January 25, 2017

DRAFT
Socioeconomic Analysis of the 2017 Bay Area Clean Air Plan

Prepared for:

Bay Area Air Quality Management District

TABLE OF CONTENTS

LIST OF TABLES

INTRODUCTION AND SUMMARY

This draft report presents findings with regard to economic impacts stemming from proposed control measures in the Bay Area Air Quality Management District's 2017 Clean Air Plan (2017 Plan). Economic impacts are derived from cost estimates to impacted industries and/or direct financial infusion of incentive or capital investments in the region, such as transportation infrastructure projects.

The 2017 Plan has two main goals of protecting public health, both regionally and in communities most impacted by air pollution, and secondly to protect the climate. The 2017 Plan has several related objectives:

- Updating the most recent Bay Area ozone plan;
- Defining a multi-pollutant control strategy to reduce emissions of ozone precursors, particulate matter (PM), and toxic air contaminants (TACs) from key sources;
- Reducing population exposure to harmful air pollutants, especially in vulnerable communities and populations; and
- Presenting a comprehensive regional climate protection strategy in order to protect the climate.

The 2017 Plan includes control measures that affect a number of different types of air emissions sources, as well as sources of emissions that affect climate change, including both stationary sources and transportation related sources. Many of the proposed control measures have been developed sufficiently to allow costs of compliance to be estimated, while other measures will require further study during the Plan implementation process. Any measures that are designed to be Air District rules will be subject to further rule development analysis, including additional socioeconomic analysis, prior to adoption and implementation. The analysis in this document therefore provides analysis based on the information currently available, and focuses on control measures for which BAAQMD staff has presented compliance cost estimates. Some of the measures, particularly in the transportation area, provide for funding programs to assist emissions sources to comply with the program objectives. In these cases there may not be a local cost, but rather the measures would, if adopted, result in an infusion of funds into the Bay Area region from outside sources (mainly federal funds), resulting in economically positive outcomes such as job creation.

As stated above, this report only addresses direct cost to specific industries or direct capital investments into the economy. However, the 2017 Plan will result in additional air quality, health and climate benefits to the Bay Area. While these benefits are not directly addressed in this report, they are expected to be significant. Reductions in emissions due to measures in the plan are estimated to reduce incidences of illness and premature mortality associated with air pollution. These health benefits are conservatively estimated to be approximately $702 million per year. Additionally, due to anticipated reductions in greenhouse gasses (GHGs), the 2017 Plan has an economic benefit of

approximately $275 million per year (based on the 4.4 MMT per year of GHG reductions estimated as part of the 2017 Plan control strategy). (For more information on estimated health benefits and GHG reductions, see Chapter 5 and Appendix C in the 2017 Clean Air Plan).In the first part of the report, we summarize control measures with known costs, almost all of which are stationary source control measures. There is one control measure discussed in the first part that is not a stationary source measure – this measure has to do with improving buildings' energy efficiency. In the first part, we also summarize transportation-related control measures, almost all of which include an infusion of state and federal funds into the region via the Metropolitan Transportation Commission (MTC).

After this introduction and summary, we discuss the methodology and data sources used in preparing this socioeconomic analysis of the 2017 Plan. In the third chapter, we then present findings with regard to how each control measure impacts various industries. The impact analysis portion of the report is organized in the order of each control measure's respective number, for the most part. In the fourth chapter, we present findings with regard to direct and indirect ("multiplier") effects of certain stationary source and transportation-related control measures.

SUMMARY OF PROPOSED CONTROL MEASURES AND IMPACTS

As indicated in Table 1 below, there are seventeen (17) control measures with known costs. Of the 17, 16 are stationary source (SS) measures. There is one building control (BL) measure. Table 1 presents cost information on a per establishment basis. Many of the control measures affect a variety of industries. Such control measures include SS22 (Stationary Gas Turbines), SS28 (LPG, Propane and Butane), SS31 (General PM Emissions Limit), and SS32 (Emergency Backup Generators). We have also divided cost information between annually recurring operating cost associated with a proposed control measure, and the annualized cost of any equipment that is required for achieving the emissions goals of each proposed control measure. Most equipment-related costs are anticipated to be fully amortized over a ten-year period, whereas annually-recurring operating costs continue for the duration control measures are in place. Thus, for example, in order to achieve the aims of proposed control measure SS2 (Equipment Leaks), a refinery will be subject to $6.8 million in annual costs, of which $6.6 million will occur annually over the life of the control measure, and $250,000 will occur in the first ten years after control measure adoption.

Table 1 — Summary of Stationary Source Control Measures (SS) and Building Control Measures (BL) With Known Annual Costs: Cost Per Affected Source

Proposed Stationary Source Control Measure With Cost Estimates	Affected Industries - *Required Equipment* (Naics Codes)	Total Annual Costs (A + B)	Annually Recurring Operating Costs (A)	Capital Equipment Costs: Annualized (B)
SS2: Equipment Leaks	Refineries (32411)	$6,800,000	$6,550,000	$250,000
SS3: Cooling Towers	Refineries (32411)	$1,000,000	$1,000,000	$0
SS6: Refinery Fuel Gas	Refineries (32411)	$1,000,000 to $3,000,000	$1,000,000 to $3,000,000	$0
SS7: Sulfuric Acid Plants	Other Chemicals Wholesaler (424690)	$900,000 to $1,000,000	$200,000 to $300,000	$700,000

Proposed Stationary Source Control Measure With Cost Estimates	Affected Industries - *Required Equipment* (Naics Codes)	Total Annual Costs (A + B)	Annually Recurring Operating Costs (A)	Capital Equipment Costs: Annualized (B)
SS8: Sulfur Dioxide from Petroleum Coke Calcining	All Other Petroleum and Coal Products Mfg. 324199	$1,870,000	$1,190,000	$680,000
SS10: Refinery Emissions Tracking	Refineries (32411)	$455,000	$140,000	$315,000
SS13: Oil and Gas production	Oil Producers (21111)	$100,000 to $200,000	$65,000 to $100,000	$35,000 to $100,000
SS22: Stationary Gas Turbines	Refineries (32411) and Electricity Producers (2211)	$4,100,000	1,400,000	$2,700,000
SS28: LPG, Propane, Butane	Petroleum Bulk Stations and Terminals (42471)	$132,000	$132,000	
	Gas Stations (4471)	$117	$117	
	Fuel Dealers (454310)	$6,700	$6,700	
	General Rental Centers (532310)	$117	$117	
SS30: Residential Fan-Type Furnaces	Households	$118 to $223	$0	$118 to $223
SS31: General PM Emissions Limit	Converted Paper Products Mfg. (3222), Adhesive Products Mfg. (325520), BART			
	Cyclones	$8,704 to $81,600		$8,704 to $81,600
	Bag Hoses	$37,800 to $122,400		$37,800 to $122,400
SS32: Emergency Backup Generators	Many	Replacement cost: $823 - $75,700 per estab. (depending on size of engine	$0	Replacement cost: $823 - $75,700 per estab. (depending on size of engine)
	Many	Filter: $768 - $70,700 per estab. (depending on size of engine)	$0	Filter: $768 - $70,700 per estab. (depending on size of engine)
SS35: PM from Bulk Materials, incl. Coke and Coal	Quarries (2123), Coke Calcining (224199), Cement (3223), Steel Pipe Mfg (331210), Bulk Terminal Facilities (488210)			
	Conveyors	$10,000		$10,000
	Stockpile	$10,000 to $25,000		$10,000 to $25,000
	Water Spray Systems	$15,000	$5,000	$10,000
SS36: PM from Track-out	Building construction (236) and Heavy Construction (237)	$32,400	$12,000	$20,400
SS37: PM from Asphalt Operations	Building Cons. (236), Heavy Cons. (237), Asphalt Paving Manufacturing (32412)			
	Blue Smoke Abatement System	$40,000	$10,000	$30,000
	Asphalt Roofing Plugs		$100,000 (note: total for region)	
SS38: Fugitive Dust	Same as SS37 (236, 237 and 32412)	$30,000	$16,400	$13,600
BL4: Urban Heat Island Mitigation	Various	5 cents per sq. ft. to 20 cents per sq. ft		5 cents per sq. ft. to 20 cents per sq. ft

Source: BAAQMD

Economic impact findings for control measures with known costs are presented in Table 2 below. Of the seventeen control measures in the table below, two include costs that may significantly impact

affected sources and industries. These control measures are SS8 (SO2 from Coke Calcining Operations, adopted on 4-20-2016) and SS22 (Stationary Gas Turbines). SS22 affects two refineries (NAICS 32411) and one pulp, paper, and paperboard mills manufacturer (NAICS 3221). While refineries are not significantly impacted by SS22, the NAICS 3221 manufacturer is significantly impacted. This manufacturer will bear annual costs of $4.1 million as a result of SS22. SS8 (SO2 from Coke Calcining) will limit emissions of sulfur dioxide (SO2) from petroleum coke calcining operations, requiring operators of coke calcining kilns to remove an equivalent of 59 percent of the SO2 created by the calcining process. There is only one petroleum coke calcining facility in the Bay Area, which operates two coke calcining kilns and currently emits a total of 4.0 tons per day of sulfur dioxide. The facility will emit 2.1 tons per day of sulfur dioxide when the improvements are fully operational. The affected facility will bear $1.9 million in costs as a result of SS8, which when viewed in the context of this facility's estimated net profits, results in significant impacts. A third control measure that will significantly impact affected sources is SS35 (PM from Bulk Materials including Coke and Coal). SS35 controls fugitive dust from petroleum coke and coal storage and handling operations. For purposes of analysis, industries subject to this control measure include quarries (NAICS 2123), cement suppliers (NAICS 3273), coke shipping facilities (NAICS 488510), and coke calcining plants (NAICS 324199). Of the industries subject to SS35, only quarries, particularly those employing less than five workers, will be significantly impacted.

Table 2 — Summary of Impacts of Proposed Stationary Source Control Measures (SS) and Building Control Measure (BL) on Various Affected Industries

Proposed Stationary Source Control Measures With Cost Estimates	Affected Industries Naics Codes (*Req'd Equip.*)	Aggregate, Industry-Wide Impacts	Impacts Per Affected Establishment
SS2: Equipment Leaks	32411	less than significant	less than significant
SS3: Cooling Towers	32411	less than significant	less than significant
SS6: Refinery Fuel Gas	32411	less than significant	less than significant
SS7: Sulfuric Acid Plants	424690	less than significant	less than significant
SS8: SO2 from Coke Calcining	324199	$1,400,000	$1,400,000
SS10: Refinery Emissions Tracking	32411	less than significant	less than significant
SS13: Oil and Gas production	21111	less than significant	less than significant
SS22: Stationary Gas Turbines	32411	less than significant	less than significant
SS22: Stationary Gas Turbines	3221	$4,100,000	$4,100,000
SS28: LPG, Propane, Butane	42471	less than significant	less than significant
SS30: Residential Fan-Type Furnaces	Households	less than significant	less than significant
SS31: General PM Emissions Limit	7225 (Cyclone)	less than significant	less than significant
SS31: General PM Emissions Limit	331 (Baghouses)	less than significant	less than significant
SS32: Emergency Backup Generators	Many	less than significant	less than significant
SS35: PM from Bulk Materials	2123, 324199, 3273, 331210 and 488510	less than significant[1]	less than significant

[1]Of the five industries subject to control measure SS35 (quarries, coke calcining, cement manufacturing, steel pipe manufacturing, and terminal facilities), only quarries (NAICS 2123) exhibits significant impacts, although this is not the case for all quarries. There are 30 quarries in the Bay Area and the eight largest of these are not significantly

Proposed Stationary Source Control Measures With Cost Estimates	Affected Industries NAICS Codes (*Req'd Equip.*)	Aggregate, Industry-Wide Impacts	Impacts Per Affected Establishment
SS36: PM from Track-out	236 and 237	less than significant	less than significant
SS37: PM from Asphalt Operations	32412	less than significant	less than significant
SS38: Fugitive Dust	236 and 237	less than significant	less than significant
SS38: Fugitive Dust	32412	less than significant	less than significant
Proposed Buildings Control Measure With Cost Estimates	**Affected Industries (NAICS Codes)**	**Total Annual Costs**	**Annually Recurring Operating Costs**
BL4: Urban Heat Island Mitigation	Various	less than significant	less than significant

Source: ADE, based on BAAQMD, US Economic Census 2012, US County Business Patterns, California Energy Commission, US Department of Energy, Energy Information Administration, US Census Statistics of Small Businesses, and US Internal Revenue Service.

Table 3 summarizes all transportation-related control measures for which BAAQMD has identified possible amounts and sources of funds. Funds in Table 3 are annual funds, meaning that BAAQMD has identified roughly $12.9 billion in funds to be used for achieving the aims of each of the transportation control measures summarized below. While the infusion of dollars identified in the table represents annual amounts, the period over which the money will be available differs from control measure to control measure. In addition to including information on annually-recurring funds for operating purposes and annually-recurring funds to purchase equipment, Table 3 also includes information on money available for purposes of improving infrastructure. For example, there is a total of $5.2 billion available via TR3 (Local and Regional Bus Service Improvements), of which $4.6 billion is annual funds for local and regional bus service. Another $250.7 million from TR3 is for improving bus service-related infrastructure, such as bus stops, with yet another $390 million for equipment, such as new buses.[2]

impacted by SS35. Each of these entities employs 20 to 49 workers. There are 22 quarries that are small businesses, each employ anywhere from one to 19 workers. The largest of these not significantly impacted. Thus, at 17 out of 30, the majority of establishments affected by SS35 are not significantly impacted, resulting in the determination that the control measure does not significantly affect NAICS 2123 as a whole. However, there are 13 establishments with one to four workers that are small businesses and are significantly impacted by control measure SS35. Thus, of the 22 small businesses, 13 are significantly impacted, resulting in the determination that small businesses could be disproportionately impacted by SS35, particularly the smallest of small businesses. More detail on SS35 will emerge as the rule proceeds through the rule development process, resulting in greater understanding as to how small business may be affected by this control measure.

[2]The BAAQMD-issued summary for TR3 identified $7.8 billion in funds, $4.6 billion of which is for transit services and operations. For the remaining balance of the $7.8 billion, $1.25 billion would be for capital infrastructure and $1.95 billion for capital equipment. As the SIA must be conducted on an annual basis (comparing annual costs vs. annual revenues), ADE used a five-year 2016-2020 period as the default period in cases where total capital costs are known but implementation-phasing is unknown. While the TR3 summary references a 15 year period for $7.8 billion in capital improvements, ADE concluded that this period did not apply to the $7.8 billion, since the bulk of the $7.8 billion is for services and operations. So, ADE assumed that the $1.25 billion and $1.95 billion would occur

Table 3 – Summary of Transportation Control Measures with Known Amounts of Incentive Funds

Proposed Transportation Control Measures	Total Incentive Funds	Annually Recurring Incentive Funds	Incentive Funds For Infrastructure: Annualized	Incentive Funds For Equipment: Annualized
TR2: Trip Reduction Programs	$8,000,000	$8,000,000		
TR3: Local, Regional Bus Service Improvements	$5,199,520,000	$4,558,800,000	$250,720,000	$390,000,000
TR4: Local, Regional Rail Svc	$7,302,600,000	$3,860,000,000	$3,352,400,000	$90,200,000
TR5: Transit Efficiency and Use	$30,400,000	$30,400,000		
TR6: Freeways and Arterial Operations	$135,000,000		$135,000,000	
TR7: Safe Routes to School	$5,760,000	$5,760,000		
TR8: Ride Sharing Last Mile	$8,900,000	$8,900,000		
TR9: Bicycle and Pedestrian	$4,200,000	$1,840,000	$2,360,000	
TR10: Land use Strategies	$14,000,000	$4,000,000	$10,000,000	
TR11: Value Pricing	$150,000,000		$150,000,000	
TR12: Smart Driving	$32,200,000	$32,200,000		
TR13: Parking Policies	$2,600,000	$2,600,000		
TR14: Cars and Light trucks	$6,800,000			$6,800,000
TR15: Public Outreach	$6,500,000	$6,500,000		
TR19: Medium, Heavy Trucks	$9,000,000	$9,000,000		
TR20: Ocean Going Vessels	$1,100,000			$1,100,000
TR22: Construction, Freight Handling, and Farm Equipment	$2,800,000 to 11,300,000			
TR23: Lawn Care Equipment	$470,000			$470,000
Total	**$12,928,350,000**	**$8,477,900,000**	**$3,603,120,000**	**$493,070,000**

Source: BAAQMD

Direct net job losses stemming from stationary source control measures with potentially significant impacts range from one (1) to three (2.9) job. Taking into account multiplier effects, the total net job loss ranges from three (3) to almost 15 jobs. It is important to note that job losses associated with stationary sources control measures are only for those stationary sources measures for which cost data is available, meaning that the actual number could be higher. Job losses also need to be balanced against any job gains associated with the infusion of incentive funds for a variety of transportation projects. We estimate direct net job gains stemming from various transportation control measures at 56,690 to 56,720 job gains. When stationary source job losses are off-set with transportation control measure direct and indirect job gains, the positive net gain in jobs ranges from 121,990 to 122,040 jobs.

over a five-year period (2016-2020), resulting in annual spending of $250.7 million on capital infrastructure and $390 million for capital equipment.

