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environmental management for business

Dr. Magnus Amajirionwu,
Office of Environmental Enforcement,
South East Region,
Environmental Protection Agency,
P.O. Box 3000,
Johnstown Caste Estate,
Co.Wexford.

14th March 2011

RE: Annual Environmental Report – Greenking Composting Ltd. (Reg. No. W0218-01)

Dear Dr. Amajirionwu,

Please find enclosed an original and 2 no. copies of the 2010 Annual Environmental Report (AER) for the above referenced facility. The AER file has been uploaded to the EPA website and is a true copy of the original Annual Environmental Report. The AER/PRTR emissions data reporting workbook has also been uploaded to the EPA website.

If you have any queries, please call me.

Yours sincerely,

Martina Gleeson

Martina Gleeson

1011701/MG/MS
Encl.
c.c. Mr. Ian Browne, Greenking Composting Ltd.,

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environmental management for business

ANNUAL ENVIRONMENTAL REPORT

FOR GREENKING COMPOSTING LTD.

COOLBEG, COUNTY WICKLOW

LICENCE REG. NO. W0218-01

JANUARY 2010 – DECEMBER 2010

Prepared For: -

Greenking Composting Ltd.,
Coolbeg,
Co. Wicklow.

Prepared By: -

O' Callaghan Moran & Associates,
Granary House,
Rutland Street,
Cork.

14th March 2011

Project	Annual Environmental Report 2010			
Client	GreenKing Composting Ltd. W0218-01			
Report No	Date	Status	Prepared By	Reviewed By
1170101	08/03/2011	Draft	Martina Gleeson PhD	Michael Watson MA.
1170101	14/03/2011	Final	Martina Gleeson PhD	Michael Watson MA.

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1. INTRODUCTION

This is the fifth Annual Environmental Report (AER) for Kings Tree Services Ltd, trading as Greenking Composting Ltd. (Greenking), composting facility at Coolbeg, County Wicklow. The facility's Waste Licence (Register No. W0218-01) was issued on the 20th October 2005 and it began accepting green waste on the 6th June 2006. This AER covers the period from January 2010 to December 2010.

The content of the AER is based on Schedule G of the Waste Licence and the report format follows guidelines set in the "Draft Guidance on Environmental Management Systems and Reporting to the Agency".

2. SITE DESCRIPTION

2.1 Site Location and Layout

The site is located in the townland of Coolbeg approximately 4 km to the south west of Wicklow Town and 3 km to the south east of Glenealy, as shown on Figure 2.1. It encompasses approximately 2.5 ha. The land adjoining the western site boundary is occupied by a non-hazardous residual waste landfill.

The site layout includes the reception office (240 m^2), workshop (540 m^2) and weighbridge and parking areas, the waste reception area (c. 1,250 m^2), windrows area (c. 9,500 m^2), maturation area (700 m^2), finished product storage (c. 2,375 m^2) and a leachate storage lagoon (1,250 m^2).

2.2 Waste Types

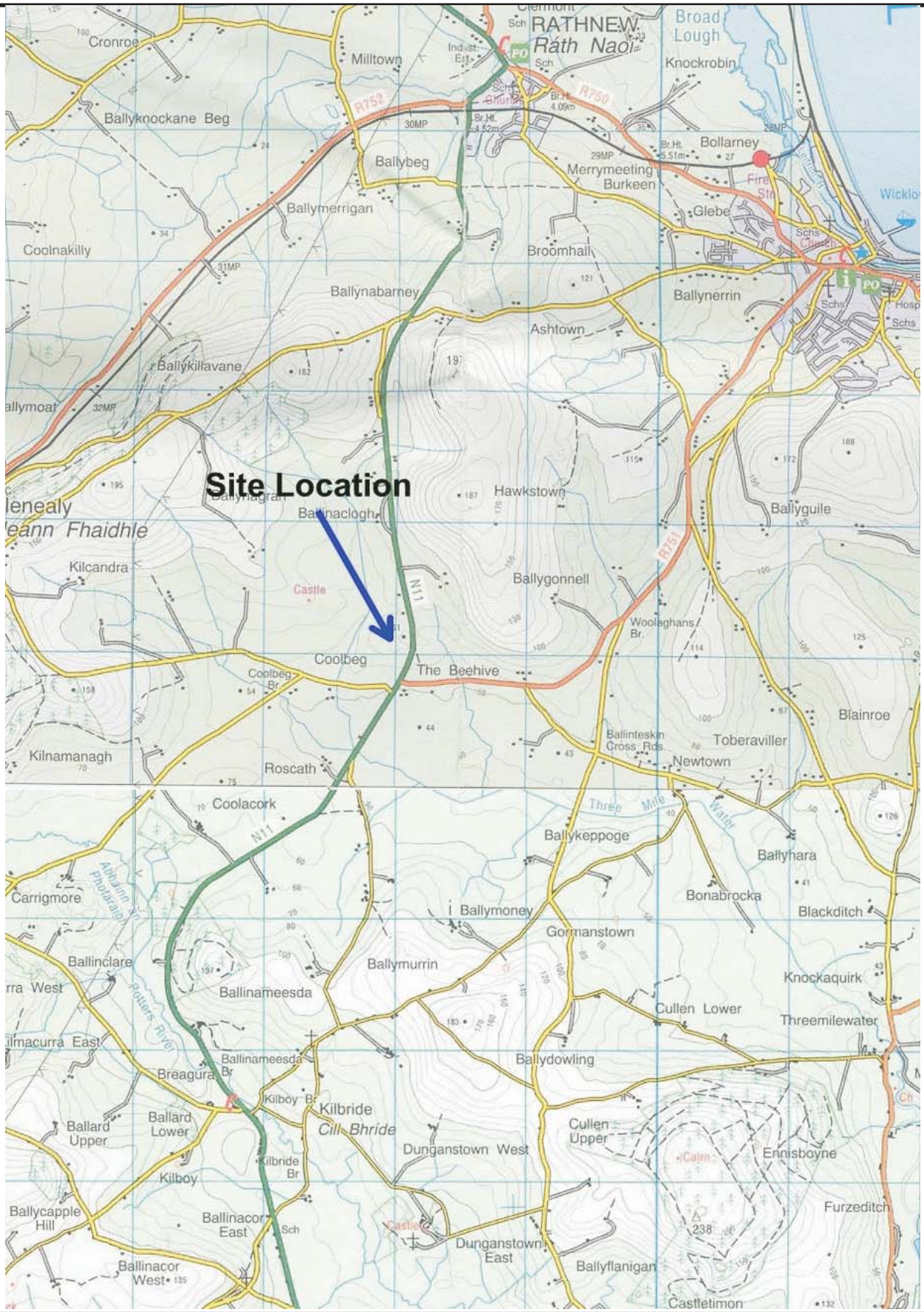
The facility is licensed to accept 40,000 tonnes of non-hazardous biodegradable green waste annually. The materials accepted include wood wastes generated by the KTS tree surgery business, garden and park waste produced during improvement and maintenance works by landscape gardeners, grass and shrub trimmings produced by individual householders and timber and wood waste (non biocide treated) recovered during construction and demolition works.

The composting operation involves pre-treatment to shred and mix the green waste; composting in open windrows; maturation; and post treatment to remove impurities. The finished product is suitable for horticultural and agricultural use.

The following plant is used on-site: -

- 1 No. Front Loading Shovel,
- 1 No. Mobile Wood Chipper/Shredder,
- 1 No. Hydraulic Excavator,
- 1 No. Mobile Star screener,
- 1 No. Leachate Tanker,
- 1 No. Tractor,
- 1 No. Teleporter

This provides for 100% duty and 50% standby for all key plant items. Additional supporting plant items are hired in for use on-site for short periods in the event of plant breakdown.



O' Callaghan Moran & Associates.
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email : ocm@indigo.ie

CLIENT

Greenking Composting

TITLE

Site Location

Details

O.S. Licence Agreement Number AR 0038702

Ordnance Survey Ireland. Government of Ireland.

FIG. No

2.1

Scale

NTS

Rev.

A

3. EMISSION MONITORING

The monitoring programme specified in the Licence includes surface water, groundwater, dust, noise, odour and micro-organism monitoring. All of the monitoring locations, with the exception of odour and micro-organisms, are shown on Figure 3.1. The odour and micro-organism monitoring locations are shown on Figure 2.1 of the specialist subcontractors report in Appendix 1.

3.1 Surface Water Monitoring

Surface water monitoring is carried out biannually at one monitoring point (SW-1). The surface water monitoring was carried out in June and November 2010.

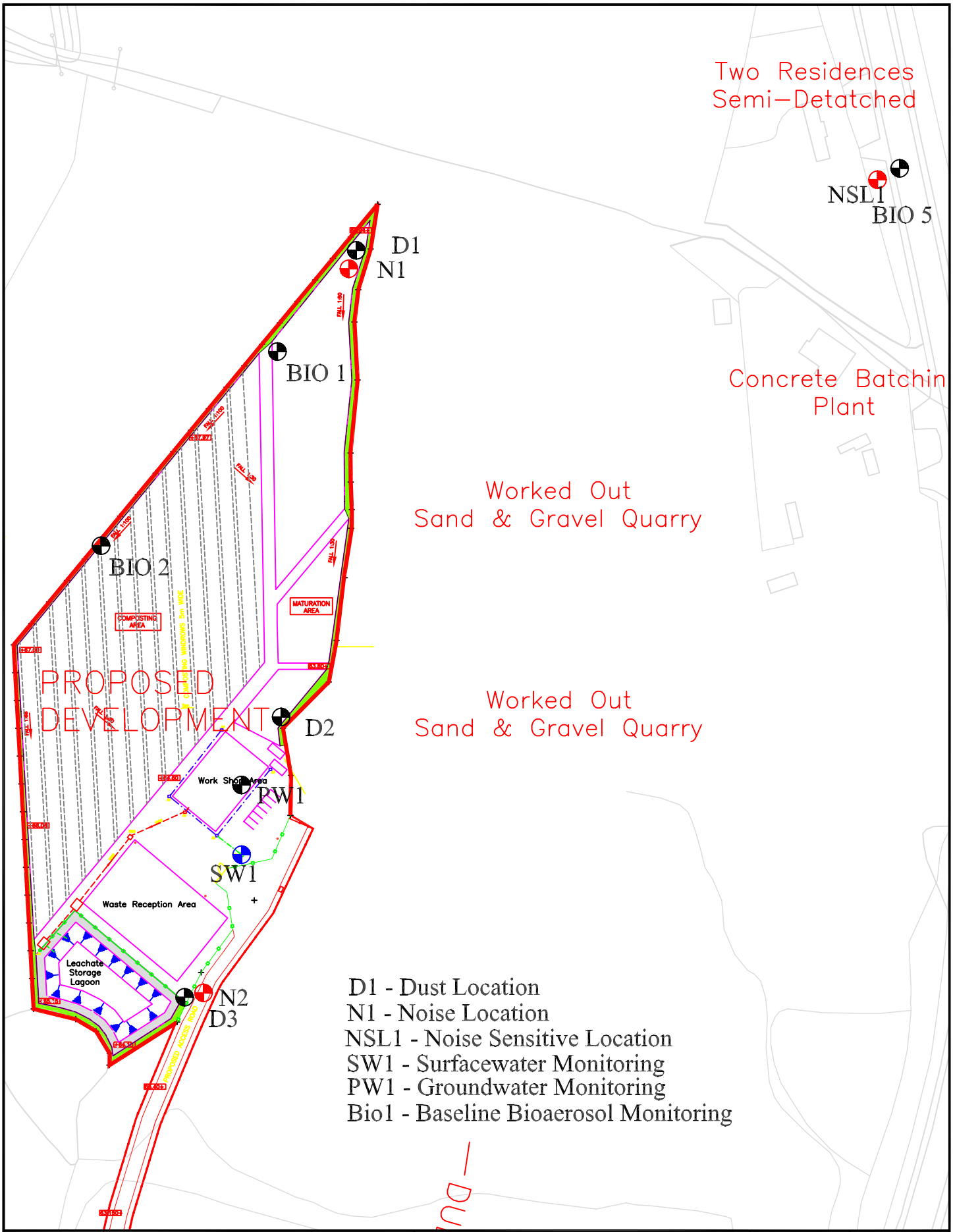
All run-off from non process paved areas and roof areas is collected and directed to a Class 1 oil-water interceptor and then to a soakway located along the access road to the south of the site. The surface water sample was collected at a manhole located between the oil interceptor and the soakway.

The range of analysis was as specified in Schedule C.2 of the Waste Licence and included pH, electrical conductivity, Biological Oxygen Demand (BOD), total suspended solids (TSS), ammoniacal nitrogen, faecal coliforms and total coliforms. The results are summarised in Table 3.1 and the full laboratory reports are included in Appendix 1.

Table 3.1 Surface Water Monitoring Results

Parameter	Units	June 2010	November 2010
pH	pH Units	8.36	7.79
Conductivity	mS/cm	0.210	0.233
BOD	mg/l	<1	<1
TSS	mg/l	<10	<10
Ammoniacal Nitrogen	mg/l	0.03	0.03
Faecal Coliforms	cfu/100ml	1,020	1,400
Total Coliforms	cfu/100ml	38,730	24,196

There are no trigger levels or emission limit values set in the Licence. The results indicate that the surface water discharge is of good chemical quality. The source of the coliforms is not known, but may be associated with animal activity in the vicinity of the facility and is not considered unusual.



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CLIENT
GreenKing Composting

DETAILS

Figure
3.1

TITLE
MONITORING LOCATIONS

SCALE
NTS

REV.
A

3.2 Groundwater Monitoring

The Licence requires annual groundwater sampling at the facilities water supply well PW-1 shown on Figure 3.1. The groundwater sampling was undertaken in May 2010 and the range of analysis was as specified in Schedule C.2 of the Waste Licence. The parameters included pH, conductivity, ammoniacal nitrogen, chloride, arsenic, boron, cadmium, chromium, copper, lead, selenium, zinc, faecal coliforms and total coliforms. The results are summarised in Table 3.2 and the full laboratory report is included in Appendix 1.

