

APPENDIX D

Socioeconomic Analysis For Proposed Amendments to Rule 4702

July 20, 2021

This page intentionally blank.



**POTENTIAL AMENDMENTS TO RULE 4702—
INTERNAL COMBUSTION ENGINES
SOCIOECONOMIC IMPACT ANALYSIS**
Final

July 7, 2021

Submitted to:



**San Joaquin Valley Air Pollution Control District
1900 East Gettysburg Avenue
Fresno, CA 93726-0244**

Submitted by:



**Eastern Research Group, Inc. (ERG)
8950 Cal Center Drive, Suite 230
Sacramento, CA 95826**

District Agreement No. CONT-00656

SAN JOAQUIN VALLEY AIR POLLUTION CONTROL DISTRICT

TABLE OF CONTENTS

APPENDIX D 1

Table of Contents 4

List of Figures and Tables 5

1. Executive Summary 6

2. Introduction and Background 8

3. Regional Demographic and Economic Trends 9

 3.1. Regional Demographic Trends 9

 3.2. Regional Economic Trends 19

 3.3. Impacts of the COVID-19 Pandemic 25

4. Socioeconomic Impact Analysis 28

 4.1. Data Sources and Methodology 28

 4.1.1. Baseline Industry Profile Estimates 28

 4.1.2. COVID-19-Adjusted Baseline Industry Profile Estimates 29

 4.1.3. Estimating Impacts on Affected Entities 31

 4.1.4. Aggregating to the Sector Level 31

 4.2. Profile of Affected Entities 31

 4.3. Compliance Cost Estimates 33

 4.4. Impacts on Affected Entities 35

 4.4.1. Direct Impacts 35

 4.4.2. Employment, Indirect and Induced Impacts 35

 4.4.3. COVID-19 Sensitivity Analysis 36

 4.5. Impacts on Small Entities 39

 4.6. Impacts on At-Risk Populations 40

References 42

Appendix A. Sector, SIC Code, and NAICS Code Concordances 47

Appendix B. Profit Rates by NAICS INDUSTRY 49

Appendix C. COVID-19 Baseline Adjustments by NAICS Industry 50

SAN JOAQUIN VALLEY AIR POLLUTION CONTROL DISTRICT

LIST OF FIGURES AND TABLES

Figure 1. Percentage of the Population Living below Two Times the Federal Poverty Level by Census Tract (2018)..... 18

Figure 2. Map of Facilities Operating Internal Combustion Engines 32

Figure 3. Distribution of Farms by Acreage in California and the District 40

Figure 4. Map of Affected Facilities in Relation to Population Living in Poverty..... 41

Table 1. Summary of Socioeconomic Impacts due to Potential Amendments to Rule 4702—Internal Combustion Engines 7

Table 2. Population Trends by County..... 10

Table 3. Median Income by County [a]..... 12

Table 4. Poverty Rate by County..... 14

Table 5. Population Below Poverty Line by County..... 16

Table 6. Employment Trends by County..... 20

Table 7. Economic Trends in the San Joaquin Valley, 2009-2019 [a]..... 22

Table 8. Compound Annual Growth Rate of Establishments, Employment, and Annual Pay [a]..... 24

Table 9. District-Wide COVID-19 Impacts 30

Table 10. Profile of Facilities Affected by Potential Amendments to Rule 4702—Internal Combustion Engines 33

Table 11. Characteristics of Average Facilities Affected by Potential Amendments to Rule 4702—Internal Combustion Engines 33

Table 12. Costs of Compliance with Potential Amendments to Rule 4702—Internal Combustion Engines 34

Table 13. Economic Impacts for Entities Affected by Potential Amendments to Rule 4702—Internal Combustion Engines 35

Table 14. Direct, Indirect, and Induced Impacts of Potential Amendments to Rule 4702—Internal Combustion Engines 36

Table 15. Comparison of Total Impacts against the District-Wide Economy 36

Table 16. Results of COVID-19 Sensitivity Analyses for the Impacts of Rule 4702—Internal Combustion Engines 38

Table A-1. SIC Code to Sector Concordance used to Analyze the Impacts of Rule 4702—Internal Combustion Engines 47

Table A-2. SIC to NAICS Concordance for Facilities that may be Affected by Potential Amendments to Rule 4702—Internal Combustion Engines 48

Table B-1. Profit Rate by NAICS Industry for Facilities Affected by Rule 4702—Internal Combustion Engines 49

Table C-1. COVID-19 Adjustments by NAICS Industry for Facilities Affected by Rule 4702—Internal Combustion Engines 50

1. EXECUTIVE SUMMARY

This report contains ERG’s analysis of the socioeconomic impacts of potential amendments to the San Joaquin Valley Air Pollution Control District (SJVAPCD or District) Rule 4702 (Internal Combustion Engines). Potential amendments to Rule 4702 would establish more strict nitrogen oxides (NOx) and volatile organic compounds (VOC) limits than in the existing rules (SJVAPCD, 2020a).

After providing an overview of demographic and economic trends in the District as a whole and describing how the COVID-19 pandemic has impacted the District economically, ERG estimates the impacts of the potential amendments on entities that would incur costs under the potential amendments by comparing compliance costs to profits.

As seen in Table 1, the overall impacts of the rule for all affected sectors are **4.61 percent** of profits. No affected sector would experience a significant adverse socioeconomic impact, defined as costs that amount to 10 percent or more of profits (Berck, 1995). The “Agriculture” sector has most of the affected facilities and would also have the highest impacts, at **7.60 percent** of profits. (Note that these impacts reflect a COVID-19-adjusted baseline, as detailed further in Section 4.1.2 below. These impacts are expected to decline as the country and economy recover from the effects of the COVID pandemic.)

Note that this rule would affect a total of four facilities in the “Water Supply and Storage” and “Wastewater Treatment” sectors. Those facilities are operated by local government agencies, which do not seek to maximize profits in the same way that private entities do, and therefore profit values are not shown in the following and subsequent tables. Local governments commonly raise fees to cover the compliance costs of regulations, and will likely plan for incurring these additional costs through their annual budgeting processes. Based on the average annualized cost per facility for the “Government” sector, there does not appear to be a significant impact to these types of facilities.

SAN JOAQUIN VALLEY AIR POLLUTION CONTROL DISTRICT

Table 1. Summary of Socioeconomic Impacts due to Potential Amendments to Rule 4702—Internal Combustion Engines

Sector	Affected Facilities (2023 and 2029)	Total Annualized Cost [a]	Average Annualized Cost per Facility	Average Profits per Firm	Cost as % Profits
Agriculture	203	\$1,042,564	\$5,136	\$67,532	7.60%
Oil and Gas Production	2	\$68,460	\$34,230	\$5,361,445	0.64%
Scrap and Waste Materials	1	\$3,732	\$3,732	\$148,324	2.52%
Water Supply and Storage [b]	2	\$5,505	\$2,752	—	—
Wastewater Treatment [b]	1	\$12,797	\$12,797	—	—
Total/Average	209	\$1,133,058	\$5,421	\$117,609	4.61%

Sources: ERG estimates based on SJVAPCD, 2020b; U.S. Census Bureau, 2017a; U.S. Census Bureau, 2017b; U.S. Census Bureau, 2020a; U.S. Census Bureau, 2020b; U.S. Census Bureau, 2020c; BLS, 2020; OPM, 2017; IRS, 2016; RMA, 2020; IMPLAN, 2020a.

Notes:

- [a] The total annualized cost is calculated by summing annualized one-time costs (annualized over a 10-year period using a 10 percent discount rate) and annual costs.
- [b] The "Water Supply and Storage" and "Wastewater Treatment" sectors are composed of government agencies, so profit values are not shown here.

As a secondary measure of impacts, ERG also used the IMPLAN (2020a) input-output model to assess how facilities with costs under the potential amendments might react by reducing employment, as well as a “ripple effect” felt if affected facilities reduce purchases from their suppliers, and their suppliers in turn reduce their own purchases. These impacts make up less than **0.001 percent** of District-wide revenue and employment.

ERG also conducted sensitivity analyses to assess how varying degrees of recovery from the effects of the COVID-19 pandemic might affect the results of the analysis. Impacts would be reduced with a full recovery, as IMPLAN (2020a) data suggests that revenues for the agricultural sector (which includes most of the affected facilities) have declined due to the COVID-19 pandemic.

2. INTRODUCTION AND BACKGROUND

This report provides economic data and analysis in support of the San Joaquin Valley Air Pollution Control District (“the District” or SJVAPCD) assessment of the socioeconomic feasibility of potential amendments to its existing Rule 4702 (Internal Combustion Engines). This work was performed by ERG under District Agreement No. CONT-00656.

Internal combustion engines are used by a variety of private businesses and public agencies throughout the Valley for a number of purposes. Primary uses of internal combustion engines in the Valley include powering irrigation pumps, compressors, electrical generators, and emergency standby engines. Examples of businesses and industries that use internal combustion engines include agriculture, oil and gas production, landfill and wastewater treatment facilities, water districts, and manufacturing.

Existing District Rule 4702, last amended in 2013, is designed “to limit the emissions of NO_x, carbon monoxide (CO), VOC, and sulfur oxides (SO_x) from internal combustion engines” and applies “to any internal combustion engine rated at 25 brake horsepower or greater” (SJVAPCD, 2013).

The potential amendments to Rule 4702 will satisfy commitments included in the *2018 PM_{2.5} Plan* to lower NO_x emission limits for a number of internal combustion engines categories, lower VOC limits to 90 ppmv for all categories of internal combustion engines, and remove the emissions fee compliance option. The potential amendments would require compliance for non-agricultural engines and agricultural rich-burn engines by the end of 2023 and agricultural lean-burn engines by the end of 2029 (SJVAPCD, 2020a).

This analysis was prepared to meet the requirements of California Health and Safety Code §40728.5, which requires an assessment of the socioeconomic impacts of the adoption, amendment, or repeal of air district rules. It begins by providing an overview of demographic and economic trends in the District, and then estimates the economic impacts on specific entities subject to the potential rule amendments (including small entities), and how those economic impacts might affect the surrounding communities, including at-risk populations.

3. REGIONAL DEMOGRAPHIC AND ECONOMIC TRENDS

In this section ERG considers larger demographic and economic trends in the District, which includes eight counties that are home to over 4 million people.¹ These counties have become more populous over the last decade, and the median income (adjusted for inflation) has also increased. Utilities, wholesale and retail trade, and transportation, along with agriculture and oil and gas extraction, are the predominant industries within the District both in terms of establishments and employment.

3.1. REGIONAL DEMOGRAPHIC TRENDS

This section presents the demographic shifts within the District's jurisdiction over the past decade. The District has experienced greater population growth rate than the state as a whole, but the median income has lagged the state. The poverty rate throughout the District, while decreasing over time, is doing so at a slower pace than California as a whole.

The San Joaquin Valley contains almost 11 percent of the state of California's population. Table 2 shows how this population has changed over the last 10 years. Table 2 also shows the compound annual growth rate (CAGR) between 2010 and 2019. The CAGR is the constant rate the population would have changed annually to go from the 2010 level to the 2019 level.

The region has seen small amounts of population growth, an annual average growth rate marginally higher than the state of California. Kings and Madera Counties, the two counties with the smallest population of the counties in the District, saw little growth in their populations from 2010 to 2019, and were the only counties to have population declines in any one year over the last ten years. San Joaquin County saw the most growth, increasing at 1.16 percent annually.

¹ While only part of Kern County falls into the District's boundaries, all of Kern County is included in the data presented in this section, as the data were only available at the county level.

SAN JOAQUIN VALLEY AIR POLLUTION CONTROL DISTRICT

Appendix D: Socioeconomic Analysis

July 20, 2021

Table 2. Population Trends by County

County	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	CAGR 2010-2019
Fresno	932,039	939,406	945,045	951,514	960,567	969,488	976,830	985,238	991,950	999,101	0.78%
Kern [a]	840,996	847,970	853,606	862,000	869,176	876,031	880,856	887,356	893,758	900,202	0.76%
Kings	152,370	151,868	150,991	150,337	149,495	150,085	149,382	149,665	151,382	152,940	0.04%
Madera	150,986	151,675	151,527	151,370	153,456	153,576	153,956	155,423	156,882	157,327	0.46%
Merced	256,721	259,297	260,867	262,026	264,419	266,353	267,628	271,096	274,151	277,680	0.88%
San Joaquin	687,127	694,354	699,593	702,046	711,579	722,271	732,809	743,296	752,491	762,148	1.16%
Stanislaus	515,145	517,560	520,424	523,451	528,015	533,211	539,255	544,717	548,126	550,660	0.74%
Tulare	442,969	446,784	449,779	452,460	455,138	457,161	459,235	462,308	464,589	466,195	0.57%
SJVAPCD [a]	3,978,353	4,008,914	4,031,832	4,055,204	4,091,845	4,128,176	4,159,951	4,199,099	4,233,329	4,266,253	0.78%
California	37,319,502	37,638,369	37,948,800	38,260,787	38,596,972	38,918,045	39,167,117	39,358,497	39,461,588	39,512,223	0.64%

Source: U.S. Census Bureau, 2020d.

