2019 Annual Environmental Report

On behalf of Greenking Composting Ltd,
Coolbeg,
Co. Wicklow

Waste Licence Number: W0218-01

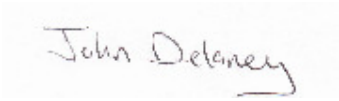
Annual Environmental Report 2019

On behalf of Greenking Composting Ltd,
Coolbeg,
Co. Wicklow

greenKING composting ltd
Coolbeg, Wicklow, Co. Wicklow

Prepared By: Geoenvironmental Consultants

Report Compilation & Writing:



John Delaney (MSc; BSc)
Environmental Consultant
On behalf of Greenking Compost Ltd

Date: 31/3/2020

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1.0 INTRODUCTION

Geoenvironmental was commissioned by Greenking Composting Ltd to collate and compile the company's 2019 Annual Environmental Report (AER). The (AER) is prepared for the Coolbeg Composting Facility operated by King Tree Services Ltd., trading as Greenking Composting Ltd. The content of this Annual Environmental Report is based on Schedule G of Waste Licence W0218-01 and follows guidelines set out in the document '*Guidance Note for Annual Environmental Report*' published by the Agency. This AER covers the period from January 2019 - December 2019.

The composting facility at Coolbeg, Co, Wicklow has with the capacity to accept and process 40,000 tonnes of green waste per annum. King Tree Services Ltd was issued with a Waste License from the Environmental Protection Agency (EPA) on the 25th October 2005. (Ref. No. W0218-01). The facility started its operation on the 6th June 2006.

The license permits the recycling or reclamation of organic substances which are not used as solvents (including com posting and other biological processes) and the 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 prescribed under Class 2 and Class 13 of the f*ourth Schedule of the Waste Management Acts, 1996 to 2003.*

2.0 SITE DESCRIPTION

2.1 Facility Location and Layout

The waste recovery facility is located in the townland of Coolbeg, approximately 4 km south west of Wicklow Town. The site is accessed via a local road running from the M11 Motorway at The Beehive towards Glenealy. The land adjoining the western site boundary is occupied by non-hazardous residual waste landfill.

The existing site layout includes the following facilities:

- a reception office
- a workshop located behind the reception building
- a weighbridge
- parking areas
- the waste reception area
- windrows area
- maturation area
- finished product storage area
- leachate storage lagoon.

The site office and welfare facilities are located at the reception; refer to Figure 2 (Site Layout Plan in Section 11).

2.2 Waste Types and Volume

Waste Licence W0218-01 regulates the operation of the composting facility at Coolbeg, County Wicklow. The green waste accepted at the facility comprises wood wastes generated by the King Tree Services 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 recovered during construction and demolition works. The facility is licensed to accept 40,000 tonnes of green waste annually. GreenKing offers a green drop off facility and compost collection service.

The composting operations involve pre treatment of green waste, shredding and mixing, composting in open windrows, maturation and post treatment and impurities removal. All operations are carried out externally. The finished product is suitable for a range of further activities which include a range of landscaping, horticultural and agricultural use.

3.0 MANAGEMENT OF THE FACILITY

3.1 Site Management Structure

King Tree Services Ltd. currently employs full time a total of two people at their Coolbeg Facility. The organisation and management structure in Coolbeg Composting Facility is provided below. Mr. Ian Browne, the facility manager is responsible for the day to day operation of the facility.

Table 1: Organisation Structure

Staff Name	Role	Experience
Ian Browne	Facility Manager	Completed FAS Waste Management Course.
Ann Keogh	Facility Administration	Completed FAS Waste Management Course.

3.2 Environmental Management System

In accordance with Condition 2.2.1, King Tree Services Ltd. has prepared and documented a basic Environmental Management System for its Composting Facility at Coolbeg. In March 2010 the emergency response procedures were updated. The schedule of Objectives and Targets for 2019 and proposed schedule of targets for 2020 are outlined in Table 2.0.

Table 2: Schedule of Objectives and Targets for 2020

No	Objective	Target	Progress
1	Reduce the energy /fuel usage at the facility.	Monitor diesel and electricity usage at least annually.	Diesel Usage & Electricity usage in 2019 was marginally higher than in 2018
3	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
4	Maintain Environmental Management System	Maintain documentation for EMS and implement on site.	Ongoing
		Review the EMP in accordance with the Licence.	Reviewed in March 2015
7	Maintain Regular Schedule of Environmental Training	Carry out training on Environmental Awareness, Emergency Response, Waste Licence W0218-01 for all staff.	Ongoing
8	Identify measures to improve efficiency and minimise waste.	Continue to identify measures to reduce waste and use of water	Ongoing

Table 3: Schedule of Objectives and Targets for 2019

No	Objective	Target	Timescale	Responsibility
1	Reduce the energy /fuel usage at the facility.	Monitor diesel and electricity usage at least annually.	Ongoing	Facility Manager
3	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	Facility Manager
4	Maintain Environmental Management System	Maintain documentation for EMS and implement on site.	Ongoing Q3 2018	Facility Manager
		Review the EMP and other procedures in accordance with the Licence		
		NB: Review and update the documented Emergency Response Procedure to include a fire prevention control procedure.		
7	Maintain Regular Schedule of Environmental Training	Carry out training on Environmental Awareness, Emergency Response, Waste Licence W0218-01 for all staff.	Ongoing	Facility Manager
8	Identify measures to improve efficiency and minimise waste.	Continue to identify measures to reduce waste and use of water	Ongoing	Facility Manager

3.3 Environmental Management Programme

A comprehensive 2019 Environmental Management Programme was implemented at Greenking Composting Facility. The environmental monitoring works undertaken included monitoring of dust emissions, surface water and groundwater quality monitoring, bioaerosol monitoring, odour monitoring. Results of the monitoring are provided in Section 4 of this report under Emissions Monitoring.

3.4 Staff Awareness and Training

No staff training was carried out in 2019.

3.5 Public Communications Programme

Records available for public inspection at the site office include:

- Copy of Waste Licence W0218-01
- Licence Application and Review documentation
- Monitoring records
- Complaints file
- Incidents file
- EPA Correspondence file

Visits to the Coolbeg Composting Facility can be arranged in advance by calling the Facility Manager at 0404-62422.

4.0 EMISSIONS MONITORING

An Environmental Monitoring Programme is required at the facility to assess the significance of emissions from site activities. Schedule C of Waste Licence W0218-01 specifies the required level of monitoring at the Coolbeg Composting Facility. All of the monitoring locations are shown on Figure 1 (Site Layout Plan) of this AER.

4.1 Noise Monitoring

No noise monitoring was carried out in 2019 as the EPA License requires monitoring to be carried out every 2 years only. Noise monitoring will be conducted at the designated Noise Sensitive Locations in 2020.

4.2 Dust Monitoring

Dust deposition monitoring was carried out quarterly at three on site locations in 2019 as prescribed in Schedule C of the Waste License. The objective of the dust stations is to monitor the level of wind blown dust and other small particles which nay be generated from on-site activities. The Bergerhoff dust method was used as the dust monitoring medium to obtain dust levels at the site. The Bergerhoff method measures airborne dustfall in milligrams per square metre. The sample is collected in an open plastic jar mounted on a stand.

The dust collecting jars were left in-situ for a period of 30 days. All samples were collected and delivered to ALT Ltd an INAB accredited laboratory located at Unit 4, Newbridge Industrial Estate, Co. Kildare for analysis using a gravimetric in-house method. The result obtained from the Lab with the amount of days the dust jar has been on site once calculated, will give the dustfall per mg/m^2 per day. The dust deposition results are set out in *Appendix A*.

Table 4.0: Summary of 2019 Dust Monitoring Results

	Period		Deposition (mg/m²/day)			Dust Deposition Limits
Quarter	**From**	**To**	**D1**	**D2**	**D3**	**mg/m²/day**
Q1	13/3	12/4	132	139	49	350
Q2	29/4	28/5	13	84	179	350
Q3	28/8	27/9	49	92	132	350
Q4	12/11	19/12	69	100	57	350

The dust monitoring results show that the 2019 results were fully compliant with the 350 mg/m^2/day limit

4.3 Surface Water Monitoring

Surface water run-off from the composting process areas is diverted to the leachate storage lagoon located and is kept isolated from the surface water drainage system. Run-off from non-process paved areas and roof area of the building is collected and diverted through an oil interceptor and silt trap prior to discharge to ground.

A surface water sample taken on the 28th November 2019 showed the levels of suspended solids and BOD to be low. No concentration of total coliform concentrations or and E-Coli were detected in the sample. The Surface Water Certificates of Analysis are set out in *Appendix B.*

4.4 Groundwater Monitoring

A groundwater sample was taken from one monitoring location (PW1), as shown on Figure 2 (Site Layout Plan), on the 6th November 2019. The sample was analysed by IAS laboratories at an INAB accredited laboratory located at Unit 4 Bagnalstown Business Park, Co. Carlow**.** The certificate of analysis is provided in *Appendix C.* Groundwater was analysed for chemical and biological parameters specified in Schedule C of the waste licence W0218-01. The results of the analysis are summarised in Table 4.3.

Table 5.0: 2019 Groundwater Monitoring Results

Parameter	Unit	PW1 6/11/2019	MAC*
pH	*pH Units*	7.9	-
Chloride	*mg/l*	20.65	187.5
Ammonial Nitrogen as NH_3- N	*mg/l*	0.04	0.175
Total Coliforms	*cfu/100ml*	0	-
E-Coli	*cfu/100ml*	0	-
Cadmium	*µg/l*	<0.6	3.75
Chromium	*µg/l*	<2	3.75
Copper	*µg/l*	20	1500
Zinc	*µg/l*	87	
Lead	*µg/l*	<6	18.75
Nickel	*µg/l*	<3	15
Mercury	*µg/l*	<0.01	

MAC Maximum Admissible Concentration
* European Communities Environmental Objectives (Groundwater Regulations, 2010 (S.I. No.9 of 2010) – Overall Threshold Value Range

The results of the groundwater analysis shows that tested parameters are compliant with the overall threshold values for chemical status of groundwater.

