

SOCIOECONOMIC
ANALYSIS
PROPOSED RULE

REGULATION 12
MISCELLANEOUS STANDARDS OF PERFORMANCE
RULE 12
FLARES AT PETROLEUM REFINERIES

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Prepared for
Bay Area Air Quality
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1. EXECUTIVE SUMMARY

INTRODUCTION

This report describes the socioeconomic impacts of proposed changes in oil refinery operations expected to comply with the proposed flare control rule (Regulation 12, Rule 12). The report summarizes the proposed rule requirements and describes the methodology for the socioeconomic analysis. The report also describes the economic characteristics of sites affected by the proposed rule along with the socioeconomic impacts of proposed operation changes. The proposed changes will assist the BAAQMD in meeting its commitments to improving air quality in the region by reducing emissions from flares by minimizing the frequency and magnitude of flaring that occur at Bay Area refineries.

SUMMARY

The proposed rule affects five oil refineries, which currently operate 21 flares. It is estimated that the refineries employ about 1,935 workers and provide a total payroll of \$557 million per year. The refineries are estimated to generate sales of \$9.8 billion per year and to realize net income of about 7 percent of sales, or \$689 million per year.

Compliance with the proposed rule would require development of a Flare Minimization Plan (FMP) as well as various reporting activities when flaring occurs. The costs for implementation of the FMP will vary considerably at each refinery depending on the existing levels of emission controls and the types of systems in place. At the upper end, a \$20 million expenditure may be necessary to install equipment for systems needing additional recovery capacities. Amortized over the 20 year life of such a system, the annual costs are estimated at about \$1.9 million. Combined with the plan development and reporting activities, the total annual cost per flare system is estimated at \$2.1 million. At the lower end, the total annual cost per flare system is estimated at \$270,145. The aggregate cost for the 5 facilities affected by the proposed rule would range between \$1.4 million per year at the lower end and \$10.6 million per year at the upper end.

The socioeconomic analysis evaluates the compliance costs in relation to the financial characteristics of the affected facilities to determine the significance of the economic impact of the rule. The annual cost of the rule compliance represents between 0.2 percent and 2 percent of annual net income for the affected facilities, below the 10 percent threshold of significance for such impacts. The analysis concludes that the affected refineries should be able to absorb these costs without significant economic dislocation or loss of jobs. The analysis also addresses the issue of potential impacts to small businesses but concludes that the affected refineries do not meet the criteria to be considered small business operations.

2. DESCRIPTION OF PROPOSED RULE

The proposed rule is intended to reduce emissions from flares by minimizing the frequency and magnitude of flaring. The proposal includes a standard that prohibits the use of a refinery flare unless the use is consistent with an approved flare minimization plan (“FMP” or “Plan”) or is necessary to prevent accident, hazard or release of gas to the atmosphere. The rule includes a requirement to conduct a causal analysis to evaluate a reportable flaring event, i.e., flaring more than 500,000 standard cubic feet per calendar day (scfd), to identify the cause (or causes) of the flaring and the means to avoid flaring from that cause in the future if possible, and to provide an annual summary for flaring less than 500,000 scfd where the sulfur dioxide emissions are greater than 500 pounds. This formal evaluation process will ensure that each refinery makes continuous improvement and progress toward the goal of flare use minimization.

3. IMPACTS OF THE RULE

This section of the socioeconomic analysis describes demographic and economic trends in the San Francisco Bay Area region. Following an overview of the methodology for the socioeconomic analysis, the first part of this section compares the Bay Area against California and provides a context for understanding demographic and economic changes that have occurred within the Bay Area between 1994 and 2004. After an overview of Bay Area industries, we focus on SIC 2911 (NAICS 32411) and how the new proposed rule would impact the refineries. 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. The refineries are located in Contra Costa and Solano Counties.

3.1 METHODOLOGY

The socioeconomic analysis of the new proposed rule involves the use of information provided directly by BAAQMD, as well as secondary data used to describe the industries affected by the proposed change.

Based on conversations with BAAQMD staff, ADE determined that the impacts would affect oil refineries in the BAAQMD region and, of these, we further focused attention on Chevron, Shell, Conoco Phillips, Valero and Tesoro.

