Environmental Protection Agency,
P.O. Box 3000,
Johnstown Castle Estate,
County Wexford

16th Nov. 2009

Objection to Proposed Decision of Review of WasteLicence
Register No. W0060-03

Dear Sir or Madam,

Please find attached objection to the Proposed Decision for a Waste Licence Review in respect of Whiteriver Landfill with the above register number and which is operated by Louth County Council. This objection is being lodged today via your web site.

Yours faithfully,

Éamonn Walsh
Director of Services
Louth County Council

Proposed Decision For Waste Licence Review
Register Number: W0060-03

Objection No. 1

Condition :	*The waste acceptance procedures established under condition 5.3.1 shall provide:*
5.13.2	*For non-cleared customers, the visual inspection and testing of waste in the waste inspection area pending acceptance/rejection*

Basis of Objection

Non-cleared customers will comprise mainly of members of the public using the public tipping area. It is not practical for visual inspections of waste brought by members of the public to be properly undertaken in the waste inspection area due to the numbers that arrive at particular times. Such customers should be excluded from the above condition and instead the visual inspection should be carried out at the public tipping area. Sampling/testing of the waste in order to determine its Biodegradable Municipal Waste (BMW) content will be carried out in the waste inspection area.

Louth County Council has developed two modern Civic Amenity Centres, one in Dundalk and the other in Drogheda. The public waste acceptance facility at Whiteriver Landfill serves a largely rural population in mid-Louth, between Ardee, Dunleer and Collon. The majority of the people who use this facility do not avail of a private waste collection service or are disposing of materials which are not recyclable e.g. contaminated food packaging, building wastes, mattresses, carpets, couch's etc. which are not accepted at the recycling centres.

The Treatment specified in the EPA technical guidance as set out in Municipal Solid Waste – Pre-treatment and residuals Management, EPA, 2009 states that;

"The minimum acceptable pre-treatment for MSW landfills would consist of a source separated collection system (2 bin or equivalent). For urban areas (>1500 population) diversion or separate collection of bio-waste (i.e. 3rd bin) is expected."

By visually inspecting each load of waste from the public (non pre-cleared customers) and rejecting non compliant material we can achieve a standard this is comparable to, or even better than, a two bin system. Any member of the public presenting with recyclable materials e.g. paper, cardboard, glass, metals, wood etc would not be allowed to dispose of it and would be required to bring it to their nearest civic amenity site. It is proposed to supervise the public tipping area on a full time basis to achieve this level of control over the waste being accepted.

Louth County Council proposes to show that this material accepted for disposal comes from a pre-segregation activity (i.e. at home). This would be done by characterisation of the material to demonstrate that it is similar in composition to the residual waste from a two or three bin collection system.

We therefore request that Condition 5.13.2 is amended to allow visual inspection of waste from members of the public using the public tipping area at that area.

Proposed wording of condition

Condition 5.13.2	For non-cleared customers excluding members of the public using the public tipping area, the visual inspection and testing of waste in the waste inspection *area* pending acceptance/rejection. Visual inspection of public users waste to be undertaken at the public tipping area.

Objection No.2

Condition 5.5.1 b)	*The working face of the landfill shall be no more than 2.5 metres in height after compaction, no more than 25 metres wide and have a slope no greater than 1 in 3.*

Basis of Objection

In order to safely accommodate two vehicles ejecting waste simultaneously, and allow for the possibility of having to tow vehicles from time to time it is requested that the width of the working face be widened from 25 metres to 35 metres.

Proposed Wording of condition

Condition 5.5.1 b)	*The working face of the landfill shall be no more than 2.5 metres in height after compaction, no more than 35 metres wide and have a slope no greater than 1 in 3.*

Objection No. 3

Condition 8.16.6 *Leachate holding tanks/lagoons shall be covered, and head gases vented to treatment as may be required by the agency.*

Basis of Objection

Leachate is treated at an on site treatment plant before being tankered off site for further treatment at a municipal wastewater treatment plant. The treatment plant consists of a lagoon, lined with high density polyethylene and containing two floating surface aerators to provide oxygen. The construction of the leachate lagoon was completed in December 1985 and it has been in operation since.

The EPA Landfill Manual Landfill Site Design states that aeration lagoons provide a flexible form of leachate treatment and can readily cope with a wide range of flows and strengths of leachate. Disadvantages listed include:

- Large heat losses due to surface area and mechanical aerators – nitrification is temperature sensitive.
- Odour and aerosol formation
- Not amenable to covering to conserve heat

In 2006 Louth County Council commissioned a report from Odour Monitoring Ireland (copy attached as appendix 2) to identify the risk of odour impact of the leachate holding lagoon on the surrounding population. This report concluded that the leachate treatment lagoon operation alone is not a significant source of odours and that it is unlikely that covering the leachate lagoon will significantly improve the elimination of risk of odour since it is such a non-significant odour emissions source in comparison to other odour sources within the landfill site.

The EPA manual points out that air stripping to remove dissolved methane is normally a requirement, where leachate is discharged to sewer without any other pre treatment. Raw leachate is often saturated with methane, containing up to 50 mg/l. Concentrations of methane as low as 0.5 mg/l in leachate can give rise to explosive concentrations of methane gas in atmospheres. However the manual states that there has been little research done into design criteria.