There are no groundwater trigger levels in the Licence. Therefore the table also includes the Interim Guideline Values (IGVs) for groundwater quality published by the Agency. The IGVs are not statutory limit values, but have been prepared to assist in the assessment of impacts on groundwater quality.

Table 3.2 Groundwater Monitoring Results

Parameter	Units	PW-1	IGV
pH	pH Units	7.82	6.5 – 9.5
Conductivity	mS/cm	0.224	1.000
Chloride	mg/l	21.9	30
Ammoniacal Nitrogen	mg/l	0.03	0.15
Mercury	mg/l	<0.001	0.001
Arsenic	mg/l	<0.0025	0.01
Boron	mg/l	<0.012	1
Cadmium	mg/l	<0.0005	0.005
Chromium	mg/l	<0.0015	0.03
Copper	mg/l	0.013	0.03
Lead	mg/l	<0.005	0.01
Nickel	mg/l	<0.002	0.02
Zinc	mg/l	0.009	0.1
Total Coliforms	cfu/100mls	1	0
Faecal Coliforms	cfu/100mls	0	0

IGV – Interim Guideline Value - EPA

With the exception of total coliforms, all parameters were below their respective IGVs. The reason for the very slightly elevated coliform levels is unknown but at this level is not considered significant. The groundwater quality is good and confirms that the site activities are not impacting on groundwater.

3.3 Noise Monitoring

As part of the Agency's audit report reference (W0218-01)sm05djm, the Agency agreed to reduce the frequency of noise monitoring carried out at the facility to biennial (once every two years). The biennial noise survey was carried out on the 25th May 2010. The monitoring was carried out at two on-site noise monitoring locations, N-1 and N-2 and one off-site noise

sensitive location NSL-1. The survey was conducted when the site was fully operational. The survey concluded that the facility was in compliance with its licence requirements. The full monitoring report is included in Appendix 1 and the findings summarised below and in Table 3.3.

During the May 2010 survey, the sources contributing to noise at N1 were dominated continuously by traffic noise from the N11, other noise included birdsong and aircraft overhead.

The noise sources at N2 were dominated by shredder emissions at 60 m which were continuously audible. Emissions from the excavator and front end loader were also audible, no other noise was audible at this location.

No emissions from the site were audible at noise sensitive location NSL1. Traffic on the N11 was continuously dominant locally and on approaches. The only other noise audible at this location was birdsong.

The noise survey found the site to be fully compliant in regards to the limits set in the Waste Licence.

Table 3.3 Noise Monitoring Results

Station	Time	$L_{Aeq\ 30\ min}$ dB	$L_{AF10\ 30\ min}$ dB	$L_{AF90\ 30\ min}$ dB	Specific level* dB	Noise audible
N1	0939-1009	54	57	50	<41	No site emissions audible due to screening by building and breeze direction. N11 traffic to NE continuously dominant. Bird song/calls & aircraft.
N2	1014-1044	69	70	64	69	Shredder emissions at 60 m continuously dominant. Emissions from excavator & front end loader also audible. No other noise audible.
NSL1	1050-1120	66	71	53	<44	No emissions audible from facility. N11 traffic entirely dominant. No other emissions audible apart from bird song/calls.

*Specific level: Sound pressure level contribution considered attributable to facility, determined using real time assessment, field notes, time history profiles, statistical analysis, frequency spectra, near field correction if applicable, and other parameters.

3.4 Dust Monitoring

The Licence requires dust monitoring be carried out quarterly. Dust monitoring was carried out in February, May, September and October 2010 at three on-site locations (D-1, D-2 and D-3). The results are summarised in Table 3.4 and are included in Appendix 1.

Table 3.4 Dust Monitoring Results

Monitoring Location	Units	February	May	September	October	Deposition Limit Value
D1	$mg/m^2/day$	16.8	57.7	45.71	64.9	350
D2	$mg/m^2/day$	28.1	98.1	18.79	178.5	350
D3	$mg/m^2/day$	24.2	231.7	39.62	*	350

* - Dust gauge contaminated with organic matter (leaves)

The gauge at D3 in October was found to contain a significant volume of leaf material which was not attributable to the facility activities. The dust deposition limit was not exceeded at any of the monitoring locations in 2010.

3.5 Bioaerosol Monitoring

Bioaerosol monitoring is carried out annually. Bioaerosol sampling including Aspergillus *fumigatus* and Total Mesophillic bacteria was carried out on the 20th October 2010 at three monitoring locations as shown on Figure 2.1 in the report which is included in Appendix 1. The results are presented on Table 3.5 and summarised below.

The Aspergillus *fumigatus* concentrations were low and at expected ambient concentration levels. Total mesophillic bacteria concentration levels at Green 2 were elevated but dissipated rapidly with distance to monitoring location Green 3 (approx 50 m downwind). The dissipation in concentrations of total mesophillic bacteria from Green 2 to Green 3 would be indicative of results obtained from international literature where bioaerosol concentrations greatly dissipate with distance from the source.

The monitoring found that there were no significant bioaerosol impacts in the vicinity of the facility, with all reported bioaerosol ambient air concentrations within the lower range of the assessment criterion for Aspergillus *fumigatus* and in the mid range for total mesophillic bacteria.

Table 3.4 Bioaerosols Concentration Levels

Location ID	Average Aspergillus *fumigatus* concentration (CFU m^{-3})[1]	Average Mesophillic bacteria concentration (CFU m^{-3})[1]	Sample count[2]
Green 1	5	21	3
Green 2	53	645	3
Green 3	16	56	3

Note: [1] denote a total of 6 blanks (3 plate and 3 impactor blanks) were incorporated into the sampling exercise. All blanks were negative CFU m^{-3}.
[2] denote total number of sample counts for each parameter monitored at each location.

3.6 Odour Monitoring

Odour monitoring was carried out on the 20th October 2010 in accordance with Schedule C of the Waste Licence. The results are summarised on Table 3.5 and the full report is included in Appendix 1. The monitoring was conducted at 8 locations shown on Figure 2.1 in the report.

All sampling and analysis was performed in accordance with EN13725:2003. All ambient odour threshold concentrations were less than 84 Ou_E m^{-3}, therefore causing no significant impact with respect to odour. All Hydrogen Sulphide concentrations were less than 3 parts per billion (ppb) in ambient air.

Table 3.6 Odour Threshold Concentration and Hydrogen Sulphide Results

Sample Number	Odour threshold conc. (OuE m^{-3})[1]	H_2S (ppb)	Comment
Green 1	67	<3	No distinct odour
Green 2	84	<3	No distinct odour
Green 3	62	<3	No distinct odour
Green 4	53	<3	No distinct odour
Green 6	72	<3	No distinct odour
Green 8	62	<3	No distinct odour
Green 5	-	<3	No distinct odour
Green 7	-	<3	No distinct odour

4. SITE DEVELOPMENT WORKS

4.1 Engineering Works

No engineering works have been carried out in 2010 and it is not envisaged that any works will be carried out in 2011. The Agency will be notified of all future engineering works as per Condition 3.2 of the Licence.

4.2 Energy Efficiency

An energy efficiency report was submitted as part of the AER for 2006. One of the main recommendations of this report was to install a thermostat in the office building. This recommendation has been implemented and currently each radiator is fitted with an individual manually adjusted thermostat, which turns the radiators on and off as required to maintain a comfortable working environment. There are only two members of staff at the facility full-time and so the energy consumption at the facility is very low. The main users of electricity are the office equipment, i.e. computers, fax, photocopier and printer.

Table 4.1 presents an estimate of the resources used on-site from January to December 2010. The water supply for the facility comes from an on-site groundwater well and this is not metered. The water is used solely for sanitary and kitchen purposes. The current carbon footprint is 37 tonnes, mostly based on the diesel usage, which is considered negligible in context of national emissions. The carbon footprint has been reduced by 2 tonnes from 2009, this is due to a reduction in diesel usage at the facility.

Table 4.1 Estimate of Resources Used On-Site

Energy Stream	Annual Quantity	Units	Period
Electricity	11,739	kWh	January – December 2010
Heating Oil	1,506	Litres	January – December 2010
Hydraulic & Engine Oil	50	Litres	January – December 2010
Diesel	9,848	Litres	January – December 2010

5. WASTE RECEIVED AND CONSIGNED FROM THE FACILITY

Table 5.1 shows the total quantities of waste received at the facility in 2010. A breakdown of the waste types is provided in accordance with the European Waste Catalogue and Hazardous Waste list. The total quantity of green waste received from January to December 2010 was 2,034 tonnes. Table 5.2 shows the quantities of waste received in the previous years. The facility is licensed to accept 40,000 tonnes of green waste annually.

All incoming waste is fully recovered during the composting process. Any erratics are removed and sent for disposal/recovery at a licensed facility. In 2009 a 20 cubic yard skip was placed on site by Greenstar Ltd for the removal of erratics. The skip was not filled in 2010 and therefore no erratics were removed off site. In 2010, a 50 gallon drum of waste oil was removed off site to an appropriate facility as shown on Table 5.3. The total quantity of compost consigned was 905 tonnes. The compost has been tested to ensure that it meets the standards set in Schedule F of the Waste Licence. The compost testing report which is included in Appendix 2 show that the compost meets the standards set in the Licence. Greenking's customers include landscape gardeners, Golf Clubs and Dun Laoghaire Rathdown County Council among others.

Table 5.1 Waste Received 2010

EWC	Description	Waste In
20 02 01	Green Waste	2,034
	Total Received	**2,034**

Table 5.2 Waste Received during period 2006 to 2009

EWC	Description	2009	2008	2007	2006
20 02 01	Green Waste	2,351	3,377	4,062	1,179
	Total Received	**2,351**	**3,377**	**4,062**	**1,179**

Table 5.3 Waste Consigned 2010

EWC	Description	Waste Out litres	Destination
13 02 05*	Waste Oil	50	Enva Ireland, Portlaoise
	Total Consigned	**50**	

6. ENVIRONMENTAL INCIDENTS AND COMPLAINTS

6.1 Incidents

There were no incidents during the reporting period.

6.2 Register of Complaints

Greenking maintains a register of complaints received in accordance with Condition 11.9 of the waste licence. No complaints were received during the reporting period.

7. ENVIRONMENTAL DEVELOPMENT & CONTROL

7.1 Environmental Management Programme Report

Greenking has developed an Environmental Management System (EMS) for the facility. The EMS was reviewed in March 2010 and the emergency response procedures were updated. The O&T for 2010 and the proposed schedule of objectives and targets for 2011 are outlined below.

7.1.1 Site Management Structure

Management and Staffing structure: -

Name: Ian Browne

Responsibility: Facility Manager, overall responsibility for the day to day running of the facility.

Experience: Has completed the relevant modules of the FÁS Waste Management course.

Name: Ann Keogh

Responsibility: Facility Administrator.

Experience: Has completed the relevant modules of the FÁS Waste Management course.

7.1.2 Staff Training

No training was carried out in 2010.

7.2 Environmental Management Programme

7.2.1 Schedule of Objectives 2010

The Schedule of Objectives for 2010 and the progress made are summarised in Table 7.1 below.

7.2.2 Schedule of Objectives 2011

A schedule of targets and objectives for 2011 has been set by the management of the facility. These objectives are outlined in Table 7.2.

7.3 Communications Programme

Records available for public inspection on-site include:-

- Waste Licence,
- Licence Application and Review documentation,
- Monitoring Records,
- Complaints File,
- EPA Correspondence File.

Visits to the site should be arranged in advance by ringing the Facility Manager at 040 – 462422.

7.4 Nuisance Controls

Nuisance controls employed at the facility include daily inspections of the facility for vermin, litter, and dust.

Table 7.1 Objectives and Targets for 2010

No	Objective	Target	Update
1	Reduce the energy/fuel usage at the facility.	Monitor diesel and electricity usage at least annually	Diesel usage was reduced
2	Control litter, dust, odour, and noise nuisances.	Continue daily Facility Inspection Form to ensure any nuisances are identified and managed on a daily basis.	Ongoing
3	Maintain Environmental Management System	Maintain documentation for EMS and implement on site.	Ongoing
		Review the EMP in accordance with the Licence	Reviewed in March 2010
4	Maintain Regular Schedule of Environmental Training	Carry out Training on Environmental Awareness, Emergency Response, Waste Licence W0218-01 for all staff.	Ongoing
5	Identify measures to improve efficiency and minimise waste	Continue to identify measures to reduce waste and use of water.	Ongoing

Table 7.2 Objectives and Targets for 2011

No	Objective	Target	Timescale
1	Reduce the energy/fuel usage at the facility.	Monitor diesel and electricity usage at least annually	Q4 2011
2	Control litter, dust, odour, and noise nuisances.	Continue daily Facility Inspection Form to ensure any nuisances are identified and managed on a daily basis.	Ongoing
3	Maintain Environmental Management System	Maintain documentation for EMS and implement on site.	Ongoing
		Review the EMP in accordance with the Licence	Q4 2011
4	Maintain Regular Schedule of Environmental Training	Carry out Training on Environmental Awareness, Emergency Response, Waste Licence W0218-01 for all staff.	Ongoing
5	Identify measures to improve efficiency and minimise waste	Continue to identify measures to reduce waste and use of water.	Ongoing

7.5 Tank and Pipeline Testing

Condition 3.17.5 of the Waste Licence requires that the integrity and water tightness of all bunded structures be tested by the licensee at least once every three years. The tank and pipeline testing was carried out in 2008 and passed and is not due to be carried out again until 2011.

7.6 Statement of Environmental Liabilities Measures

The facility has an Environmental Management Programme (EMP) in place. The EMP serves as a guidance document for facility staff and describes operational control and management practices that are applied at the facility. The EMP is also the core element of the Environmental Management System (EMS) for the facility and is designed to ensure that management of site activities complies with regulatory requirements and best practice. The EMS includes a detailed Emergency Response Procedure which sets out the steps to be taken in the event of an incident at the facility with the potential to cause environmental damage. Greenking also implements a comprehensive monitoring programme which will highlight any potential environmental incidents with the potential to cause environmental damage.