Notes:

[a] While the SJVAPCD only includes a portion of Kern County, the data shown here are for the whole of the county.

SAN JOAQUIN VALLEY AIR POLLUTION CONTROL DISTRICT

Table 3 shows the median income by county for 2010 through 2018 U.S. Census Bureau (2019a).² Median income growth rates varied across counties from 2010 to 2018, though the counties in the District as a whole had a CAGR of 0.63 percent overall; this is significantly lower than the growth rate of median income for the state of California (1.60 percent). Kern and Tulare Counties experienced declines in median income (-0.17 percent and -0.26 percent respectively) while all other counties experienced some level of growth. Kings and Merced Counties have notably higher growth rates of 2.34 percent and 2.13 percent, respectively. These are the only two counties in the District where median income increased at a rate faster than the state.

² 2018 is the most recent data year currently available in the U.S. Census Bureau (2019a) median income data from the American Community Survey.

SAN JOAQUIN VALLEY AIR POLLUTION CONTROL DISTRICT

Appendix D: Socioeconomic Analysis

July 20, 2021

Table 3. Median Income by County [a]

County	2010	2011	2012	2013	2014	2015	2016	2017	2018	CAGR 2010-2018
Fresno	\$52,859	\$49,014	\$46,766	\$48,496	\$47,071	\$50,369	\$51,728	\$53,987	\$53,547	0.16%
Kern [b]	\$53,213	\$51,781	\$51,578	\$51,758	\$51,647	\$55,082	\$52,990	\$51,959	\$52,478	-0.17%
Kings	\$52,144	\$57,645	\$51,606	\$50,538	\$46,378	\$49,078	\$56,527	\$59,985	\$62,738	2.34%
Madera	\$56,421	\$53,323	\$47,229	\$43,896	\$45,998	\$50,585	\$54,852	\$53,448	\$57,287	0.19%
Merced	\$49,619	\$45,863	\$48,979	\$44,921	\$47,788	\$45,056	\$50,692	\$49,750	\$58,752	2.13%
San Joaquin	\$58,458	\$58,227	\$56,984	\$56,785	\$55,999	\$57,617	\$63,199	\$63,746	\$65,237	1.38%
Stanislaus	\$56,159	\$50,467	\$52,134	\$52,954	\$55,376	\$56,177	\$57,664	\$62,027	\$61,373	1.12%
Tulare	\$50,727	\$47,136	\$45,277	\$43,525	\$46,191	\$45,503	\$48,719	\$48,219	\$49,668	-0.26%
SJVAPCD [b][c]	\$53,990	\$51,459	\$50,426	\$50,318	\$50,550	\$52,467	\$54,674	\$55,614	\$56,791	0.63%
California	\$67,455	\$65,594	\$65,529	\$66,454	\$67,136	\$69,198	\$71,929	\$74,837	\$76,589	1.60%

Source: U.S. Census Bureau, 2019a.

Notes:

- [a] Inflated values to 2019\$ using the BEA (2020) GDP deflator.
- [b] While the SJVAPCD only includes a portion of Kern County, the data shown here are for the whole of the county.
- [c] Median income for SJVAPCD is a weighted average by population.

SAN JOAQUIN VALLEY AIR POLLUTION CONTROL DISTRICT

Poverty rates by county for the same nine-year period are shown in Table 4. The poverty rate decreased in every county in the District in that time frame. Poverty rates within the District are higher than state average, and declining at a slower rate overall compared to the state of California's rate of -2.60 percent. Fresno and Tulare Counties consistently had the highest poverty rates while Stanislaus and San Joaquin Counties had the two lowest. San Joaquin and Stanislaus Counties were also the only two counties in the District with a lower CAGR lower than the state. Despite Merced County's notable CAGR of median household income, its poverty rate has declined at one of the slowest rates (-0.55 percent) in the District.

SAN JOAQUIN VALLEY AIR POLLUTION CONTROL DISTRICT

Appendix D: Socioeconomic Analysis

July 20, 2021

Table 4. Poverty Rate by County

County	2010	2011	2012	2013	2014	2015	2016	2017	2018	CAGR 2010-2018
Fresno	26.8%	25.8%	28.4%	28.8%	27.7%	25.3%	25.6%	21.1%	21.5%	-2.72%
Kern [a]	21.2%	24.5%	23.8%	22.8%	24.8%	21.9%	22.7%	21.4%	20.6%	-0.36%
Kings	22.2%	20.5%	21.2%	21.4%	26.6%	23.6%	16.0%	18.2%	19.2%	-1.80%
Madera	21.0%	24.3%	23.6%	23.6%	22.2%	23.4%	20.3%	22.6%	20.9%	-0.06%
Merced	23.0%	27.4%	24.3%	25.2%	25.2%	26.7%	20.3%	23.8%	22.0%	-0.55%
San Joaquin	19.2%	18.1%	18.4%	19.9%	20.9%	17.4%	14.4%	15.5%	14.2%	-3.70%
Stanislaus	19.9%	23.8%	20.3%	22.1%	18.0%	19.7%	14.2%	13.5%	15.6%	-3.00%
Tulare	24.5%	25.7%	30.4%	30.1%	28.6%	27.6%	25.2%	24.6%	22.5%	-1.06%
SJVAPCD [a]	22.5%	23.8%	24.2%	24.6%	24.3%	22.7%	20.6%	19.7%	19.3%	-1.91%
California	15.8%	16.6%	17.0%	16.8%	16.4%	15.3%	14.3%	13.3%	12.8%	-2.60%

Source: U.S. Census Bureau, 2019b.

Notes:

[a] While the SJVAPCD only includes a portion of Kern County, the data shown here are for the whole of the county.

SAN JOAQUIN VALLEY AIR POLLUTION CONTROL DISTRICT

Table 5 shows the population below the poverty line from 2010 to 2018. While there was a decline in the number of people below the poverty line from 2010 to 2018, the number fluctuated during this period. The number of people in poverty grew by over 100,000 between 2010 and 2014, but has declined since 2014.

The CAGR of population below the poverty line varies across counties. Fresno County had the largest population below the poverty line as of 2018, which coincides with its large population and relatively higher poverty rate. Conversely, San Joaquin County has a notable decline in CAGR at -2.56 percent, one of three counties to see declines in poverty at a rate faster than the state (along with Fresno and Stanislaus Counties). Kern, Madera, and Merced Counties have positive CAGR and have seen an increase in population below the poverty over the nine-year period.

SAN JOAQUIN VALLEY AIR POLLUTION CONTROL DISTRICT

Appendix D: Socioeconomic Analysis

July 20, 2021

Table 5. Population Below Poverty Line by County

County	2010	2011	2012	2013	2014	2015	2016	2017	2018	CAGR 2010-2018
Fresno	246,196	238,706	264,738	270,072	263,220	242,083	247,507	205,291	209,799	-1.98%
Kern [a]	171,950	201,230	196,625	189,484	208,388	186,501	193,133	184,619	178,239	0.45%
Kings	30,425	27,101	27,819	28,473	35,623	31,453	21,565	24,935	26,299	-1.81%
Madera	29,936	34,148	33,936	34,242	32,432	34,227	29,736	33,482	31,191	0.51%
Merced	58,360	70,243	62,448	64,552	65,405	70,118	53,314	63,485	59,283	0.20%
San Joaquin	128,748	123,258	126,610	137,663	146,601	123,817	103,399	113,136	104,622	-2.56%
Stanislaus	101,335	122,212	104,559	114,628	94,586	104,801	76,191	73,254	85,073	-2.16%
Tulare	107,660	113,515	135,194	135,066	129,485	125,728	114,290	112,524	103,711	-0.47%
SJVAPCD [a]	874,610	930,413	951,929	974,180	975,740	918,728	839,135	810,726	798,217	-1.14%
California	5,783,043	6,118,803	6,325,319	6,328,824	6,259,098	5,891,678	5,525,524	5,160,208	4,969,326	-1.88%

Source: U.S. Census Bureau, 2019b.

Notes:

[a] While the SJVAPCD only includes a portion of Kern County, the data shown here are for the whole of the county.

SAN JOAQUIN VALLEY AIR POLLUTION CONTROL DISTRICT

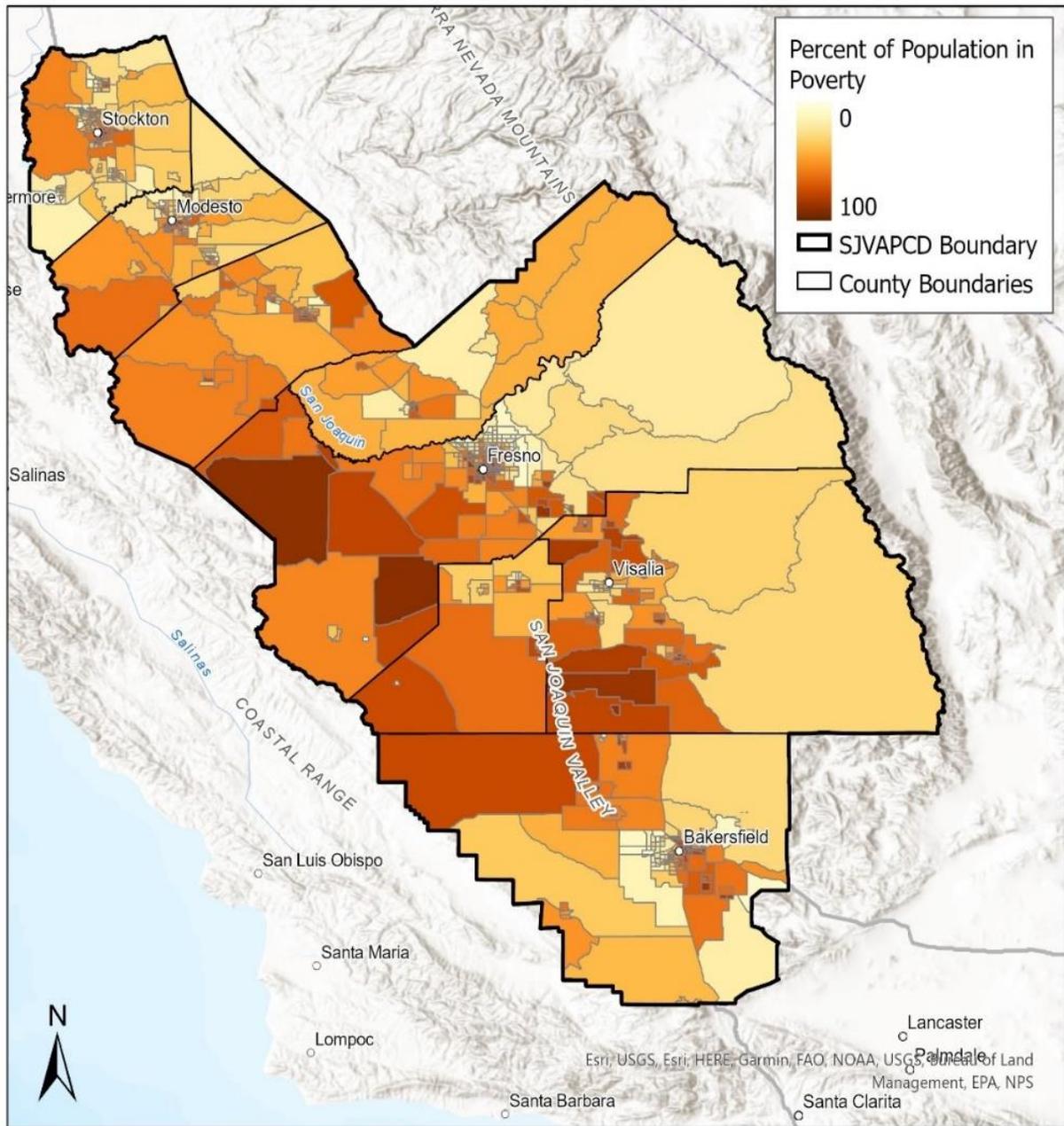
Figure 1 shows where the population in poverty or at risk of poverty lives within the District³ using CalEnviroScreen 3.0 (OEHHA, 2018) data on the percent of population living below two times the federal poverty limit. CalEnviroScreen poverty data is derived from the US Census Bureau's American Community Survey 5-year estimates for 2011 to 2015. CalEnviroScreen uses a poverty threshold of two times the poverty level to account for the higher cost of living in California compared to other parts of the country (OEHHA, 2017).