We wish to submit, that the leachate lagoon is not a significant source of odours and that it is unlikely that covering the leachate lagoon will significantly improve the elimination of risk of odour. We came to this conclusion based on our knowledge of the site and on the results of investigations carried out by odour consultants on our behalf. We further contend that the aeration lagoon is not amenable to covering and that doing so would create a confined space by creating the potential for build up of hazardous gases. Another of our concerns is the effect the proposal might have on the aeration process. Any reduction in the air supply is likely to adversely affect processes such as air stripping of methane and ammonia. **We therefore request that Condition 8.16.6 be removed.**

Objection No. 4

Schedule A: Waste Acceptance

Waste Type	Maximum (Tonnes per annum)
Industrial Non-Hazardous Sludges	300

Basis of Objection

Louth County Council previously requested a change in licence limits as below. (copy of letter to EPA dated 26th February 2007 attached as appendix 1)

Louth Co Co request a change to the licence condition to accepte 3,300 tonnes of this sludge per annum whilst maintaining the overall total of 96,000 tonnes /annum ie decrease industrial non hazardous solids to 31,700 tonnes / annum and increase industrial non hazardous sludges to 3,300 tonnes / annum

Proposed wording of condition

Schedule A: Waste Acceptance

Waste Type	Maximum (Tonnes per annum)
Industrial Non-Hazardous Sludges	3300

Objection No. 5

Condition 5.15 *Limit on Acceptance of BMW*

5.15.1 *Unless otherwise as may be specified by the Agency, the following limits shall apply:*
(i).....
(ii)....
(iii)....
Unless an alternative has been agreed in writing by the Agency in accordance with condition 5.15.2.

Basis of Objection

The double use of the word "unless" in 5.15.1 makes this condition unclear. It should be clarified whether this condition allows the Agency discretion on the BMW limits other than when an agreement is in place as specified in 5.15.2.

Whiteriver landfill predominantly serves a rural region with limited numbers of densely populated areas where separately collected kerbside collection systems are viable. It is unreasonable to expect such a landfill to achieve the same levels of diversion of BMW as landfills predominantly serving large urban areas and waste transfer stations. It is also not practical for local authorities to enter into the type of agreements envisaged in condition 5.15.2 with the private sector. Where such agreements are possible, they should in all cases be dealt with by way of technical amendment of the licences rather than a review of the "increasing" licences as proposed.

Proposed wording of condition

5.15.1 Delete "*Unless an alternative has been agreed in writing by the Agency in accordance with condition 5.15.2." from this condition.*

5.15.2 Replace second sentence with "Such agreement may be sought by technical amendment of any licence for a facility seeking an increase or decrease in the limits set out in condition 5.15.1"

Appendix 1

Mr. Eamonn Merriman,
Office of Environmental Enforcement,
Environmental Protection Agency,
East/North East Region,
McCumiskey House,
Richview,
Clonskeagh Road,
Dublin 14

Date: 26/02/2007

Our Ref: W0060-02/07/09

Re: Acceptance of Water Treatment Sludge from Dundalk Town Council

A Chara,

Whiteriver Landfill (W0060-02) currently accepts water treatment sludge (EWC 19 09 02) from Dundalk Town Council. The facility has a licence to accept 300 tonnes of this type of waste per annum. Dundalk Town Council have asked would it be possible to have the licence limit of 300 tonnes/annum increased to 3300 tonnes/annum in respect of Industrial Non-Hazardous Sludge to accommodate all the sludge from their water treatment plant. Can this be done within the scope of our existing licence by adjusting/revising the tonnages against certain waste categories (Table A1, Schedule A of the license) whilst maintaining the overall total of 96,000 tonnes/annum e.g. Decrease Industrial Non-Hazardous Solids to 31,700 tonnes/annum and increase Industrial Non-Hazardous Sludges to 3,300 tonnes/annum? Could this be done under Section 38 of the Protection of the Environment Act - "Additional power to amend waste licences"?

We are also seeking the Agency's views in relation to the definition of sludge in the waste licence (see below).

Sludge	The accumulation of solids resulting from chemical coagulation, flocculation and/or sedimentation after water or wastewater treatment with greater than 2% dry matter.

A comparison with other waste licences (see below) shows that other licences have upper limits on the dry solids content of sludge's i.e. Greenstar -Knockharley (W0146-1), Monaghan County Council (W0020-01), Greenstar – East Galway (W0178-1).

Sludge	The accumulation of solids resulting from chemical coagulation, flocculation and/or sedimentation after water or wastewater treatment with between 2% and 14% dry matter.

Would it be possible for the Agency to amend the definition of sludge in Whiteriver Landfills licence in line with that in the aforementioned licenses?

I look forward to your reply in relation to this matter.

Mise le meas

Damien O'Neill

ODOUR monitoring IRELAND

Appendix 2

ODOUR & ENVIRONMENTAL ENGINEERING CONSULTANTS

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ASSESSMENT OF PREDICTIVE ODOUR IMPACTS OF LEACHATE LAGOON LOCATED IN WHITERIVER LANDFILL, DUNLEER, CO. LOUTH.

PREPARED BY:	Dr. John Casey
ATTENTION:	Mr. Damien Holmes
DATE:	19th May 2006
REPORT NUMBER:	2005.A205
DOCUMENT VERSION:	Document Version 1

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1. INTRODUCTION

Following a conversation with Mr. Damien Holmes, Louth Co. Co., Odour Monitoring Ireland were commissioned to perform an odour audit of the Whiteriver landfill facility, Dunleer, Co. Louth in order to ascertain the significant emission points located within the landfill facility.

This initial report presented a summary of the findings of a PID leakage survey at Whiteriver landfill site and identified interim mitigation options for the control of odours from the operating site.

The objective of this report is to identify the risk of odour impact of the leachate holding tanks on the surround population.

