

## Attachment F.1: Abatement Systems

### F.1.1 Air Emissions

#### F.1.1.a Point Source Air Emissions

##### A2-1

Air emissions from emissions point A2-1 can be controlled through both process optimisation (e.g. waste acceptance procedures and furnace operations) and physical / chemical treatment (e.g. in the flue gas treatment system). These systems have been designed to ensure emissions at A2-1 are well below the limits set out in the EU Waste Incineration Directive (2000/76/EEC).

Specific abatement and treatment processes for different emissions are provided in Table F.1.a below. As described in Attachment D.2.6, the flue gas treatment system will be a combined semi-wet and dry system with recirculation, which includes:

- A first dioxin/furan and heavy metals removal stage with expanded clay injection into a duct at the exit of the boiler economiser
- A spray drier absorber, where a lime slurry is injected to cool the flue gases and react with acid gases like hydrochloric acid (HCl) and hydrofluoric acid (HF)
- A second dioxin/furan, heavy metals and acid gas treatment stage with the injection of activated carbon, recirculated and reactivated reagent from the baghouse filter and fresh hydrated lime absorbent where necessary in a reaction duct
- A high performance baghouse filter for dust and heavy metals removal
- A recycling system for baghouse filter residue
- An induced draught fan to maintain the flow through the treatment system
- A 65m stack equipped with continuous emissions monitoring systems

Table F.1.a gives the reference section where the abatement or treatment process is discussed in more detail. More detail on treatment, abatement and control for this emission point is given in Table F.1 (A2-1) in Appendix F1.

**Table F.1.a: Abatement and Treatment Techniques for Emissions Point A2-1**

<b>Emission to be treated / abated</b>	<b>Treatment / abatement process</b>	<b>Reference Sections</b>
Particulates (dust), Hydrocarbons (expressed as Total Organic Carbon (TOC), pollutants relating to the presence of certain wastes (e.g. chlorine due to presence of PVC)	<u>Abatement:</u> The quality of waste entering the furnace impacts on the completeness of combustion and on the nature of gases released. To ensure that only municipal and similar wastes are processed, waste acceptance and handling procedures will be adopted. Waste will be screened and mixed in the bunker to remove any non-conforming items and provide for complete combustion.	Attachment D.2.2, Attachment H.2 and H.3, Section 5.6.1 of the EIS
Particulates, Carbon Monoxide (CO), TOC	<u>Abatement:</u> The temperature and residence time of waste in the furnace affects the completeness of combustion. Regulation of temperature is a critical factor for CO abatement. The grate speed, auxiliary firing and other processes will be designed to optimise these parameters.	Attachment D.2.3, Section 5.6.2 of the EIS
Poly-Chlorinated Dibenzo Dioxins (PCDD) and Poly-Chlorinated Dibenzo Furans (PCDF)	<u>Abatement:</u> A minimum temperature of 850°C will be maintained for at least 2 seconds in the first pass of the boiler to abate PCDD and PCDF formation. Other dioxin abatement measures such as rapid cooling and regular cleaning will also take place in the boiler.	Attachment D.2.4, Section 5.6.4 of the EIS
Oxides of Nitrogen (NO <sub>x</sub> )	<u>Treatment:</u> A Selective Non-Catalytic Reduction (SNCR) reagent will be injected at two levels into the furnace to react with and remove NO <sub>x</sub> from the flue gases.	Attachment D.2.3, Section 5.6.3 of the EIS
Particulates, PCDD, PCDF, heavy metals	<u>Treatment:</u> Expanded clay and activated carbon will be injected in two stages in the flue gas treatment system to trap these components. The clay and carbon will then be removed from the flue gases in the baghouse filter	Attachment D.2.6, Section 5.6.7-5.6.9 of the EIS
Sulphur Dioxide (SO <sub>2</sub> ), Hydrogen Chloride (HCl), Hydrogen Fluoride (HF)	<u>Treatment:</u> Lime slurry will be injected in the spray drier absorber, and, where necessary, fresh hydrated lime in the reaction duct to react with these acid gases. The reaction salts will then be removed from the flue gases in the spray drier absorber or in the baghouse filter	Attachment D.2.6, Section 5.6.7-5.6.9 of the EIS
Visible plume	<u>Abatement:</u> The temperature of the emissions exiting the stack will be approximately 140°C, which is high enough to ensure the plume is not visible.	Attachment D.2.6, Section 5.6.10 of the EIS

## A2-2

Regular testing and maintenance will ensure that the emergency generator operates efficiently and any air emissions are controlled. The generator will only be operated infrequently and emissions will therefore be minor.

