6.1 Introduction

This chapter considers the potential impacts of emissions to atmosphere arising as a result of the construction and operation activities at the Kilbride Composting Facility. Air quality impacts on the surrounding area could be caused by the following four types of emissions:

i) **Odours**

ii) **Bio-aerosols**

iii) **Dust including PM10**

iv) ***Airborne Litter***

Emissions may arise during:

- construction of the facility (earth moving and clearing);
- operation of the composting activity (delivery of feedstock, shredding, screening, pile turning, loading and unloading of in-vessel tunnels, biofilter emissions).

With respect to the potential for air quality impacts, the key objective for the proposed composting facility is to manage the activities associated with the scheme in order to ensure that air emissions where they do arise, such as bioaerosols and odours, are adequately treated prior to release to atmosphere, and that other fugitive releases, such as dusts and litter are minimised.

6.2 Study Methodology

The potential impacts of air emissions on the sensitive locations in the vicinity of the Kilbride composting facility have been assessed. A description of the Receiving Environment surrounding the proposed development, where the air quality could be adversely affected, has been provided in Section 6.3.

Under section 6.4 '**Potential Impacts of the Development**' the following issues are then addressed separately for each of the four categories of potential impacts (6.4.1 Odour, 6.4.2 Bioaerosols, 6.4.3 Dust, and 6.4.4 Airborne Litter):

- baseline conditions -pertaining to the measured or estimated current air quality associated with the particular parameter (dust, odour) in the vicinity of the proposed development;
- evaluation criteria;
- methodology used to predict the potential impacts of the proposed development on air quality at local properties;
- an evaluation of these impacts;
- description of mitigation measures which will be incorporated into the design and operation of the composting to eliminate or reduce the potential for air quality impacts;
- summary of any residual impacts and reinstatement;
- monitoring proposals.

The Chapter concludes by assessing the Do-Nothing Scenario for the site in relation to Air Quality in the locality (Section 6.5).

6.3 Receiving Environment

The existing site is currently under tillage, and is located in a rural area north-east of Milltownpass. The site is surrounded by peatland, pine afforestation, and agricultural land. *Several residences are located within* one kilometre of the site.

This air quality impact assessment focuses on buildings in the immediate proximity (within 1000 metres) of the proposed composting facility *where potential impacts are likely to be greatest. For the purposes of this* assessment these have been termed 'Air Sensitive Receptors' (ASR). The direction and distance of each sensitive receptor from the closest proposed site operations is indicated in Table 6.1 and their locations are shown in Figure 6.1.

The closest residential dwelling is ASR 3, located 510 metres from the site boundary and 640 metres from the closest operational area.

Table 6.1 Air Sensitive Receptors

Air Sensitive Receptor (ASR)	Location	Approximate distance of ASR to site boundary	Approximate distance of ASR to nearest activity
ASR 1	East/south-east of the site	920 metres from site boundary	1110 metres from site activity
ASR 2	East/south-east of the site	880 metres from site boundary	1090 metres from site activity
ASR 3	North-east of the site	510 metres from site boundary	640 metres from site activity
ASR 4	north/north-west of the site	760 metres from site boundary	860 metres from site activity

6.4 Potential Impacts of the Development

The potential impact of the development on the air quality of the area has been assessed for four types of air emissions:

1) **Odours** - caused by fresh waste handling, and odours generated during the composting process

2) **Bio-aerosols** - microbial particles present in composting material which can become airborne and may cause irritation to lungs if inhaled at high concentrations

3) **Dust including PM_{10}** - suspended particulates which can cause nuisances if not properly controlled, and which may be detrimental to health at respirable sizes smaller than 10 micron

4) **Litter** - windblown waste

Each of these types of air emissions are assessed separately in the following sections, with details of baseline conditions, evaluation criteria, method of prediction, evaluation of impacts, proposed mitigation measures and monitoring proposals detailed for each.

6.4.1 Odour

Introduction

Potential odour problems from composting can be a significant concern to both composting operators and residents. Where odour issues arise at a composting facility, these are generally caused by the following issues:

- Fresh feedstock delivery - particularly if organic waste was stored for a period of time before transfer to the facility
- Preparation and shredding of feed stock
- Releases of odours during turning operations
- Inadequate turning or aeration of piles limiting oxygen exchange with waste causing anaerobic conditions to develop
- Fugitive emissions during tunnel loading or emptying
- Exhaust air emissions from invessel composting units

Odours can also be caused if the site surfaces and delivery vehicles are not cleaned and maintained regularly, and if general operational controls are not fully implemented.

Baseline Conditions

As the site is currently a field under tillage, no unpleasant odours are presently generated at the site. A walk-over odour survey was conducted in the vicinity of the site on the 8th January 2004 during which the only evident smell was a slight ammoniacal odour around the bog ditches, which is characteristic of damp peat.

