SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT

ADDENDUM TO STAFF REPORT

FINAL SOCIOECONOMIC IMPACT ASSESSMENT

PROPOSED AMENDMENTS TO RULE 403

AND

PROPOSED RULE 1186

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EXECUTIVE SUMMARY

The socioeconomic impacts of the proposed amendments to Rule 403 and Proposed Rule 1186 are analyzed in this report with and without contingency measures. The potential impacts are summarized below:

- The average annual cost, over the 1997-2010 period, is estimated at $16.7 million. It is expected that local governments (SICs 91-97) would experience the largest cost impact of all sectors ($14.8 million average annual). The construction, agriculture, mining, and public utilities sectors are also expected to experience minor cost impacts.
- The average annual number of jobs forgone is estimated at 251. The sector with the greatest number of jobs forgone is likely to be the government sector (238 jobs forgone), followed by retail trade (SICs 52-57, 59) and miscellaneous business services (SIC 73).
- The Rule 403 amendments and Proposed Rule 1186 could result in price increases in 2010 in the agricultural/forestry/fishery services industry (SIC 07-09) of .028 percent, in the construction industry (SIC 15-17) of 0.0028 percent, in the mining industry (SICs 10, 12-14) of 0.0023 percent, and in the public utilities industry (SIC 49) of .0017 percent.
- The Rule 403 amendments and Proposed Rule 1186 would not be expected to have impacts on the profits of affected national industries such as non-electric machinery (SIC 35) and chemicals (SIC 28).

Socioeconomic Assessment of Proposed Amendments to Rule 403 and Proposed Rule 1186

The proposed amendments to Rule 403 and Proposed Rule 1186, hereinafter referred to as "the proposed project," implement control measures BCM-01a, BCM-1b, BCM-1c, BCM-03, BCM-04, BCM-06, and WST-01; and contingency measures CTY-12 and CTY-13, as set forth in the 1997 AQMP. The proposed project calls for reductions in fugitive dust (PM10) emissions from a variety of sources, including paved and unpaved roads, construction activities, and livestock operations. The impact of all of the control measures implemented by the proposed project, including contingency measures, are analyzed in this assessment.

Affected Facilities

The proposed project could affect the industries of construction (SICs 15-17), local governments (SICs 91-97), public utility services (SIC 49), and mining (SICs 10, 12-14). The non-contingency control measures (BCM-01a, BCM-04, and BCM-06) in the proposed amendments to Rule 403 are expected to affect the industries of agricultural crop production (SIC 01), construction, public utility services, and mining. Contingency measure CTY-13 in the proposed amendments to Rule 403 would impact the construction industry.

The non-contingency control measures (BCM-1b, BCM-1c, and BCM-03) in Proposed Rule 1186 are expected to affect local governments. Contingency measure CTY-12 in Proposed Rule 1186 would also impact local governments.

Control Costs

The potential annual costs of the proposed project are presented in Table 1. The local government sector has the largest potential cost impact, followed by the construction, agricultural, mining, and public utilities sectors. The requirements of the non-contingency control measures would take effect in February, 1997, except BCM-04 - Agriculture, which would take effect on January 1, 1998, and BCM-01b - Routine Street Cleaning, which would take effect on January 1, 1999. The contingency measures, should they be necessary, would take effect as early as January 1, 2000.

Table 1

Estimated Costs of the Proposed Amendments to Rule 403 and Proposed Rule 1186 by Sector (Millions of 1995 $)

Sector	2000	2005	2010	Average Annual (1997-2010)
Local Government	$6.2	$20.4	$25.0	$14.8
Construction	1.3	1.3	1.3	1.3
Agriculture	.5	.5	.5	.5
Mining	.1	.1	.1	.1
Public Utilities	.1	.1	.1	.1
TOTAL	$8.2	$22.3	$27.0	$16.7

The non-contingency measures in the proposed amendments to Rule 403 could impose costs on the construction, mining, and public utility services industries for road paving, chemical stabilization of unpaved roads, the installation of soil removal devices for trucks, and streetsweeping operations. Agricultural operations could experience costs for the planting of vegetative cover on fallow agricultural fields, and the interest and labor costs of delayed tilling of agricultural fields. The construction industry could experience increased costs of watering disturbed soil. Appendix B has a more detailed discussion of the possible costs. Table 2 shows the average annual costs of the proposed amendments to Rule 403 and the costs of Proposed Rule 1186 separately, both with and without contingency measures. As shown in Table 2, the average annual cost of the non-contingency control measures in the proposed amendments to Rule 403, including contingency measures, is estimated at $1.8 million.[1] Contingency measure CTY-13 requires wider use of dust control plans by the construction industry. The average annual cost of contingency measure CTY-13, should it be required, is estimated to be $0.1 million.