Greenking have financial provisions in place to address any environmental liability including insurance cover to the sum of €6,500,000 for any one occurrence at the facility. The possible costs of remediation are shown on Table 7.3.

Table 7.3 Risk Classification Table

Risk	Category	Description	Cost of Remediation (€)
1	Very Low	No damage or negligible change to the environment	€0 - 10,000
2	Low	Minor/localised impact or nuisance	€10,000 - 100k
3	Medium	Moderate damage to the environment	€100k – 1m
4	High	Severe damage to the environment	€1m – 5m
5	Very High	Massive damage to a large area, irreversible in the medium term	>€5 million

7.7 European Pollutant Release and Transfer Register Regulation

Under the European Pollutant Release and Transfer Register Regulation (EC) No. 166/2006 Greenking are required to submit information annually to the Agency. A copy of the information submitted to the Agency via the web-based data reporting system is included in Appendix 3.

8. OTHER REPORTS

8.1 Waste Recovery Report

National and regional policy on waste management is based on the Department of the Environment and Local Government's policy statement of September 1998, "Changing Our Ways", in which the Government affirmed its commitment to the EU hierarchy of waste management. In order of preference this is: -

- Prevention,
- Minimisation,
- Reuse,
- Recycling,
- Energy Recovery,
- Disposal.

The policy statement was based on, and is supported by, EU legislation (Landfill Directive 99/339/EC) that requires the diversion of organic wastes, including green waste, from landfill to alternative waste treatment facilities.

The Greenking facility, which is designed to increase the recycling of biodegradable materials and reduce the volume of waste disposed to landfill, meets the needs identified in EU and national waste policy statements and contributed to the achievement of these goals as it accepted for recovery 2,034 tonnes of waste in 2010.

APPENDIX 1

Environmental Monitoring Reports

Surface Water & Ground Water Reports

Jones Environmental Laboratory

Unit 3 Deeside Point
Zone 3
Deeside Industrial Park
Deeside
CH5 2UA

Tel: +44 (0) 1244 833780
Fax: +44 (0) 1244 833781

O'Callaghan Moran & Associates
Granary House
Rutland Street
Cork

UKAS TESTING
No.4225

Attention :	Barry Sexton
Date :	24th May 2010
Your reference :	10-117-01
Our reference :	Test Report 10/2223
Location :	KTS
Date samples received :	13th May 2010
Status :	Final Report
Issue :	1

One sample was received for analysis on 13th May 2010 which was completed on 24th May 2010. Please find attached our Test Report which should be read with notes at the end of the report and should include all sections if reproduced.
All interpretations and opinions are outside the scope of any accreditation, and all results relate only to samples supplied.
All analysis is reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected.

J W Farrell- Jones CChem FRSC
Chartered Chemist

Jones Environmental Laboratory

Client Name:	O'Callaghan Moran & Associates	**Report :**	**Liquids**
Reference:	10-117-01		
Location:	KTS		
Contact:	Barry Sexton	**Liquids/products:**	V=40ml vial, G=glass bottle, P=plastic bottle
JE Job No.:	10/2223		$H=H_2SO_4$, Z=ZnAc, N=NaOH, $HN=HN0_3$

J E Sample No.	1-3										Please see attached notes for all abbreviations and acronyms		
Sample ID	PW-1												
Depth	-												
COC No / misc	-												
Containers	H,P,G												
Sample Date	11/05/10												
Sample Type	Liquid												
Batch Number	1										**LOD**	**Units**	**Method No.**
Date of Receipt	13/05/10												
Electrical Conductivity @25°C	224										<100	µS/cm	TM76
pH	7.82										<0.01	pH units	TM73W
Chloride#	21.9										<0.3	mg/l	TM038W
Amm N2/Tot Ammonia as N#	0.03										<0.03	mg/l	TM038W
Arsenic - dissolved #	<2.5										<2.5	µg/l	TM 030W
Boron - dissolved	<12										<12	µg/l	TM 030W
Cadmium - dissolved #	<0.5										<0.5	µg/l	TM 030W
Chromium - dissolved #	<1.5										<1.5	µg/l	TM 030W
Copper - dissolved #	13										<7	µg/l	TM 030W
Mercury - dissolved #	<1										<1	µg/l	TM 030W
Nickel - dissolved #	<2										<2	µg/l	TM 030W
Lead - dissolved #	<5										<5	µg/l	TM 030W
Zinc - dissolved #	9										<3	µg/l	TM 030W

NOTES TO ACCOMPANY ALL SCHEDULES AND REPORTS

SOILS

Please note we are only MCERTS accredited for sand, loam and clay and any other matrix is outside our scope of accreditation.

Where an MCERTS report has been requested, you will be notified within 48 hours of any samples that have been identified as being outside our MCERTS scope. As validation has been performed on clay, sand and loam, only samples that are predominantly these matrices, or combinations of them will be within our MCERTS scope. Your final report will reflect this, with non-MCERTS results on separate pages.

It is assumed that you have taken representative samples on site and require analysis on a representative subsample. Stones will generally be included unless we are requested to remove them.

All samples will be discarded one month after the date of reporting, unless we are instructed to the contrary. If we are instructed to keep samples, a storage charge of £1 (1.5 Euros) per sample per month will be applied until we are asked to dispose of them.

If you have not already done so, please send us a purchase order if this is required by your company.

Where appropriate please make sure that our detection limits are suitable for your needs, if they are not, please notify us immediately.

All analysis is reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected.

Asbestos screens where requested will be undertaken by a UKAS accredited laboratory.

WATERS

Please note we are not a Drinking Water Inspectorate (DWI) Approved Laboratory . It is important that detection limits are carefully considered when requesting water analysis.

UKAS accreditation applies to surface water and groundwater and one other matrix which is analysis specific, any other liquids are outside our scope of accreditation

As surface waters require different sample preparation to groundwaters the laboratory must be informed of the water type when submitting samples. All samples are treated as groundwaters and analysis performed on settled samples unless we are instructed otherwise.

DEVIATING SAMPLES

Samples must be received in a condition appropriate to the requested analyses. All samples should be submitted to the laboratory in suitable containers with sufficient ice packs to sustain an appropriate temperature for the requested analysis. If this is not the case you will be informed and any analysis that may be compromised highlighted on your schedule/ report by the use of a symbol.

The use of any of the following symbols indicates that the sample was deviating and the test result may be unreliable:

$ sample temperature on receipt considered inappropriate for analysis requested

^ samples exceeding recomended holding times

& samples received in inappropriate containers (e.g. volatile samples not submitted in VOC jars/vials)

~ no sampling date given, unable to confirm if samples are with acceptable holding times

ABBREVIATIONS and ACRONYMS USED

- UKAS accredited

M - MCERTS accredited

NAD - No Asbestos Detected

ND - None Detected (usually refers to VOC and/SVOC TICs)

SS - Calibrated against a single substance

* - analysis subcontracted to a Jones Environmental approved laboratory.

W - Results expressed on as received basis

\+ Failed AQC results should be considered as indicative only and are not accredited.

++ Result outside calibration range, may be possible to re-run with higher detection limits

Customer:	O'Callaghan Moran
Customer Address:	Granary house, Rutland st, cork Ireland
Customer Contact:	Barry Sexton
Report Reference:	10-02094-OCM
Report Date:	11/06/2010
Customer PO No.:	10-117-01
Chain of Custody No.:	11630

Certificate Of Analysis

Analysis of 2 sample(s) submitted on 09/06/2010 is now complete.
We have the pleasure of enclosing your certificate of analysis.

Should you have any queries regarding the report or require any further services, we would be happy to discuss your requirements. For additional information about the company please log-on to our web site at the above address.

Thank you for choosing City Analysts Limited. We look forward to assisting you again.

Authorised By: Jenny Pender **Date:** 11/06/2010

Authorised Signatories:
Dublin : Miriam Byrne, Niamh McIntyre, Jenny Pender, Adriana Gryczewska, Slawek Gryczewski, Ewa Krol, Darius Bartoszewicz, Diarmuid Cooney.
Limerick: Sean Culhane, Hugh O'Donnell, Maurice Daffy, Sylwia Wojtowicz.
Note: Information on methods of analysis and performance characteristics is available on request.

Certificate of Analysis

Customer: O'Callaghan Moran

Report Reference: 10-02094-OCM

Date Received: 09/06/2010

Customer Address: Granary house,
Rutland st,
cork
Ireland

Customer Contact: Barry Sexton

Sample Description: PW-1
Sample Type: Treated Water
Date Sampled: 09/06/2010
Lab Reference Number: 83628

Site/Method Ref.	Analysis Start Date	Parameter	Result	Units	PV Value	Accreditation Status
D/1201	09/06/2010	Coliforms	1.0	MPN/100ml	0/100mls	INAB
D/3221	09/06/2010	Faecal Coliforms	0	cfu/100ml		NON

Note:

NAC & ATC - No abnormal change and acceptable to customers.
PV Value is the parametric value, taken from European Communities, (Drinking Water) (No. 2) Regulations, 2007. S.I. No. 278 of 2007, and relates only to drinking water samples.
Site D = Analysed at City Analysts Dublin. Site L = Analysed at City Analysts Limerick

Jones Environmental Laboratory

Unit 3 Deeside Point
Zone 3
Deeside Industrial Park
Deeside
CH5 2UA

Tel: +44 (0) 1244 833780
Fax: +44 (0) 1244 833781

O'Callaghan Moran & Associates
Granary House
Rutland Street
Cork

UKAS TESTING
No.4225

Attention :	Barry Sexton
Date :	23rd June 2010
Your reference :	10-117-01
Our reference :	Test Report 10/2784
Location :	KTS
Date samples received :	11th June 2010
Status :	Final Report
Issue :	1

One sample was received for analysis on 11th June 2010 which was completed on 23rd June 2010. Please find attached our Test Report which should be read with notes at the end of the report and should include all sections if reproduced.
All interpretations and opinions are outside the scope of any accreditation, and all results relate only to samples supplied.
All analysis is reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected.

J W Farrell- Jones CChem FRSC
Chartered Chemist

Jones Environmental Laboratory

Client Name:	O'Callaghan Moran & Associates	**Report :**	**Liquids**
Reference:	10-117-01		
Location:	KTS		
Contact:	Barry Sexton	**Liquids/products:**	V=40ml vial, G=glass bottle, P=plastic bottle
JE Job No.:	10/2784		$H=H_2SO_4$, Z=ZnAc, N=NaOH, $HN=HN0_3$

J E Sample No.	1-3										LOD	Units	Method No.
Sample ID	SW1												
Depth	-												
COC No / misc													
Containers	H P G												
Sample Date	09/06/10												
Sample Type	Water												
Batch Number	1												
Date of Receipt	11/06/10												
pH#	8.36										<0.01	pH units	TM073
Electrical Conductivity @25°C	210										<100	µS/cm	TM76
BOD settled	<1										<1	mg/l	TM058W
Total Suspended Solids	<10										<10	mg/l	TM037W
Amm N2/Tot Ammonia as N#	0.03										<0.03	mg/l	TM038W

Please see attached notes for all abbreviations and acronyms

All solid results are expressed on a dry weight basis unless stated otherwise.

NOTES TO ACCOMPANY ALL SCHEDULES AND REPORTS

SOILS

Please note we are only MCERTS accredited for sand, loam and clay and any other matrix is outside our scope of accreditation.

Where an MCERTS report has been requested, you will be notified within 48 hours of any samples that have been identified as being outside our MCERTS scope. As validation has been performed on clay, sand and loam, only samples that are predominantly these matrices, or combinations of them will be within our MCERTS scope. Your final report will reflect this, with non-MCERTS results on separate pages.

It is assumed that you have taken representative samples on site and require analysis on a representative subsample. Stones will generally be included unless we are requested to remove them.

All samples will be discarded one month after the date of reporting, unless we are instructed to the contrary. If we are instructed to keep samples, a storage charge of £1 (1.5 Euros) per sample per month will be applied until we are asked to dispose of them.

If you have not already done so, please send us a purchase order if this is required by your company.

Where appropriate please make sure that our detection limits are suitable for your needs, if they are not, please notify us immediately.

All analysis is reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected.

Asbestos screens where requested will be undertaken by a UKAS accredited laboratory.

WATERS

Please note we are not a Drinking Water Inspectorate (DWI) Approved Laboratory . It is important that detection limits are carefully considered when requesting water analysis.

UKAS accreditation applies to surface water and groundwater and one other matrix which is analysis specific, any other liquids are outside our scope of accreditation

As surface waters require different sample preparation to groundwaters the laboratory must be informed of the water type when submitting samples. All samples are treated as groundwaters and analysis performed on settled samples unless we are instructed otherwise.

DEVIATING SAMPLES

Samples must be received in a condition appropriate to the requested analyses. All samples should be submitted to the laboratory in suitable containers with sufficient ice packs to sustain an appropriate temperature for the requested analysis. If this is not the case you will be informed and any analysis that may be compromised highlighted on your schedule/ report by the use of a symbol.

The use of any of the following symbols indicates that the sample was deviating and the test result may be unreliable:

$ sample temperature on receipt considered inappropriate for analysis requested

^ samples exceeding recomended holding times

& samples received in inappropriate containers (e.g. volatile samples not submitted in VOC jars/vials)

~ no sampling date given, unable to confirm if samples are with acceptable holding times

ABBREVIATIONS and ACRONYMS USED

- UKAS accredited

M - MCERTS accredited

NAD - No Asbestos Detected

ND - None Detected (usually refers to VOC and/SVOC TICs)

SS - Calibrated against a single substance

* - analysis subcontracted to a Jones Environmental approved laboratory.

W - Results expressed on as received basis

\+ Failed AQC results should be considered as indicative only and are not accredited.