With this information we began to prepare an economic 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 Bay Area oil refineries. 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 revenues and profit ratios for many of the sites affected by the proposed flare minimization. In calculating aggregate revenues generated by Bay Area refineries, ADE first estimated an average revenue figure for a refinery based on revenues generated over the

four-year period between 2000 and 2003. Using annual reports and publicly available data, ADE calculated ratios of profit per dollar of sales for the refineries. To estimate employment, ADE used employment data from Dun & Bradstreet.

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 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.

3.2 REGIONAL DEMOGRAPHIC TRENDS

The San Francisco Bay Area experienced moderate population growth from 1994 to 2004. Between 1994 and 1999, the nine-county region increased by 3 percent, from 6.2 million in 1994 to 6.6 million in 1999. From 1994 to 2004 the population increase was from 6.2 million to 6.8 million for an increase of 11 percent. At the same time, California had population growth of 14 percent.

Within the Bay Area the greatest percentage increase occurred in Contra Costa County. From 1994 to 2004 Contra Costa increased its population by 18 percent. All other Bay Area counties had population increases equal to, or slower than the state. The smallest percentage increase occurred in Marin and San Mateo Counties where population grew 5 percent from 1994 to 2004. Table 1 shows the population changes that have occurred in the Bay Area and California from 1994 to 2004.

TABLE 1
Population Growth: San Francisco Bay Area

	Population			Percent Change		
	1994	1999	2004	94 - 99	99 - 04	94 - 04
California	30,889,182	32,971,834	35,300,654	7%	7%	14%
Bay Area	6,189,000	6,646,167	6,865,370	7%	3%	11%
Alameda County	1,302,462	1,406,046	1,470,456	8%	5%	13%
Contra Costa County	844,076	914,645	992,608	8%	9%	18%
Marin County	228,718	236,955	239,209	4%	1%	5%
Napa County	111,083	118,088	126,283	6%	7%	14%
San Francisco County	729,024	771,122	772,985	6%	0%	6%
San Mateo County	667,218	712,376	702,017	7%	-1%	5%
Santa Clara County	1,544,523	1,672,977	1,701,831	8%	2%	10%
Solano County	356,652	377,601	399,826	6%	6%	12%
Sonoma County	405,244	436,357	460,155	8%	5%	14%

Source: Applied Development Economics, based on household population estimates from The California Department of Finance

3.3 REGIONAL ECONOMIC TRENDS

The Bay Area is one of the world’s greatest regional economies. It benefits from pre-eminent knowledge-based industries, with competitive strength flowing from an unmatched culture of entrepreneurship, world-leading research institutions, and some of the nation’s best educated and most highly skilled workforce. With these remarkable advantages, it has led through innovation in a wide range of research and industrial fields.

Many of the Bay Area’s most prominent industries are manufacturing related. From Intel to PowerBar, Bay Area manufacturers are often high profile companies with world-renowned recognition. From small to large, Bay Area industry has been dynamic creating wealth and jobs in both the export sector and local serving industries.

The economic base is typically comprised of export 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.

The industries affected by flare minimization are a prominent part of the region's economic base. Mainly engaged in export related business, the oil refineries are classified as manufacturers. In the Bay Area, manufacturing jobs have decreased over the last decade. In 1994 manufacturing accounted for 14 percent of all Bay Area employment. By 2004 manufacturing declined 11 percent to account for 11 percent of all Bay Area employment.

As of 2004, the professional and business services sector was the largest employer in the region, at 520,200 jobs or 16 percent of all private and public sector jobs. This is a change from 1994 when professional and business services accounted for 15 percent of all Bay Area employment. During the same period professional and business services increased 17 percent. The next largest industry in the Bay Area is public service, or government, with 460,300 jobs. In 2004 government accounted for 14 percent of all Bay Area employment. From 1994 to 2004 government had one of the lowest growth rates of all industries at 4 percent. Two other industries came close to manufacturing in total employment. Retail trade and education & health care both made up 11 percent of total employment and had only a few hundred or few thousand jobs less than manufacturing. Unlike manufacturing, both retail trade and education & health care had significant jobs gains from 1994 to 2004. All other industries made up less than manufacturing in total employment in 2004. Table 2 shows Bay Area industry sectors and their trends from 1994 to 2004.