The non-contingency measures in Proposed Rule 1186 could impose costs on local governments for streetsweeping, road paving, chemical stabilization of unpaved roads, and the posting of speed limit signs. Control measure BCM-01b (in Proposed Rule 1186) requires that existing streetsweepers be replaced with PM10 efficient streetsweepers. Only one-third of the streetsweeper fleet will have to be replaced with PM10-efficient models. However, due to the slower speed of the PM10-efficient sweepers, three PM10-efficient streetsweepers will be needed for every two of the current models replaced. It is assumed that the replacement will occur at the end of the 10-year useful lifetime of existing streetsweepers. The analysis, accordingly, phases in the replacement cost at 10 percent per year. The average annual cost of the non-contingency control measures in Proposed Rule 1186 is estimated at $8.8 million. Contingency measure CTY-12 could also impose costs on local governments for curb and gutter construction, chemical stabilization of road shoulders, and shoulder paving with asphaltic road base on new road construction. The average annual cost of CTY-12, should it be required, is estimated at $6.0 million.

Table 2

[1] All figures are in terms of 1995 dollars unless otherwise noted.

Estimated Costs (With and Without Contingency Measures)[2] (Millions of 1995 $)

Proposed Amendment or Rule	Average Annual (1997-2010)
403 With CTY-13	$1.9
403 Without CTY-13	1.8
1186 With CTY-12	14.8
1186 Without CTY-12	8.8

Cost-Effectiveness Analysis

The overall cost-effectiveness of the proposed project, including contingency measures CTY-12 and CTY-13 is $505. The cost-effectiveness of the proposed amendments to Rule 403 with contingency measure CTY-13 is $98 per ton of PM10 removed. The cost-effectiveness of contingency measure CTY-13 alone is $396 per ton of PM10 removed. The cost-effectiveness of Proposed Rule 1186 with contingency measure CTY-12 is $881 per ton of PM10 removed. The cost-effectiveness of contingency measure CTY-12 alone is $5,527 per ton of PM10 removed. The cost-effectiveness of both the proposed amendments to Rule 403 and Proposed Rule 1186 combined (without contingency measures) is $283 per ton of PM10 removed.

The REMI Model

The potential job and other socioeconomic impacts of the proposed project were projected through the use of the Regional Economic Models, Inc. (REMI) model. The REMI model is an economic and demographic forecasting model designed to examine the economic and demographic effects resulting from policy initiatives or external events on a local economy. The REMI model used in this analysis contains historical economic data of the four-county area through 1993. The job and other socioeconomic impact analysis considers the costs of implementing the proposed project. Appendix A has a detailed description of the REMI model.

Impact on Employment and the Economy

The total estimated employment impacts of the proposed project in key years are shown in Table 3. It is estimated that a total of 5 jobs could be created in the year 2000, largely due to the spending increases in the construction sector for PM10 reduction activities. By 2005, the job impact may be expected to reflect an estimated 359 jobs forgone. By 2010, the number of jobs forgone could rise to 442. On an average annual basis, the proposed project, including contingency measures, could result in approximately 251 jobs forgone between 1997 and 2010.

Table 3 shows the estimated job impacts by industry for the years 2000, 2005, and 2010 and the average annual job impacts over the 1997-2010 period. The industries of construction (SIC 15-

[2] CTY-14 cannot be quantified at this time due to unavailability of data.

17), auto repair services (SIC 75), agricultural services (SIC 07-09), chemicals (SIC 28), fabricated metal (SIC 34), and non-electric machinery (SIC 35) are projected to experience additional jobs created due primarily to increased expenditures made to these sectors for PM10 reduction activities. The sector in which the most funds will be spent, construction, is also estimated to have the greatest number of jobs created.

The jobs created from increased expenditures on PM10 reduction activities are projected to be more than offset by the jobs forgone from reduced expenditures on other local government activities, thereby resulting in net jobs forgone. The sectors likely to experience the greatest number of jobs forgone are the government sector, followed by retail trade (SICs 52-57, 59) and miscellaneous business services (SIC 73). Since local governments are legally required to have balanced budgets, when their expenditures on PM10 reduction activities increase, their spending on other activities must be decreased, unless local taxes are increased (which is not assumed in this analysis). Consequently, many of the sectors experiencing net jobs forgone are those which local government expenditures would otherwise have supported.

Small Business Impacts

The District defines a "small business" in Rule 102 as one which employs 10 or fewer persons and which earns less than $500,000 in gross annual receipts. In addition to the District's definition of a small business, the federal Small Business Administration (SBA), the federal Clean Air Act Amendments of 1990 (CAAA), and the California Department of Health Services (DHS) also provide their own definitions of a small business. Two common characteristics of the SBA, CAAA, and DHS small business definitions are the following: (1) standards are unique to each industry type, and (2) the businesses have to be independently owned and operated, and cannot be dominant in their field.

The SBA's definition of a small business uses the criterion of either gross annual receipts (ranging from $0.5 million to $17 million, depending on industry type) or number of employees (ranging from 100 to 1,500). The CAAA classifies a facility as a "small business stationary source" if it (1) employs 100 or fewer employees, (2) does not emit more than 10 tons per year of either ROG or NO_X, and (3) is a small business as defined by SBA. The DHS definition of a small business uses an annual gross receipts criterion (ranging from $1 million to $9.5 million, depending on industry type) for non-manufacturing industries and an employment criterion of fewer than 250 employees for manufacturing industries.

Under the SBA's and CAAA's definitions of small business, the proposed project could potentially impact a wide range of small businesses. Under the AQMD's definition, fewer of the affected businesses would be considered "small businesses."