As shown in Table 4 above, roughly 20 percent of the District population is below the federal poverty limit, depending on the year. Using the higher CalEnviroScreen 3.0 threshold, nearly half (48.7 percent) of District residents are below twice the federal poverty limit (OEHHA, 2018), reflected in the high poverty rates in the map in Figure 1 below.

³ Note that only the part of Kern County included in the SJVAPCD is shown. There are four census tracts on the eastern border of Kern County that are in the Eastern Kern Air Pollution Control District. The portions of these census tracts that fall outside of the SJVAPCD border are not shown.

SAN JOAQUIN VALLEY AIR POLLUTION CONTROL DISTRICT

Figure 1. Percentage of the Population Living below Two Times the Federal Poverty Level by Census Tract (2018)



0 12.5 25 50 75 100 Miles

Source: OEHHA, 2018.

3.2. REGIONAL ECONOMIC TRENDS

This section tracks the economic trends in the District over the past decade. Total employment growth in the District is slightly below that of California. Overall, employment, the number of establishments, and average pay have all increased across the District during that period.

Table 6 presents employment trends over the same 10-year span. During that period, overall employment throughout the District has also increased. The District as a whole saw a CAGR of 1.48 percent in employment over the last decade, slightly below that of the entire state of California (1.64 percent). No individual county experienced a decline in employment, although Kings County has a notably lower growth rate (0.72 percent) than the other counties in the region.

San Joaquin County was the only county in the District to experience an employment growth rate greater than that of California as a whole. This may be in part due to the California Central Valley Economic Development Corporation's (CCVEDC) efforts to encourage companies to locate within the District through tax credits and incentives and grants (CCVEDC, 2020). A few large employers (Amazon, Tesla, etc.) have moved to San Joaquin County in recent years, creating numerous job opportunities within the county. Some people have also moved from the more expensive Bay Area and Los Angeles-San Diego area to the Central Valley, with San Joaquin County being one of the more popular areas to relocate (Lillis, 2019).

SAN JOAQUIN VALLEY AIR POLLUTION CONTROL DISTRICT

Appendix D: Socioeconomic Analysis

July 20, 2021

Table 6. Employment Trends by County

County	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	CAGR 2010-2019
Fresno	366,200	370,200	373,500	379,800	387,500	395,700	402,700	407,400	412,783	418,092	1.48%
Kern [a]	313,400	325,700	340,400	347,200	351,700	350,500	348,000	349,500	354,892	360,783	1.58%
Kings	49,900	49,700	50,000	50,400	50,600	51,700	51,500	52,300	53,025	53,233	0.72%
Madera	51,400	52,000	53,500	54,400	54,900	53,500	55,400	56,100	56,958	57,642	1.28%
Merced	93,200	94,500	96,200	98,000	99,700	101,200	102,300	104,600	105,650	106,875	1.53%
San Joaquin	260,000	261,000	267,100	274,600	279,200	286,600	292,600	301,100	304,617	307,842	1.89%
Stanislaus	202,200	202,400	205,900	209,800	213,700	218,200	222,000	224,400	227,533	228,750	1.38%
Tulare	168,100	168,700	168,800	172,200	172,100	178,700	180,700	183,500	183,300	184,350	1.03%
SJVAPCD [a]	1,504,400	1,524,200	1,555,400	1,586,400	1,609,400	1,636,100	1,655,200	1,678,900	1,698,758	1,717,567	1.48%
California	16,091,900	16,258,100	16,602,700	16,958,400	17,310,900	17,681,800	18,002,800	18,285,500	18,460,433	18,623,900	1.64%

Source: CA EDD, 2020a.

Notes:

[a] While the SJVAPCD only includes a portion of Kern County, the data shown here are for the whole of the county.

SAN JOAQUIN VALLEY AIR POLLUTION CONTROL DISTRICT

Table 7 shows the economic trends by sector in the District by presenting three snapshots from 2009 to 2019 using data from the Bureau of Labor Statistics' (BLS, 2020) Quarterly Census of Employment and Wages (QCEW). The recent influx of new employers explains the continued growth in the utilities, trade and transportation industries. These industries have been the largest employers in the District for the last 11 years, followed closely by agriculture and oil and gas extraction. The education, health and social services industry has seen the greatest increase of establishments in the District over the past decade, although it is the one industry that has experienced a decrease in average pay over that same time frame. The information sector is the smallest industry in the district and has gotten smaller over the last 11 years.

SAN JOAQUIN VALLEY AIR POLLUTION CONTROL DISTRICT

Appendix D: Socioeconomic Analysis

July 20, 2021

Table 7. Economic Trends in the San Joaquin Valley, 2009-2019 [a]

NAICS	Sector	2009			2014			2019		
		Establishments	Employment	Average Annual Pay [c]	Establishments	Employment	Average Annual Pay [c]	Establishments	Employment	Average Annual Pay
11, 21	Agriculture, Oil and Gas Extraction	7,789	189,766	\$29,692	7,438	217,769	\$33,068	7,430	217,649	\$36,568
23	Construction	6,099	50,178	\$55,144	5,377	56,011	\$54,022	6,637	70,498	\$59,475
31-33	Manufacturing	2,640	105,142	\$52,640	2,531	107,702	\$53,749	2,715	110,892	\$55,863
22, 42, 44-45, 48-49	Utilities, Trade and Transportation	14,041	219,813	\$40,871	14,500	246,596	\$41,428	16,026	282,861	\$43,587
51	Information	602	13,482	\$59,608	510	11,035	\$68,525	498	6,127	\$60,315
52-53	Finance Activities	5,747	44,703	\$52,430	5,652	41,123	\$55,695	6,443	42,638	\$59,747
54-56	Profession and Business Services	7,944	97,494	\$45,994	8,391	106,412	\$45,985	9,054	116,895	\$50,424
61-62	Educational, Health and Social Services	7,503	140,416	\$54,050	39,280	184,959	\$47,321	53,489	223,552	\$48,667
71-72	Leisure and Hospitality	5,960	97,885	\$17,407	6,224	111,610	\$16,859	7,424	130,279	\$19,906
81	Other Services	38,938	53,413	\$24,934	5,124	32,856	\$33,084	5,603	24,860	\$35,245
99	Unclassified	1,730	2,112	\$34,651	1,917	3,006	\$31,870	4	4	\$25,752
SJVAPCD Total/Average [b]		98,993	1,014,404	\$40,664	96,944	1,119,079	\$41,095	115,323	1,226,255	\$43,903

Source: BLS, 2020.

Notes:

- [a] Includes all of Kern County.
- [b] Annual average pay is a weighted average of the eight counties in the SJV APCD weighted by employment in sector.
- [c] Annual average pay is adjusted to 2019 dollars using the BEA (2020) GDP deflator.

SAN JOAQUIN VALLEY AIR POLLUTION CONTROL DISTRICT

Table 8 presents the CAGR of the economic data from Table 7. The number of establishments, employment, and average annual pay have all increased over the last 11 years across the District. Health, education, and social services has seen the greatest growth in establishments and employment over that time frame, but it is the one industry that experienced a decrease in average pay (outside of the unclassified businesses). There are fewer establishments in the agriculture, oil, and gas extraction industry today than there were a decade ago, but employment and pay have both increased. The information industry has experienced the greatest decrease in employment across the District.

SAN JOAQUIN VALLEY AIR POLLUTION CONTROL DISTRICT

Appendix D: Socioeconomic Analysis

July 20, 2021

Table 8. Compound Annual Growth Rate of Establishments, Employment, and Annual Pay [a]

NAICS	Sector	Establishments			Employment			Average Annual Pay		
		2009-2014	2014-2019	2009-2019	2009-2014	2014-2019	2009-2019	2009-2014	2014-2019	2009-2019
11, 21	Agriculture, Oil and Gas Extraction	-0.92%	-0.02%	-0.47%	2.79%	-0.01%	1.38%	2.18%	2.03%	2.10%
23	Construction	-2.49%	4.30%	0.85%	2.22%	4.71%	3.46%	-0.41%	1.94%	0.76%
31-33	Manufacturing	-0.84%	1.41%	0.28%	0.48%	0.59%	0.53%	0.42%	0.77%	0.60%
22, 42, 44-45, 48-49	Utilities, Trade and Transportation	0.65%	2.02%	1.33%	2.33%	2.78%	2.55%	0.27%	1.02%	0.65%
51	Information	-3.26%	-0.48%	-1.88%	-3.93%	-11.10%	-7.58%	2.83%	-2.52%	0.12%
52-53	Finance Activities	-0.33%	2.65%	1.15%	-1.66%	0.73%	-0.47%	1.22%	1.41%	1.32%
54-56	Profession and Business Services	1.10%	1.53%	1.32%	1.77%	1.90%	1.83%	0.00%	1.86%	0.92%
61-62	Educational, Health and Social Services	39.25%	6.37%	21.70%	5.67%	3.86%	4.76%	-2.62%	0.56%	-1.04%
71-72	Leisure and Hospitality	0.87%	3.59%	2.22%	2.66%	3.14%	2.90%	-0.64%	3.38%	1.35%
81	Other Services	-33.34%	1.80%	-17.62%	-9.26%	-5.42%	-7.36%	5.82%	1.27%	3.52%
99	Unclassified	2.07%	-70.90%	-45.50%	7.31%	-73.40%	-46.58%	-1.66%	-4.17%	-2.92%
SJVAPCD Total/Average		-0.42%	3.53%	1.54%	1.98%	1.85%	1.91%	0.21%	1.33%	0.77%

Source: BLS, 2020.

Notes:

[a] Includes all of Kern County.

3.3. IMPACTS OF THE COVID-19 PANDEMIC

The potential amendments to Rule 4702 would primarily impacts the agricultural sector, which has seen large-scale negative impacts across the entire U.S. due to the COVID-19 pandemic. The pandemic has caused multiple disruptions to the established agricultural supply chain. Widespread shutdowns of in-person business operations, especially of processing plants, restaurants, and schools, resulted in multiple challenges to agriculture. The closure of processing plants, either as a preventative measure or due to workers testing positive for COVID-19, also slowed the production process (Penson, 2020). This results in a mismatch of supply to meet demand for food, while farmers bear lost profitability because their produce is not being processed.

The near total closure of restaurants, bars, and wineries in the spring of 2020 resulted in a significant disruption to how and where people buy their food from. Visits to sit-down restaurants nosedived right after the federal government declared a state of emergency on March 13, 2020. Visits to these restaurants had started to recover slightly, but were nowhere near 2019 levels (Penson, 2020) before the regional stay and home order announced December 3, 2020 (COVID19.ca.gov, 2020).

Given California's disproportionately large percentage of domestic wine production, the closing of wineries was a huge economic loss for the state (ERA Economics, 2020). As a result, it is expected that the price of wine grapes will remain low with wineries shifting impacts onto producers. Stops at supermarkets spiked in mid-March, but then fell below 2019 levels, likely a result of both the general public's reduced spending capacity and the concern of contracting COVID-19 in heavily trafficked places. Both of these factors also play a role in the shift in consumer preference to more shelf-stable food items as opposed to produce (ERA Economics, 2020). California's table grape market also saw depressed prices throughout the summer of 2020 as a result of this shift in consumer demand. School closures also resulted in a reconfiguring of where children get at least some of their meals, since schools provide large amounts of food to children across the United States (Ledbetter, 2020).

This shift in consumer demand has also resulted in logistical complications for the agricultural sector. Shipping and production costs have increased, cutting deeper into the margins for agricultural business (Penson, 2020). The closure of production plants has stalled produce from reaching supermarkets and dining room tables. Even when production plants are not closed, the process is slowed due to required spacing between workers, mandatory sanitation efforts, and increased breaks for personal hygiene (ERA Economics, 2020). Port closures also slowed the distribution process, making international trade of food products, especially those that are perishable, a much less profitable endeavor. As an example, California's rice producers are heavily dependent on exporting. The export value for rice, according a summer 2020 study, was nearly 17 percent lower in March 2020 than it was a year prior (ERA Economics, 2020). Walnut producers in California will also likely face increased international competition, as global stocks of walnuts are expected to be plentiful given the complications associated with exporting. The lack of labor for farm work, transportation, and processing prevents the agricultural sector from meeting food demand as well. While immigrants are presently permitted entry into the United States for seasonal work in the agricultural sector, the risk of infection may be a deterrent to their traveling.

While it is expected that supply chain disruptions are resolved in the near term, the impacts to the agricultural sector caused by a contraction of consumer income will likely take longer to recover

SAN JOAQUIN VALLEY AIR POLLUTION CONTROL DISTRICT

Appendix D: Socioeconomic Analysis

July 20, 2021

from (Westhoff et al, 2020). Farm households will face losses not only from the reduced spending capacity of potential consumers, but also due to reduced off-farm income (USDA ERS, 2020). These households typically use their off-farm income to balance the losses from on-farm operations. With both reduced off-farm income and income from their agricultural products, farm households may not be able to fund some of the necessities of their on-farm operations, including production expenses and debt, as well as their own personal living expenses for day-to-day life.

