Air Quality Program

Air Quality Program contains:

1. Scope

The Air Quality Program covers the air emissions throughout the University, including:

- Emissions from fume hoods, stacks and scrubbers;
- CFC management for cooling systems; and
- Plant emissions.

The program **excludes** the following:

- Environmentally Relevant Activities (i.e. the Pinjarra Hills Farm Incinerator, Sewage Treatment Plant);
- Indoor air quality;
- Emissions from vehicles; and
- Air quality issues covered under the Workplace Health and Safety Act (1995).

2. Objectives

- Ensure that all relevant licences, permits and approvals for air quality are in place;
- Use plume dispersion modelling to determine the effect of air emissions on the surrounding regions;
- Set procedures in line with The University of Queensland Environmental Policy in order to provide The University of Queensland's "Best Environmental Practices" for air quality and controlled substances (e.g. CFCs and Halons); and
- Determine The University of Queensland's environmental performance through air quality auditing and monitoring of emissions and comparing against current environmental legislation, guidelines and standards.

3. Procedures

3.1 Air Quality Control Strategies

The following strategies should be employed to control emissions to the atmosphere.

3.1.1 Improved Technology

Better technology can lead to combustion enhancement and more efficient cooling. The commissioning of more efficient burning and combustion equipment and cooling equipment to replace existing, less efficient, older technology. A typical example is placing chilled water air conditioning systems onto a central system instead of individual systems to improve efficiency.

3.1.2 Fuel Change

A more efficient combustion can be achieved by using various fuels. For example, high sulphuric fuels such as coal and oil may be replaced with gas. This may be done in conjunction with improving technology.

3.1.3 Exhaust Stream Cleansing

There are various systems in place for cleaning exhaust streams before discharging to the environment. In particular, this will include filter medium and scrubbers.

Filters include the application of mechanical, electrical and aerodynamic forces to remove particles and droplets from exhaust gases.

Scrubbers involve the use of chemical agents (e.g. lime), adsorption (e.g. carbon filters) or liquor (e.g. wet scrubbers) to react with contaminants in the exhaust stream to remove gaseous contaminants.

3.1.4 Buffer Zones

Buffer zones are environmental management planning tools intended to protect sensitive areas from negative environmental impacts.

3.1.5 Stack Height

Dispersion of pollutants from a point source can be enhanced by the release of the gas stream from further above the ground. These heights are set by the *Environmental Protection Act (1994)* for combustion sources (4m above the height of the roof of the nearest building within 20m radius) or AS2243.8-2001 for fume cupboards (3m above roof of penetration and any access walkway).

3.1.6 Vegetation

Vegetation close to or higher than the height of the point of emission can help to raise the centre line of the plume. Provided stable conditions do not exist, the vegetation can help 'spread' the plume, thereby diluting the concentrations within the stream.

Vegetation may be retained as part of the buffer zones as described in 3.1.4.

3.2 Ecologically Sustainable Principles

Ecologically sustainable principles aim at allowing development and activities of an organisation such as the University whilst conserving resources such that the ecological processes and environment, are maintained to meet the needs of future generations. The principals used by The University of Queensland are discussed below.

3.2.1 Efficiency of Resource Use

Fuel (including electricity) can be saved by commissioning of new technology for heating, cooling and power generation. This can be associated with the strategies described in 3.1.1 and 3.1.2 above.

3.2.2 Refrigerant Management

Of all refrigerants, CFCs are the worst for destruction of the ozone layer and adding to global warming. The two common types used, CFC-11 and CFC-12, have an atmospheric lifetime of 65 and 145 years respectively. Refrigerant management is directed towards these two and includes the following measures:

- Establish a register of all refrigeration equipment including:
  (i) quantity of refrigerant;
  (ii) type of refrigerant; and
  (iii) the estimated remaining life of the plant/refrigerant regas.
- Not to regas any plant with CFCs. Current practice for the University is to use less damaging hydrochloroflourocarbons (HCFCs), specifically R22 for all regases.
- Install CFC containment and safety equipment on all chillers to minimise refrigerant loss.

