Prepared by:
Tom Mc Donnell – Facility Manager
Kilmainhamwood Compost, Ballynalurgan, Kilmainhamwood, Kells, Co. Meath

1 Introduction

This report is the Annual Environmental Report for Kilmainhamwood Compost. It has been prepared in compliance with Condition 11.7 of the Waste Licence (Licence Reg. No. W0195-01) and includes emission details and reporting for the reporting period of 2009.

This licence was granted by the Environmental Protection Agency (EPA) to Padraig Thornton Waste Disposal Ltd (PTWDL) on the 30th January 2006. The contents of this report are as required by Schedule G of Waste Licence W0195-01.

1.1 Operator

The facility operator and licensee of licence number W0195-01 is Padraig Thornton Waste Disposal Ltd. This AER relates to Kilmainhamwood Compost, Ballynalurgan, Kilmainhamwood, Kells, Co. Meath.

The address and contact details for the company headquarters are;

Thorntons Recycling Head Office
Unit S3B Henry Road
Park West Business Park
Dublin 10.

Telephone: 01- 623 5133
Fax: 01- 623 5131
Site Contact: Tom McDonnell
Mobile: 086-8563431

1.2 Reporting Period

The reporting period for this Annual Environment Report (AER) is between the 01/01/2009 to the 31/12/2009.

2 Facility Activities

2.1 Waste Activities carried out at the Facility

Part 1 of the current Waste Licence W0195-01 lists those activities contained in the Third and the Fourth Schedule of the Waste Management Act 1996, which are licensed to be carried out at Kilmainhamwood Compost, Ballynalurgan, Kilmainhamwood, Kells, Co. Meath. These activities are as follows:

Third Schedule

Class 6	**Biological treatment not referred to elsewhere in this Schedule which results in final compounds or mixtures which are disposed of by means of any activity referred to in paragraphs 1 to 10 of this Schedule:**
Class 13.	**Storage prior to submission to any activity referred to in a preceding paragraph of this Schedule, other than temporary storage, pending collection, on the premises where the waste concerned is produced.**

Fourth Schedule

Class 2	**Recycling or reclamation of organic substances which are not used as solvents (including composting and other biological transformation processes).**
Class 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.**

2.2 Operation Processes – Waste Activities at the facility

The following section details the operational procedure for dealing with acceptable biodegradable waste that enters the Kilmainhamwood Compost Facility. (Appendix 1 details the Facility layout)

Standard Operation procedures in the Composting Building

On arrival the transportation vehicle bringing material to the facility is inspected and checked to ensure that it is clean and there are no residual materials on the truck body and that it is properly covered or netted. Passing inspection the vehicle is directed towards the weighbridge. After weighing the following information is recorded on our computerised system;

a. Date
b. The name of the carrier (including if appropriate, the waste carrier registration details),
c. The vehicle registration number,
d. The name of the producer(s)/collector(s) of the waste as appropriate,
e. The name of the waste facility(if appropriate) from which the load originated including the waste licence or waste permit register number,
f. A description of the waste including the associated EWC codes,
g. The quantity of the waste, recorded in tonnes,
h. The name of the person checking the load.

Once weighed the vehicle is directed to the reception hall, the door of the reception is opened and the vehicle is directed in, once inside the reception hall the door is closed. On clearance the driver is directed to tip load and the facility operator inspects the load whilst the load is tipping.
The facility operator signs off the acceptance form and confirms if material is suitable for processing at the facility. Any material not suitable for processing or is in contravention of the licence is removed for temporary storage in a quarantine area. The quarantined material is removed off site ASAP by a licensed contractor for disposal as per waste acceptance procedure, EP14 for Kilmainhamwood Compost.

Once tipping is complete the facility operator washes down the container with a steam power washer insuring no residual material remains. The door is opened and the driver is directed to leave the reception hall and to the weighbridge for weighing where he will be given a weighbridge docket. The vehicle then leaves the facility taking the exit route.

Inside the building the organic waste material suitable for composting is mixed and blended by weight with an amendment material. The typical blend is made up of 45% Seed Material, 10% sludge/grease trap waste and 45% Brown Bin/catering waste. This mixed material is conveyed by loading shovel to a collection area where a batch size of 120 tonnes is reached and then removed by a loading shovel and placed into an aerated bay. The material is given a unique sub-batch code which allows for full traceability of the ingredients of the batch and traceability of the batch through the facility. When the bay is full the operator places one temperature probe into the material. The aeration is switched on which is controlled by a plc that brings the temperature to the required level. The composting material stays in this bay for one week. After this period the material is taken out of the bay and placed over the wall into Zone 3 (Appendix 1). The material is

then placed into another bay and moisture is amended to the required level. A temperature probe is placed into the material and the aeration switched on. The composting material will stay in this zone for 2 weeks and will get one turn using a machine and a moisture amendment if required.

After this period the material is placed is taken into Zone 4 (Appendix 1) and screened through a 12mm screen. The oversize material is sent back to the start of the process as seed compost and any residual plastic from the process comes out the end of the screener and is sent to landfill when a full load is collected. The screened 12mm material is placed into an enclosed tunnel for pasteurisation. The tunnel can hold up to 25 sub-batches and when full the total material will be given a unique Batch Number for traceability. Once inside the enclosed tunnel the aeration is switched on and the temperature is brought to over 70°C for 60 consecutive minutes to satisfy the Animal By-Product Regulations (ABPR). After Pasteurisation the material is sampled in situ and the samples sent to an approved Laboratory for analysis. Once the material has passed the ABPR requirements and E.P.A. standards it can be classified as compost and taken out of the tunnel by a clean machine and loaded for transport off site to the appropriate end user.

Any material not meeting ABPR and EPA standards can be reworked in the facility to produce higher grade compost or transported to an appropriate landfill site as cover.

2.3 Weighbridge Calibration

The weighbridge was calibrated and certified by the legal metrology service on the 24th July 2008. A copy of this certificate is contained within Appendix 2.

3 Quantity and Composition of Waste Received, Recovered and Disposed of During the Reporting Period

3.1 Waste Handled in Kilmainhamwood Compost

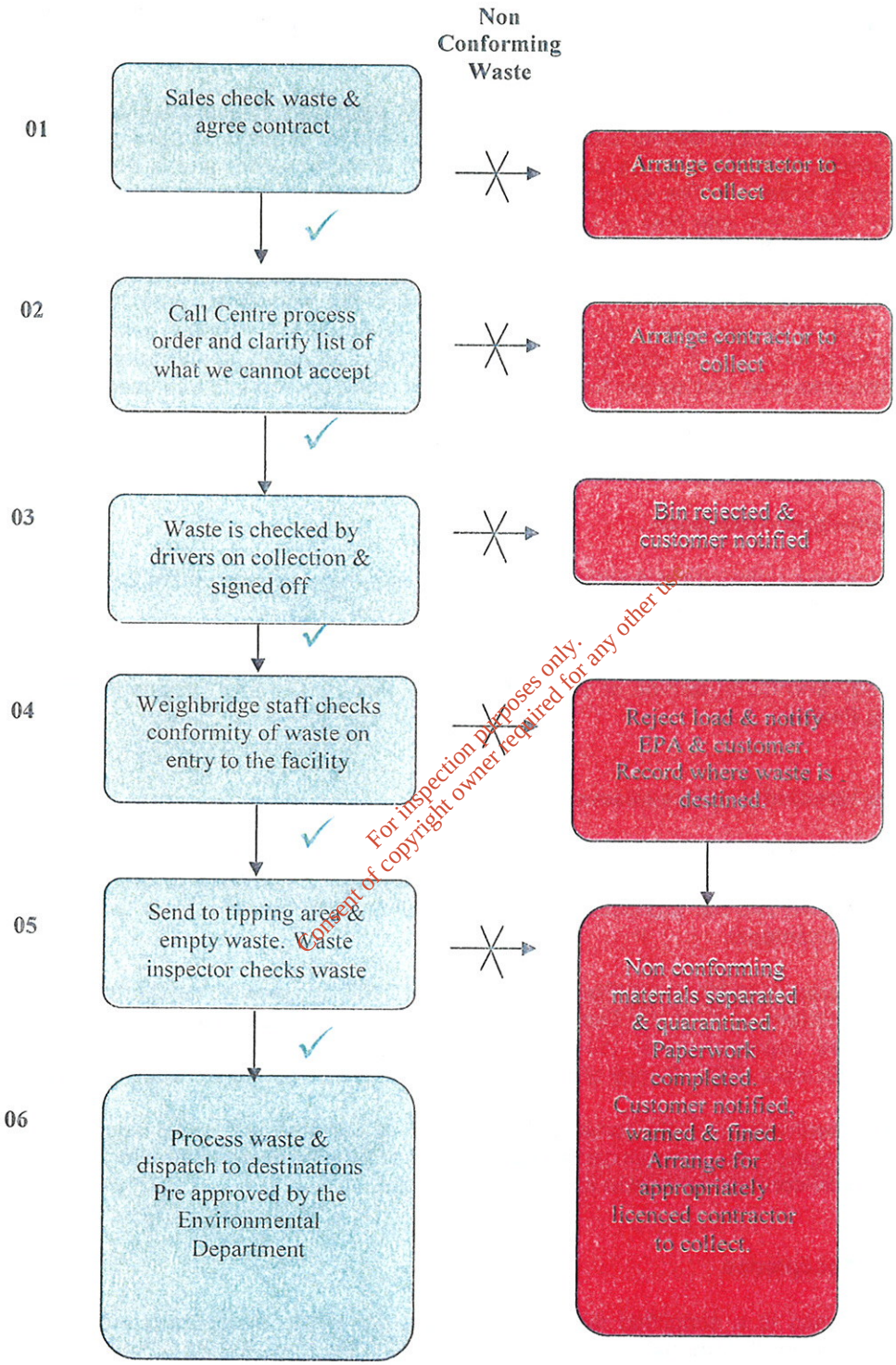
All waste is checked and documented at the weighbridge in accordance with our waste licence and our waste acceptance procedures as detailed in sectojn 2.2. Waste is then inspected, processed and placed into our production system. The composting process takes up to 8 weeks to produce mature compost.