Table 4 - Comparing Stationary Source Job Losses with Transportation Control Measure Job Gains

Net Change	Total Net Change in Jobs (A + B + C)	Total Direct Net Change in Jobs (A)	Total Indirect Net Change in Jobs (B)	Total Induced Net Change in Jobs (C)
Total Net Change (Low Cost Scenario)	**121,990**	**56,690**	**22,280**	**43,020**
Total Net Change (High Cost Scenario)	**122,040**	**56,720**	**22,290**	**43,030**
Proposed Stationary Source Control Measures With Known Cost Estimates	**Total Net Job Losses**	**Direct Net Job Losses**	**Indirect Net Job Losses**	**Induced Net Jobs Losses**
Total Stationary Source Job Loss (Low)	(3.0)	(1.0)	(1.0)	(1.0)
Total Stationary Source Job Loss (High)	(14.8)	(2.9)	(3.4)	(8.5)
SS2: Equipment Leaks	less than significant	less than significant	less than significant	less than significant
SS3: Cooling Towers	less than significant	less than significant	less than significant	less than significant
SS6: Refinery Fuel Gas	less than significant	less than significant	less than significant	less than significant
SS7: Sulfuric Acid Plants	less than significant	less than significant	less than significant	less than significant
SS8: SO2 from Petroleum Coke Calcining	(3.0)	(1.0)	(1.0)	(1.0)
SS10: Refinery Emissions Tracking	less than significant	less than significant	less than significant	less than significant
SS13: Oil and gas production	less than significant	less than significant	less than significant	less than significant
SS22: Stationary Gas Turbines (Low)	less than significant	less than significant	less than significant	less than significant
SS22: Stationary Gas Turbines (High)	(11.8)	(1.9)	(2.4)	(7.5)
SS28: LPG, Propane, Butane	less than significant	less than significant	less than significant	less than significant
SS30: Residential Fan-Type Furnaces	less than significant	less than significant	less than significant	less than significant
SS31: General PM Emissions Limit (Low)	less than significant	less than significant	less than significant	less than significant
SS31: General PM Emissions Limit (High)	less than significant	less than significant	less than significant	less than significant
SS32: Emergency Backup Generators	less than significant	less than significant	less than significant	less than significant
SS35: PM from Bulk Materials (Low)	less than significant	less than significant	less than significant	less than significant
SS35: PM from Bulk Materials (High)	less than significant	less than significant	less than significant	less than significant
SS36: PM from Track-out	less than significant	less than significant	less than significant	less than significant
SS37: PM from Asphalt Operations	less than significant	less than significant	less than significant	less than significant
SS38: Fugitive Dust	less than significant	less than significant	less than significant	less than significant
BL4: Urban Heat Island Mitigation	less than significant	less than significant	less than significant	less than significant
Proposed Transportation Control Measures with Known Incentive Funds Estimates	**Total Net Job Increases**	**Direct Net Job Increases**	**Indirect Net Job Increases**	**Induced Net Jobs Increases**
Total Transportation Measure Job Increases (Low)	121,990	56,690	22,280	43,020
Total Transportation Measure Job Increases (High)	122,050	56,720	22,290	43,040
TR2: Trip Reduction Programs	79	36	15	28
TR3: Local and Regional Bus Service Improv.	47,200	21,400	9,100	16,700
TR4: Local and Regional Rail Service	62,800	29,600	11,100	22,100

Net Change	Total Net Change in Jobs (A + B + C)	Total Direct Net Change in Jobs (A)	Total Indirect Net Change in Jobs (B)	Total Induced Net Change in Jobs (C)
TR5: Transit Efficiency and Use	295	135	56	104
TR6: Freeways and Arterial Operations	1,200	600	200	400
TR7: Safe Routes to School	291	132	56	103
TR8: Ridesharing and Last Mile Connections	88	40	17	31
TR9: Bicycle and Pedestrian Access and Facilities	8,290	3,910	1,450	2,930
TR10: Land Use Strategies	128	60	23	45
TR11: Value-pricing	1,140	560	180	400
TR12: Smart Driving	314	143	60	111
TR13: Parking Policies	26	12	5	9
TR14: Cars and Light trucks	18	9	1	8
TR15: Public Outreach	60	29	8	23
TR19: Medium, Heavy Trucks	25	12	2	11
TR20: Ocean Going Vessels	9	4	2	3
TR22: Construction, Freight, Farm Equip: Low	27	9	9	9
TR22: Construction, Freight, Farm Equip: High	76	31	16	29
TR23: Lawn Care Equipment: Low	1	1	0	0
TR23: Lawn Care Equipment: High	9	4	2	3

Source: ADE, based on BAAQMD and IMPLAN

METHODOLOGY

Applied Development Economics (ADE) began this analysis by preparing a statistical description of the industry groups of which the affected sources are a part, analyzing data on the number of establishments, jobs, and payroll. We also estimated sales generated by impacted industries, as well as net profits for each affected industry.

This report relies heavily on the most current data available from a variety of sources, particularly the State of California's Employment Development Department (EDD) Labor Market Information Division. In addition, this report relies on data from the US Census County Business Patterns, as well as from the US Internal Revenue Service.

With the above information, ADE was able to estimate net after tax profit ratios for sources affected by the proposed control measures. ADE calculated ratios of profit per dollar of revenue for affected industries. The result of the socioeconomic analysis shows what proportion of profits the compliance costs represent. Based on assumed thresholds of significance, ADE discusses in the report whether the affected sources are likely to reduce jobs as a means of recouping the cost of rule compliance or as a result of reducing business operations. To the extent that such job losses appear likely, the indirect multiplier effects of the jobs losses are estimated using a regional IMPLAN input-output model. In some instances, particularly where consumers are the ultimately end-users of goods and services provided by the affected sources, we also analyzed whether costs could be passed to households in the region.

When analyzing the socioeconomic impacts of proposed new rules and amendments, ADE attempts to work closely within the parameters of accepted methodologies discussed in a 1995 California Air Resources Board (ARB) report called "Development of a Methodology to Assess the Economic Impact Required by SB513/AB969" (by Peter Berck, PhD, UC Berkeley Department of Agricultural and Resources Economics, Contract No. 93-314, August, 1995). The author of this report reviewed a methodology to assess the impact that California Environmental Protection Agency proposed regulations would have on the ability of California businesses to compete. The ARB has incorporated the methodologies described in this report in its own assessment of socioeconomic impacts of rules generated by the ARB. One methodology relates to determining a level above or below which a rule and its associated costs is deemed to have significant impacts. When analyzing the degree to which its rules are significant or insignificant, the ARB employs a threshold of significance that ADE follows. Berck reviewed the threshold in his analysis and wrote, "The Air Resources Board's (ARB) use of a 10 percent change in [Return on Equity] ROE (i.e. a change in ROE from 10 percent to a ROE of 9 percent) as a threshold for a finding of no significant, adverse impact on either competitiveness or jobs seems reasonable or even conservative."

SOCIO-ECONOMIC ANALYSIS OF 2017 PLAN

This section of the report presents economic impacts stemming from proposed control measures for which costs data have been presented. The analysis is done for the most part on a measure by measure basis, in order of the number assigned each proposed control measure. We begin this section by discussing larger economic and demographic contexts within which the Air District is contemplating the 2017 Plan.

REGIONAL POPULATION TRENDS

Table 5 tracks population growth in the nine-county San Francisco Bay Area between 2005 and 2015, including data for the year 2010. Between 2005 and 2010, the region grew by approximately 0.9 percent a year. Between 2010 and 2015, the region grew annually at a somewhat faster rate of 1.0 percent per year. Overall, there are 7,571,297 people in the region. At 1,903,974, Santa Clara County has the most people, while Napa has the least, at 140,898. San Francisco grew the fastest between 2010 and 2015, at 1.9 percent a year, while San Mateo County declined by 1.2 percent annually over the same period.

Table 5 — Population Trends: San Francisco Bay Area: 2005 - 2015

JURISDICTION	2005	2010	2015	05-10	10-15
California	35,869,173	37,223,900	38,907,642	0.7%	0.9%
SF Bay Area	6,900,602	7,208,615	7,571,297	0.9%	1.0%
Alameda	1,462,736	1,509,240	1,610,765	0.6%	1.3%
Contra Costa	1,001,216	1,047,948	1,111,143	0.9%	1.2%
Marin	246,688	252,279	261,798	0.4%	0.7%
Napa	130,472	136,316	140,898	0.9%	0.7%
San Francisco	780,187	780,187	857,508	0.0%	1.9%
San Mateo	700,350	804,989	759,155	2.8%	-1.2%
Santa Clara	1,698,234	1,781,427	1,903,974	1.0%	1.3%
Solano	410,985	413,268	426,704	0.1%	0.6%
Sonoma	469,734	482,961	499,352	0.6%	0.7%

Source: California Department of Finance, "Report E-5: Population and Housing Estimates"

REGIONAL ECONOMIC TRENDS

Data in Table 6 describe the larger economic context within which officials are contemplating the 2017 Plan. Businesses in the region employ almost three and a half million workers, or 3,431,643. The number of private and public sector jobs in the region grew annually by 3.0 percent between 2010 and 2015, after having declined slightly between 2005 and 2010 by 0.6 percent a year. Of the 3,431,643 workers, 168,837, or 4.9 percent, are civil servants in the public sector. This figure does not include public sector education, which was combined with private sector education and placed in the private

sector portion of the table, in an effort to present a picture as to the total number of persons in the education profession in the Bay Area.

Table 6 — San Francisco Bay Area Employment Trends By Sector: 2005 - 2015

Industry Sector		2005	2010	2015	2015	2015 CA	SFBA CAGR* 05-10	SFBA CAGR 10-15	CA CAGR 05-10	CA CAGR 10-15
Total		**3,049,802**	**2,963,021**	**3,431,643**	**100.0%**	**100.0%**	**-0.6%**	**3.0%**	**-1.1%**	**2.3%**
Private Sector		2,869,200	2,774,555	3,262,806			-0.7%	-0.7%	3.3%	2.6%
62	Health	300,775	340,492	453,880	13.2%	13.9%	2.5%	5.9%	2.5%	6.5%
54	Prof., Scientific	293,262	322,617	417,902	12.2%	7.4%	1.9%	5.3%	1.2%	3.2%
44-45	Retail	335,744	306,798	340,197	9.9%	10.2%	-1.8%	2.1%	-1.8%	1.8%
31-33	Manufacturing	350,962	305,378	326,362	9.5%	7.9%	-2.7%	1.3%	-3.8%	0.7%
722	Food Srv, Drnkng	214,142	227,750	288,896	8.4%	8.0%	1.2%	4.9%	0.6%	4.2%
561	Admin. Support	170,727	157,319	192,097	5.6%	6.2%	-1.6%	4.1%	-2.4%	4.2%
61	Education	185,310	192,195	180,382	5.3%	8.5%	0.7%	-1.3%	0.1%	0.8%
23	Construction	188,473	129,820	171,403	5.0%	4.4%	-7.2%	5.7%	-9.2%	4.9%
51	Information	112,690	110,725	158,943	4.6%	2.9%	-0.4%	7.5%	-2.1%	2.2%
42	Wholesale	124,390	113,072	125,215	3.6%	4.4%	-1.9%	2.1%	-0.9%	2.1%
81	Other Services	140,159	155,133	121,676	3.5%	3.2%	2.1%	-4.7%	0.9%	-6.6%
52	Finance, Insrnce	151,375	118,163	120,272	3.5%	3.2%	-4.8%	0.4%	-4.4%	0.4%
55	Mgt. of Comp.	54,856	55,605	75,726	2.2%	1.4%	0.3%	6.4%	-2.9%	3.6%
48-49	Trnsprt-Warehsng	51,880	46,721	72,947	2.1%	2.9%	-2.1%	9.3%	-1.0%	3.6%
71	Culture	49,572	52,315	58,669	1.7%	1.8%	1.1%	2.3%	0.6%	3.0%
53	Real Estate	61,402	52,676	57,463	1.7%	1.7%	-3.0%	1.8%	-2.7%	1.6%
721	Accommodation	46,156	44,734	49,490	1.4%	1.3%	-0.6%	2.0%	-0.5%	1.9%
99	Unclassified	338	6,846	18,517	0.5%	0.6%	82.5%	22.0%	-5.5%	12.2%
11	Agriculture	20,082	18,009	14,069	0.4%	2.6%	-2.2%	-4.8%	0.1%	1.9%
562	Waste Mgt.	10,333	11,018	11,866	0.3%	0.3%	1.3%	1.5%	0.7%	3.1%
22	Utilities	4,603	6,367	5,254	0.2%	0.4%	6.7%	-3.8%	0.4%	0.1%
21	Mining	1,969	802	1,584	0.0%	0.2%	-16.4%	14.6%	2.1%	2.1%
Public Sector**		180,602	188,466	168,837	5.0%	6.8%	0.9%	-2.2%	0.4%	-0.8%

*Source: Applied Development Economics, based on State of California, Employment Development Department Labor Market Information Division, "Quarterly Census of Employment and Wages" (*Note: CAGR = compound annual growth rate \ **Note: Public sector education placed in Private Sector NAICS 61 -- similarly Public sector health placed into NAICS 62).*

Economic sectors in the table above are sorted by the share of total employment. The top-five sectors in the Bay Area in terms of total number of workers are Health and Social Assistance (NAICS 62) (453,880 workers), Professional/Technical Services (NAICS 54) (417,902 workers), Retail (NAICS 44-45) (340,197), Manufacturing (NAICS 31-33) (326,362) and Food Services (288,896). Of the top-ten leading sectors in terms of employment, six exhibited high rates of annual growth from 2010 to 2015, growing annually by more than four percent. These sectors are Health and Social Assistance (5.9 percent per year), Professional/Technical Services (5.3 percent), Food Services (4.9 percent), Administrative Support (NAICS 561) (4.1 percent), Construction (NAICS 23) (5.7 percent per year) and Information (NAICS 51), which grew at a phenomenal annual rate of 7.5 percent. Combined, these five sectors employ 49 percent of total employment, or 1,683,121 out of 3,374,902. Moreover,

of the top-ten leading sectors in the Bay Area, only one (Public Sector) had less workers in 2015 than in 2010, underscoring the resilience of the regional economy in the aftermath of the Great Recession. The table also demonstrates the advanced nature of the regional economy, as 12.2 percent of all workers are in the Professional, Scientific and Technical (NAICs 54), whereas in the state as a whole, 7.4 percent of all workers are in this sector. Interestingly, at 1.3 percent per year, manufacturing employment growth in the Bay Area almost doubled statewide manufacturing growth rates (0.7 percent), underscoring the diversity of the regional economy.

SOCIOECONOMIC ANALYSIS OF 2017 PLAN

This section of the report presents findings with regard to economic impacts stemming from proposed control measures in the 2017 Clean Air Plan (2017 Plan). The impact analysis portion of the report is organized in the order of each measures' respective number, for the most part. We begin each discussion on economic impacts with a profile of affected industries, identifying the number of establishments operating in the region, including estimates on their respective number of workers, revenues and net profits. We summarize control measures' costs, which are sometimes presented as a range ("low" versus "high"), and compare each cost against industries' net profits, to ascertain which control measures in the 2017 Plan results in potentially significant impacts. It should be noted that additional cost details on any one of the proposed stationary source control measures and possible significant impacts will be studied in greater detail as rules proceed through the rule development process. During the rule development process, control methods are typically scaled to the size of the smaller facilities operation, resulting in costs that are reasonable. If costs continue to exceed the threshold of significance, tiered emission limits or limited exemptions are considered to ensure costs fit within the socio-economic impact ranges.

ECONOMIC IMPACT ANALYSIS OF STATIONARY SOURCE CONTROL MEASURES

SS2 (Equipment Leaks), SS3 (Cooling Towers), SS6 (Refinery Fuel Gas), SS10 (Refinery Emissions Tracking) and SS22 (Stationary Gas Turbines)

Of the sixteen stationary source control measures with cost information, the first set largely affects the five refineries operating in the Bay Area. These measures are SS2 (Equipment Leaks), SS3 (Cooling Towers), SS6 (Refinery Fuel Gas), and SS10 (Refinery Emissions Tracking). SS22 (Stationary Gas Turbines) is included in the analysis below since this measure affects refineries; however, this measure also affects a pulp, paper, and paperboard manufacturer (NAICS 3221).

The five refineries in the Bay Area annually employ an estimated 3,375 workers, generate $30.3 billion in revenues and an estimated $2.1 billion in after-tax net profits. As for one source in NAICS 3221, this establishment generates annually between $100 million and $500 million revenues, and employs more than 200 workers.

Table 7 – Profile of Industries Subject to Various Proposed Control Measures (SS2, SS3, SS6, SS10, and SS22): Refineries and Others (SS22 only)

Industry	NAICS	Nos. of Establishments	Employment	Revenues	After-Tax Net Profits
Refineries	324110	5	3,375	$30,304,176,274	$2,072,502,615
Pulp, Paper, Paperboard Mfg	3221	1	200-500	$100M - $500M	$5M - $15M

Source: Applied Development Economics, based on US Census 2012, US County Business Patterns, California Energy Commission, US Department of Energy, Energy Information Administration, InfoUSA, and US Internal Revenue Service.

Below, we present annual costs associated with control measures SS2 (Equipment Leaks), SS3 (Cooling Towers), SS6 (Refinery Fuel Gas), SS10 (Emissions Tracking), and SS22 (Stationary Gas Turbines) (Table 8). Control measures SS2, SS3, and SS10 apply to all five refineries, whereas SS6 and SS22 apply to two refineries. While cost numbers in the table are mostly cost per affected sources, the cost data for SS22 refer to the cost of equipment. One of the two refineries subject to SS22 is expected to modify one gas turbine in conformance with SS22, while another is expected to modify three. In addition, BAAQMD staff indicates that there is one source that is not located at a refinery that will be subject to SS22. This source is expected to modify one gas turbine.

