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Community Summary

Lower Rio Grande Valley Transboundary Air Pollution Project (TAPP)

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The Lower Rio Grande Valley Transboundary Air Pollution Project (TAPP) was done to determine if movement of air pollutants across the U.S.-Mexican border was occurring in the Lower Rio Grande Valley (hereinafter called "the Valley") and, if so, the extent. The study was conducted from March 1996 to March 1997 by the U.S. Environmental Protection Agency (EPA) with the Texas Natural Resource Conservation Commission (TNRCC). The study objectives were to:

a) Determine the air quality within the Valley and establish a baseline of air quality data for future reference.

b) Determine the movement of air pollutants across the U.S.-Mexican border.

c) Define what, if any, additional studies might be needed.

Monitoring was done at three fixed sites located very close to the U.S.-Mexican border. Inhalable particulate matter (PM), chemical elements, volatile organic compounds (VOCs), polycyclic aromatic hydrocarbons (PAHs), and pesticides were measured. Short-term fine inhalable particle sampling was conducted to estimate potential episodes of emissions. Meteorological measurements (weather data) were also collected.

Based on the daily and near real-time monitoring conducted over the year, the study data suggest that the air quality in the Brownsville area of the Valley was good. The reason for this was that the vast majority of air pollutants were lower than or comparable to published reference values and data collected in other areas. During the study period, movement of air pollution plumes across the border did not appear to cause noticeable deterioration of air quality. The dominance of sea breezes from the Gulf of Mexico was largely responsible for the relatively clean air conditions observed. A full assessment of possible cross-border movement of air pollution

was limited since air monitoring was restricted to the U.S. side of the border and emissions from air pollution sources were not measured. Still, the TAPP establishes a baseline for future air monitoring studies in the Valley.

This Community Summary was developed by EPA to announce key findings of the research project that is fully documented in a separate report of the same title (see back for how to obtain additional information).

Introduction

In 1996, the U.S.-Mexico Border XXI Program was developed as a five-year binational plan to address transboundary environmental problems along the border. One such project under the Environmental Health Workgroup of the Border XXI Program was known as the Lower Rio Grande Valley Transboundary Air Pollution Project (TAPP). The monitoring approach used was based on findings from the Lower Rio Grande Valley Environmental Scoping Study (LRGVESS). The LRGVESS results were presented earlier as a community report and also published in a Special Issue of a scientific journal, *Environment International* (Volume 23, Number 5, 1997). One component of the LRGVESS was ambient (outdoor) air sampling at a fixed monitoring site near the U.S. border with Mexico. A lesson learned from the LRGVESS was that more information was needed concerning potential exposures to air contaminants from cross-border activities. The TAPP was developed to determine whether or not movement of air pollution across the border occurs in the Valley and, if so, to what extent.

The study involved ambient air sampling for one year at three locations in or near the Valley city of Brownsville, Texas. Air measurements and meteorological data similar to those collected in the LRGVESS were acquired at each TAPP site. Fine inhalable particle concentration data were collected at each site on short-term intervals to assess any potential episodic emissions. Precipitation measurements were also performed.

The resulting data were compared to EPA standards such as the U.S. National Ambient Air Quality Standards (NAAQS), as well as comparison values for air pollutants developed by TNRCC known as Effects Screening Levels (ESLs). Comparisons were also made with data collected in other areas. Wind sector analyses and chemical tracer analyses were performed to determine the potential extent of the movement of air pollutants during the sampling period.

Procedure

Figure 1 shows the location of the fixed ambient air sampling sites. The proximity of these sites to the border provided an opportunity to determine potential movement of air pollutants across the border. Sources close to each site were also noted.

Air sampling included: **1)** the mass of fine inhalable particles, particles less than 2.5 micrometers in diameter (abbreviated as $PM_{2.5}$; a micrometer is one-thousandth of a millimeter or one millionth of a meter), **2)** the mass of coarse inhalable particles, particles with diameters ranging from 2.5 to 10 micrometers ($PM_{2.5-10}$), **3)** the chemical elements in $PM_{2.5}$ and $PM_{2.5-10}$, **4)** elemental carbon, **5)** volatile organic compounds (VOCs), **6)** polycyclic aromatic hydrocarbons (PAHs), and **7)** pesticides. Meteorological parameters were also measured at each site.

Particles were measured since they can be produced by many sources such as wind blown dust, garbage incineration, road construction, agricultural practices including tilling, burning and fertilizer/pesticide applications, industrial operations, and burning of diesel fuel and gasoline in trucks and motor vehicles. $PM_{2.5}$ was measured because these particles have a greater potential for deeper penetration into the lung than the larger particles. VOCs were measured since they are associated with gasoline and other petroleum products, industrial and household chemicals, and even plants. PAHs and carbon (and VOCS) were measured because they are found in soot and emissions associated with combustion activities. Since farming is a major activity in the Valley, pesticides were also measured. Precipitation (rainfall) measurements were also performed. Most of the air pollutants were sampled for 24 hours each day. Additional continuous sampling was conducted for inhalable fine particles on a real-time basis. The resulting 1-hour averages were examined to determine short-term variations in particle emissions associated with any air pollution episodes or other documented activities.

Results and Discussion

Overall, the air pollution levels measured in the TAPP were low and air quality in the Valley was

considered good. Concentrations for the majority of the environmental measurements were similar to or lower than data from samples collected in other areas at the same time. Elevated concentrations were observed for some of the VOCs, but these only slightly elevated levels were most likely associated with automotive emissions in the Brownsville area.

