The Role of Stakeholders in HIA: A Landfill Site and Housing Development in Mundijong, Western Australia

Marie Little[1], Jaya Earnest[1], Jeffery Spickett[2] & Dianne Katscherian[3]

[1]Centre for International Health, Curtin University of Technology, [2]WHO Collaborating Centre in Environmental Health Impact Assessment, School of Public Health, Curtin University of Technology, [3]Environmental Health Directorate, Department of Health, Western Australia & Murdoch University

The use of Health Impact Assessment (HIA) as a tool to identify and manage issues relating to health has not been widely adopted in Western Australia. Health Impact Assessment methodology was applied to two concurrent developments in the Shire of Serpentine Jarrahdale, Western Australia. Potential health impacts of the expansion of a sanitary landfill adjacent to a proposed housing development were identified following a literature review and stakeholder interviews. Recommendations to assess the risk to the community in the housing estate through quantitative analysis, and risk management strategies were provided to the Shire. The ability of an existing stakeholder group for the landfill, the South Cardup Landfill Stakeholder Consultative Group, to resolve concerns of the community relating to environmental and social issues were also evaluated. Recommendations to improve collaborative decision making were provided to the Stakeholder Group using the Framework for Democratic Science. The outcomes of the HIA informed the Shire of potential health impacts to assist decision making during the development application process and the design of a local District Structure Plan.

Key words: *Health Impact Assessment; Sanitary Landfill, Housing Estate, Stakeholders*

Health Impact Assessment

A Health Impact Assessment (HIA) is "the process of estimating the potential impact of a chemical, biological, physical or social agent on a specific human population system under a specific set of conditions and for a certain timeframe" (enHealth 2001 p. v). The Western Australia State Sustainability Strategy, *Hope for the Future*, recommends that HIAs are adopted by health authorities to support sustainable development (Government of Western Australia 2003), however, implementation of HIA by local government has not been widely adopted.

The Shire of Serpentine Jarrahdale (SJ Shire) Environmental Health Services team recognised an opportunity to incorporate a HIA for two concurrent developments, the expansion of an existing landfill facility, and a proposed housing development adjacent to the landfill in Mundijong Western Australia. The health impacts identified would then be available to inform decision making for conditions for approval and to guide the development of a District Structure Plan for the suburb (SJ Shire 2006a). This study identified potential health impacts of the developments through a literature review and stakeholder interviews (University of New South Wales 2006). As the focus of this study was stakeholder involvement, quantitative assessment of factors such as air quality and noise modelling was not undertaken.

The aims of the study were to:

- Identify the potential health impacts of concern to the stakeholder group;

- Evaluate the ability of the stakeholder group to resolve concerns of the community regarding social and environmental issues; and,

- Recommend strategies to enhance stakeholder involvement and hence promote participatory decision making.

The Landfill Site and Housing Development

The landfill expansion was approved by the WA Minister for the Environment in 2006 despite Council opposition (SJ Shire 2006b). The approval was subject to a number of conditions that included a review of the existing stakeholder group for the landfill site (South Cardup Landfill Stakeholder Consultative Group). South Cardup Landfill is a privately owned landfill that is currently operating with a Class II license; the proprietors sought to expand two existing cells into one super-cell that extends the life of the landfill for a further seven years (Environmental Protection Authority 2006). The landfill accepts clean fill, type 1 and 2 inert wastes, putrescible waste and type 1 and 2 special waste (Western Australia Department of Environment 2004). This waste includes municipal waste, asbestos, animal manure and carcasses, office waste and demolition waste (Western Australia Department of Environment 2005). The Urban Pacific site is an area of approximately 504 hectares located in the 'Whitby' locality in Serpentine Jarrahdale and will potentially house up to 8000 new inhabitants as close as 850 metres to the landfill (Office of the Appeals Convenor, Environmental Protection Act 1986 2006).

Stakeholder Consultative Group

The South Cardup Landfill Stakeholder Consultative Group was formed in late 2004 with the objective of meeting monthly to discuss community concerns relating to the landfill. The initial group included an SJ Shire officer and council member, representatives from the Department of Environment, Western Australian Landfill Services (WALS), a representative for the Contaminated Sites Alliance and the local ratepayers association (Stass Environmental 2004). The Minister for the Environment approved the expansion of the landfill, and gave the following recommendations to the stakeholder group:

1. A review of the current structure and terms of reference for the Stakeholder Consultation Group;

2. Appointment of an independent chairperson for the Stakeholder Consultation Group in consultation with stakeholders;

3. Identification of relevant stakeholders;

4. An outline of opportunities to discuss the management plans, monitoring programmes and studies with stakeholders;

5. Reporting on environmental performance; and,

6. A review of current methods of communication with stakeholders and the community (Minister for the Environment 2006, p. 3).