Table 8 – Summary of Per Establishment Annual Costs for Various Proposed Control Measures (SS2, SS3, SS6, SS10, and SS22) That Will Affect Refineries and Others

Control Measure	Total Annual Cost: Low Scenario	Total Annual Cost: High Scenario	Annualized Costs (Recurring): Low Scenario	Annualized Costs (Recurring): High Scenario	Annualized Costs (Capital Equipment): Low Scenario	Annualized Costs (Capital Equipment): High Scenario
SS2: Equipment Leaks	$6,800,000	$6,800,000	$6,550,000	$6,550,000	$250,000	$250,000
SS3: Cooling Towers	$1,000,000	$3,000,000	$1,000,000	$3,000,000	$0	$0
SS6: Refinery Fuel Gas*	$1,000,000	$3,000,000	$1,000,000	$3,000,000	$0	$0
SS10: Emissions Tracking	$455,000	$455,000	$140,000	$140,000	$315,000	$315,000
SS22: Stationary Gas Turbines**	$4,100,000	$4,100,000	$1,400,000	$1,400,000	$2,700,000	$2,700,000

*Source: Bay Area Air Quality Management District (*Note: Two refineries subject to SS6; **Note: two refineries subject to SS22, and indicated costs are cost per equipment, not cost per refinery.)*

Table 9 below presents aggregate cost information as borne by all sources affected by the control measures they are subject to. The five refineries subject to SS2, SS3, and SS10 will bear combined costs ranging from $41.3 million to $51.3 million. Of the five refineries, two will not only bear the $41.3 million to $51.3 million in SS2, SS3, and SS10-related costs but will be subject to additional costs related to SS6 and SS22, ranging from $18.4 to $22.4 million. The one non-refinery source subject to SS22 will bear $4.1 million in annual costs.

Table 9 – Summary of Aggregate Annual Costs for Various Proposed Control Measures (SS2, SS3, SS6, SS10, and SS22) That Will Affect Refineries and Others

CONTROL MEASURE	TOTAL ANNUAL COST: LOW SCENARIO	TOTAL ANNUAL COST: HIGH SCENARIO	ANNUALIZED COSTS (RECURRING) : LOW SCENARIO	ANNUALIZED COSTS (RECURRING) : HIGH SCENARIO	ANNUALIZED COSTS (CAPITAL EQUIPMENT) : LOW SCENARIO	ANNUALIZED COSTS (CAPITAL EQUIPMENT) : HIGH SCENARIO
Tot. Cost SS2, SS3, SS10 (5 refineries)	**$41,275,000**	**$51,275,000**	**$38,450,000**	**$48,450,000**	**$2,825,000**	**$2,825,000**
Tot. Cost SS6, SS22 (2 refineries)	**$18,400,000**	**$22,400,000**	**$2,000,000**	**$6,000,000**	**$1,680,000**	**$5,440,000**
SS2: Equipment Leaks	$34,000,000	$34,000,000	$32,750,000	$32,750,000	$1,250,000	$1,250,000
SS3: Cooling Towers	$5,000,000	$15,000,000	$5,000,000	$15,000,000	$0	$0
SS6: Refinery Fuel Gas	$2,000,000	$6,000,000	$2,000,000	$6,000,000	$0	$0
SS10: Refinery Emissions Tracking	$2,275,000	$2,275,000	$700,000	$700,000	$1,575,000	$1,575,000
SS22: Stationary Gas Turbines	$16,400,000	$16,400,000	$5,600,000	$5,600,000	$10,800,000	$10,800,000
SS22: Stationary Gas Turbines (Paper)	$4,100,000	$4,100,000	$1,400,000	$1,400,000	$2,700,000	$2,700,000

Source: ADE, based on BAAQMD.

The refineries operating in the Bay Area are not significantly impacted by the combined costs of SS2, SS3, SS6, SS10, and SS22 (Table 10). All five refineries will be subject to SS2, SS3, and SS10. For these refineries, the combined annual cost of SS2, SS3, and SS10 ranges from $41.3 million to $51.3 million, which amount to 2.0 percent to 2.5 percent of refineries' estimated annual net profits. The two refineries subject to SS6 and SS22 are similarly not significantly impacted by these control measures, even when the cost of these measures are added to costs associated with SS2, SS3, and SS10. The two refineries affected by SS6 and SS22 will bear $18.4 million to $22.4 million in new annual costs; the combined annual costs of SS2, SS3, SS10, SS6, and SS22 amount to $59.7 million to $73.7 million, or three to four percent of estimated net profits for the five affected refineries. However, the pulp, paper, and paperboard manufacturer subject to SS22 may be significantly impacted. The annual $4.1 million in SS22-related costs amount to 25 percent to 35 percent of estimated net profits, which is above the standard of significance. More details on SS22 will emerge as the rule proceeds through the rule development process, resulting in greater understanding as to the impact to the pulp, paper, and paperboard manufacturer. The manufacturer is a small scale facility, and suitable controls and emissions limits will be identified to control costs appropriately within the socio-economic impact ranges.

[This space empty on purpose]

Table 10 – Socio-Economic Impact Analysis (SIA) Of Various Proposed Stationary Source Control Measures (SS2, SS3, SS6, SS10, and SS22) On Refineries and Others (SS22 only)

Industry	Refineries Sources Subject to SS2, SS3, SS10	Refineries Sources Subject to SS6	Refineries Sources Subject to SS22	Non-Refinery Source Subject to SS22
NAICS	324110	324110	324110	3221
Nos. of Establishments	5	2	2	1
Revenues	$30,304,176,274	$10B - $20B	$10B - $20B	$100M - $500M
After-Tax Net Profits	$2,072,502,615	$500,000,000 - $999,000,000	$500,000,000 - $999,000,000	$10,000,000 $19,000,000
Total Annual Cost: LOW SCENARIO	$41,275,000	$2,000,000	$16,400,000	$4,100,000
Total Annual Cost: HIGH SCENARIO	$51,275,000	$6,000,000	$16,400,000	$4,100,000
Cost-to-Net Profits: LOW SCENARIO	2.0%	< 5.0%	< 5.0%	25.0% - 35.0%
Cost-to-Net Profits: HIGH SCENARIO	2.5%	< 5.0%	< 5.0%	25.0% - 35.0%

Source: Applied Development Economics, based on BAAQMD, US Census 2012, US County Business Patterns, California Energy Commission, US Department of Energy, Energy Information Administration, InfoUSA, and US Internal Revenue Service.

None of the businesses subject to SS2, SS3, SS6, SS10 and SS22 are small businesses. Thus, small businesses are not disproportionately impacted by these control measures.

SS7 (Sulfuric Acid Plant)

In addition to SS2, SS3, SS6, SS10, and SS19, Bay Area refineries are also affected by proposed control measure SS7 (Sulfuric Acid Plant). This measure was not included with the previous set of refinery-impacting measures for two reasons. First, only one refinery is affected by SS7. And second, SS7 affects two establishments in Other Chemicals and Allied Products Wholesaling (NAICS 424690), which exist to support the refinery operations. The one affected refinery annually generates revenues ranging from $5 billion to $10 billion, and net profits between $100 million and $500 million. The two NAICS 424690 entities combined generate $500 million to $1 billion in annual revenues, with net profit estimated at $10 million to $50 million a year. These are not small businesses.

Table 11 - Industries Subject to Proposed Control Measure SS7: Refineries and Other Chemical and Allied Products Wholesaler

Industry	NAICS	Nos. of Establishments	Employment	Revenues	After-Tax Net Profits
Refineries	324110	1	500 - 999	$5B -$10B	$100M - $500M
Other chemical and allied products merchant wholesalers	424690	2	345	$500M - $1B	$10M - $50M

Source: ADE, based on California Energy Commission, US Economic Census 2012, US County Business Patterns 2014, US Census Statistics of Small Business, and US IRS.

As demonstrated below, the affected refinery would incur total costs amounting to $1 million a year, as a result of SS7. The wholesalers would incur $900,000 each in total annual costs (Table 12). Combined, the two wholesalers would incur $1.9 million in annual costs, of which $1.4 million will be costs associated with purchasing new equipment.

Table 12 – Summary of Per Establishment Annual Costs Of Control Measure (SS7) Affecting Refinery and Other Chemical and Allied Product Wholesaler

INDUSTRY	TOTAL ANNUAL COST	ANNUALIZED COSTS PER ESTABLISHMENT (RECURRING)	ANNUALIZED COSTS PER ESTABLISHMENT (CAPITAL EQUIPMENT)
Total (All Affected Sources)	$1,900,000	$500,000	$1,400,000
Refineries	$1,000,000	$300,000	$700,000
Other chemical and allied products merchant wholesalers	$900,000	$200,000	$700,000

Source: BAAQMD

Table 13 – Summary of Aggregate Annual Costs Of Proposed Control Measure (SS7) Affecting Refinery and Other Chemical and Allied Product Wholesaler

INDUSTRY	TOTAL ANNUAL COST	ANNUALIZED COSTS PER ESTABLISHMENT (RECURRING)	ANNUALIZED COSTS PER ESTABLISHMENT (CAPITAL EQUIPMENT)
Total (All Affected Sources)	$2,800,000	$700,000	$2,100,000
Refineries	$1,000,000	$300,000	$700,000
Other chemical and allied products merchant wholesalers	$1,800,000	$400,000	$1,400,000

Source: BAAQMD

The three sources affected by proposed control measure SS7 are not significantly impacted. The total annual cost stemming from proposed measure amounts to 0.2 percent of the refinery's estimated net profits, and 6.2 percent of the combined net profits of the two NAICS 424690 entities. As these are not small businesses, no disproportionate impact analysis is required.

Table 14 – Socio-Economic Impact Analysis of Proposed Control Measure SS7 On Refineries and Other Chemical and Allied Products Wholesaler

INDUSTRY	REFINERIES	OTHER CHEMICAL AND ALLIED PRODUCTS
NAICS	324110	424690
Nos. of Establishments	1	2
Revenues	$5B -$10B	$500M - $1B
After-Tax Net Profits	$100M - $500M	$10M - $50M
Total Annual Cost	$1,000,000	$1,800,000
Cost-to-Net Profits	< 5.0%	5.0% to 9.9%

Source: ADE, based California Energy Commission, US EIA, US Economic Census 2012, US County Business Patterns 2014, US Census Statistics of Small Business, and US IRS.

SS8 (Sulfur Dioxide from Petroleum Coke Calcining)

Sulfur dioxide (SO2) is a pungent-smelling gas commonly formed from the burning of fossil fuel materials that contain sulfur, such as coal or oil, and from certain industrial processes, such as petroleum refining, chemical production, and metal smelting. Once emitted into the atmosphere, SO2 reacts with chemicals in the air, such as ozone, or in the presence of water to form sulfuric acid and eventually reacts with ammonia in the air to form ammonium sulfate, a component of PM2.5. Control measure SS8, as implemented in Rule 9-14 (adopted on 4-20-2016), will limit emissions of sulfur dioxide (SO2) from petroleum coke calcining operations, requiring operators of coke calcining kilns to remove an equivalent of 59 percent of the SO2 created by the calcining process. There is only one petroleum coke calcining facility in the Bay Area, which operates to coke calcining kilns and currently emits a total of 4.0 tons per day of sulfur dioxide. When improvements are complete the facility will emit 2.1 tons per day of sulfur dioxide.

Table 15 – Industry Subject to Proposed Control Measure SS8: All Other Petroleum and Coal Manufacturing

Industry	NAICS	Nos. of Establishments	Employment	Revenues	After-Tax Net Profits
All Other Petroleum and Coal Products Manufacturing	324199	1	40	$50,000,000 to $100,000,000	$1,000,000 to $10,000,000

Source: ADE, based on BAAQMD and InfoUSA SalesGenie.

Air District staff has estimated that it will cost between $4 and $5 million to upgrade the existing SO2 controls system to meet the requirements of Rule 9-14. Under the Air District's standard method for distributing one-time capital costs over the life of the equipment, that translates to an annual cost of $680,000/year. Another significant cost is the purchase of dry sorbent material to react with the SO2 in the process stream and to convert it to an inert solid that is captured in the existing particulate matter control system. Based on cost quotes from a sorbent supplier, Air District staff estimates these costs to be $500 per ton of additional sorbent. In summary, the estimated annual cost for the Carbon Plant to improve their current Dry Sorbent Injection (DSI) system to comply with the 1,050 tpy emission requirement in Rule 9-14 is approximately $1.87 million.

Table 16 – Summary of Aggregate Annual Cost Associated with SS8 (Sulfur Dioxide from Petroleum Coke Calcining)

	Total Annual Cost	Annualized Costs Per Establishment (Recurring)	Annualized Costs Per Establishment (Capital Equipment)
All Other Petroleum and Coal Products Manufacturing	$1,870,000	$1,190,000	$680,000

Source: BAAQMD

The coke calcining plant subject to SS8 could be significantly impacted by the control measure. Compared against net profits, the $1.87 million in annual costs results in a cost-to-net profit ratio

between 25 and 50 percent. At 25 percent to 50 percent, the cost-to-net profit ratio is significantly above the ten percent threshold utilized for purposes of determining significance. The affected source is not a small business, meaning that small businesses are not disproportionately impacted by this control measure.

Table 17 – Socio-Economic Impact Analysis: Control Measure (SS8) Affecting All Other Petroleum and Coal Manufacturing

Industry	All Other Petroleum and Coal Products Manufacturing
NAICS	324199
Nos. of Establishments	1
Revenues	$50,000,000 to $100,000,000
After-Tax Net Profits	$1,000,000 to $10,000,000
Total Annual Cost	$1,870,000
Cost-to-Net Profits	25% to 50%

Source: ADE, based InfoUSA and US IRS SOI.

SS13 (Natural Gas and Crude Oil Production, Processing and Storage)

The purpose of proposed control measure SS13 (Natural Gas and Crude Oil Production, Processing and Storage) is to reduce emissions of methane, a potent GHG, and other organic compounds from natural gas and crude oil production, processing and storage facilities throughout the Bay Area. In the Bay Area, there are seven establishments within NAICS 2111111 (Oil and natural gas production). These establishments generated $157.7 million in annual revenues, net profits estimated at $20.9 million a year, and employ 78 workers.

Table 18 – Industry Subject to Proposed Control Measure SS12: Oil and Natural Gas Producers

Industry	NAICS	Nos. of Establishments	Employment	Revenues	After-Tax Net Profits
Oil and natural gas production	2111111	7	78	$157,708,214	$20,967,242

Source: ADE, based US Economic Census 2012, US County Business Patterns 2014, US Census Statistics of Small Business, US IRS.

As indicated below, each of the seven affected establishments will bear costs ranging from $100,000 to $200,000 a year. Aggregate industry costs are estimated at $700,000 to $1.4 million a year.

Table 19 – Summary of Per Establishment and Aggregate Annual Costs Of Control Measure (SS12) Affecting Natural Gas and Oil Producers

COST BASIS	TOTAL ANNUAL COST: LOW SCENARIO	TOTAL ANNUAL COST: HIGH SCENARIO	ANNUAL RECURRING OPERATING COSTS: LOW SCENARIO	ANNUAL RECURRING OPERATING COSTS: HIGH SCENARIO	ANNUALIZED CAPITAL EQUIPMENT COST: LOW SCENARIO	ANNUALIZED CAPITAL EQUIPMENT COST: HIGH SCENARIO
Per Establishment	$100,000	$200,000	$65,000	$100,000	$35,000	$100,000
Aggregate Costs	$356,583	$871,668	$111,583	$171,667	$171,667	$700,000

Source: BAAQMD

Proposed control measure SS13 does not significantly impact Bay Area oil and gas producers (NAICS 2111111) as a whole. Aggregate costs stemming from the proposed measure amount to 1.7 percent of net profits on the low end, to 4.2 percent of net profits in the high scenario (Table 20). In both cases, the ratios are below the ten-percent threshold. However, of the seven affected establishments, four employ 1 to 4 workers each and generate a combined $25.6 million in revenues, for an average of slightly above $6 million per establishment. These establishments are small businesses as they each generate less than $10 million in annual revenues. As Table 21 shows, the four small business establishments are significantly affected in the high cost scenario; the cost to net profit ratio in this scenario is close to the 10 percent threshold used for purposes of determining whether costs are significant. In the low cost scenario, the four small businesses are not significantly impacted, as the cost to net profit ratio is below 5 percent. Thus small businesses are potentially disproportionately affected by SS13. More details on SS13 will emerge as the rule proceeds through the rule development process, resulting in greater understanding as to the impact to small businesses. Small scale facilities generally require relatively lower cost control devices.

Table 20 – Socio-Economic Impact Analysis: Control Measure (SS13) Affecting Oil and Natural Gas Producers

INDUSTRY	OIL AND NATURAL GAS PRODUCTION
NAICS	2111111
Nos. of Establishments	7
Revenues	$157,708,214
After-Tax Net Profits	$20,967,242
Total Annual Cost: LOW SCENARIO	$356,583
Total Annual Cost: HIGH SCENARIO	$871,667
Total Annual Cost: LOW SCENARIO: Cost-to-Net Profits	1.7%
Total Annual Cost: HIGH SCENARIO: Cost-to-Net Profits	4.2%

Source: ADE, based US Economic Census 2012, US County Business Patterns 2014, US Census Statistics of Small Business, US IRS.

