Air Quality Planning Scheme Policy

Contents

1 Introduction

Air pollution can impact upon health, amenity, property and the environment and economy of the City. This Policy provides a framework to determine air pollution impacts and guides applicants on matters they need to address to ensure their proposal complies with the **Industrial Amenity and Performance Code**.

Developers should be aware that this Policy does not provide for the comprehensive management of air quality. It addresses those impacts on air quality, that are relevant to planning for industry in Brisbane. The *Environmental Protection Act 1994* and the *Environmental Protection (Air) Policy 1997* will also regulate environmental impacts. Th e measures in this Policy complement this legislation.

Additional information will be requested by the assessment manager and/or referral agency to assist in assessing proposals that have potential to cause significant environmental harm or nuisance impacts. This information will help Council ensure that reasonable and practicable measures are taken to minimise the risk of environmental harm from air pollution, by, for example, influencing the construction, design, location, form, environmental performance and management of operations. The Policy will assist applicants in structuring the information they need to supply to Council, which may be included in an impact assessment statement.

The Policy sets out Council's priorities for minimising air pollution from industry to prevent regional and local air quality impacts. It explains the general approach to assessing air quality impacts and contains a three phased process for applicants to follow for evaluating and managing impacts from air emissions. This process includes a step by step approach for characterising emissions, evaluating best practice environmental management (BPEM) and best available technology (BAT), and determining the level of modelling needed. A streamlined assessment process is also included for extractive industry and those developments that involve fossil fuel power generation and incineration. Technical advice is included in the annexes.

2 Council's policy on air quality

Council's policy is to minimise air pollution in Brisbane, primarily to protect the health of its residents. In doing so, it will minimise the impacts from air pollution on property and the environment. The policy also focuses on reducing cumulative impacts on the Brisbane airshed from industrial sources. It recognises that it is more effective to plan to prevent air pollution than to control pollution after development. Where air pollution occurs, the City Plan seeks to manage impacts by reducing emissions and exposure of people to pollution in local areas. Consistent with the policy of minimising pollution, Council promotes cleaner production, supports best available technology and encourages applicants to take opportunities to reduce air emissions.

The *Brisbane Air Quality Strategy* provides a wider context for Council's involvement in protecting Brisbane's air quality.

3 Air pollution priorities in Brisbane

Brisbane's topography, amount of sunshine and prevailing wind pattern increase the potential for photochemical air pollution episodes commonly referred to as smog. Areas surrounding Brisbane are also experiencing rapid growth and development. Motor vehicles continue to be the largest single sector, representing as much as 80% of the emissions of some pollutants. The combination of these factors means air pollution, particularly photochemical smog, could become a significant problem in the future as Brisbane's population and economy continue to grow.

This Policy focuses on managing the contribution of pollutants from industrial sources only. Industrial emissions have been identified in the South East Queensland Region as having a significant impact on air quality. Best managed at the planning stage, industrial sources will typically contribute emissions to the airshed over several decades. The investment of planning effort is not wasted when the long operational periods of this type of infrastructure are considered.

The *South East Queensland Regional Air Quality Strategy* (SEQRAQS) identifies as a regional priority the reduction in levels of some industrial pollutants, namely, fine particles and photochemical smog precursors—oxides of nitrogen (NO_x) and volatile organic compounds (VOCs). These pollutants contribute to photochemical smog, reduce visibility and can have adverse human health impacts. Therefore, priority is placed on controlling emissions of these pollutants from industry. Significant emitters of regional pollutants will need to undertake a regional impact assessment.

Air pollution may cause local impacts such as nuisance and adverse human health effects. It is also a priority of this policy to ensure that industry specifically addresses local air quality impacts as a result of their emissions. Industries that have the potential to cause adverse impacts on local air quality will need to minimise the exposure of sensitive receiving environments to local air pollution.

3.1 Objectives for industrial air emission reductions

SEQRAQS includes objectives for reducing industrial emissions. These objectives have been developed in light of projected changes in emissions from all sources and the Strategy's overall goal of improving air quality in South East Queensland. *Table 1* sets out the objectives of overall industrial air emission reductions under SEQRAQS. Objectives are expressed as percentage changes in relation to the air emissions inventory levels.

Table 1 SEQRAQS objectives for overall industry air emission reductions

Pollutant	1993 emissions (tonnes per year)	2011 objectives (tonnes per year)	2011 objectives % change
VOCs	12,100	9,700	-20
NO_X	14,300	12,900	-10
Particles	14,200	11,400	-20
SO_2	18,000	17,100	-50
CO	22,400	22,400	0

Source: SEQRAQS, 1999

This Policy has been developed to be consistent with the SEQRAQS objectives, regional outcomes and targets to reduce air emissions. This is achieved in a planning context by setting efficiency–based standards, and allowing offsets for the replacement of older, less efficient plant. This is an important part of the overall strategy to reduce the impact of industrial emissions in the region.