4.5 Bioaerosol Monitoring

Bioaerosol monitoring was carried out by Odour Monitoring Ireland on the 10th December 2019, as specified in Schedule C of the waste Licence W0218-01. The results of bioaerosol monitoring are summarised in Table 4.4. The full report is included in *Appendix D.* Bioaerosol monitoring locations are shown on Figure 2.1 of the Bioaerosol, Odour and Hydrogen Sulphide Impact Assessment Report.

Table 6.0: 2019 Bioaerosols concentration levels

Location ID	Average *Aspergillus fumigatus* Concentration (CUF m^{-3})[1]	Average *Mesophillic Bacteria* Concentration (CUF m^{-3})[1]	Sampling Count[2]
Loc 1	0	420	3
Loc 2	0	183	3
Loc 3	0	342	3

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

The bioaerosol concentration levels were determined at each sampling location in triplicate. Three sampling locations were chosen including Loc 1, 2, 3. The monitoring locations are shown on the schematic plant within the main report. Currently there are no significant bioaerosol impacts in the vicinity of Coolbeg site with all reported bioaerosol ambient air concentrations within the range of the proposed assessment criterion. The report produced by Odour Monitoring Ireland concluded bioaerosol concentrations within lower range for Aspergillus fumigatus. Total mesophillic bacteria concentration levels at monitored location Loc 2 were elevated but dissipated rapidly with distance to monitoring location Loc 3 (approx. 50 to 90m downwind). The dissipation in concentrations of total mesophillic bacteria from Loc 2 to Loc 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).

4.6 Odour Monitoring

Odour monitoring was carried out by Odour Monitoring Ireland on the 10th Dec 2019 as specified in Schedule C of the waste Licence W0218-01. The results of odour monitoring are summarised in Table

4.5. The full report is included in *Appendix D***.** The odour monitoring locations are shown on Figure 2.1 of the Bioaerosol, Odour and Hydrogen Sulphide Impact Assessment Report.

Table 7.0: 2019 Odour Threshold Concentration and Hydrogen Sulphide Results

Date	Sample Location	Odour threshold concentration (Ou_E m^{-3})	H_2s (ppb)	Comment
10/12/18	Loc 1	98	<3	No Distinct Odour
10/12/18	Loc 2	144	<3	No Distinct Odour
10/12/18	Loc 3	114	<3	No Distinct Odour
10/12/18	Loc 4	106	<3	No Distinct Odour
10/12/18	Loc 5	-	<3	No Distinct Odour
10/12/18	Loc 6	124	<3	No Distinct Odour
10/12/18	Loc 7	-	<3	No Distinct Odour
10/12/18	Loc 8	133	<3	No Distinct Odour

All odour sampling and analyses were performed in accordance with EN13725:2003. All ambient odour threshold concentrations were less than 144 OuE/m^{-3}, therefore there is no indication of any significant odour impact. All Hydrogen sulphide concentrations recorded at each monitoring location were less than 3ppb in ambient air.

4.7 Compost Analysis

A sample of final compost from Greenking Composting was consigned to the IAS testing laboratory at Bagnalstown on the 6th November 2019. The sample was tested for a range of Standards for Compost Quality as set out in Schedule F Waste Licence W0218-01. A copy of the analysis report is set out in *Appendix E* of this report.

4.8 Pollutant Release and Transfer Register

Under the European Pollution and Transfer Register Regulation King Tree Services Ltd. are required to submit information on emissions and waste annually to the EPA. The 2019 PRTR Emission Reporting Results were submitted to the Agency on the 31st March 2020 via the EDEN Portal.

5.0 Site Visits and Inspections

A site visit was carried out by the EPA the 21st February 2019 by Ciaran Cuddihy. The auditor noted 2 * No. Non-Compliances were raised in relation to a dust emission limit value (ELV) exceedance and for the no notification of this ELV breach as an incident. 1 * No. observation was raised in relation to failure label sampling and monitoring locations at the installation.

6.0 NUISANCE CONTROL

6.1 Mud, Dust, Litter

Nuisance controls at the facility include inspections of the facility and amenities immediate to the facility boundary for mud, dust and litter. These are documented in the daily facility inspection form to ensure any nuisances are identified and managed on a daily basis.

7.0 Site Developments Works

7.1 Engineering Works

No engineering works were carried out in 2018 and it is not envisaged that any works will be carried out in 2019. The Agency will be notified of future engineering works as per Condition 3.2 of the licence.

7.2 Tanks and Pipeline Testing and Inspection Report

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 in three years. All foul and surface water drains were surveyed and cleaned out using high pressure water jetting by M&T Plant Hire Ltd in September 2019. A cop of the pipeline test report is set out in *Appendix F* of this report. The oil storage tanks were inspected in Aug 2018 by Blanchfield Oil Storage Services and were found to be in good condition and suitable for the storage of of gas oil and kerosene.

8.0 RESOURCE USE AND ENERGY EFFICIENCY

8.1 Energy Efficiency Audit

An Energy efficiency report was submitted as part of the 2006 AER. One of the main recommendations of the report was to install thermostat in the office building. This recommendation has been implemented and currently each radiator is fitted with a thermostatic control valve. There are only two staff members' at the facility full time and the use of energy is very low. The main users of electricity are the office equipment. There is no electricity consumed in the compost production process on site.

8.2 Resource Consumption Summary

Table 8.1 presents an estimate of resources used on-site from January to December 2019. The water supply for the facility comes from an on-site groundwater well and it is not metered, water is used for sanitary and kitchen purposes. The electricity consumed in 2019 was marginally higher than in 2018 (300 kWh increase) and the volume of diesel increased by a modest 3% from 11120 litres in 2018 to 11460 litres in 2019. There was a deduction in the quantity of heating oil consumed from 800 litres in 2018 to 780 litres in 2019. The volume of hydraulic and engine oil consumed in 2019 remained unchanged at 100 litres during the course of 2019.

Table 8.0: Resource Consumption Summary in 2019

Energy Stream	Annual Quantity	Units	Period
Electricity	**10500**	**kWh**	**2018**
Diesel	**11120**	**Litres**	**2018**
Heating Oil	**800**	**Litres**	**2018**
Hydraulic and Engine Oil	**100**	**Litres**	**2018**

9.0 WASTE RECEIVED AND CONSIGNED FROM FACILITY

9.1 Waste Management Records

Table 9-1 shows the total quantities of waste received at the waste facility in 2019. A breakdown of the waste types is provided in accordance with the European Waste Catalogue and Hazardous Waste List. The total of 1416 tonnes of green waste accepted at the facility between January 2019 and December 2019. This represents a significant decease of almost 50% of the 2018 figure of 2807 tonnes. Overall the volume of green waste received at the facility has reduced significantly from 3,377 tonnes in 2008 but there has been an upward trend again in more recent years until 2019.

Table 10.0: Waste Received in 2019

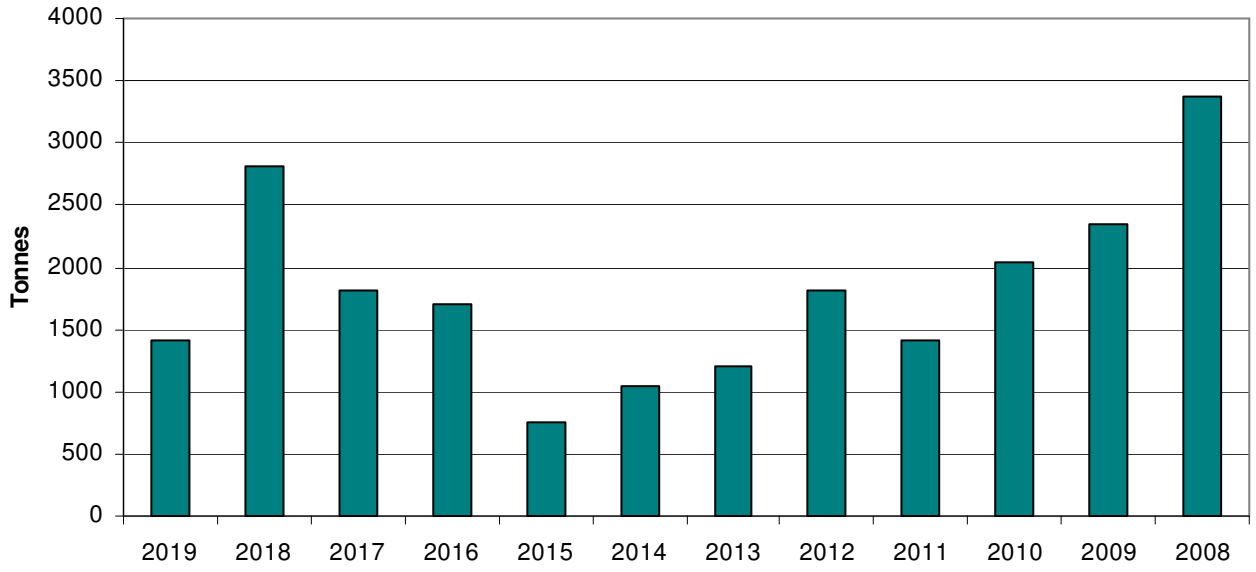
EWC	Description	Waste in (tonnes)
20 02 01	Green Waste	1416
	Total Received	1416

Table 9.2 shows the quantities of waste received in previous years.

Table 11.0: Compost Quantities Consigned in 2019

EWC	Description	Waste (tonnes)
20 02 01	Compost	600
	Total	600

Figure 1: Green Waste Quantities Received 2008 – 2019



9.2 Waste Recovery Report

All waste received at the facility was used to produce compost, therefore the facility had a 100% recovery rate in 2019.

