Schedule 7 Standard Dispersion Modelling Procedure

Acceptable Models

Where dispersion modelling is required under this Plan as noted in the information requirements in Part IV, it should be undertaken by an experienced organisation or individual. The preferred models are those developed and used for regulatory purposes by reputable authorities, such as the United States Environmental Protection Authority (USEPA) or State of Victoria's Environmental Protection Agency.

AUSPLUME is the most commonly used model but it has limitations and others may be more suitable for certain situations, such as with complex terrain or the release of gases that are heavier than air.

Examples of other suitable models are:

CTDMPLUS/CTSCREEN	- principally for complex terrain
AUSPUFF (when available)	- large range of applications
SCREEN	- simple first approximations
ISC	- similar to AUSPLUME
DISPMOD	- for complex coastal situations
AUSTOX	- for accidental releases and heavy gases

These models are used to simulate the ground level concentrations of any contaminant present in significant quantities at receptors located at regular and appropriate distances from the discharge point. All significant emissions from the site should be accounted for in the modelling procedures.

If USEPA regulatory models are used (eg, SCREEN, ISC), then it is recommended that the USEPA protocols for using these models be followed.

Input Data

The source and input data should include information on all the particular model's input requirements and default settings. There should also be a description of site related data, including:

- The location and dimensions of buildings likely to affect dispersion (usually those located within 10xL from the discharge points, where L is the lesser of the height or width of the building);
- Other nearby sources of similar contaminants or background concentrations;
- Details of topographic features which might affect the movement or dispersion of the discharges, including coastal features; and
- The location of any particularly sensitive receptors.

Meteorological Data

The minimum meteorological data requirements for most models include:

- Wind velocity;
- Wind direction;
- Turbulence conditions (stability);
- Mixing height; and
- Temperature.

Unfortunately, it is often difficult to obtain real meteorological data from a local site, particularly

information on turbulence and mixing height. A standard "theoretical" meteorological data set is therefore acceptable for the initial assessment of effects. This should cover the full range of conditions that could conceivably occur at the site so the model produces a conservative (high) estimate of the worst case downwind concentration.

In most situations it will be sufficient to use the theoretical or 'screening' meteorology, particularly if it can be clearly demonstrated that the screening approach is conservative (giving high predictions). However, if predicted concentrations exceed the design concentrations then it will be necessary to use real meteorological data for a more precise assessment to determine if this is still the case. Similarly, real meteorological data should be considered if predictions are close to the maximum acceptable concentrations (ie, within 20 percent) and if it cannot be clearly demonstrated that the screening approach was conservative.

Ideally this data should be obtained from a local meteorological station and include at least one year of information. The local data should include reliable information on turbulence and mixing height, along with wind and temperature information. Turbulence or atmospheric stability can be measured in a variety of ways and it is important that a suitably qualified organisation or individual is consulted to provide this. One of the simple ways of measuring stability is to use the "Turner" method where wind data and detailed cloud cover observations are used. The mixing height is often more difficult to obtain but it can also be estimated from basic measurements. Care should be taken in situations where the mixing height has a significant effect on dispersion, such as tall chimneys in unstable (highly convective) conditions. If the effect of mixing height is important, and it is a major source, then consideration should be given to obtaining more accurate mixing height information from temperature gradient measurements, radiation data, surface temperature data or using a Doppler acoustic sounder.

Interpretation

When using a dispersion model it is important that the correct interpretation is applied to the results. Predictions should be compared to appropriate design targets. To this end, it is not acceptable to use the regional ambient air quality guidelines (Schedule 1) as design concentrations. Such guidelines are designed for protection of air quality in areas where there is often a large number of similar sources. They cannot be used for setting emission limits or chimney heights of individual sources without some kind of modification.

In many situations it will be necessary to determine an appropriate design concentration for a particular situation in consultation with Council staff. However, the following provides a guide to what will be considered as acceptable model design concentrations for new sources in Otago:

- For a source located in a Schedule 2 area:
  (i) 75% of the Otago Goal Levels listed in Schedule 1; or
  (ii) The Workplace Exposure Standard (WES)* divided by 50, where appropriate, and used as a 1-hour average.
- For a source located in non-urban areas:
  (i) The Otago Goal Levels listed in Schedule 1; or
  (ii) The WES divided by 30, where appropriate, and used as a 1-hour average.

- For a source located in a pristine area, a suitable design concentration should be determined in consultation with Council staff.

* Workplace Exposure Standards (1994), Department of Labour, Wellington

- For carcinogens or those contaminants that primarily give rise to health effects from long term exposure, it may be necessary to follow a risk assessment approach where model results are used to estimate lifetime dose via inhalation, and to compare this with other dosage pathways and acceptable risk levels.

- For those contaminants that primarily produce odour effects, it is preferable to use an odour design concentration based on olfactometry and odour dose-response assessments, determined in consultation with Council staff.

- For dusts and other pollutants that primarily produce amenity affects, a suitable design concentration should be determined in consultation with Council staff.

In all the above cases the acceptable design concentration or guideline should be compared with the maximum prediction, the highest 99.9 percentile when real meteorological data is used for 1-hour average predictions (8^{th} highest prediction out of a whole year of hourly predictions) or the highest 99.5 percentile in the case of odour.

The correct averaging times should also be used when comparing predictions with design concentrations. Particular care should be taken when using predictions from screening meteorology, for those contaminants that have design concentrations with averaging times greater than one hour.

It should be remembered that the above are only guidelines. They do *not* represent strict standards. Deviation from these guidelines may be acceptable, but the onus is on the applicant to ensure that any deviations are based on sound science. Consequently applicants are advised to obtain appropriate specialist advice.

These guidelines also primarily apply to the assessment of new sources. Different criteria may be applied to the interpretation of modelling results for some existing sources.