4 General approach to assessment

Good planning can contribute to ecological sustainability by minimising air quality impacts from industry through:

- managing waste streams to avoid or minimise all forms of pollution
- applying appropriate control technology and best practice environmental management
- locating the development appropriately
- encouraging industries to be fully aware of normal and upset conditions so as to schedule their operations appropriately
- eliminating the air pollution source entirely or in part.

This Policy encourages the reduction of all air emissions by requiring applicants to implement measures at the planning stage. This includes evaluation of alternative manufacturing and production techniques, substitution of raw materials and improved process control methods, pollution control equipment and management practices.

When assessing development applications Council will consider the following questions:

- Will the proposal cause air pollution? (Step 1 and 3—see Section 5—How to apply this policy)
- Does the proposal take opportunities to minimise emissions, including through off–sets? (Step 4)
- Have best available technology and best practice environmental management been adopted? (Step 4)
- Has all waste been minimised or avoided where possible? (Step 4)
- Do emissions of air toxics present health risks? (Step 5)
- Will the pollutants be within the design ground level concentrations for general areas and sensitive receiving environments? (Step 7)
- Will the proposal affect local air quality? (Step 7)
- Will the proposal affect regional air quality? (Step 7)

4.1 Level of impact

All industries that emit air pollutants above a threshold of concern specified in *Table 2* should undertake local air dispersion modelling, and for some larger emitters, local modelling and a regional analysis is required to determine the level of impact from air pollution. Industries that have potentially odorous emissions must undertake local air dispersion modelling. For those industries that emit air toxics (refer *Table 4*), a health risk assessment that includes local modelling is required. Where modelling evaluations are undertaken, these will need to be for both normal and upset conditions, as upset conditions are more likely to cause exceedances in ambient air quality levels or result in complaints. Modelling results will be compared against ambient air quality design ground level concentrations for 'general' and/or 'sensitive' land uses (refer *Table 3*).

4.2 Overall air quality impacts

This Policy includes different decision making considerations, such as ambient air quality design ground level concentrations, health risk and emission performance standards, for determining air quality impacts from development proposals. These considerations will be assessed as a package. Failure to meet an individual consideration does not necessarily mean Council will refuse the development.

Emissions from individual industries will be assessed in the context of an overall improvement in air quality and effort taken to minimise air pollution. Some applicants may have opportunities to reduce emissions by replacing old plant with new efficient plant, or reducing emissions from other existing sources. Where these opportunities exist, Council will consider whether the proposal can achieve net emission reductions regionally and/or locally.

Matters that will be considered include whether the proposal is a new source or replaces an existing source, to what extent offsets in emissions from other sources can be guaranteed, and the effect of cumulative impacts.

4.3 Offsets

In situations where applicants find it difficult to comply with emission performance standards, due to excessive cost or availability of technology, Council may accept emission offsets as an alternative measure for reducing emissions within the Brisbane airshed. Council will only consider offsets in relation to air pollutants of a regional nature.

Offsets will only be considered where emissions of a pollutant at a source are traded for the same pollutant at another source. Emission reductions for each pollutant, achieved as a result of the offset, will need to be real, quantifiable and sustained. Ongoing monitoring may be requested to verify the offset.

In such cases where uncertainty exists in the delivery of offsets, an acceptable solution may be to offset more than the equivalent of emissions, i.e. 2 kg offset for every 1 kg of emissions.

Air quality in Brisbane is not to deteriorate as a result of the offset. Applicants will need to demonstrate an overall quantifiable air quality benefit. Offsets will only be favourably considered where residents are not exposed to unacceptable levels of pollutants as a result of either the proposed development or offset.

Air emissions from the proposed development and offset need to be evaluated to ensure that ambient air quality design ground level concentrations (refer *Table 3*) are met. The location of anticipated emission reductions, whether they are regional or local, should be provided.

4.4 Management of air emission impacts

Management measures that can be implemented to minimise air pollution include attenuation distances, best practice environmental management and best available technology. These measures are not intended to be definitive and world's best practice should always be considered.

Attenuation distances

Attenuation distances are particularly important measures to separate conflicting land uses and to minimise impacts from air pollution on sensitive receiving environments. Even if other control measures are used, emissions such as odour may still occur. Adequate attenuation distances between industry and sensitive receiving environments are effective ways of avoiding or minimising adverse impacts.

Attenuation distances could contain open space or other industry or business uses that can occupy land between industry and sensitive receiving environments without their location causing problems for themselves or others. Council prefers that the parts of industrial areas that are more remote from sensitive receiving environments, be used by industries that have the greatest potential for environmental harm or nuisance. Appropriate locations are those where air emissions and other effects can be adequately controlled. Smaller scale and otherwise lesser impacting uses are encouraged to locate at the periphery of the industrial areas in closer proximity to sensitive receiving environments. Refer to specific attenuation distances listed in the **Industrial Amenity and Performance Code**.

Best Practice Environmental Management (BPEM) and Best Available Technology (BAT)

Council encourages managing air pollution by avoiding emissions in the first instance and the application of BAT and BPEM. Options for adopting best practice strategies and technology are most effective if they are evaluated during the planning phase. Installing appropriate technology in the first instance can remove the need for costly add–ons.

