

**Socioeconomic Analysis
Proposed Amendments
Regulation 8
Rule 18
Equipment Leaks**

Prepared for

**Bay Area Air Quality Management District
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1. EXECUTIVE SUMMARY

The purpose of Regulation 8 Rule 18 is to reduce the emission of VOCs from valves and other components at petroleum refineries and chemical plants in the nine-county San Francisco Bay Area. Rule 8-18 was first adopted in 1980 and was amended in 1992, with minor changes in 1998 and 2002. Rule amendments adopted in 1992 significantly lowered the allowable leak concentration limits to the lowest in the country and required more effective inspection and repair programs in order to reduce emissions and promote self-compliance. Rule 8-18 was last amended in November 2002 to address a minor deficiencies identified by US EPA in their limited approval/disapproval of the rule.

The following are some of the key findings from the socioeconomic analysis of the proposed amendments.

- According to the Bay Area Air Quality Management District (BAAQMD), there are five (5) petroleum refineries in the region that are primarily affected by the amendments. These corporations are Chevron, Shell, Connoco Phillips, Valero-Valero Asphalt, and Tesoro.
- In 2002, these five refineries employed an estimated 2,280 workers, generated revenues of \$4.5 billion, and earned an estimated \$220 million in profits.
- The proposed amendments to will result in aggregate compliance costs ranging from \$23,500 to \$118,000 — between 0.01 and 0.05 percent of aggregate profits for the 5 refineries directly affected by the proposed amendments to Regulation 8, Rule 18. Thus, the proposed amendments to Regulation 8, Rule 18 do not result in any economic impact on affected refineries.

2. INTRODUCTION

This report describes the socioeconomic impacts of proposed amendments to Regulation 8, Rule 18. Following this introduction, the report summarizes proposed amendments to the rule and describes the methodology for the socioeconomic analysis. In Section 5, the report describes the economic characteristics of sites affected by the proposed amendment. The sixth section analyzes the socioeconomic impacts of proposed amendments to Regulation 8, Rule 18.

The proposed amendments to Regulation 8, Rule 18, Equipment Leaks, will assist the BAAQMD in meeting its commitments regarding the 2001 Ozone Attainment Plan for Control Measure SS-16. The proposal is intended to set stringent standards and performance requirements that, when implemented, will represent the best current industry practices and abilities, as well as allow the District to account for any associated emission reduction.

3. DESCRIPTION OF PROPOSED AMENDMENTS

Bay Area Air Quality Management District (BAAQMD) seeks to amend Regulation 8, Rule 18 (Equipment Leaks) to strengthen controls on emissions from leaking valves at petroleum refineries and chemical plants. Regulation 8, Rule 18 requires refineries to develop and implement a Leak Detection and Repair (LDAR) program to control fugitive emissions. Fugitive emissions occur from valves, pumps, compressors, pressure relief valves, flanges, connectors, piping and other equipment components.

BAAQMD staff reviewed specific valve technologies to determine short-term and long-term emission performance. From this evaluation, staff concluded that petroleum refineries are required to utilize the best technology available for replacements to consistently achieve the stringent leak standard of 100 ppm. The strict leak standard combined with the limit on the number of valves that can be placed on the non-repairable list constitute Best Available Control Technology (BACT). Therefore, compliance with this rule as proposed represents what is presently BACT.

Staff also evaluated areas in which additional emission reductions could be achieved. This evaluation indicated that:

- The number of valves allowed on the non-repairable list could be reduced from the current level of 0.5 percent to 0.3 percent. The level of 0.3 percent represents the level currently achieved by refineries.
- A maximum leak standard be established for valves leaking above 10,000 ppm because they are responsible for the largest fraction of the emission inventory.

The proposed amendments ensure that best available control technologies are used to reduce emissions. The proposed major amendments to Regulation 8, Rule 18 will:

- Reduce the fraction of components allowed on a non-repairable list;
- Set a maximum leak standard at 10,000 parts per million (ppm); and

- Allow connections to be placed on a non-repairable list at a ratio of one connection per two valves.