++ Result outside calibration range, may be possible to re-run with higher detection limits

Certificate of Analysis

Customer: O'Callaghan Moran

Report Reference: 10-02094-OCM

Date Received: 09/06/2010

Customer Address: Granary house,
Rutland st,
cork
Ireland

Customer Contact: Barry Sexton

Sample Description: SW-1
Sample Type: Treated Water
Date Sampled: 09/06/2010
Lab Reference Number: 83629

Site/Method Ref.	Analysis Start Date	Parameter	Result	Units	PV Value	Accreditation Status
D/1201	09/06/2010	Coliforms	38730.0	MPN/100ml	0/100mls	INAB
D/3221	09/06/2010	Faecal Coliforms	1020	cfu/100ml		NON

Note:

NAC & ATC - No abnormal change and acceptable to customers.
PV Value is the parametric value, taken from European Communities, (Drinking Water) (No. 2) Regulations, 2007. S.I. No. 278 of 2007, and relates only to drinking water samples.
Site D = Analysed at City Analysts Dublin. Site L = Analysed at City Analysts Limerick

Jones Environmental Laboratory

Unit 3 Deeside Point
Zone 3
Deeside Industrial Park
Deeside
CH5 2UA

Tel: +44 (0) 1244 833780
Fax: +44 (0) 1244 833781

O'Callaghan Moran & Associates
Granary House
Rutland Street
Cork

UKAS TESTING
No.4225

Attention :	Barry Sexton
Date :	18th November 2010
Your reference :	10-117-01
Our reference :	Test Report 10/5192
Location :	KTS
Date samples received :	8th November 2010
Status :	Final Report
Issue :	1

One sample was received for analysis on 8th November 2010 which was completed on 18th November 2010. Please find attached our Test Report which should be read with notes at the end of the report and should include all sections if reproduced.
All interpretations and opinions are outside the scope of any accreditation, and all results relate only to samples supplied.

All analysis is reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected.

J W Farrell- Jones CChem FRSC
Chartered Chemist

Jones Environmental Laboratory

Client Name:	O'Callaghan Moran & Associates	**Report :**	**Liquids**
Reference:	10-117-01		
Location:	KTS		
Contact:	Barry Sexton	**Liquids/products:**	V=40ml vial, G=glass bottle, P=plastic bottle
JE Job No.:	10/5192		$H=H_2SO_4$, Z=ZnAc, N=NaOH, $HN=HN0_3$

J E Sample No.	1-3										Please see attached notes for all abbreviations and acronyms		
Sample ID	SW1												
Depth	-												
COC No / misc													
Containers	H,P,G												
Sample Date	03/11/10												
Sample Type	Water												
Batch Number	1										**LOD**	**Units**	**Method No.**
Date of Receipt	08/11/10												
pH#	7.79										<0.01	pH units	TM073
Electrical Conductivity# @25°C	233										<100	µS/cm	TM28/PM11
BOD settled	<1										<1	mg/l	TM058W
Total Suspended Solids	<10										<10	mg/l	TM037W
Amm N/Tot Ammonia as N#	0.03										<0.03	mg/l	TM038W

All solid results are expressed on a dry weight basis unless stated otherwise.

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SOILS

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All samples will be discarded one month after the date of reporting, unless we are instructed to the contrary. If we are instructed to keep samples, a storage charge of £1 (1.5 Euros) per sample per month will be applied until we are asked to dispose of them.

If you have not already done so, please send us a purchase order if this is required by your company.

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All analysis is reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected.

Asbestos screens where requested will be undertaken by a UKAS accredited laboratory.

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Please note we are not a Drinking Water Inspectorate (DWI) Approved Laboratory . It is important that detection limits are carefully considered when requesting water analysis.

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DEVIATING SAMPLES

Samples must be received in a condition appropriate to the requested analyses. All samples should be submitted to the laboratory in suitable containers with sufficient ice packs to sustain an appropriate temperature for the requested analysis. If this is not the case you will be informed and any analysis that may be compromised highlighted on your schedule/ report by the use of a symbol.

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^ samples exceeding recomended holding times
& samples received in inappropriate containers (e.g. volatile samples not submitted in VOC jars/vials)
~ no sampling date given, unable to confirm if samples are with acceptable holding times

ABBREVIATIONS and ACRONYMS USED

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++ Result outside calibration range, may be possible to re-run with higher detection limits

City Analysts Limited
Environmental Laboratories

City Analysts Limited,
Pigeon House Road,
Ringsend,
Dublin 4.

Tel: (01) 613 6003 /6 /9
Fax: (01) 613 6008
Email:info@cityanalysts.ie
www.cityanalysts.ie

Customer: O'Callaghan Moran

Customer Address: Granary house,
Rutland st,
cork
Ireland

Customer Contact: Barry Sexton

Report Reference: 10-04235-OCM

Report Date: 08/11/2010

Customer PO No.: 10-117-01

Chain of Custody No.:

Certificate Of Analysis

Analysis of 1 sample(s) submitted on 03/11/2010 is now complete.
We have the pleasure of enclosing your certificate of analysis.
Should you have any queries regarding the report or require any further services, we would be happy to discuss your requirements. For additional information about the company please log-on to our web site at the above address.

Thank you for choosing City Analysts Limited. We look forward to assisting you again.

Authorised By: Jenny Pender **Date:** 08/11/2010

Authorised Signatories:
Dublin : Miriam Byrne, Niamh McIntyre, Jenny Pender, Adriana Gryczewska, Slawek Gryczewski, Ewa Krol, Darius Bartoszewicz, Diarmuid Cooney.
Limerick: Sean Culhane, Hugh O'Donnell, Maurice Daffy, Sylwia Wojtowicz.
Note: Information on methods of analysis and performance characteristics is available on request.

Template 1146
Revision 010

City Analysts Limited
Environmental Laboratories

City Analysts Limited,
Pigeon House Road,
Ringsend,
Dublin 4.

Tel: (01) 613 6003 /6 /9
Fax: (01) 613 6008
Email:info@cityanalysts.ie
www.cityanalysts.ie

Certificate of Analysis

Customer: O'Callaghan Moran

Customer Address: Granary house,
Rutland st,
cork
Ireland

Customer Contact: Barry Sexton

Report Reference: 10-04235-OCM
Date Received: 03/11/2010

Sample Description: SW-1
Sample Type: Surface Water
Date Sampled: 03/11/2010
Lab Reference Number: 92933

Site/Method Ref.	Analysis Start Date	Parameter	Result	Units	PV Value	Accreditation Status
D/1201	03/11/2010	Coliforms	24196.0	MPN/100ml	-	INAB
D/3221	03/11/2010	Faecal Coliforms	1400	cfu/100ml	-	INAB

Note:
NAC & ATC - No abnormal change and acceptable to customers.
PV Value is the parametric value, taken from European Communities, (Drinking Water) (No. 2) Regulations, 2007. S.I. No. 278 of 2007, and relates only to drinking water samples.
Site D = Analysed at City Analysts Dublin. Site L = Analysed at City Analysts Limerick

Template 1146
Revision 009

Dust Reports

Customer:	O'Callaghan Moran
Customer Address:	Granary house, Rutland st, cork Ireland
Customer Contact:	Barry Sexton
Report Reference:	10-01002-OCMR
Report Date:	13/04/2010
Customer PO No.:	10-117-01
Chain of Custody No.:	

Reissued Certificate Of Analysis

Reason for report re-issue: Amended calculation

Analysis of 3 sample(s) submitted on 12/03/2010 is now complete.
We have the pleasure of enclosing your certificate of analysis.

Should you have any queries regarding the report or require any further services, we would be happy to discuss your requirements. For additional information about the company please log-on to our web site at the above address.

Thank you for choosing City Analysts Limited. We look forward to assisting you again.

Authorised By: Jenny Pender **Date:** 13/04/2010

Authorised Signatories:
Dublin : Miriam Byrne, Niamh McIntyre, Jenny Pender, Adriana Gryczewska, Slawek Gryczewski, Ewa Krol, Darius Bartoszewicz, Diarmuid Cooney.
Limerick: Sean Culhane, Hugh O'Donnell, Maurice Daffy, Sylwia Wojtowicz.
Note: Information on methods of analysis and performance characteristics is available on request.

Template 1146
Revision 010

Certificate of Analysis

Customer: O'Callaghan Moran

Report Reference: 10-01002-OCM

Date Received: 12/03/2010

Customer Address: Granary house,
Rutland st,
cork
Ireland

Customer Contact: Barry Sexton

Sample Description: D-1 (10-117-01, 28 days)
Sample Type: Dust
Date Sampled: 12/03/2010
Lab Reference Number: 78922

Site/Method Ref.	Analysis Start Date	Parameter	Result	Units	PV Value	Accreditation Status
L/4001	15/03/2010	Dust	16.8	mg/m2/day	-	NON

Analysts Comments:

Note:

NAC & ATC - No abnormal change and acceptable to customers.
PV Value is the parametric value, taken from European Communities, (Drinking Water) (No. 2) Regulations, 2007. S.I. No. 278 of 2007, and relates only to drinking water samples.
Site D = Analysed at City Analysts Dublin. Site L = Analysed at City Analysts Limerick

Certificate of Analysis

Customer: O'Callaghan Moran

Report Reference: 10-01002-OCM

Date Received: 12/03/2010

Customer Address: Granary house,
Rutland st,
cork
Ireland

Customer Contact: Barry Sexton

Sample Description: D-2 (10-117-01, 28 days)
Sample Type: Dust
Date Sampled: 12/03/2010
Lab Reference Number: 78923

Site/Method Ref.	Analysis Start Date	Parameter	Result	Units	PV Value	Accreditation Status
L/4001	15/03/2010	Dust	28.1	mg/m2/day	-	NON

Analysts Comments:

Note:

NAC & ATC - No abnormal change and acceptable to customers.
PV Value is the parametric value, taken from European Communities, (Drinking Water) (No. 2) Regulations, 2007. S.I. No. 278 of 2007, and relates only to drinking water samples.
Site D = Analysed at City Analysts Dublin. Site L = Analysed at City Analysts Limerick

Certificate of Analysis

Customer: O'Callaghan Moran

Report Reference: 10-01002-OCM

Date Received: 12/03/2010

Customer Address: Granary house,
Rutland st,
cork
Ireland

Customer Contact: Barry Sexton

Sample Description: D-3 (10-117-01, 28 days)
Sample Type: Dust
Date Sampled: 12/03/2010
Lab Reference Number: 78924

Site/Method Ref.	Analysis Start Date	Parameter	Result	Units	PV Value	Accreditation Status
L/4001	15/03/2010	Dust	24.2	mg/m2/day	-	NON

Analysts Comments:

Note:

NAC & ATC - No abnormal change and acceptable to customers.
PV Value is the parametric value, taken from European Communities, (Drinking Water) (No. 2) Regulations, 2007. S.I. No. 278 of 2007, and relates only to drinking water samples.
Site D = Analysed at City Analysts Dublin. Site L = Analysed at City Analysts Limerick

Oldcastle Laboratories Ltd.

Cogan St., Oldcastle, Co. Meath. Ireland.
Tel: (049) 8541160/8541406, Fax (049) 8541755
Email: info@oldcastlelabs.ie
Website address:www.oldcastlelabs.ie

CERTIFICATE OF ANALYSIS

Lab Ref No: 194786 - 194788

Date Received: 14th June 2010

Commencement Date: 16th June 2010

Certificate Date: 18th June 2010

Sender: Barry Sexton, OCM, Granary Hse., Rutland St., Cork, Co. Cork

Sample Reference: **Bergerhoff Dust Gauges - PO No. 10-117 - 01 K T S - 29 Days (Samples collected by Michael Reidy)**

Sample Reference	Total Dust mg/m²/day	Inorganic Dust mg/m²/day	Organic Dust mg/m²/day
DS - 01	57.7	14.4	43.3
DS - 02	98.1	47.7	50.4
DS - 03	231.7	134.7	97.0

Signed: Karen Murtagh
Analyst

Above Results Relate Only To Sample Submitted.
Oldcastle Laboratories Ltd. perform all tests in accordance with an ISO 9001 Quality Management System.

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Energy - Sustainability- Environment

Laboratory and Technical Services

Certificate of Analysis

19249

Certificate Number

Business Innovation Centre,
Ballinode,
Sligo.

Client
O'Callaghan Moran

Address
Granary House
Rutland Street
Cork

FAO
Michael Watson

Analysis requested
All results expressed in mg/m2/d

Date of receipt
08/10/2010

Report Date
13/10/2010

Sample Date
08/10/2010

Sample ID

Client Reference
1011701 Dustfall Sample D2

Sample Description
Dustfall

Parameter	Units	Method used
Dustfall Non- Directional Total	18.79	Dustfall Non - Directional Deposit BS 1747
Dustfall Non- Directional Organic / Volatile	13.71	Dustfall Non - Directional Deposit BS 1747
Dustfall Non- Directional Inorganic	5.08	Dustfall Non - Directional Deposit BS 1747

Authorisation
Paul O'Dwyer

Analysis is carried out in accordance with the methods specified - Please see our standard terms and conditions.

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Laboratory and Technical Services

Certificate of Analysis

19250

Certificate Number

Business Innovation Centre,
Ballinode,
Sligo.

Client
O'Callaghan Moran

Address
Granary House
Rutland Street
Cork

FAO
Michael Watson

Analysis requested
All results expressed in mg/m2/d

Date of receipt
08/10/2010

Report Date
13/10/2010

Sample Date
08/10/2010

Sample ID

Client Reference
1011701 Dustfall Sample D3

Sample Description
Dustfall

Parameter	Units	Method used
Dustfall Non- Directional Total	39.62	Dustfall Non - Directional Deposit BS 1747
Dustfall Non- Directional Organic / Volatile	22.35	Dustfall Non - Directional Deposit BS 1747
Dustfall Non- Directional Inorganic	17.27	Dustfall Non - Directional Deposit BS 1747

Authorisation
Paul O'Dwyer

Analysis is carried out in accordance with the methods specified - Please see our standard terms and conditions.

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Laboratory and Technical Services

Certificate of Analysis

19248

Certificate Number

Business Innovation Centre,
Ballinode,
Sligo.

