23.0 AREA SOURCE EMISSIONS

Agricultural industries, municipal waste/hazardous waste disposal sites, green waste/biosolids/manure composting operations and sewage treatment facilities collectively represent a significant proportion of odour complaints received by regulatory authorities throughout Australia and New Zealand. Area sources of odour can be major causes of off-site impacts in these and other industries.

Area sources include:

- Landfill surfaces (working face; soil/compost/synthetic cover; clay capped; revegetated) of various ages;
- Sewage treatment plant surfaces (inlet channel; primary sedimentation tanks; aeration tanks; activated sludge tanks; clarifiers; sludge lagoons; sludge drying beds; facultative lagoons; anaerobic lagoons; dissolved air flotation tanks);
- Composting surfaces (raw material stockpiles; compost windrows; final product stockpiles);
- Sub-surface contaminated groundwater sources (floating petroleum layer affecting surface emissions);
- Industrial sources (waste storage/disposal; sumps; surface spills; wastewater treatment plant surfaces; effluent disposal areas);
- Agricultural sources (feed lots; animal waste containments; crop preparation; residual crop treatment);
- Contaminated/remediation sites.

These sources have traditionally been difficult to quantify for atmospheric contaminant impact assessments, making the task of establishing a suitable control regime difficult. This has been principally due to the variability in methods used for determining the area source emission rate. Techniques have included emission isolation flux chambers, wind tunnels, "witches hats", source enclosures and downwind sampling/modelling techniques

A.W.N. has extensive experience in the use of flux chambers for area source sampling. The equipment used has undergone extensive international validation studies, as distinct from the majority of equipment currently in use in Australia. A number of flux chamber designs are used, including the U.S. Environmental Protection Agency (USEPA) chamber, and the University of Central Florida (UCF) chamber.

The Clean Air Society of Australia and New Zealand Odour Special Interest Group, recognising the importance of the area source sampling test method, established preliminary guidelines for the sampling of various source types (Fleer, A.W.N. Consultants, 1998). Subsequently, A.W.N. Consultants was requested by Standards Australia to develop Australian Standard AS 4323.4, "Area Source Sampling".

A.W.N. Consultants is the recognised leader in area source sampling in Australia.

Resources available include an exclusive technology transfer arrangement with Dr. Charles Schmidt, U.S.A. Charles was Field Task Co-ordinator on the USEPA Office of Solid Waste programme for the testing and evaluation of area source emission assessment techniques. Techniques evaluated included emission isolation flux chamber technology, vent sampling, in-situ soil gas testing, transect testing, concentration profile testing, upwind/downwind testing and mass balance. This research led to the development of the current USEPA guidelines on the emission isolation flux chamber assessment technology.

Since 1989, Charles has specialised in the measurement of air emissions from area and fugitive emission sources.

Examples of A.W.N. Consultants experience in the field of area source monitoring and assessment are given in the following project summaries:

1. Queensland Alumina, Queensland

Organic compounds build up with time in the recirculating caustic liquor used in alumina manufacture. Exposed caustic liquid surfaces subsequently become significant area sources of odour.

A.W.N. Consultants was commissioned by Queensland Alumina, Gladstone, to conduct emission isolation flux chamber tests (pictured) on the main process caustic storage tank to enable determination of fugitive odour emission rates.

LEFT
UCF flux chamber – odour, WWTP aeration tank

CENTRE
UCF flux chamber – air toxics, contaminated site

RIGHT
UCF flux chamber – odour, Queensland Alumina

2. City of Greater Dandenong Municipal Solid Waste Landfill, Victoria

A.W.N. (Air Water Noise) Consultants was commissioned by the City of Greater Dandenong to conduct an air toxics monitoring programme in the residential zones adjacent to the municipal solid waste landfills operated by the Committee of the South Eastern Regional Refuse Disposal Group. The landfill is the largest facility in Victoria.

The aims of the study were:-

- To conduct a detailed review of literature relating to gaseous emissions from municipal solid waste landfills;
- To identify air toxics emitted from the Springvale municipal solid waste landfill; through the conduct of flux chamber testing at various landfill locations;
- To quantify air toxics concentrations and odour intensities in the residential area adjacent to the landfill;
- To collate meteorological data for the monitored periods;
- To evaluate monitoring data based on ambient air quality criteria.

3. Pine Gro Products, Victoria

Pine Gro Products produce compost from both pine-bark (aerobic composting) and hardwood waste (anaerobic composting).

In aerobic composting, additives such as urea and lime are added to pine bark fines to proliferate microbial growth and cell division. Water is added to the compost to maintain an adequate moisture content, providing the humidity required by micro-organisms for optimal degradation. Odour emissions are highly variable throughout the composting cycle.

A.W.N. Consultants was commissioned to evaluate odour emissions from an existing facility, using flux chamber technology, and subsequently to conduct a plume dispersion modelling assessment of a proposed facility. Compost surfaces of varying age were assessed to enable adequate site characterisation.

The flux chamber monitoring and modelling assessment produced results consistent with EPAV buffer distance guidelines. The guidelines are based on previous experience with composting operations.

4. Caltex Refining, New South Wales

A.W.N. Consultants was commissioned to evaluate flux emission rates from soil surfaces at Caltex Refining, Kurnell to define the extent of a contaminated groundwater plume.

The UCF flux chamber was used to determine the flux rates of benzene, toluene, ethyl benzene, xylene isomers and total petroleum hydrocarbons.