Evaluation Criteria

Under the Air Pollution Act 1987, as amended by the Third Schedule of the EPA Act 1992-2003, odour is considered a pollutant if it is injurious to public health, deleterious to ecology, or impairs or interferes with amenity or the environment.

There are no statutory standards in Ireland for the control of odour. The generation of odour can lead to environmental nuisance effects, and a deterioration of the quality of life in the vicinity of a composting site. Because of the subjective nature of the perception of odour from composting operations, there are no quantitative standards for odorous compounds in the context of the proposed facility. A qualitative approach is adopted below.

Method of Prediction

The potential odour impacts arising from the proposed composting development have been assessed by considering the following:

- design factors of the facility and the process controls that will be in place to minimise odours
- the location of sensitive receptors in relation to the proposed facility
- the effect of varied meteorological conditions on the dispersion of odour emissions;
- general housekeeping practices adopted at the site.

Based on the Mullingar windrose 1994 to 2003 depicted in Figure 7.4 (Climate Chapter), the main wind direction in the area is from the south, south-west and west. The wind blows from this quadrant (180°-270°) for approximately 38% of the year.

The greatest potential odour impact would therefore be expected downwind of the predominant wind, to the north-east of the Kilbride site. The residence most likely to be affected by odour is the Air Sensitive Receptor, ASR-3.

Evaluation of Impacts

The composting facility is designed with odour management as a principal consideration, as detailed in the '*Mitigation*' section below.

If released to atmosphere, odours may impact on the identified nearest receptors depending on the coincidence of high concentrations of odorous compounds, poor atmospheric dispersion conditions, proximity to the odour source on site and the wind direction being towards the receptors.

A full dispersion model from the site was carried out for bio-aerosols as detailed in the next section, 6.4.2. This indicated that due to the distance between the proposed facility and any residential properties, a significant reduction of pollutant loading is predicted between the facility and the sensitive receptors.

With all mitigation measures in place, and good operational management implemented, it is considered that odours emissions from the facility will be minimised as much as practicable.

Mitigation Measures

As described in Chapter 4, Process Design, and Section 4.11 Air Management, the proposed composting facility has been designed based on an air extraction and treatment system which provides advanced odour control. Waste material will undergo two stages of treatment; firstly in-vessel composting will be employed with a second further stage of curing provided in the aerated static piles. The air extraction system draws air through the static piles as well as from the invessel tunnels, and directs the emissions to biofilters for treatment prior to release to atmosphere. Untreated dispersal of odours from the static piles and the in-vessel tunnels is thereby prevented. The over riding management principle is that the waste will remain under active aerobic control as this is the most effective method of odour prevention.

Installation of Negative Aeration System under Aerated Static Piles

The negative aeration system will be the primary odour control mechanism at the composting facility Pilot studies and tests carried out at existing facilities operating with this system have shown average reductions of 78% to 99% in concentration of odorous substances, as follows:

Table 6.2 Bio-filtration performance regarding Odour Reduction

Analysis	Units	No	Mean Inlet	Mean Outlet	% Reduction	Odour Detection Threshold (Williams 1995)
Hydrogen Sulphide	ppm v/v	133	0.054	0.0005	99	0.0005
Ammonia	ppm v/v	133	1.30	0.065	95	0.04
Methyl Mercaptan	ppm v/v	28	0.26	0.039	85	0.0005
Dimethyl Sulfide	ppm v/v	28	0.34	0.061	82	0.001
Dimethyl Disulphide	ppm v/v	28	0.19	0.042	78	0.00003

Information provided by Celtic Composting Ltd

As can be seen, the concentration of odourous substances is significantly reduced due to the treatment provided in the bio-filtration process.

This proposed system is in place in a large scale facility in Cedar Grove, Seattle, Washington. It has been stated that the Cedar Grove facility, which used to get regular odour complaints when operating a windrow facility, have received no complaints regarding odours since using the aerated static pile and bio-filter system (pc from Celtic Composting).

The release of odour will be further mitigated by the adoption of good composting management practices, such as are outlined in the *Environment Agency for England and Wales (EA) Technical Guidance on Composting Operations, Draft for External Consultation, October 2001, version 3.* These include the following points for odour minimisation:

- rigorous control of delivered feedstock - contaminated or odorous wastes will be rejected (i.e. organic material that has been stored too long)
- use of good practice procedures to prevent anaerobic conditions occurring. Avoid delaying the piling of newly delivered and rapidly decomposable feedstock materials
- regular cleaning of operational areas such as roads and drainage channels will discourage odour generation from old degrading materials. This can be easily achieved through good housekeeping.
- use of in-vessel tunnels which provide optimal conditions for odour control, as they are enclosed systems and also offer a higher degree of process control.

As much of the activity as is practicable will take place within enclosed production sheds, in order to minimise odour emissions.

Residual Impacts and Reinstatement

Provided good composting procedures and odour control measures are implemented by the operator as listed above, it is not anticipated that odour will have a significant impact on the surrounding properties.

