CHAPTER 10

LOOKING BEYOND CURRENT REQUIREMENTS

INTRODUCTION

This Chapter presents additional analyses which have important future considerations, but which are not currently required under law to be included in the AQMP. Uncertainties associated with the technical analysis provided in the AQMP are discussed in this chapter. In addition, a first look at the year 2020 is provided. The 2020 air quality analysis is provided for informational purposes only and does not serve as a maintenance plan at this time. Lastly, the District has attempted to anticipate certain future federal requirements and has incorporated this information into the 1997 AQMP. In anticipation of federal changes regarding PM_{10} and ozone ambient air quality standards, a preview of future technical considerations and possible planning implications is provided in this chapter.

UNCERTAINTIES ASSOCIATED WITH THE TECHNICAL ANALYSIS

As with any plan update there are uncertainties associated with the technical analysis. Projecting air quality concentrations into the future has associated uncertainties. These uncertainties exist in the demographic and growth projections for the future base years. As projections are made to longer periods (i.e., over ten or more years), the uncertainty of the projections become greater. Examples of these types of uncertainties include:

- the location of new sources;
- military base reuse plans; and
- economic prosperity.

In addition to the above, there are also uncertainties in the technical information gathered for the air quality analysis. The three major input elements of any air quality modeling analysis (ambient air quality monitoring data, meteorological measurements, and emissions inventory) all have various levels of uncertainties. Generally, ambient air quality measurements are within plus or minus half of a unit of measurement (e.g., for ozone usually reported in units of pphm would be accurate to within $\pm$0.5 pphm). Due to this uncertainty, the Basin's ozone attainment status based on ambient monitoring data would be achieved if all ozone monitors reported ozone concentration levels less than or equal to 12.4 pphm. Examples of meteorological uncertainties include:

- averaging of instantaneous wind speeds and directions to hourly averaged values and
- directional consistency during low (stagnant) wind conditions.

As discussed in Chapter 3, large uncertainties in the mobile source emissions inventory estimates have been observed as evident with the latest EMFAC7G release. On-road mobile source emission estimates have increased with each new EMFAC release. On-road mobile source emissions have inherent uncertainties also with the current methodologies used to estimate vehicle activity such as vehicle miles traveled. Stationary (or point) source emission estimates have less associated uncertainties compared to area source emission estimates. Major stationary sources report emissions annually whereas area source emissions are, in general, estimated based on sales or population information.

The air quality model used for ozone air quality analysis (the Urban Airshed Model) is a sophisticated, complex 3-dimensional model requiring 3-dimensional meteorological data. Meteorological measurements collected at various locations throughout the Basin are used to generate 3-dimensional flow fields. In addition to uncertainties in model input data, air quality models contain inherent uncertainties due to the model formulations which rely on numerical methods to solve complex mathematical equations of motion. Examples of these types of uncertainty sources are as follows:

(1) Estimations of 3-dimensional wind fields from a limited number of measurements.

(2) Chemical reactions based on experimental data.

(3) Application of numerical solutions to complex physical processes.

It should be noted that uncertainties run in two directions and comparisons with recent year projections show that the air quality is improving at a greater rate than was projected. This would indicate that uncertainties are not significantly affecting the integrity of the Plan.

Furthermore, the concerns regarding uncertainties in the technical analysis are reduced with future AQMP revisions. For each AQMP revision, the best available technical information is used. Under state law, the AQMP revision process is a dynamic process with revisions occurring every three years. The AQMP revision represents a “snapshot in time” providing the progress achieved since the previous AQMP revision and efforts still needed in order to attain air quality standards.

Under the federal Clean Air Act, a state implementation plan (SIP) is prepared for each criteria pollutant. The SIP is not updated on a routine basis under the federal Clean Air Act. However, the federal Clean Air Act recognizes that uncertainties do exist and provides safeguards if a nonattainment area does not meet an applicable milestone or attain federal air quality standards by their applicable dates. Contingency (or backstop) measures are required in the AQMP and must be developed into regulations such that they will take effect if a nonattainment area does not meet an applicable milestone or attainment date. In addition, federal sanctions may be imposed until an area meets applicable milestone targets.