The report is based on actual area odour samples taken during a site visit conducted on the 06th April 2006. This report provides predictive analysis of the measured odour threshold concentration and emission rate from the operating leachate lagoon during no-aeration and aeration.

The influent leachate lagoon is not covered. During aeration, the stripping of odourous compounds from the influent untreated leachate can occur. This would be the primary mechanism by which odour may be generated from this source. To a lesser extent, odours may be generated from tankering effluent off site due to turbulence during filling. The tankering of liquor offsite is infrequent and therefore a low risk source of odours.

The odour impact area of the leachate lagoon utilising dispersion modelling software in accordance with the specified guideline value of ≤1.5 Ou_E m^{-3} at the 98th and ≤3.0 Ou_E m^{-3} at the 99.5th percentiles using AERMOD Prime is assessed within this report. This will allow for the assessment of any significant odour risks on the surrounding population associated with the operation of the leachate lagoon within the operating landfill site.

Direct source olfactometry sampling was performed across the surface of the lagoon with the aid of an area flux-sampling device. Three years of meteorological data were screened to ascertain the worst-case met year. Source characteristics and topography were used to building the model interface to allow for accurate computation.

In conclusion, the leachate treatment lagoon operation alone is not a significant source of odours with all residences located outside the ≤1.5 Ou_E m^{-3} at the 98th of worst-case hourly averages. As this smaller odour source is operated in conjunction with other larger odour sources (i.e. flux of landfill gas) located within the landfill site, the combination of the leachate lagoon source and landfill gas flux could cause odour impact (*see Section 3.3*).

As present, significant mitigation and management measures are been incorporated into the operating landfill site located in Whiteriver landfill, Dunleer, Co. Louth. When all odour mitigation measured are implemented, the significant emission sources (i.e. flux of landfill gas) will be mitigated and risk of odour impact will be significantly reduced. It is unlikely that covering the leachate lagoon will significantly improve the elimination of risk of odour since it is such a non-significant odour emissions source in comparison to other odour sources within the landfill site.

It is recommended that the following odour management procedures are incorporated into the operation of the leachate lagoon. These include:

- Ensure dissolved oxygen concentration within aeration tanks is maintained greater than 1.0 to 1.5 mg/l.
- Ensure that any pumping or tankering of leachate is performed in enclosed system and back flushing/mixing of leachate is prevented from occurring. The leachate lagoon should be maintained in quiescence conditions during such tankering and emptying. Settled sludge at the base of the lagoon should not be mixed using pumped liquids from the leachate tanker.
- Ensure pumped leachate from landfill cells is pumped under the minimum working height of the leachate lagoon in order to prevent the volatilisation and stripping of odourous compounds from the raw untreated leachate.
- De-sludging of leachate lagoon should only occur when meteorological conditions are favourable for dispersion of odour away from sensitive receptors.

2. MATERIALS AND METHODS

This section describes the materials and methods used throughout this study.

2.1 Odour sampling

In order to transport air samples to the odour free laboratory for odour assessment, a static sampling method was used where air samples were collected in 60 litre Nalophan^{NA} bags using a vacuum sampling device over a 15-minutes period. The sampler operates on the 'lung principle', whereby the air is removed from a rigid container around the bag by an electrically powered vacuum pump. This causes the bag to fill through a stainless steel and PTFE tube whose inlet was placed in the odour stream, with the volume of sample equal to the volume of air evacuated from the rigid container. A sampling period of 15-minutes was used to eliminate smoothing of cyclic odour emission peaks. A total of 3 (no aeration) and 3 (during aeration) odour samples were taken. All samples were taken with the aid of an area-sampling device (see Section 2.2). All odour samples were taken on the 06th April 2006.

2.2 Area sampling

In order to measure the odour emission rate from area odour surfaces a calibrated wind flux chamber was used. The flux hood works on the principle of flux whereby a fixed clean odourless sweep air amount is introduced into the wind tunnel. Following a 20-minute sweep period, an odour sample is taken from exhaust odourous air. The introduced sweep air causes the mass transfer and volatilisation of odourous compounds from the exposed liquor. Sweep airflow rates are measured continuously using a Testo 400 handheld connected to a 63mm vane anemometer. Since sweep volumetric airflow rate, sampling area and odour threshold concentration is known, then the source specific odour emission flux could be calculated in Ou_E m^{-2} s^{-1} (Sheridan et al., 2002).

2.3 Olfactometry

An ECOMA TO8 dynamic yes/no olfactometer was used throughout the experimental period to determine the odour threshold concentration of the emission sources. 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 passed 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).

The odour threshold concentration was calculated according to the response of the panel members and is displayed in $Ou_E\ m^{-3}$, which referred to the physiological response from the panel equivalent to that elicited by 40ppb/v n-butanol evaporated in one cubic metre of neutral gas (CEN, 2003). Odour units are considered a dimensionless unit, but the pseudo-dimensions of $Ou_E\ m^{-3}$ have been commonly used for odour dispersion modelling, in place of 'grams m^{-3}'

2.3.1 Measurement of odour threshold concentration

A T08 dynamic dilution olfactometer was used to determine the odour threshold concentration of the emission sources. 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 will be selected as panellists for olfactometry measurements (CEN, 2003).

The odour threshold concentration is calculated according to the response of the panel members and is displayed in $Ou_E\ m^{-3}$, which referred to the physiological response from the panel equivalent to that elicited by 123µg m^{-3} n-butanol evaporated in one cubic metre of neutral gas (CEN, 2003). Odour units are considered a dimensionless unit, but the pseudo-dimensions of $Ou_E\ m^{-3}$ have been commonly used for odour dispersion modelling, in place of 'grams m^{-3}' (Sheridan, 2003).