10.0 ENVIRONMENTAL INCIDENTS AND COMPLAINTS

10.1 Incidents Summary

King Tree Services Ltd. maintains register of incidents. There were no environmental incidents during the reporting period of 2019.

10.2 Register of complaints

One complaint was received in 2019. The complainant contacted the EPA on the 10/12/19 and stated that compost he purchases from King Trees Services Composting Facility was not sterilised correctly. He stated that the compost is full of weed seeds and should not be sold like that. He put it in a garden and the compost is now full of weeds. The site manager Mr Ian Brown had 2 * compost tested for weed seed by Bird Environmental. Both samples showed no weed seed present. The analysis results were uploaded to the EDEN portal. The matter has been closed.

11.0 OTHER REPORTS

11.1 Statement of Measures in Relation to the Prevention of Environmental Damage and Remedial Actions

Green waste composting is a relatively low impact waste management activity. The potential sources of environmental damage and the measures employed to prevent pollution are listed below:

Kerosene and Diesel tanks outside the Maintenance Shed – These are self-bunded tanks and are protected from impact by a strong steel fence.

Hydraulic and other oils in the Maintenance Shed – These are stored on bunded pallets.

Waste materials – These are stored and processed on paved surfaces with run-off directed to the leachate lagoon.

Leachate Lagoon – This is contained by a lining system, monitored regularly and serviced as required.

Sewage from the office – Municipal wastewater generated on site is treated by on on-site biocycle wastewater treatment unit. The unit was serviced in 2018

Dust and other air emissions – The composting piles are regularly sprayed with water, particularly during dry periods and this prevents excessive wind-blown dust and other material such as spores.

Noise – Noise at the facility is primarily caused by shredding of green waste. This is periodic and is mitigated by the relatively long distance between site operations and the nearest sensitive receptors. There are no noise sensitive receptors within 150m of site boundary.

The site monitoring results in 2019 has shown that the prevention measures employed at the site are currently operating effectively.

12.0 FIGURE 2: ENVIRONMENTAL MONITORING LOCATIONS

13.0 APPENDICES

Appendix A: Noise Monitoring Report
Appendix B: Quarterly Dust Monitoring
Appendix C Surface Water Monitoring Analysis Results
Appendix D: Groundwater Monitoring Analysis Results
Appendix E: Bioaerols and Odour Monitoring Report
Appendix F: Compost Sample Analysis Results
Appendix G: PRTR Emissions Submission

Appendix A: 2019 Dust Monitoring Results

ENVIRONMENTAL CHEMISTRY TEST CERTIFICATE

Report Status: **Replacement Report**

Date of Issue: **06-Jun-2019**

Report Number: **696140**

Project: **1-190408-05194**

This report replaces Report Number: **669674**

Attention:

Client: **Geoenvironmental**

Address: Knocklas
Coolcotts
Co.Wexford

Order Number:

Disclaimer

Results in this report relate only to the items tested.
Reports may not be reproduced in full without the approval of **Advanced Laboratory Testing**.
Results reported as cfu/cm2 are calculated based on information supplied by the relevant customer regarding the specific area swabbed.
* beside the method or lack of INAB symbol signifies that **Advanced Laboratory Testing** are not INAB accredited for this method.
Samples are retained post analysis for a period of 10 days. Samples are stored frozen by default except in the case of M&S requirements.
Unless otherwise stated as a Test Certificate comment, samples were received in a satisfactory condition.

ALT ID: 1694088 **Date Received:** 08/04/2019 **Date Tested:** 12/04/2019
INAB P9 Classification: Others: Others
Client ID: D1 - Q1 - 30 Day Bergenhoff Dust Sample @ Greenking Compost, Coolbeg, Co.Wicklow

Test	Result	Unit(s)	Method	Technique
Dust depostion	132	mg/m2/day	ECTM014	In-House

ALT ID: 1694089 **Date Received:** 08/04/2019 **Date Tested:** 12/04/2019
INAB P9 Classification: Others: Others
Client ID: D2 - Q1 - 30 Day Bergenhoff Dust Sample @ Greenking Compost, Coolbeg, Co.Wicklow

Test	Result	Unit(s)	Method	Technique
Dust depostion	139	mg/m2/day	ECTM014	In-House

ALT ID: 1694090 **Date Received:** 08/04/2019 **Date Tested:** 12/04/2019
INAB P9 Classification: Others: Others
Client ID: D3 - Q1 - 30 Day Bergenhoff Dust Sample @ Greenking Compost, Coolbeg, Co.Wicklow

Test	Result	Unit(s)	Method	Technique
Dust depostion	49	mg/m2/day	ECTM014	In-House

The results in this report were authorised by:

Authorized Signatory	Title
Graham O Halloran	Technical Director

Graham O'Halloran

ENVIRONMENTAL CHEMISTRY TEST CERTIFICATE

Report Status: **Final Report**

Date of Issue: **05-Jun-2019**

Report Number: **694968**

Project: **1-190520-12105**

Attention:

Client: **Geoenvironmental**

Address: Knocklas
Coolcotts
Co.Wexford

Order Number:

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ALT ID: 1759414 **Date Received:** 20/05/2019 **Date Tested:** 28/05/2019

INAB P9 Classification: Others: Others

Client ID: D1 - 30 Day Bergenhoff Dust Sample @ Greenking Compost, Coolbeg, Co.Wicklow

Test	Result	Unit(s)	Method	Technique
Dust depostion	13	mg/m2/day	ECTM014	In-House

The results in this report were authorised by:

Authorized Signatory	Title
Dylan Keane	Laboratory Manager – Environmental Chemistry

Dylan Keane

ENVIRONMENTAL CHEMISTRY TEST CERTIFICATE

Client: **Geoenvironmental**

Order Number:

Report Status: **Final Report**

Date of Issue: **05-Jun-2019**

Report Number: **694968**

Project: **1-190520-12105**

ALT ID: 1759415 **Date Received:** 20/05/2019 **Date Tested:** 28/05/2019

INAB P9 Classification: Others: Others

Client ID: D2 - 30 Day Bergenhoff Dust Sample @ Greenking Compost, Coolbeg, Co.Wicklow

Test	Result	Unit(s)	Method	Technique
Dust depostion	84	mg/m2/day	ECTM014	In-House

The results in this report were authorised by:

Authorized Signatory	Title
Dylan Keane	Laboratory Manager – Environmental Chemistry

Dylan Keane

ENVIRONMENTAL CHEMISTRY TEST CERTIFICATE

Client: **Geoenvironmental**

Order Number:

Report Status: **Final Report**

Date of Issue: **05-Jun-2019**

Report Number: **694968**

Project: **1-190520-12105**

ALT ID: 1759416 **Date Received:** 20/05/2019 **Date Tested:** 28/05/2019

INAB P9 Classification: Others: Others

Client ID: D3 - 30 Day Bergenhoff Dust Sample @ Greenking Compost, Coolbeg, Co.Wicklow

Test	Result	Unit(s)	Method	Technique
Dust depostion	179	mg/m2/day	ECTM014	In-House

The results in this report were authorised by:

Authorized Signatory	Title
Dylan Keane	Laboratory Manager – Environmental Chemistry

Dylan Keane

ENVIRONMENTAL CHEMISTRY TEST CERTIFICATE

Report Status: **Final Report**

Date of Issue: **02-Oct-2019**

Report Number: **767212**

Project: **1-190924-12693**

Attention:

Client: **Geoenvironmental**

Address: Knocklas
Coolcotts
Co.Wexford

Order Number:

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Samples are retained post analysis for a period of 10 days. Samples are stored frozen by default except in the case of M&S requirements.

Unless otherwise stated as a Test Certificate comment, samples were received in a satisfactory condition.

ALT ID: 1946679 **Date Received:** 24/09/2019 **Date Tested:** 27/09/2019

INAB P9 Classification: Others: Others

Client ID: D1 - Q3 30 Day Bergenhoff Dust Sample @Greenking Compost, Coolbeg. Co.Wicklow.

Test	Result	Unit(s)	Method	Technique
Dust depostion	49	mg/m2/day	ECTM014	In-House

ALT ID: 1946680 **Date Received:** 24/09/2019 **Date Tested:** 27/09/2019

INAB P9 Classification: Others: Others

Client ID: D2 - Q3 30 Day Bergenhoff Dust Sample @Greenking Compost, Coolbeg. Co.Wicklow.

Test	Result	Unit(s)	Method	Technique
Dust depostion	92	mg/m2/day	ECTM014	In-House

ALT ID: 1946681 **Date Received:** 24/09/2019 **Date Tested:** 27/09/2019

INAB P9 Classification: Others: Others

Client ID: D3 - Q3 30 Day Bergenhoff Dust Sample @Greenking Compost, Coolbeg. Co.Wicklow.

Test	Result	Unit(s)	Method	Technique
Dust depostion	132	mg/m2/day	ECTM014	In-House

The results in this report were authorised by:

Authorized Signatory	Title
Dylan Keane	Laboratory Manager – Environmental Chemistry

Dylan Keane

ENVIRONMENTAL CHEMISTRY TEST CERTIFICATE

Report Status: **Final Report**
Date of Issue: **16-Dec-2019**
Report Number: **814538**
Project: **1-191203-01186**

Attention:
Client: **Geoenvironmental**
Address: Knocklas
Coolcotts
Co.Wexford

Order Number:

Disclaimer

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* beside the method or lack of INAB symbol signifies that **Advanced Laboratory Testing** are not INAB accredited for this method.
Samples are retained post analysis for a period of 10 days. Samples are stored frozen by default except in the case of M&S requirements.
Unless otherwise stated as a Test Certificate comment, samples were received in a satisfactory condition.

