

## WHITE PAPER ON HUMAN HEALTH AND WELFARE EVALUATIONS FOR AIR QUALITY PERMITS IN TEXAS

To obtain an air quality permit in Texas, the applicant must demonstrate that they will meet all applicable Federal and State of Texas health-based air quality standards and guidelines. This paper describes how that evaluation is done. In general terms, the applicant must submit data concerning the off-property impacts of all the air contaminants expected to be emitted from a new or an expanded industrial facility. This is usually done by using “air dispersion models” which are computer-based programs.

These models incorporate both the emission rates of each chemical and the worst-case meteorological data for the site at which the emissions will take place. The applicant must show that the predicted levels of air contaminants do not exceed health and welfare based standards and guidelines. A description of those standards and guidelines is the main focus of this paper.

### I. Federal Air Quality Standards

Federal Air Quality Standards are set by the U.S. Environmental Protection Agency (EPA). The EPA sets two types of NAAQS: primary NAAQS and secondary NAAQS. Primary or “health-based” NAAQS are set to protect the health of even the most sensitive individuals with an adequate margin of safety. Sensitive individuals include children, the elderly, and people with a pre-existing medical condition. Secondary or “welfare-based” NAAQS are set to protect against welfare effects such as decreased visibility, effects on climate, effects on crops and other vegetation, effects on wildlife, and effects on the economy. At present, the only air pollutants having NAAQS are carbon monoxide, lead, nitrogen dioxide, ozone, particulate matter, and sulfur dioxide.

#### A. Primary (“Health-based”) NAAQS

The primary, health-based, NAAQS are based on years of thorough scientific studies using two main types of research: epidemiological studies and human exposure studies to determine levels of air contaminants that will not cause any adverse effects on human health.

##### 1. Epidemiological Studies

Epidemiological studies look at the health outcomes of various groups of people in “real-world” exposure situations. The general design of such studies is to evaluate the health of two or more groups of people who differ from each other primarily only in the amount of air pollution to which they are exposed.

##### 2. Human Exposure Studies

Some information used in the setting of the NAAQS is obtained by exposing human volunteers to measured low levels of air contaminants in exposure chambers. The effects of exposure to different levels of air contaminants in those chambers is noted and levels at which no effects are seen are determined. Some exposure experiments use individuals who might be considered to be “sensitive,” such as asthmatics. In other studies, the volunteers are exercising while being exposed to the air contaminant. This

is done because people who are exercising breathe larger volumes of air per unit of time and thus get a larger dose of the air contaminant in question.

#### B. Secondary (“Welfare-based”) NAAQS

Secondary NAAQS are set using essentially the same process described above for setting the primary standards, except instead of studying the potential adverse health impacts of air contaminants, the potential for adverse effects on human welfare and the environment are explored. As mentioned above, these effects include decreased visibility, effects on climate, effects on crops and other vegetation, effects on wildlife, and effects on the economy.

### II. State of Texas Air Quality Guidelines

Clearly there are many, many air pollutants that do not have NAAQS assigned to them. For these pollutants, sometimes referred to as “air toxics”, the State of Texas Commission on Environmental Quality (TCEQ) has devised a methodology for evaluating the potential for human health and welfare impacts from the emissions of those chemicals.

The TCEQ has established “no expected health or welfare risk” levels called Effects Screening Levels, or “ESLs”. These are set based on health effects or on welfare effects such as odor nuisance. At present there are nearly 5,000 ESLs. They are set at levels lower than levels reported to produce adverse health effects, and are set to protect the general public, including sensitive subgroups such as children, the elderly, or people with existing respiratory conditions.

#### A. Health-based ESLs

Health-based ESLs are usually set by starting with exposure levels shown in the published literature to cause no adverse health effects or very minor health effects in humans or animals, and then applying various safety factors to establish levels protective of the most sensitive members of the general public. The magnitude of the safety factor needed is determined based on the available toxicological data.

#### B. Welfare-based ESLs

Welfare-based ESLs have been set to protect against the possibility of an odor nuisance, and some have been set to prevent vegetation or materials damage. ESLs for odorous compounds are set at the laboratory-derived odor threshold levels for those chemicals. ESLs for vegetation and materials damage are set at levels low enough to protect against these types of effects.

#### C. TCEQ Guidance for Air Quality Permitting of Air Toxics

In November 2006 the TCEQ first published new technical guidelines to be used by its Toxicology Division when developing ESLs. These guidelines are contained in a TCEQ

guidance document entitled “TCEQ Guidelines to Develop Toxicity Factors.” This document has been updated and the current guidance was published in September 2015.

*Disclaimer: The information in this white paper is current as of mid-2016. Environmental agency policies change from time to time. For the latest information, please contact Dr. Dydek directly at [dydek@tox-expert.com](mailto:dydek@tox-expert.com).*