Table 21 – Socio-Economic Impact Analysis: Small Business Disproportionate Impact Analysis: Control Measure (SS13) Affecting Oil and Natural Gas Producers

Employment Size Categories	Establish-ments	Employment	Aggregate Revenues Per All Establishments (est.)	Cost: Low Scenario	Cost-to-Net Profit Ratio: Low Scenario	Cost: High Scenario	Cost-to-Net Profit Ratio: High Scenario
	7	**78**	**$157,708,214**	**$356,583**	**1.7%**	**$871,667**	**4.2%**
1-4 workers	4	8	$25,601,978	$150,833	< 5.0%	$416,667	10.0%-20.0%
5-9	1	5	$10M - $19M	$41,500	< 5.0%	$110,000	< 5.0%
10-19	1	20	$20M - $29M	$64,250	< 5.0%	$145,000	< 5.0%%
20-99	1	45	$50M - $100M	$100,000	< 5.0%	$200,000	< 5.0%
100-499							
500+							

Source: ADE, based US Economic Census 2012, US County Business Patterns 2014, US Census Statistics of Small Businesses, US IRS. $19,135,209 $29,072,972 $83,898,055

SS28 (LGP, Propane, Butane)

The District enforces gas tight requirements at stationary sources for a variety of operations that handle fuel on a bulk basis, including refineries and bulk terminals. Proposed measure SS28 (LGP, Propane, Butane) would set leakage allowance standards for Liquid Petroleum Gases (LPG), propane and butane tanks and connections, as well as prohibit or control venting during filling of such tanks. In the Bay Area, there are 61 establishments in the Petroleum Bulk Station and Terminals (NAICS 4247) industry. These entities employ almost 800 workers and generate $8.7 billion in aggregate revenues (Table 22). Other industries subject to SS28 include gas stations (NAICS 4471), fuel dealers (NAICS 454310), including liquid propane gas fuel dealers, and general rental centers (NAICS 532310).

Table 22 - Industry Subject to Proposed Control Measure SS28 (LPG, Propane, Butane): Petroleum Bulk Fuel Providers

Industry	NAICS	Establish-ments	Employ-ment	Revenues	After-Tax Net Profits
Petroleum Bulk Stations and Terminals	4247	61	757	$8,683,799,263	$102,760,130
Gas Stations	4471	1,284	6,829	$6,072,909,482	$73,573,078
Fuel Dealers	454310	33	216	$89,822,736	$4,184,461
General Rental Centers	532310	44	308	$41,772,555	$1,362,674

Source: ADE, based US Economic Census 2012, US County Business Patterns 2014, US Census Statistics of Small Business, US IRS

According to BAAQMD, petroleum bulk stations and terminals (NAICS 4247) will bear costs averaging $132,000 per establishment, for a total industry-wide cost of $8,052,000. Gas stations and general rental centers would bear costs amounting to $117 per establishment, whereas fuel dealer would bear costs averaging $6,700 a year.

Table 23 - Summary of Per Establishment and Aggregate Annual Costs for Control Measures (SS28) Affecting Bulk Fuel Providers

	Total Annualized Cost Per Establishment	Total Annualized Cost: Industry-Wide
Petroleum Bulk Stations and Terminals	$132,000	$8,052,000
Gas Stations	$117	$150,228
Fuel Dealers	$6,700	$221,100
General Rental Centers	$117	$5,148

Source: BAAQMD

As demonstrated below, aggregate cost of the control measure results in less than significant impacts across the board. Industry-wide, petroleum bulk stations and terminals would be expected to bear costs that amount to 7.8 percent of net profits, which is below the 10 percent threshold of significance.

Table 24 - Socio-Economic Impact Analysis: Control Measures (SS28) Affecting Bulk Fuel Providers

Industry	Petroleum Bulk Station and Terminals	Gas Stations	Other Fuel Dealers, incl. LPG Distributors	General Rental Centers
NAICS	424710	4471	45431	532310
Nos. of Establishments	61	1,284	33	44
Revenues	$8,683,799,263	$6,072,909,482	$89,822,736	$41,772,555
After-Tax Net Profits	$102,760,130	$73,573,078	$4,184,461	$1,362,674
Total Annual Cost	$8,052,000	$150,228	$221,100	$5,148
Cost-to-Net Profits	7.8%	0.2%	5.3%	0.4%

Source: ADE, based US Economic Census 2012, US County Business Patterns 2014, US Census Statistics of Small Business, US IRS.

Small businesses in the industries other than fuel dealers (NAICS 454310) are not significantly impacted by SS28. While the table below shows that bulk fuel providers (NAICS 4247) employing 1 to 4 workers and 5 to 9 workers would be significantly impacted given that their respective cost-to-net profit ratios exceed the ten percent threshold, these are not small businesses. According to the State of California, among other things, small businesses generate annual sales of less than $10 million.[3] Bulk fuel providers employing 1 to 4 workers generate on average $19.2 million a year in sales, with those employing 5 to 9 workers generating $70.3 million a year on average.[4] Fuel dealers (NAICS 454310) in each of the employment size categories generate less than $10 million a year on average, making all 33 fuel dealer small businesses. Of the 33 fuel dealers, those employing less than five workers are significantly impacted by SS28. At 10 establishments, those establishments employing 1

[3] http://www.leginfo.ca.gov/cgi-bin/displaycode?section=gov&group=14001-15000&file=14835-14843

[4] $19.2M = $445.6M / 23 establishments; $70.3M = $685.9 / 10 establishments

to 4 workers are one-third of all affected fuel dealers (i.e. 10 out of 33 establishments). Thus those employing 1 to 4 workers do not constitute a majority of the affected fuel dealers, meaning that small businesses are not disproportionately impacted by SS28. And, small business gas stations, fuel centers, and general centers are not significantly impacted by SS28. Thus, SS28 does not disproportionately affect small businesses.

Table 25 - Socioeconomic Impact Analysis of Control Measure (SS28) Affecting Bulk Fuel Providers: Disproportionate Impact on Small Businesses

Employment Size Categories	Establish-ments	Employment	Aggregate Revenues Per All Establishments (est.)	Aggregate Net profit Per All Establishments (est.)	Cost	Cost-to-Net Profit Ratio
Bulk Fuel	**61**	**757**	**$8,683,799,263**	**$102,760,130**	**$8,052,000**	**7.8%**
1-4	23	34	$445,648,231	$5,273,598	$3,059,760	58.0%
5-9	10	57	$685,973,318	$8,117,496	$1,288,320	15.8%
10-19	13	132	$1,387,154,940	$16,414,961	$1,771,440	10.7%
20-49	10	183	$3,212,525,524	$38,015,566	$1,288,320	3.3%
50-99	2	111	$803,131,381	$9,503,891	$322,080	3.3%
100 to 499	2	240	$2,149,365,868	$25,434,618	$322,080	1.2%
Gas Stations	**1,284**	**6,829**	**$6,072,909,482**	**$73,573,078**	**$150,228**	**0.2%**
1-4	437	617	$1,083,401,177	$13,125,366	$51,072	0.4%
5-9	588	3,265	$3,009,198,647	$36,456,332	$68,842	0.2%
10-19	207	1,943	$1,510,784,501	$18,303,099	$24,192	0.1%
20-49	50	893	$446,621,490	$5,410,803	$5,824	0.1%
50-99	3	111	$22,903,666	$277,477	$299	0.1%
100 to 499	0	0	$0	$0	$0	
Fuel Dealers	**33**	**216**	**$89,822,736**	**$4,184,461**	**$221,100**	**5.3%**
1-4	10	16	$9,713,452	$452,509	$68,031	15.0%
5-9	13	80	$32,736,032	$1,525,033	$85,038	5.5%
10-19	9	94	$38,571,401	$1,796,878	$59,527	3.3%
20-49	1	26	$8,801,851	$410,041	$8,504	2.0%
50-99	0	0	$0	$0	$0	
100 to 499	0	0	$0	$0		
Gen. Rental Ctrs	**44**	**308**	**$41,772,555**	**$1,362,674**	**$5,148**	**0.4%**
1-4	21	42	$8,327,802	$271,664	$2,504	0.9%
5-9	13	100	$12,449,472	$406,118	$1,530	0.4%
10-19	6	77	$11,279,942	$367,966	$696	0.2%
20-49	4	88	$9,715,339	$316,927	$417	0.1%
50-99	0	0	$0	$0	$0	
100 to 499	0	0	$0	$0		

Source: ADE, based US Economic Census 2012, US County Business Patterns 2014, US Census Statistics of Small Business, US IRS.

SS31 (General PM Emissions Limit)

Air District rules controlling particulate matter are less stringent in certain respects than similar rules in other urban air districts in the state. Thus, in adopting proposed control measure SS31 (General PM Emissions Limit), the District seeks to reduce or revise allowable weight rate limitations on existing PM emissions sources. Types of industries that would be affected include Restaurants, Primary Metals Manufacturers, Recyclable Materials Merchant Wholesalers, and Cement Manufacturers. These industries are already affected by seven existing Air District rules directly addressing particulate matter (PM) emissions. These existing rules are:

- Regulation 5: Open Burning
- Regulation 6, Particulate Matter, Rule 1: General Requirements
- Regulation 6, Particulate Matter, Rule 2: Commercial Cooking Equipment
- Regulation 6, Particulate Matter, Rule 3: Wood Burning Devices
- Regulation 6, Particulate Matter, Rule 4: Metal Recycling and Shredding Operations
- Regulation 9, Inorganic Gaseous Pollutants, Rule 13: Nitrogen Oxides, Particulate Matter, and Toxic Air Contaminants from Portland Cement Manufacturing
- Regulation 12, Miscellaneous Standards of Performance, Rule 4: Sand Blasting
- Regulation 12, Miscellaneous Standards of Performance, Rule 13: Foundry and Forging Operations

Control measure SS31 requires adoption of one of four types of equipment (cyclone, wet scrubbers, baghouses, and electrostatic precipitators [ESPs]) to meet new emissions requirement. It is important to note that the more stringent general requirements on emissions from stacks will not apply to very many facilities, because most sources already have even more stringent permit limits. BAAQMD staff estimate that the control measure will apply to 555 sources that are generating emissions in excess of six pounds per day. Of the 555 sources, 355 are generating fugitive dust type emissions, meaning that with no proposed changes in visible emissions limits, these sources will not generate any impacts subject to SS31. Of the remaining 200, 160 are combustion sources, where no additional control methods are feasible or cost effective. The last 40 of the remaining 200 are potentially affected. BAAQMD staff estimate that 85 percent of the 40 already have existing stringent permit conditions. Thus, there are six sources that are subject to control measure SS31. While there are 34 converted paper products manufacturers (NAICS 3222) in the Bay Area, BAAQMD staff indicate that only one will be subject to SS31. Likewise, while there are six adhesive products manufacturers (NAICS 325520) in the region, only one will be subject to the control measure. The regional mass transit agency, BART, operates four facilities that will be subject to the control measure.

Table 26 - Industries Affected by Proposed Control Measure SS31 (General PM Emissions Limit

Industry	NAICS	Nos. of Establishments	Employment	Revenues	After-tax Net Profits
Converted Paper Products Manufacturing	3222	34	1,722	$870,369,410	$58,249,239
Adhesive Products Manufacturing	325520	6	165	$102,438,299	$8,485,584
Bay Area Rapid Transit		1	3,137	$847,700,000	$6,017,200,000

Source: ADE, based US Economic Census 2012, US County Business Patterns 2014, US Census Statistics of Small Business, US IRS

Table 27 below includes total and annual costs associated with any one of the four control measures related to SS31. BAAQMD staff indicates that BART will more than likely require bag houses for its four facilities subject to SS31, while the other two affected entities will employ cyclones.

Table 27 - Summary of Average Annual Costs for Stationary Source Control Measure 31

Type of Equipment	Assumption	Costs Per Establishment (Capital Equipment) : Total Cost: LOW	Costs Per Establishment (Capital Equipment) : Total Cost: HIGH	Costs Per Establishment (Capital Equipment) : Annualized: LOW	Costs Per Establishment (Capital Equipment) : Annualized: HIGH
Cyclone	3222 / 325520	$64,000	$600,000	$8,704	$81,600
Wet Scrubber		$85,000	$488,000	$11,560	$66,368
Bag Houses	BART	$278,000	$900,000	$37,808	$122,400
Bag Houses		$278,000	$900,000	$37,808	$122,400
ESP		$1,800,000	$4,400,000	$244,800	$598,400

Source: BAAQMD

Sources subject to SS31 will not be significantly impacted. Impacts to the paper container manufacturer (NAICS 3222) range from less than 2 percent (Low Scenario) to less than 5 percent (High Scenario) of estimated net profits. For the affected adhesive manufacturer (NAICS 325520), impacts range from less than 2 percent (Low Scenario) to less than 5 percent (High Scenario) of estimated net profits. Since BART is a public agency, we compare costs to operating-and-non operating revenues combined, as well as the agency's cumulative fund balance, to see if costs affect these revenue sources in any meaningful way. Whether annual costs are compared to BART's annual operating-and-non operating revenues combined, or compared to this public agency's cumulative fund balance, costs associated with SS31 are far below one percent of either revenue types, meaning that SS31 will not significantly impact BART.

Table 28 - Socio-Economic Impact Analysis of Proposed Stationary Source Control 31 On Various Affected Industries

	Converted Paper Products Manufacturing	Adhesive Products Manufacturing	BART
NAICS	3222	325520	4851
Establishments	1	1	1
Revenues	$50M - $100M	$25M - $50M	$847,700,000
Net Profits	$5M - $10M	$1M - $5M	$6,017,200,000
Ann. Cost: Low Scenario	$11,560	$11,560	$151,232
Ann. Cost: High Scenario	$66,368	$66,368	$489,600
Cost-to-Net profit: Low Scenario	<2.0%	<2.0%	0.0%
Cost-to-Net profit: High Scenario	<5.0%	<5.0%	0.1%

Source: ADE, based US Economic Census 2012, US County Business Patterns 2014, US Census Statistics of Small Business, US IRS

SS32 (Emergency Back-up Generators)

Emergency back-up generators (BUGs) provide power when primary sources of energy are unavailable (e.g. during blackouts or brownouts). Most BUGs are powered by diesel fired engines that emit diesel particulate matter (DPM), a toxic air contaminant (TAC) and black carbon which contributes to climate change. This measure will reduce emissions of DPM and black carbon from BUGs by encouraging replacement of outdated equipment or installation of pollution control devices and thereby reduce the health risk to impacted individuals and provide climate protection benefits. Black carbon's short atmospheric lifetime, combined with its strong warming potential, means that targeted strategies to reduce BC emissions can provide climate benefits within the next several decades.

In reviewing BAAQMD's BUG database, ADE determined that of the 4,229 specific sites in the Bay Area with permits, 287 sites held multiple permits allowing up to 1,439 back-up generators. Based on the 287 sites, ADE determined that permits are for two broad categories of economic activities. A number of sites can be categorized as sites where critical services are rendered. These include airports, the BART system, hospitals, local governments (especially fire departments), and various types of utilities. From the 287 sites with multiple back-up permits, ADE also determined that a secondary characteristic had to do with private sector economic activity that required constant flow of energy, with the back-up generator as an alternative source of energy in case the primary source of energy went off-line. This second category of permit holders with BUGs tended to be large-format retailers that need to avoid temporary closure due to black-outs, advanced manufacturing businesses (especially in bio-tech or pharmaceuticals), tele-com providers, and managers and owners of large commercial (office\industrial) projects, such as business parks or large office complexes. ADE prepared the economic profile of Bay Area industries with BUGs, and determined that the additional cost stemming from proposed control measure SS32 will not significantly impact affected sources. This is largely because affected sources tend to be the larger businesses or institutions in terms of revenues and employment within their respective industries. These are not small businesses. The table directly below presents data on the aggregate and average economic characteristics of sources affected by proposed control measure SS32.