U.S. EPA recently released a guidance document on the use of modeled results to demonstrate attainment of the federal ozone air quality standard[1] The guidance document recognized that there will be uncertainties with ozone modeling analysis. For severe and extreme ozone nonattainment areas, the U.S. EPA recommends that at least one "mid-course" review of air quality, emissions and modeled data be conducted. A second review, shortly before the attainment date, should be conducted also.

A FIRST LOOK AT THE YEAR 2020 OZONE AIR QUALITY

With continued growth in the South Coast Air Basin beyond 2010, concerns have been raised whether the South Coast Air Basin can maintain the federal ozone air quality standard. As such, an ozone air quality analysis for 2020 was performed. Data on the projected growth in the Basin and surrounding areas were provided by SCAG. Future year ozone air quality projections are provided in Figure 10-1.

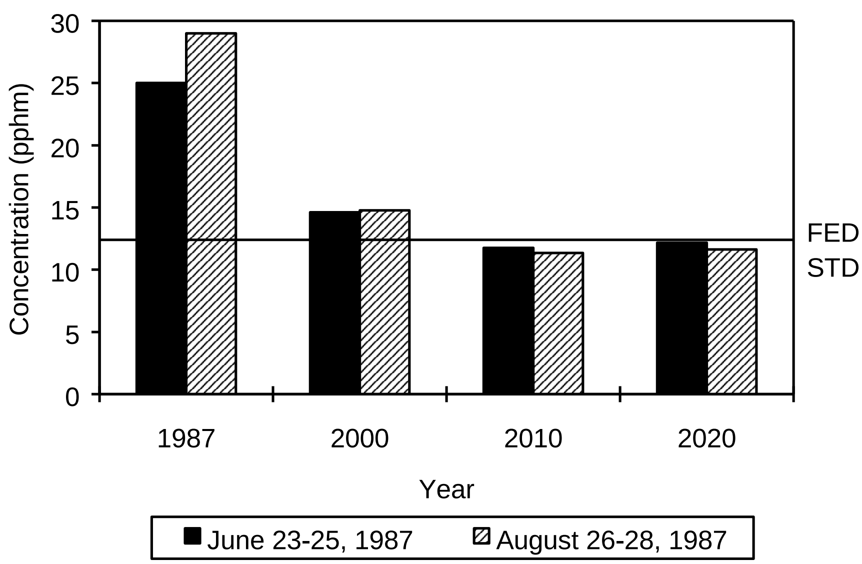

FIGURE 10-1

Basinwide Maximum Ozone Concentration with Proposed Emission Controls

The baseline inventory for the year 2020 is shown in Table 10-1, and the remaining emissions with implementation of the 1997 AQMP control strategy is shown in Table 10-2.

TABLE 10-1

[1] U.S. EPA, <u>Guidance on Use of Modeled Results to Demonstrate Attainment of the Ozone NAAQS, EPA-454/B-95-007, June 1996</u>

2020 Baseline Emissions for the South Coast Air Basin
Planning Inventory (tons/day)

	Summer		Winter
	VOC	NO_x	CO
Stationary Source Emissions	689	122	365
On-Road Emissions	117	364	1,730
Off-Road Emissions	159	282	1,761
Total Emissions	**965**	**768**	**3,856**

TABLE 10-2

2020 Remaining Emissions for the South Coast Air Basin
with the Implementation of the 1997 AQMP Control Strategy
Ozone Planning Inventory (tons per day)

	VOC	NO_x
Stationary Source Emissions	314	92
On-Road Emissions	57	268
Off-Road Emissions	72	174
Total Remaining Emissions	**443**	**534**

