineers (AMIChemE), a graduate member of the Chartered Institute of Water and Environmental Management, a member of the IChemE Environmental Protection Subject Group (EPSG), a member of the IChemE Loss Prevention and Safety Group and a Member of the Institute of Environmental Management and Assessment (IEMA) and have been appointed to the Irish Committee of this Organisation. It is a requirement of membership of these organisations that I am active in the field of professional chemistry and environmental assessment and satisfy their requirements with regard to level of qualifications and experience.

1.2 I have been active in the field of chemistry and environmental assessment for 16 years, the last 10 as an Environmental Consultant. I have considerable experience with respect to the analysis and behaviour of chemicals in the environment, and have monitored and modelled the behaviour of many man made chemicals on green field and brown field sites. I have conducted soil PCDD/F sampling studies in both urban and rural environments, in Ireland and the UK, for private developers and Local Authorities, and have modelled PCDD/F exposure for PCDD/F uptake and movement in the environment, in the UK and Ireland. I worked for many years in the UK where I designed and implemented soil contaminant monitoring programmes for the UK (Environment Agency) EA and private companies, and constructed mathematical models of contaminated sites to determine impacts on soil, water and human beings, through multiple exposure pathways. I have represented major brown field developers and Government Agencies developing brown field sites, in the UK and put together models and contaminant assessment strategies for PCDD/F, PAH, heavy metals and other contaminants, which have been accepted by the UK EA, as part of planning and licensing submissions. I have prepared soil quality assessments and modelled contaminant behaviour on development sites in Ireland and successfully presented these assessments to An Bord Pleanala and the EPA.

1.3 I am currently Director with responsibility for Soil Quality with AWN Consulting.

<u>Recent Soil PCDD/F Project Experience</u>

- Carranstown Waste-to-Energy Plant An Bord Pleanala Oral Hearing (2007)
- Ringaskiddy Waste-to-Energy Plant Waste Licence & Oral Hearing (2005)
- Carranstown Waste-to-Energy Plant Waste Licence & Oral Hearing (2005)
- MBM Waste-to-Energy Plant EIS (2003)

- Liquid Waste Incinerator EIS, Cork (2003)
- Courtlough Waste-to-Energy Plant EIS (2002)

<u>Other Soil Chemistry Assessment Project Experience</u>

- Dublin Port Tunnel (2006)
- Metro North (2007)
- Dublin North Fringe Project (2006)
- Wyeth Expansion (2004)
- Dublin S2S (2004/2005)
- Alza Pharmaceuticals EIS (2001)
- Analog Devices IPC Licence Review (2001).
- Clifden Airstrip EIS & Oral Hearing (2000))
- Heuston Office & Technology Park EIS & Oral Hearing (2002)

2.0 INTRODUCTION

2.1 AWN Consulting Limited was commissioned to conduct a detailed appraisal of the potential impact on PCDD/F intake associated with the Dublin Waste To Energy Facility. PCDD/F will be used as the term to describe dioxins and furans, the 17 dioxin and furan congeners which are considered to be of toxicological significance are commonly referred to as dioxins, although these 17 congeners comprise 7 dioxin congeners and 10 furan congeners. Dioxins and furans are chemically very similar compounds, with furans having one less oxygen atom than dioxins, in their chemical structure.

2.2 Soil PCDD/F quality data was assessed by means of a review of baseline data.

2.3 Available published guidance documents which are relevant to assessing the PCDD/F intake impacts from a WTE facility were consulted.

2.4 The impact of the proposed Dublin Waste To Energy Facility on PCDD/F intake was assessed. The assessment was carried out using Dutch, UK and USEPA modelling methodology, which has previously been accepted as a suitable approach for assessing the impacts of WTE plant, by the Irish EPA.

2.5 The impact of PCDD/F emissions was compared with relevant standards and guidance and PCDD/F intake from other sources.