These issues were evaluated along with the group's ability to resolve issues of environmental and social concern.

Methods

A health impact assessment of the South Cardup Landfill expansion and the Urban Pacific Housing development in Mundijong was undertaken by the first author in early 2007. Health Impact Assessment methodology described by the enHealth Guidelines (2001) was the framework that

underpinned the assessment. A preliminary screening assessment indicated that the projects were of an appropriate scale and interest to conduct a HIA. Scoping of the projects was conducted using the following steps:

1. A literature review that generated a comprehensive list of positive and negative health impacts of similar projects in Australia and abroad;

2. Profiling of the projects that included an analysis of population trends for the suburb, given the population at risk would largely consist of the future residents of the housing estate;

3. Semi-structured interviews with stakeholders based on focus questions that compared concerns of group members with best practise principles described in the literature. Six telephonic interviews were conducted with members of the South Cardup Landfill Stakeholder Group (Abramson & Abramson 1999).

4. The overall evaluation of the stakeholder group was based on these interview results, literature review, and analysis of the minutes of the meetings between stakeholder members;

5. Finally, recommendations to improve collaborative decision making were proposed and were based around the Framework for Democratic Science (Charnely 2000).

Quantitative data are unavailable for this study as the proponents' had not yet undertaken analysis such as water sampling or odour modelling as part of the Shire's development application conditions for approval. This type of quantitative assessment was outside the scope of this study due to time and financial constraints (Donelly, Dalal-Clayton & Hughes 1998).

Results

Screening

The Screening Tools identified in the enHealth HIA Guidelines (2001) indicated that a HIA would be suitable for both developments. A literature review examined possible factors that would lead to positive or negative health impacts, and a health impact matrix was developed that identified the factor, health impact, population at risk and probability of occurrence (enHealth 2001).

Scoping

The landfill expansion has several environmental factors which might influence health that include air quality (biogases, volatile organic compounds [VOCs], odours, litter and dust), along with noise, fire, vermin and emission of leachate. Social factors that might influence health include declining property values, access to employment, impact on vulnerable groups, the visual impact of the landfill, and management of complaints regarding the landfill by the proprietor and government agencies (Health Canada 2005). Negative health impacts experienced by communities adjacent to landfill can include neurological and respiratory conditions, with decreases in self reported symptoms correlating with distance from the landfill (Wright 2003).

The housing development has a number of environmental and social factors that will influence health which include noise, airborne waste, fire risk, physical activity of inhabitants, vector breeding sites, retention of native landscape and water bodies (Western Australian Planning Commission 2000). Social factors that influence health include suburb density and housing affordability, community facilities, street lighting, transport, access to facilities, economic and employment opportunities, and local development and community networks (Community and Disability Services 2004).

Profiling

Trend data indicate that the biggest increases in the population of SJ Shire will be in the elderly and the 0-4 age groups (Stoneham and Associates 2005). These groups are vulnerable to environmental health risks due to compromised or underdeveloped immune status (enHealth 2002). A qualitative assessment of health behaviour factors would have contributed to the study, however, as the population does not yet reside at the housing estate this was not undertaken (Institute of Public Health Scotland 2001).

Risk Assessment and Management

Risk assessment and management requires quantitative assessment of factors such as noise, odour and gas (Department of Health 2006) to guide appropriate decision making. Health impacts identified in this study were used to inform SJ Shire during the development application process. SJ Shire requested noise, odour and gas assessments from the landfill proprietor along with other conditions. The matter was reviewed through a State Administrative Tribunal (SAT) following a failure to negotiate with the proponent. The expansion of the landfill was approved through this process, and improvements to the environmental monitoring conditions and standards include gas and odour modelling from all potential sources of the landfill on a regular basis during its operation (Government of Western Australia 2007).

