

SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT

Second Draft Socioeconomic Impact Assessment for Proposed Rule 2305 – Warehouse Indirect Source Rule – Warehouse Actions and Investments to Reduce Emissions (WAIRE) Program and Proposed Rule 316 – Fees for Rule 2305

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Preface

Since its release in March 2021, the PR 2305 Draft Socioeconomic Impact Assessment has been further revised to reflect comments received. The major differences of the PR 2305 Draft Socioeconomic Impact Assessment and the PR 2305 Second Draft Socioeconomic Impact Assessment are:

- 1. Based on comments received, changes have been made to the scenario modelling assumptions regarding how CARB regulations impact individual warehouse compliance obligations. As a result of these changes, compliance obligations have decreased resulting in fewer compliance actions taken, lower costs, and lower emissions reductions.*
- 2. Revisions have been made to the scenario analyses regarding how warehouse growth (both in square footage and number of operators) is accounted for over time.*
- 3. The capital costs of ZE Class 8 trucks have been revised upwards in years 2022 and 2023, and the assumed annual mileage of ZE Class 8 trucks has been revised downward. The capital costs of ZE Class 6 trucks have also been revised upwards for years 2022-2031. Federal excise taxes have been added to the incremental capital cost of ZE Class 8 acquisitions.*
- 4. The costs of NZE/ZE Truck Visits from a Non-owned Fleet have been revised to reflect decreasing capital costs of ZE trucks over time.*
- 5. The 6.25% Mitigation Program Fee outlined in PR 316 has been added to the compliance cost of all relevant scenarios.*
- 6. The small business analysis has been refined. Facilities were removed from small business consideration if the available facility revenue data was deemed unreliable (if its reported/estimated annual revenue was less than expected annual rent).*
- 7. The total compliance cost share by industry by county has been updated. South Coast AQMD Staff made a concerted effort to identify NAICS codes for each operator listed in the CoStar database. Reliable information is now available for 1,714 of the assumed warehouse operators potentially affected by PR 2305.*
- 8. Projected administrative costs associated with PR 2305 (reporting, truck surveys, reviewing video) are now modeled as an increase in exogenous demand for Other Professional, Scientific, and Technical Services (NAICS 5419). Increases in sales tax resulting from the incremental cost of NZE/ZE truck purchases modeled as exogenous demand for State Government (NAICS 92)*
- 9. In response to the comments from the third-party peer reviewer, tables have been added to the end of the Valuation of Public Health Benefits subsection that provide a comparison of total discounted costs and monetized public health benefits for all modelled scenarios.*
- 10. In response to the comments from the third-party peer reviewer, an additional table has been added to present the potential cost impacts by industry relative to the corresponding total value of output for that industry.*

EXECUTIVE SUMMARY

A socioeconomic analysis was conducted to assess the potential impacts of Proposed Rule (PR) 2305 – Warehouse Indirect Source Rule – Warehouse Actions and Investments to Reduce Emissions (WAIRE) Program and Proposed Rule 316 – Fees for Rule 2305 on the four-county region of Los Angeles, Orange, Riverside, and San Bernardino. A summary of the analysis and findings is presented below.

<p>Elements of Proposed Amendments</p>	<p>Proposed Rule (PR) 2305 – Warehouse Indirect Source Rule – Warehouse Actions and Investments to Reduce Emissions (WAIRE) Program and PR 316 – Fees for Rule 2305 would apply to operators and owners of existing and new warehouses.</p> <p>PR 2305 would be applicable to any existing or new warehouse located in South Coast AQMD’s jurisdiction with an indoor warehouse floor space equal to or greater than 100,000 square feet within a single building that may be used for warehousing activities by one or more warehouse operators.</p> <p>PR 2305 would require warehouses subject to the rule to annually take actions which either reduce emissions regionally and/or locally or that facilitate emission reductions.</p> <p>Warehouse owners or operators would be subject to an annual WAIRE Points Compliance Obligation (WPCO). WAIRE Points can be earned by selecting from the following implementation measures in the WAIRE Menu: 1) acquiring and/or using near-zero-emission (NZE) and zero-emission (ZE) trucks; 2) acquiring and/or using ZE yard trucks; 3) installing and/or using ZE charging/fueling infrastructure (e.g., electric charger or hydrogen fuel station) for cars, trucks, and/or transport refrigeration units (TRUs); 4) installing and/or using onsite solar panels; and 5) installing MERV 16 or greater filters or filter systems in residences, schools, daycares, hospitals, or community centers.</p> <p>WAIRE Points may be earned only for “surplus” actions which go beyond existing federal and state regulations already applicable to warehouse owners or operators earning WAIRE Points. In lieu of satisfying the WPCO via implementation measures, warehouse owners or operators may choose the option to pay a mitigation fee to the South Coast AQMD which would be used in a mitigation program to achieve emissions reduction in the same region as the warehouse.</p> <p>PR 316 – Fees for Rule 2305 establishes fees to recover South Coast AQMD administrative costs associated with ensuring compliance, such as submittal and review of various notifications and reports, implementing an incentive program using up to 6.25% of the mitigation fees from warehouse operators that pay a mitigation fee, as well as compliance activities such as conducting desktop audits, onsite inspections, and reviewing records.</p>
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<p>Community Profile</p>	<p>CalEnviroScreen 3.0 (CES 3.0) GIS data was used to quantify the environmental burdens, prevalence of existing health conditions, and the population demographics in communities adjacent to PR 2305 warehouses. Based on population-weighted averages, these communities face substantially higher burden than the district as a whole.</p> <p>The population within 0.5 miles of a large warehouse has a population-weighted average CES 3.0 Score of 46.6 (85th percentile statewide), while the South Coast AQMD jurisdiction has a population-weighted average CES 3.0 Score of 33.9 (67th percentile statewide). Risks posed from PM2.5 and diesel PM are also higher for populations located within 0.5 miles of warehousing facilities.</p> <p>Communities within 0.5 miles have an average asthma rate of 56 per 10,000 individuals (64th percentile) and experience heart attacks at a rate of 9.2 per 10,000 individuals (65th percentile). Comparably, the district-wide percentiles for asthma and cardiovascular incidence rates are 53rd and 57th, respectively.</p> <p>Warehouse-adjacent communities are 62.1% Hispanic and 7.6% African American, while the district-wide population is 45.4% Hispanic and 6.5% African American. In addition, the warehouse-adjacent communities experience poverty at a higher rate (46.7%) than non-warehouse-adjacent communities (38.2%).</p>
<p>Potentially Affected Facilities and Industries</p>	<p>PR 2305 is expected to potentially affect 3,995 warehouse operators at 2,902 warehouses classified under a variety of industry codes, mainly in the goods-movement industries of construction (NAICS 23), manufacturing (NAICS 31-33), wholesale trade (NAICS 42), retail trade (NAICS 44-45), and transportation and warehousing (NAICS 48-49). Of the 3,995 warehouse operators potentially affected by PR 2305, 1,964 are estimated to be in Los Angeles (LA) County, 468 estimated to be in Orange (OR) County, 470 estimated to be in Riverside (RV) County, and 1,093 estimated to be in San Bernardino (SB) County.</p>
<p>Cost Assumptions</p>	<p>All dollar figures presented in 2018 dollars.</p> <p>Purchases of ZE and NZE emission equipment is modeled as a one-time capital cost. Costs/savings resulting from the subsequent use of ZE and NZE equipment is modeled as recurring operating and maintenance (O&M) costs.</p> <p>The potential menu options available to facilities to meet compliance obligations are:</p> <ul style="list-style-type: none"> ▪ ZE and NZE Truck Acquisitions (Capital Cost) and Usage (O&M Cost) ▪ ZE and NZE Truck Visits from a Non-Owned Fleet (O&M) ▪ Electric Vehicle Charger Acquisition (Capital) and Usage (O&M) ▪ Hydrogen Filling Station Acquisition (Capital) and Usage (O&M) ▪ ZE Yard Truck Acquisition (Capital) and Usage (O&M) ▪ Solar Panel Acquisition (Capital) and Usage (O&M) ▪ High-Efficiency Filter Systems Acquisition (Capital) and Replacement Filters (O&M) ▪ TRU Plug Acquisition (Capital) and Usage (O&M) ▪ Pay Mitigation Fee (O&M)

Facilities are also expected to incur recurring O&M costs related to notification and reporting of compliance attainment.

Zero and Near-Zero Emission Truck Acquisition and Usage

Capital costs of Diesel, NZE, and ZE trucks are presented in the tables below. Diesel and NZE capital costs are assumed to remain constant across the entire compliance period. Incremental costs for NZE Class 8 and NZE Class 6 acquisitions are assumed to be \$65,000 and \$30,000, respectively, based on analysis included in the WAIRE Technical Report. The incremental acquisition cost for ZE trucks is set equal to the difference between the capital cost of each ZE truck and its diesel equivalent. An 8% sales tax is also applied to each ZE truck purchase and an additional 12% federal excise tax applies to all ZE Class 8 purchases.

Capital Costs for Diesel Truck Acquisitions

Vehicle Class	Diesel
Class 2b-3	\$50,000
Class 6	\$85,000
Class 8	\$130,000

Capital Cost by ZE Truck Class and Year (Pre-Tax)

Year	ZE Class 8	ZE Class 6	ZE Class 2b-3
2022	\$292,544	\$155,055	\$71,920
2023	\$246,948	\$143,904	\$68,318
2024	\$201,351	\$133,554	\$64,896
2025	\$194,134	\$128,321	\$63,635
2026	\$188,312	\$124,112	\$62,599
2027	\$183,371	\$120,563	\$61,684
2028	\$178,870	\$117,345	\$60,829
2029	\$174,809	\$114,456	\$60,035
2030	\$170,748	\$111,568	\$59,241
2031	\$170,748	\$111,568	\$59,241

Recurring costs associated with the use/visits of facility-owned NZE and ZE trucks is done on a per-mile basis. Per-mile usage costs resulting from fuel consumption and other costs (including maintenance, fees, insurance, and mid-life costs) were calculated for all truck classes and fuel types.

ZE and NZE Emission Truck Visits from a Non-Owned Fleet

The cost of hiring visits from clean trucks is assumed to be based on the per mile total cost of ownership (TCO) for each truck class and fuel type. More specifically, the incremental cost resulting from third-party owned ZE and NZE trucks is assumed to be

the incremental per mile TCO cost (or savings) of clean trucks when compared to the per mile TCO cost of diesel trucks.

A TCO analysis was performed for each truck class and fuel type used for compliance. A 12-year useful life is assumed for all trucks, with a 3-year payback period for equipment costs. The TCO for all diesel and NZE trucks is constant over the compliance period and does not vary based on the year purchased. Because capital costs for ZE trucks are assumed to decline over time, the TCO does vary by purchase year.

Incremental Costs per Visit from a Non-Owned Fleet for All Truck Classes and Fuel Types Purchased in Year 2022

Truck	Cost per Visit
NZE Class 8	\$11.43
NZE Class 6	\$0.93
ZE Class 8	\$98.13
ZE Class 6	-\$0.21
ZE Class 2b-3	\$10.98

Electric Vehicle Charger Acquisition and Usage

Electric vehicle charger costs are calculated on a per unit basis, where construction and permitting costs are incurred on a project basis. The cost is assumed to be \$30,000 per charger. Construction mobilization cost is assumed to be \$10,000 per project with permitting and charger energization costs are assumed to be \$70,000 per project.

Hydrogen Filling Station Acquisition and Usage

Total installed cost is \$2,000,000 per 700 kg/day project. Each Class 8 Truck is assumed to use 2,440 kg/year of hydrogen. Hydrogen usage costs are assumed to decline over time from roughly \$9.75/kg in 2020 to \$6.20/kg in 2031.

ZE Yard Truck Acquisition and Usage

The one-time incremental cost is assumed to be \$210,000 per truck. ZE yard truck capital costs are expected to decline over time due to projected future decreases in battery costs. Each ZE yard truck is assumed to operate for 1,000 hours per year for a total annual usage cost of \$6,250 per yard.

Solar Panel Acquisition and Usage

The price for a rooftop solar panel system (including installation) is set \$2.80 per kW, resulting in a total installed cost of \$280,000 for a 100 kW solar panel system. Solar panel usage is assumed to result in a net savings of \$0.17 per kWh generated. Each 100 kW system has an estimated electrical generation of 165,000 kWh annually.

High-Efficiency Filter Systems Acquisition and Replacement Filters

The estimated costs analyzed for the installation of 25 air filter systems with MERV 16 air filters is \$65,000. The cost for the replacement/installation of 200 MERV 16 air filters is \$60,000.

	<p>TRU Plug Acquisition and Usage The per unit cost of a TRU plug is assumed to be \$1,600. Associated construction and permitting costs are assumed to be \$4,700 and \$7,000 per installation project, respectively. Each installed TRU is assumed to consume 10,658 kWh of electricity annually. Assuming a rate of \$0.18/kWh, annual TRU usage cost is set to \$1,918.</p> <p>Pay Mitigation Fee In lieu of earning WAIRE Points from equipment acquisitions and usage, all facilities may choose to pay a fee of \$1,000 for each WAIRE Point in their WPCO attributed to their facility in every year of compliance.</p> <p>Administrative Costs All operators are also expected to incur expenses related to fees outlined in Rule 316 for Warehouse Operations Notifications (\$29.51/submission), Initial Site Information Reports (\$140.68/submission), and Annual WAIRE Reports (\$392.50/submission).</p> <p>All warehouse operators are also expected to incur costs associated with the reporting related to compiling all relevant compliance data and submitting the information as required by PR 2305. This type of reporting is estimated to be no more than 25 hours of work totaling \$1,250 per year.</p> <p>Many facilities already track and record the necessary truck trip information as part of their normal course of business. However, as a conservative approach for this study, all facilities are assumed to begin recording this data only due to PR 2305. To estimate truck traffic for determining compliance obligations, it is assumed all facilities will install two cameras at a one-time cost of \$2,000 per facility. Staff time will also be required for reviewing recordings. It is conservatively estimated that 144 hours per year (at \$50/hr.) for a total annual cost of \$7,200 per facility.</p> <p>It is also expected that facilities that elect to meet compliance obligations through ZE or NZE truck visits will incur additional costs related to truck tracking. For this analysis, it is assumed that tracking will be done through truck driver surveys and is expected to take one hour of work per week (at \$50/hr.) for a total annual cost of \$2,600 per facility.</p> <p>Facilities that choose to meet their compliance obligations through payment of the mitigation fee are subject to an additional fee equal to 6.25% of the amount of mitigation fee paid as outlined in Proposed Rule 316(f).</p> <p>Total annual administrative costs are expected to range from approximately \$8,900 to \$11,500 per facility per year. Facilities are also expected to incur one-time costs for camera purchase and installation, a Warehouse Operations Notifications Fee, and an Initial Site Information Report Fee.</p>
<p>Scenario Compliance Costs</p>	<p>To estimate the potential impacts of PR 2305 and PR 316, cost estimates for 19 different scenarios were developed to show the range of potential compliance outcomes. A description of the 19 scenarios analyzed is included in Table 15 of this report.</p>

Each scenario is structured to follow a series of choices a warehouse operator may make based on compliance choices from a previous year. As a bounding analysis approach, all warehouses were assumed to only comply with a single scenario approach from 2022 through 2031.

For these scenario analyses, all 2,902 potentially affected facilities were modeled for every year from 2022-2031 using their square footage and the applicable average trip generation rates to determine their compliance obligation. The amount of warehousing space was assumed to grow 1.8% per year, consistent with analysis from SCAG.

A cost summary for all 19 scenarios is included in the table below:

	Equipment	Discounted Total Cost - NPV 4% (in millions)	Average Annual Cost (in millions)	Average Annual Cost (\$/sq. ft)
Sc1	NZE Class 8	\$1,103	\$127	\$0.16
Sc2	NZE Class 8	\$1,220	\$139	\$0.17
Sc3	NZE Class 8	\$374	\$45	\$0.06
Sc4	NZE Class 8	\$750	\$94	\$0.12
Sc5	ZE Class 8	\$942	\$112	\$0.14
Sc6	ZE Class 6 & 8	\$1,604	\$187	\$0.23
Sc7	Mitigation Fee	\$5,264	\$670	\$0.83
Sc7a	Mitigation Fee	\$985	\$114	\$0.14
Sc8	NZE Class 6	\$1,627	\$184	\$0.23
Sc9	NZE Class 6	\$468	\$59	\$0.07
Sc10	ZE Class 6	-\$87	-\$13	-\$0.02
Sc11	Solar	\$9,712	\$979	\$1.21
Sc12	ZE Class 8	\$7,445	\$837	\$1.04
Sc13	ZE Class 2b-3	\$753	\$82	\$0.10
Sc14	ZE Class 2b-3	\$978	\$119	\$0.15
Sc15	Filter System	\$5,057	\$635	\$0.79
Sc16	Filter	\$4,953	\$622	\$0.77
Sc17	TRU	\$46	\$6	\$0.70
Sc18	Yard Trucks	\$1,029	\$120	\$0.15

Average annual costs range from -\$12.6M/yr. (or -\$0.02/sq. ft./yr.) for the lowest cost scenario (Scenario 10: ZE Class 6 Visits from a Non-owned Fleet) up to \$979.0M/yr. (or \$1.21/sq. ft./yr.) for the highest cost scenario (Scenario 11: Solar Panel Installations).

The costs presented here are default calculations broadly applicable to the industry, however individual warehouse operators may identify different specific costs for their operations. Warehouse operators are assumed to gravitate towards the lowest cost options

	<p>for their specific situations. The maximum cost warehouse operators would be expected to incur is \$0.83/sq. ft./yr. resulting from the mitigation fee scenario.</p>						
<p>Jobs and Other Socioeconomic Impacts</p>	<p style="text-align: center;">PR 2305 Expected Annual Foregone Jobs (2022-2031)</p> <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th style="background-color: #cccccc;">Cost scenario</th> <th style="background-color: #cccccc;">Annual foregone jobs (% of total jobs in LA, OR, RV, and SB counties)</th> </tr> </thead> <tbody> <tr> <td>Low-cost scenario (4% interest rate)</td> <td>-240 (-0.002%)</td> </tr> <tr> <td>High-cost scenario (4% interest rate)</td> <td>11,100 (0.10%)</td> </tr> </tbody> </table> <p>Based on the above assumptions, the compliance cost of PR 2305, and the application of the Regional Economic Models, Inc. (REMI) model, it is projected -240 – 11,100 jobs will be forgone on average annually from 2022 - 2031 in total across all South Coast AQMD industries for the low-cost (Scenario 10) and high-cost (Scenario 7) scenarios. Scenario 10 assumes all potentially affected warehouse operators comply with PR 2305 through third party visits from Class 6 zero-emission vehicles, while Scenario 7 assumes all potentially affected warehouse operators comply with PR 2305 by paying a mitigation fee and not receiving any funds from the mitigation fee for future compliance with PR 2305. These projected job forgone impacts represent about -0.002% - 0.10% of total employment in the four-county region.</p> <p>Retail trade (NAICS 44-45) and construction (NAICS 23) are expected to bear most of the estimated total compliance cost of PR 2305, with around an estimated total 0 – 3,100 jobs forgone on average annually between 2022 to 2031 for the low-cost (Scenario 10) and high-cost (Scenario 7) scenarios. These forgone jobs are estimated to occur from both direct rule compliance costs, as well as indirect effects of a large group of facilities directing funds away from projects/spending into sectors like retail trade and construction.</p> <p>Estimated forgone jobs are not currently existing jobs which are lost in the future. Rather they are jobs which were expected to be created in the future which no longer are expected to be created, as the total number of jobs in the compliance period is higher than the total number of jobs before the compliance period. Additionally, the negative jobs forgone values presented for Scenario 10 are indicative of estimated additional jobs created if all facilities complied in the manner modeled in Scenario 10.</p>	Cost scenario	Annual foregone jobs (% of total jobs in LA, OR, RV, and SB counties)	Low-cost scenario (4% interest rate)	-240 (-0.002%)	High-cost scenario (4% interest rate)	11,100 (0.10%)
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<p>Competitiveness</p>	<p>As a result of PR 2305 being implemented, South Coast AQMD staff expects no warehouse relocation and minimal goods movement diversion. These conclusions are made from warehouse relocation estimation work performed by Industrial Economics, Inc. for South Coast AQMD, along with the Port of Los Angeles (POLA) and Port of Long Beach (POLB) clean truck fund rate study.</p> <p>Minimal effects on warehousing demand is expected as evidenced from historical trends in industrial rent prices and warehouse availability. Industrial rental prices in the South Coast AQMD jurisdiction have risen around 63% from 2012 to 2019, from \$5.88 per square foot to \$9.60 per square foot. Over the same time overall warehouse capacity within the South Coast AQMD jurisdiction has risen from 500 million square feet to around 700 million, with vacancy rates falling from around 6% to around 4%. These trends in warehousing operation costs with a concurrent increase in warehouse capacity</p>						

	<p>and decrease in warehouse vacancy lead South Coast AQMD staff to believe PR 2305 would have little effect on regional competitiveness.</p> <p>One competitiveness concern is how PR 2305 may increase annual operating costs in an example warehouse affected by PR 2305. Consider a hypothetical 500,000 sq. ft. warehouse operator. Further consider a low- and high-cost compliance scenario, e.g. Scenario 7a with an average annual compliance cost of \$0.14/sq. ft. and Scenario 7 with an average annual compliance cost of \$0.83/sq. ft. This warehouse is expected to incur an annual PR 2305 compliance cost between \$70,000 and \$415,000. In comparison, annual operating expenses for this warehouse are estimated to be \$13 million according to a 2015 Boyd Company report. This implies the cost of complying with PR 2305 for this example warehouse falls between 0.5% - 3.2% of average annual operating expenses.</p>																																
<p>Impacts of CEQA Alternatives</p>	<p>There are five CEQA alternatives associated with PR 2305. Alternative A, the no project alternative, would mean PR 2305 would not be adopted. Alternative B (less stringent with less emission reduction) increases minimum square feet required to be affected by PR 2305, delays the initial compliance date by one year, and relaxes the rule stringency down to 0.0001. Alternative C (more stringent with more emission reductions) increases rule stringency to 0.005 and increases the stringency phase-in period to seven years. Alternative D (no zero emission) allows for all compliance actions except for zero-emission ones. Alternative E (no natural gas) allows for all compliance actions except for natural gas ones.</p> <table border="1" data-bbox="431 999 1516 1640"> <thead> <tr> <th></th> <th colspan="3">Average Annual, 2022-2031</th> </tr> <tr> <th>Alternatives</th> <th>Cost</th> <th>Jobs Foregone</th> <th>DCF Cost-Effectiveness, 4%; \$ per ton NOx</th> </tr> </thead> <tbody> <tr> <td>Proposed Amendments</td> <td>-\$12,600,000 - \$670,200,000</td> <td>-240 – 11,100</td> <td>-\$11,000 - \$101,000</td> </tr> <tr> <td>Alternative A - No Project</td> <td>-</td> <td>-</td> <td>-</td> </tr> <tr> <td>Alternative B - Decreased Emission Reductions</td> <td>\$20,600,000 - \$37,300,000</td> <td>150 – 490</td> <td>\$139,000 - \$181,000</td> </tr> <tr> <td>Alternative C - Increased Emission Reductions</td> <td>-\$60,000,000 - \$1,015,000,000</td> <td>-670 – 16,100</td> <td>-\$35,000 - \$100,000</td> </tr> <tr> <td>Alternative D - All Natural Gas Options Only</td> <td>\$45,000,000 - \$670,200,000</td> <td>410 – 11,100</td> <td>\$32,000 - \$101,000</td> </tr> <tr> <td>Alternative E - All Electric Options Only</td> <td>-\$12,600,000 - \$670,200,000</td> <td>-240 - 11,100</td> <td>-\$11,000 - \$101,000</td> </tr> </tbody> </table>		Average Annual, 2022-2031			Alternatives	Cost	Jobs Foregone	DCF Cost-Effectiveness, 4%; \$ per ton NOx	Proposed Amendments	-\$12,600,000 - \$670,200,000	-240 – 11,100	-\$11,000 - \$101,000	Alternative A - No Project	-	-	-	Alternative B - Decreased Emission Reductions	\$20,600,000 - \$37,300,000	150 – 490	\$139,000 - \$181,000	Alternative C - Increased Emission Reductions	-\$60,000,000 - \$1,015,000,000	-670 – 16,100	-\$35,000 - \$100,000	Alternative D - All Natural Gas Options Only	\$45,000,000 - \$670,200,000	410 – 11,100	\$32,000 - \$101,000	Alternative E - All Electric Options Only	-\$12,600,000 - \$670,200,000	-240 - 11,100	-\$11,000 - \$101,000
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<p>Public Health Benefits</p>	<p>Public health benefits resulting from compliance with PR 2305 are calculated using an incidence per ton (IPT) methodology, developed by the U.S. Environmental Protection Agency. The IPT methodology is an approximation based on the general assumption that the relationship between emissions and adverse health outcomes is linear. IPT factors for</p>																																

NOx and direct PM emissions were generated based on the detailed air quality and health impact modeling completed for the 2016 Air Quality Management Plan.

PR 2305 is expected to result in 150 to 300 fewer deaths, 2,500 to 5,800 fewer asthma attacks, and 9,000 to 20,000 fewer work loss days from 2022-2031. Expected total discounted monetized public health benefits range from \$1.2 to \$2.7 billion over the compliance period.

The linearity assumption underpinning the IPT and BPT methodologies employed here is a an approximation which ignores complex chemistry, precursor pollutant interactions, and finer-scale geographical effects. To get a refined estimate of the expected reduction in adverse health outcomes resulting from PR 2305, one would need to undertake a detailed analysis similar to the CMAQ and BenMAP modeling performed for the 2016 AQMP, however the level of information needed for that style of analysis is not available given the wide variety of options available for compliance. The screening analysis shown here is therefore the most appropriate and consistent with similar analyses conducted by CARB and EPA

INTRODUCTION

Proposed Rule (PR) 2305 – Warehouse Indirect Source Rule – Warehouse Actions and Investments to Reduce Emissions (WAIRE) Program and PR 316 – Fees for Rule 2305 would apply to operators and owners of existing and new warehouses. These warehouses are used to receive, store, and serve as a distribution point for goods. The majority of emissions associated with warehouses are from on-road vehicles such as trucks that deliver goods, and off-road vehicles such as cargo handling equipment. PR 2305 would require warehouses subject to the rule to annually take actions which directly reduce or facilitate reduction of regional and local emissions and/or pollution exposure.

If adopted, PR 2305 would be applicable to any existing or new warehouse located in South Coast AQMD’s jurisdiction with an indoor warehouse floor space of 100,000 square feet or above within a single building usable for warehousing activities by one or more warehouse operators. Warehouse operators are applicable to PR 2305 if their indoor warehouse floor space is 50,000 square feet or above within one of these warehouses. At the time of this analysis, approximately 3,320 facilities located throughout South Coast AQMD’s jurisdiction would be subject to PR 2305. An estimated 418 of these facilities are expected to only be subject to reporting requirements, and the remaining 2,902 warehouses would be required to comply with additional air quality improvement measures.

Warehouse owners or operators of these 2,902 warehouses would be subject to an annual WAIRE Points Compliance Obligation (WPCO). WAIRE Points can be earned by selecting from the following implementation measures in the WAIRE Menu: 1) acquiring and/or using near-zero emissions (NZE) and zero emission (ZE) trucks; 2) acquiring and/or using ZE yard trucks; 3) installing and/or using ZE charging/fueling infrastructure (e.g., electric charger, hydrogen fuel station) for cars, trucks, and/or transport refrigeration units (TRUs); 4) installing and/or using onsite solar panels; and 5) installing MERV 16 or greater filters or filter systems in residences, schools, daycares, hospitals, or community centers. In addition, warehouse operators may apply to earn WAIRE Points through a Custom WAIRE Plan specific to their operations that satisfies prescribed performance metrics. Custom WAIRE Plans could include measures like installing offsite fueling/charging infrastructure or implementing new onsite practices to reduce air quality impacts from electricity consumption (such as installing and operating battery storage, or energy management systems to shift when electricity is used).¹

WAIRE Points may be earned only for “surplus” actions that go beyond existing federal and state regulations with which warehouse owners or operators earning WAIRE Points must comply. In lieu of satisfying the WPCO via implementation measures, warehouse owners or operators may choose the option to pay a mitigation fee to the South Coast AQMD that would be used in a mitigation program to achieve emissions reductions in the community of the facility using this compliance option. Similar to the measures used to earn WAIRE Points, the mitigation program would implement measures such as subsidizing the purchase of NZE ZE trucks and/or the

¹ Given the uncertainty regarding Custom WAIRE Plans, they are not included as a part of the cost analysis performed in this Socioeconomic Impact Assessment.

installation of charging and fueling infrastructure for ZE trucks. The environmental impacts associated with the mitigation program are similar to implementation of measures to earn WAIRE Points from the WAIRE Menu.