4. METHODOLOGY

The socioeconomic analysis involves the use of information provided directly by the District, the corporations and sites directly affected by proposed amendments, as well as secondary data used to describe the industries affected by proposed amendments to Regulation 8, Rule 18. The approach is briefly described below.

ADE began the analysis by requesting from the District a list of all sites subject to the proposed amendments to Regulation 8, Rule 18. In addition to a list of all sites, we also requested the Standard Industrial Code (SIC) for each affected site, the name of the company that manages and or owns sites, as well as information on site location. In reviewing the transmitted information, we determined that the bulk of the sites and corporations on the list were not petroleum refineries (SIC 2911). Based on conversations with District staff, we determined that the study would focus on oil refineries in the District region and, of these, we further focused attention on Chevron, Shell, Connoco Phillips, Valero and Tesoro.

We then began to prepare a statistical description of the industry groups of which the affected sites are part, as well as to analyze data on the number of jobs, sales levels, the typical profit ratios and other economic indicators for each industry. ADE also reviewed and summarized documents available to the public such as annual reports for publicly traded companies.

With the annual reports and data from the US Economic Census, ADE was able to estimate sales and profit ratios for many of the sites affected by the proposed amendments to Regulation 8, Rule 18. ADE calculated an average sales figure per affected refinery to estimate sales for and profitability of sites affected by the proposed amendments to the rule. To estimate employment, ADE used employment data from data vendors such as the US Economic Census and the Minnesota IMPLAN Group.

Using the annual reports and data culled by Dun and Bradstreet, ADE calculated ratios of profit per dollar of sales for each

refinery. This corporate profitability ratio was applied against site-level sales estimates to yield an estimate of profit generated at refineries affected by the proposed amendments. The result of the socioeconomic analysis shows what proportion of profit the compliance costs represent. Based on a given threshold of significance, ADE discusses in the report whether the affected sites 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 jobs losses appear likely, the indirect multiplier effects of the jobs losses are estimated using a regional IMPLAN input-output model.

5. IMPACTED SOURCES SUBJECT TO PROPOSED AMENDMENTS TO REGULATION 8, RULE 18

This section of the socioeconomic analysis describes demographic and economic trends in the San Francisco Bay Area region. The first part of this section compares the Bay Area against California as a whole and, in so doing, provides a context for understanding demographic and economic changes that occurred within the Bay Area between 1997 and 2002. Starting with sub-section 5.2, the second part of this section narrows the focus of the socioeconomic analysis to those industries identified by the District as subject to the proposed amendments. The five (5) sites that are affected by the proposed amendments to Regulation 8, Rule 18 are within SIC 2911 (petroleum refining). The second part of this section describes the economic characteristics of impacted sites subject to Regulation 8, Rule 18. For the purposes of this report, the Bay Area region is defined as Alameda, Contra Costa, Marin, Napa, San Francisco, San Mateo, Santa Clara, Solano and Sonoma Counties.

5.1 REGIONAL DEMOGRAPHIC AND ECONOMIC TRENDS

Regional Demographic Trends

The San Francisco Bay Area experienced moderate population growth during the 1990s. The nine-county region as a whole increased by 13 percent, from 6.0 million in 1990 to 6.8 million in 2000. The Bay Area grew almost at the same pace with the state, which increased by 14 percent. San Francisco, Marin, and San Mateo counties grew at significantly slower paces, perhaps because of the high cost of housing in these parts of the Bay Area.

TABLE 1
Population Growth: San Francisco Bay Area
1990 - 2000

	California	Alameda	Contra Costa	Marin	Napa	San Francisco	San Mateo	Santa Clara	Solano	Sonoma
1990	29,760,021	1,443,741	948,816	247,289	124,279	776,733	707,161	1,682,585	394,542	458,614
2000	33,871,648	1,279,182	803,732	230,096	110,765	723,959	649,623	1,497,577	340,421	388,222
%Change	14%	13%	18%	7%	12%	7%	9%	12%	16%	18%

Source: US Census, 1990 and 2000

Regional Economic Trends

Economic development practitioners and planners have traditionally divided economies into two broad industrial categories—the economic base and local support industries. Economic base industries are the drivers of local and regional economies in that these industries draw income into a local economy by selling products outside of the local economy, much like the export industries of a national economy. Accrued earnings then circulate throughout the local area in the form of wages and salaries, investments, purchase of fixed assets, and goods and services, generating more jobs and wealth.