Table 3
Employment Impact by Industry by Year

Industry (SIC)	2000	2005	2010	Average Annual (1997-2010)
Lumber (24)	1	1	0	1
Furniture (25)	0	-1	-1	-1
Stone, Clay, etc. (32)	3	1	0	1
Primary Metals (33)	1	0	0	0
Fabricated Metal (34)	3	1	1	1
Non-electric Machinery (35)	2	1	1	1
Elect. Equipment (36)	0	0	0	0
Motor Veh. (371)	0	0	0	0
Rest of Transp. Equip. (372-379)	0	0	0	0
Instruments (38)	0	-1	0	-1
Misc. Manuf. (39)	0	0	0	0
Food (20)	-1	-2	-1	-1
Tobacco Manuf. (21)	0	0	0	0
Textiles (22)	0	0	0	0
Apparel (23)	0	-1	-1	-1
Paper (26)	0	0	0	0
Printing (27)	0	-2	-2	-1
Chemicals (28)	2	2	2	2
Petroleum Products (29)	0	0	0	0
Rubber (30)	0	0	0	0
Leather (31)	0	0	0	0
Mining (10,12-14)	0	0	0	0
Construction (15-17)	86	57	22	44
Railroad (40)	0	0	0	0
Trucking (42)	1	-1	-1	0
Local/Interurban (41)	-1	-2	-2	-1
Air Transp. (45)	0	-1	0	0
Other Transp. (44,46-47)	0	0	0	0
Communication (48)	0	-1	-1	-1
Public Utilities (49)	1	0	-1	0
Banking (60)	-1	-5	-6	-4
Insurance (63,64)	0	-5	-7	-4
Credit & Finance (61-62,67)	0	-3	-3	-2
Real Estate (65,69)	0	-6	-5	-4
Eating & Drinking (58)	-1	-12	-15	-9
Rest of Retail (52-57,59)	3	-23	-31	-16
Wholesale (50-51)	4	-4	-5	-3
Hotels (70)	-1	-2	-2	-2
Personal Serv. & Repair (72,76)	0	-4	-5	-3
Private Household (88)	0	-1	-2	-1
Auto Repair/Serv. (75)	5	20	28	15
Misc. Busi. Serv. (73)	-2	-18	-19	-12
Amuse. & Recreation (79)	-1	-3	-2	-2
Motion Pictures (78)	0	0	0	0
Medical (80)	1	-11	-18	-9
Misc. Prof. Serv. (81,87,89)	9	-2	-7	-1
Education (82)	2	4	5	3
Non-Profit Org. (83)	-1	-7	-7	-5
Agri/Forest/Fish Serv. (07-09)	9	1	-3	3
Total Government	-119	-329	-354	-238
Total	5	-359	-442	-251

Table 4 shows the estimated employment impacts of the proposed amendments to Rule 403 and Proposed Rule 1186 separately, both with and without contingency measures. The proposed amendments to Rule 403, including contingency measure CTY-13, are estimated to result in 52 jobs forgone annually, on average, over the 1997-2010 period. Without CTY-13, the proposed amendments to Rule 403 would result in two fewer jobs forgone, i.e. 50 jobs forgone annually, on average. Proposed Rule 1186, including contingency measure CTY-12, is estimated to result in 199 jobs forgone annually, on average. Without CTY-13, Proposed Rule 1186 is estimated to result in 152 jobs forgone annually, on average. Without CTY-13 and CTY-12, the proposed amendments to Rule 403 and Proposed Rule 1186 combined are estimated to result in an average of 203 jobs forgone annually between the years of 1997 and 2010.

Table 4

Estimated Employment Impacts
(With and Without Contingency Measures)

Proposed Amendment or Rule	Average Annual (1997-2010)
403 With CTY-13	-52
403 Without CTY-13	-50
1186 With CTY-12	-199
1186 Without CTY-12	-152

Competitiveness of Industries

The proposed project would not be expected to significantly affect the competitiveness of industries in the four-county region. The competitiveness impact on the private sector can be evaluated by changes in product prices of regional industries and profits of national industries. The industries of construction and public utilities are regional industries since they do not service other parts of the nation. Increases in their cost of doing business are assumed to be reflected in the prices of their products and services. As shown in Table 5, both industries are projected to increase their service prices slightly, but not enough to affect either prices or competitiveness appreciably.

National industries, such as manufacturers of streetsweepers (SIC 35) and chemical stabilizers (SIC 28), are assumed, in the REMI model, to experience changes in profits resulting from changes in the cost of doing business. An analysis of the proposed project, using the REMI model, indicates no expected change in the profits of these two industries.

Table 5

Impacts on Selling Prices of Regional Industries' Products and Services (percent of baseline sales)

Industry (SIC)	2000	2010
Agri/Forest /Fish Services (07-09)	.0383	.0282
Mining (10,12-14)	.0032	.0023
Construction (15-17)	.0039	.0028
Public Utilities (49)	.0026	.0017

Job Impacts by Ethnic Group

The 1990 Census is the latest Census available on the ethnic distribution of the workforce. According to the 1990 Census of Population in the four-county area, Whites had a 58-percent share of the workforce, followed by Asians (24 percent), African-Americans (10 percent), Latinos (7 percent), and others (1 percent). Given the diversity of the four-county area, it is not possible to project with any certainty the job impacts the proposed project might have on any individual ethnic group.