In the event that the composting facility ceases to operate, all odour generating materials will be removed off-site and will be disposed of at a suitably licensed facility within a matter of a few weeks. There would be no residual odour impact from the development.

Proposed Monitoring

A daily site walkover to determine the levels of odour at the site boundary will be carried out. In the event of complaints or a request by the EPA, more in-depth odour surveys would be considered.

6.4.2 Bioaerosols

Introduction

This section assesses the risks to human health from emissions of bioaerosols to air. As there is currently no requirement from the Irish Environmental Protection Agency to carry out a bio-aerosol risk assessment, this assessment has been produced in line with the requirements of the Environment Agency for England and Wales (EA) position statement on composting. This states that a health risk assessment of inhalation of emissions of bioaerosols needs to be undertaken for properties less than 250 m from proposed composting plants (Ref. B1).

Around the Kilbride site none of the sensitive receptors are less than 250m from the site. However the assessment has been undertaken for all four Air Sensitive Receptors depicted on Figure 6.1, in order to provide a full assessment of the levels of bioaerosols which could occur at these locations.

The risk assessment concentrated on assessing possible risks to human health at nearby sensitive receptors as a consequence of emissions of bioaerosols from the plant, due to the composting process. These emissions comprise bacteria and fungi.

This study used an approach used for similar facilities in the UK, which was found to be acceptable by the Environment Agency for England and Wales.

Method of Prediction

The risk assessment was based upon guidance set out by the Environment Agency for England and Wales and the UK Government Department for Environment, Food and Rural Affairs (DEFRA) (Ref. 2 and Ref. 3).

The risk assessment was undertaken using the following steps:

- Information relevant to the study was obtained, including:
- A description of the proposed facility building including dimensions and location (Ref. 4);
- Derivation of the likely emissions of bioaerosols (Ref. 5);
- The location of nearby sensitive receptors from local mapping (Ref. 4);
- The Atmospheric Dispersion Modelling System (ADMS) dispersion model was used to predict the concentrations of bioaerosols at nearby sensitive receptors. A description of the ADMS model and methodology is included in section 7;
- The results of the ADMS dispersion modelling were assessed against tentative guidelines proposed in a UK EA Research and Development Report (Ref. B2) in order to assess the risks to human health;
- Where information has been received from third parties this has been accepted de facto.

Sources of emissions of Bioaerosols

The feedstock for the composting facility consists of organic fines, catering waste, green waste and wood chip. Table 6.3 sets out possible source-pathway-receptor linkages for exposure of local sensitive receptors to emissions of bioaerosols from the proposed composting facility.

Table 6.3 Source/Pathway/Receptor evaluation

Primary Source	Hazard	Transport mechanism	Pathway	Medium of exposure	Receptor
Waste reception	Chronic or acute illness due to exposure to bioaerosols	Atmospheric dispersion	Inhalation	Air	Local residents or workforce
Waste storage					
Waste screening					
Waste shredding					
Waste composting					
Storage of compost product					
Loading and transport of compost product					

The primary bioaerosols of interest are set out in a report from the UK Composting Association (Ref. 6). These include mesophilic bacteria which flourish at temperature between 20? and 45 ?Celcius and Aspergillus fumigatus, one of the widespread Aspergillus fungi. A different range of bacteria, fungi and gram-negative fungi were determined in Environment Agency sponsored research (Ref. 2). Measurements of Streptococcus and Actinomycetes were also made, but the data were not interpreted in the research. Aspergillus can be a problem at open windrow composting sites, where it forms within the top layer of compost. When this layer is disturbed, fungal spores can be released.

We therefore conclude that the principal class of bioaerosols which needs to be addressed in this project is total bacteria. We have also included an evaluation of Aspergillus fumigatus using measurements of fungi. A more detailed investigation of fungal spores could also be considered if levels of Aspergillus fumigatus are found to be a significant issue. The airborne levels of bacteria and fungi are measured as colony forming units per meter cubed (cfu/m^3).

Risk screening and prioritisation

The risks which need to be addressed are set out in Table 6.3. The distinct sources can be screened by consideration of the potential for release of bioaerosols. Bioaerosols are most likely to be released when waste is being agitated or processed. Bioaerosols may also be released during movement of waste in bulk. Any releases will be less significant from waste which is not disturbed.

As the waste is processed in the composting process, it becomes progressively less biologically active. Analysis carried out at a UK commercial composting plant, illustrated "a reduction in pathogens to below detectable levels on all samples" (Ref. 3). This report contained an independent evaluation, confirming that the process conforms to the United States Environmental Protection Agency definition of a Process to Further Reduce Pathogens. On this basis, we conclude that compost during processing, storage and transportation off-site will constitute a much less significant source of bioaerosols than fresh waste arriving at the process.