More detail on treatment, abatement and control for this emission point is given in Table F.1 (A2-2) in Appendix F2.

### **F.1.1.b Fugitive Air Emissions**

The control of potential fugitive emissions to air from any materials storage, treatment and handling operations, cleaning operations or waste liquid tanks is described in Attachment E.1.2.

## **F.1.2 Effluent Emissions**

### **F.1.2.a Point and Area Source Effluent Emissions**

The plant has been designed with a semi-wet and dry flue gas treatment system and process water recirculation to ensure there will be no process water discharge. Spillages and washwater from within the main process building will be sent directly to a spilled water tank and returned to the process. Attachment D.1.k describes these systems in greater detail.

#### SW1

The surface water drainage system has been designed to ensure that any discharge from the site will be similar in nature and quality to greenfield agricultural runoff. A schematic of the system and an outline of the abatement measures taken to control the quality and flow of the discharge are provided in Attachment D.1.k.

More detail on treatment, abatement and control for this emission point is given in Table F.1 (SW1) in Appendix F3.

#### GW1

There will be no emissions to sewer from the facility. Domestic effluent collected from staff and visitor facilities will be treated in a Puraflo system prior to discharge to an engineered percolation area in the overburden (emissions point GW1). The system is described fully in Attachments E.4.1 and D.1.k. A schematic is provided in Appendix D4.

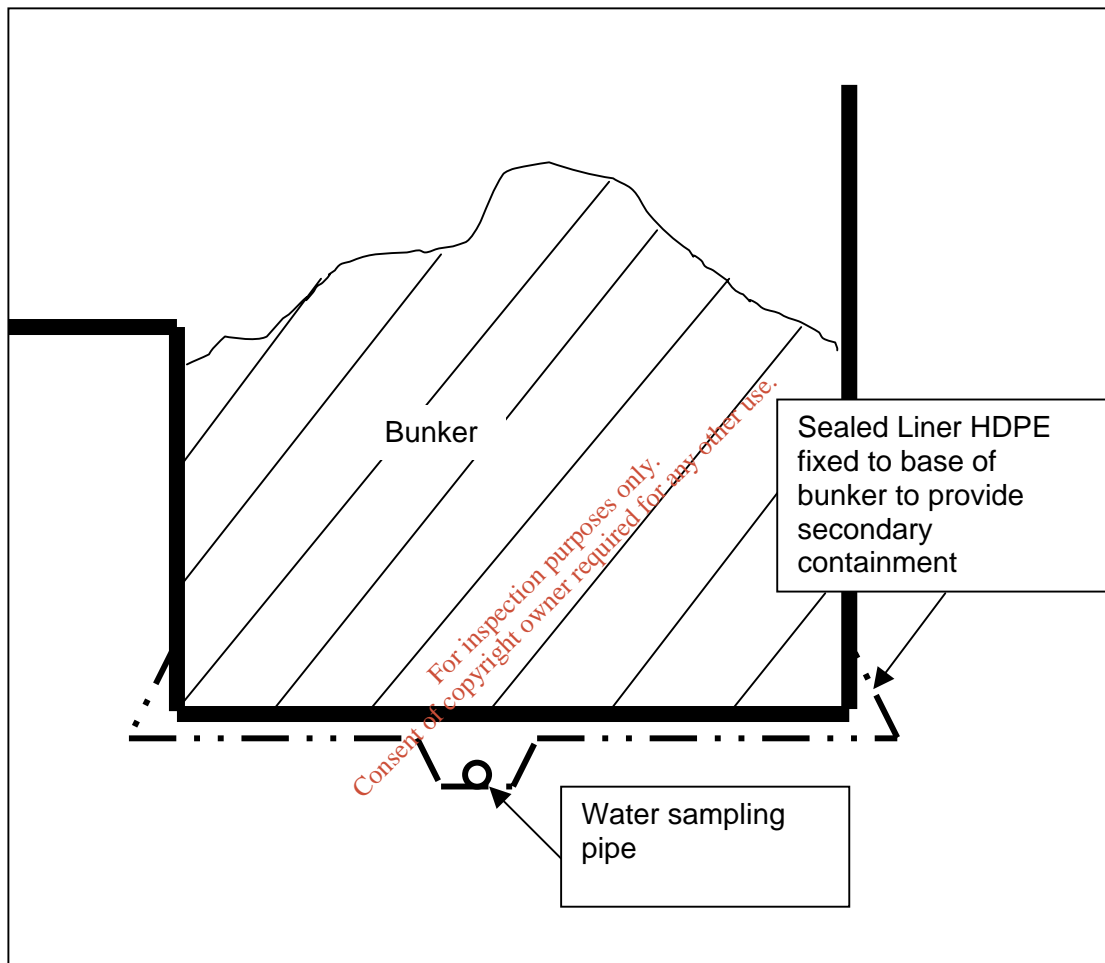
More detail on treatment, abatement and control for this emission point is given in Table F.1 (GW1) in Appendix F4.