ALT ID: 2050793 **Date Received:** 03/12/2019 **Date Tested:** 10/12/2019
INAB P9 Classification: Others: Others
Client ID: D1 - Q4 30 Day Bergerhoff Dust Sample @ Greenking Compost, Coolbeg, Co.Wicklow

Test	Result	Unit(s)	Method	Technique
Dust depostion	69	mg/m2/day	ECTM014	In-House

ALT ID: 2050794 **Date Received:** 03/12/2019 **Date Tested:** 10/12/2019
INAB P9 Classification: Others: Others
Client ID: D2 - Q4 30 Day Bergerhoff Dust Sample @ Greenking Compost, Coolbeg, Co.Wicklow

Test	Result	Unit(s)	Method	Technique
Dust depostion	100	mg/m2/day	ECTM014	In-House

ALT ID: 2050795 **Date Received:** 03/12/2019 **Date Tested:** 10/12/2019
INAB P9 Classification: Others: Others
Client ID: D3 - Q4 30 Day Bergerhoff Dust Sample @ Greenking Compost, Coolbeg, Co.Wicklow

Test	Result	Unit(s)	Method	Technique
Dust depostion	57	mg/m2/day	ECTM014	In-House

The results in this report were authorised by:

Authorized Signatory	Title
Dylan Keane	Laboratory Manager – Environmental Chemistry

Dylan Keane

Appendix B: 2019 Surface Water Monitoring Analysis

IAS LABORATORIES

Independent Analytical Supplies

Test Report

Lab Report Number:	**6649L01**	**Analysis Number:**	**99A/124439**

Customer ID:	GREE.K2	**Analysis Type:**	Misc. Tests (99A)
Contact Name:	IAN BROWNE	**Delivery By:**	Customer
Company Name:	GREENKING COMPOSTING LTD/KING SERVICE	**Sample Card Number:**	281119.H/1
Address:	COOLBEG WICKLOW A67 XD76	**Sample Condition:**	Acceptable
Sample Type:	Surface Water	**Date Sample Received:**	28/11/2019
Sample Reference:	SURFACE WATER	**Date Analysis Commenced:**	28/11/2019
Sample Description:	T:3PM 28.11.19	**Date Certificate Issued:**	09/12/2019

Parameter	Method	Result	Unit
pH	Electrometry SOP 2004	7.9	pH units
Biochemical Oxygen Demand	Oxygen Meter SOP 2006	<1	mg/l
Total Suspended Solids	Gravimetric/Dry @ 105°C SOP 2016	<1	mg/l
Total Coliforms*	Quanti-tray SOP 2090	0	MPN/100ml
E. Coli*	Quanti-tray SOP 2090	0	MPN/100ml
Ammonia Nitrogen	Konelab Aquakem SOP 2057	0.02	mg/l NH3-N
Conductivity	Electrometry SOP 2076	219	µS/cm 20°C

Signed: WD McCall

Wendy McCall - Laboratory Manager

Date: 09/12/2019

*** = not INAB Accredited** **^ = Subcontracted**

ISO 17025 INAB ACCREDITED TESTING DETAILED IN SCOPE REG NO.2751

IAS LABORATORIES, Unit 4 Bagenalstown Bus. Park, Bagenalstown, Co. Carlow,
Phone: 00353 59 9721022 Fax: 00353 59 9721897 Email: ias@iaslabs.ie Web: www.iaslabs.ie

Appendix C: 2019 Groundwater Monitoring Analysis

IAS LABORATORIES

Independent Analytical Supplies

Test Report

Lab Report Number:	**6047L01**	**Analysis Number:**	**99A/124006**

Customer ID:	GREE.K2	**Analysis Type:**	Misc. Tests (99A)
Contact Name:	IAN BROWNE	**Delivery By:**	Customer
Company Name:	GREENKING COMPOSTING LTD/KING SERVICE	**Sample Card Number:**	50471/1
Address:	COOLBEG WICKLOW A67 XD76	**Sample Condition:**	Acceptable
Sample Type:	Ground Water	**Date Sample Received:**	06/11/2019
Sample Reference:	GROUND WATER	**Date Analysis Commenced:**	06/11/2019
Sample Description:	T:9AM 06.11.19	**Date Certificate Issued:**	19/11/2019

Parameter	Method	Result	Unit
pH	Electrometry SOP 2004	7.9	pH units
Ammonia Nitrogen	Konelab Aquakem SOP 2057	0.04	mg/l NH3-N
Conductivity	Electrometry SOP 2076	218	µS/cm 20°C
Chloride	Konelab Aquakem SOP 2065	20.65	mg/l
Total Coliforms	Quanti-tray SOP 2090	0	MPN/100ml
E. Coli	Quanti-tray SOP 2090	0	MPN/100ml
Cadmium*^	Subcontracted	<0.6	ug/l
Chromium*^	Subcontracted	<2	ug/l
Copper*^	Subcontracted	20	ug/l
Mercury*^	Subcontracted	<0.01	ug/l
Nickel*^	Subcontracted	<3	ug/l
Lead*^	Subcontracted	<6	ug/l
Zinc*^	Subcontracted	87	ug/l

Signed: WD McCall Date: 19/11/2019

Wendy McCall - Laboratory Manager

*** = not INAB Accredited** **^ = Subcontracted**

ISO 17025 INAB ACCREDITED TESTING DETAILED IN SCOPE REG NO.2751

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Appendix D: 2019 Bioaerosols & Odour Monitoring Report

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

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

YEAR 2019 - BIOAEROSOL, ODOUR AND HYDROGEN SULPHIDE IMPACT ASSESSMENT AT GREEN KING COMPOSTING LTD, COOLBEG, CO. WICKLOW

PREPARED BY: Dr. Brian Sheridan
ATTENTION: Mr. Ian Browne
DATE: 06th Jan. 2020
REPORT NUMBER: 2019891(1)
DOCUMENT VERSION: Version 1
REVIEWERS:

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Document Amendment Record

Client: ***Kings Trees Limited***

Title: Year 2019 - Bioaerosol, Odour and H_2S Impact Assessment at Green King Composting Ltd, Coolbeg, Co. Wicklow

Project Number: 2019891(1)			**Document Reference:** Year 2019 - Bioaerosol, Odour and H_2S Impact Assessment at Green King Composting Ltd, Coolbeg, Co. Wicklow		
2019891(1)	Document for review	B.A.S.	JMC	B.A.S	06/01/2020
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 168 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
Loc 1	Total Mesophillic bacteria and Aspergillus fumigatus, Odour[1], H_2S	Upwind of site
Loc 2	Total Mesophillic bacteria and Aspergillus fumigatus, Odour[1], H_2S	Beside green waste, downwind of site
Loc 3	Total Mesophillic bacteria and Aspergillus fumigatus, Odour[1], H_2S	Downwind of site at entrance
Loc 4	H_2S, Odour[1]	Western boundary
Loc 5	H_2S	Upwind of site
Loc 6	H_2S, Odour[1]	Upwind of site
Loc 7	H_2S	Downwind of site
Loc 8	H_2S Odour[1]	Downwind on entrance road

Notes: [1] denotes duplicate odour samples taken

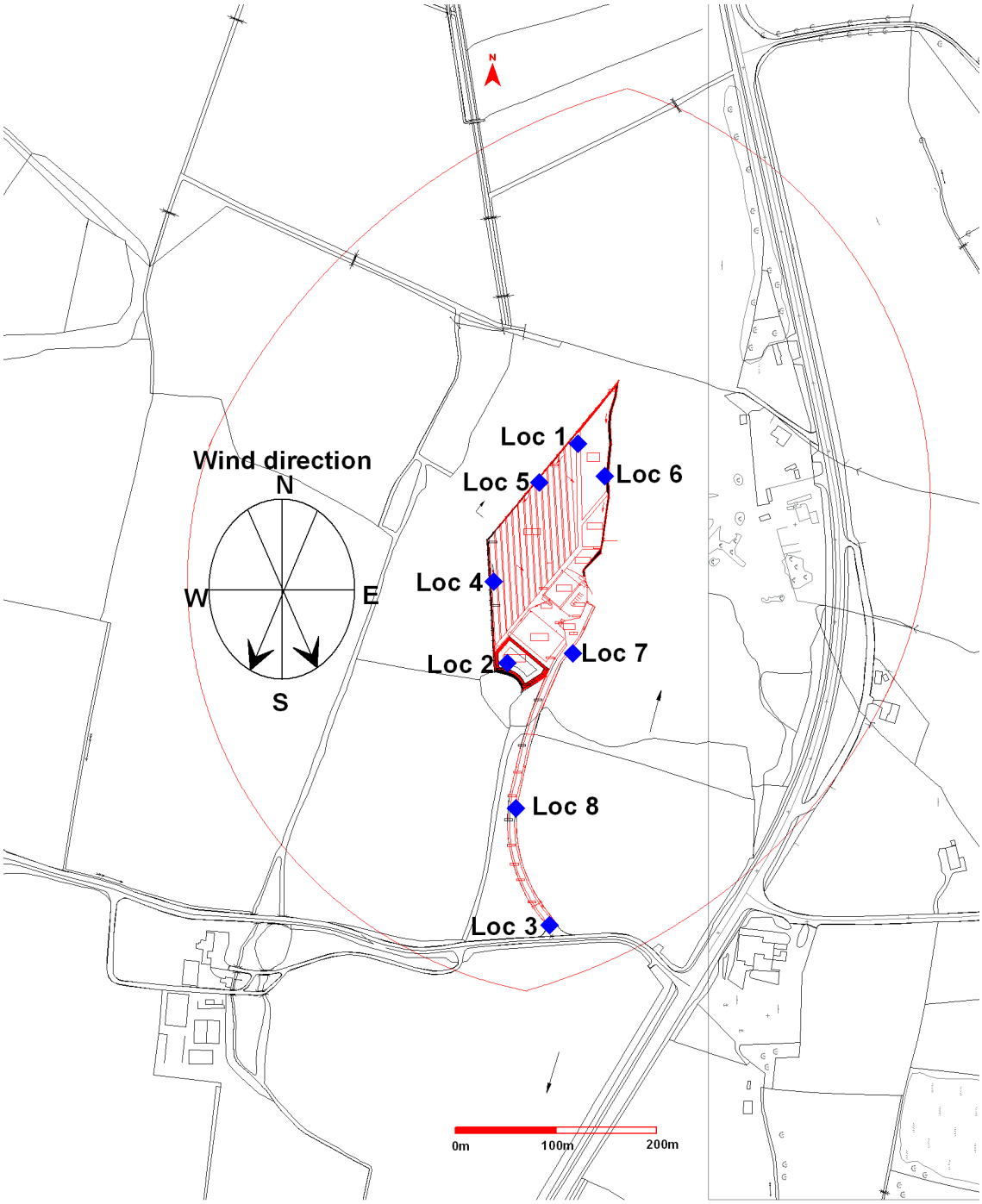

Figure 2.1. Schematic overview of Bioaerosol, Odour and H_2S monitoring locations.