While affected by the potential amendments to Rule 4702 to a much smaller extent than agriculture, some affected facilities are in the oil and gas sector. The pandemic resulted in the third oil price collapse that the oil and gas extraction industry has seen in just the last 12 years. This price shock, unlike the previous two, was swift, resulting in wide-ranging changes across the industry in a short period of time. Stay at home orders in California and around the world resulted in depressed demand for gas. Even as some of these restrictions have eased, a combination of job losses and remote work means that far fewer people are commuting. Travel for recreational activities is reduced as well, whether because facilities are closed or have restrictions in place or because people are reluctant to expose themselves to illness. Those who have lost their jobs as a result of the coronavirus are conscious of their expenses, including on travel.

The coronavirus-driven lack of demand coincided with a massive oversupply of oil that left the industry with very little storage space (Kasler, 2020). This combination of supply and demand mismatches resulted in an 87 percent drop in the Brent per-barrel price of oil from January to April of 2020 (McCarthy, 2020). Gas prices have also dropped nationwide. For instance, over a one-month period from late February to late March 2020, the price of gas dropped significantly across California, going from \$3.49 to \$3.20 statewide, while the prices in the metro areas of Fresno and Madera-Chowchilla both dropped from about \$3.33 to just under \$3.00 over that same timeframe (Sheehan, 2020). The average price of regular unleaded gasoline in California in late September 2020 (\$3.22) was about 70 cents cheaper than a year prior (\$3.95) (AAA, 2020). Fresno and Merced have seen similar changes to their average gas prices, albeit with slightly lower prices than the statewide average.

Oil and gas companies started to slow down production in response to demand changes. The number of rigs operating across the country has dropped by more than 70 percent since the end of August 2019 (Flores, 2020). California has seen a similar drop in rigs within the state, going from 18 rigs in operation in late August of 2019 to just four at the end of August 2020 (Baker Hughes, 2020). By and large, California's oil and gas production is centered in the San Joaquin Valley, with a majority of oil production in Kern County specifically. Before the pandemic began, nearly 10,000 people were employed within the oil and gas extraction industry in Kern County (Kasler, 2020). Rigs account for about 100 jobs each, which means that California's rig closures over the past year resulted in the loss of approximately 1,400 jobs.

The pandemic has also halted maintenance projects at refineries and pumps across the globe. With companies either shutdown or at limited working capacity, the supply of spare parts for repairs has dwindled. Maintenance workers are unable to conduct reviews of equipment. There will likely be a backlog of maintenance projects to attend to once all lockdowns are lifted, and companies will want to get as much maintenance work done as soon as possible given the lost production time (Yagova, George, and Sharafedin, 2020). Typically, companies perform maintenance inspections during lulls in

SAN JOAQUIN VALLEY AIR POLLUTION CONTROL DISTRICT

production. Instead, they will need to conduct these inspections when production should be picking up. This will further delay crude production, slowing the industry's ability to recover.

Unlike previous economic hits to the industry, oil and gas extraction will likely not recover quickly from this downturn. Where some industries are hoping for a "V-shaped" recovery, oil and gas extraction is more likely to recover in a "U-shaped," with a protracted downturn before recovery begins (Flores, 2020). The industry will likely be looking at flat or even decreased demand post-pandemic, with technology leading supply response instead of workers (Barbosa et al, 2020).

Some local government-operated facilities will also be affected by the potential amendments to Rule 4702. The public sector's outlook has also drastically changed due to the pandemic. State and local governments across the country are now experiencing significantly altered fiscal budgets. With the private sector struggling to attract business, the public sector has seen their projected budgets move into shortfall territory (McNichol & Leachman, 2020). The coronavirus-induced recession is estimated to cause greater budgetary shortfalls than the Great Recession of 2008. While the CARES Act granted state and local government federal aid to help offset these budgetary constraints, it is not enough. States in total also have about \$75 billion in 'rainy day' funds, but this also is not enough to weather the shortage of government revenues.

Tax revenues are expected to diminish as a result of the pandemic. Income taxes will decrease with greater unemployment (Sheiner & Campbell, 2020). Revenues from sales taxes have also decreased because of reduced spending on entertainment and travel. As a result, state and local officials have started cutting funding for numerous programs. According to analysis from the League of California Cities, no matter their size, the vast majority of cities will have to cut spending on their public services. Even spending on core services will be cut, with between 78 and 90 percent of cities cutting public safety budgets and 71 to 90 percent cutting housing budgets (League of California Cities, 2020).

Public sector employment was also cut as a result of the pandemic. While most job loss was focused on education in the public sector, local governments lost approximately 523,000 jobs in non-education related areas from March through May (NACo, 2020).

Because the COVID-19 pandemic has dramatically altered metrics used to estimate socioeconomic impacts, such as revenue and employment, ERG uses a "COVID-adjusted baseline" for these metrics, as discussed further in Section 4.1.2 below.

4. SOCIOECONOMIC IMPACT ANALYSIS

ERG calculated the direct impacts of the proposed rule amendments by comparing the costs of compliance to profits of affected facilities. ERG estimated potential employment impacts using IMPLAN's (2020a) input-output model. Additionally, ERG used the IMPLAN model to capture indirect and induced impacts (i.e., impacts that might arise if directly impacted entities reduce purchases from their suppliers and households adjust their spending as a result of changes in earnings).

4.1. DATA SOURCES AND METHODOLOGY

To estimate socioeconomic impacts, ERG compares the costs of compliance with the potential amendments with profits per facility. ERG sought to create a profile, including employment, revenue, profits, and average pay per employee, for each affected sector. The process of estimating each of these profile elements also requires other data to be used (e.g., facility name, address).

This section describes the data sources used to create the baseline industry profile, how this profile was adjusted to capture the impacts of the COVID-19 pandemic, and how socioeconomic impacts were estimated.

The sections that follow detail the resulting profile of affected entities and the socioeconomic impacts of compliance with the potential rule amendments.

4.1.1. Baseline Industry Profile Estimates

SJVAPCD (2020b) provided ERG with an initial list of affected facilities, including fields for facility ID, facility description, Standard Industrial Classification (SIC) code, number of emissions sources, and unit location.

ERG next identified additional data points for use in the analysis. For instance, SJVAPCD's (2020b) facility data includes a SIC code which ERG converted to the North American Industry Classification System (NAICS) codes. NAICS codes are used with other sources of economic data in the analysis based on a combination of U.S. Census Bureau (2020a) concordances.⁴ Where a SIC code could map to multiple NAICS codes, ERG used information on companies' websites or other search tools about what type of industry they are engaged in to assign a NAICS code. (See Appendix A for a list of the NAICS code(s) that mapped to each SIC code.)

Employment and revenue data for most private industries were drawn from the U.S. Census Bureau's (2020b) Economic Census, using 2017 data for California. Where data for certain industries

⁴ SIC codes were last updated in 1987, and NAICS codes were first issued in 1997. The U.S. Census Bureau's (2020a) concordances map 1987 SIC codes to 1997 NAICS codes, and from there to the NAICS codes that are revised every five years (thus far in 2002, 2007, 2012, and 2017). SIC and NAICS codes are available at different levels of granularity. The SIC codes used in SJVAPCD's (2020b) data are 4-digit SIC codes, and ERG mapped these to 4-digit NAICS codes.

SAN JOAQUIN VALLEY AIR POLLUTION CONTROL DISTRICT

were not available,⁵ ERG instead used estimates from the U.S. Census Bureau's (2015) Statistics of U.S. Businesses for 2012 for California.⁶

For the agricultural sector, revenue data are available in the United States Department of Agriculture (USDA) National Agricultural Statistics Service (NASS, 2019) Census of Agriculture for California for 2017. The NASS data include revenue by farm acreage and commodity, and ERG created a weighted average revenue for each agricultural NAICS code based on the distribution of farms by acreage and NAICS code in the data provided to ERG by the District on the acreage of the affected facilities.⁷ Agricultural employment data are drawn from the California Employment Development Department (CA EDD, 2020b) and are for California for 2017.

To estimate average payroll per employee, data for private entities by sector come from BLS' (2020) QCEW. For state and local government entities, data are from the U.S. Census Bureau's (2017a) State and Local Government Employment and Payroll and U.S. Census Bureau's (2017b) Government Units Survey. For federal entities, data are an Office of Personnel Management (OPM, 2017) estimate of the average base salary for full-time permanent employees.

ERG estimated profits for private industries by multiplying revenue figures by the average profit rate for each NAICS for 2010 through 2013 using data from the Internal Revenue Service (IRS, 2016) "SOI Tax Stats - Corporation Source Book." The profit rate was calculated as "Net Income (less deficit)" divided by "Total Receipts."⁸ (See Appendix B for profit rates by NAICS code.) For agricultural industries (which are not included in the IRS data at a granular level) ERG used data from the Risk Management Association's (RMA, 2020 Annual Statement Studies). The RMA studies are prepared standardized income statements from data submitted by individual enterprises to assess risk and evaluate financial performance relative to other enterprises in the same industry.

4.1.2. COVID-19-Adjusted Baseline Industry Profile Estimates

To reflect the impact of the COVID-19 pandemic, ERG estimates "COVID-adjusted" baseline, which alters employment, revenue, and payroll figures for each facility using IMPLAN (2020a) data. IMPLAN's "Evolving Economy" data use economic data points from the second quarter of 2020 to reflect the impacts on the pandemic, taking into account industry losses, shifts in household spending and behavior, stimulus checks and unemployment benefits, and Paycheck Protection Program (PPP) loans (Demski, 2020). IMPLAN uses only the second quarter 2020 data, adjusts it for seasonality, and annualizes the single quarter of data to represent an entire year. This annualization approach means that IMPLAN models 2020 as if the entire year had an economy like in the early stages of the pandemic,

⁵ U.S. Census (2020b) Economic Census data were not available for California for NAICS 1151 Support Activities for Crop Production, and 2212 Natural Gas Distribution.

⁶ U.S. Census Bureau (2020c) Statistics of U.S. Businesses estimates for 2017 that include state-level revenue data will not be released until January 2021.

⁷ The District's acreage estimates were drawn from data collected as part of the Conservation Management Practices (CMP) program and inspection reports. In cases where one farm has multiple emissions sources under different SIC codes, acreage for that farm was divided equally among the relevant codes.

⁸ 2013 is the most recent year for which profit rate data are available.

SAN JOAQUIN VALLEY AIR POLLUTION CONTROL DISTRICT

without the relatively normal first quarter of 2020 and without any level of recovery later in the year (Clouse, 2020).

While the IMPLAN data for 2020 reflect the impacts of the COVID-19 pandemic and government response, it is important to note that it does not *only* capture the impacts of the pandemic, as other factors may be driving changes between 2018 and 2020 (Clouse, 2020).

Using outputs of the IMPLAN model, ERG estimates the percentage change in employment, revenue, and payroll by NAICS between 2018 (the second-most recent year for which data are available) and 2020 (the “Evolving Economy” dataset, the most recent estimate). District-wide, this approach suggests that revenue contracted by 8 percent, and employment contracted by 9.8 percent (see Table 9).

Table 9. District-Wide COVID-19 Impacts

	2018	2020 Q2 [a]	% Change
Revenue	\$333.1 billion	\$306.5 billion	-8.0%
Employment	2.0 million	1.8 million	-9.8%

Source: IMPLAN, 2020a.

Note:

[a] Data are modeled for an entire year as if it were like the second quarter of 2020 (i.e., the early stage of the pandemic.)

To estimate the impacts of the COVID-19 pandemic on individual industries, ERG multiplies the percentage change from 2018 to the second quarter of 2020 in the IMPLAN model by the baseline data to produce “COVID-adjusted” estimates for each NAICS code (which was then mapped onto SIC codes for use in conjunction with the cost data provided by SJVAPCD (2020c)). In most industries, this results in decreased revenue and employment, but *increased* average payroll per employee, reflecting the fact that more workers in lower-paid occupations have been laid off than workers in higher-paid administrative and executive occupations (Clouse, 2020).

The agricultural sector saw a decrease in revenue and employment between 2018 and the second quarter of 2020, with revenue down between 14.7 and 17.5 percent and employment down between 12.7 and 14.9 percent (depending on the NAICS industry). Related industries, such as NAICS 1151 Support Activities for Crop Production also saw decreases in this period (a 32.2 percent decrease in revenue and 13.9 percent decrease in employment).

While the pattern of economic recovery from the effects of the COVID-19 pandemic is unknown, many sectors may have fully or partially recovered by the time compliance with the potential rule amendments is required at the end of 2023 or 2029. To capture this, while the primary analysis includes the worst-case scenario of no recovery, ERG also performed three sensitivity analyses assuming 30 percent, 70 percent, or 100 percent recovery (i.e., return to the 2018 baseline) (see the results presented in Section 4.4.3).