In addition, South Coast AQMD staff has developed PR 316 – Fees for Rule 2305 to establish fees to recover South Coast AQMD administrative costs associated with ensuring compliance, such as submittal and review of various notifications and reports, Custom WAIRE Plan application evaluation, implementing an incentive program using fees from warehouse operators that choose to pay a mitigation fee,² as well as compliance activities such as conducting desktop audits, onsite inspections, and reviewing records.

Implementation of the proposed project is expected to result in NO_x and PM, including DPM, emission reductions and reduced associated public health impacts from warehouse activities which is expected to vary depending on the implementation measures employed.

LEGISLATIVE MANDATES

The legal mandates directly related to the assessment of the proposed rule include South Coast AQMD Governing Board resolutions and various sections of the California Health & Safety Code.

South Coast AQMD Governing Board Resolutions

On March 17, 1989 the South Coast AQMD Governing Board adopted a resolution that calls for an economic analysis of regulatory impacts that includes the following elements:

- Affected industries
- Range of probable costs
- Cost-effectiveness of control alternatives
- Public health benefits

Health & Safety Code Requirements

The state legislature adopted legislation which reinforces and expands the Governing Board resolutions for socioeconomic impact assessments. California Health and Safety Code section 40440.8, which became effective on January 1, 1991, requires a socioeconomic impact assessment be performed for any proposed rule, rule amendment, or rule repeal which "will significantly affect air quality or emissions limitations."

Specifically, the scope of the socioeconomic impact assessment should include the following:

- Type of affected industries;
- Impact on employment and the regional economy;
- Range of probable costs, including those to industry;

² A 6.25% charge is added to each mitigation fee paid to cover administrative costs of implementing the incentive program from collected mitigation fees.

- Availability and cost-effectiveness of alternatives to the rule;
- Emission reduction potential; and
- Necessity of adopting, amending, or repealing the rule in order to attain state and federal ambient air quality standards.

Health and Safety Code section 40728.5, which became effective on January 1, 1992, requires the South Coast AQMD Governing Board to actively consider the socioeconomic impacts of regulations and make a good faith effort to minimize adverse socioeconomic impacts. It also expands socioeconomic impact assessments to include small business impacts, specifically it includes the following:

- Type of industries or business affected, including small businesses; and
- Range of probable costs, including costs to industry or business, including small business.

Finally, Health and Safety Code section 40920.6, which became effective on January 1, 1996, requires incremental cost-effectiveness be performed for a proposed rule or amendment which imposes Best Available Retrofit Control Technology or “all feasible measures” requirements relating to ozone, carbon monoxide (CO), oxides of sulfur (SO_x), oxides of nitrogen (NO_x), and their precursors.

COMMUNITY PROFILE

To analyze the existing environmental burdens facing communities adjacent to large warehouse facilities, we rely on CalEnviroScreen 3.0 (CES 3.0) data published by the California Office of Environmental Health Hazard Assessment (OEHHA). CES 3.0 combines local environmental, health, and socioeconomic data to generate an aggregate score for individual census tracts within the state. In general, census tracts with more sensitive populations (high prevalence of asthma, cardiovascular disease, low-birth weight infants) and elevated exposure to environmental pollution (air, groundwater, toxics) tend to have the highest CES 3.0 aggregate scores and are generally considered to be at the highest risk.^{3,4}

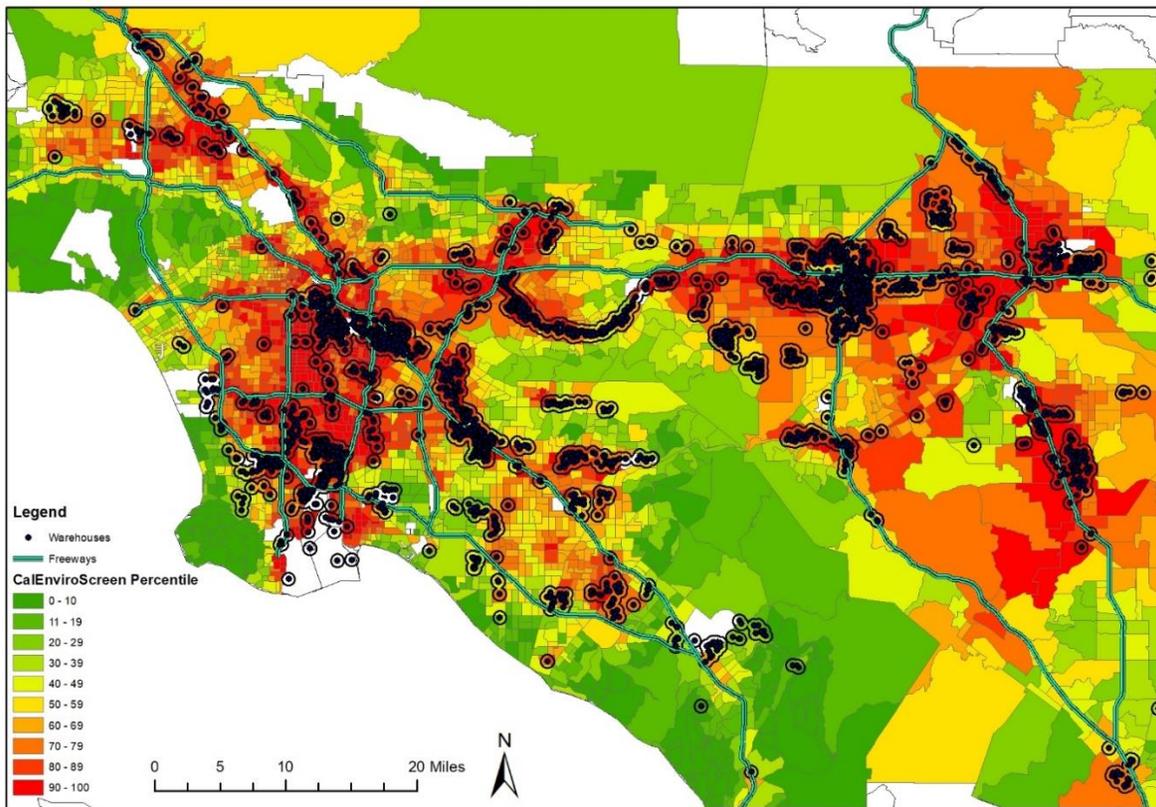
The census tract map in Figure 1 displays the location of the 2,902 large warehouse facilities potentially required to take actions to reduce emissions by PR 2305. The census tracts are color-coded with their CES 3.0 percentile, where dark green represents lower aggregate scores and less environmental burden, while dark red represents higher scores and higher burden. A buffer area of 0.5 miles around all warehouse locations is also shown.

³ Additional information on CalEnviroScreen 3.0 can be found here:

<https://oehha.ca.gov/media/downloads/calenviroscreen/report/ces3report.pdf>

⁴ The analysis contained in this section identifies a correlation between proximity to PR 2305 warehouses and increased CES 3.0 scores, it does not attempt to demonstrate a causal relationship. Higher levels of diesel PM have been identified around warehouses relative to other areas, due primarily to the sources of emissions associated with warehouses like trucks and TRUs (CARB 2005, 2020). In addition, trucks are the largest source of NO_x in the air basin, and some of the higher regional ozone and secondary PM levels found in communities near warehouses will therefore be attributable to truck emissions. (South Coast AQMD, 2017)

Figure 1: Map of Warehousing Facilities in the South Coast AQMD Jurisdiction



Using buffers of 0.5, 1, and 2 miles around potentially affected warehouse facilities, spatial statistics were calculated using ArcGIS to quantify the environmental burdens, prevalence of existing health conditions, and the population demographics in adjacent communities. Table 1 below summarizes some of the environmental burdens facing communities located near large warehousing facilities in the South Coast AQMD jurisdiction.

Based on population-weighted averages, these communities face substantially higher burden than the district as a whole (including both warehouse-adjacent and non-warehouse-adjacent communities).⁵ The population within 0.5 miles of a large warehouse has a population weighted average CES 3.0 Score of 46.6 (85th percentile statewide), while the South Coast AQMD jurisdiction as a whole has a population weighted average CES 3.0 Score of 33.9 (67th percentile statewide).⁶ Risks posed from PM_{2.5} and diesel PM are also higher for populations located within 0.5 miles of warehousing facilities. The higher South Coast AQMD average for ozone compared to warehouse adjacent communities reflects the regional nature of ozone formation.

⁵ Population-weighted average calculations assume population is uniformly distributed within census tracts.

⁶ Preliminary results presented at the October 9, 2020 PR 2305 Working Group Meeting and the February 16, 2021 Public Workshop reported that the population within 0.5 miles of a large warehouse was in the 80th percentile of CES 3.0 scores, while the population of the South Coast AQMD as a whole was in the 61st percentile. These results were based on taking a population-weighted average of CES 3.0 score percentiles directly. The updated percentiles reported in this document are based on a calculated population-weighted average CES 3.0 Score that is then compared to all statewide CES 3.0 Scores to determine the percentile.

Trucks are the largest source of NO_x emissions in the air basin and truck activity is focused at warehouses. However, since NO_x emissions spread out along an entire truck's journey to/from a warehouse and ozone is formed from secondary reactions in the atmosphere, ozone does not have as pronounced localized effects as pollutants like diesel PM.

Table 1: Population-Weighted Average CES 3.0 Scores, Ambient Concentrations of Ozone and PM2.5, and Diesel PM Emissions⁷

	Population	CES 3.0 Score (percentile)	Ozone, ppm (percentile)	PM2.5, µg/m³ (percentile)	Diesel PM, kg/day (percentile)
SCAQMD - ALL	16,114,899	33.9 (67)	0.052 (72)	11.3 (66)	21.1 (65)
Within 0.5 miles of at least one PR 2305 warehouse	2,401,554	46.6 (85)	0.051 (69)	11.9 (69)	25.5 (77)
Within 1 mile of at least one PR 2305 warehouse	6,200,544	43.2 (80)	0.050 (65)	11.8 (69)	25.0 (76)
Within 2 miles of at least one PR 2305 warehouse	11,589,892	38.4 (74)	0.051 (69)	11.7 (69)	23.8 (73)

Additionally, the prevalence of preexisting health conditions is higher on average in communities near PR 2305 warehouses. See Table 2 below. Those communities within 0.5 miles have an average asthma rate of 56 per 10,000 individuals (64th percentile) and experience heart attacks at a rate of 9.2 per 10,000 individuals (65th percentile). Comparably, the district-wide percentiles for asthma and cardiovascular incidence rates are 53rd and 57th, respectively.

Tables 3 and 4 below summarize socioeconomic and ethnic characteristics of adjacent and non-adjacent communities. Warehouse-adjacent communities are 62.1% Hispanic and 7.6% African American, while the district-wide population is 45.4% Hispanic and 6.5% African American. In addition, the warehouse-adjacent communities experience poverty at a higher rate (46.7%) than non-warehouse-adjacent communities (38.2%).

⁷ Population data is from 2010 US Census. Ozone scores reported as mean of summer months (May-October) of the daily maximum 8-hour ozone concentration (ppm), averaged over three years (2012 to 2014). PM2.5 scores reported annual mean concentration of PM2.5 (average of quarterly means, µg/m³), over three years (2012 to 2014). Diesel PM scores reported as gridded diesel PM emissions from on-road and non-road sources for a 2012 summer day in July (kg/day).

Table 2: Population-Weighted Average Incidence Rates of Asthma, Cardiovascular Issues and Low Birth Weight (per 10,000 individuals) in Warehouse-Adjacent Communities

	Asthma (percentile)	Cardiovascular (percentile)	Low Birth Weight (percentile)
SCAQMD - ALL	47.6 (53)	8.5 (57)	5.1 (55)
Within 0.5 miles of at least one PR 2305 warehouse	55.5 (64)	9.2 (65)	5.4 (63)
Within 1 mile of at least one PR 2305 warehouse	55.0 (63)	9.1 (64)	5.4 (62)
Within 2 miles of at least one PR 2305 warehouse	52.3 (59)	8.8 (61)	5.3 (60)

Table 3: Poverty and Unemployment Rates in Warehouse Adjacent Communities

	Poverty Rate (percentile)	Unemployment (percentile)
SCAQMD - ALL	38.2 (57)	10.2 (58)
Within 0.5 miles of at least one PR 2305 warehouse	46.7 (69)	11.1 (64)
Within 1 mile of at least one PR 2305 warehouse	45.2 (67)	10.9 (63)
Within 2 miles of at least one PR 2305 warehouse	42.1 (63)	10.6 (61)

Table 4: Ethnicity Rates in Warehouse Adjacent Communities

	Hispanic %	White %	African American %	Native American %	Asian American %
SCAQMD - ALL	45.4	32.3	6.5	0.2	13.1
Within 0.5 miles of at least one PR 2305 warehouse	62.1	17.5	7.6	0.2	10.9
Within 1 mile of at least one PR 2305 warehouse	59.1	19.9	7.4	0.2	11.6
Within 2 miles of at least one PR 2305 warehouse	52.4	25.1	7.4	0.2	12.8

AFFECTED INDUSTRIES/FACILITIES

Affected Industries and Industry Profile

PR 2305 covers warehousing operations with greater than 100,000 square feet due to their associated emissions of nitrogen oxide and particulate matter from fossil-fuel combustion of off-site and on-site trucks. Warehouse operators are applicable to PR 2305 if their indoor warehouse floor space is 50,000 square feet or above within one of these warehouses. Examples of these operations are visitations of diesel trucks of sizes varying from light and medium Class 2b-3 trucks to larger heavy Class 8 trucks, as well as on-site usage of hostler/yard trucks.

Using CoStar data of warehousing operations within the South Coast AQMD jurisdiction, South Coast AQMD staff expects PR 2305 to affect 2,902 warehousing locations, consisting of 3,995 warehouse operators, in that they would be required to earn WAIRE Points to meet their WPCO.⁸ More operators are expected affected than warehousing locations, i.e. physical addresses of warehouses, because many warehouses host multiple tenants/businesses. An estimated additional 418 warehouses are expected to only be subject to reporting requirements of PR 2305.

Currently industry categories are recorded and reported as numerical codes coming from the North American Industry Classification System, or NAICS. NAICS codes are hierarchical, and are as long as six digits, with the first digit indicating broad industry categories, and each additional digit indicates a more refined industry within the prior digit's relative broader industry.

⁸ CoStar data provides both warehouse locations and historical operator data, which South Coast AQMD staff believes includes historical operators no longer in operation. Consequently, South Coast AQMD staff estimates the number of PR 2305 potentially affected operators as the number of single-tenant warehouses (1,777 single-tenant and 32 unknown # of tenants) plus an assumed two operators for each multi-tenant warehouse (1,093 multi-tenant warehouses, or 2,186 warehouse operators), for a total of 3,995.

Although NAICS information of all estimated 3,995 warehouse operators potentially affected by PR 2305 would ideally be presented, several factors complicate that analysis here. First, the 3,995 estimated potentially affected warehouse operators comes from 1,809 single-tenant warehouses (1,777 single-tenant and 32 unknown number of tenants) and 1,093 multi-tenant warehouses. Warehouse operator data from CoStar does not distinguish from historical and current operators, South Coast AQMD staff was therefore unable to definitively assign operators to multi-tenant warehouses. Single-tenant warehouse information is more readily available (and these facilities are more prevalent) and this report presents NAICS information of those operators below.

Using facility-specific information collected from Dun and Bradstreet, as well as South Coast AQMD staff internet searches, South Coast AQMD staff believes it has reliable industry (NAICS) information for 1,714 of the assumed 3,995 warehouse operators potentially affected by PR 2305.⁹ Table 5 presents the industries covering these identified warehouse operators potentially affected by PR 2305. Approximately 89% of these warehouse operators are associated with NAICS codes belonging to the “goods movement” sector.¹⁰

Table 6 lists the industries within the “goods movement” sector, each industry’s estimated total number of facilities potentially subject to PR 2305, and total number of facilities in each industry.^{11,12} Approximately 2.3% of all facilities in the potentially affected “goods movement” sector are expected to be affected by PR 2305, with 7.1% of all facilities in the transportation and warehousing sector expected to be affected.

⁹ South Coast AQMD staff merged CoStar warehouse owner and operator data, specifically warehouse size, with Dun and Bradstreet facility data. The number of “reliable” potentially affected warehouse operators combined with Dun and Bradstreet data was determined by using Microsoft Excel’s “Fuzzy Lookup” add-in (<https://www.microsoft.com/en-us/download/details.aspx?id=15011>), matching CoStar warehouse operator and Dun and Bradstreet warehouse operator data. “Reliable” matches are those matches occurring for single-tenant warehouses with matches found to be greater than 85% similar when matching on operator name and warehouse address. This provided 967 “reliable” matches. South Coast AQMD staff performed internet searches to determine the NAICS for the remaining single-tenant warehouse operators. This resulted in an additional 747 matches, for a total of 1,714 single-tenant warehouse operators with NAICS information.

¹⁰ Construction (NAICS 23), manufacturing (NAICS 31-33), wholesale trade (NAICS 42), retail trade (NAICS 44-45), and transportation and warehousing (NAICS 48-49) are identified by the Southern California Association of Governments (SCAG) as the industries which make up the “goods movement” sector (https://scag.ca.gov/sites/main/files/file-attachments/0903fconnectsocial_goods-movement.pdf).

¹¹ Total facilities is estimated and provided by Economic Modeling Specialists International (EMSI), accessed February 25th, 2021, <https://www.economicmodeling.com/>. This data relies on payroll information provided by facilities for the U.S. Bureau of Labor Statistics’ Quarterly Census of Employment and Wages.

¹² Total potentially affected facilities is estimated for each industry by multiplying its identified potentially affected operators by the number of total assumed potentially affected operators divided by the number of total identified potentially affected operators ($3,995/1,714 = 2.331$).

NAICS	Industry description	Identified potentially affected operators
11	Agriculture, Forestry, Fishing and Hunting	3
22	Utilities	1
23	Construction	33
31-33	Manufacturing	455
42	Wholesale Trade	389
44-45	Retail Trade	216
48-49	Transportation and Warehousing	425
51	Information	14
52	Finance and Insurance	9
53	Real Estate and Rental and Leasing	26
54	Professional, Scientific, and Technical Services	49
56	Administrative and Support and Waste Management and Remediation Services	61
61	Educational Services	5
62	Health Care and Social Assistance	6
81	Other Services (except Public Administration)	19
92	Public Administration	3
	Total	1,714

Note: This table presents the subset of single-tenant warehouse operators expected to earn WAIRE points to comply with PR 2305 for which South Coast AQMD staff believes reliable industry information exists from Dun and Bradstreet or South Coast AQMD staff web searches as of 03/26/2021.

Table 6: PR 2305 Estimated Potentially Affected Warehouse Operators and Regional Industry Comparison for "Goods Movement" Sector

NAICS	Industry	Estimated potentially affected operators	Total facilities in 2020	Percent of facilities potentially affected by PR 2305
23	Construction	77	34,266	0.22%
31-33	Manufacturing	1,061	21,646	4.90%
42	Wholesale Trade	907	33,596	2.70%
44-45	Retail Trade	503	48,904	1.03%
48-49	Transportation and Warehousing	991	14,272	6.94%
	TOTAL	3,538	152,683	2.32%

Note: Total potentially affected facilities is estimated for each industry by multiplying its identified potentially affected operators by the number of total assumed potentially affected operators divided by the number of total identified potentially affected operators ($3,995/1,714 = 2.331$). Data on total facilities estimated and provided by Economic Modeling Specialists International. Individual operator values may not sum to total due to rounding of estimates.

Of the 3,995 PR 2305 potentially affected warehouse operators expected to earn WAIRE Points to comply with PR 2305, 1,964 are estimated to be in Los Angeles (LA) County, 468 estimated to be in Orange (OR) County, 470 estimated to be in Riverside (RV) County, and 1,093 estimated to be in San Bernardino (SB) County.

Although detailed economic information about specific PR 2305 potentially affected warehousing operators is unavailable, economic information about the broader industries which include these facilities is available. Table 7 presents a 2018 economic profile of the “goods movement” industries potentially affected by PR 2305 located in LA, OR, RV, and SB counties. These industries consist of about 147,000 facilities; facilities which earn an average annual revenue of about \$4.9 million. These industries employ about 3,160,000 employees with an average annual salary of about \$63,000.

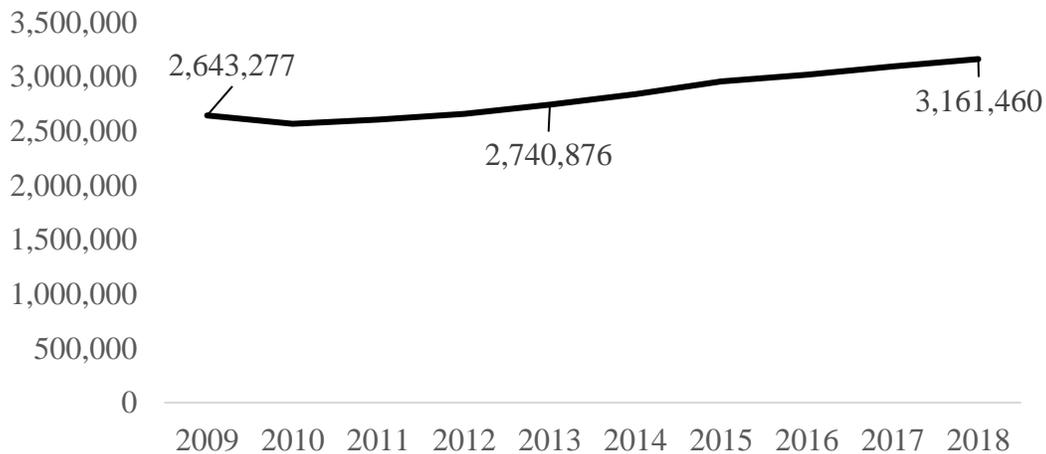
Table 7: PR 2305 Potentially Affected Industries - Industry Profile in LA, OR, RV, and SB counties (2018)

Approximate Number of Facilities	147,473
Approximate Number of Employees	3,161,460
Approximate Average Number of Employees per Facility	21
Approximate Annual Average Salary per Employee	\$63,010
Approximate Annual Average Revenue per Facility	\$4,868,717

Note: Data estimated and provided by Economic Modeling Specialists International for all "goods movement" industries with facilities expected to be affected by PR 2305, specifically NAICS 23, 31-33, 42, 44-45, and 48-49.

As illustrated by Figure 1, total employment in LA, OR, RV, and SB counties in the “goods movement” industries potentially affected by PR 2305 was around 2.64 million in 2009, and around 3.16 million in 2018. This indicates about a 20 percent growth in employment in the “goods movement” industries potentially affected by PR 2305 from 2009-2018, which is in line with the broader trends within California.

Figure 1: PR 2305 Potentially Affected Industries Employment 2009-2018



Small Businesses

South Coast AQMD defines a "small business" in Rule 102 as one which employs 10 or fewer persons and which earns less than \$500,000 in gross annual receipts. South Coast AQMD also defines "small business" for the purpose of qualifying for access to services from the South Coast AQMD's Small Business Assistance Office as a business with an annual receipt of \$5 million or less, or with 100 or fewer employees.

U.S. Small Business Administration (SBA) definitions of small businesses vary by six-digit North American Industrial Classification System (NAICS) code. For PR 2305 potentially affected industries, a firm is considered a "small business" by SBA if it has under a certain number of employees or a certain amount of revenue, which can be found on the SBA website.¹³

In addition to South Coast AQMD and SBA's definitions of a small business, the federal Clean Air Act Amendments (CAAA) of 1990 also provides a definition of a small business. The CAAA classifies a business as a "small business stationary source" if it: (1) employs 100 or fewer employees, (2) emits less than 10 tons per year of any single pollutant and less than 20 tons per year of all pollutants, and (3) is a small business as defined under the federal Small Business Act ([15 U.S.C. Sec. 631, et seq.](#)). Given most PR 2305 potentially affected facilities would be newly regulated by South Coast AQMD if PR 2305 is passed by the South Coast AQMD Governing Board, South Coast AQMD staff does not have readily available pollution information to present this small business classification.

Of the 1,714 PR 2305 identified potentially affected operators, revenue and employee data from the Dun and Bradstreet Enterprise Database (D&B) was available and reasonable for 904. A facility's D&B revenue data was considered unreliable if its reported/estimated annual revenue was less than expected annual rent. Expected annual rent for each single-tenant warehouse operator was estimated as warehouse rentable business area times the South Coast AQMD jurisdictional annual average rental price of \$10.56/sq. ft. (\$0.88/sq. ft. is the South Coast AQMD jurisdictional monthly average rental price).¹⁴ The number of these facilities potentially affected by PR 2305 classified as small business by classification definition are listed in Table 8 below:

Table 8: PR 2305 Potentially Affected Facilities Small Business Tabulation

Small Business Definition	# Small Businesses
South Coast AQMD (Rule 102)	0 out of 904
South Coast AQMD (Small Business Assistance Office)	197 out of 904
U.S. Small Business Administration (SBA)	292 out of 904

Note: Total number of potentially affected warehouse operators considered in each small business classification is based on those single-tenant warehouse operators with valid employee and revenue information from Dun and Bradstreet Enterprise Database.

¹³ The latest SBA definition of small businesses by industry can be found at the following website: <http://www.sba.gov/content/table-small-business-size-standards>.

¹⁴ Industrial Economics, Inc., 2020. [http://www.aqmd.gov/docs/default-source/planning/fbmsm-docs/iec_pr-2305-warehouse-relocation-report-\(12-23-20\).pdf?sfvrsn=8](http://www.aqmd.gov/docs/default-source/planning/fbmsm-docs/iec_pr-2305-warehouse-relocation-report-(12-23-20).pdf?sfvrsn=8).

The smallest warehouse PR 2305 could directly affect would have 100,000 square feet of warehousing space, resulting in an estimated annual rental cost of \$1,056,000. To be in operation, these facilities are expected to earn more than \$1 million in revenue, ruling them out from South Coast AQMD's Rule 102 definition of small business.

COMPLIANCE COSTS

Methods and Sources of Data

Analysis Timeframe

This analysis considers an analysis timeframe from 2022-2031, as PR 2305 would be implemented starting 2022. Although a sunset of PR 2305 is presented within its rule language, that is likely to occur beyond the 2022-2031 timeframe of this analysis and thus is not analyzed within this report.

Cost Estimate Year

All costs presented in this report are estimated 2018 dollars. The per-unit dollar figures used for any cost/benefit resulting from PR 2305 passing are either 2018 reported costs/benefits, or costs/benefits from earlier years inflated to 2018 values using the all-industry producer price index reported by the CoreLogic® Marshall & Swift® Equipment Cost Index (M&S index).

One-Time and Recurring Costs

Potentially affected facilities can meet their compliance obligation through the purchase or usage of near-zero emission (NZE) and zero emission (ZE) equipment or equipment that facilitates its use. Facilities can opt to pay a mitigation fee in lieu of the purchase and/or usage of equipment. Purchases of ZE and NZE emission equipment is modeled as a one-time capital cost. Costs/savings resulting from the subsequent use of ZE and NZE equipment is modeled as recurring operating and maintenance (O&M) costs.

The potential menu options available to facilities to meet compliance obligations are:

- ZE and NZE truck acquisitions (capital cost) and Usage (O&M cost);
- ZE and NZE truck visits from a third-party fleet (O&M);
- Electric vehicle charger acquisition (capital) and usage (O&M);
- Hydrogen filling station acquisition (capital) and usage (O&M);
- ZE and NZE yard truck acquisition (capital) and usage (O&M);
- Solar panel acquisition (capital) and usage (O&M);
- High-efficiency filter systems acquisition (capital) and replacement filters (O&M);
- Transportation refrigeration unit (TRU) plug acquisition (capital) and usage (O&M); and
- Paying mitigation fee (O&M).

Additionally, facilities are expected to incur recurring O&M costs related to notification and reporting of compliance attainment.

Below is a summary of the cost assumptions underlying this socioeconomic impact assessment. More detailed information on the analysis underlying these assumptions can be found in the WAIRE Menu Technical Report provided in Appendix B of the PR 2305 & PR 316 Draft Staff Report.

Zero and Near-Zero Emission Truck Acquisition and Usage

Table 9 below presents capital costs of Diesel and NZE trucks. These costs are assumed to remain constant across the entire compliance period.^{15,16} Per unit incremental acquisition costs of NZE Class 8 and Class 6 trucks are assumed to be \$65,000 and \$30,000, respectively. These costs are inclusive of state and local sales and federal excise taxes and based on research documented in the WAIRE Menu Technical Report.