Client
O'Callaghan Moran

Address
Granary House
Rutland Street
Cork

FAO
Michael Watson

Analysis requested
All results expressed in mg/m2/d

Date of receipt
08/10/2010

Report Date
13/10/2010

Sample Date
08/10/2010

Sample ID

Client Reference
1011701 Dustfall Sample D1

Sample Description
Dustfall

Parameter	Units	Method used
Dustfall Non- Directional Total	45.71	Dustfall Non - Directional Deposit BS 1747
Dustfall Non- Directional Organic / Volatile	29.97	Dustfall Non - Directional Deposit BS 1747
Dustfall Non- Directional Inorganic	15.74	Dustfall Non - Directional Deposit BS 1747

Authorisation
Paul O'Dwyer

Analysis is carried out in accordance with the methods specified - Please see our standard terms and conditions.

Oldcastle Laboratories Ltd.

Cogan St., Oldcastle, Co. Meath. Ireland.
Tel: (049) 8541160/8541406, Fax (049) 8541755
Email: info@oldcastlelabs.ie
Website address:www.oldcastlelabs.ie

CERTIFICATE OF ANALYSIS

RECEIVED 19 NOV 2010

Lab Ref No: 200090 - 200092

Date Received: 8th November 2010

Commencement Date: 8th November 2010

Certificate Date: 17th November 2010

Sender: Barry Sexton, OCM, Granary Hse., Rutland St., Cork, Co. Cork

Sample Reference: **Bergerhoff Dust Gauges - PO No. 10-117-01 - KTS - 29 Days**

Sample Reference	Total Dust mg/m²/day	Inorganic Dust mg/m²/day	Organic Dust mg/m²/day
D - 1	64.9	32.2	32.7
D - 2	178.5	85.9	92.6
D - 3	445.1	413.0	32.1

Signed: Lizanne Farrelly
Analyst

Above Results Relate Only To Sample Submitted.
Oldcastle Laboratories Ltd. perform all tests in accordance with an ISO 9001 Quality Management System.

Noise Report

DixonBrosnan

environmental consultants

dixonbrosnan.com

Project

2010 biennial noise survey at Kings Tree Services Ltd., Coolbeg, Co. Wicklow - EPA waste licence W0218-01

Client

O'Callaghan Moran

Project no	No pages	Client reference	©DixonBrosnan 2010
06043	8	W0218-01	v090610

DixonBrosnan Shronagreehy Kealkil Bantry Co Cork
Tel 086 813 1195 | damian@dixonbrosnan.com | www.dixonbrosnan.com

Report no	Date	Status	Prepared by	Chkd
06043.5.1	15.06.10	Original	Damian Brosnan	CD

1 Introduction

1.1 DixonBrosnan Environmental Consultants were instructed by O'Callaghan Moran, on behalf of their client Kings Tree Services Ltd. (KTS), to undertake the 2010 biennial noise survey at the latter's composting facility at Coolbeg, Co. Wicklow. Several noise conditions attached to waste licence W0218-01, issued by the Environmental Protection Agency in respect of the site, are presented in **appendix 1**.

1.2 The 2010 noise survey was undertaken on Tuesday 25.05.10 at three monitoring stations indicated in **appendix 2**. Survey methodology, equipment specifications and weather conditions are summarised in **appendix 3**. Noise emissions arose from the KTS facility during the survey, chiefly from shredding operations in progress near the site entrance. Noise emissions from national route N11 were significant throughout the survey.

2 Results & analysis

2.1 Noise levels recorded are presented in **appendix 4**. $L_{Aeq\ 30\ min}$ levels recorded at the onsite stations N1 and N2 were 54 and 69 dB respectively. Noise limits specified in waste licence W0218-01 do not apply to these stations.

2.2 The $L_{Aeq\ 30\ min}$ level recorded at the offsite station NSL1 was 66 dB. This level was entirely dominated by N11 road traffic. KTS noise emissions were inaudible at NSL1, and did not exceed the 55 dB daytime noise limit specified in waste licence W0218-01.

2.3 Recorded frequency spectra are presented in **appendix 5**. A tone detected in the 1000 Hz band at N2 was traced to shredding operations near the site entrance. The tone was not detected at station NSL1, thus complying with the licence.

3 Conclusions

3.1 $L_{Aeq\ 30\ min}$ levels at the two onsite stations measured 54 and 69 dB. Site emissions were not audible at the offsite station NSL1. A tone traced to shredding operations was also inaudible offsite. Noise levels recorded were in compliance with conditions attached to waste licence W0218-01.

Appendix 1: Waste licence W0218-01 noise conditions

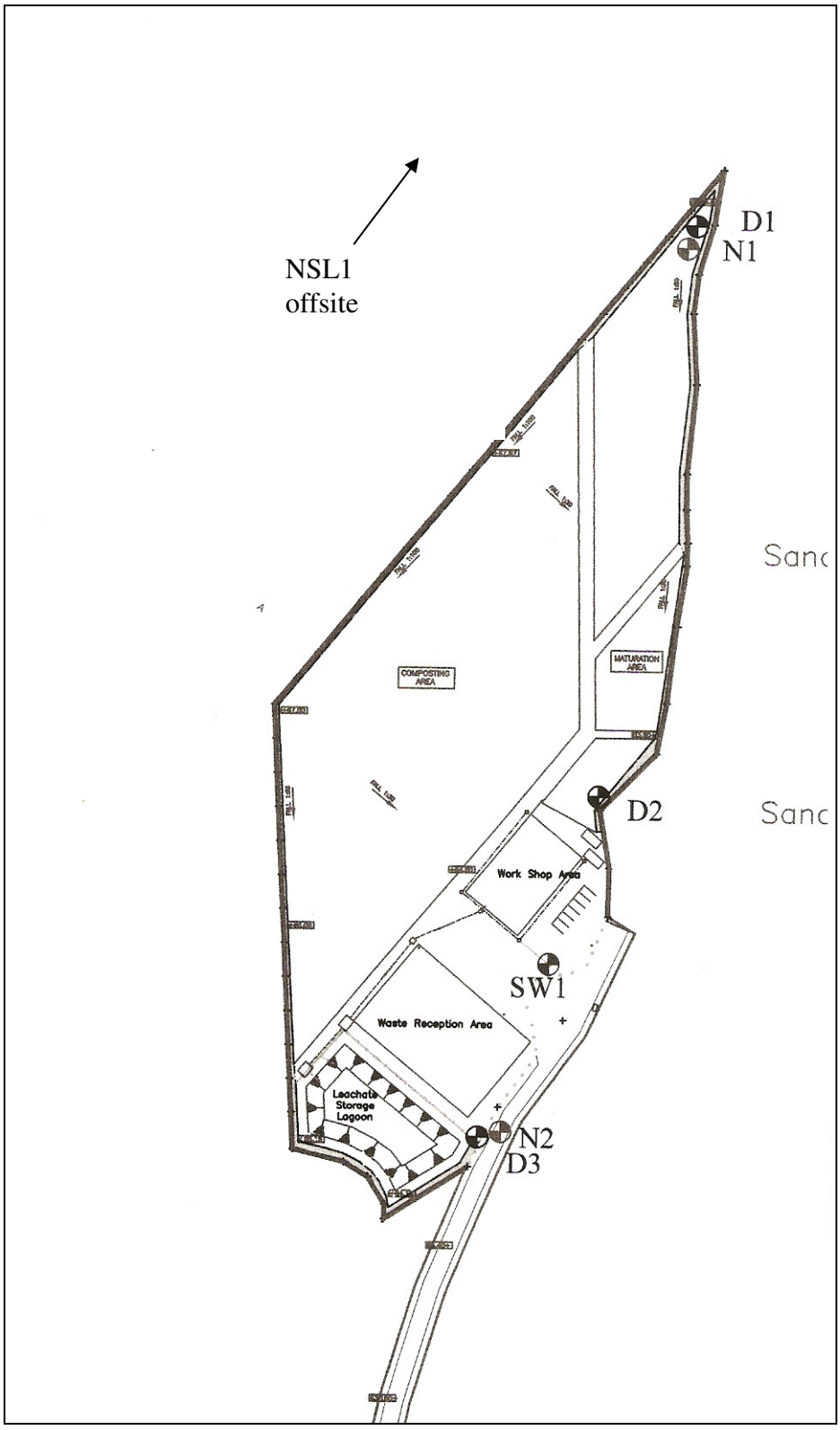
Schedule C.2.3 of licence W0218-01 specifies that quarterly noise monitoring is required at the study site. Biennial monitoring has been agreed with the EPA in the interim. Monitoring is to be undertaken in accordance with *International Standard ISO 1996 Acoustics: Description and measurement of environmental noise Parts 1-3 1982-1987*. The schedule lists the parameters which are to be monitored: L_{Aeq}, L_{A10} and L_{A90}, all over 30 minutes. One third octave band frequency analysis is also required.

Condition 6.7.1 stipulates that monitoring locations are to be agreed with the EPA. Three noise monitoring stations have been agreed as described appendix 2.

Schedule B.2 of the licence specifies maximum noise levels not to be exceeded at the agreed monitoring points. The limits specified are 55 dB during daytime hours, and 45 dB at night-time, measured as $L_{Aeq\ 30mins}$. Daytime and night-time periods are 0800-2200 and 2200-0800 respectively. Condition 5.7 states that *there shall be no clearly audible tonal component or impulsive component in the noise emissions from the activity at the noise sensitive locations*.

Condition 4..2.1 additionally states that:

Noise from the facility shall not give rise to sound pressure levels (Leq, t) measured at any noise sensitive locations of the facility [sic] *which exceed the limit value(s).*


NSL1
offsite
D1
N1
Sanc
COMPOSTING AREA
MATURATION AREA
D2
Sanc
Work Shop Area
SW1
Waste Reception Area
Leachate Storage Lagoon
N2
D3

Appendix 3: Survey details

Survey	Project ref.	06043
	Purpose	2010 biennial noise survey
	Locations	Coolbeg N1 N2 N3
	Comment	Facility operating
Event	Date	25.05.10
	Day	Tuesday
	Time	Morning
Operator	On behalf of DixonBrosnan	Damian Brosnan
Conditions	Cloud cover	0 %
	Precipitation	0 mm
	Temperature	14 ^{0}C
Wind	Direction	NE
	Speed	0-3 m/s gusting to 4-5 m/s
	Measurement	Anemo anemometer 2 m above ground level
Sound level meter	Instrument	Bruel & Kjaer Type 2250
	Instrument serial no.	2506594
	Microphone serial no.	2529531
	Application	BZ7224 Version 2.5
	Bandwidth	Broadband
	Max input level	141.16 dB
	Broadband weightings	Time: Fast Frequency: AC
	Spectrum weightings	Time: Fast Frequency: Z
	Windscreen correction	UA-1650
	Sound Field correction	Free-field
	UKAS calibration	09.12.09
	UKAS calibration certificate	Available on request
Onsite calibration	Time	25/05/2010 09:36:44
	Calibration type	External
	Sensitivity	48.48 mV/Pa
	Post measurement check	93.9 dB
Onsite calibrator	Instrument	Bruel & Kjaer Type 4231
	Instrument serial no.	1723667
	UKAS calibration	14.09.09
	UKAS calibration certificate	Available on request
Monitoring methodology	Standard	ISO 1996 Acoustics: Description and measurement of environmental noise - Part 1 (2003) & Part 2 (2007)
	Exceptions	-
	Intervals	30 min

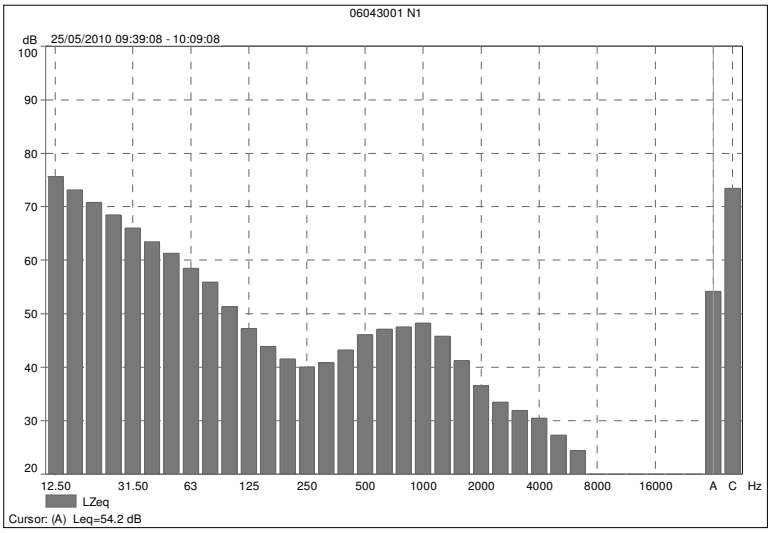
Appendix 4: Noise data

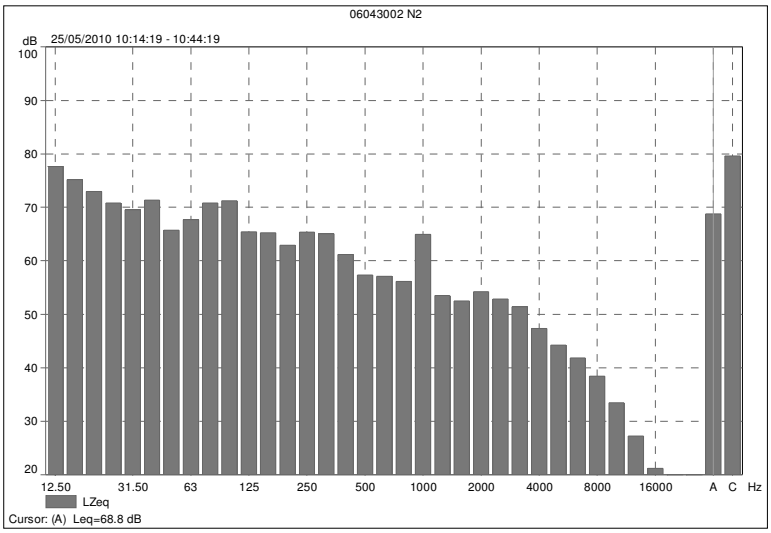
Survey date: 25.05.10

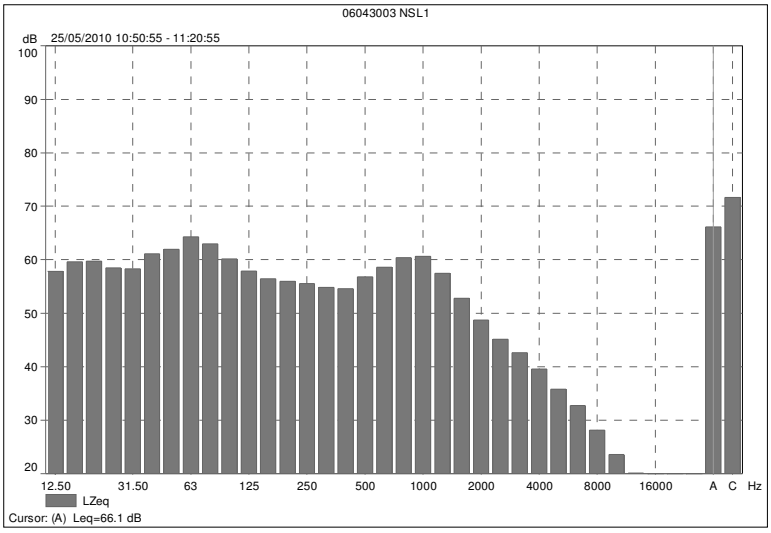
Station	Time	$L_{Aeq\ 30\ min}$ dB	$L_{AF10\ 30\ min}$ dB	$L_{AF90\ 30\ min}$ dB	Specific level* dB	Noise audible
N1	0939-1009	54	57	50	<41	No site emissions audible due to screening by building and breeze direction. N11 traffic to NE continuously dominant. Bird song/calls & aircraft.
N2	1014-1044	69	70	64	69	Shredder emissions at 60 m continuously dominant. Emissions from excavator & front end loader also audible. No other noise audible.
NSL1	1050-1120	66	71	53	<44	No emissions audible from facility. N11 traffic entirely dominant. No other emissions audible apart from bird song/calls.