### **F.1.2.b Fugitive Emissions**

All substances with the potential to cause a negative impact on groundwater or surface waters will be stored in appropriate containers within the main process building and/or in bunded areas.

All underground storage structures including the waste bunker, ash bunker, spill tank, contaminated water diversion tank and firewater/stormwater attenuation tank will be designed as watertight structures in accordance with the requirements of *BS8007 Design of Aqueous Liquid Retaining Concrete Structures*. The contaminated water tank will be provided with extra containment. The waste and ash bunkers and spill tank will be provided with a full double containment system

at the base complete with inspection ports as shown in Figure F.1.a. This system consists of a welded watertight High Density Polyethylene (HDPE) liner cast into the side walls of the structures and run under them to form a secondary containment line. Should any water leak from these structures, it will be collected in the liner, tested for contamination and removed. This will prevent any leaching of effluent to groundwater. All storage structures will be integrity tested to confirm they are watertight.



**Figure F.1.a: Design of water tight waste bunker**

As outlined in Attachment E.1.2, all storage, treatment and handling of residues and consumables and any plant cleaning operations, with the exception of fuel storage, will take place within the main process building. Fuel tanks (see Attachment D.1.g) in the service yard will be provided with bunding constructed in accordance with BS 8007 (Aqueous Liquid Retaining Concrete Structures) and designed for 110% of the total capacity of the storage tank. Materials stored within the main process will also be provided with bunding where necessary. Any spills or washwater will be contained within the building and directed to the spill tank for recirculation.

These measures will ensure that there will be no fugitive emissions to groundwater.

### **F.1.3 Abatement Systems Modifications**

The principle modifications to the abatement methods approved in Waste Licence 167-1 are outlined in Table F.1.b below.

**Table F.1.b: Modifications to Abatement Systems**

<b>Aspect</b>	<b>Difference</b>
F1.1: Air emissions	The description of the flue gas treatment system has been updated. The system is now a combined semi-wet and dry system with recirculation of reagent. An injection of expanded clay has been added prior to the spray drier reactor. Due to the effectiveness of the proposed system and the drive for greater energy efficiency, the tail end treatment has been removed. Plume abatement will no longer be required as the gases will exit the baghouse filter at 140°C.
F.1.2: Effluent emissions	As the annual volume of surface water discharge will increase, additional measures have been taken (as outlined in Attachment D.1.k) to control the rate of discharge and minimise the potential for contamination of surface water runoff.
	The design of the bunkers and spill tank has been strengthened to include a double containment system with a welded HDPE liner forming a secondary containment line rather than a steel plate in the wall of the bunker as previously proposed. This will ensure that, in the event of liquids escaping the concrete lining of the underground structures, they will be contained in the HDPE liner and removed.

