APPENDIX 4

Odour Management System Overview




ODOUR MONITORING IRELAND LTD

Unit 32 De Granville Court, Dublin Rd, Trim, Co. Meath

Tel: +353 46 9437922
Mobile: +353 86 8550401
E-mail: info@odourireland.com
www.odourireland.com

RE: Proposed odour management system to be located in Thorntons Recycling proposed materials processing and transfer facility, Millennium Business Park, Dublin 15.

Date: 23rd June 2017

Ref: 2017755(1)

Dear David

Please find included a detailed high level review outline of the proposed odour management system to be implemented in Thorntons Recycling proposed materials processing and transfer facility to be located in Millennium Business Park, Dublin 15. This document will provide an overview of the proposal and outline the basic design principles for the overall odour management system. The odour management system will be based on the key principles of odour management to include Odour containment, Capture, Extraction and Treatment.

In terms of this information request, the proposed licensee will progress with the described body of works contain in this document in general.

We would welcome recommendations and observations without prejudice from the EPA throughout this initial design phase process.

In terms of the specified works, we will perform the following general tasks:

- Seek permission from the Agency to complete works as outlined in this document if the proposed licence is granted.
- Build the new building to a building integrity level of leakage of less than 3 m^3/m^2[clad]/hr at 50 Pa.
- Fit high efficiency sealed roller doors to main entry and exit doors on building (two off doors). All doors will also be interlocked with each other on the building.
- Install automatic pressure controlled fresh air intake dampers on the building fabric so as to allow for control to be achieved on the applied negative pressure to the building fabric during operation.
- Performed validation testing of building sealing and measure the complete leakage rate for the sealed building and submit report to EPA for verification before operation.

- Perform detailed design of odour control extraction system and sign contracts for supply, installation, commissioning and training (Handover) of such a system before operations commence within the building.
- Testing and validation of odour control system for submission to the EPA.
- Update Environmental Management System and Emergency response procedures as per pending Waste licence conditions to ensure sustained performance of the odour control system.
- Agree on-going testing requirements with EPA and put testing schedule into place at the facility. These reports will be submitted to the Agency to demonstrate our on-going commitment to ensure odours from the operations at the facility do not give rise to complaints.

Overview of odour management system to be located in Thorntons Recycling, Millennium Business Park.

The proposed odour management system to be located in Thorntons Recycling is made up of a number of different elements to satisfy the principles of odour control to include odour containment, odour extraction and capture and treatment.

Each element will be installed upon the Thorntons Recycling facility and will be dry and wet commissioned and examined and verified as installed appropriately and adequately. This process can be witnessed by the EPA if they deem necessary to do so.

Odour containment system

The odour containment system is made up of a number of different elements to include:

Division of the overall building footprint into a smaller more manageable foot print by insertion of dividing walls and isolation of the MMW/Bio-waste reception holding area from the SRF processing area, and the rest of the building which will contain non odourous processes. This therefore provides division between the non odourous dry and recycling waste processing with the more odourous MMW/Bio-waste handling, processing and bailing. This provides for the application of a more manageable odour extraction rate from the facility building.

The building fabric will be design to be sealed by means of building technology such as taping all joints, push wall cap seals etc. All openings will be closed up especially around cable glands, etc. The building will be tested for effective negative pressure application by means of closing up all door openings and application of negative extraction by means of the odour control system extraction fans. The building under pressure will be continuously measured by means of static pressure sensors so as to verify that the building is under negative pressure. The negative pressure set-point will be in excess of –ive 15 Pa. This will demonstrates that the building is effectively sealed and therefore will eliminate any odour leakage from the process building even in the absence of negative pressure application.

As part of the overall odour containment system upgrade, a number of strategically located fresh air intake negative pressure controlled louver systems will be installed upon the building. This system automatically opens or closes depending on the applied negative pressure placed upon the building by the main extraction fans. These are continuous monitored by means of applied negative pressure sensors and provide for control of the ingress of air into the building while ensuring that the negative pressure applied to the building envelope is maintained above –ive 15Pa. The system is standard equipment now as part of such an odour management system.

Finally, the building will be fitted where deemed necessary with high efficiency roller doors will as part of the building works. Doors will be rapid roller and interlocked.

When all these measures have been implemented the overall building will be sealed to a leakage efficiency of less than $3m^3/m^2$[clad]/hr at 50 Pa.

Appendix I provides an overview of the overall site including an outline of the various processing areas inside the contained building.