Capital costs of ZE trucks are expected to decrease over time as a result of decreased battery costs. Projected capital costs over time for each ZE vehicle class can be found in Table 10 below.^{17,18} The incremental acquisition cost is set equal to the difference between the capital cost of each ZE truck and its diesel equivalent. An 8% sales tax and 12% federal excise tax is also applied to each ZE truck acquisition.

When the number of NZE or ZE truck purchases for a given class in any compliance year falls below the expected number of truck purchases in CARB's EMFAC 2017 projections, the incremental acquisition cost for each truck class and fuel type is used. However, if the number of truck purchases in a given year exceeds EMFAC 2017 projections, the full capital cost associated with each truck type is used for those trucks above projections.

Table 9: Capital Costs for Diesel and NZE Truck Acquisitions

Vehicle Class	Diesel	NZE
Class 2b-3	\$50,000	N/A
Class 6	\$85,000	\$115,000
Class 8	\$130,000	\$195,000

Note: Capital costs for diesel trucks listed here are pre-tax. NZE capital costs include sales taxes (Class 8 and Class 6) and federal excise taxes (Class 8 only).

¹⁵ Capital costs for diesel trucks can be found in Table C-6 of the CARB ACT Appendix C-1 – SRIA submitted to DoF: <https://ww3.arb.ca.gov/regact/2019/act2019/appc.pdf>

¹⁶ Capital costs for NZE Class 8 trucks can be found in Table 31 of the 2018 Feasibility Assessment for Drayage Trucks: <https://cleanairactionplan.org/documents/final-drayage-truck-feasibility-assessment.pdf/>. Class 6 capital costs were calculated by taking the ratio of capital costs for NZE Class 6 and 8 trucks found in the WAIRE Menu Technical Report.

¹⁷ Capital costs for each ZE truck class (2b-3, 6, 8) for model years 2024-2030 are taken from CARB's ACT Appendix C-1 – SRIA as submitted to DoF (Table C-7): <https://ww3.arb.ca.gov/regact/2019/act2019/appc.pdf>.

¹⁸ To fill in missing years (2022, 2023), ZE capital costs were linearized between 2018 and 2024. 2031 costs are assumed equal to 2030 costs.

Table 10: Capital Cost by ZE Truck Class and Year

Year	ZE Class 8	ZE Class 6	ZE Class 2b-3
2022	\$292,544	\$155,055	\$71,920
2023	\$246,948	\$143,904	\$68,318
2024	\$201,351	\$133,554	\$64,896
2025	\$194,134	\$128,321	\$63,635
2026	\$188,312	\$124,112	\$62,599
2027	\$183,371	\$120,563	\$61,684
2028	\$178,870	\$117,345	\$60,829
2029	\$174,809	\$114,456	\$60,035
2030	\$170,748	\$111,568	\$59,241
2031	\$170,748	\$111,568	\$59,241

Note: Capital costs for all ZE trucks listed here are pre-tax

Recurring costs associated with the use/visits of facility-owned NZE and ZE trucks is done on a per-mile basis. Per-mile usage costs resulting from fuel consumption and other costs (including maintenance, fees, insurance, and mid-life costs) were calculated for all truck classes and fuel types.^{19,20,21} A detailed breakdown of total usage costs for Class 8, 6, and 2b-3 trucks for all relevant fuel types can be found in Tables 11, 12, and 13 below. Per-mile usage costs (not considering capital costs) of Class 6 and 8 NZE trucks is slightly lower than diesel, and results in a modest net savings to facilities. Per-mile usage costs of Class 2b-3, 6, and 8 ZE trucks is significantly lower than diesel and results in a net savings to facilities.

¹⁹ Data on maintenance costs, mid-life costs, fuel cost and fuel economy for diesel, ZE and NZE trucks is taken from the WAIRE Menu Technical Report.

²⁰ Vehicle fees for all ZE and diesel truck classes are taken from CARB's ACT Total Cost of Ownership document: <https://ww3.arb.ca.gov/regact/2019/act2019/apph.pdf>. Fees for NZE trucks are assumed to be the same as diesel trucks.

²¹ Annual insurance costs assumed to be equal to 3% of vehicle value. Vehicle value assumed to decrease by 10% in years 2-8 and an additional 5% in years 9-11. The average annual cost is included in the per mile cost analysis.

Table 11: Usage Costs for Class 8 Trucks by Fuel Type

	Diesel	ZE	NZE
Annual Miles	54,000	42,000	54,000
Fuel Cost	\$3.74	\$0.15	\$2.92
Fuel Efficiency (miles per)	5.9	0.48	5.1
\$/mile	\$0.63	\$0.31	\$0.57
Total Fuel Cost	\$34,231	\$13,125	\$30,918
Maintenance Cost (per mile)	\$0.19	\$0.14	\$0.21
Total Maintenance Cost	\$10,260	\$5,985	\$11,340
Annualized Mid-life Cost	-	\$3,579	-
Fees	\$3,112	\$2,847	\$3,112
Insurance Costs	\$1,934	\$3,950	\$2,389
Total Other Cost	\$15,306	\$16,361	\$16,841
Total Fuel + Other Cost	\$49,536	\$29,486	\$47,759
\$/mile	\$0.92	\$0.70	\$0.88

Table 12: Usage Costs for Class 6 Trucks by Fuel Type

	Diesel	ZE	NZE
Annual Miles	24,000	24,000	24,000
Fuel Cost	\$3.74	\$0.17	\$2.42
Fuel Efficiency (miles per)	7.4	1.04	6.3
\$/mile	\$0.51	\$0.16	\$0.38
Total Fuel Cost	\$12,130	\$3,923	\$9,219
Maintenance Cost (per mile)	\$0.22	\$0.17	\$0.24
Total Maintenance Cost	\$5,280	\$3,960	\$5,760
Annualized Mid-life Cost	-	-	-
Fees	\$1,300	\$1,272	\$1,300
Insurance Costs	\$1,264	\$2,006	\$1,466
Total Other Cost	\$7,844	\$7,238	\$8,525
Total Fuel + Other Cost	\$19,974	\$11,161	\$17,744
\$/mile	\$0.83	\$0.47	\$0.74

Table 13: Usage Costs for Class 2b-3 Trucks by Fuel Type

	Diesel	ZE
Annual Miles	15,000	15,000
Fuel Cost	\$3.74	\$0.18
Fuel Efficiency (miles per)	23.2	1.79
\$/mile	\$0.16	\$0.10
Total Fuel Cost	\$2,418	\$1,508
Maintenance Cost (per mile)	\$0.17	\$0.13
Total Maintenance Cost	\$2,550	\$1,913
Annualized Mid-life Cost	-	-
Fees	\$927	\$861
Insurance Costs	\$744	\$1,070
Total Other Cost	\$4,221	\$3,843
Total Fuel + Other Cost	\$6,639	\$5,351
\$/mile	\$0.44	\$0.36

ZE and NZE Emission Truck Visits from a Non-Owned Fleet

Facilities can earn points toward their compliance obligation by arranging visits from ZE or NZE trucks owned by a third-party. The cost of hiring visits from clean trucks is assumed to be based on the per mile total cost of ownership (TCO) for each truck class and fuel type. More specifically, the incremental cost resulting from third-party owned ZE and NZE trucks are assumed to be the incremental per mile TCO cost (or savings) of clean trucks when compared to the per mile TCO cost of diesel trucks.

A TCO analysis was performed for each truck class and fuel type for each compliance year using the assumed acquisition and usage costs outlined in Tables 9-13. Tables 14, 15, and 16 below include a breakdown of the total cost of ownership for all Class 8, Class 6, and Class 2b-3 trucks purchased in year 2022, respectively. A 4% financing rate is used over a five-year financing period. A 12-year useful life is assumed for all trucks and a 4% discount rate is used to discount all costs in years beyond 2022. The TCO for all diesel and NZE trucks is constant over the compliance period and does not vary based on the year purchased. Because capital costs for ZE trucks are assumed to decline over time, the TCO does vary by purchase year.

Table 14: Total Cost of Ownership for All 2022 Class 8 Trucks

	Diesel	ZE	NZE
Annual Miles	54000	42000	54000
Total Capital Cost (with Taxes + Financing)	\$162,240	\$365,095	\$202,800
Total Fuel Cost	\$334,106	\$128,106	\$301,771
Total Maintenance	\$100,142	\$58,416	\$110,684
Midlife Cost	\$0	\$34,934	\$0
Total Fees	\$30,375	\$27,786	\$30,375
Insurance Costs	\$18,874	\$38,555	\$23,317
Total Other Cost	\$149,392	\$159,692	\$164,376
Residual	-\$15,453	-\$7,727	-\$15,453
Total Cost of Ownership	\$630,285	\$645,166	\$653,494
TCO \$/mile	\$0.97	\$1.28	\$1.01

Table 15: Total Cost of Ownership for All 2022 Class 6 Trucks

	Diesel	ZE	NZE
Annual Miles	24000	24000	24000
Total Capital Cost (with Taxes + Financing)	\$95,472	\$174,158	\$119,600
Total Fuel Cost	\$118,392	\$38,291	\$89,982
Total Maintenance	\$51,535	\$38,651	\$56,220
Midlife Cost	\$0	\$0	\$0
Total Fees	\$12,684	\$12,412	\$12,684
Insurance Costs	\$12,341	\$19,582	\$14,305
Total Other Cost	\$76,560	\$70,646	\$83,209
Residual	-\$10,477	-\$5,239	-\$10,477
Total Cost of Ownership	\$279,947	\$277,856	\$282,314
TCO \$/mile	\$0.97	\$0.96	\$0.98

Table 16: Total Cost of Ownership for All 2022 Class 2b-3 Trucks

	Diesel	ZE
Annual Miles	15000	15000
Total Capital Cost (with Taxes + Financing)	\$56,160	\$80,781
Total Fuel Cost	\$23,602	\$14,723
Total Maintenance	\$24,889	\$18,667
Midlife Cost	\$0	\$0
Total Fees	\$9,053	\$8,400
Insurance Costs	\$7,259	\$10,442
Total Other Cost	\$41,201	\$37,509
Residual	-\$8,207	-\$4,104
Total Cost of Ownership	\$112,756	\$128,908
TCO \$/mile	\$0.63	\$0.72

The incremental cost analysis assumes incremental cost is absorbed over a 3-year period, instead of the full 12-year useful life. The incremental cost is therefore multiplied by four ($12 \div 3 = 4$) to determine the default cost for truck visits. Therefore, to calculate the incremental cost of visits from a non-owned fleet you begin by taking the difference in the TCO per mile cost between the clean vehicle and its diesel equivalent ($\text{TCO } \$/\text{mile}_{\text{clean}} - \text{TCO } \$/\text{mile}_{\text{diesel}}$), then multiplying by the average number of miles per visit (79.8 miles per visit for Class 8, 28.4 for Class 6, and 30.6 for Class 2b-3), and then multiplying by four. If the difference in the TCO per mile cost between the clean vehicle and its diesel equivalent is less than zero (cost savings), then we do not assume a 3-year payback and, thus, do not multiply by 4. See Table 17 below for a summary of incremental costs (in \$/visit) for visits from a non-owned fleet by fuel type, truck class, and year of purchase.

Table 17: Incremental Cost per Visit from a Non-Owned Fleet for All Truck Classes and Fuel Types by Year of Purchase

	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
NZE Class 8	\$11.43	\$11.43	\$11.43	\$11.43	\$11.43	\$11.43	\$11.43	\$11.43	\$11.43	\$11.43
NZE Class 6	\$0.93	\$0.93	\$0.93	\$0.93	\$0.93	\$0.93	\$0.93	\$0.93	\$0.93	\$0.93
ZE Class 8	\$98.13	\$62.09	\$26.05	\$20.35	\$15.75	\$11.84	\$8.28	\$5.07	\$1.86	\$1.86
ZE Class 6	-\$0.21	-\$1.44	-\$2.59	-\$3.17	-\$3.63	-\$4.03	-\$4.38	-\$4.70	-\$5.02	-\$5.02
ZE Class 2b-3	\$10.98	\$8.23	\$5.62	\$4.66	\$3.86	\$3.17	\$2.51	\$1.91	\$1.30	\$1.30

Electric Vehicle Charger Acquisition and Usage

One-time capital costs resulting from Level 3 electric vehicle charger acquisition include the cost of the charger, as well as the construction, permitting, and charger energization costs related to charger installation. Chargers costs are calculated on a per-unit basis, where construction and permitting costs are incurred on a project basis. The cost is assumed to be \$30,000 per charger. Construction mobilization cost is assumed to be \$10,000 per project with permitting and charger energization costs are assumed to be \$70,000 per project. Costs are taken from the WAIRE Menu

Technical Report Appendix B. Each charger is expected to dispense 165,000 kWh per year. Electricity costs are accounted for in the per-mile usage costs of Class 6 and Class 8 ZE Trucks. To avoid double-counting, it is assumed no costs are incurred for charger usage in this analysis.

Hydrogen Filling Station Acquisition and Usage

The one-time cost of hydrogen station acquisition and installation and the recurring costs of subsequent usage are taken from the WAIRE Menu Technical Report. Total installed cost is \$2,000,000 per 700 kg/day project. Each Class 8 Truck is assumed to use 2,440 kg/year of hydrogen. It is assumed that hydrogen usage costs decline over time from roughly \$9.75/kg in 2020 to \$6.20/kg in 2031.²²

ZE Yard Truck Acquisition and Usage

ZE yard trucks currently cost about \$310,000 while their diesel equivalent costs about \$100,000.²³ The one-time incremental cost is assumed to be \$210,000 per truck. ZE yard truck capital costs are expected to decline over time due to projected future decreases in battery costs. However, ZE yard truck capital cost projections are not available for future years. Staff applied a yearly cost multiplier based on ZE Class 2b-3 capital costs to the incremental cost of ZE yard trucks.²⁴ Annual usage cost for ZE yard trucks is expected to be lower than their diesel equivalent. Each ZE yard truck is assumed to operate for 1,000 hours per year for a total annual usage cost of \$6,250 per yard truck based on analysis included in the WAIRE Menu Technical Report.

Solar Panel Acquisition and Usage

Based on the analysis provided in the WAIRE Menu Technical Report, the price for a rooftop solar panel system (including installation) is set \$2.80 per kW, resulting in a total installed cost of \$280,000 for a 100-kW solar panel system. Electricity generated from rooftop solar panel systems is assumed to save operators on grid power costs. Solar panel usage is assumed to result in a net savings of \$0.17 per kWh generated. Each 100-kW system has an estimated electrical generation of 165,000 kWh annually.

High-Efficiency Filter Systems Acquisition and Replacement Filters

The estimated costs analyzed for the installation of 25 air filter systems with MERV 16 air filters is \$65,000 based on the analysis provided in the WAIRE Menu Technical Report. The cost for the replacement/installation of 200 MERV 16 air filters is \$60,000.

TRU Plug Acquisition and Usage

The per unit cost of a TRU plug is assumed to be \$1,600. Associated construction and permitting costs are assumed to be \$4,700 and \$7,000 per installation project, respectively. Each installed TRU is assumed to consume 10,658 kWh of electricity annually. Assuming a rate of \$0.18/kWh, annual TRU usage cost is set to \$1,918.

²² Hydrogen cost projections can be found in CARB ACT Appendix C-1 – SRIA submitted to DoF (Figure C-5): <https://ww3.arb.ca.gov/regact/2019/act2019/appc.pdf>

²³ <https://cleanairactionplan.org/documents/final-cargo-handling-equipment-che-feasibility-assessment.pdf/>

²⁴ A cost multiplier is generated by taking ratio of difference in capital cost in each year (2022 -2031) to the difference in capital costs in year 1 (2022).

Pay Mitigation Fee

The cost calculation for the mitigation fee scenario is straightforward. In lieu of earning WAIRE Points from equipment acquisitions and usage, all facilities choose to pay a fee of \$1,000 for each WAIRE Point in their WPCO attributed to their facility in every year of compliance (final cost is \$1,062.5 due to PR 316 6.25% addition to mitigation fees paid for administrative cost recovery).

Administrative Costs

In addition to costs expected from compliance actions outlined above, all operators are also expected to incur expenses related to fees outlined in Rule 316 for Warehouse Operations Notifications (\$29.51/submission), Initial Site Information Reports (\$140.68/submission), and Annual WAIRE Reports (\$392.50/submission).

All warehouse operators are also expected to incur costs associated with the reporting related to compiling all relevant compliance data and submitting the information as required by PR 2305. This type of reporting is expected to be similar to the kind of reporting required in CARB's ACT regulation, specifically for large entity reporting, and is estimated to be no more than 25 hours of work totaling \$1,250 per year.²⁵

To estimate truck traffic for determining compliance obligations, it is assumed that all facilities will install two cameras at a one-time cost of \$2,000 per facility. Staff time will also be required for reviewing recordings. It is estimated that 1,152 hours of video will need to be reviewed per year (48 hours per month x 2 driveways per operator x 12 months). Speeding the video up to 8x results in a total staff time of 144 hours per year (at \$50/hour) for a total annual cost of \$7,200 per facility.

It is also expected that facilities that elect to meet compliance obligations through ZE or NZE truck visits will incur additional costs related to truck tracking. For this analysis, it is assumed that tracking will be done through truck driver surveys and drivers visiting a warehouse will be required to provide basic information such as license plate and/or VIN, trucking company, and contact info.²⁶ The compilation of truck surveys is expected to take one hour of work per week (at \$50/hour) for a total annual cost of \$2,600 per facility.

Facilities that choose to meet their compliance obligations through payment of the mitigation fee are subject to an additional fee equal to 6.25% of the amount of mitigation fee paid as outlined in Proposed Rule 316(f). This fee is necessary to cover the reasonable costs incurred by South Coast AQMD staff and/or its consultants to administer the Mitigation Program.

Total annual administrative costs are expected to range from approximately \$8,900 to \$11,500 per facility per year. The lower end of the range includes Annual WAIRE Report fees, reporting costs, and costs incurred due to video review. The higher end the range those same costs plus truck survey costs only attributable to those facilities who choose to track NZE/ZE truck visits to meet

²⁵ <https://ww3.arb.ca.gov/regact/2019/act2019/isor.pdf>

²⁶ Under PR 2305, a typical 250,000 sq. ft warehouse would be expected to receive anywhere from five visits per day (for larger Class 8 trucks) up to 24 visits per day (from smaller trucks).

compliance obligations. Additionally, facilities are expected to incur one-time costs for camera purchases, a Warehouse Operations Notifications Fee, and an Initial Site Information Report Fee.

Scenario Analysis

With an estimated 3,995 warehouse operators and 32 potential compliance actions, it is not possible to determine the precise cost of PR 2305 and PR 316. In addition, due to annual compliance obligations, the potential compliance approach may vary from year to year.

Table 18: Scenario Descriptions

#	Scenario Description	Notes
1	NZE Class 8 truck acquisitions and subsequent visits from those trucks	
2	NZE Class 8 truck acquisitions and subsequent visits from those trucks (early purchase)	One additional truck is acquired earlier than required, thus increasing WAIRE Points earned from truck visits in subsequent years.
3	NZE Class 8 truck acquisitions (funded by Carl Moyer program) and subsequent visits from those trucks	No WAIRE Points earned for truck acquisitions. Mitigation fees paid to earn WAIRE Points in first year of compliance.
4	NZE Class 8 truck visits from non-owned fleets	No WAIRE Points earned for truck acquisitions.
5	ZE Class 8 truck visits from non-owned fleets	No WAIRE Points earned for truck acquisitions. ZE Class 8 trucks are assumed to not be commercially available until late 2022. Mitigation fees paid to earn WAIRE Points until then.
6	Level 3 charger installations followed by ZE Class 6 & Class 8 truck acquisitions and subsequent visits from those trucks, using installed chargers	Chargers provide ~30,000 kWh/year per Class 6 truck, and ~90,000 kWh/yr per Class 8 truck. Class 8 trucks only acquired if 25 Class 6 trucks had been previously purchased for one warehouse.
7	Pay Mitigation Fee	
7a	Pay Mitigation Fee and account for NZE trucks visiting the facility incentivized from the WAIRE Mitigation Program	Incentivized trucks earn WAIRE Points and reduce mitigation fees paid.
8	NZE Class 6 truck acquisitions and subsequent visits from those trucks	
9	NZE Class 6 truck visits from non-owned fleets	No WAIRE Points earned for truck acquisitions.
10	ZE Class 6 truck visits from non-owned fleets	No WAIRE Points earned for truck acquisitions.
11	Rooftop solar panel installations and usage	Solar panel coverage limited to 50% of building square footage. Mitigation fees used to make up any shortfall in WAIRE Points.
12	Hydrogen station installations followed by ZE Class 8 truck acquisitions and subsequent visits from those trucks, using the hydrogen station	System installation in first year is followed by a truck acquisition. In subsequent years trucks are only acquired if needed to earn WAIRE Points.
13	ZE Class 2b-3 truck acquisitions and subsequent visits from those trucks	
14	ZE Class 2b-3 truck visits from non-owned fleets	
15	Filter System Installations	
16	Filter Purchases	
17	TRU plug installations and usage in cold storage facilities	Scenario is only applied to cold storage warehouses. Plugs limited to 1:10,000 sq. ft. of building space.
18	ZE Hostler Acquisitions and Usage	

To estimate the potential impacts of PR 2305 and PR 316, 19 different scenarios were developed in an attempt to show the range of potential compliance outcomes. A description of the 19 scenarios analyzed is included in Table 18.

The scenarios were developed to show potential cost and emissions impacts from all 32 WAIRE Menu actions, as well as using mitigation fees. Each scenario is structured to follow a series of choices a warehouse operator may make based on compliance choices from a previous year. For example, if a warehouse operator purchased an NZE Class 8 truck in their first year complying with PR, they were assumed to use that same truck in subsequent years to meet future compliance obligations. As a bounding analysis approach, all warehouses were assumed to only comply with a single scenario approach from 2022 through 2031. No single scenario in this bounding analysis is expected to occur. Rather, they present possible extreme compliance outcomes.

For these scenario analyses, all 2,902 potentially affected facilities were modeled for every year from 2022-2031 using their square footage and the applicable average trip generation rates to determine their compliance obligation. All results presented in this section assume a rule stringency of .0025 and three-year phase-in period. The amount of warehousing space was assumed to grow 1.8% per year, consistent with analysis from SCAG.^{27,28} In addition, the scenario analysis attempts to isolate and attribute capital and O&M costs for only the equipment incremental to current CARB regulations such as CARB's ACT and Low NOx Omnibus regulations.²⁹

Tables 19 – 24 below present the total number of each compliance action for each scenario over the 2022-2031 compliance period. Table 19 presents the number of ZE and NZE truck acquisitions by scenario by year, and Table 20 presents the associated usage in vehicle miles traveled (VMT). Projected ZE and NZE truck visits from a non-owned fleet are shown in Table 21. Truck visits in Scenario 7a earn points toward compliance obligation but do not result in additional costs to facilities.

The number of equipment acquisitions in each compliance year for Scenario 6 (level 3 chargers), Scenario 12 (hydrogen stations), Scenario 17 (TRU plugs), and Scenario 18 (ZE yard trucks) are presented in Table 22. The number of equipment acquisitions for Scenario 11 (rooftop solar), Scenario 15 (filter systems), and Scenario 16 (filters) are shown in Table 23.

Table 24 presents the total annual mitigation fees paid for Scenarios 3, 5, 6, 7, 7a, 11, and 17 inclusive of the additional 6.25% Mitigation Program Fee outlined in PR 316. These mitigation fee payments represent warehouses voluntarily choosing this compliance action over a variety of other compliance actions allowed to comply with PR 2305. Table 25 lists projected administrative costs associated with PR 316 fees, reporting, camera installations, video review, and truck surveys

²⁷ For information on average trip generation rates, see PR 2305 (d)(1)(C)

²⁸ https://scag.ca.gov/sites/main/files/file-attachments/final_report_03_30_18.pdf

²⁹ Scenario modeling assumptions regarding the impacts of CARB regulations on facility's compliance point obligation have changed since the release of the previous PR2305 Draft Socioeconomic Impact Assessment dated March 2021. As a result of the changes, the number of compliance actions necessary has decreased, resulting in decreases in both compliance costs and emissions reductions.

for every scenario except Scenario 17. Scenario 17 applies only to cold-storage facilities and total administrative costs are proportionate to the number of facilities in each compliance year. Total annual average administrative costs across all potentially affected facilities are expected to range from \$34.7M to \$44.6M per year in all scenarios excluding Scenario 17.

Table 19: ZE and NZE Truck Acquisitions by Scenario by Year.

	Equipment	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
Sc1	NZE Class 8	2,092	2,654	4,022	1,474	731	322	369	163	129	109
Sc2	NZE Class 8	3,015	2,423	4,317	1,224	825	362	176	151	130	110
Sc3	NZE Class 8	2,092	7,162	1,951	1,178	212	178	163	143	117	478
Sc6	ZE Class 8	0	4	50	111	105	34	5	0	0	0
Sc6	ZE Class 6	0	3,471	5,448	4,355	4,242	2,606	1,162	726	260	199
Sc8	NZE Class 6	4,403	7,300	10,589	7,158	5,007	1,679	649	481	415	339
Sc12	ZE Class 8	0	955	1,003	1,160	2,284	1,013	628	159	117	91
Sc13	ZE Class 2b-3	7,066	11,521	15,325	9,347	5,056	1,765	765	676	574	478

Table 20: ZE and NZE Truck VMT (in millions) by Scenario by Year.

	Equipment	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
Sc1	NZE Class 8	43.4	141.9	280.4	394.4	440.2	462.0	476.4	487.4	493.4	498.4
Sc2	NZE Class 8	62.6	175.4	315.2	430.2	472.7	497.3	508.5	515.3	521.1	526.1
Sc3	NZE Class 8	43.4	235.4	424.5	489.4	518.2	526.3	533.4	539.8	545.2	557.5
Sc6	ZE Class 8	0.0	0.0	0.2	2.1	4.6	4.4	1.4	0.2	0.0	0.0
Sc6	ZE Class 6	0.0	0.0	51.3	80.5	64.3	62.6	38.5	17.2	10.7	3.8
Sc8	NZE Class 6	32.5	118.9	251.0	382.1	471.9	521.3	538.4	546.8	553.4	559.0
Sc12	ZE Class 8	0.0	19.8	60.4	105.3	176.8	245.2	279.2	295.6	301.3	305.6
Sc13	ZE Class 2b-3	56.2	204.1	417.7	614.0	728.6	782.8	803.0	814.4	824.4	832.7

Table 21: ZE and NZE Truck Visits (Non-Owned Fleet) by Scenario by Year (in millions)

	Equipment	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
Sc4	NZE Class 8	1.18	2.76	4.63	5.37	5.62	5.48	5.23	4.87	4.40	3.79
Sc5	ZE Class 8	0.00	2.28	3.82	4.42	4.63	4.51	4.31	4.01	3.63	3.12
Sc7a	NZE Class 8	0.00	1.30	2.77	4.30	5.34	5.39	5.42	5.44	5.45	5.46
Sc7a	NZE Class 6	0.00	0.00	0.28	0.79	0.79	0.79	0.79	0.79	0.79	0.78
Sc9	NZE Class 6	4.12	9.67	16.22	18.78	19.66	19.17	18.31	17.06	15.41	13.26
Sc10	ZE Class 6	4.12	9.67	16.22	18.78	19.66	19.17	18.31	17.20	15.53	13.42
Sc14	ZE Class 2b-3	5.49	12.89	21.62	25.04	26.21	25.56	24.41	22.74	20.55	17.68

Table 22: Equipment Acquisitions by Year - Scenarios 6, 12, 17, and 18

	Equipment	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
Sc6	Chargers	1,857	1,023	1,192	119	132	127	119	110	99	85
Sc12	H2 Stations	955	1,003	1,160	54	54	54	54	54	54	54
Sc17	TRU Plugs	158	322	286	179	24	22	22	22	21	19
Sc18	ZE Yard Trucks	974	1,101	1,372	162	158	176	40	34	31	28

Table 23: Equipment Acquisitions by Year - Scenarios 11, 15, and 16 (in thousands)

	Equipment	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
Sc11	Solar (kW)	903.0	1752.6	1702.2	1154.4	705.4	154.7	103.9	102.6	101.4	96.7
Sc15	Filter Systems	62.0	145.4	243.7	282.0	295.0	317.1	275.0	256.2	231.7	199.5
Sc16	Filters	531.5	1247.7	2092.2	2422.9	2535.4	2473.3	2362.0	2200.3	1988.2	1710.8

Table 24: Mitigation Fee Paid by Scenario by Year (Inclusive of 6.25% Mitigation Program Fees) (in millions)

	Equipment	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
Sc3	NZE Class 8	\$77.19	\$6.95	\$6.85	\$9.36	\$10.76	\$9.80	\$9.23	\$8.49	\$7.70	\$5.19
Sc5	ZE Class 8	\$143.87	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Sc6	ZE Class 6 & 8	\$0.00	\$0.00	\$0.00	\$0.00	\$0.01	\$0.01	\$0.01	\$0.02	\$0.02	\$0.02
Sc7	Mitigation Fee	\$143.87	\$341.98	\$581.76	\$682.29	\$733.40	\$747.07	\$760.75	\$774.43	\$788.11	\$801.78
Sc7a	Mitigation Fee	\$143.87	\$197.84	\$236.17	\$114.12	\$2.31	\$0.12	\$0.00	\$0.00	\$0.00	\$0.00
Sc11	Solar	\$0.00	\$45.48	\$7.04	\$389.33	\$465.76	\$516.93	\$548.19	\$505.08	\$448.72	\$375.17
Sc17	TRU	\$0.00	\$0.07	\$3.57	\$6.23	\$8.46	\$7.98	\$6.98	\$5.62	\$3.85	\$1.62

Note: Warehouse operators have a variety of options outside of paying a mitigation fee to comply with PR 2305. Values presented in this table encompass possible mitigation fee totals paid if all warehouse operators choose to comply with PR 2305 voluntarily choosing the compliance method specific to each listed scenario.

