Bay Area Air District

APPENDIX C

Socioeconomic Impacts Analysis of Proposed Amendments to Rule 6-3

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Eastern Research Group, Inc.

Socio-economic Analysis for Amendments to Regulation 6 Rule 3: Wood-Burning Devices

Final Report

Submitted to:
Bay Area Air Quality Management District
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Executive Summary

ERG conducted a socio-economic analysis of the proposed amendments to Regulation 6, Rule 3 to determine whether the proposed amendments would have a significant impact on households in the Bay Area Air Quality Management District (BAAQMD), businesses in the District, and the overall District economy. ERG determined that the proposed administrative amendments will not affect any population in the District and have no socio-economic impacts. ERG found that the proposed mandatory burn ban amendment has the potential to substantially impact one type of business (firewood sellers), but that other businesses that sell firewood, households, and the overall economy would see no significant impact.

To calculate potential costs to households from the proposed mandatory burn ban amendment, ERG estimated the population of households that would be affected by the proposed amendment and calculated the cost for a household to switch to an alternative non-wood heating source for a day. By multiplying the cost to switch to a non-wood heating source on any given day by the number of affected households, the number of additional Mandatory Burn Ban days, and by the liklihood of a household planning to burn wood on the Ban day, ERG estimated the annual total household compliance costs to comply with the proposed amendments. ERG calculated costs assuming a low number of additional Ban days and a high number of additional Ban days to show the potential range of costs from additional Ban days and to address uncertainty in the number of additional days that would be issued. ERG found that the compliance cost represented less than 0.1 percent of household income for both high and low estimates, assuming conservatively that household income is equal to that of the lowest quintile of income in the region.

ERG determined that the only businesses affected by the rule are firewood suppliers, since other businesses that sell firewood or other types of wood for burning (e.g., manufactured logs, wood pellets) do so only as a very small portion of their business. ERG calculated the amount that households would spend at firewood suppliers on any given Mandatory Burn Ban day to estimate the sales revenue lost per Ban day among firewood suppliers. ERG multiplied the daily revenue by the number of Mandatory Burn Ban days to calculate the annual revenue lost across all firewood suppliers. Like the consumer impacts, ERG estimated the costs to businesses assuming a low and high number of additional Mandatory Burn Ban days. ERG's analysis shows that these businesses, which are all considered small businesses, would see a decline in sales equal to approximately 2 to 7 percent of annual revenues. However, it is challenging to accurately predict how a decline in sales revenue will impact these businesses, as their business structures vary. Some are likely seasonal, while others are likely associated with related industries, like tree service providers. Those businesses that operate part-time or as a supplement to another venture may experience less impact from the proposed amendments. In contrast, full-time operations that serve as the owner's primary source of income may see more significant impacts.

Finally, ERG used IMPLAN, a regional economic input-output model, to assess how compliance costs associated with the proposed amendments would impact the economy as a whole. This model predicts that the compliance costs across the entire economy would reduce GDP by -$271,657, which is negligible considering the Bay Area's GDP is nearly 1.3 trillion.

Certain businesses that rely primarily on firewood sales for annual revenue may be significantly affected by the proposed amendments. However, because the proposed amendments are expected to impose only minimal costs on households – regardless of income level – and have a negligible impact on the regional economy overall, they are unlikley to result in significant economic impacts.

Introduction

This report discusses the socio-economic impact of the proposed amendments to Regulation 6, Rule 3 (Rule 6-3). This report outlines ERG's methodology for calculating the cost to consumers, the cost to the firewood industry, and the macroeconomic impact and presents the results of these analyses.

Description of Proposed Rule Amendments

Mandatory Burn Ban Amendment

Rule 6-3 prohibits the use of a wood-burning device, such as a woodstove or fireplace, during a Mandatory Burn Ban. A Mandatory Burn Ban is called when the level of particulate matter (PM) in the air exceeds 35 $\mu g/m^3$ on average over a 24-hour period. There are some exceptions to the rule, including households that use a wood-burning device for their primary source of heat and who do not have an alternative heat source. Regulating wood smoke in the Bay Area mitigates its adverse health and air quality impacts. Woodsmoke contains pollutants, such as PM and volatile organic compounds, that can exacerbate pulmonary and cardiovascular illness (Environment & Human Health, Inc., 2018). Prohibiting burning wood during days with elevated PM levels prevents additional PM pollution and thus reduces the health impact from PM exposure.

The proposed amendment to Rule 6-3 lowers the forecasted 24-hour average particulate matter threshold that triggers a Mandatory Burn Ban from 35 $\mu g/m^3$ to 25 $\mu g/m^3$. This proposed amendment will further reduce PM exposure and health risks in the Bay Aea. Lowering the PM threshold is expected to increase the number of Mandatory Burn Ban days by approximately 5 to 26 days annually.[1]

Administrative Amendments

The proposed amendments include five administrative amendments, as referenced in BAAQMD's Staff Report (BAAQMD, 2025):

1. BAAQMD proposes revising Section 6-3-302 to reference EPA's performance and emission standards set in Title 40 Code of Federal Regulations (CFR), Part 60, Subpart AAA instead of the specific emissions rating. Removing references to the requirements within Title 40 CFR, Part 60, Subpart AAA would eliminate the need to amend the rule each time EPA updates its emission standards.

2. Some provisions include effective dates that have since passed (such as, "effective November 1, 2015"). BAAQMD proposes removing these dates to streamline language in the rule.

3. BAAQMD proposes modifying the language in Section 6-3-102 for clarity. This section outlines the applicability of Rule 6-3. The proposed amendment will not alter who is subject to the rule, but will clarify its scope.

4. BAAQMD proposes revisions to streamline and improve consistency in the definitions section of Rule 6-3. Two unused definitions—"Uncertified Wood Heater" and "Visible Emissions"—are proposed for removal. Several existing definitions have been revised to align with terms defined in *Regulation 6: Particulate Matter – Common Definitions and Test Methods*.

5. BAAQMD also proposes revisions to the visible emissions limitation standard to improve clarity and ensure consistent interpretation in Section 6-3-308.

[1] Estimated by BAAQMD, 2025.

Regional Trends

Demographic and economic trends provide regional context for rulemaking and socio-economic analyses. The following data highlight population and household characteristics and important industries in the Bay Area and California. These data show how the Bay Area aligns with or diverges from statewide trends and provide important baseline information for this analysis.

Table 1 presents population and household data over a ten-year period (2014 to 2023) in the Bay Area and in California.