Odour capture and extraction

Odour extraction and capture is performed by means of extraction ductwork that will located along the building internal and from dedicated areas within the building including dedicated extraction from the MSW/Bio-waste storage area. This ensures that odours are contained locally to source within the building. Predominately, the extraction ductwork will be located along the centre spine of the building. Fresh air intake louvers will be located on outer walls. Fresh air intake air will be cold and drop to ground level quickly after entering the building. The extraction ductwork will be located at building eve's level whereby it can extract warmer odourous gases that will rise to the underside of the building roof of the material (and also heat generated from processing equipment and waste).

The total building clad surface area for the proposed upgraded building will be circa 9000 m^2. Assuming a sealing efficiency of less than 3 $m^3/m^2/hr$ this equates to a collection rate of 27,000 m^3/hr to ensure a slight negative pressure upon the building.

Assuming all doors are interlocked, the worst case door size opened will be 36m^2. Assuming an air extraction rate of 75,000 m^3/hr, this equates to a total extraction rate of 19.44 m^3/s. Assuming all air will enter in through this door, this will provide a face velocity of approximately 0.58 m/s.

The extraction ductwork will be manufactured from corrosion resistant PP plastic sheet. Extraction grills will be designed to ensure an equal face velocity of approx. 2.5 m/s across each extraction point.

Odour extraction from the facility building will be provided by means of two variable speed drive controlled centrifugal extraction fans. Each fan will be capable of maintaining an extraction rate from between 40,000 m^3/hr each up to a total extraction rate of 75,000 m^3/hr. Therefore, during routine maintenance which will be temporary, the odour control system will be capable of extracting 40,000 m^3/hr on one line and 75,000 m^3/hr on two lines, thereby providing excellent coverage in terms of odour control. The system is expected to operate at a flow rate of around 75,000 m^3/hr during routine operation albeit will be controlled depending on the applied negative extraction rate recorded on the static pressure sensors fitted to the main building.

Odour treatment system

All odourous air extracted from the facility will be passed through a regenerative dust filtration system before been passed through two off carbon filtration system for removal of dust and odours. All treated air will then be directed to a common dispersion stack as a means of added security. The total stack height will be 20 m.

Appendix II provides a simplified PFD diagram and an example general arrangement drawing of the likely proposed system.

Appendix III provides some pictures of typical systems following the same process flow and arrangement.

The installed dust filtration system will be based on high eff. cartridge based technology with a fully synthetic cartridge installed providing dust removal down to very high efficiencies (i.e. 99.9% RE) and very low particle size (i.e. less than 1 μm particle size). This will ensure that all air directed to the carbon filter will be free of dust and thereby will not allow the carbon to be blocked by same. The installation of panel based filters is unacceptable and will only lead to pronounced issues in operating the odour control system.

The regenerative jet pulse (RJP) dust filter will be monitored by means of differential pressure sensors. This will activate the cleaning cycle when a high set point back pressure is achieved and the system will self-clean through operation until the lower set point is achieved. The regenerative dust filter will be examined and verified to be installed appropriately. Die tests will be performed also on the outlet of the system to verify integrity. Appropriate poly spun synthetic filters will be installed in the system. A stand-alone fully SCADA monitored compressed air feed will be installed to provide -40^{0}C dew point air at 6/7 bar.

When the air is de-dusted, this dust free air will be directed towards two individual carbon filters each capable of treating 37,500 m^3/hr of odourous air continuously and 40,000 m^3/hr intermittently. Each carbon filter will be filled with a total carbon weight of approximately 20 tonnes each. Each vessel will be filled with a virgin steam activated bituminous coal pelletised carbon. Each system will be annular design and will be mounted off the ground so as to allow for ease of emptying.

Following treatment in the carbon filters, the air will be directed to a standalone exhaust stack for dispersion which will be approximately 20 m's high. This is only in place as a secondary protection measure.

Following installation of the odour control system, the overall operation of the system will be verified through odour assessment and measurement. The expected exhaust odour threshold concentration will be typically **less than 500 Ou_E/m^3** but a **stack guaranteed limit value of 700 Ou_E/m^3 will apply.** A full odour assessment and dispersion modelling report will be submitted to the EPA as a verification tool and acceptance test.

In terms of the odour control system, designing the carbon filter with a retention time in excess of 2.8 seconds will ensure that such low odour levels will be achieved even when inlet odour loads are in excess of 8000 Ou_E/m^3. In terms of this air stream, the expected inlet odour threshold concentrations are likely to be no greater than 5000 to 6000 Ou_E/m^3 given the predominant material to be processed inside the building and given the fact that MSW/Bio-waste storage will be located inside a dedicated isolated storage area from the result of the building. Such material is not expected to remain on site for no more than 48 to 72 hours.