POTENTIAL NEW AIR QUALITY STANDARDS FOR OZONE AND FINE PARTICULATES

During the timeframe for development of the 1997 AQMP, the U.S. EPA is reviewing the current air quality standards for ozone and particulate matter. As part of the requirements of the CAA, every five years the U.S. EPA must review the current ambient air quality standards and propose revisions where necessary. This review process includes a comprehensive evaluation of the latest health studies; a redrafting, if appropriate, of the relevant pollutant criteria document; and a staff report recommending the position of the U.S. EPA staff. Both the criteria document and the staff report are reviewed by the CAA-authorized Clean Air Science Advisory Committee (CASAC), an independent panel of experts. Generally, for the U.S. EPA to proceed with the new air quality standard setting process, consensus approval must first be given by CASAC on both the criteria document and the staff report. At this point in time, these actions have occurred.

In the current process, both ozone and fine particulates are being considered for new standards. The U.S. EPA in June 1996 issued an Advanced Notice of Proposed Rulemaking (ANPR) regarding possible new ambient air quality standards for ozone and fine particulates. In the ANPR, U.S. EPA announced that proposed action would be issued in November 1996. Should the proposed action include recommendations for new standards, then final action would occur in June 1997. If new standards are proposed, a new set of planning requirements will also be proposed. Under the CAA, for new standards, new plans must be developed within three to six years from the date of final promulgation.

Health Basis

The U.S. EPA recently completed a review of the scientific and technical information on the known and potential adverse health effects of ozone and PM_{10} because results from recent studies have suggested that attainment of the existing NAAQS for these pollutants may not provide adequate public health protection. A brief summary of the effects associated with these pollutant exposures at levels observable in Southern California is presented. A more detailed discussion of health effects is provided in Appendix I.

Ozone

People exercising outdoors, children and persons with preexisting lung disease such as asthma are considered to be susceptible sub-groups for ozone effects. Identified in human and/or animal studies with varying exposure duration the adverse health effects which are either induced by ozone or associated with ambient ozone exposures include: breathing pattern changes; reduction in breathing capacity and exercise performance; increase in airway resistance; susceptibility to infections; excess hospital admissions and emergency room visits; and acute inflammation of the respiratory tract including some cellular changes.

The lowest range of ozone exposure within which lung functional changes (decrease in breathing lung volumes and increase in airway resistance) are observed is 0.08 to 0.12 ppm for 6-8 hours under moderate exercising conditions. Under similar exposure conditions, biochemical indicators of lung inflammation are induced in healthy adults exposed to ozone in the range of 0.08 to 0.10 ppm. Excess hospital admissions and emergency room visits are observed when hourly ozone concentrations are as low as 0.08 to 0.10 ppm. Thus, the attainment of the current NAAQS (0.12 ppm) is not likely to prevent all the adverse effects indicated from ozone exposure.

Particulate Matter

The major categories of adverse health effects associated with PM_{10} include: increase in mortality associated with acute and chronic exposures; exacerbation of preexisting respiratory and cardiovascular diseases leading to an increase in hospital admissions and emergency room visits; school absences; work loss days and restricted activity days; changes in lung function and structure; and altered lung defense mechanisms.

A review and statistical analysis of recent population studies published on acute adverse effects of PM_{10} indicates that an incremental increase of PM_{10} by 10 $\mu g/m^3$ can lead to a significant increase in both mortality and morbidity risks. The elderly, people with preexisting respiratory and/or cardiovascular disease(s) and children appear to be most susceptible to the effects of PM_{10}. These findings suggest that even when an area meets the existing NAAQS for PM_{10} the community is likely to continue to have the adverse impact from ambient PM_{10} exposures.

A limited number of studies which have employed both PM_{10} and $PM_{2.5}$ indices for pollution suggest that the adverse effects show a better correlation with the latter. A growing consensus exists among the scientific community that the fine fraction of PM_{10} is relatively more toxic than the coarse fraction and is responsible for the majority of PM_{10} effects observed.

