

## The Southern Metropolitan Regional Council Regional Resource Recovery Centre Odour, Health and Management

This report provides an overview summary of reports, listed below, that are held by the Department of Health (DOH). The reports relate to potential health risks posed to the residential area around the Regional Resource Recovery Centre (RRRC) from air emissions from the RRRC. The concern of the residents living close to the RRRC is odour and hence the reports focus primarily on health effects, assessment and management of odour.

1. *Preliminary health risk assessment of air emissions from SMRC composting facility at Canningvale.* Toxikos (Toxicology Consultants), March 2008.
2. *Report on health complaints associated with the Southern Metropolitan Regional Council Regional Resource Recovery Centre.* DOH, April 2008.
3. *Preliminary SMRC field odour survey report.* Department of Environment & Conservation, June 2008.
4. *Experience of and attitudes towards local environmental issues.* Patterson Market Research, August 2008.
5. *Final Reports from odour investigations around the Southern Metropolitan Regional Council, Regional Resource Recovery Centre.* DEC, October 2008.
6. *Electronic spreadsheet of GP survey.* DOH, December 2008.
7. *Rapid assessment of presentations to GPs.* DOH, December 2008.

### Background

The Southern Metropolitan Regional Council (SMRC) operates a Regional Resource Recovery Centre (RRRC) in Canningvale. A major activity of the RRRC is waste composting. The waste composting facility has been at the centre of a significant number of odour complaints from the community. Soon after the RRRC was commissioned in 2006 residents began complaining of odours. The Canning Melville Community Odour Action Group (CMCOAG) was formed to capture complaints in a single web based registry with view to reporting the residents' concerns regarding odours attributed to the RRRC back to SMRC, State government regulators, local government and other government officials. Between November 2006 and April 2008 over 200 complaints were logged on the CMCOAGs website.

The SMRC commissioned three different studies between July 2006 and June 2007 to analyse the air in and around the facility in response to community complaints. The results of these studies along with a discussion of the limitations of the studies forms part of the Toxikos report (Report # 1). A summary of these studies is provided in the overview summary that follows.




The Department of Environment and Conservation (DEC) as the lead agency and State regulator investigated the odour complaints associated with the RRRC. The Air Quality Management Branch (AQMB) of the DEC undertook an investigation of odours over a three month period from March to May 2008. The aims were to collect evidence of odour and air quality impacts in the neighbourhood of the RRRC and to characterise the nature and extent of odour and air quality impacts that could be reasonably attributed to emissions from the RRRC (Report # 3). DEC also commissioned a telephone survey of residents in the area as part of this investigation (Report # 4). The DEC later completed analysis of the odour study and reported the findings in conjunction with the telephone survey study (Report #5).

The DOH undertook a preliminary analysis of symptoms reported by the residents on the CMCOAG website to assess if the symptoms were consistent with those commonly associated with odour nuisance (Report # 2). The DOH indicated to the community and DEC that because of the complex nature of odours, the presence of strong odours could cause symptoms of headache and nausea. DOH further indicated that this could occur despite the levels of compounds in the air complying with health-based thresholds for air quality and odour. The DOH recommended that SMRC undertake a Health Risk Assessment (HRA) to justify SMRCs claim that emissions from the RRRC do not pose a health risk to the community (Report # 1). The DOH also undertook a retrospective survey of local GPs to assess the impact of odours and the RRRC on health and well-being in the residential areas (Reports # 6 & 7).

### **Overview Summary of Reports**

Residential areas are typically the most sensitive areas to industrial odours, and as such any complaints of objectionable or offensive odour effects from such areas should be investigated from within the area in question. The SMRC commissioned three studies between July 2006 and June 2007 in response to odour complaints from within residential areas close to the RRRC; the findings are detailed in the Toxikos HRA report (Report # 1). The studies identified that a large range of volatile organic compounds (VOCs) were being released from the facility at the times of testing. These chemicals were typical of emissions from such facilities. Estimates of air concentration or odour concentration were made at the boundary of the RRRC and from different areas within the waste composting facility including air released from the biofilters. Limonene, mercaptans and alkyl aromatic compounds were found to be in relatively high concentrations however, a systematic investigation of the concentration and impact of these chemicals from within the residential areas was not done and as such no conclusions can be reached on the degree to which the residents may have been adversely impacted by these chemicals. The list of chemicals identified in the studies is too long to reproduce here instead the reader is referred to the Toxikos HRA report.



Another aim of one of the studies was to identify a chemical that could act as a marker for emissions from the RRRC. While such a unique chemical was not identified, Toxikos indicates that limonene could serve as a marker for emissions from the biofilters. The biofilters were considered to be the major source of emissions to ambient air from the RRRC waste composting facility and all three studies showed that limonene was the biofilter emission constituent with the highest concentration.