Table 1. Population and households in the Bay Area and California, 2014 to 2023

Bay Area				
	2014	2023	Total Change, 2014 - 2023	Percent Change, 2014 -2023
Population	7,360,487	7,629,426	268,939	3.7%
Households	2,636,267	2,785,482	149,215	5.7%
Average Household Size	2.79	2.74		
California				
	2014	2023	Total Change, 2014 - 2023	Percent Change, 2014 -2023
Population	38,802,500	38,965,193	162,693	0.4%
Households	12,758,648	13,699,816	941,168	7.4%
Average Household Size	3.04	2.84		

[a] the Bay Area consists of the following counties: Alameda, Contra Costa, Marin, Napa, San Francisco, San Mateo, Santa Clara, Solano, and Sonoma.
Source: U.S. Census, 2014 and 2023a

The population in the Bay Area has grown by nearly 4 percent over the past 10 years, compared to a 0.4 percent population growth statewide. The number of households, however, has increased by 7.4 percent statewide, while the number of households in the Bay Area has increased by 5.7 percent. The average household size is realtievely similar in both areas: 2.74 in the Bay Area compared to 2.84 in California.

Table 2 presents employment by industry in the Bay Area and in California.

Table 2. Employment by sector, 2014 to 2023

	Bay Area			California		
Industry	2014	2023	Percent change (2014 - 2023)	2014	2023	Percent change (2014 - 2023)
Agriculture, forestry, fishing and hunting, and mining:	31,347	27,912	-11.0%	420,979	379,601	-9.8%
Construction	206,442	233,856	13.3%	1,064,294	1,258,660	18.3%
Manufacturing	397,408	415,512	4.6%	1,718,093	1,684,528	-2.0%
Wholesale trade	93,860	59,719	-36.4%	542,536	406,848	-25.0%
Retail trade	379,270	342,003	-9.8%	1,927,958	1,888,499	-2.0%

	Bay Area			California		
Industry	2014	2023	Percent change (2014 - 2023)	2014	2023	Percent change (2014 - 2023)
Transportation and warehousing, and utilities:	159,534	185,804	16.5%	830,311	1,186,824	42.9%
Information	156,929	170,588	8.7%	528,556	553,090	4.6%
Finance and insurance, and real estate and rental and leasing:	250,305	220,236	-12.0%	1,083,944	1,013,177	-6.5%
Professional, scientific, and management, and administrative and waste management services:	658,347	834,835	26.8%	2,271,628	2,780,335	22.4%
Educational services, and health care and social assistance:	776,815	827,778	6.6%	3,681,807	4,238,380	15.1%
Arts, entertainment, and recreation, and accommodation and food services:	375,147	317,953	-15.2%	1,860,773	1,838,902	-1.2%
Other services, except public administration	190,905	170,750	-10.6%	953,146	914,766	-4.0%
Public administration	133,227	144,972	8.8%	754,127	882,956	17.1%
Total Employment	**3,809,536**	**3,951,918**	**3.7%**	**17,638,152**	**19,026,566**	**7.9%**

Source: U.S. Census, 2014 and 2023b

As of 2023, the largest industry by employment in the Bay Area was the professional services industry with nearly 835,000 employees, followed closely by the educational services, health care, and social assistance industry. At the state level, the largest industry by employment is the educational services, health care, and social assistance industry, with over 4.2 million employees.

Although employment in the Bay Area in some industries has declined over the past 10 years, certain industries experienced large growth over the same period. The professional services industry, for example, grew by approximately 175,000 employees. The industries with the largest declines in employment include the wholesale trade industry (36 percent decrease) and the arts, entertainment, recreation, accommodation, and food services industry (15 percent decrease). Despite slower growth in the Bay Area compared to California, the Bay Area has seen an overall increase in employment between 2014 and 2023, indicating strong economic growth in the area.

Affected Populations

Mandatory Burn Ban Amendment

Households in the Bay Area that use wood-burning devices and firewood suppliers in the Bay Area will be impacted by the proposed mandatory burn ban amendment to Rule 6-3. During the winter, households that burn wood for heat will switch to an alternative heat source and will incur those additional costs associated with running gas or electric heat. As households burn less wood, firewood suppliers will experience a decline in demand for wood and thus a decline in sales.

Households

ERG assumes that the affected population of households are those that burn wood at least once a week for heat. Those that burn for ambiance are not expected to incur financial impacts from the proposed amendments since the only cost to households from this rule is the cost to switch to a non-wood heating source, and households that only burn for ambiance will not need to pay to run an alternative heat source. Those that burn less frequently than once per week for heat are not expected to incur any significant costs because they burn so infrequently that they likely do not rely on wood heat for a significant amount of their heating needs. Furthermore, the likelihood that the days that infrequent burners will use their wood-burning device align with Mandatory Burn Ban days is small, and it can be expected that households adjust their burn days to not fall on Mandatory Burn Bans.

Affected Households

- Affected households are those who burn wood at least once per week for heat.
- Approximately 3 percent of households in the Bay Area burn wood at least once a week for heat.

The 2023-2024 Spare the Air survey, which surveyed residents' behaviors and attitude related to wood burning, provides insight into the number and location of households that would be impacted by the proposed amendment (True North Research, 2024). According to the Spare the Air survey, approximately 30 percent of households in the Bay Area have a wood-burning device (fireplace, wood stove, or pellet stove). This equates to around 830,000 households.[2] The county with the largest percentage of residents with a wood-burning device is Solano County (approximately 41 percent of households have a wood-burning device), followed by Marin County (39 percent) and San Mateo County (38 percent). Figure 1 shows a map of BAAQMD counties by the percentage of the population with a wood-burning device.

[2] See Table 1 for the number of households in the Bay Area.