2.3.2 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 ($Ou_E\ m^{-3}$).

Simply, one odour unit is the concentration of an odourant, which induces an odour sensation to 50% of a screen panel

Although odour concentration is a dimensionless number, by analogy, it is expressed as a concentration in odour units per cubic metre ($Ou_E\ m^{-3}$), a term which simplifies the calculation of odour emission rate. 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 123ug of n-butanol evaporated in one cubic meter of neutral gas at standard conditions (CEN, 2003).

2.4 Grab sampling of Hydrogen sulphide

A Jerome analyser (631 X) was used to measure the H_2S concentration in all odour-sampling bags and within buildings. This is a real time data-logging H_2S gold leaf analyser for the measurement of hydrogen sulphide concentration levels. The Jerome 631 X measures in the range from 3 ppb to 50ppm with 1 ppb resolution. This was the only analyser/measurement technique capable of measuring in such ranges. Five individual samples were taken on all

odour samples in order to ascertain the Hydrogen sulphide concentration and emission flux/rate of each sampled process. All results were converted to $\mu g\ m^{-3}$.

2.5 Odour emission rate

The measurement of the strength of a sample of odourous air is, however, only part of the problem of quantifying odour. Just as pollution from a stack is best quantified by a mass emission rate, the rate of production of an odour is best quantified by the odour emission rate. For a chimney or ventilation stack, this is equal to the odour threshold concentration ($Ou_E\ m^{-3}$) (i.e. sometimes refereed to Dilutions to threshold (DT) in USA) of the discharge air multiplied by its flow-rate ($m^3\ s^{-1}$). It is equal to the volume of air contaminated every second to the threshold odour limit ($Ou_E\ s^{-1}$). The odour emission rate can be used in conjunction with dispersion modelling in order to estimate the approximate radius of impact or complaint (Hobson et al, 1995). Area source mass emission rates/flux were calculated as $Ou_E\ m^{-2}\ s^{-1}$.

2.6 Dispersion modelling

Any material discharged into the atmosphere is carried along by the wind and diluted by the turbulence, which is always present in the atmosphere. This dispersion process has the effect of producing a plume of polluted air that is roughly cone shaped with the apex towards the source and can be mathematically described by the Gaussian equation (Carney and Dodd, 1989). Atmospheric dispersion modelling has been applied to the assessment and control of odours for many years, originally using Gaussian forms ISC (Industrial Source Complex) (Keddie et al., 1980) and more recently utilising advanced boundary-layer physics models such as ADMS (Atmospheric Dispersion Modelling Software) and AERMOD. Once the odour emission rate from the source is known, Ou_E's, the impact on the vicinity can be estimated.

These models can be applied to facilities in three different ways:

1. To assess the dispersion of odours and to correlate with complaints;
2. To estimate which source is causing greatest impact;
3. In a "reverse" mode, to estimate the maximum odour emissions which can be permitted from a site in order to prevent odour complaints occurring (Zannetti, 1990; McIntyre et al., 2000; Sheridan, 2002).

In this latter mode, models can be employed to predetermine the amount of abatement required to prevent odour complaints, therefore reducing capital investment in abatement technologies (Sheridan et al., 2001).

2.7 Meteorological Data

Three years worth of hourly sequential meteorology data representative of the area was used for the operation of AERMOD Prime. This allowed for the determination of the worst-case scenario for the overall impact of odour emissions from the facility on the surrounding vicinity. Dublin airport 2001 to 2003 inclusive was used for the study period.

2.8 Terrain Data

All major topographically features were accounted for within the dispersion modelling assessment. Ordnance 10m spaced Cartesian grid data was using for surrounding topography.

2.9 Dispersion model used

For this study BREEZE AERMOD Prime was used.

AERMOD Prime

AERMOD Prime (EPA Version 04300) was used during this section of the study. This model is a third generation model utilising advanced boundary-layer physics. The most important parameters needed in the meteorological data are wind speed, wind direction, Monin Obukhov length, mechanical mixing height, friction velocity, etc. for each hour. AERMOD is run with a sequence of hourly meteorological conditions to predict concentrations at receptors for averaging times of one hour up to a year. It is necessary to use many years of hourly data to develop a better understanding of the statistics of calculated short-term hourly peaks or of longer time averages. Utilities associated with the dispersion model allow computation of ground level concentrations of pollutants over defined statistical averaging periods, consideration of building wake/downwash effects and the effects of elevated terrain in the vicinity of the assessed facility.

2.10 Odour impact criteria

Odours from landfill operations arise mainly from the volatilisation/leakage of odourous gases produces from anaerobic digestion of organic matter. Some of the compounds emitted are characterised by their high odour intensity. A sample of a report carried out in the Netherlands ranking 20 generic and 20 environmental odours according to their like or dislike by a group of people professionally involved in odour management is illustrated in *Table 2.1* (EPA, 2001).

Table 2.1. Ranking of environmental odours according to like and dislike (i.e. odour character).