SCADA monitoring and control system

The entire odour extraction and treatment system including all ancillaries which include doors, louvers, etc. will be monitored by means of various sensors installed throughout the system. The main sensors to be installed include static pressure, temperature and digital system outputs. This data will be collated in the SCADA system and alarm tags will be established to alert the operators of any operation issues with the system, during dry and wet commissioning.

The following tentative set points are likely to be established on the odour control / management system during dry commissioning. These are likely to change a little following full scale operation and these changes will be discussed with the EPA if deemed necessary.

Building under pressure range –ive 10 to –ive 15 Pa with an average of –ive 15 Pa.

Inlet duct work process negative pressure of – ive1000 Pa. Values in excess of –ive 1500 Pa will suggest extraction grill blockage and provide an alert to clean the grills in the building. Values less than –ive 500 Pa will suggest extraction system breach.

Before the RJP dust filter negative pressure of around –ive 1800 Pa to -2300 Pa expected. Expected pressure loss across the filters will be 800 Pa to 1200 Pa. When filters are blinded, even after cleaning the pressure drop will not go below 1,100 Pa. This will be an alarm set point and alert to change the cartridge filters.

After the RJP and before the carbon filter positive pressures of 800 to 950 Pa is expected. This will indicate that the pressure loss across the carbon filter and exhaust stack is 800 to 950 Pa. This demonstrates that the carbon filter has full integrity as if it did not then the pressure drop expected would be less than 500 Pa. This will demonstrate that the carbon filter is not blocked with dust. If the pressure loss were to increase above 1500 Pa then this would indicate blockage on the carbon filter and therefore full replacement would be required. This will be alarm tagged.

The total pressure loss across the operating fan can be calculated by adding both the negative value before the fan and positive value after the fan. This value is expected to be less than 3,500 Pa as any value higher than this would indicate that total air flow rate extraction is not been attained (fan curve static pressure capacity limit).

All data will be logged and indicated upon the control panel interface. This data will log and all trends can be reviewed on the SCADA if any issues were to develop. Alarm tagging will also occurred and this will act as a quick alert mechanism to any pending issues.

Building under pressure will also be logged. Door opening and closing will also be logged and alarmed if doors remain open for any long period of time.

We have included with this document various information in support of the proposed body of works. This is described as follows:

- *Appendix I* – Facility layout drawing illustrating odour extraction area
- *Appendix II* – PFD drawing for proposed odour treatment system.
- *Appendix III* – Pictures of similar odour treatment systems.
- Appendix IV – GA of fresh air intake dampers to be installed upon the building fabric (there will be 7 of 1m^2 louvers daisy chain linked in sequence with fast acting mechanical actuators).

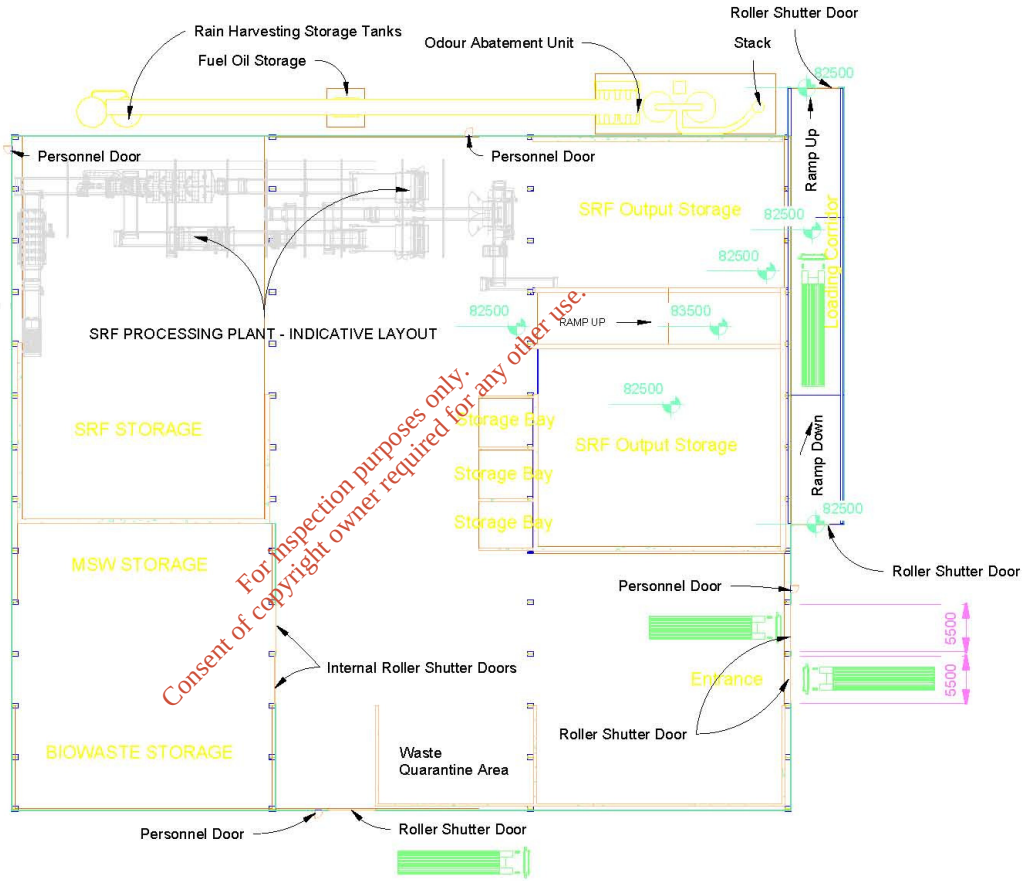
If you have any queries in relation to this information please do not hesitate to contact the undersigned below.