2.2 Meteorological data

Table 2.2 illustrates the average wind direction during the one-day monitoring period. Average wind speed was low during the monitoring. Barometric pressure was approximately 1023 hPa. Relative humidity was 86% while temperature was average from 15 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	**Monitoring event 10/12/2019**
Wind direction (From)	SSW
Wind speed (m/hr)	15
Barometric pressure	1009
Temperature (^{0}C)	8
Relative humidity (%)	75

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]	500 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 10th December 2019.

Table 2.3. Bioaerosols concentration levels within and in the vicinity of the recycling facility

Location ID	Average Aspergillus *fumigatus* concentration (CFU m^{-3})[1]	Average Mesophillic bacteria concentration (CFU m^{-3})[1]	Sample count[2]
Loc 1	<3	420	3
Loc 2	<3	183	3
Loc 3	<3	342	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 Loc 2 were elevated but dissipated rapidly with distance to monitoring location Loc 3 (approx. 50 to 90m downwind). The dissipation in concentrations of total mesophillic bacteria from Loc 2 to Loc 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	Sample Location	Odour threshold conc. (OuE m^{-3})	H_2S (ppb)	Comment
10/12/2019	Loc 1	98	<3	No distinct odour
10/12/2019	Loc 2	144	<3	No distinct odour
10/12/2019	Loc 3	114	<3	No distinct odour
10/12/2019	Loc 4	106	<3	No distinct odour
10/12/2019	Loc 5	--	<3	No distinct odour
10/12/2019	Loc 6	124	<3	No distinct odour
10/12/2019	Loc 7	-	<3	No distinct odour
10/12/2019	Loc 8	133	<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 Loc 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 144 Ou_E/m^3, therefore there is no indication of any significant odour impact.
4. All Hydrogen sulphide concentrations recorded at each monitoring location were less than 3ppb in ambient air.

Appendix E: 2019 Compost Analysis Report

IAS LABORATORIES

Independent Analytical Supplies

Test Report

Lab Report Number:	**6048L01**	**Analysis Number:**	**99A/124007**

Customer ID:	GREE.K2	**Analysis Type:**	Misc. Tests (99A)
Contact Name:	IAN BROWNE	**Delivery By:**	Customer
Company Name:	GREENKING COMPOSTING LTD/KING SERVICE	**Sample Card Number:**	50471/2
Address:	COOLBEG WICKLOW A67 XD76	**Sample Condition:**	Acceptable
Sample Type:	Compost	**Date Sample Received:**	06/11/2019
Sample Reference:	COMPOST SAMPLE	**Date Analysis Commenced:**	06/11/2019
Sample Description:	COMPOST SAMPLE	**Date Certificate Issued:**	25/11/2019

Parameter	Method	Result	Unit
Cadmium	ICP-MS	0.37	mg/kg DM
Carbon Nitrogen Ratio	Calculation	13:1	R
Chromium	ICP-MS	25.8	mg/kg DM
Copper	ICP-MS	69.5	mg/kg DM
Dry Matter	Drying @ 105°C	68.2	%
Presumptive E-Coli^	Based in ISO 7251 (2005)	4	mpn/g
Mercury	ICP-MS	0.27	mg/kg DM
Impurities-Gravel & Stone>5mm	Gravimetric	<0.1	%
Impurities >2mm	Gravimetric	<0.1	%
Kjeldahl Nitrogen	Kjeldahl Nitrogen	1.3	% DM
Ammonium Nitrogen^	Subcontracted	17.6	mg/kg DM
Nickel	ICP-MS	20.7	mg/kg DM
Organic Matter	Dry Ashing @ 500 SOP 2007	31.3	%
Lead	ICP-MS	40.7	mg/kg DM
pH	Electrometry SOP 2001	8.3	pH units
Salmonella^	Based on RayAL ELISA	Not detected	/ 25g
Zinc	ICP-MS	177.6	mg/kg DM
Nitrate Nitrogen^	Subcontracted	235	mg/kg

Signed: WD McCall

Wendy McCall - Laboratory Manager

Date: 25/11/2019

^ = Subcontracted

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IAS LABORATORIES

Independent Analytical Supplies

Test Report

Lab Report Number:	**6048L02**	**Analysis Number:**	**99A/124008**

Customer ID:	GREE.K2	**Analysis Type:**	Misc. Tests (99A)
Contact Name:	IAN BROWNE	**Delivery By:**	Customer
Company Name:	GREENKING COMPOSTING LTD/KING SERVICE	**Sample Card Number:**	50471/2
Address:	COOLBEG WICKLOW A67 XD76	**Sample Condition:**	Acceptable
Sample Type:	Compost	**Date Sample Received:**	06/11/2019
Sample Reference:	COMPOST SAMPLE	**Date Analysis Commenced:**	06/11/2019
Sample Description:	COMPOST SAMPLE	**Date Certificate Issued:**	21/11/2019

Parameter	Method	Result	Unit
Oxygen Uptake Rate^	OxiTop Control System SOP 2010	0.4	mmolO2/kg

Signed: WD McCall

Wendy McCall - Laboratory Manager

Date: 21/11/2019

^ = Subcontracted

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Appendix F: Pipeline Integrity Test Report

M&T Plant Hire Ltd
Ballyeden, Davidstown, Enniscorthy
Tel. 0539244654
eoin@mtplanthire.ie

Project

Project Name: 2019_09_09 Greenking Compost

Project Date: 09/09/2019

Inspection Standard: MSCC4 Sewers & Drainage GB (SRM4 Scoring)

M&T Plant Hire Ltd
Ballyeden, Davidstown, Enniscorthy
Tel. 0539244654
eoin@mtplanthire.ie

Table of Contents

Project Name	Project Number	Project Date
2019_09_09 Greenking Compost		09/09/2019

M&T Plant Hire Ltd
Ballyeden, Davidstown, Enniscorthy
Tel. 0539244654
eoin@mtplanthire.ie

Project Information

Project Name	Project Number	Project Date
2019_09_09 Greenking Compost		09/09/2019

Client

Company: Green King Composting Ltd
Street: M50
Town or City: Wicklow
County: Wicklow

Manager

Company: Green King Composting Ltd
Street: M50
Town or City: Wicklow
County: Wicklow

Contractor

Company: M&T Plant Hire Ltd
Description: CCTV Survey
Contact: Eoin O'Neill
Department: CCTV
Street: Ballyeden, Davidstown
Town or City: Enniscorthy
County: Wexford
Post Code: y21 pa07
Phone: 0539244654
Mobile: 0872212535
Email: eoin@mtplanthire.ie

M&T Plant Hire Ltd
Ballyeden, Davidstown, Enniscorthy
Tel. 0539244654
eoin@mtplanthire.ie

Scoring Summary

Project Name	Project Number	Project Date
2019_09_09 Greenking Compost		09/09/2019

Structural Defects

Section	PLR	Grade	Description
All inspected pipes are in an acceptable structural condition (< grade 3).			

Service / Operational Condition

Section	PLR	Grade	Description
All inspected pipes are in an acceptable service condition (< grade 3).			

Abandoned Surveys

Section	PLR	Description
All inspections complete, none are abandoned.		

Information

These scoring summaries are based on the SRM grading from the WRc.

M&T Plant Hire Ltd
Ballyeden, Davidstown, Enniscorthy
Tel. 0539244654
eoin@mtplanthire.ie

Section Profile

Project Name	Project Number	Project Date
2019_09_09 Greenking Compost		09/09/2019

Circular, 100 mm, 100 mm

Section	Upstream Node	Downstream Node	Date	Road	Pipe Material	Total Length	Inspected Length
1	MHF1	MHF2	09/09/2019	L1113	Polyvinyl chloride	59.10 m	59.10 m
2	MHF2	Tank	09/09/2019	L1113	Polyvinyl chloride	1.60 m	1.60 m

Total: 2 Inspections x Circular 100 mm, 100 mm = 60.70 m Total Length and 60.70 m Inspected Length

Circular, 225 mm, 225 mm

Section	Upstream Node	Downstream Node	Date	Road	Pipe Material	Total Length	Inspected Length
3	MHS2	MHS1	09/09/2019	L1113	Concrete	102.04 m	102.04 m
4	MHS1	POND	09/09/2019	L1113	Concrete	7.94 m	7.94 m

Total: 2 Inspections x Circular 225 mm, 225 mm = 109.98 m Total Length and 109.98 m Inspected Length

Total: 4 Inspections = 170.68 m Total Length and 170.68 m Inspected Length

M&T Plant Hire Ltd
Ballyeden, Davidstown, Enniscorthy
Tel. 0539244654
eoin@mtplanthire.ie

Section Summary

Project Name	Project Number	Project Date
2019_09_09 Greenking Compost		09/09/2019