3.0 ASSESSMENT APPROACH

3.1 The approach adopted for the PCDD/F intake assessment firstly involved a detailed consideration of the available published guidance documents and Directives which are relevant to assessing the PCDD/F intake impacts from an incineration facility. The key documents consulted in the assessment were:

- Council Directive 2000/76/EC (The Incineration Directive)
- Human Health And Ecological Risk Assessment Support To The Development Of Technical Standards For Emissions From Combustion Units Burning Hazardous Waste, EPA Contract No. 68 - W6 – 0053, US EPA, Washington, July 1999USEPA
- USEPA (1998) Human Health Risk Assessment Protocol, Chapter 3: Air Dispersion and Deposition Modelling
- RISC HUMAN (May 2005) Van Hall Institut, Leeuwarden/Groningen, for the Dutch National Institute of Public Health and Environmental Protection (RIVM), on behalf of the Dutch Ministry for Spatial Planning, Housing and the Environment, May 2005(Technical Guide)
- Risk Assessment of Dioxin Releases from Municipal Waste Incineration Processes, HMIP/CPR2/41/1/181, London 1996
- Opinion of the Scientific Committee on the Risk Assessment of Dioxins and Dioxin-like PCBs in Food 22/11/2000", adopted 30th May 2001 (SCF/CS/CNTMDIOXIN/ 20 Final)

3.2 The modelling approach, as per UK and USEPA guidance was as follows:

3.3 Develop a (Conceptual Site Model) CSM to assess the potential dietary intake of PCDD/F for the theoretical USEPA Maximum at Risk Individual (MARI) – known as the HMEI in the UK- and the Typical At Risk Individual (TARI);

3.4 The CSM was developed as follows using UK US EPA Guidance :

Background concentrations of PCDD/F are transferred to a human receptor by the following pathways;

- Inhalation indoor air
- Inhalation outdoor air
- Ingestion of soil
- Dermal contact with soil
- Inhalation of soil dust

- Ingestion of drinking water
- Dermal contact with shower water
- Inhalation of water vapour in the shower
- Ingestion of meat (this pathway was eliminated as the area of land in question is not agricultural and PCDD/F exposure from known levels in Irish produce was used to model this component of PCDD/F intake)
- Ingestion of milk and dairy products (this pathway was eliminated as the area of land in question is not agricultural and PCDD/F exposure from known levels in Irish produce was used to model this component of PCDD/F intake)
- Ingestion of vegetables
- Ingestion of surface water
- Ingestion of suspended matter in water
- Dermal contact with surface water

3.5 The CSM assumes all PCDD/F is deposited on the ground and is available for uptake, apart from the fractions which are removed through volatilisation, surface water run off, erosion and degradation. These elements are calculated for each of the 17 PCDD/F congeners.

3.6 PCDD/F deposition data and concentration data (wet and dry phase, particulate and vapour phase) was determined by Dr Edward Porter of AWN Consulting Ltd, predicted ambient air PCDD/F concentrations were also determined.

3.7 The CSM assumes the remainder of the PCDD/F deposited is available for uptake through the pathways listed above. The group of 17 PCDD/F congeners vary widely in molecular weight and chemical characteristics and behave quite differently with respect to the fraction which absorbs to soil, dissolves in water or is present in the vapour phase. It is therefore not valid to model the PCDD/F concentrations as a total TEQ as 2,3,7,8 PCDD/F value or to only model the chemical characteristics of PCDD/F intake as 2,3,7,8 PCDD/F and each congener must therefore be modelled separately.

3.8 A conservative approach has been adopted in the current assessment. This will lead to estimated PCDD/F intake values which are likely to be over-estimates of the levels which will arise under normal operations, the approach is as follows:

- The MARI lives at the point where the highest deposition rate, for emissions from the proposed WTE facility occurs.
- The MARI is an individual, who spends 16 hours per day, 7 days per week, 50 weeks per year outside in the field where the deposition occurs;

- The MARI spends 6 years as a child and 60 years as an adult living on the site;

- The MARI only eats vegetables grown on this soil (milk and meat are obtained off site as the environment in question is an urban environment and cattle raising is not practised in this area)

- The TARI lives at the point where the highest deposition rate, for emissions from the proposed WTE facility occurs.

- The TARI is an individual, who spends 16 hours per day, 7 days per week, 50 weeks per year outside in the area where the deposition occurs;

- The TARI spends 6 years as a child and 60 years as an adult living on the site;

- The TARI does not eat any food produced in the area in which they live.

