

## **3. Monitoring**

In the Portland Air Toxics Assessment, DEQ was able to complement the 1999 emission inventory data with monitoring data from the same year. This section describes the study that produced the 1999 air toxics monitoring data in Portland. In 1999, DEQ performed an air toxics monitoring study to characterize ambient concentrations in the Portland metropolitan area. At five sites, both particulate and gas phase air toxics were measured to insure that the largest number of toxic air pollutants could be assessed for their impact. The study also allowed DEQ to choose one trend site to operate after 1999.

### **3.1 Monitoring Site Locations**

The selection of sites for the 1999 air toxics monitoring study was guided by more than 30 years of agency experience monitoring criteria pollutants in the Portland area.

#### **3.1.1 North Roselawn**

This site, located in the North/Northeast quadrant of the city is representative of a typical inner city neighborhood. The sampling location is in an open lot surrounded by homes and small apartment buildings. This medium density residential area is within a half kilometer of a variety of commercial businesses, some light manufacturing, and city arterial streets. About a kilometer away is the busiest transportation corridor (Interstate 5) in the city. Major industrial and port facilities on both sides of the Willamette River are on the west, two to four kilometers away. There is another industrial/port area about the same distance to the north along the Columbia River.

The Department chose North Roselawn as the Portland trend site. For the trend site, DEQ sought a single location, with above average concentrations of toxic air pollutants. To provide a conservative estimate of public health impact this site represents high end exposures of the general public to air toxics, but is not solely influenced by a single facility or source type. The trend site can be used to document improvements as measures are implemented to reduce air toxics emissions.

#### **3.1.2 Northwest Portland**

This site in the Northwest quadrant of the city is on a residential street and is on the boundary between the highest density residential area in the city and Portland's primary industrial area. Located in a parking lot for the neighborhood post office, it is within a half kilometer of a small commercial area, a foundry, and numerous metal finishing operations. Railroad yards, port operations, including fuel handling facilities, wood products and other manufacturing businesses, and a major traffic bridgehead are within a kilometer. The West Hills, a geographic feature about 1000 feet high, is less than a half kilometer from this site, creating a barrier to air movement to the west and restricting dispersion of pollution.

#### **3.1.3 Southeast Portland**

The site in Southeast Portland has been DEQ's primary particulate neighborhood impact site for over twenty years. It is also used to monitor VOC and NO<sub>x</sub> during the summer for ozone planning purposes. Located in a small empty lot in a predominantly single family housing residential neighborhood, this was one of the first places in the country where woodstove

impacts on ambient fine particulate concentrations were recognized. Large arterials, with some commercial activity, can be found within a half kilometer. A high volume interstate link (I-205) is one to two kilometers away. No significant industrial facilities are within four kilometers.

#### **3.1.4 Downtown Portland**

This site is located within the central business district and is primarily influenced by motor vehicles, both from large arterials and surface streets, and by space heating for offices and commercial buildings. This is one of DEQ's oldest sites, primarily measuring particulates. It has recorded some of the city's highest PM pollutant measurements. The only significant point sources are about four kilometers away in Northwest Portland. Downtown Portland is within a kilometer of I-5 and several streets access the freeway from the bridges.

#### **3.1.5 Beaverton**

This site is located in a suburban residential area west of Portland on the grounds of a neighborhood middle school. It is separated from the other sites by the West Hills. The Department anticipated that this area would be spatially distinct from the central city and the east side. Some industry can be found more than a kilometer away to the north and east but this site is primarily affected by residential activities and motor vehicles. Large arterial highways are within a kilometer and state Highway 217 is within 2 kilometers.

### **3.2 Sample Collection and Analysis**

The Department's primary objective in the 1999 monitoring study was to determine annual average concentrations of air toxics to compare to exposure concentrations responsible for chronic health effects. To this end, DEQ collected integrated 24 hour samples for air toxics analyses that could then be averaged over a 12 month period. Sampling for particulate and most gas phase pollutants was on a standard one in six day schedule to coincide with the national particulate matter network schedule. Sampling for the polynuclear aromatic hydrocarbons (PAH) analyses, however, was done on a one in twelve day schedule.

EPA Compendium Methods for both sampling and analysis were used to measure gas phase pollutants, ensuring consistency with studies being done across the country. Method TO-14a (six liter Summa canisters) couples gas chromatography with mass spectrometry (GC/MS) to measure forty volatile organic pollutants. For PATA this sampling method includes the air toxics benzene, 1,3-butadiene, and tetrachloroethylene. Method TO-11 (DNPH cartridges) employs ion chromatography (IC) to measure sixteen carbonyls; PATA's focus was primarily on acetaldehyde and formaldehyde. GC/MS, Method TO-13A (PUF), was used to measure concentrations of twenty seven semi-volatile organics, including the sixteen carcinogenic PAHs (as sub-set of POM).

Federal Reference Methods were used for particulate (PM<sub>2.5</sub>) sampling and mass analysis, providing consistency with our historic data and with other national studies. After particulate mass was determined, samples were analyzed for their metal content (21 elements) using EPA Method IO-3, X-Ray Fluorescence (XRF) Spectroscopy. Over 100 individual chemical species were measured during this year-long monitoring study and included arsenic and nickel.

There was no acceptable method for measuring acrolein or diesel particulate so there is no monitoring comparison for the model for these two air toxics.

### **3.3 Target Pollutants**

Of the twelve pollutants targeted for modeling in PATA, only ten were measured during the monitoring study. It was found shortly after monitoring began that acrolein was not stable during sample collection and thus the measured values were totally uncertain. As yet there is no generally accepted direct measurement method for diesel particulate, so no monitored concentrations are available for that pollutant, either. Ambient concentration data for the ten remaining target pollutants were extracted from the DEQ database and summarized for comparison to the model estimates for the PATA study.