The sources of bioaerosols are therefore classified as following:

- **Higher risk**: Waste shredding and screening;
- **Medium risk**: Waste reception and waste storage;
- **Low risk**: Waste composting; compost storage; compost transporting.

Risk Quantification

A study was carried out to quantify the potential risk to off-site receptors associated with releases to air of bioaerosols from the proposed composting facility. The modelling methodology and inputs are set out below. In summary, the study was carried out as follows:

1. The building envelope of the composting facility and other elements of the facility were taken from information provided by Thorntons Recycling (Ref. 4);
2. Information on airflows passing through the composting building provided by Celtic Composting (Ref. 7);
3. Information on levels of bioaerosols present in the air released from the building was taken from Millner, Olenchock et al. (Ref. 5) on the recommendation of Celtic Composting (Ref. 7);
4. Information on background levels of bioaerosols likely to be found in the environment was also obtained (Ref. 8);
5. Tentative benchmarks for safe levels of exposure to bioaerosols were taken from Ref. 2;
6. Local receptors were identified from mapping of the local area (Ref. 4).

Emissions of bioaerosols

The air from within the composting plant building is passed through a biofilter before emission to the ambient air. This is primarily designed to minimise odorous emissions but will also reduce the numbers of bacteria and fungi released from the plant. While there is no specific bioaerosols emissions data available for this type of plant, Celtic Composting recommended that emissions of bacteria and fungi could be established from Millner, Olenchock et al. (Ref. 5). This document was reviewed and the likely levels of bioaerosols within the plant building were established. The biofilters are likely to reduce the bioaerosol loading by more than 90% (Ref. 9).

Table 6.4 below sets out typical values of airborne bacteria measured within composting facilities (Ref. 5), and the value which will be used in the assessment.

Table 6.4 Estimated concentrations of bacteria in emissions from the plant

Bioaerosol	Study area	Bioaerosols identified in plant air (cfu/m^3)	Emission level used in assessment (cfu/m^3)
Total Bacteria	Refuse Hoppers	43,000	
	Waste process Areas	94,000	
	Screening areas	96,000	
	Value used in assessment		**96,000**

The worst case emissions have been assumed and an emission level of 96,000 colony forming units per cubic metre has been used in the assessment.

Millner, Olenchock *et al.* (Ref. 5) reported on-site levels of fungi from a number of composting facilities. The numbers of fungi present vary considerably as set out in table 6.5.

Table 6.5 Estimated concentrations of fungi in emissions from the plant

Bioaerosol	Location	Bioaerosols identified in plant air (cfu/m³)	Emission level used in assessment (cfu/m³)
Total Fungi	Washington	175	
	Washington	3610	
	Connecticut	199	
	Maine	1000	
	West Windsor	115	
	Value used in the assessment		**3610**

The worst case emissions have been assumed and an emission level of 3610 colony forming units per cubic meter has been used in the assessment.

Background bioaerosol levels

The derivation of the background bioaerosol levels used in the study, as set out in table 6.6 is detailed below.

Table 6.6 Estimated background concentrations of bacteria and fungi used in the study

Bioaerosol	Background (cfu/m³)
Total Bacteria	200
Total Fungi	50

Benchmarks

The Environment Agency of England and Wales proposed tentative benchmarks for levels of airborne bacteria and fungi in a recent research document (Ref. 2), which are set out in table 6.7.

Table 6.7 Tentative benchmarks for bacteria and fungi used in the study

Bioaerosol	Tentative benchmark (cfu/m³)
Total Bacteria	1000
Total Fungi	1000

Local sensitive receptors

Four local sensitive receptors have been identified from a study of local mapping. These are set out in table 6.8.

Table 6.8 Location of nearby sensitive receptors

Receptor	Distance from composting facility (metres)		Direction from composting facility
	From biofilter emission point	From site boundary	
ASR1	1110	920	Southeast
ASR2	1090	880	Southeast
ASR3	640	510	East
ASR4	860	760	Northwest

Evaluation of Impacts

The highest levels of bioaerosols likely to arise at these locations were estimated using an atmospheric dispersion model as set out in Appendix 1. The results are illustrated in Table 6.9

Table 6.9 Highest levels of bioaerosols likely to arise at nearby receptors

Bioaerosol	Receptor	Bench-mark (cfu/m³)	Back-ground (cfu/m³)	Highest forecast levels of bioaerosols due to emissions from proposed facility (cfu/m³)
Bacteria	ASR1	1000	200	48
	ASR2			46
	ASR3			240
	ASR4			78
Fungi	ASR1	1000	50	1.8
	ASR2			1.7
	ASR3			8.9
	ASR4			3.0

Note: Results are based upon a 1-hour averaging period

The results of the assessment illustrate that the predicted levels of bioaerosols at the nearby sensitive receptors as a consequence of emissions from the plant are not in breach of the tentative benchmarks, and are a relatively small proportion of the estimated existing background levels.