The TAPP results were compared with a variety of environmental standards (ESLs, NAAQS, etc.). Actual numerical data are presented in the Project Summary and Project Report. The vast majority of air pollutants measured in this study were well below these reference standards. In a few random instances, one or two of the pollutant measurements met or slightly exceeded a reference value. These higher values were, in general, observed from a single sampling period or a small number of samples and are most likely associated with uncertainties due to inherent variability of the data or the presence of a local, short-term source or activity. For example, of the nearly 2600 particle and VOC measurements taken in this study, silver, 2-nitropropane, benzene, methylene chloride, and vinyl acetate exceeded the ESL only once and are not expected to result in any long-term adverse effects. While acrolein and methanol exceeded the ESL more than once, the collection of these pollutants using devices in this study is difficult. Hence, we would caution over-interpreting these pollutants with their ESLs.

ESLs are used for screening purposes and are not ambient air standards. If measured air pollutant levels of a certain constituent do not exceed its ESL, adverse effects are not expected. An air pollutant level below the ESL is based on measurements during the monitoring period and does not mean that air pollution conditions in the future will remain the same. Conversely, if an air pollutant exceeded the ESL, it does not necessarily mean there is a problem, but rather is an indication that further review is warranted. Further review may include additional sampling or consideration of ambient levels in the environment. As with all comparison values, ESLs undergo periodic review and revision to insure that they are based on current scientific literature.

Based on previous air pollution research, certain air pollutants can be used as "fingerprints" or tracers for specific sources. This knowledge was applied in this study. The high coarse particle chloride levels are most likely associated with the presence of sea salts. A dominant Gulf of Mexico influence was seen in much of the data. Elevated sulfur loadings were probably sulfates emitted by the nearby Gulf of Mexico, Laguna Madre and possible coal combustion sources. Many of the measured VOCs (benzene, methanol, 2-nitropropane, and methylene chloride) are commonly found in solvents or emitted into the air by many sources (for example, benzene is also found in automobile emissions). Since measurements of emissions from sources on both sides of the border were not performed, it was not possible to identify a specific source associated with these VOC emissions. The inability to measure air quality on the Mexican side and to measure actual emissions from all major sources in the Valley limited the ability to fully assess possible transboundary air pollution impacts.

The highest levels of $PM_{2.5}$ and several environmental species (silver, methylene chloride, vinyl acetate, etc.) were measured during periods when the wind came from the southeast direction. It is possible that these maximum levels came from a combination of sources such as sources in Mexico or more immediate sources in Texas. The study data could not be used to distinguish between these two possible sources. The predominance of daily winds from the southeast and the higher wind velocities from this direction provided a greater chance of detecting a single random event (i.e., an emission) from these areas.

Of the five highest methanol values, three came from the south and two came from the north. One high value for methylene chloride occurred from the southeast (at Site 2). There are probable sources for these VOCs in close proximity to the monitoring site on both sides of the border. The maximum values for benzene (at Site 1) and 2-nitro-propane (at Site 2) came from the north.

The EPA has recently made $PM_{2.5}$ a criteria air pollutant. Criteria air pollutants are a group of very common air pollutants regulated by EPA. The $PM_{2.5}$ from this study can only be indirectly compared with the revised National Ambient Air Quality Standard (NAAQS) for $PM_{2.5}$ because of differences in the sampling methods. Briefly, the revised NAAQS for $PM_{2.5}$ mass is the three-year average of annual average $PM_{2.5}$, spatially averaged

across an area (not yet defined). According to the EPA, the level of the three-year spatially averaged value should not exceed 15 $\mu g/m^3$. For the three sites the highest average of daily $PM_{2.5}$ values was 10.4 $\mu g/m^3$ at Site 1. Thus, the annual means calculated for the individual TAPP sites were well below the NAAQS limit for $PM_{2.5}$.

Hourly averages of $PM_{2.5}$ indicated that the highest levels were coming from the south and southeast. The hourly and daily $PM_{2.5}$ data were compared and examined with local pollution events. It was found that these identified emission events had only minimal influence at the sites since the levels and patterns of hourly $PM_{2.5}$ data at all three sites were similar. The similar daily pattern at all sites indicated that regional influences, such as dusts or automobile traffic may have been the dominant factors influencing short-term pollution levels.

Conclusions

1. Overall air quality in the Brownsville area of the Valley was good. Any movement of air pollution across the border did not appear to cause noticeable deterioration of air quality in the Valley.

2. The dominance of winds from the Gulf of Mexico was largely responsible for the clean air conditions in the Valley.

3. The vast majority of air pollution levels were lower or comparable to published standards and monitoring data (shown in Project Report) at other urban and agricultural rural areas in Texas and elsewhere. The very few observations of higher pollutant concentrations are attributed to experimental error or to random, local source emissions and activity rather than any regional phenomena or persistent movement of air pollution plumes from the border.

4. Some high short-term observations may have been influenced by cross-border movement of air pollution from the south and southeast. Local emissions in the immediate location of the sites could have also influenced these higher short-term observations. Without the ability to monitor air quality on the Mexican side and the inability to measure emissions from air pollution sources, it is difficult to ascertain the extent of this influence.

5. Any assessment of total exposure from air pollution in the Valley would require a multi-media monitoring program similar to the LRGVESS.

6. The TAPP provides a baseline to assess future air quality conditions in the Valley. While the study data do not support the immediate need for monitoring, a multi-year effort of air pollution and emission source monitoring is necessary to assess long-term trends in air quality. TNRCC is continuing to monitor air quality at Site 1 and other sites in the Valley to determine such trends.

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The complete project report and project summary entitled "Lower Rio Grande Valley Transboundary Air Pollution Project (TAPP)" is available at:

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