Council encourages attaining minimum achievable emissions per unit of output by using commercially viable technology. The implementation of control technologies can significantly reduce air pollution at the source. Control technology should ensure minimal visibility of industrial plumes from public vantage points and the avoidance of health impacts.

Implementing BPEM such as cleaner production practices is promoted as industry can produce the same level of output but with less pollution, and in many cases it results in cost savings. BPEM is wider than simply design. It includes efficient administrative systems, strategic planning and waste management practices.

5 How to apply this policy

This Policy outlines a three phased approach for determining air impacts from development. Applicants should address each phase.

Applicants should document the following phases in the information provided to Council (which may form a component of an impact assessment study).

Phase one—Screening

Step 1: Does the development have air emissions? Emissions may not be from a chimney or flue, for example, they may be dust from traffic on a haul road, odour from a waste treatment pond, or vapours from solvents etc. If not, then there are no air quality requirements.

Step 2: Is the development an extractive industry operation or does it involve fossil fuel power generation OR incineration? If yes, then check the relevant subsection in Section 10 Special requirements and demonstrate how the proposal will address the requirements.

Phase two—Initial evaluation

Step 3: Identify and characterise the air emissions from the proposed development. This characterisation may take the form of measurement of emission composition, or estimation of emission composition using standard equations.

Step 4: Undertake a full evaluation of best practice environmental management (BPEM) and best available technology (BAT) options including waste prevention and cleaner production to demonstrate best practicable reduction in air emissions. Such an evaluation should include a comparison of the proposed approach with standards being applied for similar developments.

Phase three—Detailed evaluation

Step 5: Does the development emit any air toxics (refer *Table 4*)? If yes, undertake a health risk assessment (refer to Section 9), then proceed to step 6. If no, proceed directly to step 6.

Step 6: Check *Table 2* and determine whether the proposed development is of:

- local concern and will need local air dispersion modelling, or
- regional concern and will need an assessment of regional impacts (possibly including regional modelling) and local modelling.

Note: potentially odorous emissions will always need local air dispersion modelling.

Step 7a: If the pollutants being emitted are below the local modelling guideline and contain no odour or air toxins, then no modelling is necessary.

Step 7b: If the pollutants being emitted are above the local modelling guideline, undertake local air dispersion modelling and compare the ground level concentrations against the ambient air quality design ground level concentrations for general areas and sensitive receiving environments listed in *Table 3*.

Step 7c: If the pollutants being emitted are above the regional modelling guideline, undertake local air dispersion modelling (as for step 7b) and carry out an assessment of potential regional impacts (refer to Annexe 1).

6 Modelling thresholds

This Policy recommends varied levels of analysis depending on the scale and nature of emissions. Some industries emit such low levels of pollutants that modelling is unnecessary. Others emit emissions that are likely to have only localised impacts, whereas large scaled industries can have emissions that impact both locally and regionally. In such cases, local modelling and an analysis of the impacts of air emissions on a regional scale is advised to determine the level of impact from air pollution. For those industries that have odorous emissions, local air quality modelling is needed to predict the potential impacts.

The following table identifies the rate of emissions to air of key industrial pollutants at which different levels of modelling are indicated. This table is for guidance only. Some cases may need local modelling at a level below that indicated in *Table 2* (e.g. locating very close to a sensitive receiving environment). It is advised that the level of modelling required will generally need to be discussed in some detail with Council officers.

Table 2 Emission based assessment thresholds for modelling

Pollutant	Local level modelling (grams/ second)	Regional level modelling (grams/ second)
NO_X	0.03	5.0
CO	0.03	n/a
SO_2	0.016	n/a
TSP	0.03	n/a
PM_{10}	0.016	2.5
total VOC	0.016	1.0

Note: potentially odorous emissions will always need local modelling.

7 Modelling

Modelling provides useful information for assessing the impact of releases to the airshed. It can provide an initial assessment of the localised effects through prediction of ground level concentrations in the immediate vicinity of the emission. It is very effective at testing different emission scenarios. The information generated from modelling can assist in the assessment of potential impacts at the start of the development avoiding uncosted and unplanned prevention measures.

In the cases where modelling is undertaken, the following good modelling practices should be considered:

- Select a model appropriate to the sources and pollutants to be modelled
- Select meteorological data carefully to ensure that they are representative of the proposed development site, and that the data are of high quality and appropriate in averaging times and seasonal coverage
- Consider the terrain effects as these can add substantially to the effort required in modelling. As such, the general principle should be to consider the proposed stack height in relation to the surrounding terrain and make a judgement on the impact of terrain on the modelling outcomes. For example, a tall stack in gently undulating areas may not require the consideration of terrain effects, while a ground level source in the same general area, a sewage treatment pond for example, may need to consider terrain effects. The availability of appropriate data (possibly from previous studies) should also be considered
- If there are other sources of similar pollutants in the immediate area, consideration needs to be given to how the model will emulate the situation. If the background pollution will significantly affect the peak concentration, then it will need to be considered. There are three methods to achieve this consideration of cumulative impact. The first is to use appropriate existing monitoring data to input a background figure into the model. The model adds this value to all predicted ground level concentrations. If there are no background data, in the case of a large scale development, it may be necessary to conduct monitoring to determine the background level. The second method is to model the other sources on the same modelling grid as the source of interest. This can be done where the other sources can be well characterised. The third method is appropriate where a long term steady state background level does not exist. If the background varies according to set conditions (day time/night time etc.), an individual model run for each set of conditions is useful. If the background varies hourly and the project warrants careful consideration of cumulative impact, models such as Ausplume can often be easily modified to accept hourly background data from the meteorological file
- Building and obstacle wake effects will need to be considered where stack heights are in similar proportion to the surrounding buildings. This type of aerodynamic effect can be positive or negative in its impact on ground level concentrations
- All sources to be modelled will need to be adequately characterised. Apart from the normal suite of emission data such as emission rate, temperature, exit velocity, internal stack dimensions etc, the process characteristics that impact on the source need to be recognised. Hours of operation, upset conditions, differences in process feedstock, e.g. different fuels and changes in process controls should all be considered
- The selection of grid spacing and consequent receptor locations needs to guard against underestimation of the peak concentrations. A suggested approach is to run a series of sample runs to determine the most appropriate grid spacing
- Reporting of modelling outcomes should include all model switch settings and assumptions used. The discussion should address the model limitations

including, but not limited to, averaging effects, low wind speeds, terrain steering and receptor representation. Results should be presented graphically where possible, with sufficient labelling to indicate sources and geographical features relevant to the impact of the proposal.

Annexes 1 and 2 provide technical guidance on air dispersion modelling for regional and odour impacts. Refer to these Annexes for determining matters that need to be considered when scoping the modelling to be undertaken. Applicants are advised to confirm with Council the appropriateness of the modelling proposed, prior to its commencement.

8 Local air quality design levels

Air pollution may cause local impacts, including nuisance effects and impacts on human health. Applicants will need to demonstrate that the development will not have adverse impacts on local air quality.

Table 3 includes ambient air quality goals and design ground level concentrations for sensitive receiving environments. The air quality goals are based on the *Environmental Protection (Air) Policy 1997* and the *Environmental Protection (Air) Amendment Policy (No. 1) 1998*. The design ground level concentrations for sensitive areas are generally those suggested by the *Victorian State Environment Protection Policy (The Air Environment) 1981*. They have been adapted so that only those pollutants that are most relevant to industry planning in Brisbane are included.

The concentrations for sensitive receiving environments have been set as a safety margin for the most critical pollutants, to prevent emissions from exceeding levels that could expose people to unhealthy levels or nuisance impacts from air pollution. They are more stringent than the *Environmental Protection (Air) Policy 1997* goals because modelling typically fails to adequately account for many complicating factors. Examples of these factors are very low wind speeds/stable conditions, sea breeze and recirculation and cumulative impact. The Design Ground Level Concentrations also preserve some capacity for the contribution of future sources to the air environment.

Industry should aim to meet the air quality goals in all areas and the design ground level concentrations in sensitive receiving environments. They are one consideration in determining acceptable air emission levels. The emphasis Council will give to compliance with these design ground level concentrations will depend on the type of development proposed, proximity to sensitive receiving environments, emission types, overall impact on the air environment and the extent to which other matters within the Policy such as the implementation of best practice environmental management and best available technology are addressed.

The ambient air quality design ground level concentrations in *Table 3* are to be met by industry in association with background air quality. The background levels should be selected on the basis of accepted professional practice and advice (see section 7 Modelling).

In some cases, emissions to air other than those listed in *Table 3* may need to be considered. In these cases preliminary discussions with Council's pollution officers will be required.