TABLE 2
Employment Profile of the San Francisco Bay Area, 1994 - 2004

Industry	1994	1999	2004	% of Total Employment in 2004
Farm	25,800	28,600	21,300	1%
Natural Resources & Mining	4,300	3,600	2,300	0%
Construction	109,300	171,400	181,000	6%
Manufacturing	405,400	459,400	359,700	11%
Wholesale Trade	118,500	107,100	121,900	4%
Retail Trade	300,200	339,000	337,900	11%
Transportation & Warehousing & Utilities	115,500	124,700	102,900	3%
Information	89,200	122,100	111,600	3%
Financial Activities	193,300	197,400	209,800	7%
Professional and Business Services	445,400	626,100	520,200	16%
Education & Health Care	293,800	335,000	359,200	11%
Leisure and Hospitality	250,000	289,500	304,400	10%
Other Services	100,100	108,800	109,700	3%
Government	444,500	449,800	460,300	14%
Total	2,895,300	3,362,500	3,202,200	100%

Source: Applied Development Economics from data supplied by the Labor Market Information Division of the California Employment Development Department

3.4 DESCRIPTION OF AFFECTED INDUSTRIES

The new proposed rule for flares at petroleum refineries affects industries in SIC 2911 (NAICS 32411- oil refineries). What follows is a description of this industry, along with economic trends for oil refineries in the Bay Area, and it provides a comparison between 2001 and 2004. Data in Table 3 are for all sources, not just the five major oil refineries in the Bay Area. As shown in Table 3, employment in oil refineries increased by 2 percent for in the four years from 2001 to 2004. This is at the same time that Bay Area manufacturing jobs decreased 22 percent. In California, oil refineries declined 5 percent during the same period and manufacturing jobs declined 14 percent.

TABLE 3
Employment Trends: Industries Affected by Proposed Amendments, 2001 - 2004

	2001	2002	2003	2004	Change from 2001 to 2004	% Change from 2001 to 2004
San Francisco Bay Area						
Manufacturing	460,992	402,895	362,089	357,385	-103,607	-22%
Petroleum refineries	7,086	7,271	7,248	7,196	110	2%
California						
Manufacturing	1,780,544	1,633,958	1,532,287	1,536,787	-243,757	-14%
Petroleum refineries	13,447	12,878	13,149	12,776	-671	-5%

Source: Applied Development Economics from data supplied by the Labor Market Information Division of the California Employment Development Department

Table 4 identifies the economic characteristics of the refineries affected by the new proposed rule. This table shows that the refineries are estimated to employ 1,935 workers. These sites have an estimated aggregate payroll of \$172 million, and estimated revenues of \$9.8 billion. In calculating aggregate revenues generated by Bay Area refineries, the consultant estimated an average revenue figure per refinery based on revenues generated by that refinery in 2004 using annual reports. Then, the consultant summed the refineries' estimated revenue to arrive at the aggregate amount of \$9.8 billion.

TABLE 4
Economic Characteristics of Impacted Oil Refineries in the San Francisco Bay Area

No. of Oil Refineries	Estimated Sales	Estimated Employment	ES202 Payroll
5	\$9,837,598,944	1,935	\$557,340,000

Source: U.S. Economic Census 2002; California Employment Development Department Quarterly Census of Employment and Wages

As Table 5 shows, the affected sources represent 27 percent of all employment within their respective industry in the Bay Area. Overall, there are an estimated 7,196 petroleum refining employees in the Bay Area. Of the 7,196 workers, 1,935 work in the affected refineries, or 27 percent. In all of California, there were 12,776 workers in SIC 2911 (NAICS 32411),

meaning that the affected Bay Area refineries equaled 15 percent of the state oil refinery workforce.

TABLE 5
Employment at Impacted Sites Relative to the Bay Area as a Whole

No. of Oil Refineries	Estimated Employment	Affected Oil Refineries as a % of Bay Area Total	Affected Oil Refineries as a % of California Total
5	1,935	27%	15%

Source: Calculations by Applied Development Economics

3.5 COMPLIANCE COSTS

The cost of compliance analysis indicates that recurring and one-time costs would range from \$270,145 per flare system at the lower end to \$2.1 million per flare system at the upper end. The flare monitoring consists of six elements including provisions to update the plan. In addition, there is a requirement to notify BAAQMD when a flaring event occurs, annual updates, and continuous monitoring of the flare water seal. Table 6 provides a breakdown of the estimated costs.