Mature compost started to leave the Facility on 14th April 2007 and was subjected to the quality analysis, as per Schedule E of the Licence W0195-01 and The Technical Amendment of the licence. Continued approval under the ABP Regulations from the Dept. of Agriculture was received on 05th October 2009. A copy of the Approval Certificate is contained within Appendix 3.

Should any non-conforming waste come to the attention of our staff it is either rejected before collection or segregated and quarantined to be disposed of by a licensed contractor. Paperwork in relation to all non-conforming wastes is maintained on site.

3.2 Waste Acceptance

The following is a simplified diagram explaining our waste acceptance procedures at Kilmainhamwood Compost.



All new staff employed by Kilmainhamwood Compost have received an Environmental Health and Safety Induction which included licence training, waste acceptance procedures, good practice in composting, emergency procedures and environmental awareness. All staff employed at the facility are diligent in assisting in eliminating the occurrence of non-conforming waste and producing a good quality compost at the facility.

Kilmainhamwood Compost successfully maintained its certification for its management systems in ISO14001 Environmental, ISO 9001 Quality, OHSAS 18001 Health and Safety in 2009. The IMS system is available for inspection on the IMS drive at all company site offices.

3.3 Waste Received

A total of 20,748.84 tonnes of waste for composting was accepted at the facility in the reporting period from 1st January 2009 to 31st December 2009. As per E.P.A. licence W0195-01 Kilmainmhamwood compost can accept 20,800 tonnes of waste per annum.

Table 3.3.1 Quantity and Composition of Waste Received 2008-2009

EWC Code	Materials Received	2008	2009
19 08 05	Sludge Urban Waste Water	6,159	1139.70
02 02 04	Sludge Food Prep Animal Origin	845	1322.94
20 01 25	Grease Trap Waste	1,366	655.00
02 03 04	Unsuitable food waste	2,228	1954.87
20 01 08	Compostable Food Waste	7,766	15503.47
02 07 04	Unsuitable Alcohol/Liquid	31	9.02
02 06 01	Bakers Waste	36	27.42
19 12 07	Wood – Processed	183	40.36
20 02 01	Compostable/ Green Waste	54	-
02 07 05	Sludge Alcohol/non-Alcohol	172	67.72
19 09 01	Screening Waste Water	59	2.88
02 01 01	Sludge Agriculture Washing	-	-
02 01 06	Animal manure	545	-
20 03 01	Mixed Municipal Waste	9	-
10 01 03	Ash from Peat and Untreated Wood	-	25.46
02 05 02	Sludge Dairy Industry	1,198	-
	TOTAL TONNAGE	20, 651	20, 748.84

3.4 Waste Disposed

Of the total 20,748.84 tonnes accepted at the facility in 2009, 962.52 tonnes of the material was not suitable for composting and was sent to landfill as a residual waste. The remaining material was suitable for composting and was sold as a product or returned into the operation to assist in the composting process and enable the production of compost.

4 Contribution to the achievement of recovery targets

4.1 Proposal for the contribution of the facility to the achievement of targets for the reduction of Biodegradable waste to landfill as specified in the landfill Directive

Progressive targets have been set out in the Landfill Directive (1999/31/EC) to reduce the proportion of biodegradable municipal waste landfilled. By 2006 Member States were restricted to land filling a maximum of 75% of the total weight of biodegradable municipal waste generated in 1995, the baseline year. This target is further reduced to 50% of the 1995 baseline by 2009 and 35% by 2016 According to the National Waste Report 2008, an estimated 2,091,709 tonnes of biodegradable municipal waste was generated in Ireland in 2008 of which 57% was land filled. Ireland has made significant inroads into closing the gap between the EU targets and where we currently stand
Kilmainhamwood Compost, Ballynalurgan, Kilmainhamwood, Kells, Co. Meath have been successfully contributing towards National Targets and diverted approximately 18,709 tonnes in 2007, 20,651 tonnes in 2008 and 20,748.84 tonnes in 2009 of biodegradable waste from landfill for composting. This material would have historically gone for disposal to licensed landfills

Thornton's Recycling offer all their customers the opportunity to segregate all biodegradable waste at source and with the development of Kilmainhamwood Compost can offer a composting alternative to all its customers. The facility at Ballynalurgan, Kilmainhamwood, County Meath, (Waste Licence W0195-01) has proven to be very successful. The facility accepts non-hazardous biodegradable wastes (including sewage sludge, industrial sludge's, household and commercial waste for composting).
Thorntons Recycling commenced roll out of the domestic brown bin collection service in Meath and Kildare in 2008 and 2009 and have rolled out an additional brown bin collection service to a number of commercial customers such as hospitals, hotels, restaurants etc. Kilmainhamwood Compost will aim to continue to increase the quantity of biodegradable waste that can be diverted from landfill even further and assist Ireland in achieving Targets laid down by the landfill Directive (1999/31/EC). It is hoped that in 2010 the enforcement of the food regulations in Ireland will allow Kilmainhamwood Compost to increase quantities of biodegradable material for composting at the facility.

4.2 The recovery of non hazardous biodegradable waste

All non hazardous biodegradable waste arrives at the facility and when accepted is tipped in the reception hall. After inspection the material is amended with other organic material such as wood chip or sawdust in order to create a blend with a Carbon: Nitrogen ratio of 30: 1, moisture content of 65% and with an open texture. This material will be placed into our composting bays and achieves temperatures in excess of 60°C. After 3 weeks the material is screened and the screened compost is placed into pasteurization in order to comply with the ABP Regulations, 70°C for 60mins with a 12mm particle size. After a total period of 8 weeks the composting material will have matured and using Schedule E of Licence W0195-01 can be classified in either a class I or class II compost. Any end product not meeting this standard can be reworked in the process or classified as a stabilized bio-waste and disposed of in an approved landfill site.

5.0 Summary Report and Interpretations on Environmental Monitoring and Emissions Data

In accordance with Schedule D of PTWDL waste licence W0195-01 monitoring of dust, noise, surface water, groundwater and air microbes where carried out during the reporting period of 2009. The following section details results obtained and interpretations of results.

5.1 Total Dust Deposition 2009

Three fixed monitoring locations (DA, DB and DC) were used to perform total dust deposition monitoring quarterly over the 30 day sampling period as per Waste licence W0195-01.
The monitoring locations are presented in Appendix 1. The results presented in *Table 5.1* illustrate that total depositional dust at all locations. All dust depositions levels were under the guideline limit, 350 mg/m^2/day, recommended by the EPA as per conditions of W0195-01, reports have been submitted to the EPA.

Table 5.1 Average ambient Total dust deposition concentrations at three monitoring locations at the Kilmainhamwood Compost 2009.