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## Attachment F.2: Monitoring & Sampling Air

### F.2.1 Point Source Emissions Monitoring

#### F.2.1.a Stack Emission A2-1

Air emissions from A2-1 will be monitored at the stack (see Appendix E1 – Drawing 15013\WL\013) at grid reference (306331E, 270963N). The monitoring programme will include continuous measurements, regular periodic grab samples and spot checks. The sample points will be made accessible for independent inspection and monitoring as required. The monitoring regime is summarised in Table F.2 (A2-1) in Appendix F5.

The control and monitoring of emissions to air will be carried out in line with the requirements of EU and Irish legislation and of the competent authority. All monitoring will comply with the European Standards EN 14181:2004 and EN 13284-2:2004 for quality assurance of automated measuring systems to measure stationary source emissions and dust in flue gas respectively. All equipment will also be TÜV certified, which ensures the reliability, safety and quality of the equipment.

#### Continuous Measurements

Parameters to be continuously measured, in line with the EU Directive 2000/76/EC, include:

- Total dust
- Total Organic Carbon (TOC)
- Hydrogen Chloride (HCl)
- Hydrofluoric Acid (HF)
- Sulfur dioxide (SO<sub>2</sub>)
- Oxides of nitrogen (NO<sub>x</sub>)
- Carbon Monoxide (CO)
- Temperature
- Oxygen (O<sub>2</sub>)

These will be measured by analysers from flue gas samples provided by probes positioned in the stack. The analysers will be located in a monitoring station as illustrated in Appendix F6.

Continuous measurements will be relayed to the plant computerised control system and the emission registration software system for correction. Process operators will be able to view the results on the plant's control system. In the emissions registration software system, the information will be stored on hard disk and used to generate hourly, daily, monthly and annual average results, as appropriate.

Furthermore, although not required by EU or Irish legislation, an AMESA dioxin/furan sampling system or similar system will be installed at the stack. This system will continuously sample dioxins/furans on a filter over a fortnightly period. The filter will then be removed and analysed in an independent laboratory. Results will be presented fortnightly as individual 2,3,7,8-containing cogener

concentrations, total homologue (tetra- to octa-) concentrations and I-TEQ values. This system is currently being used in existing Indaver facilities in Belgium and is described in Appendix F7.

### Grab Samples

Grab samples will be taken on a quarterly basis and during spot checks to monitor heavy metals and their compounds including Antimony (Sb), Arsenic (As), Cadmium (Cd), Chromium (Cr), Cobalt (Co), Copper (Cu), Lead (Pb), Manganese (Mn), Mercury (Hg), Nickel (Ni), Thallium (Tl) and Vanadium (V). These will be taken by an external accredited laboratory in order to control the observance of emissions limits.

### Maintenance and Calibration

Preventative maintenance contracts will be put in place with the equipment suppliers who will also provide 24 hour call-out service.

Calibration of equipment will be carried out by qualified staff as per supplier recommendations. Calibration by means of parallel measurement is currently being conducted at least annually in our facilities in Belgium and is also proposed for this facility. The monitoring equipment will also have autocalibration capabilities where possible.

## **F.2.1.b Emergency Generator Emission A2-2**

During commissioning, emissions from the emergency generator will be tested to ensure they are below levels specified in Appendix E4.

The following parameters will be sampled and analysed<sup>1</sup> by an independent laboratory:

- Oxides of nitrogen (NO<sub>x</sub>)
- Carbon monoxide (CO)
- Total Organic Carbon (TOC)
- Particulates

The emergency generator will be tested weekly for approximately 20 minutes during which time any abnormal emission will be detected and investigated.

## **F.2.2 Ambient Monitoring**

It is proposed to carry out ambient odour monitoring at two locations (one upwind and one downwind of the facility) on an annual basis. The proposed locations of the odour monitoring points are highlighted as AA1-1 and AA1-2 on Appendix E1 at grid reference points (30649E, 27093N) and (30553E, 27094N). Sampling carried out at these locations will be analysed using semi-quantitative gas chromatography/mass spectrometry (GC/MS) in an accredited laboratory. This monitoring regime is summarised in Table Ff (AA1) in Appendix F8.

It is also proposed to carry out an instantaneous olfactometric (smell) assessment at various locations within the site on a weekly basis. These will be carried out by Indaver staff. All monitoring results will be recorded in line with procedures.