*Specific level: Sound pressure level contribution considered attributable to facility, determined using real time assessment, field notes, time history profiles, statistical analysis, frequency spectra, near field correction if applicable, and other parameters.

Appendix 5: Frequency spectra







Appendix 6: Glossary

Ambient	Total noise environment at a location, including all sounds present.
A-weighting	Weighting or adjustment applied to sound level to approximate non-linear frequency response of human ear. Denoted by suffix A in parameters such as $L_{Aeq\,T}$, $L_{AF10\,T}$, etc.
Background level	$L_{AF90\,T}$. A-weighted sound pressure level of residual noise exceeded for 90 % of time interval T.
Decibel	Shortened to dB. Unit of noise measurement scale. Based on logarithmic scale so cannot be simply added or subtracted. 3 dB difference is smallest change perceptible to human ear. 10 dB difference is perceived as doubling or halving of sound level. **Throughout this report noise levels are presented as decibels relative to 20 µPa**. Examples of decibel levels are as follows: 20 dB: very quiet room; 30-35 dB: night-time rural environment; 55-65 dB: conversation; 80 dB: busy pub; 100 dB: nightclub.
Fast response	0.125 seconds response time of sound level meter to changing noise levels. Denoted by suffix F in parameters such as $L_{AF10\,T}$, $L_{AF90\,T}$, etc.
Free field	Noise environment away from all surfaces other than ground ie. outside near field.
Frequency	Number of cycles per second of a sound or vibration wave. Low frequency noise may be perceived as hum, while whine represents higher frequency. Range of human hearing approaches 20-20,000 Hertz.
Hertz	Shortened to Hz. Unit of frequency measurement.
Impulse	Noise which is of short duration, typically less than one second, sound pressure level of which is significantly higher than background.
Interval	Time period T over which noise monitoring is conducted. Denoted by T in $L_{Aeq\,T}$, $L_{AF90\,T}$, etc.
$L_{Aeq\,T}$	Equivalent continuous sound level during interval T, effectively representing average A-weighted noise level.
L_{AF}	Sound pressure level averaged over one second, and changing each second in fluctuating noise environment.
$L_{AF10\,T}$	Sound pressure level exceeded for 10% of interval T, usually used to quantify traffic noise.
$L_{AF90\,T}$	Sound pressure level exceeded for 90% of interval T, usually used to quantify background noise. May also be used to describe noise level from continuous steady or almost-steady source, particularly where local noise environment fluctuates.
Near field	Noise levels recorded near walls or other surfaces, artificially increased due to reflections. Levels near walls may be increased by up to 3 dB, and up to 6 dB near corners. Free field conditions may be achieved by maintaining separation distance of at least 3.5 m from walls.
Noise sensitive location	Any dwelling house, hotel or hostel, health building, educational establishment, place of worship or entertainment, or any other facility or area of high amenity which for its proper enjoyment requires absence of noise at nuisance levels.
1/3 octave band	Frequency spectrum may be divided into octave bands. Upper limit of each octave is twice lower limit. Each octave may be subdivided into thirds, allowing greater analysis of tones.
Residual level	Noise level remaining when specific source is absent or does not contribute to ambient.
Specific level	Sound pressure level contribution arising from specific noise source, measured directly or by estimation or calculation.
Tone	Character of noise caused by dominance of one or more frequencies which may result in increased noise nuisance.
Z-weighting	Standard weighting applied by sound level meters to represent linear scale.

Odour & Bioaerosol Report

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BIOAEROSOL, ODOUR AND HYDROGEN SULPHIDE IMPACT ASSESSMENT AT GREEN KING COMPOSTING LTD, COOLBEG, CO. WICKLOW

PREPARED BY:	Dr. Brian Sheridan
ATTENTION:	Mr. Barry Sexton (OCM)
DATE:	09th December 2010
REPORT NUMBER:	2010A359(1)
DOCUMENT VERSION:	Version 1
REVIEWERS:	

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Document Amendment Record

Client: ***Green King Composting Ltd***

Title: Bioaerosol, Odour and H_2S Impact Assessment at Green King Composting Ltd, Coolbeg, Co. Wicklow

Project Number: 2010A359(1)			**Document Reference:** Bioaerosol, Odour and H_2S Impact Assessment at Green King Composting Ltd, Cooibeg, Co. Wicklow		
2010A359(1)	Document for review	B.A.S.	JMC	B.A.S	09/12/2010
Revision	**Purpose/Description**	**Originated**	**Checked**	**Authorised**	**Date**

1. Introduction

Odour Monitoring Ireland was commissioned to perform a bioaerosol, odour and hydrogen sulphide (H_2S) assessment in the vicinity of Green King Composting Ltd, Coolbeg, Co. Wicklow. The bioaerosol assessment was carried out in accordance with the guidance document established by the UK Composting Association "Standardised protocol for the testing and enumeration of micro organisms". Total Mesophillic bacteria and Aspergillus *fumigatus* sampling was performed using equivalent Andersen single stage impactors. Triplicate sampling was performed at each of the three identified sampling locations within and in the vicinity of Green King Composting facility located at Coolbeg, Co. Wicklow.

The odour assessment was carried out in accordance with EN 13725:2003. Hydrogen sulphide (H_2S) sampling and analysis was carried out using a Gold leaf Jerome ppb analyser.

The bioaerosol concentration levels were determined at each sampling location in triplicate. Three sampling locations were chosen including Green 1, 2 and 3. Currently, there are no significant bioaerosol impacts in the vicinity of Green King Composting facility located at Coolbeg, Co. Wicklow with all reported bioaerosol ambient air concentrations within the range of the assessment criterion. All odour sampling and analysis was performed in accordance with EN13725:2003. All ambient odour threshold concentrations were less than 84 $Ou_E\ m^{-3}$. Hydrogen sulphide concentrations recorded at each monitoring location were less than the lower level of detection of 3 ppb in ambient air.

1.1 Aims of the study

The main aims of the study were:

- To enumerate the ambient air concentration of two bioaerosols groups namely: Aspergillus *fumigatus* and Total Mesophillic bacteria during operation of the composting facility at Coolbeg, Co. Wicklow. These are the two most frequently requested bioaerosols to be monitored for composting plants.
- To ascertain ambient odour and H_2S concentrations levels in the vicinity of the composting facility.

2. Materials and methods

This section describes in detail the materials and methods used throughout the study period.

2.1 Sampling locations and residential locations

Figure 2.1 and *Table 2.1* illustrates the location of the facility in relation to local residents.

Table 2.1. Monitoring locations and parameters monitored.

Location ID	Parameter monitored	Location details
Green 1	Total Mesophillic bacteria and Aspergillus fumigatus, Odour[1], H_2S	Upwind of site
Green 2	Total Mesophillic bacteria and Aspergillus fumigatus, Odour[1], H_2S	Beside green waste
Green 3	Total Mesophillic bacteria and Aspergillus fumigatus, Odour[1], H_2S	Downwind of site
Green 4	H_2S, Odour[1]	At entrance to site downwind
Green 5	H_2S	Upwind of site
Green 6	H_2S, Odour[1]	Upwind of site
Green 7	H_2S	Downwind of site
Green 8	H_2S Odour[1]	At entrance to site downwind

Notes: [1] denotes duplicate odour samples taken

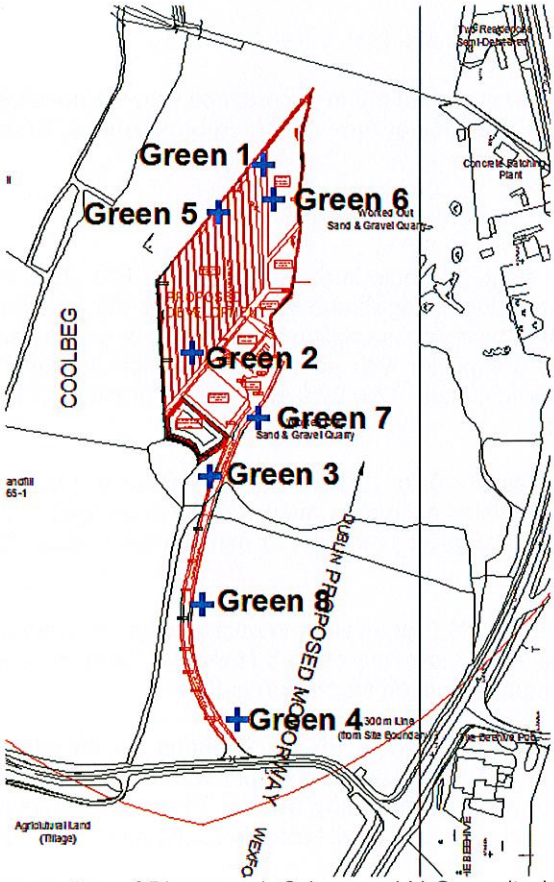

Figure 2.1. Schematic overview of Bioaerosol, Odour and H_2S monitoring locations.

2.2 Meteorological data

Table 2.2 illustrates the average wind direction during the one-day monitoring period. Average wind speed was low breeze to breezy during all day. Cloud cover was low with an octave rating of 2 to 3 (i.e. on an 8 point scale). Barometric pressure was approximately 1000 to 1004 mbar. Relative humidity was 73% while temperature was low from 8.5 degrees Celsius. This would be typical for this time period of the year in Southern Ireland.

Table 2.2 Meteorological conditions during the one-day monitoring period.

Parameter	Day 1-Oct. 20th 2010
Wind direction (From)	315 to 340
Wind speed (m s^{-1})	4.59
Barometric pressure	1000 to 1004
Temperature (^{0}C)	8.5
Relative humidity (%)	73

2.3 Bioaerosols monitoring

Monitoring of bioaerosols was performed in strict accordance with available information and advice including the sources:

1. Standardised Protocol for the Sampling and Enumeration of Airborne Micro-organisms at Composting Facilities. (1999). The UK Composting Association.
2. Macher, J. (1999). Bioaerosol assessment and control. American Conference of Government Industrial Hygienists, Kemper Woods Centre, 1330 Kemper Meadow Drive, Cincinnati, OH.

3. Direct Laboratories, (formerly ADAS), Woodthorne, Wergs Road, Wolverhampton, WV6 8QT.
4. SKC Inc, 863 Valley View Road, Eighty-four, PA, 15330.

Impactor plate sampling was carried out in accordance with the document "Sampling Protocol for the Sampling and Enumeration of Airborne Micro-organisms at Composting facilities", The Composting Association, UK.

One sampling technique was employed namely:

- Biostage single stage 400 hole impactor (SKC Inc, PA)- This is directly equivalent to the Andersen N6 single stage impactor and meets the requirements of NIOSH 0800 and NIOSH 0801 biological sampling standards (i.e. this impactor is a direct copy of the Andersen N6 impactor with added benefits including the Surelok system which prevents any air leakages. This was an inherent problem of the Andersen N6 single stage impactor).

Generally, sampling times of 10 to 15 minutes were used to assess ambient background levels using the impactor plates as longer sampling times can lead to desiccation of the plate and impacted microbes. Sampling times of 10 minutes were used for the duration of this study.

The Biostage (i.e. Andersen N 6 equivalent impactor) was calibrated using a Bios Primary flow calibrator to a volumetric flow rate of 28.3 *litres* min^{-1} and Hi Flow 30 battery operated automatically timed pumps were used for suction airflow.

The Biostage impactors were fixed to tripods ensuring an adjustable sampling height of between 0.40 to 1.90 metres. The sampling height was fixed at 1.50 metres. Two Biostage impactors were used throughout the study period. The use of correctly designed sampling equipment ensured correct operation at all times throughout the study period.

The Irish Equine Centre (ISO 17025 accredited) tested two medias including Malt Extract Agar media (MEA) for Aspergillus *fumigatus*, and standard plate count agar (TVC) for total Mesophillic bacteria. MEA media facilitates the sporulation of Aspergillus *fumigatus*, which is used to identify the species. Sterile fresh 90mm plates were supplied by Cruinn Diagnostics accredited laboratory services and placed in sealed coolers. Fresh plates were used to eliminate the formation of a skin upon the plate upper surface (i.e. develops with age). It was thought that this may cause problems while using an impaction method (i.e. particle bounce off).