The uncertainty in these levels was evaluated in qualitative terms. Because a "worst case" approach was adopted to estimating levels of bioaerosols, the levels shown in Table 7 represent the highest levels likely to arise in practice.

Discussion

The significance of the estimated levels of bioaerosols was established by comparison with both estimated background levels and with the tentative benchmarks recommended in the EA research report.

The highest forecast levels of bacteria occurring at any sensitive receptor are 59% of the tentative benchmark, and the combination of the highest forecast levels of bacteria plus the background is 790 cfu/m3, or 79% of the benchmark.. Therefore emissions of bacteria from the plant are not predicted to result in a significant risk to human health at the nearby sensitive receptors.

The highest forecast levels of fungi occurring at any sensitive receptor are less than 2.2% of the tentative benchmark, and 44% of the existing background levels. Therefore emissions of fungi from the plant are not predicted to result in a significant risk to human health at the nearby sensitive receptors.

Mitigation Measures

On the basis of the results of the assessment, the proposed facility provides an appropriate level of control of bioaerosols generated during the composting process.

It is recommended that controls described by Thorntons should be applied during the design and operation of the proposed facility. These controls include:

- Operation of the reception, shredding and composting system of organic fines and catering waste within a fully enclosed building, with release of air via biofilter;
- Use of selected materials which when mixed with a target waste stream in the correct ratio provide rapid composting activity at elevated temperature;

Residual Impacts and Reinstatement

In the event that composting activities cease at the site all operational sources of bioaerosols will be removed. There would be no residual impact on the surrounding properties.

Proposed Monitoring

Monitoring of total bacteria and Aspergillus fumigatus in ambient air should take place prior to and following construction and commissioning of the proposed facility. This should be undertaken in accordance with the guidance set out in the Composting Association guidance (Ref. 6). The guidance provides for monitoring upwind and downwind of the composting facility, together with on-site measurements.

The monitoring data should be checked to ensure that there is no evidence of a significant contribution from the proposed facility, and also to confirm that the assumptions with regard to emissions made in this report are borne out in practice.

References re. Bioaerosol Assessment

1. Environment Agency for England and Wales position statement regarding composting facilities, August 2001
2. The Environment Agency for England and Wales (2000) The health effects of composting: A study of three compost sites and review of past data, EA R&D Technical report P1-315/TR
3. Guidelines for environmental risk assessment and management The UK Government Department for Environment, Food and Rural Affairs DEFRA, the Environment Agency for England and Wales and the Institute for Environmental Sciences (2000)
4. Thorntons recycling limited (2004) plant specification and location data
5. The Composting Association (1999) Standardised protocol for the sampling and enumeration of airborne bioaerosols at composting facilities
6. Celtic Composting (2004) plant specification and airflow data
7. Millner, Olenchock et al. (1994) Bioaerosols associated with composting facilities *Compost science and utilization Vol. 2 No. 4*
8. Silo-cage composting trials technical report (1999) unpublished report
9. Sanchez-Monedero M.A. and Stentiford E.I. (2002) Aspergillus Fumigatus control at composting plants through the use of biofilters *Presented at 2002 International symposium: composting and compost utilisation*

6.4.3. Dust including PM_{10}

Introduction

Dust is airborne particulate matter in the size range of 1-75μm. In general dust can present a nuisance if it is present at high concentrations. However, specific concern has been raised with regard to particles of diameter 10 m or less (PM_{10}) due to their potential for respiratory health effects.

Dust generation during the composting process will be limited by the high moisture content required for organic degradation of waste to take place. Dust does not arise at a moisture content above 35%. However, potential dust arisings may occur during the following site activities:

- Facility construction periods including earth removal and building works
- Incoming waste handling and screening
- Green waste shredding
- Loading and unloading of invessel tunnels
- Bagging or bulk loading of final compost
- The movement of vehicles and equipment on unswept roads during dry weather

If dust is liberated, its dispersal is affected by a number of factors including particle density and size, wind speed and direction, and rainfall. Dust emissions require particular control during prolonged dry and windy weather conditions.

The larger dust particles (greater than 30μm) which make up the greatest proportion of dust emitted from general site activities, such as works during the site construction stage, will largely deposit within 100m of sources. Intermediate sized particles (10-30μm) are likely to travel up to distances of 250m. These coarser fractions of particulate matter are less harmful to human health but may constitute a potential nuisance if carried off-site and deposited at local properties. This may cause loss of amenity and lead to complaints. Smaller dust particles, such as PM10's behave more like gaseous substances and can remain airborne over greater distances, depending on metrological conditions.