Table 25: Administrative Costs by Year (millions) (excluding Scenario 17)

	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
316 Fees	\$1.03	\$1.53	\$2.05	\$1.87	\$1.87	\$1.87	\$1.87	\$1.87	\$1.87	\$1.87
Reporting	\$1.67	\$3.37	\$5.09	\$5.15	\$5.21	\$5.27	\$5.33	\$5.39	\$5.44	\$5.50
Cameras	\$2.67	\$2.72	\$2.76	\$0.09	\$0.09	\$0.09	\$0.09	\$0.09	\$0.09	\$0.09
Reviewing Video	\$9.60	\$19.40	\$29.33	\$29.66	\$30.00	\$30.34	\$30.68	\$31.02	\$31.36	\$31.69
Truck Surveys	\$3.47	\$7.01	\$10.59	\$10.71	\$10.83	\$10.96	\$11.08	\$11.20	\$11.32	\$11.45

Table 26 presents total annual costs by scenario. Total costs include one-time costs resulting from equipment acquisition, recurring costs associated with equipment usage, mitigation fees paid, and administrative costs and fees. Table 27 below shows a cost summary for each compliance scenario including net present value (assuming 1% and 4% discount rates), average annual cost, and the weighted average annual cost per square foot of warehouse space after taking into account equipment acquisition from CARB's ACT and Low NOx Omnibus regulations. The total costs presented here are inclusive of all administrative costs and fees related to compliance. Average annual costs range from -\$12.6M/yr. (or -\$0.02/sq. ft./yr.) for the lowest cost scenario (Scenario

10: ZE Class 6 Visits from a Non-owned Fleet) up to \$979.0M/yr. (or \$1.21/sq. ft./yr.) for the highest cost scenario (Scenario 11: Solar Panel Installations).

Scenario costs are typically highest in the initial years of the compliance period due to the fact that the scenarios assume that capital equipment acquisitions take place early in the analysis timeframe. Later in the analysis timeframe, costs are typically much lower due to the fact that compliance obligations can be met much more cheaply through equipment usage. Staff believes that the scenario cost estimates are conservative for two reasons, (1) the compliance period analyzed is shorter than the assumed useful life of the majority of equipment, and (2) fuel and maintenance savings resulting from NZE/ZE truck usage are only accrued for the mileage associated with warehouse visits. Extending the analysis timeframe further and accounting for the per mile savings of all truck mileage would result in the accrual of significant savings to warehouse operators using NZE/ZE truck acquisition and usage to meet their compliance obligations.

The costs presented here are default calculations broadly applicable to the industry, however individual warehouse operators may identify different specific costs for their operations. Warehouse operators are assumed to gravitate towards the lowest cost options for their specific situations. As such, the maximum average cost warehouse operators would be expected to incur is \$0.83/sq. ft./yr. resulting from the mitigation fee scenario. However, based on the cost analysis, it is likely that in most situations warehouse operators will identify substantially cheaper options that work within their operations.

Table 26: Total Annual Costs by Scenario (in millions)

	Equipment	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
Sc1	NZE Class 8	\$153	\$202	\$466	\$130	\$81	\$54	\$57	\$44	\$42	\$41
Sc2	NZE Class 8	\$272	\$186	\$512	\$113	\$86	\$56	\$44	\$42	\$41	\$40
Sc3	NZE Class 8	\$94	\$33	\$43	\$41	\$42	\$41	\$41	\$40	\$40	\$37
Sc4	NZE Class 8	\$32	\$66	\$103	\$109	\$112	\$111	\$109	\$105	\$100	\$94
Sc5	ZE Class 8	\$162	\$175	\$149	\$137	\$121	\$102	\$85	\$70	\$57	\$56
Sc6	ZE Class 6 & 8	\$149	\$365	\$473	\$239	\$220	\$137	\$86	\$76	\$63	\$64
Sc7	Mitigation Fee	\$159	\$369	\$621	\$719	\$771	\$785	\$799	\$813	\$827	\$841
Sc7a	Mitigation Fee	\$162	\$232	\$286	\$162	\$50	\$49	\$49	\$50	\$50	\$51
Sc8	NZE Class 6	\$147	\$391	\$698	\$350	\$154	\$50	\$18	\$13	\$11	\$9
Sc9	NZE Class 6	\$22	\$43	\$65	\$65	\$66	\$66	\$66	\$65	\$64	\$63
Sc10	ZE Class 6	\$18	\$20	\$8	-\$12	-\$23	-\$29	-\$31	-\$31	-\$28	-\$17
Sc11	Solar	\$2,543	\$4,727	\$4,067	\$2,436	\$932	-\$756	-\$910	-\$986	-\$1,074	-\$1,189
Sc12	ZE Class 8	\$1,928	\$2,180	\$2,472	\$272	\$357	\$274	\$248	\$217	\$210	\$209
Sc13	ZE Class 2b-3	\$181	\$244	\$260	\$132	\$54	\$4	-\$11	-\$13	-\$15	-\$16
Sc14	ZE Class 2b-3	\$79	\$140	\$171	\$164	\$149	\$129	\$110	\$93	\$77	\$74
Sc15	Filter System	\$176	\$405	\$673	\$770	\$804	\$862	\$753	\$705	\$641	\$558
Sc16	Filter	\$174	\$401	\$667	\$764	\$798	\$780	\$747	\$698	\$635	\$552
Sc17	TRU	\$1	\$2	\$6	\$8	\$10	\$9	\$8	\$7	\$5	\$3
Sc18	Yard Trucks	\$219	\$226	\$248	\$79	\$79	\$81	\$67	\$67	\$67	\$67

Table 27: Total Cost Summary for All Scenarios

	Equipment	Discounted Total Costs - NPV (1%) (in millions)	Discounted Total Costs - NPV (4%) (in millions)	Average Annual Cost (in millions)	Average Annual Cost (\$/sq. ft)
Sc1	NZE Class 8	\$1,225.7	\$1,102.6	\$127.2	\$0.16
Sc2	NZE Class 8	\$1,345.1	\$1,219.9	\$139.2	\$0.17
Sc3	NZE Class 8	\$430.2	\$374.4	\$45.2	\$0.06
Sc4	NZE Class 8	\$887.4	\$749.5	\$94.1	\$0.12
Sc5	ZE Class 8	\$1,067.2	\$941.8	\$111.5	\$0.14
Sc6	ZE Class 6 & 8	\$1,799.3	\$1,603.8	\$187.3	\$0.23
Sc7	Mitigation Fee	\$6,298.0	\$5,264.0	\$670.2	\$0.83
Sc7a	Mitigation Fee	\$1,097.7	\$985.5	\$114.0	\$0.14
Sc8	NZE Class 6	\$1,785.0	\$1,627.1	\$184.3	\$0.23
Sc9	NZE Class 6	\$553.6	\$467.6	\$58.7	\$0.07
Sc10	ZE Class 6	-\$114.9	-\$87.3	-\$12.6	-\$0.02
Sc11	Solar	\$9,796.9	\$9,712.2	\$979.0	\$1.21
Sc12	ZE Class 8	\$8,117.5	\$7,445.5	\$836.7	\$1.04
Sc13	ZE Class 2b-3	\$803.2	\$752.8	\$82.1	\$0.10
Sc14	ZE Class 2b-3	\$1,128.8	\$978.3	\$118.7	\$0.15
Sc15	Filter System	\$5,985.7	\$5,056.7	\$634.7	\$0.79
Sc16	Filter	\$5,862.9	\$4,953.4	\$621.6	\$0.77
Sc17	TRU	\$54.2	\$45.8	\$5.7	\$0.70
Sc18	Yard Trucks	\$1,152.6	\$1,028.7	\$120.0	\$0.15

JOBS AND OTHER SOCIOECONOMIC IMPACTS

The REMI model (PI+ v2.4.1) was used to assess the total socioeconomic impacts of the regulatory change from PR 2305.³⁰ The model links the economic activities in the counties of Los Angeles, Orange, Riverside, and San Bernardino, and for each county, it is comprised of five interrelated blocks: (1) output and demand, (2) labor and capital, (3) population and labor force, (4) wages, prices and costs, and (5) market shares.³¹

Given the uncertain nature of compliance action taken by each potentially affected warehouse operator potentially subject to PR 2305, a bounding analysis was performed in estimating jobs affects estimated due to implementation of PR 2305. This bounding analysis analyzes scenarios

³⁰ Regional Economic Modeling Inc. (REMI). Policy Insight® for the South Coast Area (160-sector model). Version 2.4.1, 2020.

³¹ Within each county, producers are made up of 156 private non-farm industries and sectors, three government sectors, and a farm sector. Trade flows are captured between sectors as well as across the four counties and the rest of U.S. Market shares of industries are dependent upon their product prices, access to production inputs, and local infrastructure. The demographic/migration component has 160 ages/gender/race/ethnicity cohorts and captures population changes in births, deaths, and migration. (For details, please refer to REMI online documentation at <http://www.remi.com/products/pi.>)

wherein all warehouse operators are assumed to comply using the same compliance action. South Coast AQMD staff modeled and presents the results of those scenarios which they believe to be high- and low-cost scenarios, along with a few additional scenarios to provide a more complete picture of the range of jobs impacts due to implementation of PR 2305.

The scenarios modeled to estimate the range of jobs impacts due to implementation of PR 2305 are scenarios 3, 6, 7, 7a, 10, and 13. Scenarios 3 and 10 are low-cost natural gas and zero-emission scenarios respectively. Scenarios 7 and 7a are high-cost scenarios from all warehouse operators complying with PR 2305 through paying a mitigation fee. Scenario 6 was included to consider a scenario involving electric vehicle charger installations. Scenario 13 is maintained for comparison to an earlier draft of this socioeconomic impact assessment, wherein Scenario 13 was the low-cost zero-emission scenario. Each scenario is described in Table 15.

Each assessment herein is performed relative to a baseline (“business as usual”) where PR 2305 would not be adopted. Adoption of PR 2305 would create a regulatory scenario under which the potentially affected facilities would incur average annual compliance costs estimated to range from about -\$13 to \$670 million for low- and high-cost scenarios respectively.

Direct effects of proposed rules/amendments must be estimated and used as inputs into the REMI PI+ model in order for the model to assess secondary and induced impacts for all actors in the four-county economy on an annual basis and across a user-defined horizon (2022 - 2031). Direct effects of PR 2305 include additional costs to the potentially affected facilities and additional sales by local vendors of equipment, devices, or services supplying the necessary goods/services to help the potentially affected facilities meet the proposed requirements of PR 2305.

While compliance expenditures may increase the cost of doing business for affected facilities, the purchase and installation of additional equipment combined with spending on operation and maintenance may increase sales in other sectors. Table 25 lists the sectors modeled in REMI PI+ which incur a cost/benefit from compliance expenditures.³²

All expected PR 2305 compliance costs are included in the REMI PI+ model as increased demand/spending in the industry categories listed in Table 25. This could substantially mute negative regional effects on employment if the REMI PI+ model assumed all spending from any industry in the South Coast AQMD jurisdiction was spent within the South Coast AQMD jurisdiction. This worry is mitigated as each industry is provided a set of “regional purchase coefficients,” which account for regional spending/final demand to be met by companies within and outside the South Coast AQMD jurisdiction.

³² Improved public health due to reduced criteria and toxic air pollution may improve worker productivity and other economic factors. Including these factors in a jobs/REMI analysis would only increase the desire of individuals to relocate or stay in the South Coast AQMD jurisdiction. Thus the jobs estimates provided are conservative estimates, and would likely be less after accounting for this improved “amenity” value.

Table 25: Industries Incurring Costs or Benefitting from PR 2305 Compliance

Compliance Cost Source	Industries Incurring Compliance Costs (NAICS in REMI)	Industries with Adjusted Demand (NAICS in REMI)
NZE and/or ZE truck purchases ^{3,6,7,7a,13}	Total annual compliance cost split amongst all industries potentially affected by PR 2305 proportional to total warehouse square footage. ³³	<i>One-time Capital:</i> Motor Vehicle Manufacturing (NAICS 3361)
Reduced purchase of diesel fuel ^{3,6,7,7a,10,13}		<i>Recurring:</i> Petroleum and Coal Products Manufacturing (NAICS 324)
Purchase of natural gas fuel ^{3,7,7a}		<i>Recurring:</i> Oil and Gas Extraction (NAICS 211)
Purchase of electricity as fuel ^{6,7,10,13}		<i>Recurring:</i> Electric Power Generation, Transmission, and Distribution (NAICS 2211)
Net change in maintenance cost ^{3,6,7,7a,10,13}		<i>Recurring:</i> Automotive Repair and Maintenance (NAICS 8111)
Net change in insurance cost ^{3,6,7,7a,10,13}		<i>Recurring:</i> Insurance Carriers (NAICS 5241)
Net change in DMV fees ^{6,7,10,13}		<i>Recurring:</i> State Government (NAICS 92)
Level 3 charger purchase ^{6,7}		<i>One-time Capital:</i> Other Electrical Equipment and Component Manufacturing (NAICS 3359)
Level 3 charger construction ^{6,7}		<i>One-time Capital:</i> Construction (NAICS 23)
Level 3 charger permitting ^{6,7}		<i>Recurring:</i> Local Government (NAICS 92)
Level 3 charger energization ^{6,7}		<i>One-time Capital:</i> Electric Power Generation, Transmission, and Distribution (NAICS 2211)
Administrative costs for reporting requirements ^{3,6,7,7a,10,13}		<i>Recurring:</i> Other professional, scientific, and technical services (NAICS 5419)

Note: Superscript values indicate scenarios including each compliance cost source and respective demand.

As presented in Figure 2, PR 2305 is expected to result in an industry-wide average of about 240 net jobs added to 11,100 net jobs foregone annually from 2022 to 2031 for the low-cost (Scenario 10) and high-cost (Scenario 7) scenarios respectively. The projected job impacts represent about a

³³ Warehouse operator NAICS and square footage used from CoStar warehouse single-tenant operators and Dun and Bradstreet data matching described in the “Affected Industries/Facilities” section of this report. Industry-by-county shares of total compliance costs were estimated from this data based on total square footage. Any industry-by-county-by-year expected compliance cost was estimated from total annual compliance cost multiplied by the industry’s respective industry-by-county square-footage share relative to total square footage of warehouse space potentially affected by PR 2305.

0.002% increase to a 0.1% decrease of total employment in the four-county region for both low- and high-cost scenarios.

Figure 2: PR 2305 Projected Regional Foregone Jobs, 2022 – 2031

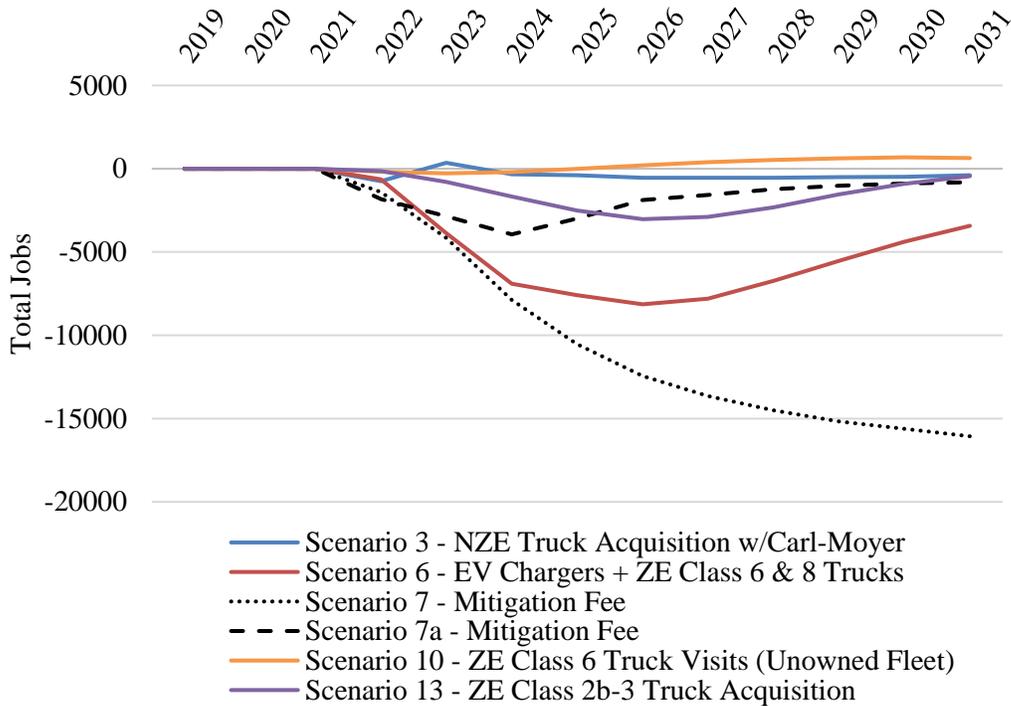
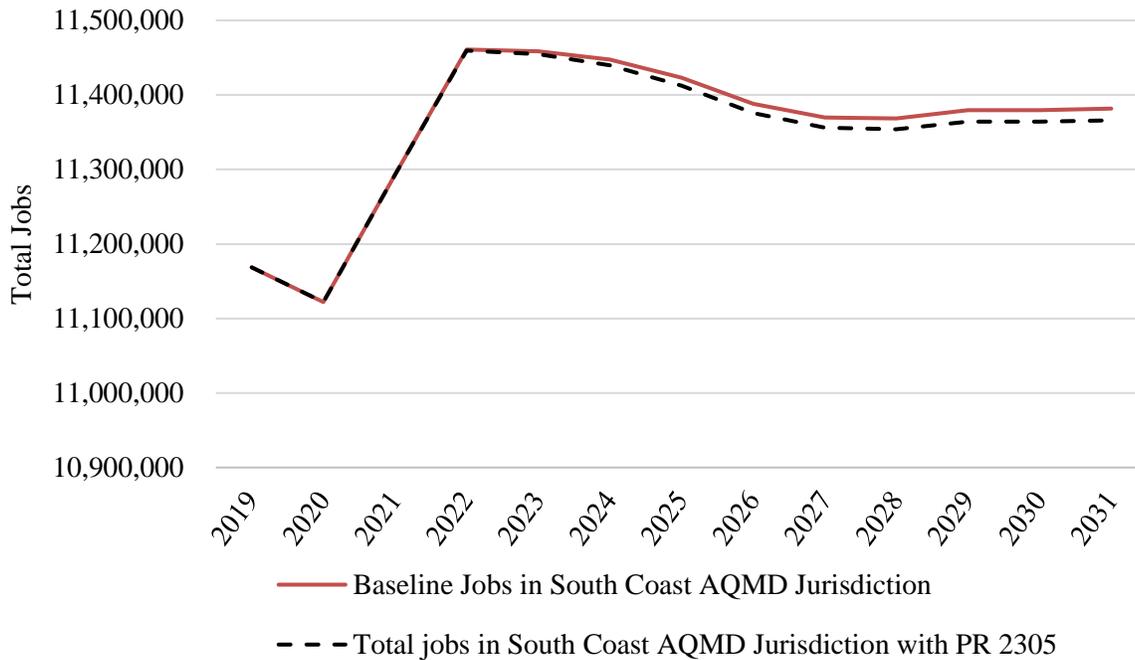


Figure 3 plots predicted foregone jobs, baseline jobs, and total jobs following adoption of PR 2305 through Scenario 7 (high-cost scenario) in 2019 to 2031. Figure 3 illustrates the predicted job impacts from PR 2305 are small relative to the total predicted jobs. Moreover, job reductions estimated from PR 2305 are viewed as foregone jobs, in that the total number of jobs in the compliance period is higher than the total number of jobs before the compliance period.

Tables 26-31 present expected job impacts of PR 2305 for each scenario modeled, presenting the top 10 industries with negative job impacts, and the top three industries with expected positive job impacts, and the remaining industries grouped together. For all scenarios except Scenario 10, job losses are expected from 2022 to 2031 due to PR 2305. Retail trade (NAICS 44-45) and construction (NAICS 23) are expected to bear most of the estimated total compliance cost of PR 2305, with an estimated total 410 jobs forgone on average annually between 2022 to 2031 for the NZE low-cost scenario (Scenario 3), and an estimated total 11,100 jobs forgone on average annually between 2022 to 2031 for the high-cost scenario (Scenario 7).

Figure 3: PR 2305 Projected Regional Job Impact 2019 – 2031 (High-Cost Scenario)

Job losses in retail trade and construction are highest across all scenarios for two reasons. First, and most importantly, retail trade and construction are sectors that are highly linked to all other sectors. Since this rule imposes costs on a broad group of industries, each of those industries is expected to have less money to spend on other projects/activities, affecting to a greater proportion retail trade and construction. Historically around 10% of jobs losses predicted in many socioeconomic impact assessments performed by the South Coast AQMD come from construction, and another 10% from retail trade, even for rules not directly affecting facilities in those sectors. This same occurrence is estimated to occur for implementation of PR 2305. Second, some of the warehouse operators affected by PR 2305 are in the retail trade or construction sector.

In all scenarios warehousing and storage (NAICS 493) is also estimated to experience a reduction in jobs.³⁴ Interestingly, the automotive repair and maintenance sector (NAICS 8111) is expected to see notable job gains in scenarios where NZE vehicles are adopted to comply with PR 2305, and forgone jobs where ZE vehicles are adopted to comply with PR 2305.

For sectors experiencing job gains, two groupings are notable. First the sectors of electric power generation, transmission, and distribution (NAICS 2211) and other electrical equipment and component manufacturing (NAICS 3359).³⁵ These sectors experience job gains when there is ZE

³⁴ Although this is a rule designed to affect trucking activities going to warehouses, most businesses with warehousing activities are not classified formally as being in the “warehousing and storage” industry. Thus the largest job reductions occur from indirect effects of a large group of facilities directing funds away from projects/spending into sectors like retail trade and construction.

³⁵ Scenario 7 assumes collected mitigation fee revenue is spent 50% on electric vehicle chargers and 50% on natural-gas and electric trucks. Spending on trucks scales linearly from 100% spent on natural-gas trucks in 2022, to 100% spent on electric trucks in 2031.

infrastructure and ZE vehicle charging expected due to PR 2305. The second grouping of note is other professional, scientific, and technical services (5419). The increase in this sector represents expected job increases due to reporting and other administrative requirements of PR 2305. Admittedly these additional jobs may be seen not in the other professional, scientific, and technical services sector, but rather in the industries directly affected by PR 2305.

Table 26: PR 2305 Job Impacts (NZE Low-Cost Scenario, Scenario 3)

Industry	REMI NAICS	2022	2024	2027	2031	Average annual jobs change (2022-2031)	Baseline annual jobs (2022-2031)	% Change from average baseline (2022-2031)
Retail trade	44-45	-181	-114	-121	-110	-117	947,862	-0.01%
Construction	23	-136	-111	-117	-69	-100	505,066	-0.02%
Warehousing and storage	493	-28	-42	-53	-53	-46	130,131	-0.04%
Wholesale trade	42	-40	-41	-57	-49	-45	422,236	-0.01%
Food services and drinking places	722	-39	-27	-35	-33	-30	795,336	0.00%
Apparel, leather and allied product manufacturing	315, 316	-19	-23	-28	-29	-26	62,634	-0.04%
Truck transportation	484	-15	-24	-30	-27	-25	105,660	-0.02%
Petroleum and coal products manufacturing	324	-3	-24	-28	-26	-23	4,950	-0.46%
State and local government	92	25	16	-70	-66	-23	945,760	0.00%
Real estate	531	-36	-25	-22	-17	-21	588,058	0.00%
Oil and gas extraction	211	1	8	8	7	7	6,974	0.10%
Automotive repair and maintenance	8111	-9	82	102	107	84	99,205	0.08%
Other professional, scientific, and technical services	5419	97	303	305	311	275	61,257	0.45%
	Other	-367	-304	-390	-341	-322	6,730,678	0.00%
	Total	-748	-326	-534	-395	-410	11,405,806	0.00%

Note: Adding all industry values may not add to total amount due to rounding.

Table 27: PR 2305 Job Impacts (ZE with Infrastructure Scenario, Scenario 6)

Industry	REMI NAICS	2022	2024	2027	2031	Average annual jobs change (2022-2031)	Baseline annual jobs (2022-2031)	% Change from average baseline (2022-2031)
Retail trade	44-45	-256	-1,309	-1,149	-550	-896	947,862	-0.09%
Construction	23	49	-950	-1,023	33	-612	505,066	-0.12%
State and local government	92	143	2	-543	-405	-307	945,760	-0.03%
Wholesale trade	42	-62	-358	-387	-205	-288	422,236	-0.07%
Food services and drinking places	722	-44	-331	-385	-240	-287	795,336	-0.04%
Warehousing and storage	493	-43	-277	-368	-250	-272	130,131	-0.21%
Apparel, leather and allied product manufacturing	315, 316	-31	-201	-265	-186	-198	62,634	-0.32%
Real estate	531	-44	-288	-265	-102	-197	588,058	-0.03%
Offices of health practitioners	6211-6213	-26	-178	-159	-71	-120	394,661	-0.03%
Business support services; Investigation and security services; Other support services	5614, 5616, 5619	-20	-141	-159	-84	-116	235,512	-0.05%
Motor vehicle manufacturing	3361	0	2	0	0	1	308	0.21%
Electric power generation, transmission and distribution	2211	11	12	-1	-3	2	9,465	0.02%
Other professional, scientific, and technical services	5419	97	270	270	295	250	61,257	0.41%
	Other	-420	-3,149	-3,361	-1,661	-2,458	6,307,521	-0.04%
	Total	-646	-6,895	-7,794	-3,428	-5,497	11,405,806	-0.05%

Note: Adding all industry values may not add to total amount due to rounding.

Table 28: PR 2305 Job Impacts (High-Cost Scenario, Scenario 7)

Industry	REMI NAICS	2022	2024	2027	2031	Average annual jobs change (2022-2031)	Baseline annual jobs (2022-2031)	% Change from average baseline (2022-2031)
Retail trade	44-45	-307	-1,372	-2,045	-2,337	-1,711	947,862	-0.18%
Construction	23	-193	-1,239	-1,864	-1,364	-1,373	505,066	-0.27%
State and local government	92	11	-249	-789	-1,183	-642	945,760	-0.07%
Food services and drinking places	722	-69	-368	-660	-850	-552	795,336	-0.07%
Wholesale trade	42	-76	-384	-659	-775	-541	422,236	-0.13%
Warehousing and storage	493	-47	-277	-588	-793	-487	130,131	-0.37%
Real estate	531	-64	-314	-481	-524	-393	588,058	-0.07%
Apparel, leather and allied product manufacturing	315, 316	-32	-196	-416	-555	-343	62,634	-0.55%
Automotive repair and maintenance	8111	-31	-111	-236	-726	-283	99,205	-0.29%
Offices of health practitioners	6211-6213	-40	-197	-292	-339	-245	394,661	-0.06%
Electric power generation, transmission and distribution	2211	1	-5	7	62	15	9,465	0.16%
Other electrical equipment and component manufacturing	3359	21	73	84	80	72	6,654	1.08%
Other professional, scientific, and technical services	5419	70	193	168	160	157	61,257	0.26%
	Other	-647	-3,440	-5,868	-6,920	-4,814	6,437,482	-0.07%
	Total	-1,402	-7,884	-13,640	-16,063	-11,141	11,405,806	-0.10%

Note: Adding all industry values may not add to total amount due to rounding.