Stakeholder Evaluation

Some stakeholders have presented concerns in meetings that subsequent analysis by the proponent has lacked scientific rigour in determining actual risk (not carried out to the relevant standard), such issues should be addressed to improve the risk communication process (quality and comparability of data). Issues of environmental concern presented by the stakeholder members include whether contamination has occurred to groundwater, surface water and air, and what type of remedial action will be taken (Stass Environmental 2005). Bore monitoring results that are carried out to determine potential leachate contamination of groundwater have lengthy delays in reporting results to stakeholders which has limited their ability to evaluate this information. This has occurred on occasions where resampling of bore sites is required. One stakeholder believed this was an opportunity for anomalous results to be rectified. Before results were reported back to the group.

The detection of elevated levels of arsenic in a bore water sampling site, along with methane and benzene, toluene, ethylbenzene and xylene (BTEX), have concerned some stakeholders as these are signatures of leachate and might be indicative of leachate contamination of groundwater (Stass Environmental 2005). Some stakeholders believe that the Department of Environment and Conservation (DEC) should have greater input at the stakeholder meetings with regard to these results. In order to improve the interpretation of the data an independent person from the process (approved by both parties) could present information, along with the consultants, to improve the issues of trust and credibility of the data (National Environment Protection Council 1999).

Some stakeholders believe that the risk is not being properly managed and that the source of increased levels of some metal compounds and other contaminants reported in the groundwater sampled is consistent with leachate signatures and is not naturally occurring as suggested by the consultants. Further, the issue of air contamination (including methane and VOCs) has not been assessed by regulatory authorities by any quantitative assessment methods. The proponent has provided a facilitator for the group and has had environmental monitoring conducted by independent consultants. Some of the stakeholders have trust issues with this

as the proponent is paying these parties to present information and coordinate the flow of information. Further, if the bore quality sample results are supplied to the stakeholders close to the meeting dates it is difficult to fully "understand the science and its implications" (United States (US) Environment Protection Agency (EPA) 2001, p. 9).

The terms of reference have changed for the stakeholder group, from a question asking basis by stakeholders, to increased interest in the environmental monitoring standards, reporting, regulation and remedial action. Self review by the stakeholders in the group on a regular basis will allow them to make the function of the group relevant to the community concerns over time (enHealth 2002). Some stakeholders do not want the expansion of the existing facility to go ahead; however, they do acknowledge that the stakeholder group might not be the appropriate forum to achieve this outcome (United States Environmental Protection Agency 2001).

Discussion

Where state and local government agencies approve development, a Health Impact Assessment in the early approval process would increase stakeholder consultation and address their concerns through scientific investigation and appropriate risk management. It is acknowledged that this process is more time consuming and expensive than traditional environmental decision making, however, benefits include increased acceptance of the development by the local community, more collaboration between government departments, opportunities to enhance health, the ability to ensure that all relevant issues are assessed (Hughes 1998). This process might also identify issues that might arise at a later stage and hence cause major problems requiring expensive processes to address the problems. If the identified problems are addressed at an early stage there might be minor expenses. Any requests by the Shire to the proponent for data or analysis not required by state government might end up in a State Administrative Tribunal for legal practitioners of the Shire and proponent to debate. This is not the transparent and democratic approach that a HIA supports (enHealth 2001).

An issue arising from this development includes the lack of timely reporting of environmental monitoring, and technical advice regarding this monitoring by a trusted agency. Over time the DEC was not seen as impartial by some stakeholders who believed they should have had increased input in the meetings with regard to bore water sampling methodology and analysis and potential action or remediation. Some stakeholders held similar views regarding the impartiality of the facilitator and the environmental consultants who carried out the monitoring. The stakeholder group has changed from consultative discourse to a participatory role in the management of the landfill. Failing to address the ongoing concerns of some stakeholders has increased the perception of risk to the community and distrust with government agencies and the proponent.

Limitations of the study

The identification of potential health impacts from the literature requires triangulation through quantitative assessment (Presidential/Congressional Commission on Risk Assessment and Risk Management 1997). As this assessment is the responsibility of the proponent, and might be subject to negotiation where legislation or standards might not apply, it might be difficult to confirm the risk to the community (enHealth 2001). Further, there can be difficulties confirming the dose-response relationships to individuals in the community where multiple sources of exposure or contamination might lead to the health impacts (enHealth 2002). The precautionary approach of HIA takes these issues into consideration to prevent harm

and enhance health within the community (Health Canada 2005).