Table 3 Ambient air quality design ground level concentrations

Air quality indicator	Goals for all areas	Design ground level concentration for sensitive receiving environment[1]	Averaging time
	Levels and units	Levels and units	
Nitrogen dioxide	0.16 ppm	0.11 ppm	1 hr
Particles (deposited)	4 g/m²/month	2.5 g/m²/month	30 days
Particles (as TSP)	90 mg/m³	n/a	1 year
Particles (as PM10)	150 mg/m³	50 mg/m³	24 hrs
Particles (as PM2.5)[2]	n/a	25 mg/m³	24 hrs
Carbon monoxide	8 ppm	3.5 ppm	8 hrs
Oxidants (as ozone)	0.1 ppm	n/a	1 hr
Sulphur dioxide	0.2 ppm	0.2 ppm	1 hr
Lead	1.5 mg/m³ n/a	n/a 0.5 mg/m³	90 days 30 days
Hydrogen sulphide	7.0 mg/m³ n/a	n/a 2.0 mg/m³	30 mins 3 mins
1,2 dichloroethane	0.7 mg/m³ n/a	n/a 6.7 mg/m³	24 hrs 3 mins
Dichloromethane	3.0 mg/m³ n/a	n/a 24 mg/m³	24 hrs 3 mins
Formaldehyde	100 mg/m³ n/a	n/a 100 mg/m³	30 mins 3 mins
TDI toluene-2,4-di-iso-cyanate	TBA n/a	n/a 0.005 mg/m³	TBA 3 mins
MDI diphenylmethane di-iso-cyanate	TBA n/a	n/a 0.007 mg/m³	TBA 3 mins
Vinyl chloride monomer	TBA n/a	n/a 0.1 mg/m³	TBA 3 mins
Tetrachloroethylene	8mg/m³ n/a	n/a 6.3 mg/m³	30 mins 3 mins
Trichloroethylene	1 mg/m³ n/a	n/a 17.8 mg/m³	24 hrs 3 mins
Styrene	0.07 mg/m³ n/a	n/a 0.21 mg/m³	30 mins 3 mins
Toluene	1 mg/m³ n/a	n/a 0.65 mg/m³	30 mins 3 mins
Benzene	TBA n/a	n/a 0.1 mg/m³	TBA 3 mins
Fluoride	0.5 mg/m³ n/a	n/a 2.9 mg/m³	90 days 24 hrs
Odour[3]	10 OU	5 OU	1 hour

(1) Sensitive Receiving Environment is defined in Chapter 3

(2) An advisory standard only. Information to be provided only at the request of Council

(3) Odour units to be determined using Australian Standard Method DR99306 Air Quality—determination of odour concentration by dynamic olfactometry

9 Air toxics

Significant emissions to air of pollutants listed in *Table 4* are to be assessed using health risk assessment (HRA). This assessment should be carried out using the guidelines developed by the California Air Pollution Control Officers Association (CAPCOA) titled *Air Toxics 'Hot Spots' Program Revised 1992 Risk Assessment Guidelines, October 1993*. Cancer risks should be assessed against the California Environment Protection Agency, Standards and Criteria Working Group document entitled *California Cancer Potency Factors: Update*.

The threshold for HRA for the air toxics listed in *Table 4* is the same as the National Pollutant Inventory Guide (NPI) thresholds for reporting, i.e. if applicants would be expected to report emissions of *Table 4* substances under NPI then they will need to do an HRA under this policy. Any substances listed in *Table 4* but not categorised under present NPI substance lists can be treated as a category 1 substance.

Modelling practices referred to in Section 7 apply to modelling undertaken to determine dose as a part of an HRA. Only emissions of pollutants listed below need to have hazard indices calculated and compared against standards.

Table 4 represents a subset of the 40 "TO–14" Organic Air Toxics listed by the U.S. Environment Protection Agency (USEPA). These pollutants are listed as Hazardous Air Pollutants by the USEPA and can be routinely detected in urban air in Australia. Dioxins and Furans, acid gases and some heavy metals have been added to this list due to their well documented toxicity and the broad range of industrial activity that gives rise to these pollutants, e.g. incineration, combustion and sintering.

Table 4 List of toxic pollutants

Pollutant	
Chloromethane	Chlorobenzene
Chloroethane	Ethylbenzene
Chloroform	(P+m)-Xylene
1,1,1–Trichloroethane	1,2,4–Trichlorobenzene
Carbon tetrachloride	Acid gases (expressed as HCl)
Trans–1,3–Dichloropropene	1,1,2–Trichloroethane
Metals (Cr,Ni,Hg,As,Cd,V)	Dioxins and Furans

10 Special requirements

The special requirements have been developed on the basis of past experience in assessing industrial development applications in Brisbane and are intended to streamline the assessment process for these industries.

The special requirements also recognise the fact that certain industries, because of the types and volumes of air pollutants emitted, have the potential to impact significantly on the airshed and the health of residents in Brisbane. While this policy encourages the reduction of air emissions from all industry, it places particular priority on industries and facilities that release large volumes of photochemical smog precursors, particles or VOCs. This approach is consistent with SEQRAQS, which also places priority on controlling emissions from these industries. High risk industries are also a priority, particularly those industries that emit air toxics.

10.1 Fossil fuel power generation

There is a trend in the energy market towards smaller, more efficient generation plants sited close to where the energy will be used. This trend may lead to greater efficiencies in the production and use of energy resources, and hence fewer greenhouse gas emissions and greater sustainability. Council supports this trend. However, given the likely air quality impacts, for fossil fuelled plant to be established in Brisbane, it must meet stringent emission standards. These standards mean that, in effect, energy plants will have to be as efficient and low in emissions as the best in the world.

Notwithstanding this policy's recommendations for local air pollution (under Section 5, step 6), any fuel source, plant design and pollution control configuration will be acceptable provided the plant does not emit more than specific efficiencies stated in *Table 5*. Council will discourage the location of more than 500 megawatts of electrical generation capacity on the one site, due to the poor dispersion characteristics of the prevailing meteorology of the Brisbane area.

