

## SECTION VII

### RECOMMENDATIONS FOR FUTURE STUDY

In this section, suggestions for future study for the Pamlico River airshed are given. These recommendations are based on the regional air quality monitoring experience acquired during the six-month study period from May 1 through October 31, 2000.

This study was the first full-scale monitoring program for the Pamlico River region and it essentially represents one of the largest undertakings by the ATAST. Consequently, the group had to go through a fast learning curve on some of the new monitoring equipment without prior experience. Understandably, there were a few oversights during the periods of planning, designing, implementing, and conducting the study. Consequently, the remedies for some of these are now reflected in the recommendations for further work.

Recommendations for future study at the Pamlico River airshed include three additional monitoring sites (total of seven) and an extension of the study duration for two years. There should be one more upwind (background) site in the vicinity of St. Hooker and two additional sites, one each further north of Bath and Hardison. Concurrent monitoring at seven sites may provide a detailed insight into kinetics of atmospheric chemical transformation of pollutants over time and distance. It is our considered opinion that the continuous two-year monitoring period is a justifiable option for obtaining true averages of airborne pollutants of the region. This would allow for the collection of masses of reliable data and thus increase the statistical certainty at individual sites. Consequently, a subtle and definite data pattern could emerge/develop for the region. This then becomes an ideal situation for chemical and meteorological data interpretations and their further extrapolations. The recommended monitoring period (two years) would enable collection of chemical, meteorological and visibility data for two complete seasonal cycles. This will provide an opportunity to evaluate data for seasonal as well as annual variations. Further, such data evaluation process may provide insight into the reasons and causes for the occurrence of episodic events as well as the design of control technology approaches. If implemented, this may minimize, if not eliminate local citizen complaints.

Each site should have similar monitoring equipment configurations as in the current study. Additions would include auto-analyzers, for monitoring of ozone, at each of the seven sites. Evaluation of data presented in **Section V** indicates an association of high ozone concentrations with high nephelometer readings, high PM<sub>2.5</sub> mass and high regional particulate sulfate and ammonium concentrations. Ozone is a potent oxidant pollutant, and therefore, its monitoring for two years may reveal an interesting relationship for the region and may perhaps further explain the origin of citizen odor complaints.

During the extension phase, we propose that the ADS sampling be carried out every day from 6:00 AM to 6:00 PM and 6:00 PM to 6:00 AM. This will allow for collection of two

samples per day per site continuously for two years. Such samples, upon analysis, may quantify pollutant airborne concentrations for both day and night times. The concentration differences between day and night may be ascribed/attributed to specific meteorological parameters and/or to the regional source(s) operations (historically more regional episodes have occurred in early AM hours). Evaluation of collected pollutant data may provide insight into regional conditions causing the episodic events and probably source(s) contributing to the episodes. It should be noted that a sample collected, after the study period, at the Bayview Ferry Landing site indicate spikes (relative increases) in SO<sub>2</sub> concentrations occurring roughly from 8:00 PM to midnight. This observation was confirmed by comparing SO<sub>2</sub> continuous auto-analyzer data from the same monitoring site, of nearly 6-months duration. Therefore, collection of two samples per day might help to interpret the regional SO<sub>2</sub> and other pollutant data.

Additionally, as a means to determine whether the citizen odor observations made in the future are related to a “transient coning plume” phenomenon related to PCS emissions (as proposed in **Section 5.2.2**), it would be recommended that SO<sub>2</sub> monitors be placed at several sites that would be near citizen observation locations. This would allow correlation of citizen observations with meteorological data on smaller time scales, given that the observations in this study indicate that the odor observations lasted between 10 minutes and 2 hours.

During the present study, samples of fog events were not collected. It is our opinion that the collection and chemical analysis of fog event samples should be considered important to obtain pollutant concentrations during the fog events and also to further support/supplement ADS episodic event samples analysis data. The ADS episodic samples were not collected because of programming error(s) with the data loggers. The data logger programming for the episodic sampling study was not completed until late September 2000 and at this time the study was well underway with no scope to identify this programming error(s).

It is our opinion that the months of May, June, July and part of August are critical for the Pamlico River region, in terms of occurrences of episodic events and citizen odor complaints. However, ATAST did not have capabilities to trigger episodic event sampling during these months. Therefore, the current study represents only an air quality characterization attempt, with no supporting chemistry data from fog and episodic events. Because of this situation, neither the source attribution nor the investigations into the causes/reasons of episodic event objectives could be met. Therefore, it is highly recommended that for future studies of the region, these and other related important facets should be ready and well tested before the actual start of the study.

Ideally, the chemical analysis turn-around time, for field collected air samples, should be minimal so that data are promptly evaluated and critical changes in the field operations can be carried out in a timely manner. Thus, an evaluation of instrument capacity to analyze field samples with the documented laboratory performance needs to be firmly assessed before the actual start of the two-year study.

For further work at the Pamlico River region, it is recommended that an ADS that permits concurrent sample collection for volatile and semi-volatile organic compounds, acidic and basic gaseous pollutants and fine particulate matter be deployed. The timely analyses of such samples will provide quantitative chemical data for the pollutants of interest. Furthermore, PM<sub>2.5</sub> mass collected on Teflon™ filters may be analyzed for particle morphology, organic carbon, elemental carbon, toxic metals and water-soluble anions and cations. The utility of an on-line IC, to analyze ADS samples for chemical pollutants, needs to be further explored on a real time basis.

Finally, the latest of the developments in air monitoring technology is the availability of real-time measurement instruments. Some of these may be ideally deployed for reliable information on pollutant chemical speciation/concentrations. Data collected may assist in source attribution and possibly reveal the reasons and causes for episodic events.

The following summarizes our recommendations for further work:

- Include seven monitoring sites and extend study duration for two-years.
- Each monitoring site should have a ozone continuous analyzer.
- Each day, collect two 12-hour ADS samples (day and night).
- Arrange to collect and chemically analyze all regional fog and episodic event samples (critical months for the Pamlico River region are May, June, July and part of August).
- Ensure that the ADS sample analysis turn-around time is reasonable to make necessary changes in the field as well as in the laboratory.
- Use the latest available air sampling denuder technology that will permit concurrent sample collection for organic volatile and semi-volatile compounds, acidic and basic gases and fine particulate matter.
- Analyze the fine particle mass collected on Teflon™ filters for organic carbon, elemental carbon, particle morphology, toxic metals and soluble anions and cations.
- Evaluate the utility of ADS sampler with on-line IC to collect chemical data on a real time basis.
- Evaluate air-monitoring instruments capable of providing chemical data, on a real time basis, for pollutants of interest.