Table 29: PR 2305 Job Impacts (High-Cost Scenario, Scenario 7a)

Industry	REMI NAICS	2022	2024	2027	2031	Average annual jobs change (2022-2031)	Baseline annual jobs (2022-2031)	% Change from average baseline (2022-2031)
Retail trade	44-45	-338	-681	-250	-178	-334	947,862	-0.04%
Construction	23	-285	-698	-152	31	-249	505,066	-0.05%
State and local government	92	-70	-157	-200	-128	-146	945,760	-0.02%
Wholesale trade	42	-92	-201	-110	-70	-115	422,236	-0.03%
Warehousing and storage	493	-52	-156	-118	-81	-108	130,131	-0.08%
Food services and drinking places	722	-83	-186	-99	-72	-107	795,336	-0.01%
Apparel, leather and allied product manufacturing	315, 316	-33	-108	-78	-54	-73	62,634	-0.12%
Real estate	531	-76	-156	-51	-28	-70	588,058	-0.01%
Truck transportation	484	-29	-75	-49	-30	-47	105,660	-0.04%
Business support services; Investigation and security services; Other support services	5614, 5616, 5619	-34	-80	-44	-28	-46	235,512	-0.02%
Oil and gas extraction	211	-1	3	6	4	4	6,974	0.06%
Automotive repair and maintenance	8111	-35	-15	73	48	35	99,205	0.04%
Other professional, scientific, and technical services	5419	92	286	300	309	268	61,257	0.44%
	Other	-783	-1,718	-804	-525	-913	6,500,116	-0.01%
	Total	-1,817	-3,942	-1,574	-802	-1,901	11,405,806	-0.02%

Note: Adding all industry values may not add to total amount due to rounding.

Table 30: PR 2305 Job Impacts (Low-Cost Scenario, Scenario 10)

Industry	REMI NAICS	2022	2024	2027	2031	Average annual jobs change (2022-2031)	Baseline annual jobs (2022-2031)	% Change from average baseline (2022-2031)
Automotive repair and maintenance	8111	-75	-282	-316	-214	-253	99,205	-0.26%
Petroleum and coal products manufacturing	324	-5	-20	-22	-14	-18	4,950	-0.36%
Oil and gas extraction	211	-5	-17	-18	-11	-15	6,974	-0.21%
Truck transportation	484	-6	-13	-5	3	-5	105,660	0.00%
Management of companies and enterprises	55	-2	-4	-3	0	-2	125,367	0.00%
Pipeline transportation	486	0	-2	-2	-1	-1	1,269	-0.10%
Warehousing and storage	493	-8	-18	0	15	-1	130,131	0.00%
Waste management and remediation services	562	-1	-2	-2	0	-1	21,709	-0.01%
Natural gas distribution	2212	0	-1	-1	-1	-1	8,486	-0.01%
Specialized design services	5414	-1	-2	-1	0	-1	43,593	0.00%
Electric power generation, transmission and distribution	2211	10	40	46	31	37	9,465	0.39%
Construction	23	-30	-24	98	84	51	505,066	0.01%
Other professional, scientific, and technical services	5419	101	308	315	320	283	61,257	0.46%
	Other	-163	-165	297	429	168	10,282,674	0.00%
	Total	-185	-203	387	641	240	11,405,806	0.00%

Note: Adding all industry values may not add to total amount due to rounding.

Table 31: PR 2305 Job Impacts (Scenario 13)

Industry	REMI NAICS	2022	2024	2027	2031	Average annual jobs change (2022-2031)	Baseline annual jobs (2022-2031)	% Change from average baseline (2022-2031)
Automotive repair and maintenance	8111	-35	-228	-393	-372	-299	99,205	-0.30%
Retail trade	44-45	-84	-342	-409	-69	-263	947,862	-0.03%
Construction	23	-43	-284	-360	158	-170	505,066	-0.03%
State and local government	92	69	20	-221	-118	-102	945,760	-0.01%
Warehousing and storage	493	-12	-73	-132	-58	-84	130,131	-0.06%
Wholesale trade	42	-8	-82	-141	-35	-83	422,236	-0.02%
Food services and drinking places	722	-12	-80	-134	-44	-82	795,336	-0.01%
Apparel, leather and allied product manufacturing	315, 316	-10	-53	-91	-42	-59	62,634	-0.09%
Real estate	531	-12	-72	-94	-4	-55	588,058	-0.01%
Offices of health practitioners	6211-6213	-8	-47	-61	-10	-37	394,661	-0.01%
Insurance carriers	5241	1	6	13	20	12	50,524	0.02%
Electric power generation, transmission and distribution	2211	3	21	38	40	30	9,465	0.31%
Other professional, scientific, and technical services	5419	101	299	298	316	273	61,257	0.45%
	Other	-93	-754	-1,200	-231	-704	6,393,612	-0.01%
	Total	-144	-1,668	-2,887	-449	-1,625	11,405,806	-0.01%

Note: Adding all industry values may not add to total amount due to rounding.

The foregone jobs estimates from PR 2305 implementation come about due to less investment spending and less future production, i.e. foregone output. Tables 32 and 33 present estimated foregone output by industry from the lower-cost scenario of Scenario 7a and the high-cost scenario of Scenario 7. Similar to tables presenting foregone jobs, Tables 32 and 33 show the top 10 most adversely impacted industries, and the top three most benefitting industries due to PR 2305. Relative to total economic output within the South Coast AQMD four-county region, PR 2305 may reduce average annual output between 0.02% and 0.10%.

Table 32: PR 2305 Estimated Impact on Output (Scenario 7a) (\$2018 million)

Industry	REMI NAICS	2022	2024	2027	2031	Average annual output change (2022-2031)	Baseline average annual output (2022-2031)	% Change in average annual output (2022-2031)
Petroleum and coal products manufacturing	324	-\$4	-\$102	-\$179	-\$128	-\$127	\$39,109	-0.33%
Retail trade	44-45	-\$39	-\$82	-\$33	-\$25	-\$42	\$116,864	-0.04%
Wholesale trade	42	-\$29	-\$67	-\$40	-\$28	-\$41	\$153,720	-0.03%
Construction	23	-\$44	-\$108	-\$25	\$4	-\$39	\$82,318	-0.05%
Real estate	531	-\$40	-\$85	-\$28	-\$15	-\$38	\$309,889	-0.01%
Apparel, leather and allied product manufacturing	315, 316	-\$6	-\$21	-\$17	-\$13	-\$15	\$7,767	-0.20%
Warehousing and storage	493	-\$5	-\$14	-\$11	-\$8	-\$10	\$11,454	-0.09%
Truck transportation	484	-\$5	-\$14	-\$10	-\$7	-\$9	\$20,932	-0.04%
Food services and drinking places	722	-\$6	-\$13	-\$7	-\$5	-\$8	\$57,676	-0.01%
Scenic and sightseeing transportation and support activities for transportation	487, 488	-\$3	-\$10	-\$7	-\$5	-\$7	\$15,192	-0.04%
Automotive repair and maintenance	8111	-\$4	-\$2	\$8	\$5	\$4	\$10,518	0.03%
Motor vehicle manufacturing	3361	-\$2	\$37	-\$2	-\$2	\$12	\$9,062	0.13%
Other professional, scientific, and technical services	5419	\$12	\$37	\$40	\$42	\$36	\$9,170	0.39%
	Other	-\$142	-\$325	-\$193	-\$132	-\$195	\$1,396,285	-0.01%
	Total	-\$316	-\$767	-\$505	-\$316	-\$480	\$2,239,957	-0.02%

Table 33: PR 2305 Estimated Impact on Output (Scenario 7) (\$2018 million)

Industry	REMI NAICS	2022	2024	2027	2031	Average annual output change (2022-2031)	Baseline average annual output (2022-2031)	% Change in average annual output (2022-2031)
Petroleum and coal products manufacturing	324	-\$3	-\$75	-\$275	-\$521	-\$246	\$39,109	-0.63%
Retail trade	44-45	-\$36	-\$165	-\$262	-\$326	-\$222	\$116,864	-0.19%
Real estate	531	-\$34	-\$170	-\$269	-\$301	-\$220	\$309,889	-0.07%
Construction	23	-\$30	-\$192	-\$296	-\$225	-\$219	\$82,318	-0.27%
Wholesale trade	42	-\$24	-\$127	-\$237	-\$311	-\$198	\$153,720	-0.13%
Apparel, leather and allied product manufacturing	315, 316	-\$6	-\$37	-\$87	-\$130	-\$74	\$7,767	-0.95%
Warehousing and storage	493	-\$4	-\$25	-\$56	-\$77	-\$46	\$11,454	-0.40%
Food services and drinking places	722	-\$5	-\$26	-\$48	-\$63	-\$40	\$57,676	-0.07%
Truck transportation	484	-\$4	-\$24	-\$47	-\$63	-\$39	\$20,932	-0.19%
Offices of health practitioners	6211-6213	-\$5	-\$26	-\$41	-\$51	-\$35	\$54,736	-0.06%
Other professional, scientific, and technical services	5419	\$9	\$25	\$22	\$21	\$20	\$9,170	0.22%
Other electrical equipment and component manufacturing	3359	\$7	\$24	\$29	\$29	\$25	\$2,385	1.03%
Motor vehicle manufacturing	3361	\$14	\$54	\$65	\$70	\$57	\$9,062	0.62%
	Other	-\$100	-\$618	-\$1,199	-\$1,572	-\$995	\$1,364,874	-0.07%
	Total	-\$220	-\$1,383	-\$2,701	-\$3,521	-\$2,234	\$2,239,957	-0.10%

Competitiveness

PR 2305 may raise the cost of operating a warehouse in the South Coast AQMD jurisdiction relative to warehouses operating outside the South Coast AQMD jurisdiction, both near and far. South Coast AQMD staff examined the potential for warehouse operators possibly relocating their operations outside the South Coast AMQD jurisdiction, as well as warehouse operators that remain in the South Coast AQMD jurisdiction possibly losing customers due to the desire of warehouse operators to pass on some of the regulatory costs of PR 2305 to their customers.

South Coast AQMD staff is aware of two studies which consider the effects of heightened costs on the goods movement sector, and how those heightened costs might affect warehouse relocation or goods diversion from the ports of Los Angeles and Long Beach.

The first study was completed in 2020 by Industrial Economics, Inc. (IEc) on behalf of the South Coast AQMD. IEC's study investigates the likelihood warehouses within the South Coast AQMD jurisdiction may relocate due to PR 2305 implementation to other regions in southern California, southern Nevada, and western Arizona. A warehouse is estimated to relocate to another region if the estimated cost of operating within the South Coast AQMD jurisdiction is higher than the estimated cost of performing the same operations in the relocation region considered, constrained by available warehouse space.

The IEC study considers the costs of operating each warehouse in the South Coast AQMD jurisdiction for another 20 years. The IEC study includes warehouse rental, labor, power, and goods transportation costs of operating in both the South Coast AQMD jurisdiction along with each relocation region. The cost of operating in the South Coast AQMD jurisdiction is raised by the \$ per square foot cost of complying with PR 2305, conservatively assuming the annual compliance cost occurs immediately upon rule passage for all warehouses greater than 100,000 square feet. The cost of operating after relocating outside the South Coast AQMD jurisdiction is raised due to estimated moving costs, as well as a possibility of new warehouse development costs when considering a scenario where land yet to be zoned for warehousing may become zoned and built on over the next 20 years.

The IEC analysis results indicate at compliance cost ranges of \$0.00-\$1.50 per square foot, no warehouses in the South Coast AQMD jurisdiction would relocate. The IEC analysis results also indicate approximately five to six warehouses may relocate to the Bakersfield region of California if PR 2305 compliance costs were in the range of \$1.50-\$2 per square foot. South Coast AQMD staff interprets the IEC analysis as indicating no warehouses would relocate outside the South Coast AQMD jurisdiction under the currently proposed PR 2305 stringency which could result in a high end mitigation fee of about \$0.82 per square foot.

In preparation for implementing a clean truck fund rate at the Port of Los Angeles (POLA) and Port of Long Beach (POLB), POLA and POLB hired Davies Transportation Consulting Inc. to perform a study estimating the amount of goods diversion away from the POLA/POLB due to a range of clean truck fund rates, considering \$0 to \$70 per twenty-foot-equivalent unit (TEU) container. The latest draft of this report was released December 2019. Based on the results of this study, the ports of Los Angeles and Long Beach have decided to implement a \$10 per TEU clean truck fund rate.

South Coast AQMD staff's current high-cost estimate of PR 2305 is approximately \$650 million annually assuming all warehouses subject to PR 2305 complied with PR 2305 by paying a mitigation fee.³⁶ Estimates of TEUs through POLA and POLB in 2020 total approximately 17.3

³⁶ This scenario assumes a compliance cost of \$0.75 per square foot, a mitigation fee of \$1,000 per WAIRE point, and no usage of mitigation fee revenue to replace trucks visiting warehouses with near-zero-emission or zero-emission vehicles.

million annually.³⁷ Thus PR 2305 could be viewed as adding on a cost of around \$55/TEU for TEUs which move through the South Coast AQMD jurisdiction. As estimated by the POLA/POLB commissioned study, a \$55/TEU fee would likely result in about one percent of goods diverted away from POLA/POLB to other ports.

The POLA/POLB commissioned study did not allow for the possibility of warehousing goods to be performed outside the South Coast AQMD jurisdiction to avoid the cost of paying the clean truck fund rate as containers landing at the San Pedro Bay Ports would pay the fee whether the warehouse is in the South Coast AQMD jurisdiction or outside it. In contrast, warehouses and/or warehouse operators can potentially relocate in response to PR 2305 to avoid paying the costs to comply with PR 2305.

As noted in the POLA/POLB commissioned study, shipping goods to other ports, e.g. ports in Texas, the U.S. Southeast, and New York/New Jersey ports could increase shipment times by over a week. Thus, if goods suppliers wished to avoid paying the compliance costs of PR 2305, it is more likely they would relocate to a nearby air district's jurisdiction than shipping their goods to another port entirely. South Coast AQMD staff expects if any goods diversion were to occur away from POLA/POLB due to PR 2305, it would be a diversion of less than one percent.

Figure 4 below presents regional industrial property rental prices. The data in Figure 4 comes from the CoStar Analytics™ module's quarterly reporting only for industrial properties with more than 100,000 square feet. Industrial is the most refined category within this CoStar module which contains warehouses, and recent discussions with our consultant Industrial Economics, Inc. indicate almost all of the industrial category is likely warehousing. As Figure 4 shows, industrial rental prices in the South Coast AQMD jurisdiction have risen around 63% from 2012 to 2019, from \$5.88 per square foot to \$9.60 per square foot.³⁸

Over the same time industrial rental prices in the San Diego region rose around 31% from \$8.40 per square foot to \$11.04 per square foot. Before 2010 industrial rental prices in San Diego seem to have maintained a price premium of between \$3-\$4.

Even though rental prices have been rising in both San Diego and the South Coast AQMD jurisdiction, the rental price premium has fallen by over half to \$1.40 by 2019. The industrial rental price premium which previously existed in the coastal areas north of the South Coast AQMD jurisdiction, e.g. Santa Barbara, is now gone, and it is now costlier to rent industrial space in the South Coast AQMD jurisdiction.

³⁷ South Coast AQMD staff calculations from POLA and POLB data;
<https://www.portoflosangeles.org/business/statistics/container-statistics/historical-teu-statistics-2020>;
<https://polb.com/business/port-statistics/#yearly-teus>;

³⁸ Industrial Economics, Inc., 2020. [http://www.aqmd.gov/docs/default-source/planning/fbmsm-docs/iec_pr-2305-warehouse-relocation-report-\(12-23-20\).pdf?sfvrsn=8](http://www.aqmd.gov/docs/default-source/planning/fbmsm-docs/iec_pr-2305-warehouse-relocation-report-(12-23-20).pdf?sfvrsn=8).

Figure 4: Annual Rental Prices for Industrial Properties (in 2019 \$)

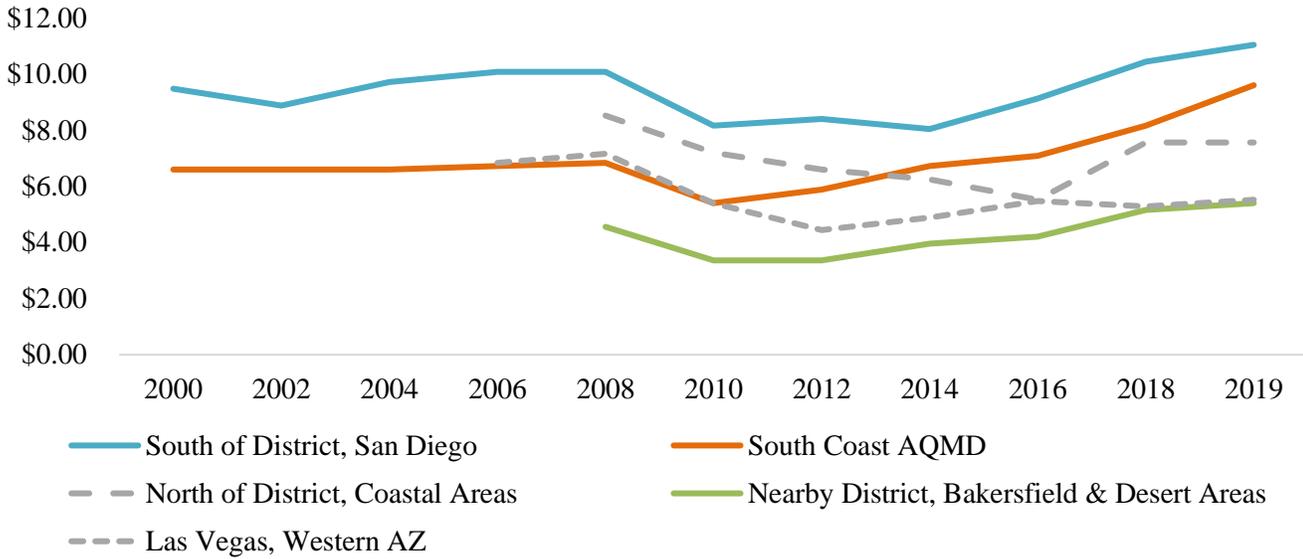
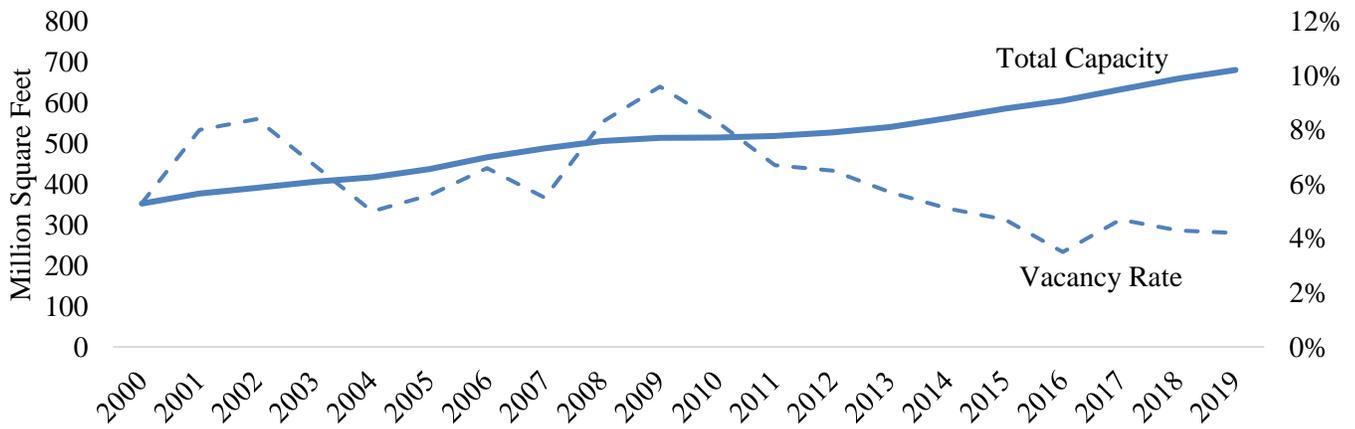


Figure 5 below presents regional warehouse vacancy rates along with available capacity. The data in Figure 5 also comes from the CoStar Analytics™ module’s quarterly reporting only for industrial properties with more than 100,000 square feet. As Figure 5 shows, available warehouse capacity in the South Coast AQMD jurisdiction has been around four percent from 2014-2019. Over the same time total warehouse capacity in the South Coast AQMD jurisdiction has grown by about 120 million square feet. Even though warehouse capacity located in the South Coast AQMD jurisdiction has grown about 20% over the past five years, available capacity has consistently maintained its lowest level observed over the past 20 years at four percent.

Figure 5: South Coast AQMD Vacant Industrial Property and Capacity



Source: CoStar Analytics™

South Coast AQMD staff interprets this combination of sizably higher increases in warehouse space rental prices over the past decade, along with a maintained low amount of available warehouse capacity while total warehouse capacity grew within the South Coast AQMD

jurisdiction, as a strong indication the South Coast AQMD jurisdiction is highly competitive for warehousing operations.³⁹

PR 2305 proposes a stringency/compliance cost of *at most* \$0.83 per square foot on warehouses with at least 100,000 square feet of space. This \$0.83 per square foot compliance cost represents an increase in the rental cost of doing business for warehouses operating in the South Coast AQMD jurisdiction that is less than 30% of the increase in rental cost this same industry has experienced over the past seven years while showing little evidence of relocation.⁴⁰

With all the above points in mind, South Coast AQMD staff believes it is highly unlikely that warehouses located in the South Coast AQMD jurisdiction would relocate outside the South Coast AQMD jurisdiction due to PR 2305. Moreover, South Coast AQMD staff believes it is highly unlikely that any goods diversion would occur away from POLA/POLB due to PR 2305.

Warehouses operating in the South Coast AQMD jurisdiction have seen rental price increases of around \$3.70 per square feet over the past decade, which has not seemed to deter expansion of warehousing operations in the South Coast AQMD jurisdiction over the past decade as indicated by vacancy and capacity data presented in Figure 2. Since PR 2305 is expected to at most raise the price of warehouse rent by 30% compared to the increases warehouses in the region have experienced over the past decade, South Coast AQMD staff believes it highly unlikely warehouse relocation and goods-movement relocation would occur due to PR 2305 implementation.⁴¹

CEQA ALTERNATIVES

Five alternatives to the proposed project have been developed for PR 2305. Alternative A – No Project, Alternative B – Decreased Emission Reductions, Alternative C – Increased Emission Reductions, Alternative D – All Natural Gas Options Only, Alternative E – All Electric Options Only. The primary components of the alternatives that have been modified are the WAIRE Program applicability in terms of warehouse size in square feet, the proposed rule stringency, the proposed initial compliance period, and the actions available on the WAIRE menu, which could make the WAIRE Program more prescriptive by including a limited number of actions that warehouse operators can select and implement.

For purposes of this document, the no project alternative assumes that the WAIRE Program would not be implemented. This means warehouse operators operating at least 50,000 square feet of warehousing activity located in existing or new warehouses in the South Coast AQMD's jurisdiction with an indoor warehouse floor space equal to or greater than 100,000 square feet within a single building would not be required to meet their WPCO. The WPCO compliance strategies in the form of WAIRE Menu actions, a Custom WAIRE Plan, and/or the payment of the optional mitigation fee would not be implemented.

³⁹ This point was also made by warehouse staff interviewed by Industrial Economics, Inc during development of PR 2305. Warehouse staff pointed out the South Coast AQMD jurisdiction has several hard to monetize benefits, specifically the very developed transportation network of multiple ports, railways, and interstate highways, along with a large labor pool that is difficult to access in more remote regions.

⁴⁰ Average rent in the South Coast AQMD jurisdiction for industrial properties from 2000-2008 and again in 2014 was around \$6.70 per square foot, while the same average rent figure was \$9.60 in 2019.

⁴¹ $\$0.75/\text{sq.ft.}/\$3.20/\text{sq.ft.} = 20.27\%$ increase.

Under Alternative B, the warehouse size requirement is increased from “greater than or equal to 100,000 square feet” to “greater than or equal to 200,000 square feet”, such that the number of affected warehouses under Alternative B would decrease. Second, the beginning of the initial compliance and reporting dates are delayed by one year, such that the regulated warehouses would have a longer time period to plan for and phase in any actions that they would need to undertake to meet their WPCO. Third, the rule stringency is relaxed, such that the rule stringency factor for the proposed project is below 0.0025 WAIRE Points per WATT and could be as low as 0.0001 WAIRE Points per WATT. The WPCO compliance strategies such as the WAIRE Menu (all of the actions), a Custom WAIRE Plan, and/or the payment of optional mitigation fee at a cost of \$1,000 per WAIRE Point to South Coast AQMD would not change.

Alternative C consists of a version of the proposed project that would result in greater emission reductions of NO_x and PM_{2.5}. To accomplish this, the rule stringency has increased, such that the rule stringency factor for the proposed project is set to 0.0050 WAIRE Points per WATT. Additionally, the three-year phase-in has been increased to a seven-year phase-in period. The WPCO compliance strategies such as the WAIRE Menu (all of the actions), a Custom WAIRE Plan, and/or the payment of optional mitigation fee at a cost of \$1,000 per WAIRE Point to South Coast AQMD would not change.

Alternative D is based on the currently proposed applicability and rule stringency factor for the proposed project 0.0025 WAIRE Points per WATT. However, this alternative limits the number of actions on the WAIRE Menu that warehouse operators could select and implement to earn WAIRE Points. Specifically, the only actions allowed to earn WAIRE Points under Alternative D are related to the use of all natural gas equipment such as the acquisition and/or use of natural gas. Alternative D limits the range of compliance actions on the WAIRE Menu as constraints. Other WPCO compliance strategies such as a Custom WAIRE Plan and/or the payment of optional mitigation fee at a cost of \$1,000 per WAIRE Point to South Coast AQMD would still be available to use by warehouse operators to comply with the proposed project.

Alternative E limits the number of actions on the WAIRE Menu that warehouse operators could select and implement to earn WAIRE Points. Specifically, the only actions allowed to earn WAIRE Points under Alternative E are related to the use of all electric equipment such as the acquisition and/or use of all electric trucks and installation and/or use of ZE fueling or charging infrastructure. Alternative E limits the range of compliance actions on the WAIRE Menu as constraints. Other WPCO compliance strategies such as a Custom WAIRE Plan and/or the payment of optional mitigation fee at a cost of \$1,000 per WAIRE Point to South Coast AQMD still be available to use by warehouse operators to comply with the proposed project.

Table 34 provides a summary of the elements of each of the alternatives and compares them to the proposed project. Assuming a 4% real interest rate, average annual compliance costs for the CEQA alternatives range from -\$670 million to \$1 billion between 2022 and 2031. Jobs forgone for the CEQA alternatives range from -240 to 16,100 between 2022 and 2031.

Table 34: Average Annual Cost and Job Impacts of CEQA Alternatives

Alternatives	Average Annual, 2022 - 2031		Cost-Effectiveness (\$/ton) ¹
	Cost	Jobs Foregone	
Proposed Amendments	-\$12,600,000 - \$670,200,000	-240 – 11,100	-\$11,000 - \$101,000
Alternative A - No Project	-	-	-
Alternative B - Decreased Emission Reductions	\$20,600,000 - \$37,300,000	150 – 490	\$139,000 - \$181,000
Alternative C - Increased Emission Reductions	-\$60,000,000 - \$1,015,000,000	-670 – 16,100	-\$35,000 - \$100,000
Alternative D - All Natural Gas Options Only	\$45,000,000 - \$670,200,000	410 – 11,100	\$32,000 - \$101,000
Alternative E - All Electric Options Only	-\$12,600,000 - \$670,200,000	-240 - 11,100	-\$11,000 - \$101,000

Note: High cost option is the highest-cost mitigation fee option (Scenario 7), as no warehouse operator is expected to comply in a costlier manner than the mitigation fee. The low-cost option in the proposed amendments, and CEQA Alternatives C and E is Scenario 10. The low-cost option in CEQA Alternatives B and D is Scenario 3.

¹ Cost-effectiveness is calculated using the discounted cash flow method (DCF) and a 4% real interest rate. This method is consistent with prior South Coast AQMD rules and the 2016 AQMP.

PUBLIC HEALTH BENEFITS

Public health benefits resulting from compliance with PR 2305 are calculated using an incidence per ton (IPT) methodology, developed by the U.S. Environmental Protection Agency (Fann et al. 2009, 2012, 2018). The IPT methodology is an approximation based on the general assumption that the relationship between emissions and adverse health outcomes is linear. In addition, the IPT methodology relies on the following assumptions, (1) changes in health incidence are proportional to ambient PM = concentrations; (2) changes in primary pollutant concentrations (PM2.5) are proportional to changes in emissions (PM2.5); and (3) changes in secondary pollutant concentrations (nitrate PM2.5) are also proportional to changes in emissions (NOx). This final assumption can vary for individual actions due to the complex chemical reactions that occur to create regional pollutants. However, as warehouse ISR is part of a larger emission reduction strategy, a simplifying assumption is that the health benefits for every ton of NOx reduction in that strategy yields equal benefits.