Job Impacts by Industry, Occupation, and Income Groups

The projected job impacts of the proposed project were further disaggregated by dividing the potentially affected industries and occupations into five groups according to annual wages of industries and weekly earnings of occupations, respectively. It is projected that in the years 2000 and 2010, industry groups 1 through 4 could experience job reductions ranging from 0.0002 to 0.0047 percent compared with their baseline job growth projection. Industry group 5 is expected to experience job gains of 0.0007 percent (in 2000) and 0.0003 (in 2010) compared to the baseline job growth projection. For industry groups 1 through 5 combined, the employment impacts expressed by the percentages in Table 6 represent an average of 251 jobs forgone annually, as reported earlier. The 251 jobs forgone are 0.0027 percent of the average annual (over the 1997-2010 period) four-county employment figure of 9.2 million. Table 6 describes the potential job impact on each industry group. Table A-2 in Appendix A has a detailed list of industries in each group.

Table 6

Employment Impact by Industry Group

Group	Average Annual Wage	% Job Impact from Baseline (Year) 2000	2010	SIC Codes
1	< $16,941	-.0005	-.0012	07-09,21,23,52-59,65,72, 75,76,79,88
2	$17,695 - $21,243	-.0047	-.0002	15-17,25,31,39, 41,42,70,73, 82,83
3	$23,254 - $30,919	-.0016	-.0005	20,22,24,27,30,32, 34,371,46,47
4	$31,720 - $39,511	-.0006	-.0017	10-14,26,36,45, 60-64,80,81
5	$40,962 - $61,420	.0007	.0003	28,29,372-379,35,38,40,48,49, 78

Source: ES-202 Data, Bureau of Labor Statistics, 1993 and REMI, 1993.

Occupational impacts would also be expected to vary between years and occupations. Table 7 shows the job impacts on five occupational groups in years 2000 and 2010. In 2000, all occupation groups except groups 3 and 5 could face reduced job growth. By 2010, all groups would experience jobs forgone. For example, occupations in Group 1, which includes farm workers, private household workers, textile workers, and retail salespersons, are projected to have 0.0028 percent of 2010 baseline jobs forgone. Table A-1 in Appendix A shows the classification of 94 different occupations into five groups.

Table 7

Employment Impact by Occupation Group

Group	Median Weekly Earnings	% Job Impact from Baseline (Year) 2000	2010	No. of Occupations
1	$187 - $298	-.0001	-.0028	19
2	$312 - $380	-.0003	-.0041	19
3	$385 - $510	.0018	-.0043	20
4	$511 - $643	-.0009	-.0066	20
5	$658 - $1170	.0009	-.0030	16

Source: Current Population Survey, 1993 and REMI, 1993.

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The proposed project could have minor impacts on the price indices of consumer goods. It is projected that in the year 2000, the average price of consumer goods could increase by 0.0007 percent for all groups of households, except the fifth quintile, which would experience a 0.0006 percent price increase. The impacts on price indices are expected to be reduced in the year 2010, with three of the five income groups experiencing price indices lower than would occur without the proposed project. Table 8 shows the possible impacts on price indices for households within five different income percentiles. A reduction in price indices has the potential to increase the purchasing power of consumers, thus leading to a welfare gain to consumers.

Table 8

Impact on the Price Index of Consumption by Income Group

Group	Annual Income	% Change in Price Index of Consumption 2000	2010
1	1st Quintile	0.0007	-0.0001
2	2nd Quintile	0.0007	-0.0001
3	3rd Quintile	0.0007	0.0002
4	4th Quintile	0.0007	-0.0002
5	5th Quintile	0.0006	0.0002

Source: Consumer Expenditure Survey, 1993 and REMI, 1993.

Alternatives, Emission Reduction Potential, and Cost-Effectiveness

The alternative to the proposed project is the Fugitive Dust versus NOx Control Strategy, Alternative 3 in the 1997 AQMP. This alternative contains all of the PM10 control measures in the proposed project, including two contingency measures: CTY-12, Control of Emissions from Paved Roads, and CTY-13, Further Emission Reductions from Construction and Demolition Activities. However, the alternative does not contain the same level of NOx control that the 1997 AQMP does. The alternative is described in the 1997 Air Quality Management Plan Environmental Impact Report, Vol. 1 (SCAQMD 1996b), and is evaluated in the 1997 Air Quality Management Plan Socioeconomic Report (SCAQMD 1996c).

The PM10 emissions reductions from the proposed project (including contingency measures CTY-12 and CTY-13,) are estimated at 92.71 tons per average annual day. The cost-effectiveness values for each of the individual control measures in the proposed project are presented in the Staff Report (SCAQMD 1996a).

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Rule Adoption Relative to the Cost-Effectiveness Schedule

The 1997 Air Quality Management Plan (AQMP) analyzed and ranked all control measures by their cost-effectiveness. The 1997 AQMP discussion of control measures and their cost-effectiveness is incorporated herein by reference as though set forth in full. It is generally recommended that the most cost-effective actions be taken first.