The DEC aimed to characterise the odours by undertaking an odour survey in the residential and industrial areas around the RRRC. Trained odour assessors 'sniffed' the air according to a predefined protocol and recorded odour intensity and quality. The survey locations were determined from a spatial analysis of complaints from the DEC's complaints database. The complaints were analysed for seasonal and temporal variability. Complaints appeared to peak in the late afternoon to early evening from 4pm to 10pm and early morning from 5am to 9am during the hotter months. Complaints during these periods correlated to wind directions that were least favourable for dispersing odours away from residential areas. Sampling occurred over 5 days from the 8<sup>th</sup> to the 16<sup>th</sup> of April, 2008 based on predicted wind directions. Complaints received during the sampling period were also investigated. VOCs in the air were sampled close to the boundary of the RRRC. A gas chromatograph was located opposite the RRRC across Banister road in a bus depot downwind of the facility and chemical samples were collected during the day between March 28<sup>th</sup> and April 5<sup>th</sup>. Emphasis was placed on detecting limonene and pinene as these chemicals dominated the community canister sampling previously undertaken by DEC. The assumption was that the community canister sampling detected the odourants that were causing the odour complaints.

The odour surveyors collected over 7000 data points; 34% of the odours were attributed to the RRRC. Compost, greenwaste and garbage odours were the most commonly detected odour with compost odour by far the most dominant odour detected 65% of the time compared to >20% for the others. Odours attributable to the biofilters were detected less than 5% of the time. The result would suggest that the biofilters were not the main source of the odours. Odour surveyors reported that odours were readily detected up to 1000 m from the RRRC but changed rapidly in quality and intensity. The pattern of odour detection suggests that odours are transient and tend to localise in narrow plumes or pockets in the residential areas. Rapid dissipation of odour and narrow localisation of odour explains why DEC officers responding to odour complaints may smell nothing on arrival. Chemical sampling detected more than 70 compounds upwind and downwind of the RRRC. The majority of chemicals detected were below 50 ppb except limonene, 1 hexanol-2 ethyl and two unknown compounds that occurred frequently at concentrations up to 200 ppb. DEC noted that limonene concentrations were higher downwind of the RRRC. Reference was made to just one of the unknown compounds as being attributed to sources other than the RRRC. The DEC concluded, "the RRRC was the most significant source contributing to odours in the area." and "Results from the chemical sampling were inconclusive." It should be noted


that it is not certain that all the chemicals in the air were found or that the limit of detection for an odiferous chemical was above its odour threshold.

A random telephone survey of residents and businesses within 500m and 1200m of the RRRC was conducted by Patterson Marketing Research (PMR) that introduced the survey as a “survey about the environmental impacts that people from various parts of Perth experience from time to time.” Approximately 93% of residents within 600m of the RRRC reported odours and 64 % of residents within 1200m of the RRRC reported odours. Compared to responses from similar surveys of residents living around sewerage treatment plants PMR found that a greater majority of residents reported odours. The surveyed residents more often (85-95%) reported smelling odours and all ‘organic type’ odours tended to be attributed to the RRRC. For instance odours such as rotten egg smell and sewerage that is not typical of emissions from such facilities. Only 12% of those surveyed believed that upgrades to the RRRC intended to combat odours were successful. PMR concluded that “there is a genuine odour issue at the plant, which is causing considerable discomfort to nearby residents.”

The relationship between environmental odours and symptoms is a complex one and consequently the relationship between cause and effect can be difficult to determine. The DOH analysed the frequency and type of physical symptoms reported by the residents on the CMCOAG website to assess if the symptoms were consistent with those commonly associated with odour nuisance. Over 200 complaints were registered on the website of which of which 62 complaints referred specifically to physical symptoms attributed to odours from the RRRC waste composting facility.


Complaints reports were available spanning 30 weeks between 26<sup>th</sup> November 2006 and 15<sup>th</sup> June 2007 and, five weeks over March and April 2008. Four complainants were responsible for 73% of complaints during 2006/7 and 44% of complaints in 2008. Residents reported non-specific symptoms of irritation of mucus membranes and skin, breathing difficulties, headaches, nausea, disturbed sleep, dizziness, gagging and nose bleeds. Mucous membrane and respiratory irritation were most commonly reported. Overall, the reported symptoms were typical of those commonly associated with odour nuisance except for those of one complainant who reported six episodes of nose bleeds which warranted further investigation. The DOH analysis of the health complaints showed some changes in the pattern of health complaints over time however much uncertainty is associated with this finding in view of the data collection method and limitations of the data. Engineering improvements to decrease odours have also taken place at the RRRC since some of the data was collected hence further analysis of data is needed.