Yours sincerely,

For and on behalf of Odour Monitoring Ireland Ltd

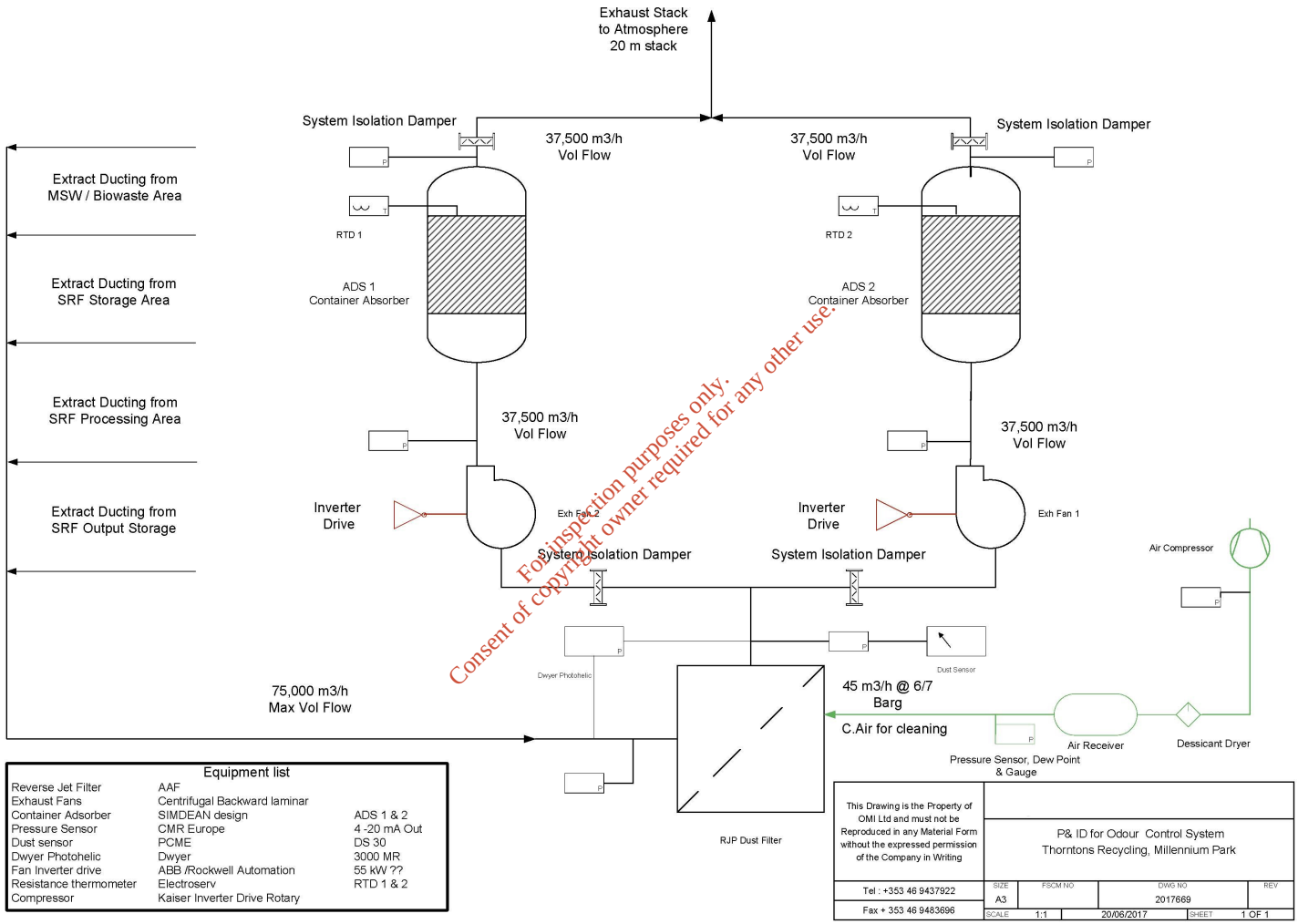
Brian Sheridan Ph.D Eng

Appendix I – Facility layout drawing illustrating odour extraction area



Overview of building internal areas.

Appendix II **– PFD drawing and GA drawing for proposed odour treatment system – Typical layout.**



Equipment list