Incidence Per Ton Methodology

Because of the assumed linear relationship between emissions and health outcomes, estimates of reductions in health endpoints resulting from PR 2305 can be found by multiplying expected

PM2.5 and NOx emission reductions by an IPT factor for each health endpoint.⁴² The IPT factors for each health endpoint were estimated using estimated control strategy emissions reductions, air quality modeling in the U.S. EPA’s Community Multiscale Air Modeling System (CMAQ), and public health benefits estimation using the U.S. EPA’s Environmental Benefits Mapping and Analysis Program – Community Edition (BenMAP-CE) from the 2016 Air Quality Management Plan (AQMP).

For example, a NOx IPT factor is calculated by dividing the estimated reduction in incidence of a given health endpoint by the total NOx emission reductions in the years 2023 and 2031.⁴³ Linear interpolation is used to generate IPT factors for the remaining years (2022, 2024-2030). IPT factors for PM2.5 are calculated similarly.⁴⁴

NOx contributes to the formation of ambient concentrations of PM2.5. For the sake of calculating contribution to ambient PM2.5 concentrations, it was assumed that each ton of NOx emitted is equivalent to 0.03 tons of directly emitted PM2.5.^{45,46}

Total emissions reductions in years 2023 and 2031 resulting from 2016 AQMP control strategies are shown in Table 35 below, while the corresponding reductions in modeled health outcomes in 2023 and 2031 are shown in Table 36 below.

Table 35: 2016 AQMP Projected Emission Reductions by Pollutant (in TPD)

	2023	2031
VOC	64	72
NOX	124	128
PM2.5	0.22	3.4

Note: Projected emission reductions are average of summer planning period (May 1 to September 30).

⁴² <https://ww2.arb.ca.gov/sites/default/files/2019-08/Estimating%20the%20Health%20Benefits%20Associated%20with%20Reductions%20in%20PM%20and%20NOx%20Emissions%20-%20Detailed%20Description.pdf>

⁴³ Reductions in health incidence were estimated for 2023 and 2031 in the 2016 AQMP.

⁴⁴ IPT factors also increase over time reflecting the projected increases in population by age class underpinning health effects modeling.

⁴⁵ U.S. EPA’s February 2018 Technical Support Document, “Estimating the Benefit per Ton of Reducing PM2.5 Precursors from 17 Sectors,” estimates the average monetary public health benefits of NOx emissions is roughly 3% of direct PM emissions (https://www.epa.gov/sites/production/files/2018-02/documents/sourceapportionmentbptsd_2018.pdf).

⁴⁶ The ratio of NOx to PM2.5 could potentially be higher than the 0.03 assumed here. Previous work done on the 2007 AQMP suggested that each ton of NOx emitted is equivalent to 0.1 tons of directly emitted PM2.5 in regards to annual PM2.5 concentrations. A higher NOx to PM2.5 ratio would lead to an increase in IPT factors for NOx and corresponding decrease in IPT factors for directly emitted PM2.5. Given that NOx emission reductions from PR 2305 are projected to be over 100 times greater than directly emitted PM2.5, an increase in the NOx IPT factor will outweigh the corresponding decrease in PM2.5 IPT factors and result in an overall increase in total benefits. In this analysis we present results assuming a ratio of 0.03 in an attempt to provide conservative estimate of public health benefits.

Table 36: 2016 AQMP Modeled Reductions in Incidence Due to PM2.5 Exposure

	2023	2031	Average Annual
Premature Deaths Avoided, All Cause			
Long-Term PM2.5 Exposure	1,394	2,716	1,512
Short-Term PM2.5 Exposure ¹	100	194	108
Reduced Morbidity Incidence			
<i>Long-Term PM2.5 Exposure</i>			
Acute Bronchitis	1,039	1,890	1,087
<i>Short-Term PM2.5 Exposure</i>			
Acute Myocardial Infarction, Nonfatal	33	71	38
Asthma Exacerbation (Wheeze, Cough, Shortness of Breath)	23,321	42,780	24,495
Asthma, New Onset (Wheeze)	2,956	5,577	3,151
HA, All Cardiovascular (less Myocardial Infarctions)	164	337	183
HA, All Respiratory (less Asthma) ²	136	290	155
HA, Ischemic Stroke	79	171	91
HA and ED Visits, Asthma	142	260	149
Lower Respiratory Symptoms	12,268	22,387	12,850
Upper Respiratory Symptoms	24,342	44,720	25,587
Minor Restricted Activity Days ³	528,869	961,248	552,809
Work Loss Days ³	91,689	166,826	95,892

* Each health effect represents the point estimate of a statistical distribution of potential outcomes. Please see Appendix 3-B of the 2016 AQMP Final Socioeconomic Report where the 95-percent confidence intervals are reported. Health effects for other years during the period 2017 to 2031 were based on interpolated, as opposed to modeled, air quality changes. The study population of each C-R function utilized can be found in Appendix 3-B of the 2016 AQMP Final Socioeconomic Report.

¹ Premature deaths avoided due to short-term exposure to PM2.5 are likely to partially overlap with those due to long-term PM2.5 exposure. Therefore, the total premature deaths associated with PM2.5 will be lower than simply summing across mortality effects from both short-term and long-term exposure (Industrial Economics and Thurston 2016a; Kunzli et al. 2001).

² This is the pooled estimate of two health endpoints: HA, Chronic Lung Disease (less Asthma) (18-64 years old) and HA, All Respiratory (65 or older).

³ Expressed in person-days. Minor Restricted Activity Days (MRAD) refer to days when some normal activities are avoided due to illness.

IPT factors for NOx and directly emitted PM2.5 were calculated using the modeled emission reductions and corresponding health outcomes in Tables 35 and 36 above. These estimated IPT factors were then used to generate estimates of the reductions in health incidence resulting from expected emission reductions resulting from PR 2305 compliance. Emission reduction estimates vary based on the modeled compliance scenario.

Projected emission reductions vary by modelled scenario, as a result a range of health impacts are presented below. Tables 37 and 38 below show NOx and diesel PM (DPM) emissions reductions in tons per day (TPD) in each compliance year for Scenario 13 (ZE Class 2b-3 Truck Acquisitions

and Subsequent Usage) and Scenario 1 (NZE Class 8 Truck Acquisitions and Subsequent Usage) net of existing CARB regulations, respectively. Scenario 13 is representative of the anticipated lower range of potential emission reductions resulting from PR 2305 compliance actions, while Scenario 1 represents the projected higher end of potential emission reductions. Scenario 13 is expected to result in approximately 3,218 cumulative tons of NOx reductions and 48 tons of direct PM reductions over the course of the ten-year compliance periods, while Scenario 1 is expected to cumulatively reduce NOx emissions by 8,609 tons and direct PM emissions by 64 tons.

Table 37: Estimated Modeled Emissions Reductions for Compliance Scenario 13 (Total ISR Emissions Net of Existing CARB Regulations)

	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
NOx Reductions (TPD)	0.150	0.487	0.889	1.165	1.230	1.177	1.075	0.973	0.878	0.791
DPM Reductions (TPD)	0.001	0.005	0.010	0.014	0.016	0.017	0.017	0.017	0.017	0.017

Table 38: Estimated Modeled Emissions Reductions for Compliance Scenario 1 (Total ISR Emissions Net of Existing CARB Regulations)

	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
NOx Reductions (TPD)	0.465	0.959	1.881	2.608	2.857	2.954	2.988	2.989	2.958	2.929
DPM Reductions (TPD)	0.004	0.007	0.014	0.019	0.021	0.022	0.022	0.023	0.023	0.023

Tables 39 and 40 show the corresponding reductions in health incidence derived using IPT factors for Scenario 13 and Scenario 1, respectively.⁴⁷ Emissions reductions from Scenario 13 are expected to cumulatively result in 151 fewer mortalities resulting long- and short-term PM2.5 exposure. Scenario 13 is also expected to result in approximately 2,500 fewer asthma attacks and nearly 9,000 fewer work loss days. Cumulatively, scenario 1 is projected to result in 341 fewer mortalities resulting from PM2.5 exposure, 5,800 fewer asthma attacks, and 20,000 fewer work loss days.

⁴⁷ To calculate PM2.5 emission reductions, DPM emission reductions are multiplied by a scaling factor (0.92). Scaling factor can be found in “Final –Methodology to Calculate Particulate Matter (PM) 2.5 and PM 2.5 Significance Thresholds”, [http://www.aqmd.gov/docs/default-source/ceqa/handbook/localized-significance-thresholds/particulate-matter-\(pm\)-2.5-significance-thresholds-and-calculation-methodology/final_pm2_5methodology.pdf?sfvrsn=2](http://www.aqmd.gov/docs/default-source/ceqa/handbook/localized-significance-thresholds/particulate-matter-(pm)-2.5-significance-thresholds-and-calculation-methodology/final_pm2_5methodology.pdf?sfvrsn=2)

**Table 39: Estimated Reductions in Incidence Resulting from Compliance Scenario 13
Emission Reductions (Total ISR Emissions Net of Existing CARB Regulations)**

	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
Premature Deaths Avoided, All Cause										
<i>Long-Term PM2.5 Exposure</i>	2	7	13	17	19	19	18	17	16	15
<i>Short-Term PM2.5 Exposure</i>	0	0	1	1	1	1	1	1	1	1
Reduced Morbidity Incidence										
<i>Long-Term PM2.5 Exposure</i>										
Acute Bronchitis	2	5	9	13	14	13	13	12	11	10
<i>Short-Term PM2.5 Exposure</i>										
Acute Myocardial Infarction, Nonfatal	0	0	0	0	0	0	0	0	0	0
Asthma Exacerbation (Wheeze, Cough, Shortness of Breath)	35	114	212	285	308	303	285	266	248	232
Asthma, New Onset (Wheeze)	4	14	27	36	39	39	37	34	32	30
HA, All Cardiovascular (less Myocardial Infarctions)	0	1	2	2	2	2	2	2	2	2
HA, All Respiratory (less Asthma)	0	1	1	2	2	2	2	2	2	2
HA, Ischemic Stroke	0	0	1	1	1	1	1	1	1	1
HA and ED Visits, Asthma	0	1	1	2	2	2	2	2	2	1
Lower Respiratory Symptoms	18	60	112	149	162	159	149	139	130	121
Upper Respiratory Symptoms	36	119	222	297	322	316	297	277	259	242
Minor Restricted Activity Days	784	2585	4810	6438	6959	6830	6417	5980	5576	5208
Work Loss Days	136	448	834	1116	1207	1185	1113	1038	968	904

**Table 40: Estimated Reductions in Incidence Resulting from Compliance Scenario 1
Emission Reductions (Total ISR Emissions Net of Existing CARB Regulations)**

	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
Premature Deaths Avoided, All Cause										
<i>Long-Term PM2.5 Exposure</i>	6	12	25	34	38	40	40	41	41	41
<i>Short-Term PM2.5 Exposure</i>	0	1	2	2	3	3	3	3	3	3
Reduced Morbidity Incidence										
<i>Long-Term PM2.5 Exposure</i>										
Acute Bronchitis	5	9	18	25	28	28	29	29	29	28
<i>Short-Term PM2.5 Exposure</i>										
Acute Myocardial Infarction, Nonfatal	0	0	1	1	1	1	1	1	1	1
Asthma Exacerbation (Wheeze, Cough, Shortness of Breath)	105	208	408	566	620	642	651	653	648	642
Asthma, New Onset (Wheeze)	13	26	52	72	79	83	84	85	84	84
HA, All Cardiovascular (less Myocardial Infarctions)	1	1	3	4	5	5	5	5	5	5
HA, All Respiratory (less Asthma)	1	1	2	3	4	4	4	4	4	4
HA, Ischemic Stroke	0	1	1	2	2	2	2	3	3	3
HA and ED Visits, Asthma	1	1	2	3	4	4	4	4	4	4
Lower Respiratory Symptoms	55	109	214	297	326	337	341	342	339	336
Upper Respiratory Symptoms	109	217	426	591	648	671	680	682	677	671
Minor Restricted Activity Days	2376	4720	9239	12798	14017	14496	14679	14707	14578	14418
Work Loss Days	412	818	1602	2219	2431	2515	2547	2552	2530	2502

Valuation of Public Health Benefits

Monetary valuations of all reductions in adverse health outcomes were calculated. The 2016 AQMP calculated total monetary valuation for each endpoint by multiplying the number of reduced outcomes for each endpoint by an estimate of the economic value of reducing individual outcome for each endpoint. For reductions in premature mortalities, an estimate of the value of a statistical life (VSL) was used. To generate value estimates for morbidities such as hospital admissions or emergency room visits, a cost-of-illness (COI) methodology was typically used. A detailed description of VSL and COI estimates can be found in Chapter 3 of the 2016 AQMP Final Socioeconomic Report. A summary of all monetary values and their associated reference(s) can be found in Appendix 3B of the 2016 AQMP Final Socioeconomic Report.

Staff estimated benefits per ton (BPT) factors for each health endpoint analyzed in the 2016 AQMP. BPT factors are calculated by dividing monetized public health benefits by modelled emission reductions from the AQMP. For example, a NO_x BPT factor is calculated by dividing the estimated monetized health benefits of a given health endpoint by the total NO_x emission reductions in the years 2023 and 2031. Linear interpolation is used to generate BPT factors for the remaining years (2022, 2024-2030). BPT factors for PM_{2.5} are calculated similarly.⁴⁸ Table 41 below shows total monetized health benefits for each modeled compliance scenario summed over the entire compliance period (2022-2031). All dollar figures are in millions of 2018 dollars.^{49,50}

⁴⁸ BPT factors increase over time reflecting the projected increases in population by age class and increases in VSL due to projected increases in future incomes.

⁴⁹ 2015 dollar figures presented in the 2016 AQMP Final Socioeconomic Report have been adjusted using a price inflator of 4.64% based on the October 2020 Marshall & Swift price index (average, all industries).

⁵⁰ To avoid double-counting, total monetized public health benefits do not include monetized benefits from reduced mortalities due to short-term PM_{2.5} exposure.

Table 41: Projected Monetized Health Benefits for Each Compliance Scenario in Millions of 2018 Dollars (Total ISR Emissions Net of Existing CARB Regulations)

	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	NPV (4%)
Sc1	\$64	\$129	\$259	\$366	\$409	\$432	\$447	\$457	\$462	\$466	\$2,713
Sc2	\$92	\$160	\$291	\$399	\$440	\$465	\$477	\$483	\$488	\$491	\$2,954
Sc3	\$64	\$437	\$412	\$475	\$511	\$526	\$531	\$536	\$538	\$547	\$3,615
Sc4	\$138	\$201	\$341	\$397	\$417	\$409	\$392	\$364	\$329	\$282	\$2,613
Sc5	\$0	\$595	\$306	\$357	\$375	\$367	\$352	\$327	\$295	\$254	\$2,611
Sc6	\$0	\$18	\$67	\$121	\$167	\$201	\$216	\$219	\$219	\$217	\$1,101
Sc7	\$0	\$414	\$1,005	\$1,744	\$2,086	\$2,286	\$2,374	\$2,463	\$2,554	\$2,646	\$13,474
Sc7a	\$0	\$95	\$212	\$337	\$417	\$424	\$427	\$429	\$430	\$431	\$2,473
Sc8	\$52	\$78	\$164	\$247	\$300	\$324	\$326	\$323	\$320	\$317	\$1,905
Sc9	\$186	\$180	\$301	\$345	\$355	\$339	\$315	\$286	\$253	\$213	\$2,239
Sc10	\$199	\$197	\$330	\$378	\$388	\$371	\$345	\$315	\$278	\$236	\$2,449
Sc11	\$0	\$20	\$191	\$119	\$1,303	\$1,580	\$1,775	\$1,911	\$1,808	\$1,657	\$7,744
Sc12	\$0	\$20	\$61	\$107	\$179	\$250	\$286	\$302	\$307	\$311	\$1,372
Sc13	\$21	\$71	\$135	\$184	\$203	\$204	\$195	\$186	\$177	\$168	\$1,212
Sc14	\$63	\$137	\$213	\$230	\$224	\$204	\$182	\$159	\$135	\$109	\$1,340
Sc15	-	-	-	-	-	-	-	-	-	-	-
Sc16	-	-	-	-	-	-	-	-	-	-	-
Sc17	\$0	\$7	\$21	\$39	\$48	\$50	\$43	\$34	\$23	\$13	\$221
Sc18	\$3	\$8	\$15	\$19	\$20	\$21	\$22	\$22	\$23	\$23	\$136

Projected discounted total public health benefits range from \$136M up to \$13.5B for all scenarios with appreciable emission reductions (excluding Scenario 15: Filter Systems and Scenario 16: Filter Replacements). Based on the low and high representative scenarios (Scenario 13 and Scenario 1, respectively), total discounted public health benefits are expected to range from \$1.2B to \$2.7B. Table 42 contains a comparison of discounted total costs and benefits for each modelled scenario. Estimated total public health benefits exceed total costs in 13 out of the 19 modelled scenarios. Total costs exceed expected benefits in Scenarios 6, 11, 12, 15, 16, and 18.

Table 42: Comparison of Projected Discounted Total Costs and Benefits Compliance Scenario in Millions of 2018 Dollars

	Equipment	Discounted Total Costs NPV (4%)	Discounted Total Benefits NPV (4%)
Sc1	NZE Class 8	\$1,103	\$2,713
Sc2	NZE Class 8	\$1,220	\$2,954
Sc3	NZE Class 8	\$374	\$3,615
Sc4	NZE Class 8	\$750	\$2,613
Sc5	ZE Class 8	\$942	\$2,611
Sc6	ZE Class 6 & 8	\$1,604	\$1,101
Sc7	Mitigation Fee	\$5,264	\$13,474
Sc7a	Mitigation Fee	\$985	\$2,473
Sc8	NZE Class 6	\$1,627	\$1,905
Sc9	NZE Class 6	\$468	\$2,239
Sc10	ZE Class 6	-\$87	\$2,449
Sc11	Solar	\$9,712	\$7,744
Sc12	ZE Class 8	\$7,445	\$1,372
Sc13	ZE Class 2b-3	\$753	\$1,212
Sc14	ZE Class 2b-3	\$978	\$1,340
Sc15	Filter System	\$5,057	-
Sc16	Filter	\$4,953	-
Sc17	TRU	\$46	\$221
Sc18	Yard Trucks	\$1,029	\$136

Total discounted costs and monetized public health benefits were also calculated for each compliance scenario under the assumptions for CEQA Alternative B and CEQA Alternative C. Tables 43 and 44 below contain a comparison of total costs and benefits for CEQA Alternative B and CEQA Alternative C, respectively.

Table 43: CEQA Alternative B Comparison of Projected Discounted Total Costs and Benefits Compliance Scenario in Millions of 2018 Dollars

	Equipment	Total Costs NPV (4%)	Total Benefits NPV (4%)
Sc1	NZE Class 8	\$247	\$382
Sc2	NZE Class 8	\$315	\$763
Sc3	NZE Class 8	\$166	\$383
Sc4	NZE Class 8	\$181	\$21
Sc5	ZE Class 8	\$191	\$30
Sc6	ZE Class 6 & 8	\$319	\$2
Sc7	Mitigation Fee	\$298	\$426
Sc7a	Mitigation Fee	\$190	\$55
Sc8	NZE Class 6	\$204	\$97
Sc9	NZE Class 6	\$179	\$21
Sc10	ZE Class 6	\$177	\$23
Sc11	Solar	\$301	\$26
Sc12	ZE Class 8	\$6,188	\$734
Sc13	ZE Class 2b-3	\$195	\$46
Sc14	ZE Class 2b-3	\$187	\$12
Sc15	Filter System	\$180	-
Sc16	Filter	\$175	-
Sc17	TRU	\$3	\$4
Sc18	Yard Trucks	\$446	\$52

Uncertainty in Public Health Benefits Estimation

The IPT methodology employed in this analysis is a proven reduced-form tool to estimate public health benefits and currently utilized by CARB and the U.S. EPA. However, the linearity assumption underpinning the IPT and BPT methodologies employed here is necessarily an approximation, and does not account for complex chemistry, precursor pollutant interactions, and finer-scale geographical effects in the same way that detailed modeling can, as in the 2016 AQMP (using CMAQ and BenMAP). In addition, the relative contribution of NO_x to PM_{2.5} concentrations is subject to uncertainty and may vary by location. Actual changes in PM_{2.5} concentration may be higher or lower than what is projected in this analysis. The approximations shown here however are consistent with the detailed and holistic 2016 AQMP analysis to the extent that the proposed rule is included as a part of that overall strategy.

Table 44: CEQA Alternative C Comparison of Projected Discounted Total Costs and Benefits Compliance Scenario in Millions of 2018 Dollars

	Equipment	Discounted Total Costs NPV (4%)	Discounted Total Benefits NPV (4%)
Sc1	NZE Class 8	\$1,680	\$3,735
Sc2	NZE Class 8	\$1,660	\$3,910
Sc3	NZE Class 8	\$341	\$5,074
Sc4	NZE Class 8	\$982	\$4,128
Sc5	ZE Class 8	\$996	\$3,934
Sc6	ZE Class 6 & 8	\$2,081	\$1,622
Sc7	Mitigation Fee	\$7,755	\$19,634
Sc7a	Mitigation Fee	\$1,426	\$3,612
Sc8	NZE Class 6	\$3,115	\$2,615
Sc9	NZE Class 6	\$534	\$3,417
Sc10	ZE Class 6	-\$427	\$3,738
Sc11	Solar	\$12,561	\$14,170
Sc12	ZE Class 8	\$8,030	\$2,075
Sc13	ZE Class 2b-3	\$1,000	\$1,631
Sc14	ZE Class 2b-3	\$1,148	\$1,993
Sc15	Filter System	\$7,827	-
Sc16	Filter	\$7,711	-
Sc17	TRU	\$111	\$372
Sc18	Yard Trucks	\$1,192	\$161

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Appendix I – Peer Review of PR 2305 Draft Socioeconomic Impact Assessment & South Coast AQMD Response to Comments

**THIRD PARTY REVIEW: STAFF DRAFT
SOCIOECONOMIC IMPACT ASSESSMENT FOR
PROPOSED RULE 2305 (PR 2305)**

Submitted to:
South Coast Air Quality Management District

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April 2, 2021

INTRODUCTION AND PURPOSE OF THIS STUDY

The South Coast Air Quality Management District (South Coast AQMD or District) is responsible for regulating stationary sources of air pollution in the South Coast Air Basin of Southern California, which includes Los Angeles, Orange, Riverside, and San Bernardino counties, excluding less populated portions of Los Angeles, Riverside, and San Bernardino counties. The agency has determined that a significant share of the region's emissions emanate from the goods movement sector, which consists primarily of the region's transportation and warehousing sector.

As a part of its effort to achieve compliance with federal and state clean air standards within its jurisdiction, the District has developed an indirect source rule (ISR), the goal of which is to reduce mobile-source emissions associated with the operation of warehouses and distribution centers in the South Coast AQMD region. The rule is known as Proposed Rule (PR) 2305 or the Warehouse Actions and Investments to Reduce Emissions (WAIRE) Program. If the rule is adopted, it would apply to any existing or new warehouse with an indoor warehouse floor space equal to or greater than 100,000 square feet within a single building located in the South Coast AQMD jurisdiction.

Under PR 2305, warehouse operators would be subject to an annual Warehouse Points Compliance Obligation (WPCO), which requires them to take actions to reduce NO_x and PM emissions associated with their operations, including trucks and other vehicles that operate at or visit the warehouse facilities covered under PR 2305. In general, WAIRE points may be earned only for actions which go beyond existing federal and state regulations already applicable to warehouse owners or operators earning WAIRE Points. Alternatively, operators may pay a mitigation fee used to offset emissions in communities of warehouses which paid mitigation fees.

South Coast AQMD staff has conducted a socioeconomic impact analysis of PR 2305, the results of which are contained in the report, "**Draft Socioeconomic Impact Assessment for Proposed Rule 2305 – Warehouse Indirect Source Rule – Warehouse Actions and Investments to Reduce Emissions (WAIRE) Program and Proposed Rule 316 – Fees for Rule 2305,**" hereafter referred to as the Socioeconomic Impact Assessment Report or the SIA Report. The South Coast AQMD has engaged Kleinhenz Economics to serve as an independent reviewer of the SIA Report.

The present report contains the findings of the independent, third-party review of the SIA Report, as conducted by Kleinhenz Economics. The review examines the overall contents of the SIA Report with particular attention devoted to the data, assumptions, modeling, and the analytical results contained in the report.

GENERAL COMMENTS ON REPORT

The SIA Report does the following:

- Identifies affected industries, providing characteristics of these industries;

- Identifies and describes characteristics of communities within which warehouses are located;
- Evaluates the economic impact of PR 2305 on employment and the regional economy;
- Evaluates the potential impact of PR 2305 on emissions reduction and health benefits; and
- Evaluates cost-effectiveness of alternatives to PR 2305.

The SIA report describes the warehouse industry and the operators within the industry. This includes a high-level profile of warehouses in the region, as well as the operators who conduct business at warehouses. As summarized in the report, warehouse operators include firms from a number of industries, not just the narrowly defined transportation and warehousing industry. It also describes how trucks and other vehicles that are used in typical business operations of these industries are significant sources of emissions in the region. It also places the warehouse industry in the broader context of the region's goods movement sector and the overall economy.

Further, the report describes the communities in which the warehouses are located, both the socioeconomic characteristics and selected measures of adverse health outcomes in the communities, specifically those related to emissions of vehicles that are a part of the industry. The report also summarizes the legislative mandates related to PR 2305.

Given the difficulty in predicting actual behavioral responses on the part of warehouse operators to PR 2305, South Coast AQMD staff simulated a range of possible responses in the form of distinct scenarios, in terms of various compliance actions that operators may adopt as responses to PR 2305. In each scenario, operators were assumed to uniformly adopt the same response. One of the scenarios assumed that all operators would pay in lieu mitigation fees rather than seek to comply with PR 2305 through direct compliance actions. The economic impact of several scenarios on employment was modeled by using the REMI model.

In addition, health impact results were calculated and presented both in terms of improved health outcomes and the monetary value of the associated public health benefits. Finally, as required under the California Environmental Quality Act (CEQA), the report briefly describes and estimates the costs of five alternatives to PR 2305. The economic cost of each was evaluated.

The aggregate impacts described in the SIA Report imply that PR 2305 would impose minimal costs on the regional economy, yet it would generate positive net health benefits. In terms of jobs, the estimated economic impact of PR 2305 was small relative to the total number of jobs in the region, ranging between 1,700 and 11,400 or anywhere between 0.01% and 0.10% of all jobs in the four county region. By comparison, the monetary value of health benefits was estimated to range between \$2.1 and \$17.2 billion over the compliance period.

Given the difficulty of obtaining data directly from firms in the affected industries, the SIA Report relies on a combination of readily available data and proprietary data, a number of working assumptions, well-established, sophisticated economic and health benefit modeling tools, and cost estimates of various technology responses to PR 2305 to determine the overall socioeconomic impact of the rule on the affected industries, the regional economy, and its residents. As comprehensive as the analysis is, it might be improved by addressing the following concerns.

- While the net benefits justify the costs of compliance, it would be informative to compare the estimated costs and benefits of PR 2305 with the actual costs and benefits of other South Coast AQMD programs as a way of evaluating the cost effectiveness of PR 2305. On this point, if one assumes that the marginal cost of emissions reductions increases with additional emissions reduction efforts (start with “low hanging fruit” first), PR 2305 costs may very well be higher when compared with previously implemented programs. If so, then the question should be, how much higher and is that higher cost justified? } 1.

- The aggregate analysis was also used along with the results of the IEC study to establish a likely maximum compliance cost of \$0.82 per square foot of warehouse space. In practice, researchers assume individual operators will choose some combination of compliance measures that will result in actual compliance costs no higher than the estimated maximum. The validity of the analysis could be reinforced if the estimated compliance costs were related in some manner to individual warehouse operator costs, whether actual or estimates such as those contained in business pro forma reports. } 2.

- The analysis considers equity aspects of the health costs associated with warehouse-related emissions and the benefits of reducing those emissions. If possible, it may also consider the equity aspects of job losses, specifically the extent to which estimated job losses are more likely to occur among one or more disadvantaged segments of workers in the region. } 3.

STRENGTHS AND WEAKNESSES OF THE STUDY

Strengths of the Study

- The community profile in the report presents data on the number and socioeconomic characteristics of residents living in the vicinity of the warehouses potentially subject to PR 2305. This includes the incidence of asthma, cardiovascular disease, and low birth-weights within 0.5, one, and two miles, with data on the broader region provided for comparison.

- The staff report draws information on the number and characteristics of warehouses within the region from the companion IEC report, which includes a detailed assessment of the warehouse industry in the region.