Air quality impacts from energy plants may be moderated by appropriate fuel selection or other plant design decisions such as combustion conditions and flue gas emission controls. Generally, high efficiency cogeneration plants exceed 50% efficiency. Current best practice management for NO_x emissions includes incorporation of low NO_x burners in the combustion phase, and chemical injection and catalytic reduction to remove nitrogen oxides from the flue gas.

Similarly, for the control of particulate emissions, bag houses are acknowledged as delivering best practice environmental management. Target levels of between 10 and 100 mg/m^3 should result from efficiencies of 95–99% for particles greater than 0.1 µm.

Although Council is principally concerned with pollutants that pose a direct risk to human health, it is also required under agreement with the Cities for Climate Protection program to deliver a program of effective greenhouse gas reductions. An essential part of this program is the delivery of a more carbon efficient industry sector. Consequently Council encourages the adoption by industry of measures and technologies that deliver goods and services at the lowest possible overall equivalent carbon dioxide efficiency. In the special case of fossil fuel power generation, this is a particularly important indicator of the suitability of the proposal.

Table 5 Special requirements: generation

Minimum standards of pollution efficiency for generation sources	
NO_X efficiency	4.0 tonnes/PJ
CO efficiency	4.0 tonnes/PJ
SO_2 efficiency	0.25 tonnes/PJ
Particulates	100 mg/m^3
CO_2 efficiency	0.6 tonnes/MWh

10.2 Incineration

Refuse, medical and hazardous waste incineration has the potential of emitting a wide range of pollutants to the air environment. For the purposes of this policy incineration is defined as combustion with a significant amount of added fuel to complete the combustion of the waste. Compounds in the waste are converted to flue gas borne pollutants, with incomplete combustion responsible for the production of particularly toxic chemicals such as the dioxin and furan group of organic compounds.

Several different combustion processes and control technologies are commonly used, with or without a thermal cycle boiler or generator to produce steam and electrical energy.

In all cases the lack of homogeneity and predictability of the fuel source is a problem in characterising the emissions from the plant. Council's risk management approach to this type of proposal is to ensure acceptable levels of human exposure to pollutants generated from incineration. Typically this will mean that fuel preprocessing, controlled combustion and flue gas scrubbing will be needed in order to ensure that levels of toxic pollutants are below the emission standards stressed in *Table 6*.

Table 6 Special requirements: incineration

Minimum emission standards for incineration sources	
Particulates	100mg/m^3, dry @NTP, corrected to 12%CO_2
HCl	50ppm or 99% removal efficiency
CO	100ppm hourly average, monitored continuously
Incinerator design	Primary chamber >850°C Secondary chamber >1000°C for >2 seconds

These criteria are considered in addition to the outcomes of any health risk assessment carried out due to the proposal exceeding the threshold levels of air toxics listed in *Table 4*.

10.3 Extractive industry

Extractive industries in the Brisbane region may occur in close proximity to sensitive receiving environments. Council advises that air pollution impacts from extractive industry proposals need to be considered for both the site establishment phase (which includes activities such as construction of haul roads and the removal of cover material, vegetation and overburden) and the operational phase.

Council encourages managing potential air pollution impacts from extractive industries through a detailed management plan for both phases. The management plan should demonstrate the use of BPEM and BAT, including waste minimisation and cleaner production practices to achieve best practicable reductions in air emissions. Guidelines for management plans can be obtained from the Environment Australia handbook on best practice environmental management for dust.

The management plan should include, where necessary, separate modelling determinations of the level of impact from the site establishment and operational phases. In cases where modelling is to be carried out, model selection will need to consider the ability of the model to handle gravitational settling and area sources. Modelling in these cases usually includes estimation of the source intensity of large area sources, a complicated process that requires professional experience or training in this special area of model use.

Annex 1—Regional impact assessment

Regional impact assessment is applicable to those development proposals that have emission rates for key industrial pollutants above the assessment guidelines for regional modelling (refer to Section 6) and do not meet the special requirements for fossil fuel power generation, incineration or extractive industry operations (refer to Section 10).

Industrial emissions have the potential to alter local and regional ozone levels on days with high levels of photochemical activity in the South East Queensland regional airshed. Many sources contribute to the particulate loading, both directly and via condensation and other processes. Both ozone and fine particulates have been established as producing short term and long term health impacts if concentrations or dosages are sufficiently high.

Large NO_X sources can reduce ozone concentrations close to the source but may generate ozone further downwind within the area covered by the plume, under a particular set of ambient conditions. For small NO_X sources, the ozone consumption stage is completed quickly but the ozone generation is quickly limited by the available in–plume NO_X concentrations. For ozone, the chemistry is not necessarily proportional to precursor concentrations and ambient levels. It is necessary to consider the detailed conditions for individual hourly events. Ground level increments from industry as predicted by a reliable dispersion model can be added to background levels in order to compile exposure statistics.

While there is now an extensive network of photochemical and particulate monitors in the South East Queensland Region, prediction of existing ambient air quality and impacts due to industry at a given location must rely on a sensible use of a hierarchy of local and regional airshed models.