<sup>1</sup> As required by Waste Licence 167-1. Please note that these differ from the parameters included in the air quality model in Section 7 of the EIS. The parameters used in the model were considered to be the most significant in terms of potential impacts.

### **F.2.3 Air Monitoring and Sampling Modifications**

The principle modifications to the monitoring and sampling of air emissions approved in Waste Licence 167-1 are outlined in Table F.2.a below.

**Table F.2.a: Modifications to Air Monitoring and Sampling**

<b>Aspect</b>	<b>Difference</b>
F.2.1: Point Source Monitoring	The emission/monitoring point reference A2-1 (stack) was previously referred to as A1.1. The emission/monitoring point reference A2-2 (emergency generator) was previously referred to as A2.1.
F.2.2: Ambient Monitoring	The odour monitoring point references AA1-1 and AA1-*2 were previously referred to as ANN1 and ANN3

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## Attachment F.3: Monitoring & Sampling Surface Water

### F.3.1 Point Source Emissions Monitoring

Surface water runoff will pass through two monitoring chambers prior to discharge at SW1, which will measure for the parameters agreed by the EPA and the drainage division of Meath County Council. The positions of the monitoring chambers are shown as MSW1-1 and MSW1-2 in Appendix E1 at grid reference (306157E, 270907N) and (306129E, 270881N) respectively. This monitoring regime is summarised in Table F.2 (SW1) in Appendix F9.

If no suspect flows are detected at the second monitoring station, surface water runoff will pass through a Class II petrol interceptor before being discharged to a drainage ditch. The drainage system is described in more detail in Attachment D.1.k.

### F.3.2 Surface Water Monitoring and Sampling Modifications

The principle modifications to the monitoring and sampling of surface water emissions approved in Waste Licence 167-1 are outlined in Table F.3.a below.

**Table F.3.a: Modifications to Surface Water Monitoring and Sampling**

Aspect	Difference
F.3.1: Point Source Monitoring	Due to an increase in the annual volume of waters discharged from the surface water drainage system, two monitoring chambers will be installed to detect and divert any suspect waters. There was previously no monitoring proposed for this emissions point.

## Attachment F.5: Monitoring & Sampling Ground Water

### F.5.1 Point Source Emissions Monitoring

The emission of treated domestic effluent to the percolation area at GW1 can be monitored via a sampling chamber located at the discharge point of the Puraflo system. The location of this sampling point is shown as MGW1-1 in Appendix E1 at grid reference (30629E, 27099N).

Samples will be taken from this sampling chamber quarterly. These will be analysed for Biological Oxygen Demand (BOD), Chemical Oxygen Demand (COD) and Total Suspended Solids (TSS). This monitoring regime is summarised in Table F.2 (GW1) in Appendix F10.

### F.5.2 Ambient Monitoring

Groundwater quality monitoring will be carried out at three permanent monitoring wells located on the site. The exact positions of these are yet to be determined, as explained in Attachment I.5. It is expected they will be installed near the three existing wells shown as AGW1-1, AGW1-2 and AGW1-3 in Appendix E1 at grid reference positions (30637E, 27075N), (30640E, 27093N) and (30608E, 27093N) respectively.

In relation to the inferred groundwater contour flow (see Section 10.5 of the EIS), one of the wells will be situated upstream of the plant (to the east) and the other two downstream of the plant (to the western and northern boundaries). This is in line with EPA guidelines.

At these locations, groundwater samples will be collected and analysed by external consultants for the following parameters and/or others as required by the EPA:

- Total Organic Carbon (TOC)
- Ammonia (NH<sub>4</sub>)
- Conductivity
- pH
- Nitrite
- Nitrate
- Chloride
- Fluoride
- Metals (Cd, Tl, Hg, Pb, Cr, Cu, Mn, Ni, As, Co, V, Sn) and their compounds
- Organohalens

The monitoring frequency for these parameters is outlined in Table Ff (AGW1) in Appendix F11.