The interviews with stakeholder members has limitations when members chose not to participate, therefore, the full range of responses is not able to be considered in the research. The information might reflect a small part of the stakeholder group concerns, and might not represent other views held within the community that are equally valid. Comparing the interview data with the minutes of the meetings, however, provides triangulation of these data, with the data collected in the literature review.

Proposed Recommendations

The use of HIA by proponents of large developments should consider stakeholder concerns and it is also a vehicle to incorporate the regulatory requirements of local and state government during the scoping process (enHealth 2001). HIAs provide an opportunity to improve health and manage potential risks, thereby promoting the acceptability of the development. Greater cohesion between the DEC and Department of Health might have increased environmental assessment and reporting to include air, surface and groundwater analysis that have now become a source of concern among stakeholders. Interagency collaboration within SJ Shire could provide environment, social and health impact assessment data for a HIA that can be incorporated into planning, building and health approval conditions as a means of addressing stakeholder concerns. Given that these State and Local Government agencies will be dealing with the long term consequences of development decisions their input and experience is highly important.

The stakeholder group should respond to new concerns from group members or the community using the Framework for Democratic Science (Charnley 2000). This would indicate a real commitment to the stakeholder process and either resolve issues, or formally acknowledge that some issues are beyond the scope of the stakeholder group (US EPA 2001). The bore monitoring results could be co-presented to the group by a suitably qualified and independent agency, as some stakeholders indicated mistrust of information provided by consultants that included highly technical language (Hughes 1998). Funding could be made available at the early stages of the development for this purpose, so that stakeholders could agree to the appointment of such an agency.

Following quantitative assessment of the potential off-site impacts of the landfill, negative health impacts could be mitigated by developing risk management strategies that are action based following stakeholder concerns. Based on previous experience this could include dust emission, gas and leachate emissions from the landfill (Redfearn & Roberts 2002). A risk communication summary should also be developed to inform the community and the media (enHealth 2001). Long term strategies such as waste minimisation and recycling would reduce the overall impact of the landfill (Department of Health 2006).

Engaging social service agencies in the process might increase the use of age friendly housing design including highly walkable street design and pedestrian friendly facilities, such as adequate public toilets (Community and Disability Services 2004), legible signage, street lighting, wide footpaths, seating and shaded areas and safe road crossings. These would encourage all sectors of the community to exercise (Australian Local Government Association 2005). Access to important facilities, such as retail, public transport, meeting places, medical and education centres, also needs to be readily available to pedestrians (Institute of Public Health Scotland 2001), particularly for older members of the community as car use declines with age (Community and Disability Services 2004). Limiting wood heating devices in residences will preserve

indoor air quality and protect respiratory function. Where odour modelling conducted by the landfill proponent indicates potentially offensive characteristics (Department of Environmental Protection 2002), the release of the land for the housing estate could be staged to prevent proximity to the landfill until the landfill site closes.

Planning and environment agencies might have particular interest in the retention of natural bushland in the housing development, which supports a 'sense of place' and encourages recreation as well as providing some noise attenuation from transport factors (Western Australian Planning Commission 2000). Further, noise modelling carried out at the housing development would assist the design of the estate to orient noise sensitive premises such as schools and parkland away from noise sources such as major roads and trains (World Health Organization 1999). Analysis and management of water bodies would prevent accidental consumption or dermal contact by the public of potentially hazardous water (Redfearn & Roberts 2002), and reduce vector breeding (Western Australian Planning Commission 2000). A dust management plan would assist dust control during site works and construction activities to improve air quality. The precautionary approach of HIA would suggest that groundwater extraction should be prevented in the housing development if elevated levels of arsenic have been identified in bore water sampling sites in landfills (enHealth 2001). HIA and stakeholder involvement needs to be action based to ensure that the process is participatory and equitable.

Conclusion

The study found several environmental and social determinants of health that might have a negative or positive effect on the community. Many of the environmental determinants require quantitative assessments to determine actual risk. These determinants require careful monitoring and management to prevent short term and long term harm to community wellbeing and sustainability in the region (Presidential/Congressional Commission on Risk Assessment and Risk Management 1997). The stakeholder's concerns that had not been adequately addressed by the proponent reinforced the perceived risks to the environment and health from the landfill and decreased trust in regulatory authorities and the landfill operators (National Environment Protection Council 1999). This study might be the first where Health Impact Assessment has been considered from a local government perspective in Western Australia.