The proposed project implements control measures BCM-1a, BCM-1b, BCM-1c, BCM-03, BCM-04, BCM-06, CTY-12, CTY-13, and portions of WST-01 as set forth in the 1997 AQMP. In the list of all 1997 AQMP control measures, BCM-01, BCM-04, BCM-06, and BCM-03 are ranked second, third, fourth, and fifth, respectively, in order of cost-effectiveness. The cost-effectiveness of control measures WST-01, CTY-12, and CTY-13, were not quantified in the 1997 AQMP. The control measure ranked as the most cost effective, i.e., CTS-02C (amendments to Rule 1171) has already been considered and adopted. In consideration of the fact that the portions of the proposed project which would implement CTY-12 and CTY-13 would be implemented only if the necessary emission reductions are not achieved, the control measures contained in the proposed project are being considered in rank order by cost-effectiveness as defined in the 1997 AQMP.

APPENDIX A

The REMI Model

INTRODUCTION

At the March 17, 1989 Air Quality Management Plan (AQMP) adoption hearing, the District's Governing Board adopted a resolution calling for the incorporation of an analysis of impacted industries, range of control costs, cost-effectiveness, and public health benefits into the evaluation of economic impacts of all proposed rules. Since then, the District has provided an analysis of socioeconomic impacts for each proposed rule.

In an effort to expand socioeconomic impact assessments for proposed rules and AQMP revisions, the District has purchased a computerized economic model from Regional Economic Models, Inc. (REMI) for the counties of Los Angeles, Orange, Riverside, and San Bernardino. The structure and assumptions of the model are briefly described below.

FRAMEWORK OF THE REMI MODEL

The District's REMI model links the economic activities in the counties of Los Angeles, Orange, Riverside, and San Bernardino. The model is comprised of a standard module, a demographic/migration module, and an input-output module. The standard module has 53 industries (2-digit SIC) or 214 industries (3-digit SIC), 94 occupations, and 25 final demand sectors. The demographic/migration module captures population changes due to births, deaths, and migration; and has 202 age/sex cohorts. The input-output module contains detailed inter-industry relationships for 466 sectors. The input-output module is used to assess the detailed inter-industry effects of a policy change. The effects are then fed into the standard module to allow for the assessment of total effects.

The standard module can be divided into the following five components: (1) production (output); (2) labor and capital demand; (3) population and labor supply; (4) wages, and prices, and profits; and (5) market share. These five components are interrelated and the linkages are depicted in Figure B-1.

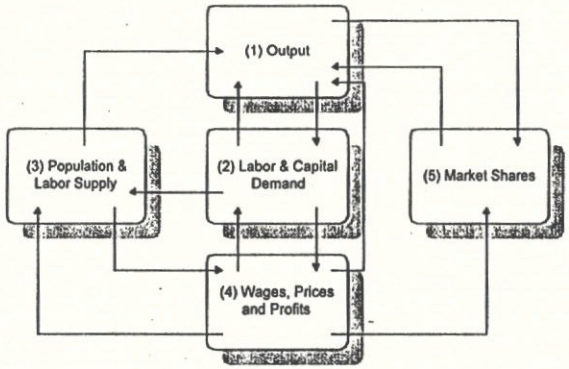
Each component is built upon a two-step process. First, producers and consumers throughout all regions of the country have similar behavioral characteristics. Because of these similarities, statistical techniques can be used to estimate economic responses based on studies done throughout the United States. The second step of the modeling process is region specific, and involves calibration of the model based on region-specific historical data.

ASSUMPTIONS OF THE REMI MODEL

The REMI model has been built based on well-established economic theory and is updated regularly to incorporate new findings in economic theory and new historical data. Major assumptions behind the REMI model fall into the following three categories: overall, production, and population and labor. The major assumptions behind the REMI model are as follows:

FIGURE A-1

Components of REMI Model



Overall

1. Production costs, such as capital equipment, labor and fuel, are allowed to be substituted based on the changes in relative costs of these inputs to those in the United States. Total production costs are the sum of input costs weighted by their usage.

2. Location of a firm is driven by profitability.

3. All industries sell to both local and national markets. The model calculates the proportions of local demand that an industry can satisfy and its export share. Exports are divided into shipments from one county to the remaining counties (e.g., counties of Los Angeles, Orange, Riverside, and San Bernardino) and sales outside of the four-county region.

4. For pricing purposes, industries are classified as national or regional. Goods sold in national markets must be priced at the average national price to be competitive. National industries, on average, supply more than 50 percent of their output to national markets. Regional industries sell more than 50 percent of their output locally. The national industries in the model are hotels and manufacturing sectors with the exception of stone, clay, and glass; printing and publishing; and petroleum and coal products. The regional industries consist of mining, construction, finance, wholesale and retail trade, services (except hotels), and agriculture.