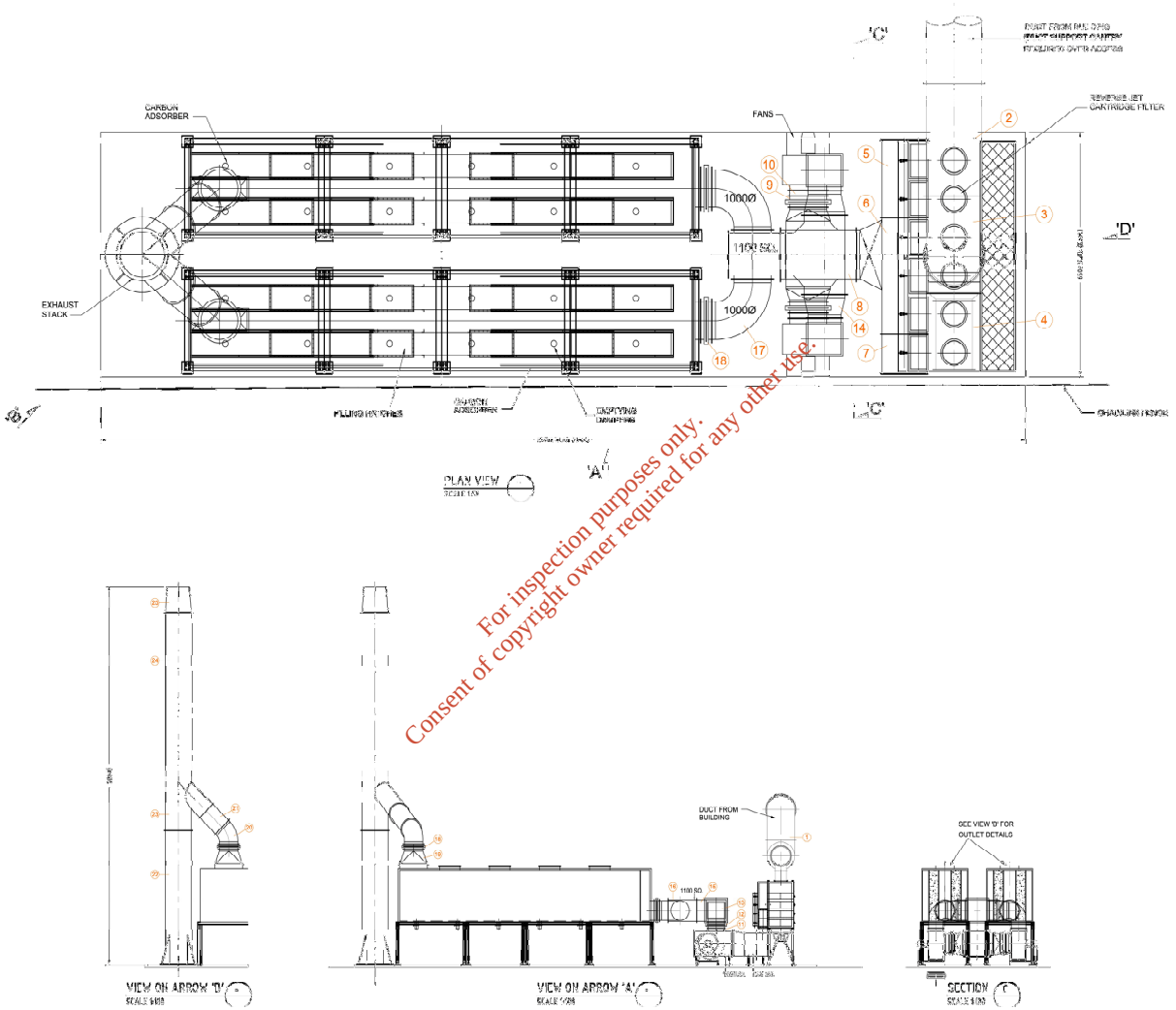
Reverse Jet Filter	AAF	
Exhaust Fans	Centrifugal Backward laminar	
Container Adsorber	SIMDEAN design	ADS 1 & 2
Pressure Sensor	CMR Europe	4 -20 mA Out
Dust sensor	PCME	DS 30
Dwyer Photohelic	Dwyer	3000 MR
Fan Inverter drive	ABB /Rockwell Automation	55 kW ??
Resistance thermometer	Electroserv	RTD 1 & 2
Compressor	Kaiser Inverter Drive Rotary	

