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HEALTH RISK ASSESSMENT FROM AIR EMISSIONS

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THESE NOTES HAVE BEEN PREPARED BY DR. BATES AND PUBLISHED BY WEST COAST ENVIRONMENTAL LAW IN ORDER TO AVOID REPETITION OF ERRORS IN THE HEALTH RISK ASSESSMENTS FOR LARGE FACILITIES THAT CAUSE AIR POLLUTION.

HEALTH RISK ASSESSMENT FROM AIR EMISSIONS

Most new projects involve air emissions; these may be from the proposed facility itself (as with natural gas-fired electric generating plants), or from off road and on road heavy diesel emissions, or from combustion of different materials. Such proposals usually arouse considerable anxiety among the local population, and formal "Health Risk Assessments" may be required in advance of public hearings about the impact of the work to be undertaken or the building of the facility.

These notes have been prepared as a guide to those preparing, and evaluating such Reports. There are four principal issues that must be addressed for any Health Risk Assessment to be complete.

1. ASSESSMENT OF EMISSIONS:

This may be relatively simple if it is a matter of a manufacturer's specifications; however it is essential that all modes of operation are considered. In the case of natural gas-fired generators for example, the emissions of NOx will be much higher (by a factor of about 9) during start-up of the facility than in the hot-running condition. Since start-ups may be common, and last for two hours or so, the emission impact must be precisely calculated for these conditions. Other emissions are more difficult to project, particularly those from off road diesel equipment and heavy diesel trucks that may be moving large volumes of material. In such cases, approximate estimates only can be attempted.

2. DESCRIPTION OF THE IMPACTED POPULATION:

There is now sufficient scientific information for the identification of vulnerable groups in the general population. Asthmatic children are adversely affected by low concentrations of gases, such as NOx, SO_2, and ozone, as well as particles. Elderly subjects with heart disease are at risk from particulate pollution. If the emissions are from a single facility, the impacted population, together with the location of schools, shopping malls, and sporting facilities must be precisely described.

3. MODELLING POLLUTION IMPACTS:

It is essential that atmospheric dispersion models embody "worst case" emission scenarios (startup emissions if from natural gas-fired generators for example) together with the most adverse meteorologic conditions so that the maximal likely impact on the exposed population can be calculated.

Attention must be paid both to long term and to short term (1 hour) pollutant exposures. It should be remembered that 'annual average values' of a pollutant never sent anyone to hospital. We do not depend on 'annual average driving speed' to control traffic.

4. ESTIMATES OF THE INCREASED RISK:

There is a variety of "dose-response" metrics that can be used to calculate the increased risk to a population of increased levels of particulates and gases. These should be used, rather than simple dependence on "standards" or "guidelines" because many of these are out of date and none consider adequately the impact on vulnerable populations.

Health Risk Estimates should not include judgements of the "acceptability" of any indicated risk level since these necessarily involve factors in addition to the estimate of health risk.

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1. ASSESSMENT OF POLLUTANT EXPOSURE:

This primary requirement is not often completely described. It may involve the following steps:

a) Assessing such factors as the frequency of transits of heavy diesel trucks adjacent to housing or schools.

b) Whether these trucks will be under load or going uphill.

c) What the particulate emissions would be predicted to be from such vehicles or from proposed operations (such as natural gas fired generating plants or 'beehive burners').

d) In some cases, pollutant emissions may only be modeled for 'hot-running' conditions, and no attention paid to much higher short-term (2 to 3 hour) emissions during startup.

This becomes very important if residential or public areas are very close to the plant.

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e) It is important that 'worst-case' scenarios be evaluated and modeled. 24 hour and 1 hour maximum exposures to combustion PM_{10} (particles less than 10 microns in size), or to NOx (oxides of nitrogen) are an essential requirement.

2. EVALUATION OF THE POPULATION IMPACTED:

This is often overlooked entirely. Sensitive subgroups include asthmatic children (more sensitive to PM_{10} and to NOx and to SO_2 (sulphur dioxide) than others, and to whom ozone exposure represents a threat); elderly people with heart disease; and the possibility of children or others taking physical exercise on sports fields or elsewhere within the zone of impact. It also applies to outdoor field workers who may be at particular risk from ambient ozone.

3. THE NEED FOR A 'SAFETY FACTOR':

It is often assumed (particularly by engineers) that if predicted levels of a pollutant do not reach a level which is the 'Canadian standard', then there is no possibility of any adverse health impact. This ignores the fact that in the preambles to such standards it is often pointed out that no threshold has been demonstrated, and even, in some instances, that there are studies showing that adverse effects are occurring at levels below some numerical standard. Good public health practice would require that there be some margin of safety between a projected impact and a level which would be adverse.

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