3.3 Audits

Air quality audits shall be carried out in accordance with the procedures set out in The University of Queensland Auditing Program. Auditing frequency and targeted sources are determined by the auditing schedule annually and on a reactionary basis (eg to assess a complaint). Audits should assess the emissions and associated ground concentrations but shall also observe and note the existence, effectiveness, potential for improvement and lack of all other measures and strategies for controlling emissions as discussed in this program.

All audit results will be compared against previous data and/or modelled using an appropriate methodology (refer to Section 3.5). All results shall be presented in the form of a formal report to the Sustainability Manager.

It is the responsibility of the Sustainability Manager of the Property and Facilities Division to conduct air quality audits on the University campuses.

3.4 Monitoring

Monitoring programs will be undertaken when required and are subject to the results and recommendations included in the air quality audit reports.

Air Monitoring Programs for the University of Queensland will be established on the Environmental Engineers discretion based on audit results.

3.5 Air Dispersion Modelling

The dispersion of pollutants from a stationary source can be represented by Gaussian dispersion models. These models can then be used to estimate pollutant concentrations at ground level at sensitive receptors.

Numerous software packages are available for this type of calculation. For audits and monitoring any reliable package will be sufficient. When the results are regulatory based or for compliance, the administering authority shall be approached to determine which programmes are considered acceptable for generating this analysis.

Typically data will need to be collected prior to any auditing that is to be used for modelling. The manual of the particular programme should be consulted prior to conducting any auditing if modelling is to be performed for any results. Ensure all data can be obtained before undertaking any work.

3.6 Stationary Emission Sources - Standards

There have been various types of stationary emission sources identified within the University. The following lists the adopted standards and the management techniques to lessen the effect of emission from these sources.

3.6.1 Air Contaminant Standards

No emission levels have been set for any type of air pollutant source. All figures given in Table 1 are background concentrations. For all contaminants, the general guide for background levels are those printed as air quality guides in the *Environmental Protection (Air) Policy (1997)* or $1/30^{th}$ of the TWA levels printed for occupational exposure. Common emissions are listed in Table 1.

Table 1. Adopted Standards for Various Emissions

Parameter	Concentration mg/m3 (ppm)	Time Weighted Average	Potential Source	Standard Source
Acetone	39.5 (16.7)	8 hrs	Fume cupboard exhausts	NOHSC
Acetonitrile	2.2 (1.3)	8	Fume cupboard exhausts	NOHSC
Benzene	0.5 (0.1)	8	Fume cupboard exhausts	NOHSC
2-Butanone	14.8 (5)	8	Fume cupboard exhausts	NOHSC
Dichloromethane	3 (0.8)	24hrs	Fume cupboard exhausts	EPP
Ethyl Ether	40.3 (13.3)	8	Fume cupboard exhausts	NOHSC
Ethanol	62.7 (33.3)	8	Fume cupboard exhausts	NOHSC
Formaldehyde	100 (0.07)	30 mins	Fume cupboard exhausts	EPP
Hexane	58.3 (16.7)	8	Fume cupboard exhausts	NOHSC
Isobutanol	5.0 (1.6)	8	Fume cupboard exhausts	NOHSC
Methanol	8.7 (6.6)	8	Fume cupboard exhausts	NOHSC
Pentane	59 (20)	8	Fume cupboard exhausts	NOHSC
Tert-butanol	10.1 (3.3)	8	Combustion equipment	NOHSC
Triethylamine	0.4 (0.1)	8	Fume cupboard exhausts	NOHSC
Sulfur Dioxide	700 (0.25) 570 (0.20) 60 (0.02)	10 mins 1 hr 1 yr	Combustion equipment	EPP
Nitrogen Dioxide	320 (0.16)	1 hr	Combustion equipment	EPP
Nitrogen Monoxide	1.0 (0.8)	8	Combustion equipment	NOHSC
Carbon Dioxide	300 (166.7)	8	Combustion equipment	NOHSC
Carbon Monoxide	10 (8)	8 hrs	Combustion equipment	EPP

3.6.2 Odour Standards

For any source on any University site, it is not permissible to generate any odour that is perceived as a nuisance beyond the boundary of that property (adopted from licence conditions for Environmentally Relevant Activities).