P& ID for Odour Control System
Thorntons Recycling, Millennium Park

Tel : +353 46 9437922
Fax + 353 46 9483696

SIZE A3 | FSCM NO | DWG NO 2017669 | REV
SCALE 1:1 | 20/06/2017 | SHEET 1 OF 1

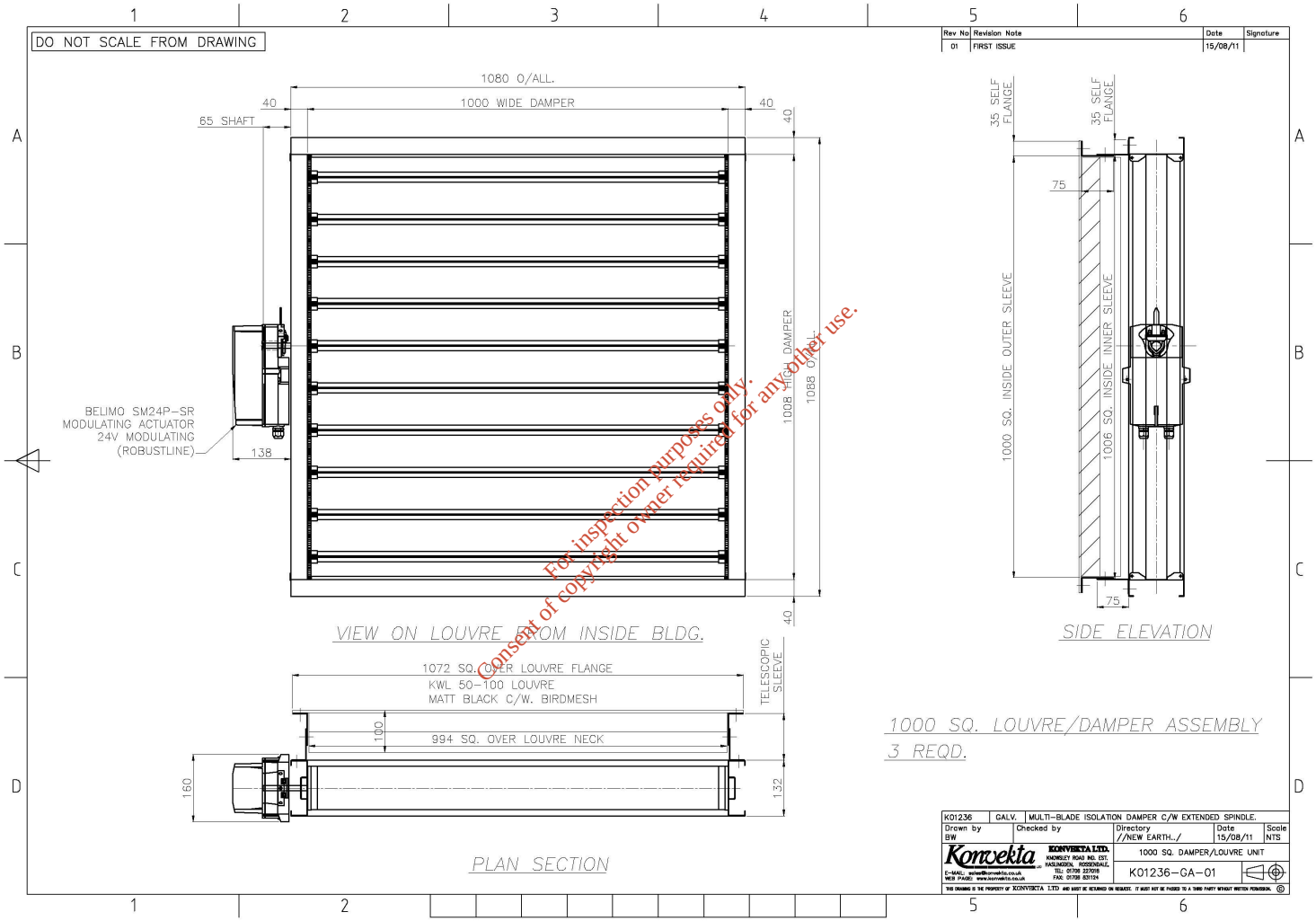
Proposed PFD model for proposed odour control system.