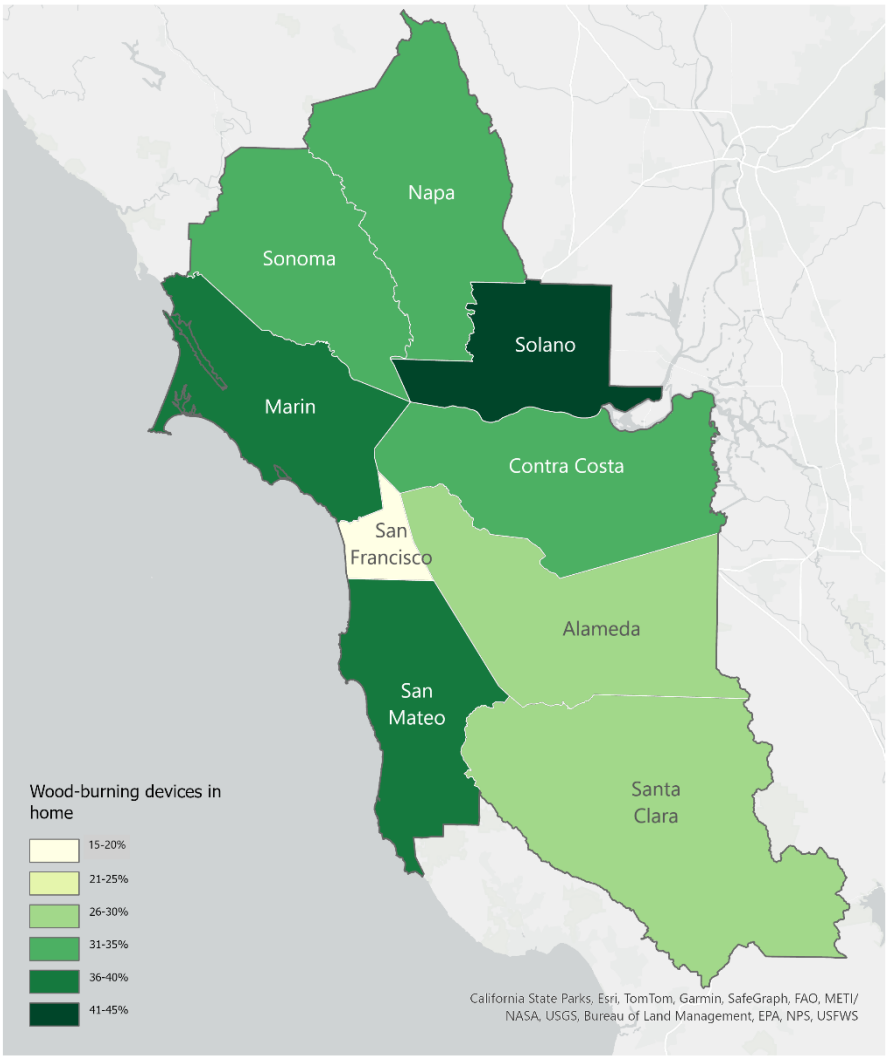

Figure 1. BAAQMD counties percentage of homes with a wood-burning device

Of those with a wood-burning device, 34.7 percent reported that they plan to use their device. This means that of the 830,000 households with a wood-burning device, 288,000 plan to use the device over the winter. Of the households with a wood-burning device that indicated they plan to use their device, 41.6 percent indicated they plan to use their device at least once a week and 58 percent indicated they plan to use their device less frequently or were not sure how often they would use the device. This means that 120,000 households are "frequent burners," that is, they use their wood-burning device at least weekly. However, not all "frequent burners" burn wood for heat. 76.5 percent of frequent burners indicated that they burn wood for heat. As described above, ERG assumes that the population affected by the proposed amendments are those households that burn at least once a week and burn for heat, so ERG estimates that approximately 91,700 households (76.5 percent of 120,000) will be impacted by the proposed amendments. This is equivalent to approximately 3 percent of households in the Bay Area. Table 3 presents the percentages from the Spare the Air survey used to estimate the number of affected households, along with the resulting estimates. While the calculations were performed using unrounded estimates, Table 3 presents rounded estimates.

Table 3. Estimate of affected households based on Spare the Air survey data

Metric	Percent of households (from Spare the Air Survey)	Number of households (ERG calculation)
Households in Bay Area	n/a	2,785,000
Households with a wood-burning device	29.8%	830,000
Households with a wood-burning device that plan to burn wood	34.7%	288,000
Households with a wood-burning device that plan to burn at least once a week (frequent burners)	41.6%	120,000
Frequent burners that burn wood for heat (affected households)	76.5%	91,700

While data on burning frequency and the percentage of frequent burners that burn for heat is unavailable at the county level, the Spare the Air survey provides the percentage of households that have a wood-burning device and the percentage of those households that plan to use the device by county. Assuming the proportion of frequent burners and the proportion of those frequent burners that burn for heat is the same at the county level as it is in aggregate, ERG calculated the percentage of households that would be impacted by the proposed amendment by county to understand the distribution of impact across the Bay Area. Less than 10 percent of households in each county will be affected. The county with the lowest percentage of households impacted is San Francisco County (1 percent of households affected), and the county with the highest percentage of affected households is Solano County (6 percent). Table 4 shows the percentage and number of households that would be impacted by the proposed amendments in each county and in the district.

Table 4. Percentage of Households Affected by Proposed Amendments to Rule 6-3 by Area

Area	Number of households affected by proposed amendments to Rule 6-3	Percentage of households affected by proposed amendments to Rule 6-3
Alameda County	13,800	2%
Contra Costa County	14,700	4%
Marin County	4,400	4%
Napa County	2,400	5%
San Francisco County	5,200	1%
San Mateo County	11,900	4%
Santa Clara County	20,700	3%
Solano County	10,100	7%
Sonoma County	10,600	6%
BAAQMD	**91,700**	**3%**

Note: The sum of affected households by county does not equal total affected households across the district because ERG applied district-wide percentages to some individual counties due to missing data. Additionally, component values may not sum to total due to rounding.

Firewood Suppliers

According to the Spare the Air survey, Bay Area households acquire natural firewood by gathering their own wood, purchasing wood from a firewood supplier, and by purchasing wood from a local store like a gas station or grocery store. The majority of households gather their own wood (39.9 percent) or purchase wood at a local store (36.1 percent). Twenty-one percent of households acquire wood through a wood supplier, and 2.5 percent acquire wood through some other source.

ERG anticipates that the impact to industry from the proposed amendment to Rule 6-3 would be limited to natural firewood suppliers. No revenue is lost to those who acquire their own wood. In fact, the proposed amendment would save time for households as it decreases the amount of wood a household would need to collect. While many households purchase from a local store, the sales of wood at these stores are so small that any impact from the proposed amendment would be insignificant to their total sales. Table 5 shows the percentage of sales at hardware stores and gas stations from household fuels from the 2022 Economic Census Product Line data. This includes wood, propane, coal, and oil, so the percentage of sales from wood is even smaller than the estimates below.

Affected Businesses

- The proposed amendments would affect firewood. suppliers in the Bay Area
- There are approximately 22 firewood suppliers in the Bay Area with $4.0 million in total annual sales.