TABLE 6
Estimated Cost of Compliance per Flare System

Provision	Costs	
	Lower End	Upper End
FMP Development*	\$100,000	\$100,000
Control Measure	\$121,945	\$1,921,592
FMP Updates	\$30,000	\$30,000
Notification of Flaring	\$50	\$500
Causal Analysis	\$4,200	\$40,200
Annual Reports	\$10,950	\$10,950
Water Seal Monitoring*	\$3,000	\$9,000
Total	\$270,145	\$2,112,242

Source: BAAQMD Staff

*Note: One time cost

For purposes of the rule, there are 21 flares among the five refineries. The total aggregates costs of compliance for the industry would range from \$1.4 million per year in the lower end to \$10.6 million per year in the upper end.

3.6 BUSINESS RESPONSE TO COMPLIANCE COSTS

Sites impacted by flare minimization plans 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, although in general throughout the oil industry prices are set in global markets and individual producers or refineries are not in a position to affect prices. More likely, 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.

3.7 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 for the proposed new rule, ADE calculated the socioeconomic impacts of the proposed actions. In calculating impacts on profits, ADE used return on sales ratios identified by media reports and in annual reports of companies directly affected by the proposal. Based on this information, we estimate that the affected refineries generated a combined profit of \$688 million on \$9.8 billion in revenues.

Table 7 compares the estimated costs of the proposed new rule and its impact on profits. Affected refineries will incur an aggregate annual cost ranging between \$1.4 million and \$10.4 million under the flare minimization program. This cost represents an estimated 0.2 percent to 2 percent of profits for the oil refineries affected by the proposed rule.

TABLE 7
Impact of Proposed Measure on Estimated Profits at Bay Area Oil Refineries

Impacted Refineries	Estimated Profits Generated	Cost of Prevention Measure		Cost as a % of profits	
		Lower End	Upper End	Lower End	Upper End
5	\$688,631,926	\$1,350,725	\$10,561,210	0.2%	2%

Source: Calculations by ADE, based on a 7 percent profit margin for oil refiners

3.8 IMPACT ON SMALL BUSINESSES

In addition to analyzing the employment impacts of the proposed new rule, state legislation requires that the socioeconomic analysis assess whether small businesses are disproportionately affected by air quality rules. 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 new rule. Finally, this section shows how the five refineries affected by the proposal fail to qualify as small businesses as defined by the State of California.

Oil Refineries by Employment Size Categories

Fifty percent of all businesses in California and 46 percent of United States businesses employ less than fifty people. Data in Table 8 are for all sites in industries identified by the BAAQMD, and it includes data on sites affected by the proposed flare monitoring. The data in the table comes from Dun & Bradstreet and is current as of the second quarter of 2005. Table 8 distributes affected industries by number of employees per 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 37 percent of all establishments in all industries in California and 41 percent in the United States. In contrast, 90 percent of Bay Area oil refineries employ at least 100 people. We estimate that the sites directly affected by the proposed rule employ,

on average, 387 workers, placing these facilities as mid- to large-sized employers.

TABLE 8
Distribution of Oil Refineries by Employment Size in the San Francisco Bay Area

	Employment Size Categories*							
	1 thru 4	5 thru 9	10 thru 24	25 thru 49	50 thru 99	100 thru 249	250 thru 499	500 or more
Bay Area Petroleum refineries	0%	1%	1%	3%	5%	0%	30%	60%
California (all industries)	16%	8%	14%	12%	13%	14%	8%	15%
U.S. (all industries)	12%	8%	14%	12%	13%	15%	8%	18%

Source: Applied Development Economics, based on data supplied by Zapdata.com (a Dun & Bradstreet Company)

*Note: Employment size based on number of employees located at individual company/business sites

Definition of Small Business per California Statute

The previous section showed oil refineries in the San Francisco Bay Area, including refineries affected by flare monitoring are significantly larger than most businesses in California and the nation, which, on average, employ less than 50 people. In contrast, the refineries, on average, employ 387 workers. This section discusses how the State of California defines small business, and shows how the five sources affected by the proposed new rule 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 manner. 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:
 - 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 refineries that are affected by the proposed new rule are not independently-owned and operated businesses. These refineries are owned by publicly-traded global corporations whose headquarters are generally outside of California. In addition, each of the refineries that are affected by the proposal employ, on average, 387 workers, and their average revenue is approximately \$1.9 billion. Thus, by the standards established by the State of California, these sources are not small businesses. Based on this discussion, it is determined that proposal does not disproportionately affect small businesses because the sources impacted by the proposed new rule do not meet California's definition of small business.