2.4. Transport of bioaerosol samples

All sampling plates during monitoring were allowed to equilibrate to ambient temperature before sampling. This allowed for the development of less harsh conditions upon impacted bioaerosols. It was also noticed that cooled plates (approximately 5^0C) formed an outer "skin" which could facilitate particle bounce. Following equilibration, it was apparent from observation, better "knitting" of impactor plates occurred. Before each sampling event, the Biostage impactors were sterilised using cotton wool and 70% iso-proponal. The impactors were autoclaved for complete sterilisation before sampling. Once sampled, all agar plates were inverted, sealed with parafilm, placed within a flexible plastic container, and neatly stacked within a mobile cooler for delivery to Irish Equine Centre laboratory located in Kill, Co. Kildare. Once received, they were incubated at the appropriate temperatures of 30^0C for Total viable counts (i.e. Mesophillic bacteria) and 37^0C for Aspergillus *fumigatus* by the laboratory technician. Results were received within 10 to 15 days following sampling.

2.5. Odour sampling

In order to obtain air samples for odour assessment, a static sampling method was used where air samples were collected in 60 litre pre-conditioned Nalophan^{NA} bags using a vacuum sampling device over a ten to twenty minute period. The sampler operates on the 'lung principle', whereby the air is removed from a rigid container around the bag by a battery powered SKC vacuum pump at a rate of 3 to 5 l min^{-1}. This caused the bag to fill through a stainless steel and PTFE tube whose inlet is placed in ambient air, with the volume of sample equal to the volume of air evacuated from the rigid container. All odour-sampling bags were pre-conditioned and flushed with odourless lab air to remove any interference from the sample material.

2.6. Olfactometry

Olfactometry using the human sense of smell is the most valid means of measuring odour (Dravniek et al, 1986) and at present is the most commonly used method to measure the concentration of odour in air (Hobbs et al, 1996). Olfactometry is carried out using an instrument called an olfactometer. Three different types of dynamic dilution olfactometers exist:

- Yes/No Olfactometer
- Forced Choice Olfactometer
- Triangular Forced Choice Olfactometer.

In the dynamic dilution olfactometer, the odour is first diluted and is then presented to a panel of screened panellists of no less than four (CEN, 2003) Panellists are previously screened to ensure that they have a normal sense of smell (Casey et al., 2003). According to the CEN standard this screening must be performed using a certified reference gas *n*-butanol. This screening is applied to eliminate anosmia (low sensitivity) and super-noses (high sensitivity). The odour analysis has to be undertaken in a low odour environment such as an air-conditioned odour free laboratory. Analysis should be performed preferably within 8 to 12 hours of sampling.

2.7. Odour measurement in accordance with EN13725:2003

An ECOMA TO8 dynamic yes/no olfactometer was used throughout the measurement period to determine the odour threshold concentration of the sample air. The odour threshold concentration is defined as the dilution factor at which 50% of the panel can just detect the odour. Only those panel members who pass screening tests with n-butanol (certified reference gas, CAS 72-36-3) and who adhered to the code of behaviour were selected as panellists for olfactometry measurements (CEN, 2003). Odour measurement was carried out in an odour free laboratory in accordance with EN13725:2003.

2.7.1 What is an odour unit?

The odour concentration of a gaseous sample of odourant is determined by presenting a panel of selected screened human panellists with a sample of odourous air and varying the concentration by diluting with odourless gas, in order to determine the dilution factor at the 50% detection threshold. The Z_{50} value (threshold concentration) is expressed in odour units (Ou_E m^{-3}).

The European odour unit is that amount of odourant(s) that, when evaporated into one cubic metre of neutral gas (nitrogen), at standard conditions elicits a physiological response from a panel (detection threshold) equivalent to that elicited by one European Reference Odour Mass (EROM) evaporated in one cubic meter of neutral gas at standard conditions. One EROM is that mass of a substance (n-butanol) that will elicit the Z_{50} physiological response assessed by an odour panel in accordance with this standard. *n*-Butanol is one such reference standard and is equivalent to 123µg of n-butanol evaporated in one cubic meter of neutral gas at standard conditions (CEN, 2003).

2.8. H_2S measurement

A Jerome real time data-logging H_2S gold leaf analyser (measurement range 3 ppb to 50ppm) was also used for the measurement of ambient hydrogen sulphide levels in order to ascertain any elevations in ambient H_2S concentrations. This was used, as H_2S is commonly associated with composting operations and is a good indicator gas for the assessment of significant odour nuisance in the vicinity of compost facilities.

2.9 Bioaerosol assessment criteria

Table 2.2 illustrates the assessment criterion which is used for comparison of results during operation to ascertain ambient bioaerosol air quality in the vicinity of the Green King Composting facility located at Coolbeg, Co. Wicklow.

Table 2.2. Assessment criteria for the ambient bioaerosol air quality in the vicinity of Green King Composting facility Coolbeg, Co. Wicklow.

Assessment criteria	Reference concentration range	Notes	Reference
Total fungi (includes Aspergillus *fumigatus*)[1]	1000 to 5,000 CFU m^{-3}	Environment Agency proposed concentration level, Reported concentration range in Swan, 2003 & Sheridan et al., 2004	McNeel et al., 1999 Wheeler et al., 2001, Swan et al., 2003 Sheridan et al., 2004
Mesophillic bacteria[1]	5,000 to 10,000 CFU m^{-3}	Environment Agency proposed concentration level, Reported concentration range in Swan, 2003 and Sheridan et al., 2004	Gorny and Dutkiewicz (2002) Wheeler et al., 2001 Swan et al., 2003 Dutch Occupational Health Association NWA 1989. Sheridan et al., 2004

Notes: [1] denotes the values of CFU m^{-3} refers to Colony Forming Unit per cubic metre of air sampled.

2.10 Ambient Bioaerosol air quality

Table 2.3 illustrates the results from bioaerosol air quality monitoring. Both Aspergillus *fumigatus* and Total Mesophillic bacteria were assessed on the day of sampling in 20th October 2010.

Table 2.3. Bioaerosols concentration levels within and in the vicinity of the recycling facility in 20th October 2010.

Location ID	Average Aspergillus *fumigatus* concentration (CFU m^{-3})[1]	Average Mesophillic bacteria concentration (CFU m^{-3})[1]	Sample count[2]
Green 1	5	21	3
Green 2	53	645	3
Green 3	16	56	3

Note: [1] denotes a total of 6 blanks (3 plate and 3 impactor blanks for the monitored bioaerosol) were incorporated into the sampling exercise. All blanks were negative CFU m^{-3}.
[2] denote total number of sample counts for each parameter monitored at each location.

Table 2.3 illustrates the ambient bioaerosol air quality within and in the vicinity of the Green waste composting facility. As can be observed, Aspergillus *fumigatus* concentrations are low and at expected ambient concentration levels. Total mesophillic bacteria concentration levels at monitored location Green 2 were elevated but dissipated rapidly with distance to monitoring location Green 3 (approx. 50m downwind). The dissipation in concentrations of total mesophillic bacteria from Green 2 to Green 3 would be indicative of results obtained from international literature where bioaerosol concentrations greatly dissipate with distance from the source (i.e. within 80 to 200 metres).

Following a review of literature, it is reported that concentration levels of bioaerosols in ambient environment range from 0 to 400 CFU m^{-3} for Aspergillus *fumigatus*, 0 to 15,673 CFU m^{-3} for Total fungi and 79 to 3204 CFU m^{-3} for Total bacteria. The data set measured is within the lower end of this range.

In accordance with the assessment criteria reported in *Table 2.2*, bioaerosol concentrations within lower range for Aspergillus fumigatus and in the mid range for total Mesophillic bacteria.

2.11. Odour and H_2S results

Table 2.4 and 2.5 illustrates the odour threshold concentration and hydrogen sulphide results obtained during the monitoring period. All sampling and analysis for odour was performed in accordance with EN13725:2003. No elevated concentrations of odour or hydrogen sulphide were detected during the survey.

Table 2.4. Odour threshold concentration and Hydrogen sulphide results following monitoring of Green King Composting Ltd, Coolbeg, Co. Wicklow.

Date/Time	Location	Odour threshold conc. (OuE m^{-3})	H_2S (ppb)	Comment
Oct 2010	Green 1	67	<3	No distinct odour
Oct 2010	Green 2	84	<3	No distinct odour
Oct 2010	Green 3	62	<3	No distinct odour
Oct 2010	Green 4	53	<3	No distinct odour
Oct 2010	Green 6	72	<3	No distinct odour
Oct 2010	Green 8	62	<3	No distinct odour
Oct 2010	Green 5	-	<3	No distinct odour
Oct 2010	Green 7	-	<3	No distinct odour

3. Conclusions

The following conclusions may be drawn from the study;

1. The bioaerosol concentration levels were determined at each sampling location in triplicate. Three sampling locations were chosen including Green 1, 2, 3. Currently, there are no significant bioaerosol impacts in the vicinity of Green King Composting facility located at Coolbeg, Co. Wicklow with all reported bioaerosol ambient air concentrations within the range of the proposed assessment criterion.
2. All odour sampling and analysis was performed in accordance with EN13725:2003.
3. All ambient odour threshold concentrations were less than 84 Ou_E m^{-3}, therefore causing no significant impact with respect to odour.
4. All Hydrogen sulphide concentrations recorded at each monitoring location were less than 3ppb in ambient air.

APPENDIX 2

Compost Testing Results

BORD NA MÓNA

BORD NA MÓNA HORTICULTURE LIMITED

ANALYSIS OF GREENWASTE FROM GREENKING

REPORT NO: **GW 100512**

ATTENTION:
Ian Browne,
GREENKING,
COOLBEG,
WICKLOW.

PREPARED BY:
Dearbháil Ní Chualáin/Sarah Lombard,
Scientist,
Bord na Móna ltd.

DATE: 28th June 2010

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1 Introduction

Sample number 20-5-10 (1)
This compost has been through an open windrow composting process at Greenking Composting Ltd. The compost is made from green garden waste arising from landscaping activities

2 Applied Standards

This compost has been tested as per EPA requirements in Greenkings Licence (W0218-1) Schedule F

SCHEDULE F Standards for Compost Quality

The following criteria are deemed a quality standard for the use of compost as a soil improver and should not be deemed as criteria for fertiliser. In addition N, P, K, NH_4-N, NO_3-N, pH and dry matter content should also be measured.

Compost shall be deemed unsatisfactory if more than 10% of samples fail the criteria below. No sample shall exceed 1.2 times the quality limit values set.

1. Maturity

Compost shall be deemed to be mature if it meets two of the following requirements:

- C/N ratio ≤ 25
- oxygen uptake rate ≤ 150 mg O_2/kg volatile solids per hour;
- germination of cress (Lepidium sativum) seeds and of radish (Raphanus sativus) seeds in compost must be greater than 90 percent of the germination rate of the control sample, and the growth rate of plants grown in a mixture of compost and soil must not differ more than 50 percent in comparison with the control sample;
- elimination of the following test organisms (used to evaluate composting system efficiency in removing plant pathogens and weed seeds during the composting process): Plasmodiophora brassicae, tobacco-mosaic-virus (TMV) and tomato seeds.

Guidance on test may be obtained from the German document LAGA M10 'Quality Criteria and Application Recommendations for Compost'.

2. Foreign Matter

Compost must not contain any sharp foreign matter measuring over a 2mm dimension that may cause damage or injury to humans, animals and plants during or resulting from its intended use.

Foreign matter content as a percentage of oven-dried mass	≤1.5%
Foreign matter, maximum dimensions, in mm	25 mm

3. Trace Elements

Maximum Trace Element Concentration Limits for Compost[Note 2]

Trace Elements	(mg/kg, dry mass)
Arsenic (As)[Note 1]	15
Cadmium (Cd)	1.5
Chromium (Cr)	100
Copper (Cu)	100
Mercury (Hg)	1
Molybdenum (Mo)[Note 1]	5
Nickel (Ni)	50
Lead (Pb)	150
Selenium (Se)[Note 1]	2
Zinc (Zn)	350

Note 1: Monitoring of these parameters required if waste from an industrial source.
Note 2: The above alone should not be taken as an indication of suitability for addition to soil as the cumulative metal additions to soil should be first calculated.

4. Pathogens

Pathogenic organism content must not exceed the following limits:

- Escherichia coli ≤1,000 CFU/g
- Salmonella species absent in 25 g sample.

Results of Analysis

A sample was received from Greenking on the 21st May 2010 (GW 100512). It was received in good condition. Analysis was carried out on this sample as requested by the client.

Compost Testing and Analysis Service

Report ref: GW 1000512

Sample reference: GW 100512
Sample matrix: Composted greenwaste

Maturity Tests

Oxygen Uptake Rate

Sample no	$mmolO_2/kg$ OS/h
GW 100512	6.37

Self Heating Test

Sample no	Maximum temperature reached (°C)
GW 100512	22

Plant Nutrient and Organic Matter Content

Water Soluble Nutrients

pH	**EC** $\mu S.cm^{-1}$	**NH_4-N** $mg.L^{-1}$	**NO_3-N** $mg.L^{-1}$	**PO_4-P** $mg.L^{-1}$	**K** $mg.L^{-1}$
8.38	1146	4	13	3	1271

Total Plant Nutrients and Carbon Content (Dry Wt. Basis)

N %	**P** **%**	**K** %	**C** %	**C:N** %
1.6	0.3	1.2	24.51	15.7

Heavy Metals (Dry Wt. Basis)

Cd $mg.kg^{-1}$	**Cr** $mg.kg^{-1}$	**Cu** $mg.kg^{-1}$	**Hg** $mg.kg^{-1}$	**Ni** $mg.kg^{-1}$	**Pb** $mg.kg^{-1}$	**Zn** $mg.kg^{-1}$
1.01	70.6	55	0.120	32.9	66.4	192

Physical Analysis

H_20 %
56.8

Particle Size Analysis (Dry Wt. Basis)

>31.5 mm %	**16.5-31.5mm %**	**8-16.5mm %**	**4-8mm %**	**2-4mm %**	**1-2mm %**	**<1mm %**
37	23	18	17	5	<0.01	<0.01

Contaminants (Dry Wt. Basis)

Sieve size	**Stones** %	**Metals** **%**	**Plastic** **%**	**Glass** **%**	**Other** **%**
<1mm	n/d	n/d	n/d	n/d	n/d
1-2mm	n/d	n/d	n/d	n/d	n/d
2-4mm	<0.01	<0.01	<0.01	0.86	<0.01
4-8mm	<0.01	<0.01	<0.01	1.60	<0.01
8-16mm	<0.01	<0.01	<0.01	0.71	<0.01
16-31.5mm	<0.01	<0.01	<0.01	0.00	<0.01
>31.5mm	<0.01	<0.01	<0.01	<0.01	<0.01

Microbiological Analysis

Faecal Coliforms (MPN/g)	**Salmonella** (sp/25g)
<10	Not detected

Note:

N/A NOT AVAILABLE

Results given on a fresh weight basis except where indicated

Samples will be kept for three months

[f]Yield is expressed as % of control plants grown in 100% peat in relation to plants grown in 10%, 25%, 50% and 100% GW.