Table 5. Percent of sales from household fuels by business type

NAICS Code	NAICS Description	Establishments	Employment	Percentage of Sales from Household Fuels
444140	Hardware retailers	241	12,636	0.6%
445110	Supermarkets and other grocery retailers (except convenience retailers)	1,834	67,809	0.9%
445131	Convenience retailers	550	2,814	0.1%
457110	Gasoline stations with convenience stores	1,144	9,031	2.3%
457120	Other gasoline stations	200	1,308	6%

Sources: 2022 Economic Census Multi-Sector Statistics Product Statistics, https://data.census.gov/table/ECNNAPCSPRD2022.EC2200NAPCSPRDIND
County Business Patterns 2023: County File. https://www.census.gov/data/datasets/2023/econ/cbp/2023-cbp.html

Households in the Bay Area also use manufactured wood, pallets, and pellets in their wood heating devices. Manufactured logs are typically composed of compressed saw dust or saw dust mixed with a binding agent such a paraffin and formed into a log shape. Although manufactured logs are used by a significant percentage of households that burn wood, they are designed to burn in fireplaces, not wood stoves. As stated in BAAQMD's 2024 Woodsmoke White Paper: "An important differentiation between fireplaces and wood stoves is that fireplaces burn wood in an open hearth and are not typically the primary source of heat." Therefore, ERG did not estimate the impact of the Burn Ban on this product.

ERG also assumes no impact to pallet suppliers since the percentage of the pallets sold at these suppliers for the purposes of firewood is likely very small. Pallets are typically used for material transport and handling and are assumed to be purchased most often for those purposes.

Wood pellet stoves are used for heating, however, less than 1 percent of households anticipate using their device. ERG conducted a search for pellet wood suppliers in the Bay Area and found they were sold at local stores, primarily hardware retailers and large home improvement retailers such as Home Depot

and Lowe's. We expect no substantial impact on revenues to these sellers from decreases in the use of wood pellets.

ERG identified firewood suppliers in the Bay Area primarily through Google and Google map searches. ERG used several search terms to identify firewood suppliers, including but not limited to "firewood sellers in Bay Area" and "firewood suppliers near Bay Area." ERG also cross referenced the list of suppliers identified in BAAQMD's staff 2019 report on the Proposed Amendments to Regulation 5: Open Burning and Regulation 6: Particulate Matter and Visible Emissions, Rule 3: Wood-Burning Devices to make sure all businesses identified in that report that are still operating are also on our list. ERG identified 22 firewood suppliers in the Bay Area. Table 6 shows the number of firewood suppliers identified by county.

Table 6. Number of firewood suppliers identified by county

County	Count
Alameda	3
Contra Costa	2
Marin	2
Napa	1
San Francisco	1
San Mateo	4
Santa Clara	3
Solano	3
Sonoma	3
BAAQMD Total	**22**

After identifying the firewood suppliers in the Bay Area, ERG downloaded business data from the NAICS Association Company Lookup tool. Business data were used to estimate industry impacts from the proposed amendments, as described in the Approach section below, and to determine whether the affected businesses are small businesses. The NAICS Association's tool provides data on sales, employment, location, industry, and more for individual businesses. NAICS Association sources these data through Dun and Bradstreet's database (NAICS Association, n.d.). Of the 22 suppliers identified, 8 had data available through this tool. The other 14 businesses had no results in the database, likely because they do not have Dun and Bradstreet profiles. ERG calculated the average sales from the businesses with NAICS profiles, excluding one business that we assume is an outlier because it has sales that are almost double that of the business with the second highest sales. ERG then applied this average to the businesses with no NAICS profile. Annual sales among firewood suppliers ranged from $55,000 to $474,000, with total estimated sales of approximately $4.0 million across the region.

According to California Government Code 14835, a business is considered a small business if it meets all of the following requirements:

- 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 officers domiciled in California.
- Together with affiliates, it must have 100 or fewer employees and average annual gross receipts of ten million dollars ($10,000,000) or less over the previous three years.

Assuming each business is independently owned, and that annual revenue has remained relatively consistent over the past three years, all the suppliers identified are small businesses under California Government Code 14835.

Administrative Amendments

The proposed administrative amendments change the language within Rule 6-3 but have no socio-economic impact on any population in the District since they do not change any costs associated with the rule or the population subject to the rule.

Impacts

Mandatory Burn Ban Amendment: Consumer Impacts

Approach

The cost to consumers from the proposed amendments is the cost to heat a home with a non-wood heating source during the additional Mandatory Burn Days. This analysis assumes that on a Mandatory Burn Ban day, homes that would otherwise burn wood will substitute an alternative fuel for space heating and will therefore incur additional costs for heating.

Conceptually, affected households would also accrue savings from not burning wood on such days, either directly through reduced expenditure on wood or pellets, or implicitly due to a decrease in time cutting, splitting, transporting and stacking their own wood. ERG did not estimate this potential cost offset because many households use nonmarket means of obtaining firewood. This would make savings highly variable. Excluding the savings offset from the analysis results in an overestimation of household costs and impacts.

ERG estimated consumer impacts under two scenarios: a low estimate of the additional number of Mandatory Burn Bans and a high estimate of the additional number of Mandatory Burn Bans. These scenarios are based on BAAQMD estimates on the maximum and minimum expected additional Mandatory Burn Bans under the proposed maximum daily PM threshold. ERG estimated consumer impacts in both scenarios by taking the following steps:

1. Calculate the number of households that would switch to an alternative fuel used for space heating, including natural gas, electricity, propane, and other fuel, on a Mandatory Burn Ban day.
2. Calculate the daily cost per household to switch to each fuel type.
3. Calculate the likelihood that a household is burning wood on any given day to account for the fact that not all households would burn wood on a Mandatory Burn Ban day.
4. Calculate the total annual cost across all households switching to alternative non-wood fuels for space heating, considering the likelihood that a household burns wood on any given additional Mandatory Burn Ban day.
5. Adjust the annual cost to reflect Bay Area fuel prices.

Number of households that switch to each fuel type

ERG used data from the U.S. Energy Information Administration's (EIA) California Profile to calculate the number of affected households that would use natural gas, electricity, propane, or other fuel instead of wood on Mandatory Burn Ban days. EIA data show the percentage of homes that use each fuel type in California. ERG multiplied the percentage that uses each fuel type by the number of affected households to calculate the number of households that would use each fuel type on a Mandatory Burn Ban day. In the absence of heating data at the county level, ERG assumed that the percentage of households using each fuel for heating is the same for the BAAQMD air district as it is for the state of California.