Location	Unit	Mar-09	July-09	Sep-09	Dec-09
DA	mg/m2/day	44	98	128	66
DB	mg/m2/day	52	114	144	92
DC	mg/m2/day	36	128	167	111

5.2 Noise Monitoring 2009

The noise survey was carried out at the location N1 referenced in the waste licence (see map attached Appendix 1). Monitoring was carried out on a quarterly basis as per Schedule D of waste licence W0195-01. The monitoring results are presented in *Table 5.2.* The results presented in *Table 5.2* illustrate that recorded noise levels at all locations. Reports have been submitted to the EPA, as per waste licence requirements, and all levels displayed in Table 5.2 are below the emission levels set down by the waste licence W0915-01.

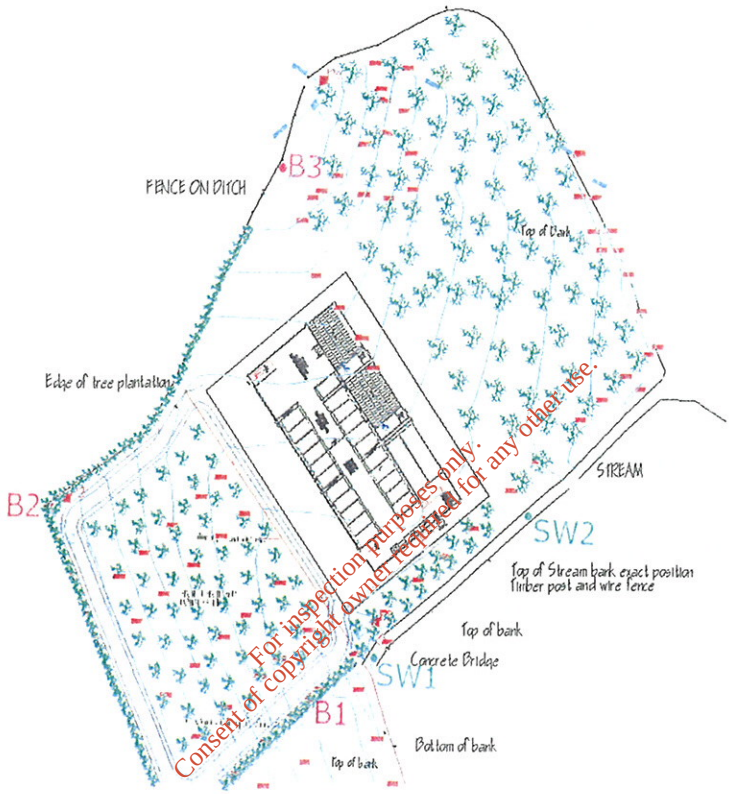
Table 5.2 Recorded Noise Levels dB(A) – Intervals 30 minutes 2009

Location	Time	unit	Feb-09	June-09	Sept-09	Dec-09
N1	Day	Leq	48	41	41	46.4
	Day	L10	39.9	47	42.9	47
	Day	L90	33.3	38	35.7	33
	Night	Leq	35.3	36.6	39	40.5
	Night	L10	42	44	41.3	40
	Night	L90	32.5	36	30.1	30

5.3 Groundwater and Surface Water

As per Schedule D of waste licence W0195-01 Groundwater was monitored at B1, B2 and B3 bore wells and Surface Water was monitored quarterly at SW1 and SW2.
Diagram 5.3.1 shows the locations of the monitoring points and the results are outlined in the tables below.

Figure 5.3.1 Monitoring Locations of Surface Water and Groundwater



SW1 -----Down stream Monitoring Point.
SW2------Up stream Monitoring Point.

B1 -------Groundwater Well No.1 Monitoring Point.
B2 -------Groundwater Well No.2 Monitoring Point.
B3 -------Groundwater Well No.3 Monitoring Point.

The results of monitoring during the reporting period are recorded in the following tables.

Table 5.3.2

MONITORING WELL B1: Chemical Analysis of Groundwater.						
PARAMETERS	UNIT	Limit	25/02/2008	18/09/2008	21/01/2009	15/09/2009
FIELD ANALYSIS						
General Water Quality Parameters	mAoD(malin)		80.81m	80.81m	80.81m	80.81m
Colour	-	No abnormal change	-	Clear	-	
Conductivity @ 25°C	uS/cm	1,000	1,106		-	
Odour	-		-	No Odour	-	
pH	pH Units	6.5-9.5	7.21	7.4	-	
Temperature	deg C	25	9	11.6	-	
Ground Water Level	M		-	16.7	35.5	16.35
LABORATORY ANALYSIS						
General Water Quality Parameters						
pH	pH Units	6.5-9.5	-	7.4	7.4	7.6
Inorganics						
Ammonia	NH_4 mg/l	<0.15	<0.2	<0.6	<0.06	0.055
Calcium	Ca mg/l	200		151.3	-	81.94
Chloride	Cl mg/l	30	24	25.59	23.78	20.41
Nitrate	$N0_3$ mg/l	25	-	0.1	-	<0.09
Phosphorous	P mg/l		-	0.005	-	0.042
Potassium	K mg/l		-	4.01	-	3.69
Ortho Phosphate	PO_4 mg/l	0.03	-	0.005	-	<0.005
Sodium	Na mg/l	150	-	25.86	-	20.53
Sulphate	SO_4 mg/l	200	447	277.3	281.22	202.43
Metals						
Boron	B mg/l	1	-	0.207	-	0.1031
Cadmium	Cd mg/l	0.005	-	<.00009	-	<0.00009
Chromium (Total)	Cr mg/l	0.03	-	0.0013	-	0.001
Copper	Cu mg/l	0.03	-	<0.002	-	<0.0002
Iron	Fe mg/l	0.2	-	0.1388	-	0.4828
Lead	Pb mg/l	0.01	-	<0.0043	-	0.0111
Magnesium	Mg mg/l	50	-	38.02	-	28.14
Manganese	Mn mg/l	0.05	-	0.0095	-	0.00112
Nickel	Ni mg/l	0.02	-	0.0006	-	0.004
Zinc	Zn mg/l	0.1	-	0.0749	-	0.1798
Bacteria						
Feacal Coliforms	cfu/100ml	0.00	-	6	-	2
Total Coliforms	cfu/100ml	0.00	-	112	-	10
List I/II						
Volatile Organic Compounds	mg/l		---	<0.001	---	<0.001
Semivolatiles	mg/l		--	<0.001	--	<0.0005
Pesticides	mg/l		-	<0.001	-	-

Table 5.3.3

MONITORING WELL B2: Chemical Analysis of Groundwater.						
PARAMETERS	UNIT	Limit	25/02/2008	18/09/2008	21/01/2009	11/09/2009
FIELD ANALYSIS						
mAoD(malin)			86.93	86.93	86.93	86.93m
General Water Quality Parameters						
Colour	-	No abnormal change	-	-	-	
Conductivity @ 25°C	uS/cm	1,000	1,112	_	-	
Odour	-		No Odour	No Odour	-	
pH	pH Units	6.5 9.5	7.18	7.3	-	
Temperature	deg C	25	8.8	12.3	-	
Ground Water Level	M		-	23	16	21.9
LABORATORY ANALYSIS						
General Water Quality Parameters						
pH	pH Units	6.5 9.5	-	7.3	7.4	7.5
Inorganics						
Ammonia	NH_4 mg/l	<0.15	<0.2	<0.06	0.43	0.018
Calcium	Ca mg/l	200	-	147	-	88.78
Chloride	Cl mg/l	30	13	14.88	14.73	14.05
Nitrate	NH_3 mg/l		-	<0.09	-	<0.09
Phosphorous	P mg/l		-	0.004	-	0.017
Potassium	K mg/l	5	-	2.01	-	1.89
Ortho Phosphate	PO_4 mg/l	0.03	-	0.004	-	<0.005
Sodium	Na mg/l	150	-	30.96	-	24.76
Sulphate	SO_4 mg/l	200	167	270.51	279.88	188.77
Metals						
Boron	B mg/l	1	-	<.0042	-	0.0625
Cadmium	Cd mg/l	0.005	-	<0.00009	-	<0.00009
Chromium (Total)	Cr mg/l	0.03	-	<0.00093	-	0.00093
Copper	Cu mg/l	0.03	-	<0.0002	-	0.185
Iron	Fe mg/l	0.2	-	0.213	-	0.0927
Lead	Pb mg/l	0.01	-	<0.0018	-	0.0118
Magnesium	Mg mg/l	50	-	33.23	-	25.34
Manganese	Mn mg/l	0.05	-	0.6462	-	0.0849
Nickel	Ni mg/l	0.02	-	0.0005	-	0.0011
Zinc	Zn mg/l	0.1	-	0.0114	-	0.1084
Bacteria			-	-	-	
Feacal Coliforms	cfu/100ml	0.00	-	5	-	1
Total Coliforms	cfu/100ml	0.00	-	58	-	7
List I/II			-	-	-	
Volatile Organic Compounds	mg/l		-	<0.001	-	<0.001
Semivolatiles	mg/l		-	<0.001	-	<0.0005
Pesticides	mg/l		-	<0.00001	-	-