The economic base is typically comprised of industries within the manufacturing, minerals-resource extraction, and agricultural sectors. There are also the “local support industries” such as retail or service sectors, the progress of which is a function of the economic base and demographic changes, and more so the latter than the former. As population increases in a given area, demand for services – such as realtors, teachers, healthcare – increases, as does demand for basic retail items like groceries, gas for commuting, or clothing at the local apparel shops.

With notable companies such as Intel, Apple, NUMMI, to name a few, manufacturing continues to be the economic base of the San Francisco Bay Area, exporting goods and produce throughout the nation and globe. The industries affected by Regulation 8, Rule 10 are a prominent part of the region’s economic base. Over the course of the late 1990s, local support industries gained somewhat within the region. Growth in local support industries, such as construction, retail and services, is in large part due to regional population growth, particularly in

Alameda (Livermore Valley region), Contra Costa, Solano and Sonoma Counties.

As Table 2 shows, the service sector is the largest employment sector in the region, at 1.1 million or 40 percent of all private sector jobs. In 1997, services represented 37 percent of all jobs (1.0 million jobs). While the proportion of people employed in the services-based sector increased between 1997 and 2002, the proportion of people employed in the manufacturing economic base declined, from 18 to 15 percent of all private sector workers in the Bay Area. Between 1997 and 2002, manufacturing jobs decreased by 16 percent, from 495,500 to 416,500, as Table 2 shows.

Between 2000 and 2002, construction decreased, leading to the overall 1 percent decline in the number of construction jobs between 1997 and 2002. Retail also declined, by 3 percent between 1997 and 2002. In short, the Bay Area's economy continues to be diverse even as it experiences one of its worst recessions in history. However, the region has lost jobs in the relatively higher wage generating economic base of manufacturing, while population-driven local support industries as a whole have been stable. Services increased by 6 percent between 1997 and 2002, and has become an even greater share of regional employment. Overall, total employment decreased by 3 percent in the Bay Area between 1997 and 2002, versus the statewide decline of 2 percent.

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TABLE 2
Employment Profile Of The San Francisco Bay Area, 1997 - 2002

Description	Bay Area Employment 1997	Bay Area Employment 2002	Percentage Change in Bay Area Employment 1997 to 2002	State Employment 1997	State Employment 2002	Percentage Change in State Employment 1997 to 2002
Agriculture	42,617	37,714	-12%	501,483	461,708	-8%
Mining	4,003	3,881	-3%	28,962	25,246	-13%
Construction	142,408	140,486	-1%	551,269	582,641	6%
Manufacturing	495,584	416,460	-16%	1,902,332	1,680,811	-12%
Transportation And Public Utilities	179,333	171,438	-4%	650,006	659,116	1%
Wholesale Trade	176,870	165,640	-6%	774,779	782,708	1%
Retail Trade	513,214	497,373	-3%	2,271,468	2,306,136	2%
Finance, Insurance, And Real Estate	202,944	181,113	-11%	759,924	728,334	-4%
Services	1,017,933	1,075,368	6%	3,984,420	3,984,420	0%
Not Elsewhere Classified	356	356	0%	23,867	23,867	0%
Total	2,775,262	2,689,828	-3%	11,448,510	11,234,987	-2%

Sources: Applied Development Economics, based on data from the US Economic Census, IMPLAN-MIG and California LMID-EDD

5.2 DESCRIPTION OF AFFECTED INDUSTRIES

Regulation 8, Rule 18 affects industries in SIC 2911 (oil refineries). What follows is a description of this industry. Table 3 identifies economic trends for oil refineries in the Bay Area and state, and it provides a comparison between two points in time—1997 and 2002. Data in Table 3 are for all sources, not just the five (5) impacted sources subject to the proposed amendments. Employment and other estimates for the year 2002 for sites affected by Regulation 8, Rule 18 are based on from vendors such as the California LMID-EDD, Minnesota IMPLAN Group, and the US Census Economic Census.