Acknowledgments

The authors wish to thank the Principal Environmental Health Officer for the Shire of Serpentine Jarrahdale, Tony Turner, and the South Cardup Landfill Stakeholder Consultative Group for their valuable contributions to this project.

References

Abramson, J.H. & Abramson, Z.H. 1999, 'Interviews and self-administered questionnaires', *Survey Methods in Community Medicine: Epidemiological Research, Programme Evaluation, Clinical Trials*, 5th edn, Churchill Livingstone, Edinburgh.

Australian Local Government Association 2005, *Age-friendly built environments*, <http://www.alga.asn.au/policy/healthAgeing/ageing/resources/publications/Agefriendly_built_environment_paper.pdf/> 26 February 2007.

Charnley, G. 2000, *Enhancing the Role of Science in Stakeholder-Based Risk Management Decision-Making*, <http://www.riskworld.com/Nreports/2000/Charnley/NR00GC05.htm#section5.1> 7 February 2007.

City of Melville 2007, City of Melville: *SEIFA Index of Disadvantage*, <http://www.id.com.au/melville/commprofile/default.asp?id=253&gid=10&pg=240&bhcp=1> 9 March 2007.

Community and Disability Services 2004, *Age-friendly built environments*, <http://www.health.gov.au/internet/wcms/publishing.nsf/Content/2C1B48A0B980486ACA25708A00138A8D/$File/afbe.pdf> 21 December 2006.

Department of Environment and Conservation 2007, Media Statement: 2 February 2007, *Composting operation to recommence with conditions*, <http://portal.environment.wa.gov.au/pls/portal/docs/PAGE/DOE_ADMIN/MEDIA_REPOSITORY/TAB108318/TAB116513/SMRC%20REVOCATION%20010207.PDF/> 18 July 2007.

Department of Environmental Protection 2002, *Odour Methodology Guideline*, Department of Environmental Protection, Perth, Western Australia.

Department of Health Western Australia 2006, *Submission to the Productivity Commission Public inquiry into Waste Generation and Resource Efficiency: Impacts of Waste Generation and Resources Efficiency on the Community*, <http://www.pc.gov.au/inquiry/waste/subs/sub063.pdf/> 15 December 2006.

enHealth 2001, *Health Impact Assessment Guidelines*, Commonwealth of Australia, Canberra.

enHealth 2002, *Environmental Health Risk Assessment: Guidelines for Assessing Human Risk from Environmental Hazards*, Commonwealth of Australia, Canberra.

Environmental Protection Authority 2006, *Landfill Footprint Modification: South Cardup Landfill, West Australian Landfill Services Pty Ltd,* Report and Recommendations of the Environmental Protection Authority, Bulletin 1218, April 2006.

Donnelly, A., Dalal-Clayton, B. & Hughes, R. 1998, *A Directory of Impact Assessment Guidelines*, 2nd edn, International Institute for Environment and Development, Russell Press, Nottingham

Government of Western Australia 2003, *Hope for the Future: The Western Australia State Sustainability Strategy*, Department of Premier and Cabinet, Perth.

Government of Western Australia 2007, Western Australian Landfill Services Pty Ltd v Shire of Serpentine Jarrahdale, MATTER No. DR/89 of 2007, State Administrative Tribunal, Perth.

Health Canada 2005, *Canadian Handbook on Health Impact Assessment: Volume 2,*

Health Impacts by Industry Sector, Table 7.2 Sanitary Landfilling, <http://www.hc-sc.gc.ca/ewh-semt/pubs/eval/handbook-guide/vol_4/table-tableau-7_e.html#Table-7-2b> 24 February 2007.

Hughes, R. 1998, *Environmental Impact Assessment and Stakeholder Involvement*, International Institute for Environment and Development, Environmental Planning Issues, No. 11, 1998.

Institute of Public Health Scotland 2001, *Heath Impact Assessment: A Guide for Local Authorities*, <http://www.phel.gov.uk/hiadocs/263_scottish_hia_guide_for_local_authorities.pdf> 6 December 2006.

Mindell, J. & Joffe, M. 2003, 'Health impact assessment in relation to other forms of impact assessment', *Journal of Public Health Medicine*, 1 June, vol. 25, no. 2, pp. 107-13.

Minister for the Environment 2006, Appeal Decision Summary: Appeal Numbers 126-208 of 2006, Appeals Convenor Environmental Protection Act, Perth.