Table 5.3.4

MONITORING WELL B3: Chemical Analysis of Groundwater.						
PARAMETERS	UNIT	Limit	25/02/2008	18/09/2008	21/01/2009	15/09/2009
FIELD ANALYSIS						
General Water Quality Parameters	mAoD(malin)					
Colour	-	No abnormal change	-	Clear	-	-
Conductivity @ 25°C	uS/cm	1,000	540	-	-	-
Odour	-		-	No Smell	-	-
pH	pH Units	6.5-9.5	7.23	7.36	-	-
Temperature	deg C	25	10	14.1	-	-
Ground Water Level	M		-	9	-	23.8
LABORATORY ANALYSIS						
General Water Quality Parameters						
pH	pH Units	6.5-9.5	-	8	7.4	7.7
Inorganics						
Ammonia	NH_4 mg/l	<0.15	<0.3	<0.06	<0.06	<0.01
Calcium	Ca mg/l	200	-	63.51	-	90.25
Chloride	Cl mg/l	30	14	13.62	13.68	14.79
Nitrate	NH_3 mg/l	25	-	0.48	-	0.46
Phosphorous	P mg/l		-	0.028	-	0.041
Potassium	K mg/l		-	2.2	-	2.44
Ortho Phosphate	PO_4 mg/l	0.03	-	0.028	-	0.02
Sodium	Na mg/l	150	-	10.6	-	15.16
Sulphate	SO_4 mg/l	200	88	95.77	86.89	94.47
Metals						
Boron	B mg/l	1	-	<0.0042	-	0.00409
Cadmium	Cd mg/l	0.005	-	<0.00009	-	<0.00009
Chromium (Total)	Cr mg/l	0.03	-	<0.00093	-	<0.00093
Copper	Cu mg/l	0.03	-	0.012	-	<0.0002
Iron	Fe mg/l	0.2	-	0.0211	-	<0.0037
Lead	Pb mg/l	0.01	-	0.0008	-	<0.00038
Magnesium	Mg mg/l	50	-	14.14	-	20.4
Manganese	Mn mg/l	0.05	-	0.0094	-	0.0208
Nickel	Ni mg/l	0.02	-	0.0006	-	<0.00047
Zinc	Zn mg/l	0.1	-	0.0394	-	0.0046
Bacteria						
Feacal Coliforms	cfu/100ml	0.00	-	0	-	0
Total Coliforms	cfu/100ml	0.00	-	23	-	0
List I/II Volatile Organic Compounds	mg/l		-	<0.001	-	<0.001
Semivolatiles	mg/l		-	<0.001	-	<0.0005
Pesticides	mg/l		-	<0.0001	-	-

5.3.1 Interpretation of Groundwater Analysis

Results from monitoring of groundwater locations were compared to the Interim Guideline Values from the EPA document "Towards Setting Guideline values for the Protection of Groundwater in Ireland.

Reference to the relevant geological information for this area, the 1:100,000 scale Sheet 13 – Bedrock Geological Map of Meath (*GSI* 1999) indicate that Kilmainhamwood Compost is located in quite a varied area of bedrock geology and one of the few areas of Permo-Triassic rocks within Ireland. A sequence of red sandstones and evaporate deposits of gypsum and anhydrite unconformably overlie a sequence of older Carboniferous rocks bounded to the west by the Kingscourt Fault. The Kingscourt Sandstone Formation (KS) consists of a lower siltstone unit which grades upwards to a thickly bedded, cross laminated red sandstone. This formation conformably overlies the Kingscourt Gypsum Formation (KG). This formation is composed of a basal impersistent conglomerate, followed by a mud dominated sequence of two major gypsum and anhydrite levels.

3 no. monitoring boreholes were drilled within the site in March 2003 by Southern Pumps Ltd. The type of subsoil and bedrock described in the driller's logs supports the above description of geology in the area. Clay with gravel layers was reported to overlie Chalk. Based on the appearance of Chalk, it is assumed that the bedrock encountered was Gypsum, which would be typical of the geology in this region of Ireland.

Monitoring Location B1 indicated elevated levels of sulphate, this is consistent with baseline data and may be attributed to the underlying geology in the area as discussed above. Iron levels recorded were slightly elevated to 0.48mg/l in September 2009 when compared with the interim guideline value of 0.2mg/l as per table 3.1 of the EPA document "Towards Setting Guideline values for the protection of Groundwater in Ireland". It is important to note that this Borehole is not used for drinking water at the facility and potable water is bought in. Iron levels are still below 1.0mg/l which is the EQSs for surface waters.

Monitoring Location B2 shows elevated levels of copper 0.185mg/l in September 2009 where the interim value is set at 0.2mg/l. Copper can occur naturally, with the drinking water standard having a level of 2.0mg/l. There was also an elevation in Ammonia and Sulphate in January 2009, elevations in sulphate attributed to the underlying geology in the area and the elevation in ammoniacal nitrogen could possibly be linked to agricultural activity on the surrounding lands. The groundwater levels taken at B1 and B2 indicate that the water table is following from a west to east direction with the water table being higher at B2. As the facility is to the east of this borehole B2 then we can conclude that agricultural runoff may have attributed to the elevated ammoniacal nitrogen result.

Monitoring Location B3 recorded good quality groundwater with all parameters below the respective limits in the interim guideline value as per EPA report.

Boreholes are not used for potable water at the facility and are used only used for sanitary facilities and to top up the existing water tank on site in the event that it may be required. Nevertheless Thorntons Recycling will continue to monitor the groundwater and mitigate against any elevations, within their power to do so.

Surface Water Monitoring Location SW1: Chemical Analysis

PARAMETERS	UNIT	Limit	18/03/09	18/06/09	11/09/09	25/11/09
FIELD ANALYSIS						
General Water Quality Parameters						
Colour	-		-	Clear	Clear	Clear
Conductivity @ 25°C	uS/cm		-	-	-	-
Odour	-		No Odour	No Odour	No Odour	No Odour
pH	pH Units	6 to 9	-	-	-	-
Temperature	deg C	<21.5	-	13.2	10.3	8.1
LABORATORY ANALYSIS						
General Water Quality Parameters						
Total Suspended Solids	mg/l	<25	<10	3.5	2.5	6
Mineral Oils	mg/l	<5	<0.01	<0.01	<0.01	<0.01
pH	pH Units	6 to 9	7.61	7.45	8.37	8.22
Inorganics						
Ammoniacal Nitrogen	NH_4 mg/l	<1	<0.2	<0.2	<0.2	<0.2
Chloride	Cl mg/l		14	13.2	12.8	13

LEGEND
- = No data reported or no analyses conducted
< = Less Than
NDP = No Determination Possible

Limit - Salmonid Water Quality Standards - S.I. No 293 of 1988

Table 5.3.5: SW1 Results

Surface Water Monitoring Location SW2: Chemical Analysis.

PARAMETERS	UNIT	Limit	18/03/09	18/06/09	11/09/09	25/11/09
FIELD ANALYSIS						
General Water Quality Parameters						
Colour	-		-	Clear	Clear	Clear
Conductivity @ 25°C	uS/cm		-	-	-	-
Odour	-		No Odour	No Odour	No Odour	No 0dour
pH	pH Units	6 to 9	-	-	-	-
Temperature	deg C	<21.5	-	13.1	10.6	8.4
LABORATORY ANALYSIS						
General Water Quality Parameters						
Total Suspended Solids	mg/l	<25	<10	4.0	2.5	10
Mineral Oils	mg/l	<5	<0.01	<0.01	<0.01	<0.01
pH	pH Units	6 to 9	7.61	7.37	7.43	8.23
Inorganics						
Ammoniacal Nitrogen	NH_4 mg/l	<1	<0.2	<0.2	<0.2	<0.2
Chloride	Cl mg/l		14	13.5	14.1	13

LEGEND
- = No data reported or no analyses conducted
< = Less Than
NDP = No Determination Possible

Limit - Salmonid Water Quality Standards - S.I. No 293 of1988

Table 5.3.6: SW2 Results

5.3. Interpretation of Surface Water Analysis

Results of the surface water were compared to the Salmonid Water Quality Standards - S.I. No 293 of 1988

The samples taken from SW2 represent the background water quality in the stream adjacent to the composting plant. All parameters tested lie below the limits contained within the standard. . Combining these results with the clarity of the water and the lack of odour on days of sampling, it is concluded that the stream on the days of water testing contained good quality water.