Ozone impacts are not straightforward to predict. Any sources requiring detailed assessment by Council are likely either to be major emitters of NO_X or VOCs, located in an industrial area close to other similar or larger sources or likely to affect a particularly sensitive part of the airshed. Specialist advice will be needed to assess photochemical and fine particulate impacts. Assessments should refer to the substantial amount of local information on regional windfields, emission characteristics, high pollution event days and modelling tools.

Photochemical assessments are advisable for major sources of NO_X and VOC emissions in the South East Queensland airshed, which is likely to experience significant increases in NO_X and VOC emissions from transport and industrial sources over the next 10–15 years. The design of the emission control equipment should be consistent with the minimisation of ambient concentrations and population dosages, the intent of state and national air quality objectives and the SEQRAQS objectives.

There should be no significant change in health indicators predicted to be caused either by the industry operating in isolation (but utilising an appropriate sub–regional background air quality) or in association with other major emitters (either existing or approved for future operation). By their location and/or proximity to existing sources, certain areas of the airshed are especially sensitive to emissions of ozone precursors.

New industries are encouraged to adopt best practice emission control technology and to achieve target energy–related emission levels of ozone precursors.

Industries undertaking expansion and/or retrofitting of control measures should ensure that the changes neither produce any net increase in NO_X and VOC emission rates or, by virtue of different emission characteristics, any significant net increase in ground level NO_X and ozone impacts within the areas covered by the plumes. Ideally, efficiency standards should be met where applicable.

Predictions of particulate impact are most often concerned with the increase in maximum daily and annual concentrations of fine particulates (PM_{10} for national and state guidelines, but $PM_{2.5}$ is also considered important from a health viewpoint). Industrial emissions should be well characterised by a size distribution down to the 0.01 µm aerodynamic diameter or equivalent. Particular attention should be paid to number and mass densities for combustion products and the transformation processes that may occur between source and downwind receptors.

As photochemical activity and background particulate levels in the Brisbane airshed show a wide inter–annual variability, a five year period should be considered when identifying potential problem periods. Generic datasets are available for most EPA monitoring locations that include the hourly values of ozone, NO_X and NO_2, and parameters describing the photochemical age of air parcels. Where only PM10 information is available at the nearest monitoring site, PM2.5 and other indicators should be based on a reasonable interpretation of information from other Brisbane sites and similar urban areas.

Table 7 lists the different airshed models that may be used to determine hourly concentrations of NO_X, particulates and ozone increments.

Table 7 Airshed models

Role	Models	Comments
1. Screening evaluation of NO_x and PM10/PM2.5 impacts	Ausplume ISC3 Auspuff AERMOD Spillane	Note: Ausplume may underpredict for near–coastal areas. Tall stacks require consideration of strong convection (e.g. Aermod or Spillane models).
2. Screening of ozone increment	CSIRO TAPM Stage 1 models with IER or SOS chemical evaluations	Used together with nearest suitable ambient air quality database. Sensitivity testing on VOC/NO_x ratios required.
3. Detailed evaluation of airshed impact	South East Queensland regional AQS CSIRO LADM EPAV 3–D scheme EPAV 2–D scheme Turco/Leslie CSIRO TAPM	When available For individual sources, not full emissions inventory Low–level sources, full emissions inventory Tall stack sources embedded in 3–D grid Currently under validation in Sydney, Los Angeles and Beijing.

Photochemical assessment techniques usually require simplification of source structure for airshed modelling to proceed. Multiple stack sources may be replaced with an equivalent point source having the same average plume height and total NO_x/VOC emission rates. Significant extended sources, e.g. ground level VOC sources with emission rates over 10 g/s, may require some simplification prior to airshed model use.

For some wind directions, plumes from sources located close (within 5km) to other significant precursor sources may overlap significantly with existing plumes and therefore undergo substantial photochemical interactions. Unless it can be demonstrated that source characteristics and local meteorological conditions result in essentially separate plume trajectories for the proposed and existing sources, recourse to detailed and appropriate numerical models will then be necessary. Industrial developments in such areas are acceptable if it can be demonstrated that the exceedance rate of designated sub–regional impact thresholds, e.g. four hourly exposures and daily ozone dosages, are unlikely to increase by more than 1%.

Modelling of regional impacts should be on the scale of the plume dimensions when pollutants are well mixed in the vertical plane, e.g. typically over a 500m grid. Some schemes may experience technical difficulties for near–field evaluations until plume dimensions exceed the grid size of emission inventories. Sensitivity testing to scale size may then require plume–in–box or trajectory models.

For some sources, especially those giving rise to significant increments in ozone levels, it is advisable to undertake model sensitivity testing to perturbations in source characteristics, emission rates (especially for upset conditions) and variations in VOC/NOx ratios to encompass different airshed states (such as presence of bushfire emissions).