5. The REMI model consists of exogenous and endogenous economic variables. Values of exogenous variables are determined outside of the model. Exogenous variables are a driving force of change in the regional economy. The resulting changes are reflected in the values of endogenous variables calculated by the

model. Therefore, policy changes can be simulated by changing exogenous variables whose values are developed by District staff as inputs to the REMI model. For example, increases in demand for control equipment due to a rule can be simulated by increasing the sales of the supplier of control equipment. The impact of such a policy change includes changes in employment, among others.

6. There will be two avenues for market expansion. First, as the cost of production decreases, firms become more competitive in the export market and more competitive with imports. Second, markets are assumed to expand as a region's economy grows.

Production

1. Production costs affect regional competitiveness which impacts the shares of local and export markets. As the relative production costs increase, there will be a reduction in the proportion of local demand which can be satisfied locally as imported goods are substituted for local goods.

2. Production levels drive labor demand which interacts with labor supply to determine wage rates. Combined with other production costs, e.g., capital and fuel costs, wages determine relative production costs in the four-county region compared to the rest of the United States.

3. Production levels are determined by the total demand which consists of consumption, investment, government spending, and net exports. Employment is determined by the level of production and labor intensity, i.e., number of employees per unit of production.

4. An increase in demand will increase production by a factor greater than one because of indirect impacts.

Population and Labor

1. There are four types of migrants: international migrants, retired migrants, former military personnel, and economic migrants. These economic migrants are individuals moving to the region for employment opportunities. They respond to both economic and amenity factors.

2. The demographic section of the model predicts the number of births and deaths that occur in the population. Labor supply is derived from the indigenous labor force and potential job migrants.

3. Labor is segmented by occupation as well as by industry. Employment within an industry is translated to occupation level employment through the use of occupational skill requirements by industry.

VERIFICATION OF THE MODEL

The District's version of the REMI model was independently evaluated by the University of Pittsburgh in 1989 to determine its forecasting and simulation capabilities. The model's performance was judged to meet accepted standards of practice (Cassing and Giarratani, 1992).

ENHANCEMENTS TO THE MODEL

The District's socioeconomic assessment process is an evolving one. The assessment has expanded from impacts on directly-affected industries to include employment impacts on all industries. In 1992, enhancements were made to the REMI model to allow the assessment of impacts on different income groups and on low- versus high-wage groups.

Using the nationwide median weekly earnings of full-time workers from the 1993 Current Population Survey (CPS), 94 occupations in the REMI model were ranked in ascending order of earnings and divided into five equal (quintile) groups. Table A-1 shows how the 94 civilian occupations were ranked:

TABLE A-1

Ranking of Occupational Earnings

Occupation	Median Weekly Earnings	Quintile Group
Private Household Workers	$187	1
Cashiers	$226	1
Food Prep. & Service Workers	$243	1
Textile & Related Operators	$247	1
Farm Occupations	$248	1
Other Sales Workers, Nec.	$268	1
Farm Operators & Managers	$269	1
Fishers, Hunters, & Trappers	$269	1
Other Agricultural-related Workers	$269	1
Non-farm Gardeners	$273	1
Non-farm Animal Care Workers	$277	1

TABLE A-1

(Continued)

Occupation	Median Weekly Earnings	Quintile Group
Personal Service Workers	$279	1
Retail Salespersons	$281	1
Counter & Rent Clerks	$288	1
Stock Clerks, Sales Workers	$288	1
Health Service Workers	$289	1
Cleaning Workers	$291	1
Other Service Workers, Nec.	$293	1
Precision Textile, Apparel Workers	$298	1
Hand Helpers, Laborers	$312	2
Mail Clerks & Messengers	$324	2
Information Clerks	$329	2
Comb. Machine Tool Operators	$333	2
Machine Tool Cut & Form Operators	$333	2
Metal Fabrication Machine Operators	$333	2
Numerical Control Machine Tool Operators	$333	2
Woodworking Machine Operators	$333	2
Precision Woodworkers	$340	2
Other Precision Workers, Nec.	$348	2
Precision Assemblers	$348	2
Precision Food Workers	$348	2
Precision Print Workers	$348	2
Forestry & Logging Occupations	$356	2
Other Clerical Workers, Nec.	$360	2
Other Machine Operators, Nec.	$366	2
Hand Workers	$376	2
Non-Financial Record Processing Workers	$376	2
Financial Record Processing Workers	$380	2
Communication Equipment Operators	$385	3
Secretaries, Stenographers, & Typists	$385	3
Recording, Scheduling, and Dispatching Workers	$392	3
Supervisors, Farm, Forest, & Agriculture	$401	3
Metal & Plastic Machine Operators	$410	3
Adjustment, Investment, & Collections Occupations	$412	3
Travel Agents	$417	3
Printing, Binding & Related Workers	$418	3
Computer & Related Equipment Operators	$435	3
Motor Vehicle Operators	$437	3
Material Moving Operators	$440	3
Other Transportation Operators, Nec.	$447	3
Health Technicians & Technology Occupations	$458	3
Vehicle, & Mobile Equipment Mechanics	$475	3
Soc., Recreation, & Religious Workers	$492	3
Construction Trades Occupations	$495	3
Other Mechanical, Installers, Nec.	$496	3
Water & Liquid Waste Occupations	$505	3
Communication Equipment Mechanics, Installers	$510	3

TABLE A-1

(Continued)