Environmental Odours	Mean dislike ranking	Odour impact criterion	Reference
Intensive Agriculture	12.8	≤3.0 Ou_E m^{-3} at the 98th percentile of hourly averages	EPA, 2002
Waste water treatment	12.9	≤1.50 Ou_E m^{-3} at the 98th percentile of hourly averages	EA, 2002
Green fraction composting	14.0	≤1.50 Ou_E m^{-3} at the 98th percentile of hourly averages	EA, 2002
Landfill	14.1	≤1.50 Ou_E m^{-3} at the 98th percentile of hourly averages	EA, 2002
Abattoir/Slaughter house operation	17.0	≤1.50 Ou_E m^{-3} at the 98th percentile of hourly averages	EPA, 2002

As can be observed, landfill odours are more dislikeable than intensive agricultural odours and wastewater treatment odours and more likeable than Abattoir/Slaughterhouse odours (see *Table 2.1*). Green fraction composting and landfill odours are similar in their dislike ability and therefore it is rational to suggest that a similar odour impact criterion may be used based on these facts.

In the UK, research performed by Longhurst (1998) established an odour impact criterion (odour concentration level that did not lead to significant complaint generation) of ≤3.0 Ou_E m^{-3} at the 98th percentile of hourly averages for Boghborough Landfill. Additionally, the UK

Environment Agency considers that odours from landfills are considered high risk and therefore have allocated an odour impact criterion of ≤1.50 Ou_E m^{-3} at the 98th percentile of hourly averages. It is quite evidential from the data presented that the odour impact criterion required to limit odour impact from landfills falls between the 1.50 and 3.0 Ou_E m^{-3} at the 98th percentile impact criterion (i.e. Dislike ability *Table 2.1*, the specific odour impact criterions presented in *Table 2.2*, and the odour impact criterion proposed and utilised by Longhurst (1998) and the Environment Agency).

Table 2.2. Odour annoyance criteria for odour dispersion modelling.

Odour Concentration Limit (Ou_E m^{-3})	Percentile value (%)	Application
Dutch (MPTER and Complex 1 Model)		
≤3.5	98th	Wastewater treatment works existing site, rural area or industrial estate.
≤3.0	98th	Compost facility existing site
≤1.5	98th	Wastewater treatment works new site, rural area or industrial estate.
English (ADMS model)		
≤5	98th	Waste water treatment works Greenfield site,
Environment Agency (EA 2002)		
≤1.5	98th	Limit value for Waste water treatment plants, landfills and other high risk odour categories
<3.0	98th	
Ireland (ISC ST Complex 1 section) (EPA 2002)		
≤1.5	98th	Target limit for new pig production facility/Limit value for tanning and mushroom compost industry
≤3.0	98th	Limit value for new pig production facility/Limit value for tanning and mushroom compost industry.
≤6.0	98th	Limit value for existing pig production facility
≤1.5	98th	Limit value for new abattoirs/slaughterhouses
≤5.0	98th	Limit value for existing abattoirs/slaughterhouses
England (Complex 1 model) (Longhurst (1998)		
≤3.0	98th	Acceptable guideline for elimination of significant odour impact in vicinity of landfill. Used for planning application for Boghborough Landfill

An odour threshold concentration of 1 Ou_E m^{-3} is the level at which an odour is detectable by 50% of screened panellists. According to research on wastewater treatment works, the odour recognition threshold is approximately 3-5 times this concentration and is liable to cause offence (3-5 Ou_E m^{-3}). An odour impact criterion of ≤ 5 Ou_E m^{-3} is implemented in England for wastewater treatment works (Newbiggin-by-the-Sea, Northumberland, 1993 Planning Board) and is accepted in planning applications for these facilities to limit odour impact (McIntyre et al., 2000). An odour impact criterion of ≤3.0 Ou_E m^{-3} is implemented in England for Boghborough Landfill and is accepted in the planning applications for this facility to limit odour

impact (Longhurst, 1998). Odours from abattoirs/slaughterhouses are considered more offensive than odours from landfills (see Table 2.1 and 2.2) and an odour impact criterion of ≤ 1.50 Ou_E m^{-3} at the 98th percentile was established by regulatory agency EPA to limit odour nuisance in this vicinity of such enterprises (EPA BAT Notes, 2002).

As odours from landfills are considered more hedonically unpleasant than odour from intensive agricultural facilities, but more likeable than odours from abattoirs/slaughterhouses, it would be more prudent to limit the possibilities of odour impact and apply an odour impact criterion of between 1.5 Ou_E m^{-3} and less than ≤3.0 Ou_E m^{-3} at the 98th percentile. In accordance with the arguments established within this Section, an odour annoyance criterion of between 1.50 Ou_E m^{-3} and less than 3.0 Ou_E m^{-3} should be implemented. These odour impact criterions will be presented and analysed within the odour risk dispersion modelling as presented in *Section 4*.

An odour impact criterion of ≤1.5 Ou_E m^{-3} at the 98th percentile of hourly averages is used to assess the long-term risk while ≤3.0 Ou_E m^{-3} at the 99.5th percentile of hourly averages is used to assess any short-term risk. This ≤3.0 Ou_E m^{-3} at the 98th percentile of hourly averages has been recommended by the Irish EPA for the assessment of odours from tanneries, mushroom composting facilities and intensive pig production enterprises in rural areas. The odour impact criterion used in this study is stricter.

3. RESULTS

3.1 Assessment of odour emission flux

The sampling locations and times chosen for each parameter are illustrated in *Table 3.1*. These sampling locations and times were chosen to assess the overall odour emission rate of the leachate lagoon during aeration and during no aeration.

Table 3.1. Sampling locations and times for assessment of aeration/non aeration process of leachate lagoon located within Whiteriver landfill.

Date	Lagoon (No aeration)	Lagoon (Aeration)	Approx. Sampling time	Analysis performed
06/04/06	White 1	White 4	15 minutes	Odour and H_2S
06/04/06	White 2	White 5	15 minutes	Odour and H_2S
06/04/06	White 3	White 6	15 minutes	Odour and H_2S

The results of all analysis performed on the leachate lagoon are presented within *Section 3.2*.