As Table 3 shows, employment in oil refineries increased by an estimated 8 percent for the five-year period from 1997 to 2002 — from 7,292 to 7,849 jobs. In contrast, oil refinery employment for the state as a whole decreased by 12 percent. While Bay Area refinery jobs increased, between 1997 and 2002, manufacturing as a whole decreased by 16 percent and 12 percent in the Bay Area region and California respectively, as Table 2 above demonstrates. In short, employment in

petroleum refining industries in the Bay Area increased at a time when manufacturing as a whole experienced declined significantly.

TABLE 3
Employment Trends: Industries Affected By Proposed Amendments to Regulation 8, Rule 18
1997 - 2002

	Bay Area 1997	Bay Area 2000	Bay Area 2002 (estimated)	Bay Area 1997 -2002	State 1997	State 2000	State 02 (estimated)	State 1997 -2002
Manufacturing (all)	495,584	510,376	416,460	-16%	1,902,332	1,939,161	1,680,811	-12%
SIC 2911: refineries	7,292	7,539	7,849	8%	16,851	14,351	14,900	-12%
Total Employment	2,775,262	3,097,902	2,689,828	-3%	11,448,510	12,652,960	11,234,987	-2%

Sources: Applied Development Economics, based on data from the US Economic Census, IMPLAN-MIG, and California EDD-LMID

5.3 ECONOMIC CHARACTERISTICS OF SOURCES AFFECTED BY THE PROPOSED AMENDMENTS TO REGULATION 8, RULE 18

Table 4 identifies the economic characteristics of the refineries affected by the proposed amendments. This table shows that the refineries are estimated to employ 2,280 workers. These sites have an estimated aggregate payroll of \$134 million, and estimated revenues of \$4.5 billion. As Table 4 further shows, the five affected sources produced an estimated \$887 million in value-added production in 2002.¹

¹ Value-added measures the difference between sales and costs of inputs (i.e. materials and labor). It is a measure of productivity.

TABLE 4
Economic Characteristics of Impacted Sources Subject To Proposed
Amendments to Regulation 8, Rule 18

Refineries	Estimated Employment	Estimated Payroll	Estimated Value-Added	Revenues
SIC 2911 Oil Refineries	2,280	\$134,891,089	\$887,478,276	\$4,546,989,022

Sources: Applied Development Economics, based on data from the US Economic Census, Dun and Bradstreet, and various corporate annual reports

As Table 5 shows, the affected sources represent 29 percent of all employment within their respective industry (SIC 2911) in the Bay Area region. Overall, there are an estimated 7,539 petroleum refining employees in the Bay Area. Of these 7,539 workers, 2,280 work in the five affected refineries.

TABLE 5
Employment In Impacted Sites Subject To Proposed
Amendment to Regulation 8, Rule 18
Relative To the Bay Area and California, 2002

SIC	Estimated employment at Affected Refineries 2002	Affected Sites As percent of Bay Area 2911 Employment	Affected Sites As percent of California 2911 Employment
2911	2,280	29%	15%

Sources: Applied Development Economics, based on data from the US Economic Census and IMPLAN-MIG

6. SOCIOECONOMIC IMPACTS

6.1 COMPLIANCE COST ESTIMATES

The District's cost of compliance analysis indicates that, overall, all sources affected by the amendments would experience an aggregate annual cost between \$23,500 and \$118,000. Table 6 provides a breakdown of the estimated costs, and these costs are broken down into four cost scenarios.

The costs associated with the proposed amendment are primarily the costs of determining the mass emission rates of valves leaking in excess of 10,000 ppm and the cost of controlling component with emissions above the 15-pound limit. There are two methods that were identified as reliable methods of determining mass emissions: high volume collection system (HCVS) and the US EPA vacuum method. Table 6 compares the cost of each of these methods. The cost values in Table 6 have been inflated from 1995 values using inflation factor of 1.2 obtained from the US Department of Labor, Bureau of Statistics.