Samples taken from SW1 are downstream of the main activities at the site. Results from this monitoring point were also compared with the Salmonid Water Quality Standards - S.I. No 293 of 1988

Combining these results from SW1 and SW2 with the clarity of the water and the lack of odour on days of sampling, it is concluded that the stream on the days of water testing contained good quality water.

5.4 Air Monitoring – Bacteria and Aspergillus Fumigatus

As per schedule D of the licence, bacteria and Aspergillus fumigates monitoring was carried out by independent consultants Odour Monitoring Ireland, a copy of this report is contained within Appendix 4 of this report

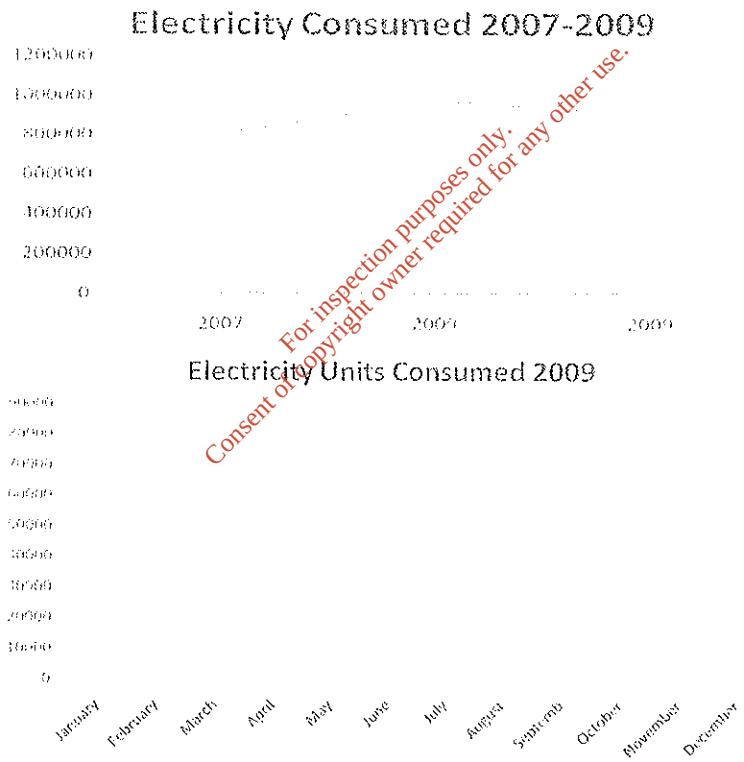
6.0 Resources and Energy Usage

The following section discusses resources such as Electricity, Fuel and Water used at Kilmainhamwood Compost in 2009. As per condition 5.7 of the licence a copy of the energy efficiency audit carried out at the facility is contained within Appendix 5 of this report.

6.1 Electricity

Electricity consumption at the facility decreased in 2009 with a conscious effort to reduce energy consumption at the facility. In 2007 a total of 799,842 Kwh was consumed, 2008 962,551 Kwh and in 2009 897,035 Kwh was consumed at the facility.
Figures 6.1 displays a comparison in previous year's energy consumption at Kilmainhamwood Compost.

Figure 6.1 Energy Consumption 2009



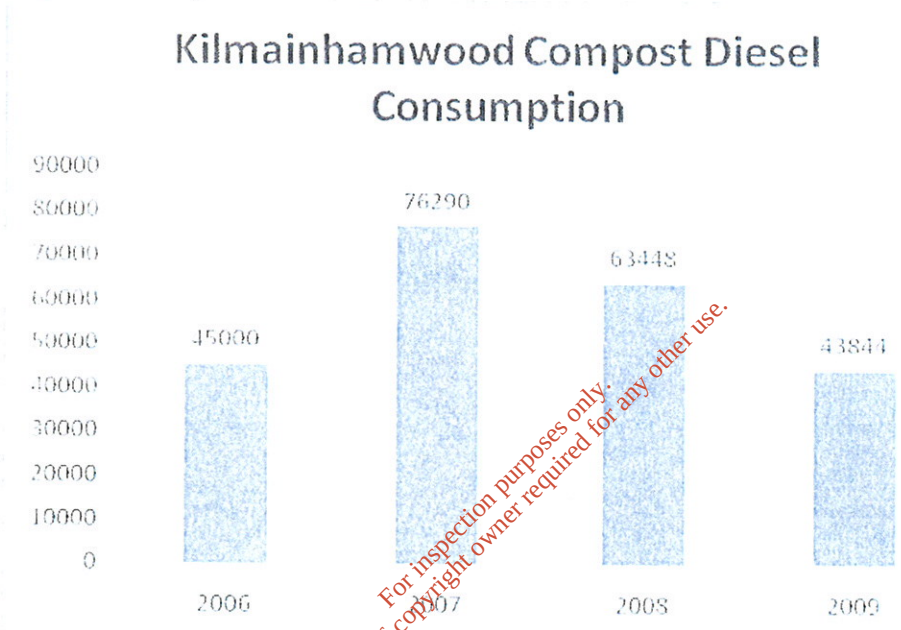
6.2 Water

Kilmainhamwood compost is not connected to the local water mains and uses its rain collection tank as a source of water for the facility. This water is used for washing trailers, equipment and floors. No water is used in the process as the incoming material contains excess moisture.
Drinking water is supplied by a contract water supplier. For emergency purposes there is an over ground collection tank that holds 90,000 litres and is supplied by Bore well 3 if required.

6.3 Diesel

The main consumption of diesel in 2009 was the Loading shovels and Shredding machines. A total of 43,844 litres of diesel were consumed during 2009. All machines are serviced regularly in order to achieve optimum fuel efficiency. Diesel consumption reduced due to the fact that most of the incoming feedstock is already shred and does not require on site shredding. The process is continuously monitored in order to access possible methods of making changes that would make fuel saving.

Figure 6.3 Diesel Consumption 2006 – 2009



7.0 Development/Infrastructural Works

7.1 Site Developments 2009

During 2009 the facility accepted and processed 20,748.84 Tonnes of waste. The following developments were carried out in 2009;

- **Training -** Staff training - Machinery operation and driver certification
- **ISO-** Kilmainhamwood Compost maintained certification in standards for ISO 14001 Environmental, ISO 9001 Quality and OHSAS 18001 in 2009.
- **Odour abatement upgrade -** During 2009 Kilmaimhamwood Compost commenced the first stage of its odour abatement upgrade. Phase 1 was completed in 2009 which resulted in existing composting bays being enclosed. This allows the processed air to be captured and with future advances in additional infrastructure processed air can be treated to remove the ammonia before it is sent to the biofiltration system, thus increasing efficiency and effectiveness of the biofilters which are currently on site.

7.2 Proposed Developments 2010

A number of developments are proposed for the forthcoming year of 2010. All developments are carried out with the intention of reducing environmental impacts of the facility and increasing waste processing efficiency at Kilmainhamwood Compost. Developments proposed include;

- It is proposed to complete the upgrade of our odour abatement system. We intend to reduce the amount of air requiring treatment by extracting the process air from our enclosed composting bays within the building and passing this process air through an acid scrubber before the air is sent to out biofiltration system. This will increase the efficiencies and the effectiveness of the biofilters. Details of which have been forwarded to the EPA.
- It is proposed that a 15 acre willow plantation is developed at the facility. This will enhance the environment by its consumption of CO2 and its timber can be used as a renewable source of Biofuel. This land is currently not in use and was to be planted in 2009.
- Continuous development of facility procedures in line with ISO certification and Animal By Products Regulations, it is proposed to introduce a one way flow system at the facility.
- With a deficit of composting infrastructure in Ireland needed to divert and treat biodegradable waste from going to landfill we intend to complete the planning process for the construction of infrastructure that would allow the facility to accept and process 40,000 tonnes of biodegradable waste. Once planning permission is completed it is the intention of Thorntons Recycing to apply for a licence review with the EPA of Kilmainhamwood Compost.

7.3 Plant Capacity 2009

The Facility is licensed to process 20,800 tonnes of waste per year. During 2009 20,748.84 tonnes of waste was processed. The facility contains the following plant which processes the waste;

List of equipment on site;

- Two L90E Volvo Loading Shovels
- One Doppstadt Shredder AK 430 Profi
- One McDonald 50ft Screener

The L90E Volvo Loading Shovels can move over 100 tonne of material per hour so they are well within their working capacity.
The Doppstadt Shredder can shred 30 Tonne per hour.
The McDonald Screener has a capacity of 120 tonne per hour.