As photochemical activity may proceed once plumes exit the Brisbane airshed, consideration may be required of ozone increments anywhere on the day in question and the likelihood of recirculation on subsequent days, should ambient conditions be suitable. Refer to the results of the *Brisbane Windfield Study Final Report 1993* and South East Queensland regional airshed investigations.

Modelling of particulate impacts should involve not only the production of concentration statistics but, as considered necessary by Council, the evaluation of increments in population dosages and anticipated health impacts.

Annex 2—Odour policy and modelling

This Policy promotes industrial development that is planned and designed so that significant odour annoyance is not caused at nearby sensitive receptors. It assumes that industry design is based on ensuring that offensive odours are not routinely emitted beyond the boundary of the industrial premises, although there may be occasions where plant upsets may cause inadvertent increases in odour emissions for a short period. This policy aims to ensure good design practice and encourages modern and effective odour control technology.

Odour annoyance requires odour levels at the receptor to be sufficiently strong, offensive and frequent to cause nuisance to most people in a community. Odour evaluations should recognise the wide variety of individual response to odours, the difficulties in establishing odour emission rates for normal and upset operating conditions and the potential for various community–industry interactions to modify odour sensitivities. Consideration is necessary of likely odour levels and meteorological conditions and the likelihood of adverse odours occurring for each hour of a typical year of site meteorology.

Offensive odour is generally taken as an odour that, by reason of its strength, nature, duration, character or quality, or the time at which it is emitted, or any other circumstances, is either harmful to (or likely to be harmful to) a person outside the emitting premises or interferes unreasonably with the comfort of an external observer.

Odour assessments should proceed in a series of steps:

- inventory all potential odour sources at the site
- determine odour release characteristics
- estimate emission characteristics using either standard emission factors or relevant measurements
- determine whether a small number of known odorants are present or a complex mixture. If the latter, use performance criteria based on the Australian standard for olfactometry
- select suitable meteorological data files for the site in question (preferably one or more typical years)
- select suitable emission scenarios
- select source–specific peak–to–mean ratios (see below), terrain information and a suitable list of odour–sensitive receptors
- select a suitable odour dispersion model and estimate hourly concentrations but with emission rates corrected to the nose–response time (via peak–to–mean ratios based on source type and emission variability)
- evaluate the 99.5th percentile concentrations against odour criteria in *Table 3*
- revise odour control design to achieve a suitable general society benefit.

In this process, account should be taken of the potential future land use, the likelihood of odours from other sources and the available control technology and/or odour mitigation measures. Any mitigation measures should be accompanied by expert certification of the likely effectiveness and long term suitability.

Design and operational procedures should consider the following factors:

- reliability and maintenance of equipment
- sustainable management procedures
- effectiveness of intervening barriers and stands of vegetation. Refer to attenuation distances in the **Industrial Amenity and Performance Code**
- scheduling of odorous activities, e.g. via wind direction, or other odorous activity on–site or at neighbouring industries
- staff education on the impact and assessment of odours
- liaison and consultation with the neighbouring community
- avoidance of aerodynamic downwash for any stack sources
- long term cumulative impacts.

Peak–to–mean ratios are used to recognise that industrial odours are often intermittent and of short duration. Odour response involves nose–response timescales of approximately 1 second. Dispersion models can only reliably forecast hourly averages (and then only the ensemble average). Correction factors are required to predict the probability distribution of nose–response–time odour levels. The recommended peak–to–mean ratios are those prescribed by the NSW EPA that are based on a survey of recent literature and generic wind tunnel experiments on point, line and area sources.

Practical consideration should be given to the likelihood of separate odour response to the overlapping of odour plumes from physically separated sources. If the odours are judged to be similar, odour instances should be added for a given hour prior to assessment against an odour annoyance threshold. If the odours are dissimilar, the responses should be judged separately for each source in a given hour and that hour counted as an 'odour event hour' only if any of the source contributions exceed the annoyance threshold.

Hourly averages can be calculated by any of the accepted general dispersion models (see Ausplume, Screen 3 ISCST3) so long as averaging time corrections are not used to calculate very short term concentrations. It should be noted that, for some tall stack sources and area sources, near–field concentrations may be underestimated by such techniques. The estimation of point source dispersion in the presence of buildings should utilise building profile pre–processors, such as those readily available from the USEPA, to determine aerodynamic wake influences. Peak–to–mean ratios for wake–affected sources need to be treated with caution.

Meteorological files should cater for site–specific conditions and use a minimum windspeed of 0.5 m/s for odour evaluations. Dispersion calculations should be performed both over a suitable grid and at any particularly sensitive receptors such as residences, schools, hospitals or known complainants. Consideration should be given to the probability of upset emission conditions, the hourly variation of emissions (especially at night–time) and the likelihood of hypersensitive people in the local community. Community education programs can assist in minimising these effects.

For existing industries changing operation or source configurations, allowance can be made for tolerance of local communities to odour if well–targeted community odour surveys are conducted over a reasonable time period, to a standard that will satisfy a recommended external odour expert. Reliance on general community surveys in climates dissimilar to Brisbane's are unlikely to be acceptable.