Table 29 – Profile of Industries Subject to Proposed Stationary Source Control Measure SS32 (Emergency Backup Generators), Including Socioeconomic Impact Analysis

Affected Uses	Esta-blishments	Aggregate Revenues	Per Establishment Revenues	Est. Net Profits
Airports \ Mass Transit				
Airports	11	$1,039,576,125	$94,506,920	-- na
BART	1	$847,700,000	$847,700,000	-- na
Hospitals				
Private (large only)	63	$19,562,933,634	$310,522,756	-- na
Public	8	$3,126,841,976	$390,855,247	-- na
Local and County governments				
Local govt.*	101	$6,501,205,649	$64,368,373	-- na
County govt.**	8	$838,800,222	$104,850,028	-- na
Public and private utilities				
Private electric utility	76	$5,253,638,047	$69,126,816	$1,886,396
Public electric utilities	5	$560,700,000	$112,140,000	
Other public utilities (water\wastewater)				
Local govt.*	69	$1,327,412,532	$19,237,863	-- na
Special Districts	9	$1,257,929,803	$139,769,978	-- na
Large Format Private Sector Entities In Need of Constant Source of Energy				
Large format general merchandise retail stores				
444110 Home Centers	47	$2,037,017,306	$43,340,794	$1,014,190
445110 Supermarkets and Other Grocery Stores	165	$6,875,536,015	$41,669,915	$975,091
452111 Department Stores	72	$2,112,578,675	$29,341,370	$686,599
452112 Discount Department Stores	59	$2,611,333,917	$44,259,897	$1,035,698
452910 Warehouse Clubs and Supercenters	29	$3,018,866,710	$104,098,852	$2,435,951
Advanced manufacturing				
325411 Medicinal and Botanical Manufacturing	1	$100M - $300M	$100M - $300M	$25M - $50M
325412 Pharmaceutical Preparation Manufacturing	5	$31,055,211,492	$6,211,042,298	$1,057,538,957
325413 In-Vitro Diagnostic Substance Manuf.	3	$945,382,505	$315,127,502	$53,655,988
325414 Biological Product Manufacturing	4	$2,834,192,757	$708,548,189	$120,642,764
334111 Electronic Computer Manufacturing	1	$5B - $10B	$5B - $10B	$500M - $1B
Communications				
517110 Wired Telecommunications Carriers	30	$17,898,366,019	$108,517,845	$6,489,501
Manager and owners of large real estate complexes\offices				
531120 - 531312 Lessors, Managers of Non-Residential Real Estate Properties	1	$25M - $50M	$25M - $50M	$5M - $20M
531190 Lessors of Other Real Estate Property	8	$286,061,646	$35,757,706	$9,676,362

Source: ADE, based on California State Controller Local Governments Annual Report, US Economic Census 2012, US County Business Patterns 2014, US Census Statistics of Small Businesses, and US IRS. (Note: public sector allocations are for point-of-contact services (police, fire, library, parks) only; ** Note: allocations only for general operations - federal transfers not included. San Francisco included in local govt.)*

The cost to implement SS32 varies by age and size of engine, and by control device. According to the District, the oldest engines, tier zero engines which predate USEPA standards, would likely face replacement costs. Because CARB has yet to certify any control device for use with tier zero engines. Therefore, any, application of control these devices on a tier zero engine would require some sort of

additional verification, according to BAAQMD. In most cases, replacement of the engine would be a more likely outcome considering years of service and the additional costs of source testing for compliance verification. The cost to replace a back-up generator is approximately $121 dollars per horsepower ($121/hp). Engines can vary in size from less than 50 to over 4,600hp. A small engine (50 hp) would face a cost of $6,050, while the replacement cost of a 2,000hp engine could equal $556,600. The majority of engines in the Bay Area that are Tier 0 are less than 610hp, and therefore would cost approximately $73,810. Newer engines can implement control devices. Control devices to reduce emissions include active and passive diesel particulate filters, known as DPFs. An active DPF cost approximately $113/hp, and a passive DPF is estimated to be $67/hp. Active filters are more commonly installed, as a passive DPF would require additional maintenance costs. Filter costs can range from $5,650 to over $519,000 – depending upon engine size. The average engine in the Bay Area, that is over Tier 0, is less than 750hp – an active DPF would cost $84,750 for a 750hp engine. The table below summarizes the range of replacement and filter costs depending on size of engine. Costs are expressed as total and annual costs.

Table 30 – Costs Associated With Proposed Control Measure 32 By Size of Engine

Engine Horsepower Range	50 HP	608 HP	750 HP	2000 HP	4600 HP
Total Replacement Cost @ $121/hp	$6,050	$73,568	$90,750	$242,000	$556,600
Annual Replacement Cost @ $121/hp	*$823*	*$10,005*	*$12,342*	*$32,912*	*$75,698*
Total Diesel Particulate Filter Cost @ $113/hp	$5,650	$68,704	$84,750	$226,000	$519,800
Annual Diesel Particulate Filter Cost @ $113/hp	*$768*	*$9,344*	*$11,526*	*$30,736*	*$70,693*

Source: Bay Area Air Quality Management District

The table below compares the cost of a single replacement engine by engine size against net profits generated by the average affected source. In the case of public sector entities, replacement engine costs are compared against annual revenues generated by an agency. For example, there are eleven airports operating in the region and, in the aggregate, these entities generate $1.0 billion in revenues. On average, a Bay Area airport generates $94.5 million in annual revenues. If an airport was to replace a 2000 hp back-up generator with one that complies with SS32, the total cost for such an engine would be $242,000, which, on an annual basis, amounts to $32,900. When the $32,900 annual cost is compared against the average annual revenues generated by a Bay Area airport, at 0.03 percent, the cost-to-revenues is significantly below the ten-percent level used for purposes of determining whether a rule results in significant impacts, or not. Overall, the impact of the replacing back-up generators is negligible across the board, except in one scenario (Table 31). If a large format department store replaced a back-up generator with a 4,600 hp engine, this would place the cost-to-net profit ratio one percentage point above the ten-percent threshold used to determine whether the cost impacts of proposed measures are significant, or not. However, it is unlikely that a department store would need a 4,600 horse power back-up generator.

Table 31 – Socioeconomic Impact Analysis of Proposed Control Measure SS32: Annual Replacement Engine Cost-to-Annual Net Profit Ratios

Affected Uses	50 HP	608 HP	750 HP	2000 HP	4600 HP
Airports \ Mass Transit					
Airports	0.001%	0.01%	0.01%	0.03%	0.08%
BART	0.001%	0.00%	0.00%	0.00%	0.01%
Hospitals					
Private (large only)	0.001%	0.00%	0.00%	0.01%	0.02%
Public	0.001%	0.00%	0.00%	0.01%	0.02%
Local and County governments					
Local govt.*	0.001%	0.02%	0.02%	0.05%	0.12%
County govt.**	0.001%	0.01%	0.01%	0.03%	0.07%
Public and private utilities					
Private electric utility	0.04%	0.53%	0.65%	1.74%	4.01%
Public electric utilities	0.00%	0.01%	0.01%	0.03%	0.07%
Other public utilities (water\wastewater)					
Local govt.*	0.00%	0.05%	0.06%	0.17%	0.39%
Special Districts	0.00%	0.01%	0.01%	0.02%	0.05%
Large Format Private Sector Entities In Need of Constant Source of Energy					
Large format general merchandise retail stores					
444110 Home Centers	0.08%	0.99%	1.22%	3.25%	7.46%
445110 Supermarkets and Other Grocery Stores	0.08%	1.03%	1.27%	3.38%	7.76%
452111 Department Stores	0.12%	1.46%	1.80%	4.79%	11.03%
452112 Discount Department Stores	0.08%	0.97%	1.19%	3.18%	7.31%
452910 Warehouse Clubs and Supercenters	0.03%	0.41%	0.51%	1.35%	3.11%
Advanced manufacturing					
325411 Medicinal and Botanical Manufacturing	0.001%	0.03%	0.03%	0.09%	0.21%
325412 Pharmaceutical Preparation Manufacturing	0.001%	0.001%	0.001%	0.001%	0.01%
325413 In-Vitro Diagnostic Substance Manuf.	0.001%	0.02%	0.02%	0.06%	0.14%
325414 Biological Product Manufacturing	0.001%	0.01%	0.01%	0.02%	0.04%
334111 Electronic Computer Manufacturing	0.001%	0.001%	0.001%	0.001%	0.01%
Communications					
517110 Wired Telecommunications Carriers	0.01%	0.15%	0.19%	0.51%	1.17%
Manager and owners of large real estate complexes\offices					
531120 - 531312 Non-Res. Real Estate Prop. Mgt.	0.01%	0.07%	0.08%	0.22%	0.51%
531190 Lessors of Other Real Estate Property	0.02%	0.22%	0.27%	0.73%	1.68%

It is important to note that approximately 40 percent of back-up generators in BAAQMD's inventory are Tier 0, meaning that the majority are Tier 1 and above. Thus, the majority will have to utilize a filter to comply with the proposed control measure SS32. Overall, the impact of adopting filters are negligible across the board, except in a remote case in which a department store has a 4,600 hp BUG in place (Table 32).

Table 32 – Socioeconomic Impact Analysis of Proposed Control Measure SS32: Annual Diesel Particulate Filter Cost-to-Annual Net Profit Ratios

Affected Uses	50 HP	608 HP	750 HP	2000 HP	4600 HP
Airports \ Mass Transit					
Airports	0.001%	0.01%	0.01%	0.03%	0.08%
BART	0.001%	0.00%	0.00%	0.00%	0.01%
Hospitals					
Private (large only)	0.00%	0.01%	0.01%	0.03%	0.07%
Public	0.00%	0.00%	0.00%	0.00%	0.01%
Local and County governments					
Local govt.*	0.00%	0.00%	0.00%	0.01%	0.02%
County govt.**	0.00%	0.00%	0.00%	0.01%	0.02%
Public and private utilities					
Private electric utility	0.00%	0.01%	0.02%	0.05%	0.11%
Public electric utilities	0.00%	0.01%	0.01%	0.03%	0.07%
Other public utilities (water\wastewater)					
Local govt.*	0.04%	0.50%	0.61%	1.63%	3.75%
Special Districts	0.00%	0.01%	0.01%	0.03%	0.06%
Large Format Private Sector Entities In Need of Constant Source of Energy					
Large format general merchandise retail stores					
444110 Home Centers	0.08%	0.92%	1.14%	3.03%	6.97%
445110 Supermarkets and Other Grocery Stores	0.08%	0.96%	1.18%	3.15%	7.25%
452111 Department Stores	0.11%	1.36%	1.68%	4.48%	10.30%
452112 Discount Department Stores	0.07%	0.90%	1.11%	2.97%	6.83%
452910 Warehouse Clubs and Supercenters	0.03%	0.38%	0.47%	1.26%	2.90%
Advanced manufacturing					
325411 Medicinal and Botanical Manufacturing	0.00%	0.03%	0.03%	0.09%	0.20%
325412 Pharmaceutical Preparation Manufacturing	0.00%	0.00%	0.00%	0.00%	0.01%
325413 In-Vitro Diagnostic Substance Manuf.	0.00%	0.02%	0.02%	0.06%	0.13%
325414 Biological Product Manufacturing	0.00%	0.01%	0.01%	0.02%	0.04%
334111 Electronic Computer Manufacturing	0.00%	0.00%	0.00%	0.00%	0.01%
Communications					
517110 Wired Telecommunications Carriers	0.01%	0.14%	0.18%	0.47%	1.09%
Manager and owners of large real estate complexes\offices					
531120 - 531312 Non-Res. Real Estate Prop. Mgt.	0.01%	0.06%	0.08%	0.21%	0.47%
531190 Lessors of Other Real Estate Property	0.02%	0.21%	0.26%	0.68%	1.56%

SS35 (PM from Bulk materials, including Coke and Coal)

The Air District has been receiving complaints about black dust from petroleum coke and coal storage and transfer operations. This dust is leaving black residue on residential property and business equipment. The intent of this proposed measure (SS35 PM from Bulk Materials) is to develop a new regulation to control fugitive dust from petroleum coke and coal storage and handling operations. For purposes of analysis, industries subject to this control measure can also include quarries, cement suppliers, coke shipping facilities, and coke calcining plants. Certain scrap metal yards could

potentially be subject to this control measure but are expected to be exempt as they are controlled by other existing rules. Affected sources generate an estimated $764.5 million in economic value a year, off which they further generate an estimated $42.2 million in annual profits.

Table 33 – Various Industries Subject to Proposed Control Measures SS35 (PM from Bulk Materials, including Coke and Coal)

INDUSTRY	NAICS	ESTAB	EMP	REVENUES	PROFITS
Total		118	2,178	$764,465,325	$42,188,534
Quarrying	2123	30	354	$128,186,383	$6,837,871
Coke Calcining Plant	324199	1	40	$50,000,000 - $100,000,000	$1,000,000 - $10,000,000
Cement Manufacturing	3273	85	1676	$460,838,650	$27,358,055
Steel Pipe Manufacturing	331210	1	68	$25,000,000 - $50,000,000	$1,000,000 - $5,000,000
Terminal facilities	488510	2	70	$20,000,000 - $50,000,000	$1,000,000 - $10,000,000

Source: ADE, based US Economic Census 2012, US County Business Patterns 2014, US Census Statistics of Small Business, and US IRS.

Table 34 identifies the annual cost of equipment associated with control measure SS35. BAAQMD staff indicates that affected sources will adopt windscreens in varying manners to achieve the purposes of SS35. Quarries will adopt windscreens proportional to their size, with large quarries typically having windscreens for three conveyors and three large stockpiles. The already-identified cement supplier subject to this control measure will need windscreens for three small stockpiles. Of the two coke shipping facilities in Richmond, one will need windscreens on two conveyors and for three large stockpiles, and the other needs windscreens for a rail unloading area. A steel pipe manufacturer might need a windscreen for a conveyor, and another windscreen for a small stockpile. A coke calcining plant requires a windscreen for two conveyors, and will need to spend $100,000 on clean-up.

Table 34 – Proposed Stationary Source Control Measure SS35: Summary of Per Equipment Costs

CONTROL MEASURE	TOTAL COSTS: ANNUALIZED	RECURRING COSTS: ANNUALIZED:	CAPITAL EQUIPMENT COSTS: ANNUALIZED:
Conveyors	$10,000		$10,000
Stockpile	$10K - $25K		$10K - $25K
Water spray systems	$15,000	$5,000	$10,000

Source: BAAQMD

As indicated in the table below, industries subject to control measure SS35 are not significantly impacted.

Table 35 – Socioeconomic Impact Analysis of Proposed Control Measure SS35

	Quarries (NAICS 2123)	Coke Calcining Plant (NAICS 324199)	Cement manufacturing (NAICS 3273)	Steel Pipe manufacturing (NAICS 331210)	Terminal Facilities (NAICS 488510)
Nos. of Establishments	30	1	1	1	2
After-Tax Net Profits	$6,837,871	$1M - $5M	$1M - $5M	$1M-$5M	$1M - $10M
(a) Total Annual Cost: Conveyors	$58,857	$20,000	$30,000	$10,000	$20,000
(b1) Total Annual Cost: Stockpiles (LOW)	$147,143			$10,000	$40,000
(b2) Total Annual Cost: Stockpiles (HIGH)	$147,143			$25,000	$75,000
(c) Total Annual Cost: Other		$13,600			
Total Annual Cost: (LOW) (a+b1+c)	$206,000	$33,600	$30,000	$20,000	$60,000
Total Annual Cost: (HIGH) (a+b2+c)	$206,000	$33,600	$30,000	$35,000	$90,000
Cost-to-Net profit (LOW)	3.01%	<5.0%	<5.0%	<5.0%	<5.0%
Cost-to-Net profit (HIGH)	3.01%	<5.0%	<5.0%	<5.0%	5-9.9%

Source: ADE, based US Economic Census 2012, US County Business Patterns 2014, US Census Statistics of Small Business, and US IRS.

Quarries employing less than twenty workers are small businesses in so far as they typically average less than $10 million in annual revenues. The coke calcining, cement manufacturing, steel pipe manufacturing plants, along with the terminal facilities, are not small businesses per State definition of small businesses, as each generates annual revenues greater than $20 million. While 22 of the 30 affected quarries are small businesses, not all of these businesses are significantly impacted by control measure SS35. As indicated in the table below, quarries with less than five workers are significantly impacted, though those employing 5 to 19 workers are not significantly affected. However, as 13 out of 22 small business quarries are significantly impacted in a negative manner, control measure SS35 disproportionately impacts small businesses. More details on SS35 will emerge as the rule proceeds through the rule development process, resulting in greater understanding as to how small businesses may be affected by this measure.

Table 36 – Socioeconomic Impact Analysis of Proposed Control Measure SS35: Small Business Disproportionate Impact Analysis

Quarrying (NAICS 2123)	Total	Employment Size Category			
		1 to 4	5 to 9	10 to 19	20 to 49
Establishments	**30**	13	4	5	8
Net Profits	**$6,837,871**	$47,961	$153,587	$832,948	$5,803,374
Cost of Conveyors	**$58,857**	$3,658	$4,157	$11,140	$39,903
Cost of Stockpile	**$147,143**	$9,144	$10,391	$27,849	$99,758
Combined Costs	**$206,000**	$12,802	$14,548	$38,989	$139,661
Cost-to-Net profit	**3.0%**	26.7%	9.5%	4.7%	2.4%

Source: ADE, based US Economic Census 2012, US County Business Patterns 2014, US Census Statistics of Small Business, and US IRS.

SS36 (PM from Track-Out), SS37 (Asphalt Operations) and SS38 (Fugitive Dust)

Development of proposed amendments to Regulation 6, Particulate Matter; Rule 1: General Requirements (Rule 6-1) identified track-out as a potential significant source of PM2.5. Thus, the intent of control measure SS36 is to develop a new regulation to address mud and dirt that can be

"tracked out" from construction sites, bulk material storage, and disturbed surfaces onto public paved roads where vehicle traffic will pulverize the mud and dirt into fine particles and entrain them into the air. Control measure SS37 would develop a new regulation, Regulation 6, Particulate Matter, Rule 7: Asphalt Operations (Rule 6-7) that, among other things, would establish a requirement to use low fuming asphalt for all roofing asphalt operations. SS38 (Fugitive Dust) proposes that Air District staff consider controls for a broader range of more general sources of fugitive dust, such as large construction sites, large bulk material operations, and disturbed surfaces larger than 1 acre when California and the Bay Area are no longer in drought conditions.

While SS36 and SS38 affect construction and construction-related industries, not all establishments within construction will be subject to these control measures. BAAQMD staff estimates that only the largest establishments in building construction (NAICS 236) and heavy construction (NAICS 237) would be affected by these two control measures. The larger establishments have the capacity to operate at the large construction sites where SS36 and SS38 would apply. There are approximately 300 large construction sites generating the type of emissions requiring SS36 and SS38. Medium and small construction sites don't need any capital improvements, but need to pay attention to track-out and clean it up when it occurs. Only cost is brooms and dust pans, since the workers are already there. These control measures also affect other industries that handle and store construction materials in bulk.