Daily cost to switch to each fuel type

EIA's Residential Energy Consumption Survey (RECS) publishes data on the average annual cost to heat a home in California with each type of non-wood space heating fuel. ERG first inflated these data, which show annual heating costs in 2020 dollars, to 2024 dollars using the Bureau of Economic Analysis' GDP Price Deflator (Bureau of Economic Analysis, 2025a). ERG then calculated the daily fuel costs from the inflated annual costs. Simply dividing the annual cost by 365 days to calculate daily heating costs would assume that heating costs are equal across the year, however, heating costs are often much higher during

winter months due to low ambient temperatures. To account for the non-uniform distribution of heating costs across seasons, ERG used heating distribution data to split annual heating costs between winter and non-winter months.[3] ERG used data on heating degree days in the Bay Area from the National Oceanic and Atmospheric Administration to identify the percentage of annual heating costs that are incurred in each season (NOAA National Centers for Environmental Information, 2025). ERG found that 61 percent of heating degree days occur in the winter, while 39 percent of heating degree days occur in the nonwinter. ERG then:

- multiplied annual heating costs by the percentage of annual heating costs that are incurred in the winter (61 percent) to estimate total winter heating costs per household.
- divided total winter heating costs by the number of days in the winter months to calculate the average daily winter heating costs per household.
- multiplied the average daily winter heating cost by the number of affected households that use the particular type of fuel to estimate the cost per day of switching to that fuel type across all households.
- repeated this process for the non-winter months and for all non-wood fuel types.

Table 7 shows the average daily heating costs per household and the daily heating costs across all households for each type of fuel in the winter and non-winter months.

Table 7. Average daily heating costs in winter and non-winter months (2024 dollars).

		Winter		Non-Winter	
Fuel Type	Number of households	Average cost per household per day	Total cost per day across all households	Average cost per day per household	Total cost per day across all households
Natural Gas	55,600	$1.82	$101,000	$0.57	$31,500
Electricity	27,100	$0.86	$23,300	$0.27	$7,200
Propane	3,300	$4.96	$16,400	$1.54	$5,100
“Other” fuel [a]	5,600	$1.54	$8,600	$0.48	$2,700

Notes: All costs represent costs before adjusting for Bay Area pricing.
Multiplying the number of households by the average daily cost per household may not result in the total daily cost across all households because of rounding.
[a] Other fuel represents any other fuel type besides natural gas, electricity, or propane.

Likelihood of a household burning wood on a given day

Mandatory Burn Ban days may not fall on days when households were planning to burn wood. Most households do not burn wood every day, so all affected households will not be impacted by Mandatory Burn Ban days on each day that they occur. Since Mandatory Burn Bans would likely not affect all wood-burning households on each day that they occur, ERG estimated the probability that a household uses wood for heating on any given day to more accurately calculate total annual heating costs across the affected population.

ERG used data from the Spare the Air survey on the frequency of wood burning to calculate the likelihood of a household burning wood on a given day. The survey provided the percentage of wood-burning households that burn at least one day per week. ERG calculated that the average number of burn days per week weighted by the percentage of households that burn that number of days is equal to 3.16 days per week. ERG divided this by seven to determine the probability of any “frequent burner” household

[3] In line with the winter season defined in the Spare the Air report, ERG considered the winter months to be November, December, January, and February. All other months were considered non-winter.

having a wood fire on any given day. Based on this analysis, the likelihood that such a household burns wood on any given day is 45 percent.

Total annual additional fuel costs

To calculate the total annual additional fuel costs, ERG first multiplied the total heating cost per day across all households, as shown in Table 7, by the number of additional Mandatory Burn Ban days in the winter and non-winter months. This resulted in the total cost across all households and across all Mandatory Burn Bans for each fuel type and for each season. The estimated number of additional Ban days are listed in Table 8 below.

Table 8. Estimated additional Mandatory Burn Ban days by winter and non-winter

Season	Low estimate	High estimate
Winter	9	17
Non-Winter	0	5

Source: BAAQMD

ERG then summed the winter and non-winter costs, which resulted in the cost of all affected households to switch to non-wood heat over the course of all additional Mandatory Burn Ban days in a year. ERG multiplied this cost by 45 percent to account for the fact that all households may not be affected by each Mandatory Burn Ban. ERG added the annual cost associated with each fuel type to determine the total additional fuel costs across all households, across all types of fuel, and across all additional Mandatory Burn Ban days.

Bay Area pricing adjustment

The daily heating costs that ERG calculated are based on data from the EIA for the state of California. However, ERG adjusted these results to more accurately reflect Bay Area prices using data from the Bureau of Labor Statistics (BLS) and EIA. BLS provides data on natural gas prices per therm in the San Francisco-Oakland-Hayward, California metropolitan area (U.S. Bureau of Labor Statistics, 2025).[4] The EIA provides the price of natural gas per Thousand Cubic Feet in California, which was converted to therms for comparison purposes. ERG estimated the difference in Bay Area gas prices from the rest of California by calculating the percentage change between the EIA data and the BLS data. We found that natural gas prices are 6.44 percent higher than the state average. ERG applied this increase to the total additional cost calculated to more accurately represent Bay Area pricing in our results.

Results

Table 9 presents the estimates of the costs incurred by households in the Bay Area over the course of one year as a result of the proposed amendments to Rule 6-3.

Table 9. Annual heating costs per household, adjusted for Bay Area prices (2024 dollars)

	Low estimate		High estimate	
Fuel Type	Annual additional heating costs	Annual additional heating costs per household	Annual additional heating costs	Annual additional heating costs per household
Natural Gas	$223,000	$4.02	$948,000	$17.00
Electricity	$51,300	$1.89	$218,000	$8.03
Propane	$36,000	$10.90	$153,000	$46.40
“Other” fuel [a]	$19,000	$3.39	$80,000	$14.40
Total	**$330,000**		**$1,400,000**	

Note: Component values may not sum due to rounding

[4] A therm is a unit of measurement for heat equal to 100,000 British Thermal Units (BTUs).

ERG's analysis shows that the additional cost to households from the proposed amendments to the rule ranges from $1.89 to $46.40 annually per household. Across all affected households, the average annual cost of these amendments is estimated to range from $330,000 to $1,400,000.

However, the income of households affected by a Mandatory Burn Ban is unlikely to be evenly distributed across District communities. Based on anecdotal evidence, ERG expects that households that frequently burn wood for heat earn below average incomes. Therefore, ERG measured the impact to these households as the ratio of annual compliance costs to the lowest quintile of household income rather than median income. Table 10 presents the estimated compliance costs as a percentage of income for the lowest quintile of household income and the median household income in the Bay Area.