Example GA drawing for proposed odour control system

Appendix III **– Pictures of similar odour treatment systems.**

Appendix IV **– GA of fresh air intake dampers to be installed upon the building fabric.**



Example mechanically actuated louver system.

APPENDIX 5

AWN Consulting Technical Note

The Tecpro Building,
Clonshaugh Business & Technology Park,
Dublin 17, Ireland.

T: + 353 1 847 4220
F: + 353 1 847 4257
E: info@awnconsulting.com
W: www.awnconsulting.com

TECHNICAL NOTE

Project **Thorntons Recycling**

Subject **Response To RFI**

Author **Dr. Edward Porter**

Date **13/06/17**

Ref. **17_9588AT01**

Attached is a response to a Section 2c and 2d of the Request For Additional Information from the EPA (Dated 15th May 2017).

AWN Consulting were responsible for carrying out the odour modelling assessment (Appendix 9) that was submitted as part of the Environmental Impact Statement with the Planning Application.

Kind regards

Dr. Edward Porter C CHEM MRSC MIAQM

AWN Consulting

Cork Office
Unit 5, ATS Building,
Carrigaline Industrial Estate,
Carrigaline, Co. Cork.
T: +353 21 438 7400
F: +353 21 483 4606

AWN Consulting Limited
Registered in Ireland No. 319812
Directors: F Callaghan, C Dilworth,
T Donnelly, P Foster,
Associate Director: D Kelly

RFI, Section 2

2. Emissions to air:

c. Table 5 of the odour dispersion model outlines than an odour concentration of 700 OUE/Nm3 was used as a model input factor; however the discussion above this table states that the odour emission rate was based on an odour concentration of 700 OUE/m3. Confirm which units of measurements were used an input factor in the model i.e. normalised or not normalised.

Response:

The input to the odour dispersion model is based on an emission rate (OU_E/s). The emission rate is derived from the normalised emission concentration (OU_E/m^3) times the normalised volume flow (Nm^3/hr). OU_E/m^3 is a normalised value already and thus there is no need to add the N in the denominator (i.e. OU_E/m^3 is equivalent to OU_E/Nm^3). Normalised / standard conditions for olfactometry are 293.15K and on a wet basis (EN 13725:2003 "*Air Quality – Determination Of Odour Concentration By Dynamic Olfactometry*").

d. Figure 2 indicates that there is an odour plume of maximum of 1.5 OUE/m3 at the facility directly north of the proposed installation.

i. Confirm if this is the predicted odour plume (Max. 1.5 OU_E/m^3) resultant from the model input factors shown in Table 5.

ii. Clarify why this same plume reduces to a max. 1.0 OU_E/m^3 when combined odour impacts are taken into consideration in Figure 3.