In addition, U.S. EPA in its recent PM_{10} NAAQS review has concluded that the difference in exposure relationships, and the strong likelihood of fine mode fraction of PM_{10} being significant contributors to PM-related health effects in sensitive populations, are sufficient to justify the consideration of fine and coarse mode particles in PM_{10} as separate classes of pollutants. Hence, U.S. EPA has recommended additional $PM_{2.5}$ NAAQS.

Assessment of Potential New Standards

Ozone

The U.S. EPA is considering replacing the current 1-hour federal ozone standard of 0.12 ppm with an 8-hour standard. At this time, U.S. EPA is considering the level of the standard to be in the range of 0.07 to 0.09 ppm, with the most likely value at 0.08 ppm. In addition, U.S. EPA is considering a change in the form of the standard, from an exceedance-based to a concentration-based form. Under this scenario, if the 5th highest 8-hour average, as averaged over the three most recent years of record, is above 0.08 ppm, then the area would be deemed to be in violation of the standards. U.S. EPA is also considering the 2nd highest 8-hour average, averaged over three years, and if the 2nd highest value is below 0.08 ppm, then an area will be deemed to be in attainment of the standard. What happens if an area records values between these two bands has not been specifically delineated.

The District has evaluated the differences between the current 1-hour standard and the possible 8-hour standard for both 1995 (actual) and 2010 (projected). These are summarized in Table 10-3. Currently, the 1-hour standards are exceeded by 116 percent. The maximum 8-hour would exceed the possible new standard by 155 percent. Future year projections show that the 1-hour standard would be met in 2010, but the maximum 8-hour standard would still be exceeded by 31 percent. Because federal guidance has not yet been developed for modeling attainment demonstrations of a 5th highest value, a projection of this value cannot be made at this time.

TABLE 10-3

Comparison of Ozone Standards

		1995		2010	
	Standard (ppm)	Max Value (ppm)	% above Standard	Max Value (ppm)	% above Standard
Current 1-hour	0.12	0.26	116	0.118	Met
Possible 8-hour (maximum)	0.08	0.204	155	0.105	31
Possible 8-hour (5th highest)	0.08	0.165	106	*	*

*Future-year federal guidance for attainment demonstration not available.

Particulate Matter

The U.S. EPA is currently recommending that new fine particulate standards be established at a cut-point of 2.5 micrometers ($PM_{2.5}$). The latest recommendations would establish a $PM_{2.5}$ annual average at a value between 12.5 and 20 μg/m^3, and a $PM_{2.5}$ 24-hour average at a value between 18 and 65 μg/m^3. The PM_{10} annual average is likely to be retained, but the 24-hour PM_{10} standard may be deleted.

A comparison of the current PM_{10} standards and the possible new $PM_{2.5}$ standards for 1995 and 2006 are shown in Table 10-4. The 1995 values are derived from the measurements taken during the PTEP study; the 2006 $PM_{2.5}$ values are estimated from the PM_{10} model application coupled with PM_{10}-to-$PM_{2.5}$ conversion factors applied on a component basis, as derived from the PTEP data. Currently, the PM_{10} standards are exceeded by 38 percent, and attainment can be demonstrated by 2006. If the new $PM_{2.5}$ standards are promulgated, the $PM_{2.5}$ annual standard in 2006 with the current control strategy would be exceeded by 25 percent at the upper (or least stringent) end of the range, while the 24-hour average would be exceeded by 51 percent at the upper end of the range. At the lower end of the range (most stringent), the percent above standards would be 100 percent for the annual average, and 444 percent for the 24-hour average.