See Appendix C for detail on the revenue, employment, and payroll adjustments for the sectors affected by the potential amendments.

4.1.3. Estimating Impacts on Affected Entities

Cost estimates (i.e., the direct cost of the potential rule amendments by SIC code) were provided to ERG by the District (SJVAPCD, 2020c). Total costs were calculated by summing the one-time capital costs (annualized over a 10-year period using a 10 percent discount rate) and ongoing annual costs. (Note that this approach does not account for the fact that costs will not be incurred for several years, thus resulting in greater cost and impacts estimates than an approach that takes into account the time value of money.)

To estimate impacts, the direct costs of the rule (i.e., the cost of compliance with the rule) are compared to profits for each SIC code (with data for each SIC code including one or more NAICS codes).

To estimate both direct employment impacts of the potential rule amendments and indirect and induced effects, ERG used IMPLAN's (2020a) input-output model. IMPLAN "is a regional economic analysis software application that is designed to estimate the impact or ripple effect (specifically backward linkages) of a given economic activity within a specific geographic area through the implementation of its Input-Output model" (IMPLAN Group LLC, 2020b).

Based on the costs to affected facilities, the IMPLAN model estimates how many jobs might be lost in reaction to the costs to affected firms. It also estimates indirect costs (i.e., the impact to affected firms' suppliers when the direct cost of rule compliance causes affected firms to reduce their purchases from those companies) and induced impacts (i.e., how households that have lost income in turn adjust their purchases).

4.1.4. Aggregating to the Sector Level

While the inputs to the analysis are estimated on a NAICS code or SIC code basis, the results are presented with those more granular industries aggregated into a smaller number of sectors:

- Agriculture
- Oil and Gas Production
- Scrap and Waste Materials
- Water Supply and Storage
- Wastewater Treatment

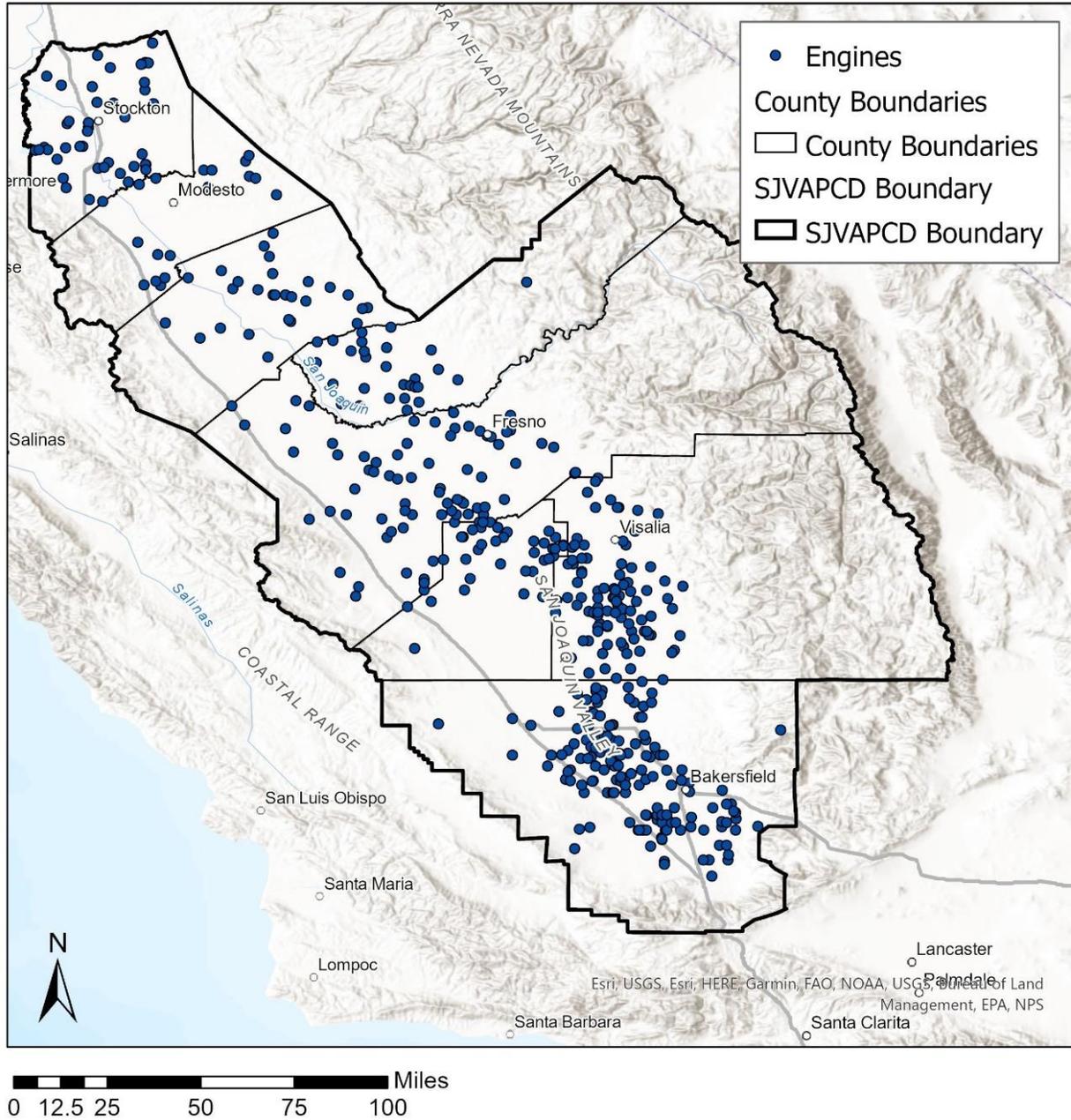
These SIC code to sector mappings were developed by ERG and SJVAPCD (2020d). See Appendix A for a concordance between SIC codes and sectors.

4.2. PROFILE OF AFFECTED ENTITIES

Figure 2 shows the facilities operating internal combustion engines in the District. The map was created by ERG using ArcGIS Pro 2.6.0 to geocode the affected facilities. Out of the 649 total facilities (which may or may not have costs under the potential amendments to Rule 4702), 534 were mapped while the remaining facilities did not have sufficient information to be displayed.

SAN JOAQUIN VALLEY AIR POLLUTION CONTROL DISTRICT

Figure 2. Map of Facilities Operating Internal Combustion Engines



Source data: SJVAPCD, 2020b; CARB, 2020; ERG estimates.
Map created by ERG using ArcGIS® software by Esri

SAN JOAQUIN VALLEY AIR POLLUTION CONTROL DISTRICT

Table 10 includes a profile of facilities affected by the potential amendments to Rule 4702 (i.e., those that will incur compliance costs). There are 143 facilities required to comply by the end of 2023 and 66 required to comply by the end of 2029, for a total of 209 facilities (assuming no overlap between those complying by 2023 and those complying by 2029).

Table 10. Profile of Facilities Affected by Potential Amendments to Rule 4702—Internal Combustion Engines

Sector	Total Facilities	2023		2029		Total		
		Affected Facilities	% Affected	Affected Facilities	% Affected	Emp-loyees	Revenue	Profits
Agriculture	560	137	24.5%	66	11.8%	545	\$306,012,976	\$13,709,082
Oil and Gas Production	8	2	25.0%	0	0.0%	86	\$146,309,732	\$10,722,889
Scrap and Waste Materials	2	1	50.0%	0	0.0%	20	\$4,269,806	\$148,324
Water Supply and Storage [a]	17	2	11.8%	0	0.0%	107	\$474,087,512	—
Wastewater Treatment [a]	4	1	25.0%	0	0.0%	54	\$237,043,756	—
Other Industries	58	0	0.0%	0	0.0%	N/A	N/A	N/A
Total	649	143	22.0%	66	10.2%	813	\$1,167,723,782	\$24,580,295

Sources: ERG estimates based on SJVAPCD, 2020b; U.S. Census Bureau, 2017a; U.S. Census Bureau, 2017b; U.S. Census Bureau, 2020a; U.S. Census Bureau, 2020b; U.S. Census Bureau, 2020c; BLS, 2020; OPM, 2017; IRS, 2016; RMA, 2020; IMPLAN, 2020a.

Note:

[a] The "Water Supply and Storage" and "Wastewater Treatment" sectors are composed of government agencies, so profit values are not shown here.

Table 11 shows the characteristics of the average facility affected by the potential amendments to Rule 4702. (The exact characteristics of individual facilities could be either higher or lower than these average estimates.)

Table 11. Characteristics of Average Facilities Affected by Potential Amendments to Rule 4702—Internal Combustion Engines

Sector	Average per Facility			Average Annual Pay per Employee
	Employees	Revenue	Profits	
Agriculture	3	\$1,507,453	\$67,532	\$41,633
Oil and Gas Production	43	\$73,154,866	\$5,361,445	\$38,934
Scrap and Waste Materials	20	\$4,269,806	\$148,324	\$54,159
Water Supply and Storage [a]	54	\$237,043,756	—	\$23,376
Wastewater Treatment [a]	54	\$237,043,756	—	\$23,376
Average	4	\$5,587,195	\$117,609	\$38,040

Sources: ERG estimates based on SJVAPCD, 2020b; U.S. Census Bureau, 2017a; U.S. Census Bureau, 2017b; U.S. Census Bureau, 2020a; U.S. Census Bureau, 2020b; U.S. Census Bureau, 2020c; BLS, 2020; OPM, 2017; IRS, 2016; RMA, 2020; IMPLAN, 2020a.

Note:

[a] The "Water Supply and Storage" and "Wastewater Treatment" sectors are composed of government agencies, so profit values are not shown here.

4.3. COMPLIANCE COST ESTIMATES

Compliance costs were estimated by SJVAPCD (2020c), and include:

- One-time costs for units replaced or retrofitted by December 31, 2023.

SAN JOAQUIN VALLEY AIR POLLUTION CONTROL DISTRICT

- One-time costs for units replaced or retrofit by December 31, 2029.
- Annual operating and maintenance (O&M) costs for the units replaced or retrofit in 2023, beginning in 2023 and continuing indefinitely.
- Annual O&M costs (or cost savings) for the units replaced or retrofit in 2029, beginning in 2029 and continuing indefinitely.

The December 31, 2023 compliance date applies to (SJVAPCD, 2020a):

- Non-agricultural rich-burn engines
- Non-agricultural lean-burn engines
- Agricultural rich-burn engines

The December 31, 2029 compliance date applies to (SJVAPCD, 2020a):

- Agricultural lean-burn engines

Total costs are calculated by annualizing the one-time retrofit costs that will be incurred in either 2023 or 2029 over a 10-year period using a 10 percent interest rate, and then summing annualized one-time costs and annualized costs to yield the total.⁹

Table 12 shows the one-time, annual, and total annualized costs incurred by sector. Costs would total **\$1.1 million**, with cost primarily incurred by facilities in the “Agriculture” sector.

Table 12. Costs of Compliance with Potential Amendments to Rule 4702—Internal Combustion Engines

Sector	Retrofit Capital Costs [a]		Retrofit O&M Costs [b]		Total Annualized Costs [c]
	One-Time		Annual		Annualized One-Time + Annual
	2023	2029	2023+	2029+	—
Agriculture	\$2,438,681	\$723,445	\$239,040	\$288,903	\$1,042,564
Oil and Gas Production	\$397,372	\$0	\$3,790	\$0	\$68,460
Scrap and Waste Materials	\$22,930	\$0	\$0	\$0	\$3,732
Water Supply and Storage	\$24,977	\$0	\$1,440	\$0	\$5,505
Wastewater Treatment	\$78,630	\$0	\$0	\$0	\$12,797
Total	\$2,962,590	\$723,445	\$244,270	\$288,903	\$1,133,058

Source: SJVAPCD, 2020c.

- [a] Includes one-time capital costs for retrofit or replacement (with compliance for non-agricultural engines and agricultural rich-burn engines by the end of 2023 and agricultural lean-burn engines by the end of 2029).
- [b] Includes the costs to operate and maintain the retrofit/replaced unit.
- [c] The total annualized cost is calculated by summing annualized one-time costs (annualized over a 10-year period using a 10 percent discount rate) and annual costs.

⁹ Note that this is a conservative cost estimate in the sense that costs that will not be incurred until 2023 or 2029 are not discounted to account for the time value of money.

4.4. IMPACTS ON AFFECTED ENTITIES

This section first discusses our primary impacts test, which compares compliance costs to profits for affected facilities. ERG then discusses indirect and induced impacts to related industries, and the results of sensitivity analyses that examine results under varying degrees of economic recovery from the COVID-19 pandemic.

