EXECUTIVE SUMMARY

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The 2007 Air Quality Management Plan (AQMP or Plan) has been prepared to meet the challenge of achieving healthful air quality in the South Coast Air Basin (Basin) and the Coachella Valley. This report accompanies the 2007 AQMP and presents the potential socioeconomic impacts resulting from implementation of the Plan. The information contained herein is considered by the South Coast Air Quality Management District (District) Governing Board when taking action on the Plan.

The Plan contains several short- and long-term measures designed to achieve federal ambient air quality standards, make progress toward state air quality standards, and meet air quality planning requirements. These measures will be implemented by the District, the California Air Resources Board (CARB), the U.S. Environmental Protection Agency (EPA), the Southern California Association of Governments (SCAG), and other local and regional governments. Implementation of these control strategies will affect the region's economy. This plan relies heavily on mobile source strategies, such as accelerated fleet turnover.

The District relies on a number of methods, tools, and data sources to assess the impact of proposed control strategies on the economy. These tools include the following: air quality models and concentration-response relationships to estimate benefits of clean air; capital, operating and maintenance expenditures on control devices and emission reductions to assess the cost of the Plan; the REMI (Regional Economic Models, Inc.) model to assess potential employment and other socioeconomic impacts (e.g., population and competitiveness); 2000 Census data to assess employment impacts among ethnic groups; and the Consumer Expenditure Survey from the Bureau of Labor Statistics to examine the impact of changes in product prices on consumer price indexes by household income.

Overall, the Plan is expected to have significantly higher benefits than costs, and likely an overall job increase. Based on the methods and tools described above, the Socioeconomic Report attempts to answer the following important questions.

What Are the Benefits of the 2007 AQMP?

Over the years, there has been an overall trend of steady improvement in air quality in the Basin. Additional emission reductions are still needed in order to bring the Basin into compliance with federal air quality standards. The benefits of better air quality through implementation of the 2007 AQMP include reductions in morbidity and mortality, increases in crop yields, visibility improvements, reduced expenditures on refurbishing building surfaces, and reduced traffic congestion.

The 2007 Plan is projected to comply with the federal $PM_{2.5}$ and ozone standards with a quantified average annual benefit of $14.6 billion between 2007 and 2025. The $14.6 billion includes approximately $9.8 billion for averted illness and higher survival rates, $3.6 billion for visibility improvements, $966 million for congestion relief, $204 million for reduced damage to materials, and $18 million for increased crop yields.

The total benefit of the Plan is expected to exceed the analyzed $14.6 billion annually since not all of the benefits associated with the implementation of the Plan can be quantified. For example, the quantified health benefits only account for reduced exposure from $PM_{2.5}$ and ozone, while those from decreased exposure to other pollutants are not included. In addition, reductions in vehicle hours traveled for personal trips and damages to plants, livestock, and forests have not been quantified. Further research is needed before these benefits can be quantified.

What Is the Total Implementation Cost of the 2007 AQMP?

The projected annual average implementation cost of the Plan is $2.3 billion between 2007 and 2025. The cost for implementing the Plan was estimated for both quantified and unquantified measures.

The projected cost for 33 quantified short-term measures is approximately $1.8 billion per year. Transportation control measures alone account for 24 percent of the total quantified cost. The cost of unquantified measures is projected to be approximately $523 million per year. The cost of unquantified measures, mostly long-term measures, was derived from emission reductions as they are implemented and the average cost effectiveness of quantified measures.

The cost of quantified measures represents 47 percent of total emission reductions needed for attainment. A sensitivity test performed for the unquantified measures shows that their cost could vary from a low of $21 million to a high of $1.1 billion. Thus, the total annual average cost of the Plan could range from a low of $1.8 to a high of $2.8 billion. Additional efforts will be made to better quantify and/or refine the costs associated with all control measures during rulemaking or before the next AQMP revision.

What Are the Costs of the 2007 AQMP Compared to the Benefits?