Table 10. Compliance costs as a percent of total income

	Low estimate	High estimate
	Compliance costs as a percentage of income	Compliance costs as a percentage of income
Lowest quintile of household income	0.014%	0.060%
Median income	0.003%	0.012%

Averaging the lowest income quintile across the counties comprising the District, annual compliance costs represent between 0.014 percent and 0.060 percent of annual income. The proposed amendments therefore do not have a significant impact on household income under a 1 percent significance threshold.[5]

Figure 2 shows the percentage of population affected by the rule change, overlaid with population in poverty data.[6] Poverty is defined as the population living two times below the federal poverty level. The portions of Solano and Sonoma counties within the BAAQMD have the highest rates of poverty within the district. These areas also have a higher proportion of population affected by the rule.

[5] U.S. EPA, for example, suggests that compliance costs comprising less than 1 percent of income do not impose a significant impact of families (U.S. EPA, 2014).

[6] Poverty data is from CalEnviroScreen 4.0 at the census tract level. Census tracts within the BAAQMD boundaries were aggregated to the county level.

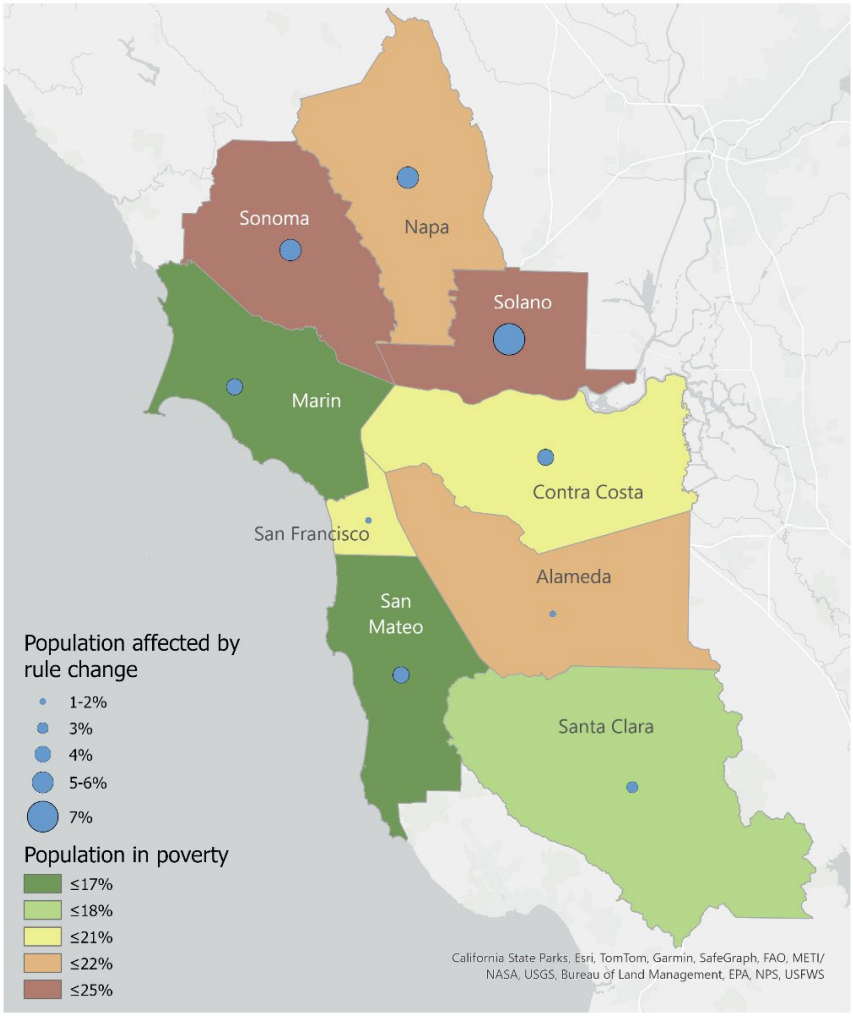

Figure 2. BAAQMD affected population by county overlaid with percent of population in poverty. Population in poverty data is from CalEnviroScreen 4.0.

While the population affected by the amendments is proportionally higher in the counties with higher poverty rates, the impact on households is negligible and represents less than 0.1 percent of income when considering annual income for the lowest quintile. Even if a larger percentage of the population is impacted in counties with higher poverty rates, the impacted households will not see any significant cost as a result of the proposed amendments.

Mandatory Burn Ban Amendment: Industry Impacts

Approach

As described in the Affected Populations section, firewood suppliers in the Bay Area are expected to be affected by the proposed amendments. Like the consumer impacts, ERG estimated the impact on firewood suppliers using both the high and low estimates of additional Mandatory Burn Ban days. ERG calculated the lost revenues to firewood suppliers through the following steps:

1. Calculate the number of households that purchase firewood from a wood supplier.
2. Calculate the price per natural wood log in a cord of firewood.
3. Calculate the cost per day a household would incur on a typical burn per day in both the winter and nonwinter.
4. Calculate the cost of natural wood for all households that purchase from a wood supplier across all additional Mandatory Burn Ban days (i.e., the total sales lost at wood suppliers as a result of additional Ban days).

Number of Households Purchasing from a Wood Supplier

ERG first estimated the number of households in the Bay Area that purchase natural wood through a wood supplier. The Spare the Air survey indicated that 34 percent of wood burners use natural logs, and 21 percent of those burners purchased from a firewood supplier. Although the population of affected households is just frequent burners, and these figures represent all burners, the survey did not provide data on the type of wood used broken down by frequent and infrequent burners. Using the data available, ERG predicts that 6,600 frequent burners purchase their wood from a firewood supplier. Table 11 presents the percentages from the Spare the Air survey used to estimate the number of households that purchase from a wood supplier, along with the resulting estimates. While the calculations were performed using unrounded estimates, Table 11 presents rounded estimates.

Table 11. Estimate of households purchasing from a wood supplier based on Spare the Air survey data

Metric	Percent of households (from Spare the Air Survey)	Number of households (ERG calculation)
Number of affected households	n/a	91,700
Wood-burners that burn natural wood	34%	31,200
Natural wood-burners purchasing from a firewood supplier	21%	6,600

Price per Piece of Wood

There is little data available on the average price of natural firewood in the Bay Area. However, some of the firewood suppliers identified through ERG's review post their prices online. ERG calculated the average price per cord of wood based on these supplier's prices. ERG excluded one supplier in this average, which had a price per cord that was nearly double the other suppliers. The average price per cord calculated was $452.50. Since there are approximately 600 to 800 pieces of wood in a cord, each piece sells for around $0.65 using the midpoint of 700 pieces of wood per cord (Greubel, 2024).