4.4.1. Direct Impacts

One possible metric for determining economic feasibility is a comparison of total annualized costs to profits for affected facilities, with a threshold of 10 percent of profits indicating a finding of a finding of significant adverse impact (Berck, 1995). Therefore, ERG uses this comparison to aid in the District’s determination of economic feasibility of the rule amendments.

Table 13 shows the impacts of the rule by sector, which are **4.61 percent** for all affected sectors and **7.60 percent** for the “Agriculture” sector. No sector would be affected at a significant level.

Table 13. Economic Impacts for Entities Affected by Potential Amendments to Rule 4702—Internal Combustion Engines

Sector	Average Annualized Cost per Facility	Average Profits per Firm	Cost as % Profits
Agriculture	\$5,136	\$67,532	7.60%
Oil and Gas Production	\$34,230	\$5,361,445	0.64%
Scrap and Waste Materials	\$3,732	\$148,324	2.52%
Water Supply and Storage [a]	\$2,752	—	—
Wastewater Treatment [a]	\$12,797	—	—
Average	\$5,421	\$117,609	4.61%

Sources: ERG estimates based on SJVAPCD, 2020b; SJVAPCD, 2020c; U.S. Census Bureau, 2017a; U.S. Census Bureau, 2017b; U.S. Census Bureau, 2020a; U.S. Census Bureau, 2020b; U.S. Census Bureau, 2020c; BLS, 2020; OPM, 2017; IRS, 2016; RMA, 2020; IMPLAN, 2020a.

Note:

[a] The "Water Supply and Storage" and "Wastewater Treatment" sectors are composed of government agencies, so profit values are not shown here.

4.4.2. Employment, Indirect and Induced Impacts

In addition to the primary metric for estimating direct impacts on revenue (i.e., costs), ERG also assessed potential direct impacts on employment, indirect impacts, and induced impacts using IMPLAN’s (2020a) input-output model. The IMPLAN model uses the direct costs of the rule to estimate “ripple effect (specifically backward linkages) of a given economic activity within a specific geographic area through the implementation of its Input-Output model” (IMPLAN, 2020b).

Outputs from the IMPLAN model include:

- **Direct employment impacts** caused if facilities with compliance costs under the potential amendments were to attempt to offset these costs by reducing the number of employees.

SAN JOAQUIN VALLEY AIR POLLUTION CONTROL DISTRICT

- **Indirect revenue and employment impacts** that capture how directly affected firms might react to the direct cost of rule compliance by reducing purchases from their suppliers, and how those suppliers might in turn reduce employees.
- **Induced revenue and employment impacts** that capture how households will adjust their spending as a result of any changes in earnings.

Table 14 summarizes these impacts, which, taken together, could have a total impact on the District economy of **\$1.3 million** and **13 jobs**.

Table 14. Direct, Indirect, and Induced Impacts of Potential Amendments to Rule 4702—Internal Combustion Engines

Sector	Direct		Indirect		Induced		Total	
	Revenue (Costs)	Employment	Revenue	Employment	Revenue	Employment	Revenue	Employment
Agriculture	\$1,042,564	11.95	\$19,281	0.12	\$2,262	0.01	\$1,064,107	12.08
Oil and Gas Production	\$68,460	0.09	\$1,509	0.00	\$398	0.00	\$70,367	0.09
Scrap and Waste Materials	\$3,732	0.02	\$764	0.00	\$827	0.00	\$5,322	0.02
Water Supply and Storage	\$5,505	0.02	\$903	0.00	\$476	0.00	\$6,884	0.02
Wastewater Treatment	\$12,797	0.04	\$860	0.00	\$366	0.00	\$14,023	0.05
Other Industries	\$0	0.00	\$85,877	0.17	\$68,570	0.42	\$154,446	0.58
Total	\$1,133,058	12.11	\$109,193	0.30	\$72,898	0.43	\$1,315,150	12.85

Sources: ERG estimates based on SJVAPCD, 2020b; SJVAPCD, 2020c; U.S. Census Bureau, 2017a; U.S. Census Bureau, 2017b; U.S. Census Bureau, 2020a; U.S. Census Bureau, 2020b; U.S. Census Bureau, 2020c; BLS, 2020; OPM, 2017; IRS, 2016; RMA, 2020; IMPLAN, 2020a.

Note: Fractional employees are shown here to show how the total is derived from the direct, indirect, and induced impacts; these may represent a reduction in average hours worked.

Table 15 compares these impacts to the total size of the District’s economy (as estimated in the IMPLAN model). These impacts represent **less than 0.001 percent** of revenue and employment District-wide.

Table 15. Comparison of Total Impacts against the District-Wide Economy

	Total Rule Impacts	District-Wide [a]	% of District-Wide
Revenue	\$1,315,150	\$306,518,988,618	0.0004%
Employment	13	1,806,161	0.0007%

Source: ERG estimates based on IMPLAN, 2020a.

Note:

[a] While the SJVAPCD only includes a portion of Kern County, the data shown here include the whole of the county.

4.4.3. COVID-19 Sensitivity Analysis

As discussed in Section 4.1.2, the primary estimates used in this analysis reflect a “COVID-19-adjusted baseline” where the baseline economic indicators are adjusted using the percentage change between IMPLAN’s (2020a) 2018 and second quarter of 2020 “Evolving Economy” model. ERG also

SAN JOAQUIN VALLEY AIR POLLUTION CONTROL DISTRICT

conducted three sensitivity analyses that capture varying degrees of economic recovery from the pandemic (i.e., 30 percent, 70 percent, 100 percent).

Table 16 shows how the results of the analysis would vary under these three degrees of economic recovery. Direct costs would represent a smaller percentage of profits (i.e., economic impacts would be lower) under the recovery scenarios, as the agricultural industry's revenue recovers from the effects of the COVID-19 pandemic.

Induced impacts also increase slightly with greater COVID-19 recovery, likely because IMPLAN's (2020a) 2020 model takes into account changes in household income and spending patterns (including stimulus checks, unemployment checks, and increased saving) that is removed in the recovery scenarios.

SAN JOAQUIN VALLEY AIR POLLUTION CONTROL DISTRICT

Appendix D: Socioeconomic Analysis

July 20, 2021

Table 16. Results of COVID-19 Sensitivity Analyses for the Impacts of Rule 4702—Internal Combustion Engines

Analysis	Recovery from COVID-19 Baseline	Direct			Indirect		Induced		Total	
		Revenue (Costs)	Costs % Profits	Employment	Revenue	Employment	Revenue	Employment	Revenue	Employment
Primary Estimate	0%	\$1,133,058	4.61%	12	\$109,193	0.3	\$72,898	0.4	\$1,315,150	13
Sensitivity Analysis 1	30%	\$1,133,058	2.24%	12	\$108,842	0.3	\$73,678	0.4	\$1,315,578	12
Sensitivity Analysis 2	70%	\$1,133,058	2.28%	11	\$108,374	0.3	\$74,718	0.5	\$1,316,150	12
Sensitivity Analysis 3	100%	\$1,133,058	2.31%	11	\$108,023	0.3	\$75,498	0.5	\$1,316,579	11

Sources: ERG estimates based on SJVAPCD, 2020b; SJVAPCD, 2020c; U.S. Census Bureau, 2017a; U.S. Census Bureau, 2017b; U.S. Census Bureau, 2020a; U.S. Census Bureau, 2020b; U.S. Census Bureau, 2020c; BLS, 2020; OPM, 2017; IRS, 2016; RMA, 2020; IMPLAN, 2020a.

4.5. IMPACTS ON SMALL ENTITIES

The entities affected by the potential amendments may include small entities (i.e., small businesses and/or small government entities).

For private entities, small businesses are defined in the California Small Business Procurement and Contract Act (Cal. Gov't Code § 14837) as an independently owned and operated, non-dominant business with principal office located in California with fewer than 100 employees and earning less than \$15 million in revenues.

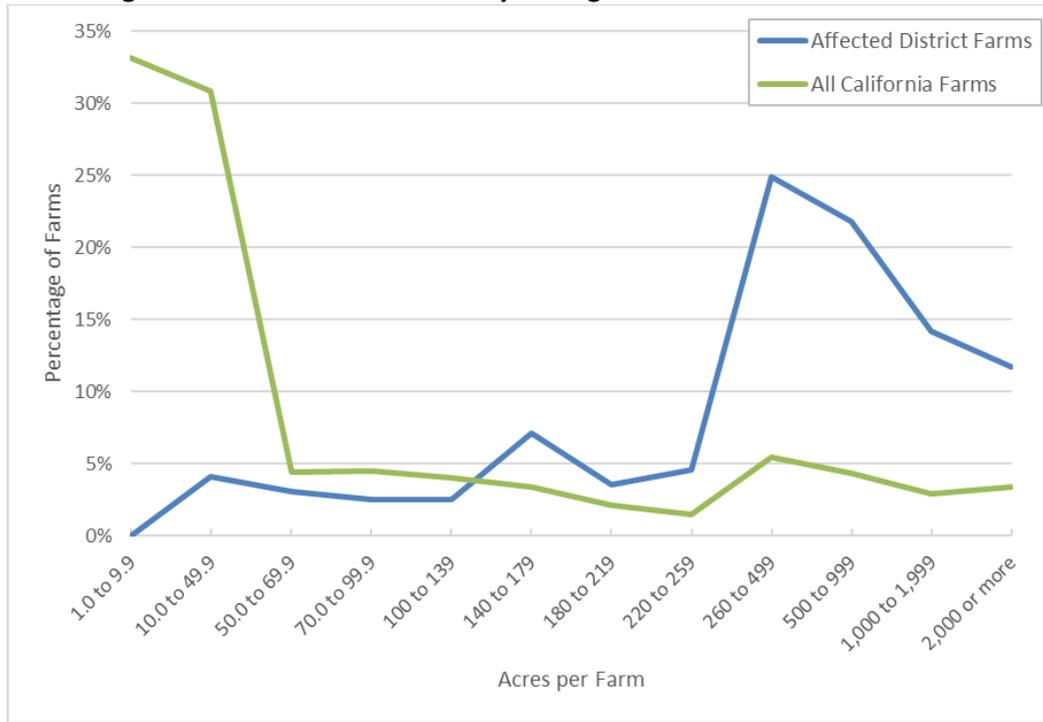
For government entities, the Regulatory Flexibility Act definition is that "a small governmental jurisdiction is a government of a city, county, town, township, village, school district, or special district with a population of less than 50,000."

Because ERG did not estimate costs on a facility-specific basis, it is not possible to identify whether any small entities are among the facilities that will incur costs under the potential rule. To the extent that small entities face similar costs to large entities but have lower profits, compliance costs will make up a greater proportion of their profits.

For engines operated by facilities in the Agriculture sector, data provided to ERG by the District on the acreage of affected farms suggests that those affected facilities in the District are larger, in terms of acreage, than farms in California as a whole (see

Figure 3; USDA NASS (2019) Census of Agriculture for California for 2017). To the extent that revenue is a function of acreage for many commodities, the affected farms are thus likely to have higher revenues than the average farm in California.

Figure 3. Distribution of Farms by Acreage in California and the District



Outside the agricultural sector, affected private sector industries include Oil and Gas Production and Scrap and Waste Materials. As noted in Table 11 above, the average facility in each of these sectors has average revenues of \$73.2 million and \$4.3 million, respectively (although individual affected facilities may have higher or lower revenues than the average for the sector overall).