Number of sections	4
Total length of sewer network	170.68 m
Inspected length of sewer network	170.68 m
Not inspected length of sewer network	0.00 m
Total abandoned inspections	0
Number of section inspection photos	10
Number of section inspection videos	5
Number of section inspection scans	0
Number of section inclination measurements	0

PLR:	MHF1X	**Upstream Node:**	MHF1
Inspection Direction:	Upstream	**Downstream Node:**	MHF2
Inspected Length:	59.10 m	**Dia/Height:**	100 mm
Total Length:	59.10 m	**Pipe Material:**	Polyvinyl chloride

No.	m+	Code	Observation
1	0.00		
2	0.00	MH	Start node type, manhole, reference number: MHF2
3	59.10	MHF	Finish node type, manhole, reference number: MHF1

PLR:	MHF2X	**Upstream Node:**	MHF2
Inspection Direction:	Downstream	**Downstream Node:**	Tank
Inspected Length:	1.60 m	**Dia/Height:**	100 mm
Total Length:	1.60 m	**Pipe Material:**	Polyvinyl chloride

No.	m+	Code	Observation
1	0.00	MH	Start node type, manhole, reference number: MHF2
2	1.60	CPF	Finish node type, catchpit, reference number: Tank

PLR:	MHS2X	**Upstream Node:**	MHS2
Inspection Direction:	Upstream	**Downstream Node:**	MHS1
Inspected Length:	102.04 m	**Dia/Height:**	225 mm
Total Length:	102.04 m	**Pipe Material:**	Concrete

No.	m+	Code	Observation
1	1.09	MH	Start node type, manhole, reference number: MHS1
2	22.95	CN	Connection other than junction at 2 o'clock, diameter: 150mm
3	61.67	CN	Connection other than junction at 12 o'clock, diameter: 150mm
4	62.63	CN	Connection other than junction at 10 o'clock, diameter: 150mm
5	74.25	CN	Connection other than junction at 10 o'clock, diameter: 150mm
6	84.42	CN	Connection other than junction at 10 o'clock, diameter: 150mm

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Section Summary

Project Name	Project Number	Project Date
2019_09_09 Greenking Compost		09/09/2019

No.	m+	Code	Observation
7	93.85	CN	Connection other than junction at 10 o'clock, diameter: 150mm
8	103.13	MHF	Finish node type, manhole, reference number: MHS2

PLR:	MHS1X	**Upstream Node:**	MHS1
Inspection Direction:	Downstream	**Downstream Node:**	POND
Inspected Length:	7.94 m	**Dia/Height:**	225 mm
Total Length:	7.94 m	**Pipe Material:**	Concrete

No.	m+	Code	Observation
1	1.01	MH	Start node type, manhole, reference number: MHS1
2	8.95	CPF	Finish node type, catchpit, reference number: POND

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Section Inspection - 09/09/2019 - MHF1X

Section	Inspection	Date	Time	Client`s Job Ref	Weather	Pre Cleaned	PLR
1	1	09/09/19	9:30	Not Specified	No Rain Or Snow	Yes	MHF1X

Operator	Vehicle	Camera	Preset Length	Legal Status	Alternative ID
John Condon	162WX1142	Push Rod	Not Specified	Not Specified	Not Specified

Town or Village:	Coolbeg	**Inspection Direction:**	Upstream	**Upstream Node:**	MHF1
Road:	L1113	**Inspected Length:**	59.10 m	**Upstream Pipe Depth:**	
Location:	Property with buildings	**Total Length:**	59.10 m	**Downstream Node:**	MHF2
Surface Type:		**Joint Length:**	0.00 m	**Downstream Pipe Depth:**	

Use:	Foul	**Pipe Shape:**	Circular		
Type of Pipe:		**Dia/Height:**	100 mm	**Width:**	100 mm
Year Constructed:		**Pipe Material:**	Polyvinyl chloride		
Flow Control:	No flow control	**Lining Type:**	No Lining		
Inspection Purpose:	Routine inspection of condition	**Lining Material:**	No Lining		

Comments:
Recommendations:

Scale: 1:514

Position [m]	Code	Observation	MPEG	Photo	Grade
0.00			00:00:00		
0.00	MH	Start node type, manhole, reference number: MHF2	00:00:02		
59.10	MHF	Finish node type, manhole, reference number: MHF1: Small dip at 50meters	00:03:05	1	

Construction Features					Miscellaneous Features				
Structural Defects					Service & Operational Observations				
STR No. Def	**STR Peak**	**STR Mean**	**STR Total**	**STR Grade**	**SER No. Def**	**SER Peak**	**SER Mean**	**SER Total**	**SER Grade**
0	0.0	0.0	0.0	1.0	0	0.0	0.0	0.0	1.0

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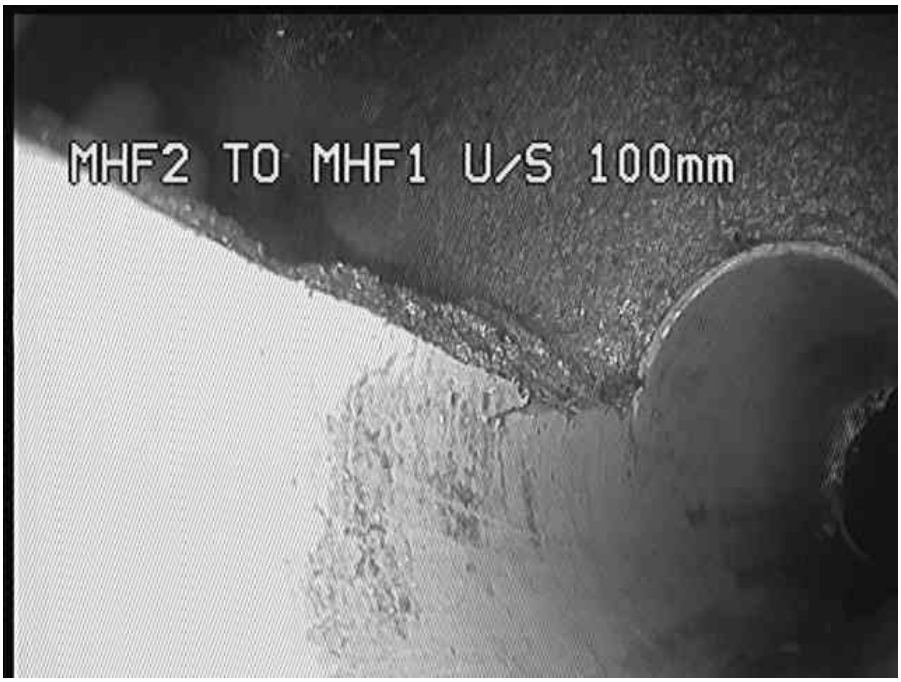
Section Pictures - 09/09/2019 - MHF1X

Section	Inspection Direction	PLR	Client`s Job Ref	Contractor`s Job Ref
1	Upstream	MHF1X		Job No.17281



1, 00:03:05, 59.10 m
Finish node type, manhole, reference number: MHF1, Small dip at 50meters

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Section Inspection - 09/09/2019 - MHF2X

Section	Inspection	Date	Time	Client`s Job Ref	Weather	Pre Cleaned	PLR
2	2	09/09/19	9:55	Not Specified	No Rain Or Snow	Yes	MHF2X

Operator	Vehicle	Camera	Preset Length	Legal Status	Alternative ID
John Condon	162WX1142	Push Rod	Not Specified	Not Specified	Not Specified

Town or Village:	Coolbeg	**Inspection Direction:**	Downstream	**Upstream Node:**	MHF2
Road:	L1113	**Inspected Length:**	1.60 m	**Upstream Pipe Depth:**	
Location:	Property with buildings	**Total Length:**	1.60 m	**Downstream Node:**	TANK
Surface Type:		**Joint Length:**	0.00 m	**Downstream Pipe Depth:**	

Use:	Foul	**Pipe Shape:**	Circular		
Type of Pipe:		**Dia/Height:**	100 mm	**Width:**	100 mm
Year Constructed:		**Pipe Material:**	Polyvinyl chloride		
Flow Control:	No flow control	**Lining Type:**	No Lining		
Inspection Purpose:	Routine inspection of condition	**Lining Material:**	No Lining		

Comments:
Recommendations:

Scale: 1:50	Position [m]	Code	Observation	MPEG	Photo	Grade
Depth: m MHF2						
	0.00	MH	Start node type, manhole, reference number: MHF2	00:00:01		
	1.60	CPF	Finish node type, catchpit, reference number: Tank: Septic tank	00:00:19	1	
Tank Depth: m						

Construction Features					Miscellaneous Features				
Structural Defects					Service & Operational Observations				
STR No. Def	**STR Peak**	**STR Mean**	**STR Total**	**STR Grade**	**SER No. Def**	**SER Peak**	**SER Mean**	**SER Total**	**SER Grade**
0	0.0	0.0	0.0	1.0	0	0.0	0.0	0.0	1.0