5. M.C. Herd, Victoria

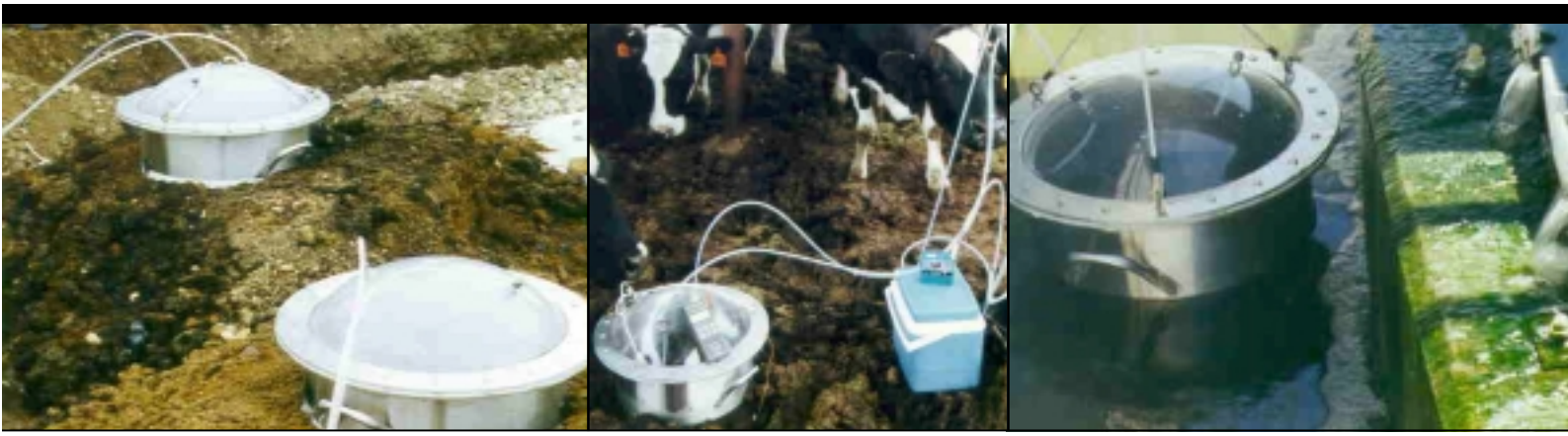
M.C. Herd Pty. Ltd. commissioned A.W.N. Consultants to conduct an odour audit of their processing plant located in Corio, Victoria.

M.C. Herd operates an abattoir, rendering plant and wastewater treatment plant on the site. Odour sources include:

- Sheep and cattle stockyards;
- Rendering plant;
- Wastewater treatment plant area sources (holding ponds, aerated lagoons, dissolved air flotation tanks, rock filter, trickling filter, sludge bins and belt presses);
- Land disposal of sludge.

Source odour emission rates were determined using point and volume source emission monitoring techniques (rendering plant) and area source monitoring using an emission isolation flux chamber.

The emission monitoring data was used to evaluate various odour control options through a plume dispersion modelling assessment. Following a subsequent technical and economic evaluation, odour control systems were successfully implemented.



LEFT
USEPA flux chamber – odour, air toxics, contaminated site

CENTRE
USEPA flux chamber – odour, cattle feed lot

RIGHT
USEPA flux chamber – odour, WWTP clarifier

6. South West Water Authority, Victoria

A.W.N. (Air Water Noise) Consultants was commissioned by South West Water Authority to conduct an odour audit of their Warnambool wastewater treatment facility, to quantify the impact of odorous emissions to air from the proposed quick drain filter beds.

The odour audit comprised the following stages:

- Measurement of existing odour sources;
- Measurement of trial filter bed odour rates of emission;
- Plume dispersion modelling assessment.

Odour flux emission rates were determined for various odour sources, including the inlet channel (selector tank), aeration tanks and trial filter bed, utilising an emission isolation flux chamber.

A plume dispersion modelling assessment was subsequently conducted, to predict the incremental change in odour ground level concentrations at the nearest sensitive receptors, due to the proposed installation of the filter beds.

7. Tasmanian Mushrooms, Tasmania

An odour audit conducted by A.W.N. Consultants determined the following odour sources associated with mushroom growing:

- Phase I composting (principal ingredients; straw; gypsum; poultry manure);
- Peak heat rooms (Phase II composting);
- Spawn runner rooms;
- Growing rooms.

A subsequent monitoring programme evaluated the odour rates of emission from room ventilation system exhausts and Phase I composting at various stages of the process. Maximum Phase I compost flux emission rates were determined using a UCF emission isolation flux chamber, by placing the chamber on the freshly turned surface at various stages during the 14 day composting cycle. Together with measurement of compost surface area, the process odour emission rates were calculated.

8. Amcor Fibre Packaging Australasia, Victoria

A.W.N. Consultants was commissioned by Amcor Fibre Packaging Australasia, the packaging subsidiary of Amcor Ltd., to conduct a statutory odour audit of the Fairfield Mill paper manufacturing facility, Alphington.

The project scope included a review of potential point and fugitive odour sources and historical emission test results, evaluation of odour control options and the conduct of a plume dispersion modelling assessment.

A number of major sources were identified by A.W.N. Consultants, that had not been monitored previously.

Subsequent emission tests conducted by A.W.N. included the determination of odour flux rates for the wastewater treatment plant clarifier, utilising an emission isolation flux chamber. Computer modelling subsequently demonstrated that this was the major source causing off-site impacts.