- The industry impact component of the analysis is based upon an extensive number of scenarios (19) that are used to simulate extreme outcomes that would result if all warehouse operators subject to PR 2305 in the region universally and uniformly adopted a single technology. This approach was warranted because of the difficulty required to obtain actual data about business operations and operating costs for any industry, including those affected by PR 2305. In the absence of such information, the rationale behind the simulation approach was a) at least one of the simulation scenarios involving uniform adoption of a single technology may be assumed to represent the highest cost outcome from PR 2305, thereby establishing an upper bound on industry-wide compliance costs, b) in practice, an individual operator can be assumed to select the compliance option or set of options that would minimize compliance costs for that

operator’s operations, c) given the choices made by individual operators, the actual industry-wide compliance cost would be less than the upper bound established by the simulation.

Weaknesses of the Study

The following potential weaknesses in the study may affect the validity of its findings.

- The distinction between warehouse owners and warehouse operators is blurred throughout the report. In general, the report ought to refer to “warehouse operators” as the relocation decision makers and not “warehouses” for the benefit of the reader. } 4.
- It is difficult to critique the health outcomes based on CalEnviroScreen 3.0 (CES 3.0). There is no direct mention of the causal relationship between warehouse-related vehicle emissions adverse health outcomes. It is recommended that citations be included that affirm the validity of CES 3.0 for this study. It is also recommended that citations be included to affirm the linkage between warehouses/vehicle emissions and adverse health outcomes, thereby ruling out the possibility of a spurious relationship between the two. } 5.
- In order to evaluate PR 2305, it was necessary to develop a profile of warehouse operators in the region, including such information as the operator’s industry (NAICS code), operator size as represented by the number of employees, and operator revenues. In general, it is difficult to obtain establishment level characteristics of businesses, which tend to be proprietary.

Official government data on establishments is collected and maintained by government sources such as the California Employment Development Department (EDD) or other federal/state agencies. While the data provides information on an establishment’s industry, its employee headcount, payroll, and other details, it is generally confidential. This places limits on how the data may be used.

Dun and Bradstreet (D&B) is a proprietary data source that collects and maintains data on businesses. While the original purpose of D&B data is to determine the creditworthiness of businesses, its business data records also include details such as the formal business name, business address, its officers, business size in terms of number of employees, and some financial data. AQMD used establishment data from D&B to develop operator the profile, matching warehouse facilities and operator data from CoStar to business establishment data from D&B.

The resulting profile was based on 1,154 operators that was subsequently applied to the larger population of warehouses subject to PR 2305. This effort involves a large data collection and analysis effort and revealed important details about the collection of industries that make up the population of warehouse operators. However, using D&B data is problematic because it is known to contain incorrect or out-of-date information on a business employee count and available financial information, and to a lesser degree, the businesses industry classification. If available and if permitted for this use, it would be preferred to supplement D&B data with establishment information from the EDD. Moreover, County Business Patterns may be used } 6.

as an alternative data source for certain questions such as the distribution of firms by size within and across industries.

- The above discussion is particularly important when considering the incidence of PR 2305 on small businesses. There is considerable variation in business size across the individual industries. For example, data on the transportation and warehousing sector in the four-county region (Los Angeles, Orange, Riverside, and San Bernardino counties) from the 2018 County Business Patterns show that firms in the warehousing and storage industry (NAICS 493) have a substantially higher average employee count (63.2) than firms in the truck transportation industry (NAICS 484) where the average is 9.3 workers per firm. Moreover, financial and employment data for firms in the D&B database can be out of date by several quarters or years, leading to a less-than-accurate picture of the affected industries in general and small businesses in particular.

It is recommended that South Coast AQMD staff consider the value of using other data sources to obtain better information on the sizes of the firms in the industries covered under PR 2305, and in particular, to determine how small businesses will be affected by the proposed rule. EDD data is one possible data source, but it reports annual payroll and not annual revenues. County Business Patterns data reports aggregate revenues, but not revenue per firm. Staff may consider whether there is a way to use payroll as an indirect measure of a firm’s size in terms of revenues.

7.

DISCUSSION OF COMMUNITY PROFILE

The community profile section of the SIA Report presents data on selected socioeconomic and ethnic characteristics of residents living in the vicinity of the warehouses potentially subject to PR 2305. It also includes summary data on the incidence of adverse health outcomes within one-half, one, and two miles of warehouses. The health hazards cited include elevated occurrences of asthma, cardiovascular disease, and low birth-weights near warehouses when compared with data on the broader region provided for comparison. It also described the presence of higher levels of particulate matter (PM2.5 and diesel PM) within 0.5 miles of warehouse facilities compared to the broader region.

In simple terms, the community profile paints a picture of residents in the vicinity of warehouse facilities who are largely low income, minority residents, and who have higher incidences of adverse health outcomes that are related to emissions and air quality problems because of proximity to the facilities.

DISCUSSION OF AFFECTED INDUSTRIES

The SIA report uses available data from a number of sources to identify the affected industry groups (2-digit NAICS) and associated industries. The assembled profile showed how warehouse operators were distributed across an array of industries within the following major industry groups:

construction, manufacturing, wholesale trade, retail trade, and transportation and warehousing. It also used data to estimate the likely number of facilities that would be subject to PR 2305.

Footnote 7 on page 7 states that multi-tenant facilities are assumed to be occupied by two operators. How prevalent are the multi-tenant facilities, specifically what is their share of total warehouses affected by PR 2305? If small, the working assumption may be satisfactory. If large, then it may be necessary to justify that assumption.

} 8.

As implied by the discussion above under Weaknesses of the Report, it is challenging to obtain hard data on individual firms that may be used to establish the number and size of businesses that will be affected by PR 2305. Therefore, South Coast AQMD staff used a variety of data to come up with a profile of affected industries in the aggregate, including their number, their distribution across various industries, and revenue information. Within that estimated population of affected industries, the analysis identified the subset of warehouses and warehouse operators that would fall under the jurisdiction of PR 2305.

DISCUSSION OF ECONOMIC IMPACT ANALYSIS

Using available data, the number and locations of warehouses and associated warehouse operators that would be potentially affected by PR 2305 was established. The assembled profile also showed how warehouse operators were distributed across an array of industries within the following major industry groups (2-digit NAICS): construction, manufacturing, wholesale trade, retail trade, and transportation and warehousing.

In the absence of firm-specific data that could be used to estimate the economic impact of PR 2305, South Coast AQMD staff developed estimates of aggregate compliance costs over a ten-year time period based upon a set of 19 scenarios, each of which was predicated on adoption of one or more of the available 32 compliance actions by all affected warehouse operators. Payment of mitigation fees was one of the available compliance actions. Compliance costs were estimated for each of the scenarios and summarized in Table 24 on page 22 of the SIA report. South Coast AQMD staff then used REMI to produce a bounding analysis, estimating economic impacts of the following selected scenarios:

- Scenarios 3 and 13 which were considered to be the low-cost scenarios;
- Scenarios 7 and 7a which were considered to be the high-cost scenarios; and
- Scenario 6 which involved EV charger installations.

Economic impact analysis requires the estimation of initial or so-called direct effects. Under PR 2305, the direct effect is represented by compliance costs associated with acquisition, installation, operation, and monitoring of equipment, as well as the administrative costs of compliance.

To the extent that some compliance expenditures involve purchases from local vendors, there may be a positive multiplier effect on the regional economy that can partially offset the negative economic effects of the compliance costs themselves. The modeling process accounts for this possibility. For example, a warehouse operator may incur the cost of purchasing a zero emissions

truck or other piece of equipment, but if it purchases that truck or piece of equipment from a local vendor (or local manufacturer), it may trigger a positive ripple effect on the local economy depending on the capacity of the local industry. The model is calibrated to account for capacity limits on individual industries in the region, such that purchases in excess of the region’s production capacity will “leak” out of the region in the form of purchases from vendors outside of the region.

The estimates of economic impact under the selected scenarios are represented in terms of jobs. Based on the low-cost and high-cost scenarios, job losses over the ten-year period are assumed to average between 1,700 and 11,400 per year, equivalent to job losses ranging between 0.01% and 0.1% of the region’s total job base. While job losses are an important aspect of evaluating the impact of PR 2305, a more complete picture can be obtained by also reporting on the impacts in terms of output and value added, and to the extent possible, relating those impacts to the overall size of the economy and individual industries.

} 9.

One important finding of the analysis may be the array of industries across the economy that are ultimately affected by the implementation of PR 2305. In discussing the results, footnote 31 on page 27 indicates that although the rule is intended to affect trucking activities going to warehouses, most establishments with warehousing activities are not in the narrowly-defined “warehousing and storage” industry. Moreover, because of industry linkages across the industries of the regional economy as implied by the regional economic impact model, the largest estimated job reductions occur from indirect effects, and they have substantial impacts on sectors like retail trade and construction, both of which generally experience large effects regardless of the source of the (initial) direct expenditure. Put simply, PR 2305 compliance costs have impacts that extend well beyond the target industries themselves.

} 10.

DISCUSSION OF PUBLIC HEALTH BENEFITS ANALYSIS

Public health benefits are based upon a well-established incidence per ton (IPT) methodology that was developed by the U.S. EPA and has been used in many applications and project evaluations. South Coast AQMD staff relied on the IPT methodology and analysis from the 2016 Air Quality Management Plan to produce emission reduction estimates from PR 2305 and associated estimated reductions in health incidence. These estimates were used to calculate the monetary value of reduced adverse health outcomes for each scenario, measured in net present value terms over the ten-year period from 2022 through 2031.

The results are presented in Table 36 on page 43 of the report, but they are not discussed in any way. At a minimum, the monetary benefits of the presumed low-cost and high-cost scenarios should be summarized in the body of the report and the Executive Summary. Looking at the presumed low cost and high cost scenarios, the monetized health benefit of PR 2305 is estimated to range between \$2.1 billion (Scenario 13) and \$17.2 billion (Scenario 7). These figures may also be discussed in the context of the estimated compliance costs for these scenarios as summarized in Table 24 of the report.

} 11.

} 12.

South Coast AQMD Responses to Kleinhenz Economics Review of South Coast AQMD PR 2305 Draft Socioeconomic Impact Assessment

Response to Comment #1

It is not current practice to compare the expected costs and emissions reductions (cost-effectiveness) of proposed and existing rules/regulations in the Socioeconomic Impact Assessment for individual rules/regulations. Typically, the expected costs and emissions reductions for available control strategies (i.e. rules) are estimated and compared in South Coast AQMD long-term planning documents, such as in Air Quality Management Plan(s). Additionally, a comparison of PR 2305 cost-effectiveness to the cost-effectiveness of existing South Coast AQMD may be unwarranted given PR 2305 focuses on indirect sources whereas most South Coast AQMD rules focus on stationary sources. A better comparison might be to compare the cost-effectiveness of PR 2305 to California Air Resources Board (CARB) regulations. The Feasibility section in Chapter 3 of the PR 2305 & PR 316 draft staff report contains a detailed description of PR 2305 cost-effectiveness along with a comparison to the cost-effectiveness of a set of recently adopted CARB regulations, including Airport Shuttle Bus, Innovative Clean Transit, At-Berth, Low-NOx Omnibus, and Advanced Clean Trucks. The range of cost-effectiveness found for the varying scenarios for PR 2305 are consistent with those found for CARB regulations.

Response to Comment #2

The example below compares warehouse compliance costs with PR 2305 to an estimate of the underlying costs of running their operation.

Consider a hypothetical 500,000 sq. ft. warehouse operator. Further consider a low- and high-cost compliance scenario, e.g. Scenario 7a with an average annual compliance cost of \$0.14/sq. ft. and Scenario 7 with an average annual compliance cost of \$0.83/sq. ft. This warehouse is expected to incur an annual PR 2305 compliance cost between \$70,000 and \$415,000. In comparison, annual operating expenses for this warehouse are estimated to be \$13 million according to a 2015 Boyd Company report. This implies the cost of complying with PR 2305 for this example warehouse falls between 0.5% - 3.2% of average annual operating expenses.

Response to Comment #3

The analysis of jobs impacts was conducted using the REMI model as described in the SIA. South Coast AQMD staff met with REMI staff, and was reassured by REMI staff that its modeling tool did not present jobs impacts by income grouping, ethnicity, or other socioeconomic factors considered when discussing equity. South Coast AQMD staff will maintain discussion with REMI staff on this topic for future inclusion.

Response to Comment #4

The draft socioeconomic impact assessment was reviewed to ensure proper delineation of warehouse owner versus warehouse operator. Warehouse operators are the primary

decision makers/facilities modeled within the draft socioeconomic impact assessment for PR 2305. This is emphasized throughout the draft socioeconomic impact assessment, for example the introduction, industry profile, and compliance cost sections all indicate their analysis accounts for the number of warehouse operators.

Response to Comment #5

The analysis contained in the Community Profile section of the PR 2305 & PR 316 draft socioeconomic impact assessment is not intended to show a causal relationship between emissions from warehouse activities and increased CES 3.0 scores in warehouse-adjacent communities. The intent of the analysis is to summarize the current environmental burdens, prevalence of preexisting health conditions, and socioeconomic characteristics of those communities located within close proximity of PR 2305 warehouses. Additional reference to analyses that document the linkage between air pollution associated with warehouses and health effects have been added to the SIA. The emissions from warehouse activities are one of multiple likely contributors leading to increased CES 3.0 scores, including but not limited to emissions from industrial activity and non-warehouse related mobile source emissions. To further clarify this point, staff has added footnote #4 to the draft socioeconomic impact assessment:

The analysis contained in this section merely shows a correlation between proximity to PR 2305 warehouse operations and increased CES 3.0 scores, it does not attempt to demonstrate a causal relationship. Higher levels of Diesel PM have been identified around warehouses relative to other areas, due primarily to the sources of emissions associated with warehouses like trucks and TRUs (CARB 2005, 2020). In addition, trucks are the largest source of NOx in the air basin, and some of the higher regional ozone and secondary PM levels found in communities near warehouses will therefore be attributable to truck emissions. (South Coast AQMD, 2017).

Response to Comment #6

To improve the D&B data used within the small business analysis performed within the PR 2305 draft socioeconomic impact assessment, warehouse operators were screened out if their estimated annual rent payments were more than the reported revenue values from Dun and Bradstreet (D&B).

U.S. Census County Business Patterns were considered as suggested by the commenter, however this data is not specific to the individual facilities covered by PR 2305. As a result, it's use would not be able to improve the small business analysis already performed using the D&B data.

Response to Comment #7

To the extent D&B data may be out of date, South Coast AQMD staff is unaware of formal documentation showing this reality. Moreover, revenue and employee values at larger companies, even if out of date by several quarters or years, is unlikely to change enough to

sizably affect the current small business analysis results within the draft socioeconomic impact assessment. In addition, D&B data does include revenue and employee data on parent companies which is the appropriate data for determining whether or not a firm qualifies as a small business. Of the potentially affected PR 2305 warehouse operators possible for small-business determination, South Coast AQMD staff determined about 50% had reliable revenue data to credibly perform small-business determination.

There are potential issues with using the suggested alternatives, CA EDD and County Business Patterns, for small-business determination. CA EDD data is provided just for the local site within South Coast AQMD jurisdiction and not for the entire firm. County Business Pattern data is aggregated by industry and not specific to individual facilities.

Staff believes the small-business analysis contained in the PR 2305 Second Draft Socioeconomic Impact Assessment is a sufficiently representative analysis based on the data available.

Response to Comment #8

South Coast AQMD staff estimates the number of PR 2305 potentially affected warehouses that are expected to earn WAIRE Points to comply with PR 2305 to be 1,777 single-tenant warehouses, up to 1,093 multi-tenant warehouses, and 32 warehouses with an unidentified number of tenants, for a total of 2,902 warehouses. These estimates are derived primarily from CoStar data.

As described in Appendix C of the draft staff report for PR 2305, operator data from CoStar, Dun and Bradstreet, and other data sources was reviewed, however determining highly accurate data on the number of warehouse operators proves difficult with currently available data. For example, business listings are often out of date, and it is not possible to determine if a business listing is active. These warehouse operator datasets contain many companies which upon further review are understood to be companies which historically operated at a location and have either shut down or moved.

This uncertainty in warehouse operator data will be clearer if PR 2305 is approved, as warehouse owners and operators will be required to submit reports/notifications to South Coast AQMD.

Response to Comment #9

Tables 32 and 33 have been added to the draft socioeconomic impact assessment, presenting estimated forgone output by industry from the lower-cost scenario of Scenario 7a and the high-cost scenario of Scenario 7. Similar to tables presenting forgone jobs, Tables 32 and 33 show the top 10 most adversely impacted industries, and the top three most benefitting industries due to PR 2305. Relative to total economic output within the South Coast AQMD four-county region, PR 2305 may reduce average annual output between 0.02% and 0.10%.

Response to Comment #10

This point is addressed in the draft SIA in the paragraph proceeding this footnote (footnote #34 in the updated draft socioeconomic impact assessment).

Response to Comment #11

A range of estimated total discounted monetized public health benefits has been included in the Valuation of Public Health Benefits subsection for (1) all scenarios with appreciable NO_x emission reductions (excluding Scenarios 15 and 16), and (2) those scenarios identified as representative of the expected low- and high-end of realizable NO_x emission reductions (Scenario 13 and Scenario 1).

Response to Comment #12

An additional table has been added to the end of the Valuation of Public Health Benefits subsection (Table 42) that includes estimated total discounted costs (NPV 4%) and estimated total discounted monetized public health benefits (NPV 4%) for each modelled scenario, where applicable.

Appendix II – Peer Review of Industrial Economics, Inc. (IEc) Socioeconomic Analysis of Warehouse Relocations, IEc Response to Comments, and South Coast AQMD Response to Comments

**THIRD PARTY REVIEW: SOCIOECONOMIC
ANALYSIS OF ISR RULE (PR 2305) REPORT BY
INDUSTRIAL ECONOMICS, INC. (IEc)**

Submitted to:
South Coast Air Quality Management District

Submitted by:
Robert A. Kleinhenz, Ph.D.
Kleinhenz Economics

April 2, 2021

INTRODUCTION AND PURPOSE OF THIS STUDY

The South Coast Air Quality Management District (South Coast AQMD) is responsible for regulating stationary sources of air pollution in the Southern California region that includes Los Angeles, Orange, Riverside, and San Bernardino counties, excluding less populated portions of Los Angeles, Riverside, and San Bernardino counties. The South Coast AQMD has determined that a significant share of the region's emissions emanate from the goods movement sector, which consists primarily of the region's transportation and warehousing sector.

As a part of its effort to achieve compliance with federal and state clean air standards within its jurisdiction, the South Coast AQMD has developed an indirect source rule (ISR), the goal of which is to reduce mobile-source emissions associated with the operation of warehouses and distribution centers in the South Coast AQMD region. The rule is known as Proposed Rule (PR) 2305 or the Warehouse Actions and Investments to Reduce Emissions (WAIRE) Program. If the rule is adopted, it would apply to any existing or new warehouse with an indoor warehouse floor space equal to or greater than 100,000 square feet within a single building located in the South Coast AQMD jurisdiction.

Under PR 2305, warehouse operators would be subject to an annual Warehouse Points Compliance Obligation (WPCO), which requires them to take actions to reduce NO_x and PM emissions associated with their operations, including trucks and other vehicles that operate at, or visit, the warehouse facilities covered under PR 2305. Alternatively, operators may pay a mitigation fee used to offset emissions in communities of warehouses which paid mitigation fees.

Warehouse operators may evaluate whether it is more cost-effective to avoid PR 2305 compliance costs by moving their operations outside of the South Coast AQMD region. The operator's relocation decision would presumably weigh operating costs at the current location (including PR 2305 compliance costs) against the prospective operating costs at another location (including any changes in transportation costs), plus the one-time costs of moving. The calculation would likely account for the benefits of the current and prospective location as well.

The South Coast AQMD engaged Industrial Economics, Inc. (IEc) to perform a study with the goal of estimating PR 2305's likely costs to the warehouse industry in the region. One crucial aspect of IEc's study is to assess possible responses on the part of the warehouse industry, including the potential for warehouse operators to relocate outside the South Coast AQMD region.

The South Coast AQMD has engaged Kleinhenz Economics to serve as an independent reviewer of the IEc study. This report contains the findings of the independent, third-party review of the IEc report entitled, "Assessment of Warehouse Relocations Associated with the South Coast Air Quality Management District Warehouse Indirect Source Rule." The review examines the IEc's analysis of:

- Warehouse markets in the South Coast AQMD's jurisdiction and in nearby areas; and

- The decision analysis framework used to model relocation decisions of warehouse operators, and the results of IEC's analysis and their implications.

GENERAL COMMENTS ON REPORT

The IEC study is intended to evaluate the relocation decisions of warehouse operators in the South Coast AQMD region in response to the implementation of PR 2305. The study consists of three main components:

- Comparative market analysis of warehouse space in the South Coast AQMD region and other nearby regions to which warehouses may relocate in response to PR 2305 (competing regions).
- Survey of stakeholders to determine factors that may affect relocation decisions.
- Development and application of a model to simulate relocation decisions. This includes a separate pathways model of transportation costs that is used to determine how transportation costs affect the relocation decision.

Technically, the IEC study is a comprehensive analysis of the relocation decisions of warehouse operators. It makes extensive use of both publicly available data and proprietary data (CoStar data on properties). It also relies on a survey of stakeholders to identify variables that are likely to enter an operator's relocation decision. The study develops and uses a complex relocation decision model which is driven in part by the above-mentioned pathways model of transportation costs. Finally, IEC uses the model to estimate the likely number of warehouse relocations that would occur under a number of PR 2305 compliance-cost scenarios.

While the analysis is generally robust, there are at least a few areas where the IEC analysis can be augmented. Moreover, thought experiments and illustrative examples can be used as a "taste test" to determine whether the assumptions, analysis, and conclusions are reasonable. Details follow below. Some of the comments here may be addressed in South Coast AQMD's socioeconomic impact analysis or staff report for PR 2305, although summarizing them in this report will provide important context for the relocation decision analysis and results.

STRENGTHS AND WEAKNESSES OF THE STUDY

Strengths of the Study

- Warehouse market assessment and analysis is a robust discussion of both the local warehouse market and those of competing regions. The assessment describes the state of the warehouse markets in each of the regions in terms of commonly used market indicators, but it also goes to great lengths to assemble inventories of individual properties in each of the regions, including current warehouse space and prospective

space. However, while the study produces forecasts of future warehouse capacity, it relies on a 2018 forecast that may be dated as discussed in the third bullet under “Weaknesses of the Study.”

- The stakeholder survey provides valuable insights regarding decisions to stay in the region or relocate. The survey results identify variables that would be taken into consideration during a relocation decision process. While the list of variables may not have been surprising, it is hoped that including the survey as part of the overall study ensures that no key decision variables would be overlooked.
- The pathway analysis used in the study is remarkable as a technical approach to simulating transportation costs and relocation decisions. In the end, relocation decisions in a regional setting must be viewed probabilistically: What is the probability that a given warehouse operator at a given warehouse will relocate? As described in the report, there is considerable variation in the types of warehouse space and their functions across the region; and there is considerable variation in the population of warehouse operators themselves. Simplifying assumptions are frequently needed to arrive at a tractable modeling methodology, but the pathway analysis goes a long way in replicating the complexity of the industry.

Weaknesses of the Study

The following potential weaknesses in the study may affect the validity of the study findings.

- The distinction between warehouse owners and warehouse operators is blurred throughout the report, yet these are two distinct groups of stakeholders whose interaction in response to PR 2305 may play a significant role in its rollout and effectiveness. Warehouse operators can quickly move in response to the new rule, but warehouses cannot. At a minimum, the report ought to explicitly identify the “warehouse operators” as the relocation decision makers and not “warehouses.” Moreover, as described below, the market response to compliance costs associated with PR 2305 may be different for warehouse owners compared to warehouse operators, and the dynamic relationship between the two may result in compliance costs being shared. } 1.
- Despite the extensive discussion on the warehouse market, the report does not include a sufficient amount of background information on the broader goods movement sector of the Southern California region, including the composition of the sector, long-run trends, and competitive pressures. As described below in the “Discussion of Warehouse Market Analysis” a more complete discussion of these details will give the reader much needed context. } 2.
- While the survey of stakeholders is a strength of the analysis, it should be complemented by reference to the extensive literature on the relocation decisions of firms, including the key factors that commonly trigger relocation on the part of a firm. As one would expect, firm profitability is one factor that enters a firm’s relocation decision. Relocation research shows that marginally profitable firms are more likely to } 3.

relocate to improve profit margins, all else being equal. The literature also sheds light on the extent to which regulations and regulatory costs affect a firm’s decision to move and adds context to the findings of the stakeholder survey.

3.

- Even with the detailed discussion of the stakeholder survey results, there is room in the report for a more complete profile of the warehouse/fleet operators by individual industry components. This may include the number of operators, payroll employment, and distribution by size, as well as number of self-employed independent operators. These details have implications for the socio-economic characteristics and equity aspects of PR 2305 implementation for the operators, not just the communities and residents. A closer look may show that some individual industries are more sensitive to changes in regulations and compliance costs, hence more susceptible to relocation than others.

4.

- The 2018 CoStar/Moody’s forecasts to drive baseline scenarios (Attachment 2, p. 25) may result in out-of-date forecasts, analyses, and conclusions. Many decisions pertaining to warehouses (planning, development and construction, and operations) are long-run decisions on the part of firms, and as such, these decisions follow a deliberate and somewhat lengthy process. As a rule, long-run trends and forecasts are likely to prevail regardless of typical cyclical fluctuations in the economy. However, the current pandemic situation is neither typical nor cyclical, but rather a singular event that has caused unprecedented disruption to the local, national, and global economies, disrupted supply chains, and potentially changed consumption patterns of households and businesses. As such, it is advisable to compare the 2018 vintage forecasts with more recent long-run forecasts, identify their differences, and address the likely implications of these differences for the conclusions of the report.

5.

- The IEc report references the SCAG report entitled, “Industrial Warehousing in the SCAG Region-Final Report,” which was published in 2018. This report summarizes the structure and geographic location of the warehouse industry in the SCAG jurisdiction. While industry structure and location tend to change slowly over several years’ time, the warehouse sector in Southern California is still driven by a variety of market dynamics, not the least of which is the trend in cargo volumes passing through the region’s ports. It may be advisable to bring the SCAG report “up to date” by briefly describing qualitatively or quantitatively how the structure of the industry in 2021 compares with that described in the 2018 report, which itself contains data from as far back as 2014.

6.

- The study cites the 2014 SCAQMD High Cube Warehouse Truck Trip Study. This study was based on a survey that was conducted in 2013-2014. Again, even though industry structure tends to change relatively slowly, changes do occur over a period of 5 to 7 years and may have accelerated in the wake of the pandemic. Thus, to the extent possible, it is advisable to check that the relevant contents of the 2014 report adequately represent present circumstances.

7.

- Having identified and discussed the variety of warehouse uses and warehouse operators in the report, one potential drawback of the study may be the need to make simplifying assumptions in order to move forward with simulations of relocation decision scenarios. The study’s conclusions rely heavily on the results of the simulations, which imply that there would be minimal relocation activity once PR 2305 is implemented. If the analysis is correct, compliance costs will generally be spread over the existing number of operators in the existing warehouses. However, if the analysis underestimates the effects of PR 2305 and there is a larger than predicted exodus of warehouse operators, compliance costs may have to be spread over a smaller number of operators/warehouses, possibly resulting in a higher average compliance cost per operator. One possible “taste test” would be to conduct a sensitivity analysis, independent of the scenario analysis, to evaluate the implications from hypothetical relocation shares, for example 1%, 2%, 5%, and 10%. The results may shed additional light on how compliance costs will be borne by warehouse operators and owners.

8.

DISCUSSION OF WAREHOUSE MARKET ANALYSIS

The comparative warehouse market analysis carefully lays out recent historical and current market conditions in the South Coast AQMD region (Attachment 1) and in other nearby regions to which warehouse operators may move in response to PR 2305 (Attachment 2). The report goes to great lengths to produce an inventory of warehouses and potential warehouse space, with particular attention given to warehouses of at least 100,000 square feet that would be subject to PR 2305. Relying on such measures as capacity, absorption, lease rates, and sales prices, the study describes the advantages and disadvantages of operating in the South Coast AQMD region.

It is difficult to discuss the region’s warehouse sector without including more background on the broader goods movement industry of which it is a part. A significant share of jobs and economic activity in the region are tied to the goods movement sector, which includes both transportation and warehousing. Attachment 1 in the report could improve on its discussion of recent dynamics of the region’s goods movement sector, by presenting a more complete profile of the industry. This can be accomplished by reporting the region’s total building area as shown in first two columns of Exhibit 4 on page 9 of Attachment 2 in Attachment 1, which shows a breakdown of building area by type of warehouse. This may be complemented by including the table “Goods Flow Categories Defined Based on the Commodity Flow Survey” shown in Exhibit 1 on page 8 of Attachment 4, which describes the various flow of goods, inbound and outbound, and internal.