4.0 BASELINE ASSESSMENT

4.1 Information existing (baseline) soil PCDD/F concentrations in the vicinity of the proposed WTE facility was obtained from a monitoring survey conducted in the region of the site of the proposed facility.

4.2 AWN Consulting Ltd previously carried out a programme of background soil sampling and monitoring (ref FC/03/2008SR01). The results of this survey and the location of the monitoring points are summarised in Tables 4.1 - 4.3.:

AWN Sampling Point	Sampling Point Location	Position	Sampling Date
A	Sean Moore Park	53^0 20.169' N 006^0 12.923' W	5th November 2003
B	Irishtown Nature Park	53^0 20.161' N 006^0 11.757' W	6th November 2003
C	Ringsend Park	53^0 20.520' N 006^0 13.258' W	3rd November 2003
D	Sandymount (grassed area along the sea front)	53^0 19.584' N 006^0 12.456' W	7th November 2003
E	Clontarf (grassed area along the sea front)	53^0 21.476' N 006^0 11.605' W	29th October 2003
F	Bull Island Nature Reserve	53^0 21.962' N 006^0 09.223' W	31st October 2003

Table 4.1 Location of AWN Sampling Points

Sampling Point	Sampling Point Location
A	SW of site, peak area from dispersion model
B	Adjacent and to the South of site, predicted peak area from dispersion model
C	West of site, closest residential community
D	SW of site, residential community (downwind of NE winds)
E	North of site, residential community
F	NE of site (downwind of SW winds)

Table 4.2 Rationale for choosing AWN sampling locations

Sample	Site Location	PCDD/F (ng/kg) [1]
A	Sean Moore Park	10
B	Irishtown Nature Park	5.7
C	Ringsend Park	3.2
D	Sandymount Promenade	23
E	Clontarf Promenade	3.9
F	Bull Island Nature Reserve	0.54

Table 4.3 Analysis results

1 NATO/CCMS I TEQ (Toxic Equivalent) (2,3,7,8 – tetrachloro dibenzo-p-dioxin)

4.3 The highest PCDD/F value recorded (NATO CCMS TEQ OF 23 ng/kg)was for the sample from the road side location at Sandymount, Sample D from the soil monitoring report. However, this is a road side location and is subject to localised PCDD/F emission sources such as traffic fumes and hence would not be a realistic background soil concentration for the MARI.

4.4 The next highest PCDD/F value, recorded for Sean Moore Park, which was also at the point of maximum ground level concentration as predicted using the US EPA approved ISC modelling software package (and as presented elsewhere in this EIS). This source is not close to significant traffic emissions and therefore is not likely to be significantly affected by the PCDD/F component of such emissions, unlike the Sandymount sample.

4.5 It was therefore decided that the soil concentration for the background on the site inhabited by the MARI and the TARI would consist of a soil PCDD/F contribution of 9.5 ng/kg WHO TEQ. The ambient air concentrations used were those measured by AWN (and presented elsewhere in the EIS Document) in Winter 2004 which are considerably higher than those measured in Summer 2003 and hence it was felt that the use of these figures was suitably conservative

5.0 MODELLING ASSESSMENT

5.1 Baseline Modelling

5.1.1 The RISC Human Model Version 3.2 (May 2005) package was chosen to model intake of PCDD/F. The model was developed by the Dutch National Institute of Public Health and Environmental Protection (RIVM)., on behalf of the Dutch Ministry for Spatial Planning, Housing and the Environment and has been used to model the Dutch Soil standards for protection of human health. The model consists of series of equations which allow each of the pathways listed in Section 3.0 to be modelled mathematically.

5.1.2 Baseline modelling for the MARI and TARI was conducted using the baseline soil concentrations described in Section 4.0.

5.1.3 The model predicted a baseline PCDD/F intake for the MARI of 1.4 pg/kg body weight/day using the WHO TEF values and a baseline intake for the TARI of 0.0849 pg/kg body weight/day using the WHO TEF values . Both values are much less than the EC TWI (Tolerable Weekly Intake) of 14 pg WHO-TEQ/kg body weight/wk (from Update to “Opinion of the Scientific Committee on the Risk Assessment of Dioxins and Dioxin-like PCBs in Food 22/11/2000”, adopted 30th May 2001 (SCF/CS/CNTMDIOXIN/ 20 Final)), the individual congeners are shown in Tables 5.1 and 5.2.