3.2 Odour threshold and Hydrogen sulphide concentrations.

Table 3.2 illustrates the geometric odour threshold concentrations measured upon the leachate lagoon during no aeration and aeration modes. The odour emission flux is the product of sweep air rate (m^3 s^{-1} by odour threshold concentration (Ou_E m^{-3}) divided by area (m^2). As can be observed in *Table 3.2*, the leachate lagoon odour emission flux increases during aeration mode. This is due to the stripping and volatilisation of odourous precursors from the leachate liquid.

Table 3.2. Odour emission flux from Leachate lagoon during operation

Sample identity	Process operation	Average Odour emission flux (Ou_E m^{-2} s^{-1})	Area (m^2)	Odour emission rate (Ou_E s^{-1})
White 1	No aeration	19.10	725	13,847
White 2	No aeration			
White 3	No aeration			
White 4	Aeration	12.20	725	8,845
White 5	Aeration			
White 6	Aeration			

Table 3.3 illustrates the average hydrogen sulphide concentrations measured upon leachate lagoon during no aeration and aeration modes of operation. When combined with volumetric airflow rate (m^3 s^{-1}), the overall hydrogen sulphide emission rate (μg s^{-1}) of the aeration tanks can be computed.

Table 3.3. Hydrogen sulphide emission flux from Leachate lagoon during operation

Sample identity	Process operation	Average H_2S emission flux (μg m^{-2} s^{-1})	Area (m^2)	Odour emission rate (μg s^{-1})
White 1	No aeration	0.43	725	312
White 2	No aeration			
White 3	No aeration			
White 4	Aeration	0.19	725	138
White 5	Aeration			
White 6	Aeration			

3.3 Dispersion modelling

Table 3.4 illustrates the overall exhaust stream characteristics used within the dispersion modelling assessment. This data is inputted into the dispersion model whereby maximum downwind ground level concentrations (GLC's) of odour are predicted for a worst-case meteorological file. Dublin Airport 2001 to 2003 inclusive was used to calculate the dispersion estimates. These computations give the odour concentration at each 10-meter x y Cartesian grid receptor location that is predicted to be exceeded for 0.5% and 2% (175 hours) of the worst-case year.

This will allow for the predictive analysis of any potential impact on the neighbouring sensitive locations while the leachate lagoon is in operation. It will also allow the operators of the landfill site to assess the effectiveness of their proposed odour abatement/minimisation strategies for future operations. The intensity of the odour from the two or more sources of the landfill operation will depend on the strength of the initial odour threshold concentration from the sources and the distance downwind at which the prediction and/or measurement is being made. Where the odour emission plumes from a number of sources combine downwind, then the predicted odour concentrations may be higher than that resulting from an individual emission source. It is important to note that various odour sources have different odour characters. This is important when assessing those odour sources to minimise and/or abate. Although an odour source may have a high odour emission rate, the corresponding odour intensity (strength) may be low and therefore it is easily diluted. Those sources that express the same odour character, as an odour impact should be investigated first for

abatement/minimisation before other sources are examined as these sources are the driving force behind the character of the perceived odour.

The odour contour maps for the predicted GLC of odour are presented in Appendix 1 (*see Figure 6.1 and 6.2*).

3.4 Leachate lagoon operation-No aeration

Figure 6.1 illustrates the odour plume spread during no aeration. As can be observed, the odour plume spread is radial with a plume spread of approximately 140 metres to the northwest from the boundary of the landfill. All residential/amenity or industrial facilities will perceive an odour concentration less than 1.50 Ou_E m^{-3} for 175 hours in a worst-case meteorological year. In keeping with the odour impact criterion presented in *Section 2.10*, the leachate lagoon will cause no significant odour impact.

3.5 Leachate lagoon operation-Aeration

Figure 6.2 illustrates the odour plume spread during aeration. As can be observed, the odour plume spread is radial with a plume spread of approximately 220 metres to the northwest from the boundary of the landfill. All residential/amenity or industrial facilities will perceive an odour concentration less than 1.50 Ou_E m^{-3} for 175 hours in a worst-case meteorological year. In keeping with the odour impact criterion presented in *Section 2.10*, the leachate lagoon will cause no significant odour impact.

Additionally the short term odour impact associated with the continuous operation of the leachate lagoon were assessed. As can be observed in *Figures 6.1 and 6.2*, no short-term odour impacts will be perceived by residential receptors living in the vicinity of the leachate lagoon. Strict operating protocols will required to be maintained upon the leachate lagoon in order to prevent any puff odour emissions during emptying or desludging.

4. Conclusions

The following conclusions were drawn:

1) The currently operating leachate treatment plant is not causing any significant odour impact in the vicinity of the operating plant.
2) Following dispersion modelling assessment using the conservative third generation dispersion model AERMOD Prime, all GLC's at or beyond the boundary were below 3.0 Ou_E m^{-3} at the 98th, and 99.5th percentile for a worst-case meteorological year. No residential properties were incorporated by this odour impact criterion. It is therefore concluded that no predicted odour impacts will be generated from the currently operating leachate lagoon.

5. Recommendations

The following recommendations are presented:

- Ensure dissolved oxygen concentration within aeration tanks is maintained greater than 1.0 to 1.5 mg/l.
- Ensure that any pumping or tankering of leachate is performed in enclosed system and back flushing/mixing of leachate is prevented from occurring. The leachate lagoon should be maintained in quiescence conditions during such tankering and emptying. Settled sludge at the base of the lagoon should not be mixed using pumped liquids from the leachate tanker.