Table 37 – Profile of Industries Subject to Proposed Stationary Source Control Measures SS36 (PM from Track-Out), SS37 (Asphalt Operations) and SS38 (Fugitive Dust)

Industry	NAICS	Control Measures	Establish-ments	Employment	Revenues	Profits
Total			**26**	**4,187**	**$6,255,579,078**	**$273,323,929**
Buildings Construction	236	SS36/SS38	9	2,099	$3,252,348,715	$126,262,106
Heavy Construction	237	SS36/SS38	1	730	$1B - $4B	$100M - $130M
Brick, Stone, and Related Construction Material Merchant Wholesalers	423320	SS36/SS38	9	879	$694,849,695	$19,894,783
Other Construction Material Merchant Wholesalers	423390	SS36/SS38	7	479	$371,329,105	$19,894,783
Total			**16**	**3,081**	**$5,294,081,637**	**$238,642,633**
Asphalt Manufacturing	32412	SS37	5	49	$62,843,548	$2,791,329
Buildings Construction	236	SS37	9	2,099	3,252,348,715	126,262,106
Heavy Construction	532412	SS37	2	933	$1B - $4B	$100M - $130M

Source: ADE, based on US Economic Census 2012, US County Business Patterns 2014, US Census Statistics of Small Business, US IRS.

The table above also identifies industries subject to SS37. These are asphalt manufacturers (NAICS 32412), building construction and heavy construction. Similar to above, larger establishments within these industries are subject to SS37. The table below presents annual unit costs associated with each control measure. Establishments affected by SS36 will, on average, bear $32,400 in costs. District

staff indicates that only the largest construction sites will be subject to the SS36 requirement on truck wheel wash systems, and staff anticipates that no more than 10 sites will need to upgrade to truck wheel wash systems.[5] As for SS37, District staff estimates that the five of the largest asphalt plants will require blue smoke abatement systems, while the remainder of asphalt plants will have to limit the pace at which they load-out asphalt, to remain within visible emissions limits per SS37. Also, the heavy construction (NAICS 237) industry is expected to rent two portable blue smoke abatement systems at $80,000 a year when conducting chip seal paving projects. Buildings construction (NAICS 236) is expected to bear a $100,000 cost a year as a result of SS37. While a number of establishments may already have SS38-compliant equipment that handle fugitive dust emissions, those that do not have such equipment will spend an estimate $30,000 a year. For purposes of analysis, we assume all business subject to SS38 will spend $30,000 a year.

Table 38 – Summary of Unit Costs Associated with Proposed Control Measures SS36, SS37, and SS38

Industries By Control Measures	NAICS	Annual Unit Costs	Notes
SS36 (PM from Track-Out)			
Building Construction	236	$32,400	Truck wheel wash system for largest construction sites costs $150K each ($20.4K annualized), plus $12,000 annual clean-out cost (ie $1,000/mos.)
Heavy Construction	237	$32,400	
Brick, Stone, and Related Construction Material Merchant Wholesalers	423320	$32,400	
Other Constr. Material Merchant Whlsl	423390	$32,400	
SS38 (Fugitive Dust)			
Building Construction	236	$30,000	Annual cost for establishments without SS37-compliant equipment already in place is $30,000 per establishment ($16,400 for annually recurring costs and $13,600 for capital equipment)
Heavy Construction	237	$30,000	
Brick, Stone, and Related Construction Material Merchant Wholesalers	423320	$30,000	
Other Constr. Material Merchant Whlsl	423390	$30,000	
SS37 (Asphalt Operations)			
Asphalt Manufacturing	32412	$40,000	$30,000 is the annualized cost for purchasing one $200,000 blue smoke abatement system: four systems will be needed to be purchased. In addition, another $10,000 is needed for operations. Of the four systems, three will be purchased and installed in place, while the fourth will be rented out to contractors.
Building Construction	236	$100,000	Est. total annual amount spent industry-wide on plugs for asphalt roofing
Heavy Construction	237	$10,000	Est. total annual cost for renting one blue smoke abatement system borne by 2 larger establishments. Plus, another $10,000 for operations.

Source: BAAQMD

[5]According to the District, the Bay Area typically only has 250 – 300 large construction sites at any one time, where more than one acre of disturbed surface is exposed with the potential to create significant trackout or fugitive dust. One company could have two of these projects (or more) at the same time. No incremental SS36-compliant equipment is needed, because the large projects are already supposed to be meeting SWPPP requirements. Smaller projects only need some wind screens, and minor watering to control dust.

As indicated below, impacts stemming from SS36, SS37, and SS38 are less than significant. Because affected sources are not small businesses, these control measures do not result in disproportionate impacts to small businesses.

Table 39 – Summary of Aggregate Cost Associated with Proposed Control Measures SS36, SS37 and SS38

Industries By Control Measures	NAICS	Total Annual Costs	Cost to Net Profits
SS36 (PM from Track-Out)			
Buildings Construction	236	$288,073	0.2%
Heavy Construction	237	$32,400	0.0%
Brick, Stone, and Related Construction Material Merchant Wholesalers	423320	$291,600	1.5%
Other Constr. Material Merchant Whlsl	423390	$226,800	1.1%
SS38 (Fugitive Dust)			
Buildings Construction	236	$266,734	0.2%
Heavy Construction	237	$30,000	0.0%
Brick, Stone, and Related Construction Material Merchant Wholesalers	423320	$270,000	1.4%
Other Constr. Material Merchant Whlsl	423390	$210,000	1.1%
SS37 (Asphalt Operations)			
Asphalt Manufacturing	32412	$160,000	5.7%
Buildings Construction	236	$100,000	0.1%
Heavy Construction	237	$80,000	0.2%

Source: ADE, based on US Economic Census 2012, US County Business Patterns 2014, US Census Statistics of Small Businesses, and US IRS.

SS30 (Residential Furnaces)

The Air District's Regulation 9, Rule 4 is a "point-of-sale" type regulation, requiring that any new residential furnace rated up to 175,000 BTU/hr be certified to meet 40 nanograms (ng) of NOX per joule of delivered heat, which is equivalent to an emission concentration of about 55 ppmv at 3 percent oxygen. This control measure (SS30) would reduce oxides of nitrogen (NOX) emissions from fan type central furnaces by reducing allowable NOX emission limits on new furnace installations in Regulation 9, Rule 4.

Many of the users affected by SS30 are households in the Bay Area. There are 2.7 million households in the Bay Area, of which 1.5 million are homeowners (Table 40). The table below distributes Bay Area households by tenure, age of householder, and household income. Data is presented in this manner as consumer spending on specific items is often a function of these demographic attributes.

Table 40 – Profile of Bay Area Households by Tenure and Age of Householder: Households Potentially Subject to Proposed Residential Fan-Type Furnaces Stationary Source Control Measure (SS30)

Income Group	Total House-holds	Age Group				
		<25	25 – 34	35 – 54	55 - 64	65+
All tenure	**2,674,697**	**9,337**	**182,175**	**1,118,846**	**625,057**	**739,282**
Owner occupied:	**1,462,942**	**5,070**	**98,701**	**610,687**	**343,562**	**404,922**
Less than $10,000	30,656	107	2,049	12,649	7,235	8,615
$10,000 to $14,999	25,445	93	1,752	10,577	5,993	7,029
$15,000 to $19,999	26,625	94	1,780	10,981	6,314	7,456
$20,000 to $24,999	32,285	115	2,175	13,322	7,666	9,007
$25,000 to $34,999	67,223	240	4,551	27,813	15,915	18,705
$35,000 to $49,999	107,680	386	7,310	44,756	25,387	29,841
$50,000 to $74,999	191,618	694	12,991	79,420	45,294	53,219
$75,000 to $99,999	175,321	637	11,887	72,506	41,500	48,791
$100,000 to $149,999	307,296	1,066	20,862	128,542	72,086	84,741
$150,000 or more	498,793	1,640	33,345	210,120	116,171	137,517
Renter occupied:	**1,211,755**	**4,267**	**83,474**	**508,160**	**281,495**	**334,359**
Less than $10,000	90,108	326	6,275	37,603	21,012	24,892
$10,000 to $14,999	81,205	294	5,648	33,876	18,876	22,511
$15,000 to $19,999	58,523	211	4,054	24,500	13,565	16,194
$20,000 to $24,999	55,327	201	3,852	23,073	12,966	15,235
$25,000 to $34,999	101,900	360	7,037	42,553	23,886	28,064
$35,000 to $49,999	144,174	513	9,821	59,872	33,859	40,109
$50,000 to $74,999	196,380	698	13,516	82,045	45,927	54,194
$75,000 to $99,999	145,741	509	10,000	61,219	33,930	40,083
$100,000 to $149,999	182,905	630	12,612	77,364	42,090	50,210
$150,000 or more	155,492	525	10,660	66,054	35,384	42,869

Source: ADE, Inc., based on US Census ACS.

Table 41 below estimates that the 1.5 million Bay Area home owners annually spend $603 million at appliance stores and $648 million at home centers and hardware stores, where furnaces would most likely be purchased. It is important to note that households are not required to replace their existing furnaces with new, SS28-compliant furnaces, meaning that implementation of this control measure would not necessarily cause certain retailers to lose out on sales they otherwise would have achieved. A home owner will purchase a new, compliant furnace when the existing furnace reaches the end of useful life. Since the user will more than likely purchase the furnace at stores in the Building Materials and Home Furnishings Group, the amount of money spent represents an increase in sales to certain retailers in this group, such as home centers and household appliance stores. For illustrative purposes, if all 1.5 million home-owning households in the Bay Area had to purchase a new furnace now, the additional cost associated with SS30 ($118 to $223 per unit) represents a corresponding $172.6 million to $326.2 million in additional spending within the Building Materials and Home Furnishings Group. However, in this illustration the $172.6 million to $326.2 million range also represents a

corresponding reduction in spending in other retail and services establishments. As a ratio of total discretionary spending (i.e. excluding spending at food stores, gas stations, drugs stores, legal services, medical services, accounting services, and pet care), the $172.6 million to $326.2 million range amounts to 0.8 percent to 1.6 percent of aggregate spending for all non-essential items. Thus, the impact to retailers and services providing non-essential items is less than significant, since the foregoing was an illustrative conservative analysis in which all 1.5 million households simultaneously purchase compliant furnaces in a single year, which is unlikely. Thus, the impact to retailers and services of non-essential items will be far less than 0.8 percent to 1.6 percent of sales.

Table 41 – Socioeconomic Impact Analysis of Proposed Residential Fan-Type Furnaces Stationary Source Control Measure (SS30) on SF Bay Area Homeowners

Consumer Impact Analysis	Tot. HHDs Spending	Age Group				
		<25	25 - 34	35 - 54	55 - 64	65+
Total Retail and Select Service Spending	$35,842,831,179	$116,893,197	$2,279,974,946	$15,203,792,536	$8,292,569,980	$9,949,600,520
Total Retail and Select Service Spending (Discretionary Only)	$20,572,877,836	$67,459,983	$1,317,911,368	$8,656,503,201	$4,803,019,570	$5,727,983,713
Building Materials and Home Furnishings Spending	$2,572,645,355	$7,617,626	$148,922,990	$1,035,582,880	$595,388,007	$785,133,851
Home Furnishings	$483,131,252	$1,406,490	$31,341,401	$200,298,313	$111,805,529	$138,279,518
Household Appliances, Elect.	$603,556,999	$1,941,556	$36,420,591	$244,356,493	$138,297,047	$182,541,311
Home Centers and Hardware Store	$648,794,811	$1,860,010	$35,301,318	$257,847,950	$150,323,872	$203,461,660
Other Building Materials	$837,162,293	$2,409,570	$45,859,680	$333,080,123	$194,961,559	$260,851,362
Potential Per Household Outlay Ranging from $118 to $223						
Assume all homeowners spend $118	$172,627,156	$598,279	$11,646,737	$72,061,012	$40,540,296	$47,780,833
Assume all homeowners spend $223	$326,236,066	$1,130,646	$22,010,358	$136,183,099	$76,614,287	$90,297,675
Aggregate New Illustrative Outlay as Ratio of Aggregate Bldg. Materials\Home furnishings Spending						
@ $118	6.7%	7.9%	7.8%	7.0%	6.8%	6.1%
@ $223	12.7%	14.8%	14.8%	13.2%	12.9%	11.5%
Aggregate New Illustrative Outlay as Ratio of Total Discretionary Retail and Select Services Spending						
@ $118	0.8%	0.9%	0.9%	0.8%	0.8%	0.8%
@ $223	1.6%	1.7%	1.7%	1.6%	1.6%	1.6%

Source: ADE, based on US Census ACS 2012-2014 and US Bureau of Labor Statistics Consumer Expenditure Survey (2012-2014).

OTHER CONTROL MEASURES WITH KNOWN COST INFORMATION

BL4 (Urban Heat Island)

Building control measure BL4 (Urban Heat Island) aims to reduce the "urban heat island" (UHI) phenomenon by increasing the application of "cool roofing" and "cool paving" technologies, as well as increasing the prevalence of urban forests and vegetation, through voluntary approaches and educational outreach. BAAQMD estimates that the cost associated with this proposed measure ranges from five cents a square foot to 20 cents a square foot. Using construction cost data for the Bay Area that was generated by RS Means for various types of construction, ADE produced the table below. Based on information from RS Means, ADE concludes that costs associated with BL4 are less than significant.

Table 42 – San Francisco Bay Area Cost of Construction Trends and Socioeconomic Impact Analysis of BL4

Type of Building	Roof Area	Total Floor Area	Floors	RS Means Bay Area: Construction Cost PSF By Type	Low Scenario: $.05 PSF: Per. Chng. In Construction Cost	High Scenario: $.20 PSF: Per. Chng. In Construction Cost	Low Scenario: $.05 PSF: Cost to Net Profit	High Scenario: $.20 PSF: Cost to Net Profit
1-story office	7,000	7,000	1	$206.85	0.02%	0.10%	0.62%	2.49%
2-4 story office	6,667	20,000	3	$178.06	0.03%	0.11%	0.72%	2.89%
5-10 story office	10,000	80,000	8	$185.01	0.03%	0.11%	0.70%	2.78%
11+ stories office	16,250	260,000	16	$182.05	0.03%	0.11%	0.71%	2.83%
Restaurant	5,000	5,000	1	$332.71	0.02%	0.06%	0.39%	1.55%
Fast Food	4,000	4,000	1	$329.68	0.02%	0.06%	0.39%	1.56%
Dprtmnt store (1-story)	110,000	110,000	1	$125.30	0.04%	0.16%	1.03%	4.11%
Dprtmnt store (2-stories)	31,667	95,000	3	$152.62	0.03%	0.13%	0.84%	3.38%
General retail	8,000	8,000	1	$136.19	0.04%	0.15%	0.95%	3.78%
Supermarket	44,000	44,000	1	$116.85	0.04%	0.17%	1.10%	4.41%
Convenience	4,000	4,000	1	$139.48	0.04%	0.14%	0.92%	3.69%
Factory (1-story)	30,000	30,000	1	$136.67	0.04%	0.15%	0.94%	3.77%
Factory (3-stories)	30,000	90,000	3	$147.08	0.03%	0.14%	0.88%	3.50%
Medical office (1-story)	7,000	7,000	1	$206.85	0.02%	0.10%	0.62%	2.49%
Medical office (2-stories)	3,500	7,000	2	$269.18	0.02%	0.07%	0.48%	1.91%
Warehouse	30,000	30,000	1	$116.29	0.04%	0.17%	1.11%	4.43%
Apartment 1-3 stories	7,500	22,500	3	$170.96	0.03%	0.12%	0.75%	3.01%
Apartment 4-7 stories	10,000	60,000	6	$186.85	0.03%	0.11%	0.69%	2.76%
Apartment 8+	9,667	145,000	15	$237.43	0.02%	0.08%	0.54%	2.17%
Single-Family Home	2,600	2,600	1	$179.54	0.03%	0.11%	0.72%	2.87%

Source: ADE, based on BAAQMD, and RS Means for various cities in the San Francisco Bay Area.

IMPACTS TO RESIDENTS HOUSEHOLDS IN THE BAY AREA

In addition to affecting a number of industries in the nine-county Bay Area, when implemented, most if not all of the control measures described above could also affect consumer households in the region as well. As indicated above, there are a number of control measures that will directly affect households. These are SS30 (Residential Fan-Type Furnaces) and BL4 (Urban Heat Island). In the case of the former, persons purchasing a new SS30-compliant furnace will pay an added cost associated with SS30; in the case of the latter, builders of single-family homes will more than likely pass on costs associated with BL4 to future home buyers. It is important to note that, even beyond SS30 and BL4, households in the region could still be subject to cost associated with the number of other control measures discussed above, since industries subject to new costs associated with a control measure will attempt to pass on costs to end-users, i.e. consumers in the region. For all of the control measures for which cost data is readily available, except in two cases (SS8 [SO2 from Coke Calcining] and SS22 [Stationary Gas Turbines]), we have found that costs associated with the bulk of the control measures are less than significant. That notwithstanding, affected industries might still attempt to pass on costs to consumers.