PCDD Congeners	**pg/kg/d**
	WHO TEQ
2,3,7,8-TCDD	1.66E-01
1,2,3,7,8-PeCDD	7.26E-01
1,2,3,4,7,8-HxCDD	3.28E-02
1,2,3,6,7,8-HxCDD	1.21E-01
1,2,3,7,8,9-HxCDD	7.01E-02
1,2,3,4,6,7,8-HpCDD	7.52E-02
OCDD	1.08E-02
PCDF Congeners	0.00E+00
2,3,7,8-TCDF	7.70E-03
1,2,3,7,8-PeCDF	4.89E-03
2,3,4,7,8-PeCDF	8.50E-02
1,2,3,4,7,8-HxCDF	3.60E-02
1,2,3,6,7,8-HxCDF	1.97E-02
1,2,3,7,8,9-HxCDF	9.90E-03
2,3,4,6,7,8-HxCDF	9.38E-03
1,2,3,4,6,7,8-HpCDF	1.64E-02
1,2,3,4,7,8,9-HpCDF	1.40E-02
OCDF	1.81E-03
WHO TEF	**1.40668**

Table 5.1 MARI Baseline PCDD/F congeners

PCDD Congeners	pg/kg/d
	WHO TEQ
2,3,7,8-TCDD	2.65E-03
1,2,3,7,8-PeCDD	5.28E-03
1,2,3,4,7,8-HxCDD	1.43E-03
1,2,3,6,7,8-HxCDD	1.47E-03
1,2,3,7,8,9-HxCDD	1.69E-03
1,2,3,4,6,7,8-HpCDD	3.48E-03
OCDD	2.90E-04
PCDF Congeners	
2,3,7,8-TCDF	3.10E-03
1,2,3,7,8-PeCDF	1.18E-03
2,3,4,7,8-PeCDF	4.53E-02
1,2,3,4,7,8-HxCDF	5.52E-03
1,2,3,6,7,8-HxCDF	3.89E-03
1,2,3,7,8,9-HxCDF	4.02E-03
2,3,4,6,7,8-HxCDF	2.09E-03
1,2,3,4,6,7,8-HpCDF	3.24E-03
1,2,3,4,7,8,9-HpCDF	3.01E-04
OCDF	3.45E-05
WHO TEF	**0.08492**

Table 5.2 Modelled baseline PCDD/F intake for TARI– using WHO TEF

Note: this exposure is, for both a child and an adult, from exposure to inhaled and ingested soil particles, and is only 4% of the EU t-TWI. This modelled value also assumes that the exposed individual spends 16 hours per day, 7 days per week outside in the exposed area, whereas the most likely exposure one could envisage might be 8 hours per day, 7 days per week so actual exposure is at most 2% of the t-TWI.

5.1.4 However, in order to determine PCDD/F total contribution for the MARI and TARI, it is necessary to include PCDD/F exposure from vegetables, meat and dairy products, based on dairy products sourced in the Dublin area and in the EU and meat sourced in Ireland and the EU and Food Safety Promotion Board food consumption data. The calculation procedure and calculated values are shown in Tables 5.3 and 5.4

MARI						
		PCDD/F	**PCDD/F**	**PCDD/F**	**Adult**	**PCDD/F**
	kg/day	**ng/kg**	**ng/day**	**pg/day**	**Body Wt**	**pg/kg/day**
Meat	0.157	0.067	0.010	10.458	60	0.17
Milk	0.238	0.022	0.005	5.232	60	0.09
Sum						0.26

Table 5.3 Calculated PCDD/F from off-site Meat and Milk Intake for MARI

TARI						
		PCDD/F	PCDD/F	PCDD/F	Adult	PCDD/F
	kg/day	ng/kg	ng/day	pg/day	Body Wt	pg/kg/day
Meat	0.157	0.067	0.010	10.458	60	0.17
Milk	0.238	0.022	0.005	5.236	60	0.09
Leafy Veg	0.118	0.012	0.001	1.416	61	0.02
Tuber Veg	0.225	0.017	0.004	3.825	62	0.06
Sum						0.35

Table 5.4 Calculated PCDD/F from off-site Meat, Milk and Vegetable Intake for TARI

5.1.5 The predicted MARI and TARI baselines, for the modelled site related PCDD/F dose from exposure to PCDD/F in the area and for the PCDD/F dose from food sources are shown in Table 5.5.