Daily Cost of Wood

Frequent burners burn on average 7.13 pieces of wood on each day they use their wood-burning device, according to the Spare the Air survey. So, frequent burners that aquire wood through firewood suppliers spend $4.63 at a firewood supplier for each day they burn wood at a supplier ($0.65 per piece x 7.13

pieces). The Spare the Air survey reflects wood burning in the winter months only (November through February). To estimate daily wood use during the non-winter months, ERG first calculated the ratio between the daily cost of "other fuel" in winter and non-winter months (as detailed in the "Consumer Impacts" section). This ratio was then applied to the number of wood pieces burned daily in the winter, resulting in an estimate of 2.21 pieces burned per day in the non-winter months. Therefore, during the non-winter months, frequent burners who purchase wood from a firewood supplier spend approximately $1.43 per day day ($0.65 per piece x 2.21 pieces).

Annual Cost of Wood

To estimate the total annual spending at firewood suppliers that would no longer occur as a result of the proposed amendment, ERG multiplied the daily household wood cost by the number of additional Mandatory Burn Bans days in both winter and non-winter months. The resulting winter and non-winter costs were then summed to determine the total annual cost per household. Table 12 presents the daily cost of wood for households as well as the amount spent at a wood supplier across all additional Ban days (i.e., the annual sales revenue lost) per household.

Table 12. Average daily cost of natural wood from a wood supplier in winter and non-winter months

			Low estimate		High estimate	
	Logs burned per day	Daily cost of wood	Additional Mandatory Burn Ban Days	Annual sales revenue lost per household	Additional Mandatory Burn Ban Days	Annual sales revenue lost per household
Winter	7.13	$4.61	5	$21.20	17	$76.50
Non-winter	2.21	$1.43	0	$0.00	9	$13.50
Total			**5**	**$21.20**	**26**	**$90.00**

Notes: These estimates reflect the current price per cord of firewood on sellers' websites (as of June 2025). Because the time between 2024 and 2025 is short, the market is small, and it is uncertain how firewood prices change over time, the price was not deflated to represent 2024 dollars. The effect of this on the estimate of firewood sellers' revenues should be small.
Component values may not sum due to rounding

ERG multiplied the annual spend per household by the number of households that purchase from a wood supplier. As described in the Consumer Impacts section, since the likelihood of a household burning wood on a Mandatory Burn Ban day is 45 percent, we multiplied the result by 45 percent to calculate the total annual spent at firewood suppliers across the Bay Area. These calculations were performed for both the low and high estimates of additional ban days and can be understood as the sales revenue lost across firewood dealers in the Bay Area as a result of the proposed amendments.

Results

Table 13 presents the total annual sales revenue that would be lost as a result of households not burning wood on the additional Mandatory Burn Ban days. Table 13 also presents the percentage of annual sales revenue lost across the industry as a result of the proposed amendments.

Table 13. Annual industry sales revenue lost

	Low estimate	High estimate
Total annual industry sales	$3,990,000	$3,990,000
Annual sales revenue lost	$62,400	$265,000
Percent of industry revenue lost	**1.6%**	**6.6%**

Note: estimates reflect current prices but are not deflated to 2024 dollars for reasons described in Table 12.

The proposed amendments are estimated to reduce annual sales at firewood suppliers by $62,400 to $265,000. This reduction would be distributed among all firewood suppliers in the Bay Area. This

represents 1.6 percent to 6.6 percent of total annual sales across the industry. The proposed amendments thus have the potential to reduce sales a significant amount to firewood suppliers in the Bay Area. Furthermore, all of the businesses that would be impacted are small businesses.

It is unclear how the proposed amendments would impact employment at firewood suppliers. ERG found annual revenue data for eight firewood sellers ranging from $55,000 to $474,000 per year. On average, 3.25 employees worked at each company, with a range of 1 to 6 employees. Revenue per employee ranged for $27,500 to $145,000. It is unclear how many of these companies provide fulltime employment but it seems apparent that at least some businesses are primarily partime or seasonal employers.

This analysis included potential year-round lost sales revenue due to the increased number of Burn Ban days. ERG included nonwinter sales for consistency with the household analysis. To the extent that the reduction in sales only occurs during the winter, estimated lost sales will range from $62,400 to $225,000 per year, or from 1.6 percent to 5.6 percent of sales. This would still be considered a potentially significant using a 3 percent of revenue threshold.

Because the firewood industry is considered a niche industry, it is difficult to evaluate how the proposed rule will impact these businesses. Some businesses may be part-time or seasonal and will be impacted by fewer Mandatory Burn Ban days than year round businesses. Furthermore, some may be associated with tree, landscaping, or lot clearing services, and the income from selling firewood might be in addition to their primary business. In these cases, the impact of the rule might be relatively small. To the extent some are fulltime, and a primary source of income, the impact might be more significant.

While ERG's analysis shows there may be a substantial impact to firewood sellers, there should not be a substantial impact to other retailers who sell firewood, such as gas stations, convenience stores, supermarkets, hardware stores and large home imporvement retailers because firewood comprises a small percentage of their sales. Additionally, ERG used the IMPLAN Input-Output model (see below for details) to evaluate the overall impact of the proposed rule on the District economy. This analysis projects negiligible impacts on employment, income, and production. Therefore ERG expects the overall impact of the proposed rule on the District will be insubstantial, although one specific sector, firewood sellers, will be more affected than others.