Whether affected industries can pass on costs to those in the region depends on a number of factors, such as the absence of similar but cheaper items produced by industries selling goods in but not physically located in the region. In the face of cheaper goods produced by industries from outside of the area, affected industries in the region might not be able to pass on costs, and thus will have to absorb new costs in the form of diminished returns. In addition, faced with possible increase in prices, households might seek to substitute items if the substitutes are cheaper, available, and ultimately serve the same ends that the consumer sought with their initial (but now more expensive) goods. Thus, affected industries producing goods and services for which substitutes are easily obtained might not be able to pass on costs stemming from the proposed control measures.

Whether households in the region seek out cheaper substitutes (including products made from outside of the region), completely eliminate products whose costs have risen due to the control measures, or simply continue to purchase items from affected sources operating in the region, it is important to note that households will make their respective decisions with other budgetary constraints in mind. For example, of the 2,674,697 households in the region, 1,211,755 (45 percent) rent their homes. At $57,000, the typical income of the Bay Area renter is slightly over half that of the typical Bay Area homeowner income (i.e. $111,400) (Table 43). The number of rent control measures on the November 2016 ballots of mid-sized, bed-room communities in the Bay Area (Alameda, San Mateo, Burlingame, and Mountain View) underscores the financially tenuous position of Bay Area renters. In other words, households in the Bay Area will not be affected uniformly in situations where affected industries are able to pass on costs stemming from the control measures. In addition to generating significantly less household income across the board relative to homeowners, differences in renter-to-homeowner income is evident across all ages, which is an important point since the earning potential of persons in the workforce generally lessens over-time. So a renting household whose householder is 55 years or more, faced with new costs, cannot easily mitigate those costs by finding higher income employment. There is also strong anecdotal evidence that renters' income gains have lagged considerably behind income gains exhibited by homeowners, in the aftermath of the Great Recession.

Table 43 – San Francisco Bay Area Household Income by Tenure and Age of Householder

Households By Tenure	Total	Age Group				
		<25	25 – 34	35 – 54	55 - 64	65+
All Households	2,674,697	9,337	182,175	1,118,846	625,057	739,282
Median HH Inc.: All	$82,951	$80,842	$82,496	$83,405	$82,563	$82,737
Owner occupied:	1,462,942	5,070	98,701	610,687	343,562	404,922
Median HH Inc.: Home-owners	$111,359	$107,184	$110,912	$112,247	$110,608	$110,837
Renter occupied:	1,211,755	4,267	83,474	508,160	281,495	334,359
Median HH Inc.: Renters	$57,024	$55,996	$56,882	$57,359	$56,677	$56,861

Source: ADE, based on US Census ACS 2012-2014.

"CARE" PROGRAM COMMUNITIES ECONOMIC AND HOUSEHOLD IMPACTS

While overall air pollution continues to decrease in the Bay Area, some communities still experience higher pollution levels than others. Many of these communities are near pollution sources (such as

freeways, busy distribution centers, and large industrial facilities) or are impacted by pollution sources upwind; therefore negative impacts on public health in these areas are greater. Through the "Community Air Risk Evaluation" (CARE) Program, BAAQMD aims to reduce these health impacts linked to local air quality. The communities within the CARE program include select neighborhoods within San Francisco, San Jose, Vallejo, Concord, Richmond, Pittsburgh, San Rafael, Western Alameda County and Tri-Valley/Eastern Alameda County. If it is true that households in the Bay Area in general may be affected in instances when industries are able to pass on costs to consumers, this would be the case with regard to households residing in CARE Program areas as well. If at $57,000 renters income are generally low relative to homeowners incomes ($111,400), then this is even more so the case when it comes to renters in many CARE Program areas. For example, household income for renters residing in zip codes comprising Richmond's CARE Program area is $36,100, which is substantially less than the regional average of $57,000 (Table 44). As indicated in the table below, this is the case for renters in many CARE Program areas, as incomes there are in many cases significantly below the regional average.

In addition to households in the CARE Program areas, there are also a number of businesses in industries subject to control measures in the 2017 Plan. Private sector businesses operating in the CARE Program areas employ 1,698,900 workers (Table 45). The bulk of these workers are in San Francisco area (483,400), San Jose (439,568), and Western Alameda County (374,100). Of the 1,698,900 workers, 89,700 (5.3 percent) are in industries that will be subject to control measures in the 2017 Plan. The rate is much higher in Richmond because there is a refinery that is a large employer there that will be subject to a number of control measures in the Plan. Thus, almost thirteen percent of private sector workers in Richmond are in industries subject to new control measures (4,100 out of 31,900).

Table 44 – Household Incomes in CARE Program Areas by Tenure

	All Households	Median HH Inc.: All	Owner occupied:	Median HH Inc.: Home-owners	Renter occupied:	Median HH Inc.: Renters
All BAAQMD Counties	2,674,697	*$82,951*	1,462,942	*$111,359*	1,211,755	*$57,024*
CARE Program Areas Combined	1,467,304	*$71,814*	728,847	*$100,999*	738,457	*$46,656*
Richmond Area	47,701	*$50,331*	22,690	*$70,030*	25,011	*$36,079*
San Jose Area	395,606	*$65,617*	186,597	*$96,530*	209,009	*$44,133*
West Alameda County Area	395,606	*$65,617*	186,597	*$96,530*	209,009	*$44,133*
Pittsburg Area	26,076	*$55,189*	14,531	*$73,348*	11,545	*$35,600*
Concord Area	22,954	*$58,789*	11,524	*$82,644*	11,430	*$40,638*
Vallejo Area	23,331	*$47,358*	11,531	*$65,715*	11,800	*$33,044*
San Francisco Area	209,190	*$71,068*	64,459	*$107,876*	144,731	*$51,461*
Eastern Alameda Co. Area	119,884	*$122,382*	88,479	*$135,884*	31,405	*$72,579*
Other Contra Costa Area	136,388	*$77,190*	84,812	*$98,986*	51,576	*$50,570*
Marin County Area	43,427	*$90,885*	25,876	*$127,652*	17,551	*$52,572*
Bethel island	47,141	*$66,784*	31,751	*$80,276*	15,390	*$37,635*

Source: Applied Development Economics, based on US Census ACS 2012-2014 3-Year Sample Table B25118

Table 45 – CARE Program Area Employment in Industries Subject to BAAQMD Control Measures Versus Overall CARE Program Area Employment

Affected Industries	NAICS	Employment in Communities of Care											
		Total	Concord	Pittsburg	Richmond	San Francisco	San Jose	Vallejo	West Alameda County	Eastern Alameda County Areas	Other Contra Costa County Areas	Marin County Areas	Bethel island
Total: All Industries		1,698,903	43,453	11,082	31,917	483,378	439,568	19,220	374,050	125,364	113,869	40,729	16,273
Sub-Total: Industries Subject to CMs		89,651	2,948	1,734	4,052	8,468	15,137	603	16,908	18,174	14,050	4,466	3,111
Percentage		5.28%	6.80%	15.60%	12.70%	1.80%	3.40%	3.10%	4.50%	14.50%	12.34%	10.97%	19.12%
Oil and Gas Extraction	21111	72	0	0	0	31	2	0	30	3	6	0	0
Nonmetallic Mineral Quarrying	2123	149	0	0	0	0	0	0	0	92	27	30	0
Construction of Buildings	236	7,777	263	0	0	1,378	0	0	0	2,644	2,276	799	417
Heavy and Civil Engineering Constr.	237	3,795	0	0	0	0	0	0	0	1,388	1,371	469	567
Sawmills and Wood Preservation	3211	0	0	0	0	0	0	0	0	0	0	0	0
Converted Paper Product Manufact.	3222	1,687	0	13	0	2	151	0	849	237	13	0	422
Petroleum Refineries	324110	1,875	0	0	1,853	0	0	0	0	19	3	0	0
Asphalt Paving, Roofing, Manufact.	32412	171	0	0	6	0	102	0	44	19	0	0	0
All Other Petroleum and Coal Prod.	324199	0	0	0	0	0	0	0	0	0	0	0	0
Cement and Concrete Product Man.	3273	0	0	0	0	0	0	0	0	0	0	0	0
Medicinal and Botanical Man.	325411	693	0	0	0	0	0	0	689	0	2	0	2
Pharmaceutical Preparation Man.	325412	109	0	0	0	0	0	0	0	83	26	0	0
In-Vitro Diagnostic Substance Man.	325413	342	0	0	0	0	156	0	0	186	0	0	0
Biological Product (except Diagnostic)	325414	3,907	0	0	0	0	0	0	3,901	6	0	0	0
Adhesive Manufacturing	325520	901	0	335	0	0	0	0	227	0	337	0	2
Iron and Steel Pipe and Tube Man.	331210	136	0	68	0	0	0	0	0	0	68	0	0
Electronic Computer Manufacturing	334111	1,824	0	0	0	0	1,783	0	0	32	6	3	0
Other Chemical, Allied Products Whole.	424690	1,164	0	300	0	0	0	0	0	753	91	9	11
Petroleum Bulk Stations and Terminals	42471	633	0	6	157	158	191	0	19	15	6	0	81

Affected Industries	NAICS	Employment in Communities of Care											
		Total	Concord	Pittsburg	Richmond	San Francisco	San Jose	Vallejo	West Alameda County	Eastern Alameda County Areas	Other Contra Costa County Areas	Marin County Areas	Bethel island
Gasoline Stations	4471	4,155	80	75	102	300	1,027	112	1,101	509	488	117	244
Home Centers	444110	5,113	491	156	0	156	1,248	0	1,138	624	803	341	156
Supermarkets and Other Grocery Stores	445110	19,667	625	469	468	2,231	2,498	491	3,658	2,643	3,842	1,757	985
Department Stores	452111	7,212	647	0	469	2,118	1,158	0	781	677	1,138	224	0
Discount Department Stores	452112	7,142	0	312	491	156	1,583	0	2,254	1,027	1,027	136	156
Warehouse Clubs and Supercenters	452910	6,006	491	0	335	335	2,185	0	1,340	829	491	0	0
Fuel Dealers	454310	107	8	0	15	0	40	0	36	0	8	0	0
Freight Transportation Arrangement	488510	0	0	0	0	0	0	0	0	0	0	0	0
Wired Telecommunications Carriers	517110	12,241	335	0	156	936	2,654	0	803	5,855	1,205	282	15
Lessors of Nonresidential Buildings	531120	740	0	0	0	0	156	0	0	159	201	205	19
Lessors of Other Real Estate Property	531190	178	0	0	0	0	0	0	0	45	102	15	16
Nonresidential Property Managers	531312	1,714	0	0	0	647	156	0	0	325	491	79	16
General Rental Centers	532310	141	8	0	0	20	47	0	38	4	22	0	2

Source: ADE. Inc., based on US Census ZIP Business Patterns

REGIONAL ECONOMIC ANALYSIS

This part of the report summarizes findings with regard to regional economic effects resulting from control measures whose costs significantly affect various industries. There are three kinds of effects analyzed below. First, the report issues findings with regard to direct effects, which refers to loss of jobs in industries directly affected by industries significantly affected by proposed measures. Direct effect also refers to reduction in economic output by significantly impacted industries. As some measures involve the purchase of equipment, not all direct effects are negative. Purchase of equipment that is manufactured locally by affected industries can result in increase in jobs, so the analysis below also examines the net direct effects stemming from control measures with significant impacts.

A second type of impact analyzed below is indirect effects. This refers to buyer-supplier relationships between directly affected industries and other industries. As directly affected industries curtail spending in the wake of new costs related to control measures, the resulting economic effects ripples down to supplier businesses that would also experience reductions in jobs and economic output. Another multiplier effect in addition to indirect effect is the induced effect. Workers laid off as a result of direct and indirect impacts, in turn, cut back on spending for retail and services items. Their reduction in spending induces further loss in jobs and economic output, mostly in the retail and services sectors.

The first of this section presents multiplier findings with stationary source measures exhibiting significant impacts to industries. The second part of this section presents findings with regard to multiplier effects of various transportation measures, which entail the introduction of funds to pay for operations and a variety of transportation-related infrastructure improvements. Whereas the stationary source discussion focuses on loss of jobs resulting from significant costs borne by industries, the discussion regarding transportation measures is about possible job increases as a result of flow of new funds into the Bay Area region.

MULTIPLIER CONSEQUENCES OF STATIONARY SOURCE MEASURES EXHIBITING SIGNIFICANT IMPACTS

SS8 SO2 FROM COKE CALCINING

Currently, there is only one coke calcining plant in the Bay Area. SS8 will negatively impact this establishment. As a result of the control measure, the affected source would reduce output by $1.4 million. A reduction in output by this amount would result in direct loss of 1.0 job, which in turn would lead to the indirect loss of an additional position in industries that maintain buyer-supplier relations with the affected coke calcining plant. In total, a reduction of 3.6 jobs would result from the $1.4 million reduction in output by the coke calcining plant.

Table 46 - Direct and Indirect Effects of Significant Costs Associated with Proposed Control Measure SS8

SS8 Compliance Cost Scenario	Direct Effect	Indirect Effect	Induced Effect	Total Effect
Employment	(1.0)	(1.1)	(1.4)	(3.6)
Labor Income	($52,182)	($100,522)	($82,300)	($235,005)
Industry Output	($1,401,412)	($438,598)	($197,903)	($2,037,914)

Source: ADE, based on BAAQMD and IMPLAN Input-Output Model

SS22 Stationary Gas Turbines and Electric Power Generators, Transmission and Distributors (NAICS 2211)

SS22 will negatively impact one firm operating in pulp, paper, and paperboard mills manufacturing (NAICS 3221). Thus, the affected manufacturer might reduce output by $2.8 million. A reduction in output by the affected source in the amount of $2.8 million would result in direct loss of 2.7 jobs, which in turn would lead to the indirect loss of an additional 2.7 positions, and further induce loss of 8.0 jobs. In total, a total reduction of 13.3 jobs would result from the $2.8 million reduction in output by NAICS 3221 establishment. Because SS22 entails the purchase of certain equipment, this control measure includes positive job increases as well, albeit slight. Overall, SS22 results in a total net loss of almost 12 positions.

Table 47 – Direct and Indirect Effects of Significant Costs Associated with Proposed Control Measure SS22

	Direct Effect	Indirect Effect	Induced Effect	Total Effect
SS22				
Employment	-2.7	-2.7	-8.0	-13.3
Labor Income	(613,288)	(130,398)	(677,661)	($1,421,348)
Total Value Added	(1,465,329)	(194,798)	(1,034,497)	($2,694,624)
Industry Output	(2,847,147)	(350,546)	(1,509,417)	($4,707,109)
SS22 High Equipment Purchases				
Employment	0.8	0.25	0.51	1.52
Labor Income	$45,961	$21,590	$34,963	$102,514
Total Value Added	$69,674	$32,511	$56,604	$158,789
Industry Output	$194,031	$55,492	$84,817	$334,340
SS22 High Net Effect				
Employment	-1.9	-2.4	-7.5	-11.8
Labor Income	($567,327)	($108,808)	($642,698)	($1,318,833)
Total Value Added	($1,395,655)	($162,287)	($977,893)	($2,535,835)
Industry Output	($2,653,116)	($295,054)	($1,424,600)	($4,372,769)

Source: ADE, based on BAAQMD and IMPLAN Input-Output Model

SS35 PM from Bulk materials (NAICS 2123)

Control measure SS35 (PM from Bulk Materials) affects five different types of establishments. Of the five types, four are not significantly impacted by the control measure. These are a coke calcining plant (NAICS 324199), cement manufacturers (NAICS 3273), a steel pipe manufacturer (NAICS 331210), and two terminal facilities (NAICS 488510). However, while establishments engaged in quarrying (NAICS 2123) are generally not significantly impacted, very small entities employing less than five workers. Affected sources would reduce output by $8,000, resulting in total impacts

(including multiplier) consisting of a reduction of less than 0.1 FTE. However, for purposes of the socioeconomic impact analysis, the quarrying industry in general is not significantly impacted by control measure SS35.

Table 48 – Direct and Indirect effects of Significant Costs Associated with Proposed Control Measure SS35: Very Small Quarrying Only

SS35 Low Compliance Cost Scenario	Direct Effect	Indirect Effect	Induced Effect	Total Effect
Employment	(0.01)	(0.03)	(0.0)	(0.04)
Labor Income	($1,954)	($3,178)	($468)	($5,600)
Industry Output	($24,213)	($8,776)	($1,339)	($34,327)

Source: ADE, based on BAAQMD and IMPLAN Input-Output Model

MULTIPLIER CONSEQUENCES OF TRANSPORTATION CONTROL MEASURES

There are 18 transportation control measures with known funding levels. In total, these 18 measures would directly stimulate the regional economy through incentive funds appropriated by either MTC or by BAAQMD, in the amount of $12.9 billion. The $12.9 billion directly supports 56,700 jobs (Table 49). The $12.9 billion in incentive funds leverages another 22,300 jobs, as a result of buyer-supplier relationships between MTC and\or BAAQMD grantees, and grantees' sub-contractors or suppliers. In total, the $12.9 billion in incentive funds leverages 121,990 jobs. It is important to note that the infusion of $12.9 billion into the regional economy is an annual amount that assumes all funding programs make funds available simultaneously; the actual period over which incentive funds will be available differs from transportation control measure to transportation control measure.