	A	B	C	D
	pg/kg/d	pg/kg/d	%	%
MARI	0.26	1.4066	16	84
TARI	0.35	0.0849	80	20

Table 5.5 Calculated total MARI and TARI Baselines and percentage of PCDD/F from outside area

Where:

A = Food sourced outside area pg/kg bw/day

B = PCDD/F intake from area pg/kg bw/day

C = % PCDD/F from outside area

D = % PCDD/F contribution from area

5.1.6 It is of interest to note that the strongly conservative modelling assumptions used to generate the MARI intake figures lead to a relatively high baseline dose for the MARI, when compared with the more realistic TARI, where the baseline dose from the area is shown to be quite low.

5.1.7 However, even the TARI is somewhat conservative, as it is assumed that the receptor in question spends all of their time (for 16 hours per day) in the environment where the soil value used in the modelling study was measured

5.2 **Maximum Deposition Rate of PCDD/F from WTE Emissions and Calculation of Predicted Soil and Air Concentrations**

5.2.1 Air emissions from the proposed WTE facility were modelled by AWN Consulting. Emissions were assessed assuming the unrealistically worst case scenario that the plant operated continuously under the maximum emission limits of EU Directive 2000/76/EC Modelling was carried out using AERMOD with meteorological data from Dublin Airport for the period 1993 - 2005 and using on-site data for the Years 2004 and Years 2005. The worst-case year (i.e. the year giving the highest ambient concentration) was the on-site data for 2004.

5.2.2 The deposition flux data determined by the air dispersion modelling exercise was used to predict the average soil concentration over the exposure duration period, by applying the model used by the US EPA for Assessment of Hazardous Waste Facilities. The model enables increases in soil concentrations due to aerial deposition of PCDD/F to be calculated, over a set time period and includes for natural processes such as volatilisation and sediment removal by surface water run-off, which reduce PCDD/F concentrations in soil.

5.3 Modelling of Impact of WTE Emissions on PCDD/F Intake

5.3.1 The modelled PCDD/F WHO TEQ intake value for the impact of WTE Emissions on PCDD/F intake for the MARI and the TARI (using the predicted soil and ambient air concentrations), in pg/kg body weight/day, are presented in Tables 5.6 and 5.7.

PCDD Congeners	mg/kg/d PCDD/F	WHO TEQ	mg/kg/d WHO TEQ	pg/kg/d WHO TEQ
2,3,7,8-TCDD	1.68E-10	1	1.68E-10	1.68E-01
1,2,3,7,8-PeCDD	8.15E-10	1	8.15E-10	8.15E-01
1,2,3,4,7,8-HxCDD	3.51E-10	0.1	3.51E-11	3.51E-02
1,2,3,6,7,8-HxCDD	1.27E-09	0.1	1.27E-10	1.27E-01
1,2,3,7,8,9-HxCDD	7.33E-10	0.1	7.33E-11	7.33E-02
1,2,3,4,6,7,8-HpCDD	7.54E-09	0.01	7.54E-11	7.54E-02
OCDD	1.08E-07	0.0001	1.08E-11	1.08E-02
PCDF Congeners				
2,3,7,8-TCDF	7.75E-11	0.1	7.75E-12	7.75E-03
1,2,3,7,8-PeCDF	9.80E-11	0.05	4.90E-12	4.90E-03
2,3,4,7,8-PeCDF	1.75E-10	0.5	8.75E-11	8.75E-02
1,2,3,4,7,8-HxCDF	3.67E-10	0.1	3.67E-11	3.67E-02
1,2,3,6,7,8-HxCDF	2.01E-10	0.1	2.01E-11	2.01E-02
1,2,3,7,8,9-HxCDF	1.01E-10	0.1	1.01E-11	1.01E-02
2,3,4,6,7,8-HxCDF	9.98E-11	0.1	9.98E-12	9.98E-03
1,2,3,4,6,7,8-HpCDF	1.64E-09	0.01	1.64E-11	1.64E-02
1,2,3,4,7,8,9-HpCDF	2.00E-11	0.01	2.00E-13	2.00E-04
OCDF	1.81E-08	0.0001	1.81E-12	1.81E-03
			1.50E-09	1.50004