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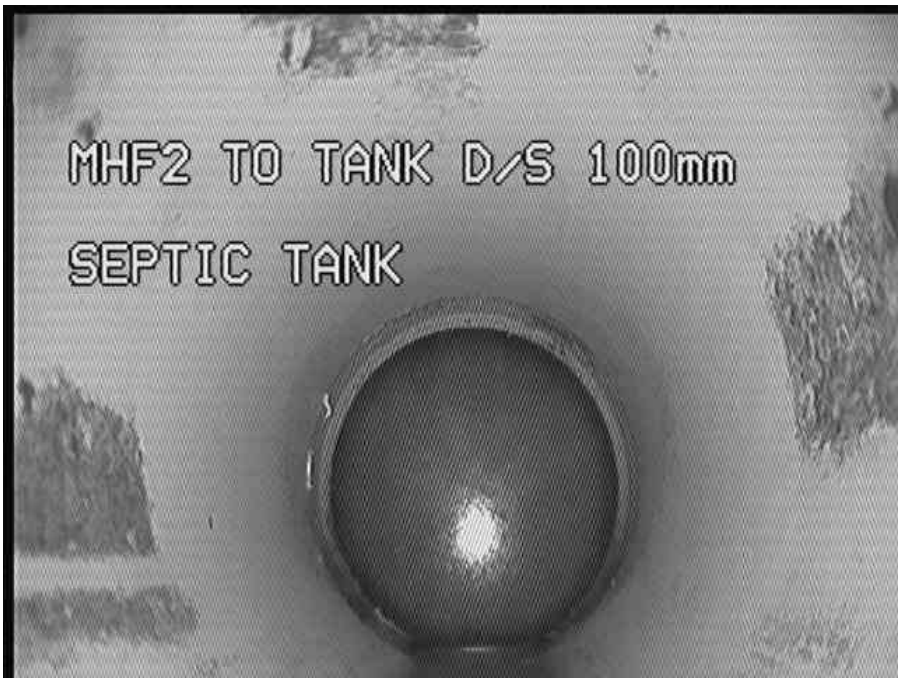
Section Pictures - 09/09/2019 - MHF2X

Section	Inspection Direction	PLR	Client`s Job Ref	Contractor`s Job Ref
2	Downstream	MHF2X		Job No.17281



1, 00:00:19, 1.60 m
Finish node type, catchpit, reference number: Tank, Septic tank

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Section Inspection - 09/09/2019 - MHS2X

Section	Inspection	Date	Time	Client`s Job Ref	Weather	Pre Cleaned	PLR
3	3	09/09/19	10:10	Not Specified	No Rain Or Snow	Yes	MHS2X

Operator	Vehicle	Camera	Preset Length	Legal Status	Alternative ID
John Condon	162WX1142	Push Rod	Not Specified	Not Specified	Not Specified

Town or Village:	Coolbeg	**Inspection Direction:**	Upstream	**Upstream Node:**	MHS2
Road:	L1113	**Inspected Length:**	102.04 m	**Upstream Pipe Depth:**	
Location:	Property with buildings	**Total Length:**	102.04 m	**Downstream Node:**	MHS1
Surface Type:		**Joint Length:**	0.00 m	**Downstream Pipe Depth:**	

Use:	Surface water	**Pipe Shape:**	Circular		
Type of Pipe:		**Dia/Height:**	225 mm	**Width:**	225 mm
Year Constructed:		**Pipe Material:**	Concrete		
Flow Control:	No flow control	**Lining Type:**	No Lining		
Inspection Purpose:	Routine inspection of condition	**Lining Material:**	No Lining		

Comments:
Recommendations:

Scale: 1:888 Position [m]	Code	Observation	MPEG	Photo	Grade
Depth: m MHS1					
1.09	MH	Start node type, manhole, reference number: MHS1	00:00:07		
22.95	CN	Connection other than junction at 2 o'clock, diameter: 150mm	00:02:00	1	
61.67	CN	Connection other than junction at 12 o'clock, diameter: 150mm	00:05:23	2	
62.63	CN	Connection other than junction at 10 o'clock, diameter: 150mm	00:06:01	3	
74.25	CN	Connection other than junction at 10 o'clock, diameter: 150mm	00:07:52	4	
84.42	CN	Connection other than junction at 10 o'clock, diameter: 150mm	00:09:25	5, 6	
93.85	CN	Connection other than junction at 10 o'clock, diameter: 150mm	00:10:49	7	
103.13	MHF	Finish node type, manhole, reference number: MHS2	00:12:14	8	
MHS2 Depth: m					

Construction Features					Miscellaneous Features				
Structural Defects					Service & Operational Observations				
STR No. Def	STR Peak	STR Mean	STR Total	STR Grade	SER No. Def	SER Peak	SER Mean	SER Total	SER Grade
0	0.0	0.0	0.0	1.0	0	0.0	0.0	0.0	1.0

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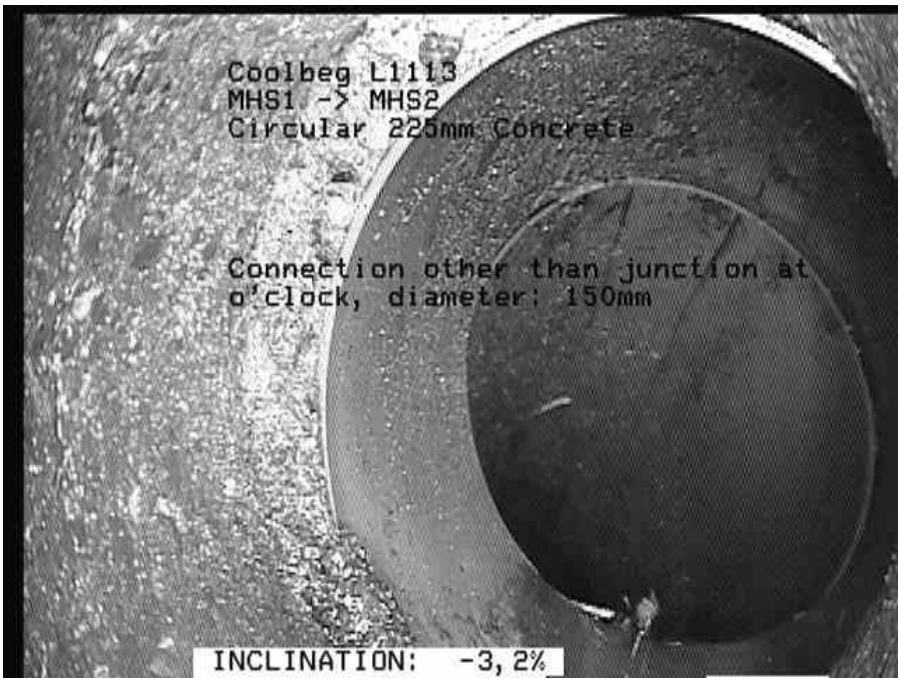
Section Pictures - 09/09/2019 - MHS2X

Section	Inspection Direction	PLR	Client`s Job Ref	Contractor`s Job Ref
3	Upstream	MHS2X		Job No.17281



1, 00:02:00, 22.95 m
Connection other than junction at 2 o'clock, diameter: 150mm

2, 00:05:23, 61.67 m
Connection other than junction at 12 o'clock, diameter: 150mm

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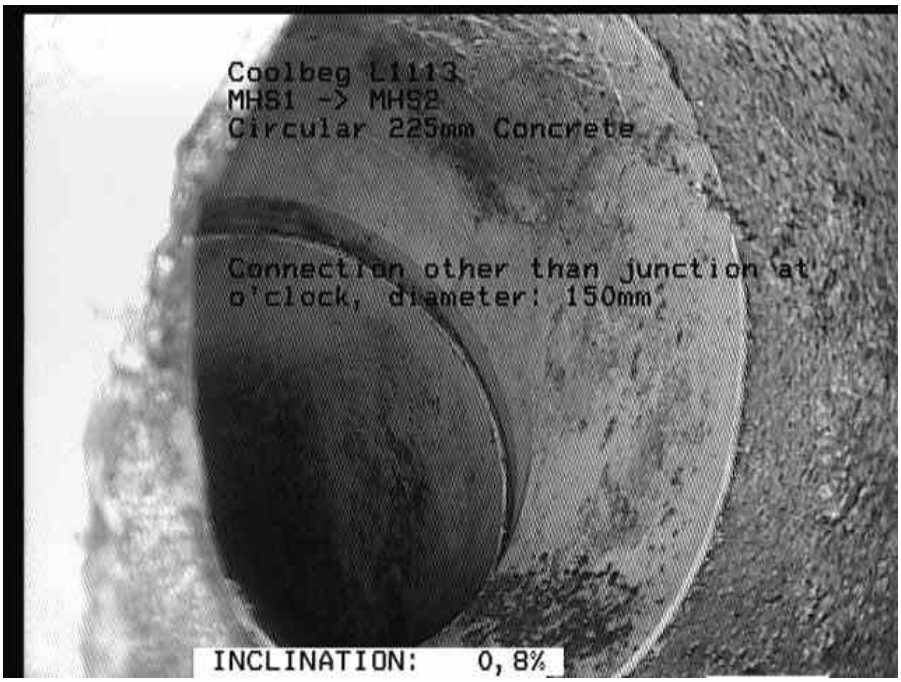
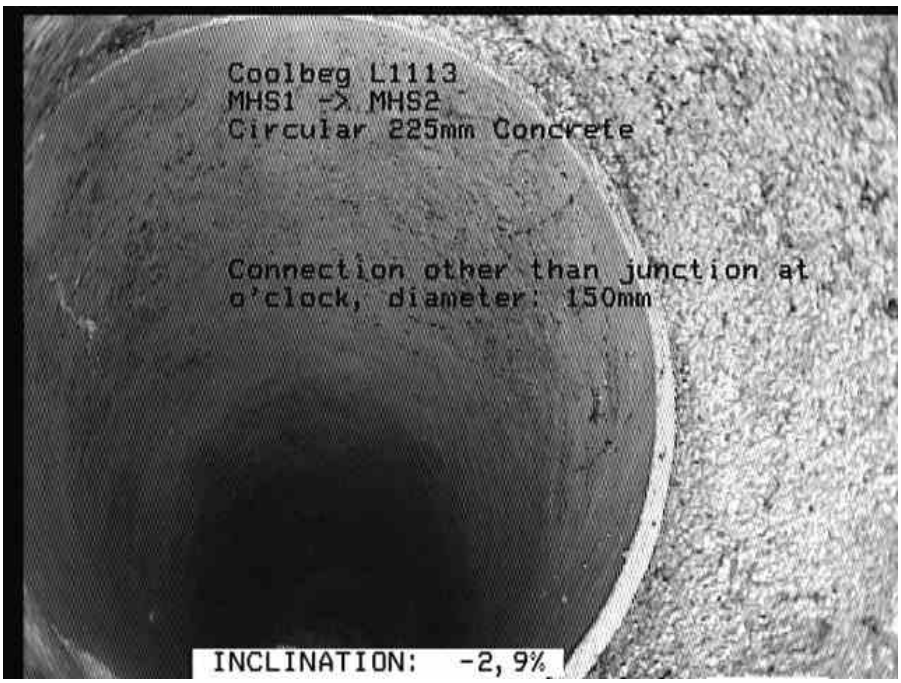
Section Pictures - 09/09/2019 - MHS2X