The analysis contained herein shows the benefits quantified for the Plan significantly outweigh the anticipated costs. The measurement of clean air benefits is performed indirectly since clean air is not a commodity purchased or sold in a market. This often results in incomplete and underestimated benefits. The benefits of clean air (based on the total emission reductions required for attainment) for which a monetary figure can be applied are $14.6 billion as compared to the costs of $2.3 billion on an average annual basis. There are, however, many benefits which are still unaccounted for, such as reductions in chronic illness and lung function impairment in human beings, reduced damage to livestock and plant life, erosion of building materials, and the value of reduced vehicle hours traveled for personal trips.

The cost of quantified measures was based on the prices of equipment and materials that would be required for the implementation of these measures. Ninety-five percent of the emission reductions from short-term measures have been quantified with costs. The cost of unquantified measures was extrapolated based on the average cost effectiveness of quantified measures. Since quantified measures represent only 47 percent of overall emission reductions, questions have been raised by the AQMP Advisory Group and the Scientific, Technical and Modeling Peer Review Advisory Group (STMPRAG) about the appropriateness of this approach. This is

because as the District comes closer to its attainment goals for various pollutants, the cost in achieving the final increment towards attainment might actually result in higher costs than projected. It is also not clear whether the costs associated with maintaining attainment of various pollutants will be reflective of the currently projected costs. Historically, in many instances actual control costs are shown to be lower than projected costs due to cost reductions resulting from technological advancements over time. However, actual costs could be higher than projected costs if modifications to existing plant structure are required.

When all these factors are considered, District staff believes that the estimated benefits are expected to further outweigh the costs.

What Potential Effects Will the Plan Have on Employment?

Both control costs and clean air benefits impact regional employment. The employment impact analysis was performed separately for quantified control measures and clean air benefits resulting from the attainment of air quality standards. Since the technical tools used to perform employment impact analysis (i.e., REMI model) require detailed information on affected industries, unquantified measures, mostly long-term measures, cannot be analyzed for their potential employment impacts. Therefore, only quantified measures are included for the cost analysis and the associated employment impacts. However, the clean air benefits include all the intended emission reductions for attainment. As such, the employment impacts from quantified measures (most of the short-term measures) and benefits should be viewed separately.

While not all costs and benefits can be quantified, the overall jobs created are expected to be greater than jobs forgone. Specifically, the total jobs created from quantified benefits are expected to be greater than 61,400 per year. Annual average jobs forgone from quantified short-term control measures are approximately 28,300 per year.

Nearly all industries would experience additional jobs created due to cleaner air. The wholesale trade sector and manufacturers of transportation equipment would experience additional jobs created due to additional demand for their products as required by on- and off-road control measures. Concerns were raised by business stakeholders at an AQMP Advisory Group meeting that the scarcity of New Source Review (NSR) offsets should be addressed so that manufacturing job growth would not be unnecessarily limited. The District acknowledges these concerns, and is taking separate efforts in addressing the offset issues.

The potential small business impacts of individual control measures will be further examined in the rule development process. The employment impacts associated with unquantified measures will be examined further as the affected industries of these measures are defined in more detail. In addition, as measures are developed into rules, their potential employment impacts will be specifically assessed.

What Are the Potential Impacts on Socioeconomic Groups and Ethnic Communities?

Implementation of the 2007 AQMP is projected to result in air quality improvements sufficient to attain the federal air quality standards in 2014 for $PM_{2.5}$ and in 2023 for ozone. The eastern and western portions of Los Angeles County and the Chino-Redlands area are projected to have the highest shares of quantified air quality benefits. Central and Eastern Los Angeles County and the Chino-Redlands area of San Bernardino County would benefit the most from reductions in $PM_{2.5}$. The northern and coastal portions of Los Angeles County, Southern Orange County, and Riverside and San Bernardino Counties will benefit from reductions in ozone.