DOH undertook a survey of the local General Practitioners (GPs) to investigate the influence of odours on the well being of the community. No reports of health affects purported to be associated with odours in the residential areas have been presented directly to the DOH by individuals, local GPs or the area hospitals despite residents discussing symptoms on the CMCOAG website. Five GP practices closest to the RRRC were contacted for



comment. Three practices commented that no patients mentioned the RRC. One GP saw more 'hay fever' type symptoms and one GP, who saw patients that lived close to the RRRC, said some patients complained of smells from the RRRC and other industries however presenting symptoms were not attributed to industry emissions. Overall the GPs reported no irritation symptoms or nosebleeds in excess of what would be normally expected. It should be noted that although patients tend to see GPs within the residential area where the patients live, residents may not wish to consult a GP specifically for nuisance irritation. Residents may also not be able to see a GP in a timely fashion or they may choose to present to a hospital for assessment.

Given the inventory of chemicals, odour complaints and depth of feeling in the community (as confirmed by the DEC and SMRC investigation) towards the RRRC, DOH deemed it important to distinguish between olfaction and sensory irritation and potential toxicological effects such as specific organ toxicity, and carcinogenesis. The Toxikos report commissioned by the SMRC provides a screening risk assessment for potential health effects that may be associated with air emissions from the RRRC. Toxikos used air quality data obtained by DEC and SMRC prior to upgrading the facility for the risk analysis and hence the data was purported to be representative of much higher concentrations of chemicals than would be released subsequent to the upgrades. Toxikos indicated that emissions from the RRRC were typical of those from similar facilities however; there were no clearly definable chemical emissions from the RRRC. Toxikos indicated that it was possible that residents closest to the RRRC experienced odour episodes arising from the RRRC under unfavourable wind conditions and even during low concentrations of odiferous chemicals. Reduced sulphur compounds and limonene are likely to have contributed to odour events in the community as these were consistently reported in concentrations significantly above their odour thresholds in and around the facility. Toxikos indicates that odour events can occur even when chemicals in the air are below the odour threshold because once mixed in the air, they can collectively exceed the threshold concentration and cause complaints. It is also possible for certain chemicals in combination to exceed an irritation threshold. However this did not appear to be the case because the concentrations of the chemicals in the emissions components were consistently and significantly below the irritation threshold both individually and in combination. It should be noted that the bulk of the air-quality data supplied to Toxikos was collected from within or at the boundary of the facility. To compensate for the lack of community based air-quality data Toxikos assumed the highest reported concentrations of chemicals to be representative from within the community. Toxikos concluded that health effects were unlikely from individual chemicals or mixtures of chemicals contained in the emissions from the RRRC under the traditional mechanisms of toxicology. However, not all pathophysiological mechanisms can be defined by toxicology and other mechanisms involving attitudinal and behavioural responses to odour may prevail. Even though an odour is an unreliable indicator of a harmful effect and odour is not a measure of toxicity, a human response to repeated offensive odour events can progress from worrying about harm, to an acute stress state culminating in real symptoms.



Toxikos provides a detailed discussion of the indirect health effects of odour in their report.

Based on the experience of Toxikos, DOH and other national and international agencies there are a number of key issues that limit the effective and consistent assessment of industrial odours. These include:

- the subjective definition of what may be deemed to be an objectionable and offensive odour;
- the selection of the most appropriate odour assessment tools and how these can be most effectively implemented to assess the extent of adverse odour effects;
- the restrictive common interpretation of what constitutes an adverse odour effect;
- the absence of objective criteria for indicating when significant adverse odour effects are likely to occur beyond the use of odour complaints monitoring;
- the need for a common basis for linking different odour assessment and monitoring tools objectively; the development of useful odour-modelling concentration guidelines that are effects-based and appropriate to differing circumstances.

Public health professionals and regulators are often challenged by odour complaints and while an important first step is to catalogue the chemicals involved and to assess their irritant and toxic potentials, it is equally important not to dismiss complaints based on non-toxicological explanations for odour related symptoms.

#### **DOH Conclusion and Future Considerations.**

Taking into account the various reports, DOH agrees residential areas surrounding the RRRC are experiencing odours attributable to the RRRC. The odour events although not causing clearly defined toxicological health effects are nevertheless causing residents significant discomfort from non-toxicological health effects. For many individuals the frequent odour events has lead to all odour events being attributed to the RRRC. For a few individuals the response to frequent odour events has lead to physiological symptoms. Regulators should consider using 'population annoyance' as an indicator of odour impacts on a community in addition to the more conventional monitoring and site investigation tools. Traditional air quality measurements may be insufficient to determine non-toxicological health effects. It is important for regulators to note that acute reactions to offensive odours can lead to chronic psychological stress over time with repeated odour events.