TABLE 10-4

Comparison of Particulate Matter Standard

		1995		2006	
	Standard ($\mu g/m^3$)	Max Value ($\mu g/m^3$)	% above Standard	Max Value ($\mu g/m^3$)	% above Standard
Current PM_{10} (24-hour)	150	207	38	143	Met
Current PM_{10} (Annual)	50	69	38	48	Met
Possible $PM_{2.5}$ (24-hour)		125		98	
upper range	65		92		51
lower range	18		594		444
Possible $PM_{2.5}$ (Annual)		40		25	
upper range	20		100		25
lower range	12.5		220		100

It is also important in looking into the future to understand the significant components of $PM_{2.5}$ as projected for the year 2006. These are shown in Figure 10-2. The ammonium and nitrate portions represent the dominant fraction of $PM_{2.5}$ on both an annual and episodic (24-hour) basis. Note, too, that the crustal component, as identified within the category labeled "others," and which represents a significant fraction of PM_{10}, plays a very small role in the $PM_{2.5}$ picture. For the 24-hour standard, it is evident that significant reductions in ammonium nitrate will be needed over and above the current PM_{10} control strategy in order to attain a possible $PM_{2.5}$ standard. Appreciable reductions will also be needed for both organic and elemental carbon, the former from VOC emissions and the latter from soot emissions, primarily from diesel exhaust.

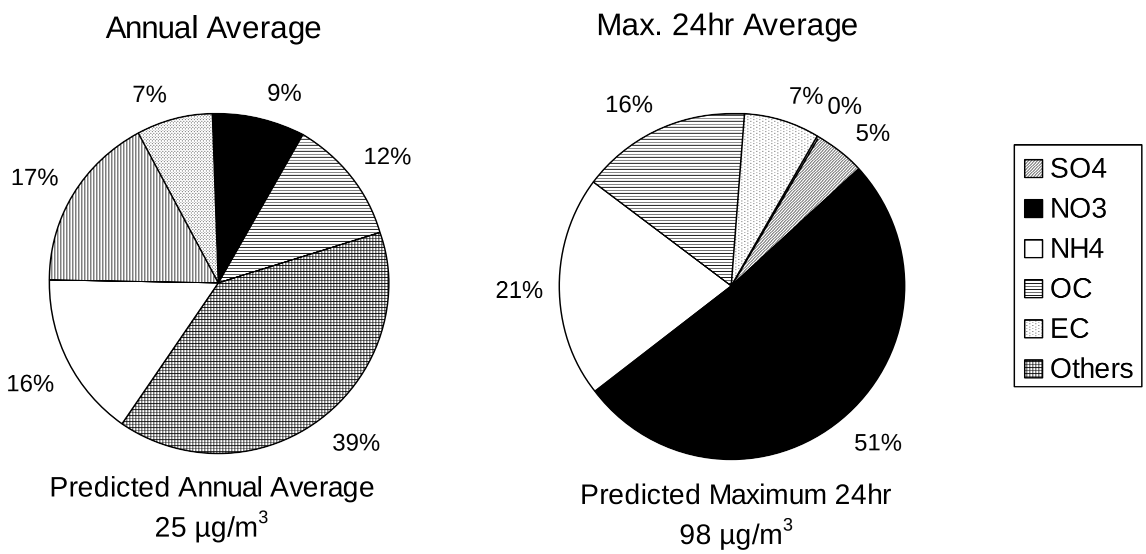

FIGURE 10-2

Estimated $PM_{2.5}$ Components in 2006

Implementation

With any new standard, U.S. EPA provides "interim" guidance on the transition from the old to the new standard. To better address the concerns and implications of a transition policy as well as other implementation issues regarding ozone, fine particulates, and regional haze, U.S. EPA has assembled an advisory committee under the Federal Advisory Committee Act (FACA). The FACA Committee represents over 50 representatives from state and local air regulatory agencies, industry, environmental organizations, consulting organizations, academia, and federal agencies. In addition, four subgroups have been formed to focus on: (1) Base Programs and Policies; (2) National and Regional Strategies; (3) Science and Technology; and (4) Communications and Outreach. In addition, a Coordination work group integrates the results from the subgroups. It is anticipated that U.S. EPA will rely on the FACA process in developing new guidance and policies should new standards be promulgated. The District staff are actively participating/following the subgroup activities to ensure consideration of South Coast Air Basin conditions.