Section	Inspection Direction	PLR	Client`s Job Ref	Contractor`s Job Ref
3	Upstream	MHS2X		Job No.17281



3, 00:06:01, 62.63 m
Connection other than junction at 10 o'clock, diameter: 150mm



4, 00:07:52, 74.25 m
Connection other than junction at 10 o'clock, diameter: 150mm

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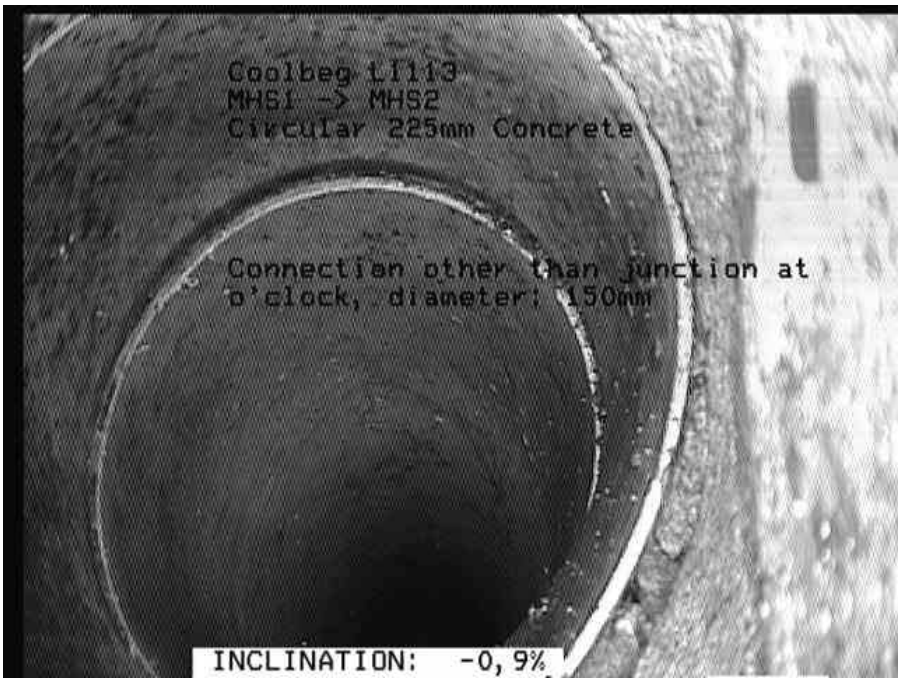
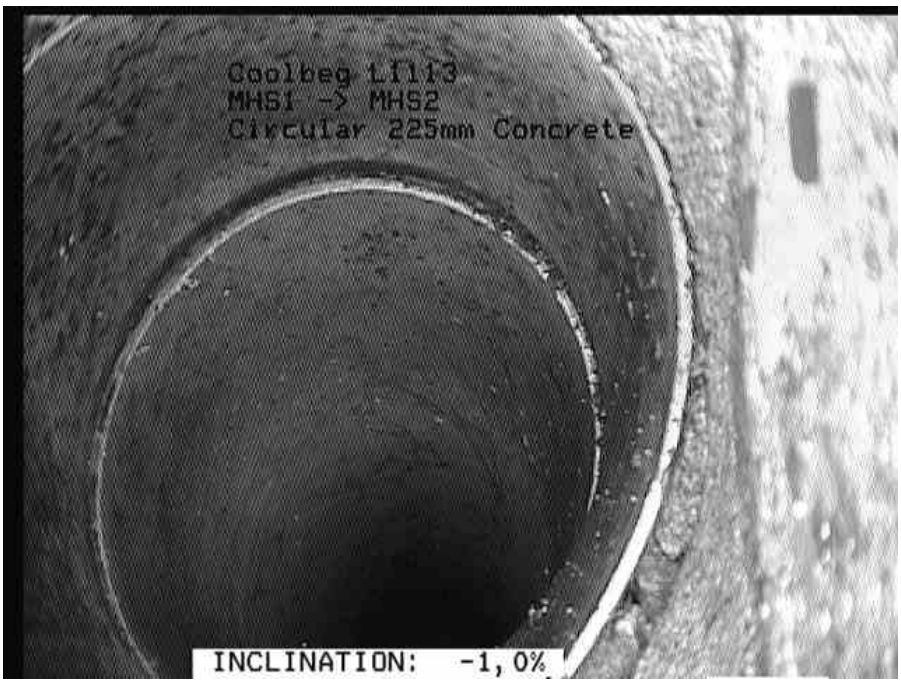
Section Pictures - 09/09/2019 - MHS2X

Section	Inspection Direction	PLR	Client`s Job Ref	Contractor`s Job Ref
3	Upstream	MHS2X		Job No.17281



5, 00:09:25, 84.42 m
Connection other than junction at 10 o'clock, diameter: 150mm



6, 00:09:25, 84.42 m
Connection other than junction at 10 o'clock, diameter: 150mm

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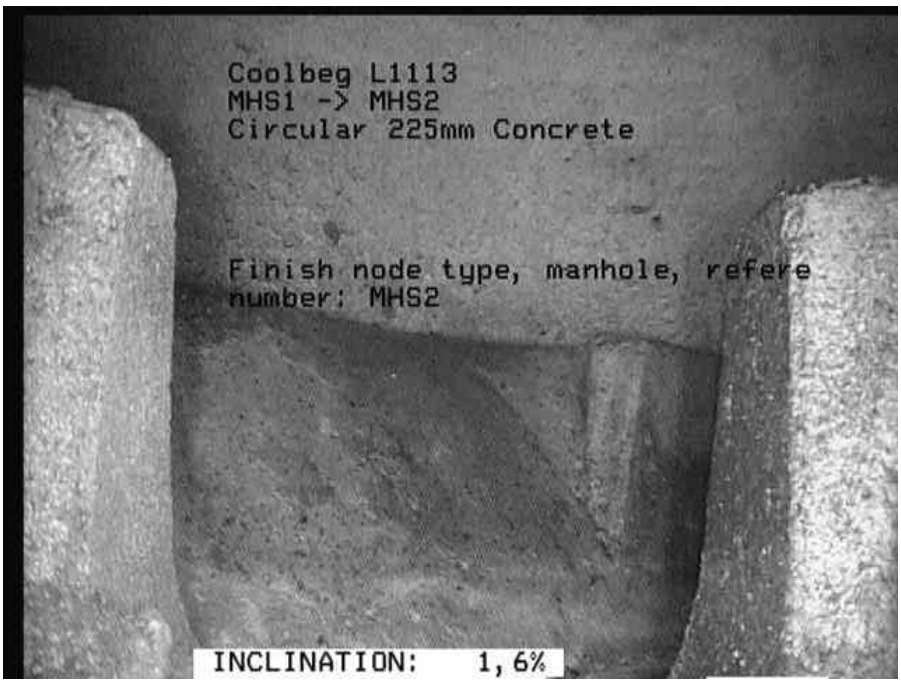
Section Pictures - 09/09/2019 - MHS2X

Section	Inspection Direction	PLR	Client`s Job Ref	Contractor`s Job Ref
3	Upstream	MHS2X		Job No.17281

7, 00:10:49, 93.85 m
Connection other than junction at 10 o'clock, diameter: 150mm



8, 00:12:14, 103.13 m
Finish node type, manhole, reference number: MHS2

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Section Inspection - 09/09/2019 - MHS1X

Section	Inspection	Date	Time	Client`s Job Ref	Weather	Pre Cleaned	PLR
4	4	09/09/19	10:59	Not Specified	No Rain Or Snow	Yes	MHS1X

Operator	Vehicle	Camera	Preset Length	Legal Status	Alternative ID
John Condon	162WX1142	Push Rod	Not Specified	Not Specified	Not Specified

Town or Village:	Coolbeg	**Inspection Direction:**	Downstream	**Upstream Node:**	MHS1
Road:	L1113	**Inspected Length:**	7.94 m	**Upstream Pipe Depth:**	
Location:	Property with buildings	**Total Length:**	7.94 m	**Downstream Node:**	POND
Surface Type:		**Joint Length:**	0.00 m	**Downstream Pipe Depth:**	

Use:	Surface water	**Pipe Shape:**	Circular		
Type of Pipe:		**Dia/Height:**	225 mm	**Width:**	225 mm
Year Constructed:		**Pipe Material:**	Concrete		
Flow Control:	No flow control	**Lining Type:**	No Lining		
Inspection Purpose:	Routine inspection of condition	**Lining Material:**	No Lining		

Comments:
Recommendations:

Scale: 1:70	Position [m]	Code	Observation	MPEG	Photo	Grade
Depth: m						
MHS1						
	1.01	MH	Start node type, manhole, reference number: MHS1	00:00:08		
POND	8.95	CPF	Finish node type, catchpit, reference number: POND	00:00:47		
Depth: m						

Construction Features					Miscellaneous Features				
Structural Defects					Service & Operational Observations				
STR No. Def	**STR Peak**	**STR Mean**	**STR Total**	**STR Grade**	**SER No. Def**	**SER Peak**	**SER Mean**	**SER Total**	**SER Grade**
0	0.0	0.0	0.0	1.0	0	0.0	0.0	0.0	1.0

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