- Ensure pumped leachate from landfill cells is pumped under the minimum working height of the leachate lagoon in order to prevent the volatilisation and stripping of odourous compounds from the raw untreated leachate.
- De-sludging of leachate lagoon should only occur when meteorological conditions are favourable for dispersion of odour away from sensitive receptors.

6. APPENDIX 1-ODOUR CONTOURS FOR LEACHATE TREATMENT PLANT.

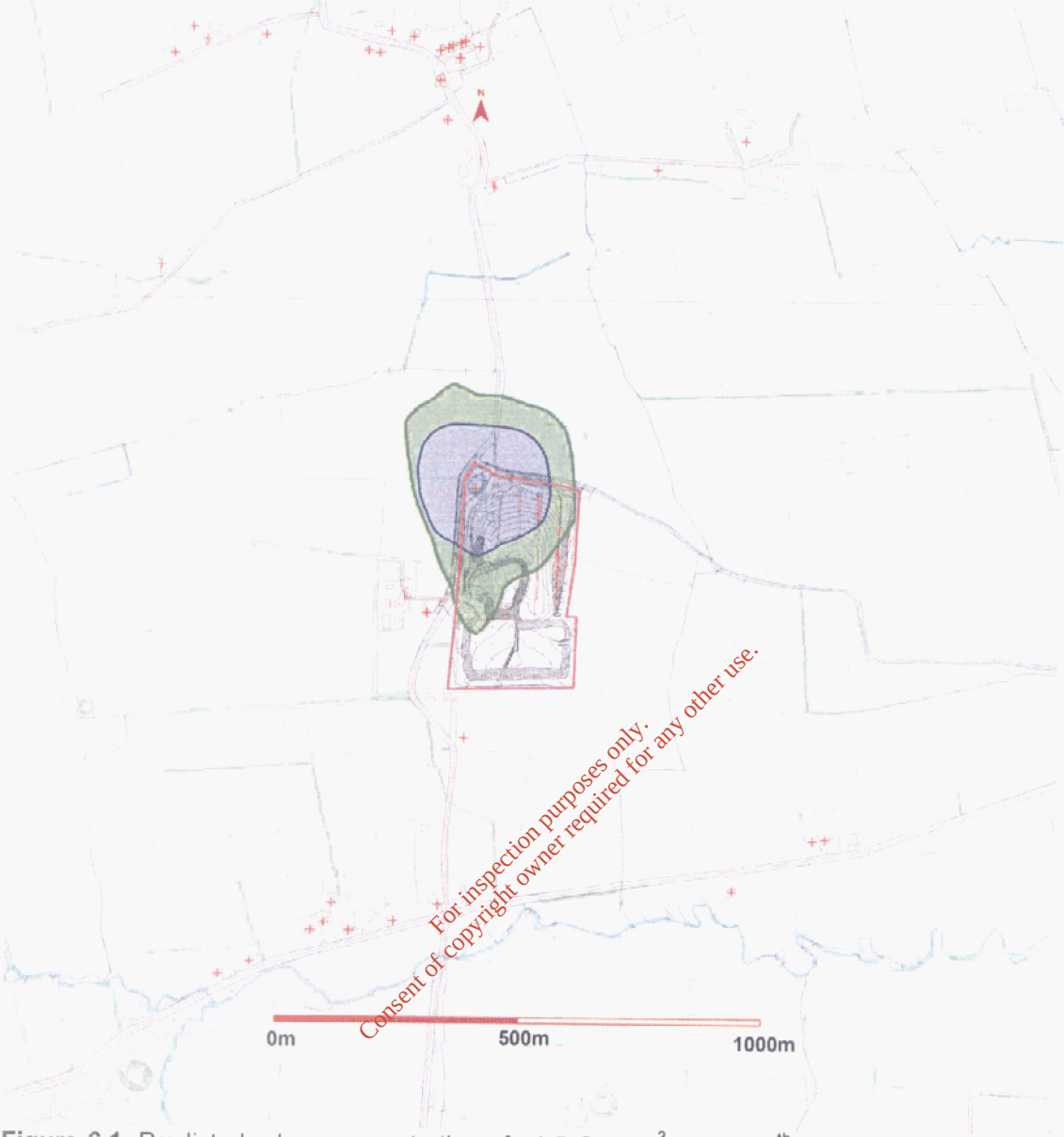

Figure 6.1. Predicted odour concentration of ≤1.5 Ou_E m^{-3} at the 98th percentile (———)and predicted odour concentration of ≤3.0 Ou_E m^{-3} at the 99.5th percentile (———) for Leachate lagoon during **No Aeration** located in Whiteriver landfill, Dunleer, Co. Louth.