In the unlikely event that monitoring shows deterioration in groundwater quality beneath the development site as a result of operations at the waste-to-energy facility, the cause of contamination will be identified and removed. As the development site is located beside the Platin excavation any plume of contaminated groundwater generated below the waste-to-energy facility would migrate towards the Platin

excavation and eventually form part of the quarry's piped discharge to the River Nanny. Therefore, in the case of any deterioration in the quality of groundwater beneath the site, the company would consult with Irish Cement to ensure that the quality of groundwater pumped from the quarry to the River Nanny is not compromised.

### **F.5.3 Groundwater Monitoring and Sampling Modifications**

The principle modifications to the monitoring and sampling of groundwater emissions approved in Waste Licence 167-1 are outlined in Table F.5.a below.

**Table F.5.a: Modifications to Groundwater Monitoring and Sampling**

<b>Aspect</b>	<b>Difference</b>
F.5.2	The monitoring wells AGW1-1, AGW1-2 and AGW1-3 were previously referred to as AGW1, AGW2 and AGW3. Parameters to be monitored will be in line with WL167-1.

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## Attachment F.6: Monitoring & Sampling Noise

### F.6.1 Point Source Emissions Monitoring

It is proposed to carry out noise monitoring at the six noise sources identified in Attachment E.5 once as part of the first annual noise survey. For each emission source (N1 to N6), the following information will be collected:

- Sound pressure level (dBA) at a reference distance of 1m from the source
- Octave band analysis (dB)
- Location (in National Grid Coordinates)
- Elevation
- Periods of noise emission
- Details of any impulsive or tonal qualities
- Loading e.g. whether source is running at full load, at 50% load or other

The locations of these monitoring points are marked as N1 to N6 on Appendix E1. The grid references for these points are provided in Appendix E7.

### F.6.2 Ambient Monitoring

Annual noise monitoring will be carried out at three locations (AN1-1, AN1-2 and AN1-3) near sensitive receptors and at a fourth location (AN1-4) toward the rear of the site, isolated from the noise of the road. The locations of these monitoring points are shown in Appendix E1 at grid reference (30649E, 27093N), (30639E, 27076N), (30553E, 27094N) and (30612E, 27089N) respectively.

Daytime (30 minute duration) and night time (15 minute duration) noise measurements including  $L_{\text{aeq}}$ ,  $L_{10}$  and  $L_{A90}$  will be taken at each of the four monitoring points. This monitoring regime is summarised in Table Ff (AN1) in Appendix F12.

### F.6.3 Noise Monitoring and Sampling Modifications

The principle modifications to the monitoring and sampling of noise emissions approved in Waste Licence 167-1 are outlined in Table F.6.a below.

**Table F.6.a: Modifications to Noise Monitoring and Sampling**

Aspect	Difference
F.6.1: Point Source Monitoring	The locations of noise emitting equipment and hence the monitoring points for the first annual noise survey have changed with the revised site layout.
F.6.2: Ambient Monitoring	The noise monitoring locations AN1-1, AN1-2 and AN1-3 were previously referred to as ANN1, ANN2 and ANN3. The monitoring location AN1-4 at the rear of the site was previously referred to as ANB1.

## Attachment F.7: Monitoring & Sampling Meteorological Data

### F.7.1 Meteorological Monitoring Station

A meteorological monitoring station (reference point AA2) will be installed onsite to monitor wind speed and direction and atmospheric pressure on a continuous basis. Precipitation volume and temperature will be monitored on a daily basis. This monitoring regime is summarised in Table Ff (AA2) in Appendix F13.

It is proposed to locate the station near the staff carpark on flat ground at least 140m from the building, or in another suitable location as agreed with the Agency. Appendix E1 shows the proposed location of AA2, with a grid reference 30629E, 27072N. A wind sock will also be installed on top of the main process building, visible from the public roadway. All measurements will comply with World Meteorological Organisation Standards and Recommendations.

### F.7.2 Meteorological Monitoring and Sampling Modifications

The principle modifications to monitoring and sampling meteorological data approved in Waste Licence 167-1 are outlined in Table F.7.a below.

**Table F.7.a: Modifications to Meteorological Monitoring and Sampling**

Aspect	Difference
F.7.1	A reference number and location for the meteorological station and wind sock were not identified in the previous application.