When combined $PM_{2.5}$ and ozone improvements are considered, communities throughout the region will experience net air quality benefits. The 2007 AQMP is designed to meet both federal ozone and $PM_{2.5}$ standards. $PM_{2.5}$ has significant mortality impacts and the Basin has a deadline for attainment of the $PM_{2.5}$ standard in 2014. Ozone has health impacts, including mortality, but current ozone levels do not cause as many premature deaths as $PM_{2.5}$. Significant NOx reductions are necessary and they are more effective than VOC reductions to attain the $PM_{2.5}$ standard in 2014. Built upon the $PM_{2.5}$ strategy, further NOx reductions are still needed even with substantial VOC reductions in order to attain the ozone standard. The NOx-heavy strategy in this Plan was chosen to meet both standards and provide greater certainty to reach attainment due to less total reductions (VOC and NOx) required. Downwind areas also benefit more from this strategy. Moreover, VOC controls at this time are less advanced than NOx controls. Under the NOx-heavy strategy, there is an environmental trade-off where some areas experience increases in ozone levels (but they still remain below the federal standard). This trade-off would occur even with a combined VOC and NOx strategy, which does not meet the air quality goals. Even though ozone increases in some areas, overall health benefits are positive for each of the 19 sub-regions because benefits from $PM_{2.5}$ are much greater than any dis-benefits from ozone.

The greatest $PM_{2.5}$ health benefits are in Central and Eastern Los Angeles County and the Chino-Redlands area of San Bernardino County. When compared to the ozone projections under the future baseline condition where no additional control is proposed beyond today's level, ozone concentrations in some more densely populated areas will increase under the 2007 AQMP but will still be below the federal standard in exchange for $PM_{2.5}$ improvements. This is termed "dis-benefit." The overall regional population-weighted exposure shows that the magnitude of ozone dis-improvements exceeds that of improvements in 2009, 2012, and 2020, thus resulting in a net overall ozone dis-benefit (or increase in symptoms). However, there will be net ozone benefits of $1.4 billion in 2023. The northern and coastal portions of Los Angeles County, southern Orange County, and Riverside and San Bernardino Counties will benefit from reductions in ozone. These areas are dominated by either White or Hispanic residents. Currently, the worst ozone locations are in Santa Clarita and Crestline.

In order to design the most efficient path to clean air, it is imperative that an integrated plan including both $PM_{2.5}$ and ozone be developed. A plan targeting only a single pollutant may jeopardize the attainment of the other pollutant.

The attainment of the ozone and $PM_{2.5}$ air quality standards depends on full implementation of control measures that are proposed in the 2007 AQMP. The costs of these measures will ripple

throughout various communities. Quantified control measures would impose relatively greater share of costs on the southern portion of Los Angeles County than the rest of the communities. This is because of the significant costs incurred by several mobile source control measures with affected sources located around the ports of Southern Los Angeles County.

All of the 19 sub-regions are projected to have additional jobs created from cleaner air. All ethnic groups are expected to have job gains, as a result. Conversely, implementation of quantified control measures would result in jobs forgone between 2007 and 2025. Because of their large representation in today's workforce, Whites and Hispanics will be affected most by changes in jobs. However, significant uncertainty exists in projecting the job distribution by race and ethnicity due to the rapidly-changing structure of population and workforce in the four-county area.

Job gains from cleaner air would benefit all five wage groups comprised of 94 occupations. Conversely, all five groups would experience jobs forgone from quantified control measures. However, there is no significant difference in impacts expected for high- versus low-paying jobs. The same is observed for impacts on the price of consumption goods from one income group to another. These findings require further evaluation during individual rule development efforts.

What Potential Effect Will the Plan Have on Competitiveness of Local Industries?

The Socioeconomic Report examines competitiveness of local industries in four areas: the Basin's share of national jobs, cost of production, relative delivered prices, and exports and imports. The quantified measures and benefits of the 2007 AQMP are not expected to result in discernible differences in the four-county region's share of national jobs. The impacts on product prices of nearly all sectors are projected to be less than one percent of their respective baseline indices. The impacts on imports and exports are relatively small as well.