Table 5.6 Modelled WTE + baseline PCDD/F intake for MARI

PCDD Congeners	mg/kg/d PCDD/F	WHO TEQ	mg/kg/d WHO TEQ	pg/kg/d WHO TEQ
2,3,7,8-TCDD	2.68E-12	1	2.68E-12	2.68E-03
1,2,3,7,8-PeCDD	5.71E-12	1	5.71E-12	5.71E-03
1,2,3,4,7,8-HxCDD	1.45E-11	0.1	1.45E-12	1.45E-03
1,2,3,6,7,8-HxCDD	1.53E-11	0.1	1.53E-12	1.53E-03
1,2,3,7,8,9-HxCDD	1.76E-11	0.1	1.76E-12	1.76E-03
1,2,3,4,6,7,8-HpCDD	3.48E-10	0.01	3.48E-12	3.48E-03
OCDD	2.92E-09	0.0001	2.92E-13	2.92E-04
PCDF Congeners				0.00E+00
2,3,7,8-TCDF	3.12E-11	0.1	3.12E-12	3.12E-03
1,2,3,7,8-PeCDF	2.38E-11	0.05	1.19E-12	1.19E-03
2,3,4,7,8-PeCDF	9.13E-11	0.5	4.57E-11	4.57E-02
1,2,3,4,7,8-HxCDF	5.60E-11	0.1	5.60E-12	5.60E-03
1,2,3,6,7,8-HxCDF	3.92E-11	0.1	3.92E-12	3.92E-03
1,2,3,7,8,9-HxCDF	4.06E-11	0.1	4.06E-12	4.06E-03
2,3,4,6,7,8-HxCDF	2.17E-11	0.1	2.17E-12	2.17E-03
1,2,3,4,6,7,8-HpCDF	3.24E-10	0.01	3.24E-12	3.24E-03
1,2,3,4,7,8,9-HpCDF	1.86E-11	0.01	1.86E-13	1.86E-04
OCDF	3.45E-10	0.0001	3.45E-14	3.45E-05
			8.61E-11	0.08607

Table 5.7 Modelled WTE + baseline PCDD/F intake for TARI

5.3.2 The increase in PCDD/F dose associated with the WTE facility, for both the MARI and TARI, is shown in Table 5.8. The baseline PCDD/F dose, from food sourced outside area of the WTE facility and within area, is shown in Table 5.9 to allow for comparison with the predicted PCDD/F dose when the WTE facility is operational, which is shown in Table 5.10.

5.3.3 It can be seen that the increase in PCDD/F dose, for both the MARI and TARI, is very low, and both MARI and TARI PCDD/F intake is still well below the recommended value of 14 pg/kg bw/week.

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	Baseline	**Inc. Dose**	**Predicted Dose**	**% increase**	**Predicted Dose**
	pg/kg/d	**pg/kg/d**	**pg/kg/d**		**pg/kg/wk**
MARI	1.4066	0.0938	1.5004	6.67	10.5028
TARI	0.0849	0.00117	0.08607	1.38	0.60249

Table 5.8 Increase in PCDD/F dose associated with WTE facility

	A	**B**	**C**	**D**	**E**	**F**
	pg/kg/d	**pg/kg/d**	**%**	**%**	**pg/kg/d**	**pg/kg/wk**
MARI	0.26	1.4066	16	84	1.67	11.7
TARI	0.35	0.0849	80	20	0.4314	3.0196

Table 5.9 Baseline PCDD/F dose from within and outside site

	A	**B**	**C**	**D**	**E**	**F**
	pg/kg/d	**pg/kg/d**	**%**	**%**	**pg/kg/d**	**pg/kg/wk**
MARI	0.26	1.5004	15	85	1.76	12.3
TARI	0.35	0.08607	80	20	0.4325	3.0278