4.6. IMPACTS ON AT-RISK POPULATIONS

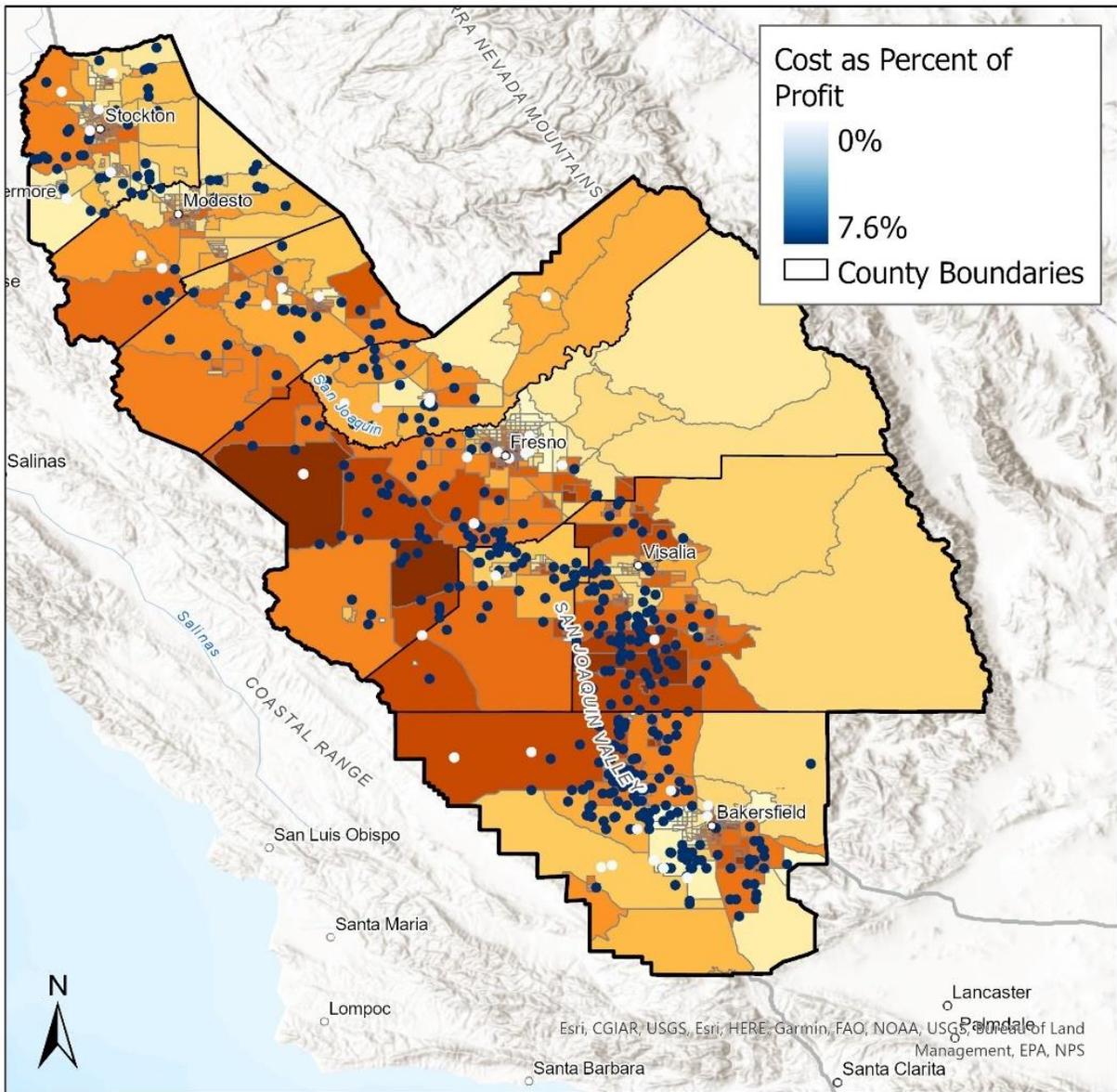
Cal. Gov't Code § 65040.12 defines environmental justice as “the fair treatment of people of all races, cultures, and incomes with respect to the development, adoption, implementation, and enforcement of environmental laws, regulations, and policies.”

The entities affected by the potential amendments may operate facilities in areas with a high number of at-risk populations. To help further the District’s environmental justice goals, ERG overlaid data on the impacts of the rule with data on poverty using data from CalEnviroScreen 3.0 (OEHHA, 2018). (Note that not every facility in a given industry will necessarily be impacted by the rule, but this analysis does not include an assessment of impacts on individual facilities.)

Figure 4 presents the percent of the population living below two times the poverty rate overlaid with potentially affected facilities. The majority of facilities are agricultural and are located on the outskirts or outside of major population centers. Facilities are more heavily concentrated in the southern half of the District in Tulare, Kern and Fresno counties. There is no correlation between percent of poverty and number of facilities. However (as noted in Section 3.1 above), Kern and Tulare counties have seen less growth in median income and smaller rates of poverty decline compared to other counties in the District.

SAN JOAQUIN VALLEY AIR POLLUTION CONTROL DISTRICT

Figure 4. Map of Affected Facilities in Relation to Population Living in Poverty



Source data: SJVAPCD, 2020b; CARB, 2020; ERG estimates; OEHHA, 2018
Map created by ERG using ArcGIS® software by Esri

SAN JOAQUIN VALLEY AIR POLLUTION CONTROL DISTRICT

REFERENCES

- Abood, M. (2014). San Joaquin Valley Fair Housing and Equity Assessment. Available at <https://www.frbsf.org/community-development/files/SJV-Fair-Housing-and-Equity-Assessment.pdf> (Accessed November 10, 2020)
- American Automobile Association (AAA). (2020). California Average Gas Prices. Available at <https://gasprices.aaa.com/?state=CA> (Accessed September 28, 2020)
- Baker Hughes. (2020). North America Rotary Rig Count (Jan 2000 - Current). Available at <https://rigcount.bakerhughes.com/na-rig-count> (Accessed September 28, 2020)
- Barbosa, F., Bresciani, G., Graham, P., Nyquist, S., and Yanosek, K. (2020). Oil and gas after COVID-19: The day of reckoning or a new age of opportunity? Available at <https://www.mckinsey.com/industries/oil-and-gas/our-insights/oil-and-gas-after-covid-19-the-day-of-reckoning-or-a-new-age-of-opportunity> (Accessed September 28, 2020)
- Berck, P. (1995). Development of a Methodology to Assess the Economic Impact Required by SB 513/AB 969. Available at <https://ww2.arb.ca.gov/sites/default/files/classic//research/apr/past/93-314.pdf> (Accessed September 23, 2020)
- Bureau of Economic Analysis (BEA). (2020). Table 1.1.9. Implicit price deflators for Gross Domestic Product. March 26, 2020. Available at <https://apps.bea.gov/iTable/iTable.cfm?reqid=19&step=2#reqid=19&step=2&isuri=1&1921=survey> (Accessed November 16, 2020)
- Bureau of Labor Statistics (BLS). (2020). Quarterly Census of Employment and Wages (QCEW). Available at <https://www.bls.gov/cew/downloadable-data-files.htm> (Accessed September 17, 2020)
- Cal. Gov't Code § 65040.12. Available at <https://codes.findlaw.com/ca/government-code/gov-sect-65040-12.html> (Accessed September 24, 2020)
- California Air Resources Board (CARB). (2020). Facility Search. Available at <https://www.arb.ca.gov/app/emsinv/facinfo/facinfo.php?dd=> (Accessed September 3, 2020)
- California Central Valley Economic Development Corporation (CCVEDC). (2020). Incentives. Available at <https://centralcalifornia.org/our-services/incentives/> (Accessed September 24, 2020)
- California Code, Health and Safety Code - HSC §40728.5. Available at https://leginfo.legislature.ca.gov/faces/codes_displayText.xhtml?lawCode=HSC&division=26.&title=&part=3.&chapter=6.5.&article= (Accessed September 24, 2020)
- California Employment Development Department (CA EDD). (2020b). Agricultural Employment in California. Available at <https://www.labormarketinfo.edd.ca.gov/data/ca-agriculture.html> (Accessed September 16, 2020)

SAN JOAQUIN VALLEY AIR POLLUTION CONTROL DISTRICT

Appendix D: Socioeconomic Analysis

July 20, 2021

- California Employment Development Department (CAEDD). (2020a). Local Area Unemployment Statistics (LAUS), Annual Average. Available at <https://data.edd.ca.gov/Labor-Force-and-Unemployment-Rates/Local-Area-Unemployment-Statistics-LAUS-Annual-Ave/7jbb-3rb8> (Accessed August 31, 2020)
- California Office of Environmental Health Hazard Assessment (OEHHA). (2017). CalEnviroScreen 3.0. Update to the California Communities Environmental Health Screening Tool. January 2017. Available at <https://oehha.ca.gov/media/downloads/calenviroscreen/report/ces3report.pdf> (Accessed November 10, 2020)
- California Office of Environmental Health Hazard Assessment (OEHHA). (2018). CalEnviroScreen 3.0 (updated June 2018). Available at <https://oehha.ca.gov/calenviroscreen/maps-data> (Accessed September 3, 2020)
- California Small Business Procurement and Contract Act (Cal. Gov't Code § 14837). Available at https://leginfo.ca.gov/faces/codes_displaySection.xhtml?sectionNum=14837.&lawCode=GOV (Accessed September 17, 2020)
- Clouse, C. (2020). Using the Evolving Economy - COVID 2020 Q2 Data. IMPLAN Support Site, IMPLAN Group, LLC.
- COVID19.ca.gov. (2020). Stay Home Order. Available at <https://covid19.ca.gov/stay-home-except-for-essential-needs/#rsho-qas> (Accessed December 7, 2020)
- Demski, J. (2020). Modeling the Impact of the Coronavirus with Evolving Economy Data. IMPLAN Blog, IMPLAN Group, LLC. September 28, 2020.
- ERA Economics LLC. (2020). Economic Impacts of the COVID-19 Pandemic on California Agriculture. Available at https://www.cfbf.com/wp-content/uploads/2020/06/COVID19_AgImpacts.pdf (Accessed September 28, 2020)
- Flores, J. (2020). Nowhere to labor: The US oil industry, sapped by COVID-19, has lost hundreds of rigs in a 'historic and troubling' year. Available at <https://www.usatoday.com/story/news/nation/2020/09/07/covid-19-us-oil-industry-wyoming-texas-baker-hughes/5735992002/> (Accessed September 28, 2020)
- IMPLAN Group LLC. (2020a). Evolving Economy - COVID Q2-2020. Huntersville, NC. Available at <https://www.implan.com/> (Accessed September 29, 2020)
- IMPLAN Group LLC. (2020b). IMPLAN Citation Guidelines. Available at <https://implan.com/citation-guidelines/> (Accessed October 1, 2020)
- IMPLAN Group LLC. (2020c). Email to Eastern Research Group, Inc. (ERG) Re. Growth in the Oil and Gas Industry. November 16, 2020.
- Internal Revenue Service (IRS). (2016). SOI Tax Stats - Corporation Source Book- Data File. . Available at <https://www.irs.gov/statistics/soi-tax-stats-corporation-source-book-data-file> (Accessed April 25, 2016)

SAN JOAQUIN VALLEY AIR POLLUTION CONTROL DISTRICT

Appendix D: Socioeconomic Analysis

July 20, 2021

- Kasler, D. (2020). COVID-19 shutdown is crushing oil prices. Why this part of California isn't celebrating. Available at <https://www.sacbee.com/article242153486.html> (Accessed September 28, 2020)
- League of California Cities. (2020). COVID-19: Fiscal Impact on California Cities. Available at <https://www.cacities.org/Images/COVID19-Fiscal-Impact-on-CA-Cities-Infographic-FIN.aspx> (Accessed October 13, 2020)
- Ledbetter, K. (2020). Study: COVID-19 Economic Impact \$2.5 Trillion Loss in Goods, Services. Available at <https://www.agweb.com/article/study-covid-19-economic-impact-25-trillion-loss-goods-services> (Accessed September 28, 2020)
- Lillis, R. (2019). On the rise? The Central Valley is beating the Bay Area and L.A. in key measures Available at <https://www.sacbee.com/news/california/big-valley/article223896300.html> (Accessed September 24, 2020)
- McCarthy, K. (2020). Oil & Gas: The Impact of COVID-19 and Oil Price Declines on Oil Sensitive Office Markets. Available at <https://www.cushmanwakefield.com/en/insights/covid-19/oil-and-gas-impact-on-commercial-real-estate> (Accessed September 28, 2020)
- McNichol, E. & Leachman, M. (2020). States Continue to Face Large Shortfalls Due to COVID-19 Effects. Available at <https://www.cbpp.org/research/state-budget-and-tax/states-continue-to-face-large-shortfalls-due-to-covid-19-effects> (Accessed September 28, 2020)
- National Association of Counties (NACo). (2020). Analysis of May Jobs Report and COVID-19 Impact on Local Government Job Loss. Available at <https://www.naco.org/resources/analysis-may-jobs-report-and-covid-19-impact-local-government-jobs> (Accessed September 28, 2020)
- Office of Personnel Management (OPM). (2017). Profile of Federal Civilian Non-Postal Employees- September 30, 2017. Available at <https://www.opm.gov/policy-data-oversight/data-analysis-documentation/federal-employment-reports/reports-publications/profile-of-federal-civilian-non-postal-employees/> (Accessed September 21, 2020)
- Penson, J. (2020). The Economic Impact of COVID-19 on U.S. Agriculture. Available at <https://agamerica.com/wp-content/uploads/2020/05/the-economic-impact-of-covid19-on-us-agriculture-whitepaper.pdf> (Accessed September 28, 2020)
- Risk Management Association (RMA). (2020). Annual Statement Studies. Available at <https://www.rmahq.org/annual-statement-studies/> (Accessed October 13, 2020)
- San Joaquin Valley Air Pollution Control District (SJVAPCD). (2013). Rule 4702 Internal Combustion Engines (Adopted August 21, 2003; Amended June 16, 2005; Amended April 20, 2006; Amended January 18, 2007; Amended August 18, 2011; Amended November 14, 2013) . Available at https://www.valleyair.org/rules/currentrules/R4702_Clean.pdf (Accessed September 23, 2020)
- San Joaquin Valley Air Pollution Control District (SJVAPCD). (2020a). District Rule 4702 (Internal Combustion Engines). Presentation November 19, 2020. Available at

SAN JOAQUIN VALLEY AIR POLLUTION CONTROL DISTRICT

Appendix D: Socioeconomic Analysis

July 20, 2021

https://www.valleyair.org/Workshops/postings/2020/11-19-20_rules/presentation.pdf
(Accessed November 30, 2020)

San Joaquin Valley Air Pollution Control District (SJVAPCD). (2020b). Facility Data Prepared for Eastern Research Group, Inc. (ERG). May 2020.