The average waste intake is 400 tonnes per week and all of the above plant is well within their working Capacity. Kilmainhamwood Compost is part of the Thornton's Recycling Group so if there were any emergency breakdowns or additional plant machinery required then they can be brought from another facility for use on site. Thorntons Recycling have a maintenance garage which is fully equipped with mechanics, fitters etc which are available for use by Kilmainhamwood Compost if required.

8.0 Schedule of Environmental Objectives and Targets for 2010

The contents of the Integrated Management System (IMS) are too large to contain within the main body of this report, however the Agency can access the system for inspection on a specially designated Drive (X Drive or IMS Drive) at any of the companies' site offices.

A new schedule of objectives and targets for the forthcoming year of 2010 for Kilmainhamwood Compost is contained within Appendix 6 of this report.

9.0 Report on the progress towards achievement of the Environmental Objectives and Targets contained in the previous year's report

An update on the Environmental Objectives and Targets for Kilmainhamwood Compost, waste licence W0195-01, as detailed in the Management Programme for the company for 2009 is contained in Appendix 6 of this report. Kilmainhamwood Compost established an Environmental Management System on commencement of activities in 2006. This was further expanded in 2007 2008 and 2009 to cover a number of additional procedures specific to composting and the Animal By Products Regulations. The following is a summary of what is currently on the IMS and which relates to Kilmainhamwood Compost;

Top Level Manual
Legal Register
Emergency Response Plans
Polices – EHS and Quality
Key Performance Indicators
Training File – Skills Matrix
Third Party Contractors Files
Management Programme – Objectives and Targets
Staff Handbook

Environmental Procedures

- Communications Programme
- Waste Outlet Audit
- Environmental Monitoring and Analysis
- Odour Control
- Oil – Chemical Spill
- House Keeping
- Biofilters Monitoring Procedure Kilmainhamwood
- Waste Acceptance Kilmainhamwood
- Vehicle Emergency Response WCP Procedure
- Residual Waste Management Kilmainhamwood
- Tanker Emergency Response WCP Procedure
- Screen Sampling Procedure for Kilmainhamwood
- Housekeeping Procedure Kilmainhamwood
- Sampling Procedure Kilmanhaimwood
- Filling Pasteurisation Tunnel Procedure.
- Pasteurisation procedure
- Emptying Compost from Pasteurisation Tunnel Procedure

Health and Safety

- A detailed Safety Statement with risk assessments is also contained within the EMS
- An emergency site specific plan is available for Kilmainhamwood Compost.

Quality

- Staff Appraisal
- Purchasing
- Weekly Operating Report Procedure
- Call Centre Instruction Manual
- Customer Focus
- Third Party Contractors

Generic Procedures

- Aspects
- Legal Identification and Evaluation

- Management Programmes
- Communications
- Training
- Emergency Response
- Monitoring and measurement
- Complaints
- Non-conformance and preventative actions
- Document control
- Internal auditing
- Management Review
- Records Management
- Risk Assessment
- Contractor Control
- Operational Control

10 Tank, drum, pipeline and bund testing.

At Kilmainhamwood Compost there is only one tank in use. This tank collects the leachate from the biofilters and from the wash bay. There are no fuel tanks on site and diesel is filled via a boozer. Kilmainhamwood Compost commissioned White Young Green, environmental consultants to carry out an integrity test on the leachate process tank in December 2009 to BS8007 standards. The tank at the facility passed the integrity tests. A copy of the report is attached in Appendix 7. This tank will be tested every three years as per Condition 3.10.5 of waste licence; therefore further tests are not due to be completed until the end of 2012.

10.1 Pipeline Tests

All pipe lines are running free and clear and will be serviced on a regular basis by Thornton's Tanker Services.

11 Summary of Incidents and Complaints

11.1 Incidents

There were no incidents recorded in 2009.

11.2 Complaints

There were twenty three complaints made to the Facility during 2009, most of these were in relation to odour and made during March/April and September. All complaints were investigated in full and responded to. During 2009 the decision was made by the Board of Directors to upgrade the odour abatement technology which would include the installation of an acid scrubber to improve the effectiveness of the biofilter systems. This project started in May 2009 and is expected to be completed in the 2nd Quarter 2010.
Full details of the complaints have been maintained on site at the facility as per our complaints procedure PM08 – Complaints

12 Review of Nuisance Controls

Potential nuisances at composting facilities include dust, noise, odour, litter, birds, vermin and mud. Kilmainhamwood Compost do their utmost to control any nuisance which may occur at the facility, checks on nuisances are carried out daily and corrective actions are carried out as required.

12.1 Dust

Kilmainhamwood Compost is required to carry out dust monitoring quarterly (please refer to section 5.1 of this report). As all waste processes takes place indoors there are no dust emissions from the process. The main source of dust is from the roadways which will be wetted down during dry weather conditions.

In an effort to further reduce dust emissions from the yard and roadways Kilmainhamwood compost use Thornton's road sweeper on a regular basis at the facility.

12.2 Noise

Noise monitoring surveys were conducted at the facility; see section 5.3 of this report. As all activities takes place inside the building noise levels are well within the permitted range.

12.3 Odour

All waste activities take place inside the fully enclosed building which is under negative pressure. All exhausted air from the building must pass through the biofilter system before entering the atmosphere. This biofilter system is designed to breakdown any foul odours before it leaves the system. Daily monitoring of this system takes place and the biofilters were continuously assessed during 2009. A survey of the biofilter system was carried out during 2008 and it is proposed to install an acid scrubber in 2010 which will enhance the efficiency of the existing odour abatement system.

12.4 Litter

Daily checks are carried out on litter within and around the site boundary any litter which may escape is cleared up immediately. All waste transportation vehicles are either enclosed or have a net which covers waste, preventing littering while waste is in transit. All staff sweep and tidy picking areas constantly throughout the day and daily housekeeping checks are carried out by supervisors in all areas with random checks carried out by the site manager to ensure that these are completed. All housekeeping checks are maintained on file in the site office.

12.5 Birds

Kilmainhamwood Compost has no problems with birds at the facility. Doors at the facility are kept closed.

12.6 Vermin

Complete Pest Control are contracted to carry out pest control for the facility. This includes rodents and flies. They conduct regular checks of all bait points around the facility which effectively controls rodents at the facility, all documentation for site visits and reports are maintained on site.

Flies have not been a problem at the facility. However to ensure a fly problem never develops at the facility, Complete Pest Control carry out mitigation measures of spraying of areas where flies would most likely occur at regular intervals e.g. in the corridors.

12.6 Mud

All surfaces are hard standing and as such mud is not an issue at the facility. We also have a regular visit from Thornton's road sweeper that keeps these hard standings clean

13 Management Structure, Programme for Public Information

Programme of Public Information

Kilmainhamwood Compost operates an open door policy at the facility and has carried out tours with local representative groups,etc in 2009. The Environmental team also met if requested with Local representatives of the area to discuss operation of the facility and to ensure that clear channels of communication are kept open between the facility and the public for the future.

New and existing clients are brought through our waste acceptance procedures and are supplied with information by sales representatives or call centre agents in relation to what waste types we can accept at the facility. Thornton's Recycling has also upgraded its website so customers can access information such as waste collection permit numbers and waste licences etc.

All information relating to activities carried out at Kilmainhamwood Compost is maintained on site. Public information is accessible at the site at all times at the site office or at the Office of Environmental Enforcement. Detailed Communications Procedures (PM04-Communications, PM08 Complaints Procedure and EP01 – Communications Programme) has been implemented in our IMS and are used throughout the company (Appendix 8). A company newsletter was produced and circulated to interested parties in 2008.

Management Structure

Kilmainhamwood Compost is part of the Thornton's Recycling Group and as such has access to the Management Facilities of Thornton's Recycling. These facilities include an Environmental Department which includes Mercedes Feely, David Duff and Tommy Rogers. Below is a brief outline of the management structure of the site;

Carmel Thornton
Director

Paul Thornton
Director

Shane Thornton
Director

Anna Marie Thornton
Director

Gary Brady
Managing Director

Tom McDonnell
Facility Manager

Dermot Ward
Production Supervisor

General Operatives
(2)

The Facility Manager of Kilmainhamwood Compost is Tom Mc Donnell. The Production Supervisor is Dermot Ward and is deputy manager when Tom Mc Donnell is not on site. There are two Loader Shovel Drivers, Fran Dowd and Marius Lanaskuas.

14 Quantity of Compost Produced 2009

The total amount of compost produced in Kilmainhamwood compost in 2009 was 4534.23 Tonnes.