Table 5.10 Predicted PCDD/F dose when WTE plant operational

Where:

A = Food sourced outside area pg/kg bw/day
B = PCDD/F intake from area pg/kg bw/day
C = % PCDD/F from food from outside area pg/kg bw/day
D = % PCDD/F contribution from area pg/kg bw/day
E= Combined Dose pg/kg bw/day
F= Combined Dose pg/kg bw/day

5.4 Modelling of Accident Scenario at WTE facility

5.4.1 It was also considered prudent to model the impact of a credible accident scenario, on PCDD/F intake, this was accomplished as follows. It was assumed that the facility operated at 10 ng/m^3 PCDD/F I-TEQ for 48 hours and the impact of this event was assessed, in terms of PCDD/F intake, in pg/kg bw/day. The results of this modelling assessment are shown in Tables 5.11 and 5.12.

PCDD Congeners	**mg/kg/d**	**WHO**	**mg/kg/d**	**pg/kg/d**
	PCDD/F	**TEQ**	**WHO TEQ**	**WHO TEQ**
2,3,7,8-TCDD	1.68E-10	1	1.68E-10	1.68E-01
1,2,3,7,8-PeCDD	8.59E-10	1	8.59E-10	8.59E-01
1,2,3,4,7,8-HxCDD	3.60E-10	0.1	3.60E-11	3.60E-02
1,2,3,6,7,8-HxCDD	1.29E-09	0.1	1.29E-10	1.29E-01
1,2,3,7,8,9-HxCDD	7.48E-10	0.1	7.48E-11	7.48E-02
1,2,3,4,6,7,8-HpCDD	7.54E-09	0.01	7.54E-11	7.54E-02
OCDD	1.08E-07	0.0001	1.08E-11	1.08E-02
PCDF Congeners				0.00E+00
2,3,7,8-TCDF	7.76E-11	0.1	7.76E-12	7.76E-03
1,2,3,7,8-PeCDF	9.81E-11	0.05	4.91E-12	4.91E-03
2,3,4,7,8-PeCDF	1.77E-10	0.5	8.85E-11	8.85E-02
1,2,3,4,7,8-HxCDF	3.70E-10	0.1	3.70E-11	3.70E-02
1,2,3,6,7,8-HxCDF	2.02E-10	0.1	2.02E-11	2.02E-02
1,2,3,7,8,9-HxCDF	1.01E-10	0.1	1.01E-11	1.01E-02
2,3,4,6,7,8-HxCDF	1.02E-10	0.1	1.02E-11	1.02E-02
1,2,3,4,6,7,8-HpCDF	1.64E-09	0.01	1.64E-11	1.64E-02
1,2,3,4,7,8,9-HpCDF	2.00E-11	0.01	2.00E-13	2.00E-04
OCDF	1.81E-08	0.0001	1.81E-12	1.81E-03
			1.55E-09	1.55008

Table 5.11 Modelled WTE Accident + baseline PCDD/F intake for MARI

PCDD Congeners	mg/kg/d PCDD/F	WHO TEQ	mg/kg/d WHO TEQ	pg/kg/d WHO TEQ
2,3,7,8-TCDD	2.72E-12	1	2.72E-12	2.72E-03
1,2,3,7,8-PeCDD	5.93E-12	1	5.93E-12	5.93E-03
1,2,3,4,7,8-HxCDD	1.46E-11	0.1	1.46E-12	1.46E-03
1,2,3,6,7,8-HxCDD	1.56E-11	0.1	1.56E-12	1.56E-03
1,2,3,7,8,9-HxCDD	1.78E-11	0.1	1.78E-12	1.78E-03
1,2,3,4,6,7,8-HpCDD	3.48E-10	0.01	3.48E-12	3.48E-03
OCDD	2.92E-09	0.0001	2.92E-13	2.92E-04
PCDF Congeners				0.00E+00
2,3,7,8-TCDF	3.13E-11	0.1	3.13E-12	3.13E-03
1,2,3,7,8-PeCDF	2.38E-11	0.05	1.19E-12	1.19E-03
2,3,4,7,8-PeCDF	9.20E-11	0.5	4.60E-11	4.60E-02
1,2,3,4,7,8-HxCDF	5.63E-11	0.1	5.63E-12	5.63E-03
1,2,3,6,7,8-HxCDF	3.93E-11	0.1	3.93E-12	3.93E-03
1,2,3,7,8,9-HxCDF	4.06E-11	0.1	4.06E-12	4.06E-03
2,3,4,6,7,8-HxCDF	2.21E-11	0.1	2.21E-12	2.21E-03
1,2,3,4,6,7,8-HpCDF	3.24E-10	0.01	3.24E-12	3.24E-03
1,2,3,4,7,8,9-HpCDF	1.87E-11	0.01	1.87E-13	1.87E-04
OCDF	3.45E-10	0.0001	3.45E-14	3.45E-05
			8.68E-11	0.08683