Baseline Conditions

As part of this EIS, a baseline dust deposition survey was carried out at the site initially proposed for the development. This site is located approximately 500 metes to the west of the final site now proposed. Four sampling stations (D-1 to D-4) were erected on the 8th January 2004, and left exposed to the ambient air for one month, as specified in the *German Bergerhoff Dust Deposition sampling standard VDI method 2119 part 2, 1972*. Sample locations are shown in Figure 6.1. Although one sampling station was vandalised, baseline dust deposition levels measured at the remaining three sampling locations (at the initially proposed site) would be similar to ambient dust levels found at the final site now proposed, and are therefore representative as dust deposition baseline levels for the area. Recorded dust deposition concentrations are presented in Table 6.10. The values measured ranged from less than 26 mg/m2/day to 48mg/m2/day, indicating a typical rural environment with relatively low dust levels.

For completeness, an additional 2 samples were taken on the new site (D5 and D6). The results are awaited and will be included in the waste licence application for the site.

Additionally an ambient PM10 dust survey was carried out at the final proposed site on the 17th February 2004 in accordance with the standard method *prEN12341 'Air Quality-field test procedure to demonstrate reference equivalence of sampling methods for PM_{10} fraction of particulate matter'*. A mobile Minivol sampler was installed at one location (P-1) to the north-east of the site and ambient air was drawn into the instrument over a 24 hour period. The sampling location is shown on Figure 6.1. The concentration of fine dust fractions collected on an internal filter medium was determined in a laboratory. The resultant concentration of fine particulates -PM_{10} -was less than the limit of detection (< 13 ug/m³) which reflects an environment with low levels of inhalable dust particles.

Table 6.10 Baseline Dust Measurements in the vicinity of the Kilbride Site

Dust Deposition Measurement Position	Location	Dust deposition mg/m²/day
D1	Eastern boundary of originally proposed site	48
D2	Northern boundary of originally proposed site	48
D3	Western boundary of originally proposed site	<26 Note 1
D4	Northern boundary of originally proposed site	Sample station vandalised
Ambient PM_{10} Measurement Position	**Location**	**Ambient PM10 µg/m³**
P1	North-eastern boundary of final proposed site	< 13.8 Note 1

Note 1: These results indicate that the dust concentrations were below the laboratories limit of detection

Example of a dust collection jar

Evaluation Criteria

Under the *Air Pollution Act 1987* dust is considered a pollutant if concentrations are such that it is injurious to public health, deleterious to ecology, or impairs or interferes with amenities or the environment. This definition of air pollution has been transposed into the more recent Protection of the *Environment Act 2003*.

There are no statutory standards in Ireland for the control of dust nuisance. The TA Luft Guideline entitled "*Technical Instructions on Air Quality Control, 2001"* which is frequently applied as a guideline in Ireland sets a limit of 350 mg/m²/day on dust deposition. The recent *EPA Landfill Monitoring Manual, 2nd edition, 2003,* refers to a dust deposition limit value of 350 mg/m²/day and a PM_{10} trigger level of >50µg/m³ .

The air quality standards prescribed in the European Union Framework Directive on Ambient Air Quality Assessment and Management (1996/62/EC) and subsequent Daughter Directives (1999/30/EC and 2000/69/EC) include limits for ambient PM_{10}, as detailed below.

Table 6.11 EU Air Quality Framework/Daughter Directive Air Quality Standards

Substance	Description of standard	Statistic	Value (µgm⁻³)
PM_{10}	Daughter Directive Limit to be achieved by 1 Jan 2005	Annual mean	40
	Daughter Directive Limit to be achieved by 1 Jan 2005	90.4th percentile of 24 hour means (35 exceedences allowed)	50

Method of Prediction

The potential dust impacts arising from the proposed composting development have been assessed qualitatively by considering the following factors:

- the likelihood of dust arising during the composting process, with regard to the design and process flow of the operation
- the location of sensitive receptors in relation to the proposed facility
- the effect of varied meteorological conditions on the dispersion of dust emissions
- general housekeeping practices adopted at the site

The greatest impact of dust blowing from the facility must be expected at sensitive receptors directly downwind of the site.

Based on the Mullingar windrose 1994 to 2003 depicted in Section 6.4.1 Odours the main wind direction is from the south, south-west and west. The wind blows from this quadrant (180°-270°) for approximately 38% of the year.

Other factors being equal, dust impact would therefore be expected to be most apparent downwind of the predominant wind, to the north-east of the Kilbride site. The residences with the greatest potential to be affected by air blown dust are therefore the Air Sensitive Receptors at ASR-3.

Evaluation of Impacts

During the construction of the facility the dust particles generated by ground levelling and general site preparation works are likely to be between 10 and 70 m diameter with the majority over 30 m in diameter. On this basis, and considering the larger fractions of dust are deposited within 100m of the release point, most of the dust potentially emitted during site construction will be deposited on the ground between the composting site and any of the identified properties, even when the wind blows directly from the site towards these Air Sensitive Receptors.

During composting operations potential dust emissions are limited by the amount of moisture present in the waste material. The composting process requires a minimum moisture level of at least 35%, in order for the organic decomposition to take place, rising to 65-70% at some stages. Therefore the material will not be permitted to dry out to such an extent that significant dust generation may arise.