AER 2009 List of Appendices

Appendix 1 – Facility Layout complete with Monitoring Locations

Appendix 2 – Weighbridge Certificate 2008

Appendix 3 – ABP Approval Certificate

Appendix 4 – Bioaerosol Impact Assessment

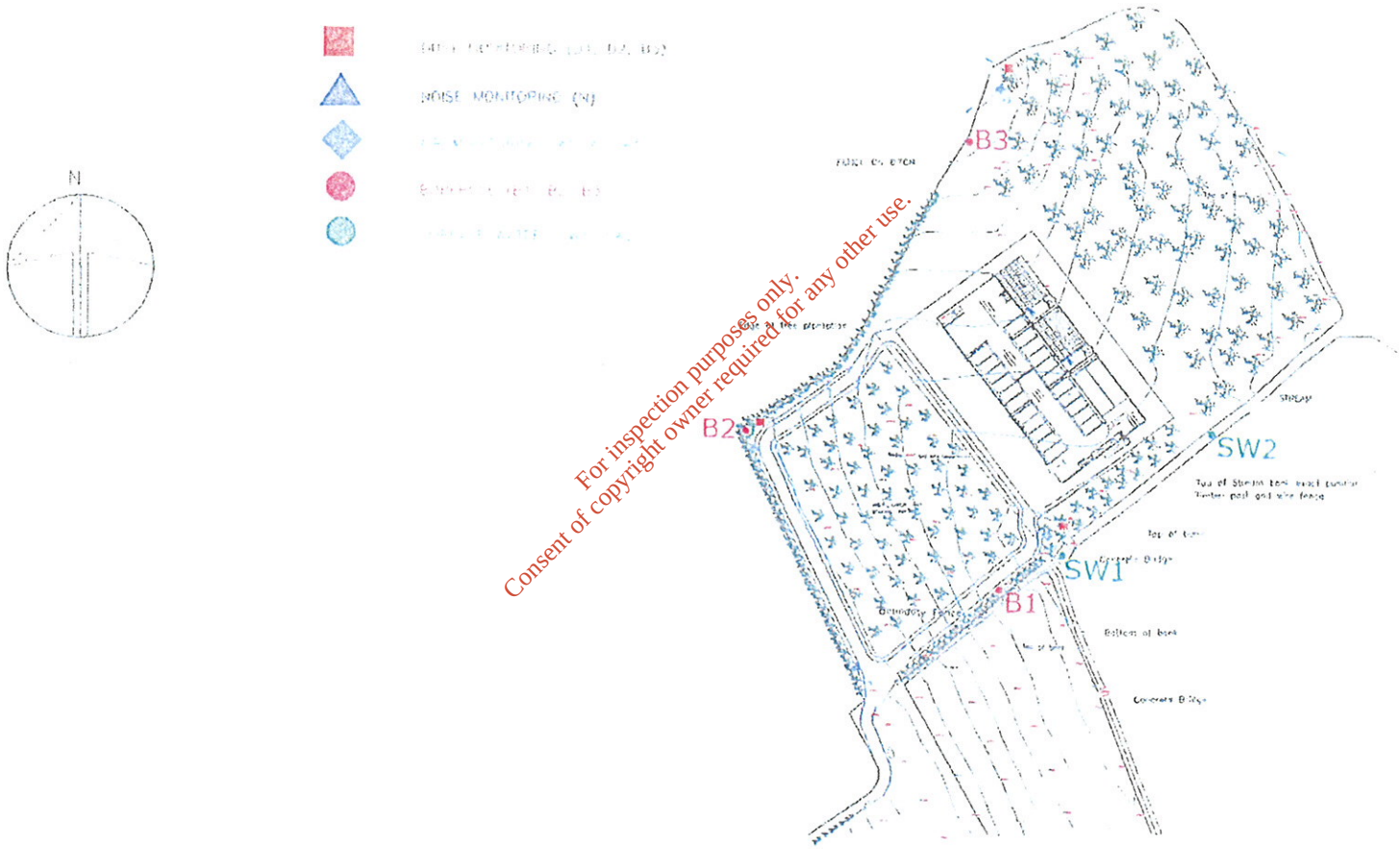
Appendix 5 – Energy Efficiency Audit

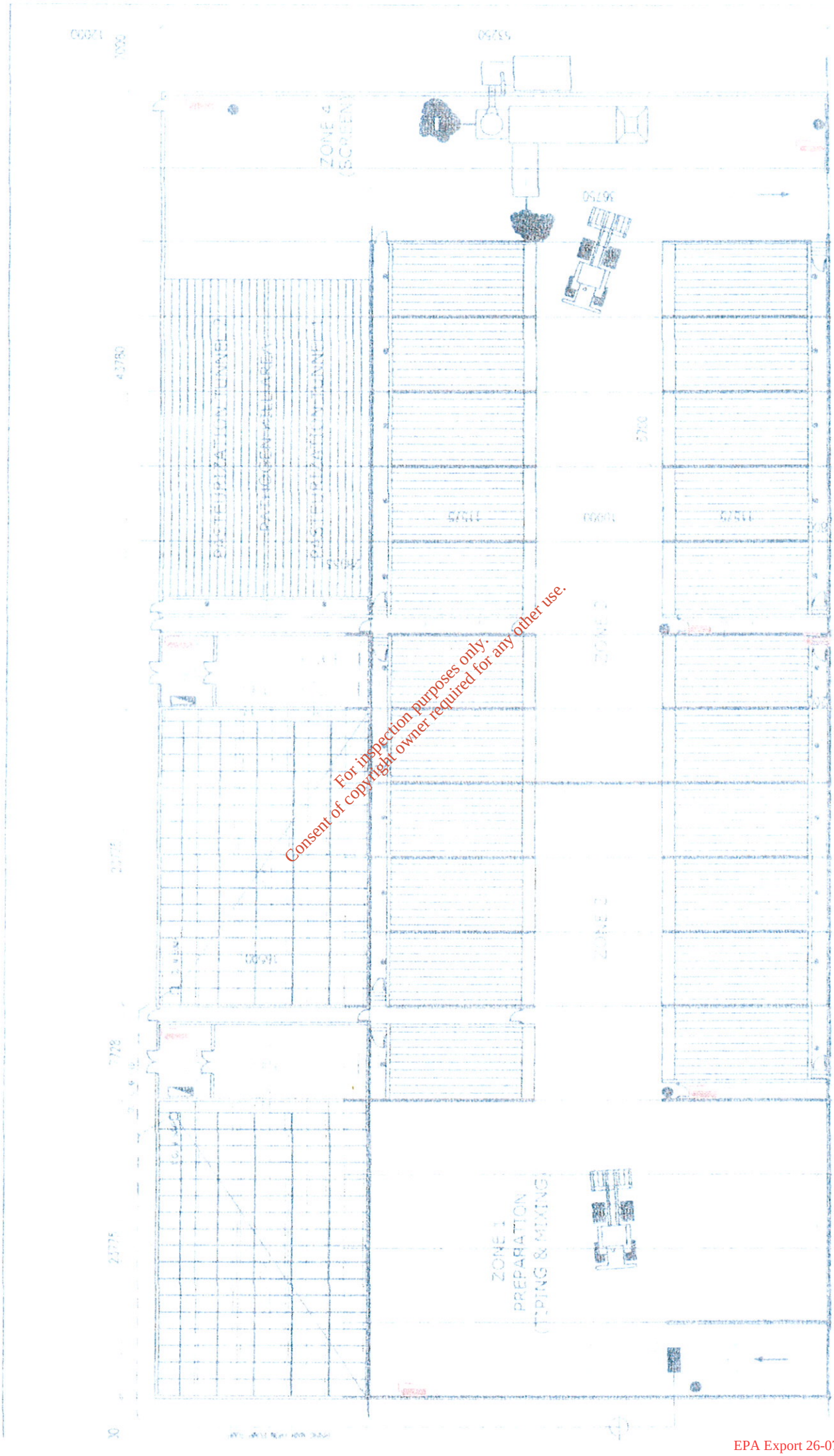
Appendix 6 –Progress on Objectives and Targets for 2009 and New Objectives and Targets for 2010

Appendix 7 – Leachate Tank Integrity Certificate

Appendix 8 – Communications Programme and Associated Procedures

APPENDIX 1





APPENDIX 2

Legal Metrology Service

Dundalk Regional Centre

IDA Small Business Park,
Coe's Road,
Dundalk,
Co Louth

Tel: 042 933 2758
Fax. 042 933 2791

Metrology Acts, 1980-1998
Certificate of Conformity

Certificate No: DK 05 22

File No: – Job No: – Order No: –

CLIENT NAME: Thornton Recycling

ADDRESS: Killamonan [illegible] Co Meath

This is to certify that the metrological instrument described hereunder was/were examined and tested by me on 28/7/08 and was/were found to be in conformity with the requirements of the Metrology Acts, 1980-1998 and that the Standards used to perform the tests are traceable to National Standards.