The competitiveness analysis of the Plan focuses on its impact on various sectors of the local economy. Individual control measures could result in impacts on individual companies. Competitiveness at the company level will be analyzed during individual rule development efforts, to the extent feasible.

The actual effects of the 2007 AQMP (including unquantified measures and benefits) on regional competitiveness could vary from the projected effects of quantified measures and benefits for several reasons. First, the analysis assumes that all control costs are "extra" costs when compared to air pollution control costs in other regions. This ignores the fact that competing regions tend to follow the District's lead and adopt control measures with objectives similar to those proposed in the District or at a minimum have some level of control with consequent costs. For example, a number of eastern states have adopted the California vehicle exhaust standards. The Socioeconomic Report underestimates the benefits from clean air that would increase regional attractiveness. In addition, as part of the 2007 AQMP, District staff is making efforts to maintain and further foster economic competitiveness in the region by:

(1) Pursuing state and federal tax incentives for early replacement of higher-emitting engines or vehicles;

(2) Developing demand side management programs (e.g., product certification programs and energy conservation measures); and

(3) Seeking additional state and federal funding to further incentivize fleet turnover.

Does This Analysis Affect the Selection of Possible Alternatives to the 2007 AQMP?

Yes. The Socioeconomic Report can affect the selection of alternatives to the proposed Plan as identified in the Environmental Assessment for the 2007 AQMP. In considering whether to adopt the Plan or one of the alternatives, the District Governing Board will select the alternative that presents the best balance of greatest socioeconomic and environmental benefits and least adverse environmental and socioeconomic impacts.

The No Project Alternative, which is the 2003 AQMP, would not reach attainment of air quality standards. Both the 2007 AQMP and CEQA Alternative 2—VOC/NOx Combined Alternative—are demonstrated to meet the federal air quality standards for ozone and $PM_{2.5}$.[1] The VOC/NOx Combined Alternative has higher cost and lower air quality benefit than the Plan.

The VOC/NOx Combined Alternative has the same $PM_{2.5}$ attainment benefit as the Plan. Thus, only benefit categories associated with ozone concentrations would show differences between the VOC/NOx Combined Alternative and the Plan. For example, in 2023, the ozone health benefit under the Plan is larger than that of the VOC/NOx Combined Alternative.

Quantified air quality benefits of the 2007 AQMP and the VOC/NOx Combined Alternative are projected to foster continued growth of the local economy. Overall, the Plan results in a lower implementation cost and a higher number of jobs gained from clean air.

[1]The VOC/NOx Combined Alternative has the same short-term measures as the 2007 AQMP but has more VOC and less NOx reductions for the "black-box" commitment; it also attains the 8-hour ozone standard by 2023. Since Alternative 2 has more VOC reductions, it is assumed that more concurrent toxic reductions would occur than the 2007 AQMP.

What Are the Key Areas of Uncertainty and Caveats in This Assessment?

As with any complex analysis, some uncertainty is inherent in the methodology employed. Consequently, caveats need to be applied in interpreting the results. The key areas of uncertainty and caveats in this socioeconomic assessment are described below.

- Air Quality Change: The air quality response to controls for the socioeconomic assessment was derived for the entire region (comprised of 2,600 grids of 25 square kilometers per grid), and relies on the air quality modeling designed for attainment demonstration (i.e., ensuring every grid cell stays below the federal air quality standards under severe weather conditions). For the ozone analysis this report assumed that the relative response factors (RRF) based on limited episodic days were representative of average annual days. An assessment was made of the potential for an ozone dis-benefit from the use of RRFs determined from a limited number of episode days and an adjustment was made to reduce exaggerated nighttime projections of future year ozone. While the adjustment minimized the potential for misrepresentation, ozone dis-benefits continued to be projected in the central Los Angeles area. This impact is consistent with the results of the ozone simulations used for the regional attainment demonstration. The $PM_{2.5}$ analysis is not affected by this approach since an annual meteorological data set was used. Appendix V of the Draft 2007 AQMP provides a more detailed discussion on the air quality modeling analysis.