However potentially some dust may be released during the following operations:

- *Green waste delivery and shredding*: During green waste delivery, handling and shredding dust may be generated if the feed stock (wood, garden waste) has a moisture content of less than 35%.
- *Catering waste/organic fines waste material delivery and mixing*: During waste delivery, handling and the loading of materials into the mixer dust may be generated, the amount of which will vary depending on the composition of dry and wet materials. This unit process will take place indoors.
- *In-vessel tunnel loading*: After the waste mixing the moisture content of the material should be a uniform 50-65%. As dust does not arise above a moisture content of 35%, no dust generation should occur during this process. This unit process will take place indoors.

- *In-vessel tunnel composting*: During in-vessel composting in tunnels no dust is emitted as the units are fully sealed and the exhaust air from the tunnels is directed to biofilter treatment system prior to release to atmosphere.
- *In-vessel tunnel unloading*: Dust may arise during the unloading of in-vessel tunnels. The tunnels should be switched to negative air pressure during the unloading, in order to contain as much of the dust particles as possible within the air pressurised system.
- *Curing on Aerated Static Piles*: During the curing process air is drawn down through aerated piles into a contained air handling system. The air drawn through the piles is directed to the biofilters, which act as an efficient dust trap. However, during pile turning dust generation may arise. The proposed aerated pile system is designed to ensure only a minimum of pile turnings are required, at one turn every 6-8 weeks. During the turning moisture may also be added to the piles, to ensure that the moisture content remains above 35%.
- *Trommel screening*: Excessive dust will only be generated during screening if the moisture content during curing has been allowed to drop below 35%. However during the vigorous agitation of material in the trommel some dust generation is likely.

Mitigation Measures

The main dust control measure at the proposed composting facility will be the aeration system connected to the in-vessel tunnels, the curing piles and part of the materials handling and storage areas. As stated above, the aeration system directs all pollutant laden air to biofilter units for treatment prior to release to atmosphere.

The biofilters significantly reduce dust loading from exhaust air, due to the high absorption capacity of the biofilter material. The biofilter must always remain moist in order to ensure efficient operation, which is based on the viability of microbes within the substrate. As stated earlier, dust does not arise at moisture levels above 35% , therefore it is not envisaged that significant dust levels will arise from the biofilters.

With regard to dust levels arising within the general plant and working units, these will be strictly controlled by operational management, in order to ensure that concentrations do not breach the Occupational Exposure Limit for workers specified in the Safety, Health and Welfare at Work (Chemical Agents) Regulations , 2001, Code of Practice 2002. This Code specifies a work place limit of 10mg/m3 for general dust and 4 mg/m3 for inhalable dust (PM10's). As the workplace must conform with these strict limits, any fugitive dusts leaving the facility will be of a low concentration, and will have a negligible impact on any of the sensitive receptors.

Dust generation will be further minimised by implementing the following guidance contained in the Environment Agency for England and Wales Technical Guidance on Composting Operations, Draft for External Consultation, October 2001, version 3. The final version of the Guidance is due to be released shortly by the Environment Agency for England and Wales. The measures will include the minimisation of dust emissions by:

- Monitoring the moisture content within all stages of the composting process to prevent material drying out and forming dusts. The process control specifies that the moisture in the static piles should never drop below 37.5%, with a design optimum of 43% moisture.
- Dampening of site roads and all surfaces on site that could lead to dust arisings.
- Good maintenance of plant and machinery.
- The site will be bordered by mixed deciduous and evergreen trees, which will provide a screen against for wind gusts entering the site, and a barrier for dust blow from the site.
- Most of the operations on site will be contained within buildings and production sheds, thereby minimising dust arisings.

Forestry to the West of the Proposed Site

Residual Impacts and Reinstatement

In the event that composting activities cease at the site all operational sources of dust will be removed. There would be no residual dust impact on the surrounding properties.

Proposed Monitoring

Annual dust deposition monitoring over a one-month period would be carried out using Bergerhoff sampling stations. Four locations around the site boundary would be assessed as a minimum.

Annual PM_{10} monitoring would be carried out at three site boundary locations as a minimum.

6.4.1 Litter

Introduction

Potential litter problems from composting facilities can arise from the waste delivery and screening/ shredding area. Poor litter control both on and off site may be offensive to residents living close to a composting site.

Litter is not expected in green waste. Catering wastes/organic fines will be received, mixed and screened indoors. Therefore there is very little potential for litter at the site.

Good operational practice and measures for controlling litter are specified in the *Environment Agency for England and Wales Technical Guidance on Composting Operations, Draft for External Consultation, October 2001*, version 3 and include:

- Implementing procedures for the storage and processing of the feed stock
- strategically placed litter screens close to shredding areas
- good housekeeping

Mitigation Measures

The impact of litter will be controlled by the adoption of good housekeeping practices including those specified above. *There is very little potential for litter at the site, however the situation will be monitored and if necessary* litter pickers will be assigned to collect litter which escapes the preventative measures detailed above and the litter screens will be placed around screening areas.