3.7 Stationary Emission Sources - Management

Table 2 lists the measures adopted by the University to mediate the effects of emissions to the atmosphere.

Table 2. Emission Control Measures

Activity	Air quality control	Controlled emission
Piggery	buffer zone, vegetation	Odour
Effluent ponds	buffer zone, vegetation	Odour
Feedlots	buffer zone and vegetation	Odour
Chicken sheds	buffer zone and vegetation	Odour
Boilers	efficient burners, fuel (gas) and stack height	NO_x
Fume hood systems	wet scrubbers; stack height.	VOC's

*Note: **VOC's** = Volatile Organic Compounds*

4. Responsibilities

Responsibilities for air emissions lie with various people in the University. Table 3 outlines these responsibilities.

Table 3. Responsibilities

Responsible Person	Duties
Users, employees, students	• Ensure awareness and understanding of the air emission control procedures applicable to The University of Queensland; • Ensure toxic materials are handled under fume hoods; and • Attend environmental and occupational health and safety management training seminars.
Heads of Schools and Centres and Executive Officers (e.g. Farm Managers)	• Ensure that staff are aware of the waste management procedures; • Provide adequate environmental management training; • Ensure that Air Quality Management is carried out according to The University of Queensland Environmental Management Plan; and • Review the Air Quality Management program as necessary.
Property and Facilities Division	• Liaise with Heads of Schools and Centres and Executive officers to ensure that the control of air emissions is effectively carried out at the University campuses; • Provide facilities to collect and phase out CFCs in the University; • To ensure the efficient operation of the University's fume hoods; and • To provide technical and environmental advice on the management of air quality issues.

5. Records

All documents issued regarding air quality and emissions are to be held by the Property and Facilities Division (St Lucia, Ipswich and Gatton) and/or farm and research stations as applicable with their area of responsibility. The term documents, for the purpose of the Air Quality Program, refers to:

- Operational Procedures;
- Checklists;

- Reports;
- Notes/ Memoranda;
- Letters; and
- Invoices.

6. Training

It is the responsibility of the Heads of Schools and Centres, Managers of Farms and Research Stations and other Senior Officers to ensure that their personnel are adequately trained in environmental management issues.

Refer to the "Environmental Training Program" for further information.

7. Budget

It is the responsibility of the Director of the Property and Facilities Division to delegate staff to allocate the necessary resources to the Air Quality Program on a yearly basis.

8. Contacts

If further information is required regarding air quality management, please refer to Table 4:

Table 4. Enquiries at The University of Queensland.

Subject	Contact	Person	Telephone
Fumehood and combustion equipment	Property and Facilities Division P&F Assist	Customer Service Officer	(07) 336 **52222**

9. Definitions

9.1 CFC

CFC means a chlorofluorocarbon and includes all isomers of a chlorofluorocarbon.

9.2 Sensitive Receptor

A sensitive receptor is a fixed location such as a house, building, other premises or open area where health or property is affected emissions that increase the concentration of the emitted parameter above background levels.

9.3 Time Weighted Average (TWA)

Time Weighted Average is the average concentration of a chemical observed over a period of 8 hours which represents the typical exposure over a working day.

10. References

- Environmental Protection Act 1994
- Environmental Protection Regulations 2008
- Environmental Protection (Air) Policy 2008
- National Occupational Health and Safety Commission, Exposure Standards for Atmospheric Contaminants in the Occupational Environment 1995
- AS2243.8 - 2001 Safety in Laboratories. Part 8: Fume cupboards
- Ozone Protection and Synthetic Greenhouse Gas Management Act 1989 and Regulation 1995
- Ozone Protection and Synthetic Greenhouse Legislation Amendment Bill 2003