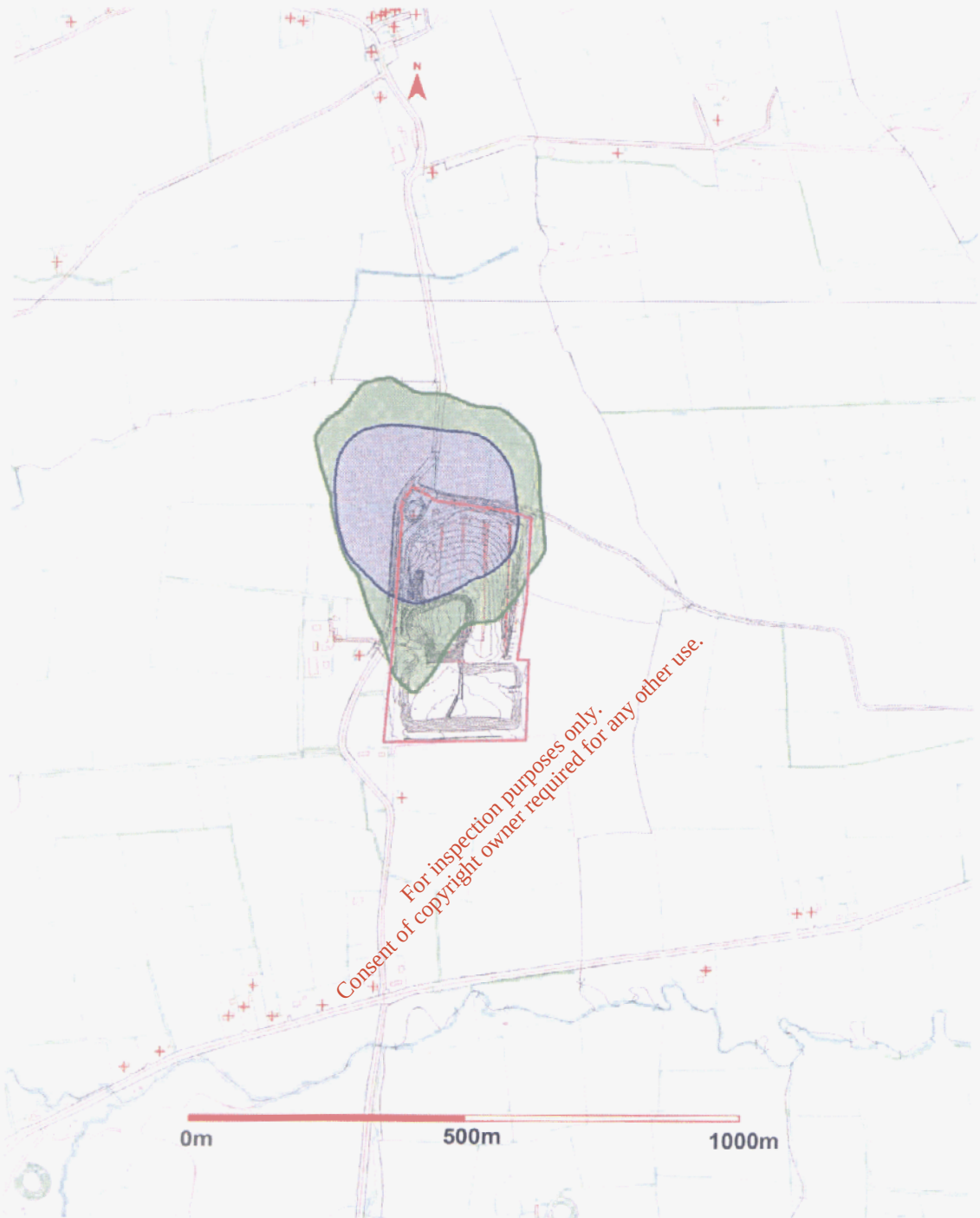

Figure 6.2. Predicted odour concentration of ≤1.5 Ou_E m^{-3} at the 98th percentile ( )and predicted odour concentration of ≤3.0 Ou_E m^{-3} at the 99.5th percentile ( ) for Leachate lagoon during **Aeration** located in Whiteriver landfill, Dunleer, Co. Louth.

Ann Kehoe

From:	Eamonn Walsh [eamonn.walsh@louthcoco.ie]
Sent:	16 November 2009 16:57
To:	Licensing Staff
Subject:	New Applicant objection entered for Reg no: W0060-03. (Reference Number: W0060-03-091116045705)
Importance:	High
Attachments:	Objection.doc; Appendix 1.doc; Appendix 2.doc

Title:	Mr
First Name:	Eamonn
SurName:	Walsh
Organisation Name:	Louth County Council
Address Line 1:	County Hall
Address Line 2:	Millennium Centre
Address Line 3:	Dundalk
County:	Louth
Post Code:	0000
Phone Number:	
Email:	eamonn.walsh@louthcoco.ie
Objector Type:	Applicant
Oral Hearing:	No

Ann Kehoe

From: Licensing Staff
Sent: 16 November 2009 16:59
To: eamonn.walsh@louthcoco.ie
Cc: Licensing Staff
Subject: Successful Objection Payment for Licence Number W0060-03. (Reference Number: W0060-03-091116045705)

Thank you for your online Applicant Objection for licence number W0060-03.Your objection has been received by the Environmental Protection Agency and will be acknowledged once the Objection has been validated.

A fee of €500 will be debited from your credit card once the objection has been confirmed.

Your reference number is W0060-03-091116045705. Please retain this for future reference.

Regards,

Environmental Protection Agency

Ann Kehoe

From: Licensing Staff
Sent: 17 November 2009 08:58
To: Accounts Receivable
Subject: FW: Successful Objection Payment for Licence Number W0060-03. (Reference Number: W0060-03-091116045705)

Please process online objection fee

Regards
Ann

From: Licensing Staff
Sent: 16 November 2009 16:59
To: eamonn.walsh@louthcoco.ie
Cc: Licensing Staff
Subject: Successful Objection Payment for Licence Number W0060-03. (Reference Number: W0060-03-091116045705)

Thank you for your online Applicant Objection for licence number W0060-03.Your objection has been received by the Environmental Protection Agency and will be acknowledged once the Objection has been validated.

A fee of €500 will be debited from your credit card once the objection has been confirmed.

Your reference number is W0060-03-091116045705. Please retain this for future reference.

Regards,

Environmental Protection Agency