TABLE 6
Cost Estimates for
Mass Emission Rate Determinations

	HCVS	Vacuum Method
Total time required for ONE sample ¹	4 hours	Two days
Labor Cost per sample (\$450/day)	\$225	\$900
Lab Cost per sample	\$0	\$400
TOTAL COST per sample	\$225	\$1,300

Source: Bay Area Air Quality Management District

It was estimated that a total of 60 valves within the BAAQMD may need mass measurements each year. The cost of sampling 60 valves annually was estimated between \$13,500 and \$78,000. The cost to capture, vent and control emissions from a valve with excess emissions can range from

\$5,000 to \$20,000 each depending on the valve size, location (accessible or inaccessible, proximity to a vent for flare or fire box, spatial proximity to other components, etc.). It was estimated that 2.5 percent of valves leaking in excess of 10,000 ppm will have emissions of 15 pounds per day or greater, or 2.5 percent. That is approximately two valves District-wide that could potentially be required to be controlled. The annual costs associated with these proposed amendments are presented in Table 7.

**Table 7
Costs of the Proposal**

Requirement	Annual Costs
Mass Emission Rate Determinations	\$13,500 - \$78,600
Control of Valves with Excessive Leaks	\$10,000 to \$40,000
TOTAL COSTS	\$23,500 to \$118,000

Source: Bay Area Air Quality Management District

6.2 BUSINESS RESPONSE TO COMPLIANCE COSTS

Sites impacted by the proposed amendments to proposed amendments to Regulation 8, Rule 18 may respond in a variety of ways when faced with new regulatory costs. These responses may range from simply absorbing the costs and accepting a lower rate of return to shutting down the business operation altogether. Businesses may also seek to pass the costs on to their customers in the form of higher prices, or they may renew efforts to increase productivity and reduce costs elsewhere in their operation in order to recoup the regulatory costs and maintain profit levels.

6.3 IMPACT ANALYSIS

The businesses' responses to increased compliance costs hinge on the effect of the costs on the profits generated at the affected sites. An impact on estimated profits greater than 10 percent implies that the source would experience serious economic effects because of the compliance cost. When compliance costs are greater than 10 percent of estimated profits, companies typically respond to the impact by laying

off some workers, closing parts of manufacturing facilities or, in the most drastic case, possibly closing the manufacturing facility.

Using the cost estimates developed by the District, Applied Development Economics calculated the socioeconomic impacts of the proposed amendments. In calculating impacts of the proposed amendments on profits, ADE used return on sales ratios identified by Dun and Bradstreet for select industries and in annual reports of companies directly affected by the proposal. Base on data from the US Economic Census and from corporate annual report, we estimate that the 5 affected refineries generated a combined profit of \$220 million on \$4.5 billion in sales in the year 2002.

Table 8 compares the estimated costs of the proposed amendments to this rule under both cost alternatives. Affected sources will incur an aggregate cost \$23,500 under the lower cost alternative. This cost represents an estimated .01 percent of profits for the five sources affected by the proposed amendments.

**TABLE 8
Employment Impacts of Proposed Amendments to Regulation 8, Rule 18**

Refineries	Estimated SF Region Refinery Returns	Throughput Capacity (BPD)	Throughput Capacity Distribution	Lower Cost Scenario: \$23,500	Upper Cost Scenario: \$118,000	Lower Cost Scenario As Percentage Of Profits	Upper Cost Scenario As Percentage Of Profits	Exceeds Significance Threshold?	Potential Direct Job Losses
SIC 2911 Oil Refineries	\$220,301,259	676,200	100%	\$23,500	\$118,000	0.01%	0.05%	no	none

Sources: Applied Development Economics, based on data from the US Economic Census, Dun and Bradstreet, and various corporate annual reports

Affected sources will incur an aggregate cost of \$118,000 in the higher cost alternative. This cost represents an estimated 0.05 percent of aggregate profits for the 5 sites affected by the proposed amendment. Moreover, Table 8 shows that the cost of the proposed amendments does not disproportionately affect a single refinery. At \$3,288 to \$16,508, depending on the cost scenario, the cost of the proposed amendments to Valero could represent between 0.6 and 3.2 percent of profits generated by this refinery. However, these cost impacts are well below the significance threshold.