Table 5.12 Modelled WTE Accident + baseline PCDD/F intake for TARI

5.4.2 A comparison with the predicted PCDD/F intake under normal operating conditions and the % increase in PCDD/F dose resulting from an accident are shown in Table 5.14. It can be seen from Table 5.14 that the accident scenario described above is predicted to lead to an increase in PCDD/F dose for the MARI of 3.3% and of 0.88% for the TARI. Again, these dose levels are insignificant when compared with EU weekly intake guideline values.

	Normal Operation Predicted Dose pg/kg/d	Increase in Dose pg/kg/d	Accident Scenario Predicted Dose pg/kg/d	% increase
MARI	1.5004	0.04968	1.55008	3.31
TARI	0.08607	0.00076	0.08683	0.88

Table 5.13 Comparison with predicted PCDD/F intake and percentage increase

5.5 Summary of Impact on PCDD/F intake

It was concluded that the predicted impact of the emissions from the proposed WTE facility, for both maximum operating conditions and an accident scenario, on the MARI and the TARI is not significant. The predicted PCDD/F intake for the MARI and the TARI was modelled to be well below the EC TWI of 14 pg/kg body weight/wk.

6.0 REPLIES TO THIRD PARTY OBSERVATIONS – PCDD/F INTAKE

The Principle Observations Relate To:

Issue 1 – Dioxins – general impacts

Observation Number- 1, 37, 142, 149, 153

Issue 2 – Risk Assessment

Observation Number - 154

Issue 3 – Exposure to Dioxins

Objector Number – 140, 211

Issue 4 – Dioxins in food chain

Observation Number – 36, 183

6.1 Issue 1 - Generic Letter - Dioxins

Response

The modelling of emissions to air from the Dublin Waste To Energy facility, for both maximum licensed operating conditions and a theoretical accident scenario, indicates the impact on dioxins, even for the worst case MARI, is negligible.

6.2 Issue 2 – Risk Assessment

Response

The observation states that insufficient risk assessment resources have been made available for assessing waste facilities. This is refuted and the risk assessments made available in the preceding pages is considered proof of this.

6.3 Exposure to Dioxins

Response

Observation 140 (Labour Party Submission Page 51) – states “there is no safe level of dioxins”

This statement is incorrect and reference to WHO TDI and EU TWI values shows that the stated scientific opinion of the WHO and EU is to the contrary.

Observation 211 (Page 4) states” over one third of adults in western Europe exposed to dioxin levels in excess of TDI and breast fed babies exposed to up to 170 times TDI”.

Firstly, the relative increase in predicted PCDD/F intake, for even the theoretical MARI, is very low. Secondly, current levels in breast milk are high (but are falling in western Europe) and dioxin exposure limit values are concerned with exposure over a life-time, rather than short term elevated exposures associated with breast feeding.

6.4 Issue 4 – Dioxins in the Food Chain

Response

Observation 36, page 22 states: “large tracts of agricultural land would be unusable in the event of an accident”.

Modelling of the accident scenario shows that predicted PCDD/F increase for the MARI is still very low. It is also not correct to say that levels in cow’s milk in Dublin are rising, the trend indicates that the opposite is actually the case.

Observation 183 , page 9 states “concern over the cumulative impact of dioxins and the risk to young girls of drinking milk”. The EU TWI has set an EU approved safe limit for dioxin intake so there should be no concerns of the nature expressed.