- Adult Mortality Function: Three adult mortality functions for $PM_{2.5}$ and three mortality functions for all ages for ozone were selected for the analysis of premature deaths. For the $PM_{2.5}$ mortality analysis, a pooled estimate with a weight on each function was used. For the ozone mortality analysis, a central estimate was used. A sensitivity analysis was provided in this report to illustrate the potential range of these estimates.

- Valuation of Clean Air Benefits: The health benefit analysis in this report is limited by the availability of health studies that link health effects with exposure to various pollutants and the economic valuation of these effects. Not all the known adverse health effects caused by air pollution have been quantified. Similarly, not all other clean air benefits such as congestion relief are quantifiable at this time.

- Control Costs: The cost analysis for unquantified measures (mostly the long-term measures) was based on the cost of quantified measures (short-term measures) since the former is largely undefined in terms of affected industries, control technologies, and the extent of control, among others. However, since all the long-term measures are in the mobile source category and rely heavily on accelerated fleet turnover, extrapolation from short-term measures, which are dominated by mobile sources and fleet turnover, is reasonable. Should NOx retrofit technologies become more widely available for on-road and off-road applications, the control costs would be significantly lower.

- Socioeconomic Model: The REMI model, which was used to analyze the impacts of the 2007 AQMP, projects possible impacts on jobs, distribution of jobs, income, cost of production, relative delivered prices, exports, and imports based upon cost data for control measures and the benefit data for each effect of clean air. The projections were based on national and local statistics for a cluster of economic actors such as industries and population by age and

cohort. These statistics reflect the net changes of all the events on these actors and cannot be segregated into gross changes of individual events.

- Regional Economic Impacts: Due to data limitations the REMI analysis herein only included the short-term measures where affected industries, equipment, and/or control technology are specified. As technology evolves and long-term measures become more defined, the analysis could become more inclusive. In addition, during rule development more detailed industry- or facility-specific socioeconomic analysis will be performed to the extent feasible, before the District or CARB adopts a regulation.

- Demographic Projection: The rapidly-changing structure of population and workforce in the four-county area makes uncertain the projection of distribution of job impacts among ethnic and racial groups that were based on the 2000 Census.

What Efforts Will Be Taken to Refine the District's Socioeconomic Report?

Previous AQMPs have identified actions that would further enhance the ability to quantify and evaluate the benefits and costs of the proposed Plan. This Report has accomplished several of these actions and identified others for future assessments. Enhancements to this Report included the conversion to the North American Industrial Classification System (NAICS) and new health benefit assessment for the improvements in $PM_{2.5}$ and ozone.

The STMPRAG, the Ethnic Community Advisory Group (ECAG), and the Local Government and Small Business Assistance Advisory Group (LGSBAAG) recommended the following enhancements for future AQMPs:

- Incorporate health benefits resulting from reductions in air toxic pollutants such as diesel particulates;

- Divide the two eastern counties into finer geography;

- Develop a methodology to include long-term measures or unquantified measures as part of the overall socioeconomic assessments;

- Expand sub-regional analyses to include environmental justice (EJ) areas. These areas may be classified by income or race; and

- Evaluate potential social ramifications of migration and job losses.

Furthermore, future enhancements to health benefit assessments may include the impact of exposure to pollutants on life expectancy, differential impacts on various segments of the population, and identification of significant pollutant thresholds. Refinement of air quality modeling techniques should also be pursued in light of the current analysis of air quality changes as reflected in various concentration-response functions in the health benefit assessment, which is often beyond the State Implementation Plan (SIP) planning requirements for attainment demonstration.

The socioeconomic analysis will continue to evolve to reflect changes in regulatory structure such as greater reliance on incentive programs and public financing strategies. Building a time series database would enhance the assessment on specific segments of an industry, facilitate the alignment with published governmental statistics, and strengthen the analysis on competitiveness impacts. To this end, future efforts may include the use of different databases to track existing facilities and new facilities, review of inspectors' reports for annotated information on firm turnover and closure, and identification of start-up companies in high tech disciplines.