6.4 IMPACT ON SMALL BUSINESSES

In addition to analyzing the employment impacts of proposed amendments to Regulation 8, Rule 18, state legislation requires that the socioeconomic analysis assess whether small businesses are disproportionately affected by air quality rules such as the proposed amendments to the Regulation 8, Rule 18. First, this section profiles oil refineries in the San Francisco Bay Area region by employment size categories, and, in so doing, shows that most of these manufacturers are relatively large employers. Then, this section discusses the average size of the five refineries affected by the proposed amendments. Finally, this section shows how the five refineries affected by the proposed amendments to Regulation 8, Rule 18 fail to qualify as small businesses as defined by the State of California.

Oil Refineries By Employment Size Categories

More than 50 percent of all businesses in California and the United States employ less than four people, and almost 80 percent employ less than ten people. Data in Table 10 are for all sites in industries identified by the BAAQMD, and it includes data on sites affected by amendments to Regulation 8, Rule 18. The data in the table comes from a combination of vendors—Minnesota IMPLAN Group and the US County Business Patterns—and is current as of the year 2001. Table 9 distributes affected industries by number of employees per manufacturing site. As a group, establishments in the affected industries are significantly larger than state and national industries as a whole. Establishments with more than 100 workers represent 2.5 percent of all establishments in all industries in California and the United States. In contrast, 44 percent of affected sites employ at least 100 people. In fact, 55 percent of all sites employ at least 50 people versus the statewide and national average of 5.7 percent, as Table 9 shows. Consistent with data in Table 9, we estimate that the sites directly affected by the proposed amendment employ, on average 455 workers, placing these facilities as mid- to large-sized employers.

TABLE 9
Distribution Of Oil Refineries (SIC 2911) In The San Francisco Bay Area By Size of Facilities, 2001

	Employment Size Categories						
	1 thru 4	5 thru 9	10 thru 19	20-49	50-99	100-249	250 or more
Bay Area SIC 2911	11%	0%	11%	22%	11%	0%	44%
California (all industries)	54.0%	18.5%	12.6%	9.1%	3.2%	1.8%	0.7%
US (all industries)	53.9%	19.3%	12.7%	8.7%	3.0%	1.8%	0.7%

Source: United States Bureau of the Census, County Business Patterns 2000, IMPLAN MIG

Definition Of Small Business Per California Statute

The previous section showed oil refineries in the San Francisco Bay Area, including the five sources that are affected by the proposed amendments to Regulation 8, Rule 18, are significantly larger than most businesses in California and the nation, which, on average, employ less than 10 people. This section discusses how the State of California defines small business, and, in so doing, shows how the five sources affected by the proposed amendments to Regulation 8, Rule 18 fail to meet the State's definition of small business.

For purposes of qualifying small businesses for bid preferences on state contracts and other benefits, the State of California defines small businesses in the following manner².

To be eligible for small business certification, a business:

- Must be independently owned and operated;
- Cannot be dominant in its field of operation;
- Must have its principal office located in California
- Must have its owners (or officers in the case of a corporation) domiciled in California; and
- Together with its affiliates, be either:

² State of California. Department of General Services. "California Small Business Certification" (<http://www.pd.dgs.ca.gov/smbus/sbcert.htm>)

- A business with 100 or fewer employees, and an average gross receipts of \$10 million or less over the previous tax years, or
- A manufacturer with 100 or fewer employees

The five sources that are affected by the proposed amendments are not independently-owned and operated businesses. These refineries are owned by publicly-traded global corporations whose headquarters are outside of California (except for Chevron). In addition, each of the sources that are affected by the proposed amendments to Regulation 8, Rule 18 employ, on average, 455 workers, and their average revenue is approximately \$909 million. Thus, by the standards established by the State of California, these sources are not small businesses. Based on this discussion, it is determined that proposed amendments to the Regulation 8, Rule 18 do not disproportionately affect small businesses because the sources impacted by the proposed amendments do not meet California's definition of small business.