Occupation	Median Weekly Earnings	Quintile Group
Machinery & Related Mechanics, Installers	$510	3
Protective Services Occupations	$511	4
Precision Inspectors, Testers	$517	4
Precision Metal Workers	$527	4
Engineering & Science Technicians	$550	4
Insurance Sales Workers	$565	4
Blue Collar Workers Supervisors	$573	4
Writers, Artists, Entertainers	$574	4
Postal Clerks, & Mail Workers	$585	4
Teachers, Librarians, & Counselors	$585	4
Management Support Occupations	$597	4
Chemical Plant & System Operators	$600	4
Electric Power Operators, Distribution Workers	$600	4
Gas & Petroleum Plant Workers	$600	4
Other Plant & System Operators, Nec.	$600	4
Elec. Equip. Mechanics, Installers	$603	4
Real Estate Agents	$610	4
Life Scientists	$626	4
Mining, Quarrying Occupations	$643	4
Oil & Gas Extraction Occupations	$643	4
Other Extraction Occupations, Nec.	$643	4
Other Technicians	$658	5
Managerial and Administrative Occupations	$664	5
Social Scientists	$670	5
Other Professional Workers, Nec.	$682	5
Stationary Engineers	$682	5
Health Assessment & Treatment Occupations	$687	5
Architects & Surveyors	$694	5
Water Transportation Workers	$715	5
Physical Scientists	$722	5
Rail Transportation Workers	$722	5
Secur. & Fin. Srvcs. Workers	$783	5
Computer, Math., and Operations Research Analysts	$816	5
Engineers	$911	5
Health Diagnosing Occupations	$994	5
Lawyers	$1164	5
Judges, Magistrates	$1170	5

In doing so, the percentage changes of a policy on each quintile of earnings can thus be reported for occupational wage rate, employment, and wage bill.

The ES-202 data (excluding self-employment) from the BLS for the four-county area provide the average annual wage per worker (full-time and part-time) for the 49 private non-farm industries at the 2-digit SIC level in the REMI model. By ranking the 49 industries in ascending order of the average annual wage per worker, we can divide them into five equal groups, as shown in Table A-2:

TABLE A-2

Ranking of Wages by Sector

Sector	SIC	Average Annual Wage	Quintile Group
Tobacco Manufacturing	21	$8,989	1
Private Households	88	$9,628	1
Personal Services & Repair	72,76	$10,030	1
Real Estate	65	$10,506	1
Eating & Drinking Places	58	$10,844	1
Agri., Forest, Fish.,Hunt. Services	07-09	$11,770	1
Rest of Retail	52-57,59	$15,849	1
Apparel	23	$16,615	1
Auto Repair/Services/Parking	75	$16,783	1
Amusement & Recreation	79	$16,941	1
Hotels	70	$17,695	2
Local Transit/Interurban Transport.	41	$17,775	2
Construction	15-17	$17,803	2
Leather	31	$18,613	2
Misc. Business Services	73	$19,033	2
Education	82	$19,472	2
Non-profit Organizations	83	$19,612	2
Furniture	25	$19,867	2
Misc. Manufacturing	39	$20,861	2
Trucking	42	$21,243	2
Textiles	22	$23,254	3
Lumber	24	$24,251	3
Rubber	30	$25,933	3
Stone, Clay, etc.	32	$26,752	3
Fabricated Metal	34	$27,181	3
Other Transportation	46,47	$28,500	3
Printing	27	$28,540	3
Food	20	$28,852	3
Primary Metals	33	$30,580	3
Motor Vehicles	371	$30,919	3
Medical	80	$31,720	4
Wholesale	50,51	$32,226	4
Mining, Oil/Gas Extraction	10-14	$32,746	4
Misc. Professional Services	81	$33.749	4
Insurance	63,64	$34,464	4
Paper	26	$35,440	4
Banking	60	$35,507	4
Credit & Finance	61,62	$37,559	4
Air Transportation	45	$38,270	4
Electrical Equipment	36	$39,511	4

TABLE A-2

(Continued)

Sector	SIC	Average Annual Wage	Quintile Group
Communications	48	$40,962	5
Chemicals	28	$41,157	5
Non-electrical Mach., Computers	35	$41,447	5
Rest of Transportation Equipment	372-379	$44,068	5
Instruments	38	$45,234	5
Motion Pictures	78	$45,631	5
Public Utilities	49	$46,560	5
Railroad Transportation	40	$55,777	5
Petroleum Products	29	$61,420	5

The percentage change in employment, wage bill, and wage rate resulting from a policy can thus be reported for each quintile of wages, by sector.

The annual Consumer Expenditure Survey (CEX), published by the BLS, provides a continuous flow of information on the buying habits of American households. The CEX reports average annual expenditures and characteristics of households by income group. There are eight income groups: less than $5,000; $5,000 to $9,999; $10,000 to $14,999; $15,000 to $19,999; $20,000 to $29,999; $30,000 to $39,999; $40,000 to $49,999; and $50,000 and over.

By linking consumption expenditures in the REMI model with spending patterns of the eight income groups in the CEX, we can then develop a composite price change for consumer goods for each income group.