Mandatory Burn Ban Amendment: Macroeconomic Analysis and Results

Analytical Approach

ERG conducted a multi-regional Economic Impact Analysis (EIA) of the changes in household spending as a result of the proposed mandatory burn ban amendment. EIAs measure the economic effect of an event on the economy in a specified geographic area. ERG conducted this analysis in IMPLAN, an Input-Output (I-O) modeling software. The primary purpose of IMPLAN is to show how a change in the economy (e.g., an infusion of money, a new infrastructure project, the loss of a major business or entity) will impact all other industries in that economy within a selected geographic area based on established business relationships that describe how money ripples through the economy between industries. Some key terms related to IMPLAN include:

- Employment refers to the number of individuals hired for a salary or compensation to work within a sector. IMPLAN follows job definitions from the Bureau of Economic Analysis (BEA), which include full-time, part-time, and seasonal positions. IMPLAN jobs are not Full-time Equivalent (FTE) positions.
- Labor income represents the total value of income from employment.
- Value added is the increase in a product or service's market value at each stage of production.
- Economic output refers to the total value of all goods and services produced in an economy.
- Direct effects from IMPLAN show the immediate impact of a change on its own sector.
- Indirect effects describe the effect of direct impacts to a sector on the economic sectors that support that sector (e.g., assuming firewood producers purchase equipment to split logs, the addition of an additional firewood producer into the economy would have an indirect impact by boosting the industry supplying the equipment to split logs).
- Induced effects show how changes in labor income due to direct and indirect effects result in additional economic impacts (e.g., staff who work for a firewood producer and get paid then spend that money within the local economy, which boosts any industry from which they make purchases such as grocery, restaurants, and retail).

We considered one geographic area in our model: a custom region that encompasses each of the nine counties regulated by the BAAQMD. All estimated costs are allocated to our combined region. We entered changes in household income due to the proposed rulemaking as reductions in institutional spending in IMPLAN. While IMPLAN does allow changes in household income to be entered into the model as household income events, inputting them as changes in institutional spending allows us to customize household spending patterns and choose how to distribute costs based on household income levels. Because many households that heat with wood are believed to have lower income, we distributed expected costs evenly across four household income groups.

- Households with income between $15-$30 thousand
- Households with income between $30-$40 thousand
- Households with income between $40-$50 thousand
- Households with income between $50-$70 thousand

Additionally, we customized household spending patterns for each income bracket level to reflect the expected increase in cost burdens related to heating fuels as substitutes to wood fuel products. We increased affected household groups' spending on natural gas and electricity by 0.009 percent and 0.005 percent, respectively, to reflect estimated increases in annual household spending on fuel for space

heating. To be conservative, we used our estimated increase in spending on non-wood fuel for space heating as a percentage of income for the mean household at the lowest quintile (averaged across affected counties), equal to 0.014 percent and distributed the increased spending between natural gas and electricity based on the proportion of CA households using each fuel for space heating. IMPLAN requires that changes in spending are characterized as percent changes in spending on specific IMPLAN commodity codes. IMPLAN does not have commodity codes that are specific to spending on propane and "other" fuels, so we distributed changes in household spending related to propane and "other" fuels evenly between the natural gas and electricity commodity codes. In order to increase household spending on non-wood fuels for space heating, our model necessitates that we decrease household spending on other purchases within the model. IMPLAN does not have a commodity code associated with wood fuels, so we were unable to decrease spending related to wood fuel products. In lieu of this option, we chose to evenly decrease household spending on owner-occupied housing and tenant-occupied real estate services since we expect that the proposed rulemaking will have little effect on households' spending on housing.

Due to the lack of granularity possible in the IMPLAN model, this analysis models changes in household spending rather than a decrease in spending at wood suppliers. Modeling a change in revenue at wood suppliers is unlikely to adequately capture indirect and induced effects downstream of firewood sellers. Firewood suppliers are included in the "Retail – Gasoline stores" sector; modeling a decrease in revenue in this sector would not accurately represent the spending changes as a result of these proposed amendments. Furthermore, the firewood dealers we identified had few employees, and most firewood dealers do not have many indirect relationships with other industries. Some dealers are associated with tree service providers, for example, but a change in revenue among firewood suppliers is unlikely to significantly impact any other industries.

Model Results

Table 14 presents the results of ERG's IMPLAN analysis and shows the direct, indirect, induced, and total impacts on employment, labor income, value added, and output as a result of an increase in household spending on heating.

Table 14. Results of IMPLAN analysis

	Employment	Labor Income	Value Added	Output
Direct	-1	-$83,200	-$186,400	-$251,000
Indirect	0	-$26,400	-$42,200	-$63,100
Induced	0	-$23,100	-$43,100	-$60,700
Total	**-1**	**-$133,000**	**-$272,000**	**-$375,000**

Note: Component values may not sum due to rounding

As seen in Table 14, the proposed amendments would result in a decrease in value added (or GDP) of nearly $272,000 across the region. The proposed amendments are also estimated to decrease employment by 1. With a regional GDP of nearly $1.3 trillion, the impact on GDP from these proposed amendments is negligible (Bureau of Economic Analysis, 2025b).

Mandatory Burn Ban Amendment: Uncertainty Analysis

In determining the potential impacts of the proposed rule, the primary source of uncertainty is the number of Mandatory Burn Ban days that might occur in any given year. ERG addressed that issue by examining impacts of the expected minimum and maximum Burn Ban days. ERG also assessed the effect of uncertainty in compliance costs by assuming nonwinter Burn Ban days are not costless, and uncertainty concerning which households would be most affected by the potential rule by comparing compliance costs to those earning in the lowest quintile of household income. As shown above, these conservative assumptions did not result in significant impacts to households.

Finally, ERG performed a sensitivity analysis to examine the effects of the proposed rule by assuming that: (1) the high-end estimate of Burn Ban days occurs, (2) all of the Burn Ban days occur in the winter months, and (3) all households that frequently burn wood for heat switch to alternative fuels on those Burn Ban days. Under these assumptions, estimated annual compliance costs more than triple from $1.4 million to $4.14 million. Thus, this sensitivity analysis examines the potentially largest impact on household incomes, although this outcome is highly unlikely. Under these assumptions, annual compliance costs comprise less than 0.2 percent of the lowest quintile of household income in the District (and about 0.034 percent of median income).

Administrative Amendments

As described in the Affected Populations section, the administrative amendments have no socio-economic impact.

Discussion

ERG's analysis shows that there will be no impact from the administrative amendments to Rule 6-3 and no significant impact on consumers from the proposed mandatory burn ban amendments to Rule 6-3. However, there is potential for significant impact on firewood sellers, depending on how many additional Mandatory Burn Ban days there are in a given year. Our results show that the firewood seller industry may experience a loss of between approximately 2 percent and 7 percent of revenues across the industry. With a significance threshold of 3 percent, if the number of additional Mandatory Burn Ban days is in line with the low estimate, there will be no significant impact on revenue. However, if the number of additional Ban days is closer to the high estimate, there will be a significant impact on revenue. Note that all firewood suppliers identified are small businesses, so all impact on industry from the proposed regulation would fall on small businesses. Even though there is potential for a significant impact on firewood sellers, ERG's IMPLAN modeling predicts a negligible impact on overall output and employment in the District economy.

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