Residual Impacts and Reinstatement

Provided good litter control measures are implemented by the operator, it is not anticipated that windblown litter will have a significant impact on the surrounding properties.

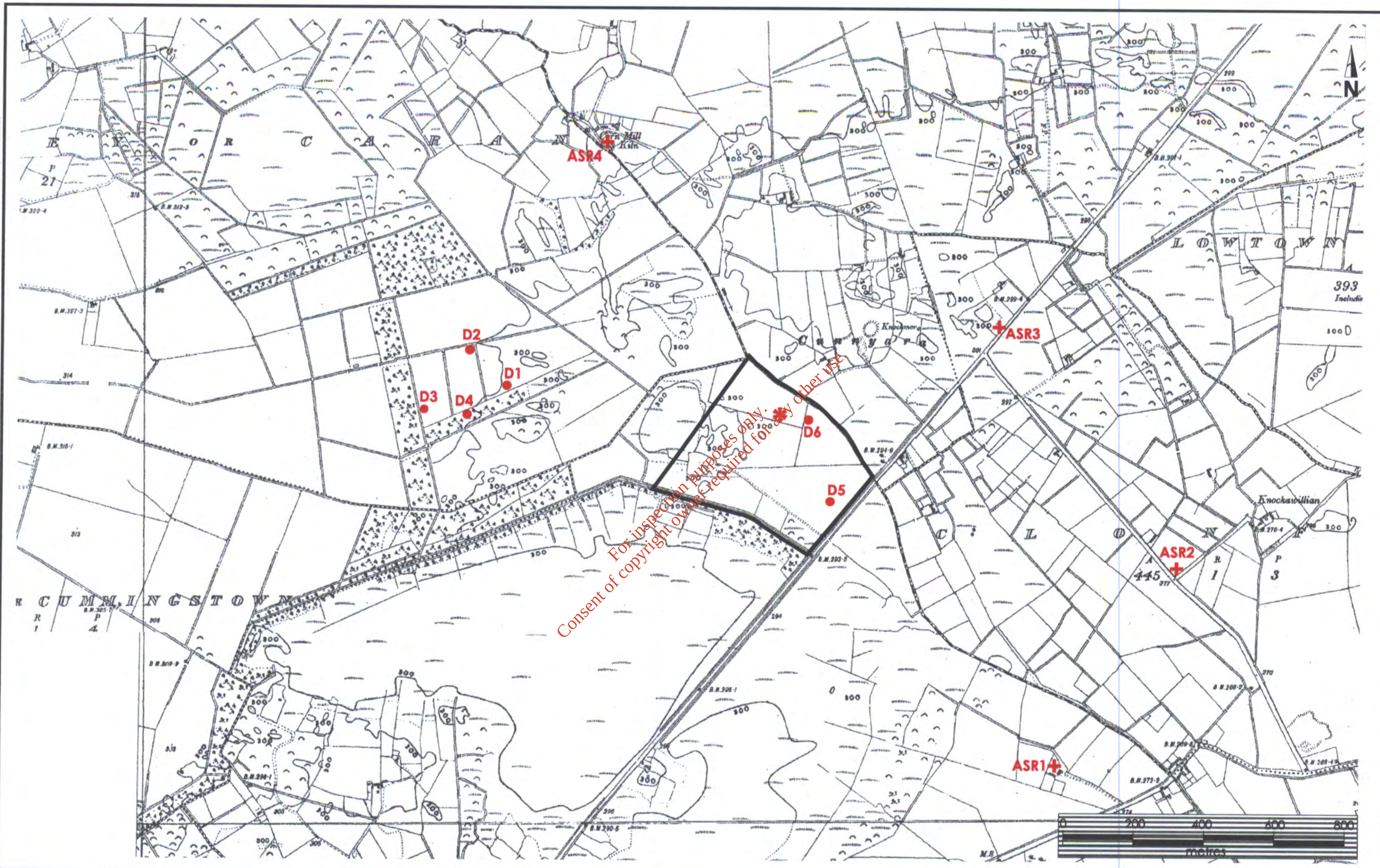
In the event that the composting facility ceases to operate, all sources of windblown litter would be removed off-site.

Proposed Monitoring

It is not expected that litter will be generated at the site. However, this situation will be monitored and if required a site walkover will be carried out daily to check visually for windblown litter at the site boundaries, which will then be cleared by site operatives.

6.5 Do Nothing Scenario

If the proposed composting facility is not developed, the air quality in the area will remain as it currently is, typical of a rural environment.



Thorntons recycling

FIGURE 6.1
AIR SENSITIVE RECEPTORS AND AIR MONITORING POINTS

KEY:

- ● Dust deposition sampling locations
- ✱ PM10 sampling location
- ✚ Air sensitive receptors