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APPENDIX B

Assumptions of the Socioeconomic Analysis for the Proposed Amendments to Rule 403 and Proposed Rule 1186

The socioeconomic impacts of the proposed project on the four-county economy were analyzed using policy variables in the REMI model. These policy variables represent direct impacts of a policy initiative and were used as inputs to the REMI model. Four types of policy variables for the analysis of the proposed project were chosen: changes in the cost of doing business for affected sectors, changes in local government spending on goods and services, changes in the local amenities, and changes in the demand for equipment and services used in controlling PM10 emissions. For the proposed project, a 14-year analysis period (from 1997 to 2010) was used.

Cost of Doing Business

The additional cost of doing business due to PM10 control activities was assigned to the affected sectors, by specific control measures in the proposed project. For example, control measure BCM-01a (Minimal Track-Out) affects the construction industry, landfills (in the public utilities sector), and aggregate (sand and gravel) production facilities. BCM-01a requires the treatment of access connections between unpaved and paved roads. For each affected sector the specific number of access connections requiring annual treatment was estimated. These estimates were based on parameters such as the number of acres of construction activity, the number of landfills, and the number of aggregate facilities. The cost of control for a specific sector is the cost of treatment per access connection multiplied by the number of access connections estimated for that sector.

The use of the REMI model requires that the additional cost of doing business be developed for affected sectors in each county. For each affected sector, the additional cost was allocated to the counties of Los Angeles, Orange, Riverside, and San Bernardino in proportion to each county's share of the total amount of that sector's PM10 emission sources, e.g., miles of unpaved roads, or construction acreage.

BCM-04, agricultural operations, prohibits tilling of agricultural fields during high wind days. It is assumed that there will be an average of two days per year on which agricultural tilling will be prohibited. The two days of delayed tilling impose two types of costs: labor and interest. The labor cost is the cost of agricultural labor which is hired, but not used while tilling is delayed. The interest cost is the cost of borrowing funds for agricultural operations, whose repayment is delayed by the two days of delayed tilling, planting, and harvest. BCM-04 also requires the stabilization of fallow fields, which can be achieved by the planting of vegetative cover. The cost of planting vegetative cover is calculated by multiplying the $100-per-acre planting cost by the acreage of fallow fields.

Demand for Goods and Services

The costs of goods and services to an affected sector are equivalent to the sales made by the producers of those goods and services. The additional sales are modeled by using policy variables for increased demand in the sectors providing the goods and services. Examples include increased demand for streetsweepers and chemical stabilizers used in PM10 control. The demand for goods

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and services is allocated over each of the four counties using the fraction of each county's output in those respective sectors as projected in the REMI control forecast.

One example of the spending on goods and services to comply with the proposed project is the spending by local governments on PM10-efficient streetsweepers. These special streetsweepers are needed to comply with control measure BCM 01b (Routine Streetsweeping). The PM10-efficient streetsweepers cost approximately $37,000 more than the standard model streetsweepers. In addition, for the one-third of the existing streetsweeper fleet that needs to be replaced, local governments will need to purchase 50 percent more of the PM10-efficient streetsweepers than the standard models they presently operate, due to the slower operating speed of the PM10-efficient streetsweepers. BCM 01b requires the purchase of PM10-efficient streetsweepers when local governments' existing (standard model) streetsweepers wear out. Streetsweepers are assumed to have a 10-year lifetime. For purposes of analysis, therefore, each year, ten percent of one-third the existing fleet of streetsweepers was presumed to be replaced by PM10-efficient models each year. Due to the speed factor, each standard model streetsweeper must be replaced with 1.5 PM10-efficient streetsweepers, on average.

The increased demand for streetsweepers from the machinery sector (SIC 35) is composed of two components. First, each replacement streetsweeper will cost $37,000 more than the standard models now in use. Since each year ten percent of the streetsweeper fleet is replaced, the cost to replace the standard model streetsweepers with PM10-efficient models will be $37,000 multiplied by the ten percent of the fleet being replaced each year, Second, 50% more streetsweepers will be needed because of the speed factor. The cost of these additional PM10-efficient streetsweepers is the full cost of a new PM10-efficient sweeper ($157,000) times 50 percent of the annual ten percent of the fleet replaced, i.e., 5 percent of the fleet. The annual demand for streetsweepers, composed of these two components, is assumed to be constant throughout the period of analysis (1997-2010).

Local Government and Amenity Changes

Cost impacts on local governments are modeled differently from cost impacts on private industries. For purposes of this analysis, local governments are assumed not to raise taxes to pay for the additional costs resulting from the rules' requirements. Instead, it is assumed that in order to maintain a balanced budget, they reduce their spending on other items to compensate for the increased spending on PM10 control activities.

This spending reduction is allocated to each county using the proportion of state and local government final demand (the spending by cities and county government in a specific county) to the total state and local government final demand in the four-county region. A county's spending reduction is expressed as a percentage of that county's total state and local government final demand.

The reduction of expenditures in activities other than PM10 emissions reductions reduces the level of general services which local governments provide to their residents, thereby making the four-county region less attractive. The REMI model simulates these impacts as changes in the real wage rates, which then affect the flow of migrants in and out of the area.

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