(NOTE: This Certificate only indicates that the instrument concerned conforms to the requirements of the Metrology Acts 1980 - 1998 and does not imply compliance with any other applicable regulations enforced by other Statutory Bodies.)

DESCRIPTION

Instrument Type: Weighbridge

Manufacturer	Model	Serial no.	Capacity	Scale Interval	Type Approval No.	Accuracy Class (where Applicable)
TS 300	CDS7014	16042246	50t	20kg	DK0199.254	III

Date: 28/7/08

[signature]
Legal Metrology Inspector

nsai

A division of the National Standards Authority of Ireland

APPENDIX 3

Department of
Agriculture,
Fisheries and Food
An Roinn
Talmhaíochta,
Iascaigh agus Bia

Ref no: RNP 6-1 (Comp-6)

5 October 2009

Padraig Thornton Waste Disposal Ltd
T/a Thorntons Recycling Ltd
Unit S3B
Parkwest Business Park
Dublin 12

RE: European Communities (Transmissible Spongiform Encephalopathies and Animal By-Products) Regulations of 2008 (S.I. No. 252 of 2008 as amended by S.I. No. 291 of 2009 and S.I. No. 345 of 2009) and Regulation (EC) No. 1774/2002

I am directed by the Minister for Agriculture, Fisheries & Food to inform you that you have been approved to operate Kilmainhamwood Compost located at Ballynalurgan, Kilmainhamwood, Kells, Co. Meath as a Composting Plant from **8th October 2009 to 7th October 2011,** in accordance with Part 4 of the European Communities (Transmissible Spongiform Encephalopathies and Animal By-Products) Regulations of 2008 (S.I. No. 252 of 2008 as amended).

The official **approval number** allocated to your composting plant is **COMP - 6** and your approval is subject to the following conditions:

SPECIFIC PLANT CONDITIONS:

1. The plant may accept Category 2 manure and digestive tract content separated from the digestive tract, as detailed in **Article 5(1)(a)**, milk and colostrum as detailed in **Article 5(1)(c)** of Regulation (EC) No 1774/2002.

2. The plant may accept the following Category 3 material:
   - Feathers as detailed in **Article 6(1)(c)**
   - Former foodstuff waste as detailed in **Article 6(1)(f)**
   - Raw milk as detailed in **Article 6(1)(g)**
   - Fish waste as detailed in **Article 6(1)(h)** and **Article 6(1)(i)**
   - Shells, hatchery by-products and cracked eggs as detailed in **Article 6(1)(j)**
   - Catering waste as detailed in **Article 6(1)(l)** of Regulation (EC) No 1774/2002 and defined in **Annex 1** of this Regulation.

3. The plant must not accept any other Animal By-Products, as defined in **Article 2(1)(a)** of Regulation (EC) No 1774/2002.

4. The plant must process the above mentioned approved Category 2 and 3 material using EU processing standards:
   (a) Maximum particle size before entering the composting reactor: 12mm

(b) Minimum temperature in all material in the reactor: 70°C
(c) Minimum time in the reactor at 70°C (all material): 60 minutes

4. The plant's HACCP must be implemented and must be updated and modified as required.

5. Unless otherwise directed by the Department of Agriculture, Fisheries and Food (DAFF), every batch of material, immediately after processing must be sampled for E-coli. Every batch of end product must be sampled for Salmonella. Batches for Salmonella testing may comprise of up to one months production of compost. Microbiological analysis must be carried out at a DAFF approved laboratory. In the event of a sample failure, DAFF must be notified immediately.

GENERAL CONDITIONS

1. The plant must meet the requirements of Regulation (EC) No 1774/2002, S.I. No. 252 of 2008 as amended, S.I. No. 253 of 2008, and all other relevant legislation.

2. Plant management must ensure that all necessary conditions as outlined in the attached document: *"Conditions for approval and operation of composting plants treating animal by-products in Ireland"* are complied with. These conditions may be subject to change.

3. Sale or supply of fertiliser or soil improvers must be in accordance with S.I. No. 253 of 2008, Regulation (EC) No 181 of 2006 and the Conditions for approval and operation of composting plants treating animal by-products in Ireland.

4. DAFF must be notified immediately of any changes in the registered company name or in plant management.

Please note that failure to comply with these conditions may result in enforcement proceedings or the suspension or withdrawal of your approval.

For the Minister for Agriculture, Fisheries and Food

Geraldine Lanigan
Higher Executive Officer

An Officer authorised in that behalf by the said Minister.

APPENDIX 4

ODOUR & ENVIRONMENTAL ENGINEERING CONSULTANTS

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

BIOAEROSOL IMPACT ASSESSMENT AT KILMAINHAMWOOD COMPOST, NOBBER, CO. MEATH

PERFORMED BY ODOUR MONITORING IRELAND ON BEHALF OF KILMAINHAMWOOD COMPOSTING LTD

PREPARED BY:	Dr. Brian Sheridan
ATTENTION:	Mr. Tom McDonnell
DATE:	13th January 2010
REPORT NUMBER:	2010A34(1)
DOCUMENT VERSION:	Version 1
REVIEWERS:	

TABLE OF CONTENTS

Document Amendment Record

Client: ***Kilmainhamwood Compost Ltd***

Title: Bioaerosol Impact Assessment at Kilmainhamwood Compost Ltd, Nobber, Co. Meath

Project Number: 2010A34(1)			Document Reference: Bioaerosol Impact Assessment at Kilmainhamwood Compost Ltd, Nobber, Co. Meath		
2010A34(1)	Document for review	B.A.S.	JMC	B.A.S	13/01/2010
Revision	**Purpose/Description**	**Originated**	**Checked**	**Authorised**	**Date**

1. Introduction

Odour Monitoring Ireland was commissioned to perform a bioaerosol assessment in the vicinity of Kilmainhamwood Compost, Nobber, Co. Meath. 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 and plates / impactor blanks were performed at each of the three identified sampling locations within the vicinity of Kilmainhamwood Compost facility located at Nobber, Co. Meath.

The bioaerosol concentration levels were determined at each sampling location in triplicate. Three sampling locations were chosen - Loc 1, Loc 2, Loc 3. Currently, there are no significant bioaerosol impacts in the vicinity of Kilmainhamwood Composting facility located at Nobber, Co. Meath with all reported bioaerosol ambient air concentrations within the range of the proposed assessment criterion.

1.1 Scope 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 Nobber, Co. Meath. These are the two most frequently requested bioaerosols to be monitored for composting plants.

2. Materials and methods

This section describes in detail the materials and methods used throughout the study period. Monitoring was carried out on the 16th December 2009.

2.1 Sampling locations

Figure 5.1 and *Table 2.1* illustrates the sample location in the vicinity of the site. Sample locations were predominately chosen on the basis of meteorological conditions on the day of the survey whereby one upwind location and two downwind locations were chosen to determine the bioaerosol concentration levels in the vicinity of the facility.

Table 2.1. Monitoring locations and parameters monitored.

Location ID	Parameter monitored	Location details
Loc 1	Total Mesophillic bacteria and Aspergillus fumigatus	Upwind of site at boundary
Loc 2	Total Mesophillic bacteria and Aspergillus fumigatus	Downwind of site on boundary
Loc 3	Total Mesophillic bacteria and Aspergillus fumigatus	Downwind of site on boundary

2.2 Meteorological data

Table 2.2 illustrates the average wind direction during over the monitoring period. Average wind speed was low breeze to breezy. Cloud cover was high with an octave rating of 5 to 6 (i.e. on a 8 point scale). Barometric pressure was approximately 1003 mbar. Relative humidity was high with an average reading of 86.90% while temperature was low with a value of 6.50 degrees Celsius recorded. This would be typical for this time period of the year in Eastern Ireland.

Table 2.2 Meteorological conditions during the monitoring period.

Parameter	Day 1-16/122009
Wind direction (From)	WNW
Wind speed (m s^{-1})	3 to 5
Cloud cover (Octaves)	5 to 6
Barometric pressure	1003
Temperature (^{0}C)	6.50
Relative humidity (%)	86.90
Rainfall (mm)	0

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 1.0 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 $5^{0}C$) 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 $30^{0}C$ for Total viable counts (i.e. Mesophillic bacteria) and $37^{0}C$ for Aspergillus *fumigatus* by the laboratory technician. Results were received within 10 to 15 working days following sampling.