San Joaquin Valley Air Pollution Control District (SJVAPCD). (2020c). Cost Data Prepared for Eastern Research Group, Inc. (ERG). September 2020.

San Joaquin Valley Air Pollution Control District (SJVAPCD). (2020d). SIC Industry Groupings.

Sheehan, T. (2020). Gas prices plummet in Fresno, Valley as coronavirus sinks global demand for oil. Available at <https://www.fresnobee.com/news/business/article241438721.html> (Accessed September 28, 2020)

Sheiner, L. & Campbell, S. (2020). How much is COVID-19 hurting state and local revenues? Available at <https://www.brookings.edu/blog/up-front/2020/09/24/how-much-is-covid-19-hurting-state-and-local-revenues/> (Accessed September 28, 2020)

U.S. Census Bureau. (2015). Statistics of U.S. Businesses - 2012 - States, 6-digit NAICS. Available at <https://www.census.gov/programs-surveys/susb/data/datasets.2012.html> (Accessed December 1, 2015)

U.S. Census Bureau. (2017a). State and local government employment and payroll data: March 2017. Available at <https://www.census.gov/programs-surveys/cog/data/tables.All.html> (Accessed July 7, 2020)

U.S. Census Bureau. (2017b). Government Units Survey. Available at <https://www.census.gov/data/datasets/2017/econ/gus/public-use-files.html> (Accessed July 6, 2020)

U.S. Census Bureau. (2019a). American Community Survey-Median Income in the Past 12 Months (In 2018 Inflation-Adjusted Dollars). Table ID: S1903. Available at <https://data.census.gov/cedsci/table?q=S1903&text=S1903&tid=ACSST1Y2018.S1903&hidePreview=false> (Accessed September 8, 2020)

U.S. Census Bureau. (2019b). Poverty Status in the Past 12 Months. Available at <https://data.census.gov/cedsci/all?q=POVERTY%20STATUS%20IN%20THE%20PAST%2012%20MONTHS> (Accessed September 8, 2020)

U.S. Census Bureau. (2020a). North American Industry Classification System - Concordances. Available at <https://www.census.gov/eos/www/naics/concordances/concordances.html> (Accessed September 2, 2020)

U.S. Census Bureau. (2020b). All Sectors: Summary Statistics for the U.S., States, and Selected Geographies 2017 (ECNBASIC2017). Revised June 2, 2020. Available at <https://data.census.gov/cedsci/table?q=EC1771BASIC%20Summary%20Statistics%20for%20the>

SAN JOAQUIN VALLEY AIR POLLUTION CONTROL DISTRICT

Appendix D: Socioeconomic Analysis

July 20, 2021

%20U.S.,%20States,%20and%20Selected%20Geographies%3A%202017&n=N0000.00&tid=ECNBASIC2017.EC1700BASIC&hidePreview=true (Accessed September 24, 2020)

U.S. Census Bureau. (2020c). Annual Survey of State and Local Government Finances - 2017 State & Local Government Finance Historical Tables. Revised April 3, 2020. Available at <https://www.census.gov/data/tables/2017/econ/gov-finances/summary-tables.html> (Accessed July 7, 2020)

U.S. Census Bureau. (2020d). County Population Totals: 2010-2019: Annual Estimates of the Resident Population for Counties: April 1, 2010 to July 1, 2019. Available at https://www.census.gov/data/datasets/time-series/demo/popest/2010s-counties-total.html#par_textimage_739801612 (Accessed September 8, 2020)

U.S. Department of Agriculture National Agricultural Statistics Service (NASS). (2019). Census of Agriculture-California-2017 Census Volume 1, Chapter 1: State Level Data. Issued April 2019. Available at https://www.nass.usda.gov/Publications/AgCensus/2017/Full_Report/Volume_1,_Chapter_1_State_Level/California/cav1.pdf (Accessed September 16, 2020)

USDA ERS. (2020). Farms and Farm Households During the COVID-19 Pandemic. Available at <https://www.ers.usda.gov/covid-19/farms-and-farm-households/> (Accessed September 28, 2020)

Westhoff, P., Meyer, S., Binfield, J., and Gerlt, S. (2020). Early Estimates of the Impacts of COVID-19 on U.S. Agricultural Commodity Markets, Farm Income and Government Outlays. Available at <https://www.fapri.missouri.edu/wp-content/uploads/2020/04/FAPRI-Report-02-20.pdf> (Accessed September 28, 2020)

Yagova, O., George, L., Sharafedin, B. (2020). Coronavirus creates repair headache for oil and gas industry. Available at <https://www.reuters.com/article/us-health-coronavirus-oil-maintenance-an/coronavirus-creates-repair-headache-for-oil-and-gas-industry-idUSKBN22VOLT> (Accessed September 28, 2020)

SAN JOAQUIN VALLEY AIR POLLUTION CONTROL DISTRICT

APPENDIX A. SECTOR, SIC CODE, AND NAICS CODE CONCORDANCES

Table A-1 shows the concordance between SIC codes and sectors developed by SJV APCD (SJVAPCD, 2020d). (SIC codes that were not in this concordance but that might have indirect and induced impacts were assigned the sector “Other Industries.”)

Table A-1. SIC Code to Sector Concordance used to Analyze the Impacts of Rule 4702—Internal Combustion Engines

SIC Code	SIC Industry	Sector
0115	Corn	Agriculture
0119	Cash Grains, NEC - Dry Pea and Bean Farms	Agriculture
0131	Cotton	Agriculture
0139	Field Crops, Except Cash Grains, NEC - Hay Farms	Agriculture
0161	Vegetables and Melons	Agriculture
0172	Grapes	Agriculture
0173	Tree Nuts	Agriculture
0174	Citrus Fruits - Orange Groves and Farms	Agriculture
0175	Deciduous Tree Fruits - Apple Orchards and Farms	Agriculture
0179	Fruits and Tree Nuts, NEC - Combination Fruit and Tree Nut Farms	Agriculture
0191	General Farms, Primarily Crop	Agriculture
0211	Beef Cattle Feedlots	Agriculture
0241	Dairy Farms - Dairy Heifer Replacement Farms	Agriculture
0251	Broiler, Fryers, and Roaster Chickens	Agriculture
0291	General Farms, Primarily Livestock and Animal Specialties	Agriculture
0721	Crop Planting, Cultivating, and Protecting	Agriculture
0723	Crop Preparation Services For Market, except Cotton Ginning - Other	Agriculture
1321	Natural Gas Liquids	Oil and Gas Production
4941	Water Supply	Water Supply and Storage
4952	Sewerage Systems	Wastewater Treatment
5093	Scrap and Waste Materials	Scrap and Waste Materials
9199	General Government, NEC	Water Supply and Storage

Source: SJVAPCD, 2020d.

SAN JOAQUIN VALLEY AIR POLLUTION CONTROL DISTRICT

Table A-2 shows the NAICS codes that map to the SIC codes used in the analysis (limited to the NAICS codes assigned to the facilities in the District that may be affected by the potential amendments). This concordance was primarily developed using the U.S. Census Bureau’s (2020a) SIC to NAICS concordances. Where multiple NAICS codes map to one SIC code, ERG used information on companies’ websites or other search tools about what type of industry they are engaged in to assign a NAICS code.

Table A-2. SIC to NAICS Concordance for Facilities that may be Affected by Potential Amendments to Rule 4702—Internal Combustion Engines

SIC Code	SIC Industry	Corresponding NAICS
0115	Corn	1111 (Oilseed and Grain Farming)
0119	Cash Grains, NEC - Dry Pea and Bean Farms	1111 (Oilseed and Grain Farming)
0131	Cotton	1119 (Other Crop Farming)
0139	Field Crops, Except Cash Grains, NEC - Hay Farms	1112 (Vegetable and Melon Farming), 1121 (Cattle Ranching and Farming)
0161	Vegetables and Melons	1112 (Vegetable and Melon Farming)
0172	Grapes	1113 (Fruit and Tree Nut Farming)
0173	Tree Nuts	1113 (Fruit and Tree Nut Farming)
0174	Citrus Fruits - Orange Groves and Farms	1113 (Fruit and Tree Nut Farming)
0179	Fruits and Tree Nuts, NEC - Combination Fruit and Tree Nut Farms	1113 (Fruit and Tree Nut Farming)
0191	General Farms, Primarily Crop	1119 (Other Crop Farming)
0211	Sheep and Goats	1121 (Cattle Ranching and Farming)
0241	Dairy Farms - Dairy Heifer Replacement Farms	1121 (Cattle Ranching and Farming)
0251	Broiler, Fryers, and Roaster Chickens	1121 (Cattle Ranching and Farming)
0291	General Farms, Primarily Livestock and Animal Specialties	1129 (Other Animal Production)
0721	Crop Planting, Cultivating, and Protecting	1151 (Support Activities for Crop Production)
1321	Natural Gas Liquids	2111 (Oil and Gas Extraction)
4941	Water Supply	9993 (Local Government)
4952	Sewerage Systems	9993 (Local Government)
5093	Scrap and Waste Materials	5629 (Remediation and Other Waste Management Services)
9199	General Government, NEC	9993 (Local Government)

Source: ERG estimates based on SJVAPCD, 2020b; U.S. Census Bureau, 2020a.

SAN JOAQUIN VALLEY AIR POLLUTION CONTROL DISTRICT

Appendix D: Socioeconomic Analysis

July 20, 2021

APPENDIX B. PROFIT RATES BY NAICS INDUSTRY

Table B-1 shows the profit rates used for non-agricultural private industry NAICS codes, which were estimated using the average rate for 2000 through 2013 data from the Internal Revenue Service (IRS, 2016) "SOI Tax Stats - Corporation Source Book."

Table B-1. Profit Rate by NAICS Industry for Facilities Affected by Rule 4702—Internal Combustion Engines

NAICS	Industry	Average	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
1151	Support Activities for Crop Production	2.00%	1.04%	0.92%	-0.49%	1.06%	1.89%	3.36%	2.06%	2.84%	0.48%	0.87%	2.64%	2.33%	4.76%	4.31%
2111	Oil and Gas Extraction	7.33%	6.53%	5.55%	0.85%	5.50%	8.04%	14.89%	16.06%	11.11%	10.31%	2.50%	8.29%	5.99%	3.50%	3.50%
5629	Remediation and Other Waste Management Services	3.47%	1.83%	2.78%	1.49%	-0.78%	3.05%	5.19%	-1.57%	6.69%	4.14%	6.25%	6.27%	4.23%	4.92%	4.13%
9993	Local Government	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Source: ERG estimates based on IRS, 2016.

Note: Profit rate calculated as "Net Income (less deficit)" divided by "Total Receipts."

SAN JOAQUIN VALLEY AIR POLLUTION CONTROL DISTRICT

APPENDIX C. COVID-19 BASELINE ADJUSTMENTS BY NAICS INDUSTRY

Table C-1 shows the percentage change in revenue, employment, and average pay per employee by NAICS code, derived by comparing IMPLAN’s (2020a) datasets for 2018 and the “Evolving Economy” dataset developed using data for the second quarter of 2020.

Table C-1. COVID-19 Adjustments by NAICS Industry for Facilities Affected by Rule 4702—Internal Combustion Engines

NAICS	Industry	COVID-19-Adjusted Change in Baseline		
		Revenue	Employment	Average Pay
1111	Oilseed and Grain Farming	-17.47%	-14.09%	13.85%
1112	Vegetable and Melon Farming	-17.46%	-13.79%	13.98%
1113	Fruit and Tree Nut Farming	-17.46%	-12.71%	13.90%
1119	Other Crop Farming	-17.46%	-14.86%	13.76%
1121	Cattle Ranching and Farming	-17.46%	-16.08%	13.78%
1129	Other Animal Production	-14.66%	-14.12%	13.74%
1151	Support Activities for Crop Production	-32.19%	-13.91%	13.78%
2111	Oil and Gas Extraction	33.55%	29.86%	6.47%
5629	Remediation and Other Waste Management Services	9.90%	3.37%	7.41%
9993	Local Government	9.59%	4.86%	5.84%

Source: ERG estimates based on IMPLAN, 2020a.

This page intentionally blank.