National Environment Protection Council 1999, Schedule B (8) Guideline on

Community Consultation and Risk Communication, <www.ephc.gov.au/pdf/cs/cs_08_community_consult.pdf/ > 9 March 2007.

Office of the Appeals Convenor Environmental Protection Act 1986, 2006, *Landfill Footprint Modification South Cardup Landfill*, <http://203.20.251.100/appeals/documents/126-208-06%20Appeal%20Convenors%20Report2.pdf/> 9 March 2007.

Presidential/Congressional Commission on Risk Assessment and Risk Management 1997, *Framework for Environmental Health Risk Management*, Final Report, Volume 2, US Government Printing Office.

Razom, O. & Gerhardus, A. 1999, 'Methodological triangulation in public health Research: Advancement or mirage?, *Tropical Medicine and International Health*, vol. 4, no. 4, pp. 243-4.

Redfearn, A. & Roberts, D. 2002, *Health Effects and Landfill Sites*, Issues in Environmental Science and Technology, No. 18, Environmental and Health Impacts of Solid Waste Management Activities, The Royal Society of Chemistry, <http://www.rsc.org/images/IS018004_tcm18-27410.pdf> 18 December 2006.

SJ Shire 2006a, Mundijong/Whitby District Structure Plan, Information Sheet 2, Strategic Planning.

SJ Shire 2006b, Council News, September 2006, South Cardup Landfill Expansion Site Approved Despite Council Opposition. <http://www.sjshire.wa.gov.au/site/news/september2006.html> 6 March 2007

Scott-Samuel, A., Birley, A. & Ardern, K. 2001, *The Merseyside Guidelines for Health Impact Assessment*, 2nd edn, <http://www.ihia.org.uk/document/merseyguide3.pdf 5 February 2007> 5 February 2007.

Stass Environmental 2004, South Cardup Landfill Stakeholder Consultative Group Meeting, Minutes, Meeting No. 1. Kalamunda, Australia.

Stass Environmental 2005-2006, South Cardup Landfill Stakeholder Consultative Group Meeting, Minutes (12-17, 19). Kalamunda, Australia.

Stoneham and Associates 2005, *Preliminary Draft: Serpentine Jarrahdale Shire Population Health Profile*, East Fremantle, Western Australia.

University of New South Wales 2006, *HIA Connect: Building Capacity to Undertake Health Impact Assessment: Step 3 - Identification and Assessment of Potential Health Impacts*, <http://www.hiaconnect.edu.au/stage_3_assessment_of_potential_health_impacts.htm> 5 February 2007.

US EPA 2001, *Improved Science-Based Environmental Stakeholder Decision Making*, A Commentary by the EPA Science Advisory Board, <http://www.epa.gov/sab/pdf/eccm01006.pdf/> 18 February 2002.

Waste Management WA 2002, *Proposal to Change Plant Processes and Waste Acceptance Criteria at the Brookdale Liquid Waste Treatment Facility: Response to Public Submissions, 11 January 2002*, <www.epa.wa.gov.au/docs/1000_B1039.pdf/> 18 July 2007.

Western Australian Department of Environment 2004, *Landfill Waste Classifications and Waste Definitions 1996 (as amended)*, <http://portal.environment.wa.gov.au/pls/portal/docs/PAGE/DOE_ADMIN/GUIDELINE_REPOSITORY/LANDFILL_WASTE_CLASSIFICN_V3_2004.PDF> 6 March 2006.

Western Australian Department of Environment 2005, *Licence: Licence Number 7390/7*, <http://www.epa.wa.gov.au/docs/SouthCardup/SouthCardup_App2.pdf> 6 March 2007.

Western Australian Planning Commission 2000, *Bush Forever: Volume 1, Policies, Principles and Processes*, Appendix 3, Site Implementation Guidelines Practice Notes, Perth, Western Australia.

Wright, J. 2003, *Parkwood Health Impact Assessment 2003 North Sheffield PCT*, <http://www.sheffield.nhs.uk/healthdata/resources/nspctlandfillreportsumm.pdf/> 15 December 2006.

World Health Organization 1999, Guidelines for Community Noise, <http://www.who.int/docstore/peh/noise/guidelines2.html> 19 December 2006.

Correspondence to:
Marie Little
Centre for International Health
Curtin University of Technology
GPO Box U1987
Perth, Western Australia, 6845
AUSTRALIA
Email: marielittle@westnet.com.au