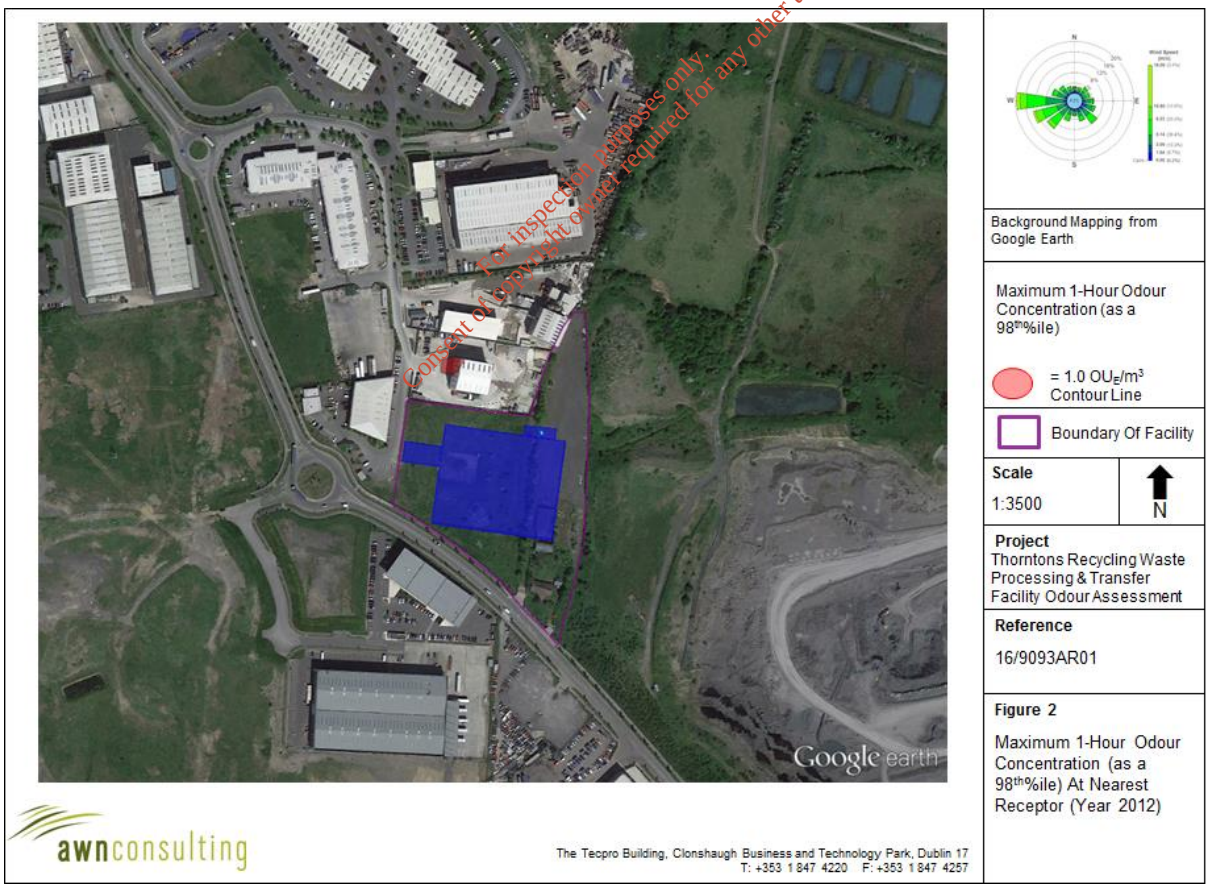
Response:

The maximum odour plume contour in Figure 2 should read 1.0 OU_E/m^3 (rather than 1.5 OU_E/m^3) and is based on the model input factors outlined in Table 5 of the Odour Modelling Assessment (Appendix 9). As shown in Table 6 of the Odour Modelling Assessment (Appendix 9) (reproduced below) the results peak at 1.1 OU_E/m^3 in any of the five years:

Table 6 Predicted Ambient Odour Concentration at Worst-case Offsite Receptors Based on the Proposed Abatement System (carbon filtration, 20m stack height) – Thorntons Recycling Waste Processing & Transfer Facility (OU_E/m^3)

Model Scenario / Meteorological Year	**Averaging Period**	Predicted Odour Conc. (OU_E/m^3)		Guideline (OU_E/m^3)
		Boundary Of Facility	Nearest Sensitive Receptor	EPA AG4 (2010)
Year 2011	Maximum 1-Hour (as a 98th%ile)	1.1	0.90	**1.5 (as a 98th%ile)**
Year 2012		1.1	0.91	
Year 2013		1.1	0.91	
Year 2014		1.0	0.97	
Year 2015		1.1	0.88	

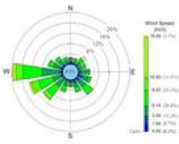
Figure 2 has been reproduced below with the updated legend (1.0 OU_E/m^3):



For the cumulative assessment, Figure 3 correctly shows the extent of the 1.0 OU_E/m^3 in the region of the facility with a 1.5 OU_E/m^3 in the region of the other two facilities (reproduced below):

awnconsulting

The Tecpro Building, Clonshaugh Business and Technology Park, Dublin 17
T: +353 1 847 4220 F: +353 1 847 4257



Background Mapping from Google Earth

Maximum 1-Hour Odour Concentration (as a 98th%ile)

= 1.0 OU_E/m^3

= 1.5 OU_E/m^3

Boundary Of Facility

Scale
1:5500

N

Project
Thorntons Recycling Waste Processing & Transfer Facility Odour Assessment

Reference
16/9093AR01

Figure 3
Maximum 1-Hour Odour Concentration (as a 98th%ile) At Nearest Receptor (Year 2012) – Cumulative Assessment