[†]DBD=Dry bulk density (after drying at 105°C for 12 hours)

[‡]MBD=Moist bulk density (sample as received)

CBW=Composted Biowaste

MP=Multipurpose Peat (fertilised peat)

Compost Testing and Analysis Service Interpretation of Results Sheet

Ref: IR-1

Below are detailed maximum values or desirable ranges of values for mature biowaste compost. Results are on a fresh wt. basis except where indicated.

Plant Nutrient and Organic Matter Content

Exchangeable Nutrients

pH*	**SC*** $\mu S.cm^{-1}$	**NH4-N mg.L^{-1}**	**NO3-N** mg.L^{-1}	**P** mg.L^{-1}	**K** mg.L^{-1}
6.9-8.3	**2000-6000**	**<1-500**	**<1-240**	**50-120**	**620-2280**

*****Water soluble

Total Plant Nutrients and Carbon Content (Dry wt. Basis)

N %	**P** **%**	**K** **%**	**ASH** **%**	**C:N**	**Mg** **%**	**Ca** **%**
0.8-1.9	**0.4-1.1**	**0.6-1.7**	**24-51**	**≤25**	**0.18-0.78**	**1.57-5.07**

Heavy Metals (Dry Wt. Basis)

Class	**Cd** mg.kg-1	**Cr** mg.kg-1	**Cu** mg.kg-1	**Pb** mg.kg-1	**Hg** mg.kg^{-1}	**Ni** mg.kg-1	**Zn** mg.kg-1
I	**0.7**	**100**	**100**	**100**	**0.5**	**50**	**200**
II	**1.5**	**150**	**150**	**150**	**1**	**175**	**400**

Physical Analysis

H_20 **%**	**DBD**** g.L^{-1}	**MBD** g.L^{-1}
55-76	**120-369**	**500-820**

Contaminants (Dry Wt. Basis)

vs.L-1	**0.5.L^{-1}** Free	**0.5-2.L^{-1}** Low	**>2.L-^{1}** Significant	
Foreign Material (Metal, Glass, Plastic etc)	**<0.1%** Free of foreign material	**0.1-0.5 %** Potentially free	**>0.5%** Marked quantity (Noticeable)	**>2%** Significant quantity (distinct)
Stones	**<5%** Low	**>5%** Significant		

Microbiological Analysis

Faecal Coliforms (MPN/g)	**Salmonella** (sp/25g)
<1000	**Absent in 25g**

**Denotes Bord na Móna suggested standard

Oxygen Uptake Rate

Bord na Móna Maturity Indicator Values (OS = organic solids)

mmolO_2/kg OS/h**	**Compost Process Stage**
>26	Very Unstable
16-25	Unstable
11-15	Moderately Stable
5-10	Stable
<5	Completely stable

APPENDIX 3

European Pollutant Release and Transfer Register

Guidance to completing the PRTR workbook

AER Returns Workbook

Version 1.1.11

REFERENCE YEAR	2010

1. FACILITY IDENTIFICATION

Parent Company Name	Kings Tree Services Limited
Facility Name	Kings Trees Services Composting Facility
PRTR Identification Number	W0218
Licence Number	W0218-01

Waste or IPPC Classes of Activity

No.	class_name
4.2	Recycling or reclamation of organic substances which are not used as solvents (including composting and other biological transformation processes).
4.13	Storage of waste intended for submission to any activity referred to in a preceding paragraph of this Schedule, other than temporary storage, pending collection, on the premises where such waste is produced.

Address 1	Coolbeg
Address 2	Co Wicklow
Address 3	
Address 4	
Country	Ireland
Coordinates of Location	-6.09863 52.9559
River Basin District	IEEA
NACE Code	3832
Main Economic Activity	Recovery of sorted materials
AER Returns Contact Name	Ian Browne
AER Returns Contact Email Address	ian@greenking.ie
AER Returns Contact Position	Facility Manager
AER Returns Contact Telephone Number	0404 62422
AER Returns Contact Mobile Phone Number	086 8382004
AER Returns Contact Fax Number	040468846
Production Volume	0.0
Production Volume Units	
Number of Installations	0
Number of Operating Hours in Year	0
Number of Employees	0
User Feedback/Comments	
Web Address	

2. PRTR CLASS ACTIVITIES

Activity Number	Activity Name
50.1	General
50.1	General

3. SOLVENTS REGULATIONS (S.I. No. 543 of 2002)

Is it applicable?	No
Have you been granted an exemption ?	
If applicable which activity class applies (as per Schedule 2 of the regulations) ?	

Is the reduction scheme compliance route being used ?	

4.1 RELEASES TO AIR Link to previous years emissions data | PRTR# : W0218 | Facility Name : Kings Trees Services Composting Facility | Filename : W0218_2010.xls | Return Year : 2010 | 10/03/2011 14:49

SECTION A : SECTOR SPECIFIC PRTR POLLUTANTS

RELEASES TO AIR					Please enter all quantities in this section in KGs			
POLLUTANT		METHOD				QUANTITY		
			Method Used					
No. Annex II	Name	M/C/E	Method Code	Designation or Description	Emission Point 1	T (Total) KG/Year	A (Accidental) KG/Year	F (Fugitive) KG/Year
					0.0	0.0	0.0	0.0

* Select a row by double-clicking on the Pollutant Name (Column B) then click the delete button

SECTION B : REMAINING PRTR POLLUTANTS

RELEASES TO AIR					Please enter all quantities in this section in KGs			
POLLUTANT		METHOD				QUANTITY		
			Method Used					
No. Annex II	Name	M/C/E	Method Code	Designation or Description	Emission Point 1	T (Total) KG/Year	A (Accidental) KG/Year	F (Fugitive) KG/Year
					0.0	0.0	0.0	0.0

* Select a row by double-clicking on the Pollutant Name (Column B) then click the delete button

SECTION C : REMAINING POLLUTANT EMISSIONS (As required in your Licence)

RELEASES TO AIR					Please enter all quantities in this section in KGs			
POLLUTANT		METHOD				QUANTITY		
			Method Used					
Pollutant No.	Name	M/C/E	Method Code	Designation or Description	Emission Point 1	T (Total) KG/Year	A (Accidental) KG/Year	F (Fugitive) KG/Year
					0.0	0.0	0.0	0.0

* Select a row by double-clicking on the Pollutant Name (Column B) then click the delete button

Additional Data Requested from Landfill operators

For the purposes of the National Inventory on Greenhouse Gases, landfill operators are requested to provide summary data on landfill gas (Methane) flared or utilised on their facilities to accompany the figures for total methane generated. Operators should only report their Net methane (CH4) emission to the environment under T(total) KG/yr for Section A: Sector specific PRTR pollutants above. Please complete the table below:

Landfill: Kings Trees Services Composting Facility

Please enter summary data on the quantities of methane flared and / or utilised	T (Total) kg/Year	M/C/E	Method Used: Method Code	Method Used: Designation or Description	Facility Total Capacity m3 per hour	
Total estimated methane generation (as per site model)	0.0				N/A	
Methane flared	0.0				0.0	(Total Flaring Capacity)
Methane utilised in engine/s	0.0				0.0	(Total Utilising Capacity)
Net methane emission (as reported in Section A above)	0.0				N/A	

4.2 RELEASES TO WATERS Link to previous years emissions data | PRTR# : W0218 | Facility Name : Kings Trees Services Composting Facility | Filename : W0218_2010.xls | Return Year : 2010 | 10/03/2011 14:52

SECTION A : SECTOR SPECIFIC PRTR POLLUTANTS

Data on ambient monitoring of storm/surface water or groundwater, conducted as part of your licence requirements, should NOT be submitted under AER / PRTR Reporting as this

RELEASES TO WATERS					Please enter all quantities in this section in KGs			
POLLUTANT					QUANTITY			
			Method Used					
No. Annex II	Name	M/C/E	Method Code	Designation or Description	Emission Point 1	T (Total) KG/Year	A (Accidental) KG/Year	F (Fugitive) KG/Year
					0.0	0.0	0.0	0.0

* Select a row by double-clicking on the Pollutant Name (Column B) then click the delete button

SECTION B : REMAINING PRTR POLLUTANTS

RELEASES TO WATERS					Please enter all quantities in this section in KGs			
POLLUTANT					QUANTITY			
			Method Used					
No. Annex II	Name	M/C/E	Method Code	Designation or Description	Emission Point 1	T (Total) KG/Year	A (Accidental) KG/Year	F (Fugitive) KG/Year
					0.0	0.0	0.0	0.0

* Select a row by double-clicking on the Pollutant Name (Column B) then click the delete button

SECTION C : REMAINING POLLUTANT EMISSIONS (as required in your Licence)

RELEASES TO WATERS					Please enter all quantities in this section in KGs			
POLLUTANT					QUANTITY			
			Method Used		SW-1			
Pollutant No.	Name	M/C/E	Method Code	Designation or Description	Emission Point 1	T (Total) KG/Year	A (Accidental) KG/Year	F (Fugitive) KG/Year
					0.0	0.0	0.0	0.0

* Select a row by double-clicking on the Pollutant Name (Column B) then click the delete button

4.3 RELEASES TO WASTEWATER OR SEWER

Link to previous years emissions data

SECTION A : PRTR POLLUTANTS

OFFSITE TRANSFER OF POLLUTANTS DESTINED FOR WASTE-WATER TREATMENT OR SEWER					Please enter all quantities in this section in KGs			
POLLUTANT		METHOD			QUANTITY			
			Method Used					
No. Annex II	Name	M/C/E	Method Code	Designation or Description	Emission Point 1	T (Total) KG/Year	A (Accidental) KG/Year	F (Fugitive) KG/Year
					0.0	0.0	0.0	0.0

* Select a row by double-clicking on the Pollutant Name (Column B) then click the delete button

SECTION B : REMAINING POLLUTANT EMISSIONS (as required in your Licence)

OFFSITE TRANSFER OF POLLUTANTS DESTINED FOR WASTE-WATER TREATMENT OR SEWER					Please enter all quantities in this section in KGs			
POLLUTANT		METHOD			QUANTITY			
			Method Used					
Pollutant No.	Name	M/C/E	Method Code	Designation or Description	Emission Point 1	T (Total) KG/Year	A (Accidental) KG/Year	F (Fugitive) KG/Year
					0.0	0.0	0.0	0.0

* Select a row by double-clicking on the Pollutant Name (Column B) then click the delete button

4.4 RELEASES TO LAND

Link to previous years emissions data

SECTION A : PRTR POLLUTANTS

RELEASES TO LAND					Please enter all quantities in this section in KGs		
POLLUTANT		METHOD			QUANTITY		
			Method Used				
No. Annex II	Name	M/C/E	Method Code	Designation or Description	Emission Point 1	T (Total) KG/Year	A (Accidental) KG/Year
					0.0	0.0	0.0

* Select a row by double-clicking on the Pollutant Name (Column B) then click the delete button

SECTION B : REMAINING POLLUTANT EMISSIONS (as required in your Licence)

RELEASES TO LAND					Please enter all quantities in this section in KGs		
POLLUTANT		METHOD			QUANTITY		
			Method Used				
Pollutant No.	Name	M/C/E	Method Code	Designation or Description	Emission Point 1	T (Total) KG/Year	A (Accidental) KG/Year
					0.0	0.0	0.0

* Select a row by double-clicking on the Pollutant Name (Column B) then click the delete button

5. ONSITE TREATMENT & OFFSITE TRANSFERS OF WASTE

Please enter all quantities on this sheet in Tonnes

3

Transfer Destination	European Waste Code	Hazardous	Quantity (Tonnes per Year)	Description of Waste	Waste Treatment Operation	Method Used		Location of Treatment	Haz Waste : Name and Licence/Permit No of Next Destination Facility Non Haz Waste: Name and Licence/Permit No of Recover/Disposer	Haz Waste : Address of Next Destination Facility Non Haz Waste: Address of Recover/Disposer	Name and License / Permit No. and Address of Final Recoverer / Disposer (HAZARDOUS WASTE ONLY)	Actual Address of Final Destination i.e. Final Recovery / Disposal Site (HAZARDOUS WASTE ONLY)
						M/C/E	Method Used					
Within the Country	20 02 01	No	2034.0	biodegradable waste	R3	M	Weighed	Onsite in Ireland	King Tree Services,W0218-01	Coolbeg,Co. Wicklow,.,.,Ireland		
Within the Country	13 02 05	Yes	0.05	mineral-based non-chlorinated engine, gear and lubricating oils	R9	M	Weighed	Offsite in Ireland	Enva Ireland Ltd.,W0184-01	Clonminam Industrial Estate,Portlaoise,Co. Laois,.,Ireland	Enva Ireland Ltd. ,W0184-01,Clonminam Industrial Estate,Portlaoise,Co. Laois,.,Ireland	Clonminam Industrial Estate,Portlaoise,Co. Laois,.,Ireland

* Select a row by double-clicking the Description of Waste then click the delete button