2.

This background information provides important data that can be used to describe the local transportation and warehousing sector, including broad industry trends that may provide valuable context to the reader. This includes trends in cargo volumes at the local ports, recent investments in infrastructure, the role of labor in the industry, and so on.

It also includes a discussion of the global goods market within which the local ports operate, including the competitive pressures they face and how they affect other parts of

9.

the local industry. San Pedro ports must contend with competitive pressures in international trade as ports on the Pacific Coast and elsewhere compete for discretionary cargo, which can move through any port in the country at the discretion of the shipper. This is a major source of demand for warehouse space. Being near the largest port complex in the western hemisphere confers a considerable advantage (market power) on warehouses and operators in the region. However, the ports face competition to varying degrees from other ports on the West Coast and the Atlantic Coast. With 30% or more of the cargo passing through the San Pedro Bay ports classified as discretionary cargo, a more robust discussion of the dynamics of this situation is warranted than the brief mention in Attachment 4 on page 6.

9.

More immediately, it would describe how an already tight warehouse market became even more taut in the past year as the good movement industry handled record levels of cargo, triggering accelerated interest in real estate development of industrial/warehouse properties in the region. At the same time, it would include a discussion of how the local goods movement sector meets the needs of households and businesses in a vast region that is home to upwards of 23 million residents, depending on how the narrowly or how widely the region is defined.

2.

The report also presents dynamics of warehouse markets neighboring non-South Coast AQMD markets vis a vis the warehouse markets in the South Coast AQMD region, describing how slower net absorption in the South Coast AQMD region “is offset with an increase in non-South Coast AQMD growth, particularly in the Phoenix and Las Vegas markets. This provides suggestive evidence that warehousing activity may shift between the South Coast AQMD jurisdiction and these outlying areas” (Attachment 2, page 17). While this is a *possible* explanation, it is, at best, a partial explanation. More robust analysis would entail looking that the economic growth rates of each region, changes in local demand for industrial space as well as capacity, and discussion of variables that may be affecting all of the regions in question, such as the national economic expansion that only recently ended with the pandemic.

10.

In all, this discussion will paint a more complete picture of the goods movement at the aggregate industry level. The discussion will describe more completely the market conditions within which individual warehouse operators and warehouse owners are making their microeconomic profit maximizing decisions, a topic that is addressed in the following section.

DISCUSSION OF WAREHOUSE RELOCATION DECISION ANALYSIS AND RESULTS

As described in the IEc study, the warehouse operator relocation decision process is a function of several costs, which include real estate costs, other warehouse-related operations costs, transportation costs, labor costs, regulatory costs, and relocation costs. As a part of analyzing transportation costs, IEc provides a profile of the truck fleets that serve the South Coast AQMD region (Attachment 3) and adapts a route- or pathways-based model of goods flows to the analysis of relocation decisions (Attachment 4). The results of

the relocation decision analysis appear in Attachment 5 of the report and are summarized in the Executive Summary.

As pointed out earlier, the report should be more explicit in describing the relocation decisions as being made by warehouse operators. Assuming warehouse operators are tenants and not property owners, they can move their operations more easily than property owners, for whom the relocation decision is different, unless they both own the warehouse and conduct business as an operator. More generally, however, warehouse operators and warehouse owners may respond differently to compliance costs associated with PR 2305. For example, if PR 2305 triggers enough relocation on the part of warehouse operators to cause a sizable decline in demand, then, given the relatively inelastic supply of warehouse space in the South Coast AQMD region, property owners may see a decline in lease rates their properties can fetch, and as a result, may be willing to absorb a share of compliance costs to avoid loss of tenants.

1.

The survey of warehouse operators provided insights into operator behavior and possible responses to PR 2305. It would also have been an opportunity to obtain actual data on transportation routes (pathways). For example, the survey asks the question, “What region does your fleet typically serve?”, with *general* follow up questions about the routes used and locations they service. With properly framed questions, it might have been possible to obtain information that reflects *actual* behavior. For example, in addition to the general questions in the survey, one might ask for information on specific trips, such as: “For each vehicle in your fleet, please provide the origin, destination and path of the xth trip taken by that vehicle in the past week (or day or month).” As is known in the field of survey design, a self-reported general statement (“my usual commute is 30 minutes”) is laden with greater variability than a self-reported specific statement (“my commute today was 37 minutes).

11.

Beyond this point, while the technical approach to the relocation analysis is impressive, its validity can be bolstered by supplying additional background information, drawing comparisons with applicable knowledge and theory of the warehouse market, and using illustrative examples or thought experiments to demonstrate consistency of the relocation analysis with the likely situation for warehouse operators in real world circumstances.

12.

For example, while the report lists the set of costs that are a part of an operator’s location decision analysis, knowing the cost structure in the warehouse operator industry across the individual categories would provide valuable context. This would be particularly helpful if the relocation decision comes down to two or three cost categories such as real estate costs, regulatory costs, and transportation costs. Knowing the distribution of costs would make the relocation decision of an operator more transparent.

13.

Other assumptions of the analysis may be oversimplified and may merit more discussion than appears in the study. For example, the pathways analysis only considers transportation costs per mile of distance but does not take into consideration time costs of travel, which begs the question, if Southern California road congestion results in a higher time cost of travel compared to out of area, should differences in the time cost of travel be considered. Admittedly, if drivers are paid on an hourly basis, differences in the time cost of travel

14.

should be reflected in higher wage bills for local operators compared to non-local operators. If these differences are not incorporated into the analysis, at a minimum, IEC may outline a thought experiment that walks through such a comparison using plausible assumptions about wage costs, and per-mile costs, and then use the results of the thought experiment to shed light on the ramifications of omitting the time cost of travel from its analysis.

14.

It also appears that the process of determining which warehouse will relocate (most distant warehouse) is driven by distance and does not consider differentials in real estate costs across regions within the South Coast AQMD. While this may be a simplifying assumption, one might have more confidence in the report findings if a thought experiment or other construct is used to determine whether or not the results would be sensitive to differences in real estate costs.

15.

While the survey of stakeholders is a strength of the analysis, it should be complemented by drawing from the extensive literature on the relocation decisions of firms to describe the most important variables a firm considers when going through the relocation decision process. In particular, this would address the perception that costs of regulation drive firms to leave a given region or a given state. For example, relocation research shows that marginally profitable firms are more likely to relocate to improve profit margins, all else being equal. The literature also sheds light on the extent to which regulations and regulatory costs affect a firm's decision to move and adds context to the findings of the stakeholder survey.

3.

Even with the detailed discussion of the stakeholder survey results, there is room in the report for a more complete profile of the warehouse/fleet operators by individual industry components. This may include the number of operators, payroll employment, and distribution by size, as well as number of self-employed independent operators. These details have implications for the socio-economic characteristics and equity aspects of PR 2305 implementation for the operators, not just the communities and residents. A closer look may show that some individual industries are more sensitive to changes in regulations and compliance costs, hence more susceptible to relocation than others.

4.



INDUSTRIAL ECONOMICS, INCORPORATED

Responses to Kleinhenz Economics Review of Industrial Economics Socioeconomic Analysis of Warehouse Relocations

Response to Comment 1:

As the reviewer suggests, “warehouse operators” are the relocation decision makers modeled by IEC. Because warehouse operators can relocate in response to the rule, our focus on operator decisions provides South Coast AQMD with insights into the rule’s potential economic and emissions impacts within the AQMD’s boundaries. We agree with the reviewer’s suggestion that warehouse owners may lower the rents they charge to warehouse operators as an incentive for them to remain within the South Coast AQMD. In not capturing this effect, however, our analysis provides a conservative, high-end estimate of likely relocations.

Response to Comment 2:

We appreciate that additional background on the broader goods movement sector in the region may be useful to provide context for our analysis. Such information is available from several key sources listed below, from which we have summarized high-level findings relevant to this analysis.

The 2018 “Industrial Warehousing Study” from the Southern California Association of Governments (SCAG) catalogues the state of the industrial warehousing sector in Southern California, describes warehouse categories and functions, and interprets evolving trends in warehousing to determine the region’s ability to develop future capacity.⁵¹ This report also provides an inventory of warehousing space within the SCAG region, which though it uses different boundaries than the South Coast AQMD region and makes use of slightly older data, may be helpful context in comparison with the findings in Attachment 2 of this analysis.

Robert Leachman’s 2017 white paper “Strategic Initiatives for Inland Movement of Containerized Imports at San Pedro Bay” includes the detailed discussion of supply chain strategies IEC relied on for the development of the transport pathways in this analysis.⁵² A key trend discussed in Leachman’s paper is that fewer imported international shipping containers arriving through the San Pedro Bay are being shipped onward to inland ports via rail without first being sorted and inventoried in the Los Angeles vicinity. This growing trend results in more drayage between the ports and warehousing locations within the South Coast AQMD region to enable the disassembling and repacking of shipping containers prior to rail

⁵¹ Southern California Association of Governments (2018). Industrial Warehousing in the SCAG Region. https://scag.ca.gov/sites/main/files/file-attachments/final_report_03_30_18.pdf?1604268012.

⁵² Leachman, R. (2017) Strategic Initiatives for Inland Movement of Containerized Imports at San Pedro Bay. University of California at Berkeley. https://ieor.berkeley.edu/wp-content/uploads/2019/10/RCL-LA-Basin-Initiatives-Jan_13_2017.pdf.

transport. The result is a continued growth in reliance on warehousing in the area for the processing of imports.⁵³

SCAG's 2020 Regional Transportation Plan's "Goods Movement" chapter, as well as the corresponding appendix from the 2016 Regional Transportation Plan, include discussions of how national import strategies are evolving and the relevance of these changes to logistics and transportation networks in Southern California.^{54,55} A key finding is that strong growth in port traffic in other "corners" of the U.S., in addition to significant market share growth in Canadian and Mexican ports on the Pacific coast, is projected to continue to outpace growth at the Port of Los Angeles and Port of Long Beach.⁵⁶ The authors note that while not growing as quickly as other ports, sustained high demand continues at the Port of Los Angeles and the Port of Long Beach. This is driven in large part by continued anticipated growth in trade volumes from Pacific Rim nations, with a significant share of imports passing through the San Pedro Bay.⁵⁷

Response to Comment 3:

As the reviewer suggests, the literature does provide additional context for the location decision-making of firms. Targa et al. (2006) note the importance of transportation network availability and highway access as important components of firm economic success and location decision-making.⁵⁸ Similarly, Jaller et al. (2016) note the importance of transportation access and population centers in explaining warehouse and distribution center location decision-making specific to Southern California.⁵⁹ Hu et al. (2008) found that internal factors such as firm sales and employment do not play as large of a role as access to transportation options and the general economic environment.⁶⁰ Kang (2018) notes that Los Angeles warehouses built more recently (since 2000) have prioritized cheaper land and access to intermodal transport facilities relative to the labor center and port proximity of older warehousing infrastructure, though this may simply reflect the outward expansion of the Los Angeles area goods movement sector.⁶¹ Rivera et al. (2015) note the benefits realized by logistics firms of various sizes co-locating in logistics "parks," specifically increased employee training opportunities and the sharing of transportation capacity.⁶²

⁵³ Leachman (2017).

⁵⁴ Southern California Association of Governments (2020). Regional Transportation Plan Technical Report: Transportation System Goods Movement. https://scag.ca.gov/sites/main/files/file-attachments/0903fconnectsocial_goods-movement.pdf?1606001690.

⁵⁵ Southern California Association of Governments (2016). Regional Transportation Plan Appendix: Transportation System Goods Movement. https://scag.ca.gov/sites/main/files/file-attachments/2016rtpscs_goodsmovement_1.pdf.

⁵⁶ SCAG (2020).

⁵⁷ SCAG (2018, 2020).

⁵⁸ Targa, F., Clifton, K. J., & Mahmassani, H. S. (2006). Influence of transportation access on individual firm location decisions. *Transportation research record*, 1977(1), 179-189.

⁵⁹ Jaller, M., Pineda, L., & Phong, D. (2017). Spatial analysis of warehouses and distribution centers in Southern California. *Transportation Research Record*, 2610(1), 44-53.

⁶⁰ Hu, W., Cox, L. J., Wright, J., & Harris, T. R. (2008). Understanding firms' relocation and expansion decisions using self-reported factor importance rating. *Review of Regional Studies*, 38(1), 67-88.

⁶¹ Kang, S. (2018). Warehouse location choice: A case study in Los Angeles, CA. *Journal of Transport Geography*.

⁶² Rivera, L., Sheffi, Y., & Knoppen, D. (2016). Logistics clusters: The impact of further agglomeration, training and firm size on collaboration and value added services. *International Journal of Production Economics*, 179, 285-294.

With respect to policy changes specifically impacting firm relocation decisions, Pan et al. (2020) note that while traditional factors such as taxation and incentives do have a statistically significant effect on relocation decisions, individual policy changes are unlikely to influence firm relocation decisions without being inordinately large or arriving in combination with other policies or changes.⁶³ Similarly, Conroy et al. (2016) report small marginal effects of any individual factor on industrial firm relocation, stating the low likelihood of such decision-making being affected by changes to local or state-level taxes or other economic incentives.

As the reviewer mentions, firm profitability may also influence relocation decisions, and less profitable firms are more likely to consider alternatives.^{64,65} Given the low numbers of modeled relocations in our analysis, even under higher compliance cost scenarios than proposed in PR 2305, it is more likely that firm relocation decisions will be based off of transportation and goods pathway needs specific to each firm, which we capture by modeling each goods pathway separately. We also note that accounting for the financial health of individual warehouse operators in our modeling would not have been feasible with the available data.

Response to Comment 4:

South Coast AQMD staff have addressed this comment.

Response to Comment 5:

The long-term forecast in our analysis consists of projected developments plus “slack capacity,” defined as potential additional developments available on land zoned for industrial development plus projected vacancies. In calculating slack capacity, we subtract the land required for forecasted developments under the 2018 CoStar/Moody’s economic case. Projected developments represent roughly six percent of slack capacity in the outlying market areas (approximately 1,400 million square feet of estimated slack capacity versus 80 million square feet of forecasted developments). If a more recent forecast projects more warehouse development in the outlying market areas than the 2018 forecast used in our analysis, this would likely reduce the projected slack capacity available in these areas and, due to capacity constraints, potentially reduce the number of relocations (for those compliance cost scenarios where the estimated number of relocations is greater than zero). Thus, the forecast of outlying market capacity in the analysis supports the development of conservative estimates of relocations.

The reviewer also suggests that a more recent forecast could show an increase in warehouse development activity in the South Coast AQMD’s boundaries and that this development may imply more relocations than projected in our analysis. We note, however, that at the compliance cost of \$0.87 per square foot proposed in PR 2305, IEc’s analysis found that zero percent of warehouses in the South Coast AQMD are likely to relocate. The economics of the relocation decision would be the same for additional warehouses located in the South Coast

⁶³ Pan, Y., Conroy, T., Tsvetkova, A., & Kures, M. (2020). Incentives and firm migration: an interstate comparison approach. *Economic Development Quarterly*, 34(2), 140-153.

⁶⁴ Brouwer, A. E., Mariotti, I., & Van Ommeren, J. N. (2004). The firm relocation decision: An empirical investigation. *The Annals of Regional Science*, 38(2), 335-347.

⁶⁵ Pellenbarg, P. H., Van Wissen, L. J., & Van Dijk, J. (2002). *Firm relocation: state of the art and research prospects*. Groningen: University of Groningen.

AQMD. Thus, even if there are indeed more warehouse developments in the South Coast AQMD than we calculate in our long-term scenario, expected relocations would still likely be zero under the rule as it is proposed.

Response to Comment 6:

IEc’s primary use of the 2018 SCAG report “Industrial Warehousing in the SCAG Region” is to inform the warehouse categorization used throughout the analysis.⁶⁶ Because this general categorization has not significantly evolved since 2018, the 2018 SCAG report serves as a reasonable basis for the warehouse categorization relevant to PR 2305. Although SCAG’s October 2020 “Last Mile Freight Study” notes the increasing prevalence of smaller delivery fulfillment facilities oriented toward package sorting for last-mile delivery,^{67,68} most of these smaller facilities are unlikely to exceed the 100,000 square foot threshold for regulation under PR 2305.

With respect to recent trends in the flow of goods through the region’s ports, 2019 and the first half of 2020 saw slight declines in imports through the San Pedro Bay ports complex relative to 2018. The second half of 2020 resulted in a strong turnaround for imports, with the Port of Los Angeles finishing with 2020 as its fourth-largest cargo volume year ever and the Port of Long Beach having its single largest cargo volume year in its history.⁶⁹ The growth trend has continued in the first part of 2021, with January and February volumes at the Port of Los Angeles tracking 21 percent above the same months in 2020, and five percent above the same months in 2019.⁷⁰

Response to Comment 7:

South Coast AQMD staff have addressed this comment.

Response to Comment 8:

The reviewer suggests that the relocation of warehouse operators outside the South Coast AQMD region would increase the per-facility costs of complying with PR 2305 for those warehouses that remain. However, the costs of compliance with PR 2305 for a given facility are a function of each warehouse’s size and operations (truck trips). The number of warehouses in the regulated universe does not affect the costs of compliance for any one warehouse. Therefore, if any warehouse operators leave the South Coast AQMD region in response to the rule, we do not expect compliance costs for other facilities to be affected.

Response to Comment 9:

South Coast AQMD staff have addressed this comment.

⁶⁶ SCAG (2018).

⁶⁷ Southern California Association of Governments (2020) Last Mile Freight Study. https://scag.ca.gov/sites/main/files/file-attachments/2958_lastmilefreightstudy-final.pdf?1604195996.

⁶⁸ Southern California Association of Governments (2020). Regional Transportation Plan Technical Report: Transportation System Goods Movement. https://scag.ca.gov/sites/main/files/file-attachments/0903fconnectsocal_goods-movement.pdf?1606001690.

⁶⁹ Logistics Management (2021)

https://www.logisticsmgmt.com/article/port_of LOS_angeles_and_port_of_long_beach_end_2020_with_strong_volume_gain.

⁷⁰ Freightwaves (2021) <https://www.freightwaves.com/news/san-pedro-bay-congestion-recedes-to-christmas-eve-level>.

Response to Comment 10:

We agree with the reviewer's assertion that slower net absorption in the South Coast AQMD region coupled with growth in net absorption in some outlying markets is likely driven by a variety of factors other than warehouse operators shifting between the South Coast AQMD region and these other areas. Our intention was not to suggest warehouse operator relocation was the main driver of this pattern observed in the net absorption data but merely to highlight this pattern is consistent with relocation. Other possible factors include, as the reviewer mentions, each respective market area's economic growth and local demand for warehousing space. Cities in some areas, such as Western Arizona, actively recruit new warehousing developments. Increases in absorption in these areas cannot be specifically tied to relocations from the Los Angeles area without an understanding at the individual firm level.

Response to Comment 11:

Although it is possible that a survey of warehouse operators on the goods flow movements through their warehouses would have generated useful information, Leachman (2017) includes the most detailed analysis of goods movement in the Los Angeles area that we were able to identify from published or unpublished sources. It reflects input that Leachman obtained through industry interviews, as well as statistics for goods pathway identification from sources such as the Alameda Corridor Transport Authority, Union Pacific, and BNSF. While a few years have passed since this report's writing, we are unaware of any information to suggest that the general goods distribution shares across pathways has changed significantly in that time. Therefore, given the quality of the Leachman (2017) study and the significant resources required to obtain the detailed information necessary to update the study, we focused our efforts on applying Leachman's findings to develop a detailed understanding of the transportation cost implications of warehouse operator relocation.

Response to Comment 12:

In response to the reviewer's suggestion for illustrative examples, consider the example of two warehouse operators weighing relocation to the Phoenix market. The first operator largely supports goods bound for rail transport for national distribution (e.g., Pathway 6 in our analysis), and the second operator is on a goods flow pathway concluding in distribution within the South Coast AQMD region, such as Pathway 3. For the first operator, relocation from the South Coast AQMD region to Phoenix would entail trucking goods to Phoenix for repacking, followed by drayage to the rail terminal in Phoenix. The goods would not have to be transported significant extra distance, but the change in transportation costs would be due to truck transport being more expensive than rail (see Exhibit 1 below). Alternatively, for the second warehouse operator on Pathway 3, goods must be trucked all the way to Phoenix and then back to the South Coast AQMD region. There are also no avoided rail costs associated with the warehouse on Pathway 3, as there are for the warehouse on Pathway 6. As shown in Exhibit 1, the total change in transportation costs is almost three times higher for goods flowing through the warehouse on Pathway 3 (\$147,000 per square foot per year) versus the warehouse on Pathway 6 (\$63,000 per square foot per year). The other cost impacts associated with relocation to Phoenix are the same for the two warehouses (also shown in Exhibit 1).

As demonstrated in the above example, the end market for distribution of the goods passing through a warehouse has a significant influence on the changes in transportation costs due to potential relocation. In practice, each warehouse operator is likely to serve a unique combination of pathways that evolves over time, as opposed to serving just a single pathway as presented in our illustrative example. It is possible that changes to the goods that individual warehouse operators manage may affect decision-making around relocation. We note, however, that under the expected compliance costs for PR 2305, our analysis shows no relocations under any single pathway. Thus, a combination of pathways is unlikely to result in different decision-making.

EXHIBIT 1: SAMPLE WAREHOUSE CHANGES IN OPERATING COSTS - RELOCATION TO PHOENIX MARKET AREA

Cost Category	Warehouse Serving Pathway 3 - South Coast AQMD Distribution (\$/1000 sq. feet per year)	Warehouse Serving Pathway 6 - National Distribution (\$/1000 sq. feet per year)
Rent	\$ 4,610 - cost savings	\$ 4,610 - cost savings
Labor	\$ 1,962 - cost savings	\$ 1,962 - cost savings
Power	\$ 549 - cost savings	\$ 549 - cost savings
Transportation (Trucking and Rail)	\$ 147,211 - cost increase	\$ 62,629 - cost increase

Response to Comment 13

In response to the reviewer’s suggestion that we provide data on the cost structure of warehouse operators in the Southwest region, Exhibit 2 below outlines total baseline geographically-variable operating costs for model 500,000 square foot warehouses in different locations, as reported by The Boyd Company.⁷¹ This is the source we primarily relied on for calculating differences in operating costs across market areas, as described in greater detail in Attachment 4. As indicated in Exhibit 2, costs considered in the Boyd report include labor, power, amortization, taxes, and shipping. These categories differ slightly from those considered in our analysis. We assume amortization and tax costs reported by Boyd are captured in rents. The shipping costs as reported by Boyd reflect only outbound shipments, do not account for differences in rail transport costs, and appear to assume a much lower truck trip rate than is expected under PR 2305.

⁷¹ The Boyd Company (2015). “Comparative Distribution Costs in Port and Intermodal-Proximate Cities: Distribution Warehouse Site Selection.”

EXHIBIT 2: SAMPLE WAREHOUSE TOTAL OPERATING COSTS - 500,000 SQUARE FOOT
GENERAL DISTRIBUTION WAREHOUSE IN SELECT AREAS

Cost Category	Location:	Mira Loma, CA	Victorville, CA	Mesquite, NV	Kingman, AZ
	Market Area:	South Coast AQMD	Bakersfield	Las Vegas	Western AZ
Labor		\$ 6,448,562	\$ 5,759,695	\$ 5,132,061	\$ 4,802,935
Power		\$ 837,888	\$ 837,888	\$ 769,080	\$ 655,200
Amortization		\$ 4,072,557	\$ 3,922,992	\$ 3,679,813	\$ 3,121,886
Property and Sales Tax		\$ 1,260,146	\$ 1,292,371	\$ 1,105,588	\$ 1,596,576
Shipping Costs		\$ 293,772	\$ 524,815	\$ 1,803,532	\$ 1,760,047
Total Annual Geographically-Variable Operating costs		\$ 12,912,925	\$ 12,913,886	\$ 12,490,074	\$ 11,936,644

Response to Comment 14:

The available data on fully loaded trucking costs (i.e., with labor, vehicle wear and tear, etc.) are expressed on a per mile basis rather than per hour. Because labor represents a significant portion of these costs, we agree with the reviewer that congestion is likely to affect the trucking cost per mile. However, we do not believe that explicitly incorporating congestion effects into our analysis would change the conclusions of the analysis. Regardless of warehouse location, trucks must still pass through the congested Los Angeles metro area for all of the goods flow pathways included in our analysis in the baseline and under the proposed rule scenario. In addition, if a warehouse operator were considering relocation to an outlying market and serves goods flow pathways involving local distribution to the South Coast AQMD region, accounting for congestion could *increase* the estimated cost of relocation. Under this scenario, goods would flow through the congested L.A. area *en route* to the outlying area warehouse and would travel through the L.A. area again for local distribution. To the extent that this congestion effect is not represented in the unit cost values applied in our analysis, we may underestimate the transportation cost impact of relocation and overestimate the number of relocations.

Response to Comment 15:

The reviewer correctly points out that different areas within the South Coast AQMD have different average rental prices for warehousing space. Using data available at the county level, rents within the South Coast AQMD's boundaries are higher in Los Angeles county, where rental prices are \$11.19 per square foot per year, which is \$0.58 higher than the South Coast AQMD average value of \$10.61 used in the modeling. Thus, warehouse operators located in Los Angeles County could expect to see an additional \$0.58 per square foot in cost savings following relocation. Combining this with the \$0.87 per square foot expected compliance cost of PR 2305, this difference in rents effectively corresponds to warehouse operators saving \$1.45 per square foot due to relocation. Within the context of our analysis,

this is similar to avoiding \$1.45 per square foot in compliance costs by relocating. However, because our analysis of the \$1.50-per-square-foot compliance cost scenario shows no incremental relocations, we would not expect warehouse operators paying rent in the more expensive areas of the South Coast AQMD to relocate under the proposal.

South Coast AQMD Responses to Kleinhenz Economics Review of Industrial Economics Socioeconomic Analysis of Warehouse Relocations

Response to Comment #1

Industrial Economics, Inc. (IEc) staff have addressed this comment.

Response to Comment #2

IEc staff have addressed this comment.

Response to Comment #3

IEc staff have addressed this comment.

Response to Comment #4

South Coast AQMD staff has produced a draft socioeconomic impact assessment for PR 2305 which addresses several of the reviewer’s concerns. The draft socioeconomic impact assessment for PR 2305 addresses information about the number of warehouse operators, small-business considerations, and other socioeconomic characteristics of facilities with warehousing operations.

Response to Comment #5

IEc staff have addressed this comment.

Response to Comment #6

IEc staff have addressed this comment.

Response to Comment #7

The commenter is correct to note the importance of truck trip rates for PR 2305. For this reason, warehouse operators will be required to report actual truck trip data for their operations. This source of information is currently unavailable from any other data source. The 2014 SCAQMD High Cube Warehouse Truck Trip Study was a multi-year effort that concluded with the Institute of Transportation Engineers (ITE) – the preeminent national organization for transportation engineers – completing the analysis and incorporating it into their industry standard Trip Generation Manual. This manual is the basis for the vast majority of transportation engineering studies conducted for development projects in South Coast AQMD and throughout the nation, and continues to be used today. The trip rates are also incorporated into CalEEMod, the primary model used throughout the state to estimate air quality impacts from new development, including for warehousing.

While different types of warehousing will have different trip characteristics, the use of the ITE trip rates provide the most reasonable average to consider a large population of warehouses, such as those covered by PR 2305. Based on the results of that study, the actual trip rates at individual warehouses are expected to vary considerably, but considered

together should approximate the average. Importantly, each warehouse operator's compliance obligation will not be tied to the ITE trip rate. Rather it will be tied to their actual truck trip rate, and the costs they experience due to PR 2305 will be directly tied to their own activity. If PR 2305 is approved by the South Coast AQMD Board, the trip rate data collected may be able to inform future versions of ITE's Trip Generation Manual.

Response to Comment #8

IEc staff have addressed this comment.

Response to Comment #9

The commenter's emphasis on the importance of the region's goods movement industry relative to other ports is acknowledged and has been addressed elsewhere, in particular in Chapter 3 of the draft staff report in the Rule Stringency section, as well as the draft socioeconomic impact assessment for PR 2305. Discussion in Chapter 3 of the draft staff report includes an evaluation of conditions at the ports, including their own economic study of their proposed update to the Clean Truck Rate program.

Response to Comment #10

IEc staff have addressed this comment.

Response to Comment #11

IEc staff have addressed this comment.

Response to Comment #12

IEc staff have addressed this comment.

Response to Comment #13

IEc staff have addressed this comment.

Response to Comment #14

IEc staff have addressed this comment.

Response to Comment #15

IEc staff have addressed this comment.