Table 49 – Direct and Indirect Effects of Transportation Control Measures: All Transportation Control Measures

ALL TCMs	DIRECT EFFECT	INDIRECT EFFECT	INDUCED EFFECT	TOTAL EFFECT
Employment	56,690	22,280	43,020	121,990
Labor Income	$4,597,553,628	$1,715,402,518	$3,188,704,328	$9,501,660,475
Total Value Added	$6,353,049,603	$2,880,753,739	$5,148,121,892	$14,381,925,234
Industry Output	$12,744,526,800	$4,820,120,426	$7,709,432,080	$25,274,079,306

Source: ADE, based on BAAQMD and IMPLAN Input-Output Model

Below are 18 tables summarizing the direct and indirect effects of each individual transportation control measure. In some cases, certain transportation measures involve funds for purchasing equipment. Multiplier implications of these transactions are also presented. In other cases, certain measures involve incentive funds for improving physical infrastructure. In most cases, incentive funds entail money from the MTC to cover certain services towards fulfilling the goals and objectives of their respective transportation control measure.

Table 50 – Direct and Multiplier Effects of TR2 (Trip Reduction Programs)

TR2 Subsidies	Direct Effect	Indirect Effect	Induced Effect	Total Effect
Employment	35.6	15.0	27.6	78.2
Labor Income	$2,685,644	$1,027,858	$1,931,310	$5,644,812
Total Value Added	$3,718,670	$1,743,898	$3,116,966	$8,579,534
Industry Output	$7,376,672	$2,884,240	$4,667,068	$14,927,980

Source: ADE, based on BAAQMD and IMPLAN Input-Output Model

Table 51 – Direct and Multiplier Effects of TR3 (Local and Regional Bus Service Improvements)

TR3 Subsidies	Direct Effect	Indirect Effect	Induced Effect	Total Effect
Employment	20,243.9	8,531.8	15,714.0	44,489.8
Labor Income	$1,530,413,717	$585,725,006	$1,100,556,869	$3,216,695,591
Total Value Added	$2,119,083,653	$993,760,457	$1,776,203,613	$4,889,047,723
Industry Output	$4,203,596,513	$1,643,583,875	$2,659,528,806	$8,506,709,195
TR3 Infrastructure	Direct Effect	Indirect Effect	Induced Effect	Total Effect
Employment	1,059.1	396.1	795.4	2,250.6
Labor Income	$77,979,700	$32,451,942	$55,491,223	$165,922,866
Total Value Added	$103,420,000	$53,327,871	$89,909,217	$246,657,088
Industry Output	$231,702,358	$100,224,895	$134,857,573	$466,784,826
TR3 Equipmt. Purchases	Direct Effect	Indirect Effect	Induced Effect	Total Effect
Employment	120.9	127.7	180.5	429.1
Labor Income	$9,704,114	$12,674,166	$12,756,232	$35,134,513
Total Value Added	$16,999,450	$20,055,844	$20,425,399	$57,480,693
Industry Output	$123,579,303	$31,998,090	$30,463,533	$186,040,926
TR3 Total Effect	Direct Effect	Indirect Effect	Induced Effect	Total Effect
Employment	21,423.9	9,055.6	16,689.9	47,169.5
Labor Income	$1,618,097,531	$630,851,114	$1,168,804,324	$3,417,752,970
Total Value Added	$2,239,503,102	$1,067,144,172	$1,886,538,229	$5,193,185,504
Industry Output	$4,558,878,174	$1,775,806,861	$2,824,849,912	$9,159,534,947

Source: ADE, based on BAAQMD and IMPLAN Input-Output Model

Table 52 – Direct and Multiplier Effects of TR4 (Local and Regional Rail Service)

TR4 Subsidies	Direct Effect	Indirect Effect	Induced Effect	Total Effect
Employment	17,140.8	7,224.0	13,305.3	37,670.1
Labor Income	$1,295,822,793	$495,941,590	$931,856,961	$2,723,621,344
Total Value Added	$1,794,257,897	$841,430,939	$1,503,936,550	$4,139,625,386
Industry Output	$3,559,244,218	$1,391,645,556	$2,251,860,400	$7,202,750,174
TR4 Infrastructure	Direct Effect	Indirect Effect	Induced Effect	Total Effect
Employment	12,450.8	3,869.9	8,837.4	25,158.1
Labor Income	$918,091,774	$299,093,551	$617,011,582	$1,834,196,907
Total Value Added	$1,265,504,236	$487,317,623	$998,940,527	$2,751,762,386
Industry Output	$2,488,878,721	$829,570,643	$1,497,807,975	$4,816,257,339
TR4 Total Effect	Direct Effect	Indirect Effect	Induced Effect	Total Effect
Employment	29,591.5	11,093.9	22,142.8	62,828.2
Labor Income	$2,213,914,567	$795,035,141	$1,548,868,543	$4,557,818,251
Total Value Added	$3,059,762,133	$1,328,748,562	$2,502,877,077	$6,891,387,772
Industry Output	$6,048,122,940	$2,221,216,198	$3,749,668,375	$12,019,007,513

Source: ADE, based on BAAQMD and IMPLAN Input-Output Model

Table 53 – Direct and Multiplier Effects of TR5 (Transit Efficiency and Use)

TR5 Subsidies	Direct Effect	Indirect Effect	Induced Effect	Total Effect
Employment	135.0	56.9	104.8	296.7
Labor Income	$10,205,444	$3,905,861	$7,338,977	$21,450,282
Total Value Added	$14,130,943	$6,626,814	$11,844,474	$32,602,231
Industry Output	$28,031,353	$10,960,110	$17,734,859	$56,726,323

Source: ADE, based on BAAQMD and IMPLAN Input-Output Model

Table 54 – Direct and Multiplier Effects of TR6 (Freeway and Arterial Operations)

TR6 Infrastructure	Direct Effect	Indirect Effect	Induced Effect	Total Effect
Employment	570.3	213.3	428.3	1,211.8
Labor Income	$41,988,112	$17,473,725	$29,879,209	$89,341,045
Total Value Added	$55,686,423	$28,714,353	$48,411,552	$132,812,328
Industry Output	$124,759,965	$53,966,021	$72,613,961	$251,339,947

Source: ADE, based on BAAQMD and IMPLAN Input-Output Model

Table 55 – Direct and Multiplier Effects of TR7B (Safe Routes to School)

TR8 Subsidies	Direct Effect	Indirect Effect	Induced Effect	Total Effect
Employment	132	56	103	291
Labor Income	$9,981,994	$3,820,340	$7,178,291	$20,980,624
Total Value Added	$13,821,540	$6,481,715	$11,585,134	$31,888,390
Industry Output	$27,417,600	$10,720,138	$17,346,552	$55,484,290

Source: ADE, based on BAAQMD and IMPLAN Input-Output Model

Table 56 – Direct and Multiplier Effects of TR8 (Car Sharing – Last Mile)

TR9 Subsidies	Direct Effect	Indirect Effect	Induced Effect	Total Effect
Employment	39.5	16.6	30.7	86.9
Labor Income	$2,987,778	$1,143,492	$2,148,582	$6,279,852
Total Value Added	$4,137,019	$1,940,087	$3,467,626	$9,544,732
Industry Output	$8,206,548	$3,208,716	$5,192,113	$16,607,377

Source: ADE, based on BAAQMD and IMPLAN Input-Output Model

Table 57 – Direct and Multiplier Effects of TR9 (Bikes and Pedestrian Access)

TR10 Subsidies	Direct Effect	Indirect Effect	Induced Effect	Total Effect
Employment	8.2	3.4	6.3	18.0
Labor Income	$617,698	$236,407	$444,201	$1,298,307
Total Value Added	$855,294	$401,097	$716,902	$1,973,293
Industry Output	$1,696,635	$663,375	$1,073,426	$3,433,435
TR10 Infrastructure	Direct Effect	Indirect Effect	Induced Effect	Total Effect
Employment	3,904	1,445	2,928	8,277
Labor Income	$286,588,924	$119,266,743	$203,940,051	$609,795,717
Total Value Added	$380,086,582	$195,989,117	$330,432,288	$906,507,987
Industry Output	$851,546,824	$368,344,078	$495,625,397	$1,715,516,299
TR10 Total Effect	Direct Effect	Indirect Effect	Induced Effect	Total Effect
Employment	18.1	7.2	13.8	39.1

TR10 Subsidies	Direct Effect	Indirect Effect	Induced Effect	Total Effect
Labor Income	$1,351,712	$541,874	$966,534	$2,860,120
Total Value Added	$1,828,775	$903,066	$1,563,208	$4,295,049
Industry Output	$3,877,624	$1,606,781	$2,342,825	$7,827,230

Source: ADE, based on BAAQMD and IMPLAN Input-Output Model

Table 58 – Direct and Multiplier Effects of TR10 (Land Use Strategies)

TR11 Subsidies	Direct Effect	Indirect Effect	Induced Effect	Total Effect
Employment	17.8	7.5	13.8	39.0
Labor Income	$1,342,822	$513,929	$965,655	$2,822,406
Total Value Added	$1,859,335	$871,949	$1,558,483	$4,289,767
Industry Output	$3,688,336	$1,442,120	$2,333,534	$7,463,990
TR11 Infrastructure	Direct Effect	Indirect Effect	Induced Effect	Total Effect
Employment	42.2	15.8	31.7	89.8
Labor Income	$3,110,231	$1,294,350	$2,213,275	$6,617,855
Total Value Added	$4,124,920	$2,126,989	$3,586,041	$9,837,950
Industry Output	$9,241,479	$3,997,483	$5,378,812	$18,617,774
TR11 Total Effect	Direct Effect	Indirect Effect	Induced Effect	Total Effect
Employment	60.0	23.3	45.5	128.8
Labor Income	$4,453,052	$1,808,279	$3,178,930	$9,440,261
Total Value Added	$5,984,255	$2,998,938	$5,144,524	$14,127,717
Industry Output	$12,929,815	$5,439,603	$7,712,346	$26,081,764

Source: ADE, based on BAAQMD and IMPLAN Input-Output Model

Table 59 – Direct and Multiplier Effects of TR11 (Value Pricing)

TR12 Value Pricing Penalty	Direct Effect	Indirect Effect	Induced Effect	Total Effect
Employment	562.8	178.0	401.5	1142.3
Labor Income	$41,502,112	$13,825,595	$28,029,368	$83,357,076
Total Value Added	$57,037,710	$22,549,850	$45,381,724	$124,969,284
Industry Output	$113,365,247	$38,776,598	$68,046,775	$220,188,620

Source: ADE, based on BAAQMD and IMPLAN Input-Output Model

Table 60 – Direct and Multiplier Effects of TR 12 (Smart Driving)

TR13 Subsidies	Direct Effect	Indirect Effect	Induced Effect	Total Effect
Employment	143.0	60.3	111.0	314.2
Labor Income	$10,809,713	$4,137,129	$7,773,522	$22,720,365
Total Value Added	$14,967,644	$7,019,191	$12,545,792	$34,532,626
Industry Output	$29,691,105	$11,609,064	$18,784,949	$60,085,118

Source: ADE, based on BAAQMD and IMPLAN Input-Output Model

Table 61 – Direct and Multiplier Effects of TR14 (Cars and Light Trucks)

TR14 Equipment Purchases	Direct Effect	Indirect Effect	Induced Effect	Total Effect
Employment	8.6	1.3	8.0	17.9
Labor Income	$633,051	$107,832	$587,957	$1,328,840
Total Value Added	$1,100,373	$174,113	$902,716	$2,177,202

Industry Output	$1,319,200	$275,607	$1,321,010	$2,915,818

Source: ADE, based on BAAQMD and IMPLAN Input-Output Model

Table 62 – Direct and Multiplier Effects of TR15 (Public Outreach)

TR15 Subsidies	Direct Effect	Indirect Effect	Induced Effect	Total Effect
Employment	29.8	8.8	23.0	61.6
Labor Income	$2,251,940	$753,982	$1,610,378	$4,616,300
Total Value Added	$3,615,857	$1,158,033	$2,596,790	$7,370,680
Industry Output	$5,549,630	$1,854,245	$3,885,821	$11,289,696

Source: ADE, based on BAAQMD and IMPLAN Input-Output Model

Table 63 – Direct and Multiplier Effects of TR19 (Medium, Heavy Trucks)

TR19 Equipment Purchases	Direct Effect	Indirect Effect	Induced Effect	Total Effect
Employment	11.7	1.8	10.8	24.3
Labor Income	$837,864	$142,722	$778,176	$1,758,762
Total Value Added	$1,456,380	$230,445	$1,194,768	$2,881,593
Industry Output	$1,745,991	$364,770	$1,748,385	$3,859,146

Source: ADE, based on BAAQMD and IMPLAN Input-Output Model

Table 64 – Direct and Multiplier Effects of TR20 (Ocean Going Vessels)

TR20 Equipment Purchases	Direct Effect	Indirect Effect	Induced Effect	Total Effect
Employment	4.2	2.2	3.9	10.3
Labor Income	$360,540	$196,531	$273,413	$830,484
Total Value Added	$405,488	$276,662	$441,903	$1,124,052
Industry Output	$1,100,000	$450,804	$662,313	$2,213,117

Source: ADE, based on BAAQMD and IMPLAN Input-Output Model

Table 65 – Direct and Multiplier Effects of TR22 (Construction, Freight Handling and Farm Equipment): Low Scenario

R24 Equipment Purchases (Low)	Direct Effect	Indirect Effect	Induced Effect	Total Effect
Employment	8.8	1.5	5.2	15.5
Labor Income	$416,235	$134,076	$387,800	$938,111
Total Value Added	$679,221	$232,768	$603,076	$1,515,065
Industry Output	$970,841	$356,241	$887,799	$2,214,881

Source: ADE, based on BAAQMD and IMPLAN Input-Output Model

Table 66 – Direct and Multiplier Effects of TR22 (Construction, Freight Handling and Farm Equipment): High Scenario

R24 Equipment Purchases (High)	Direct Effect	Indirect Effect	Induced Effect	Total Effect
Employment	30.9	16.2	28.7	75.7
Labor Income	$2,651,029	$1,445,081	$2,010,390	$6,106,500
Total Value Added	$2,981,529	$2,034,279	$3,249,287	$8,265,096

Industry Output	$8,088,235	$3,314,735	$4,869,949	$16,272,919

Source: ADE, based on BAAQMD and IMPLAN Input-Output Model

Table 67 – Direct and Multiplier Effects of TR23 (Lawn, Garden and Utility Equipment)

TR25 Equipment Purchases	Direct Effect	Indirect Effect	Induced Effect	Total Effect
Employment	1.5	0.3	0.9	2.6
Labor Income	$69,721	$22,459	$64,959	$157,138
Total Value Added	$113,772	$38,990	$101,018	$253,780
Industry Output	$162,620	$59,672	$148,711	$371,003

Source: ADE, based on BAAQMD and IMPLAN Input-Output Model

Table 68 - Direct and Multiplier effects of TR13 (Parking Policies)

TR13 Parking Policies	Direct Effect	Indirect Effect	Induced Effect	Total Effect
Employment	11.6	4.8	8.9	25.3
Labor Income	$872,834	$334,053	$627,675	$1,834,563
Total Value Added	$1,208,568	$566,768	$1,013,014	$2,788,349
Industry Output	$2,397,419	$937,378	$1,516,798	$4,851,594

Source: ADE, based on BAAQMD and IMPLAN Input-Output Model

CONCLUSION

The proposed 2017 Plan would affect a wide variety of businesses, households and land uses as it seeks to achieve $977 million in regional health and climate benefits from reducing harmful air emissions. This socioeconomic analysis has evaluated both the adverse private sector impacts of the compliance costs associated with the measures, as well as the public investments and incentives included in many of the measures that would help to create additional regional economic activity. On balance, the plan would create more jobs than it would eliminate throughout the region. The plan would also save the region in health costs and generate climate benefits, as reducing air pollution, especially harmful particulate matter, generates savings due to reduced hospital admissions, fewer lost days at work, and reduced premature mortality.

Currently, only two control measures result in significant impacts, some of which are confined to small businesses within affected industries. These control measures are SS8 (SO2 from Petroleum Coke Calcining Plants) and SS22 (Stationary Gas Turbines). SS22 affects two refineries (NAICS 32411) and one pulp, paper, and paperboard mills manufacturer (NAICS 3221). While refineries are not significantly impacted by SS22, the NAICS 3221 manufacturer is significantly impacted. This manufacturer will bear annual costs of $4.1 million as a result of SS22. SS8 (SO2 from Coke Calcining) will limit emissions of sulfur dioxide (SO2) from petroleum coke calcining operations, requiring operators of coke calcining kilns to remove an equivalent of 59 percent of the SO2 created by the calcining process. There is only one petroleum coke calcining facility in the Bay Area, which operates two coke calcining kilns and currently emits a total of 4.0 tons per day of sulfur dioxide.

In addition to direct economic impacts, the plan has anticipated health and climate benefits. Health benefits are realized in terms of reduced illness and premature mortality associated with air pollution. These benefits are estimated at $702 million per year. Because there is a high cost associated with premature mortality, and exposure to fine particulate matter accounts for nearly all the premature mortality, reductions in emissions of fine particulate matter account for the majority of the estimated value of the health benefits. The climate benefits of the 2017 Plan are estimated using the social cost of carbon. Economists use the term "social cost of carbon" to estimate the monetary benefit of reducing GHG emissions in terms of avoiding or mitigating the global warming and climate change impacts that would otherwise occur. Using a social cost of $62 per metric ton of CO2e reduced, the anticipated GHG reductions from the 2017 Plan control strategy will have a value of approximately $275 million per year (based on the 4.4 MMT per year of GHG reductions using the 100-year GWP values). (See Chapter 5 and Appendix C of the 2017 Clean Air Plan for more information.)